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Diseases of Fruit and Nut Crops

In the United States in 1926

July 30, 1927

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PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

DISEASES OF FRUIT AND NUT CROPS IN THE UNITED STATES IN 1926

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CONTENTS

INTRODUCTION

In the preparation of this summary the compilers have made use of all the information received by the Plant Disease Survey during 1926 on the subject of diseases of fruits and nuts. This information came principally from three sources, namely: from collaborators of the Plant Disease Survey, who supplied 2,176 individual plant reports, from articles in the literature of the year, and from reports furnished by the members of the Office of Fruit Disease Investigations. Acknowledgment is made of the assistance of collaborators and the following members of the Fruit Disease Office: W. S. Ballard, Charles Brooks, J. B. Demaree, B. O. Dodge, J. C. Dunegan, D. F. Fisher, J. W. Roberts, D. H. Rose, N. E. Stevens, and M. B. Waite.

FRUIT DISEASES OF 1926

DISEASES OF POME FRUITS

APPLE

SCAB CAUSED BY VENTURIA INAEQUALIS (CKE.) ADERH.

Apple scab is widespread over the United States and may be considered as the most important of the major diseases of the apple. Reports of collaborators indicate that since 1918 it has caused an annual loss averaging approximately 5 per cent. The states reporting the heaviest losses during this period of time are: Kentucky, 18 per cent; Maine, 13 per cent; New York, Pennsylvania, and Iowa, each 10 per cent; Tennessee, 9 per cent; Michigan, 8 per cent; Ohio, Wisconsin, South Dakota, Virginia, North Carolina, and Oregon, each 6 per cent.

Scab was of minor importance in 1926, only one state, Tennessee, out of 25, reporting more than usual, while 17, Connecticut, Virginia, Indiana, Nebraska, Arkansas, Kansas, New Jersey, Mississippi, Delaware, West Virginia, Illinois, Iowa, Missouri, Pennsylvania, New York, and Oregon, reported less. The loss for the United States was approximately 3.5 per cent, which marks the second successive year of slight infection. The percentage losses reported for 1926 are given in table 1.

Apple - Scab

Evidently the hot dry weather during the spring interfered with the normal development, ejection and germination of ascospores and thus reduced the usual infection. Alabama, Delaware, Illinois, Indiana, Arkansas, Massachusetts, Minnesota, Missouri, Nebraska, New York, New Jersey, North Carolina, Ohio, Oregon, Virginia, and Wisconsin, all reported adverse weather for early scab development, and in many states the same unfavorable conditions persisted during the summer. In Minnesota, Wisconsin, Arkansas, and Michigan favorable conditions occurring in the latter part of the season brought on a late infection, especially on the leaves. The data on spore discharge and on earliest appearance are given in tables 2 and 3.

The following selected extracts from reports of collaborators will represent the general conditions for the year:

> Illinois: To explain the remarkable absence of scab throughout the southern half of the state we must go back to the season of 1925. During that year very little scab developed and as a consequence the amount of overwintering scab on dead leaves was much below normal. The fall development of scab on the leaves was prevented by hot, dry weather. Observations on overwintering are made each spring at the University, but extreme difficulty was experienced in finding the perfect stage in the spring of 1926. The growing season of 1926 opened nearly two weeks late in most sections of the state and for this reason the young leaves were not exposed until the early part of May when very dry weather prevailed throughout the state. Rainy periods in the latter part of May and the middle of June were responsible for rather serious scab conditions in some sections in the northern half of the state. (Anderson)

> Alabama: Scab much less injurious than usual this year due to unfavorable weather for ascospore dispersal. (Miles)

> Arkansas: Apparently the season was exceptionally favorable but scab did not develop as commonly as predicted. Since scab was almost absent last year, the lack of infective material might be a factor. (V. H. Young)

> Massachusetts: Unusually dry weather prevailed in Massachusetts during April and May, and as a result ascospore development was retarded and spore ejection delayed. Infection was very light in most orchards. (Osmun, Doran, Guba)

> Missouri: Usually abundant but scarce this year, even on leaves. (Archer)

> New York: Has caused less damage than for several years past. Severe in a few orchards of susceptible varieties like McIntosh but this variety has a light crop this year. (Mills)

> North Carolina: As a rule more prevalent in mountains than in Piedmont section. (Fant)

Apple - Scab

Ohio: Scab serious only in one section of the state. (H. C. Young)

Oregon: Abundant sunshine and dry atmospheric conditions prevailing in March and April were rather unfavorable to spore formation and infection. (Barss)

South Dakota: Although the season was very hot and dry yet scab is reported to be most severe disease of apple. (Evans)

Tennessee: Apparently increasing in seriousness. (McClintock)

Wisconsin: Much less than usual. Most trees show very little foliage infection. The season has been too dry for scab to develop rapidly. (Vaughan)

Indiana: This is the second year that apple scab has been mild. There was practically no scab in well sprayed orchards, except perhaps in the northeast corner of the state. The season was very late and rather dry weather prevailed during the comparatively short period when infection occurs. (Gardner)

No new data have been contributed by collaborators this year concerning the susceptibility of varieties.

The New Jersey Department of Plant Pathology submitted figures showing the season's results in experimental control of scab on Winesap and Stayman with various spray and dust combinations and applications. It is clear from these data that spray mixtures give uniformly better results than the dust applications. The sprays and dusts used were concentrated lime sulfur; colloidal sulfur; 6-4-50, 8-4-50; and 8-8-50 dry mix; 90-10 and 70-10-20 dust; and Kolotex. The regular schedule followed consisted of concentrated lime sulfur at Pink and 8-4-50 dry mix at Calyx, 7 day, 17 day and 4 weeks. In the comparison of various spray materials and combinations it seemed that concentrated lime sulfur all seasons gave slightly better control (97.5 per cent. scab free fruit) than the regular schedule. In the use of regular schedule combined with dusts it was found that 70-10-20 dust starting at Calyx gave 81.7 per cent scab free fruit but that Kolotex starting at Calyx gave 87.6 per cent scab free fruit.

The data in table 4 showing correlation between date of spray application and ascospore ejection in 1926 has been contributed by Schneiderhan as a supplement to table 2 which appeared in his publication (15). He finds that during the last five years 75 per cent of the ascospore ejections have occurred between the Pink and 5 week applications.

The results of control studies in Ohio (1 and 3) show that: (a) timeliness of spraying, gaged by spore discharge, is important; (b) controlling initial infection is necessary; and (c) the expense of spraying can vary with rainfalls, the latter governing initial infection. A graph is given showing the relation of the amount of rainfall to spore discharge.

Keitt and Wilson (11) point out the possible value of reducing ascosporic inoculum by the use of post-harvest sprays prior to leaf fall. Mention is made of preliminary limited trials with various materials, such as copper, sulfur, mercury, arsenic preparations, and fluosilicates.

Apple - Scab

Roberts and Pierce (14) recommend spraying with lime sulfur solution (a) directly after the opening of the blossom clusters, (b) immediately after the fall of the petals, and (c) additional sprayings from 2-4 weeks and from 8-10 weeks after petal fall, depending on the weather. Dusts were not found to be as efficient as dilute lime sulfur.

Table 1. Percentage losses from apple scab, as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
16	Iowa	1	Illinois, Ohio, Pennsylvania
6	North Carolina, New Jersey	.5	Delaware, Indiana, California
5	Michigan, Wisconsin, South Dakota, Montana	Trace	West Virginia, Minnesota, Missouri, North Dakota, Kansas, Nebraska, Idaho, Washington, Mississippi, Arkansas
3	New York		
2.5	Maryland		
2	Virginia, Alabama, Oregon		

Table 2. Data relating to ascospore maturity and ejection as reported by collaborators, 1926.

State and locality	Date	Condition of fungus: First mature ascospores noted	Condition of fungus: First spore ejection noted
Delaware	March 18	x	
Connecticut	March 28	x	
Virginia, Winchester	April 8		x
Maryland	April 28		x
Michigan	April 30	x	
Massachusetts, Amherst	May 3		x
New York, Chautauqua Co.	May 5	x	
Wayne Co.	May 7	x	
Dutchess Co.	May 9	x	
Ithaca	May 10	x	
Canada, Ontario	May 10	x	
Massachusetts, West Acton	May 11		x
New York, Ulster Co.	May 17	x	

Apple - Scab

State and locality	Date	Condition of fungus: First mature ascospores noted	Condition of fungus: First spore ejection noted
Canada,			
Ontario	May 19	x	
Ohio	June 1	x	
New York,			
Monroe Co.	June 1	x	
Ontario Co.	June 24		x

Table 3. Dates and places of first observation of apple scab, as reported by collaborators, 1926.

Date	Place	County	State
April	- - -	- - -	Tennessee
May 8	- - -	Ulster	New York
May 8	Snow Hill	Worcester	Maryland
May 13	Raleigh	Wake	North Carolina
May 14	Bridgeton	- - -	Connecticut
May 18	Snohomish	Snohomish	Washington
May 20	Urbana	Champaign	Illinois
May 20	- - -	Bucks	Pennsylvania
May 25	Blacksburg	Montgomery	Virginia
May 26	- - -	Simpson	Mississippi
June 1	- - -	Dutchess	New York
June 1	Milford	New Haven	Connecticut
June 2	Staunton	Augusta	Virginia
June 9	Dover	Kent	Delaware
June 9	- - -	Greene and Orange	New York
June 9	- - -	Knox	Indiana
June 14	- - -	Onondaga	New York
June 17	Faribault	Rice	Minnesota
June 17	Ontario	- - -	Canada
June 18	Amherst	Hampshire	Massachusetts
June 23	Sturgeon Bay	Door	Wisconsin
June	- - -	- - -	South Dakota

Table 4. The correlation between the dates of spray application and ascospore ejections for 1926 at Winchester, Virginia.

Spray	Dates of Spray application	Dates of Ascospore ejection
Delayed Dormant	March 31	April 8 April 11
Pink	April 26	
Calyx	May 10	May 16 May 19
10-days	May 28	June 5 June 12 June 13 June 15
5-weeks	June 18	June 23
10-weeks	July 5	
Total		9

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3. Ballou, F. H., and I. P. Lewis. Spraying to control apple scab and apple blotch in southeastern Ohio. Proc. Ohio State Hort. Soc. 59: 165-181. 1926.

4. Bremer, H. Ausbaumöglichkeiten in der Pflanzenschutzstatistik. (Beispiel: Die Beziehungen des Apfelfusikladiums zum Wetter.) Nachrichtenbl. Deutsch. Pflanzenschutzdienst 6: 1-2, 12-13. 1926.

5. Dutton, W. C. Concentration of materials and rates of application in the control of apple scab. Michigan Agr. Exp. Sta. Techn. Bul. 76: 1-18. June 1926.

6. Howitt, J. E., and W. G. Evans. Preliminary report of some observations on ascospore discharge and dispersal of conidia of Venturia inaequalis (Cke.) Wint. Phytopath. 16: 559-563. Aug. 1926.

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10. ________ and L. K. Jones. Studies of the epidemiology and control of apple scab. Wisconsin Agr. Exp. Sta. Res. Bul. 73: 1-104. Dec. 1926.

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14. Roberts, J. W., and L. Pierce. Apple scab. U. S. Dept. Agr. Farm. Bul. 1478: 1-11. 1926.

15. Schneiderhan, F. J. Apple disease studies in northern Virginia. Virginia Agr. Exp. Sta. Bul. 245: 3-35. 1926.

16. Shear, E. V. Field trials of spray materials on apples in 1925. Proc. New York State Hort. Soc. 71: 145-150. 1926.

17. Thurston, H. W. Pennsylvania's experience with the dusting of apples. Proc. Ohio State Hort. Soc. 59: 138-140. 1926.

BLOTCH CAUSED BY PHYLLOSTICTA SOLITARIA ELL. & EV.

Of the major apple diseases in the United States blotch ranks about third in importance according to reports of collaborators during the past nine years. As mentioned in previous reports the disease is rather sharply confined to the area south of the 42nd parallel and east of the 100th meridian. A comparison of Fig. 1 of this publication with Fig. 2 in Plant Disease Reporter Supplement 14 will show that an extension in the area of severe infestation and loss has occurred in all directions, particularly eastward and southward, since 1920. In Fig. 1 there are indicated the localities in Minnesota, Wisconsin, Michigan, and New York where infection has been reported outside the usual area. These are of interest in conjecturing on the possibility of blotch spreading into northern states. This year in Rock County, Wisconsin, Vaughan reports a new location, stating that blotch occurred with a late scab infection. This report coupled with that of last year from Waushara County, where 50 trees with a 75 per cent infection were found, would lead to the assumption that the disease is gradually gaining a foothold in the state. The situation in New York on the other hand may be somewhat different since Thomas reports that:

"Blotch on apple seedlings planted at Ithaca in May 1924 has shown only slight spread on the originally infected trees. Only one small canker has been found on one of five budded trees interplanted with these seedlings. Clean seedlings planted in a row continuous with the infected seedlings show no blotch at the end of three seasons. Each of three lots of infected seedlings, the shipment of which has been traced, came to New York from Iowa."

Likewise Bennett reporting for Michigan states that blotch is extremely rare and that it was observed on trees sent in from southern nurseries. He states:

"Specimens of blotch were received this spring from Riverside. Upon investigation it was found that the trees had been set in the spring of 1924 and that all trees were badly infested when received. There was a small amount of infection on the growth of 1924, but the growth of 1925 shows no signs of blotch and this season's growth is also free."

Indiana collaborators report the discovery, in September, of cankers of nursery origin on young trees at Marquette, Michigan. This is the farthest north that blotch has been reported yet. In the meantime reports of collaborators in Illinois, Indiana, Ohio, Pennsylvania, and New Jersey indicate that each succeeding year the area of infestation steadily creeps northward.

Estimated percentage losses are given in table 5. Collaborators' reports on the prevalence of blotch in comparison with the normal year show that the season of 1926 was perhaps an average year, since out of 18 states 11 report the usual prevalence while 7 report less.

The following are the only reports of value contributed this year on the subject of the relation of the weather to blotch.

Illinois: The weather in southern Illinois where blotch is a real problem could not have been more unfavorable. May and June were extremely dry and even unsprayed Duchess was free from infection. Some blotch developed at the northern edge of the blotch region, i.e., from Neoga north to Champaign, but even here the control was easily accomplished by the few sprays applied. (Anderson)

Tennessee: Warm and moist weather favorable to disease. (McClintock)

Virginia: Sufficient rain to cause spore emission. Hot weather and late season rains favored the dissemination. (Schneiderhan)

Apple - Blotch

Spore emergence and infection data were received from Virginia and Illinois as follows:

> Virginia: A close correlation between spore emissions and the relative values of blotch sprays was found to exist in our experimental work on blotch control in 1925 and 1926. There were nine spore emissions from blotch cankers in 1926. The first occurred May 19 and the last on July 10. The average time between emissions was six days. In 1925 there were only seven emissions occurring eight days apart, from May 24 to July 15. In 1925, 57 per cent of the early spore emissions occurred just after the 5-weeks spray. In contrast to this, approximately 55 per cent of the total spore emission occurred earlier in 1926, namely, just after the application of the 3-weeks spray. Compared to the total seasonal control value, the 5-weeks spray in 1925 was valued at 59 per cent, while the 3-weeks spray in 1926 was worth 53 per cent. These values were determined from our blotch control experiment. (Schneiderhan)

> Illinois: Conditions in 1925 account in part for the behavior of blotch in 1926. Very little blotch was present in 1925 and thus twig infection was rare. Many orchards were examined where blotch had been serious in previous years and the wood of 1926 was found to be nearly free of cankers. However, cankers and spores were abundant on the 1924 wood, so that there was no lack of sources of infection in the spring of 1926 (see data under weather conditions). (Anderson)

In general the collaborators report that spraying gave good control in the following states: Tennessee, Ohio, Arkansas, New Jersey, Delaware, Pennsylvania, Virginia, and Missouri. W. H. Martin reports good control in New Jersey by the use of the regular schedule, 2-4-50 Bordeaux mixture 4-10 weeks after petal-fall.

In Ohio (1) it was found that under the conditions of the experiment Bordeaux gave considerably better control of blotch than lime sulfur. It is stated that from the results of two years' tests it would seem inadvisable to use lime sulfur for the cleaning up of blotch in a badly infested orchard. It was further found that the effectiveness of lime sulfur depends upon the time of blotch infection, which is entirely regulated by weather conditions. When the infection was early, as in 1924, lime sulfur was very efficient, especially where the 2-, 4-, and 6-weeks sprays were applied. On the other hand, when the infection was late, lime sulfur was less effective, due, undoubtedly, to the long period between the 6-weeks and second codling-moth spray.

Canker eradication gave effective control results in Indiana according to Gardner. He states that:

> "The effectiveness of canker eradication in relation to prevention of the disease in young plantings was demonstrated by the second year's results in the two blocks of Duchess from which the blotch sprays were omitted. These blocks were in orchards in which the canker eradication campaign was begun in 1922. A good crop was produced this year and a careful examination of the fruit showed practically no infection in the

unsprayed blocks, a result which indicates not only that the canker eradication had been successful but that there is very little long distance spread of blotch by such agencies as wind, insects, or birds."

Gardner (3) again reports the effectiveness of blotch canker eradication in two young apple orchards of Oldenburg in which was demonstrated freedom from fruit infection in blocks of trees left unprotected by the blotch sprays during 1925 and 1926. One of the orchards was set out in 1917, the other in 1918. The eradication campaign was begun in 1922 and consisted of shaving off or pruning out the old cankers and spraying to prevent the formation of new cankers.

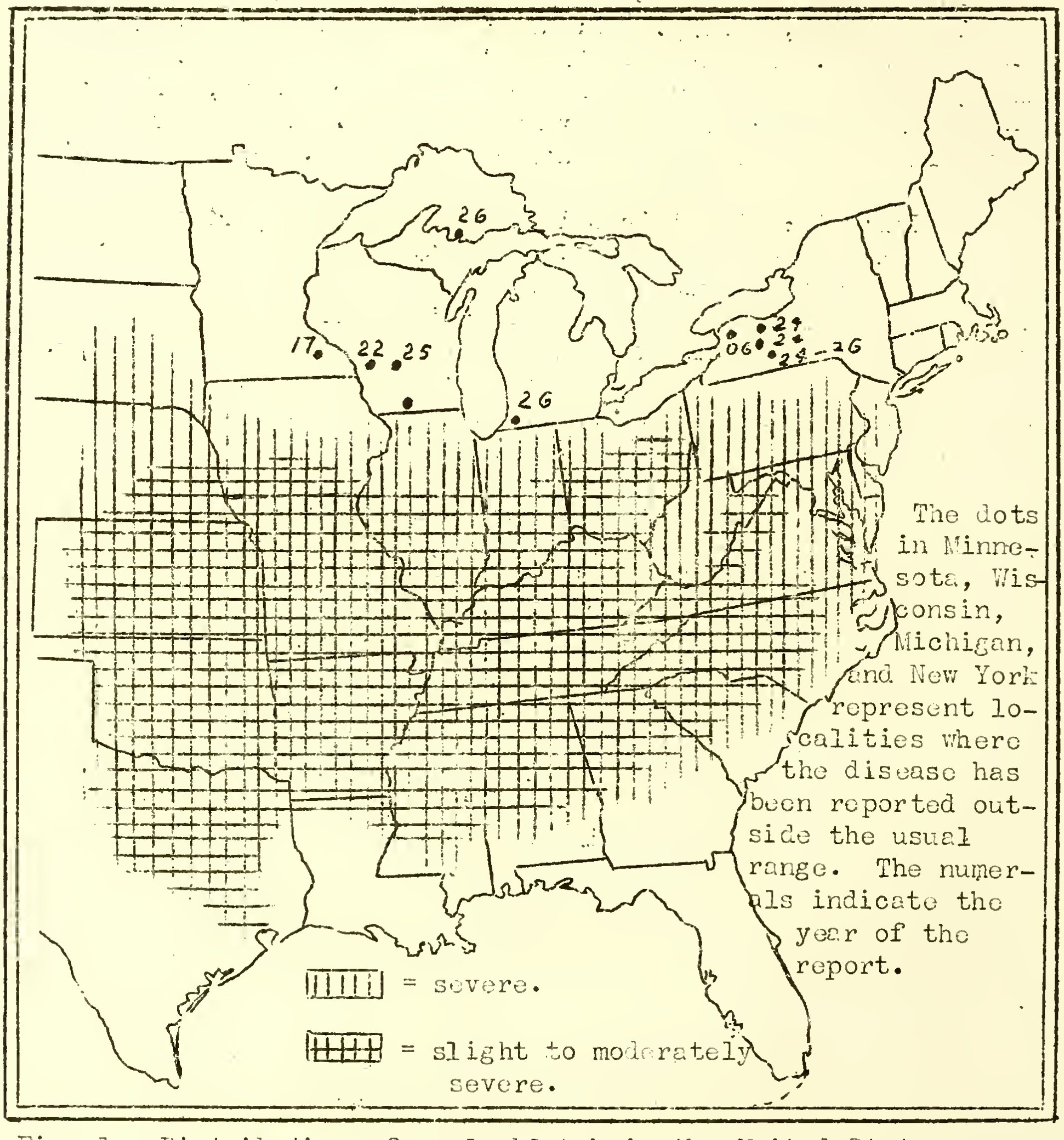

Fig. 1. Distribution of apple blotch in the United States - revised to 1926.

Table 5. Percentage losses from apple blotch, as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
15	Missouri		Illinois
5	Tennessee	.5	New Jersey
4	Kansas	Trace	Delaware, Virginia, West Virginia, Georgia, Wisconsin, Iowa, South Dakota
3.5	North Carolina, Alabama		
1.5	Ohio, Indiana		
1	Maryland, Mississippi, Texas, Arkansas,		

Recent literature

1. Anon. Forty-fourth Annual Report of the Ohio Agricultural Experiment Station for 1924-25. In Ohio Agr. Exp. Sta. Bul. 392: 11-99. 1926.

2. Ballou, F. H., and I. P. Lewis. Spraying to control apple scab and apple blotch in southeastern Ohio. Proc. Ohio State Hort. Soc. 59: 165-181. 1926.

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CEDAR RUST CAUSED BY GYMNOSPORANGIUM JUNIPERI-VIRGINIANAE SCHW.

According to reports of collaborators during the past nine years cedar rust ranks about fifth among the major diseases of apple and is confined to the eastern half of the United States. The average annual loss since 1918 is estimated at slightly more than 1 per cent, with Virginia, North Carolina, West Virginia, Iowa, Nebraska, South Carolina, and Missouri, in order of importance, reporting the heaviest losses. This year the majority of the states reported the prevalence of the disease to be the same or less when compared with last year and with the average year. Nebraska, Kansas, Connecticut, and Arkansas reported more in comparison with last year and with the average year. The percentage losses in 1926 are given in table 6. Goss reported that in Nebraska cedar rust caused more damage this year than any other apple disease and that there was severe injury on fruit, whereas usually only leaf infection occurs. The early season was very dry, retarding somewhat the development of fruit and leaves. In Kansas, White reported a heavy infection which caused defoliation of susceptible varieties. Fant in North Carolina reports that damage to foliage is probably greater than to fruit.

The information received on susceptibility is included in the following notes and in table 8. Fant states that in North Carolina the susceptibility of Magnum foliage to infection has been noted for a number of years. White reports that in Kansas infection on Wealthy has been so severe that normal twig growth will be hindered. In Virginia, according to Schneiderhan, the susceptibility of York to infection varies widely even in the same orchard. The younger and rapidly growing trees are much freer from the disease than the older ones. He explains that it seems to be a case of correlation of vigor resulting from fertilization and cultivation with lessened susceptibility.

Data on relation to weather conditions in 1926 are very meager. Ohio and South Dakota report unfavorable weather conditions for rust development while Tennessee and Mississippi report favorable conditions.

> Virginia: Dry early season prevented teliospore formation and ejection. There were 10 teliospore ejections in 1926 from April 11 to July 4, while in 1925 there were 21. Lack of rain in April and May evidently accounted for this difference. In spite of fewer spore ejections, the infection was heavier in some places than in 1925. (Schneiderhan)

The following notes were received concerning the relation of cedars to rust:

> Arkansas: Rather prevalent and serious where cedars have not been cut, but reported in many areas supposedly cleared of cedars. (V. H. Young)

> Minnesota: Only traces found in vicinity of cedars. (Dept. Pl. Path.)

> Virginia: Occurs in appreciable amounts only where red cedars are very near to apple trees. (Fromme)

Apple - Cedar Rust

Table 6. Percentage losses from cedar rust of apple, as reported by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
3	Virginia	.1	Tennessee, Ohio
2	North Carolina, Arkansas, Iowa, Kansas	Trace	Delaware, South Carolina, Alabama, Mississippi, Michigan, Wisconsin, Minnesota, Missouri
1	Connecticut, West Virginia, Illinois, South Dakota		
.25	Maryland		

Table 7. Dates and places of first observation of cedar rust of apple, as reported by collaborators, 1926.

Date	Place	County	State
April 15	- - -	- - -	Tennessee
May 30	Winchester	Frederick	Virginia
June 3	Spartanburg	Spartanburg	South Carolina
June 7	Manhattan	Riley	Kansas
June 8	Le Sueur	Le Sueur	Minnesota
June 9	Mitchell	Lawrence	Indiana
June 10	Mt. Carmel	New Haven	Connecticut
June 11	Cumberland	- - -	New Jersey
June 24	Millsboro	Sussex	Delaware
July 15	Madison	Dane	Wisconsin
July 19	- - -	Ulster	New York

Table 8. Comparative susceptibility of apple varieties as reported by collaborators, 1926.

Very susceptible	Susceptible	Resistant	Very resistant	Immune
Ensee 4	Crabs 5	Gano 4	Delicious 4	Arkansas 4
Jonathan 2	Delicious 7, 8	Grimes 4	Stayman 8	Grimes 8
Rome 2, 8	Golden Delicious 6	McIntosh 4	Winesap 8	Northwestern Greening 4
Wealthy 1,3,4		Newtown 4		
	Henry Clay 4		York Imperial 4	Stayman 4
York 8		Rome 4		
	Jonathan 4,6			Winesap 4

Very susceptible	Susceptible	Resistant	Very resistant	Immune
	Palouse 4	Wagener 4		Yellow Transparent 4
	Rome 7			
	Starr 7			
	Wealthy 6			
	Winter Banana 6,7			

The numerals used in the table above refer to the collaborator and state from which the data was received, as follows:

1. G. P. Clinton in Connecticut.
2. M. W. Gardner in Indiana.
3. J. C. Gilman in Iowa.
4. R. P. White in Kansas.
5. Minnesota Department of Plant Pathology.
6. W. A. Archer in Missouri.
7. W. H. Martin in New Jersey.
8. F. J. Schneiderhan in Virginia.

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1. East, W. H. Cedar cutting. Proc. Virginia State Hort. Soc. 30 (1925): 84-87. 1926.

2. Schneiderhan, F. J. Cedar rust studies in 1925. Proc. Virginia State Hort. Soc. 30 (1925): 134-140. 1926.

BLACK ROT OF APPLE CAUSED BY PHYSALOSPORA MALORUM (PK.) SHEAR

In general this disease is more prevalent and causes most loss in the eastern half of the United States, although it is found occasionally in western apple growing states. From reports of collaborators during the past nine years it is estimated that black rot canker, leaf spot, and fruit rot have caused an average yearly loss of slightly less than 1 per cent. During this period the states reporting the heaviest losses have been North Carolina, South Carolina, Georgia, and Ohio, each with an approximate average of 4 per cent; Tennessee, Oklahoma, and Iowa, each approximately 3 per cent; and Pennsylvania, West Virginia, Kentucky, Mississippi, Indiana, and Missouri, each approximately 2 per cent. In 1926 the majority of the states report that the prevalence of the disease is the same or more compared with both last year and the average year. Delaware, Mississippi, and Ohio report less in comparison to last year and the average year. The following table 9 indicates the extent of losses reported this year.

Fruit rot infection following codling moth injury was mentioned in the following reports:

Apple - Black Rot

Virginia: A year of heavy codling moth injury like 1926 is always followed by considerable black rot infection. (Schneiderhan)

Arkansas: Much fruit injury in connection with codling moth injury. (Dept. Pl. Path.)

Illinois: Black rot was more prevalent than usual because of severe codling moth infestation. (Anderson)

Delaware: There was less infection on early fruit but more on the fall crop because of insect injury. (Adams)

In Minnesota, according to the Section of Plant Pathology, black rot followed fire blight and caused damage mostly as bark cankers. Direct loss of fruit was slight.

Leaf infection was reported as important or serious in Connecticut, New York, Pennsylvania, Delaware, Maryland, and Missouri. In the last named state cankers and fruit rot were found but rarely. In Michigan and North Carolina, on the other hand, the canker form was most important, the latter state reporting severe canker injury both in young and bearing orchards.

Jehle reports from Maryland that leaf spot was abundant on parts of trees where dead wood was not removed and the same fact was observed in Missouri by Archer.

In Ohio, according to H. C. Young, sulfur dust does not control black rot defoliation entirely, but a regular schedule of lime sulfur reduces its prevalence.

Additional susceptible varieties, York Imperial, Red Astrachan, Delicious, and Wealthy are reported by Martin in New Jersey. The annual report from Minnesota states that the fruit of Patten is affected more often than that of other kinds.

The literature and records in the Plant Disease Survey indicate that Sphaeropsis malorum causes three types of injury, viz., fruit rot, canker, and leaf spot. Of the three, it appears that quite often the leaf spot causes most severe injury through defoliation, and also is often difficult to control by spraying. Sphaeropsis malorum Pk., Phyllosticta limitata Pk., Coniothyrium pirinum (Sacc.) Sheldon, Coryneum foliicolum Fckl., Phoma mali Schulz. & Sacc., etc., are found rather commonly associated with the leaf spot.

Table 9. Percentage losses from black rot of apple as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
5	Maryland		Michigan
3	Iowa	.75	Alabama
2.5	Ohio	.1	Tennessee
2	Arkansas, North Carolina	Trace	Missouri, Minnesota, Illinois, West Virginia, Delaware, Texas
1.5	Connecticut, Virginia		
1	Indiana, Kansas,		

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BITTER ROT CAUSED BY GLOMERELLA CINGULATA (STON.) SPAULD. & SCHRENK

Bitter rot occurs principally in the southern and eastern portions of the United States, in the area limited by the Ohio Valley on the north and by the Mississippi Valley on the west. This region may be defined more accurately as bordered on the west by the ninety-fifth meridian and on the north by the fortieth parallel, except along the eastern coastal region where the disease occurs in southeastern Pennsylvania, New Jersey, New York, and southern New England. The states suffering most loss, according to the estimates of the Plant Disease Survey, are Tennessee, South Carolina, Georgia, Alabama, Kentucky, North Carolina, Mississippi, Arkansas, and Missouri. The disease is locally destructive during some years in Virginia, in the southern parts of Ohio, Indiana, and Illinois. The situation in the various states may be mentioned briefly.

First, considering those on the border of the bitter rot area, the following seems to be evident. Along the western border the disease is limited by insufficient moisture. In Texas the disease is of little importance. In Oklahoma it appears in scattered localities to a negligible extent. In Kansas and Nebraska it is unknown except for a narrow region along the Missouri boundary. In Iowa the disease is rather rare, although observed occasionally in southern counties. In Wisconsin and Michigan it is unknown as an orchard disease. In New York it is confined to the counties bordering the Hudson River and south of Albany. In New England it is sometimes important on susceptible varieties in the southern part when weather conditions favor the disease. In New Jersey, Pennsylvania, Delaware, and Maryland it assumes destructive proportions locally during epidemic years. In West Virginia during earlier years it occurred in epidemic form from time to time, but in recent years it has become much less serious, owing apparently to the elimination of certain trees of susceptible varieties which seemed to act as carriers.

Coming now to the states in which bitter rot is of more importance, we find that in Virginia it is rated as one of the major apple diseases. In general it is secondary to cedar rust and scab, but in the Piedmont Section, especially in Albemarle, Nelson, and Amherst Counties it usually outranks other diseases of apples and is the one most feared by the growers. This section grows the highly prized, but very susceptible Yellow Newtown, or Albemarle Pippin. In some years growers of this variety have had their crops practically wiped out by bitter rot. In the Carolinas, Georgia, Alabama, and Tennessee bitter rot is regarded as the most serious apple disease and requires more attention than all other apple diseases combined. In Kentucky and in the southern fruit-producing areas of Illinois, Indiana, and Ohio, bitter rot is not of great importance when considered over a period of several years. In seasons with warm and wet weather, however, epiphytotics are likely to occur and heavy losses sometimes result.

When the average estimates of losses for the past eight years for the country as a whole are considered, we find that bitter rot ranks about sixth in importance of the diseases of apple, the average annual loss being estimated at slightly less than 1 per cent. The losses in 1926 seemed to be somewhat less than normal within the usual zone of severity, but apparently there was some increase in the amount of damage along the northern border, particularly in Ohio, Indiana, Maryland, and Kansas. The estimated percentages reduction in yield in the various states for 1926 are given in table 10. The highest percentage losses were reported from Tennessee and North Carolina, but a greater loss in bushels occurred in Ohio because of its larger crop. The average annual percentage state losses according to estimates for the past eight years are presented on the accompanying map (Fig. 2).

The increase in severity of the disease along the northern border of the bitter rot area seems to be correlated with the prevalence of weather favorable for the development of the fungus as shown by the following reports:

> Maryland: Hot and moist conditions in August and September were favorable. (Temple & Jehle)
>
> Tennessee: Heavy rains in August made bitter rot spread rapidly. (McClintock)
>
> Ohio: Temperature and moisture both favorable. (H. C. Young)
> In the Proctorville and Gallipolis sections bitter rot was markedly destructive this season. This outbreak was rather localized in that territory, but quite a number of orchards had the entire crop destroyed, particularly Rome Beauty and Grimes. (H. W. Dye, Niagara Sprayer Co.)
>
> Indiana: Heavy and frequent rains in fall caused rapid spread. (Gardner)
>
> Missouri: A cool and somewhat dry summer probably reduced infection. (Archer)
>
> Virginia: The temperature was favorable but there was not enough rain in midseason to cause exudation from mummies. (Schneiderhan)

The dates and locations of earliest infections in 1926 as reported by collaborators are given in the accompanying table 11.

Several resistant and susceptible varieties were reported this year, but all have been listed before with the possible exception of the Missouri Pippin reported as susceptible by Archer from Missouri. For the first time in New Jersey W. H. Martin reports Grimes, Winter Banana, and Maiden Blush as susceptible varieties.

Apple - Bitter Rot

Three states, Virginia, Indiana, and Illinois, report good results from eradication of bitter rot mummies. The results of this and other control measures as well as notes on overwintering and infection studies are given below:

Virginia: The ability of the bitter rot fungus to live over for two years in mummies was demonstrated at Winchester on June 30. A wire cage containing bitter rot mummies of the year 1924 was the center of infection on Early Harvest. Later the same fact was noted in Northwestern Greening. Infection was obtained on Early Harvest apples again on July 18 by inoculation from bitter rot mummies two years old. These mummies had been exposed in this tree for two seasons including the past winter. There was a possibility of twig infection in the tree because three years ago a large portion of the apples were artificially inoculated by exposure to mummies. This possibility was eliminated after the mummies were soaked 30 minutes and then piled on top of apples. The checks were not diseased under a bell jar. Infected twigs exposed with these mummies in the same tree and used in the same manner have not produced infection in the damp chamber.

For the fifth year bitter rot is reported on the old Smokehouse trees. These trees were demummified this spring to such an extent that no mummies could be found for bitter rot spore exudation data. As in previous years the whole crop will be a loss. The evidence again proves that twig infection is the method of overwintering of the fungus. (Schneiderhan)

Indiana: Bitter rot became very serious in southern Indiana, especially where the fungicide was omitted in the July sprays. The disease was first noted the last of July and the frequent rains caused it to spread very rapidly.

The sources of early infection of bitter rot under Indiana conditions are not well known. Cankers are very rarely found. Old mummied fruits hanging on the tree are a dangerous source of infection and should be removed. Growers are instructed that sanitary measures should be adopted this fall to minimize the danger for next year. All rotted fruits should be raked from under the infected trees. In removing mummies care should be taken to remove the stem of the fruit since the fungus may grow up into the stem and thus serve as a source of infection. Many growers wage an active campaign against bitter rot during the late summer not only by spraying, but by watching the trees and removing the infected fruits as soon as they are noticed.

Failure to use Bordeaux with late codling moth sprays on Grimes results in much rot in that variety. (Gardner)

Illinois: Aside from a few local outbreaks this disease was not serious and no complaints were received. The weather was unfavorable for bitter rot in those sections where this disease is normally serious until late in the season. The general absence of the disease in 1925 may account in part for the condition in 1926. In an orchard where the disease was serious in 1925 and where the

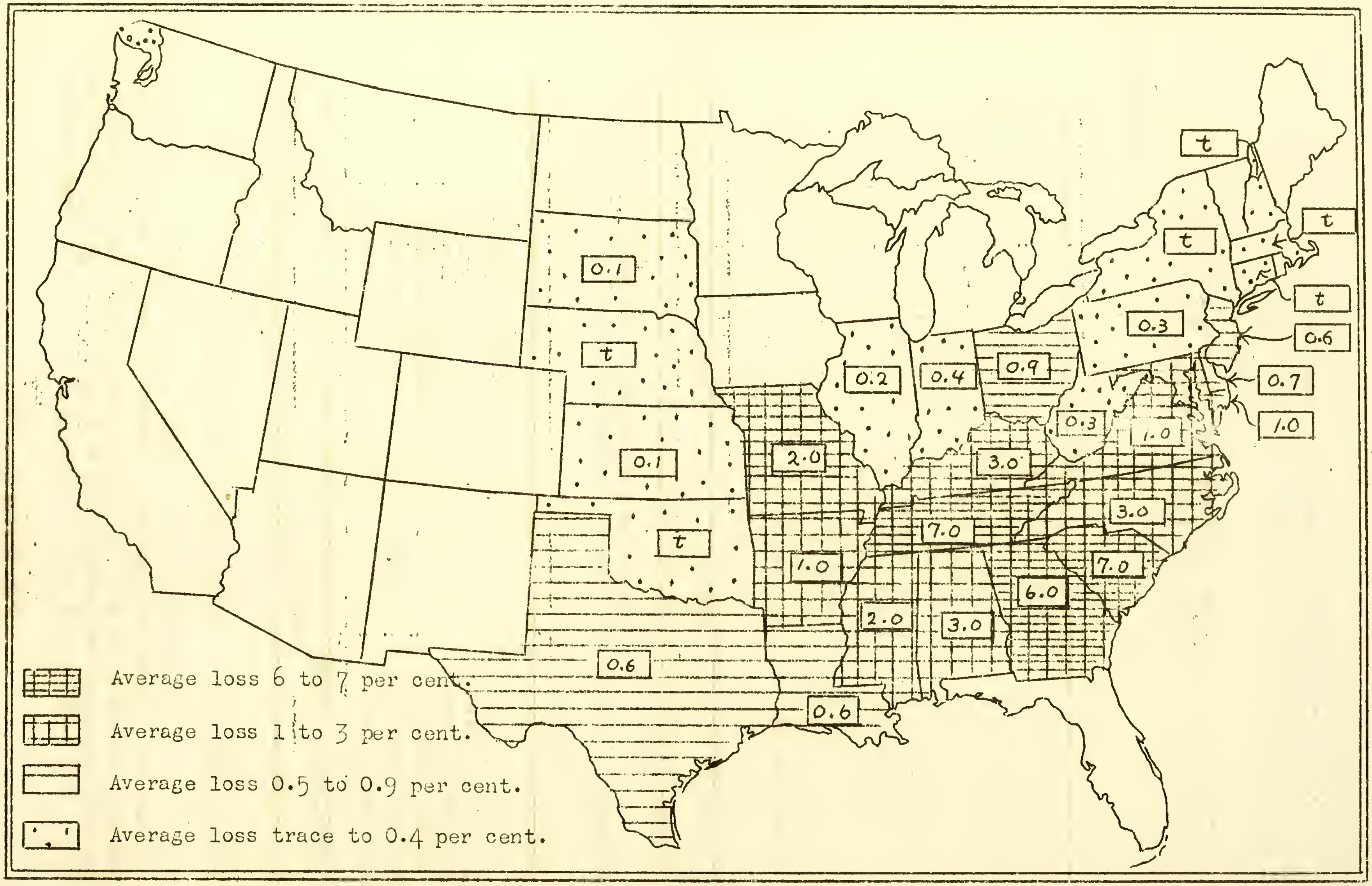

Fig. 2. Average annual percentage loss from apple bitter rot, 1918 to 1926.

mummied fruit was allowed to remain on the ground there was another outbreak in 1926. In another orchard where the diseased fruit was carefully picked from the trees in 1925, not only was the disease checked but no bitter rot appeared in 1926 in spite of favorable weather the latter part of August. (H. W. Anderson)

Table 10. Percentage losses from bitter rot of apple, as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
5	Tennessee	.5	Delaware, Virginia
3.5	North Carolina	Trace	New Jersey, Illinois, Missouri, South Dakota, Arkansas, West Virginia, Texas
2	Maryland, Ohio, South Carolina		
1	Mississippi, Indiana, Alabama, Kansas		

Table 11. Dates and places of first observation of bitter rot of apple, as reported by collaborators, 1926.

Date	Place	County	State
June 30	Winchester	Frederick	Virginia
July 12	- - -	Chatham	North Carolina
July 15	- - -	Madison and Jefferson	Tennessee
July 26-31	- - -	Warrick	Indiana
July 29	Jackson	Cape Girardeau	Missouri
July 29	Bridgeville	Sussex	Delaware
August 2	- - -	Middlesex	New Jersey
August 16	Proctorville	Lawrence	Ohio
September 10	A. & M. College	Oktibbeha	Mississippi
September 21	St. Charles	Lee	South Carolina
October 1	Hamden	New Haven	Connecticut

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FIRE BLIGHT CAUSED BY BACILLUS AMYLOVORUS (BURR.) TREV.

Fire blight is widespread in the United States and judging from reports of collaborators during the last nine years it would seem to be about the second most important disease of the apple for the country as a whole. The average loss in the United States during the past nine years is estimated at about 2 per cent. The great majority of the comparatively few reports received this year indicate that the prevalence and severity of the disease is about the same as last year and as usual. New York, Indiana, Wisconsin, Missouri, Pennsylvania, Illinois, and Iowa report more blight than the average year; while Ohio, Michigan, North Dakota, Nebraska, Kansas, Washington, Arkansas, Colorado, and Oregon report less. Losses estimated are given in table 12.

Some of the collaborators' reports regarding the prevalence and importance of the disease in 1926 follow:

New Hampshire: Disease rarely found. Of no economic importance. (Butler)

Connecticut: Only two reports. One of some injury to blossoms (this usual) and one of moderate injury to leaves and twigs. (McClintock)

New York: Severe in central and southern part of state. (Mills)

In Onondaga County fire blight caused considerable damage particularly in orchards where nitrate of soda has been used for several years. (D. D. Ward)

Severe in central and southern New York and elsewhere, even in Clinton County. (Barrus)

Pennsylvania: Blossom infection epidemic in west, moderate in east. Twig blight apparently increasing in importance. (Thurston)

Virginia: In the Norfolk section apples are grown only as a farm-yard crop. This season fire blight is unusually severe, especially in die-back stage. (McWhorter)

Disease always of minor importance. It causes slight loss in the form of twig blight. Cankers are rare. Fruit infection is practically unknown. (Schneiderhan)

Kentucky: Considerable blossom and twig blight. (Valleau)

Tennessee: Spur blight on early varieties. (Baskin)

South Carolina: Damage chiefly blossom and twig blight and cankers of small branches. (Ludwig)

Alabama: Abundant blossom blight in northern part of state. (Miles)

Apple - Fire Blight

Indiana: The worst disease of the year was the veritable scourge of fire blight which broke all previous records for severity on apples. It was worse in some parts of the state than in others, the southwest corner being especially hard hit. (Gardner)

Michigan: Blossom blight was only slightly serious. Twig blight was very destructive in the northern and eastern part of the state. Cankers were produced in large numbers. (Bennett)

Wisconsin: Farm orchard situation in critical condition. (Vaughan)

Missouri: Third successive year of severe damage. (Archer)

North Dakota: Important in the eastern and northwestern parts of state. (Brentzel)

Kansas: Moderately important in the northeastern and in the eastern part of state; also in Arkansas Valley. (White)

Oregon: Severe blossom blight in the eastern part of state, but no damage in Willamette and Hood River Valleys of any economic significance. (Barss)

The relation of pear trees to infection of apples is indicated by the first three of the following reports:

Missouri: Serious all over state where pears are present. Where pears are absent the blight is practically negligible. (Archer)

Indiana: Pear trees seem to be a very dangerous source of early infection for apple orchards. (Gardner)

Arkansas: All evidence points toward the efficacy of pear eradication as an important factor in this year's situation. Pears have been largely eradicated from many apple growing sections of northwest Arkansas with a marked reduction in the incidence of fire blight on apples. Many orchards in the vicinity of pear plantings are suffering severely. (V. H. Young)

Illinois: The disease started rather late in the season apparently not doing much damage during the blossoming period. It reappeared as a spur blight, probably having been dormant in the blossoms. The almost total absence of aphids in the state indicates that some other agent must have been responsible for spread this season. Practically no twig blight has been observed. (H. W. Anderson)

Nixon (2) has attacked the study of fire blight from a new angle. He has studied (1) the migration of the bacteria through apple tissue; (2) the effect on the host cell; (3) longevity and life cycle of the pathogen; (4) varietal tests for root immunity, together with (5) a new method of pathologic histology whereby immunity studies can be made microscopically. As a result of these studies nearly 1,200 trees of the more promising selections have been planted to test out their adaptability in locations favorable to infection.

H. W. Anderson in a report to the Plant Disease Survey advances the theory that when aphis are absent little early blight infection is to be expected. In Illinois this year, aphis infestation was extremely rare and blight did not occur until much later than usual. He states further:

> "Spur blight was quite severe and was remarkable that it did not develop until after petal fall. It is possible that the blight bacteria were introduced by pollinating insects but that weather conditions delayed the development of the disease. Again it must be admitted that blight can become serious during a dry spring. This is the second season that this fact has impressed us. Favorable weather for insect pollination may be a factor.
>
> "One of the outstanding facts in regard to fire blight is the seriousness of cankers in Willow Twigs in the western part of the state. This condition has been noticed in past years. It should be a well known fact that the severity of blight infection on any variety is not an index of the number of hold-over cankers which may be found. Thus, Jonathan is one of our worst varieties for twig blight, and Transparent the worst for body blight, yet on neither of these can hold-over cankers be found. Certain other varieties, particularly Willow Twig, which do not show serious twig or blossom blight, on the other hand do have abundant hold-over cankers."

Collaborators' reports on the susceptibility of varieties are given in the following notes and in table 13.

> Wisconsin: Hold-over cankers most serious in Transcendent Crab. (Vaughan)

> Indiana: The Jonathan variety was most severely injured. The infections were not only more numerous than ever before but proceeded down the limbs much farther than usual. Actual fruit infection was very common in Transparent early in July. The fruits were often one-quarter grown before becoming infected. Grimes is subject to severe blossom blight but the twigs seem fairly resistant. In Duchess this year only the late bloom was blighted, a condition which held true for certain other varieties. Turley blighted worse than Winesap, and Golden Delicious did not seem to be as resistant as Red Delicious. Cankers have not been common except in Jonathan, Esopus, and Red Detroit. Badly blighted trees of these varieties may carry the disease over winter. (Gardner)

> Minnesota: Folwell apple very susceptible in nursery rows. Some of nurserymen plan to discontinue growing this variety. (Sect. Pl. Path.)

Table 12. Percentage losses from fire blight of apple, as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
15	Missouri		South Carolina, Arizona
6	Mississippi	1.5	Alabama
5	Indiana, Michigan, North Dakota	1	Ohio, Kansas, West Virginia, Tennessee, Montana
4	Maryland		
3.5	North Carolina, Arkansas	.5	Connecticut, Delaware
		.3	California
3	Minnesota, Iowa, South Dakota, Texas	Trace	Virginia, Idaho, Washington, New Hampshire, New York, Oregon
2	Illinois, Wisconsin,		

Table 13. Comparative susceptibility of apples to fire blight as reported by collaborators, 1926.

Very susceptible	Susceptible	Resistant	Very resistant
Chenango (8)	Baldwin (3)	Arkansas Black (3)	Black Twig (3)
Esopus (3)	Benoni (3)	Baldwin (8)	Gano (3)
Folwell (5)	Black Twig (9)	Carson (3)	Kinnard (3)
King (3)	Delicious (9, 10)	Clayton (3)	Lawver (3)
Maiden Blush (6)	Dr. Matthews (3)	Delaware Red (3)	McMahon (3)
Red Detroit (3)	Duchess (3)	Fallawater (Tulpehocken) (3)	Minkler (3)
Strawberry (8)	Early Harvest (9)	McIntosh (3)	Salome (3)
Transcendent Crab (4)	Golden Delicious (3)	Northern Spy (4)	
Wagener (1)	Grimes (2)	Ortley (3)	
Yellow Transparent (6)	Jonathan (10)	Red June (3)	
	King (1)	Rhode Island Greening (3)	
	King David (3)	Tetofsky (3)	
	King Genet (Genet) (3)	Thaler (3)	
	Lilly (2)	Williams (3)	
	Maiden Blush (3)	Winesap (6)	
	Missouri Pippin (3)	York (6)	
	Moon (9)		
	Northern Spy (3)		
	Northwestern Greening (3,4)		

Apple - Fire Blight

Very susceptible	Susceptible	Resistant	Very resistant
	Ozark (9)		
	Red Winesap (9)		
	Rhode Island Greening (8)		
	Rome Beauty (9)		
	Simmons Red (9)		
	Stayman (3,9)		
	Transparent (2)		
	Turley (3) (#)		
	Twenty Ounce (8)		
	Wealthy (3)		
	Western Beauty (9)		
	Westfield (3)		
	Willow (3)		
	York (3)		

(1) Reported from Connecticut by G. P. Clinton.
(2) Reported from Delaware by J. F. Adams.
(3) Reported from Indiana by M. W. Gardner.
(4) Reported from Michigan by C. W. Bennett.
(5) Reported from Minnesota by Dept. of Plant Path.
(6) Reported from Missouri by W. A. Archer.
(7) Reported from New Jersey by W. H. Martin.
(8) Reported from New York by M. F. Barrus.
(9) Reported from South Carolina by L. M. Fenner.
(10) Reported from Virginia by F. J. Schneiderhan.
(11) Reported from Wisconsin by R. E. Vaughan.
(#) The Turley is a new variety described in Hoosier Hort. 8: 175. 1926.

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CROWN GALL CAUSED BY BACTERIUM TUMEFACIENS EFS. & TOWNS.

In 1926, as in previous years, the reports of occurrence of crown gall and of losses due to it came mainly from nurseries. In Missouri, however, a large orchard was seen in which one-fourth of the trees had been affected with callus galls and hairy root at the time of planting several years ago, and at the present time fully one-fourth of the trees are either stunted or dead. Several of the stunted or dead trees were dug and in practically all cases large galls were found on the roots. Presumably the gall formation had seriously interfered with water transference. Similar galls were found on young trees which died in scattered localities in the state.

Arkansas: Often over 50 per cent of nursery stock rejected; supposedly because of crown gall but probably much of it is not crown gall. (Dept. Pl. Path.)

Minnesota: Three to four per cent of nursery stock infected with bacterial crown gall (estimate from Nursery Inspection Service.) (Sect. Pl. Path.)

Michigan: One nursery reported 50 per cent of the apple nursery stock affected. (Bennett)

North Carolina: Hairy root noted by nursery inspectors in several localities this year. (Fant)

Arizona: One of our most serious diseases. (Street)

In Tennessee the disease is moderately important. In New Jersey, South Dakota, Washington, and Idaho it is only slightly important. In Delaware, according to Adams,

"Infection is generally prevalent in some plantings and the increased weakening of trees has caused their removal."

Muncie (8) suggests that the abundant development of fibrous roots from an overgrowthat the union of piece-root grafted trees is not a reliable index of crown gall infection. Numerous attempts at isolation, using Patel's modification, yielded negative results, and likewise inoculations of macerated tissue of fibrous root did not produce galls upon young tomato plants. Overgrowths closely resemlbing those found on discarded nursery trees have been induced upon aseptically made grafts and scion cuttings planted in sterilized soil. Isolations from these malformations did not yield Pseudomonas tumefaciens. It seems evident that these overgrowths were caused by excess callus formation at the tip of the scion lip of the graft and scion cuttings. The "wooly knot" form of hairy root was obtained repeatedly by artificial infection under controlled conditions. It was discovered that the pathogen could retain its virulence at least 154 days after infestation in non-sterilized greenhouse soil. It was determined that gall formation interfered considerably with the rate of water flow.

Apple - Crown Gall

Patel (12) isolated both pathogenic and non-pathogenic strains of Pseudomonas tumefaciens from overgrowths and from nursery soils. Cultural characters of the two strains were quite similar. Pathogenic strains have retained their virulence after two years in culture.

Riker (13) in his experimental studies finds that gall formation is stimulated in tomato by low temperature (18 - 22° C.) and on tomato and raspberry by excess moisture. Effective agglutinans were secured by intraperitoneal injections of the pathogen into rabbit.

Recent literature

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BLISTER CANKER CAUSED BY NUMMULARIA DISCRETA (SCHW.) TUL.

Blister canker apparently has not spread, or if so but little, since the distribution map was published as Fig. 8 in Supplement 14 of the Plant Disease Survey of 1920. The map shows that the disease is practically confined to a tier of states extending east of the one-hundredth meridian to the Atlantic coast; and south of the forty-second parallel to a line which includes the northern corner of Oklahoma, the northern half of Arkansas, and all of Tennessee, but not including any of South Carolina. In addition to this main area of general infestation there have been scattered reports from various surrounding states.

In general the disease has been of most importance on old neglected trees, especially Ben Davis, and reports of collaborators indicate that drought conditions are favorable to development of the fungus.

In 1926 the prevalence was reported to be the same as last year and as in the average year, except in Illinois where Anderson and Tehon report more. The only losses reported this year were Missouri, 5 per cent; Kansas, 2 per cent; Illinois, 1.2 per cent; Ohio, 0.1 per cent; Maryland and Virginia, each a trace.

The following are the only reports of interest received this year:

Tennessee: No infection seen in 1926. (McClintock)

New York: Slowly on the increase as young orchards mature. (Thurston)

Arkansas: Probably decreasing in state as Ben Davis is supplanted. (Dept. Pl. Path.)

Missouri: Most important disease of old trees. Old neglected trees are invariably attacked and killed. Many die every year. (Archer)

Table 14 gives data on the relative susceptibility of varieties from various states.

Table 14. Relative susceptibility of apple varieties to blister canker as reported by collaborators, 1926.

Susceptibility	Varieties and Authorities
Very susceptible	Ben Davis (1,2,3,4,5,6); Gano (4,5); Genet (3); Maiden Blush (3); White Pippin (3)
Susceptible	Clayton (3); Delicious (2); Jonathan (3); Mammoth Black Twig (3); Rome (3); Stark (3)

(1) Arkansas Department of Plant Pathology.
(2) H. W. Anderson and L. R. Tehon in Illinois.
(3) M. W. Gardner in Indiana.
(4) W. A. Archer in Missouri.
(5) H. C. Young in Ohio.
(6) F. J. Schneiderhan in Virginia.

POWDERY MILDEW CAUSED BY PODOSPHAERA LEUCOTRICHA (ELL. & EV.) SALM.

In general it seems that powdery mildew has been most troublesome in California, Oregon, Washington, Idaho, and Utah. Perhaps the most severe losses have occurred in the Pajaro Valley of California and in the Walla Walla, Yakima, and Wenatchee districts of Washington. In Colorado it is reported as very important. Eastward the most damage occurs perhaps in some of the Middle Atlantic States, particularly on nursery stock.

In 1926 the disease was mostly reported to be of about the usual prevalence. California and Arizona each reported 1 per cent loss; North Carolina, 0.6 per cent; Maryland, Virginia, West Virginia, Minnesota, Iowa, and Colorado, each a trace. In Wisconsin, Minnesota, and Iowa the disease was important only on nursery stock. According to the Arizona State Commission of Agriculture, powdery mildew was much less prevalent in 1926, due to careful pruning and spraying. Fromme states that in Virginia infection was noticeable on Ben Davis, York, and particularly on Jonathan. In West Virginia also it appeared mostly on Jonathan, according to Sherwood. Fisher reports that Jonathan, Grimes, and Black Ben were very susceptible in Washington.

The Tasmanian Government (1) gives the results of spraying experiments with iron sulfide and atomic sulfur for mildew control, the former injuring the leaves less but the latter giving better results. Oppenheimer (3) states that applications of "Cosan" combined with pruning are effective in controlling mildew on nursery stock. Schubert and Richter (4) describe at length a series of laboratory and field experiments in the control of apple mildew and other fungous diseases by means of castor oil potash soap emulsions of hydrocarbons with phenol bases, and mixtures of hydrocarbons with phenols, and a preparation of tar components known as pomastin. They consider that the phenols are likely to prove of great importance in plant protection.

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SOOTY BLOTCH AND FLYSPECK CAUSED BY GLOEODES POMIGENA (SCHW.) COLBY AND LEPTOTHYRIUM POMI (MONT. & FR.) SACC.

These two diseases are widespread in eastern United States, but the principal losses have been reported from the Middle Atlantic and Ohio Valley States southward.

In 1926 sooty blotch was reported to be more or much more prevalent than either last year or the average year in Delaware, Maryland, New Jersey, Arkansas, Illinois, and Minnesota. The losses reported were Virginia, 6 per cent; Maryland, 1 per cent; Illinois, 0.7 per cent; Delaware, New York, Kansas, and Missouri, a trace. It was reported as important on unsprayed fruit in Arkansas, Indiana, and Michigan. According to H. W. Anderson:

> "An unusual condition resulted in many of the western Illinois orchards because of the extremely wet weather in August and September which brought about an unusual outbreak of sooty blotch. In general the disease was serious only in those orchards where late spraying with a fungicide was neglected. Where a fungicide was included in the second brood codling moth spray there was little trouble."

Schneiderhan observes that "sooty blotch was the most important disease of apples in Virginia in 1926. The reason for this unusual importance is found in the fact that all spraying was discontinued in June because of the arsenic residue problem. In addition, the heavy rains in the late growing season resulted in very favorable conditions for infection."

Martin states that in New Jersey, "sooty blotch was observed on Rhode Island Greening, Bismarck, Fallawater, Northern Spy, Wealthy, York, Grimes Golden, Maiden Blush, Golden Pippin, and Ohio Nonpareil. Northern Spy was especially susceptible in Michigan, while Grimes Golden is reported as very susceptible in Indiana and Missouri."

FRUIT SPOT CAUSED BY PHOMA POMI PASS.

Records of the Plant Disease Survey since 1908 show that this disease is restricted to the region from Maine to North Carolina westward to Iowa and Arkansas. The prevalence and losses vary considerably from year to year in each state. The disease appears during one season and may be entirely absent the next. Fruit spot usually does not cause severe losses over a whole state, rather it may be confined to a single variety, perhaps in a restricted locality, although there have been reports in some years when the damage equalled that caused by some one of the major apple diseases. In 1926 there were but few reports from collaborators, however the fragmentary data indicate that the disease was more prevalent than either last year or the average year and that the losses were greatest in a group of eastern states, i.e., New Jersey with 1.5 per cent loss; Delaware, Maryland, and Ohio each with 0.5 per cent; and Virginia with a trace. Missouri also reported a trace. In Ohio, H. C. Young reports that a great deal of the disease developed on fruit in storage. In New Jersey, W. H. Martin reports:

> "In some sections of Burlington County this is the most serious disease the fruit grower has to contend with. Observations showed that infection took place much earlier than formerly supposed."

Walton and Orton (2) also discovered that fruit infection could take place much earlier in the spring and later in the fall than was thought to be the case. These investigators have connected _Phoma pomi_ Passer. (_Cylindrosporium pomi_ Brooks) with a perfect stage belonging to the genus Mycosphaerella, probably _M. pomi_ Passer. Positive infections were obtained on Baldwin, Grimes Golden, and Stayman with cultures from single ascospore isolations.

The 1926 data on varietal susceptibility can be summed up in the following: _Varieties reported susceptible_ - King David in Missouri; Stayman and Golden Delicious in New Jersey. _Varieties reported very susceptible_ - Grimes Golden and Jonathan in New Jersey. Delaware reports that the disease was generally prevalent on fall varieties.

Recent literature

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2. ____________ and C. R. Orton. The perfect stage of Cylindrosporium pomi. Science n.s. 63: 236. Feb. 26, 1926.

BITTER PIT, NON-PARASITIC

Bitter pit occurs widely in the United States. In some years it is destructive in eastern sections, while in the irrigated apple districts of the West it is one of the more important apple diseases.

The reports of collaborators in 1926 indicate that the disease was present in the Middle Atlantic and Ohio Valley states, New York, Michigan, Minnesota, and Oregon. The losses reported were, Virginia, 5 per cent; Ohio, 1.5 per cent; Michigan, 1 per cent; Maryland, 0.75 per cent; Delaware, 0.25 per cent; New Jersey, West Virginia, and Illinois, each a trace. Anderson and Tehon report it as occurring mostly on fruit from young Delicious and Winesap trees in western Illinois. Schneiderhan, in Virginia, reports Winesap and Rome subject to bitter pit, and York, King David, and Grimes to be very liable to attack. He states further that:

> "Practically 15 per cent of all cull apples in northern Virginia had bitter pit. It is the commonest non-parasitic and the most important disease in Virginia."

Bennett reports Northern Spy to be susceptible in Michigan. According to H. C. Young in Ohio:

> "A considerable amount of this disease appeared in storage, apparently due to the excessively wet weather prevalent before and during harvest."

<u>Recent literature</u>

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2. Smith, A. J. M. Bitter pit in apples, a review of the problem. Spec. Rep. Food Invest. Board. Great Britain 28: 1-24. 1926.

JONATHAN SPOT, CAUSE UNDETERMINED

The reports of collaborators show that Jonathan spot was perhaps slightly more prevalent this year in comparison to last year and the average year. As to losses, however, there were but few reports as follows: Illinois, 1 per cent; Delaware, 0.25 per cent; Maryland, Virginia, Ohio, Michigan, Minnesota, Oregon, and Missouri, a trace. Anderson and Tehon report for Illinois that there was a 10 per cent loss in grade of Jonathans which constituted about one-tenth of the entire apple crop. According to Bennett, 20 per cent of some lots of stored Jonathans in Michigan showed spotting; in Iowa too, stored fruit in local markets showed a high percentage of spotting. Several states specified Jonathan as the most susceptible variety but in addition Delaware reported the disease on Stark Delicious and Rome, Minnesota on Wealthy, and Michigan on Northern Spy.

Harrison (1) in experimenting on the relation of temperature to the keeping quality of the Jonathan apple concluded that Jonathan spot developed more profusely at higher temperatures. Pentzer (3), in a histological study of the skin of affected apples, determined that the normally red pigment in subepidermal cells was bluish-brown in spotted regions. A colorimetric determination showed this condition to be associated with a deficiency of acid (P 4.7 compared with 2.8 for normal tissue). The use of paper wrapppers impregnated with various harmless acids is suggested as a control.

Recent literature

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2. Osterwalder, A. Die fleckenbildung beim Jonathan apfel. Zeitschr. Pflanzenkr. 36: 264-269. 1926.

3. Pentzer, W. T. Color pigment in relation to the development of Jonathan spot. Proc. Amer. Soc. Hort. Sci. 22 (1925): 66-69. 1926.

4. Plagge, H. H. Prevention of storage disorders in apples. Amer. Fruit Grow. Mag. 46 (10): 3, 18. Oct. 1926.

KING DAVID SPOT, NON-PARASITIC

A brief account of this apprently new disease on the King David variety is given by Robbins (1). He states that the spotting occurred on fruit approaching maturity during late summer, and that the disease is characterized by the occurrence of circular, dark brown to black, slightly sunken spots, 2-8 mm. in diameter, centered usually about a lenticel, and more abundant on the side of the fruit exposed to the sun. The disease is considered to be physiological in nature.

Brooks and Fisher, Office of Fruit Disease Investigations, submit the following report:

> "A spotting of King David apples has been an annual occurrence in the Pacific Northwest for a number of years and occasionally has been reported from Virginia and other Eastern States. The spots often are almost indistinguishable from bitter pit, differing in that they are always superficial with no deep-seated areas out of contact with the skin. This "pit" type occurs on the cheek of the apple, generally in the median portion or toward the calyx end. In other cases King David spot resembles typical Jonathan spot in that only skin cells are affected. It differs, however, in that it first appears long before the apples are mature on the trees and does not increase in storage. It differs also in being more prevalent on the green side and frequently is confined to groups of spots adjacent to the

calyx lobes or the base of the stem. Both the "pit" type and the less severe injury are at first dark green in color, later becoming dark brown or black.

"King David spot has shown no response to irrigation and fertilizer experiments conducted at Wenatchee, Washington, but there has been a correlation between its occurrence and more or less severe aphid infestation."

Gardner in Indiana reported in 1926 that the surface type of injury of bitter pit (presumably King David spot) occurred rather generally on King David, with a trace on Rome.

Recent literature

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ROOT ROTS

Armillaria root rot (Armillaria mellea (Vahl) Quel.)

Tennessee reports Armillaria root rot to be generally distributed, causing an estimated loss of 2 per cent. In Mississippi the disease was local with a loss of only a trace. In Oregon it was scattered and appeared mostly on land which had been cleared of oak. The disease was reported merely as present in Arkansas, New York, and Ohio. Miles remarks that, "one orchard in northern Alabama showed 20 per cent of trees dead in the last five years, and 12 per cent now show external and evident signs of disease. The loss for the state is probably 2 per cent." Zeller (5) states that it is a widespread and destructive orchard disease in the Northwest, especially in that portion of the coast states west of the Cascade Mountains. Infection of the roots may take place (1) through wounds, (2) at points of contact of diseased and healthy roots, and (3) at point of emergence of lateral roots.

Other root rots

Ozonium omnivorum Shear is reported as causing death of apple trees in northern Arizona, especially in irrigated farms. Loss estimated at 3 per cent. H. R. Brisley and Streets). Taubenhaus reports a 10 per cent loss for Texas. He says that because of this disease apples cannot be grown in the black lands.

Hypholoma sublateritium Fr., according to Thomas (3), was found associated with crown injury of apples in New York. (see also winter injury, page 38)

Xylaria spp., black root rot. Only five collaborators sent data relating to occurrence of this root rot. Virginia reported a loss of 1.5 per cent, and Illinois and Maryland, a trace each. In Tennessee it was considered to be of moderate importance, while in Michigan it was said to be extremely rare. Schneiderhan reported from Virginia as follows: "Xylaria causes our commonest root rot. A survey of 25 of the best orchards in Frederick County indicates an average mortality rate in trees of 15.2 per cent. Black root rot is considered to be responsible for at least half of this trouble. Sporulating Xylaria was found in July." A maximum infection of 10 per cent was found in an orchard of Yellow Transparents in the Ozark region of Illinois, according to Anderson and Tehon.

Hawkins (2) remarks that from Virginia to Illinois reports have been made of orchard infection by _Xylaria polymorpha_ (Pers.) Grev., _X. hypoxylon_ (Linn.) Grev., and _X. digitata_ (Linn.) Grev. It is known that the parasitic infection by these species is very destructive to apple orchards, and cases are cited east of the Mississippi River where they also affect pear trees. Both Hawkins (2) and Thomas (3, see also winter injury) state that the fungus attacks through injured bark.

Recent literature

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2. Hawkins, Stacy. Some Xylarias of Indiana. Proc. Indiana Acad. Sci. 35 (1925): 225-229. 1926.

3. Thomas, H. E. Root and crown injury of apple trees. Cornell Agr. Exp. Sta. Bul. 448: 1-9. 1926.

4. Valleau, W. D. Root troubles a cause of early death of apple trees. Trans. Kentucky State Hort. Soc. 1925: 141-155. 1926.

5. Zeller, S. M. Observations on infections of apple and prune roots by Armillaria mellea Vahl. Phytopath. 16: 479-484. July 1926.

SPRAY INJURY

In Delaware, according to Adams, "Pyrox" (containing copper) caused severe leaf-yellowing on weakened trees. He says also that arsenical dust (90-10) caused typical spotting on the foliage of weakened Williams and Early Ripe. From New Jersey, Martin reports that a summer strength of concentrated lime-sulfur caused severe leaf burning and that even Bordeaux mixture caused damage in some orchards. The Division of Plant Pathology in Washington reports that more injury than usual occurred from oil sprays, Bordeaux, and lime-sulfur. Oil injury took several forms including reduced vitality of trees and reduced size, spotting and russeting, and premature dropping of the fruit. The necessity of limiting arsenic residues on the fruit stimulated extensive commercial use of summer oil sprays. In southeastern Ohio, Ballou and Lewis (1) find that low temperature and excessive cloudiness and moisture just previous to and during the blooming period favored russet injury to apples from sprays. They say that their work of the past four years shows that much of the russet injury caused by caustic sprays occurs in the use of Bordeaux for the pink spray of fruit buds. On the other hand, dry lime-sulfur straight through the spraying period gave 94 per cent of clear, unrusseted fruit on the Ensee variety, which is particularly susceptible to spray injury. Hydrated lime used in the same manner gave 96 per cent unrusseted fruit. Grubb and Hatton (3) maintain that post-blossoming use of lime-sulfur entails a considerable risk of reducing the crop. Osterwalder (4) summarizes the results of ten years' experiments with sprays. Bordeaux and various commercial spray materials generally induced foliage injury while, on the whole, lime-sulfur preparations (1-30 proportions especially) were more efficacious than the copper mixtures.

Recent literature

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2. Farley, A. J. Spray injury. Rept. Maryland State Hort. Soc. 28: 165-167. 1926.

3. Grubb, N. H., and R. G. Hatton. Post-blossoming use of lime-sulfur spray and fruit dropping. Gard. Chron. 79: 324-325. 1926.

4. Mogendorff, N. Some chemical factors involved in arsenical injury of fruit trees. New Jersey Agr. Exp. Sta. Bul. 419: 1-47. 1925.

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8. Wilcox, E. V. Apples and arsenic. England's complaint brings some new suggestions for orchard spraying. Country Gentleman 91: 21, 85-86. 1926.

WINTER INJURY

Arkansas: The extremely dry weather of last summer combined with variable winter weather has resulted in a great deal of injury, especially to young apple trees on the exposed southwest side. An unusual number of both old and young trees have died this season. (V. H. Young)

Minnesota: Some apple trees killed and many twigs killed back from tips. Wet weather in late fall (1925) following extremely dry weather caused late growth and failure of proper ripening of wood. (Sect. Pl. Path.)

Michigan: Young orchards of Grimes and Yellow Delicious were considerably damaged by an October freeze in 1925. (Bennett)

Missouri: There is a serious crown and root injury on Jonathan and Grimes. The Missouri Pippin shows evidence of being resistant. In some 15-year old orchards there is a loss of 20 per cent of the trees and it is estimated that 75 per cent of the orchards over 10-years old in the central portion of the state show from 1 to 10 per cent dead or dying trees. (Archer)

In New York, Thomas (3) found several fungi, especially Xylaria and Hypholoma, to be associated with root and crown trouble; from artificial infection and from observation he decided that the action of low temperature on immature crown and root tissues is primarily responsible. Serious root injury caused by low winter temperature occurred on apple in the northeastern part of Kansas, according to White. Missouri and South Carolina both reported the occurrence of basal cankers on apple due to freezing injury.

Bradford and Cardinell (1) base an analysis of the relation of winter conditions to fruit culture in Michigan during a period of 80 years on an exhaustive study of the literature including available weather records. It was found that intense cold was not necessarily a cause of winter injury, but, when combined with either unusually heavy autumn rainfall or long drought, was a potential source of damage. Lack of maturity in the wood is deemed the greatest factor in inducing winter injury, and in this connection prolonged cultivation and heavy manuring have proved unwise practices. The location or site of an orchard is potentially important from the standpoint of winter injury.

Recent literature

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2. Sandster, E. P. Winter killing of apple trees in Colorado. Fruit Belt 24 (3): 18. Mar. 1926.

3. Thomas, H. E. Root and crown injury of apple trees. Cornell Agr. Exp. Sta. Bul. 448: 1-9. 1926.

MISCELLANEOUS PARASITIC DISEASES

Botrytis sp., blossom-end rot, reported by Heald and Sprague (4) to be the cause of a spot rot in storage.

Cercospora mali Ell. & Ev., leaf spot, Texas.

Corticium salmonicolor Berk. & Br. Burt (2, p. 228) lists this as parasitic on apple, pear, and fig shoots in Florida and Louisiana.

Corticium galactinum (Fr.) Burt, reported by Burt (2, p. 202) as occurring on living roots of apple in Arkansas, Illinois, and Missouri. Corticium stevensii Burt (Hypochnus ochroleucus Noack), according to Miles caused considerable twig blight in two orchards in northeastern Alabama.

Gloeosporium perennans Zeller & Childs, perennial canker, was reported by the Division of Plant Pathology to be of moderate importance in eastern Washington. It occurs both as a canker and a fruit rot. Winesap is resistant but Spitzenberg is very susceptible. In Oregon, according to Zeller, the disease is less prevalent than usual. He says that: "As a canker, new infections were almost nil this year but fruit picked after the first fall rains was materially reduced in storage and transit due to a rot produced by this organism. The canker is linked with winter injury but none of the latter occurred during the previous season." Barss reported that perennial canker and anthracnose together caused 10 per cent loss in Oregon.

Leptosphaeria coniothyrium (Fckl.) Sacc., orange pox canker. Fromme states that specimens of the fungus were received from Bryant, Virginia. The injury was very slight.

Myxosporium corticolum Speg., superficial bark canker, was observed in all parts of New Jersey by Martin.

Nectria galligena Bres., European canker. Zeller (10) fully describes this disease as it occurs in Oregon. He reports for 1926 that the disease was practically absent due to the fact that trees had not been subjected to winter injury during the preceding season. However, the disease was recorded in the White Salmon section of Washington. Mills indicates that it is of slight importance in New York. Maryland and South Dakota both report losses as a trace.

Species of Nectria, Gibberella, Fusarium, Cylindrocarpon, and Ramularia are reported on bark of Pyrus spp. by Zeller (12).

Neofabraea malicorticis (Cord.) Jack., anthracnose, reported to be moderately important in western Washington and in the White Salmon Section; and also in western Oregon. (see perennial canker)

Penicillium sp., blue mold rot, occurred commonly.

Phoma mali Schulz. & Sacc., canker. A report of this disease has been published in Plant Dis. Rept. 10: 124. Nov. 1, 1926.

Phytophthora cactorum (Leb. & Cohn) Schroet., fruit rot. Indiana - Heavy rains in late fall and summer made favorable conditions for infection of Grimes. It occurred only on fallen or low hanging fruit. (Gardner)

Pleospora sp., fruit rot. Rose and Butler (7) state that the fungus, presumably P. herbarum citrorum, was isolated several times from apples shipped from Washington, Oregon, and California.

Pleurotus subaveolatus Pk. was reported in Washington as slightly important as a heart rot of Stayman Winesap. Fisher suggests that this fungus may be identical with P. corticatus of Europe but material was lacking for confirmation.

Rhizoctonia sp., damping-off, 5 per cent loss as damping off in young seedlings in Texas. (Taubenhaus)

Schizophyllum commune Fr., heart rot. In Missouri on old trees in neglected orchards; loss a trace, according to Archer. The disease is also reported from Washington.

Sclerotinia fructicola (Wint.) Rehm., brown rot, is widely distributed on apples in the United States but the losses ordinarily are quite small. In 1926, losses were reported as follows: Maryland, 0.5 per cent; New Jersey, Virginia, North Carolina, Ohio, Illinois, and Kansas, each a trace. Dowson (3) discusses the association of Sclerotinia fructigena with a core rot and premature fall of fruit.

Stereum purpureum Pers., associated with silver leaf, is reported to be quite important in eastern and central Washington.

Trametes peckii, reported as the cause of heart rot in an occasional tree in Washington.

Valsa leucostoma (Pers.) Fr., die-back, was reported from New York and Missouri where slight damage occurred. In Washington it is reported as a canker. Beaumont and Hodson (1) list the various fungi associated with die-back of fruit trees.

Volutella fructi Stev. & Hall, spongy dry rot. Sherwood in West Virginia reports this on Northwestern Greening.

Recent literature

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11. Zeller, S. M. Cankers of apple and pear in Oregon and their control. Oregon Agr. Exp. Sta. Circ. 73: 1-29. Apr. 1926.

12. ____________ Species of Nectria, Gibberella, Fusarium, Cylindrocarpon and Ramularia occurring on the bark of Pyrus spp. in Oregon. Phytopath. 16: 623-627. Sept. 1926.

MISCELLANEOUS NON-PARASITIC DISEASES

Chlorosis, lime induced. Texas - Prevalent in limestone regions. (Taubenhaus). Washington - Of slight importance. It occurs locally and is associated with high water table and very calcareous subsoil. It can be overcome by application of iron sulfate in the root area. The disease is very general in the region of Boise and Twin Falls, Idaho, where it causes severe loss. (Fisher). Wallace and Mann (12) determine that green apple leaves, when compared with chlorotic leaves, contain higher percentages of dry matter and lower percentages of ash, and that the calcium content of the ash is much higher, while the percentages of potassium and sodium are much lower. Data, presented in tabular form, tend to show that the soils associated with chlorosis contain high percentages of carbonates.

Cracking. Fromme reported a rather widespread cracking of apples in Virginia, especially on the Stayman variety. The trouble evidently was induced by heavy rains. He states: "We assume that this phenomenon is similar to the cracking of cherries in which osmotic processes are set into motion, resulting in sufficient pressure to cause a rupture of the skin." Schneiderhan reported that York Imperial, Winesap, Rome Beauty, and King David were affected also.

Corky core. In describing this trouble, D. F. Fisher says that it occurs locally in Washington but is of slight importance. It occurred where there was a deficiency of soil moisture and apparently was favored by a high temperature. It was more or less general where there was a shortage of irrigation water or where soil conditions were such that trees could not get adequate moisture. The Rome, Delicious, and Jonathan varieties were susceptible. The effect on the tree was premature ripening and dropping of the fruit. It seems that the disease is generally more prevalent in the Okanogan Valley of British Columbia than in Washington.

Cork, drought spot, and drought die-back. New York - Occurs only in the Champlain Valley, affecting chiefly the Fameuse and McIntosh varieties. The 1926 loss amounted to 1 per cent of the crop on these varieties. In Clinton County cork and drought spot are the chief concern of most growers. In 1925, these apparently related troubles reduced the marketable crop one-half in several orchards. (Burrell).

Drought die-back. Mills and Burell of New York say that this trouble is known to occur in New York only in the Champlain Valley. It was less severe than in 1925. They consider that cork, drought spot, and drought die-back may be symptoms produced by a common cause. Burrell states "Die-back of the terminals, which is associated with cork and drought spot, is very prevalent on McIntosh and is found to some extent on Fameuse, Northern Spy, Wealthy, and Ben Davis. While the die-back proper commonly includes only the previous season's growth a more or less irregular browning of the cambial region can often be traced back into three-year old wood."

Drought spot. Also occurs in the Lake Champlain region of New York on McIntosh and Northern Spy. The loss in Clinton County in 1926 was estimated at 5 per cent of the commercial crop. A 30 per cent loss was found in one 90 acre orchard. In Orwell, Vermont, about a dozen trees were found with drought-spotted fruit. Burrell states, "This disease can be found abundantly in some parts of the northern orchards in Clinton County, New York, where it is not known to have occurred previously. It occurs on trees that are large and vigorous as well as on trees that are small and stunted. It occurs on trees that show die-back and on trees that do not. The first drought spot lesions discovered in 1926 occurred on a McIntosh tree which showed considerable die-back of the terminal twigs. The external symptoms as noted on fruits 1-1.5 cm. in transverse diameter are, a brown band in the epidermis, partially encircling the apple near the calyx end with many minute droplets of an amber-colored fluid exudate scattered over the surface of the lesion."

Anderson reports the disease to be serious in western Illinois and Barss states that unusually dry weather in Oregon was the cause of considerable trouble.

Incompatibility with black walnuts. Schneiderhan, in reports to the Plant Disease Survey, calls attention to the incompatibility between apple trees and black walnut trees when growing closely enough to permit the intermingling of the roots. He states:

> "Eighteen instances have been noted. Measurements of distances between the walnut and apple have been completed in 16 of the cases. A total of nineteen walnuts were found to have caused the death of 49 and the dwarfing of 10 apple trees. The maximum distance at which a tree was killed by the toxic substance given off by the walnut roots was 75 feet and the minimum distance was 16 feet. The average distance at which death occurred was 33 feet and the average distance at which they were dwarfed was 40 feet. In only one instance was an apple tree found to function normally within the average border of the toxic court. This was a Stayman tree 30 feet from a large walnut. The irregularity of the direction of root growth of the walnut may account for this exception. English walnuts do not cause injury to the apple."

Internal breakdown. Schneiderhan reports the trouble to have been prevalent in Virginia on Duchess and Ben Davis apples. The cause of the trouble is assigned to the abnormally low rainfall late in the season.

Internal browning was reported from California as the cause of a 3 per cent loss. In Missouri it was found in one orchard of Newtown Pippin where 75 per cent of the crop was affected.

Measles was found in Indiana on two-year-old nursery stock of Delicious and Winesap. In Virginia, according to Fromme, this disease was responsible for the poor condition of 100 trees in an orchard. Archer reports the disease to be of slight importance in southern Missouri.

Mosaic is again reported by Mills from New York.

Rosette is reported to be slightly important in Idaho and Washington.

Spot necrosis. Slightly important in Washington.

Stigmonose induced by the box elder bug caused some damage in a few orchards in Washington, according to Fisher. The Rome variety seemed to be especially preferred. The crop was completely ruined on some trees. The insects were quite gregarious, confining themselves to certain trees and often to the sunny side. The feeding punctures produced brown spots just below the skin of the apple.

Water core was present to a slight extent in Missouri on Early Harvest and in Michigan on King and Northern Spy. In Indiana some of the younger trees of Yellow Transparent and Duchess showed as high as 75 per cent water core. Brooks and Fisher (1) state that irrigation experiments show that apples from lightly irrigated trees develop more water core than those from heavily irrigated trees. An excess of soil moisture did not increase the amount of injury. Nitrate and potash fertilizers seemed to reduce the amount of injury. They believe that the disease is the result of sap exudation under pressure and that high sap concentration is a precursor of the disease.

Sun scald of apple fruit was reported from New York, Connecticut, and Delaware. In the last named state, Adams reports that the injury was more severe than ever before and that 20 per cent of the Stayman variety was affected.

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PEAR

BLIGHT CAUSED BY BACILLUS AMYLOVORUS (BURR.) TREV.

In 1926, as in previous years, blight was reported from practically all pear-growing districts. The majority of collaborators reported the prevalence to be the same as last year and as the average year. However, Delaware, Connecticut, Pennsylvania, Illinois, and Indiana reported more than usual, while New York, Arkansas, Arizona, Colorado, and Washington reported less. The losses reported for 1926 are given in table 15.

The following reports of collaborators indicate the nature of damage occurring in 1926.

New York: Some orchards have been badly damaged this year. There was only a slight amount of blossom blight but late infection occurred through the twigs. (Barrus)

Virginia: Eastern Shore Section - Blight has practically eliminated pears from home orchards. Severe infections were common in the southern peninsula. (McWhorter)

Tennessee: Outbreak was later than usual, perhaps due to dry and cool spring. By May, however, the blight was widespread in eastern Tennessee. (Hesler)

Arkansas: For the first time in a number of years there was a good crop of fruit and very little blight. (Dept. Pl. Path.)

Ohio: Especially severe in southern and southwestern Ohio with infection extending northward. (Thomas)

Indiana: Serious mainly as a source of infection for apple orchards. (Gardner)

Pear - Blight

Kansas: Severe in scattered localities in southeastern and eastern portions of state. (White)

Arizona: Blossom blight severe in northern part of state. (Brisley)

Washington: Only traces of blight were observed in the eastern part of the state. The disease was particularly active last season and considerable hold-over blight was observed early this spring. (Dept. Pl. Path.)

California: Growers succeeded in stopping the spread of blight which caused serious losses last season. (H. A. Harris)

The sterilizing solution used in Los Angeles County consisted of mercuric chloride 4 tablets, mercuric cyanide 4 tablets, water 1 pint, glycerine 1 pint. (C. R. Gorton, Deputy County Hort. Comm.)

The following represents the scant data on varietal resistance: In Delaware it was very prevalent on Keiffer (Adams). The Sand Pear, considered to be resistant, sometimes suffers severely in Florida (West). At the Stark Nursery in Missouri all varieties were severely blighted except Surprise (Archer). In Michigan the Keiffer was resistant and the Bartlett very susceptible (Bennett).

Reimer (2) reporting on spraying tests, states that Bordeaux spray applied at the proper time will materially reduce the number of blight infections, although russeting of the fruit will occur when spray applications are followed by continued rains. The pink or pre-bloom application was found to be the most effective, although there was evidence that later application also had value. Spraying with Bordeaux mixture is to be regarded strictly as supplementary to the other work of root inspection, eradication of cankers and blighted branches, etc.

Table 15. Percentage losses from pear blight, as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
75	Louisiana	3	Arizona
40	Mississippi	2	Connecticut, Delaware, Texas, Kansas
30	Arkansas		
25	Tennessee		
20	North Carolina	1.5	Ohio
15	Missouri	1	Virginia, West Virginia
10	Illinois, Iowa		
8	Maryland	Trace	New Jersey, Wisconsin, Idaho, Washington, Oregon
5	Michigan, South Dakota, California		

Recent literature

1. Nixon, E. L. Fire blight. Pennsylvania Agr. Exp. Sta. Bul. 203: 1-22. June 1926.

2. Reimer, F. C. Value of Bordeaux mixture in blight control. Seventeenth Ann. Rept. Oreg. State Hort. Soc. p. 1-7. Dec. 1925.

3. Rosen, H. R. The number and arrangement of flagella of the fire blight pathogen, Bacillus amylovorus. Mycologia 18: 23-26. Jan.-Feb. 1926.

SCAB CAUSED BY VENTURIA PYRINA ADERH.

Apparently scab was relatively unimportant in 1926 since its occurrence was reported only in 13 states and of these only 10 gave estimates of losses: New Jersey, 5 per cent; Maryland, Wisconsin, Oregon, and California, each 1 per cent; Ohio and Connecticut, each 0.5 per cent; Michigan, Delaware, Virginia, and West Virginia, a trace. New York, Pennsylvania, Iowa, and Washington reported the disease to be present but gave no estimates of losses. Connecticut, New York, Pennsylvania, Maryland, Ohio, Illinois, Iowa, and Washington report less prevalence in comparison with a normal year. New Jersey, Delaware, Michigan, and Wisconsin report average prevalence.

Some of the reports of collaborators follow:

New York: Although reported as present in many counties in the eastern and western parts of the state, the disease has caused practically no damage. The dry cool spring and early summer is probably responsible for this condition. (Barrus)

Pennsylvania: Occurrence very slight. Least on record. (Thurston)

Washington: Scab occurred only in slight amounts in western part of state. (Dept. Pl. Path.)

Oregon: Present throughout western portion of state but by no means as severe as in 1925. (Barss)

A few reports were received on varietal susceptibility as follows: Flemish Beauty in Michigan; Clapp Favorite, Anjou, and Flemish Beauty in New York; Sheldon and Flemish Beauty in Connecticut reported as susceptible; Bartlett and Keiffer in Michigan reported as resistant.

LEAF BLIGHT CAUSED BY FABRAEA MACULATA (LEV.) ATK.

The records of the Plant Disease Survey show that practically all the reports of this disease have come from areas east of the Missouri River, with most of the reports of important losses coming from New York, Pennsylvania, New Jersey, Delaware, Maryland, and Ohio. In 1926 only eight states reported losses as follows: New Jersey and Maryland, 5 per cent each; Tennessee, 2 per cent; Delaware, West Virginia, Arkansas, Illinois, and Michigan, a trace. In Delaware, Adams reports that there was heavy leaf infection on neglected trees. In Georgia, Higgins reports that the disease did not appear although it is usually serious on most varieties of pear. The Department of Plant Pathology in Arkansas reports that it was abundant on French seedling pears, defoliating the trees in September.

MISCELLANEOUS PARASITIC DISEASES

Armillaria mellea (Vahl) Quel., root rot. Washington.

Brown blotch (undet.) - Occurred commonly on Keiffer and slightly on Bartlett in Missouri. (Archer)

Bacterium tumefaciens EFS. & Town., crown gall. One report in Connecticut on nursery stock imported from France. (Clinton)

Fumago vagans Pers. Occurred as a sooty mold following plant lice in Connecticut. (Clinton)

Gymnosporangium globosum Farl., rust. Connecticut and Florida.

Gymnosporangium kernianum Bethel rust. 100 per cent infection of the fruit on one tree in northern Arizona. (Brisley)

Leptothyrium pomi (Mont. & Fr.) Sacc. and Gloeodes pomigena (Schw.) Colby, fly speck and sooty mold. Occurred quite commonly in Missouri. (Archer)

Mycosphaerella sentina (Fr.) Schroet., leaf spot. In 1926 reports of losses were received from Tennessee, 2 per cent; Maryland, Illinois, and Michigan, a trace each. In addition the disease was reported to occur in New York, Virginia, and Indiana.

Nectria galligena Bres. Reported by Dillon-Weston (2) as an "eye rot" of pears.

Ozonium omnivorum Shear, root rot. Prevalent in black lands of Texas, causing a loss of 2 per cent. (Taubenhaus). 2 per cent loss in Arizona.

Physalospora malorum (Pk.) Shear, black rot. Losses were reported in 1926 from Maryland, 5 per cent; Tennessee, 1 per cent; Illinois and Michigan, a trace each. In Delaware fruit infection was prevalent on late harvested fruit. In Arkansas it was reported as slight on fruit. In New Jersey injury to tips of new shoots was observed in one orchard. In Missouri two small collections were made, one on leaves and the other on twigs.

Phytophthora cactorum (Leb. & Cohn) Schroet., fruit rot. Indiana.

MISCELLANEOUS NON-PARASITIC DISEASES

Bitter pit - Reported from Washington.

Black-end rot. Caused a 0.5 per cent loss in California. (Milbrath). Also present in Washington. Heppner (4) describes black-end rot or hard-end as a serious trouble, evidently physiological, which has been causing enormous losses to the California Bartlett pear industry for the past several years. It has been observed in practically every pear growing section of the state, such as the Antelope Valley of Los Angeles County, the Sacramento River section, and Mendocino, El Dorado, Contra Costa, Lake, and Napa Counties, and reports have come also from other sections where the Bartlett pear is produced; so apparently no pear producing section of the state is entirely free from it. In preliminary investigation to determine the nature of the disease, careful records were kept of the fruit as harvested from each tree in twelve orchards in various parts of the Antelope Valley. Of the trees on Japanese roots 70 per cent produced fruit with black-end, while none of the trees on French roots produced such fruit. About the same results were obtained in observations in other sections. A very few isolated trees on French roots were found bearing black-end fruit, in each case in soil which was excessively wet in winter and extremely dry in summer. Conclusions cannot be drawn until more work has been done.

Chlorosis (excess of lime) - Traces in Texas. (Taubenhaus)

Exanthema - Two occurrences reported in California. (H. E. Thomas)

Frost injury - Michigan reported a 0.5 per cent loss; Arizona and Virginia, a trace. In Washington the injury was said to be important.

Hail injury - In South Carolina, according to Ludwig, affected 85 per cent of the crop.

Leaf scorch - Caused probably by atmospheric desiccation was moderately important in Washington. The damage occurred during a period of high temperatures with frequent drying winds. The Bartlett was resistant, while Anjou and Bosc were susceptible. (Fisher)

Rough bark - Reported in Washington. (Dept. Pl. Path.)

Recent literature

1. Barnard, L. C. Little leaf of pears (Lake County conditions). California Cult. 67 (1): 8. July 1926.

2. Dillon-Weston, W. A. R. An "eye" rot of pears. Gard. Chron. III, 80: 373. Nov. 1926.

3. Harrison, J. E. Cold storage of pears. Fruit World of Australasia 27: 30-32. 1926.

4. Heppner, Myer J. Bartlett pear black-end rot investigation. California Pear-Grower 6 (9): 5-6. 1926.

5. Zeller, S. M. A blossom and spur blight of pear caused by a strain of Botrytis cinerea Pers. Jour. Agr. Res. 33: 477-482. Sept. 1926.

Q U I N C E

Bacillus amylovorus (Burr.) Trev., fire blight. The losses reported by collaborators for 1926 were New York, 5 to 10 per cent; Maryland and Michigan, each 5 per cent; Texas, 1 per cent; Virginia, a trace. The disease was said to be important in Ohio and New Jersey, and only slightly important in Pennsylvania, Delaware, Tennessee, South Carolina, Florida, and Indiana.

Fabraea maculata (Lev.) Atk., leaf blight. Reported from Tennessee with loss of 2 per cent; Michigan, 1 per cent; New York and Maryland, each a trace. Also reported to occur in Connecticut, Delaware, South Carolina, and Florida.

Gymnosporangium germinale (Schw.) Kern, rust. Loss in Maryland, 5 per cent; and in Michigan and Virginia, a trace each. Also slight occurrence reported in New York, Connecticut, Pennsylvania, New Jersey, South Carolina, and North Carolina.

Gloeodes pomigena (Schw.) Colby, sooty blotch. Found plentifully both on harvested quinces and on fruit on the trees in Missouri. Superficially and microscopically the fungus has the appearance of the sooty blotch fungus, although there were no fruiting bodies. So far as could be determined there seems to be no reference in the literature reporting this fungus on quince. (Archer)

Physalospora malorum (Pk.) Shear, black rot. Reported from Indiana and Connecticut.

Recent literature

1. Wormald, H. On the occurrence in Britain of the conidial stage of Sclerotinia cydoniae Schell. Trans. Brit. Myc. Soc. 10: 303-306. Feb. 25, 1926.

D I S E A S E S O F S T O N E F R U I T S

P E A C H

BROWN ROT CAUSED BY SCLEROTINIA FRUCTICOLA (WINT.) REHM.

This disease is widespread in all the principal peach growing districts of the United States. Since 1918, according to records of the Plant Disease Survey, the heaviest percentage losses have occurred in South Carolina, with an average loss of 23 per cent; Florida, 18.5 per cent; Georgia, 12.5 per cent; Kentucky and Mississippi, each 11.5 per cent; Pennsylvania, 10.9 per cent; North Carolina, 10.2 per cent; Delaware, 10.1 per cent; Maryland, 9.8 per cent; Alabama, 9.7 per cent; New Jersey, 7.1 per cent. The losses for 1926 are given in table 16.

The prevalence of brown rot in 1926 was the same in comparison with the average year in New Jersey, Tennessee, Alabama, Mississippi, Louisiana, Indiana, Missouri, and Kansas. It was said to be more prevalent in Delaware, Maryland, and Michigan; while it was less so in Connecticut, New York, Pennsylvania, Virginia, North Carolina, South Carolina, Arkansas, and Illinois.

Peach - Brown Rot

The following data on the observance of the first mature apothecia are presented:

Georgia: Apothecia were not plentiful but a few were observed in the orchards towards the end of March. (Dunegan)

Arkansas: Perfect stage abundant around Fayetteville. (Dept. Pl. Path.)

Illinois: Apothecia were abundant in old plum thickets and under peach trees which had not been cultivated. A few were found in the region of Collinsville in cultivated peach orchards. In general, however, apothecia were not common in well kept orchards. (Anderson)

Indiana: Active apothecia found in Knox County, April 21, under seedling trees. (Gardner)

Connecticut: Some rot on early varieties, but little on late varieties compared with most seasons. (Clinton)

New York: One orchard of Rochester peaches showed severe injury to the branches which appears to be caused by brown rot. Other varieties in the same orchard seem to be free from the injury. (E. E. Frane)

Delaware: The first infection was found on Early Rose. Early varieties in general showed heavy infection. Infection on Carman followed peach moth infestation. (Adams)

Georgia: Blossom blight first seen on April 16. Scattered infections were observed on Mayflower, Red Bird, Carman, Uneeda, and Hiley, but the disease did not become prevalent. As a result it was possible to successfully harvest the early varieties. (Dunegan)

Mississippi: Very severe on early varieties due in part to injuries resulting from a heavy hail storm and a wet spring. (Wedgworth)

The relation of weather conditions to the development of brown rot is discussed in the following remarks by collaborators:

Illinois: Brown rot was almost absent from fruit this year because of two factors. Curculio was extremely rare and weather conditions were unfavorable for the development of the disease up to the time of harvesting. The wet weather during harvest might have caused heavy losses but for the fact that growers had sprayed unusually carefully and had thinned their fruit more than usual. The cracking of the fruit as a result of heavy rains following extreme dry weather in southern Illinois would have been a serious factor so far as brown rot was concerned had the spores been abundant in the orchards. Some brown rot developed in transit and in the market, but it was much less than expected. (Anderson)

Oregon: Abundant sunshine and dry atmospheric conditions prevailing through March and April were rather unfavorable for spore formation and infection. There was considerable loss in some orchards. Little spraying done. (Barss)

Ohio: The weather during late August and early September was favorable for development of the disease but spraying held it in check. (H. C. Young)

South Carolina: With relation to the dry weather, which existed during the summer, it might be said that brown rot was less troublesome than in any other year. The result was an unusually large crop which caused the price to drop almost to the no-profit point. (Ludwig)

North Carolina: A deficiency of summer rainfall retarded the disease. In the Sandhills sections, where orchards were well sprayed, the disease was less prevalent than in other parts of the state. (Fant)

Delaware: Evidence indicates more fruit infection than has been experienced for five years. Above normal rainfall during July with humid weather favored infection. (Adams)

Table 16. Percentage losses from brown rot of peach as estimated by collaborators, 1926.

Percentage: loss	States reporting	Percentage: loss	States reporting
25	Louisiana	3	Connecticut, West Virginia
15	Maryland, Missouri	2	Delaware, Indiana, Oregon
10	Michigan	1.5	Virginia
8	Alabama	1	South Carolina, Kansas
6	Arkansas	.5	New York
5	New Jersey, Tennessee, North Carolina, Mississippi	.1	California
4	Ohio	Trace	Texas, Illinois

Recent literature

1. Anon. Spray calendar for peaches. New Jersey Agr. Exp. Sta. Circ. 181: 1-4. 1926.

2. Anon. Control of brown rot in stone fruits. Recent experiments at Henderson. New Zealand Jour. Agr. 33: 170-173. Sept. 1926.

3. Roberts, J. W., and J. C. Dunegan. Blossom blight of the peach. Phytopath. 16: 217-222. Mar. 1926.

4. Schneiderhan, F. J., and R. H. Hurt. The dry-mix spray for peaches. Virginia Agr. Exp. Sta. Bul. 239: 1-16. 1926.

LEAF CURL CAUSED BY EXOASCUS DEFORMANS (BERK.) FCKL.

Records of the Plant Disease Survey would indicate that leaf curl has been reported from all states except Vermont, Wisconsin, Minnesota, North Dakota, South Dakota, Montana, and Wyoming. According to collaborators' reports since 1918 the highest percentage losses have occurred in Oregon, 4.8; Maryland, 4.2; Kentucky, 3.6; New York, 3.3; Pennsylvania, 3; Missouri, 2.7; Arizona, 2.5; Kansas and Iowa, 2.1; and Michigan, 2.

In 1926 it would seem that the disease occurred as an epidemic in Arkansas, Illinois, Indiana, Missouri, Mississippi, and Louisiana where it was reported to be more prevalent than usual or than last year. Edgerton reports the occurrence of the disease for the first time in Louisiana. He states that there was apparently an epidemic on young trees in all the northern part of the state.

The first occurrence is recorded from Utah also by B. L. Richards. He states:

> "The disease was found in a severe form in the Bear River Canyon District. Two orchards were damaged to the extent of from 60 to 75 per cent of the crop. The almost complete defoliation of the trees at the late date of July indicated that the trouble may become a serious factor in peach culture in the state."

A collaborator's report in the files of the Plant Disease Survey states that the disease occurred slightly in Utah in 1912, but evidently it has not been reported since that time.

The reports on losses for the United States are given in table 17 and the dates of earliest appearance in table 18.

Following are extracts from the reports of collaborators:

Massachusetts: Infection very light in orchards which received a dormant spray. (Osmun)

Connecticut: This disease is now seldom reported. (Stoddard)

New York: Only slight amounts noted. (Mills)

New Jersey: Reported only from north Jersey. (Martin)

Peach - Leaf Curl.

Georgia: Due to the late season and severe cold in last of March and early April, leaf curl has been serious in some parts of state. (McHatton)

Mississippi: General as the result of cool wet weather in spring. (Beale)

Texas: Epidemic due to late cold wet spring. (Taubenhaus)

Arkansas: Perhaps the most outstanding disease this spring. Extremely prevalent, causing severe defoliation of unsprayed and poorly sprayed trees. Weather extremely favorable for the development of the disease during spring. (V. H. Young)

Ohio: Of no importance this year. Few scattering cases. (H. C. Young)

Indiana: Serious in orchards not properly sprayed. Lesions noted on fruits. (Gardner)

Illinois: The outstanding disease of peach this season was leaf curl. It is safe to say that this was the worst outbreak of this disease which we have experienced for a decade. The outbreak was unexpected since no leaf curl was observed the previous season in the region where it was most severe this year. As a result of the conditions this year we have learned that there is no way of foretelling epidemics of leaf curl, and the only way to protect the orchards is to spray in the fall with a fungicide which we know will control the disease. It is not safe to wait until spring.

The belt where the disease was most severe extended from Carbondale northward to Neoga with the severest infection in the Centralia region and eastward. Some orchards were completely defoliated and so weakened that they did not set a crop. Where nitrate was used promptly some orchards recovered sufficiently to produce a fine crop.

The cause of the unusual outbreak this season was the prolonged cool weather during April following a warm period in March which started the buds. Also, growers had not been able to apply the sprays early in the spring due to unfavorable weather, and a great many orchards were either sprayed too late or were sprayed with oil emulsion. (Anderson)

Michigan: Common over the entire state on unsprayed trees. (Bennett)

Missouri: Most severe infestation in 15 years. Severe all over state in unsprayed orchards. Severe defoliation occurred in parts of the Ozarks resulting in total loss of fruit in many small orchards. (Archer)

Peach - Leaf Curl

The following few reports of collaborators indicate the nature and effectiveness of control measures:

Illinois: It was noticed that where Bordeaux mixture had been used with oil emulsion that very good control had been secured. In one orchard oil emulsion alone had been used on part of the orchard while oil emulsion plus Bordeaux had been used on the remainder. Although the spray had been applied after the buds began to swell, fairly good control had been secured.

Orchards which had had consistently good care both as to pruning and fertilization in former years although sprayed with oil alone did not suffer as much as those which had not received this care. It is not known why this should make a difference but it was evident in several sections. (Anderson)

Maryland: Severe in all unsprayed orchards and also where dormant application was made after the buds began to swell. In one orchard check trees had 95 per cent leaf curl and trees which were sprayed while dormant with concentrated lime-sulfur (1-9) had only 5 per cent infection. (Jehle)

Tennessee: Very prevalent where dormant spray with fungicide was omitted. (Boskin)

Georgia: Orchards well sprayed with concentrated lime-sulfur during February have shown little infection. (McHatton)

Alabama: Unsually severe where only winter spray or oil spray was given. (Miles)

Arkansas: Many growers are apparently dispensing with a fungicide in the dormant spray, since lubricating oil emulsion has displaced lime-sulfur as a scalecide in many cases. This omission of the fungicide is risky, as demonstrated by the severe infestation of leaf curl this season. (V. H. Young)

Table 17. Percentage losses from peach leaf curl as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
5	Missouri	.1	California
2	Maryland, Tennessee, Arkansas	Trace	New York, New Jersey, Delaware, West Virginia, Georgia, Louisiana, Michigan, Iowa, Idaho, Washington, Oregon
1.5	North Carolina, Alabama		
1	Illinois, Indiana, Kansas		
.5	Virginia, Texas		

Table 18. Dates and places of first observation of peach leaf curl, as reported by collaborators, 1926.

Date	Place	County	State
April 8	Everett	Snohomish	Washington
April 10	Clemson Agricultural College	Pickens	South Carolina
April 16	Fort Valley	Houston	Georgia
April 22	Rose Hill	Jasper	Mississippi
April 25	Newport	Cocke	Tennessee
April 27	- - -	Granville	North Carolina
April 29	- - -	Knox	Indiana
May	- - -	- - -	Louisiana
May 5	Bridgeville	Sussex	Delaware
May 12	Newport	Cocke	Tennessee
June 6 (on fruit)	- - -	Granville	North Carolina
June 16	Minden	New Haven	Connecticut
July 1	- - -	Box Elder	Utah

Recent literature

1. Cavadas, D. S. Report of the Phytopathological Station of Pelion for the year 1925. Volo (Thessaly, Greece): 1-25. 1926.

2. Guyot, L. Essais de lutte pratique contre la chlorose du Pêcher. Rev. Path. Vég. et Ent. Agr. 13: 66-69. 1926.

3. Weber, Anna. Sprojtning af Frugttraeer og Frugtbuske mod Snyltesvampe samt disses Biologi. (Spraying of fruit trees and bushes against parasitic fungi, together with the biology of the latter.) Tidsskr. for Planteavl. 32: 219-318. 1926.

SCAB CAUSED BY CLADOSPORIUM CARPOPHILUM THÜM.

In 1926 scab was reported from the eastern states and westward to Texas, Oklahoma, Kansas, Missouri, Illinois, and Michigan. The prevalence in comparison to the average year was the same in eight states. Delaware, Illinois, and Michigan reported more, while Connecticut, New Jersey, Maryland, Virginia, Tennessee, North Carolina, and Indiana reported less. The losses for 1926 are given in table 19.

In Virginia, Hurt reports, "it is evident that the fungus continues to sporulate throughout the growing season. New lesions were plentiful on young wood and some of them were sporulating on September 16." Schneiderhan in the same state says that moisture was not sufficient for early spore discharge and that the temperature was too hot for the normal development of the fungus.

Gardner states that the disease was not controlled by Sulfocide in Indiana. In Tennessee, according to McClintock, the disease was controlled by the same spray used for brown rot. In Ohio, H. C. Young states that scab was very abundant even on sprayed trees but not commercially important.

With reference to varietal susceptibility, Belle of Georgia, Elberta, and Hale were reported to be susceptible in Delaware; Crawford in New York; and Gold Drop and Prolific in Michigan. Elberta, however, was reported to be resistant in Michigan.

Table 19. Percentage losses from peach scab, as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
15	Texas	1	Maryland, West Virginia, Ohio, Michigan
10	Missouri	.5	New Jersey, Virginia
5	Louisiana	.1	Tennessee
2	North Carolina, Alabama	Trace	Arkansas, Illinois, Kansas
1.5	Delaware		

BACTERIAL SPOT CAUSED BY BACTERIUM PRUNI EFS.

Bacterial spot has been reported from all the principal peach growing districts east of the one-hundredth meridian. The disease has not been found in the northern New England states nor in the Pacific Northwest nor California. It was reported for the first time in Arizona in 1920.

In 1926, compared with the average year, more was reported from New York, Delaware, Maryland, Virginia, and Illinois, and the usual amount from New Jersey, Tennessee, Ohio, Indiana, Michigan, and Missouri. The following percentage losses were given by collaborators in 1926: North Carolina, 6; Texas, 3; Indiana, 2; Ohio, New York, Alabama, Mississippi, and Illinois, 1; New Jersey, Delaware, Maryland, and Michigan, 0.5; Virginia and Arizona, a trace.

It would appear that bacterial spot had become rather more severe, at least locally, during the past few years. The following reports of collaborators indicate that in 1926 it was the most important peach trouble of the year in several states.

> Georgia: Bacterial spot was the outstanding peach disease in Georgia during the 1926 season. Specimens and reports were received from practically every important commercial district. The weather during the early growing season was particularly favorable to the early development and continued spread of the disease. Throughout April, May, June, and July there were frequent periods of rainy cloudy weather which were of course conducive to the spread of this disease. The first report of the disease was received April 21. By May 3 the spots had reached an advanced stage of development.

In 1925 there were practically no secondary infections, but in 1926 there were distinct periods of reinfection until the fruit ripened. As late as July 13 specimens were collected with bacteria oozing from young spots.

The disease was confined mainly to Elberta or J. H. Hale but orchards of Carman, Georgia Belle, and Brackett showed infection.

Twig cankers on the 1926 wood were observed as early as May 8. The organism was isolated from the cankers and proved pathogenic, thus definitely demonstrating the nature of the cankers. Perhaps the most striking feature of the situation in 1926 was the widespread distribution in orchards where in previous years its presence could be detected only by actually examining all the fruit on the trees. This was particularly true of orchards on the Fort Valley plateau. Under favorable conditions in 1926 this infection multiplied so rapidly that large blocks showed trees with from 30 to 75 per cent of the fruit infected. In one orchard near Fort Valley a block of 612 trees was examined and 583 trees showed fruit infection. In another orchard a block of 218 trees selected at random showed fruit infection on every tree. Leaf spotting with consequent defoliation was prevalent all over the state and in some cases the defoliation became so severe as to leave only tufts of leaves at the tips of the branches.

The disease was most prevalent on light sandy soils and in orchards where nitrogenous fertilizers had not been used. It was particularly severe in orchards located on hillsides where undoubtedly much of the plant food had been washed down the slope. The improved condition of the trees at the bottom of the hills seemed to bear out this theory.

The actual monetary loss from infected fruit was not as high as the amount of infection would lead one to suppose. Due to the large crop (18,000 cars) the prices received for fruit by growers were very unsatisfactory so that the presence of many diseased fruits did not entail losses such as would have been the case had prices been high. (Dunegan)

Higgins (5) describes the effect of a heavy driving rain on the increased prevalence of the disease this year in Georgia. He states:

"The wind-driven rain washed the dust and spray residues from the leaves and fruits and left them unprotected and, at the same time, moist for several hours. The infection was always worse on the northwest side of the tree except on trees with very open tops. Often the branches on the northwest side of the tree were almost completely defoliated. Infection on the fruits was rarely found other than on the side exposed to the Northwest. Wherever the trees had been protected from the wind by tall timber or by buildings the infection was very light."

Illinois: As in 1925 bacterial spot was one of the most destructive diseases of the peach. It easily ranks first in importance this year. It was generally prevalent in spite of the unusually dry spring. Since the same was true last year it is evident that heavy rains or a prolonged rainy period is not necessary for infection.

Peach - Bacterial Spot

The disease was unusually severe on the fruit. In one orchard where actual counts were made of several thousand peaches, infection on the fruit ranged from 50 to 90 per cent. About 20 per cent of the fruit could not be put in a No. 1 pack. Foliage infection was heavy but for some reason defoliation was not as marked as one would expect. Observations on numerous orchards again demonstrated that nitrating did not reduce the amount of infection but did serve to keep the foliage on the trees. (Anderson)

North Carolina: Severe again this year. Infection generally worse on southwest side of trees. No reduction in the prevalence of the disease could be noted in the case of trees receiving moderate applications of either nitrate of soda or stable manure just prior to blooming time. (Fant)

Delaware: Cultural and histological studies during the winter months until March indicate that overwintering occurs in cankers both on plum and peach. Field observations indicate that the cankers are the source of foliage infection in spring and that the principal source of fruit infection, coming later, is a drip infection from the leaves. (Adams)

Mississippi: Generally severe on young trees in an apparently low state of vitality. (Neal & Wedgworth)

Alabama: Worse on poorer soils and in ill-kept orchards. (Miles)

Arkansas: Always present on leaves, fruits, and wood of nursery stock. (Dept. Pl. Path.)

Missouri: Distribution quite irregular but there was severe defoliation and in some cases severe fruit infection in several counties. In the same orchard often there was irregular distribution, some trees practically escaping injury. A hail storm in one section caused severe infection of leaves and fruit on the southwest side of the trees. (Archer)

Data relating to experimental control of bacterial spot in Delaware were submitted by Adams. He states that no consistent results were secured with various combinations of miscible oils, sulfur, copper sulfate, and sodium fluosilicate in dormant and summer applications.

Recent literature

1. Anon. Bacterium pruni and peach canker. 44th Ann. Rept. Ohio Agr. Exp. Sta. (Bul. 392): 11-99. Mar. 1926.

2. Anderson, H. W. Control of bacterial spot of peach with sodium silicofluoride. Trans. Illinois State Hort. Soc. 59: 266-271. 1926.

3. Anderson, H. W. A theory to account for the bactericidal action of sodium silicofluoride and lack of injury to host tissues. (Abstract). Phytopath. 17: 50. Jan. 1927.

4. ______________ Experiments with fertilizers and cultivation for the control of bacterial spot of peach. Trans. Illinois State Hort. Soc. 59: 258-261. 1926.

5. Higgins, B. B. Bacterial spot of peach. Georgia Agr. Exp. Sta. Circ. 79: 1-8. Aug. 1926.

BLIGHT CAUSED BY CORYNEUM BEIJERINCKII OUD.

Peach blight occurs principally in Oregon and California, where it is most severe, and in Washington, Idaho, Utah, and Colorado. During the past four years the disease has been reported consistently from Ohio and Michigan, where slight losses occur each year. Scattered reports have been received from time to time from various other localities in the United States, but in general these occurrences have not been consistent nor have they been substantiated with authentic specimens. In 1926, California reported a loss of 2 per cent. Hungerford reports that it is the most serious parasitic disease of peach in Idaho. In Washington, Idaho, and Oregon it was moderately important, while in Colorado it was practically absent.

Recent literature

1. Parker, C. S. Coryneum blight of stone fruits. Howard Rev. 2: 1-40. Jan. 1925.

YELLOWS (CAUSE UNDETERMINED)

Peach yellows was reported in 1926 from Connecticut, New York, Pennsylvania, New Jersey, Delaware, Maryland, Virginia, Ohio, and Michigan. In North Carolina, Fant states that the occurrence of yellows is rather doubtful since only a few trees were noted with slight symptoms. Negative reports were received from Tennessee, South Carolina, Texas, Arkansas, Illinois, Iowa, Missouri, and Kansas. Losses reported for 1926 are Maryland and Michigan, 2 per cent; New York, a trace to 1 per cent; Ohio, 0.5 per cent; Delaware, Virginia, and West Virginia, a trace.

The disease is said to be very important usually in New York, moderately so in Connecticut, Ohio, and Michigan, and slightly so in Virginia. In New Jersey its importance varies from moderate to slight.

W. A. McCubbin of the Pennsylvania Department of Agriculture in a report to the Plant Disease Survey states:

Peach - Yellows

"In the thirteen counties inspected for yellows in 1926, three hundred and ninety orchards were covered. In these 624,743 trees were examined, of which 2,524 were marked for yellows, or a disease average of 0.4 per cent. The average percentage of disease in 1926 is thus slightly above that found in 1925 when the low mark of 0.35 per cent was reached. Since the difference in the two years amounts to only one-twentieth of one per cent it is easily attributable to mere seasonal fluctuation and does not necessarily indicate any increase in yellows. The following table 20 indicates the decline in prevalence of the disease in Pennsylvania during the past 5 years."

Table 20. Peach yellows inspection results in Pennsylvania in the years 1921-1926.

Year	No. orchards	No. trees inspected	No. trees Blazed	Per cent Yellows
1921	324	287,466	17,376	4.45
1922	422	442,507	11,052	2.50
1923	417	482,614	10,698	2.21
1924	456	674,012	6,064	.89
1925	408	655,493	2,326	.35
1926	390	624,743	2,524	.40

The following reports of collaborators deal with the distribution or seriousness of the infection:

Connecticut: Three reports received. Earliest appearance was June 17 at Rockville. (Clinton)

New York: Many more trees found affected in Monroe and Orleans Counties than in previous years. The disease was serious in the counties just named; moderately important in Greene and Nassau Counties and slightly important in Ulster and Columbia Counties. The earliest appearance noted was August 2 at Columbia. (Mills)

Pennsylvania: On the decrease under careful management. (Thurston)

New Jersey: Observed in vicinity of Hammonton but not severe. (Martin)

Delaware: Frequently observed in plantings but there is no general increase. (Adams)

Peach - Yellows; Little Peach; Rosette; Spray Injury

Virginia: But very little of it in the state. Elberta and Late Crawford are susceptible. (Schneiderhan)

Ohio: Found in Wayne, Medina, and Lawrence Counties. (H. C. Young)

LITTLE PEACH (CAUSE UNKNOWN)

In 1926 little peach was reported to be present in Connecticut, New York, Pennsylvania, Delaware, Maryland, Virginia, and Michigan; while it was said not to occur in South Carolina, Ohio, and Illinois. Michigan reported a loss of 1.5 per cent, and Delaware, Maryland, and Virginia, each a trace. In Connecticut the disease was recorded but once in 1926. In New York, slight amounts occurred in Orleans County. One orchard in Seneca County showed a considerable number of affected trees of Rochester and Hill's Chili but not so many of Elberta and Stevens Rare Ripe. In Delaware the disease was observed generally. In Maryland infection occurred late in scattered localities. In Michigan the areas of infection were scattered but the disease had spread rapidly since last year. In one orchard 20 per cent of the trees were affected.

ROSETTE (CAUSE UNKNOWN)

No reports regarding rosette were received in 1926.

SPRAY INJURY

Spray injury due to arsenicals was reported from Connecticut, New York, New Jersey, Delaware, Virginia, Alabama, and Michigan.

Connecticut: White arsenic was used in one place instead of lead arsenate in a dry-mix spray. As a result 200 trees were killed and 150 more were badly injured. The trees were 4 to 8 years old. (Stoddard)

New Jersey: Injury was present seemingly wherever lead arsenate was used heavily or where concentrated lime sulfur was applied. Regular sprays were harmless. Following are some reports from individual orchards: Regular dry lime sulfur (not dry-mix) with lead caused 25 per cent defoliation and severe burning of remaining leaves in Burlington County. Spray of 1-50 lime sulfur and lead caused almost complete defoliation in Burlington County. Atomic sulfur with 1 1/4 pounds lead per 50 gallons caused spotting of leaves in Atlantic County. (Dept. Pl. Path.)

Delaware: All peach dust with calcium arsenate used by growers caused serious defoliation and dropping of fruit. This source of lead was used to cheapen price. Tags showed lead arsenate analysis but this was not confirmed by samples examined by state chemists. Magnesium arsenate also caused leaf injury. (Adams)

Virginia: Cankers due to lead damage are found in nearly every peach orchard in the Piedmont section. Insufficient use of lime with lead arsenate is the cause. A minimum of 4 pounds of stone lime or 6 pounds of hydrated lime per pound of lead arsenate should be used. In one orchard where only three pounds of lime was used there was 50 per cent defoliation. (Hurt)

Michigan: Considerable foliage and twig injury has been noted in orchards sprayed with arsenicals. One dusted orchard also showed marked injury. (Bennett)

Recent literature

1. Bennett, C. W. Arsenical injury to peach. Quart. Bul. Michigan Agr. Exp. Sta. 8: 183-185. May 1926.

FROST INJURY

The nature and extent of injuries caused by freezing are given in the following reports of collaborators:

Delaware: Some orchards showed 90 per cent blossom loss in Elberta and Georgia Belle; but the loss was not general and furthermore the injury was offset by heavy pollination so that a large crop was harvested. (Adams)

Virginia: Estimated loss for state 20 per cent. In the central part of the state (Burkeville section) the crop of all varieties was a total loss. The low temperatures lasted a week and killed buds in a fall dormant stage. (Schneiderhan)

South Carolina: Fruit of Carman and Elberta affected by frost in some localities after attaining considerable size. (Poole)

Michigan: Estimated loss for state is 8 per cent. (Bennett)

Washington: Fruits in Yakima Valley showed irregular russet-like lesions, sometimes with atrophy of tissue. Possibly due to early frosts. (Div. Pl. Path.)

Missouri: One large orchard in the southern part of the state had a 5 per cent loss due to frost cankers at base of trunk or of the larger branches. In other sections there was considerable gummosis of twigs and smaller branches in young orchards. Distinct frost rings were found in the wood of these injured branches. (Archer)

Recent literature

1. Adams, J. F. Terminal shoot and bud injury on peaches associated with low temperatures during the spring of 1925. Trans. Peninsula Hort. Soc. 39: 44-46. 1926.

WINTER INJURY

In New York losses were serious along Lake counties in the western part of the state, especially in orchards on poorly drained or light soil. Slight injury occurred in the Hudson Valley and Long Island. On injured trees the twigs withered and the buds failed to develop. In many instances the crown of the tree was injured, the bark being killed for a space of six inches or more above and below the ground. This injury in some orchards amounted to 100 per cent of the trees. In Connecticut there was a moderate amount of killing of young twigs and a few cases of trees killed or badly injured. In Missouri most cases of winter killing can be traced back to the fact that the trees were not allowed to harden before winter set in. In Ohio injury occurred generally throughout the northeastern part of the state.

Recent literature

1. Weldon, G. P. Peach winter injury in southern California and a possible remedy. California Cult. 66: 593. May 1926.

MISCELLANEOUS DISORDERS DUE TO WEATHER CONDITIONS

Cracking. Losses ranged from 2 to 25 per cent from cracked fruit due to wet weather following an extremely dry spring and summer in the southern part of Illinois. (Anderson)

Delayed blooming and defoliation, in relation to climatic conditions, is discussed by Horne, Weldon, and Babcock (1).

Hail injury. In South Carolina resulted in hardened depressions on ripening fruit. (Ludwig)

Recent literature

1. Horne, W. J., G. P. Weldon, and E. B. Babcock. Resistance of peach hybrids to an obscure disease in southern California. Jour. Hered. 17: 99-104. Mar. 1926.

MISCELLANEOUS PARASITIC DISEASES

Armillaria mellea (Vahl) Quel., root rot. Reported on an occasional tree in many orchards in California and as a trace in Texas. In North Carolina, according to Poole, Armillaria mellea was found fruiting at the base of twenty peach trees. The external condition of the trees was excellent. Although typical mycelial development was observed beneath the bark there was no evidence that the fungus was injuring the trees.

Bacterium cerasi Griffin, bacterial gummosis, was reported from California where it is stated that peach trees as a rule are not attacked, except the Phillips variety which is usually attacked. In western Oregon the disease is found only occasionally on peach.

Bacterium tumefaciens EFS. & Towns., crown gall. General. Arizona reports loss as 2 per cent. Weldon (4) states that in California probably every peach tree over 15 years old has crown gall infection.

Botryosphaeria ribis chromogena Gross & Dug. Florida.

Cercosporella persicae Sacc., frosty mildew. Observed in Georgia on leaves of unsprayed seedling peaches. It was seen in the same locality in 1925. It has not been found in commercial orchards.

Fomes applanatus, P. connatus, Polystictus versicolor, and Panus sp. Reported to occur in Connecticut on trees which were subjected to severe winter injury several years ago.

Caconema radicicola (Greef) Cobb, root knot. In Missouri in Dunklin and Mississippi Counties, where the soil is a sandy type, nematode is the limiting factor in peach culture. Old trees are poorly developed and are subject to die-back. The roots of seedlings are covered with galls. In Mississippi the loss is estimated at 4 per cent; in Texas at 0.5 per cent. In Arkansas severe infestation caused a total loss of some peach seedlings planted for budding.

Ozonium omnivorum Shear, Texas root rot. Loss 3 per cent in Arizona and a trace in Texas.

Rhizopus nigricans Ehr., soft rot. General.

Sphaerotheca pannosa (Wallr.) Lev., powdery mildew. Reported from Connecticut, South Carolina, Mississippi, Texas, Georgia, and Oregon. In Georgia, Dunegan states: "The disease was quite prevalent in several orchards during May. In all cases the disease in the orchards was directly correlated with the presence of badly infected rambler rose bushes. The fruit on the tree nearest the rose bushes was marked by rough, hairless, calloused spots and could not be shipped, but on trees further removed from the source of inoculum only an occasional fruit was affected. No leaf or twig infection seen." In Oregon the disease is more common in arid areas than in Willamette Valley.

Tranzschelia punctata (Pers.) Arth., rust. Traces reported from Alabama, Florida, Louisiana, and Texas. In California, according to Goldsworthy (1) peach rust occurred along the Feather and Bear Rivers. The loss for the state was negligible but in the Yuba district, a highly developed canning peach area, the losses were severe and amounted to 70 per cent infection in some orchards.

Recent literature

1. Goldsworthy, M. C. Peach rust epidemic of 1926. California Countryman 13 (2): 7, 28. Nov. 1926.

2. Hesler, L. R. Peach disease conditions in Ohio. Ohio Sta. Bimo. Bul. 11: 110-114. 1926.

3. Walton, R. C. Cause and prevention of peach canker. Pennsylvania State Hort. Assoc. News 3: 40-45. Mar. 1926.

4. Weldon, George P. The crown gall meance. Pacific Rural Press 112 (25): 691. Dec. 1926.

5. Zeller, S. M. The brown pocket heart rot of stone-fruit trees caused by Trametes subrosea Weir. Jour. Agr. Res. 33: 687-693. Oct. 1926.

MISCELLANEOUS NON-PARASITIC DISEASES

Chlorosis due to excess of lime. Caused a loss of 0.5 per cent in Texas on limestone soils.

Little leaf. Occurred in Arizona but it did not seem to be identical with the little leaf disease in eastern states.

Marcel. Reported by M. C. Goldsworthy from the Yuba-Sutter district in California. It occurred on early varieties such as Tuscan and on mid-summer varieties (Hauss, Oragne, Palora, etc.) Corky areas characterized the disease and they occurred all over the fruit surface. Loss ranged as high as 100 per cent.

Paradichlorobenzene injury occurred in Connecticut. Canker-like, dead areas at base of certain trees, evidently resulting from placing the chemical too near the trunks the year before.

Scald occurred in Delaware during midseason and was often followed by soft rot.

Wart. A peculiar malformation was found in several orchards in south-central Illinois, where from 5 to 10 per cent of the peaches showed warty overgrowths. These consisted in some cases of a small pimple with a rather sharp apex and in other cases they were wart-like. In some cases the enlargements were extensive and cauliflower-like and then rendered the fruit unfit for packing. The exact cause has not been discovered.

Recent literature

1. Anon. Peach hybrids again resist defoliation disease. Jour. Hered. 17: 389. Oct. 1926.

2. Blake, M. A. The secret of the split-pit peach. New Jersey Agr. 8 (10): 2-3. Oct. 1926.

3. Guyot, L. Essais de lutte pratique contre la chlorose du Pêcher. Rev. Path. Vég. et Ent. Agr. 13 (1): 66-69. 1926.

4. McClintock, J. A. Further evidence of uncongeniality in disease-resistant stocks. Proc. Amer. Soc. Hort. Sci. 22: 231-232. 1926.

5. McCubbin, W. A. Three little known diseases of peach. I. Rootlet rot. II. Punky rot. III. Heart rot. Pennsylvania State Hort. Assoc. News 3: 46-50. Mar. 1926.

P L U M

BROWN ROT CAUSED BY SCLEROTINIA FRUCTICOLA (WINT.) REHM

In 1926 brown rot was reported on plums in eastern United States westward to Arkansas, Kansas, North Dakota, and South Dakota, and from California and Oregon. The prevalence compared with the average year was greater in Virginia, Tennessee, Michigan, Delaware, Missouri, and California; the same in Maryland, Mississippi, Ohio, Kansas, and Oregon; and less in New York, New Jersey, Pennsylvania, Arkansas, Illinois, Wisconsin, Minnesota, Iowa, and North Dakota. The losses reported by collaborators in 1926 are given in table 21.

The following data were submitted by collaborators on varietal susceptibility: Varieties susceptible - Damson in Virginia; Burbank, Green Gage, and several varieties originated by Hansen, in Missouri; Imperial, Sugar, and Jefferson in California; Burbank in Connecticut; Shiro in Delaware. Varieties resistant - French in California; Damson and German Prune in Missouri.

Table 21. Percentage losses from brown rot of plum, as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
25	Missouri	3	New York, Virginia, Oregon
10	Ohio, Michigan	2.5	Minnesota
7	Maryland	1	Delaware, South Dakota
6	North Carolina, Wisconsin	Trace	North Dakota, Kansas, Washington
5	Tennessee, Arkansas, Illinois		
4	Connecticut		

BLACK KNOT CAUSED BY PLOWRIGHTIA MORBOSA (SCHW.) SACC.

In 1926 black knot was reported from New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, Tennessee, South Carolina, Texas, Ohio, Illinois, Indiana, Michigan, Missouri, North Dakota, Nebraska, and Arizona and that the disease was of some importance is indicated by the following loss estimates: New York, 1 to 3 per cent; Tennessee, 2 per cent; Maryland and Arizona, each 1 per cent; Ohio and Michigan, each 0.5 per cent; Texas and Illinois, a trace. In New York, Pennsylvania, Delaware, and Michigan it was reported to be severe only in neglected or home orchards. In Wisconsin, American and Japanese varieties are said to be very resistant to the disease but European varieties are very susceptible.

POCKETS CAUSED BY EXOASCUS PRUNI FCKL. AND E. COMMUNIS SADEB.

Plum pockets was reported in 1926 from Maryland, North Carolina, South Carolina, Mississippi, Texas, Arkansas, Illinois, Michigan, Wisconsin, Minnesota, North Dakota, South Dakota, and Kansas. Losses reported were Texas, 3 per cent; North Dakota, 1 per cent; Maryland, Illinois, Michigan, Minnesota, and Kansas, a trace. In Wisconsin it was serious on all American varieties in the northern part of the state. In North Carolina, Arkansas, and Minnesota it was found only on wild plums.

BACTERIAL SPOT CAUSED BY BACTERIUM PRUNI EFS.

Bacterial spot was reported in 1926 from New York, Delaware, Maryland, Virginia, Tennessee, Georgia, Mississippi, Texas, Ohio, Illinois, Michigan, and Missouri. Losses reported were Tennessee, 1 per cent; Ohio, 0.5 per cent; Maryland, Virginia, Illinois, Michigan, and Missouri, a trace. In Delaware the Shiro variety is considered to be susceptible. In Missouri the disease was widespread over the state and although most of the damage occurred on leaves yet a few cases of cankers were observed, particularly in the Ozarks. In Georgia no fruit spotting was seen but leaf infection and cankers were abundant by August and some killing of twigs by girdling occurred.

MISCELLANEOUS DISEASES AND DISORDERS

Alternaria sp., fruit rot. In Minnesota numerous specimens sent in as brown rot were found to be infected with Alternaria.

Armillaria mellea (Vahl) Quel., root rot. Occasional trees in many orchards of California. (Thomas)

Coccomyces prunophorae Hig., leaf spot. New York, Delaware, Maryland, Arkansas, Ohio, Michigan, Wisconsin, Minnesota, Missouri, and Oregon. Losses were reported as a trace in Maryland, Ohio, Michigan, and Minnesota.

Phyllosticta prunicola Sacc., leaf spot. In Missouri 100 per cent in one locality. (Archer)

Phyllosticta virginianae (E. & H.) Seaver, leaf spot. Iowa. In nursery on Hansen variety. (Archer)

Phyllosticta sp., plum blotch. Texas; traces. (Taubenhaus)

Tranzschelia pruni-spinosae (Pers.) Arth., rust. Texas.

Chlorosis due to excess of lime. Texas.

Exanthema (cause unknown). Present in the Santa Cruz Mountain District of California. (H. E. Thomas)

Internal browning and shrivel (non-parasitic). Reported from Wasco County, Oregon. Little was noted in Willamette Valley where it is often serious. (Barss)

Recent literature

1. Brooks, F. T., and W. C. Moore. Silver-leaf disease. V. Jour. Pomol. & Hort. Science 5: 61-97. 1926.

2. Carne, W. M. Crinkle of Japanese Plums. Jour. Dept. Agr. Western Australia 2nd Ser. 3 (2): 175. 1926.

3. Swarbrick, T. The healing of wounds in woody stems. Jour. Pomol. & Hort. Science 5: 98-114. 1926.

CHERRY

BROWN ROT CAUSED BY SCLEROTINIA FRUCTICOLA (WINT.) REHM.

Reports of brown rot on cherries in 1926 came from the Middle Atlantic and the Ohio Valley States, as well as from some of the Middle Western, most of the Great Lake States, and the Pacific Coast States. Apparently there was less than usual, only Virginia, Tennessee, and California reporting more. The losses for 1926 are given in table 22.

In Oregon Barss states: "At harvest time, which was three weeks in advance over the average season, some brown rot showed in all western Oregon orchards but not enough to cause severe losses on the trees except in case of Bing cherries which cracked from rain and became badly rotted afterward." In New York, according to Mills, brown rot following curculio injury caused considerable loss to some growers in Ulster County. In Virginia, Schneiderhan reported that worm injury and moist weather during ripening season increased the infection.

Table 22. Percentage losses from brown rot of cherry, as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
7	Maryland	1	West Virginia, Illinois, California
5	New Jersey, Tennessee	.5	Ohio, Wisconsin
3	Virginia, Arkansas, Michigan	Trace	New York, Delaware, Iowa, Kansas, Washington
2	Oregon		
1.5	Connecticut		

LEAF SPOT CAUSED BY COCCOMYCES HIEMALIS HIG.

In 1926 the leaf spot of cherry occurred in scattered states, although it was mostly confined to the Middle Atlantic and Ohio Valley States. Evidently the disease was not important this year since, of the 17 states reporting on comparative prevalence, only 4, New Jersey, Maryland, Virginia, and Missouri, reported it to be normal, and Connecticut alone reported it to be more than normal. Losses for 1926 were reported from Maryland and Missouri as 10 per cent; Michigan and Arkansas, 2 per cent; Virginia, Tennessee, Iowa, and Montana, 1 per cent; Wisconsin, 0.5 per cent; West Virginia, Illinois, Kansas, and Oregon a trace.

In New Jersey, Missouri, and Arkansas complete defoliation occurred in many cases where sprays were not applied. In Delaware it was generally prevalent but no heavy defoliation occurred. In Wisconsin the disease was controlled with lime-sulfur and in Tennessee with Bordeaux mixture.

BACTERIAL SPOT CAUSED BY BACTERIUM PRUNI EFS.

Bacterial spot on cherry was reported from two states only in 1926. In New York it was said to be the cause of much dropping of leaves in one county. In Missouri it caused defoliation of trees in some parts of the Ozarks and it was also found several times causing severe leaf spotting of nursery stock.

BACTERIAL GUMMOSIS CAUSED BY BACTERIUM CERASI GRIFFIN

Bacterial gummosis was reported from Washington, Oregon, and California. In California, according to Goldsworthy, gummosis is a more or less chronic condition in cherries. Many limbs are lost each year, although not many trees are affected. The fruit is usually harvested before wood losses occur. Losses due to the disease cannot be estimated, but it was of moderate importance in 1926. In western Oregon, according to Barss, the disease is causing less damage than formerly, due to the fact that many growers are resorting to seedling stock for bodies, to which limbs are grafted later.

Sackett (1) reports on a new bacterial disease of the Wragg cherry, caused by <u>Phytomonas (Pseudomonas) cerasi wraggi</u> Sackett. The disease is characterized by brown spots on the leaves and by watery, green (later black and sunken) lesions on the unripe fruit, which eventually becomes mummified.

<u>Recent literature</u>

1. Sackett, W. G. Report of the Bacteriologist. 38th Ann. Rept. Colorado Agr. Exp. Sta. for year 1925: 16-20. 1926.

Cherry

MISCELLANEOUS DISEASES

<u>Armillaria</u> <u>mellea</u> (Vahl) Quel., root rot. Reported on an occasional tree in many orchards in California.

<u>Botrytis</u> <u>cinerea</u> Auct., gray mold. Caused 1 per cent loss in California.

<u>Exoascus</u> <u>cerasi</u> (Fckl.) Sadeb., witches' broom. Occasional in western Oregon.

<u>Plowrightia</u> <u>morbosa</u> (Schw.) Sacc., black knot. Although widespread this disease was reported only from New Jersey, Pennsylvania, Virginia, Missouri, and Idaho. It was not mentioned as of economic importance in any of these states.

<u>Podosphaera</u> <u>oxyacanthae</u> (DC.) D By., powdery mildew. Reported from Missouri, Iowa, Wisconsin, Indiana, and New York but the disease was considered to be important only in Iowa where the loss was reported as 3 per cent.

<u>Recent literature</u>

1. Faes, H., and Staehelin. Les maladies des cerisiers au printemps 1926. Terre Vaud. 18: 411-415. July 1926.

2. Gray, W. P. Spraying and harvesting the cherry crop. Ann. Rept. State Hort. Soc. Michigan 55: 21-24. 1926.

3. Ross, W. A. Sour cherries injured by Bordeaux. Canada Hort. 49: 28. Feb. 1926.

4. Tubeuf, Carl von. Auftreten der blattbräune der süsskirchen durch befall von Gnomonia erythrostoma in Ramberger Tal (Rheinpfalz). Zeitschr. Pflanzenkr. 36: 237-238. 1926.

<u>A P R I C O T</u>

<u>Armillaria</u> <u>mellea</u> (Vahl) Quel., root rot. Occasional tree killed in California.

<u>Bacillus</u> <u>amylovorus</u> (Burr.) Trev., fire blight. Loss a trace in Texas.

<u>Bacterium</u> <u>cerasi</u> Griffin, bacterial gummosis. In California the disease is chronic in all apricot regions. Apparently the infected trees produce as well as healthy ones, but the life of a diseased tree is considerably shortened. (Goldsworthy)

<u>Bacterium</u> <u>pruni</u> EFS., bacterial spot. Reported from Texas and Missouri.

<u>Bacterium</u> <u>tumefaciens</u> EFS., crown gall. Loss 2 per cent in Arizona.

<u>Cladosporium</u> <u>carpophilum</u> Thuem., scab. Texas. Loss 0.5 per cent.

<u>Coryneum</u> <u>beijerinckii</u> Oud., blight. Reported from California, Oregon, Washington, and Idaho. In Idaho there was an unusual amount of the disease due to the neglect in spraying last year on account of a severe freeze which killed all the San Jose Scale. (Hungerford)

Coccomyces sp., leaf spot. Texas.

Ozonium omnivorum Shear, root rot. Loss 1 per cent in Arizona.

Sclerotinia fructicola (Wint.) Rehm., brown rot. Reported from Washington and Connecticut. Losses negligible.

Chlorosis due to too much lime. Trace in Texas.

Exanthema (cause unknown). Occurred in one district in California. Loss a trace.

DISEASES OF SMALL FRUITS

GRAPE

BLACK ROT CAUSED BY GUIGNARDIA BIDWELLII (ELL.) VIALA & RAVAZ

Of sixteen states reporting on black rot in 1926, seven, Maryland, Tennessee, South Carolina, Wisconsin, Iowa, Missouri, and Kansas, reported the average amount; five, Connecticut, Pennsylvania, Michigan, New York, North Carolina, and Illinois reported less; while only one, Virginia, reported more. The losses for 1926 are given in table 23.

General remarks of collaborators are given below:

North Carolina: In an average year black rot is important on fruit of the bunch grape but it does not occur on fruit of the muscadine grape. (Poole & Fant)

Arkansas: Very important where spraying is not well done. Always present in home vineyards. Noted also on vinifera type. (Dept. Pl. Path.)

Missouri: Particularly serious in southern Ozarks but is found to certain extent all over state. The Vergeens variety is especially susceptible. (Archer)

Table 23. Percentage losses from black rot of grape, as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
10	Maryland, Tennessee	2	Delaware
9	Virginia	1	West Virginia, Wisconsin, Kansas
4	North Carolina		
3	South Carolina, Texas, Arkansas, Ohio	Trace	Illinois, Michigan, Missouri

DOWNY MILDEW CAUSED BY PLASMOPARA VITICOLA (BERK. & CURT.) BERL. & DETONI

Comparatively speaking, downy mildew was of little importance in 1926. It was reported from 15 states, and 4 of these, New Jersey, Michigan, Minnesota, and Missouri, reported the prevalence to be the same as the average; while Connecticut, New York, Pennsylvania, Ohio, Illinois, and Iowa reported less; and Indiana and Maryland reported more. The estimated losses for 1926 were Maryland, 5 per cent; Illinois, Michigan, Minnesota, Iowa, Arizona, and Missouri, a trace. In Connecticut there were five reports and only one of injury. Adams reported heavy leaf infection on Niagara but the disease was not commercially important in Delaware. In Texas the infection occurred mostly on wild varieties. Some infection occurred in Arkansas but since mostly the Concord type is grown the disease was of slight importance. In Illinois it was abundant on leaves and fruit of wild grapes and one case was noted where the fungus had apparently spread from wild to cultivated varieties.

In New Jersey the Concord and Chautauqua are considered to be less susceptible than white varieties.

In Iowa and New York weather conditions prevented the development of the fungus. In Illinois moisture conditions were favorable but the early part of the season was too cool. In Maryland both moisture and temperature were reported to be favorable to the fungus. In Ohio the weather conditions were so favorable for the fungus that in some northern sections of the state the disease was controlled with difficulty.

Recent literature

1. Arnaud, G. Essais d'anticryptogamiques sur les arbres fruitiers et la Vigne en 1925. Comptes Rendus Acad. Agric. France 12: 92-96. 1926.

2. Durand, A. Contre le mildiou. Vie Agr. et Rur. 28: 412-413. June 26, 1926.

3. Faes, H., and P. Tonduz. Station federale d'essais viticoles a Lausanne et Domaine de Pully. Rapport Annuel, 1925. Annuaire Agr. Suisse 27: 241-270. 1926.

4. Harrison, R. M., and W. M. Ware. Downy mildew of the vine again in England. Gard. Chron. III, 80: 448-449. Dec. 4, 1926.

5. Marescalchi, A. Nuove osservazioni in materia di peronospora della vite. Ital. Vinic. 16: 211-213. Apr. 4, 1926.

6. Pee-Laby, E. L'invasion du mildiou en 1925. Resistance de quelques hybrides producteurs. Rev. Vitic. 64 (1646): 31-33. 1926.

7. Schneider, G. A. Erfahrungen in der Rebschädlingsbekämpfung. Nachr. über Schädlings bekämpf. (Formerly Nachrichtenbl. Landw. Abteil. Farbenfabriken vorm. F. Bayer & Co., Leverkusen bei Koln-am-Rhein) 1: 5-7. 1926.

8. Villedieu, G., and Mme. La composition et l'action des bouillies cupriques. Comptes Rendus Acad. d'Agric. de France 12 (2): 65-70. 1926.

POWDERY MILDEW CAUSED BY UNCINULA NECATOR (SCHW.) BURR.

In 1926 powdery mildew was reported to be present in Connecticut, New York, New Jersey, Pennsylvania, Maryland, Virginia, Texas, Ohio, Michigan, Iowa, Arizona, California, and Oregon. The losses reported were Maryland and California, 0.5 per cent; Virginia, Texas, Michigan, and Iowa, a trace. In Arizona the disease was especially severe in a large vineyard of Thompson Seedless. In Oregon it was general on Vinifera stock but was controlled by sulfur dust. D. H. Rose and W. S. Ballard have made surveys in California during 1925 and 1926, and report as follows on powdery mildew:

> "Powdery mildew was less serious in 1925 and 1926 than in 1924 and much less so than in 1923. Early in both seasons it caused some russeting of Malaga, Muscat and a few other varieties, about October 1, because of increased rainfall and cooler weather, the "active" mildew (live mycelium and spores) was found to a slight extent on the stems of the bunches in numerous vineyards of Muscat, Malaga, Emperor, Chanez and a few other varieties. On all of these perithecia in various stages of development were found.
>
> "Evidence was obtained from holding tests during both seasons that mildewed stems are very likely to be attacked in storage or in transit by decay fungi, especially gray mold."

Recent literature

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2. Eyles, F. Two diseases of the vine. Rhodesia Agr. Jour. 23: 929-932. Oct. 1926.

3. Flossfeder, F. Grape mildew and its control. California Grape Grow. 7 (6): 6-7. June 1926.

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BLACK MOLD ROT CAUSED BY ASPERGILLUS NIGER VAN TIEGH.

"In California black mold rot was found on all commercial varieties in 1925 and 1926 but caused most loss on Zinfandel, Burger, and Grenache Alicante Bouschet. The first two regularly and the third occasionally form bunches so tight that the berries are often broken merely by their pressure against each other in the bunch. The consequent leakage of juice furnishes a culture medium for the germination of the spores of the mold and seems to be the main cause for occurrence of the decay in the varieties mentioned. Varieties which form loose, open bunches such as Malaga, Thompson Seedless, and Muscat were not found attacked by the mold except during or soon after periods of rainy weather. Black mold rot was fairly common from Modesto southward in the San Joaquin Valley, rare in the districts east of Los Angeles, and seemed not to occur at all north of Modesto or in Sonoma and Napa Counties. The rot was easily recognized in the vineyard or in packing houses by the characteristic dark purplish-brown masses of spores. These usually occurred on nests of two or three or a dozen or more berries. In diseased spots in the bunches where the fungus had been present for sometime, affected berries were dried up and much shriveled. Berries only recently affected were soft and leaky like those attacked by gray mold.

"In transit the fungus seems to spread and develop less than gray mold, for shipments inspected at the receiving markets rarely show much loss because of it. In one test made at Fresno in 1926, three bunches badly rotted by the mold were placed on a two-inch layer of sound bunches of Grenache grapes in a lug, and then covered with more bunches of the same good quality. At the end of 10 days at 45 to 50° F. there was no sign of black mold rot in any but the three bunches which were rotten when the test began." (D. H. Rose and W. S. Ballard)

GRAY MOLD ROT CAUSED BY BOTRYTIS SP. (PROBABLY B. CINEREA)

"In California gray mold rot was found in 1925 in practically all of the vineyards visited in Sonoma and Napa Counties; it also occurred, though to a lesser extent, in the territory around Sacramento and Lodi, mainly on Zinfandel, Tokay, and Alicante Bouschet. It was still less important at Modesto and could scarcely be found at all around Fresno and Bakersfield until the rains began early in October. It is noteworthy that as here indicated gray mold rot was progressively worse from south to north and, as pointed out in the case of black mold rot that this disease was progressively worse from north to south. Both were found at Modesto, which is roughly half way between Bakersfield (Kern County) and Santa Rosa (Sonoma County). The distribution of the two probably depends on differences in temperature and humidity in the different sections. It is known at least that Botrytis is most prevalent in moist, cool temperatures like that of the Bay counties. A recent survey in Oregon by Schuster and Husman shows that in the grape growing regions of that state Botrytis is quite prevalent and often destructive. These regions, it is scarcely necessary to point out, have a cool, damp climate. Anderson in 1924 reported Botrytis as by far the most serious fungous parasite in southeast Alaska which, as he also points out, has a climate characterized by mild winters and cool summers accompanied by much cloudy and rainy weather.

"In 1926 the distribution of the rot was quite the opposite of that found in 1925. The Bay counties had almost no rot of any kind and the southern sections (San Diego, Los Angeles, Ontario) an unusual amount in some localities and more in most localities than they had the year before. At some places in the south the increase in decay was thought to be due to extremely hot weather just after picking began, followed by weather in which there was much fog and dew at night.

"Like black mold rot, and evidently for the same reasons, the rot caused by Botrytis was most serious on Zinfandel. Examination of bunches of this variety in which the decay was only slight showed almost invariably that the decay had started in a cracked berry and had spread from that to others around it. In a few instances it appeared that infection had progressed into the berries through the cap stem from an old lesion on the main stem of the bunch. Such lesions may, of course, have resulted from growth of the fungus inward to the main stem from infected berries; on the other hand they may have resulted from the spring infection reported by Milbrath. This seems to have affected only the blossoms and young grapes though there is a possibility that here and there the fungus spread into the main stem, but soon became dormant and remained so until favorable conditions later in the season caused it to resume growth.

"In the Alicante Bouschet variety infection was usually worse in the tighter bunches. In the Tokay variety it was confined almost entirely to bunches which showed the cracking described elsewhere in this paper. In the Chenez variety in one vineyard it was found attacking the stem and occasionally the berries at the lower end of the bunch. Where only the stem was affected the berries attached beyond the stem lesion were slightly browned and much shriveled." (D. H. Rose and W. S. Ballard)

FROST INJURY

In 1926 frost injury, confined largely to the old canes, caused considerable loss in the Lake Erie region of New York. In Delaware only weakened vines were affected but the commercial crop was not reduced in yield. Michigan reported a loss of 5 per cent. In Minnesota the loss was estimated at 0.5 per cent, the crop being reduced by frost in only a few isolated places. Iowa reports the injury to be much more than the average year, due to a combination of a wet fall and an early freeze which killed many vines. The loss in Arizona was estimated as a trace.

OTHER DISEASES AND INJURIES

Bacterium tumefaciens EFS. & Towns., crown gall. Indiana and Utah. In Oregon, Barss reports crown gall on European grape due presumably to Bacterium tumefaciens. He states that Muscats were resistant and Rieslings susceptible in Wasco County. The disease was common also in Josephine County.

Clitocybe monadelpha (Morg.) Sacc., root rot. Reports were received from South Carolina and from Missouri. However, the fungus was not fruiting in either case, the determination being made solely on the nature of the mycelium and the symptoms. In Missouri, where the damage was reported as slight, the grape root worm seems to be associated with the disease. Plants in low, moist ground have worm holes and are covered with mycelium. These plants die but those on high dry ground, similarly attacked by the worm, are not affected with mycelium and do not die.

Cryptosporella viticola (Reddick) Shear, dead arm. A single case was reported from New York.

Glomerella cingulata (Stone) Spauld., ripe rot. Caused slight loss in southern Missouri. In Arkansas, according to Rosen, a species of Pestalozzia is associated with the ripe rot fungus. He states: "Much shelling of Concord grapes together with a brownish discoloration of fruit stalks and a rotting of the fruit has occurred in vineyards where ripening of fruit has been retarded. Acervuli of both Gloeosporium and Pestalozzia have been found on fruit and fruit stalks. The symptoms of the disease are markedly different from those described in the literature."

Caconema radicicola (Greef) Cobb, root knot. California, 0.5 per cent loss.

Ozonium omnivorum Shear, root rot. Texas, 5 per cent and Arizona 2 per cent loss.

Phakopsora vitis (Thuem.) Syd., rust. In Florida, according to Rhoads, this disease often becomes abundant late in the season but it occurs so late that it does not have economic importance.

Sphaceloma ampelinum D By., anthracnose. Maryland, Ohio, Wisconsin, Minnesota, and South Carolina. In none of these states was it said to be of importance.

Chlorosis due to excess of lime. Texas, 0.5 per cent.

Pedicel canker (undet.) This trouble is rather important in Missouri and evidently it is not reported in the literature. In Jackson County, where it has been observed for a number of years, it caused a loss of 25 per cent in one vineyard of White Diamond. The disease was reported on the same variety from two other widely separated localities. Later it was found in Wright County in the Missouri Fruit Experiment Station vineyards where it occurred on Niagara, Lady Washington, Janesville (all white varieties) and on Vergeens (a red variety). The disease is prevalent before ripening of the fruit. The first symptom appears as a small area at some point on a fruit pedicel. The area increases in size until the pedicel is girdled by dead tissue. The grapes below the girdle then become shriveled and fall off. No organisms could be isolated and it seems probable that the disease is non-parasitic. (Archer)

Uneven ripening (undet.) In Arkansas, Rosen states that vineyards in two counties showed an unusual amount of green underdeveloped fruit in clusters of ripe fruit. In some instances this seemed to be associated with a withering of peduncles. Extreme dry weather alternating with rains is offered as an explanation of the trouble.

Grape - Other Diseases

Recent literature

1. Bennett, C. W. Dead arm disease of grape. Ann. Rep. Michigan Hort. Soc. 54: 22-24. 1925.

2. Bonnet, L. O. A promising remedy for black measles. California Sta. Circ. 303: 1-10. 1926.

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5. ________ and P. Tunduz. Station federale d'essais viticoles a Lausanne et Domaine de Pully. Rapport Annuel, 1925. Annuaire Agric. de la Suisse 27 (2): 241-270. 1926.

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8. Hoc, P. Le remplacement des manquants dans les vignes atteintes d'apoplexie. Jour. Agr. Prat. n.s. 45: 476-478. June 1926.

9. Nougaret, R. L. Folletage and apoplexy of the grape. California Cult. 66: 649. June 1926.

10. Quaintance, A. L., and C. L. Shear. Insect and fungous enemies of the grape. U. S. Dept. Agr. Farm. Bul. 1220: 1-54. Mar. 1926.

11. Rhoads, A. S. Diseases of grapes in Florida. Florida Agr. Exp. Sta. Bul. 178: 75-156. Jan. 1926.

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13. ________ Lesions de l'esca. Rev. Vitic. 65: 105-111; 121-125; 205-212. 1926.

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15. ________ Traitements de l'esca. Rev. Vitic. 64: 201-208. 1926.

S T R A W B E R R Y

LEAF SPOT CAUSED BY MYCOSPHAERELLA FRAGARIAE (TUL.) LIND.

The common leaf spot was evidently of slight importance in 1926 judging from reports received from 22 scattered states. Losses reported were 1 per cent in Texas and a trace in Illinois. In eastern Virginia severe late infections occurred. In Michigan, according to F. C. Strong of the State Agricultural College, Dunlap is considered susceptible, while Premier seems to be more resistant. In Oregon, Zeller states that Marshall, Oregon, Wilson, and particularly Ettersburg No. 121 are susceptible.

LEAF SCORCH CAUSED BY DIPLOCARPON EARLIANA (ELL. & EV.) WOLF

Leaf scorch was reported in 1926 from Connecticut, North Carolina, Virginia, Maryland, Delaware, and Arkansas. The disease was not considered to be important except, perhaps, in North Carolina where it was found to the extent of 75 per cent on the calyces in some fields of Klondike causing the so-called "dead-caps." The trouble was found rather abundantly on Heflin's Early variety in Virginia and on Gandy in Maryland. Rosen states that the disease was severe in Arkansas on the variety known as "Texas", while Aroma grown alongside appeared to be almost immune. Wolf (1) notes the wide difference in susceptibility of varieties to the disease and suggests the planting of immune or resistant varieties and spraying with Bordeaux mixture as control measures.

Recent literature

1. Wolf, F. A. Leaf scorch disease of strawberries. North Carolina Sta. Tech. Bul. 28: 1-16. 1926.

POWDERY MILDEW CAUSED BY SPHAEROTHECA HUMULI DC.

Powdery mildew was reported in 1926 from New York, Maryland, Delaware, New Jersey, and Washington. Heald and Dana (1) state that an unusual development of the disease occurred especially on Champion and Progressive varieties in Spokane Valley in Washington. The first crop was a complete loss in some cases.

Recent literature

1. Heald, F. D., and B. F. Dana. 36th Ann. Rept. Washington Agr. Exp. Sta. 1925-1926 (Bul. 208): 35. Nov. 1926.

MISCELLANEOUS DISEASES AND INJURIES

Botrytis sp., fruit rot. Reported from Connecticut, Maryland, Delaware, Virginia, North Carolina, and California. A. G. Plakidas remarks that ordinarily the strawberry fruit rots are of slight importance in California, but that this year, due to heavy rains in April and May, about one-half of the first crop was ruined.

Colletotrichum sp., anthracnose. Found in Florida by A. N. Brooks. Infected patches occurred in scattered localities on Missionary variety. The disease was noticed mainly on the runners and very seldom on other parts of the plants. Young tissue is attacked readily.

Dendrophoma obscurans (Ell. & Ev.) And., angular spot. Florida, Missouri, and Illinois. Exceptionally severe. (Anderson)

Fuligo sp. and other slime molds. In several cases growers stated that plants had been smothered by the slime mold. (White)

Fusarium sp., root rot. Moderately important in Massachusetts, New Jersey, and Florida. In all three states a Fusarium has been isolated from diseased tissue. As yet there has been no demonstration that this fungus was the cause of the disease.

Rhizoctonia sp., black root rot. Reported from Kansas and Washington. In Kansas, White states that often entire patches are killed presumably by this disease. Black root is reported to occur in Missouri and Michigan also, but in these two states the cause is undetermined. In Michigan, according to F. C. Strong, the disease was present in many places where losses varied from 10 to 25 per cent.

Rhizopus nigricans Ehr., leak. A 2 per cent loss was said to have occurred in the field in eastern and southern Texas. One report was received in Connecticut.

Tylenchus dipsaci (Kuehn) Bast., stem nematode. McKay in Oregon reports that the disease is known mostly along the coast and that it is spreading from wild plants back to cultivated ones.

Chlorosis (undet.) Texas.

Mosaic (undet.) A trouble reported as mosaic occurred in Ohio, Indiana, and Wisconsin, and in Manitoba. Ohio - The disease which is being described in Ohio as the mosaic is showing up and is quite prevalent, causing a distinct loss throughout our strawberry section. (H. C. Young, July 1). Manitoba - Trace found first time in 1925. Also a little this year. (Bisby)

Root burn (alkali). Texas, scattered traces in irrigated sections of southern Texas.

Yellows (undet.) Colorado. This trouble has been reported from several locations in the state, but not at all severe. (Learn). California - Continues to be serious throughout central coastal districts of California. Spreads rapidly through new fields of Banner, Marshall, and Oregon varieties and caused permanent stunting. Other varieties are affected but in varying degrees. (Horne). Etter's selections very resistant; Marshall, Banner, Oregon very susceptible. (Plakidas). Yellows, as it occurs on the Pacific Coast, is apparently a virus disease, according to Plakidas (2).

Recent literature

1. Hodson, W. E. Notes on the stem eelworm. Jour. Min. Agr. Great Britain 33: 259-262. June 1926.

2. Plakidas, A. G. Strawberry 'yellows' a degeneration disease of the strawberry. Phytopath. 16: 423-426. 1926.

3. Rose, Dean H. Diseases of strawberries on the market. U. S. Dept. Agr. Circ. 402: 1-8. Dec. 1926.

4. ______________ Relation of strawberry fruit rots to weather conditions in the field. Phytopath. 16: 229-232. 1926.

5. Staniland, L. N. Some observations on strawberry eelworm. Ann. Rept. Agr. & Hort. Res. Sta. Univ. Bristol 1925: 61-65. 1926.

R A S P B E R R Y

ANTHRACNOSE CAUSED BY PLECTODISCELLA VENETA (SPEG.) BURKH.

In 1926 anthracnose was reported rather generally throughout most of the territory east of the Great Plains States. The losses for 1926 are given in table 24.

Pennsylvania: This is by far the worst fungous disease of raspberries in the state. It is easily controlled by lime sulfur spray. (Krout)

Virginia: Most important raspberry disease of state. (Schneiderhan)

Arkansas: The limiting factor in raspberry culture. (Dept. Pl. Path.)

Wisconsin: Severe enough to note in 16 nurseries. (Vaughan)

Iowa: Drought in early season checked disease. (Gilman)

Oregon: Our dry summers must keep the disease in check. (Zeller)

It is generally recognized that red varieties of raspberry are rather resistant to anthracnose while black varieties are susceptible. This fact was further attested in 1926 by reports of collaborators: Bennett in Michigan and Archer in Missouri report red varieties to be resistant. In Missouri the red raspberry does not propagate freely and is subject to winter killing and therefore is not grown commercially. Black varieties were reported to be susceptible in Minnesota, New York, Oregon, and Missouri. Table 25 represents data on varietal susceptibility which has been compiled from the literature and from reports of collaborators. It will be seen that there is a lack of agreement regarding the resistance of several varieties.

Table 24. Percentage losses from raspberry anthracnose, as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
10	Pennsylvania	3	Minnesota, Iowa
7	Virginia	2	Michigan
6	Maryland, Indiana	1	Ohio, North Dakota
5	Kansas	.5	New York

Table 25. Data on varietal susceptibility to anthracnose compiled from literature and from collaborators' reports.

Very Resistant	Resistant	Susceptible
Columbian (P) (1)*	Columbian(P) (6)*	Antwerp (R) (14)
Hoosier (B) (15)	Cumberland (B) (14)	Cardinal (P) (10)
Quillen (B) (12)	Cuthbert (R) (11,14)	Columbian(P) (11)*
Van Fleet (R) (13)	Kansas (B) (14)	Cumberland (B) (1,3,7, 10)
	King (R) (2,9)	Eureka (B) (14)
	Latham (R) (2)	Gregg (B) (3,5,7,14)
	Miller (R) (9)	Kansas (B) (8,10)
	Plum Farmer (B) (13 a, 14)	Mammoth Cluster (B) (14)
		Ohta (R) (2)
		Plum Farmer (B) (1,3,4)
		Sunbeam (R) (2)
		Turner (R) (9)

(P) - Purple variety. (B) - Black variety. (R) - Red variety

*The Columbian, according to Burkholder (11, p. 158), "formerly was regarded as nearly immune, but it now exhibits a marked susceptibility. It is not known whether this variety really possessed resistance at one time or whether merely the stock was free from the disease."

References and authorities for data on varietal susceptibility.

(1) Reported in 1926 to the Plant Disease Survey by W. S. Krout from Pennsylvania.
(2) Reported in 1926 to the Plant Disease Survey by the Section of Plant Pathology of Minnesota.
(3) Reported in 1926 to the Plant Disease Survey by C. W. Bennett from Michigan.
(4) Reported in 1925 to the Plant Disease Survey by G. P. Clinton from Connecticut.

(5) Reported in 1924 to the Plant Disease Survey by W. S. Krout and C. R. Orton from Pennsylvania.
(6) Reported in 1923 to the Plant Disease Survey by E. F. Guba from New York.
(7) Reported in 1923 to the Plant Disease Survey by J. F. Adams from Delaware.
(8) Reported in 1921 to the Plant Disease Survey by J. A. Elliott from Arkansas.
(9) Reported in 1919 to the Plant Disease Survey by R. E. Vaughan from Wisconsin.
(10) Reported in 1919 to the Plant Disease Survey by W. E. Maneval from Missouri.
(11) Burkholder, W. R. in Cornell Agr. Exp. Sta. Bul. 395. 1917.
(12) Colby, A. S. in Amer. Fruit Grower Mag. 46 (3): 50. 1926.
(13) Darrow, G. M. in U.S.D.A. Circ. 320. 1924.
(13a) Gregory, C. T. in Hoosier Hort. 7 (3): 35-39. 1925.
(14) Rhoads, A. S. in Ozark Fruit Grower 9: 3-5. 1924.
(15) Taylor, W. A. in U.S.D.A. Yearbook 1910: 429-430. 1911.

Recent literature

1. Ulrich, F. Spraying raspberries. Minnesota Horticulturist 54: 113-115. 1926.

LEAF CURL, MOSAIC, AND STREAK (VIRUS)

Leaf curl

Leaf curl in 1926 was reported from Connecticut, New York, Pennsylvania, Maryland, Ohio, Illinois, Indiana, Michigan, Minnesota, Iowa, North Dakota, Nebraska, and Washington. Estimates of losses were given by collaborators as follows: Ohio, 8 per cent; Pennsylvania, 5 per cent; Maryland and Michigan, 3 per cent; North Dakota, 2 per cent; and Iowa, a trace.

In Pennsylvania the disease is easily controlled by roguing (Krout). The report from Nebraska is the first for that state (Goss). In Minnesota an unusual condition occurred in a few scattered plantings where 75 to 80 per cent of leaf curl appeared suddenly after several years of apparent freedom from the disease (Sect. Pl. Path.). In New York a large amount of the disease was found on stock imported from Canada and Michigan (Mills).

With reference to varietal susceptibility the following notes were submitted by collaborators: In Minnesota, Latham and King resistant; Marlboro and Cuthbert susceptible. In Iowa, black varieties are susceptible. In Michigan, King and Plum Farmer are immune; Gregg and Viking and especially Cuthbert, Victory, an Cumberland are susceptible. In Connecticut, Cuthbert is susceptible.

Mosaic

Reported to be present in Connecticut, New York, New Jersey, Pennsylvania, Maryland, Virginia, North Carolina, Ohio, Michigan, Wisconsin, Minnesota, Iowa, Kansas, Colorado, Washington, and Idaho. The estimated losses for 1926 are given in table 26.

Pennsylvania: The disease is being controlled by a thorough system of roguing which has been practiced for four consecutive years. By the spring of 1927, 400,000 disease-free plants will be ready for distribution. (Krout)

Wisconsin: Nearly half of nursery stock was refused certification because of mosaic. Seven types of the disease are recognized in inspection. (Chambers & Vaughan)

Minnesota: Mosaic and mildew are so closely associated that it is not possible to estimate the relative amount of damage caused by each. (Sect. Pl. Path.)

Kansas: First discovery in the state. Found on Latham variety introduced from Minnesota. (White)

Idaho: Most serious raspberry disease in state. (Hungerford)

Collaborators' reports for 1926 on varietal susceptibility are inconsistent in certain points but they are listed as given:

Connecticut: Herbert very resistant; King, Golden Queen, and Cuthbert susceptible. Reports received; several serious. Mostly on red varieties but some reports received of slight injury on black varieties, i.e. Plum Farmer and Cumberland. (Clinton & Hunt)

New York: Herbert and Latham resistant.

Michigan: All varieties suceptible. (Bennett)

Pennsylvania: All varieties susceptible. (Krout)

Indiana: Black varieties susceptible. (Gardner)

Minnesota: Sunbeam and St. Regis apparently resistant. Latham very susceptible to infection but very tolerant. King and Marlboro less susceptible to infection and less tolerant. (Sect. Pl. Path.)

Iowa: One hundred per cent infection found on Columbian. (Gilman)

Table 26. Percentage losses from raspberry mosaic as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
40	Pennsylvania	3	Maryland
15	New York	2	Connecticut, Washington
14	Minnesota		
12	Michigan	Trace	Virginia, Iowa, Kansas
5	Ohio		

Streak

No reports received from collaborators in 1926. The disease is discussed by Berkeley and Jackson (1).

Recent literature

1. Berkeley, G. H., and A. B. Jackson. Studies in raspberry diseases. Mosaic, leaf curl, rosette, and wilt. Pamph. Canada Dept. Agr. n.s. 72: 3-15. 1926.

2. Glenn, P. A. The mosaic situation in Illinois. Proc. Wisconsin State Hort. Soc. 56: 117-121. Aug. 1926.

3. Hanchett. Raspberry mosaic. Proc. Wisconsin State Hort. Soc. 56: 40-44. Aug. 1926.

4. Rankin, W. H. Raspberry mosaic control in Hudson River Valley. Proc. New York State Hort. Soc. 71: 173-178. 1926.

5. ____________ Mosaic of red and black cultivated raspberries. (Abstract) Phytopath. 17: 46. Jan. 1927.

6. Ruggles, A. G., and J. D. Winter. Some aspects of mosaic of the red raspberry from the standpoint of the nursery inspector. Minnesota Hort. 54: 79-85. Mar. 1926.

7. Thatcher, R. W. Forty-fourth Ann. Rept. New York Agr. Exp. Sta. 1924: 29. 1926.

8. Winter, J. D. Raspberry mosaic in Minnesota. Proc. Wisconsin State Hort. Soc. 56: 121-130. Aug. 1926.

BLUE STEM (WILT) CAUSED BY VERTICILLIUM ALBO-ATRUM REINKE & BERTH.

Blue stem in 1926 was reported in scattered localities in New York where, according to Mills, 10 per cent infection occurred in some fields. It was said to be increasing in Erie and Monroe Counties. In New Jersey, the Department of Plant Pathology reports that the disease was first recorded July 13 at Richfield in Passaic County. In California, according to B. A. Rudolph:

"The disease occurred locally in the San Francisco Bay region. The variety Syracuse was resistant but Columbian Purple, Cuthbert, Ranaree, and black caps were susceptible, especially the last two named. One field of Ranaree showed 40 per cent of the plants infected. The first infection was noted in June near Palo Alto. In general the season was not favorable in this district for the development of the disease."

Recent literature

1. Berkeley, G. H., and A. B. Jackson. Verticillium wilt of the red raspberry. Scient. Agr. 6: 261-270. Apr. 1926.

2. Harris, R. V. The blue stripe wilt of the raspberry. Ann. Rept. East Malling Res. Sta. 1924: 126-134. 1925.

WINTER INJURY

In 1926 frost injury was reported from New York, Pennsylvania, Michigan, Minnesota, Iowa, Missouri, South Dakota, and Oregon. Reports of losses were: Minnesota, 35 per cent; Iowa, 15 per cent; Pennsylvania, 1 per cent; and Michigan, a trace.

New York: The injury occurred in Erie and Wayne Counties. Especially on red varieties. (Mills)

Michigan: Cuthbert and Cumberland were susceptible. (Bennett)

Minnesota: In 1926 there was much more damage than in the average year, in some plantings 100 per cent of the plants being affected. Wet weather in fall of 1925 following long dry period caused plants to continue growing late into the winter. Sunbeam and Ohta were very resistant; Latham moderately resistant and King was susceptible. (Sect. Pl. Path.)

Iowa: Wet fall and early freeze caused a great deal of injury. (Gilman)

Missouri: Red varieties are especially susceptible. (Archer)

Oregon: This year there was a type of injury affecting 25 per cent of canes in the worst places. We suspect that this was due to late growth of canes in 1925, thus partially using the reserve which was needed the following summer (in 1926). (Zeller)

Recent literature

1. Frank, A. Winter injuries to berry plants. West. Fruit. 8 (2): 11, 14-15. Feb. 1926.

OTHER DISEASES

Ascospora rubi (Westend.) Zeller, cane spot. This is the most common cane-inhabiting fungus of most brambles in western Oregon and Washington and in average years I believe it must do more damage than spur blight. (Zeller (4)

Raspberry - Other Diseases

Bacterium tumefaciens EFS. & Towns., crown gall. Reported in 1926 from New York, Pennsylvania, Maryland, Virginia, Tennessee, Ohio, Indiana, Michigan, Wisconsin, Minnesota, Iowa, Nebraska, Kansas, and Idaho. The losses were estimated as 6 per cent in Michigan and Iowa; 3 per cent in Ohio and Kansas; 2 per cent in Pennsylvania and Minnesota; 1 per cent in Tennessee; and a trace in New York, Maryland, and Virginia. In Wisconsin plants pulled in roguing for mosaic showed 15 per cent infection with crown gall (Vaughan). In Pennsylvania the infection was said to be heavier in light sandy soils. A great deal of rain in latter half of year seemed to cause a rapid growth of galls (Krout). In Tennessee the St. Regis variety was very susceptible (McClintock). In Michigan, King, Cumberland, Plum Farmer, Cuthbert, and Columbian were susceptible, especially the last two named (Bennett). In Oregon, Barss reports one doubtful case of crown gall on canes of black caps.

Gymnoconia interstitialis (Schl.) Lagh., orange rust. Reported from New York, Illinois, Iowa, and Washington. Orange rust was unusually severe in New York on black raspberries, especially the Orlando. In Illinois the disease was rare. In Iowa it occurred moderately in the southwestern part of the state. Germination tests in Washington proved the long cycle form to be present.

Leptosphaeria coniothyrium (Fckl.) Sacc., cane blight. Reported from Virginia, Missouri, and Oregon. In Oregon, according to Zeller, the fungus caused damage for the first time. It was found on the Munger variety which had been attacked by the strawberry root borer. The fungus entered through pruning wounds and killed some of the laterals.

Mycosphaerella rubi Roark, leaf spot. New York and Missouri.

Mycosphaerella rubina (Pk.) Jacz., spur blight. Indiana and Oregon. In Indiana the fungus occurred on the Cuthbert variety as a leaf spot, according to Gardner. Zeller states that damage occurs only in the Ashland district of southern Oregon, although the fungus is widespread in the Willamette Valley.

Pezizella lythri (Desm.) Shear & Dodge. Observed in one locality in Missouri on living canes.

Phragmidium imitans Arth., leaf rust. Washington and Oregon. In Oregon, according to Zeller, it occurred on the Cuthbert variety in the Willamette Valley. He states that the lesions on the canes are usually destructive but that they were not common in 1926.

Pucciniastrum americanum (Farl.) Arth., rust. Reported on Rubus idaeus aculeatissimus in Wisconsin.

Sphaerotheca humuli (DC.) Wint., powdery mildew. Reported for second time from Connecticut where Stoddard states that the Latham variety was attacked but that Cuthbert nearby was not affected. In Minnesota mildew is closely associated with mosaic.

Recent literature

1. Colby, A. S., and H. W. Anderson. Diseases of brambles in Illinois and their control. Illinois Sta. Circ. 305: 3-20. 1926.

2. Dodge, B. O., and R. B. Wilcox. Diseases of raspberries and blackberries. U. S. Dept. Agr. Farm. Bul. 1488: 1-32. June 1926.

3. Harris, R. V. Three raspberry diseases. The blue stripe wilt, cane spot disease, mosaic. Fruit Grow. Fruit., Flor. & Mark. Gard. 62: 205-206, 208. Aug. 12, 1926.

4. Zeller, S. M. A correction. Mycologia 19: 150-151. May-June 1927. Coryneum ruborum Oud. = Hendersonia rubi (West.) Sacc. as suggested by Archer. Ascospore stage should be called Ascospora rubi (Westend.) Zeller instead of Ascospora ruborum (Oud.) Zeller.

B L A C K B E R R Y

ORANGE RUST CAUSED BY GYMNOCONIA INTERSTITIALIS (SCHL.) LAGH. AND KUNKELIA NITENS (SCHW.) ARTH.

These two rusts, not always easily separated, were reported widespread in the United States. The losses as a rule are very slight and in 1926 only six states gave estimates; i.e., Michigan, 3 per cent; Pennsylvania, 0.1 per cent; Maryland, Iowa, Missouri, and Kansas, a trace.

In Michigan, according to Bennett, Eldorado is quite resistant while Kittatinny and Blower are susceptible. In Tennessee, McClintock states that Early Harvest is susceptible.

Recent literature

1. Dodge, B. O., and L. O. Gaiser. The question of nuclear fusions in the blackberry rust, Caeoma nitens. Jour. Agr. Res. 32: 1003-1024. 1926.

ANTHRACNOSE CAUSED BY PLECTODISCELLA VENETA (SPEG.) BURKH.

Anthracnose was reported in 1926 from New York, Delaware, North Carolina, Arkansas, Minnesota, Missouri, and Oregon but evidently it was of slight importance as only traces of it were said to occur. In Delaware the disease was generally observed in home plantings (Adams). In New York it was thought to be important only in Chautauqua County (Mills). In Missouri most of the plantings are conducted on a scientific basis with proper spraying, pruning, etc., thus reducing losses to a minimum (Archer). In Oregon the disease is not a factor due perhaps to the dry summers (Zeller).

OTHER DISEASES

Bacterium tumefaciens EFS. & Towns., crown gall. Texas, Idaho, Washington, and Oregon. In Porto Rico, Cook reports one case was found at the Experiment Station on a plant sent from the United States.

Cercospora rubi Sacc., blotch. Caused a 15 per cent loss in North Carolina according to Poole. Blotch caused heavy defoliation of plants during the late season when the new canes were being formed. Leaf infection was 100 per cent in every field and the coalescing of spots was so heavy that many leaves were shed.

Fusisporium rubi Wint., reported as double blossom. Common in Louisiana. (Tims)

Mycosphaerella rubi Roark, leaf spot. Occurred in New Jersey, North Carolina, Indiana, Texas, and Missouri. The losses were estimated as 0.5 per cent in Texas and as a trace in Missouri. In North Carolina, Poole reports much injury to the canes because the fungus remained active in spots near the ends of the canes throughout the winter. In some fields the girdling of the canes just before the berries ripened caused heavy losses

Frost injury. Reported from North Carolina, Minnesota, Iowa, and South Dakota. In North Carolina, Poole stated that the injury resulted in poorly formed berries. In Minnesota the lack of winter hardiness is the limiting factor in the culture of blackberry.

Recent literature

1. Weber, G. F. Double blossom of blackberry. Citrus Indust. 7 (2): 9. Feb. 1926.

D E W B E R R Y

Cercospora rubi Sacc., blotch. Reported from North Carolina by Poole who remarks that "On such perennials as the Lucretia dewberry the disease caused severe defoliation in some fields early in September. The normal growing season extends into December and the defoliation will probably result in a shortage for the 1927 crop, since the cane growth in badly infected fields is not well developed. The disease was prevalent in every dewberry field examined."

Gymnoconia interstitialis (Schl.) Lagh., orange rust. New York, Arkansas.

Mycosphaerella rubi Roark, leaf spot. Texas.

Plectodiscella veneta (Speg.) Burkh., anthracnose. In North Carolina there was only a slight infection in the vicinity of Cameron, where the disease caused heavy losses in 1925 (Poole). One report from Missouri.

Mosaic (virus). In Washington, mosaic was the cause of considerable damage.

Frost injury. In North Carolina, Poole reports that the Lucretia variety was affected, with poorly formed berries as a result.

Recent literature

1. Wolf, F. A., and B. O. Lodge. Anthracnose of dewberries and its control. North Carolina Agr. Exp. Sta. Bul. 248: 1-16. Feb. 1926.

L O G A N B E R R Y

Mycosphaerella rubi Roark., leaf spot. Reported from Oregon. Zeller states that the disease is important also as a cane spot. He mentions that the disease is serious in some years but usually it does so little damage that growers cannot be induced to spray for it.

Plectodiscella veneta (Speg.) Burkh., anthracnose. Reported from one locality in Washington.

Verticillium albo-atrum Reinke & Berth., blue stem. In California Rudolph states that red and black varieties of loganberry are very resistant to blue stem.

Dwarf. This disease, evidently due to a virus, was reported from Oregon by Zeller. A small planting of about one-half an acre was observed in which about 15 per cent of the plants were diseased.

C U R R A N T

Botryosphaeria ribis Gross. & Dug., cane blight. Reported from New Jersey.

Pseudopeziza ribis Kleb., anthracnose. Indiana.

Puccinia grossulariae (Schum.) Lagh., rust. Severe in some parts of North Dakota (Brentzel).

Recent literature

1. Briton-Jones, H. R. A note on the leaf spot disease of black currants (Pseudopeziza ribis). Ann. Rep. Agr. & Hort. Res. Stat. Univ. Bristol 1925: 105-108. 1926.

2. Cobb, A. J. Reversion or nettle head in black currants. Garden 90: 328. June 5, 1926.

3. Stevens, N. E. Occurrence of the currant cane blight fungus on numerous hosts in the Southern States. Mycologia 18: 278-282. 1926.

G O O S E B E R R Y

Botrytis cinerea Auct., die-back. Reported on Oregon Champion from one locality in Oregon (Barss).

Pseudopeziza ribis Kleb., anthracnose. In Illinois anthracnose was very abundant in all sections of the state and caused defoliation early in the season (Anderson). The disease was reported also from New Jersey where it caused moderate damage. In western Oregon the disease is general and serious when not controlled with Bordeaux mixture (Barss).

Puccinia grossulariae (Schum.) Lagh., rust. Severe in some parts of North Dakota.

Septoria grossulariae (Lib.) West., leaf spot. Slightly important in Missouri.

Sphaerotheca mors-uvae (Schw.) Berk. & Curt., powdery mildew. Connecticut and Oregon.

Recent literature

1. Anon. The die-back disease of gooseberry (Botrytis cinerea Pers.) Gard. Chron. III, 80: 434. Nov. 27, 1926.

2. Anon. Gooseberry rust. Scottish Jour. Agr. 9: 308. July 1926.

C R A N B E R R Y

In 1926 the Division of Plant Pathology of the Washington Agricultural Experiment Station reported the following cranberry diseases to be present in Washington. The majority of the fungi were found only in Pacific County. Exobasidium oxycocci Rostr. (hypertrophy) slight importance; Exobasidium vaccinii (Fckl.) Wor. (red leaf spot) very important; Fusicoccum putrefaciens Shear (end rot) very important; Glomerella cingulata vaccinii Shear (bitter rot) slight importance; Guignardia vaccinii Shear (blast) slight importance; Pestalozzia sp. (rot) slight importance; Venturia compacta Pk. (leaf smudge) slight importance; Sclerotinia oxycocci Wor. (hard rot) very important.

Sclerotinia oxycocci was also reported from Wisconsin by H. F. Bain of the State Department of Agriculture. He estimates the loss to be a trace for the state with a 40 per cent infection found in some fields. The disease was most severe in Juneau, Monroe, and Jackson Counties. He mentions that dry weather conditions were unfavorable for the development of the fungus, since it is considered that rainy weather is necessary during the time of discharge of ascospores and conidia. The tip blight stage appears at about blossom time. Berry infection occurs during or just after blossoming while the typical hard rot stage is reached at harvesting time.

With relation to storage rots in Wisconsin, Bain has reported that:

"The harvesting season was the most unfavorable on record. It was very rainy and there were some freezes, both conditions being conducive to rot. It is impossible to estimate loss since most berries were remilled as often as required and eventually sold. Real loss consisted of remilling charges and low prices at which unsound fruit had to be sold. Poor keeping quality aided abnormally large production in depressing market value of the crop. On the basis of incomplete culture studies, the active fungi were: Fusicoccum putrefaciens (end rot) most prevalent rot; Guignardia vaccinii (early rot) some; Acanthorhyncus vaccinii (rot) slight; Phomopsis sp., slight; Penicillium sp. (ripe rot) slight; Ceuthospora lunata (black rot) very slight; Helminthosporium inaequalis Shear, trace.

"Most of the trouble was experienced with Searl's variety and least with Howes (very small production), McFarlins and some native varieties. All other varieties were intermediate between these with no extensive trouble in the production of any of them. The crop as a whole kept poorly and, in addition to the varietal difference noted above, some bogs suffered more than others without relation to geographical location or variety."

The following report submitted by Neil E. Stevens deals with cranberry diseases in Massachusetts and New Jersey:

"The most serious disease of cranberry plants at the present time is false blossom, formerly called Wisconsin false blossom, the cause of which has not yet been determined. It is apparently on the increase in both Massachusetts and New Jersey, although it is impossible to tell with any degree of accuracy how much of the apparent increase is due to increasing interest in the disease and to the fact that many growers are now able to recognize it in their bogs.

"The amount of loss from fruit rots in New Jersey was not very different from that of the last two years. That is, it was somewhat above the average for that state.

"In Massachusetts, the Early Blacks, which constituted about half the crop, showed excellent keeping quality but there was much loss from decay in the Howes (the chief late berry). Part of this loss may no doubt be attributed to the fact that this is the largest cranberry crop on record and some of the berries were held much longer than usual. Comparative storage tests carried out in Chicago on berries from Massachusetts and New Jersey as well as Oregon and Wisconsin showed end rot to be more important in storage than all other rot fungi combined."

Recent literature

1. Stevens, N. E., and W. H. Sawyer. The distribution of cranberry false blossom. Phytopath. 16: 223-227. 1926.

2. ____________ The false blossom situation. Proc. Amer. Cran. Grow. Assoc. 57: 20-26. 1927.

B L U E B E R R Y

The Department of Plant Pathology in New Jersey reports finding what appears to be a new disease of the blueberry. The diseased plants were found at Whites Bog in Burlington County. A gall-like formation resembling black knot covered the entire stems. Out of 16 isolations, 15 colonies of a Fusarium were obtained but this fungus is not believed to be the original cause of the galls.

MULBERRY

Ozonium omnivorum Shear, root rot. Prevalent in the black lands of Texas, causing a loss of 1 per cent, according to Taubenhaus.

Sclerotinia carunculoides Siegler & Jenkins, popcorn disease. Reported from Texas, Florida, Georgia, and South Carolina. A specimen received from Florida is the first collection in that state, according to Miss Jenkins.

Recent literature

1. Nicolas, G. Un nouvel hôte de Ganoderma applanatum (Pers.) Bul. Soc. Mycol. France 42: 190-191. Nov. 15, 1926.

DISEASES OF SUBTROPICAL FRUITS

Prepared by H. R. Fulton

CITRUS FRUITS

I. DISEASES CAUSED BY OR ATTRIBUTED TO PARASITES

CANKER CAUSED BY BACTERIUM CITRI (HASSE) JEHLE

In Florida two infected trees were found and destroyed at Sebring in December, 1926. Tims reports the occurrence of citrus canker on orange at Thibodaux, Louisiana. None was reported from Alabama, Mississippi, or Texas.

Recent literature

1. Neal, D. C. Scouting for citrus canker. Quart. Bul. Mississippi State Pl. Bd. 6 (2): 14-15. July 1926.

2. Peltier, G. L., and W. J. Frederich. Effects of weather on world distribution and prevalence of citrus canker and citrus scab. Jour. Agr. Res. 32: 147-164. 1926.

3. ______________ Further studies on the overwintering of Pseudomonas citri. Jour. Agr. Res. 32: 335-345. 1926.

BLAST AND BLACK PIT CAUSED BY BACTERIUM CITRIPUTEALE C. O. SM. (B. CITRAREFACIENS LEE)

Fawcett reports that black pit is of minor importance on lemon fruit in California, while blast occurs locally in the northern part of state on navel oranges.

Lewcock (2) and Carne (1) report the occurrence of the organism in South Australia and in Western Australia, respectively.

Recent literature

1. Carne, W. M. Citrus pit (Pseudomonas citriputeale, C. O. Smith). Jour. Dept. Agr. West. Australia II, 3: 378-381. Sept. 1926.

2. Lewcock, H. K. A citrus bacteriosis occurring in South Australia. (Abstract) Phytopath. 16: 80. Jan. 1926.

3. Smith, C. O. Similarity of bacterial diseases of avocado, lilac, and citrus in California. Phytopath. 16: 235-236. Mar. 1926.

SCAB CAUSED BY SPHACELOMA FAWCETTI JENKINS (SPOROTRICHUM CITRI BUTLER)

Florida: Scab on grapefruit was general and much more prevalent than usual. Cool rainy weather in late March favored infection. Loss was due to heavy drop of small fruit, and to the culling of scabby mature fruit. (Winston)

Occurred on grapefruit and lemons in moderate amount in scattered localities, being of considerable importance in the central ridge section. (Rhoads)

Alabama: Satsuma oranges in Mobile and Baldwin Counties are very susceptible; satisfactorily controlled by spraying with Bordeaux mixture. Unusually heavy infection on fall flush of growth. (Fulton)

Louisiana: Reported by Tims on Satsuma oranges.

Texas: Reported as unimportant by Taubenhaus.

Porto Rico: Much less severe than usual on fruit from winter bloom, more severe on later blooms. (Cook)

Recent literature

1. Peltier, G. L., and W. J. Frederich. Effects of weather on the world distribution and prevalence of citrus canker and citrus scab. Jour. Agr. Res. 32: 147-164. 1926.

2. Winston, J. R., J. J. Bowman, and W. J. Bach. Relative susceptibility of some rutaceous plants to attack by citrus scab fungus. Citrus Industr. 7 (3): 28-29. Mar. 1926.

MELANOSE CAUSED BY DIAPORTHE CITRI (FAWCETT) WOLF (PHOMOPSIS CITRI FAWCETT)

Florida: Less prevalent than usual, but general in all old plantings; grapefruit most susceptible, oranges and tangerines less so; pruning out dead wood reduces infection of young fruit and leaves, but spraying with Bordeaux mixture is more effective. (Winston)

More leaf infection of grapefruit, and less fruit infection than in previous year. (Kuntz)

Alabama: Somewhat more prevalent than previously, but of slight importance; the routine spraying of young fruit with Bordeaux mixture keeps melanose in check. (Fulton)

Porto Rico: Unimportant; good results from treating with Bordeaux spray. (Cook)

The melanose reported in 1925 (Pl. Dis. Reptr. Suppl. 47: 282. 1926) on leaves of sweet seedling orange from **Arizona** proved to be false melanose, not the true melanose caused by <u>Phomopsis citri</u>, which apparently does not occur in that state.

Wolf (3) reports the discovery of the perfect stage of <u>Phomopsis citri</u>, which he calls <u>Diaporthe citri</u>.

Recent literature

1. Fulton, H. R. Spraying for citrus melanose control. Citrus Industr. 7 (3): 6-7, 31. Mar. 1926.

2. __________ Spraying for control of citrus melanose. Florida Grow. 33 (11): 6, 29. Mar. 13, 1926.

3. Wolf, F. A. The perfect stage of the fungus which causes melanose of citrus. Jour. Agr. Res. 33: 621-625. Oct. 1, 1926.

4. __________ Something new about melanose. Proc. Florida State Hort. Soc. 39 (1926): 153-154. 1926.

STEM END ROT CAUSED BY PHOMOPSIS CITRI FAWCETT or DIPLODIA NATALENSIS EV. or OTHER FUNGI

Rhoads reported Phomopsis citri on oranges and grapefruit in Florida. Both the Diplodia and Phomopsis types are of slight importance on Satsuma oranges in Alabama (Fulton). In Porto Rico, Phomopsis is of very little importance, but Diplodia is severe in some places (Cook). In California, Phomopsis californica Fawc. causes a minor rot of lemons only (Fawcett).

Stevens (1) reports that the perfect stage of Diplodia natalensis is Physalospora rhodina (Berk. & Curt.) Cke., which is also the perfect stage of Diplodia gossypina and occurs on numerous other hosts. Two other species of Physalospora are reported by him as occurring on citrus, one found in Cuba, described by him as a new species, P. fusca; the other, P. malorum (Pk.) Shear & Stevens collected in Alabama by Fulton. Another similar fungus, a Botryosphaeria very similar to B. ribis Gross. & Dug., was found in a culture isolated from a rotted orange from California.

Recent literature

1. Stevens, N. E. Two species of Physalospora on citrus and other hosts. Mycologia 18: 206-207. Sept.-Oct. 1926.

BLUE MOLD AND GREEN MOLD ROTS CAUSED BY PENICILLIUM ITALICUM WEHMER AND PENICILLIUM DIGITATUM (FR.) SACC.

Florida: Slightly more severe than usual in January; can be controlled to some extent by borax treatment. (Fulton)

Alabama: Caused slight losses on marketed fruit. (Fulton)

California: Penicillium digitatum very important; borax wash a help in control. Penicillium italicum more prevalent than usual; especially on lemons, not effectively controlled by borax treatment. (Fawcett)

Porto Rico: Of little importance. (Cook)

Recent literature

1. Benton, R. J. Borax treatment of lemons for store. Agr. Gaz. New South Wales 38: 94. 1926.

2. Hostetler, V. V. Prevention of decay in citrus fruits. Better Crops 7 (1): 14, 44, 50-51. Sept. 1926.

3. Powell, H. C. The control of blue and green molds of orange. Negative results from borax. South African Fruit Grow. 13: 232. Sept. 1926.

4. ____________ The use of sodium borate for the control of blue and green molds of oranges. Pretoria, 1926.

FRUIT ROTS CAUSED BY VARIOUS ORGANISMS

Alternaria citri Pierce, black rot, occurred in the usual very slight amounts in Florida and Alabama (Fulton). It was observed in several groves in Arizona, causing premature ripening of the fruit (Arizona News Letter). It caused less damage than last year, about the normal amount, to navel oranges (Fawcett). Bartholomew (2) states that Alternaria causes probably more decay to California lemons than any other one fungus, except possibly Penicillium.

The following organisms were reported (by Fawcett except where otherwise indicated) from California, mostly as of moderate or slight importance.

Aspergillus niger Tiegh.

Botrytis cinerea Pers.

Oospora citri-aurantii C. O. Sm., sour rot, less prevalent than last year on lemons.

Penicillium roseum Link, pink mold, a minor rot of lemons.

Pleospora sp. causes mainly a storage rot of lemons that was observed only occasionally.

Pythiacystis citrophthora E. H. & R. E. Sm., brown rot, on fallen orange fruit. (Horne)

Sclerotinia sclerotiorum (Lib.) Mass.

Trichoderma lignorum (Tode) Harz, a minor rot of lemons.

Recent literature

1. Bartholomew, E. T. Alternaria rot of lemons. California Agr. Exp. Sta. Bul. 408: 1-32. Oct. 1926.

2. ________________ Concerning Alternaria rot of lemons. California Citrogr. 12 (1): 14-15, 17. Nov. 1926.

3. Fawcett, H. S. Alternaria problem in relation to navel oranges. California Citrogr. 12 (1): 30-31. Nov. 1926.

4. Hawkins, L. A., and W. R. Barger. Cold storage of Florida grapefruit. U. S. Dept. Agr. Bul. 1368: 1-6. 1926.

5. Read, F. M. The storing of lemons. Jour. Dept. Agr. Victoria 24: 292-303. May 1926.

6. Rose, D. H., and L. F. Butler. Pleospora rot of lemons and apples. (Abstract) Phytopath. 17: 47. Jan. 1927.

FOOT ROT ATTRIBUTED TO PHYTOPHTHORA TERRESTRIS SHERB.

Florida: General; affects chiefly the sweet orange seedling groves. (Rhoads)

Sanitation appears to be a fairly effective control measure. The best apparent results follow treating the affected parts with a wash made of bluestone and soda lye, applied two or more times at intervals of six months. (Winston)

Porto Rico: A form of gummosis or foot rot of unknown causation is common and sometimes serious. Good results follow cutting out and painting with a mixture of tar and carbolineum. (Cook)

Recent literature

1. Rhoads, Arthur S. A new method for treating foot rot. Amer. Fruit Grower Mag. 46 (11): 7, 24. Nov. 1926.

GUMMOSIS AND BARK DISEASES DUE TO VARIOUS ORGANISMS

Botrytis cinerea Pers., Botrytis gummosis, California - see Dothiorella.

Diplodia natalensis Ell. & Ev., die-back, Porto Rico.

Diplodia sp., Diplodia gummosis was of the usual moderate importance in California, lemon being most susceptible and oranges slightly so. (Fawcett)

Dothiorella ribis (Fckl.) Sacc., Dothiorella gummosis and Botrytis gummosis were reported from California as occurring scatteringly and being of moderate importance, lemon being most susceptible and orange slightly so. (Fawcett)

Phomopsis californica Fawc., decorticosis or shell-bark was moderately important in attacking trees after they are 10 to 15 years old. Lemon is the only susceptible commercial type of citrus, the Eureka variety is very susceptible and the Lisbon is susceptible in California. (Fawcett)

Pythiacystis citrophthora E. H. & R. E. Sm., Pythiacystis gummosis was of usual prevalence and generally distributed in California. Bark infection was favored by April rains and moderate temperatures, and later the lower leaves and twigs were attacked. Trifoliata root stock is immune, sour orange is very resistant, sweet orange and grapefruit are susceptible, and lemon is very susceptible (Fawcett). In Arizona this disease was found to have damaged a number of large grapefruit trees where debris had accumulated above the bud unions and where there was an almost constant supply of waste irrigation water. (Arizona News Letter)

Recent literature

1. Petri, L. Azione tossica della calciocianamide sulla Blepharospora cambivora e la Pythiacystis citrophthora. (The toxicity of calcium cyanamide to Blepharospora cambivora and Pythiacystis citrophthora.) Boll. R. Staz. Pat. Veg. 6: 135-138. 1926.

OTHER PARASITIC DISEASES

Armillaria mellea (Vahl) Quel., root rot, California.

Capnodium citricolum McAlp., sooty mold, Florida - Control of insect pests eliminates sooty mold (Fulton). Texas. Porto Rico - Quite common and necessitates washing the fruit. (Cook)

Cephaleuros virescens Kunze, algal leaf spot. Porto Rico.

Colletotrichum gloeosporioides Penz., to which anthracnose and withertip are attributed. In Florida, anthracnose was rather prevalent on grapefruit during spring on dead ripe fruit in many sections, particularly so on ridges and locations subjected to extremes of drought and wet (Winston). Less than usual on twigs and leaves in California with slight damage because of absence of contributing conditions such as frost, wind, etc. It also causes a fruit rot of moderate to slight importance (Fawcett). Porto Rico.

Epiphytic higher plants of many kinds, Porto Rico, rarely of any importance unless very abundant, and can be controlled by removal. (Cook)

Gloeosporium limetticolum Clausen, withertip of limes, Florida - Affects Key lime trees wherever they are grown throughout the state (Rhoads). Porto Rico - Occasionally found on lime trees, usually very serious where it occurs. (Nolla)

Tylenchus semipenetrans Cobb, citrus nematode, was reported for the first time from Arizona in two grapefruit orchards in Maricopa County, apparently not having seriously affected the trees. (Streets)

Recent literature

1. Fawcett, H. S., and H. A. Lee. Citrus diseases and their control. New York, McGraw-Hill Book Co., Inc. 1926.

2. Fulton, H. R. Relative susceptibility of citrus varieties to attack by Gloeosporium limetticolum Clausen. Citrus Ind. 7 (8): 13, 17, 24-25. Aug. 1926.

3. Harland, S. C. Withertip disease of limes. Suggestions for its control. Trop. Agriculture 3: 74-75. Apr. 1926.

NON-PARASITIC DISEASES AND INJURIES

Blight or wilt, caused by deficient or irregular water supply, Florida - Most prevalent in thirsty soils, very deficient in organic matter, especially in the older groves on rough lemon root stock. The addition of organic matter to the soil seems to be the most promising line of treatment (Winston). In certain of the heavier soil types with normally high water table injury from drought was very serious in May. Some young groves showed 50 per cent of the trees completely defoliated and there has been excessive drop of fruit from mature citrus trees (Kuntz). Wilt continues to be of considerable importance in the groves of certain localities, but causes slight loss for the state as a whole (Rhoads). Porto Rico - A few reports have been received. (Cook)

Spray injury, Florida - Bordeaux-oil burn caused moderate loss, grapefruit being most susceptible and oranges and tangerines somewhat less so. There was no definite correlation between weather conditions and this injury. A large excess of lime in the Bordeaux tends to reduce injury. The degree of injury does not vary with the several types of emulsifier. Calcium caseinate added to the Bordeaux oil reduces the injury but does not eliminate it. Refined white oils are about as risky as red oils (Winston). Porto Rico - In varying degrees depending on workmanship, usually slight. (Cook)

Recent literature

1. Bartholomew, E. T. Internal decline of lemons. III. Water deficit in lemon fruits caused by excessive evaporation. Amer. Jour. Bot. 13: 102-117. 1926.

2. ______________ and W. J. Robbins. Internal decline (endoxerosis) of lemons. IV. The carbohydrates in the peel of healthy and endoxerotic fruits. Amer. Jour. Bot. 13: 342-354. 1926.

3. Braunton, E. June drop of oranges. California Cult. 67: 56. July 17, 1926.

4. Rhoads, A. S. Investigations on citrus "blight", wilt or leaf curl in Florida. (Abstract) Phytopath. 17: 58-59. Jan. 1927.

5. ___________ Progress report on citrus blight investigations. Proc. Florida State Hort. Soc. 39 (1926): 143-146. 1926.

6. Surr, G. J., and L. D. Batchelor. Citrus culture in central California. California Agr. Exp. Sta. Bul. 405: 1-23. Aug. 1926. June drop: p. 20-21.

DISEASES OF UNKNOWN CAUSATION

Die-back and ammoniation, cause unknown, is on the wane in Florida due to more judicious use of fertilizers, less cultivation, and the prompt use of bluestone as a soil application whenever die-back symptoms appear. Old seedling orange trees are most likely to show symptoms on the fruit while grapefruit shows the symptoms most usually on the vegetative parts (Winston). There was slight damage in scattered localities in California. (Fawcett)

False melanose or greasy spot, cause unknown, Porto Rico.

Gummosis, cause unknown, Florida - Less prevalent now than several years ago. Lemons and seedling oranges are most susceptible. The usual treatments are of questionable value. Possibly gummosis may be induced or aggravated by cold injury. (Winston)

Mottle leaf or foliocellosis, cause unknown, is a disease of major importance in California but is probably gradually growing less because of better general management of orchards (Fawcett). Common and occasionally serious in Porto Rico. (Cook)

Nail head rust or scaly bark, cause unknown, Florida - Is on the decrease and seems to disappear in any particular grove as soon as it begins to receive ordinary spraying and care (Winston). Affects chiefly the sweet orange, and is of importance only in certain localities throughout the citrus belt (Rhoads). Arizona - A slight amount on a few trees in one locality. (Streets)

Psorosis, cause unknown, is less prevalent in Florida than some years ago. It is most prevalent in droughty locations. No treatment now in use gives satisfactory results (Winston). Tangerines are especially susceptible (Rhoads). In California it is very important and generally distributed on trees 8 to 10 years of age. Lemon is immune, grapefruit and tangerine are susceptible, and sweet orange varieties are very susceptible. (Fawcett)

Recent literature

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2. Doidge, Ethel M. Scaly bark (psorosis) of citrus trees. Jour. Dept. Agr. South Africa 12: 61-67. 1926.

A V O C A D O

Cephaleuros virescens Kunze, algal leaf spot. Porto Rico.

Colletotrichum gloeosporioides Penz. caused rot of mature fruits, especially of the Fuerte variety, in Florida (Fulton). In Porto Rico it was severe on some seedling trees and of little importance on others. (Cook)

Diplodia sp., stem disease, was reported from Porto Rico as killing twigs and seedlings, being most severe on seedlings grown in heavily manured soils. (Cook)

Pestalozzia sp., blight, Texas.

Pestalozzia guepini Desm. was reported to kill twigs and seedlings in Porto Rico, being most severe on seedlings that had been grown in heavily manured soils. (Cook)

Phyllachora gratissima Rehmy, tar spot. Porto Rico.

Pythiacystis citrophthora E. H. & R. E. Sm., bark disease. California.

Rhizopus sp. Most active and serious rot of ripe avocado fruit in California. (Horne)

Sphaceloma sp., scab, was general in Florida causing serious leaf spotting and fruit blemish. (Fulton)

Recent literature

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2. Smith, C. O. Blast of avocados - a bacterial disease. Ann. Rep. California Avocado Assoc. 1925-26: 72-74. 1926.

3. ___________ Blast of avocados - a bacterial disease. California Citrogr. 11: 163. Mar. 1926.

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M A N G O

Colletotrichum gloeosporioides Penz., canker and fruit rot, was reported as common in Porto Rico and very severe in some cases (Cook). The same fungus was reported as causing blossom blight during moist weather throughout the island, and as producing serious withertip in one locality. (Nolla)

Diplodia sp., withertip. Porto Rico.

Meliola mangierae Earle, sooty mold. Porto Rico.

O L I V E

Bacterium savastanoi EFS., knot or tubercle disease. California. (C. O. Smith)

Monkey face, probably physiological, was less severe in California than during the preceding year, causing moderate loss. It is generally distributed on the Barouni variety. There is distortion of the blossom and with development of corky tissue in the flesh, correlated with degeneration of the embryo. (Rawlins)

Soft nose, probably physiological, was less severe in California than during preceding year, causing moderate loss. It is generally distributed, but confined to the Sevillano variety. It develops after fruit begins to color. Young trees, heavily pruned, and heavily irrigated trees appear to produce most affected fruit. The fruit is soft at the end, shrivels and spoils. (Rawlins)

B A N A N A

Fusarium cubense EFS., wilt, was very destructive throughout Porto Rico. (Cook)

Gloeosporium musarum Cke. & Massee, fruit rot, was very common but not important on over-ripe fruit in Porto Rico. (Cook)

P A P A Y A

Glomerella cingulata (Ston.) Spauld. & Schrenk, fruit rot, occasionally severe in Porto Rico. (Cook)

Pucciniopsis caricae Earle, leaf spot. Porto Rico. Florida.

G U A V A

Clitocybe monadelpha (Morg.) Sacc., root rot, observed occasionally in Florida. (Rhoads)

Glomerella cingulata (Ston.) Spauld. & Schrenk, fruit rot, was common and severe in Porto Rico. (Cook)

D A T E

Graphiola phoenicis (Moug.) Poit., rust. Porto Rico. Texas.

F E I J O A

Botrytis cinerea, Botrytis rot, apparently the most serious rot of this fruit in California. (Horne)

Penicillium expansum Link, rot, was reported as abundant on ripening fruit in California. (Horne)

F I G

Caconema radicicola (Greef) Cobb, root knot. Texas.

Cercospora spp., leaf spot. Prevalent but unimportant in Texas.

Colletotrichum sp., anthracnose. Texas.

Corticium salmonicolor Berk. & Br. Slightly important in Florida.

Macrophoma fici Alm. & Cam., canker. Loss a trace in Texas.

Ozonium omnivorum Shear, root rot. Arizona and Texas. Loss 2 per cent in black lands of Texas.

Rhizoctonia microsclerotia Matz., leaf blight. Mississippi. Florida.

Sclerotinia sp., foot rot. Texas.

Cerotelium fici (Cast.) Arth., rust. In Texas unimportant in sprayed orchards but in unsprayed orchards the loss often 100 per cent.

Premature dropping (physiological). Prevalent, with loss of 0.5 per cent in Texas.

Souring of fruit (cause unknown). Reported from Texas where Taubenhaus reports the loss to be 30 per cent. He states that the disease is associated with fruit punctures made by the cotton leaf moth. Caldis (1) and Smith (2) discuss the relation of certain insects, acting as carriers of a yeast, to infection of fig fruits.

Recent literature

1. Caldis, P. D. Souring and internal rot of the fig. Pacific Rural Press 111: 500. Apr. 17, 1926.

2. Smith, R. Fig diseases and their control. Pacific Rural Press 112: 573. Nov. 20, 1926.

P O M E G R A N A T E

Cercospora lythracearum Heald & Wolf, leaf spot. Reported for the first time in Alabama.

D I S E A S E S O F N U T S

P E C A N

SCAB CAUSED BY FUSICLADIUM EFFUSUM WINT.

The situation with regard to pecan scab is well summarized in a report of J. B. Demaree to the Plant Disease Survey.

"The prevalence of pecan diseases during the season of 1926 as observed in several places in southeastern United States was not greatly different from that of previous years. Scab caused by Fusicladium effusum Wint., however, is undoubtedly gradually increasing in importance. While at one time the disease in an epiphytotic form was confined to one or two varieties, the causative fungus is now capable of seriously attacking several varieties of the host. There is evidence that this process of adaptation is still going on. During the earlier days of the pecan industry (20 or 25 years ago) the Delmas and Georgia and some Texas varieties were the only ones that seemed to be susceptible. Later, other varieties, such as Van Deman, Alley, Schley, and Pabst were added to the susceptible list. The fungus now seems to be adapting itself to other varieties once thought to be quite resistant. Of the formerly considered resistant varieties Moneymaker was found to be susceptible at Jeanerette and Whileville, Louisiana, and Selma, Alabama. Scab infected nuts of the Stuart variety were collected this season by Wedgworth in Mississippi, and Boyd at Thomasville, Georgia. The fungus has been attacking the variety Frotscher slightly in south Georgia and north Florida for the past four or five years and some loss of the variety occurred in south Georgia and Louisiana this season. Pecan scab caused a total loss of the Schley, Pabst, Delmas, Georgia, and Alley varieties in several thickly planted areas of north Florida, and the south portions of Georgia, Alabama, Mississippi, and Louisiana this season. Control measures under the direction of the U. S. Department of Agriculture are keeping pace with the gradual extension of the disease. Two to four applications of Bordeaux mixture applied during May, June, and July, if supplemented with orchard sanitary measures, will effectively control pecan scab. Four to six applications of monohydrate copper-lime dust controlled the disease very satisfactorily on the Schley and Alley varieties in south Georgia this season. Fighting the disease with dust is meeting with considerable favor and as a result of experiments conducted this past year extensive commercial dusting will be practiced next season."

Recent literature

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2. Blackmon, G. H. Preliminary report from the Florida Agricultural Experiment Station on pecan investigations. Proc. Georgia-Florida Pecan Grow. Assoc. 20: 40-44. 1926.

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4. Demaree, J. B. Recent developments regarding pecan diseases. Proc. Georgia-Florida Pecan Grow. Assoc. 20: 62-65. 1926.

5. ____________ The pecan scab fungus. (Abstract) Phytopath. 16: 642-643. Sept. 1926.

6. ____________ and J. R. Cole. Commercial control of pecan scab. U. S. Dept. Agr. Dept. Circ. 386: 1-8. June 1926.

7. Nolen, R. E. Pecan scab. Florida Agr. Exp. Sta. Bul. 181: 251-276. May 1926.

OTHER DISEASES

Bacterium tumefaciens EFS. & Towns., crown gall. Texas.

Cercospora fusca (Heald & Wolf) Rand, brown leaf spot. Reported from North Carolina; southern Georgia - loss a trace; and Texas - loss 0.5 per cent. J. B. Demaree, of the Office of Fruit Disease Investigations, in a report to the Plant Disease Survey states, "The Cercospora leaf spot makes its appearance about midsummer. It becomes quite plentiful during the latter part of the season and is found in most orchards. It is not considered important in thrifty trees. In prevalence it was not noticeably different this season than in former years."

Microsphaera alni (Wallr.) Wint., powdery mildew. Very prevalent in Texas causing premature shedding of fruit. Loss 5 per cent (Taubenhaus). Loss a trace in southern Georgia. Usually common on isolated or city trees; also common on Mobile, Success, and Pabst varieties. (Boyd)

Ozonium omnivorum Shear, root rot. Texas.

Phyllosticta caryae Pk., nursery leaf blight, was less prevalent during 1926 than it has been for several years. Very few nurserymen considered it sufficiently serious this season to employ any control measures. During favorable seasons the disease is serious in nurseries (Demaree). Reported from Texas by Taubenhaus.

Kernel spot (insect puncture). Reported from Georgia and Arkansas. According to Boyd, the loss in southern Georgia was estimated at about 3 per cent, there being a 50 per cent loss in some plantings.

Black pit (undet.) Reported from South Carolina and Georgia. Boyd estimates the loss in southern Georgia at 3 per cent. He states that the Schley and Frotscher varieties suffered most in 1926, especially in the southern part of the state. Some trees lost 5 to 25 per cent of their crop.

Little leaf. In a report to the Plant Disease Survey, Demaree makes the following observation:

> "The known distribution of little leaf of pecans is from Savannah, Georgia, south to Miami, Florida, and west to Biloxi, Mississippi. Recently the writer found the disease present on trees near an old plantation homestead eight miles from Charleston, South Carolina. Dr. S. G. Lehman showed the writer specimens of typical little leaf that he had collected in an orchard near Raleigh, North Carolina. Heretofore, little leaf had only been found on trees that had been planted in fertile garden soils within city limits. The Raleigh specimen is the only one known by the writer to have been collected from trees growing under orchard conditions." (See also Demaree (2)

Rosette (undet.) Reported from South Carolina, Georgia, Texas, and Arizona. A loss of 10 per cent was reported for southern Georgia by Boyd. Demaree in his report to the Plant Disease Survey states:

> "A smaller percentage of pecan trees are affected with rosette now than ten years ago. McMurran reported in 1919 (U. S. Dept. Agr. Bul. 756) that 10 to 20 per cent of the pecan trees planted in orchards in southeastern United States were affected with this disease. The smaller percentage of rosetted trees now present may be attributed

to several factors, as follows -- better care of orchards, judicious use of fertilizers, the general practice of plowing under leguminous cover crops, and greater discrimination in the selection of new orchard sites. During the pioneer days of the pecan industry many orchards were planted on impoverished cotton lands, deep sandy lands or eroded hillsides. Such soils as a rule develop rosetted trees. The selections of such undesirable soils for orchard sites are now very generally avoided, consequently a smaller percentage of rosette affected trees develop in the younger orchards." (See also Skinner and Demaree (4)

Recent literature

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2. Demaree, J. B. Little leaf disease of Pecans. Phytopath. 16: 277-283. 1926.

3. ____________ Recent developments regarding pecan diseases. Proc. Georgia-Florida Pecan Grow. Assoc. 20: 62-65. 1926.

4. Skinner, J. J., and J. B. Demaree. Relation of soil conditions and orchard management to the rosette of pecan trees. U. S. Dept. Agr. Bul. 1378: 1-16. 1926.

P E R S I A N (E N G L I S H) W A L N U T

Bacterium juglandis (Pierce) EFS., bacterial blight. Reported from Delaware, Washington, Oregon, and California. California - Epidemic, loss about 60 per cent. The reason for the epidemic is not clear, since both temperature and rainfall were normal. The Franquette and Eureka varieties were resistant, while Payne, Placentia, Chase, Concord, and others were susceptible. Although generally considered to be resistant the Eureka variety in 1926 showed a loss of 30 per cent and the Mayette a loss of 50 per cent (Rudolph). Oregon - Experience shows that even our most favored commercial variety, the Franquette, often suffers severe losses. It is estimated that in 1925 and in 1926 at least half the crop that set on the trees was attacked by blight. These two years are probably for Oregon about the worst years on record. (Barss (1)

Gnomonia leptostyla (Fr.) Ces. & DeNot., anthracnose. In Delaware, according to Adams, anthracnose was very severe on the black walnut and butternut, causing defoliation. English walnuts also showed infection but there was no defoliation. The disease was reported also from Connecticut and Missouri.

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A L M O N D

Cladosporium carpophilum Thuem., scab. Reported for the first time in Connecticut by Clinton.

Coryneum beijerinckii Oud., blight. Loss 4 per cent in California, according to Milbrath.

Sclerotinia fructicola (Wint.) Rehm, brown rot. Loss estimated as 30 per cent in Stanislaus County, California. There was much rain during and following the blooming period and mild temperatures prevailed during the time of infection. The Jordan, Texas, and Languedoc varieties were considered to be resistant but the I.X.L., Non Pareil, and especially the Drake and Ne Plus Ultra were susceptible. (Rudolph)

F I L B E R T

Bacterium sp., blight. General in Oregon and causing large losses in some nurseries and in some young plantings.

Phyllactinia corylea (Pers.) Karst., powdery mildew. Present in Washington.

Recent literature

1. Barss, H. P. Bacterial blight of filbert. Oregon Agr. Coll. Exten. Serv. Circ. (mim.) 230: 1-6. Dec. 1926.

C O C O N U T

Colletotrichum sp., anthracnose. Florida - Quite commonly found in nurseries on young plants and apparently of some importance. (Seal)

Diplodia sp., leaf spot. Florida - Not uncommon in the nurseries in the southeastern section of the state. Of little importance. (Seal)

Pestalozzia sp., leaf spot. Florida - General in the southeastern part of the state. Of little importance. (Seal)

Phytophthora palmivora Butler, bud rot. Porto Rico - The campaign for the extermination of this disease by the destruction of diseased trees has been very successful. (Cook)

Coconut

Phytophthora sp., bud rot. Florida - Generally distributed over the southeastern part of the state. Of major importance. (Seal)

Thielaviopsis paradoxa (DeSeyn.) Hoehn., fruit fall. Rare in Porto Rico. (Cook). Seal reports *Thielaviopsis* sp. on leaves to be general and of some importance in the southeastern section of Florida.

Recent literature

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2. Sharples, A. Diseases of coconut palms. Malayan Agr. Jour. 14: 65-73; 91-95. Mar. 1926.

3. Teodoro, N. G. Coconut diseases and their control. Philippine Agr. Rev. 18: 585-592. 1925.

4. Tucker, C. M. Phytophthora bud rot of coconut palms in Porto Rico. Jour. Agr. Res. 32: 471-498. 1926.

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THE
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THE OFFICE OF MYCOLOGY AND DISEASE SURVEY

Supplement 53

Diseases of Cereal and Forage Crops

In the United States in 1926

August 30, 1927

BUREAU OF
PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

DISEASES OF CEREAL AND FORAGE CROPS IN THE UNITED STATES IN 1926.

Section on Cereal Crops Prepared by

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Plant Disease Reporter. August 30, 1927.
Supplement 53

CONTENTS

FOREWORD

This summary of diseases of cereal and forage crops has been prepared utilizing the same sources of information and following the same methods that have been employed in previous years. An additional feature of this year's compilation, however, is the inclusion of several maps and graphs showing the average losses from various diseases over a period of years.

The compilers wish to thank the collaborators and the various members of the Offices of Cereal Crops and Diseases and Vegetable and Forage Diseases for supplying information and for criticizing the manuscript.

SEED TREATMENT OF CEREALS

Considerable investigation of the various methods and chemicals best adapted for cereal seed treatment has been reported recently. This might be reported on briefly under four general headings as follows:-

1. Organic mercury compounds. "Bayer Compound," "Bayer Dust," "Germisan," "Semesan Jr.," "Uspulun," and others have been reported as adapted for the treatment of the several cereal diseases. Bunt of wheat was usually controlled by immersion in solutions of these compounds (2, 21). When applied as a dust they do not usually seem to be so effective as when in the liquid form (2). Loose smut of wheat usually has not been satisfactorily controlled by soaking in these solutions. On the other hand, Gibberella seedling blight and Helminthosporium blight were partially controlled by a 30 minutes soak in certain of these chemicals (5, 2).

Stimulating germination of wheat is reported as a worth while consideration (2) and R. S. Kirby states that soaking of wheat in a 1/4 per cent organic mercury solution for 5 to 10 minutes following hot water treatment offsets seed injury and supplements the hot water in controlling seed borne diseases.

The soaking of sweet corn and dent corn in organic mercury solutions apparently helps to control certain diseases such as Diplodia and Fusarium rots, and to cause a marked increase in the yield (18).

Reports of Leukel, Dickson and Johnson (10), Dickson (5), and Linfors (11), show that certain of these mercury compounds in the dust form give partial control of barley stripe and in the liquid form give practically complete control. In some varieties of barley, like Tennessee Winter, covered smut is satisfactorily controlled with the liquid (9, 11). Loose smut is controlled in certain barley varieties like Hybrid, No. 19, while in others such as Alpha the treatment is not successful.

The loose and covered smuts of oats were partially controlled by soaking in organic mercury compounds (11, 8). Thomas and Tilford (24) found that in the dust form many of them do not give satisfactory results but that a dust made by mixing one part of copper acetate and two parts of mercuric chloride gave good control.

2. Copper Carbonate Dust. The copper carbonate dust treatment has generally been reported as giving satisfactory control (8) of bunt of wheat. For example, in Virginia 20 treated fields had an average of 0.1 per cent bunt while 31 untreated fields had an average of 5.2 per cent (Fromme and Godkin). In Pennsylvania a survey of 196 untreated and 85 treated fields showed 6.26 per cent in the untreated and 0.18 per cent in the treated. (Kirby)

In the West, where soil infestation with Tilletia tritici is general, the copper carbonate dust treatment is only a partial control for bunt of wheat. This was reported as being the case in 1926 by E. A. Lungren in Colorado and by H. E. Morris in Montana.

Concerning grades of copper carbonate, L. E. Melchers in Kansas states:

> "All in all the 50-55 per cent grades of copper carbonate give the best control and require only two ounces. The 18-20 per cent grades require 3 to 4 ounces for best results."

In Colorado, E. A. Lungren states that a survey of 150 farms where wheat had been treated showed that fields treated with fine 50-55 per cent copper carbonate dusts had an average of 0.7 per cent smut with a maximum infection of 10 per cent in a single field. Fields treated with 18 to 20 per cent copper carbonate had an average of 2.6 per cent smut and a maximum infection of 35 per cent in a single field.

The oat smuts are prevented in the hulless varieties by copper carbonate dust, but it is not a satisfactory treatment for smut in hulled varieties (26, 8).

Kernel smut of millet is satisfactorily controlled with two ounces of 55 per cent copper carbonate dust per bushel and the kernel smut of sorghum is controlled with either grade of copper carbonate as well as several kinds of dusting sulphur (14).

3. Hot Water Treatment. A new single bath treatment for the control of loose smut of wheat has been found by Tapke (23) to be effective and less injurious to the seed than the modified hot water treatment.

4. Formaldehyde. This chemical is still the standard in most states for the control of smut in hulled varieties of oats (8). It is reported by L. E. Melchers in Kansas to be a more efficient control for bunt than copper carbonate dust when the wheat seed is black with smut spores, and C. Gregory in Indiana reports that much formaldehyde was used instead of copper carbonate dust to avoid injury to the drills.

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19. Richards, B. L. and A. F. Bracken. Control of stinking smut of wheat with copper carbonate. Utah Agr. Exp. Sta. Circ. 59: 8. 1926.

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DISEASES OF CEREALS

WHEAT

WHEAT DISEASES IN GENERAL

The estimated percentage loss to the wheat crop from diseases in the United States during the past nine years has varied from about 8 per cent in 1925 to nearly 17 per cent in 1919. Climatic conditions, farm practices, and varieties apparently largely determine the sections of the country in which any one disease will be the most important, and each major wheat disease seemingly is more important in some sections than in others. Thus stem rust appears to be most important in the spring wheat section and in Texas, California, and Utah, bunt in the western states, scab in the corn belt, and loose smut in the Eastern United States. (See Figs. 3-7).

The spring wheat area leads in total loss from diseases with the average loss of nearly one-fifth of its wheat crop. The smallest average loss in any important wheat growing region occurs in the Rocky Mountain and Pacific Coast States. New England apparently has the smallest percentage losses of any section but wheat there is a minor crop.

Table 27 . Estimated percentage loss to wheat from the most important diseases, according to average estimates of plant disease survey collaborators.

Disease	Average percentage loss 1918 to 1925
Stem rust	4.05
Stinking smut	1.58
Wheat scab	1.33
Loose smut	1.11
Leaf rust	.99
Total - All Diseases	10.82

STINKING SMUT OF WHEAT CAUSED BY TILLETIA LAEVIS KUEHN AND T. TRITICI (BJERK.) WINT.

Stinking smut has been reported from every state except Florida. Until the last two years it was most prevalent in the Pacific Northwest, moderately common in the Middle West, and fairly scarce in the East. (See Figs. 4). During the last two years, however, it seems to have become much more prevalent in Kansas, Nebraska, and Colorado, and only slightly less so in eastern states such as Pennsylvania and Virginia.

In an effort to determine more definitely the distribution of the two species of smut in Eastern and Central United States, Tisdale, Leighty, and Boerner (14) examined 539 samples of smutty wheat collected during 1926 in 377 localities in 19 states and in one province of Canada. T. tritici occurred in samples from only four states, Minnesota, North Dakota, South Dakota and Montana. It was the predominating form in North and South Dakota, but was less prevalent than T. laevis in Minnesota and Montana. T. laevis was the only form collected in the other 14 states and in Ontario. It was further found that:

> "If the samples examined can be considered as representative, they furnish strong indications that T. tritici, in the upper Mississippi, and Missouri Valleys, is confined almost entirely if not entirely, to durum wheat."

In 1924, 1925, and 1926, stinking smut caused a larger total loss in the United States than any other wheat disease. Estimates sent in by collaborators in 37 states indicate that stinking smut in 1926 caused the largest loss ever recorded for this disease since records have been kept. It was the most destructive wheat disease in the following thirteen states: Pennsylvania, Delaware, Maryland, Virginia, North Carolina, Michigan, North Dakota, Nebraska, Kansas, Colorado, Idaho, Washington, and Oregon. (See Table 28).

Some preliminary studies on the relationship of smut discounts to total loss from smut were made in Pennsylvania by Kirby. The results indicated that the percentage of smut-balls in threshed but uncleaned wheat represented one-fifth

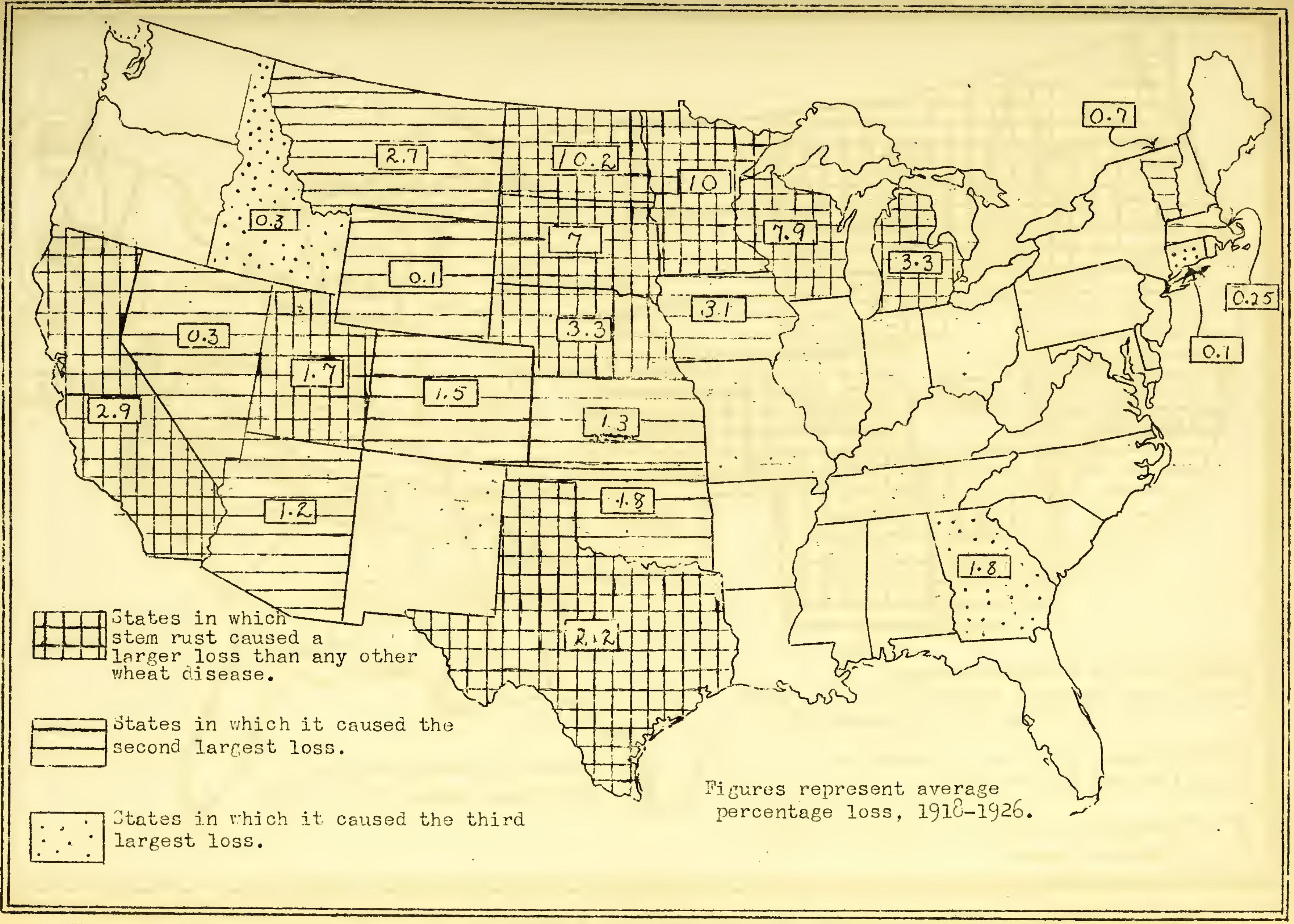

Fig. 3 States in which stem rust was the most destructive, second most destructive, and third most destructive of all wheat diseases, during 1918 to 1926.

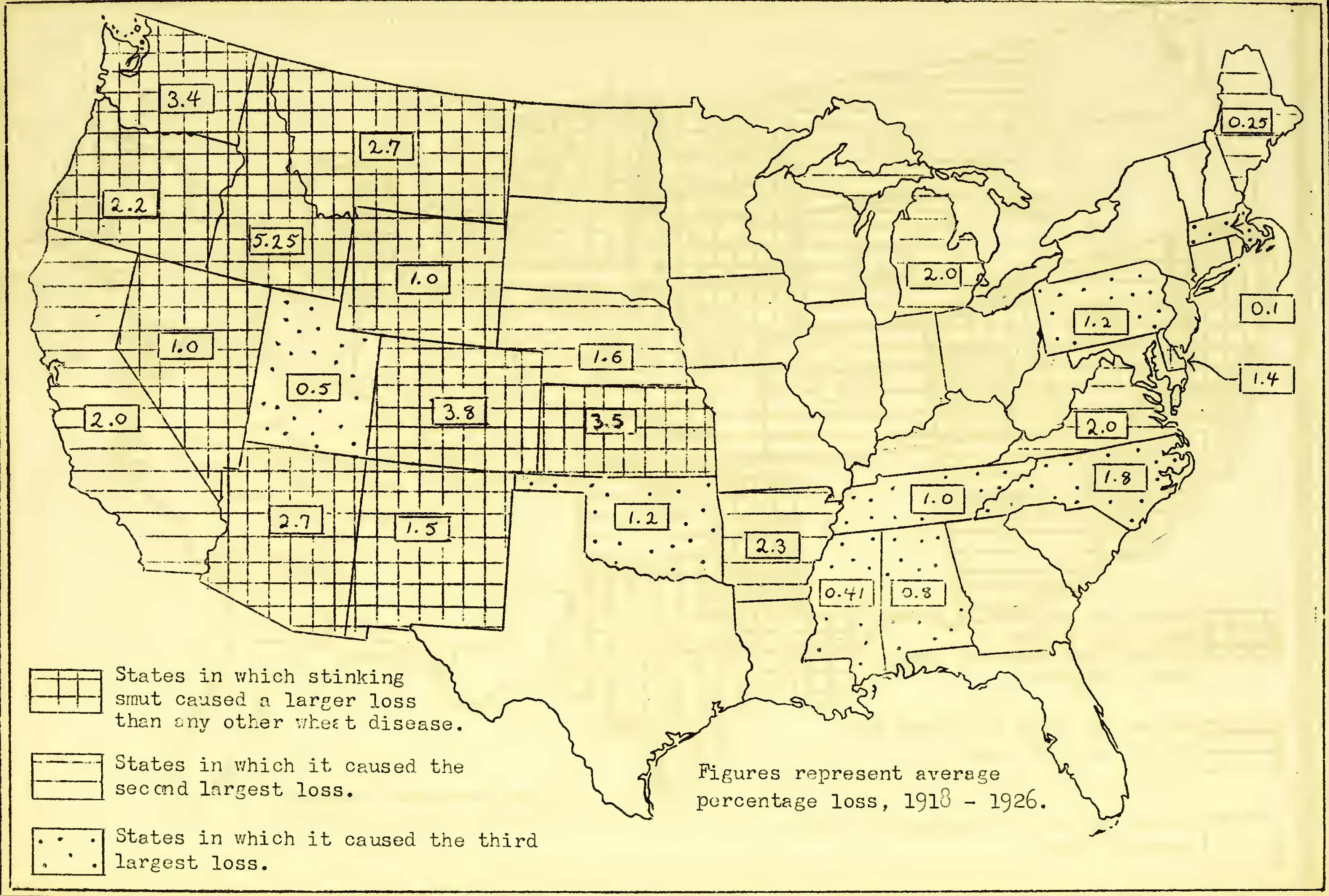

Fig. 4 States in which stinking smut was the most destructive, second most destructive, and third most destructive, of all wheat diseases during 1918 to 1926.

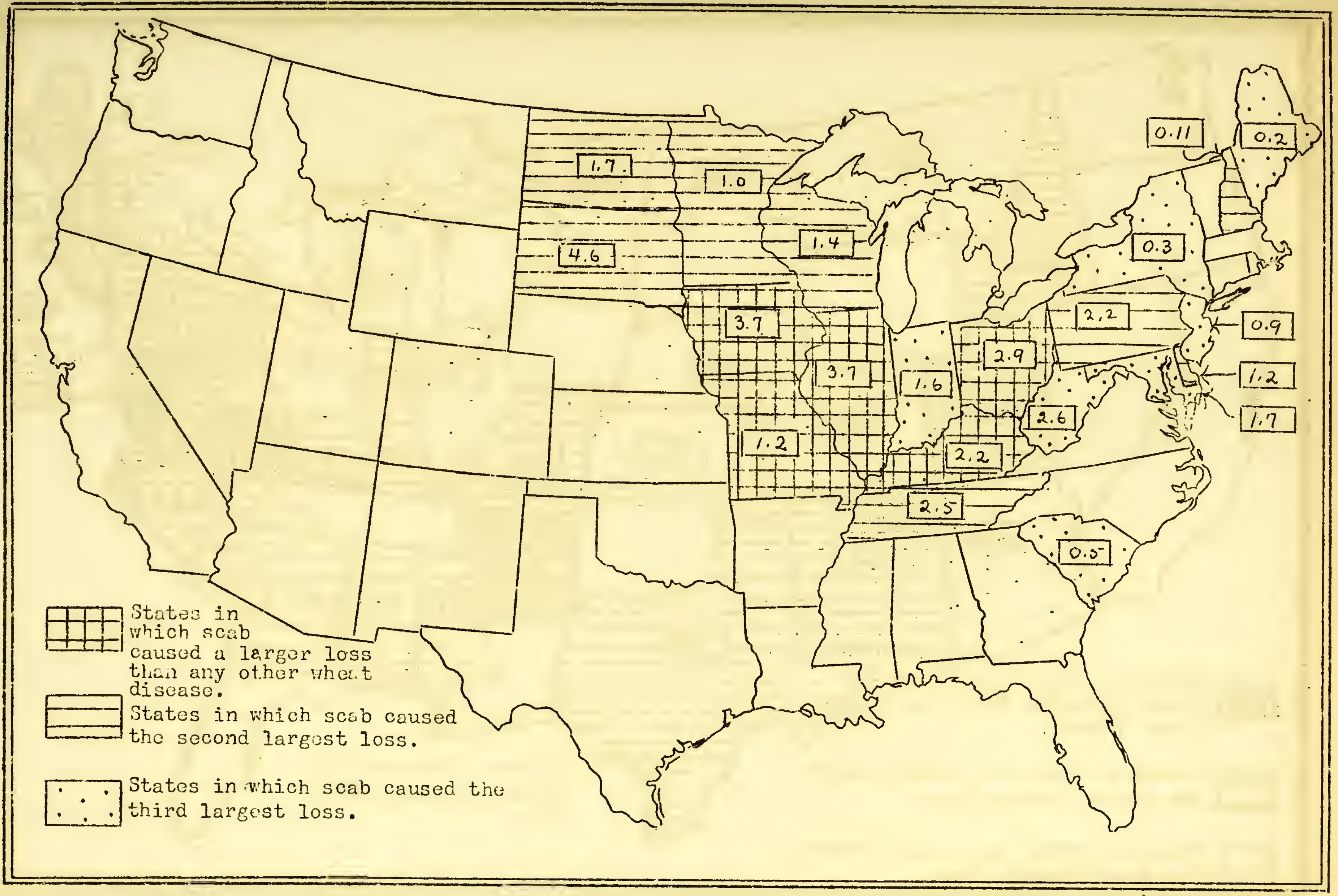

Fig 5 . States in which scab was the most destructive, second most destructive, and third most destructive, of all wheat diseases during 1918 to 1926.

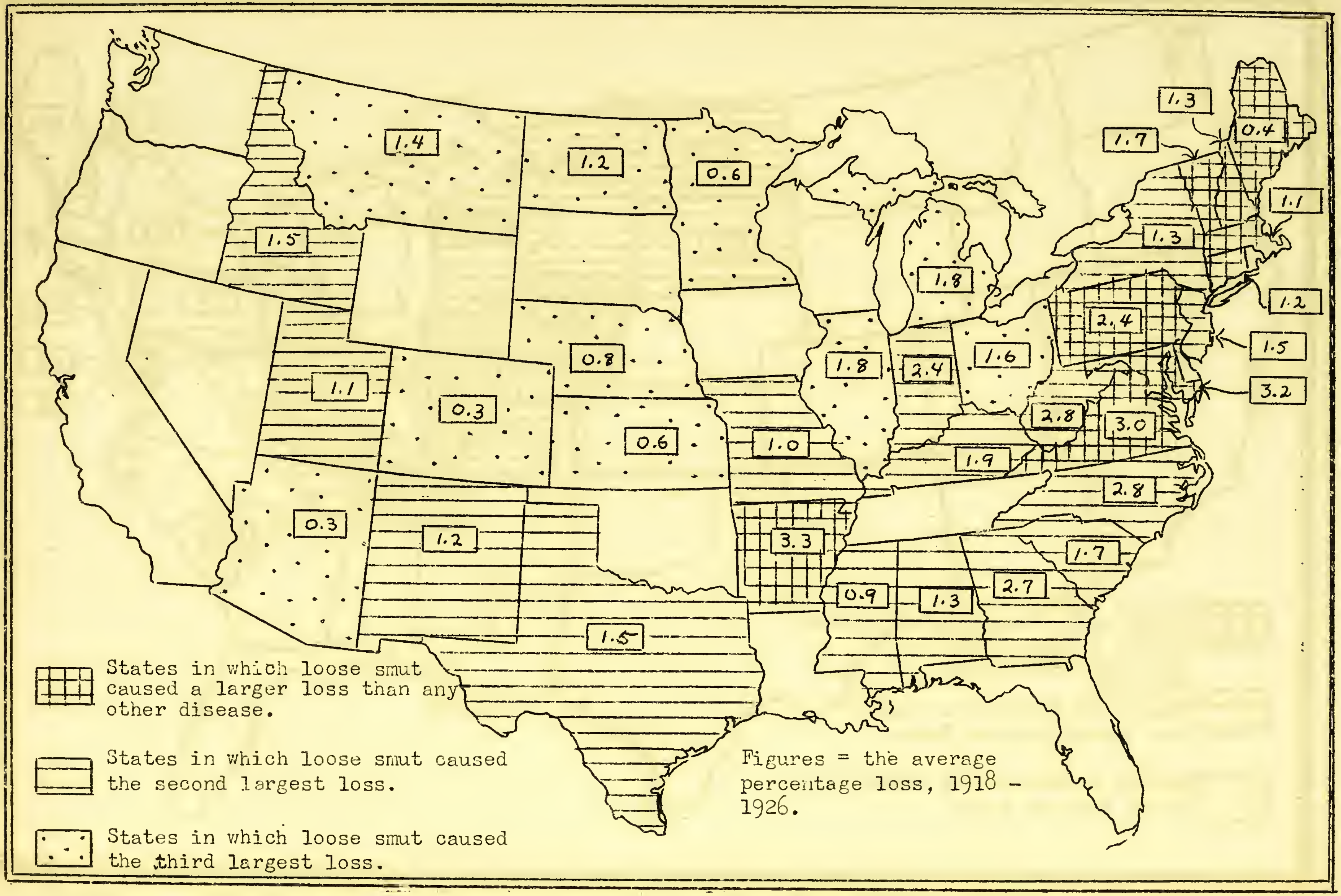

Fig. 6 . States in which loose smut was the most destructive, second most destructive, and third most destructive of all wheat diseases, during 1918 to 1926.

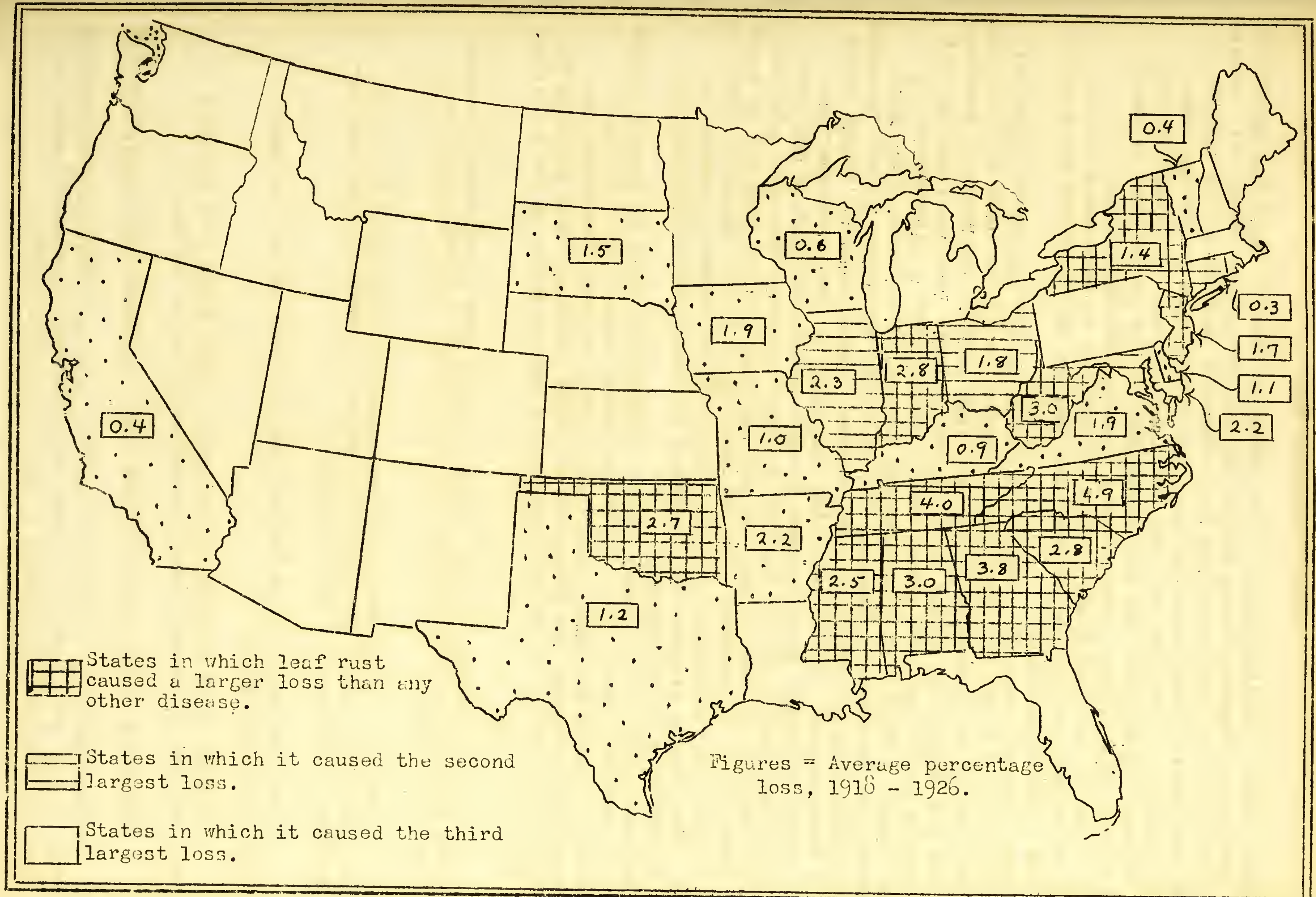

Fig. 7 . States in which leaf rust was the most destructive, second most destructive and third most destructive of all wheat diseases, during 1918 to 1926.

to one-tenth that of smutted heads in the field, or that 80 to 90 per cent of the smutted kernels are removed during harvesting and threshing. Table 29 gives the percentage of cars grading smutty at 15 terminal markets during each of the past four years. These data indicate that during this period smut has been very prevalent in the Central West and the East, and has beenincreasing in some states. F. C. Meier has calculated that of the 22,000 cars of wheat received at the Kansas City market, during August, September, October and November, 1926, 25 per cent graded smutty. Discounts on these cars totaled $272,360, an average of $49.336 for each car grading smutty, which means about 4 1/2 cents a bushel discount.

Tehon obtained records on discounts levied by 207 dealers on 4,796,699 bushels of wheat in Illinois. Smut discounts made on 6.3 per cent of this wheat totaled $22,625.28 or an average of 7.4 cents per bushel. In Missouri similar information was secured by Archer on 3,830,900 bushels. Dealers reported that 30,866 bushels or 0.8 per cent graded smutty and received a discount of 9.1 cents per bushel. These data were compiled for only 18.5 and 12.5 per cent, respectively, of the crops in Missouri and Illinois, therefore, if all the wheat in the two states was as smutty as that reported on, the discount losses would be 5 to 8 times larger. In Pennsylvania, according to Kirby, reports from about 35 of the principal grain dealers in the southeastern part of the state showed that approximately 25 per cent of the wheat offerred them for sale was smutty, but that by refusing to buy the most severely smutted lots and by keeping all smutty wheat in separate bins and cleaning it before shipment, they were able to cut down the percentage of wheat docked at the terminal markets to about 12. The average discount to the grower on smutty wheat purchased was between 10 and 15 cents per bushel.

Weather conditions following sowing of wheat are known to greatly influence smut infection. Little or no infection takes place in soil having a temperature of over 70°F., while soil temperatures ranging between 41° and 59°F. are highly favorable for infection by either species. Late planting was generally given as one cause of the increase of smut in 1926. A few individual reports follow:

North Carolina: Weather bureau records show below normal temperatures and above normal rainfall during November 1925 when wheat was sprouting. (Fant).

Indiana: Wet weather early prevented planting until late when weather became unusually cold, thus checking growth of wheat and permitting development of smut. (Gregory)

North Dakota: Dry at seeding time but cool enough for severe infection. (Brentzel)

Kansas: Smut increase due to cool, moist weather at planting time and the planting of much contaminated wheat. (Melchers)

Colorado: Late plantings more highly infected than early. (Durrell)

Pennsylvania: A very dry late fall kept most farmers from planting wheat until after October 1, when there occurred a period of moist cold weather, especially favorable to smut infection. (Kirby)

Wheat - Stinking Smut

There has been considerable speculation during the past two years as to the reason for the marked increase in smut in the Central and Eastern parts of the United States. Tisdale, Leighty and Boerner (14) have found that it was not due to the introduction of the western form of the smut into these sections. A comparison of the percentage of stinking smut with the date of planting during the period from 1919 to 1926 in Pennsylvania is shown in Figure 10. According to Kirby, these data indicate that the amount of stinking smut in general increased with later planting but that a sudden delay in the date of planting may not cause a continued general increase for several years. Severe infestation of Hessian fly occurring in 1920 and 1921 caused the radical change in the subsequent dates of planting. The change of planting dates in the fall of 1925 (recorded under 1926) was due to abnormal weather conditions. In sharp contrast to the conditions previously described, which occur in most of the surrounding counties, Union County growers have always planted their wheat early and have almost entirely escaped the smut.

Different groups of common wheat taken as a whole show marked differences in degree of resistance to stinking smut. Comparatively speaking the hard red winter wheats, as a group, are the most resistant, followed by the hard red spring wheats. The soft red winter, the white, and the club wheats, are considered very susceptible. The following data on varietal resistance are taken largely from collaborators' reports during the past five years.

1. <u>Hard Red Winter Wheats.</u>

   <u>Resistant:</u>

   Ridit. Idaho, Washington. One of most resistant of all common wheats. Its introduction has been a factor in the reduction of smut in the Pacific Northwest.

   Hussar. Very resistant in Oregon.

   Kanred and Turkey in Kansas, Michigan, Colorado and Pennsylvania, and Kharkof in Kansas and Michigan. Very resistant to <u>T. tritici</u> but only moderately resistant to <u>T. laevis</u>.

   <u>Susceptible:</u>

   Alton. In the Far West.

2. <u>Soft Red Winter Wheats.</u>

   <u>Resistant:</u>

   Berkeley Rock. Michigan, Very resistant. This Turkey x Red Rock cross is the outstanding resistant variety in this group.

   Fultz in Michigan and Pennsylvania and Pennsylvania 44 in Pennsylvania. These varieties are often fairly heavily smutted and can only be considered as resistant when compared with most of the other soft red winter wheats.

   <u>Susceptible:</u>

   Fulhio and Trumbull in Pennsylvania. Moderately susceptible but usually having less smut than the following varieties:

   Forward and Fulcaster in Pennsylvania, Harvest Queen in Pennsylvania and Kansas. Very susceptible.

   Purplestraw. In the Far West. Extremely susceptible.

3. Soft White Winter Wheats.

Resistant:

Martin C. I. 4463. Oregon. This strain of this variety is nearly immune to smut.

Susceptible:

Goldcoin in New York and Pennsylvania. Usually has slightly less smut than Honor and Dawson.

Honor and Dawson in New York and Pennsylvania, Baart and Hard Federation in California, Dicklow in the Far West. All very susceptible varieties.

4. Common Spring Wheats.

Resistant:

Marquis in Minnesota, North Dakota, Colorado. Usually considered as resistant, but under some conditions it has considerable smut. It is apparently the most resistant spring wheat.

Susceptible:

Defiance in Colorado (White Spring Wheat), Kota and Prelude in Minnesota and North Dakota. Susceptible to very susceptible.

5. Durum Wheats.

These wheats as a group are considered quite resistant in Minnesota and North Dakota.

6. Club Wheats.

These are all considered to be very susceptible. Hybrid 128 and Jenkins in Oregon, Little Club in Idaho.

Control:

In practically all states the copper carbonate dust treatment is the one that has been adopted as the standard. In general it has been reported as being very successful. Naturally some difficulties have been encountered such as the following: 1. With very heavily infected seed, copper carbonate dust has been reported as being less efficient than formaldehyde and under some conditions at least it has been found that all smut balls must be removed from the wheat before treating if the smut is to be efficiently controlled. 2. In infested soil, copper carbonate, like blue vitriol reduces but does not eliminate smut infections. 3. Seed treated with copper carbonate dust runs with greater difficulty through most grain drills. This sometimes results in injury to the drill and in the inability of the grower to seed his field properly.

Wheat - Stinking Smut

Table 28. Percentage loss from stinking smut of wheat, as estimated by collaborators. 1926.

Percentage Loss	States Reporting	Maximum loss in one field	Percentage Loss	States Reporting	Maximum loss in one field
10	Kansas	80	2	Montana	80
8	Colorado	35	2	Washington	
6	Pennsylvania	75	1	South Dakota	
6	Nebraska	80	1	California	48.5
6	Idaho		.75	Oklahoma	
5	Virginia	75	.7	Illinois	1.8
5	Arizona	50	.5	Texas	
4	North Carolina		.5	Ohio	
4	Indiana	25	.5	Minnesota	14
4	Michigan		.5	Iowa	40
3.5	Delaware	33	.2	New York	30
3	Maryland	50	Trace	West Virginia	
3	Oregon		"	Missouri	15
2	North Dakota	50	"	Arkansas	

Table 29. Percentage of cars grading smutty at terminal markets 1923 - 1926.

Figures compiled by F. C. Meier.

Market	Percentage of all cars received grading smutty 1923	1924	1925	1926
Astoria, Oregon.	52	69	32	57
Portland, Oregon	45	60	30.2	42
Tacoma, Washington	42	54	30	30.5
Los Angeles, California	20	12	15	16
Bozeman, Montana	12	19	15	25
Ogden, Utah	13	21	29	31
Denver, Colorado	21	25	36	25
Oklahoma City, Oklahoma	1	1	-	7
Kansas City, Missouri	8	11	10	25
Omaha, Nebraska	14	26	39	44
Duluth, Minnesota	-	5	17	17
Lawrenceburg, Indiana	6	37	38	40
Toledo, Ohio	1	3	2	5
Philadelphia, Pennsylvania	3	2	10	9
Baltimore, Maryland	.8	2.3	8.5	-

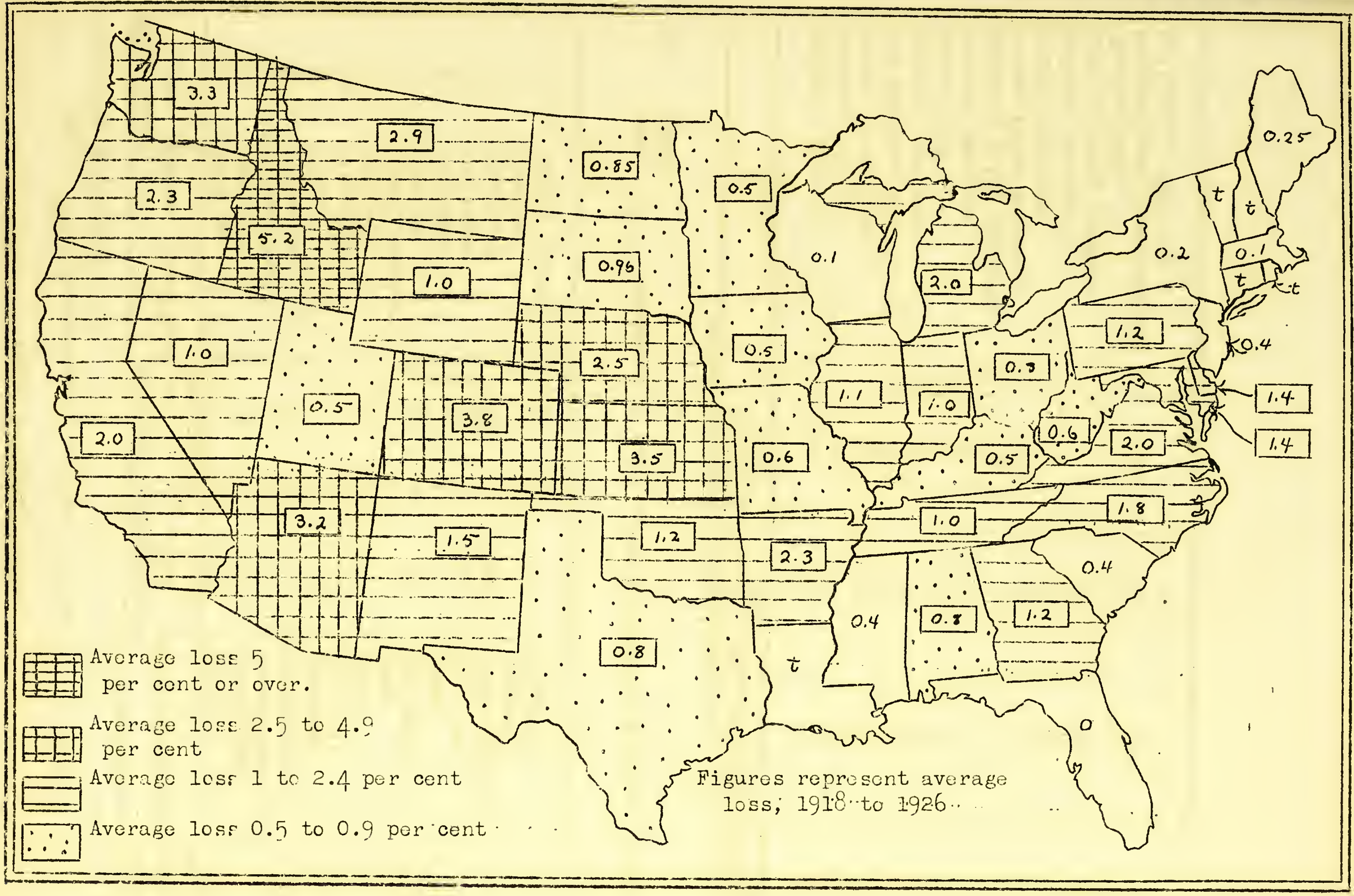

Fig. 8 Average percentage loss from stinking smut of wheat during the period 1918 to 1926.

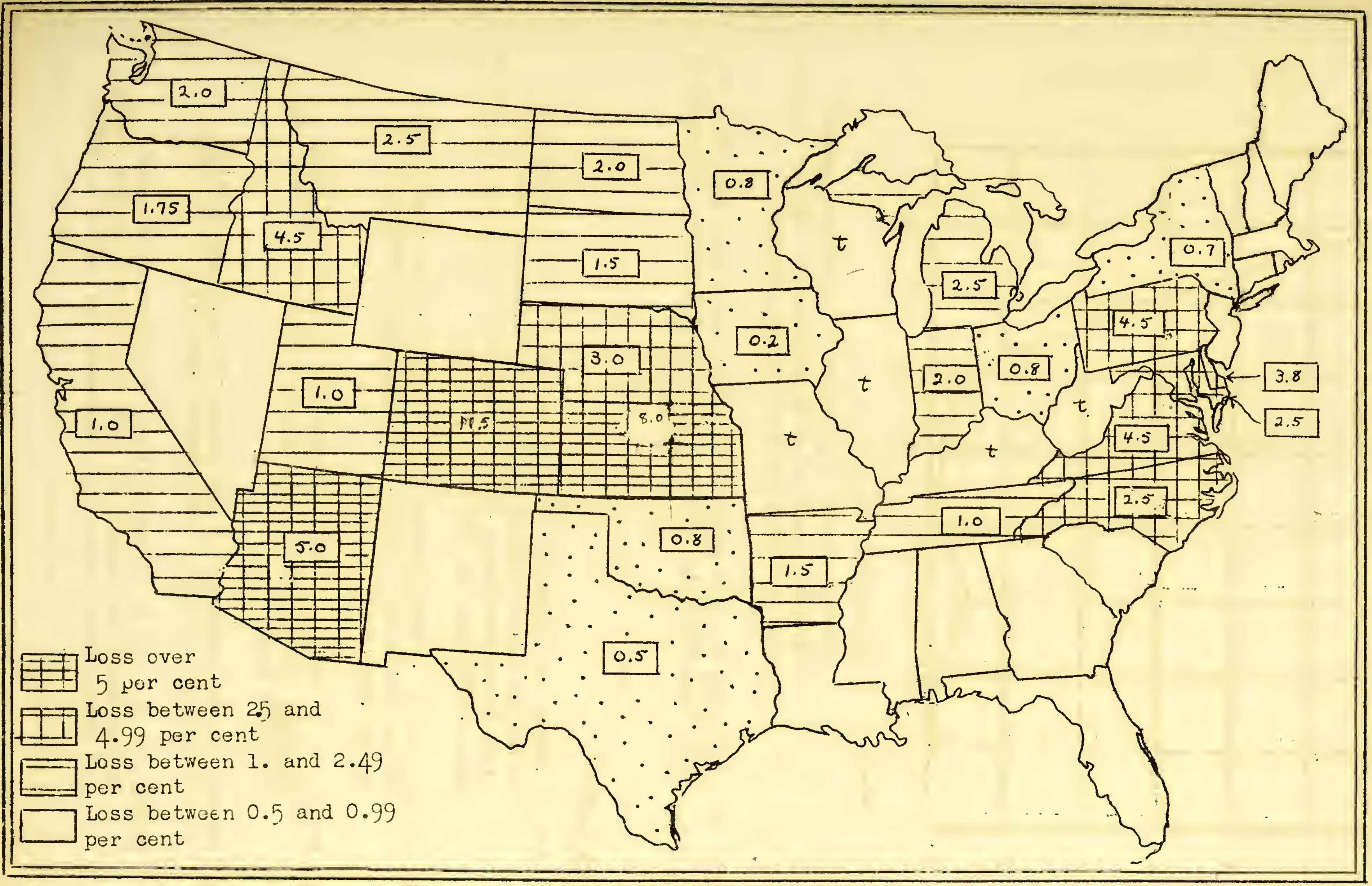

Fig. 9 Average Percentage loss from stinking smut of wheat for 1925 and 1926 as estimated by collaborators.

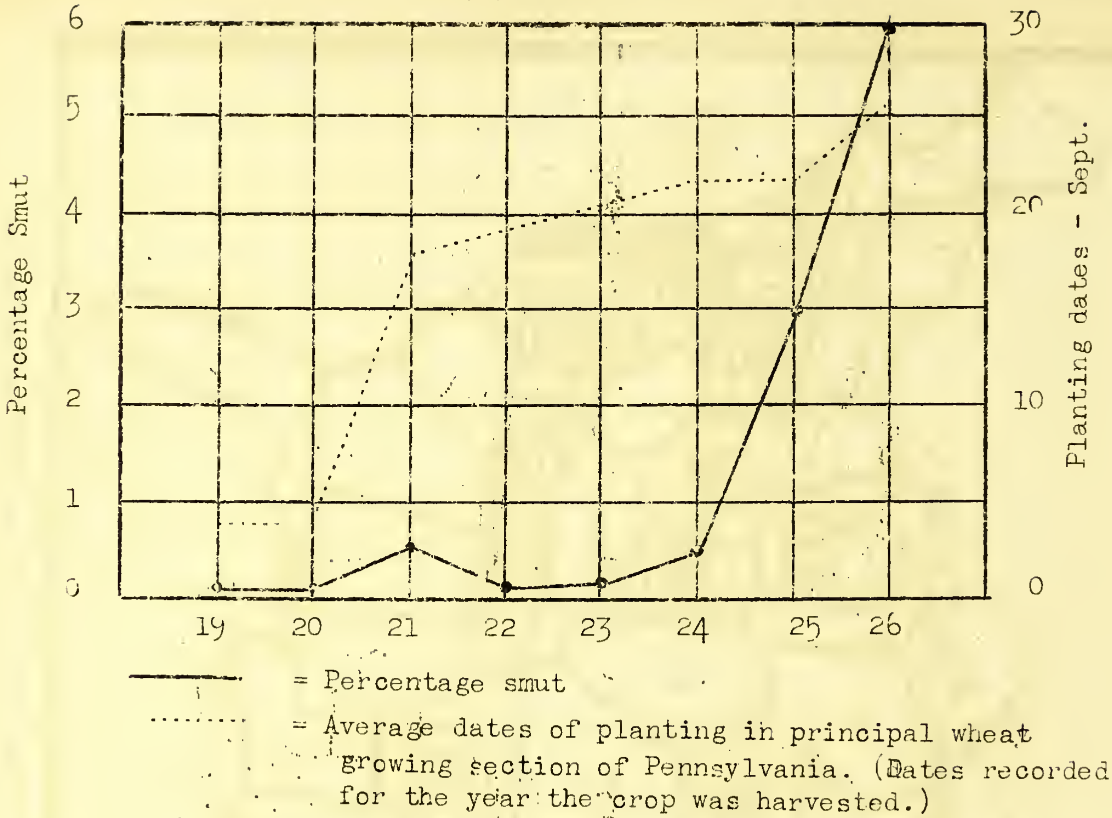

Fig. 10 Relation between Percentage of Stinking Smut and Date of Planting Wheat in Pennsylvania, 1919 - 1926. Prepared by R. S. Kirby.

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LOOSE SMUT CAUSED BY USTILAGO TRITICI (PERS.) ROSTR.

Loose smut has been reported from every state now growing wheat. The loss from this smut seems to have been more constant during the past nine years than that from any other important wheat disease. The average loss has been estimated at 1.11 per cent, and with the exception of 1919 when it was 1.57 per cent, it has not varied over 0.2 per cent from this mean in any year. Loose smut, while rating only fourth in importance among wheat diseases for the country as a whole (see table 30), is nevertheless a most important disease in all regions except the Great Plains and most of the western states. It is most destructive along the Atlantic Coast, where in some states it is the most important wheat disease, and in the Ohio valley. (see figs. 6 and 11.; Losses caused by loose smut 1918-1926) It has also been reported as of considerable importance during some years in the irrigated regions of certain far western states like Idaho and Utah. It seems to be most prevalent in sections of the country having a high rainfall, and is almost entirely absent in the unirrigated arid regions of the West. Reports from collaborators in 35 states show that in 1926, loose smut was more prevalent in five states and less prevalent in eight than in 1925. Losses reported in 1926 are given in table 30 .

Table 30. Percentage loss from loose smut of wheat, as estimated by collaborators.

Percentage loss	States reporting	Percentage loss	States reporting
3	Maryland, Montana		Texas, Oklahoma, Ohio,
2.8	Virginia (9.1)*		Minnesota, (10), Iowa,
2.5	Michigan (7)		Idaho (7).
2.	Pennsylvania (25),	0.5	Illinois, (6), Indiana,
	Arkansas, Missouri (20),		Arizona
	North Dakota (15),	Trace	Maine. Delaware,
	South Dakota (15).		West Virginia, Tennessee,
1.5	New York (10)		Mississippi, Wisconsin,
1	New Jersey, North Caro-		Kansas (12), Colorado,
	lina, South Carolina,		Oregon, California.

(*) Figures in parentheses represent maximum percentage of smut found in any one field.

In 1926 no variety was reported to be immune.

Resistant Varieties

Spring wheats:

Federation: Very resistant in Idaho.
Haynes Bluestem: Very resistant in Minnesota.
Marquis: Very resistant in Minnesota.

Winter wheats:

Soft white varieties:

Goldcoin (Junior No. 6): Very resistant in New York and Pennsylvania.

Soft red varieties:

Fulcaster: Strains of this variety have been reported in Virginia and Missouri as resistant.
Fultz: Quite resistant in Pennsylvania.
Leap: Most resistant soft red variety in New York, Pennsylvania, and Virginia.

Hard red varieties:

These varieties (Kanred, etc.) in Kansas in 15 years observation never showed over 2 per cent, and in commercial fields the average is about 0.25 per cent, as compared with 3 to 10 per cent in soft varieties. -- Melchers.

Susceptible Varieties

Spring wheats:

Defiance: Very susceptible in Colorado.

Dicklow: Susceptible in Idaho.

Kota: Susceptible in Minnesota and North Dakota.

Winter wheats:

Soft white varieties:

Dawson, Honor: Reported as susceptible or very susceptible in New York and Pennsylvania.

Soft red varieties:

These varieties (Harvest Queen, etc.)"in Kansas often show 12 to 20 per cent infection."

Fulcaster: Strains of this variety growing in New York and Pennsylvania are susceptible.

Pennsylvania 44: Moderately susceptible in Pennsylvania.

Poole: Very susceptible in Missouri.

Red Rock: Very susceptible in New York and Pennsylvania.

"The control measures recommended in Colorado are the securing of seed from fields as free as possible from smut." (L. W. Durrell). In Pennsylvania the control measures consist of "establishing 3 to 5 disease-free seed source farms for each susceptible wheat variety, i. e., Pennsylvania 44 and Red Rock. On each of these farms a college pathologist supervises the treating of all the seed wheat, by a combined hot water organic mercury method. Wheat grown from this treated seed is then distributed to numerous farms. Such seed one generation from treatment has been found to produce wheat crops which in nearly all cases are entirely free of smut." (Kirby). In Virginia hot water treatment was used. "A survey of 57 fields from hot water treated seed averages 0.3 per cent smut as compared to an average of 2.8 per cent infection in the whole state." (Fromme and Godkin).

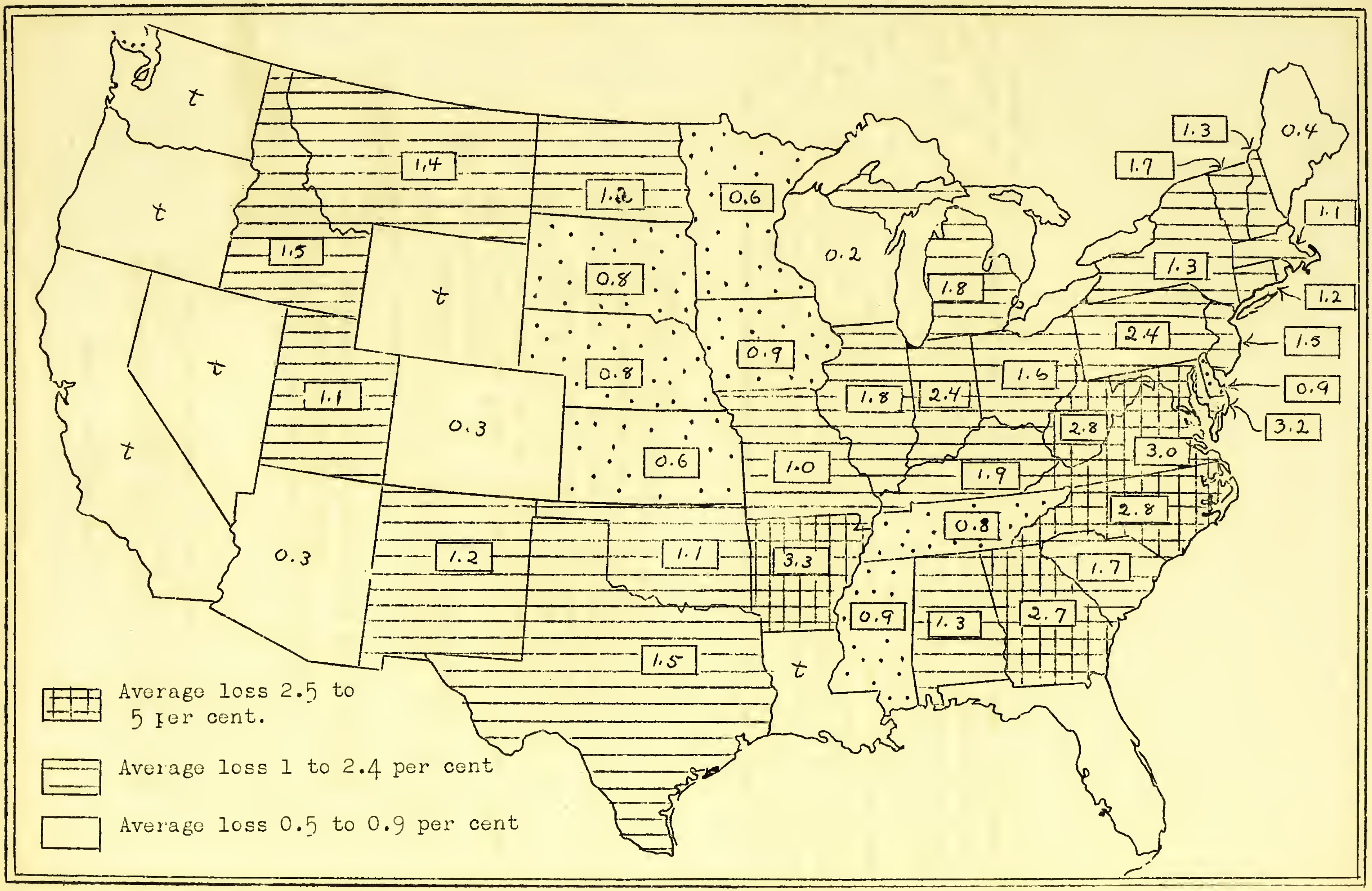

Fig. 11. Average percentage loss caused by loose smut of wheat from 1918 to 1926.

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FLAG SMUT CAUSED BY UROCYSTIS TRITICI KOERN.

What was thought to be the first collection of this smut in the United States was made by J. G. Dickson and others, May 5, 1919, in Madison County, Illinois. However, during 1926 the Plant Disease Survey received through W. H. Tisdale a specimen collected by S. M. Zeller, one year earlier, May 11, 1918, in St. Louis County, Missouri. The specimen had been labeled Urocystis sp. and was not determined as Urocystis tritici by Tisdale until 1924.

Flag smut is known to occur only in three states, Illinois, Kansas, and Missouri. Brief reports from two of these are given below:

Missouri - Flag smut is reported to be rather common each year in the bottom lands of St. Charles County. (W. A. Archer).

Illinois - P. A. Glenn of the Illinois State Department of Agriculture reports:- "Surveys were made in each of the nine counties in which flag smut has been reported and in Perry and Randolph Counties. The survey included about 1100 fields and 7 were found to be infested. The infestations in these 7 fields were all very slight. Results of the survey are shown in table 31.

Table 31 . Survey for flag smut of wheat in Illinois, 1926.

County	No. Fields inspected	No. Fields infested	Acres of Resistant wheat
Greene	125	None	
Jersey	Not stated	"	225
Lincoln	80	"	
Macoupin	95	"	
Madison	200	4	565
Monroe	84	1	500
Perry	22	None	
Randolph	60	"	
Scott	33	"	
St. Clair	230	2	500
Washington	131	None	
	1,060	7	

Tisdale (1) reports that Shepherd, Mammoth Red and Trumbull are resistant to flag smut.

Recent literature:

1. Tisdale, W. H. Recent progress in the control of cereal smuts. (Abstract) Phytopath. 16: 645-646. Sept. 1926.

STEM RUST CAUSED BY PUCCINIA GRAMINIS PERS.

Stem rust occurs practically everywhere wheat is grown in this country. The loss data presented in Fig. 12 indicate that during the last nine years it has caused greatest loss in the spring wheat states and Wisconsin, and has been very destructive in Texas, California, and most of the middle western states.

In the United States during the past eight years stem rust probably caused a loss more than twice as large as that due to any other wheat disease and it has been estimated to be responsible for 37.5 per cent of the total loss caused by all wheat diseases in Minnesota and Wisconsin. Since 1919, however, its importance has, in general, been decreasing. This fact is well brought out in the accompanying graph (fig. 13), prepared from collaborators' annual estimates of crop losses since 1918, which shows also that most of the decrease has occurred in the barberry eradication area, losses in the other states having remained more or less constant during the entire period.

In 1926 several other wheat diseases were responsible for a greater total loss than stem rust. Losses from stem rust were much below normal, in fact the damage was probably less than has occurred during any year since 1918. Table 32 gives estimates of losses for the year as reported by collaborators.

Concerning the 1926 rust situation, Kempton and Hutton report as follows: (Cereal Courier 18: 186, July, 1926.)

"Stem rust did very little damage in Texas, Oklahoma, Kansas, Missouri, and Nebraska. While wheat was not harvested in late June in South Dakota and southern Minnesota, it did not seem that the rust could do very much damage except locally.

"Stem rust is much later in most places than it was last year. The weather in most places has not been so favorable for the development of rust as it was last year. This much is certain, however: Wherever there are barberry bushes stem rust is exceptionally heavy."

In Minnesota the Department of Plant Pathology reports that stem rust was general throughout the state, infection ranging from 30 to 70 per cent. The amount of rust varied greatly in different fields and different sections. The rust came late and did little damage. In California, J. A. Clark reported that a real North Dakota epidemic of stem rust occurred, completely destroying much of the wheat in the southern part of the state.

To assist observers in estimating losses from stem rust when attacking the host at different stages, the Office of Cereal Crops and Diseases has worked out the following convenient table.

Table 32. A Table for computing loss from stem rust.

Stage of development of the crop						Loss from stem rust
Boot	Flower	Milk	Soft dough	Hard dough	Mature	
Percentage of stem rust-average severity in field (According to scale for estimating rust)						Per Cent
-	-	-	-	(tr)	5	0.0
-	-	-	(tr)	(5)	10	0.5
-	-	(tr)	(5)	(10)	25	5.
-	(tr)	(5)	(10)	(25)	40	15.
(tr)	(5)	(10)	(25)	(40)	65	50.
(5)	(10)	(25)	(40)	(65)	100	75.
(10)	(25)	(40)	(65)	100	100	100.

Epidemiology

Stem rust was reported by Kempton and Hutton (Cereal Courier 18: 186, July 31, 1926) as overwintering in the uredinial stage on wheat in both southern and northeastern Texas. It apparently also overwintered in Sonora, Mexico, where A. W. Morrill reports that stem rust caused great damage to wheat during February and March. Reports indicate that stem rust infection became general in California and Arizona during April and May and that it was found during May in Arkansas, and during the first half of June in all the Mississippi Valley states to the Canadian line; further that barberry infection appeared in Missouri, Iowa, South Dakota, and Minnesota three to four weeks before the uredinial stage of stem rust was observed on wheat in those states.

In connection with the important relationship between barberry infection and the resulting loss from stem rust in wheat, it has been pointed out by several reporters that the small amount of stem rust in 1926 was partly attributable to exceptionally late appearance of the rust on the barberry bushes and its abnormally late spread to the wheat. Dry weather was reported from several states as causing this late barberry infection, and L. W. Melander (Cereal Courier 18: 111. 1926) states that extremely dry weather prevented teliospore germination.

Stem rust, as usual, was reported from the barberry eradication area and certain surrounding states, Colorado, Ohio, Pennsylvania, South Dakota, as first coming from infected barberry bushes. In Colorado, Missouri, Ohio, Pennsylvania, and Virginia, it was too late on wheat to do much damage. Data on first observation of stem rust infection are given in table 34.

Weather relationships

The relation between dry weather and barberry infection has already been mentioned. The amount of rainfall during the month preceding wheat harvest greatly influenced the amount of stem rust damage. In California, where much of the wheat crop was destroyed by rust, April, 1926, is recorded as the wettest (rainfall 3.48 in. above normal) and warmest April on record during the thirty years of keeping weather records. Very heavy rust losses were reported from Arizona, where much the same conditions prevailed as in California (April rainfall 2.25 in. above normal.) In the middle western states, with only two exceptions, Illinois and Michigan, the loss from stem rust was below the average. The rainfall during June throughout that section was far below the average, with only Illinois and Michigan having a definite excess.

Varietal Susceptibility

In the following reports it must be taken into account that the susceptibility of any variety of wheat may vary in different sections, or even in the same section from year to year, because of the many biologic forms of stem rust which are scattered throughout the country.

Varieties immune

Acme, Indiana
Buford, Indiana
Einkorn, Indiana
Kubanka strain, Indiana
Mindum, Indiana
Vernal (emmer) Indiana

Varieties very resistant

Kota, Minnesota
Peliss (Webster), Indiana.

Varieties resistant

Defiance, California, Mexico[1]
Early Defiance, California

Wheat - Stem Rust

Varieties resistant (Cont'd)

Ervan, California[2]
Huron, Indiana
Kanred, Kansas[3]
Kota, North Dakota, California.
Marquis, California[4]
Norka, Indiana
White Federation, California[5]
Pacific Bluestem, Colorado
Quality, North Dakota
Resaca, Indiana
Ruby, North Dakota
Turkey Red, Colorado

Varieties susceptible

Agini, Indiana
Illinois #1, Indiana.
Marquis, North Dakota, Indiana, Colorado.

Varieties very susceptible

Marquis, Minnesota
Preston, Minnesota
Ruby, Minnesota
White Spring Spelt, Indiana

Notes: All reports from Indiana by E. B. Mains, from Colorado by L. W. Durrell, from Minnesota by the Section of Plant Pathology, from Kansas by L. E. Melchers, from North Dakota by W. E. Brentzel.

1. In the Yaqui Valley of Sonora, Mexico, A. W. Morrill reports that this variety stands up best under epidemic conditions.

2. One of the most resistant. -- W. W. Mackie
Some of the selections in Prof. Mackie's nursery proved very resistant, the most resistant coming from Early Defiance crosses. Pusa No. 4 also transmits resistance in hybrids in a satisfactory degree. The classification nursery grown by Mr. Florell was nearly destroyed by rust, Kota, Kanred, and Erivan having less than 5 per cent infection. Most of the earlier Australian and Indian varieties also escaped rust. -- J. A. Clark, Cereal Courier 18:142. June, 1926.

3. Most resistant hard red variety. -- L. E. Melchers.

4. Was one of most resistant. -- J. A. Clark.

5. One of most resistant varieties. -- W. W. Mackie

Clark, Martin, and Stakman (4) reported in a report on the results of cooperative experiments conducted at 39 places in the United States and Canada, that the durum wheats were much more resistant as a class than the hard red spring wheats. The varieties Pentad, Monad, Acme, and Nodak were the most resistant. Of the hard red spring wheats, Kota and a few hybrid wheats were much more resistant than Marquis, and Marquis escaped rust slightly better than Power, Preston, and Haynes Bluestem. Except for the resistant varieties, the average rust infection on the common wheats increased with the lateness of the average date of maturity of the varieties. Early varieties evaded rust better than Marquis. Two varieties of spring emmer that were tested were nearly immune to rust.

Table 33 . Estimated percentage loss from stem rust of wheat, as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
8	Arizona	.1	New York, Pennsylvania
5	Minnesota		Virginia, Montana.
3.5	Michigan	Trace	Massachusetts, Maryland,
3.	Wisconsin		West Virginia, North
1.75	North Dakota		Carolina, Arkansas,
1.24	South Dakota		Missouri, Nebraska,
1.	Illinois, Iowa		Kansas, Wyoming,
.75	Texas, Oklahoma		Colorado, Idaho,
.5	Ohio, Indiana, California		Washington, Oregon.

Table 34 . Dates and places of first observation of stem rust on barberry and wheat in 1926.

Date	Place	County	State
On Barberry Bushes			
May 3	Marion	Cole	Missouri
May 3	Dayton	Montgomery	Ohio
May 5	Jefferson	Greene	Iowa
May 5	Marion Township	Olmsted	Minnesota
May 15	----------	Brookings	South Dakota
June 1	Warren	Warren	Pennsylvania
June 5	----------	------	North Dakota
On Wheat			
February	Severe infestation Yaqui Valley, Sonora, Mexico.		
April	" "	Davis	California
May	" "	Salt River Valley	Arizona
May 30	Fayetteville	Washington	Arkansas
June 7	Columbus	Cherokee	Kansas
June 9	Wells	Faribault	Minnesota
June 10	North Platte	Lincoln	Nebraska
June 11	Grayville	White	Illinois
June 11	----------	----------	South Dakota
June 11	Fargo	Cass	North Dakota
June 16	Marshall	Madison	North Carolina
June 18	St. Louis	St. Louis	Missouri
June 24	North Freeman	Sauk	Wisconsin
June 24	Shippensburg	Cumberland	Pennsylvania
July 1	Grand Traverse	----------	Michigan
July 10	Montrose	Montrose	Colorado

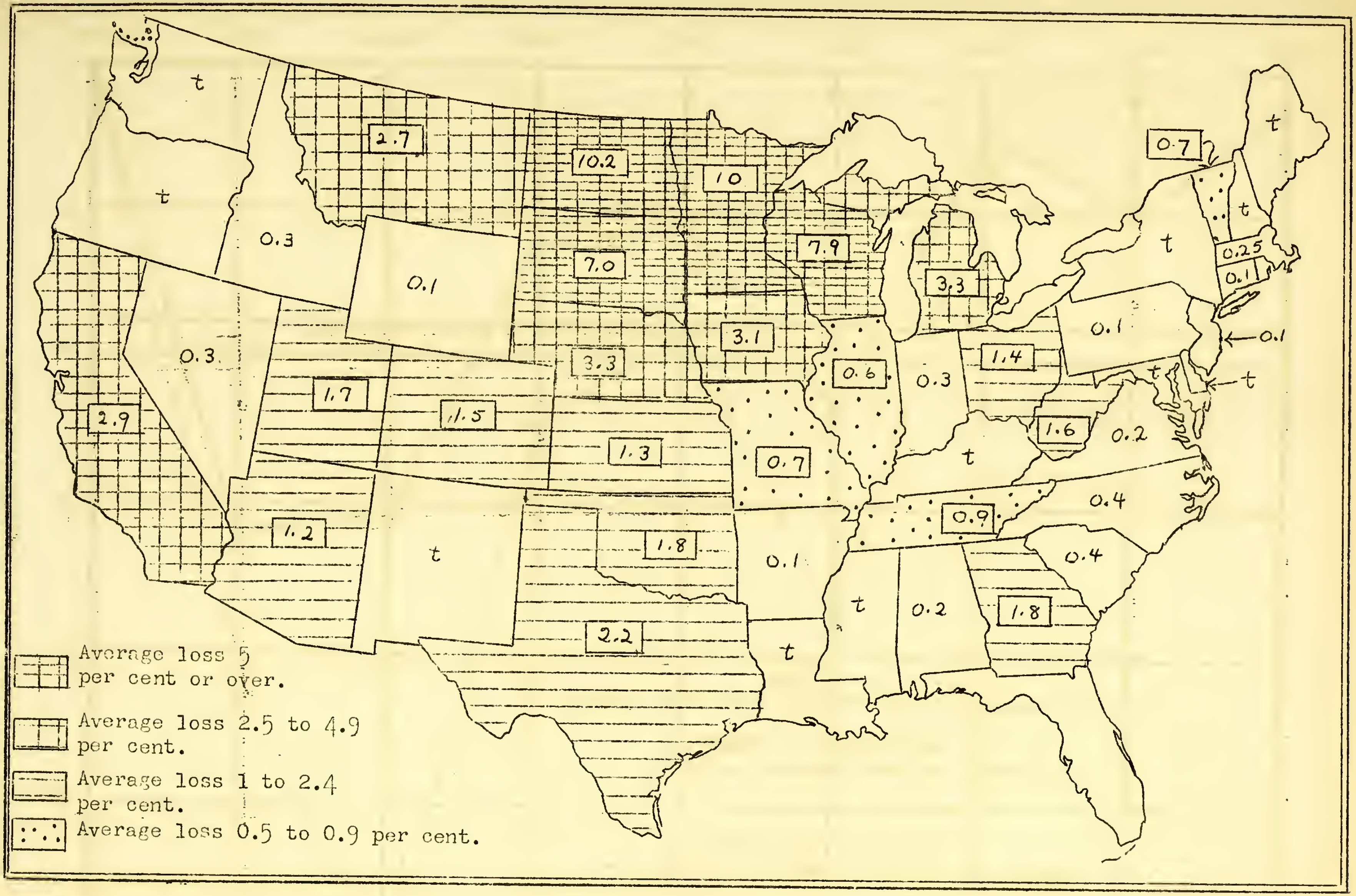

Fig. 12 . Average percentage loss caused by stem rust of wheat from 1918 to 1926.

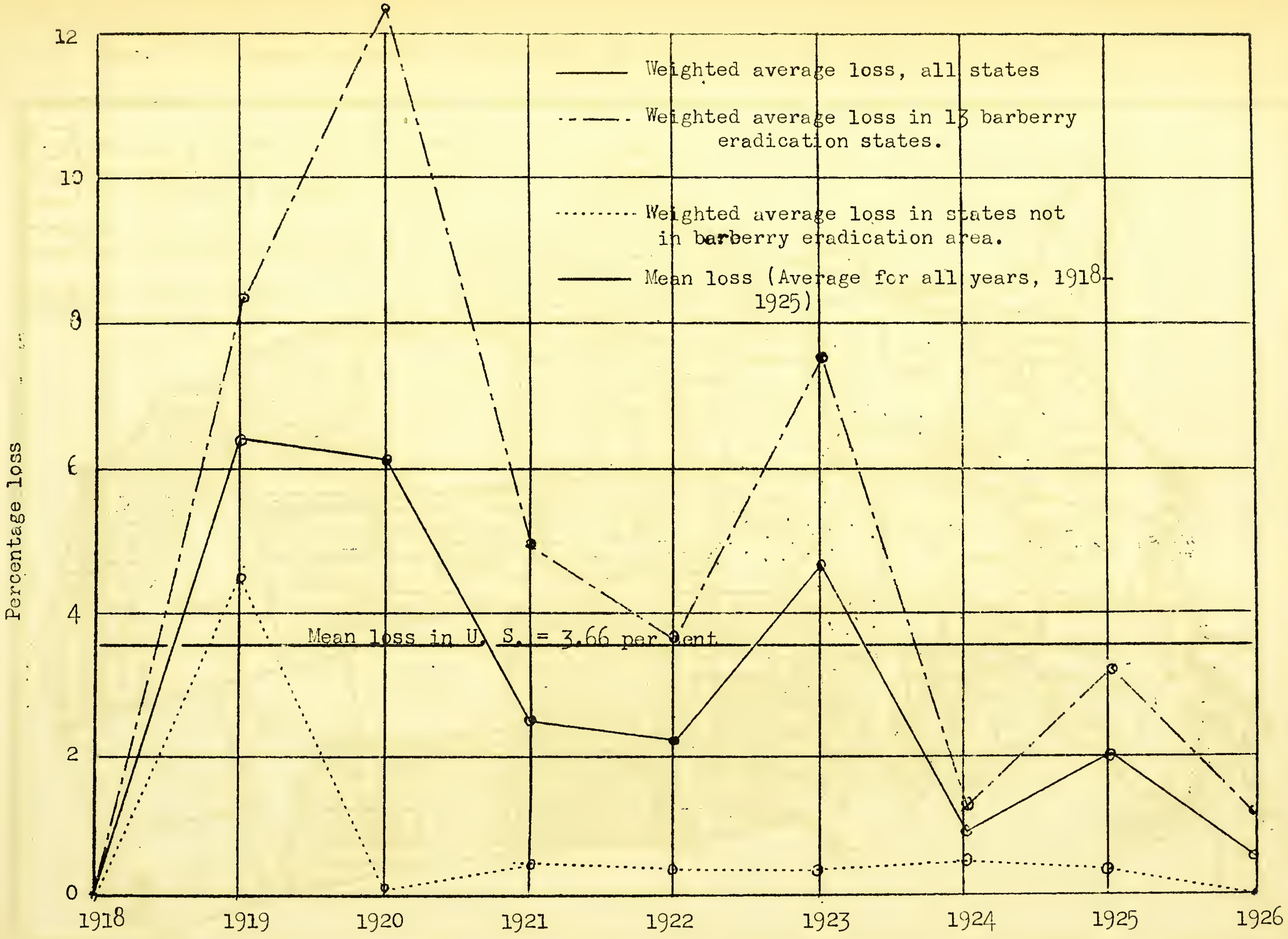

Fig. 13 Estimated percentage loss of wheat from stem rust from 1918 to 1926.

Wheat - Stem Rust

Recent literature:

1. Allen, R. F. Cytological studies of Forms 9, 21 and 27 of Puccinia graminis tritici on Khapli emmer. Jour. Agr. Res. 32: 701-725. 1926.

2. Bailey, D. L. and F. J. Greaney. Field experiments on the control of stem rust by sulphur dust. Sci. Agr. 7: 153-156. Jan. 1927.
   Stem rust was a negligible factor in Manitoba this year due apparently to unfavorable environmental conditions and to scarcity of inoculum.

3. Bulger, R. O. Stem rust and the common barberry in South Dakota. South Dakota State Col. Agr. Ext. Div. Circ. 240: 1-23. 1926.

4. Clark, J. A., J. H. Martin, and E. C. Stakman. Relative susceptibility of spring-wheat varieties to stem rust. U. S. Dept. Agr. Circ. 365: 1-18. 1926.

5. Curran, G. C. and B. Koehler. Protection of grain crop demands barberry eradication. Illinois Agr. Exp. Sta. Circ. 308: 1-12. 1926.

6. Durrell, L. W. and E. A. Lungren. Berberis fendleri, an alternate host of Puccinia graminis tritici. Phytopath. 16: 234-235. 1926.

7. Gonzales Fragoso, R. Las 'royas' des los cereales. Bol. Estac. Pat. Veg. 1: 41-48, 1926.

8. Henning, E. Annu Nagra ord om mojligheterna for en rationell utrotning av Berberisbusken. (A few more observations on the possibilities of a rational system of eradication of barberry bushes.) Landtmannen, 9: 472-473, 1926.

9. Hynes, H. J. Studies on the reaction to stem rust in a cross between Federation wheat and Khapli emmer, with notes on the fertility of the hybrid types. Phytopath. 16: 809-827. Nov. 1926.

10. Lindfors, T. Berberisutrotningen i Sverige. (Barberry eradication in Sweden.) Landtmannen 9: 412-413. 1926.

11. Maxwell, I. and C. B. Wallace. Black rust in Scotland. Trans. Brit. Mycol. Soc. 11: 138-145. 1926.

12. Newton, Margaret and Thorvaldur Johnson. Greenhouse experiments on the relative susceptibility of spring wheat varieties to seven physiologic forms of wheat stem rust. Sci. Agr. 7: 161-165. Jan. 1927.

13. Newton, Margaret and Thorvaldur Johnson. Physiologic forms of wheat stem rust in western Canada. Sci. Agr. 7: 158-161. Jan. 1927.

14. Reddy, W. F. Black stem rust situation in Michigan. Michigan Agr. Exp. Sta. Quart. Bull. 8: 148-151. Feb. 1926.

15. Stakman, E. C. The wheat rust problem in the United States. Proc. Pan-Pacific Sci. Congr. 1923, 1: 88-96. 1924.

16. Stakman, E. C. Methods of reducing losses from black stem rust of wheat. Proc. Pan-Pacific Sci. Congr. 1923, 1: 132-136. 1924.

17. Stakman, E. C. Present status of the black stem rust situation. Northwestern Miller 145: 476. Feb. 3, 1926.

LEAF RUST CAUSED BY PUCCINIA TRITICINA ERIKS.

This major wheat disease has been reported from practically every state. It is very destructive in the southeastern part of the country where the spring rainfall is usually heavy, moderately important in most of the states east of the Rocky Mountains, and practically negligible in the dry sections of the western states. See Fig. 14.

In 1926 it apparently caused a slightly larger loss than in 1925. Losses reported are given in Table 35. It was unusually severe in California and Arizona. Concerning its occurrence in the southwestern part of the country, C. O. Johnston, (Cereal Courier 18: 159, 1926) states that:

> "The spring of 1926 was one of extremes in leaf-rust infection. An extremely heavy infection occurred in nursery seedings at Denton, Texas. Northern Texas and southern Oklahoma experienced generally heavy infections. The amount of rust gradually diminished to the northward. Northern Oklahoma and southern Kansas had a moderate amount of leaf rust early in the season, but very dry weather ripened the wheat early and prevented any material increase. Eastern, northern and northwestern Kansas had very light infections of leaf rust, which came in very late. Central Kansas had a moderate amount of rust, which came in very late but increased rapidly until hot dry weather ripened the wheat."

Concerning the southeastern and eastern parts of the United States, E. B. Mains states:

> "The dry spring again held leaf rust of wheat in check. At Tifton, Georgia, Prof. R. P. Bledsoe report on May 20 that many of the varieties in the wheat nursery were dried up making notes on varietal differences very difficult. Susceptible varieties at that time, however, showed a fairly heavy infection. At Experiment,

Georgia, leaf rust developed only to a slight extent on account of the dry weather. Dry weather also interfered with leaf rust development at Knoxville, Tennessee. On June 14, however, susceptible varieties on low ground were moderately rusted. On higher ground very little leaf rust was evident and wheat was ripening. At Marshall, North Carolina, June 15, leaf rust was fairly abundant on susceptible varieties in a wheat nursery in a creek bottom. At Swannanoa, North Carolina, only a scattering of leaf rust was found on high ground. Prof. Lehman later reported a moderate infection on wheat in low spots. On the Arlington Farm, Washington, D. C., June 17, I was unable to find leaf rust except on one or two low spots.

"At La Fayette, Indiana, there was a slight amount of overwintering of leaf rust. Although we had plenty of rain the rust developed slowly, possibly due to cool weather. By June 22 the most susceptible varieties showed a moderate infection. By July 6, a few days before harvesting, these were fairly heavily infected. On spring wheat, which was planted very late on account of difficulty in preparing the ground, leaf rust had a good opportunity to develop. By July 8, susceptible varieties were 100 per cent rusted, and harvesting did not start until July 23.

"At Madison, Wisconsin, Dr. Dickson informed me that leaf rust also developed very slowly this spring. On July 19, winter wheats were starting to ripen. At that time susceptible varieties were fairly heavily rusted. Spring wheats at that time were still green and susceptible varieties showed 100 per cent leaf rust."

In Indiana, Iowa, and Michigan, leaf rust was said to be more prevalent and destructive than for several years.

At La Fayette, Indiana, E. B. Mains reported that, "A slight amount of overwintering of leaf rust occurred," and R. E. Vaughan stated that in Wisconsin, "Leaf rust is present throughout the whole year." The rust became general in April in California, in May as far north as Kentucky and Delaware, and during the first half of June as far north as the Dakotas.

Regarding injury to wheat by leaf rust, E. B. Mains (2) states:

"Leaf rust often has been considered as causing little or no loss in production. By a comparison of a number of series of rusted plants with rust-free plants in the greenhouse from 1922 to 1925, it has been found that under some conditions there is a considerable reduction in the seed developed by rusted plants. The extent of the reduction depends on the severity of the infection, the infection period, and varietal susceptibility. When susceptible varieties are heavily infected from the seedling state to maturity, little or no seed is produced. Severe infection from the beginning of heading to maturity has produced 15 to 25 per cent reduction in seed formation. It was found that the upper and lower spikelets in the heads of rusted plants usually failed to develop seed. The middle spikelets produced fewer seeds due to the failure of the development of the central flowers. Blossoming starts in the outer flowers of the spikelets and the middle spikelets of the head, progressing inwardly in the spikelet and up and down the head. While the first flowers to blossom in rusted plants are able to receive sufficient material for the development of seed, the later blossoms are starved and fail to develop seed."

Concerning varietal susceptibility collaborators report as follows:

Immune varieties. -- Most durums, einkorn, and emmers, Indiana.

Very resistant varieties. -- Durums in Minnesota; a strain of Fultz and Indiana Swamp in Indiana.

Resistant varieties. -- Coker's Blue Stem, Purple Straw, and Red May in Arkansas; Kanred, Michikoff, and Purkoff in Indiana.

Susceptible varieties. -- Forward, Fulcaster, Fultz, Leap, and Pennsylvania 44 in Pennsylvania; Fulcaster (strains of), Michigan amber, and Red Rock in Indiana; Kanred, Marquis, and Turkey Red in Colorado; Kota in Minnesota.

Very susceptible varieties. -- Chul, Forward, Fulhio, Little Club, and Trumbul in Indiana; Defiance in Colorado; Red Rock in Pennsylvania.

(All reports from Colorado by L. W. Durrell; from Arkansas and Minnesota by the respective Department of Plant Pathology; from Indiana by E. B. Mains; and from Pennsylvania by R. S. Kirby).

On account of the occurrence of biologic forms of leaf rust, a single variety may exhibit different degrees of susceptibility when grown where different forms of the rust occur. This may account for the apparent discrepancies in the preceding statement.

E. B. Mains, (3) found that resistance to leaf rust is not limited to a small group of closely related or similar varieties of the hosts of the rusts studied, but often is present in varieties of quite diverse types. Resistance to the leaf rust of wheat has been found in the durum, emmer, spelt, poulard, polish einkorn, and common types, the club wheats being the only major group in which it has not so far been discovered although club types have been bred which are resistant. In the common wheats, resistance has been found in certain strains of such diverse groups as are represented by the varieties Bobs, Fultz, Kofod, Reseca, Democrat, Gladden, Valley, Fulcaster, Hussar, Pesterboden, Turkey, Kanred, Dixon, Imperial Amber, Norka, Mediterranean, and Webster, including winter and spring, bearded and beardless, hard and soft, and white and red-seeded types.

Control

See discussion on the control of this disease by dusting at the start of this section.

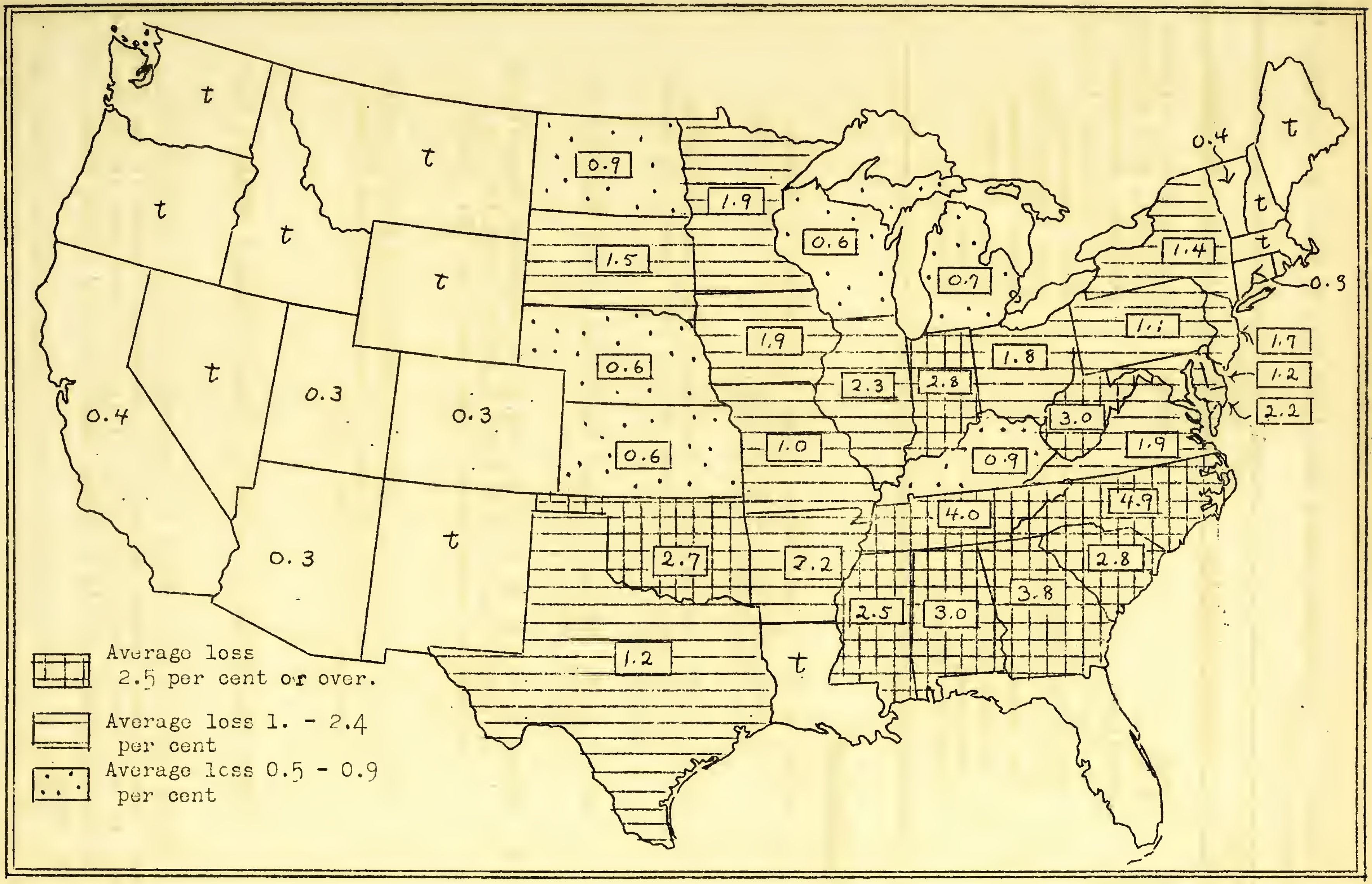

Fig. 14 . Average annual percentage loss from leaf rust of wheat, 1918 - 1926.

Table 35 . Percentage losses from leaf rust of wheat as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
6	Iowa	Trace	Massachusetts, Delaware Virginia, West Virginia Kentucky, Tennessee, North Carolina, Arkansas, Ohio, Minnesota, North Dakota, South Dakota, Nebraska, Kansas, Montana, Idaho, Washington.
5	Indiana		
2	Michigan		
1	New York, South Carolina, Texas, Illinois, Wisconsin		
0.5	New Jersey, Pennsylvania, Maryland, Arizona, Oregon.		

Recent literature:

1. Allen, R. F. A cytological study of Puccinia triticina physiologic form 11 on Little Club wheat. Jour. Agr. Res. 33: 201-222. Aug. 1, 1926.

2. Mains, E. B. The effect of leaf-rust, Puccinia triticina, on the seed production of wheat. (Abstract). Phytopath. 17: 40. 1927.

3. Mains, E. B. Studies in rust resistance. Jour. Heredity 17: 313-325. Sept. 1926.

4. Mains, E. B., C. E. Leighty, and C. O. Johnston. Inheritance of resistance to leaf rust, Puccinia triticina, in crosses of common wheat. Jour. Agr. Res. 32: 931-972. 1926.

5. Mains, E. B., and H. S. Jackson. Physiologic specialization in the leaf rust of wheat, Puccinia triticina Erikss. Phytopath. 16: 89-120. 1926.

STRIPE RUST CAUSED BY PUCCINIA GLUMARUM (SCHM.) ERIKS. & HENN.

Stripe rust has been found in seven western states, California, Arizona, Utah, Oregon, Idaho, Montana, and Washington, since it was first observed in the United States in 1915. It is most prevalent in the Pacific Coast States and Idaho, but is of minor importance and seldom causes over a trace of loss.

In 1926 D. E. Stevens reported that in Idaho, (Cereal Courier 18:117. May 20, 1926). "Stripe rust is more prevalent this year than it has been since 1917. Some varieties in the nursery already show 100 per cent infection.

Of the wheats in the varietal experiment Federation is the only one so far showing a very heavy infection." In Montana, H. E. Morris reported that stripe rust was present in the usual small amounts and in California, W. W. Mackie found less stripe rust than last year or the average year.

Stripe rust is known to overwinter, at least in Idaho, as mycelium in the tissue of its hosts, and becomes plentiful before harvest. It is usually most prevalent during years having heavy spring rainfall. This was true in Idaho this year as shown by C. W. Hungerford's statement that, "The wet weather in early June favored infection while later dry weather checked it."

The wheat variety Velvet Chaff was observed to be severely infected in Montana by H. E. Morris.

Recent literature:

1. Kharbush (S.). Recherches cytologiques sur blés parasités par Puccinia glumarum. Rev. Path. Vég. 13: 92-110. 1926.

SCAB CAUSED BY GIBBERELLA SAUBINETII (MONT.) SACC.

Scab has been reported from all Eastern wheat growing states. It is generally absent in the western states. During the past nine years it has been estimated to have caused the third largest loss in the United States of any disease attacking wheat, being exceeded only by stem rust and bunt. In certain sections like the Ohio and Upper Mississippi Valleys, and the Middle Atlantic Coast States it is very prevalent and destructive, often being responsible for a larger loss than any other disease. (See figures 5 and 15). Scab epithytotics are so dependent on weather conditions that the loss may be negligible during one year and most important the next, as for example in 1918 and 1919, when the average percentage losses were 0.4 and 5.27 respectively.

In 1926 practically all of the twenty-five states sending in estimates, with the exception of New York, reported that scab was less prevalent than in 1925 or in an average year. Estimates of losses for 1926 are given in table 36.

The unusually small amount of scab in 1926 was attributed by most collaborators to the lack of favorable weather for infection and spread. There were no long periods of rainy weather between heading and maturity of the wheat such as are required for scab development.

Dickson (2) in Wisconsin found that the seedling blight stage of this disease is greatly influenced by the soil temperature. Seedling blight was controlled by planting wheat in soil having a temperature as low as 46°F. but 21 per cent of the plants were killed at soil temperatures of 53°F. The percentage of blighted plants increased with an increase in the temperature up to 81°F. at which point about 60 per cent of the seedlings were killed.

Six years of careful study on varietal susceptibility in Minnesota has been reported on recently by Christensen and Stakman (1).

Wheat - Scab

For several years it has been recognized that one important control measure is to so arrange the farm rotations as to avoid following corn with wheat. In 1926 reports from three states, Ohio, North Dakota, and Pennsylvania were to the effect that scab is invariably much worse when wheat comes after corn in the rotation.

Concerning seedling blight, Dickson (3) states that in Wisconsin "Seeding made later than April 20, when the soil temperature was above 40°F., blighted badly resulting in poor stand and low yields." He says also that scabbed seed should be treated for thirty minutes in a .5 per cent solution of Uspulun, Semesan, or Germisan.

Table 36 . Percentage loss from scab of wheat, as estimated by collaborators in 1926. Figures in parentheses are maximum percentage infection observed in a single field.

Percentage loss	States reporting	Percentage loss	States reporting
1.	New York, North Carolina	Trace	Virginia, West Virginia Ohio, Indiana, Michigan, Wisconsin, Minnesota, Iowa (20), Missouri (0.5) South Dakota.
0.5	Pennsylvania, Illinois North Dakota.		
0.4	Maryland		
0.3	New Jersey		

Recent literature:

1. Christensen, J. J. and Stakman, E. C. Susceptibility of wheat varieties and hybrids to wheat scab in Minnesota. (Abstract) Phytopath. 17: 40-41. Jan. 1927.

2. Dickson, J. G. Making weather to order for the study of grain diseases. Wisconsin Agr. Exp. Sta. Bul. 379: 3-36. Jan. 1926.

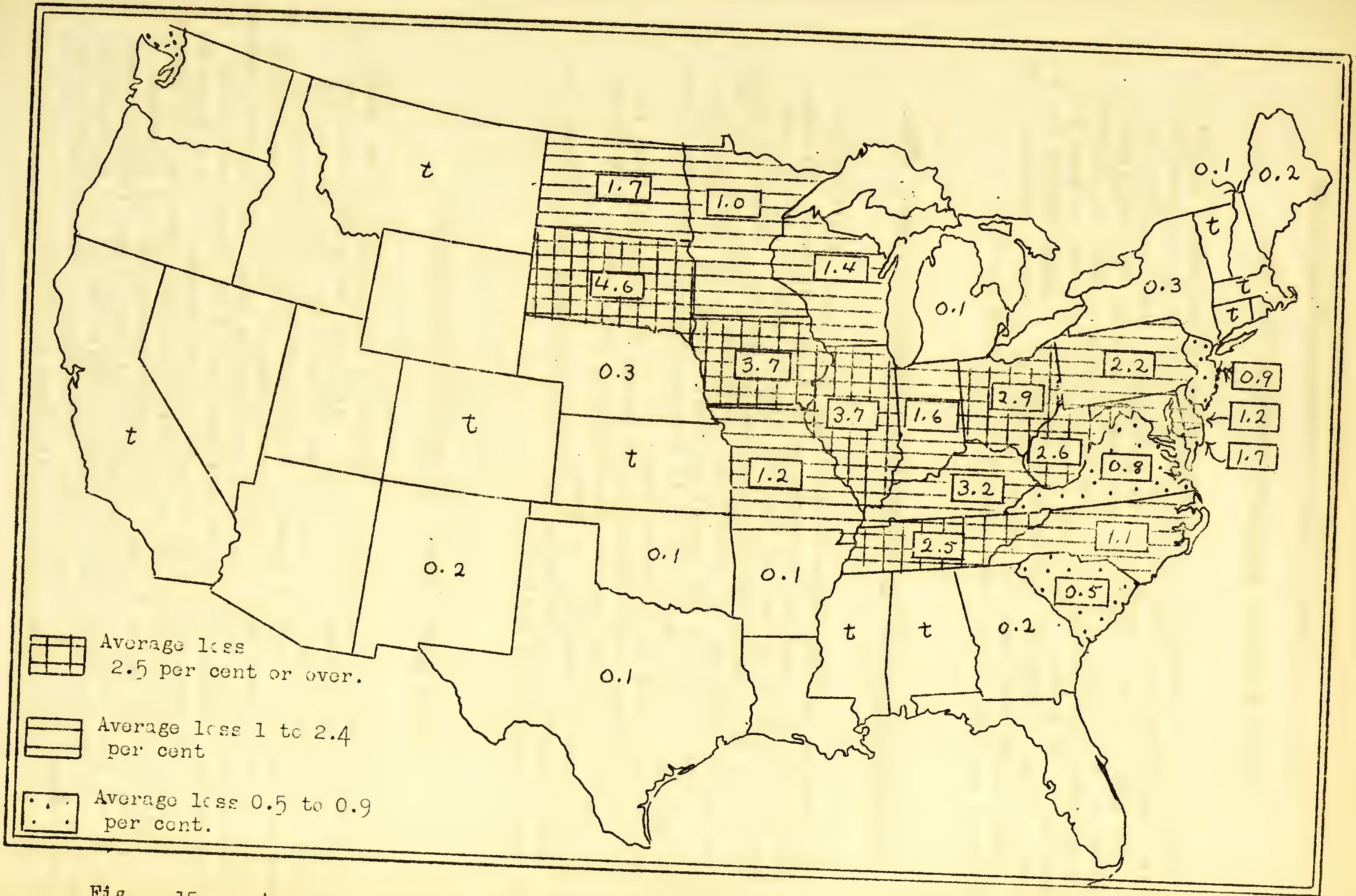

Fig. 15 . Average annual percentage loss caused by scab of wheat, 1918 - 1926.

ERGOT CAUSED BY CLAVICEPS PURPUREA (FR.) TUL.

Ergot has been reported on wheat from most of the Middle Atlantic and Middle West States and from Arizona. It rarely causes appreciable damage. The greatest loss occurs in the hard spring wheat sections of the Dakotas and Minnesota. In 1926 the loss from ergot was negligible, with the following four states reporting its presence - Indiana, Wisconsin, Minnesota and North Dakota. In North Dakota it was too dry in June for germination of the sclerotia, according to Brentzel. Durum wheats are in general more susceptible than the common spring and winter varieties. The variety Monad was said to be very susceptible in North Dakota.

ANTHRACNOSE CAUSED BY COLLETOTRICHUM GRAMINICOLUM (CES.) WILS.

Anthracnose has been reported from all the states east of the Great Plains with the possible exception of Michigan, Missouri, Florida, North Carolina, West Virginia, and the New England states. It is most prevalent in the Ohio Valley and Middle Atlantic states. Except in Ohio, Pennsylvania, and Virginia, it appears to be of minor importance. In Ohio, it has been reported during the past nine years as one of the most destructive diseases in the state, while in Pennsylvania and Virginia it has often been ranked as of major importance.

In 1926 collaborators' estimates of losses are: 0.5 per cent in New York and Ohio, 0.3 per cent in Pennsylvania, and a trace in Indiana, Virginia, Illinois, Wisconsin, and Iowa.

Tehon reported that Fultz appears to be resistant while Turkey and Kanred are susceptible in Illinois.

GLUME BLOTCH CAUSED BY SEPTORIA NODORUM BERK.

Glume blotch has been reported from most states east of the Rocky Mountains and from California and Oregon. It seems to be most prevalent in New York and Pennsylvania and south of the Ohio River. The disease is favored by excessive rainfall between heading and maturity and attains epiphytotic proportions only under such conditions. In 1926 glume blotch was about as prevalent as in 1925 or in an average year, judging from reports from 26 states. Losses reported by collaborators were 1 per cent in New York (15) and Pennsylvania, (80), 0.5 per cent in Maryland, and a trace in West Virginia, Arkansas, Ohio, Illinois (5), Wisconsin, Iowa, and Minnesota. The figures in parentheses indicate the maximum percentage of infection found in any one field. Under Illinois conditions, Tehon reported that Fulcaster, Fultz, and Valley were resistant, While Turkey and Kanred were slightly susceptible. In Pennsylvania, Kirby observed Velvet Chaff to be much more susceptible than varieties like Leap and Forward.

Some of the reports of collaborators follow:

Pennsylvania: Glume blotch was more prevalent than in 1926. It was observed to be shriveling the kernels in the infected spikelets to a greater exten than usual. From 10 to 40 per cent of the spikelets were usually found to be infected. (Kirby).

West Virginia: Slight amount in most fields, no apparent importance. (Sherwood).

Arkansas: Less noted than in last nine years. (Dept. Plant Path.).

Ohio: This disease is quite general in northern Ohio and is causing quite a distinct loss. In some of the fields in which we have made definite counts it will cause a reduction in yield of about 12 per cent. (H. C. Young).

Illinois: The fungus has hitherto been known in Illinois only as the cause of rare cases of glume blotch. It has been found recently in Schuyler and McDonough Counties in considerable abundance on several varieties, attacking the topmost nodes. The wheat there is now cut and the heads on diseased stalks generally show poorer grain and fewer filled spikelets. (Tehon).

SPECKLED LEAF BLOTCH CAUSED BY SEPTORIA TRITICI DESM.

Speckled leaf blotch is common but of slight importance in most of the states east of the Rocky Mountains. In the Far West it has only been reported to the Survey from California, Colorado, and Idaho. In 1926, reports from 27 states indicated that leaf blotch was slightly less prevalent than in 1925, and considerably less prevalent than usual. The small amount was attributed by several collaborators to the dry spring. The losses estimated were 0.5 per cent in Maryland, 0.1 per cent in Illinois, considerable in California, and a trace in New York, Pennsylvania, Wisconsin, Minnesota, Colorado, and Idaho.

Illinois: Found rarely in the south, commonly in the central counties, and not at all in the north. (Tehon).

Colorado: Found in seedling stage, little damage. (Durrell).

California: Septoria is common in all wheat fields, especially in the northern portion of the state, and has in many instances caused considerable damage from early leaf pruning. (Mackie).

BLACK CHAFF CAUSED BY BACTERIUM TRANSLUCENS UNDULOSUM SMITH, JONES, & REDDY.

Black chaff is most frequently reported from the Great Plains area and the Missouri River Valley States. It has been found only occassionally east of the Mississippi River. It is usually not considered to be of much importance, causing on the average less than one per cent loss even in such states as Kansas, North Dakota, South Dakota, and Idaho where it is most prevalent. In 1926 it was less prevalent than in 1925 or in an average year, as the collaborators all reported less than last year and all but two reported less than in an average year. Dry weather was generally given as the cause for this marked decrease in prevalence. Melchers in Kansas has pointed out that moderately high temperatures (above 60°F.) are most favorable for the disease and that in order to have an epiphytotic of black chaff it is necessary to have excessive moisture almost continuously between the emergence of the wheat heads and the dough state. In North Dakota it was estimated to have caused a 0.5 per cent loss, in Montana 1 per cent, and in Minnesota, Iowa, Missouri, South Dakota, and Colorado collaborators report only a trace of loss. The highest infection reported was 5 per cent, observed in a field in North Dakota.

In North Dakota, Brentzel has found Kota to be more susceptible to this disease than Marquis and Ruby.

Recent literature:

1. Smith, Erwin F. Black chaff of wheat in Russia. Science n. s. 63: 305-307. Mar. 19, 1926.

   The author had suspected that black chaff was introduced from Russia, since it was not observed in this country until after numerous importations of Russian wheat. Janczewsky now reports that black chaff occurs in Russia. He found it in wheat collected in 1910 in the Province of Mohilew and in 1916 in Poltawa; and it was observed in many localities in Russia in 1924.

BASAL GLUME ROT CAUSED BY BACTERIUM ATROFACIENS McC.

In general basal glume rot is of minor importance, seldom causing over a trace of loss. Prior to 1926 it was reported only from New York, Pennsylvania, Iowa, Missouri, Arkansas, North Dakota, Nebraska, Kansas, Oklahoma, and Montana. In 1926 Tehon reported it to the Plant Disease Survey for the first time from Illinois where it was found June 22 at Lovington. It was estimated to cause only a trace of loss and the highest infection found was only 1.1 per cent. Tehon considered Kanred, Fulcaster, Turkey and Fultz susceptible. The only other report was from Pennsylvania, where the disease was found in the northwestern section of the state, causing only a trace of loss and not occurring in amounts greater than 3 per cent in any one field.

POWDERY MILDEW CAUSED BY ERYSIPHE GRAMINIS DC.

Powdery mildew is prevalent in most of the northeastern quarter of the country, and has been reported from many of the western states. In general it is of only minor importance. During most years only one or two states report more than a trace of loss and the maximum loss reported to the Survey is 2 per cent from Pennsylvania in 1924. The disease is most troublesome in New York, Pennsylvania, and Maryland, but even in these states the average loss is only a fraction of one per cent. In other sections of the country the loss is negligible, with the disease occurring only in low places in fields where the wheat stands thick or is lodged. Powdery mildew requires considerable wet weather for its best development and this is apparently the reason why the destructive attacks are limited to the humid Atlantic Coast States.

In 1926, of reports from 25 states there were 6, the most prominent of which were Arkansas, Colorado and Arizona, which indicated an increase in the amount of mildew over 1925, and two which showed a slight decrease. The others state that there seemed to be about the average amount. Collaborators' estimates of losses in 1926 were: 1 per cent, New York (0.5) and Arizona (trace); 0.5 per cent, Pennsylvania (0.6): 0.3 per cent, Maryland (0.1): and a trace each in Texas, Ohio, Wisconsin, Minnesota, Nebraska, Montana, and Colorado. The figures in parentheses are the average percentage loss from 1918 to 1926. Heavy spring rains probably explain the unusually large loss in Arizona, where the disease does not often occur.

The variety Little Club was reported as very susceptible in Idaho and Kentucky. The Department of Plant Pathology of the New Jersey Agricultural Experiment Station submitted the following data from observations made in 1926.

Very resistant varieties: Fulcaster, Kanred, Four-Row Fultz, Red Row, Dawson's Golden Chaff, Pennsylvania 44.

Resistant varieties: China, Red Wave, Kentucky R-50, Missouri Blue Stem, Lancaster-Fulcaster, Gladden.

Susceptible varieties: Red Rock, Leaps Prolific, Foward, Curroll's Prolific, Kentucky R-47, Fultz, Leaps Prolific N-12.

Very susceptible varieties: Shepherd, Ashland, Purple Straw, Ohio 127.

In Pennsylvania, surveys of fields and varietal plots by R. S. Kirby gave the following percentages of infection.

Variety	No. fields surveyed	Percentage infection
Pennsylvania 44	68	1.7
Forward	29	1.7
Fulcaster	36	2.9
Leap	84	3.9

TAKE-ALL CAUSED BY OPHIOBOLUS GRAMINIS SACC.

Since its appearance in America, take-all has been reported from Arkansas, California, Indiana, Kansas, Maryland, New York, North Carolina, Oregon, Tennessee, Virginia, and Washington, and from the provinces of Saskatchewan and Alberta, Canada. In 1926, L. E. Melchers summarized the Kansas situation thus: "Foot-rots and especially take-all were not common in Kansas in 1926. Only a few fields in those counties that had a normal rainfall showed some foot-rot. A dry spring very evidently had a marked influence in suppressing foot-rot damage. Many fields known to have soil infestation showed no disease." H. P. Barss stated that in Oregon, "The disease was severe in a Lane County field of winter wheat on ground that had been summer fallowed after clover sod had been turned down. Other reports were received also." In New York, M. F. Barrus reported that take-all was local in distribution, and caused a 0.1 per cent reduction in yield with a maximum infection of 1 per cent. In California, according to W. W. Mackie, "Take-all was less prevalent than usual. It was observed to cause the greatest injury in April when the wheat started to head. The variety Hard Federation showed most damage."

Recent literature:

1. Frazer, W. P., Russell, R. C., and P. M. Simmonds. The take-all disease in Canada. (Abstract) Phytopath. 16: 80-81. 1926.

2. Jones, S. G. The development of the perithecium of Ophiobolus graminis, Sacc. Ann. Bot. 40: 607-629. July 1926.

3. Parisot. Le pietin du blé. - Comptes rendu Acad. Agric. France, 12: 565-569. 1926.

4. Petri, L. Osservazioni sul 'mal del piede' del frumento (Observations on 'foot-rot' of wheat.) Boll. R. Staz. Pat. Veg. 6: 174-178. 1926.

HELMINTHOSPORIUM BLIGHT CAUSED BY HELMINTHOSPORIUM SATIVUM PAM., KING, & BAK.

Helminthosporium sativum causes primarily a foot and root rot, but it may also attack all other parts of the plant. It is most prevalent in the Great Plains, Middle Western, and Middle Atlantic states. It has been reported at times as unimportant in other states scattered throughout the country. The disease has caused the largest loss in North Dakota, where the reduction in yield varies in different years from 0.5 to 10 per cent.

In 1926 reports from collaborators in twenty-two states indicate that it was slightly more prevalent than in 1925, but of about the same prevalence as usual. Collaborators' estimates of percentage reduction in yield are, 1.5 per cent, North Dakota, 0.5 per cent, New York and Kansas, 0.4 per cent, Pennsylvania, trace in Maryland, West Virginia, Virginia, Wisconsin, Minnesota, Mississippi, Idaho and California.

Wheat - Helminthosporium blight: Nematode: Other Diseases and Injuries.

In North Dakota, Brentzel observed that there was more foot rot than head and grain infection and that damage caused was apparently less severe than the average.

In Pennsylvania, Kirby reported that although Helminthosporium blight was seldom found except where wheat followed wheat or oats, under these conditions it often caused losses of 10 to 20 per cent.

The variety Pennsylvania 44 was reported as resistant, and Forward, Leap, Fulcaster, and Longberry Red as susceptible, in Pennsylvania. Brentzel found Monad and Kubanka to be very susceptible in North Dakota.

NEMATODE, TYLENCHUS TRITICI (STEIN.) BAST.

The wheat nematode has been reported from the Eastern states of Maryland, Virginia, West Virginia, North Carolina, South Carolina and Georgia, and the western states of California and Arizona. This can be considered as one of the minor diseases since in no state have the losses aggregated over a trace, except locally. Nematode was definitely reported with specimens for the first time from Maryland in 1926. R. A. Jehle and F. W. Oldenburg found a single head of infected wheat in Howard County and subsequently a survey by these men and members of the Office of Cereal Crops and Diseases revealed traces on a few farms in Montgomery County. In Virginia, the nematode disease was found in two fields in 1926, one field in Loudoun County had 5 per cent infestation and one in Fluvanna County 14 per cent, according to Fromme and Godkin. In West Virginia, Sherwood reported that: "Only local areas were affected in the eastern mountain section bordering Virginia."

Recent literature:

1. McConnell, H. S. Ext. Service, Univ. Maryland Circ. 59: 4 pp. Jan. 1926.

OTHER DISEASES AND INJURIES.

Cladosporium herbarum (Pers.) Lk., sooty mold, caused some damage in Colorado. (Le Clerg).

Epicoccum glumarum Daniels, glume smudge. Traces found in fields in Champaign and Randolph Counties, Illinois, on June 26, when the wheat was in the dough stage. This is the first report of this disease from Illinois. (Tehon).

Fusarium sp., pink rot, was reported from California. It occurred in all parts of the state and was about as prevalent as in 1925, when it caused about 4 per cent loss. It caused the death of the wheat plants in all stages. (Mackie).

Wheat - Other Diseases and Injuries

Heterodera schachtii Schmidt, Nematode From Saskatchewan, Canada, R. C. Russell reported that in the spring of 1926 the sugar beet nematode, Heterodera schachtii, was found occurring in four widely separated fields of wheat in the Humboldt district. The nematodes were present on the secondary, as well as the primary roots. This nematode has not been reported on wheat in the United States so far as is known.

Hormodendrum cladosporioides Sacc., sooty mold, was more prevalent than usual in California (Mackie).

Sclerotium rhizodes, Auersw., foot-rot. This disease, which was previously reported in 1922, occurred in Idaho again in 1926. According to Hungerford, June 1, "A severe infection of the Sclerotium disease on wheat has again been reported this spring. A survey of this section revealed the fact that over 75 per cent of the winter wheat in parts of Fremont and Teton Counties had to be resown to spring wheat due to this disease. It was also noted that early sown wheat suffered the most. Fields sown after September 15 showed little injury, while many early sown fields were a total loss." Pape (3), writing in Germany, states that, judging from Hungerford's description of the disease (Phytopath. 13: 463-464. 1923), the causal fungus is possibly Typhula graminum.

Crinkle joint, cause unknown, has been observed in northeastern Montana for the past three years. In 1926 it was quite serious in some fields of Marquis wheat in Valley and Daniels Counties, affecting between a trace and 10 per cent of wheat stalks. The breaking of the stems is probably due to wind pressure or hail and the bending of the joints above the break is a normal phenomenon. (P. A. Young).

Distortion of wheat heads, cause unknown, was found in California and Oregon. In Oregon as high as 30 per cent of the wheat heads in a field of White Winter wheat were affected. (R. J. Haskell).

Purple leaf spot, cause unknown. A trace was observed in one field of Fulcaster wheat in Clinton County, Missouri. (Archer).

Root rots, cause undetermined. In Wisconsin an unknown foot rot caused very slight losses at Madison. (Vaughan). Unknown foot rots (Fusarium, Helminthosporium, etc.) caused a 1 per cent loss in Minnesota. (Sect. Pl. Path). In Kansas the high temperatures and drought undoubtedly held foot rots in check so that there was only a trace of loss. (Melchers). A foot rot (apparently caused by Fusarium sp.) was found at State College, Pennsylvania, on June 16, causing a slight loss in some of the college breeding plots. (Kirby). Scattered occurrences of foot rots of unknown cause, and of slight importance were reported in Montana and Idaho.

Stripe, cause unknown. Traces were reported from Pennsylvania and Illinois. Tehon in Illinois observed less stripe on Fulcaster and Fultz than on Kanred.

Recent literature on miscellaneous diseases of wheat.

1. Jones, J. S. and G. A. Mitchell. The cause and control of yellow berry in Turkey wheat grown under dry-farming conditions. Jour. Agr. Res. 33: 281-292. Aug. 1, 1926.

2. Noble, R. J. Downy mildew of wheat. Sclerospora macrospora, Sacc. Agr. Gaz. New South Wales 37: 204-208. Mar. 1, 1926.

3. Pape, H. Die Sclerotium-Krankheit der Wiesengräser, insbesondere des Rohrglanzgrases. Illus. Landw. Zeit. 46: 295-296. June 4, 1926.

4. Spafford, W. J. Some diseases of wheat crops and their treatments. Dept. Agr. South Australia. Bul. 190: 1-16. 1925.

5. Webb, Robert W. Certain factors influencing the development of the mosaic disease in winter wheat. (abstract). Phytopath. 17: 41. Jan. 1927.

RYE

STEM RUST CAUSED BY PUCCINIA GRAMINIS PERS.

In 1926 stem rust of rye caused a smaller loss than in any previous year on record. A trace was reported from Massachusetts, Pennsylvania, Maryland, Georgia, Texas, Michigan, Wisconsin, Minnesota, North Dakota, South Dakota, Nebraska, Colorado, and California and 0.5 per cent from Connecticut. This decrease in injury apparently was due to the unfavorable, hot dry weather which prevailed during the maturity of the rye crop, and to the eradication of the barberry bushes in many sections. Both California and Wisconsin report fields with 100 per cent infection, but the rust apparently came late and did little damage. The dates of earliest appearances as reported by collaborators were, April, Sacramento, California; June 14, Madison, Wisconsin; June 18, Lake City, Minnesota; July 10, Fort Collins, Colorado; and July 28, Clarion County, Pennsylvania.

Two selections from the variety Abruzzes showed high resistance to stem rust, leaf rust, and powdery mildew according to Mains (1).

Recent literature:

1. Mains, E. B. Rye resistant to leaf rust, stem rust, and powdery mildew. Jour. Agr. Res. 32: 201-221. 1926.

LEAF RUST CAUSED BY PUCCINIA DISPERSA ERIKS.

During the past year leaf rust apparently caused about one-third less loss than it did during 1925. Losses reported by collaborators were 1 per cent in New Jersey and Maryland, 0.5 per cent in Pennsylvania, 0.2 per cent in Indiana and Illinois, 0.1 per cent in Georgia, and traces in Connecticut, New York, Virginia, Kentucky, Florida, Mississippi, Michigan, Wisconsin, Iowa, Nebraska, Kansas, Oregon, and California. The lack of prevalence of this rust was due to the generally dry, cool spring which retarded the development and spread of the fungus. R. E. Vaughan reported overwintering of the rust in Wisconsin, and stated that it was found in April as soon as the plants started after snow was melted.

Recent literature:

1 Mains, E. B. Studies in rust resistance. Jour. Heredity 17: 313-325. Sept. 1926.

2. Mains, E. B. Rye resistant to leaf rust, stem rust, and powdery mildew. Jour. Agr. Res. 32: 201-221. 1926.

ERGOT CAUSED BY CLAVICEPS PURPUREA (FR.) TUL.

Ergot is found in nearly every state where rye is grown. In 1926 the loss due to it was largely confined to the principal rye growing states, and was slightly above the average, such as occurred last year, but still considerably lower than that caused in years of severe ergot, as for example, 1924. In Illinois, Tehon writes that abundant infection of rye often occurred when it was mixed in wheat. In Michigan Nelson states that there was apparently more of this disease than for several years, while in Wisconsin, Vaughan based estimates of more loss than usual on statements of millers. The percentage losses as estimated by collaborators were: 2 per cent, Michigan; 1.5 per cent Wisconsin; 1 per cent, North Dakota and South Dakota; .1 per cent, Indiana; and trace, Massachusetts, New York, New Jersey, Pennsylvania, Ohio, Illinois, Minnesota, Iowa, and Nebraska.

ANTHRACNOSE CAUSED BY COLLETOTRICHUM GRAMINICOLUM (CES.) WILS.

In general anthracnose was reported as being less destructive than in 1925. In Pennsylvania, where the disease was about one-third less prevalent than usual, it still caused a greater loss than any other two rye diseases taken together. The losses were estimated as follows: 4 per cent, Missouri; 2 per cent, Pennsylvania and Mississippi; .5 per cent, Wisconsin; and .1 per cent, Indiana. As high as 85 per cent infection was observed in a back yard patch of rye in Missouri. Other maximum percentages noted were 25 in Pennsylvania and 15 in Mississippi.

Rye - Stem Smut: Loose Smut: Scab
Powdery Mildew.

STEM SMUT CAUSED BY UROCYSTIS OCCULTA (WALLR.) RABH.

This smut is largely confined to the north central and eastern parts of the United States, but has been reported from as far west as Arizona and Idaho. It is not as destructive as many of the other smuts attacking cereals, since it has never been reported as causing over one and one-half per cent loss in any state. In 1926, when only four states reported its occurrence, the loss was several times smaller than for any other year on record. The estimated losses were: Pennsylvania 0.6 per cent, and Connecticut, Michigan and Minnesota each a trace.

LOOSE SMUT CAUSED BY USTILAGO TRITICI (PERS) ROSTR.

No reports of this smut were received this year. Previously it has been reported from nine states, in none of which was it prevalent enough to be considered of economic importance.

SCAB CAUSED BY GIBBERELLA SAUBINETII (MONT.) SACC.

The head blight, or scab, of rye was observed in 1926 in the following five states; Maryland, Tennessee, Indiana, Wisconsin, and Iowa. It was reported as not reducing the yield in any of these states, but in Wisconsin, Vaughan reported a two per cent loss in grade. The greater loss in Wisconsin was due to rains coming before harvest in contrast to subnormal rainfall in most of the other states.

Recent literature:

1. Dounin, M. The fusariosis of cereal crops in European Russia in 1923. Phytopath. 16: 305-308. 1926.

2. Schaffnit, E. and A. Volk. Ueber die Roggenfusariose und ihre Bekämpfung durch die 'Trockenbeize.' Zeitschr. Pflanzenkrankh. 36: 42-52. 1926.

POWDERY MILDEW CAUSED BY ERYSIPHE GRAMINIS DC.

Powdery mildew was observed in Connecticut, New York, Pennsylvania and Maryland, Indiana, Wisconsin, and California. The rather dry spring seemed to retard its development so that it did not cause any appreciable damage. In the East, the mildew caused most of its damage in the spring, but in

Wisconsin, Vaughan reports that it is a fall problem of minor importance.

Mains (1) has reported on two rye selections from the Abruzzes variety which showed high resistance to powdery mildew.

Recent literature:

1. Mains, E. B. Rye resistant to leaf rust, stem rust and powdery mildew. Journ. Agr. Res. 32: 201-221. 1926.

OTHER DISEASES.

Helminthosporium sativum Pam., King, & Bak., leafspot. Traces of this disease occurred in Pennsylvania and California. In Pennsylvania it was general while in California it was reported only from one locality. In Minnesota a species of Helminthosporium was reported as causing considerable root rot in some sandy regions in Anoka and Isanti Counties.

Hormodendrum cladosporioides Sacc. In California it caused considerable damage in the rye growing districts along the coast and in the great interior valleys. (Mackie).

Rhynchosporium secalis (Oud.) Davis, scald. In Illinois L. R. Tehon saw a field of rye having a 60 per cent infection of what appeared to be Rhynchosporium blight.

Septoria secalis Prill. & Delacr. A leaf spot, apparently caused by Septoria, was reported from Jacksonville, Illinois, by L. R. Tehon.

Stripe of ryeleaves, cause unknown. L. R. Tehon states, "This disease, reported for the first time from Illinois, is the same in all outward appearances with the stripe disease of wheat."

B A R L E Y

Judging from the estimates of collaborators for the past eight years, the barley crop annually suffers a loss from diseases ranging from about 4 per cent to 11 per cent of the crop with an average of nearly 6 per cent. Covered smut is apparently the most important disease with an average loss of 1.45 per cent. Then follow, in order of importance, stripe, (1.13 per cent), stem rust (1.12 per cent), loose smut, (0.77 per cent), and leaf rust, (.004 per cent).

COVERED SMUT CAUSED BY USTILAGO HORDEI (PERS.) KELL. & SW.

As in previous years, this most important disease of barley was reported from nearly all of the barley growing sections. In general, the largest losses occur in the Southwest and the Far West.

Reports from twenty-seven states indicate that more than normal amounts were present in 1926 but in general there was less than in 1925. In California, where the largest loss occurred, 40 per cent was observed in one field. The estimates of 1926 losses are given in Table 37.

White Hulless and beardless varieties were reported from Minnesota and Pennsylvania as being very susceptible to this smut.

Table 37. Estimated reduction in yield of barley due to covered smut for 1926 and for the period 1918 to 1925, as estimated by collaborators.

Percentage loss	States reporting	Percentage loss	States reporting
6	California (3.3)		Maryland (1.1), Iowa (1.2)
4	Montana (1.9)		Missouri (1), North
3.3	Virginia (1.9)		Dakota (0.9), Idaho (1.1)
3	Colorado (.13)	0.75	Minnesota (0.8)
2.5	Tennessee (2.5)	0.5	Wisconsin (0.4), Texas,
2	Kansas (2)		Oregon.
	Arizona (1.4)	Trace	West Virginia *
1.5	Pennsylvania (0.9)		South Carolina *
1	New York (0.9)		Arkansas (6)

Figures in parentheses equal average percentage loss from 1918 to 1925.

*Disease percentage estimated but insufficient data for average.

Recent literature:

1. Lambert, E. B., H. A. Rodenhiser, and H. H. Flor. The effectiveness of various fungicides in controlling the covered smuts of small grains. Results of the cooperative cereal seed treatment project of the Crop Protection Institute. Phytopath. 16: 393-411. 1926.

   Reports that covered smut of barley was best controlled by formaldehyde.

2. Rump, L. Studien über den Gerstenhartbrand (Ustilago hordei Kell. & Sw.) Forsch. auf dem Gebiet der Planzenkrank. u der Immunität im Pflanzenreich 2: 21-76. 1926.

3. Schaffnit, E. Zur Physiologie von Ustilago hordei Kell. u Sw. Ber. Deutsch. Bot. Gesellsch. 44: 151-156. 1926.

LOOSE SMUT CAUSED BY USTILAGO NUDA (JENS.) KELL. & SW.

The loose smut of barley probably occurs in every state in which barley is grown. The greatest loss apparently is caused in the northern part of the winter barley section, extending from Oklahoma to Indiana, Pennsylvania and southward, where it is the most important barley disease. Within this area the average loss is about twice as much as in the spring barley section to the north. The smallest loss seems to occur in the arid regions of the Far West. Reports from twenty-seven states show that this smut was about equally severe in 1926 and 1925 and that loss was almost exactly the same as the average for the years 1918 to 1925. Estimates of losses for 1926 are given in Table 38. Losses in individual fields were reported as high as 20 per cent for one field in California and 11 per cent for a field in Virginia. The following reports concerning varietal susceptibility to loose smut have been sent by collaborators. Varieties very resistant, Manchuria and Minn. 184 in Minnesota; varieties resistant, Featherstone in Pennsylvania; varieties susceptible, Lion and White Hulless in Minnesota, Alpha in New York and Pennsylvania, and Tennessee Winter in Pennsylvania. For information on control see section on seed treatment, page 111.

Table 38. Estimated reduction in yield of barley due to loose smut for 1926 and for the period 1918 to 1925, as estimated by collaborators.

Percentage: loss	States reporting	Percentage: loss	States reporting
4	Illinois (1.8)	1.5	Minnesota (.8)
3.5	Pennsylvania (3.2)	1	North Dakota
3.	Montana (1.6)		Iowa (1.2), Wisconsin,
2.	South Dakota (.8)		South Carolina (1.6)
	Kansas (1.9)		Virginia (3.5)
	Michigan (.9)	0.5	Arizona (.8), Texas (.8)
	Tennessee (3.1)	Trace	California (1.)
	Maryland (2.6)		Colorado (.4)
	New York (1.9)		Idaho, Oregon.

Figures in parentheses equal average percentage loss from 1918 to 1925.

Recent literature:

1. Tisdale, W. H., and Marion A. Griffiths. Strains of Ustilago nuda and certain host relationships. (Abstract). Phytopath. 17: 42. Jan. 1927.

STEM RUST CAUSED BY PUCCINIA GRAMINIS PERS.

This rust has been reported from most of the states growing barley. Losses from it are almost completely confined to the barberry eradication area, and within this largely to Iowa, Minnesota, Wisconsin, and the Dakotas, where the average estimated reduction in yield is from 2 to 5.85 per cent in each state. Before 1923 stem rust was the most destructive disease of barley in most of the Central West. As will be seen from the graph (Figure 16) the loss due to this rust during the past eight years has been on the decrease. During the past two or three years it has become a disease of only moderate importance.

Reports from twenty-eight collaborators show that, in general, stem rust was not so destructive in 1926 as in 1925, and that the loss in 1926 is the lowest of any on the records of the Plant Disease Survey. Table 39 gives the estimates of percentage losses by states. Rust was reported to be severe on barley near infected barberry bushes in Illinois, Pennsylvania, and Colorado. The dry weather apparently greatly reduced the rust in many states. In Iowa, M. A. Smith states that: "Very dry, windy weather at the time aeciospores were being discharged very likely was a factor in the development of only a light sprinkling of uredinial infection which followed."

On the other hand, rain and cool weather in March and April were favorable to the disease in Arizona, according to Streets.

Concerning varietal susceptibility, Minnesota reports that the variety Lion is resistant and that most other varieties are susceptible, and in Colorado L. W. Durrell reports that Coloss, Hanna, and Trebi are susceptible.

Table 39. Estimated reduction in yield of barley due to stem rust for 1926 and for the period 1918 to 1926, as estimated by collaborators.

Percentage loss	States reporting	Percentage loss	States reporting
3	Arizona (1)	Trace	North Dakota (2.1)
1	New York (0.3)		Wyoming, Colorado (1)
	Iowa (5.)		Nebraska (1), Kansas
0.6	Texas		Minnesota (2.28)
0.5	California		Michigan (1.2)
	South Dakota		Pennsylvania
	Wisconsin (2)		Maryland
0.4	Illinois (1.3)		Ohio, Oregon.

Figures in parentheses equal average percentage loss from 1918 to 1926.

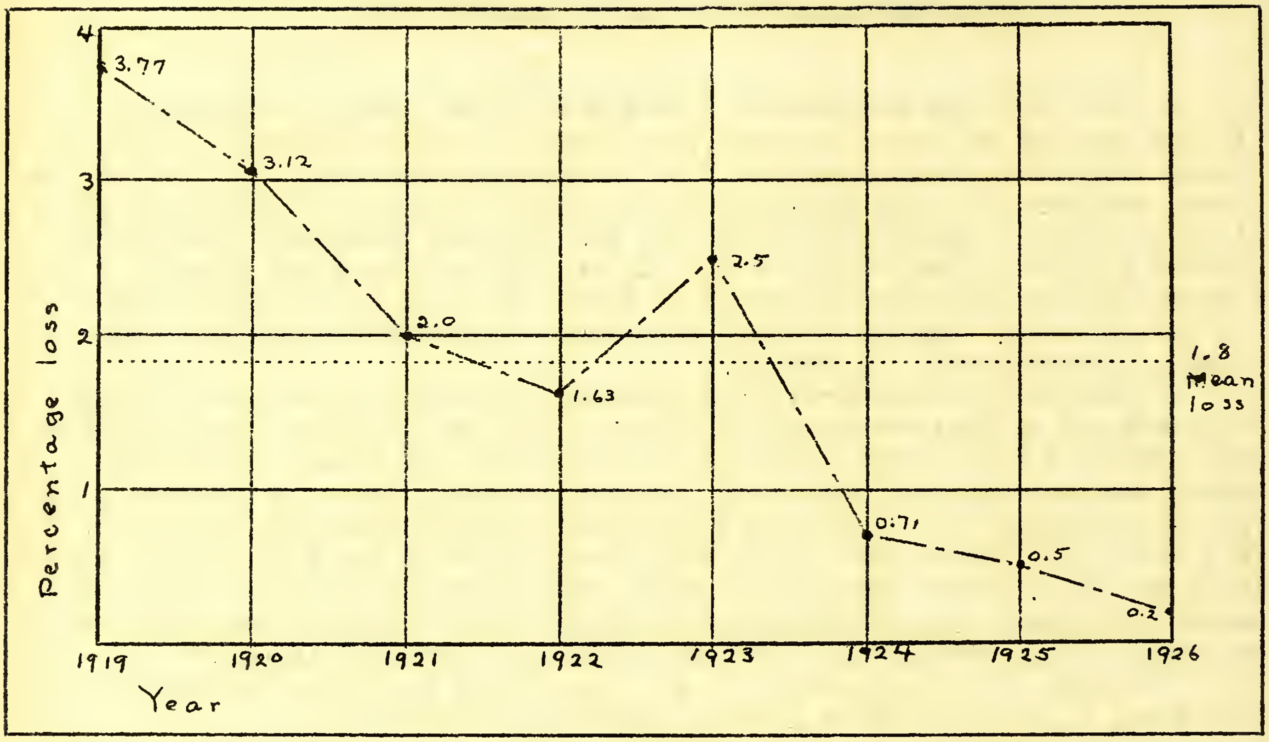

Fig. 16 . Estimated average percentage loss in barley from stem rust in the 13 barberry eradication states from 1919 to 1926.

LEAF RUST CAUSED BY PUCCINIA ANOMALA ROSTR.

Leaf rust of barley is present over a considerable area of the United States but is rarely reported from the southern and arid western states and is not usually considered to be of more than slight importance. In 1926 dry weather during the spring reduced its prevalence to less than that in 1925. Arizona reported the largest loss, 2 per cent. In Illinois the loss was 0.5 per cent. Twelve other states reported finding small amounts but estimated the losses at a trace. In Oregon, H. P. Barss reported that: "The rust was common and much more abundant than usual in the western part of the State."

Mains (1) has reported that 49 strains of barley out of 697 studied showed a very high resistance in greenhouse tests, and a still larger number were resistant in the field. Marked leaf-rust resistance has been found in both six-rowed and two rowed, hooded and awned, white and blue-seeded, including certain lines of such varieties as Oderbrucker C. I. 940, Brewing C. I. 657, Featherstone C. I. 1120, Horsford C. I. 507, Black Hulless C. I. 1097, Nepal C. I. 262, Heil's Hanna No. 3 C. I. 682, Black Arabian C. I. 202, etc.

Recent literature:

1. Mains, E. B. Studies in rust resistance. Jour. Heredity 17: 313-325. Sept. 1926.

2. Ducomet, V. A propos de la forme ecidienne de Puccinia simplex. Rev. Path. Vég. et Entom. Agr. 13: 86-91. Jan.-Mar. 1926.

STRIPE CAUSED BY HELMINTHOSPORIUM GRAMINEUM RABH.

Stripe has been reported in most of the barley growing states. It is most destructive in the Middle West, and in California and Utah, where the loss averages from 1.5 to 2 per cent. The disease appears to be of little economic importance in most of the other states.

In 1926 there was slightly less stripe than in 1925 when the estimated average loss in the United States was 1.5 per cent. The 1926 loss is very nearly the eight year average of 1.13 per cent. In Wisconsin, Vaughan reported a maximum infection of 25 per cent. In Arizona one forty-acre field planted with untreated seed from California showed 20 per cent of dead plants according to Streets.

Table 40 gives estimates of losses in 1926.

Table 40 . Estimated reduction in yield of barley due to stripe for 1926 and for the period 1918 to 1925, as estimated by collaborators.

Percentage loss	States reporting	Percentage loss	States reporting
2.5	Illinois (1.6)	Trace	Connecticut (.5)
	Wisconsin (1.1)		Maryland
2	California (.6)		Pennsylvania
1.5	North Dakota (1.1)		Virginia
1	New York (.7)		Michigan (1.4)
	North Carolina		Iowa (4.2)
	South Carolina		Kansas, Nebraska
	Minnesota (1.2)		Montana
	South Dakota (2.7)		Arizona
0.5	Colorado (1.3)		Idaho, Oregon.

Dry weather was reported as the reason for the small amount of this disease in Illinois, Michigan, and South Dakota, and in Iowa, Gilman reported that an early spring drought very greatly reduced the amount of stripe. In Iowa, in fact, the disease caused only a trace of loss in 1926 as compared with records of 2 to 5 per cent during the years 1918 to 1925. Streets states that stripe does not thrive under the dry climatic conditions of Arizona. Vaughan of Wisconsin reports that delayed seeding gives less stripe but also less favorable conditions for barley development.

Experiments on the temperature and moisture relations of barley stripe were conducted at the Wisconsin Station, with results reported by Dickson (1), as follows:

> "The experiments upon barley stripe have shown that seeding very early in a wet, cold soil increases the losses from barley stripe. The barley plants develop best and give the highest yield when seeded in a moderately cool soil, about 55°F. The later seedings in a warm, dryer soil are in general more free from the stripe disease but yields are greatly reduced due to the late seeding. A safe compromise can be used inseeding barley later than wheat and oats when the soil is still cool and moist by treating the seed for the control of stripe."

The following notes concerning varietal susceptibility have been sent in by collaborators. Very resistant, Lion in Minnesota; slightly resistant, Trebi in Colorado; and susceptible, Minsturdi and Svansota in Minnesota and Colsess in Colorado.

For control see section on seed treatment, pages 111 and 112.

Recent literature:

1. Dickson, J. G. Making weather to order for the study of grain diseases. Wisconsin Agr. Exp. Sta. Bul. 379: 3-36. 1926.

2. Hann, K. de. Onderzoek over de strepenziekta van de gerst en de verwekker Helminthosporium gramineum Rab. Tijdschr. Plantenz. 32: 45-56. Feb. 1926. English summary (Investigations on the stripe disease of barley): 55-56.

SPOT BLOTCH CAUSED BY HELMINTHOSPORIUM SATIVUM PAM., KING, AND BAK.

Spot blotch is most commonly reported from all of the Middle West and the Pacific Coast States. It is of minor importance, seldom causing over a trace of loss in any section of the country. Losses reported in 1926 were 1 per cent from Pennsylvania and Minnesota, .5 per cent from New York, and a trace from Maryland, Virginia, Wisconsin, Iowa, South Dakota, and Montana. In California, spot blotch caused the heaviest damage on record, according to Mackie. Maximum percentages of infection reported were 100 in Iowa and California and 30 in Pennsylvania.

NET BLOTCH CAUSED BY PYRENOPHORA TERES.(DIED) DRECHS.

Net blotch occurs widely but appears to be of very minor importance except possibly in Iowa, South Dakota, and Wisconsin. In the former state it caused losses averaging nearly 5 per cent from 1919 to 1925, but in the two others the loss during the same period was only about one-seventh of that in Iowa. Reports from twenty collaborators indicate that net blotch caused less damage in 1926 than in either 1925 or an average year. In Iowa, Gilman reports only a trace of loss. In California, on the other hand, the disease was more important than usual. All fields throughout the state were affected, some as much as 100 per cent, according to Mackie.

RUSTY BLOTCH CAUSED BY HELMINTHOSPORIUM CALIFORNICUM MACKIE AND PAXTON

Rusty blotch of barley has been reported only from California where it seems to be of moderate economic importance. In 1926 it was reported as causing the heaviest damage on record.

Concerning varietal susceptibility, W. W. Mackie reported that:

> "All varieties of barley were more or less badly infected with Helminthosporium californicum. Only one variety was found to be immune to this disease. Of the varieties in the replicated plat experiment, Smooth Awn barley, No. 1367, is highly resistant; it promises also to be one of the highest yielding varieties."

SCALD CAUSED BY RHYNCHOSPORIUM SECALIS (OUD.) DAVIS

Judging from the reports of collaborators barley scald seems to be confined almost entirely to the states in the Pacific Coast Region and to those in the Middle West. It is apparently of minor importance except on the Pacific Coast, where in some years, it is the most destructive barley disease.

In 1926 there was less scald than in 1925 or in an average year. Of the collaborators reporting from 26 states only three, from Wisconsin, Washington, and California, reported having found scald. In each case the loss was a trace. In California, Mackie states, "Attacks of barley scald are much lighter this year than any of the past five years, probably due to the very dry foggy period during midwinter."

SCAB CAUSED BY GIBBERELLA SAUBINETII (MONT.) SACC.

Scab on barley is commonly reported from the Middle West and Middle Atlantic States. Outside of this area it is seldom found. It is of little economic importance except possibly in Iowa where it causes an appreciable loss about one year out of three, and where the loss during the past eight years has averaged about 1 per cent.

During 1926 reports indicate that scab was even less important than usual as only five or six states, New York, Pennsylvania, Maryland, Wisconsin, Iowa, and North Dakota, reported even a trace.

ERGOT CAUSED BY CLAVICEPS PURPUREA (FR.) TUL.

Ergot is of no economic importance on barley since only very rarely are more than a few infected heads observed in any one field. In 1926 traces were reported from Indiana, Wisconsin, and North Dakota. Vaughan stated that the beardless barley is very susceptible under Wisconsin conditions.

ANTHRACNOSE CAUSED BY COLLETOTRICHUM GRAMINICOLUM (CES.) WILS.

Anthracnose is almost entirely confined to the northeastern quarter of the United States. Outside of this area it has been reported from Alabama, Louisiana, and Texas. On barley, it is a disease of almost no economic importance, only one collaborator having reported a loss of over a trace since 1918. In 1926 it was reported only from Pennsylvania where a few infected plants were found in a barley field August 2.

POWDERY MILDEW CAUSED BY ERYSIPHE GRAMINIS DC.

Powdery mildew is most often reported from the northeastern quarter of the United States. It has also been reported from several states in the Pacific Northwest and from Texas and California. Normally it is of very slight importance.

Losses reported in 1926 were 5 per cent in California, 1 per cent in Arizona, one-half of one per cent in Pennsylvania, and a trace in Connecticut and Oregon. In Arizona, Streets reported that powdery mildew was prevalent in Yuma County and quite severe on the later plantings, but was not abundant in Maricopa or other southern counties. It was aggravated by cool, wet weather in March and April.

OTHER DISEASES

Bacterium translucens Jones, Johnston & Reddy, bacterial blight. Texas, a trace.

Fusarium sp., pink rot. Mackie stated that in California this disease caused considerable damage causing plants to blight at all stages of development.

Hormodendrum cladosporioides Sacc., sooty mold. California, slight injury.

Puccinia glumarum (Schw.) Eriks. & Henn., stripe rust. On July 1, Nita, a Japanese variety, was found to be badly affected with stripe rust at Pullman, Washington. Other varieties growing in the same plots had from slight to no infection.

OATS

DISEASES OF OATS

The percentage of loss to the oat crop from disease has varied from 4.8 to 8.6, from 1918 to 1925, the smallest loss occurring in 1920 and the largest in 1921.

The diseases in order of importance are loose and covered smuts, 2.99 per cent average loss, stem rust 0.99 per cent, crown rust 0.91 per cent. The average loss from all diseases during the period is 7.51 per cent.

LOOSE AND COVERED SMUTS OF OATS CAUSED BY USTILAGO AVENAE (PERS.) JENS. AND U. LEVIS (KELL. & SW.) MAGN.

Oat smuts are present in every section of the country where oats are grown. The highest losses seem to be, in general, east of the Rocky Mountains and especially south of the Mason-Dixon Line. The loss due to the two smuts of oats is greater than that caused by any other single disease attacking oats and represents on the average about 40 per cent of the total loss to the oat crop from disease.

In 1926 reports from collaborators in 38 states indicate that oat smuts caused a slightly greater loss than in 1925, or in the average year. Six states, New York, Pennsylvania, Georgia, South Carolina, Nebraska, and Tennessee reported the highest losses recorded in the plant disease survey records while five reported less loss in 1926 than in 1925. The maximum percentages of infection in single fields were reported as follows: Missouri and Georgia, 50; New York, 40; Minnesota, 35; Arizona and South Carolina, 25; North Carolina, Colorado, and California 20; Pennsylvania, 19. The estimates of losses are listed in Table 41.

Table 41. Estimated reduction in yield of oats due to loose and covered smuts for 1926 and (in parentheses) for the period 1918 to 1925, as estimated by collaborators.

Percentage: loss	States reporting	Percentage: loss	States reporting
11.0	Georgia (5.)		Maryland (3.3)
10.0	South Carolina (5.)	2.6	North Carolina (4.27)
8.0	Pennsylvania (3.8)	2.5	Mississippi (3.28)
	Massachusetts (3.07)	2.0	Arizona (1.6)
6.0	Nebraska		North Dakota (2.36)
5.0	South Dakota (2.08)		Connecticut (2.5)
	Minnesota (1.6) Iowa (2.2)	1.5	Colorado (.188)
	New York (3.6)		Idaho (2.7)
4.0	Montana (3.16)		New Jersey (2.35)
	Missouri (3.4)		Oregon (1.)
	Arkansas (8.8)	1.0	Texas (4.8)
	Michigan (2.68)		Florida (1.3)
	Virginia (4.6)		West Virginia (2.8)
3.0	Wisconsin (1.6)	0.5	Washington (1.37)
	Illinois (5.07) Ohio (2.5)		Kansas

In Pennsylvania, Kirby reports that: "The 1926 loss, which was the largest on record, was apparently due to farmers planting their oats unusually late when the ground was warm and fairly dry, and to lack of seed treatment." In South Carolina, according to Ludwig: "In a few cases crops of volunteer winter oats were entirely free of smut while the same seed when planted at the normal time in the fall produced a badly smutted crop." In Kansas, D. D. Hill, (Cereal Courier 18: 225, 1926) states that: "Smut infection is the lowest it has been for several years owing to climatic conditions unfavorable for the development of the smut fungus."

The weather prevailing while the oats germinate and emerge from the soil is reported as determining the amount of smut in the resulting crop. Dickson (1) states that spring weather conditions largely control the development of oat smut and determine not only the regions in which oats are generally smutted but the amount of smut developing from year to year within these regions. On the basis of planting experiments he recommends planting oats early in the spring in moist soil to avoid smut.

Considerable difference apparently exists in the susceptibility of various oats to smut. The following have been reported this year.

Varieties immune: Black Mesdag and Markton in Minnesota.

Varieties very resistant: Kanota in California and Kansas. Concerning Kanota, L. E. Melchers states that it is a Fulghum oat which has shown marked resistance to both smuts and that seed treatment is not necessary for this variety. In 1926, 50 per cent of Kansas oat acreage was planted to this variety, and 75 per cent will be planted to it in 1927. Fulghum in California and Missouri.

Oats - Loose and Covered Smuts

Varieties susceptible: Jeanette in Minnesota; Swedish Select and Silvermine in Pennsylvania.

Varieties very susceptible: White Russian in Minnesota, most hulless varieties.

Following are some of the comments of collaborators regarding control. (See also section on seed treatment at beginning of this summary).

Maine: Oat smut present in fields planted with untreated seed. (Folsom).

Pennsylvania: Dry formaldehyde treatment only one used. In the fifty fields surveyed there was an average of 8.56 smut in the untreated in comparison with less than one-tenth of one per cent in the treated. (Kirby).

Ohio: Increasing attention given to seed treatment and to the securing of seed free from smut is gradually reducing this disease. (Thomas).

Wisconsin: Formaldehyde treatment was effective when used. (Vaughan),

Colorado: Recommends sprinkling method using 1 pint formalin to 40 gallons of water. (Durrell).

Idaho: Recommends Idaho modification of concentrated formalin treatment (1 part formalin to 10 parts water.) Used extensively with absolute control. (Hungerford).

W. H. Tisdale (7) writes that copper carbonate dust prevents smut of hulless oats, but is less effective on hulled varieties.

<u>Recent literature</u>:

1. Dickson, James G. Making weather to order for the study of grain diseases. Wisconsin Agr. Exp. Sta. Bul 379: 3-36. Jan. 1926.

2. Reed, G. M. Plant pathology. Disease resistance. Fifteenth Ann. Rept. Brooklyn Bot. Gard., 1925, pp. 55-57. 1926.

   A few of the numerous smut collections from various regions indicate the existence of distinct new races definitely limited to certain varieties.

3. Rösch, A. Studien über den Haferflugbrand, Ustilago avenae (Pers.) Jens. und den Glatthaferbrand, Ustilago perennans Rostr., mit besonderer Berucksichtigung der Immunitatsfrage beim Haferflugbrand. Bot. Arch. 13: 382-431. 1926.

   Study confirms previous investigations in that the spores of loose smut germinate on the open blossoms, and form resting mycellium and gemmae which in turn may resume growth and infect the seedlings in the spring.

4. Tisdale, W. H. Present status of the copper carbonate seed treatment. U. S. Dept. Agr. Office Coop. Ext. Work Extension Pathologist (mimeogr.) 4: 14-16. May, 1926.

STEM RUST CAUSED BY PUCCINIA GRAMINIS PERS.

Stem rust is present in all sections of the United States. It is most prevalent in the upper middle western states where it is one of the most destructive oat diseases. In the other sections of the country, with the exception of four or five scattered states, it is of minor importance.

In 1926 there occurred one of the most severe epiphytotics of oat stem rust on record, the loss being several times greater than that recorded for any other year. The percentage losses reported are given in table 42. In Illinois, Tehon stated that this was the most serious rust epidemic experienced in this state in 40 years. In Iowa, S. M. Dietz reports the most stem rust since 1917. In California Mackie reported 100 per cent infection as general and estimated a 25 per cent loss from this disease, and stated that stem rust caused a complete loss in whole areas in southern California. Indiana, Wisconsin, and Minnesota each report a larger loss than any recorded since 1918. The following graph (Fig.17) shows that in the barberry eradication area the 1926 loss was the largest since 1919.

Table 42. Percentage losses from stem rust on oats, as estimated by collaborators, 1926, and the average loss 1919 to 1925.

Estimated percentage loss 1926	States reporting	Average percentage loss 1919-1925	Estimated percentage loss 1926	States reporting	Average percentage loss 1919-1925
15.	Ill.	.08	0.1	Ohio	.52
10	Minn.	1.64	0.1	Oreg.	
10	Iowa	1.45	Trace	Md.	Tr.
10	Calif.	3.2	"	W. Va.	Tr.
7.5	Mich.	3.7	"	Ga.	1.
3.5	Wis.	.78	"	Mo.	Tr.
3.5	S. Dak.	4.8	"	Neb.	.75
3.	Mass.	.4	"	Kans.	Tr.
1.13	N. Dak.	3.08	"	Ark.	.4
1.	Pa.	.5	"	Mont.	Tr.
1.	Ind.	tr.	"	Colo.	.4
0.5	Conn.		"	Wyo.	Tr.
0.5	Ariz.		"	Wash.	Tr.
			Present, unknown	Tex.	1.18

Oats - Stem rust

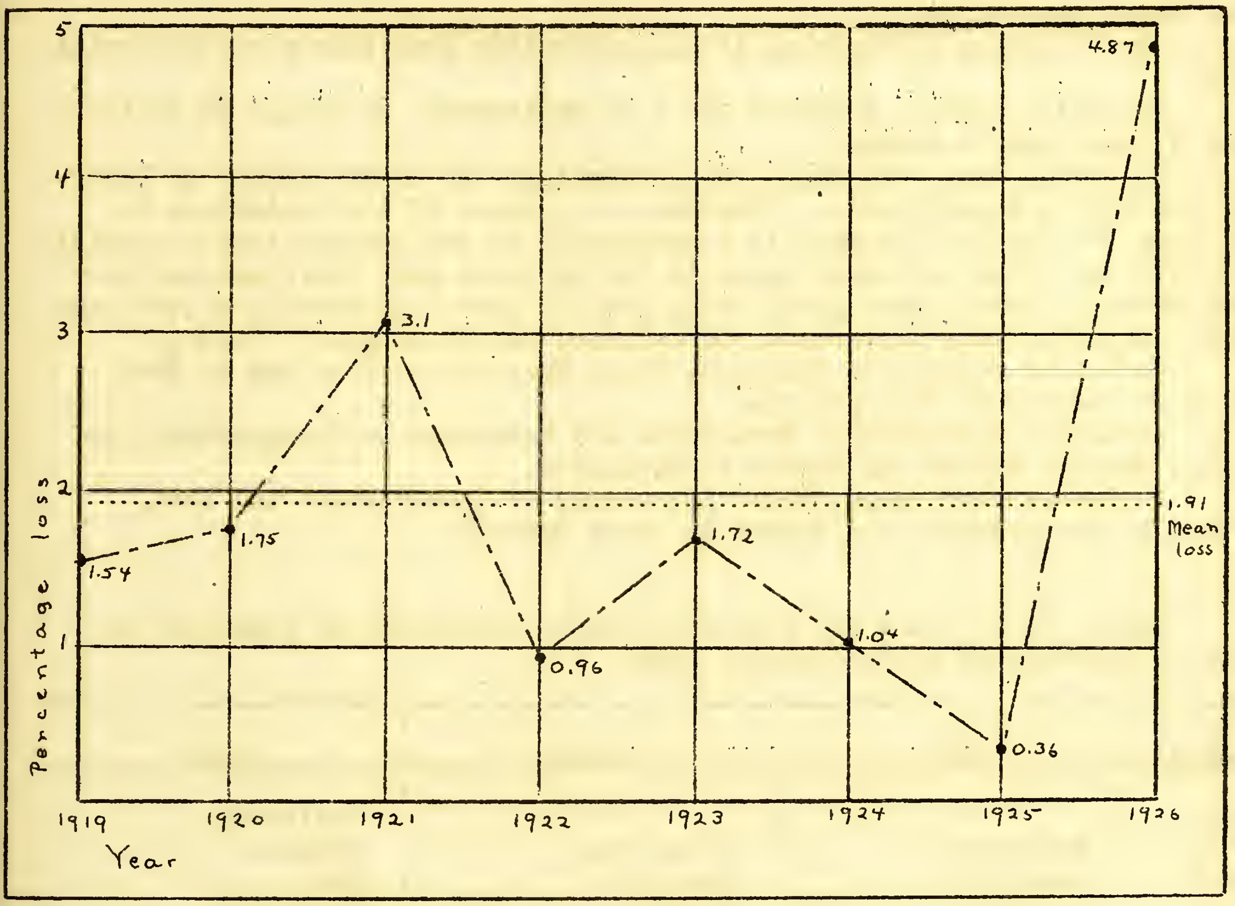

Fig. 17 Estimated average percentage loss in oats from stem rust in the 13 barberry eradication states from 1919 to 1926.

The 1926 epidemic of stem rust on oats in certain of the middle western states may have been due to a combination of weather conditions. The rainfall during April and May was considerably below normal throughout this region. This resulted, as described by Nelson and Reddy for Michigan, in late planting and delayed maturity, thus prolonging the period of susceptibility. The long dry spells in certain states, such as Iowa, Illinois, and North Dakota, were broken during the last of May, June 16 and 17 and July 9 and 10, by short rainy periods favorable to rust infection. In contrast, the weather was continuously dry in Missouri, Kansas, Nebraska, and Montana, and held the rust in check so that it caused little or nor loss. Iowa and North Dakota reported the largest losses in the later maturing oats.

As to the source of infection, several states, including Pennsylvania, Wisconsin, Illinois and South Dakota report greatest loss in the vicinity of escaped barberry bushes. J. W. Baringer, (Cereal Courier 18: 267. 1926.) states that in Ohio the relation between the existence of barberry and the occurrence of severe infection on oats was not clear in many cases, and R. E. Vaughan reports that in northern Wisconsin the rust appeared to result from wind-blown spores.

The following differences in susceptibility have been reported during 1926.

Varieties immune: Richland 320 a in California, as usual, is entirely free of stem rust. - Mackie.

Varieties very resistant: Hybrid Richland and Green Russian in Iowa, and Richland in Pennsylvania. Richland, on account of its resistance to the forms of stem rust present in Pennsylvania at the present time is rapidly replacing the other varieties grown in the northern part where escaped barberry bushes in many cases enable stem rust to almost completely destroy the common varieties like Silvermine, Cornellian, and Patterson. - Kirby.

Varieties resistant: Richland, Green Russian and Iowa 444 in Iowa and Green Russian in Pennsylvania.

Varieties susceptible: Cornellian and Patterson in Pennsylvania, and 60-Day, Swedish Select and Gopher in Minnesota.

Varieties very susceptible: Silvermine in Pennsylvania and Iowa, Victory in Pennsylvania and Gopher in North Dakota.

Table 43. Dates and places of first observation of stem rust on oats, as reported by collaborators. 1926.

Date	Place	County	State
April	- - -	- - -	California
May 30	Fayetteville	Washington	Arkansas
June 6	Humboldt	Humboldt	Iowa
June 9	Wells	Faribault	Minnesota
June 12	Union	Franklin	Missouri
June 23	Edwardsville	Madison	Illinois
June 29	Glenhaven	Grant	Wisconsin
July 6	- - -	Gutrim	Michigan
July 12	Fargo	Cass	North Dakota
July 15	Fort Collins	Larimer	Colorado
July 27	Franklin	Venango	Pennsylvania

Stem rust on oats can apparently pass the winter in the uredinial stage in the Gulf Coast States and California.

CROWN RUST CAUSED BY PUCCINIA CORONATA CDA.

Crown rust has been reported in the past from all sections of the United States, with the possible exception of three of the Southern Rocky Mountain States. This rust is most prevalent in the Cotton Belt States, where it and oat smuts are the most destructive diseases. North of these states it becomes of moderate importance and in the West, with the possible exception of California, it is a very minor trouble.

Some of the collaborators' reports on prevalence are:

New York: More than last year with some late planted fields having considerable. (Barrus).

Pennsylvania: Much less than in 1925. Trace found in about 2 per cent of the oat fields. (Kirby).

South Carolina: Less than last year. (Ludwig).

Mississippi: More than last and average years. (Neal).

Louisiana: Present in normal amounts. (Tims).

Texas: Unusually prevalent. (Taubenhaus).

Arkansas: Common and more prevalent than last year, but not as serious as in average years. (Rosen).

Illinois: Less than last year. (Tehon).

Minnesota: Much less than last year. (Sect. Plant Path.)

Iowa: Less than last year. (Dietz).

Kansas: Practically absent. (Melchers).

Nebraska: Rare to trace. (Peltier).

Oregon: Unusually severe in Coast Regions (Barss).

California: Very prevalent this year, much more so than usual, but not doing very much damage. (Mackie).

The largest loss from crown rust in 1926 occurred in the West Gulf Coast State, and in California, New York, and Wisconsin. (See Table 44).

The abnormally small loss caused by crown rust is attributed by at least seven collaborators to the exceptionally dry spring which retarded the development of the rust. Excess rainfall is given as a cause for the increased amount of rust in Louisiana, where precipitation was 1.81 inches above normal in April, and 1.06 inches above normal in May, and the loss from crown rust was more than twice the average for the previous eight years.

This rust was first observed on January 11, in Louisiana; February 4, at Gainesville, Florida; in April in California; April 30, at Kane Island, Beaufort County, North Carolina; May, in southern Iowa; May 30, at Fayetteville, Arkansas; June 2, at Marshall, Illinois, and June 18, at Red Wing, Minnesota.

Several reports have been sent in concerning the difference in susceptibility of oat varieties to the crown rust. Texas Rust Proof is reported by Tims in Louisiana, and the Department of Plant Pathology in Arkansas as being resistant. Richland shows fair resistance in Pennsylvania, while Richland 320 in California showed considerable infection according to W. W. Mackie.

Table 44. Estimated reduction in yield of oats due to crown rust for 1926 and (in parentheses) for the period 1918 to 1925, as estimated by collaborators.

Percentage: loss	States reporting	Percentage: loss	States reporting
20.0	Louisiana (8.7)	Trace	North Dakota (1.66)
2.0	Texas (6.75)		Minnesota (.15) Iowa (.71)
	New York (1.)		Arkansas (5.7)
1.5	Mississippi (4.14)		Michigan (1) Ohio (.58)
	California (.8)		West Virginia (.66)
.7	Wisconsin		Maryland,
.5	Connecticut (.8)		Pennsylvania (.75)
.2	Illinois (1.7)		New Jersey (.76)
Trace	Oregon,		Massachusetts (.4)
	South Dakota (.83)		Arizona

Oats - Crown Rust: Blast: Halo Blight.

Recent literature:

1. Davies, D. W. and E. T. Jones. Studies in the inheritance of resistance and susceptibility to crown rust. (P. coronata corda) in a cross between selections of Red Rustproof (A. sterilis L.) and Scotch Potato (A. sativa L.). Welsh Jour. Agr. 2: 212-221. 1926.

2. Dietz, S. M. Alternate hosts of Puccinia coronata. II. - Abs. in Phytopath., 16: 84. 1926.

3. Popp, W. Crown rust of oats in eastern Canada. Ann. Rep. Quebec Soc. Prot. Plants. 18: 38-54. 1926.

BLAST (NON-PAR.)

In 1926 there was apparently about the same amount of blast as in 1925, with four states, Pennsylvania, Wisconsin, California, and Illinois, reporting more, and the same number, Arkansas, Tennessee, Nebraska, and South Dakota reporting less. The dry weather again caused the amount of blast to be considerably higher than normal. In several sections blast must be considered as a very important trouble since it has been reported to cause almost as much loss as the smuts or rusts. This year it caused a greater loss in Kansas and Montana than any other disease.

Loss estimates for 1926 were submitted as follows: 10 per cent in California; 3 to 15 per cent in Montana; 7 per cent in Iowa; 5 per cent in Illinois, Minnesota, and Kansas; 1.5 per cent in Pennsylvania; 1 per cent in New York and Mississippi; and a trace in Maryland, Arkansas, Wisconsin, South Dakota, North Dakota, and Colorado.

HALO BLIGHT CAUSED BY BACTERIUM CORONAFACIENS ELLIOTT.

Halo blight has been reported to the Plant Disease Survey from twenty-nine states. It occurs commonly in most of the Middle Western and Middle Atlantic States and California. In most of the southern and western states it is rarely, if ever, observed. It is a disease of minor importance, usually causing only a trace of loss. It is most severe in the five principal oat growing states, where as high as one per cent loss has been reported. There seems to have been very little change in its severity during the past three years.

In 1926 collaborators in sixteen states reported the presence of halo blight but in no case was the loss said to be over 0.1 per cent.

In Wisconsin, R. E. Vaughan reports that maximum injury was to seedlings and that the early rains and cool weather favored the development of the disease. In Missouri, W. A. Archer observed that the infection appeared immediately after the end of a long drought and that the variety Fulghum was susceptible.

SCAB CAUSED BY GIBBERELLA SAUBINETII (MONT.) SACC.

During the past twenty-two years scab on oats has been reported to the Plant Disease Survey from sixteen states, viz., California, Texas, and fourteen states in the Northeastern part of the country. It is of minor importance, seldom causing over a trace of loss in any individual state. In 1926 traces were reported from Pennsylvania, Maryland, Wisconsin, Minnesota, and Iowa.

ANTHRACNOSE CAUSED BY COLLETOTRICHUM GRAMINICOLUM (CES.) WILS.

Anthracnose has been reported from seventeen states scattered throughout the central, southern and eastern sections of the United States. It has been most prevalent in the states bordering on the Great Lakes and Gulf of Mexico. Losses greater than a trace (less than 0.1 per cent) are very rarely reported. In 1926 it was reported from Pennsylvania, Ohio, Mississippi, and Wisconsin. Dry weather likely held it in check. In Pennsylvania, Ohio, and Wisconsin, only a few infected plants were observed. In Mississippi, where weather conditions were normal, a loss of two per cent was reported by D. C. Neal.

OTHER DISEASES

Erysiphe graminis DC., powdery mildew. This disease, of minor importance, has been reported most commonly from the Pacific Coast States. In 1926 it was reported as causing a trace of loss in Washington, by the Department of Plant Pathology, and in Oregon, H. P. Barss reported that considerable development of mildew was noted during the spring in the Williamette Valley.

Fusarium sp., pink rot. Common throughout California, 1 per cent loss. (Mackie).

Helminthosporium sp., probably H. avenae Eidam, leaf spot. Pennsylvania, South Carolina and California. In South Carolina, D. B. Rosenkrans stated that "About April 26 leafspot was largely prevalent in river bottoms but not so much on upland." In California, W. W. Mackie reported on May 25 that "Leaf spot has been noted in a number of areas in the Sacramento Valley, but it is rare and causing but little damage." In Pennsylvania, it was observed on June 4 to be very common, but was causing only a slight damage.

Macrosporium sp. sooty mold. Specimens of this were collected in Montana, by P. A. Young. In Pennsylvania, continued rains during harvest caused a loss of at leat 10 per cent by allowing the oats to become severely molded, and to sprout in the shock. (R. S. Kirby).

Pseudomonas sp., bacterial leaf blotch. Arkansas, reported on April 1, at Fayetteville, "The bacterial disease of oats, reported to the Survey last year, in which spots and streaks are not surrounded by halos, has been found in great abundance this spring, on spring oats. Winter oats on the other hand show very few spots." (Rosen).

In Manitoba, Canada, G. R. Bisby reports that "A bacterial leaf spot of oats is very prevalent. It is much more common than halo-blight. Specimens were submitted to H. R. Rosen, who finds that the disease is similar to, or identical with, the bacterial blotch he has found in Arkansas."

Sclerotium rolfsii Sacc., southern blight. This disease has been reported only from Arkansas and Mississippi. In 1926 it was reported from Mississippi where D. C. Neal states that "Southern blight of oats was very prevalent in the oat nursery here this spring. There was at least 20 or 25 per cent of Sclerotium rolfsii on many of these oat varieties. There does not seem to be any difference in varietal susceptibility so far as I have been able to tell."

Recent literature:

1. Anon. Arkansas Diseases. Arkansas Sta. Bul. 203: 44-51. 1926.

2. Anon. M. A. Die Anwendung von Kupfervitriol gegen die Heidemoorkrankheit. Deut. Landw. Presse 53: 156. Mar. 27, 1926.

3. Hiltner, E. Hafer-Dorrfleckenkrankheit und Hederich Bekämpfung. Illus. Landw. Zeit. 46 (15): 188-190. Apr. 9, 1926.

4. Tacke, B. Neue Erfahrungen über Heidemoorkrankheit. Deut. Landw. Presse 52: 16. Jan. 9, 1926.

C O R N

SMUT CAUSED BY USTILAGO ZEAE (BECKM.) UNG.

Corn smut has been reported from every state. It is one of the most important diseases of this crop and has been estimated to cause a total reduction in yield varying in different years from 1.6 to 3.1 per cent. The map showing distribution of corn smut, 1918 - 1926, (Fig. 18) gives the average of the estimated annual losses from this smut in the different states.

In 1926 there apparently occurred an epiphytotic of this disease which resulted in one of the largest losses on record. Fourteen reported that corn smut was more prevalent in 1926 than in 1925, twelve that there was about the same amount, and only three, Georgia, Kansas, and Minnesota, reported less. Losses for 1926 are given in table 45 .

Corn - Smut

The following reports of collaborators are of interest:

New Jersey: Throughout central and southern Jersey corn smut is more prevalent than it has been for the past five years. (Dept. Plant. Path.)

Pennsylvania: Caused a larger loss in 1926 than previously recorded. (Kirby).

South Carolina: Was much more severe than usual. (Ludwig).

Arkansas: More corn smut noticed this year, on late maturing varieties, than in eight years previously. (Rosen).

Iowa: General throughout the state, showing more prevalence in central and southern Iowa; 5 per cent loss. (Burns).

South Dakota: An unusual amount of corn smut was noted this year, from 30 to 50 per cent of ears being affected as well as other plant parts. (Brenckle).

Kansas: Less than usual. It is believed the excessive drought in many places in Kansas reduced the vegetative growth of the corn to an extent which prevented considerable infection. (Melchers).

In general smut was reported as becoming severe later than usual, and late corn was usually more severely injured than the early maturing corn. The general increase in severity in most sections of the country was apparently correlated with weather conditions, as shown in table 46. In most of the states where August precipitation was above normal there was more smut than usual. On the other hand, in a few states, as Kansas and South Dakota, where rainfall was less than normal, there was also less corn smut. This appears to be particularly significant when these extremes are reported from neighboring states as North and South Dakota, Iowa, and Kansas. Fromme and Godkin reported that in Virginia, "Corn smut was especially prevalent in sections where rainfall was plentiful." In both Arkansas and Pennsylvania, corn smut was almost absent until the abnormally rainy period started, according to collaborators.

The conditions occurring in 1926 agreed closely with the findings of Coffman, Tisdale, and Brandon (1), during three years' investigations at the United States Dry Land Field Station, Akron, Colorado, that the percentage of smut varied in different seasons, according to the weather, summarized as follows:

> "Scant precipitation in May and June followed by moderate rainfall and comparatively high temperatures seemed to favor the disease. Such conditions prevailed in 1921. Moderate amounts of precipitation throughout the season accompanied by high temperatures in July and August seemed to favor moderately abundant infection. Such a result was obtained in 1922. A rather heavy precipitation in the early part of the season followed by scant rainfall and low temperatures in the later summer was not conducive to heavy infection. The greater part of the smut appeared in July and August in all years."

Regarding the influence of temperature on smut infection, Vaughan of Wisconsin stated that corn smut is rarely seen until the temperature gets above 70°F.

Sweet corn was reported to be much more susceptible to smut than field corn, by collaborators in Connecticut, New York, Delaware, Ohio, Michigan, South Dakota, and Colorado. The heterogeneous nature of corn largely precludes comparing the susceptibility of the common varieties as they occur in most sections. The Minnesota Section of Plant Pathology reported considerable variation in pure lines of both field and sweet corn at the University Farms.

Coffman, Tisdale, and Brandon (1) report that in their investigations in Colorado:

> "Varietal differences in susceptibility of corn to smut were found. Strains selected for smut resistance consistently showed lower percentages of smut. Strains of Swadley corn grown during 1920 to 1922, inclusive, showed marked differences in degree of smut susceptibility. Although variation from year to year occurred in a given strain, some strains produced consistently less smut than others. Ear-row progenies from the same parent ear-row in some cases showed marked differences in degree of smut susceptibility, while in other cases they were very similar, all strains showing either high or low percentages of smut. This may prove of some practical value in breeding smut-resistant strains of corn."

Griffiths (2) reports that the resistance of highly resistant strains of corn in the field appears due merely to the fact that inoculum does not reach the young growing tissue.

Table 45 . Percentage losses from smut of corn as estimated by collaborators, 1926. (Maximum percentage field infection in parentheses.)

Percentage: loss	States reporting	Percentage: loss	States reporting
15.	South Carolina (36.)	1.	Massachusetts,
10.	California (90.)		Delaware,
5.5	Pennsylvania (25.)		West Virginia
5.	Tennessee,		Texas
	Iowa		South Dakota (70.)
	North Dakota (15.)		Minnesota (70.)
4.	Arizona		Colorado (10.)
3.5	North Carolina (20.)	0.5	Mississippi (1.)
3.	Connecticut,		Indiana (60.)
	Arkansas,		Wisconsin
	Kansas,		New York
	Michigan (25.)	0.1	Alabama
	Missouri (30.)	Trace	Maine,
2.5	New Jersey		Idaho
2.	Virginia,		Washington
	Ohio		Montana, Florida (10)
1.5	Maryland		Louisiana.

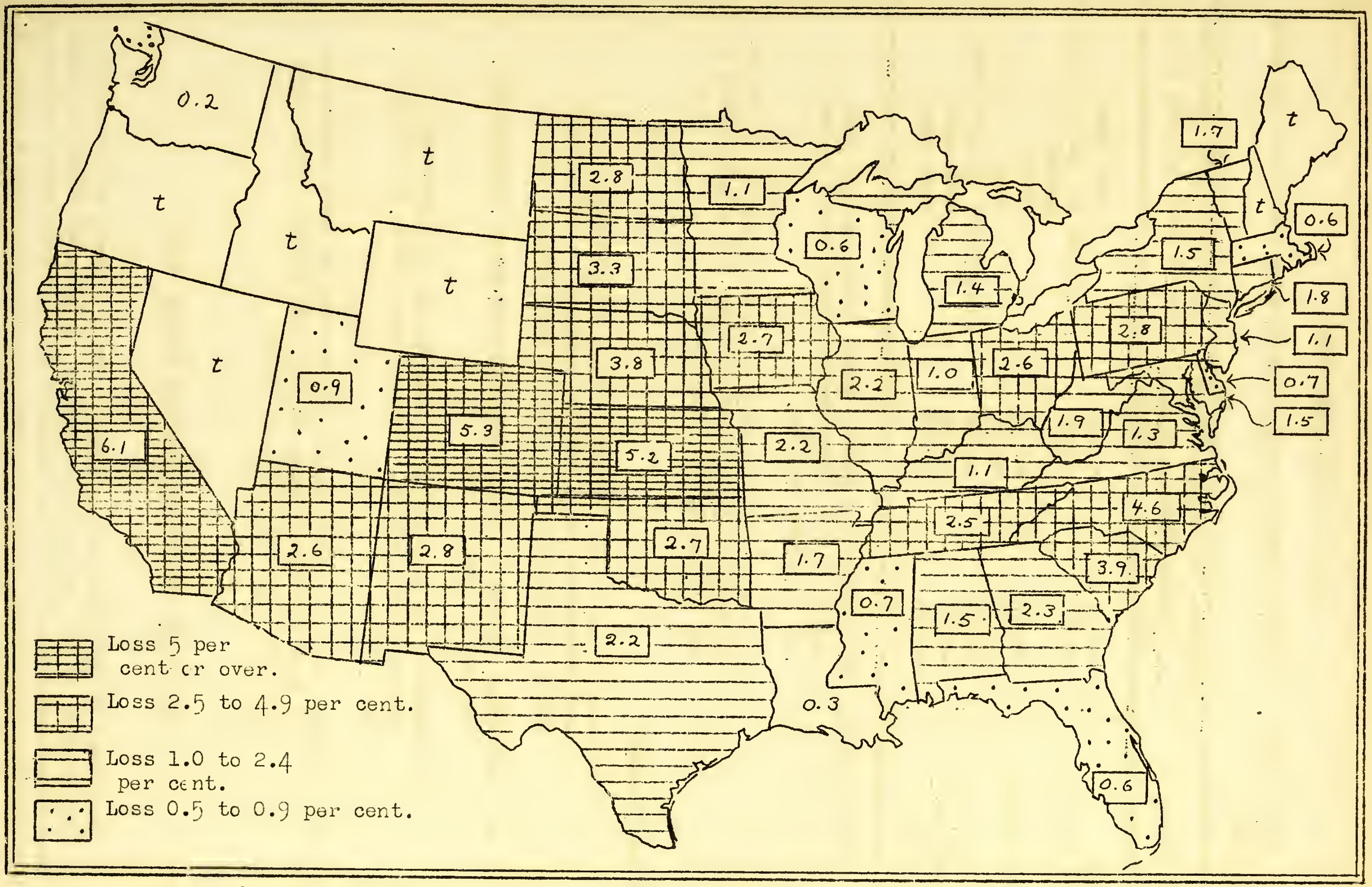

Fig. 18 Average annual percentage loss from corn smut, 1918 to 1926.

Corn - Smut: Leaf Rust

Table 46 . Relation between weather conditions and amount of corn smut, 1926.

State	Departure of precipitation from normal		Amount of corn smut compared with average year.
	July	August	
Kansas	-0.94	-0.22	Much less
South Dakota	+0.01	-0.12	Same as in 1925 or less than normal
North Dakota	-0.61	+0.15	More
Iowa	-0.13	+0.36	More
Arkansas	-0.27	+1.81	Much more in late corn
Pennsylvania	-0.52	+1.46	Much more
Tennessee	+0.19	+3.98	Much more

Temperature: In August, 1 to 2.8°F. above normal in all the above states except South Dakota where it was 0.2°F. above normal.

In July it was 0.1 to 0.7°F. below normal in Pennsylvania and Arkansas while in the other states it was 0.6 to 2.8°F. above normal.

Recent literature:

1. Coffman, F. A., W. H. Tisdale, and J. F. Brandon. Observations on corn smut at Akron, Colorado. Jour. Amer. Soc. Agron. 18: 403-411. May, 1926.

2. Griffiths, Marion A. Smut resistance in Corn. (Abstract). Phytopath. 17: 42. Jan. 1927.

3. Hurd-Karrer, A. M. Effect of smut on sap concentration in infected corn stalks. Amer. Journ. Bot. 13: 286-290. May, 1926.

4. Tisdale, W. H. & Johnston, C. O. A study of smut resistance in corn seedlings grown in the greenhouse. Journ. Agr. Res. 32: 649-668. April 1, 1926.

LEAF RUST CAUSED BY PUCCINIA SORGHI SCHW.

Leaf rust of corn has been reported from all parts of the United States except some of the far western states. In general it is a disease of minor importance. In 1926 North Carolina was the only state reporting an increase in prevalence. Only four states report more than a trace of loss, viz., Mississippi 2 per cent, North Carolina and Louisiana 1 per cent, and Indiana 0.5 per cent.

In Wisconsin, according to Vaughan, "The aecial stage was found to be very abundant on Oxalis sp., under natural conditions."

DRY ROT CAUSED BY DIPLODIA ZEAE LÉV.

Dry rot has been reported from nearly all of the states east of the Rocky Mountains, and from California and Washington. It is one of the most destructive corn diseases in the central and southeastern parts of the United States, where losses of from two to five, or even ten per cent are often reported. Further north, where the weather is cooler, in New York, Pennsylvania, Michigan, Wisconsin, Minnesota, the Dakotas, and the dry western states, the loss is usually slight and the disease is of minor importance.

Nineteen twenty-six was reported by collaborators as being an epiphytotic year for Diplodia. Of the fifteen states reporting on its relative prevalence seven reported the disease as more or very much more severe in 1926 than in 1925 or than usual and no report indicates less loss than in 1925. The estimates of losses are given in Table 47 . This epiphytotic of Diplodia apparently was due to the abnormally wet, warm weather, which occurred in nearly all states where the disease was severe.

In Delaware, Adams reported that, "Infestation by corn ear worm appears to have favored much Diplodia ear rot infection."

Recent literature:

1. Jehle, R. A., F. W. Oldenburg, and C. E. Temple. Relation of internal cob discoloration to yield of corn. Phytopath. 16: 207-215. 1926.

2. Tryon, H. Ear rot of maize. (Diplodia zeae (Schwein.) Lev.) Queensland Agr. Journ. 25: 237-258. March, 1926.

Table 47 . Percentage loss from Diplodia dry rot of corn as estimated by Collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
8.55	Illinois	2.	North Carolina, Kansas
6.	Iowa	1.5	Mississippi
5.	Arkansas, Ohio	1.	Delaware, Virginia
4.	Maryland		South Dakota
3.5	Indiana	.8	Pennsylvania
3.	Michigan	Trace	Massachusetts, Wisconsin

ROOT AND STALK ROTS CAUSED BY GIBBERELLA SPP. AND FUSARIUM SP.

Root and stalk rots have been reported from practically every state except some of those in the Far West. In 1926 it was apparently slightly more prevalent than in 1925. More than the average was reported from New Jersey, Maryland, Tennessee, Indiana, and Wisconsin and less from Delaware, Virginia, Kentucky, and Illinois. The following are some of the reports received from collaborators:-

<u>Virginia</u>: Especially severe in Loudoun, Fairfax, and Fauquier Counties; accompanied by deficiency in one of more of the essential elements. (Fromme and Godkin).

<u>Kentucky</u>: Where moisture was limited early in the season the disease was slight, but where heavy rains occurred while corn was small certain areas were quite badly injured, the root system being nearly destroyed. (Valleau)

<u>Kansas</u>: Somewhat more prevalent than usual, due probably to the unfavorable growing season. Twelve per cent loss. (Melchers).

<u>Missouri:</u> Loss about 25 per cent. In many fields there was 90 per cent lodging due to rotted roots. (Archer).

A loss of 25 per cent from root and ear rots together was estimated by Archer in Missouri. Other percentage losses reported were as follows: 15, Tennessee; 9, Maryland; 6, Indiana and Kansas; 5, Mississippi and Louisiana; 4, Pennsylvania, Alabama and South Dakota; 3, Virginia, Ohio, and Wisconsin; 2.8, North Carolina; 2.5, New Jersey and Michigan; 2, New York, West Virginia and Montana; 1, Minnesota; 0.5, Connecticut and Delaware; 0.2, Illinois.

In Wisconsin, Dickson (1) recommends planting disease-free, fire-dried, pedigree corn on clover or alfalfa land moderately early to prevent seedling blight and to secure the highest yield of well matured corn. If it is necessary to use diseased, poorly cured seed or to plant on old corn or wheat land, it should be planted in a warm soil to prevent seedling blight.

<u>Recent literature:</u>

1. Dickson, J. G. Making weather to order for the study of grain diseases. Wisconsin Agr. Exp. Sta. Bul. 379: 3-36 1926.

2. Dickson, J. G. and J. R. Holbert. The influence of temperature upon the metabolism and expression of disease resistance in selfed lines of corn. Jour. Amer. Soc. Agron. 18: 314-322. 1926.

3. Jehle, R. A., F. W. Oldenburg, and C. E. Temple. Relation of internal cob discoloration to yield of corn. Phytopath. 16: 207-215. March 1926.

4. Valleau, W. D., P. E. Karraker, and E. M. Johnson. Corn root-rot a soil-borne disease. Jour. Agr. Res. 33: 453-476. 1926.

EAR ROTS CAUSED BY GIBBERELLA SPP. AND FUSARIUM SPP.

Ear rots are very prevalent in all of the states east of the Great Plains especially in the central and southern parts of this area. In the western states outside of California they are of little importance.

Concerning the relative prevalence of ear rots in 1926, collaborators in Pennsylvania, Delaware, Maryland, and Arkansas reported much more, and in Louisiana, Indiana, Wisconsin, and Iowa, more than usual; otherwise there was about the average amount. Losses reported for 1926 are given in table 48.

Reports for certain individual states are as follows:

<u>Pennsylvania</u>: On account of extremely wet weather while the ears were developing, ear rots have been the most destructive I have ever observed. In many fields the percentage of ears showing symptoms and signs of rot are running between 80 and 90 per cent. Loss about 10 per cent. (Airby).

<u>South Carolina</u>: Ear rots are abundant, at least in places this autumn. Part of this prevalence is doubtless due to unusual corn ear worm damage. Loss 5 per cent. (Ludwig).

<u>Georgia</u>: (Southern) Wet weather favored disease which caused about 6 per cent loss. (Boyd).

<u>Louisiana:</u> Heavy rains and storm in the southwest part of state favored root rots. Loss 10 per cent. (Tims).

<u>Arkansas:</u> Associated with extreme prevalence of corn ear worm. Loss 4 per cent. (Dept. Plant Path.)

<u>Illinois:</u> The <u>Gibberella saubinetti</u> type of ear rot is much more common than usual. Loss 1.2 per cent with an additional loss of 2.85 per cent due to the <u>Fusarium moniliforme</u> type. (Koehler).

<u>Kansas</u>: Less than usual due to dry season. Two per cent loss would probably cover it. (Melchers).

<u>Missouri</u>: About one-third of corn is badly rotted. Loss about 30 per cent. Farmers report heavy damage for last six years. (Archer).

<u>California:</u> Common in central and coastal areas. (Mackie).

The excessively wet weather which occurred in August and September over much of the central and eastern corn producing area is generally regarded as the cause for the marked increase in the amount of ear rot while to the westward, as in Kansas, abnormally dry weather was reported as holding the disease in check.

Table 48. Percentage losses from ear rots of corn, as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
25.	Missouri	1.5	Delaware, Alabama, Mississippi.
10.	Pennsylvania, Tennessee		
6.	Georgia	1.	Iowa
4.	Illinois	.6	Indiana
3.	North Carolina, Louisiana	.5	Connecticut
	Minnesota, South Dakota.	Trace	Massachusetts, New York,
2.	Maryland, Virginia		Florida, Texas,
	Kansas.		Wisconsin, North Dakota,
			Idaho, California.

Recent literature:

1. Jehle, R. A., F. W. Oldenburg, and C. E. Temple. Relation of internal cob discoloration to yield of corn. Phytopath: 16: 207-215. 1926.

2. Jehle, R. A., F. W. Oldenburg, and C. E. Temple. Results of five years' selection for freedom from internal cob-discoloration in corn. (Abstract) Phytopath. 16 (9): 639. Sept. 1926.

3. Viber, T. The relation of temperature and moisture to diseased and disease-free corn. Philippine Journ. Sci. 31: 169-215. O. 1926.

BACTERIAL WILT CAUSED BY APLANOBACTER STEWARTII (EFS.) McC.

Bacterial wilt has been reported to the Plant Disease Survey from most of the states east of the Rocky Mountains. It is primarily a disease of sweet corn, but occurs on field corn also.

In 1926 bacterial wilt was reported as of about the usual prevalence. In most cases it was unimportant.

West Virginia: Observed only on sweet corn; occasional severe loss. (Sherwood).

Ohio: Serious losses are always noted on sweet corn. This disease is of increasing importance upon field corn. Loss 2 to 5 per cent. (R. C. Thomas).

Missouri: Present in garden lots of sweet corn over the state, causing moderate to slight loss. On pop corn it caused 10 per cent loss in a few small plantings in southeast Missouri. (Archer).

BROWN SPOT CAUSED BY PHYSODERMA ZEAE-MAYDIS SHAW.

Brown spot is primarily a disease of the South. It has been reported as far west as Kansas and Nebraska, and as far north as Ohio and New Jersey, but outside of the southern states it causes little or no loss.

In 1926 brown spot was slightly more destructive than in 1925. In southern Georgia, Boyd reported a 2 per cent reduction in yield with individual fields having one hundred per cent infection. Mississippi and Louisiana reported 1 per cent loss, and Alabama 0.5 per cent loss. Traces were reported from Missouri and Kansas.

OTHER DISEASES

Aspergillus sp., ear mold. Slight losses in certain local areas in Missouri. (Archer).

Basisporium gallarum M. Molliard, cob rot. General in Iowa. (Burns).

Bacterium dissolvens Rosen, bacterial stalkrot, was reported from Missouri for the first time by Archer who found it August 6, in Mississippi County, where it was causing about one per cent loss in one field. The determination was verified by Rosen.

Cephalosporium acremonium Cda. black bundle. Reported from three states in 1926. In Pennsylvania there was more than usual and it caused about 2 per cent loss as an ear rot. (Kirby). In Illinois the loss was 2 per cent. (Koehler). In Virginia it caused considerable loss as an ear rot in one field in Prince William County. (Fromme and Godkin).

Sorosporium reilianum (Kuehn) McAlp., head smut. Idaho and Washington.

Scutellum rot caused by various soil fungi was reported by Koehler in Illinois to cause an 8 per cent reduction in yield.

Ustilaginoidea sp., green smut, was reported with specimens from Summit, Canal Zone, by H. Johansen.

Recent literature:

1. Jehle, R. A., F. W. Oldenburg, and C. E. Temple. Relation of internal cob discoloration to yield of corn. Phytopath. 16: 207-215. 1926.

2. Kendrick, J. B. Holcus bacterial spot on species of Holcus and Zea mays. Phytopath. 16: 236-237. 1926.

3. Kunkel, L. O. The corn mosaic of Hawaii distinct from sugar cane mosaic. (Abstract) Phytopath. 17: 41. Jan. 1927.

4. McDonald, J. Diseases of maize and notes on a parasitic maize weed in Kenya. Kenya Dept. Agric. Bul. 4: 6 pp. 1926.

5. Nisikado, Y. and C. Miuyake. Studies on two Helminthosporium diseases of maize. Ber. Ohara Inst. Landw. Forsch. 3: 221-266. 1926.

6. Reed, G. M. Plant Pathology. Disease resistance - Fifteenth Ann. Rept. Brooklyn Bot. Gard., 1925, pp. 55-57, 1926.

7. Rosen, H. R. Bacterial stalk rot of corn. Phytopath. 16: 241-267. Apr. 1926.

8. Wolf, F. A. Tuckahoe on maize. Journn. Elisha Mitchell Sci. Soc. 41: 288-290. April, 1926.

RICE

Acrothecium sp., and Fusarium sp., on inflorescence, Porto Rico.

Piricularia grisea (Cke.) Sacc., blast. Florida, Texas, Arkansas, Porto Rico, of slight importance.

Sclerotium oryzae Catt., stem rot. Arkansas, loss 2 per cent. "Found in all sections on a few farms. Increasing slowly, more found every year. Often causes severe loss. A number of fields have been abandoned for rice growing. This is the most serious disease of rice in Arkansas by far." (V. H. Young).

Tilletia horrida Tak., black smut. This smut was found in Arkansas for the first time in 1926. V. H. Young and A. H. Prince discovered it in a field of long grain rice near Ulm, October 6. During a preliminary survey to determine its distribution, conducted by the Arkansas State Plant Board, the smut was found on nearly every place examined, always in minute amounts, however. Young reported that infection was greatest on the variety Fortuna, a long grain rice, but was seen on all types. The loss was very slight.

In the Check List of Diseases of Economic Plants (Dept. Bul. 1366) Tilletia horrida is reported from South Carolina, Georgia, Louisiana, and Arkansas. No records have been found to substantiate the report from Arkansas and it apparently had not been found in that state prior to 1926. The report from Georgia seems to be somewhat doubtful, as there were no specimens accompanying it. South Carolina and Louisiana are therefore the only states in which it is certain that the disease had occurred before 1926. In the Mycological herbarium of the Bureau of Plant Industry there are specimens from both of these states. Black smut was found in South Carolina in 1898, but apparently was eradicated or died out, as it has not been reported since 1899. The last year in which the disease was definitely reported to the Survey as having occurred in Louisiana was 1919, so that it would seem that the smut was at least of only slight importance.

Recent literature:

1. Palo, M. A. Rhizoctonia disease of rice. I. Philipp. Agr. 15: 361-375. Nov. 1926.
   I. A study of the disease and of the influence of certain conditions upon the viability of the sclerotial bodies of the causal fungus.

2. Young, V. H. Black smut of rice discovered in Arkansas. Rice Jour. 29 (12): 13. Dec. 1926.

FLAX

Alternaria sp., boll disease. North Dakota, general in late flax about Fargo. (Brentzel).

Colletotrichum linicolum Peth. & Laff., anthracnose. Wisconsin, fairly abundant on variety plats at Madison, not seen alsewhere. (Vaughan).

Fusarium lini Bolley, wilt, was reported from Wisconsin, Minnesota, Iowa, Missouri, North and South Dakota, Montana, and Idaho. Losses estimated were 10 per cent in North Dakota, 3 per cent in Montana, 1 per cent in South Dakota, .5 per cent in Minnesota, and a trace in Missouri. The disease caused less damage than usual in North Dakota and Minnesota, the axplanations suggested being too cool weather early in the season for its development in the former state, and too dry weather in the latter. The varieties Winona and Chippewa were reported as very resistant, and Minnesota 25 as very susceptible, from Minnesota.

Melampsora lini (Schum.) Desm., rust, was reported from Wisconsin, Minnesota, Iowa, North Dakota, South Dakota, and Oregon. The disease was severe in some fields of late flax in North Dakota, where the maximum infection observed was 50 per cent, and the total loss for the state 1.5 per cent, according to Brentzel. In Minnesota the loss was estimated at a trace, but in some fields it was from 5 to 25 per cent.

The reports from the recently developed fiber flax area in the Williamette Valley of Oregon are especially interesting. The rust has been collected there for the past two years, but 1926 is apparently the first time that it has caused damage. Barss reported that E. N. Bressman of the Oregon Agricultural College examined 8 fields, including 250 acres, in Marion County, and found the rust in every field. In some fields all of the stalks showed damage; in others as little as 5 to 10 per cent, according to Bressman. L. N. Dewey of the Office of Fiber Investigations, Bureau of Plant Industry, makes the following statement in a letter to A. G. Johnson, Office of Cereal Investigations:

> "This specimen was collected by Mr. B. B. Robinson of this Office in a field of fiber flax near Turner, Oregon, July 18, 1926. Mr. Robinson wrote that he had sent to Dr. Henry at St. Paul samples of rust flax from 20 different fields in Oregon. The flax growers there told him that nine-tenths of the fields were infested with this rust and some of them very badly. I fear this may prove a very serious handicap to the flax industry in Oregon, where about 4000 acres were grown last year and a little more than 3000 acres this year."

Henry (5) discusses the control of this rust, mostly from the standpoint of the development of immune varieties and strains. He states that there is some evidence of the existence of specialized physiologic forms.

Phlyctaena linicola Speg., pasmo. Minnesota and North Dakota were the only states reporting the occurrence of pasmo in 1926. In both there was less than usual, and the loss was a trace in each.

Polyspora lini Laff. Minnesota, one report.

Heat canker, non-par. North Dakota, loss 3.5 per cent; Montana, loss 2 per cent; Minnesota, loss a trace.

Recent literature:

1. Brentzel, W. E. The pasmo disease of flax. Jour. Agr. Res. 32: 25-37. 1926.

2. Brinsmade, J. C. Jr. Differences in wilt infection of flax varieties grown from seed of same sources at Fargo, St. Paul, and Mandan. Cereal Courier 18: 230. Aug. 10, 1926. (mimeogr.)

3. Dickson, J. G. Making weather to order for the study of grain diseases. Wisconsin Agr. Exp. Sta. Bul. 379: 3-36. Jan. 1926.

4. Hart, Helen. Factors affecting the development of flax rust, Melampsora lini (Pers.) Lév. Phytopath. 16: 185-205. Mar. 1926.

5. Henry, A. W. Flax rust and its control. Minnesota Agr. Exp. Sta. Techn. Bul. 36: 3-20. Mar. 1926.

6. Reynolds, E. S. Nutritional studies on Fusarium lini. Plant Physiology 1: 151-164. Apr. 1926.

7. Tochinai, Y. Comparative studies on the physiology of Fusarium lini and Colletotrichum lini. Jour. Coll. Agr. Hokkaido Imp. Univ., Sapporo, Japan. 14: 171-236. 1926.

S O R G H U M

COVERED KERNEL SMUT CAUSED BY SPHACELOTHECA SORGHI (LINK) CLINT.

Covered kernel smut has been recorded from most of the country. Only four states reported its occurrence in 1926 - Texas, Missouri, Kansas, and California. In both Kansas and California there was more than usual. Melchers estimated a loss of 10 per cent for Kansas, and stated that many fields showed from 50 to 85 per cent infection. Weather conditions were favorable and much contaminated seed was planted. From Texas and Missouri losses of 1/2 per cent and a trace were reported respectively.

The milo varieties, Dwarf and Double Dwarf were attacked by this smut in California, according to Mackie. Milo was affected in Texas also. Tisdale reported Feterita as resistant (2).

Melchers and Johnston (1) state that dust treatments of the seed with copper carbonate, flowers of sulfur, or "the more reduced sulfur dusts, such as 'Sulfodust' and 'Kolodust,'" are effective in the control of kernel smut. The copper carbonate treatment is widely used in Kansas. Tisdale (3) also recommends copper carbonate dust for the control of this smut.

Sorghum - Kernel Smut: Loose Kernel Smut:
Head Smut.

Recent literature:

1. Melchers, L. E., and C. O. Johnston. Sulphur and copper carbonate dusts as efficient fungicides for the control of sorghum kernel smut and millet smut. (Abstract). Phytopath 17: 52. Jan. 1927.

2. Tisdale, W. H. Recent progress in the control of cereal smuts. (Abstract). Phytopath. 16: 645-646. Sept. 1926.

3. Tisdale, W. H. Copper carbonate prevents bunt (stinking smut) of wheat. U. S. Dept. Agr. Circ. 394: 1-9. 1926.

LOOSE KERNEL SMUT CAUSED BY SPHACELOTHECA CRUENTA (KÜHN) POTTER

In 1926, loose kernel smut was reported only from Texas, where Taubenhaus estimated a loss of 2 per cent.

HEAD SMUT CAUSED BY SOROSPORIUM REILIANUM (KÜHN) MCALP.

Head smut does not seem to be quite so generally distributed as the covered smut, but it has, nevertheless, been reported over a wide area. In 1926 reports were received from South Carolina, Texas, Kansas, and California. No losses greater than a trace were reported. In California, according to Mackie, the disease seems to be disappearing. Melchers stated that head smut has never become an important disease in Kansas, probably being held in check by a combination of temperature and moisture conditions. The results of a preliminary study of the effect of soil moisture and temperature on infection of sorghum seedlings by head smut are reported by Christensen (1) as follows:

> "Seedlings of sorghum became infected in dry soil at temperatures ranging from 16° to 36° C. In moist soil no infection occurred at 16° C. The amount of infection was greatly reduced toward the two extremes of soil temperature. The optimum soil temperature for infection was 28° C. The minimum, and probably the maximum, fluctuates with the percentage of moisture in the soil. High soil moisture materially reduced the percentage of smutted plants at all temperatures and also narrowed the thermal range for infection."

Recent literature:

1. Christensen, J. J. The relation of soil temperature and soil moisture to the development of head smut of sorghum. Phytopath. 16: 353-357. May, 1926.

OTHER DISEASES AND INJURIES

Bacterium andropogoni EFS., bacterial stripe. Missouri, Kansas. A bacterial blight reported by Taubenhaus as due to Pseudomonas sorghi occurred in Texas.

Bacterium holci Kendrick, bacterial spot. Lafayette, Indiana, in Experiment Station plots. Kendrick (1) has described this species as the cause of a widespread bacterial spot of Holcus spp., corn and other grasses.

Helminthosporium turcicum Pass., leafspot. Missouri.

Phyllosticta sp., leafspot, was found on sorghum and broom corn in several localities in Missouri. The spots contained pycnidia of a Phyllosticta, presumably the P. sorghina Sacc. reported on Johnson grass in Texas by Wolf. (Archer).

Mosaic (virus). Louisiana, very common in sorghum fields; its significance uncertain. (Tims).

Recent literature:

1. Kendrick, J. B. Holcus bacterial spot on species of Holcus and Zea mays. Phytopath. 16: 236-237. Mar. 1926.

2. Lee, H. A. The common grasses in Hawaii in relation to mosaic or yellow stripe disease. Hawaiian Planters' Record 30: 270-278. Apr. 1926.

3. Walker, M. N. and C. F. Stahl. Certain grass hosts of the sugar cane mosaic disease and of the corn aphid considered in relation to their occurrence in Cuba. Trop. Plant Res. Foundation Bul. 5: 3-14. 1926.

B U C K W H E A T

Phyllosticta polygonorum Sacc., leafspot. Pennsylvania.

Ramularia anomala Pk., leafspot. Indiana.

Yellows, due to the aster yellows virus, identified by L. O. Kunkel. About 6 to 10 per cent of the plants in a three-acre field on the College Farm, New Brunswick, New Jersey, were affected. The effects of the disease show in the inflorescence - indefinite proliferation of flower buds and abundant production of small greenish flowers on long rather erect pedicels. (Dept. Plant Path.)

DISEASES OF FORAGE CROPS

ALFALFA

LEAF SPOT CAUSED BY PSEUDOPEZIZA MEDICAGINIS (LIB.) SACC.

In 1926 this leaf spot was reported from Connecticut, New Jersey, Mississippi, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, Kansas, Montana, Colorado, Arizona, Washington, and Oregon. In no one of these states was the loss estimated at more than a trace, which is the usual amount of injury.

In North Dakota, Brentzel indicated that the infection was much less important than usual, likely due to the dry weather prevailing during June and July. In Kansas, according to Weimer, there was a 5 to 10 per cent loss of leaves in some fields early in the season. In Arizona, Brisley remarked that ordinarily the disease is not evident until the second crop. In 1926, however, the first crop was attacked severely due to many rains during the spring. Defoliation was conspicuous, with an average of 25 per cent of the leaves involved. In Washington, Zundel said that almost complete defoliation of the first crop was reported from a number of places. In Oregon, according to Barss, the disease was common but rarely serious.

YELLOW LEAF BLOTCH CAUSED BY PYRENOPEZIZA MEDICAGINIS FCKL.

South Carolina, Iowa, Kansas, Utah, Arizona, Idaho, and Washington reported the presence of this leaf spot, in 1926. In Kansas, Weimer and Melchers indicated that it was prevalent early in the season causing a loss of 25 to 50 per cent of the leaves in some fields, but later in the season it was uncommon because of dry weather. In Utah the disease was reported by Richards to be serious for the first time. Infection was 100 per cent in Utah and Cache Counties and many plants were practically defoliated.

DOWNY MILDEW CAUSED BY PERONOSPORA TRIFOLIORUM D BY.

Downy mildew was reported from Connecticut, Kentucky, Illinois, Iowa, Kansas, Montana, Colorado, Utah, and Idaho. Evidently the disease was of the usual minor importance.

Clinton remarked that the disease was noted by him for the second time in Connecticut. In Iowa, M. H. Burns reported local damage to the extent of

5 per cent. In Kansas, according to Melchers, there was no appreciable damage, although the disease could be found on the first crop in fields of all ages. In Colorado, Learn remarked on the unusual occurrence of the disease in the third cutting, as ordinarily it is found only in the first crop. Sometimes entire plants were dwarfed and discolored. The first crop was severely damaged in many localities in Utah, according to Richards.

BACTERIAL STEM BLIGHT CAUSED BY BACTERIUM MEDICAGINIS (SACK.) EFS.

Bacterial stem blight was reported in 1926 from Kansas, Arizona, and Idaho. In Kansas it was generally prevalent before the first cutting, according to Weimer. In northern Arizona, Brisley reported that it was present in all fields, but was not so severe as usual, being confined mostly to leaf and petiole infection. He stated that the spring was wet, with very little frost, and this condition is thought to account for the comparative absence of stem infection.

BACTERIAL ROOT ROT CAUSED BY APLANOBACTER INSIDIOSUM McCULLOCH.

This root rot, the causal organism of which was found in 1925, has been reported from many scattered states. In 1926, one new state, Minnesota, was added to the list, making a total of 18, as indicated in the accompanying map (Fig. 19) which is based on data secured from reports to the Plant Disease Survey and from recent literature (see Jones and McCulloch (1). In addition to Minnesota, already mentioned, reports of the occurrence of the disease in 1926 were received from Illinois, Iowa, Missouri, Kansas, and Mississippi.

The following data deal with severity and occurrence of the disease in various states:

<u>Mississippi</u>: Severe in Washington County; slight in Coahoma and Monroe. (Neal).

<u>Illinois:</u> Loss 1 per cent. Fields that were known to be infected last year have all been turned under. The loss this year is practically all in new fields. (Koehler).

<u>Minnesota:</u> First report for the state, 1 to 2 per cent infected plants found in the original field in Carver County where Grimm alfalfa was introduced from Germany in 1857. (Sect.Pl. Path.)

<u>Iowa:</u> Local. Five per cent reduction. (Burns).

<u>Missouri:</u> The disease was definitely associated with the causal organism for the first time in the state by Irl T. Scott. Infested fields were located in eight counties scattered along the outer borders of the state but undoubtedly the disease is present also in all parts of the state. Many fields are a total loss and it is likely that as new plantings mature they will succumb in turn. The estimated loss for the state is 25 per cent. (Archer).

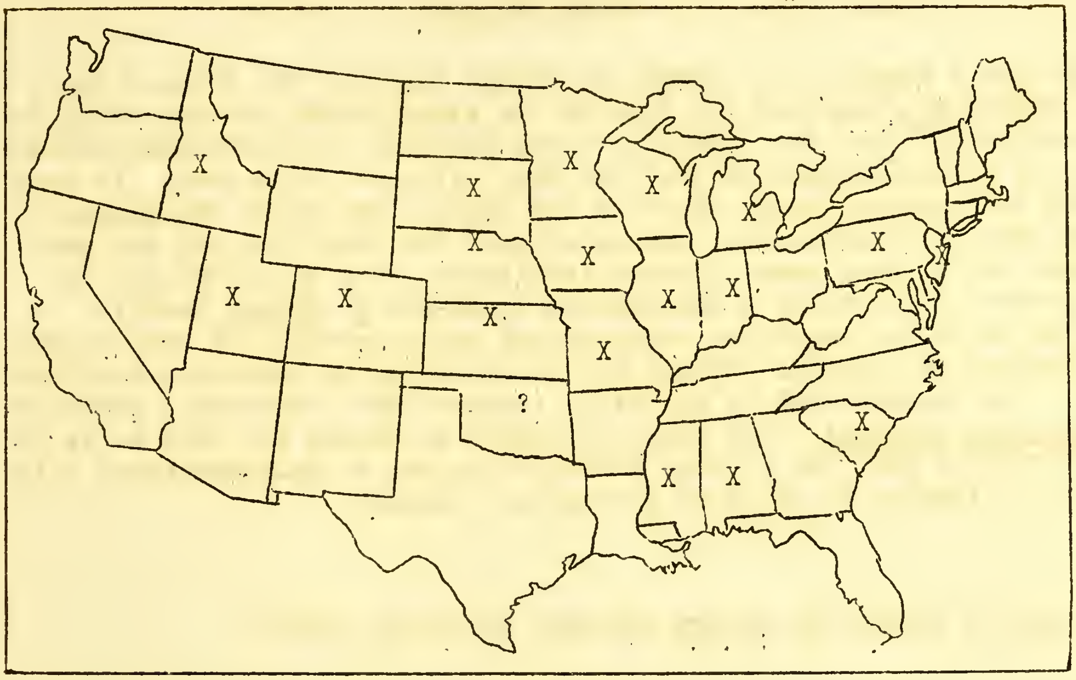

Fig. 19. Distribution of bacterial wilt of alfalfa in the United States, 1925 and 1926.

Kansas: The disease has been located in all counties where alfalfa is grown. It was very prevalent in the first crop and it is found in fields of all ages. Loss for state is estimated at 5 per cent. (Melchers)

Common especially in eastern Kansas. Some fields show practically 100 per cent infection. (Weimer)

Large acreages of older fields have been abandoned because of this disease. (White)

Recent literature:

1. Jones, F. R., and L. McCulloch. A bacterial wilt and root rot of alfalfa caused by Aplanobacter insidiosum L. McC. Jour. Agr. Res. 33: 493-521. Sept. 15, 1926.

STEM ROT AND CANKER CAUSED BY CORTICIUM VAGUM BERK. & CURT.

In southeastern Kansas, Weimer has found instances where alfalfa stems were white for an inch or more above the surface of the ground due to the presence of the perfect stage of this fungus. Small stem cankers were sometimes present. In southeastern Missouri, Archer found extensive stem infection in the form of cankers. The lesions had the appearance of those caused by the common anthracnose organism (*Colletotrichum trifolii*) but no spores or fruiting structures of this organism were found. Similar lesions were found, to a less extent however, on nearby red clover plants. The lesions start as small brownish areas near the base of the stems, which enlarge until the stem is encircled; then the involved tissue takes on a water-soaked appearance and may become flaccid so that the stem wilts or falls over. In many such cases the infected plant sends up new shoots from below the cankered area, and several observations were made where the stalk had put out new roots above the injured area. Tissue isolations, both by Weimer and by Archer, yielded cultures of a Rhizoctonia (probably R. Solani Kuehn). There seems to be no literature reference of the occurrence of this fungus in stem lesions of alfalfa. Weimer was unsuccessful in obtaining artificial infection. He remarks that he has often isolated the anthracnose organism (Colletotrichum trifolii) from similar lesions in Kansas and that he is inclined to believe that the initial infection is due to Colletotrichum with Rhizoctonia following in the dead or weakened tissue.

CROWN AND ROOT ROT CAUSED PROBABLY BY WINTER INJURY

Crown rot was reported in 1926 from Wisconsin, Minnesota, Missouri, Kansas, and Colorado. Weimer in Kansas, I. T. Scott in Missouri, and the Section of Plant Pathology in Minnesota report the finding of various fungi, especially Fusaria, associated with the rotted crown tissue. Weimer, however, is inclined to believe that the fungi are secondary invaders of tissue injury by low winter temperatures. In Wisconsin, Missouri, and Kansas also, the crown rot injury was further complicated by association with the bacterial wilt (Aplanobacter insidiosum).

In Wisconsin, according to Vaughan, the disease is extensive in southern and eastern sections. In Missouri, Archer estimates the loss to be 25 per cent. He states that this injury bids fair to be the limiting factor in the culture of the crop. Several thousand acres were abandoned or plowed up in 1926. In Kansas, Melchers and Weimer estimate the loss to be 3 per cent. They state that "Winter injury is a very general term since the factors entering into it are not well understood. The problem together with crownrot is being extensively investigated here. Many fields have been so badly killed out that they have been plowed up. The life of other fields has been much shortened." In Colorado, Learn reports that a root rot is very prevalent in alfalfa districts and that it has been serious in some cases. In Minnesota, the Section of Plant Pathology reports the occurrence of a root rot in the northern part of the state, although the extent of the damage is not known.

STEM NEMATODE CAUSED BY TYLENCHUS DIPSACI (KUEHN) BAST.

Records of the Plant Disease Survey show that this nematode has been found on alfalfa in Illinois, Nebraska, Colorado, New Mexico, Arizona, Utah, Idaho, Washington, Oregon, and California. In 1926 the eleventh state, Kansas, was definitely added, although Melchers stated that the disease had been reported twenty years ago. Besides Kansas the disease was reported in

1926 from Colorado, Washington, and Oregon. In Washington, Zundel reported that the nematode is gradually killing out large areas and is becoming more serious each year. In Oregon, according to McKay, it is not known exactly how fast the pest is spreading nor how much damage is done but that certainly it will persist and spread in the areas where it now occurs beyond hope of eradication.

WHITE SPOT (UNDETERMINED.)

White spot was reported from Utah and Connecticut. Hill states:

> "White spot has been known to occur in Utah for a number of years. In 1926 it was particularly severe in many fields in the northern portion of the state and undoubtedly reduced the yield materially. It is worse on well drained land which becomes dry quickly. In a number of instances a severe outbreak was brought on by the application of cold mountain irrigation water during a very hot day. In a few fields the appearance of the disease was much the same as sulfur dioxide injury, for which it has been mistaken by a number of farmers in the districts surrounding smelters. It can be clearly distinguished from sulfur injury by the progressive development which usually occurs from the basal leaves to the newly formed leaves, by the nature and location of the white spots that occur on most of the affected leaves, and by the fact that alfalfa is the only plant affected; whereas in sulfur dioxide injury there are usually a number of weeds also sensitive to sulfur injury which show markings as well as alfalfa.
>
> "In some cases the white spot appeared rather suddenly on most of the leaves of an alfalfa shoot, in other cases there was a progressive development, lasting over at least three weeks. In some cases there seems to have been a regeneration of chlorophyll in the whitened areas, though this statement needs checking. In a large number of fields, with the resumption of warm weather, the alfalfa outgrew the trouble."

YELLOWS (UNDETERMINED.)

Yellows was reported from Maryland, Michigan, Illinois, Wisconsin, Kansas, and Washington. This disease has been reported under various names as yellow leaf, yellow top, yellow blotch, hopperburn, etc. Recent investigations by Jones and Granovsky (1) indicate that the leafhopper <u>Empoasca fabae</u> is responsible for the trouble.

In Michigan, Kotila found the disease to be more severe than usual, especially in Berrien and Kent Counties. He states:

Alfalfa Yellows: Other Diseases.

"Variety plots at the Experiment Station show varying degrees of injury and some varieties are seemingly resistant. On close inspection the yellowed foliage shows a pink color. The tips of severely injured leaves turn brown. Leafhopper adults and nymphs were very abundant on diseased plants."

In Illinois, Koehler estimates the reduction in yield to be 20 per cent. In Kansas, Melchers states that yellows is practically limited to the first crop.

Recent literature:

1. Jones, Fred R., and A. A. Granovsky. Yellowing of alfalfa caused by leafhoppers. (Abstract). Phytopath. 17: 39. 1927.

OTHER DISEASES

Ascochyta imperfecta Pk., leaf spot. Caused minor damage in New Jersey, Missouri, and Kansas.

Caconema radicicola (Greef) Cobb, root knot. Scattered traces found in Texas where irrigation is retarded or neglected. Important where hairy Peruvian is not grown. (Taubenhaus)

Cercospora medicaginis Ell. & Ev., leaf spot. Losses estimated as a trace in Texas and Missouri. In Kansas it occurs commonly in latter part of season, causing a loss of a trace to 0.5 per cent defoliation in some fields.

Colletotrichum trifolii Bain, anthracnose. Present in some fields in Kansas. A few plants killed.

Cuscuta sp., dodder. Washington and Texas.

Macrosporium sp., leaf blotch. Reported this year only from New Jersey and Missouri. In Missouri the fungus causes insignificant losses in an average year. In 1926, however, a number of young fields had been subjected to an unusual drought and in these fields the plants were practically defoliated and sometimes killed by the attack of the fungus. Neighboring fields of sweet and red clover were attacked also but to a less degree. Losses were confined to the southeastern part of the state, particularly St. Francois County. (Archer)

Ozonium omnivorum Shear, root rot. Reported from Texas and Arizona. The loss in the latter state is estimated at 3 per cent.

Pleosphaerulina briosiana Poll., leaf spot. Kansas.

Sclerotinia trifoliorum Eriks., stem rot. Reported from Virginia, Oregon, and Washington. In Washington, Zundel reported that the disease occurred on one and two-year old plants, the infection ranging from a trace to 90 per cent.

Uromyces medicaginis Pass., rust. Reported from New Jersey, South Carolina, Mississippi, Louisiana, Texas, Missouri, Kansas, and Arizona. Losses are estimated as a trace in Missouri and Kansas. In Kansas, Weimer stated that after heavy rains in September some defoliation occurred. Brisley reported that the disease was found in neglected fields in Arizona. Where the crop is allowed to stand too long before cutting, the resultant hay is sometimes conspicuously browned. The trouble occurs only on the fourth crop.

Urophlyctis alfalfae (Lagh.) Magn., crown wart. Reported from Alabama, Mississippi, Texas, Oregon, and Washington. In May, 1926, Weimer (3) found the disease in two fields near Muldon and in two fields near Columbus, Mississippi. He also found it in three fields in Alabama. These, together with a report from Miles of Alabama, constitute the first authentic reports from the Southern States.

Recent literature:

1. Mains, E. B. Studies in rust resistance. Jour. Heredity 17: 313-325. Sept. 1926.

2. Oakley, R. A., and H. L. Westover. Commercial varieties of alfalfa. U. S. Dept. Agr. Farm. Bul. 1467: 1-21. Feb. 1926.

3. Weimer, J. L. Crown wart of alfalfa in the South. Phytopath. 16: 1012. Dec. 1926.

CLOVER

POWDERY MILDEW CAUSED BY ERYSIPHE POLYGONI DC.

Powdery mildew was reported in 1926 from 12 widely scattered states; Connecticut, New Jersey, Delaware, Virginia, North Carolina, South Carolina, Georgia, Indiana, Missouri, North Dakota, Oregon, and Washington. In general it seemed to be less prevalent than usual, although in Virginia, South Carolina and Indiana it was said to be as prevalent as in 1925. The following dates of earliest recorded appearances were submitted: May 10, Clemson Agricultural College, South Carolina; June 14, New Castle County, Delaware; June 15, Marshall, North Carolina; June 27, Caldwell County, Missouri; June 30, Bristol, Virginia; August 2, Monmouth County, New Jersey; July 2, East Haven, Connecticut; July 16, Spaulding County, Georgia.

In North Dakota Brentzel reported that infection was not found by August 1, although in past years it had been abundant. Zundel stated that the disease is becoming more prevalent in Washington each year. In Georgia, according to Higgins, the disease was formerly consistently present on all clover plants, but in 1926 up to the middle of July only a single infected volunteer plant was found. In Oregon, Barss mentions the marked difference in susceptibility of various seed strains and individual plants.

Clover - Powdery Mildew - Other Diseases.

Recent literature:

1. Barss, H. P. Clover mildew. Oregon Agr. Coll. Ext. Service Circ. 227. 1-2. (Mimeogr.). May, 1926.

2. Delwiche, E. J. Tests of strains of Red Clover from various sources. Jour. American Soc. Agron., 18 (5): 393-403. 1926.

OTHER DISEASES

Bacterium trifoliorum Jones, leaf spot. In Indiana it was first observed May 17 at Lafayette. The loss for the state, caused primarily through severe defoliation, was estimated at 0.3 per cent. Alsike is considered to be immune. Canadian strains were resistant in Wisconsin, Oregon, Tennessee, Minnesota, Ohio, and Indiana. Foreign strains, especially Roumanian, French, and Hungarian were very susceptible. (Mains)

Gloeosporium caulivorum Kirchner, anthracnose. In Indiana the disease was first observed May 17 at Lafayette in test plots. North American strains were resistant, while the Altasweet variety, Italian, and French strains were susceptible. (Mains). Also reported from New Jersey by Dept. Pl. Path.

Macrosporium sp., leaf blotch. Reported in Missouri on plants weakened by drouth. A 50 per cent infection was found in several fields but the loss for the state is estimated as a trace. The same fungus was found on nearby alfalfa plants where the infection was more severe.

Phyllachora trifolii (Pers.) Fckl., sooty spot. Reported byHaenseler to be severe in two localities in New Jersey on White Dutch clover.

Sclerotinia trifoliorum Eriks., root rot. Reported from Virginia, Washington, and Oregon. In Oregon Barss reports less injury than usual, due perhaps to dry weather conditions which prevailed during the spring months.

Tylenshus dipsaci (Kuehn) Bast., stem nematode. Washington and Oregon.

Uromyces trifolii (Hedw. f.) Lev., rust. On alsike in Indiana and on red clover in Connecticut. U. trifolii-repentis (Cast.) Liro on white clover in Connecticut. U. hybridi Davis on alsike in Connecticut chiefly along roadsides. U. fallens (Desm.) Kern. on red clover in New Jersey.

Root and crown rot (undet.) Apparently a vascular trouble possibly caused by a Fusarium, reported from Indiana. French and Italian strains are very susceptible. (Mains)

Mosaic (virus). Caused a reduction in yield of 0.5 per cent in Indiana where no varieties were immune. (Mains).

Recent literature:

1. Hallowell, E. A., John Monteith, Jr., and W. P. Flint. Leaf-hopper injury to clover. (Abstract) Phytopath. 17:58. 1927.

2. Hodson, W. E. Notes on the stem eelworm. Jour. Min. Agr. Great Britain 33: 250-262. June 1926.

3. Pieters, A. J., and J. Monteith. Anthracnose as a cause of red clover failure in the southern part of the clover belt. U. S. Dept. Agr. Farm. Bul. 1510: 1-17. Nov. 1926.

4. Wellensiek, S. J. Waarnemingen over de klaverstengelbrandziekte. Tijdschr. Plantenz. 32: 266-302. Oct. 1926. (English summary: Observations on clover anthracnose. pp. 295-298)

S W E E T C L O V E R

Macrosporium sp., leaf blotch. Occurred in Missouri on plants weakened by drought. Nearby red clover and alfalfa plants were also attacked. (Archer).

Mycosphaerella lethalis Stone, stem spot. Common in Missouri.

Canker (Undet.) Missouri; occurring on drought-weakened plants and was associated with a similar trouble on alfalfa and red clover. The lesions resembled Colletotrichum infection but no spores were present. Tissue cultures from alfalfa yielded a Rhizoctonia. (Archer).

C O W P E A

WILT CAUSED BY FUSARIUM VASINFECTUM TRACHEIPHILUM EFS.

Wilt was reported from Texas, Virginia, South Carolina, and Missouri. In southeastern Missouri, especially in Scott and Mississippi Counties, Archer found several fields which were a total loss. The loss for the state is estimated at 10 per cent. Since cowpeas are proving to be more susceptible each year county agents are endeavoring to substitute soybeans, which are obviously not subject to the wilt. The loss in Texas is estimated at 2 per cent.

Recent literature:

1. Weimer, J. L. and L. L. Harter. Root rot of the bean in California caused by Fusarium martii phaseoli Burk. and F. aduncisporum n. sp. Jour. Agr. Res. 32: 311-319. 1926.

SCAB CAUSED BY CLADOSPORIUM VIGNAE GARDNER

Scab was reported from Delaware, Virginia, Alabama, and Arkansas. All four states are new localities for the disease which was described as new only last year in Indiana by Gardner. It is evident from the following reports of collaborators that the disease was epidemic in 1926 and it will be interesting to note its development next season.

In Delaware, Adams reported the disease from two localities where it had slight importance. In Virginia, Fromme remarked that the disease has been present for a number of years. In 1926 it was collected from five different localities in all of which severe injury occurred. Iron, Hull, and Clay varieties seem to be immune, while Whippoorwill and especially Blackeye are susceptible. In Alabama, Miles reported the severe occurrence of the disease in two fields of Blackeye where the loss was practically complete. He stated that other fields in the same locality, of the same variety but from seed of other sources, were unaffected. Wingard, of Virginia, also reports finding the disease in Alabama in Montgomery County. He states:

> "The Blackeye variety showed 100 per cent infection on pods, stems and leaves; many of the young pods being completely destroyed before any seed were formed. Other varieties of cowpeas growing in other parts of the same field showed no infection. The infection was thought to general in the vicinity of Grady. The rainfall for this section was very heavy and no doubt accounts for this severe infection."

In Arkansas, V. H. Young reports that the disease was formed in several localities causing severe loss on Blackeye.

OTHER DISEASES

Bacterium phaseoli EFS., bacterial blight. Traces in Texas.

Bacterium vignae Gard. & Kendr., bacterial spot. Moderate importance in Indiana.

Caconema radicicola (Greef) Cobb, root knot. Virginia and South Carolina.

Cercospora cruenta Sacc., leaf spot. Reported from Texas with loss of 0.5 per cent. Also in Delaware and Florida.

Phoma bakeriana Sacc. Reported by Wedgworth from Mississippi on pods. According to Diehl the fungus is similar to *Phyllosticta phaseolina* Sacc.

Mosaic (virus). In Indiana Gardner reported that mosaic was serious in plots on 12 varieties and also on *Vigna catjang*. Evidence obtained in field plots with single plant selections of seed indicates that mosaic is seed borne in the Progressive White variety.

Ozonium omnivorum Shear, root rot. Loss 0.5 per cent in eastern Texas.

Recent literature:

1. Gadd, C. H., and L. S. Bertus. A Rhizoctonia disease of Vigna. Year Book Dept. Agr. Ceylon 1926: 31-33. 1926.

S O Y B E A N

Bacterium glycineum Coerper, bacterial blight. Reported from Tennessee, Indiana, and Kansas. Weimer states that this blight is widespread in Kansas and that it was responsible for a loss of 1 to 5 per cent of lower leaves.

Bacterium phaseolii sojones Hedges, bacterial pustule. Reported from Delaware, Missouri, and Kansas. In Missouri both the Laredo and Virginia varieties were attacked although injury seemed to be minimal. Weimer considers pustule to be widespread in Kansas although not so prevalent nor appearing quite so early as bacterial blight.

Botrytis sp., grey rot. On leaves in Connecticut.

Cercospora sp., leaf spot. North Carolina and Louisiana.

Fusarium sp., pod spot. Fromme reported that in one locality in Virginia pods of Virginia soybeans showed spots with Fusarium fruiting on them.

Glomerella glycines (Hori) Lehman and Wolf, anthracnose. The authors (3) have studied this disease in North Carolina and consider it to be distinct from G. cingulata.

Peronospora sojae Wolf, downy mildew. Generally found in Delaware on Wilson variety according to Adams but not showing evidence of injury. Wolf and Lehman (6) decide that P. sojae is to be considered as a synonym of P. manshurica (Naumoff) Sydow.

Pythium debaryanum Hesse, root rot. Described by Lehman and Wolf (2) from North Carolina.

Septoria glycines Hemmi. Reported from Delaware, North Carolina (5), and Indiana.

Mosaic (Virus). Reported from Indiana and Kansas. In Indiana a six acre field of Midwest variety was rejected for seed certification. In Kansas scattered infection was observed early in July but was more prevalent later. The loss is estimated as a trace.

Recent literature:

1. Burgwitz, G. K. Bacterial blight and spotting of soybean (Glycine hispida Maxim.) Morbi Plantarum, Leningrad 14: 38-41. 1925.

2. Lehman, S. G., and F. A. Wolf. Pythium root rot of soybean. Jour. Agr. Res. 33: 375-380. Aug. 15, 1926.

3. ____________ Soybean anthracnose. Jour. Agr. Res. 33: 381-390. Aug. 15, 1926.

4. Mendiola, N. B., and G. O. Ocfemia. The work of breeding disease resistant crop plants at the College of Agriculture at Los Baños. Philipp. Agriculturist. 15: 117-128. Aug. 1926.

5. Wolf, F. A., and S. G. Lehman. Brown spot disease of soybean. Jour. Agr. Res. 33: 365-374. August 15, 1926.

6. ____________ Diseases of soybeans which occur both in North Carolina and the orient. Jour. Agr. Res. 33: 391-396. Aug. 15, 1926.

V E T C H

Mycosphaerella sp., leaf spot. South Carolina.

K U D Z U

Bacterium pueriae Hedges, bacterial halo spot. This new disease is described and the organism tentatively named by Hedges (1). The disease was first reported in 1924 by Clinton from Connecticut in Plant Disease Reporter Supplement 42: 354. In 1926 Boyd reported for Southern Georgia as follows:

> "The first report of this disease from Georgia was made in 1925 from Grady County. In Worth County in 1926 a second field was visited in which about 5 acres of a 30-acre field shows heavy infection, with probably 90 per cent leaf infection and numerous petiole and runner lesions. It is estimated that about 10 per cent of the leaves are killed. The diseased area was planted with cuttings from a different source than the unaffected area of the field. The grower is contemplating eradicating the disease by pulling the vines and burning, in order to prevent spread of the disease to the healthy area. The planting is two years old. It is surprising to note that the disease should make such rapid progress in 1926, since the months of May and April have been relatively dry. The loss for the state is estimated at 1 per cent. Fields vary greatly in severity of infection but in general there is less damage in the lower, damper fields."

Caconema radicicola (Greef) Cobb, root knot. Loss 1 per cent for Georgia. One field in Worth County had 50 per cent infection and apparently the infection had developed during the winter months. (Boyd)

Recent literature:

1. Hedges, Florence. Bacterial halo spot of kudzu. (Abstract) Phytopath. 17: 48. 1927.

G U A R

Sclerotium rolfsii Sacc., southern wilt. Loss a trace in eastern Texas.

S U N F L O W E R

Erysiphe cichoracearum DC., powdery mildew. New Jersey, severe infection observed in one planting. Reported also from New York.

Plasmopara halstedii (Farl.) Berl. & de Toni, downy mildew. Collected at Bozeman, Montana, by R. J. Haskell and P. A. Young.

Puccinia helianthi-mollis (Schw.) Jackson, rust. Reported from Connecticut, New Jersey, Minnesota, and Missouri. In Connecticut the rust was found on wild plants. In Missouri it was found on Giant and double-flowered varieties.

Rhizoctonia (probably R. solani), stem rot and wilt. New York,

Sclerotinia sp., wilt. Washington.

Septoria helianthi Ell. & Ev., leaf spot. Connecticut.

Recent literature:

1. Nishimura, M. Studies in Plasmopara halstedii. Jour. Coll. Agr. Hokkaido Imp. Univ. 17: 1-61. Apr. 1926.

G R A S S E S

Bacterium holci Kendrick
Holcus sorghum sudanensis - Indiana.

Claviceps purpurea (Fr.) Tul.
Lolium perenne - Washington.
Phalaris arundinacea - Pennsylvania.

Colletotrichum graminicolum (Ces.) Wils.
Agropyron repens - Pennsylvania.
Agrostis palustris - Pennsylvania.
Bromus secalinus - Pennsylvania.
Dactylis glomerata - Pennsylvania.
Festuca elatior - Pennsylvania.
Holcus sorghum sudanensis - Missouri.
Poa pratensis - Pennsylvania.

Erysiphe graminis DC.
Agropyron repens - Pennsylvania.
Poa pratensis - South Dakota.

Helminthosporium turcicum Pass.
Holcus sorghum sudanensis - North Carolina.

Helminthosporium vagans Drechsler
Poa pratensis - Pennsylvania.

Fuligo ovata
Golf greens - Connecticut

Phyllachora graminis (Pers.) Fckl.
Agropyron repens - Pennsylvania.

Physarum cinereum
Poa pratensis - Kentucky.

Piricularia grisea (Cke.) Sacc.
Digitaria sanguinalis - Missouri.

Puccinia clematidis (DC.) Lagh.
Agropyron repens - Pennsylvania.
Elymus glaucus - Montana.

Puccinia coronata Cda.
Festuca elatior - Pennsylvania.

Puccinia epiphylla Wetts.
Poa pratensis - Pennsylvania.
Poa sp. - Wyoming.

Puccinia glumarum (Schm.) Eriks. & Henn.
Aegilops cylindrica - Washington.
Elymus sp. - Washington.

Puccinia graminis Pers.
Agrostis palustris - Pennsylvania.
Agropyron repens - Pennsylvania.

Bromus secalinus - Pennsylvania.
Festuca elatior - Pennsylvania.
Hordeum jubatum - Colorado.
Phleum pratense - Pennsylvania, Missouri, Connecticut.
Poa compressa - Pennsylvania, Michigan, Virginia.
Poa pratensis - Indiana.

Scolecotrichum graminis Fckl.
Poa pratensis - Indiana.

Sorosporium syntherismae (Peck) Farl.
Panicum proliferum - New Jersey,

Tilletia asperifolia Ell. & Ev.
Sporobolus asperifolia - Utah.

Tilletia holci (West.) Rostrup
Notholcus lanatus - Washington, Oregon.

Tolyposporium bullatum Schroet.
Echinochloa crus-galli - Connecticut.

Ustilago bromivora (Tul.) Fisch.
Bromus tectorum - Washington, Wyoming, Utah, Idaho, Oregon.
Bromus sterilis - Washington.

Ustilago crameri Koern.
Chaerochloa italica - Connecticut.

Ustilago crus-galli Tracy & Earle
Echinochloa crus-galli - Connecticut.

Ustilago hypodytes (Schlecht.) Fr.
Eriocoma cuspidata - Washington.

Ustilago lorentziana Thuem.
Hordeum jubatum - Idaho, Utah, Washington.

Ustilago rabenhorstiana Kuehn.
Digitaria sanguinalis - Missouri, New Jersey.

Ustilago striaeformis (West.) Niessl.
Dactylis glomerata - Pennsylvania, New York.
Phleum pratense - Pennsylvania.
Poa pratensis - Pennsylvania, Indiana.

Recent literature:

1. Bauch, R. Untersuchungen über die entwicklungsgeschichte und sexualphysiologie der Ustilago bromivora und Ustilago grandis. Zeitschr. Bot. 17: 129-177. 1926.

Grasses - Diseases

2. Bayliss Elliott, Jessie S. Concerning 'Fairy rings' in pastures. Ann. of Appl. Biol. 13 (2): 277-288. 1926.

3. Davis, W. H. Life history of Ustilago striaeformis (Westd.) Niessl. which causes a leaf smut in timothy. Jour. Agr. Res. 32: 69-76. Jan. 1, 1926.

4. Dietz, S. M. The effect of the alternate hosts on physiologic forms. (Abstract) Phytopath. 16: 83-84. 1926.

5. Fraser, W. P., and G. A. Scott. Smut of western rye grass. Phytopath. 16: 473-477. July, 1926.

6. ________, P. M. Simmonds, and R. C. Russell. The take-all disease in Canada. (Abstract) Phytopath. 16: 80-81. 1926.

7. Kendrick, J. B. Holcus bacterial spot on species of Holcus and Zea mays. Phytopath. 16: 236-237. 1926.

8. Lee, H. A. The common grasses in Hawaii in relation to mosaic or yellow stripe disease. Hawaiian Plant. Rec. 30: 270-278. Apr. 1926.

9. McLennan, E. The endophytic fungus of Lolium II. The mycorrhiza on the roots of Lolium temulentum L., with a discussion on the physiological relationships of the organism concerned. Ann. Bot. 40: 43-68. Jan. 1926.

10. Mains, E. B. Studies in rust resistance. Jour. Heredity 17: 313-325. Sept. 1926.

11. Melhus, I. E., Frank Van Haltern, and D. E. Bliss. A study of the downy mildew, Sclerospora graminicola (Sacc.) Schroet. (Abstract) Phytopath. 17: 57. 1927.

12. Monteith, J. Jr. The relation of mushroom soil to brown patch. Bul. Green Sect. U. S. Golf Assoc. 6: 119-120. May 1926.

13. ______________ The brown patch disease of turf: its nature and control. Bul. U. S. Golf Assoc. Green Sect. 6: 127-142. June 1926.

14. ______________ Corrosive sublimate as a control for brown patch. Bul. U. S. Golf Assoc. Green Sect. 6: 151-155. July 1926.

15. Monteith, John Jr., and T. Carter Harmon. Fungicidal control of brown-patch of turf. (Abstract) Phytopath. 17: 50. 1927.

16. Pape, Heinrich. Die sclerotium-krankheit der wiesengraser insbesondere des rohrglanzgrasses. Illus. Landw. Zeit. 46: 295-296. June 4, 1926.

17. Weston, W. H., and G. F. Weber. Downy mildew (Sclerospora graminicola (Sacc.) Schroet.) on the Everglade Millet (Chaetochloa magna (Griseb.) Scribn.) (Abstract). Phytopath. 16: 71. 1926.

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Diseases of Vegetable and Field Crops

In the United States in 1926

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BUREAU OF
PLANT INDUSTRY
UNITED STATES DEPARTMENT OF AGRICULTURE

DISEASES OF VEGETABLE AND FIELD CROPS OTHER THAN CEREALS

IN THE UNITED STATES IN 1926

Prepared by R. J. Haskell, Associate Pathologist, and
Jessie I. Wood, Junior Pathologist, Office of Mycology and Disease Survey,
Bureau of Plant Industry.

CONTENTS

INTRODUCTION

The information on which the present summary is based has been furnished for the most part by collaborators of the Plant Disease Survey. The literature of the year, both printed amd mimeographed, has also yielded many notes which have been utilized. Furthermore, various members of the Office of Vegetable and Forage Diseases have assisted materially by supplying notes concerning their observations and collections, by determining specimens, and by reading the manuscript. In the following pages notes will be found by Charles Drechsler, T. P. Dykstra, A. C. Foster, W. W. Gilbert, L. L. Harter, H. G. McMillan, G. B. Ramsey, M. Shapovalov, and J. L. Weimer. To these and to all other persons who have assisted in connection with this summary the Plant Disease Survey is indebted.

The general arrangement and the method of presentation of data is the same as that followed in other years.

DISEASES OF POTATO

POTATO SEED CERTIFICATION

Since 1914 when work was first started potato seed certification has increased very rapidly until now it is being carried on in more than 20 states and several provinces in Canada. In 1926 some four million bushels of certified seed were produced in the United States on about 32,000 acres.

Various agencies have charge of the certification work in the different states. According to Tolaas (16) in ten of the states it is administered by horticultural and extension workers at the agricultural colleges; in six by the State Departments of Agriculture; in four by potato associations working in conjunction with various departments of the agricultural colleges; and in one by a seed improvement association cooperating with the State Department of Agriculture.

At the present time there seem to be two outstanding needs in the seed certification movement,-for the development of uniform standards by the various certifying agencies,and for the protection of certified seed potatoes from fraud by the misuse of tags. The Potato Association of America through its committee on Seed Certification is making definite progress towards these ends.

It may be of interest to notice the relative importance of the various diseases in causing the disqualification of fields in New York state in 1926. Leafroll caused the highest number of rejections, twenty-four in all, mosaic was next in importance with twenty-one, then came spindle tuber with five, varietal mixture with two, and blackleg with one. H. C. Moore (12) in his statement concerning prevalence in the Great Lake States says that blackleg, Rhizoctonia, and mosaic are the most serious diseases interfering with certification in Minnesota. In Wisconsin, mosaic is a serious problem in Bliss Triumphs. In Michigan, he states that the virus diseases are not considered so troublesome, but blackleg, in certain seasons is a serious problem. In Pennsylvania, mosaic, of which several types are recognized, is said to be the worst disease, with leafroll and giant hill following in order of importance. In Indiana, blackleg is usually the most serious disease found in certified seed, especially on the early varieties such as Early Ohio and Irish Cobbler. Of the late potato diseases in that state, however, leafroll seems to be most important.

Recent literature

1. Barrus, M. F. The value of the seed source or sample plot in certification of potatoes. Proc. Potato Assoc. America 12: 62-64. 1926.

2. Curry, J. E. Problems confronting seed potato certification authorities in the Pacific States. Proc. Potato Assoc. America 12: 85-89. 1926.

3. Fernow, Karl H. Accuracy in potato inspection. Amer. Potato Jour. 3: 44-47. Feb. 1926.

4. Fernow, Karl H. Growing potatoes for seed purposes. Amer. Potato Jour. 3: 369-375. Aug. 1926.

5. Folsom, Donald. Is uniformity of potato seed certification rules possible and desirable? Amer. Potato Jour. 3: 377-382. Dec. 1926.

6. Folsom, Donald and E. S. Schultz. Methods of conducting the seed plot and its importance in potato improvement work. Proc. Potato Assoc. America 12: 64-70. 1926.

7. Harrington, F. M. Problems confronting certification authorities in the Inter-Mountain States. Proc. Potato Assoc. America 12: 83-85. 1926.

8. Mac Leod, D. J. Problems confronting the certification authorities in Canada. Proc. Potato Assoc. America 12: 74-77. 1926.

9. Martin, Wm. H. The Freehold seed potato certification conference. Amer. Potato Jour. 3: 237, 240-242. July 1926.

10. Martin, W. H. Report of seed certification committee. Proc. Potato Assoc. America 12: 147-157. 1926.

11. McCubbin, W. A., R. E. Hartman, and K. W. Lauer. Seed Potato certification in Pennsylvania. Bul. Pennsylvania Dept. Agr. 9 (2): 1-45. 1926.

12. Moore, H. C. Problems confronting the certification authorities in the Great Lake States. Proc. Potato Assoc. America 12: 77-80, 1926.

13. Moore, H. C. The seed plot an important factor in seed potato certification. Amer. Potato Jour. 3: 321, 324-325. Oct. 1926.

14. Peppin, S. G. Seed potato certification in Prince Edward Island. Amer. Potato Jour. 3: 325-327. Oct. 1926.

15. Tolaas, A. G. The production of mosaic-free Triumphs. Amer. Potato Jour. 3: 301-302. Sept. 1926.

16. Tolaas, A. G. Administration of seed potato certification. Proc. Potato Assoc. America 12: 70-74. 1926.

17. Wedgworth, H. H. and C. B. Anders. Value of certified Irish potato seed in Mississippi. Mississippi Agr. Exp. Sta. Circ. 60: 1-4. 1925.

18. Werner, H. O. and Wm. Morrow. Factors influencing certification work in the Great Plains States. Proc. Potato Assoc. America 12: 80-83. 1926.

POTATO SPRAYING AND DUSTING

Tests of the relative efficiency of copper dusts and sprays are being made in several states as is shown by the following references.

In Florida, Ensign (2) has reported that liquid Bordeaux was $94.47 more economical per acre than dust in limited tests at Hastings. In Maine, according to Folsom (3), the advantage of spray over dust is not evident and in fact during some seasons neither treatment proves profitable as far as fungous disease control is concerned. In Pennsylvania, Nixon (6) has reported that over an 8-year period, from 1918 to 1925, there was an average increase in yield of sprayed plots over unsprayed of from 34.8 to 78 bushels per acre. In Ohio, Tilford (7) reports good results with dust. In Kansas, White (8) reports no benefit from liquid Bordeaux or copper dust in the Kaw Valley during the 4-year period, 1920-1925.

Recent literature

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POTATO SEED TREATMENT

In 1925 Bert Ball (2) sent a questionnaire concerning seed treatment methods to the Department of Agriculture and to the various state experiment stations. In his summary he says that the following states advocated the use of corrosive sublimate: Alabama, Maine, Michigan, Montana, Nebraska, New Jersey, New York, and South Carolina. States which have advocated the hot formaldehyde treatment, according to him, are California, Colorado, Idaho, Iowa, Kansas, Minnesota, Mississippi, Missouri, Ohio, South Dakota, Washington, West Virginia, and Wisconsin, and reports indicated that pre-soaking of potatoes is favored by those who have given it the most careful tests. At that time the new organic mercury disinfectants were not being tested very much, but during the last year several workers have been experimenting with them. (3, 4).

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LATE BLIGHT CAUSED BY PHYTOPHTHORA INFESTANS (MONT.) D BY.

Late blight and rot of potatoes was reported to the Plant Disease Survey as occurring widely over the principal late crop area from New England and Pennsylvania westward to Wisconsin, also in the three Pacific Coast States, and in Florida on the early crop. The greatest amount of damage occurred in areas comprising, - 1, western New York, Pennsylvania, except for certain southeastern and southwestern counties, western Maryland, and northern Ohio; 2, northern and eastern Wisconsin; 3, northern Maine; 4, west of the Cascades in Oregon and Washington; and 5, Florida. No late blight was observed by pathologists in the important potato state of Minnesota, although the weather was said to have been favorable for it, nor in Iowa or Virginia where it sometimes occurs. Only comparatively slight amounts were found in southern New England, New Jersey, and West Virginia. The only report for New Jersey was very late in the year when infected tubers were sent to New Brunswick from a small area in Camden County, where blight rot was very bad on stored Jersey Red Skins. What seems to be the first authentic report of the occurrence of late blight in

Indiana was received this year. It was observed in October in Laporte County in the northern part of the state according to M. W. Gardner.

The situation was unusual this year in that the disease generally occurred very late in the season and caused losses not so much from vine blight as from decay of the tubers both in the field and in storage. As will be seen from the accompanying table (49) the earliest reports of appearance, with the exception of Florida, were during August, September, and October. These three months were generally rainy in the sections where the disease occurred. The wet, and in some cases, snowy weather delayed digging and in many places the potatoes were harvested, and in some instances stored wet. Furthermore, in eastern United States the fall was abnormally prolonged and in many cases vines had not been killed by frost at the time potatoes were dug. This resulted in an unusual amount of tuber rot after harvest in storage, transit, and market.

The loss from late blight in 1926 was probably greater than that during any other year since 1920. When the final figures have been averaged it is likely that the estimated loss for the United States will be between 4 and 5 per cent of the total crop. The accompanying table (50) gives collaborators' estimates of damage both on account of reduction in yield and from rot in storage.

Details concerning the situation have already been given (4). The following statements from collaborators present some additional information.

> New York: This year about one-tenth of the late potato crop of New York State will be left in the field because of late blight rot. In addition to this, another tenth of the crop never grew because the vines were killed by late blight. Probably at least a twentieth of the crop will rot in the grower's cellar, in the car or in the hands of the dealer. And not the least of the losses will be the labor of sorting and resorting the potatoes to remove the rotten tubers which are not only useless themselves, but which by their presence, impair the value of the sound ones. (Fernow) (See Fig.20)
>
> Pennsylvania: The first specimen was found on August 18 in Lehigh County. (This is in the section east of the Blue Ridge.) Inside of two weeks all unsprayed fields were almost completely dead throughout this region. The outbreak occurred simultaneously throughout the mountain portions, occurring about ten days later than the eastern outbreak. The extreme southwestern and southeastern portions of the state are the only areas escaping.
>
> Rot is the most severe on record in the state, amounting to from 25 to 150 bushels per acre. The properly sprayed fields have escaped both foliage and tuber infection, and yields of over 500 bushels per acre are being recorded, with 125 bushels per acre increase and over, due to spraying. Dusting is failing as usual. (Nixon) (See Fig.21).
>
> Maryland: Late blight was very severe in unsprayed potato fields in Garrett County this year. On account of the rainy weather which has been prevalent during the past month potatoes could be dug only with great difficulty. Those which have been dug had to be removed from wet soil and most of them are covered with mud. Over 50 per cent of the crop is still in the ground.

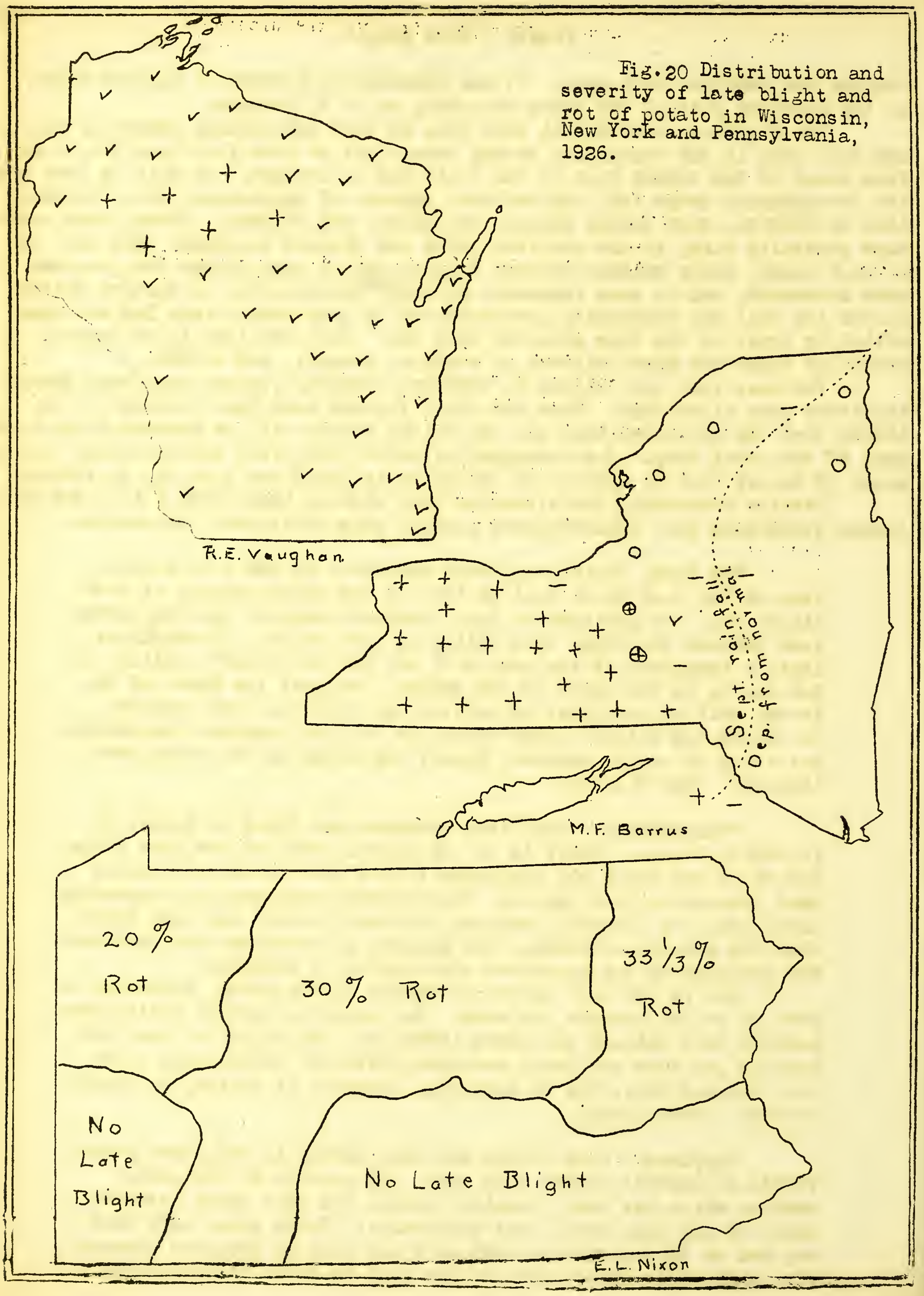

Fig. 20 Distribution and severity of late blight and rot of potato in Wisconsin, New York and Pennsylvania, 1926.

The ground was covered with snow when I made the inspection and I could not examine any potatoes in the fields, but some growers report that 50 to 75 per cent of the potatoes remaining in the ground are rotting. (Jehle)

Ohio: Many fields in northern Ohio went down completely with late blight the first week in October. Much rotting of tubers occurred in the ground and also in storage. (Tilford)

Michigan: Reported from Van Buren County by H. C. Moore. Considerable leaf infection; no tuber rot. Late blight also occurred in Schoolcraft County but damage from it was prevented by killing frost of September 26. (Kotila)

Wisconsin: Reports coming from all over the state. Losses will be more than for several years. Extreme wet weather in August and September made spraying impossible. Blight rot accompanied by wet bacterial rot in low ground. Most dealers are refusing to accept potatoes for storage when hauled direct from field. Potatoes stored green a total loss. Impossible to make definite statement now but total loss will probably be over 15 per cent of crop. (Vaughan) (See Fig. 22)

Oregon: Causing heavy loss in western Oregon by rot in bin and necessitating heavy culling for market. No control methods in general use. Disease unimportant in average years. (McKay)

Florida: Foliage infection found in all fields. Good commercial control was obtained where the field was properly dusted or sprayed, and in most of the fields the actual loss was small. Several fields which were not dusted were completely killed about four weeks before maturity with at least a 50 per cent decrease in yield.

Considerable damage was caused in the new crop in transit when the tubers were shipped wet and muddy. They were placed in double headed barrels and never dried out. The early shipments from the Federal Point section were the worst but the condition persisted throughout the season. (Gratz)

An account of results with spraying and dusting potatoes for the control of this and other diseases will be found under that heading (page 212)

Potato - Late Blight

Table 51. Dates and places of first observation of late blight of potato, as reported by collaborators, 1926.

Date	County	State
March	St. John	Florida
August 5	Aroostook	Maine
August 16	Ontario	New York
August 17	Rusk	Wisconsin
August 18	Lehigh	Pennsylvania
September 18	Portage	Ohio
September 25	New Haven	Connecticut
September	Coos	Oregon
October	Laporte	Indiana
October	Coos	New Hampshire

Table 52. Percentage losses from late blight and rot of potato, as estimated by collaborators, 1926.

Percentage loss: Total	Percentage loss: Reduction in yield	Percentage loss: Loss in storage	State	Percentage loss: Total	Percentage loss: Reduction in yield	Percentage loss: Loss in storage	State
53	23	30	Pennsylvania	3	0	3	Oregon
25	10	15	New York	1.5	1.5	-	Conn.
15	13	2	Wisconsin	1	1	-	N. Car.
10	10	0	Florida	0.1	-	-	Calif.
7	5	2	Ohio	trace	-	-	W. Va.
4	3	1	Maryland	trace	-	-	Michigan
3	0	3	New Hampshire				

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EARLY BLIGHT CAUSED BY ALTERNARIA SOLANI (ELL. & MART.) JONES & GROUT

Early blight is one of the most generally distributed fungous diseases of potato, occurring in practically all states. In 1926, records of occurrence were received from most states east of the Great Plains, but in the West only Colorado, Idaho and Oregon reported it.

In the New Jersey, Delaware, and eastern Maryland area the early or main crops escaped the disease for the most part, but the late crop, planted in August for seed purposes, was damaged considerably. W. H. Martin reported heavy infection in unsprayed and poorly sprayed fields in southern New Jersey, and R. A. Jehle of Maryland wrote that during the week of October 11 he found early blight to be very severe on the late crop grown from northern seed in Worcester County on the Eastern Shore.

In the potato sections along the Atlantic Coast, in Virginia and North Carolina, the early crop was said to be unusually free from this blight. On the other hand, in South Carolina, especially in Beaufort County, early potatoes suffered materially, although not so much as in some other recent years. Regarding the situation there W. D. Moore says:

> "First found in Beaufort County, April 17. On May 12 it was general on all light lands. Some fields reduced from 3 to 5 per cent. Where two applications of a 5-5-50 home-made bordeaux mixture were applied, the trouble was checked. On June 1 practically all fields showed slight infections. Total reduction from 2 to 5 per cent."

In Kentucky, Valleau and Gardner reported that September rains favored early blight development with the result that it became very important on the late crop. It also caused about 15 per cent loss to the early crop according to them.

More than the average amount of early blight was also reported from Minnesota and North Dakota. In those, as in other states, the disease was associated and complicated with hopperburn. Some fields around Fargo, North Dakota, showed heavy infection early in August.

In some years and in some localities early blight causes heavy losses but the average damage for the country as a whole is probably somewhat less than 1 per cent. The losses in 1926 total about the same as during the past few years. As will be seen from the accompanying table the highest percentage loss estimates came from Delaware and Ohio.

Regarding the susceptibility of varieties, R. E. Vaughan of Wisconsin reported the Ohio and Triumph as very susceptible in that state, and R. A. Jehle of Maryland stated that there was very little early blight in fields of Jersey Redskins and McCormicks, but in fields from northern grown seed (Irish Cobblers) heavy infection occurred.

Early blight is primarily a foliage disease but in recent years the pathologists of the Maine Experiment Station (2) have shown that the fungus also attacks the tubers. Some tuber injury was reported in Maine in 1926, and in Florida, L. O. Gratz, located in the Hastings section, noted that a considerable portion of the Maine seed stock arriving in Florida during December 1925 and January 1926 showed from one to 5 spots approximately 1-5 mm. in diameter. This did not result in much foliage injury, however, and the loss on that score was negligible.

Bonde (1) of Maine has recently isolated several distinct strains of <u>Alternaria solani</u> from tuber lesions and has observed mutations of some of these strains in culture.

Table 53 . Percentage losses from early blight of potato, as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
1.5	Arizona, Delaware, Ohio	0.2	New Jersey
1.	Maryland, Virginia, North Carolina, Louisiana, South Dakota	trace	New York, West Virginia, South Carolina, Georgia, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Oregon.
0.5	Tennessee, Michigan, North Dakota		

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SCAB CAUSED BY ACTINOMYCES SCABIES (THAX.) GÜSSOW

Scab is one of the most common diseases of potato, being present practically everywhere the crop is grown but varying greatly in its occurrence and severity with fluctuations in environmental factors such as soil temperature, moisture, reaction, and degree of infestation of the soil, as well as with the extent of infection of the seed, the rate of growth of the tubers, and the variety.

In 1926 it was reported from a great majority of the states. In most of them it was said to be of about the average, or less than average prevalence, but in North Carolina, Indiana, Nebraska, the Kaw Valley of Kansas, and in certain parts of some other states, it was thought to be more prevalent than usual. Some of the collaborators' reports concerning prevalence and losses follow:

> New York (Long Island): The money loss from this disease is not great because the percentage of infection is low enough to permit the sale of crop as a whole for No.1 stock. (Clayton)
>
> Kentucky: From St. Mathews, Jefferson County, reports of about 50 per cent infection on about 11,000 acres were received. Some crops cut in price as much as 20 per cent. Some as little as 5 per cent. The yield of scabby potatoes is generally higher than those free. (Gardner)
>
> North Carolina: Potato scab was rather severe this year, especially on scab-infested soil. In some instances more than 50 per cent of the tubers were sufficiently scabbed to be rejected from U. S. Grade No. 1. It is likely that dry weather with low moisture content of the soil was responsible for the prevalence of this disease. (Fant)
>
> Texas: An epidemic of this disease in the lower Rio Grande Valley around San Benito and Brownsville. Found everywhere on all soils and where treated and certified seed was used and on untreated seed. The disease was favored by an unusually wet and cool period during the spring months. (Taubenhaus)
>
> Arkansas: Quite common this year with typical raised blisters, symptoms which are rare in this state. Instead of these symptoms there are usually found deep pits with heavily calloused margins. Is this injury due to scab? Whatever the cause, these pits are quite common and are often taken to be scab. (Rosen)

Missouri: In Jackson County this disease is entirely controlled by means of seed treatment and seed certification. In one field visited a check plot showed heavy infestation of scab. In southern Missouri it was common to find scab infection as high as 25 per cent. Seed treatment of course had not been used. (Archer)

Oregon: Not an important disease in the State. Troublesome only in some sections as in eastern portion on early market crop. (McKay)

The percentage loss in grade, or the percentage of culls, on account of scab as reported by collaborators from some of the states is given in table 54

Potato varieties differ considerably in their susceptibility to scab. Lutman (8) has shown that resistance is correlated with thickness of skin, the tubers having the thickest skin, as with the russet type, being the most resistant. Table 55 summarizes the information on file in the Plant Disease Survey with regard to the susceptibility of individual potato varieties. It shows rather close agreement of various authorities as to which varieties are susceptible and which ones are resistant. It also shows that varieties within a group all tend to exhibit the same characteristics as regards susceptibility to scab. Thus the Green Mountain group as a whole appears to be susceptible, while the Burbank and Rural groups show resistance.

Treatment of the seed with corrosive sublimate or formaldehyde, either cold or hot, is one of the standard methods of scab prevention. Organic mercury compounds used as a dust or a dip were reported by W. H. Martin to have given satisfactory results as a seed disinfectant for scab in New Jersey last year. The recent progress in potato seed treatment has already been discussed (see page 221).

Sanford (9) has recently made a study of some of the factors influencing the pathogenicity of the potato scab organism. He has attempted to learn the reason for reported reduction in the amount of scab following the plowing under of green rye crops and concludes that if control is secured by this means it is probably not because of an increase in soil acidity but for some other reason, and suggests that it may be on account of competition of the scab bacterium with other microorganisms which are increased in the soil by the turning under of the rye crop.

Table 56. Percentage loss in grade of potatoes on account of scab. 1926.

Percentage loss	States reporting	Percentage loss	States reporting
8	Texas		
5	New Jersey, Missouri, Kansas	1	Virginia, North Carolina
3	New York	0.5	California
2	Maryland, Minnesota, Iowa, Arizona	trace	Majority of other states

Potato - Scab

Table 57. List of scab resistant and scab susceptible varieties of potatoes as reported by Plant Disease Survey collaborators and others.

Group and Variety	Reported as: Resistant	Reported as: Susceptible	Percentage clean tubers in tests	State	Authority	Year
1. COBBLER GROUP						
Irish Cobbler	--	x	--	Kans.	R. P. White	1924
	--	x	--	Mich.	J. E. Kotila	1926
	--	x	--	N. J.	W. H. Martin	1922
		x	40.8	N. J.	W. H. Martin	1924
		x	--	N. J.	W. H. Martin	1926
		x	--	N. Y.	Charles Chupp	1924
	--	x	--	Pa.	C. R. Orton	1924
	--	x	38	Wisc.	Brann & Vaughan (1)	1921
	--	x	21.5	Wisc.	Brann & Vaughan (1)	1923
2. TRIUMPH GROUP						
Triumph	--	x	--	General	L. R. Jones (6)	1903
		x	--	Mich.	J. E. Kotila	1906
		x	49	Wisc.	Brann & Vaughan (1)	1921
		x	4.9 *	Vt.	Lutman (8)	1919
4. ROSE GROUP						
Early Rose	--	x	--	General	L. R. Jones (6)	1903
	--	x	--	Europe	L. R. Jones (6)	1903
	--	x	--	Pa.	C. R. Orton	1913
5. EARLY OHIO GROUP						
Early Ohio	--	x	--	General	L. R. Jones (6)	1903
	--	x	--	Iowa	I. E. Melhus	1917
	--	x	--	Kans.	R. P. White	1924
	--	x	--	Wisc.	Brann & Vaughan (1)	1921

Group and Variety	Reported as Resistant	Reported as Susceptible	Percentage clean tubers in tests	State	Authority	Year
6. HEBRON GROUP						
Beauty of Hebron	--	x	--	General	L. R. Jones (6)	1903
7. BURBANK GROUP						
Money Maker	x	--	52.1	Vt.	Wm. Stuart (10)	1914
Cambridge Russet	x			Mich.	L. R. Jones (6)	1903
	x			N. Y.	L. R. Jones (6)	1903
	x		63.5	Vt.	Lutman (8)	1919
Russet Burbank (Netted Gem)	x			Minn.	Sect. Pl. Path.	1917
	x			Minn.	Sect. Pl. Path.	1918
	x			Idaho	O. A. Pratt	1915
	x			Idaho	C. W. Hungerford	1924
	x			Idaho	C. W. Hungerford	1925
	x		60.6	Vt.	Lutman (8)	1919
Scab-proof	x		67.9	Vt.	Lutman (8)	1919
	x			Wisc.	L. R. Jones (6)	1903
Burbank	x		61.8	N. J.	W. H. Martin	1923
		x	37.0	N. J.	W. H. Martin	1924
	x		68	Wisc.	Brann & Vaughan(1)	1921
8. GREEN MOUNTAIN GROUP						
Green Mountain		x		Ky.	J. S. Gardner	1922
		x		Mich.	J. E. Kotila	1926
		x		N. J.	W. H. Martin	1922
		x	6.2	N. J.	W. H. Martin	1923
		x	28.4	N. J.	W. H. Martin	1924
		x		N. J.	W. H. Martin	1926
		x		N. Y.	Charles Chupp	1924
		x		Pa.	C. R. Orton	1924
		x		R. I.	L. F. Kinney (7)	1891
		x	2.9	Vt.	Lutman (8)	1919
		x		Wisc.	Brann & Vaughan(1)	1915
		x	60	Wisc.	Brann & Vaughan(1)	1921
		x		Wisc.	R. E. Vaughan	1922
		x		Wisc.	R. E. Vaughan	1923
Norcross		x		N. J.	W. H. Martin	1926
		x		Vt.	Lutman (8)	1919
Idaho Rural		x		Idaho	Hungerford	1924
		x		Idaho	Hungerford	1925

Group and Variety	Reported as Resis-tant	Reported as Suscep-tible	Percentage clean tubers in tests	State	Authority	Year
9. RURAL GROUP						
Carmen No.3	x			Ohio	L. R. Jones (6)	1903
	x			N. Y.	L. R. Jones (6)	1903
	x			Vt.	L. R. Jones (6)	1903
Million Dollar	x		59.3	Vt.	Wm. Stuart (10)	1914
No. 9	x		50.6	N. J.	W. H. Martin	1923
	x		56.0	N. J.	W. H. Martin	1924
Rural New Yorker	x			Iowa	I. E. Melhus	1917
	x			Mich.	J. E. Kotila	1926
	x		50.4	N. J.	W. H. Martin	1923
	x			Pa.	C. R. Orton	1924
	x			Wisc.	R. E. Vaughan	1917
	x			Wisc.	R. E. Vaughan	1918
	x			Wisc.	R. E. Vaughan	1919
	x			Wisc.	R. E. Vaughan	1920
	x		76	Wisc.	Brann & Vaughan(1)	1921
	x			Wisc.	R. E. Vaughan	1922
Late Petosky (Rural Russet)	x			Mich.	H. C. Moore	1924
	x			Mich.	J. E. Kotila	1926
	x			N. J.	W. H. Martin	1923
	x		69	N. J.	W. H. Martin	1924
	x			N. J.	W. H. Martin	1926
	x			N. Y.	Charles Chupp	1924
	x			Pa.	C. R. Orton	1924
UNCLASSIFIED AMERICAN VARIETIES						
American Giant	x			N. J.	L. R. Jones (6)	1903
	x			N. J.	W. H. Martin	1922
	x		62.6	N. J.	W. H. Martin	1923
	x		60.0	N. J.	W. H. Martin	1924
	x			N. J.	W. H. Martin	1926
	x			N. Y.	Charles Chupp	1921
Aurora	x			Vt.	L. R. Jones (6)	1903
Rehobeth		x		Md.	J. B. S. Norton	1915
Reading Russet		x	1	Vt.	Lutman (8)	1919
Rough Diamond	x			Mass.	Humphrey (5)	1891
White star		x	3	Vt.	Lutman (8)	1919
Smooth skin varieties		x		West States	Shapovalov	1921
		x		Calif.	D. G. Milbrath	1923

Group and Variety*	Reported as: Resistant	Reported as: Susceptible	Percentage clean tubers in tests	State	Authority	Year
UNCLASSIFIED AMERICAN VARIETIES (Cont.)						
Early varieties		x		Wyo.	H. G. McMillan	1920
		x		Wisc.	R. E. Vaughan	1922
UNCLASSIFIED EUROPEAN VARIETIES						
Boncza	x			Europe	L. R. Jones (6)	1903
	x		74.2	Vt.	Wm. Stuart (10)	1914
Dabersche		x		Germ.	L. R. Jones (6)	1903
Discovery	x		50.3	Vt.	Wm. Stuart (10)	1914
Eureka	x		52.1	Vt.	Wm. Stuart (10)	1914
Füerst Bismark	x		61.4	Vt.	Wm. Stuart (10)	1914
Irene	x			Europe	L. R. Jones (6)	1903
Ninety-fold	x		59.9	Vt.	Wm. Stuart (7)	1914
		x	0.7	Vt.	Lutman (8)	1919
Pomerania	x			Vt.	Wm. Stuart (10)	1914
Prof. Wohltmann	x		50.2	Vt.	Wm. Stuart (10)	1914
	x			Europe	L. R. Jones (6)	1903
Richter's Imperator	x			Germ.	L. R. Jones (6)	1903
Sir John Llewellyn	x		60.6	Vt.	Wm. Stuart (10)	1914

Footnote:

*Lutman's figures represent the average of three annual tests.

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4. Funk, F. J. and J. H. Gooding. Some experiments on the control of potato scab (Actinomyces scabies) with semesan and other organic mercury compounds. Proc. Potato Assoc. Amer. 12: 109-113. 1926.

5. Humphrey, J. E. Potato scab. In Eighth Ann. Rept. Massachusetts Agr. Exp. Sta. 1890: 216-220. 1891.

6. Jones, L. R. Disease resistance of potatoes. U. S. Dept. Agr. Bu. Pl. Ind. Bul. 87: 1-39. 1903.

7. Kinney, L. F. The potato scab. Rhode Island Agr. Exp. Sta. Bul. 14: 183. 1891.

8. Lutman, B. F. Resistance of potato tubers to scab. Vermont Agr. Exp. Sta. Bul. 215: 1-30. 1919.

9. Sanford, G. B. Some factors affecting the pathogenicity of Actinomyces scabies. Phytopath. 16: 525-547. Aug. 1926.

10. Sanford, G. B. The relation of some soil factors to the development of common scab of potatoes. Proc. Potato Assoc. Amer. 12: 113-120. 1926.

11. Stuart, William. Disease resistance of potatoes. Vermont Agr. Exp. Sta. Bul. 179: 147-183. 1914.

BLACKLEG CAUSED BY BACILLUS PHYTOPHTHORUS APPEL

Blackleg occurs widely with the potato crop, but, depending on the seed source and other factors, for the most part is more or less localized or scattered in its distribution. It seems to be most common and troublesome in the northern potato states and, as these states grow a large proportion of the seed crop, it is spread far and wide with the seed stock and sometimes causes heavy local losses in central and southern states where infected seed is planted.

The prevalence of blackleg in 1926 as compared with last year and the average year as reported by collaborators is given in table 57 . More than usual prevalence was reported from New York, New Jersey, Michigan, Missouri, Idaho, and Louisiana.

In Maine considerable damage was occasioned in some fields. No definite estimate of loss for the state is available, but some fields with high percentages (10 per cent) were reported. The Maine reporter stated that the damage seemed to occur in isolated cases and remarked that imported Canadian seed was showing more of the disease than was formerly the case. In New Hampshire the disease was reported again from the Colebrook area in the extreme northern part of the state where it seems to be largely confined. In New York the Monroe County Farm Bureau reported that blackleg was found in practically every shipment of Michigan seed. In New Jersey it was found only in fields planted with seed from two northern sources. As high as 15 per cent was found in some fields planted with this seed. In Kentucky a field of 4 acres showed 75 per cent reduction in yield from what appeared to be mostly blackleg. F. P. McWhorter of the Virginia Truck Experiment Station reported that blackleg seemed to be the most serious potato disease in the Norfolk section in 1926, as it was widely distributed and was occasionally severe. In the North Carolina early potato sections also it was rather prevalent. In the Hastings section of Florida, however, according to L. O. Gratz, only a little of the disease was observed and the loss was no more than a trace. In Michigan, J. E. Kotila reported blackleg more prevalent than usual with some fields showing 6 per cent. On August 1 he reported that it was found in most fields visited in Lower Michigan but was probably more abundant in Upper Peninsula fields where weather conditions of July were more favorable. R. W. Goss noted that it was present only in eastern Nebraska where a trace to 5 per cent infection occurred in fields planted to northern grown seed. Considerable infection was observed in Douglas County, Nebraska, in plantings of Early Ohio from the Red River Valley. In Wisconsin collaborators reported it as a very minor trouble. In the Kaw Valley of Kansas the disease was of about average severity. As high as 10 per cent infection was observed in some fields. From Idaho, C. W. Hungerford reported that a slight annual increase in amount of blackleg seemed to be occurring. Warm dry weather was said to be unfavorable to the disease in Oregon.

The estimated losses by states are given in table 58.

A paper by J. G. Leach (3) on the relation of the seed-corn maggot to potato blackleg, published during the year, reports a mutualistic symbiosis between the seed-corn maggot and the organism, or organisms, causing blackleg. The bacteria are associated with, or carried by, the insect in all its stages and hibernate within the puparia. The insect inoculates the potato tuber with the pathogene and assists in the development of the disease by destroying the wound cork naturally formed by the seed-piece to ward off the disease. From the standpoint of the insect the bacteria are necessary for normal growth, for when larvae are deprived of them as food they remain stunted and die early. The results of this investigation answer some hitherto puzzling questions. They explain the occurrence of blackleg in fields planted with seed that is known to be free from blackleg infection, show that seed-piece contamination at cutting time is probably not so important as has been commonly believed, demonstrate that in the control of blackleg the seed-corn maggot must be considered, and indicate, although this has not been proved, that a poison on the surface of the cut seed-piece may be effective in killing the maggots as they attack and thus prevent injury.

Three collaborators mentioned this insect relationship in their reports.

> Virginia: This season's notes give clear proof that the disease may come from the soil. We are particularly interested in the relation to insects. (McWhorter)

> Kansas: We have been able to check upon the relationship of the seed-corn maggot to blackleg, finding maggots in most of the seed-pieces that are decayed and in diseased stems. Pupae, young adults, mature adults, and eggs were also collected indicating that the second brood of seed-corn maggot flies is here. (White) (June)

Potato - Blackleg

Missouri: Last year (1925) some fields had 75 to 80 per cent loss even on certified seed. Infection probably due to maggot injury to seed-pieces. (Page)

Table 59. Estimated average percentage loss from, and relative prevalence of potato blackleg in 1926, as reported by collaborators, 1926.

State	Estimated percentage loss 1926	Prevalence compared with 1925	Prevalence compared with Average year	State	Estimated percentage loss 1926	Prevalence compared with 1925	Prevalence compared with Average year
Mo.	7	less	more	N. Y.	0.6	more	more
Minn.	3	same	same	Oreg.	0.5	less	less
Kans	3	same	same	Mont.	0.5	--	--
Ariz.	2.5			N. J.	0.2	much more	more
N. Dak.	2.	less	less	N. H.	trace	same	same
N. Car.	1.5	--	--	W. Va.	trace	--	--
Md.	1	same	same	Fla.	trace	same	same
Mich.	1	more	more	La.	trace	more	more
Iowa	1	less	less	Ohio	trace	less	less
S. Dak.	1	--	--	Wisc.	trace	--	--
Idaho	0.75	more	more	Colo.	--	same	same
				Wash.	trace	same	same
				Calif.	trace	--	--

Recent literature

1. Berridge, Emily M. Studies in bacteriosis. XIV. Chemical agglutination as a means of differentiating bacterial species causing soft rot of potatoes and other vegetables. Ann. Appl. Biol. 13: 12-18. 1926.

   The results indicate that chemical agglutination tests are as reliable as those with serum in the case of <u>Bacillus phytophthorus</u>, <u>B. carotovorus</u>, and <u>B. solanisaprus</u>. They show also that the three organisms are all different.

2. Lacey, Margaret S. Studies in bacteriosis. XIII. A soft rot of potato tubers due to Bacillus carotovorus and a comparison of the cultural, pathological and serological behavior of various organisms causing soft rots. Ann. Appl. Biol. 13: 1-11. 1926.

   The tests show that <u>Bacillus carotovorus</u>, <u>B. phytophthorus</u>, and <u>B. solanisaprus</u> are closely related but that there are sufficiently marked and constant differences to warrant their continued separation into different species.

3. Leach, J. G. The relation of the seed-corn maggot (Phorbia fusciceps Zett.) to the spread and development of potato blackleg in Minnesota. Phytopath. 16: 149-176. 1926.

STEMROT AND SCURF CAUSED BY CORTICIUM VAGUM BERK. & CURT. (RHIZOCTONIA SOLANI KÜHN)

Rhizoctonia is one of the most widespread and important fungous parasites of potato, causing rotting of sprouts, missing hills, girdling of stems, rosetting of tops, and scurf and russeting of the tubers. In 1926 it was reported as occurring in about the same amounts as usual in most states although New Jersey, Maryland, Louisiana, Arkansas, and Arizona reported more than normal prevalence, and New Hampshire, Illinois, Iowa, Kansas, and Oregon reported less. The losses as estimated by collaborators are given in table 60 . The estimated average percentage losses for the United States for the past eight years have been: 1918, 2.2; 1919, 2.0; 1920, 2.0; 1921, 2.7; 1922, 2.9; 1923, 2.7; 1924, 2.7; 1925, 2.8; eight year average, 2.5. It will be noted that the losses have not fluctuated much.

Some of the collaborators' reports are given herewith:

New York (Wyoming Co.): More than one-tenth of the potatoes planted in this county this year were destroyed by Rhizoctonia. (Woodward)

(Ontario Co.): Rhizoctonia on untreated seed has caused an uneven stand on many potato fields. (Pease)

(Nassau Co.): Rhizoctonia is present to some extent. (Boyce)

New Jersey: Most of the damage resulted before the plants came through the ground. The trouble was most severe on light soils. The dip treatments with the organic mercury compounds gave as efficient control of scurf as $HgCl_2$. (Martin)

Maryland: This disease made its first appearance in our early Cobblers soon after they began to sprout, killing and injuring many young sprouts and causing an uneven stand. The trouble was general, but was much more severe in some fields than in others. Later the disease made its appearance in the field with the usual rosette symptoms. The loss was only slight in the early crop, since few plants were affected. However, in the late crop in western Maryland losses were very severe from this phase of the disease, some fields inspected for certification having as high as 8 per cent of the plants affected. In the early crop a third phase of the disease was unusually severe. This phase of the disease caused a fine cracking of the skin giving the tubers a russeted appearance. The injury was so severe in many cases that the potatoes could not be placed in the U. S. No. 1 grade. (Jehle)

Kentucky: Injury to sprouts in early crop. Apparently no injury to late crop and no sclerotia on late crop potatoes. (Gardner & Valleau)

South Carolina (Beaufort Co.): Fields planted with untreated seed damaged from 5 to 20 per cent by bad stands and infected growing plants. General losses from 5 to 10 per cent. (Moore)

Florida: Less than 1 per cent of the plants show symptoms, and the actual loss in yield is much less than one-half per cent. However, slightly more plants had Rhizoctonia symptoms this year than last year. These symptoms appeared comparatively early, and disappeared to a large extent later on. (Gratz)

Missouri: This is most severe disease of potato. The average untreated field will run 70 to 90 per cent infection. Treated fields have 10 to 20 per cent infection. Loss in untreated fields is 20 per cent. (Page)

Nebraska: Very slight sprout infection. More stem girdling of large plants and considerable sclerotia. (Goss)

Kansas: Untreated fields and check plots are showing from 40 to 80 per cent diseased plants. Treated fields or parts of fields show from none to 40 per cent diseased plants. (White)

Washington: Generally prevalent in all parts of the state. Considerable damage is done throughout the season. The disease is of minor importance as compared with the virus diseases. (Dept. Pl. Path.)

Oregon: This disease is doing the usual amount of damage. It is a major factor in reducing yields in Oregon. (Barss)

Arizona: General. Severe in Greenlee County, Duncan District. Maximum reduction in yield 50 to 60 per cent; 90 per cent infection in some fields. No difference in susceptibility of varieties (Peerless, Early Ohio, etc.). Cold wet season after planting and too much irrigation water. Formaldehyde treatment (cold solution) and certified seed ineffective. Beans and other crops also attacked. (Brown)

The acidulated corrosive sublimate treatment reported by Cunningham (2) from New Zealand in 1925 has been tested further by Cunningham and Neill (3) who state that although the results in the laboratory were excellent under the conditions of their experiments the treatment did not appear to be so satisfactory when put into actual practice. For other notes on control see "Potato Seed Treatment" page 61 .

Table 62 . Percentage losses from stemrot and scurf of potato as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
15	Arizona	1	Virginia, Louisiana, Wisconsin, Iowa, Montana
10	Missouri, Oregon		
7	Kentucky, Kansas		
4	Maryland, Minnesota	.5	Connecticut, New York
3.5	New Jersey, North Dakota	.1	Florida
3	South Carolina, Arizona	.25	Michigan
		trace	West Virginia, Georgia, Arkansas, Texas, Ohio
2	North Carolina, South Dakota, Idaho, Washington California		

Recent literature

1. Braun, H. Ueber den Wert der Kartoffelbeizung, insbesondere über die Möglichkeit der Hypochnusbekämpfung mit Hilfe der Beizung. Fortschr. Landwirtsch. (Vienna) 50: 201-206. 1926.

2. Cunningham, G. H. Corticium-disease of potatoes. New Zealand Jour. Agr. 30: 14-21. Jan. 1925.

3. ________________ and J. C. Neill. Corticium-disease of potatoes. New Zealand Jour. Agr. 33: 174-175. Sept. 1926.

WILT CAUSED BY FUSARIUM SPP.

Several states reported the occurrence of Fusarium wilt caused by F. oxysporum but in none of them was much damage reported except locally. Of the states reporting, Ohio and Minnesota reported less than the usual amount, and Virginia reported more. In Northampton County on the eastern shore peninsula of Virginia, where some 3,000,000 bushels of early potatoes are grown, considerable trouble from what appeared to be Fusarium wilt was reported, with as high as 30 per cent infection being observed in some fields. In the Grand Junction-Fruita section of western Colorado, H. G. McMillan, located at Greeley, Colorado, reported that the disease was general and very severe and that the early Irish Cobbler crop was practically an entire loss, there being estimated an 80 per cent reduction in yield.

Comparatively few collaborators ventured to make estimates of losses from Fusarium wilt for their states, however, it was thought that perhaps 3 per cent reduction in yield occurred in Virginia and Montana, 2 per cent in

Oregon, 1.5 per cent in North Dakota, and 1 per cent in Maryland, Michigan, Texas, and California. Only a very small fraction of a per cent loss was reported from North Carolina, Georgia, Louisiana, Ohio, Wisconsin, Missouri, Washington, and Arizona.

Recent literature

1. Morris, H. E. Field wilt (Fusarium) of potatoes. Montana Agr. Exp. Sta. Bul. 184: 1-14. 1926.

STORAGE ROTS CAUSED BY FUSARIUM SPP.

Although Fusarium storage rots are of considerable importance only a very few state collaborators sent in reports concerning them in 1926.

> Missouri: Probably high infection but commercial produce is sold immediately. Home garden produce, when stored, shows high loss. (Page)

> Washington: Usual amount of loss from Fusarium storage rots in 1925 crop. (Dept. Pl. Path.)

Recent literature

1. Morris, H. E. Storage dry rot of potatoes. Montana Agr. Exp. Sta. Bul. 183: 1-10. 1926.

WILT AND STEM-END ROT CAUSED BY FUSARIUM EUMARTII CARPENTER

High temperatures and low moisture in Nebraska favored wilt and decreased stem-end rot of the tubers, according to R. W. Goss. As usual the disease was very important in that state. What seems to be the same disease was reported for the first time from Iowa by I. E. Melhus. No specimens were received however.

WILT CAUSED BY VERTICILLIUM ALBOATRUM REINKE & BERTH.

The Verticillium wilt was reported by collaborators from Maine, Florida, Oregon, and California. In the first two states the losses were said to be very slight. In Oregon, however, M. B. McKay estimated the loss at 4 per cent and in California, D. G. Milbrath estimated it at 1 per cent. In Oregon, according to McKay, it is more common and disastrous than Fusarium wilt and is generally distributed in most counties. It is being brought more under control there by roguing and rotation. All varieties noted were susceptible.

Recent literature

1. Curzi, M. La tracheo-verticilliosi della Patata in Italia. (Tracheoverticilliosis of potato in Italy.) Riv. Patol. Veg. 16: 77-83. 1926.

2. McKay, M. B. Further studies of potato wilt caused by Verticillium albo-atrum. Jour. Agr. Res. 32 (5): 437-470. 1926.

3. ____________ Potato wilt and its control. Oregon Sta. Bul. 221: 1-23. 1926.

BACTERIAL WILT CAUSED BY BACTERIUM SOLANACEARUM EFS.

Maryland, South Carolina, and Florida are the only states reporting this disease in 1926. Some of the states where it is known to have occurred in the past, but which sent in negative reports for 1926, are Virginia, Tennessee, Georgia, and Louisiana.

Maryland: A trace of bacterial wilt was found in several fields of Cobbler potatoes inspected for certification. In one field an area of about 1/16 of an acre located in a low portion of the field was entirely killed out and scattered plants in the adjacent area were becoming infected. (Jehle)

South Carolina: First found near Beaufort April 22. Found in all fields inspected by June 1. Reduction in yield trace. (Moore)

Florida: A trace only was found. This disease seems to be localized chiefly in one or two fields while elsewhere usually but an occasional hill is observed.

WART CAUSED BY SYNCHYTRIUM ENDOBIOTICUM (SCHILB.) PERC.

No extension of the infested areas in Pennsylvania, Maryland, and West Virginia were reported to the Plant Disease Survey during the year. The situation in these three states is given in the following quotations from collaborators.

Potato - Wart

Pennsylvania: The potato wart disease is now present in eight hundred and thirteen gardens and one farm; these infections occurring in fifty-eight towns and villages in eleven counties of Pennsylvania.

In 1923 it was decided to begin a resurvey of Pennsylvania starting with the known warted areas as a center and to expand the survey from these centers each year as funds and time permit until the whole state is covered.

In the present survey work every town and village in the county being surveyed is covered, except large cities, and in each town or village surveyed every garden is looked over and if potatoes are found growing a note is made of the variety and if susceptible an inspection is made for the presence of the wart disease. This inspection is made as follows: The inspector examines a plant, every tenth throughout the row, and in every other row. To do this the plant need not be pulled out for inspection, since the presence of wart can be detected on the stem of the plant by carefully removing the soil to a depth of about four inches, for rarely is wart found below this depth, and usually at the surface or at most one to two inches below the surface. If wart is not found the soil is replaced and no injury follows the inspection. This fact is of considerable value, since it tends to prevent hostility or interference with the inspections. (McCubbin)

Maryland: We have no further information on wart this year. Inspection of Westernport and adjoining territory was made last year, as well as gardens adjacent to the wart infected premises. No new infected gardens were found. The situation is, therefore, the same as last year. (Jehle)

West Virginia: There are no particularly new developments in West Virginia up to the present time. The quarantine is still enforced and planting under permit is allowed. The known infected area has been increased slightly but it is merely another garden or two at Thomas. (Giddings)

In Pennsylvania (1) the resistant McCormick has been crossed with the susceptible Rural Group, with the result that three lots of seedlings showing some promise as commercial varieties have been developed.

Table 63. . Potato wart survey in Pennsylvania, 1926.

County	Towns	No. gardens planted to potatoes	No. gardens planted to immune varieties	No. gardens planted to susceptible varieties	No. gardens found to contain wart disease
Cambria	3	46	14	32	0
Fulton	20	99	33	66	0
Bedford	16	83	25	58	0
Indiana	4	33	14	19	0
Somerset	29	149	32	117	0
Fayette	9	116	42	74	0
Tioga	5	194	6	188	0
Totals 7	86	720	166	544	0

The 1926 literature on potato wart from countries outside of the United States is very extensive and space will permit the listing of only a few of the more important references.

Recent literature

1. Anon. Potato wart project. In Pennsylvania Agr. Exp. Sta. Bul. 204 (Ann. Rept. 39: 1925-26): 18. 1926.

2. Botjes, J. G. O. De stand van het vraagstuk der bestrijding van Aardappelwratziekte. (The position of the question of the control of Potato wart disease.) Tijdschr. over Plantenziekten 32 (2): 33-44. 1926.

3. Cartwright, Katherine. On the nature of the resistance of the potato to wart disease. Ann. Bot. 40: 391-396. Apr. 1926.

4. Doidge, Ethel M. Wart disease of potatoes (Synchytrium endobioticum Pers.) Jour. Dept. Agr. South Africa 12 (2): 161-169. 1926.

5. Esmarch, F. Untersuchungen zur Biologie des Kartoffelkrebses. I. Angew. Bot. 8: 102-135. 1926.

6. Glynne, Mary D. The viability of the winter sporangia of Synchytrium endobioticum (Schilb.) Perc., the organism causing wart disease in Potato. Ann. Appl. Biol. 13 (1): 19-36. 1926.

7. Glynne, M. D. Wart disease of potatoes: the development of Synchytrium endobioticum (Schilb.) Perc., in "immune" varieties. Ann. Appl. Biol. 13: 358-359. Aug. 1926.

8. Kohler, E. Fortgeführte Untersuchungen über den Kartoffelkrebs. Biol. Reichsanst. fürLand- und Fortwirtsch. 14: 267-290. 1926.

9. Neuweiler, E. Das Auftreten des Kartoffelkrebses in der Schweiz im Jahre 1925. Landw. Jahrb. der Schweiz 40: 283-285. 1926.

10. Roach, W. A., and Wm. B. Brierley. The treatment of wart disease of potatoes with sulphur. Science n.s. 63: 307-308. Mar. 1926.

11. ______________ Further experiments on the use of sulphur in relation to wart disease of potatoes. Ann. Appl. Biol. 13: 301-307. 1926.

12. Schlumberger, O. Fünf Jahre Reichskrebsprüfungen. Deutsche Landw. Presse 53 (1): 1. 1926.

POWDERY SCAB CAUSED BY SPONGOSPORA SUBTERRANEA (WALLR.) T. JOHNSON

The State of Washington is the only one reporting powdery scab in 1926. It was found by G. L. Zundel during July at Oysterville, Pacific County, where there was about 3 per cent infection in the field observed. Zundel thinks that the disease occurs rather generally in western Pacific County. A specimen of the disease was received from Oysterville, Washington, by the Bureau of Plant Industry August 30.

Powdery scab on potatoes from Scotland was intercepted by Federal Horticultural Board inspectors at Philadelphia in October, 1926.

Recent literature

1. Anon. Corky scab in potatoes. Gard. Chron. 3 (1783): 97, 98. 1921.

VIRUS DISEASES

The following references are given under this heading since they include work on the virus diseases in general rather than on any one specific disease. A number of workers have been conducting tests to determine the reduction in yield caused by various percentages of disease. In Maine, Folsom, Schultz, and Bonde (2) found that the yield of diseased plants was lower than that of the healthy plants by the following percentages:

Potato - Virus Diseases

	1924	1925
Spindle tuber	20%	25%
Mild mosaic	8-15%	25%
Rugose mosaic	50%	60%

In New Jersey, W. H. Martin (3) has worked out the following table based on his experiments which shows decrease in yield due to varying percentages of disease.

	10%	15%	20%
Mild mosaic	7 bus.	12 bus.	15 bus.
Spindle tuber	22 bus.	34 bus.	45 bus.
Rugose mosaic	23 bus.	35 bus.	46 bus.
Leafroll	27 bus.	41 bus.	54 bus.

Recent literature:

1. Folsom, D. Virus diseases of the potato. Ann. Rept. Quebec Soc. Prot. Plants 18: 14-29. 1926.

2. Folsom, D., E. S. Schultz, and R. Bonde. Potato degeneration diseases: natural spread and effect upon yield. Maine Agr. Exp. Sta. Bul. 331: 57-112. Mar. 1926.

3. Martin, W. H. Influence of degenerative diseases on yield. Hints Potato Grow. 7 (6): 1-4. Oct. 1926.

4. Morstatt, H. A. Entartung, altersschwäche und abbau bei Kulturpflanzen, insbesondere der kartoffel. Freising-München, F. P. Datterer & cie., 1925 (Naturwissenschaft und landwirtschaft. h. 7)

5. Murphy, Paul A., and Robert McKay. Investigations on the leafroll and mosaic diseases of the potato. Jour. Dept. Lands & Agr. Ireland 26: 1-8. 1926.

6. ________________ Methods for investigating the virus diseases of the potato, and some results obtained by their use. Scient. Proc. Royal Dublin Soc. 18 (14): 169-184. 1926.

7. Tompkins, C. M. Influence of the environment on potato mosaic symptoms. Phytopath. 16: 581-610. Sept. 1926.

MOSAIC (CAUSE UNDETERMINED)

Mosaic is widespread with susceptible varieties of potatoes throughout the United States. In 1926 it was reported as occurring in all states sending in reports. In prevalence it was either less than, or the same as, the average year. Oregon was the only state reporting it as more prevalent than usual. On the other hand Maryland, South Carolina, Louisiana, Wisconsin, and Idaho reported less than usual, and the same states together with New Hampshire reported less than last year. With the increased use of certified seed for commercial planting a gradual reduction in the amount of mosaic is undoubtedly taking place. Several collaborators mention this in their reports.

Mosaic is one of the most important potato diseases. The average loss for the United States during the past eight years has been 2.5 per cent. The losses in 1926 as estimated by state collaborators are given in table 64.

The situation in the various states can best be judged directly from some of the collaborator's reports.

> Maine: An analysis of 119 fields taking into consideration all varieties showed that mosaic on the first inspection was only 1.8 per cent. The highest one in the lot was 8 per cent while there were several where the percentage was much less than 1 per cent. (E. L. Newdick)

> New York: This disease appeared to be somewhat masked in July so that it was impossible to determine the amount of infection. Later observations indicate it to be as abundant as last year. It appears to be especially prevalent in Green Mountain fields of northeastern part of state. (Barrus)

> (Long Island): Observed much more mosaic in certified seed this year than usual, some lots showed 40 and 50 per cent. Impossible, owing to scattered occurrence, to estimate loss. (Clayton)

> New Jersey: Very common on Green Mountains. Some fields planted with certified seed showed 25 per cent infection. (Martin)

> Maryland: Disease-free McCormick seed gave an increase of 200 bushels per acre over diseased seed. (Jehle & Temple)

> Kentucky: About 15 per cent reduction of crop where non-certified seed were used in Jefferson County. (Gardner)

> Tennessee: Mosaic conspicuous by its absence. The weather has been generally cool for season. More than the usual amount certified seed has been used. (Baskin)

> Southern Georgia: Important in most garden plots since certified seed is rarely used in them. (Boyd)

Potato - Mosaic

Florida: Four per cent or less of the plants are affected. This is of a mild type as far as damage to the plant is concerned and the actual loss in yield is small. (Gratz)

Louisiana: The disease is general but much reduced in amount by use of certified seed from Montana and Nebraska. (Tims)

Texas: Quite prevalent on Irish potatoes in the lower Rio Grande Valley. Two per cent loss. (Taubenhaus)

Indiana: Serious in early crop. (Gardner)

Michigan: Trace in certified fields. Various types of mosaic observed, including mild, crinkle, rugose, and dwarf. (Kotila)

Mississippi: We have the mosaic and allied degeneration diseases in great abundance, but I regret that it is impossible to give reports on them this season. (Neal)

Wisconsin: Since the majority of potatoes belong to the Rural group the losses from mosaic are very minor. (Vaughan)

Missouri: Triumph, uncertified has 75 to 90 per cent infection; certified has 8 to 10 per cent infection. On other varieties it is slight. (Page & Archer)

Oregon: Rugose mosaic continues to be the chief destructive virus disease of potatoes in Oregon. In many fields a very high proportion of diseased plants is noted. (Barss)

Both mild and rugose mosaics gradually increasing each year. Effectively controlled by proper roguing in tuber unit seed plots and by eye indexing tubers. (McKay)

Varieties reported very resistant to mosaic in 1926 were the Ohio Rural and Burbank in Wisconsin. Varieties resistant were Rural in New York and Missouri, and Irish Cobbler in New York and Tennessee. Varieties susceptible were Green Mountain in New York, New Jersey, and Wisconsin, and Jersey Redskin in Maryland. Varieties reported very susceptible were Triumph in New York, Tennessee, Wisconsin, and Missouri; McCormick in Maryland; and Earliest of All and Idaho Rural in Oregon.

Recent literature

See also "Potato - Virus Diseases" page 246.

1. Tolaas, A. G. The production of mosaic-free Triumphs. Amer. Potato Jour. 3: 301-302. Sept. 1926.

Table 64. Percentage losses from mosaic of potato, as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
15	Arkansas, Montana	2.5	Kansas
13	Oregon	2	Ohio, Indiana, Iowa
10	New Hampshire, Georgia Louisiana, Washington	1	Texas, Michigan, Minnesota, North Dakota
8	Maryland, Idaho	.5	Connecticut
7	Kentucky	trace	Virginia, West Virginia, South Carolina, Florida, Wisconsin, Missouri, Arizona
5	Tennessee		
3.2	New Jersey		
3.	New York, North Carolina, California		

LEAF ROLL (CAUSE UNDETERMINED)

Leaf roll occurred widely over the country as usual. Of the thirty states reporting it New Jersey was the only one where it was mentioned as being more prevalent than usual, and in no state was it reported as being more prevalent than in 1925. The estimates of losses are given in table
Some of the collaborators' reports are as follows:

Maine: Symptoms are distinct and outside of Aroostook it shows evidence of having spread in 1925 more than usual. (Folsom)

New York: A larger percentage of affected plants occurs in western New York, particularly in the Northwest section and along Lake Ontario. Largely Rurals grown there but it occurs in other varieties there as well. (Barrus)

(Long Island): This disease was important in a few fields most of which were planted with locally grown seed. In these cases leafroll varied from 40 to 90 per cent. (Clayton.

New Jersey: Present in every field of potatoes. Not severe in certified seed but very prevalent in non-certified seed. (Martin)

Virginia (Norfolk section): Leafroll is far more abundant than mosaic this season. As the season has been dry one must carefully distinguish between this disease and Fusarium or physiological wilt. The above statement is made with this fact in mind. Typical leafroll is too abundant in plants from all sources. The percentage is especially high for New Jersey and New York seed. Three to ten per cent is estimated for the crop in general. (McWhorter)

Georgia: Occurs in most all city and farm gardens where there is little certified seed used. (Boyd)

Florida: Trace; loss negligible. (Gratz)

Louisiana: Present but not important. (Tims)

Arkansas: Conditions in early part of season made it possible to distinguish leaf roll. (Dept. Pl. Path.)

Ohio: Present in practically all plantings where disease-free seed has not been used. Leaf roll plants yield 40 to 60 per cent as much as healthy plants. (Tilford)

Indiana: Most important disease. (Gardner)

Michigan: Most fields of certified stock show only trace. Abundant in fields planted with commercial stock. Twenty-eight per cent observed in field of Russet Burbank, 96 per cent in garden patch of mixed varieties. (Kotila)

Oregon: Disease increasing rapidly in some places. Not abundant yet over whole state. Effectively controlled by proper roguing in tuber unit plots and by eye indexing tubers. (McKay)

No varieties were mentioned as resistant to leaf roll, on the other hand most of them seem to be susceptible. The Triumph in New York and the Netted Gem in Idaho were listed as especially susceptible.

Schweizer (6) reports disappearance of symptoms of leaf roll in plants injected with albumen and pepsin. Leaves on older portion of plant unrolled and appeared normal and new growth was free from phloem necrosis.

<u>Recent literature</u> - See also "Virus Diseases" page 246.

1. Esmarch, F. Blattrollkrankheit oder nicht? Sachs. Landw. Zeitschr. 74: 543-545. Aug. 1926.

2. ___________ Das Blattrollen der Kartoffel. Kranke Pflanze. 3: 143-146. Aug. 1926.

3. Ludewig, K. Beiträge zum Studium der Blattrollkrankheit der Kartoffel. (Contributions to the study of the leaf roll disease of the potato.) Landw. Jahrb. 63 (2): 277-303. 1926.

4. McLean, W. The control of leaf roll disease in potatoes by the diagnosis of "primarily infected" tubers. Jour. Agr. Sci. 16: 149-157. Jan. 1926.

5. McLean, W. Effect of leaf roll disease in potatoes on the composition of the tuber and "mother tuber." Jour. Agr. Sci. 16: 318-324. Apr. 1926.

6. Schweizer, G. Zur Blattrollkrankheit der Kartoffelpflanze. Ber. Deut. Bot. Ges. 44: 551-561. Dec. 1926.

Table 65. Percentage losses from leaf roll of potato, as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
8	California	2	Maryland, Georgia, Idaho, Washington
7	Kentucky	1	North Carolina, Michigan,
6	Oregon	.5	Connecticut, Delaware, Montana
5.5	New Jersey	trace	West Virginia, Louisiana, Minnesota, North Dakota, South Dakota, Arizona
5	New Hampshire, Ohio		
4	Indiana		
3	New York, Arkansas		

SPINDLE TUBER (CAUSE UNDETERMINED)

It is only of recent years that spindle tuber has come to be recognized as one of the important potato diseases. The tendency of strains of potato tubers to become elongated has long been recognized as one of the symptoms of "running out", but it was not until 1922 and 1923 that spindle tuber, or marginal leaf roll, was reported in the literature as a definite transmissible disease. Since that time it has been recognized as occurring widely. In his recent treatise on this disease Werner (3) of Nebraska makes the statement that "it is apparently generally distributed through all the commercial potato growing sections of the United States." It has been reported to the Plant Disease Survey from 19 widely scattered states and probably occurs in many others but has not been recognized and reported.

In 1926 it was reported to the Plant Disease Survey for the first time from the states of New Hampshire, Missouri, Arkansas, and Kansas. In New Hampshire it was observed locally, infecting 5 per cent of the plants in some fields, and in Kansas 2 per cent reduction in yield was estimated on account of it.

In New York it was thought to be less prevalent than usual and was reported to be of slight importance, causing not over a trace of loss. In New Jersey, however, an estimate of 1.8 per cent reduction in yield was made, while 15 per cent infection was observed in some fields. In Nebraska, R. W. Goss reported it as very important, occurring generally in about the same amounts as usual. Some of the collaborators' reports are as follows:

> New York: Found in varying amounts up to 6 per cent in Nassau County. Probably less than 2 per cent spindle tuber plants in state, possibly less than 1 per cent. (Barrus)

Potato - Spindle Tuber

New Jersey: Very little spindle tuber in fields planted with certified seed. Some non-certified seed showed considerable amount. (Martin)

Florida: Four to five per cent of the plants are affected. The tubers from these hills are typically long, cylindrical, and spindly, many of which drop through the prime chain on the grader into the seconds. With high prices this is a serious loss. Spindle tuber symptoms are apparently worse in the southern part of the state. The same strain of potatoes planted in the Hastings belt produced but from one third to one half the percentage of spindle tubers as when planted in the Belle Glade section. (Gratz)

Arkansas: Quite prevalent on Bliss Triumph. (Rosen)

Missouri: Severe on Irish Cobbler; also on Early Ohio variety. The use of certified seed eliminates the disease. (Page).

Nebraska: Probably the most serious disease in Nebraska....... Spindle tuber has been the leading factor causing fields to be rejected for certification during the last few seasons. However, the certified stock is showing a constant annual decrease in spindle tuber content as a result of a general roguing and seed selection campaign. (Werner (3)

Kansas: A large amount of spindle tuber is showing up in our fields, especially in uncertified seed stock. Some such stocks ran as high as 10 per cent spindle tuber. Certified stock is much better in this respect and absence of spindle tuber in certified seed stock will be a big factor in convincing Kaw Valley growers that certified stock is what they must have for best returns. (White)

The control of spindle tuber is much the same as with the other virus diseases such as mosaic and leaf roll. Roguing and the growing of the seed stock in isolated plots has been found to be effective. The tuber index method according to Werner (3) has not been demonstrated as very effective on account of difficulty of recognizing symptoms under winter greenhouse conditions. No instance of resistant or immune varieties has been reported.

Recent literature

1. Goss, R. W. Transmission of potato spindle tuber disease by cutting knives and seed piece contact. (Abstract) Phytopath. 16: 68-69. 1926.

2. ______________ Transmission of potato spindle tuber by cutting knives and seed piece contact. Phytopath. 16: 299-303. 1926.

3. Werner, H. O. The spindle tuber disease as a factor in seed potato production. Nebraska Agr. Exp. Sta. Res. Bul. 32: 1-128. 1926.

4. Werner, H. O. Spindle tuber - the cause of "run out" potatoes. In Ann. Rep. Nebraska Potato Improvem. Assoc. Ann. Rep. Nebraska State Bd. Agr. 1925: 719-741. 1926.

WITCHES' BROOM (CAUSE UNDETERMINED)

Witches' broom has been reported most frequently since 1923 from the northwestern states of Montana, Idaho, Washington, and Oregon. It has also been recorded at various times from British Columbia in Canada. It is in this general area that the disease seems to be of most importance.

What may be this same trouble was reported to the Plant Disease Survey as occurring in Michigan on a planting of imported Rural Russet seed in 1915. The symptoms of the disease as it occurred in Michigan at that time seemed to agree with those manifested in the Northwest. From Maine also a disease called "yellow top" and answering somewhat to the description of witches' broom has been reported. Bisby and Tolaas (1) in their bulletin on potato diseases mention witches' broom, stating that it occurs rarely and may be similar to spindling sprout. The Canadian Plant Disease Survey has also reported witches' broom from Canada in 1924.

In 1926 it was said to be much less prevalent than usual and was only of slight importance in Idaho, according to C. W. Hungerford. In Washington one field of 30 acres was reported in the Pasco region which showed 100 per cent infection. The crop was an entire loss. From the general standpoint, however, the disease was said to be of minor importance in Washington. In Oregon it was reported as being present in about the same amounts as usual, causing about 1% reduction in yield and being more prevalent in eastern Oregon than in the western part of the state. As high as 10 per cent infection was noted in at least one field.

Young and Morris (3) have recently reported artificial transmission of witches' broom from one plant to another by means of cork borer plug inoculations, and by inarch and side grafting.

Recent literature

1. Bisby, G. R. and A. G. Tolaas. Potato Diseases in Minnesota. Minnesota Agr. Exp. Sta. Bul. 190: 1-44. June 1920.

2. McLarty, H. R. Witches' broom of potatoes. Scient. Agr. 6: 395. July 1926.

3. Young, P. A. and H. E. Morris. Potato witches' broom is a transmissible disease. Pl. Dis. Reptr. 10: 26-28. July 15, 1926.

OTHER VIRUS DISEASES

Streak

Maryland and Missouri were the only states reporting streak to the Survey in 1926. In Maryland, R. A. Jehle reported more than usual and said that a trace could be found in almost all Irish Cobbler fields inspected. The largest amount found in any one field was 2 per cent. In Missouri, E. M. Page reported it to be of slight importance.

Yellow dwarf

Whether or not this disease, originally reported from New York, will eventually prove to be a virus disease is a question but tentatively it is so classified. From New York, M. F. Barrus reports that it was more prevalent than last year or the average year although in general it was scattered and of slight importance. He states that there is an indication that the use of disease-free seed and roguing keeps the disease in check. In New Jersey it was observed only in tuber unit plots planted with seed received recently from New York. It was not found in commercial plantings. A few plants of what were suspected of being yellow dwarf were noticed by McWhorter in Virginia and Tilford in Ohio occurring on plants from New York State seed. These cannot be considered as definite reports, however, as specimens have not been received nor the basis of determination given.

Giant hill

Connecticut and Oregon reported giant hill. In Oregon, according to McKay, it is seemingly of increasing importance and the chief loss is because of poorly shaped tubers. As high as 5 per cent infection was observed in some fields and the estimated loss for the state largely on account of loss in grade was placed at 1 per cent plus. All varieties noted in Oregon were susceptible.

TIPBURN AND HOPPERBURN

More leafhopper injury than usual was reported by collaborators of the various states in 1926.

It is probable that tipburn and hopperburn taken together cause more loss on the average than any single potato disease. Late blight causes heavy losses during some years but the average loss over a period of years seems to be less than that from tipburn and hopperburn. The average estimate of reduction in yield for the past eight years has been 3.68 per cent for these diseases, whereas, late blight has only averaged slightly over 3 per cent, mosaic about 2.5 per cent, and leaf roll about 2 per cent.

The percentage losses for 1926 are high in some states as will be seen from the accompanying table 67.

From the following collaborators' reports it will be observed that an increasing amount of evidence is accumulating to show that leaf hoppers are important factors in the bringing about of foliage burning which for many years was considered purely physiological.

Potato -- Tipburn and Hopperburn

New Hampshire: In the greater part of the state the year was too dry for best growth of potatoes and tipburn caused considerable damage. (Butler)

New York: Some fields that were well sprayed gave indication of marked control. (Barrus)

New Jersey: Hopperburn is one of the most serious troubles of the potato in New Jersey. Where Bordeaux is not used the vines are killed early with resulting yield decrease. Copper-lime dust failed to control hopperburn. In one spray test the yield of the check plots was 269.9 bushels per acre, sprayed six times with 5-5-50 Bordeaux 316.0, and dusted with copper-lime dust 284 bushels. In another test, on Irish Cobbler, on July 15, 79 per cent of leaves were dead on plots sprayed with arsenate of lead and 24 per cent where four applications of Bordeaux were made. Spraying with Bordeaux is being generally adopted by central and south Jersey growers, the former reporting an average yield increase of 50 bushels this year, mostly from control of leaf hoppers. (Martin)

Pennsylvania: The severe damage was noted especially upon Cobblers early in July. (Beach)

Arkansas: Extremely prevalent this year. As there has been considerable rainfall where this injury has been observed, and as leaf hoppers were very common, there is little doubt that the injury was due to the hoppers and not to any lack of moisture. (Rosen)

Ohio: Hopperburn is our most important potato disease. It has been controlled the past two years satisfactorily with a fresh mixed copper-lime dust. (Tilford)

Michigan: Severe on unsprayed early planted potatoes in lower Michigan. Hot weather during first half of July a factor responsible for rapid multiplication of hoppers. Cold June and wet July in Upper Peninsula conditions unfavorable for hoppers. Hopperburn will not be a serious factor in that part of state. (Kotila)

South Dakota: Very prevalent. (Evans)

Washington: The hot weather has surely caused a large amount of tipburn in the potato fields of Walla Walla. (Zundel)

Table 67. Percentage losses from tipburn and hopperburn of potato, as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
25	Delaware, West Virginia	2.8	North Carolina
		2	New York
15	Minnesota	1.5	North Dakota
10	South Dakota, Kentucky	1	Maryland, Texas
		.5	Connecticut
7	New Jersey, Ohio	trace	Wisconsin, Missouri, Kansas, Louisiana
6	Arizona		
5	New Hampshire, Virginia, Tennessee, Arkansas		

Recent literature

1. Dudley, J. E., Jr. The potato leafhopper and how to control it. U. S. Dept. Agr. Farm. Bul. 1462: 2-13. 1926.

OTHER DISEASES

Bacillus carotovorous Jones and related species, soft rot. This disease is always more or less common and troublesome in shipments of potatoes. It often follows injury from other causes such as over-heating in field or car, freezing injury, late blight rot, etc. Only two collaborators mention this disease in their annual reports. W. H. Martin of New Jersey mentions its being found on seed pieces in one field April 9, and C. T. Gregory reports much more of it this year than usual in Indiana where it occurred locally following heavy rains in August and September. He estimates 5 per cent loss in storage and in transit on account of it.

Caconema radicicola (Greef) Cobb, (Heterodera radicicola) rootknot. Reported as prevalent in Texas causing one-half of one per cent loss. Milbrath also reports it as rather serious in California.

Phymatotrichum omnivorum (Shear) Dug. root rot. The first record of Ozonium root rot on the Irish potato was received from J. J. Taubenhaus June 15. He states that the disease was found in the lower Rio Grande Valley around San Benito where it was destroying from 4 to 10 per cent of the crop in that section. Many different hosts for this fungus have been reported in the past, but this is the first year that the Irish potato has been recorded as such.

Sclerotium rolfsii Sacc., stemrot. South Carolina, Mississippi, and Texas report this disease of potato. In South Carolina, W. D. Moore reported a very severe case on May 8 near Sheldon in a 40-acre field of Green Mountains. By June 8 over 50 per cent of the plants in the field were destroyed. Irish Cobbler is grown in the same section but the disease was not observed on that variety. On July 15, C. A. Ludwig wrote that the Horticultural Division of the

Experiment Station in South Carolina reported a case at Summerville. Other cases of this fungus on potato in South Carolina are (1) a mild attack in Thurston County in June 1922 and (2) a slight attack in Spartanburg County in the same year. In Mississippi a trace of the disease was observed June 9 in Clark County, and in Texas definite reports were received from three counties.

Spondylocladium atrovirens C. O. Harz, silver scurf. In New Jersey it was said to be present on the commercial and late crop but most severe on the latter. The disease also occurred in western Washington. This trouble is generally distributed and doubtless occurred in most states, but for various reasons collaborators failed to report it.

Tylenchus dipsaci (Kuehn) Bast., stem nematode. This nematode has never been reported on potatoes in the United States so far as is known; however, in England, according to Hodson (13), the potato is reported in recent years as a common host. He says "The attack on the potato is probably unique for the tubers only are attacked, the haulm above ground being free and presenting a normal appearance." In regions where this nematode occurs it would be well to watch out for possible infestation of potato tubers.

Black heart (non-par.) Although this disease occurs widely wherever potatoes are subjected to over-heating in storage, it was only reported in 1926 to the Survey from California and Texas.

Heat necrosis. California. Estimated loss 8 per cent. (Milbrath)

Internal brown spot (non-par.) A specimen of this trouble was received by the Office of Vegetable and Forage Diseases, Bureau of Plant Industry, from Mississippi, July 3, and collaborators in Washington and California reported its occurrence. In Washington it was noted on potatoes of the 1925 crop in four widely separated regions. The losses, however, were small. In California the loss from internal browning, as it was called by Milbrath, was reported as 5 per cent. Atanasoff (6) showed that internal brown spot or sprain is transmissible through tuber grafts, and believes it to be caused by living organism, which enter the tuber from without. It is not seed transmitted and is not caused by environment.

Net necrosis (undet.) Estimated loss in California according to Milbrath is 0.5 per cent. Atanasoff (5) has reported that "Net necrosis is a tuber symptom, not of leaf roll, but of Aucuba mosaic."

Seed piece decay. In western Washington there was considerable decaying of seed pieces following cold rains in May according to Zundel. Very few fields planted in that month had over 35 per cent of a stand except where whole potatoes were used. Also, according to Zundel, in the Yakima Valley and in Washington in general the stand was not up to normal. The Department of Plant Pathology, Washington Experiment Station, reports as follows concerning this.

> "Some trouble is experienced each year from rotting of seed pieces after planting. In some cases this is traceable to improper handling of stock after cutting. Heating in sacks and lack of attention to drying cut seed after cutting are factors affecting germination and vitality of young plants. This trouble is reported from scattered localities each season."

Spindling sprout. In Michigan J. E. Kotila reported spindling sprout causing 5 per cent loss in a field of Rural Russets. This disease was said to be distinguishable from witches' broom.

Potato - Other Diseases; Literature.

Sprout tubers (undet.) Potato seed pieces which produce small tubers rather than aerial stems were reported from North Carolina April 20 by G. W. Fant and from Michigan August 1 by J. E. Kotila. Weakness due to prolonged storage under warm conditions is suggested as a cause by Kotila.

Stem-end browning (undet.) New York - "Very little reported this year. That which was reported may have been due to pathogens or to environment." (Barrus)

Stem-end rot (associated with drought conditions and various Fusaria). Much more of this rot was reported than usual from California, according to W. T. Horne. In Humboldt County where it occurred it was a very dry year which possibly accounted for the damage. White Mountain and Multnomah varieties were reported by Horne as susceptible, whereas British Queen seemed to be immune.

Recent literature on potato diseases

1. Anon. Potato blights. New Jersey Agr. Exp. Sta. Circ. 192. 3 pp. June 1926.

2. Appel, O. Gelbfleckigkeit der Kartoffelstauden. (Mottling of potato plants.) Deutsch. Landw. Presse 53: 209. 1926.

3. Appel, O. Taschenatlas der Kartoffelkrankheiten. 2. Staudenkrankheiten. Berlin, P. Parey, 1926. (Parey's Taschenatlanten nr. 2).

4. Atanasoff, D. The stipple streak disease of potato. A complex problem. Izv. Bulg. Bot. Druzh. (Bul. Soc. Bulgarie) 1: 43-52. 1926.

5. ____________ Net necrosis of potato. Phytopath. 16: 929-940. Dec. 1926.

6. ____________ Sprain or internal brown spot of potatoes. Phytopath. 16: 711-722. Oct. 1926.

7. Barrus, M. F., and C. Chupp. Potato diseases and their control. Bul. Cornell Univ. Coll. Agr. Ext. Serv. 135: 1-123. Mar. 1926.

8. Berridge, Emily M. Studies in bacteriosis. XIV. Chemical agglutination as a means of differentiating bacterial species causing soft rot of potatoes and other vegetables. Ann. Appl. Biol. 13: 12-18. 1926.

9. Bolley, H. L. (Plant disease investigations). North Dakota Agr. Exp. Sta. Bul. 194: 40-50. 1926.

10. Davis, W. B. Physiological investigation of black heart of potato tuber. Bot. Gaz. 81: 323-338. 1926.

11. Dickson, B. T. The black dot disease of potato. Phytopath. 16: 23-40. 1926.

12. Goss, R. W. Nebraska potato diseases. In Ann. Rept. Nebraska Potato Improvem. Assoc. Ann. Rept. Nebraska State Bd. Agr. 1925: 764-767. 1926.

13. Hodson, W. E. Notes on the stem eelworm. Jour. Min. Agr. Great Britain 33: 259-262. June 1926.

14. Lacey, Margaret S. Studies in bacteriosis. XIII. A soft rot of potato tubers due to Bacillus carotovorus and a comparison of the cultural, pathological and serological behaviour of various organisms causing soft rots. Ann. of Appl. Biol. 13 (1):1-11. 1926.

15. MacMillan, H. G. Irrigation and diseases. Amer. Potato Jour. 3: 198-201. June 1926.

16. Millard, W. A. Internal rust spot of potatoes. Nature 118: 804. Dec. 1926.

17. Moore, H. C. Some studies in hollow heart of potatoes. Proc. Potato Assoc. Amer. 12: 41-46. 1926.

18. ____________ Hollow heart of potatoes. Michigan Sta. Quart. Bul. 8 (3): 114-118. 1926.

19. Naoumoff, N. A. Some new or little known species. Morbi Plantarum, Leningrad 14: 137-149. 1926.

20. Patwardhan, G. B. Appendix M. Annual report of the plant pathologist to Government of Bombay, Poona, for the year 1924-25. Ann. Rept. Dept. Agr. Bombay Presidency for year 1924-25: 156-158. 1926.

21. Quanjer, H. M. Waarnemingen over "kringerigheid" of "vuur" on over "netnecrose" van aardappelen. Tijdschr. Plantenz. 32 (4): 97-128. 1926.

22. Racicot, H. N. A spotting and shrinking of potatoes in storage. Ann. Rept. Quebec Soc. Prot. Plants 18: 55-56. 1926.

23. Schwarz, Marie B. De roestvlekkenziekte van aardappelknollen in Nederlandsch Oost-Indie. Tijdschr. Plantenz. 32: 321-330. Dec. 1926.

24. Strachan, J. and T. H. Taylor. Potato eelworm. Jour. Min. Agr. Great Britain 32: 941-947. Jan. 1926.

FUSARIUM WILT CAUSED BY FUSARIUM LYCOPERSICI SACC.

Fusarium wilt was reported from most states east of Kansas. In the northern tier of states such as Minnesota, Wisconsin, Michigan, and Pennsylvania the small amount that was reported occurred mostly in greenhouses.

In prevalence wilt was apparently about the same as usual. Of the 18 states reporting on prevalence, 13 reported the usual amount, 4 reported less, and 1 more than the average.

The losses as estimated by collaborators are given in the following table 68.

Table 68 . Percentage losses from Fusarium wilt of tomato, as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
20	Louisiana	3	Virginia
15	South Carolina	2	Texas; Indiana
10	Tennessee, Alabama, Mississippi, Arkansas, Kansas	1	Ohio
		0.3	California
		trace	New York, Delaware, West Virginia, Michigan, Wisconsin, Minnesota, Iowa, North Dakota
6	North Carolina		
5	Missouri		
4.5	New Jersey		
4	Maryland, Georgia, Mississippi		

The following collaborators' reports are of particular interest.

New Jersey: Seedlings sent in from Gloucester May 8 were wilted. Isolations yielded an organism that looked like <u>Fusarium lycopersici</u>. (Dept. Pl. Path.)

Maryland: Losses gradually decreasing due to the use of resistant varieties. (Norton & Jehle)

Virginia: Wilt seems to be the most common tomato disease of the season. (Fromme)

North Carolina: Severe in many town gardens when wilt resistant varieties are not used. (Fant)

South Carolina: Wilt has limited tomato growing throughout state. Many farmers have had to abandon tomatoes on account of wilt in conjunction with rootknot. (Moore)

Southern Georgia: Generally worse in small home gardens than in fields and worse in second crop than in spring crop. A 400-acre planting of Globe in Coffee County showed about 1 per cent. (Boyd)

Florida: The most serious disease with tomatoes this year, there being very few fields in which at least 35 per cent of the plants were not affected more or less seriously. There are cases where wilt may be found on 80 to 95 per cent of the plants. (Kelbert, D.G.A. May 26)

Alabama: Very general in home gardens. (Miles)

Arkansas: Twenty to 30 per cent count made in three fields around Fayetteville on non-resistant varieties. (Rosen)

Indiana: Much of this year's wilt could be traced to southern grown plants of this year or last year, when the state was flooded with imported plants. (Gardner)

Much work has been done on the development of resistant varieties during recent years. During 1926 four collaborators have reported to the Survey on this subject. In Kansas, White (3) has reported that the following six varieties have proved to be resistant, commercially desirable, and climatically adapted to Kansas - Louisiana Red, Louisiana Pink, Marvel, Norton, Norduke, Marvana, and Kanora. Tims, of Louisiana, reports the first two very resistant in that state. McClintock in Tennessee mentions Tennessee Beauty and Marglobe as very resistant and the Globe as resistant. E. M. Page of Missouri reports Globe and New Century resistant.

I. T. Scott (2), of Missouri, found that three to four tons of lime per acre thoroughly incorporated with the soil to a depth of nine inches reduced losses from wilt. It is necessary to incorporate the lime deep in the soil in order to have any beneficial effect.

Recent literature

1. Essary, S. H. Two important tomato diseases and their control. Tenessee Agr. Exp. Sta. Circ. 8: 1-4. Jan. 1927.

2. Robbins, W. J. Botany. In Report of the Director, July 1, 1924, to June 30, 1925 - Missouri Agr. Exp. Sta. Bul. 236: 44-45. 1926.

3. White, R. P. Tomato wilt investigations. Kansas Agr. Exp. Sta. Tech. Bul. 20: 4-32. 1926.

LEAFSPOT CAUSED BY SEPTORIA LYCOPERSICI SPEG.

Of the 28 states reporting Septoria leafspot only one, Iowa, reported more than usual. The others all reported either less than or the same as the average year. This was probably due to comparatively cool early summer temperatures coupled with a deficiency of rainfall which retarded and inhibited the development of the fungus. The accompanying table 69 shows the relative prevalence of the disease as reported from various states as well as the estimates of loss.

Tomato - Leafspot

Table 69 . Estimated average percentage loss from and relative prevalence of leafspot of tomato in 1926, as reported by collaborators.

State	Estimated percentage loss 1926	Prevalence compared with 1925	Prevalence compared with Average year	State	Estimated percentage loss 1926	Prevalence compared with 1925	Prevalence compared with Average year
Iowa	12	more	more	Mo.	2	more	same
N. J.	8	more	same	Conn.	1	more	same
Md.	5	much less	much less	Va.	1	less	less
Wisc.	5	same	same	W. Va.	1	----	----
Ga.	4	more	same	S. Dak.	1	same	same
Mich.	3	less	less	Ala.	0.5	----	----
Kans.	3	same	same	N. Y.	trace	same	same
Del.	2	less	less	Pa.	trace	less	same
N. Car.	2	----	----	S. Car.	trace	less	less
Texas	2	----	----	Miss.	trace	----	----
Indiana	2	less	same	Minn.	trace	same	----

The following collaborators' reports are of interest:

New York: In general of minor importance in the canning districts. On account of the dry summer it did not become established until August 1 or after. A few fields were heavily defoliated where rotation of crops was not followed. (Jones)

New Jersey: In many fields the Bonny Best and other second earlies are almost completely defoliated as the result of the presence of Septoria leafspot. The Marglobe variety is apparently much more resistant to this disease than are the varieties commonly grown. The Marglobe has yielded well and the fruit has good size and color. (Dept. Pl. Path.)

Maryland: Very much less than usual, probably due to dry weather during the early part of the season. To September 1 none observed south of Kent County. More observed in the northern and western part of the state than in the southern and eastern parts. (Norton & Jehle)

Missouri: Damage moderate. General. Especially troublesome in cannery district, i. e., Ozarks. (Page)

Porto Rico: Common and sometimes severe, especially in seed beds. (Cook)

Recent literature

1. Anon. Tomato leafspot New Jersey Agr. Exp. Sta. Circ. 193: 1-2. 1926.

2. Essary, S. H. Two important tomato diseases and their control. Tennessee Agr. Exp. Sta. Circ. 8: 1-4. Jan. 1927.

3. Pritchard, F. J. Control of tomato blights. Canning Trade 49 (22): 50, 52, 54, 56, 60, 62. Jan. 17, 1927; (23): 18, 20, 22. Jan. 24, 1927.

EARLY BLIGHT CAUSED BY ALTERNARIA SOLANI (ELL. & MART.) JONES & GROUT

This disease was reported from most of the Eastern and Southern States principally as a leaf blight, although in Florida and some of the other southern States the nailhead spot phase was most common, while in New York a rot of the fruit following growth cracks, and in other states collar rot, were reported.

Several states reported more than usual. This may have been on account of cool temperatures, which, according to Pritchard (2), favor early blight. The disease seemed to be more prevalent than usual in the Delaware, Maryland, and Virginia section and, as will be seen from the accompanying table, heavy losses occurred there.

Table 70 . Percentage losses from early blight of tomato, as estimated by collaborators, 1926.

Percentage loss	States reporting	Percentage loss	States reporting
10	Georgia	1	New Jersey, West Virginia, Florida, South Dakota
6	Maryland	trace	New York, North Carolina, South Carolina, Arkansas, Michigan, Wisconsin, Minnesota, Missouri, California
5	Delaware, Virginia, Louisiana		
3	Indiana		
2	Mississippi		
1.5	Texas		

F. P. McWhorter, of the Virginia Truck Experiment Station, reports in addition to the leafspot and collar rot form of the disease, a dropping of the fruit which he thinks may be caused by this fungus.

Some of the collaborators' reports are as follows:

New York: Of minor importance in causing defoliation but appears to be causing considerable damage as a rot in cracked fruit in the canning districts. (L. K. Jones)

Delaware: Very prevalent with early and late crops. Heavy rains cut yield of canning crop. (Adams)

Tomato - Early Blight

Maryland: Much more prevalent than usual. This disease in combination with weather conditions caused a loss of 30 to 90 per cent of the foliage during August. This disease practically replaced the usual Septoria leafspot. (Norton & Jehle)

Georgia: First observed in cold frame March 28; in field April 7, Ambrose, Georgia. An epidemic of both early blight and Septoria spot destroyed 50 per cent of the plants in two large beds under glass, April 1. (Boyd)

Florida: This disease has not been as prevalent this season as last year. In only three or four instances have fields been severely infected. The disease made a very late appearance on the large vines, none being found on the fruit until the latter part of March. Although this disease was rather serious in seed beds it appears that the older leaves dropped off of the seedlings after they were set in the field. Thus little or no disease was found in the older plants until the middle of April. A more rapid spread of the disease was noticed after warm weather and fogs at night as compared with the cold spring. (D.G.A. Kelbert)

Alabama: Leaf blight severe in southern section of state. Nailhead spot more serious in the interior parts. Latter form important locally. Loss conservatively estimated at 2 per cent for the state. (Miles)

Mississippi: Very severe on the early tomatoes, especially in the leaf spot form. (Wedgworth)

Arkansas: Noted in unusual abundance on early varieties, many plants almost completely defoliated. Dry weather in August checked the disease very considerably. (Rosen)

Nailhead spot is an important disease in the tomato section of western Mexico, according to A. W. Morrill, who reported as follows (Jan. 13, 1927):

"There seem to be two types of nailhead spot present on tomato in western Mexico, both of which were unusually destructive in 1926 in the Fuerte Valley, State of Sinaloa. The damage probably amounted to at least one million dollars in the Fuerte Valley alone, where 22,000 acres of tomatoes are grown. There was also considerable of the disease further south. Excessive rainfall late in December was probably one of the most important contributing causes."

Good control with copper-lime dust (25 per cent monohydric copper sulfate) was reported by Gardner and Kendrick of Indiana. Six applications with a knapsack bellows duster gave 20 to 70 per cent increase in yield.

Pritchard (1) recommends for control of this disease and also for the Septoria leafspot: 1- seed treatment with mercury bichloride 1-3000 for 5 minutes followed by washing in fresh water from 10 to 15 minutes; 2- clean seed beds; 3- the use of early plants; 4- crop rotation; 5- spraying and dusting; 6- deep fall plowing and 7- clean culture. He stresses the desirability of plowing under old tomato vines in the fall.

Recent literature

1. Pritchard, F. J. Control of tomato blights. Canning Trade 49 (22): 50, 52, 54, 56, 60, 62. Jan. 17; (23): 18, 20, 22. Jan. 24, 1927.

2. Ramsey, G. B. and Alice A. Bailey. The development of nail-head spot of tomatoes during transit. (Abstract) Phytopath. 17: 43-44, Jan. 1927.

WESTERN YELLOW BLIGHT (CAUSE UNDETERMINED)

Much more western yellow blight than usual occurred in the Pacific Northwest, where the losses were extremely high, Washington and Oregon each reporting 90 per cent of the crop lost and Idaho reporting 50 per cent loss.

It was also very destructive in California and Arizona. In the latter state a total loss of 25 per cent was estimated, with as high as 95 per cent loss in some fields. Other Rocky Mountain States where the disease sometimes occurs were not heard from.

The following collaborators' reports give further details concerning the situation:

> Washington: The western blight of tomato is extremely prevalent in the state this year. As an example: The forecast of the yield of tomatoes in the Walla Walla section was 100 cars, but the blight has done such a good job that they will not have over two or three cars to ship. During my recent visits in western Washington, it was not uncommon for the farmers to take me to their tomato patches and show me where from 50 to 95 per cent of the plants had been killed. The damage done by this disease is the greatest that I have known in the nine years I have been in the state. (Zundel)

> Oregon: Worst year in history. Tomato areas such as Milton-Freewater and The Dalles suffered all but total loss. Five per cent crop reported in many places. (McKay)

> California: The southern part of the San Joaquin Valley has suffered the most, as usual. Unprotected fields in the Shafter section were affected to the extent of about 100 per cent, and in the Bakersfield section up to 80 to 90 per cent.

The average loss at Merced was not in excess of 20 to 25 per cent. The Sacramento district, where the disease was extremely severe last year, showed on the average not more than 5 per cent by the middle of July, as against some 80 to 90 per cent last year. The peninsula in the San Francisco Bay region is practically free from blight. An unusual amount of the disease, up to 60 per cent, has developed in canyons along the coast between San Diego and Santa Ana. The greatest damage there appeared during the month of June, coinciding with the period of dry and hot weather. The amount of blight in the Riverside section is extremely variable, from almost nothing to 60 per cent. Lighter soils as a rule have the greatest amount. (Shapovalov)

Arizona: Growers report that this is the worst year for yellow blight in their experience. Seventy-five per cent of the fields are a total failure in the Verde Valley. Of more than a dozen fields examined within the past week, none have better than a 50 per cent stand. One field of one-half acre had only four healthy plants remaining. Plants seeded in the field have been attacked in about the same severity as those transplanted. Shading the plants by interplanting with corn has had little beneficial effect. (Brisley)

McKay and Dykstra (2) have recently shown that this disease is caused by the same virus that is responsible for the curly top of the sugar beet and other plants - a very important step in the solution of this problem. They point out that the occurrence of this disease is correlated with that of the curly top of sugar beets. A comparison of figures 23 and 24, giving the distribution of yellow blight and of curly top, shows that they are more or less coincident, and an examination of survey records concerning the prevalence of these two diseases in the same year also shows correlation in many cases.

Recent literature

1. Lesley, J. W. A study of resistance to western yellow blight of tomato varieties. Hilgardia 2: 47-66. Sept. 1926.

2. McKay, M. B., and T. P. Dykstra. Sugar beet curly top virus, the cause of western yellow tomato blight. (Abstract) Phytopath. 17: 39. Jan. 1927.

3. Shapovalov, M., and F. S. Beecher. Menace of western yellow blight. Pacific Rural Press 111: 365, 371. March, 1926.

Tomato - Western Yellow Blight

Figure 23.

Distribution of western yellow blight of tomato as reported to the Plant Disease Survey.

Each dot represents a year in which the disease was definitely reported from a county.

Figure 24.

Distribution of curly top of sugar beet as reported to the Plant Disease Survey.

Dots - See above.

R = Disease reported; location not given.
* = Recorded in literature.

MOSAIC, CAUSE UNDETERMINED

Mosaic was reported from practically every state sending in reports on vegetable diseases. It seems to have been generally distributed both in greenhouses and in the field. Most reports indicated average or less than average prevalence, however, New Jersey, Maryland, Virginia, Arkansas, Iowa, and Kansas reported more than usual. The losses estimated by collaborators were: Louisiana, 15 per cent; Pennsylvania, 10 per cent; New Jersey and Maryland, 5 per cent; Iowa, 4 per cent; Kansas, 2 per cent; Virginia, 1 per cent; California, 0.5 per cent. In Delaware, Adams reported it as generally found in home plantings but not important in commercial fields. In Florida, Kelbert reported heavy infection of the crop but not much actual damage since tomatoes were affected late, in most instances after the vines had matured fruit of good size; however, certain fields were attacked early with considerable damage resulting. In Illinois, G. A. Meckstroth noted light general infection in a field of canning tomatoes, but as the fruit was heavily set the plants made a good yield in spite of the disease. In Michigan, it was said to be very important on greenhouse crops at Grand Rapids and some cases of from 50 to 75 per cent infection were observed. In Nebraska from traces to 100 per cent infection were reported but the loss in the largest commercial sections was not severe. In Oregon 20 per cent infection was noted in one greenhouse near Eugene. In Porto Rico, Mel T. Cook states that the disease is common but its importance is not established.

<u>Recent literature</u>

1. Berkeley, G. H. Mosaic disease of tomatoes. Canad. Hort. 49: 139. June 1926.

2. Brewer, P. H., J. B. Kendrick, and M. W. Gardner. Effect of mosaic on carbohydrate and nitrogen content of the tomato plant. Phytopath. 16: 843-851. Nov. 1926.

3. Eckerson, Sophia H. An organism of tomato mosaic. Bot. Gaz. 81: 204-209. 1926.

4. Kraybill, R. and H. Separation of fern leaf from mottling in tomato mosaic. (Abstract) Phytopath. 17: 57. Jan. 1927.

5. Purdy, Helen A. Attempt to cultivate an organism from tomato mosaic. Bot. Gaz. 81: 210-217. 1926.

STREAK (CAUSE UNDETERMINED)

It has recently been reported by Dickson and Vanterpool (2, 4) that streak of tomatoes is the result of a mixed infection with the virus of tomato and potato mosaic. However, Berkeley (1) has recently submitted evidence to show that it is not necessary to have a combination of viruses in order to produce streak in tomatoes, but that it can be produced by inoculation with juice from either mosaic or streak potatoes, or from apparently healthy potatoes.

Although tomato streak has most commonly been reported as occurring in greenhouses, reports out-of-doors are becoming more frequent and this year two states, Ohio and Indiana, reported its occurrence in the field - In Ohio, H. C. Young reporting it as being quite abundant and in Indiana, M. W. Gardner stating that it was not uncommon late in the season.

Recent literature

1. Berkeley, G. H. Studies in tomato streak. Scient. Agr. 7: 210-223. Feb. 1927.

2. Dickson, B. T. Tobacco and tomato mosaic. (2) Streak of tomato in Quebec a 'double-virus' disease. Science 62: 398. 1925.

3. Gardner, M. W., and J. B. Kendrick. Potatoes a virus disease menace to tomatoes. Hoosier Horticulture 9 (1): 5-8. Jan. 1927.

4. Vanterpool, T. C. Streak or winter blight of tomato in Quebec. Phytopath. 16: 311-331. May 1926.

STEM ROT CAUSED BY CORTICIUM VAGUM BERK & CURT.

Damping-off of seedlings or collar rot of stems was reported from Connecticut, New York, Virginia, Florida, Indiana, Missouri, Texas, Kansas, and Washington. In Florida it caused considerable damage in the seed beds during January and February and also on larger plants in the field. In one instance 85 per cent loss in a two-acre field was noted. In Kansas a case of 20 per cent killing of young plants was reported March 24.

Recent literature

1. Small, T. Rhizoctonia foot rot of the tomato. Ann. Rep. Exp. & Res. Stat. Nursery & Market Gard. Industr. Devel. Soc. 11: 76-85. 1925.

BACTERIAL WILT CAUSED BY BACTERIUM SOLANACEARUM EFS.

This disease, normally southern in its range, was reported from Maryland, North Carolina, South Carolina, Florida, Alabama, Louisiana, and Texas. What seems to have been the same trouble was also reported by L. K. Jones of the New York Experiment Station as causing 10 per cent loss of the crop in a single canning section in western New York, the organism apparently having been introduced with the seed. In Maryland, 25 per cent of the plants were found badly affected in one field in Prince George's County. In North Carolina, where 2.5 per cent loss for the state was estimated, G. W. Fant reported severe infection on the Horticultural Farm at the State College. In Alabama, L. E. Miles estimated the loss as 1 per cent and stated that the disease was common in the coastal districts, causing serious damage in some fields. The disease was also reported from Porto Rico (abundant and severe) by Mel. T. Cook and from the Philippine Islands (one of the most serious diseases of plants grown in vegetable gardens) by Mendiola and Ocfemia (1).

Recent literature

1. Mendiola, N. B., and G. O. Ocfemia. The work of breeding disease resistant crop plants at the College of Agriculture at Los Baños. Philipp. Agriculturist 15: 117-128. Aug. 1926.

BACTERIAL SPOT CAUSED BY BACTERIUM VESICATORIUM DOIDGE

During 1926 this disease was reported as occurring in New York, Florida, Indiana, Missouri, and Nebraska. A report of its occurrence in South Carolina, unsubstantiated by specimens, was made to the Survey by W. D. Moore. In New York it was observed on foliage and fruit in one field in Erie County, August 10. In Indiana, according to Gardner, infection was serious on the first set of fruits and was the worst that has occurred since 1919. He states that it was controlled by copper-lime dusts. In Missouri it was found commonly on local tomatoes in the markets, according to W. A. Archer.

A bacterial spotting of the fruit which may or may not have been caused by this organism was reported by D.G.A.Kelbert of Florida on May 26 as follows:

> "This disease has been a big factor this season, considerable damage having been noticed from this cause. The disease made its appearance following the very heavy wind early in April. The spots have every evidence of being caused by sand bruise, later bursting somewhat like a canker. They grow as large as 6 mm.,often being so close together as to combine, making a spot one-half inch in diameter. I have found this disease in the field all through the season following the above mentioned rain, new young spots being found on the fruit continually."

Negative reports of the occurrence of bacterial spot were received from twenty-two states.

LATE BLIGHT CAUSED BY PHYTOPHTHORA INFESTANS (MONT.) D BY.

Late blight caused some damage to early tomatoes in Florida and in California. During some years it is prevalent in northern states such as Virginia and West Virginia, but during 1926 the collaborator for West Virginia reported that an interesting feature of the season was the failure to find a single case of this disease in the state.

In Florida, G. B. Ramsey reported finding the disease in certain localized areas but it did not appear to be doing much damage. In California it was of considerable importance as indicated by the following reports:

> "In the tomato fields several of the usual tomato diseases are beginning to be evident. Among the commonest of these is the so-called late blight (Phytophthora infestans) which attacks both tomatoes and potatoes." (C. R. Gorton, Calif. Cult. May 22, 1926.
>
> "The only draw-back of the tomato season (Orange County, California) was the late blight and, though many shippers handled the situation successfully, a few lost money. One large firm had very good results by setting the stock back for a short time to determine whether blight would develop. They also turned down some patches known to be badly infested with the disease. Another shipper signed up some of these infested patches, and stood some heavy losses from the blight as a result." (H. G. Whitney, Dec. 10, 1926.)
>
> "At the present time (Nov. 8, 1926) a great many of the California tomatoes arriving on the market show a semi-watery to watery decay about the stem-end and upper half of the fruit .... I find that my notes indicate that most of this disease was found in cars from Los Angeles, Sacramento, and Stockton. In some cars the decay ranged from 3 per cent to as high as 40 per cent, the average for most cars being between 3 per cent and 15 per cent. I have been in the Market Pathology work and advisor to the Food Products Inspection Service of the Bureau of Agricultural Economics since 1919, but have never seen an appreciable amount of this type of rot until this season." (G. B. Ramsey)
>
> "Late blight occurred on tomatoes in Orange County late in October, 1926. It did not injure leaves very much, but caused a considerable damage of fruit in some individual fields extending to about 30 per cent. I may add to this that last month (Jan. 1927) I noticed an alarming outbreak of this disease on tomato seedlings in a few greenhouses in Los Angeles County. I presume, however, that with the advent of different weather the disease may be checked." (Shapovalov)

BUCKEYE ROT CAUSED BY PHYTOPHTHORA TERRESTRIS SHERB.

Buckeye rot was reported from Maryland, Florida and Tennessee and what was thought to be either this species or Phytophthora parasitica was reported from Indiana. Reports of non-occurrence were received from 22 other states.

In Maryland, Norton and Jehle reported 30 per cent loss in one field in Prince George's County. In Florida, according to Kelbert, the disease took about 35 per cent of the earliest fruit and caused about 15 per cent damage to the total crop. It appeared after the first rains during the latter part of March. In Indiana, according to Kendrick, heavy rains in August and September brought on a rot which totally destroyed all of the fruit in some fields. It was not a ripe rot but typically a rot of green immature fruits.

LEAF MOLD CAUSED BY CLADOSPORIUM FULVUM CKE.

This common disease of greenhouse tomatoes doubtless occurs widely, but it was only reported to the Survey in 1926 from seven states and Porto Rico. In all of these, with the exception of Florida and Porto Rico, it was mentioned as occurring on tomatoes under glass, in some instances affecting them seriously. In Florida it made its appearance about the middle of May, according to D. G. A. Kelbert, but since the crop was well advanced the attack was too late to do much damage. In Porto Rico, Mel. T. Cook says that the disease is common and sometimes severe on tomatoes grown in the open.

Recent literature

1. Guba, E. F. The control of tomato leaf mold or "mildew" in the greenhouse. Amer. Produce Grow. 1 (4): 6. Dec. 1926.

2. Williams, P. H. Tomato leaf mold. Ann. Rep. Exp. & Res. Stat. Nursery & Market Gard. Industr. Devel. Soc. 11: 67-72. 1926.

BLOSSOM-END ROT, NON-PARASITIC

In 1926 blossom-end rot was reported as being more prevalent than usual in the states of Delaware, Virginia, Kentucky, Missouri, Iowa, and Florida. In the other states reporting it the disease was of average or below average prevalence. A number of collaborators mentioned its being especially common on the early crop while the later crop which matured following rains in August was not badly affected. A loss of 10 per cent was reported from Missouri. The next highest estimate of damage came from Kentucky where 5 per cent reduction in yield was estimated. Other estimated losses were Georgia, 4 per cent; Alabama and Texas, 3 per cent; North Carolina, 2 per cent; New York, 1 to 2 per cent; Maryland, Virginia, Iowa, and Kansas, 1 per cent. In the Crystal Springs trucking section of Mississippi it was thought that nearly one-third of the early crop was affected with blossom-end rot. It was also quite a factor in reducing the yield in Florida from the middle of April on to the end of the shipping season.

OTHER DISEASES

Tomato - Other Diseases

Aplanobacter michiganense EFS., bacterial canker, was quite serious in many greenhouses in Ohio, according to R. C. Thomas. The disease did not appear to be an economic factor in the field.

Blossom drop (non-par.) A specimen of this trouble was received from New York early in July. J. J. Taubenhaus reports it a very important trouble in Texas, causing about 2 per cent loss.

Colletotrichum phomoides (Sacc.) Chester, anthracnose, was reported from New Jersey, Maryland, Indiana, and Missouri. Only moderate damage was reported in all cases. Gardner of Indiana states that since the rot does not greatly discolor the fruit it is not so objectionable to canners as certain other decays.

Cuscuta sp., dodder. A case of severe infestation of tomato plants in seed beds planted on land where alfalfa had been grown last year was reported by R. A. Jehle of Maryland.

Caconema radicicola (Greef) Cobb, root-knot, several of the southern states report damage from root-knot. In South Carolina W. D. Moore says that it is becoming serious everywhere. In southern Georgia one 5-acre field was reported by O. C. Boyd where the infection was 100 per cent and the loss estimated at 50 per cent. In Missouri, according to Archer, severe damage was noted in the southeastern section and in some greenhouses in other parts of the state. In California, Milbrath estimated the loss at 3 per cent.

Hollow stem (undet.) Stems hollow for a distance of 4 to 5 inches, or, in most cases, about one-half their length, were reported by the Department of Plant Pathology of New Jersey. Plants wilted from the top down and finally died. There were streaks of discolored tissue in longitudinal sections.

Lightning injury (non-par.) was observed on July 28 in New Jersey.

Macrosporium sp., stem canker, was reported by Adams of Delaware as being much more prevalent than last year, seriously cutting the stands in commercial canning crops.

Phoma destructiva Plow., ripe-rot, traces observed in Florida and Texas.

Oospora lactis parasitica Pritchard & Porte, fruit-rot, New Jersey.

Pythium sp., damping-off, observed in greenhouse in New York and in seed beds in South Carolina.

Puffing (undet.) Very severe and prevalent on the variety Detroit in Texas according to Taubenhaus. Also caused some loss in California according to Milbrath.

Sclerotium rolfsii Sacc., stem rot, was reported from Tennessee; South Carolina particularly severe in fields where no rotation was practiced; Florida- found entirely on old ripe fruit in the field; Alabama - important locally in southern section of state, loss as high as 20 per cent in some fields; Mississippi - many fields show only a trace but one field was observed with 35 per cent infection; Arkansas - considerable injury reported in southeastern Arkansas on early crops, several specimens sent in; Kansas - in experimental plots at Manhattan.

Sclerotinia sclerotiorum (Lib.) Mass., stem-rot, was reported from Florida, Ohio, and Illinois. In Ohio, it was noted especially in several greenhouses in June and July. In one house, where a crop of lettuce badly affected with rot had immediately preceded tomatoes, 15 per cent of the plants were infected.

Verticillium alboatrum Reinke & Berth., wilt, was reported by B. A. Rudolph from the San Francisco Bay region of California where it showed up in June in about the same prevalence as usual. D. G. Milbrath estimates that this disease probably caused a loss of one-half per cent in California.

Recent literature

1. Becker, A. Die Braunfleckenkrankheit der tomaten. Blumen u. Pflanzenb. 41: 122-123. Apr. 15, 1926.

2. Bewley, W. F., and H. L. White. Some nutritional disorders of the tomato. Ann. Appl. Biol. 13: 323-338. Aug. 1926.

3. Brown, N. A stem-end and center rot of tomato caused by various unrelated organisms. Jour. Agr. Res. 33: 1009-1024. Dec. 1, 1926.

4. Fenton, F. A. A case of arsenical injury to tomato plants. Proc. Iowa Acad. Sci. 31 (1924): 135-137. 1926.

5. Kraybill, H. R. Effect of nutrition on the number of blossoms per cluster and the dropping of blossoms in the tomato. Proc. Amer. Soc. Hort. Sci. 22: 371-374. 1926.

6. Pritchard, F. J. Control of tomato blights. Canning Trade 49 (22): 50, 52, 54, 56, 60, 62; (23): 18, 20, 22. Jan. 17, Jan. 24, 1927.

7. Rudolph, B. A. Verticillium wilt of tomatoes in California. Phytopath. 16: 234. Mar. 1926.

8. Weber, G. F. and G. B. Ramsey. Tomato diseases in Florida. Florida Agr. Exp. Sta. Bul. 185: 61-138. Dec. 1926.

9. Williams, P. H. Root rot of the tomato caused by Thielavia basicola. Ann. Rep. Exp. & Res. Stat. Nursery & Market Gard. Industr. Devel. Soc. 11: 74-75. 1926.

DISEASES OF SWEET POTATOES

STEM ROT CAUSED BY FUSARIUM BATATATIS WOLL. AND F. HYPEROXYSPORUM WOLL.

This widespread and important disease of sweet potatoes seemed to be less prevalent in the Maryland, New Jersey, and Virginia section than last year, but in a majority of the Southern States and in Kansas and Indiana it was said to be more prevalent than in 1925. The percentage losses were reported as follows: New Jersey, 15; Missouri, 10; Iowa, 8; Kansas, 6; North Carolina, 5; Alabama and Indiana, 4; Delaware, Maryland, Virginia, Georgia, and Arkansas, 3; Tennessee and California, 2; Washington, 1. In Arkansas, according to Rosen, it was very common, 50 per cent infection being counted in one field. What is probably the first authentic report of this disease from Colorado was made by L. L. Harter. Doctor Harter also estimated 1 per cent infection in Washington, where several hundred acres of sweet potatoes are now being grown.

The varieties White Yam, Red Brazil, and Yellow Yam were reported as very resistant in New Jersey. Varieties reported as susceptible were Yellow Jersey; Big Stem Jersey, Porto Rico, and Triumph in Georgia; and Nancy Hall in Arkansas. R. F. Poole (1, 2) continues to report beneficial results in the control of this disease by planting two or three plants in a hill in order to offset cutting down the stands by the disease.

Recent Literature

1. Poole, R. F. Cultural methods for reducing sweet potato losses caused by stem rot. New Jersey Agr. Exp. Sta. Bul. 433: 1-16. 1926.

2. ________________ Fusarium wilt of sweet potatoes on infested soil. Phytopath. 17: 42-43. Jan. 1927.

BLACK ROT CAUSED BY CERATOSTOMELLA FIMBRIATA (ELL. & HALS.) ELLIOTT

As usual blackrot was widespread in sweet potato states. Reports of collaborators indicate that it is gradually decreasing owing to the use of certified seed, seed treatment, seed bed sanitation, and other control measures. The collaborators' estimates of losses for the last eight years have shown a gradual reduction in amount of loss.

In 1926, however, the states of North Carolina, Arkansas, Indiana and Arizona reported the disease as more prevalent than usual. Losses from black rot occur both in the field and in storage. Estimates (percentage) of losses in the field as given by collaborators in 1926 are : Kentucky, 15; Mississippi, 5; Arkansas, 4; Alabama and Texas, 3; Tennessee, North Carolina, Iowa, California, 2, Arizona, 1.5; Maryland, Virginia, South Carolina, Louisiana, 1; Delaware, Georgia, Kansas, 0.5. In North Carolina, R. F. Poole reports the rot as most severe in low areas of fields.

H. D. Barker (1) reports that black rot is of considerable economic importance in Haiti because of its prevalence and the importance of the sweet potato as a food crop. He states that in some cases the damage amounts to 90 per cent of the crop and that very little attempt is made to control the disease.

Recent Literature

1. Barker, H. D. Plant diseases in Haiti. Intern. Rev. Sci. & Pract. Agr. 4: 184-187. Jan.-Mar. 1926.

2. Harter, L. L., J. L. Weimer, and J. I. Lauritzen. The comparative susceptibility of sweet potato varieties to black rot. Jour. Agr. Res. 32: 1135-1142. 1926.

3. Harter, L. L. and W. A. Whitney. Influence of soil temperature and soil moisture on the infection of sweet potatoes by the black rot fungus. Jour. Agr. Res. 32: 1153-1160. 1926.

4. Lauritzen, J. I. Infection and temperature relations of black rot of sweet potatoes in storage. Jour. Agr. Res. 33: 663-676. 1926.

SOIL ROT CAUSED BY CYSTOSPORA BATATA (ELL. & HALS.) ELLIOTT

Estimates of losses from this disease in 1926 were: Kansas, 3 per cent; New Jersey, 2 per cent; Delaware and Maryland, 0.5 per cent; Virginia, North Carolina, and Louisiana, a trace.

New Jersey: Severe in only a few instances. In these cases the fields had previously been limed. (Martin)

North Carolina: Observed in Currituck County on the Yellow Jersey variety and in Craven County on the Porto Rico variety. (Poole)

Reports of non-occurrence were received from eight other sweet potato states.

SCURF CAUSED BY MONILOCHAETES INFUSCANS HALS.

Scurf was reported as occurring rather generally with the crop and for the most part in the same amount as usual, although in Tennessee, Arkansas, Iowa, and Arizona more than the average was noted. The losses from scurf are due to the unsightly appearance of the roots and to shrinkage which may occur in storage. Arizona reported the most trouble from this disease. According to R. B. Streets of that state it occurs in practically all plantings and is the most prevalent disease. The chief loss is reduction in grade of tubers. In Georgia, O. C. Boyd noted a 10-acre field in Coffee County in which digging was delayed until fall and infection was unusually severe. In North Carolina, R. F. Poole reported that the use of potatoes grown on vine cuttings in the plant bed for the development of sprouts has had much to do with the present excellent control of the disease. E. M. Page in Missouri reports that damage seems to be correlated with the amount of organic matter in the soil.

FOOT ROT CAUSED BY PLENODOMUS DESTRUENS HARTER

The only states reporting foot rot in 1926 were Maryland, Virginia, Georgia, Alabama, and Mississippi. In Georgia an infestation was found on a single farm in Coffee County where plants were grown from New Jersey potatoes. O. C. Boyd writes as follows concerning this case:

"The entire crop of potatoes was dug in August, loaded into barrels in the field, and shipped out of the state for eating purposes. All vines in that field were destroyed by cutting with a disc harrow and exposing to the sun. Fifty acres of vine cuttings were destroyed. The entire farm was quarantined, covering the prohibiting of growth of sweet potatoes for a period of five years. The potatoes were shipped into Georgia in violation of the state rules and regulations governing the importation of sweet potatoes into the state."

MOSAIC (UNDETERMINED)

Alabama, Mississippi, Missouri, and Arkansas reported sweet potato mosaic in 1926, but in none of them was over a trace of loss estimated. In Mississippi it was said to be present in a large number of sweet potato fields in nearly every section of the state. In Arkansas, members of the Department of Plant Pathology noted a considerable amount on Nancy Hall potatoes growing near Fayetteville.

During the year Wedgworth (3) conducted a preliminary experiment comparing the yields of mosaic and healthy plants and found that the mosaic diseased plants yielded only 38.9 per cent as much as healthy ones.

Recent Literature

1. Rosen, H. R. Sweet potato mosaic and its incubation period of two growing seasons. (Abstract) Phytopath. 16: 74. 1926.

2. ______________ The mosaic disease of sweet potatoes with special reference to its transmissibility. Arkansas Agr. Exp. Sta. Bul. 213: 1-16. Aug. 1926.

3. Wedgworth, H. H. Effect of mosaic on sweet potato yields. Quart. Bul. State Plant Board of Mississippi 6 (3): 11-12. Oct. 1926.

4. Weimer, J. L. Further evidence of the non-transmissibility of the so-called sweet potato mosaic. (Abstract) Phytopath. 16: 74. 1926.

STORAGE ROTS

The decay of sweet potatoes in storage houses and pits is sometimes very great. It would appear, however, that owing to better storage conditions and improved methods this source of waste is being reduced. Chief among the organisms causing loss in storage is Rhizopus nigricans Ehr., but other organisms such as Diplodia, Fusarium, and the black rot fungus(Ceratostomella fimbriata) are also responsible for much damage. Sweet potato storage losses reported in December 1926 for the year previous are: Arkansas and Kentucky, 30; Texas, 20; North Carolina and Louisiana, 15; Georgia, 12; Arizona, 11; Maryland, Alabama, and Mississippi 10; South Carolina, 8; Tennessee, 7; Virginia and Washington, 5; Kansas and California, 3; Delaware, 2.

OTHER DISEASES

Albugo ipomoeae-panduranae (Schw.) Sw., white-rust, was reported from New Jersey, Delaware, North Carolina, and Porto Rico.

Caconema radicicola (Greef) Cobb, root-knot, Specimens of sweet potatoes affected with root-knot were received from Pope County, Arkansas, March 25. The Department of Plant Pathology at Fayetteville, Arkansas, reports the pest as being common and important. In California, the assistant farm advisor in Los Angeles County reported the Porto Rico variety as very resistant to root-knot.

Diplodia tubericola (Ell. & Ev.) Taub., Java black rot, R. F. Poole of North Carolina reported that this fungus was prominently associated with others in destroying more than 3,000 bushels of Porto Rico potatoes in a single storage house in North Carolina in 1925. Apparently the rot originated in the field. The disease was also reported from Texas by Taubenhaus.

Phymatotrichum omnivorum (Shear) Dug., root rot, was reported by J. J. Taubenhaus as affecting sweet potatoes in the black lands of Texas, possibly causing 3 per cent loss. It was also observed on sweet potatoes in Arizona where 2 per cent loss was estimated.

Phyllosticta batatas (Thuem.) Cke., leaf spot, caused slight defoliation of the Big Stem Jersey and Norton Yam varieties in North Carolina, according to R. F. Poole.

Pythium sp., rootlet rot. L. L. Harter observed this disease in the state of Washington during the summer of 1926. He estimated 5 per cent infection in the fields he visited.

Rhizoctonia sp., damping-off, was reported on sweet potatoes from Texas.

Sclerotium bataticola Taub., charcoal rot, was reported from North Carolina and Texas. In North Carolina, Poole reported that the Jersey varieties grown for the early market in Currituck County were slightly diseased in August. After the marketable potatoes were removed the small potatoes and stems left on top of the ground in some fields were attacked by the fungus. It was also found to be associated with other fungi causing loss in storage houses.

Sclerotium rolfsii Sacc., stem rot. Collaborators in Georgia and Alabama report this fungus as causing frequent damage in seed beds.

Septoria bataticola Taub., leaf spot, observed in few fields in New Jersey.

Recent Literature

1. Lauritzen, J. I. A strain of yellow Jersey sweet potato resistant to surface rot (Fusarium oxysporum W. & C.). Jour. Agr. Res. 33: 1091-1094. 1926.

2. ________________ and L. L. Harter. The relation of humidity to infection of the sweet potato by Rhizopus. Jour. Agr. Res. 33: 527-539. 1926.

3. Poole, R. F. Fertilizer injuries to sweet potatoes. Better Crops 6 (4): 5-6, 47-51. June 1926.

4. Small, W. Rhizoctonia bataticola (Taub.) Butler. Trop. Agr. Ceylon 67: 237-239. Oct. 1926.

5. ________________ On the identity of Rhizoctonia lamellifera and Sclerotium bataticola. Trans. Brit. Myc. Soc. 10: 287-302. 1926.

D I S E A S E S O F B E A N

ANTHRACNOSE CAUSED BY COLLETOTRICHUM LINDEMUTHIANUM (SACC. & MAGN.) BRIOSI & CAV.

On account of dry weather early in the season anthracnose was slow in appearing but with the advent of rains in August and September it became the cause of some damage to the late crop. Collaborators in the states of New York, Maryland, South Carolina, Indiana, Kentucky and Minnesota reported more than the average year, while others reported the same or less than the average year. The disease was not reported to any extent west of the Great Plains. Some of the collaborators' reports are as follows:

New York: Not much early infection due to dry weather but developed later in the season. (Barrus)

Maryland: Seed from irrigated sections of Idaho had less than seed from Michigan, New York, and Maryland. (Jehle & Temple)

Kentucky: Canners reported the crop cut in half in Carlisle County. This was the crop canned in late July. (J. S. Gardner)

Georgia: Very little observed on early crop. More in late fields. (Boyd)

Ohio: Very prevalent on snapbeans especially in latter part of season. Many small gardeners experienced severe epidemics. (H. C. Young)

Indiana: Not serious in canning crop since it was harvested before wet weather. Bad in gardens late in season. (Gardner & Kendrick)

Michigan: Where conditions were favorable, as in northwestern part of the southern peninsula, anthracnose caused some damage. In most sections of the state it was too dry for development. (Nelson)

Wisconsin: More on canning beans than dry beans. Rains did not come early enough to cause much damage. (Vaughan)

The reductions in yield on account of this disease as reported by collaborators were 3.5 per cent, New York; 3 per cent, South Carolina; 2 per cent, Maryland; 1 per cent, Virginia, Mississippi, Louisiana; 0.5 per cent, Delaware, Georgia, Michigan, and Tennessee; trace, West Virginia, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Arkansas, and Montana.

Recent Literature

1. Boning, K. Ueber die Empfänglichkeit von Phaseolus vulgaris für Colletotrichum lindemuthianum im Lichte der Rassenbildung des Krankheitserregers. Forsch. auf dem Gebiet der Pflanzenkrankh. u. der Immunität im Pflanzenreich 2: 4-18. 1926.

2. Esmarch, F. Die Brennfleckenkrankheit der Bohnen. Kranke Pflanze 3: 181-185. Oct. 1926.

3. Muller, H. R. A. Physiologic forms of Colletotrichum lindemuthianum (Sacc. et Mag.) Bri. et Cav. in the Netherlands. Phytopath. 16: 369. 1926.

BACTERIAL BLIGHTS CAUSED BY BACTERIUM PHASEOLI EFS., B. FLACCUMFACIENS HEDGES, AND PHYTOMONAS MEDICAGINIS PHASEOLICOLA BURK.

It was not until recently that these diseases were distinguished from one another. Hedges (2) has recently described the bacterial wilt caused by B. flaccumfaciens as being rather widely distributed in bean growing sections and causing primarily a wilt rather than a blight. One phase of the disease is a breaking over of the diseased plants at one of the nodes. Burkholder (1) has described a disease caused by Phytomonas medicaginis phaseolicola from New York State with symptoms not unlike those caused by the other two organisms. It also produces a wilt as a result of invasion of the vascular system. One of the most characteristic symptoms is a dwarfing and mottling of the leaves not unlike mosaic. Stems, pods, and seed are affected. In the past these three diseases have all been considered as bacterial blight (B. phaseoli) but from now on they should be distinguished as far as possible.

In 1926 bacterial blights were reported from the majority of the Eastern States as far west as the Great Plains. New York, New Jersey, Indiana, and Minnesota were the only states reporting more than usual. In New York these were the most serious diseases of beans. On September 27, L. K. Jones of that state wrote:

Bean - Bacterial Blights

"Very abundant on Green Refugee variety of canning beans in the state. Extreme damage in local sections causing joint rot. Ten to 15 per cent damage to crop in state. Less important on wax beans. In general less damage than last year."

Other reports on prevalence were:

New Jersey: Because of blight and low prices many fields were plowed under before harvesting. (Dept. Pl. Path.)

Ohio: Very serious on snapbeans this year in all sections of the state. (Thomas)

Wisconsin: Leading symptom is breaking of stems and lower nodes. Also water-soaked spots on leaves. (Vaughan)

Colorado: Five per cent reduction in yield in Greeley district. Severity varies with variety and source of seed. Earlier maturing varieties showing more general infection. No control measures practiced. (H. G. MacMillan)

Arizona: In northern Arizona it was present in all fields where the vines were old enough to flower. In many instances early plantings were severely diseased and the vines died weeks ahead of maturity. (Brisley)

The estimates of losses as reported by collaborators were: 4 per cent, Indiana and Louisiana; 3 per cent, Montana and Michigan; 1.5 per cent, Texas and Maryland; 1 per cent, Connecticut, Virginia, Wisconsin, Minnesota, and Mississippi.

Beans of the medium, marrow, and Robust Pea types were reported as resistant in New York, while the Red and White Kidneys were said to be very susceptible in South Carolina, according to W. D. Moore.

Recent Literature

1. Burkholder, W. H. A new bacterial disease of the bean, Phytopath. 16: 915-927. Dec. 1926.

2. Hedges, Florence. Bacterial wilt of beans (Bacterium flaccumfaciens Hedges), including comparisons with Bacterium phaseoli. Phytopath. 16: 1-22. 1926.

3. Link, Geo. K. K., and C. G. Sharp. Serological differentiation of Bacterium campestre from Bact. phaseoli, Bact. sojense, and Bact. flaccumfaciens. (Abstract) Phytopath. 17: 53-54. 1927.

4. Sharp, C. G. Correlation of virulence and acid agglutination of a smooth and a rough strain of Bacterium phaseoli sojense. (Abstract) Phytopath. 17: 49. 1927.

5. ______________ Serological and physiological studies of Bacterium phaseoli, Bact. phaseoli sojense, and Bact. flaccumfaciens. (Abstract) Phytopath. 17: 54. 1927.

RUST CAUSED BY UROMYCES APPENDICULATUS (PERS.) LINK.

Rust was reported from 14 widely scattered states. In Florida and Colorado it was said to be more prevalent than usual. On the other hand, in southern Georgia, Illinois, Michigan, and North Dakota it was said to be less in evidence. Losses of 1 per cent were estimated for Virginia and Texas while in most of the other states only traces of damage occurred. Collaborators in four states report Kentucky Wonder as susceptible. In Colorado the Mexican Pinto is said to be very liable to infection.

Recent literature

1. Waters, C. W. The reactions of bean rust grown on leaves in solutions. Papers Mich. Acad. Sci. 5: 163-177. 1926.

ROOT ROTS DUE TO VARIOUS CAUSES

Dry root rot caused by Fusarium martii phaseoli Burk. was reported from New York, especially in the western portions, West Virginia, Florida, and Indiana. During the past year also Weimer and Harter (1) have given a description of bean root rot in California caused by this fungus and by a new species, F. aduncisporum. In New York, M. F. Barrus reports Perry Marrow as resistant, Blue Pod Medium and marrows in general as susceptible, and Navy Pea as very susceptible.

Root rot caused by Fusarium spp. A severe root rot was reported from Mississippi during the year, as high as 90 per cent infection being observed in one field and an average estimated loss for the state of 2 per cent being made. In northern Arizona, H. G. Brisley reports that root rot is always bad in some sections and can generally be depended on to cause a 20 per cent loss. From Idaho the report was received that root rot was general and probably caused a loss of 2 per cent for the state. Oregon and California are other states reporting Fusarium root rot.

Undetermined root rots were reported from New York, Florida, Georgia, and California.

> New York: Early cold season (June) delayed germination and growth, reducing vitality of roots. Also extreme injury resulted from attacks of the corn seed maggot on roots and stems in the cold early season. Average stand of plants resulting from these factors did not exceed 50 per cent in the state (canning or snap-beans). (L. K. Jones)

Florida: Several fields have been observed which showed considerable reduction in stand and retarded growth from root diseases. The etiology of the injury has not been determined. In some cases Rhizoctonia appeared to be the cause while in other fields different symptoms were manifest. (Tisdale)

Georgia: This disease, with a reddish, swollen, pithy tap-root was unusually prevalent this year. Sclerotium bataticola repeatedly isolated. (Boyd)

Recent Literature

1. Weimer, J. L., and L. L. Harter. Root rot of the bean in California caused by Fusarium martii phaseoli Burk. and F. aduncisporum n. sp. Jour. Agr. Res. 32: 311-319. 1926.

STEM ROT CAUSED BY CORTICIUM VAGUM BERK. & CURT.

In 1926 stem rot was reported from the majority of the Atlantic and Gulf states from Massachusetts to Texas, and also from Arizona and California. In Massachusetts it was said to be common and severe throughout the state. In New Jersey only traces of loss were noted. In Maryland one field was found with 5 per cent of the plants severely injured. In Virginia it was said to be the cause of considerable damage in the Tidewater Section on snapbeans. In Charleston County, South Carolina, Fenner reported three fields with 20 per cent infection. In Arizona and in California 1 and 3 per cent reduction in yield was estimated, respectively.

ASHY STEM BLIGHT CAUSED BY MACROPHOMA PHASEOLI MAUB.

This disease, but recently reported in this country and heretofore known only in South Carolina, was reported in 1926 from other locations in that state and also from Georgia and Mississippi. In Georgia it was observed May 10 in Thomas County by O. C. Boyd and W. A. Whitney in a one-acre field where the loss was about 5 per cent. In Mississippi three scattered cases were found. Concerning the Mississippi situation H. H. Wedgworth wrote on September 29 as follows:

"Beans infected with a stem rot and having fruiting bodies very similar to Macrophoma phaseoli have been collected from two fields in Oktibbeha County and from one field in George County. The disease was quite destructive, especially in one field this year. This particular field in Oktibbeha County suffered a loss of about 60 or 65 per cent of the plants from the spring planting. Unfortunately, the grower planted this field to fall beans and the disease has been prevalent in this planting also to the extent of about 50 per cent."

This disease has been called ashy stem blight by Ludwig on account of the grayish coloration of affected stems and lower branches.

Recent Literature

1. Anon. A new fungus pest of beans. Science n. s. 64: 10, 12. Sept. 17, 1926.

2. Wedgworth, H. H. A new bean disease in Mississippi. Quart. Bul. State Plant Board of Mississippi 6 (3): 6-10. Oct. 1926.

MOSAIC (UNDET.)

Mosaic occurred widely in the bean crop. In the western United States mosaic and curly top have been and probably still are, confused. Recently Carsner (1), and also McKay and Dykstra, have shown that the bean is a host of the sugar beet curly top virus.

Mosaic ranks with the bacterial blights and anthracnose in importance. Estimates of reduction in yield were: 6 per cent, Iowa, and Montana: 5 per cent, Idaho and Minnesota; 4 per cent, Indiana; 3 per cent, Mississippi; 2 per cent, Michigan and Washington; 1 per cent, Arizona; 0.2 per cent, California; and 0.1 per cent, Tennessee.

Resistant varieties reported during 1926 were: Robust Pea and Red and White Kidneys in New York and Robust in Idaho. The susceptible varieties were Navy Pea, Scotia, Refugee Wax and others in New York; Giant Stringless Green Pod and Kentucky Wonder in Mississippi; Rogers Improved Kidney Wax and Kenneys White Seeded Refugee Wax in Indiana; Refugee Green in Wisconsin, and Lady Washington and Little Navy in Idaho.

CURLY TOP (UNDET.)

Reports of this disease, caused by the same virus as that of curly top of beet, were received from Idaho and Oregon. In Idaho, Eubanks Carsner found that the damage was extensive and was led to believe that this was the cause of considerable loss of Idaho beans in 1924. In Oregon, M. B. McKay estimated a loss of one-half of the bean crop. The hot, dry season was favorable for leafhoppers with a result that the disease was more widespread and destructive than ever before.

Recent Literature

1. Carsner, E. Susceptibility of the bean to the virus of sugar beet curly top. Jour. Agr. Res. 33: 345-348. Aug. 15, 1926.

OTHER DISEASES

Alternaria fasciculata (Cke. & Ell.) Jones & Grout, leaf spot. Collected in Missouri.

Chlorosis caused by excess lime. Texas.

Caconema radicicola (Greef) Cobb, root knot. Virginia - very severe on Navy bean at Surrey. South Carolina - one report. Southern Georgia - 5 per cent reduction in yield. Mississippi - one report. Texas - prevalent in light sandy loams. Missouri - found in one field of sandy soil in southeastern part of state. California - 2 per cent loss.

Erysiphe polygoni DC., powdery mildew. Virginia - severe on the Bountiful variety in eastern Virginia according to McWhorter. South Carolina - traces loss. Florida - more than usual; general. Texas - Prevalent. California - 0.2 to 0.3 per cent loss.

Isariopsis griseola Sacc., angular leaf spot. Specimen received from Ridgely, Maryland, September 9. Also reported as occurring locally in Florida.

Phymatotrichum omnivorum (Shear) Dug., root rot - Fairly prevalent on beans in Rio Grande Valley of Texas, according to Taubenhaus.

Pythium sp., rootlet rot. Collected by Drechsler and Whitney at Bladensburg, Maryland.

Sclerotinia sclerotiorum (Lib.) Mass., stem rot. A very important disease of beans in Florida according to Weber.

Sclerotium rolfsii Sacc., stem rot. South Carolina - trace of loss. Mississippi - general throughout the state; as high as 50 per cent loss in some gardens and fields.

DISEASES OF LIMA BEAN

DOWNY MILDEW CAUSED BY PHYTOPHTHORA PHASEOLI THAX.

This disease was reported from Connecticut, New York, Pennsylvania, New Jersey, and Delaware. On Long Island, N. Y., E. E. Clayton reported more than usual with losses as high as 15 and 20 per cent. In the vicinity of Philadelphia, Pennsylvania, W. S. Beach estimated a reduction in yield of 3 per cent and as high as 25 per cent infection in some fields.

In Pennsylvania, Beach continued control experiments with copper-lime dust, dusting sulfur, and dry-mix lime-sulfur. Successful control was obtained by copper-lime dusting even though the first application was delayed until September when the first signs of infection were evident. Results with sulfur were not satisfactory.

OTHER DISEASES

Bacterium vignae Gardner & Kendrick. (B. viridifaciens Tisdale & Williamson) was reported from Long Island, New York, where, according to E. E. Clayton much defoliation reduced the set of pods; New Jersey, where it was thought to be present wherever lima beans are grown; and Pennsylvania, where W. S. Beach reported traces of loss with as high as 10 per cent infection in some fields.

Cercospora cruenta Sacc., leafspot. One collection in Missouri, by W. A. Archer, October 16.

Colletotrichum lindemuthianum (Sacc. & Magn.) Br. & Cav. Collected at Bladensburg, Maryland, by Drechsler and Whitney.

Diaporthe phaseolorum (Cke. & Ell.) Sacc., pod blight. Much more than usual was reported from Delaware by J. F. Adams. Collections were also made in Maryland and Mississippi.

Fusarium aduncisporum Weimer & Harter, root rot. Widespread and the cause of considerable damage in California according to Weimer and Harter (1).

Fusarium martii phaseoli Burk., dry root rot. This fungus has been found by Weimer and Harter (1) to be the cause of serious root rot to lima beans as well as common beans in California. On June 16 a specimen affected with dry root rot was sent in to the Bureau of Plant Industry from Grafton, West Virginia, and the fungus determined as Fusarium martii phaseoli.

Pythium sp., rootlet rot. Collected at Bladensburg, Maryland, by Whitney and Drechsler, September 1.

Recent Literature

1. Weimer, J. L., and L. L. Harter. Root rot of the bean in California caused by Fusarium martii phaseoli Burk. and F. aduncisporum n. sp. Jour. Agr. Res. 32: 311-319. Feb. 15, 1926.

DISEASES OF ONION

SMUT CAUSED BY UROCYSTIS CEPULAE FROST

Smut was reported in 1926 from onion sections in Connecticut, New York, Maryland, Ohio, Michigan, Wisconsin, Minnesota, Iowa, North Dakota, Kansas, and Idaho. It will be noted that most of these states are in the northern half of the country. Walker and Wellman (4) in their work on the temperature relations of onion smut have pointed out that comparatively low temperatures are favorable for the disease and that it occurs in the more northern and cooler sections of the United States and Europe. In New York, M. F. Barrus makes the observation that the infested area in the Orleans-Genesee County section is increasing in extent from year to year. In Ohio also smut is said to be on the increase in places where the formaldehyde soil treatment is not used. In Michigan specimens were received from commercial onion fields in Van Buren County. This seems to be the first definite report of the disease in that state, which seems rather singular, considering the fact that the disease has long been established in this country, particularly in northern sections.

From Oregon, H. P. Barss reported that smut continued to occur in the western part of the state but was well controlled by the formaldehyde drip treatment.

Recent Literature

1. Alcock, N. L., A. E. S. McIntosh, and G. B. Wallace. The control of onion smut. Scott. Jour. Agr. 9: 55-70. Jan. 1926.

2. Blizzard, A. W. The nuclear phenomena and life history of Urocystis cepulae. Bul. Torrey Bot. Club 53: 77-117. 1926.

3. Szembel, S. J. (Some observations on the biology of the smut fungus Urocystis cepulae Frost.) La Defense des Plantes, Leningrad 2: 524-530. 1926.

4. Walker, J. C., and F. L. Wellman. Relation of temperature to spore germination and growth of Urocystis cepulae. Jour. Agr. Res. 32: 133-146. 1926.

DOWNY MILDEW CAUSED BY PERONOSPORA SCHLEIDENI UNG.

Out of 26 state reports, 19 recorded downy mildew as not having been found during the year, while 7, namely, New York, Maryland, Georgia, Arkansas, Wisconsin, Oregon, and California, reported its occurrence. In New York, 5 per cent reduction in yield was estimated by J. G. Gaines. The disease was most prevalent during the first two weeks in August and was favored by wet weather. In Maryland a trace of loss was said to have occurred late in the season. In Georgia it was common on seedlings early in the year (February). Its occurrence in Arkansas was remarked by collaborators as this is the first time it has been reported for several years. In the central California coastal region heavy damage took place in seed fields, where as high as 50 per cent loss occurred in many cases. Seed stalks were spotted causing them to break over. D. G. Milbrath estimated a loss of 40 per cent to the seed crop.

Recent Literature

1. Katterfeld, N. O. Zur Biologie der Peronospora schleideni Ung. Bolezni Rast. 15: 71-87. 1926.

2. Murphy, Paul A., and Robert McKay. Some new facts concerning onion mildew. Jour. Dept. Lands & Agr. Ireland 26: 115-123. 1926.

3. ______________________ The downy mildew of onions (Peronospora schleideni) with particular reference to the hibernation of the parasite. Sci. Proc. Roy. Dublin Soc. n.s. 18: 237-261. July 1926.

NECK ROTS CAUSED BY BOTRYTIS SPP.

J. C. Walker has described three distinct neck rot diseases of onion bulbs, namely, grey mold neck rot (Botrytis allii Munn), mycelial neck rot (Botrytis byssoidea Walker), and small sclerotial neck rot (Botrytis squamosa Walker); The first named disease was reported in 1926 from Connecticut, New York, and Indiana. The second, mycelial neck rot, was reported from Wisconsin and Illinois where it was said to be severe in the Racine - Kenosha and the Chicago districts on white onions. The injury was estimated at from 10 to 80 per cent. Red and yellow varieties were comparatively free.

Recent literature:

1. Walker, J. C. Botrytis neck rots of onions. Jour. Agr. Res. 33: 893-928. Nov. 15, 1926.

BULB ROT CAUSED BY FUSARIUM SPP.

Link and Bailey (1) have reported several different Fusaria causing bulb rot, with practically identical symptoms. In 1926 these rots were reported from New York, Indiana, Arizona, and Washington and market inspectors found them in onions from many other states.

Recent Literature

1. Link, G. K. K., and A. A. Bailey. Fusaria causing bulb rot of onions. Jour. Agr. Res. 33: 929-952. Nov. 15, 1926.

PINK-ROOT CAUSED BY FUSARIUM MALLI TAUB.

This disease was reported from Louisiana, Texas, where 2 per cent loss was estimated, Ohio, and Missouri. A pink root rot of undetermined cause resulted in serious losses where seedlings were grown in infested soil in Orleans and Wayne Counties, New York.

OTHER DISEASES

Alternaria allii Nolla, was reported by J. A. B. Nolla from Porto Rico. He stated that moist weather is most favorable for spread and inoculation.

Aspergillus niger Tiegh., black mold. One per cent loss was estimated in Texas and 2 per cent in Arizona. In the latter state there was much more than usual because of rains preceding and during harvest.

Bacillus carotovorus Jones, soft rot. Caused considerable rotting at base of onions in Nassau County, New York, and in Arizona an estimated loss of 3 per cent was thought to have occurred through reduction in yield and grade.

Caconema radicicola (Greef) Cobb, root knot. Texas.

Colletotrichum sp., leaf anthracnose. In Porto Rico it was estimated by J. A. B. Nolla that 40 per cent of the crop was injured by this disease which was favored by prolonged rainy weather.

Colletotrichum circinans (Berk.) Vogl., smudge. This common disease undoubtedly occurred widely on white onions, although it was actually reported to the Survey only from New York, Indiana, and Porto Rico.

Cuscuta sp., dodder. Texas.

Diplodia sp., slow rot. J. A. B. Nolla of Porto Rico reported this to the Survey for the first time.

Fusarium sp., brittle. Traces prevalent in isolated fields in western New York. Losses negligible (J. G. Gaines)

Fusarium sp., root rot. In Walla Walla County G. L. Zundel found root rot affecting about half of the crop August 25 and causing considerable loss.

Macrosporium sarcinula parasiticum Thuem., black stalk rot, was more prevalent than usual in New York, according to J. G. Gaines. It became most prevalent during August after tops had been attacked by peronospora. Reported also from New Jersey, Florida and Wisconsin.

Macrosporium porri Ell., mold. Found in seed fields in Indiana and Wisconsin preventing maturity of heads. In Porto Rico also it was said to have been common.

Recent Literature

1. Hansen, H. N. Pink root of onions caused by Phoma sp. Science 64: 525. Nov. 26, 1926.

2. Nattras, R. M. White rot disease of onions - immunity trials. Jour. Bath & West & South Co. Soc. Agr. 20: 177-178. 1926.

3. Walker, J. C. The influence of soil temperature and soil moisture upon white rot of Allium. Phytopath. 16: 697-710. Oct. 1926.

DISEASES OF CRUCIFERS

CABBAGE

YELLOWS CAUSED BY FUSARIUM CONGLUTINANS WOLL.

Yellows has been reported generally in the eastern part of the country except in the extreme north, and occasionally outside of this area. In 1926 it was reported from all of the states, excepting Pennsylvania and Michigan, included between New York, Minnesota, Nebraska, Kansas, and North Carolina, and from Texas. Only two states, Iowa and Tennessee, reported it to be of more than average importance; in most states there was about the usual amount; while Indiana, Illinois, Minnesota, and Missouri reported less. Yellows was not reported at all from the infested region of southeastern Michigan, the weather being too cool for its development there. The highest estimated state loss, 30 per cent, was reported from Iowa. Other loss estimates received were 10 per cent in Kentucky and Missouri, 8 per cent in Maryland, Texas, and Kansas, 5 per cent in West Virginia and Tennessee, 1.5 per cent in North Carolina, and a trace in New York. The loss in Kentucky was in home gardens, the use of resistant varieties preventing any damage to the commercial crop.

During the year three new yellows-resistant midseason varieties of cabbage were reported by the Wisconsin station (7), namely, All Head Select, Globe, and Marion Market, selected from All Head Early, Glory of Enkhuizen, and Copenhagen Market, respectively. A strain of Copenhagen Market, known as Iacope, which has been bred for yellows-resistance but is somewhat later than the earliest strains of the parent variety and also less uniform as to type, has been developed at the Iowa station by a new method of seedbed selection for resistance and seed stock propagation in the greenhouse. (1,4). During 1924 and 1925 it produced a marketable crop on badly infested soil.

Recent Literature

1. Erwin, A. T. The development of a yellows resistant strain of early cabbage for the corn belt. Minn. Hort. 54 (1): 20-22. 1926.

2. Jones, L. R. Science helps grow truck crops; disease resistance developed from Wisconsin experiments. Wisc. Agr. 50: 181, 204. Feb. 13, 1926.

3. Jones, L. R. James Johnson, and James G. Dickson. Wisconsin studies upon the relation of soil temperature to plant disease. Wisconsin Agr. Exp. Sta. Res. Bul. 71: 1-144. Nov. 1926.

4. Melhus, I. E., A. T. Erwin, and F. van Haltern. Cabbage yellows, caused by Fusarium conglutinans, in Iowa. Iowa Agr. Exp. Sta. Bul. 236: 187-216. June 1926.

5. Tims, E. C. On the nature of resistance to cabbage yellows. Jour. Agr. Res. 32: 183-199. Jan. 15, 1926.

6. Tims, E. C. The influence of soil temperature and soil moisture on the development of yellows in cabbage seedlings. Jour. Agr. Res. 33: 971-992. Nov. 15, 1926.

7. Walker, J. C. Three new yellows-resistant midseason cabbage varieties. Seed World 20 (14): 15. Dec. 31, 1926.

BLACK ROT CAUSED BY BACTERIUM CAMPESTRE (PAM.) EFS.

Black rot has been reported throughout most of the country, except some of the western states, but is most important in the eastern half. In 1926 reports were received from 21 states, all in the region from the Great Plains eastward. For the country as a whole it seems to have been of about the usual importance, six states reporting the average amount, six more, and six less. Rather heavy losses occurred in some localities. Beach reported 25 per cent loss to cruciferous crops, of which cabbage was most important, in the South Philadelphia section of Pennsylvania. Black rot was said to be the most important cabbage disease in Nebraska, where infections of as much as 85 per cent occurred. Ten per cent loss was reported from West Virginia, 5 per cent from Missouri, 1 per cent from Iowa and Texas, and a trace from New York and South Carolina. McWhorter stated (May 31) that black rot was very inconspicuous in the Norfolk section of Virginia where it is usually considered of great importance. In New York, according to Barrus, seed treatment for black rot and blackleg is becoming commonly practiced, which may partially account for the small loss in the state.

BLACKLEG CAUSED BY PHOMA LINGAM (TODE) DESM.

In past years blackleg has been reported to the Survey from all the states between Massachusetts, Minnesota, Louisiana and Florida, from Colorado, and occasionally from 4 or 5 additional states. All of the 18 states reporting the disease in 1926 were within the usual range. In 8 of these there was the average slight or moderate amount, in 2 less, and in one more. The coastal plain area of Georgia, the one state reporting more than usual, experienced its first epiphytotic of blackleg this year. A loss of 7 per cent was estimated for that section. Other losses reported were 1 to 3 per cent in New York, 2 per cent in North Carolina, and 1.5 per cent in Maryland.

CLUBROOT CAUSED BY PLASMODIOPHORA BRASSICAE WOR.

Clubroot has been reported from most states, but causes losses only locally or occasionally and is not of general importance. It is most prevalent in the eastern part of the country, especially in the north. In 1926 reports were received from Connecticut, New York, New Jersey, Maryland, North Carolina, Ohio, Michigan, Wisconsin, Minnesota, Iowa, and Oregon. Barrus reported that in New York it was more abundant and general than for several years. There was more than usual in Wisconsin also where spread from infected seedbeds resulted in total loss in some cases. In most other states there was about the usual amount. Loss estimates given are 1.5 per cent in North Carolina, 1 per cent in Ohio, and a trace in Missouri and Oregon.

<u>Recent literature</u>:

1. Vaughan, R. E., and F. L. Wellman. Club root of cabbage. Wisconsin Agr. Exp. Sta. Circ. 200: 1-3. 1926.

DAMPING-OFF AND WIRE STEM CAUSED BY CORTICIUM VAGUM BERK. & CURT.

Wire stem was reported from New York, New Jersey, and Kansas. According to R. P. White, the disease had not previously been found in the seed bed in Kansas. Connecticut and South Carolina reported damping-off due to this organism. An interesting statement by J. S. Gardner of Kentucky, regarding control of damping-off, is given here, although he does not mention the cause of the trouble.

> "Much trouble is experienced by gardeners, in frames, of course. The standard formaldehyde drench is proving effective. So is a 1-1000 mercuric chloride drench applied (as an emergency) just before seeding. One co-operator 'killed his ground' by using it at the rate of 10 gallons per 4 x 6 foot sash (5 times recommended), but things became normal when he sprinkled the plants with 1 gallon of water plus 1 tablespoonful of sodium nitrate, 2 applications 2 weeks apart. He had perfect control of damping-off." (May 18)

A head rot due to Rhizoctonia was reported by G. B. Ramsey, who stated that it was new in his experience. He found it at Bradentown, Florida, in May, on heads left standing in the field after harvesting. Isolations made from two or three heads gave pure cultures of Rhizoctonia in each case. The Survey has one other report of Rhizoctonia head rot of cabbage, from Philadelphia County, Pennsylvania, where it caused a loss of 7 per cent in 1922, according to W. S. Beach.

DOWNY MILDEW CAUSED BY PERONOSPORA PARASITICA (PERS.) D BY.

Downy mildew was reported, mostly as local or scattered in occurrence, from New York, New Jersey, Florida, Louisiana, and Texas. In New Jersey it was reported May 27, from Paterson, Passaic County, where there was 100 per cent infection in plant beds. Aeration and witholding of water checked its advance (Dept. Plant Path.). In Texas downy mildew was very prevalent on early cabbage, and caused a loss of 3 per cent. (Taubenhaus)

Recent Literature

1. Gäumann, E. Ueber die Spezialisierung des falschen Mehltaus (Peronospora brassicae Gm.) auf dem Kohl und seinen Verwandten. Landw. Jahrb. Schweiz. 40: 463-468. 1926.

2. Thung, T. H. Opmerkingen ober Peronospora parasitica op kool. (Bemerkungen über die Kohl-Peronospora). Tijdschr., Plantenz. 32: 161-179. June 1926.

3. ____________ Peronospora parasitica (Pers.) De By. attacking cabbage heads. Phytopath. 16: 365-366. May 1926.

OTHER DISEASES

Alternaria brassicae (Berk.) Sacc., black leafspot. New York, New Jersey, southern Georgia, Florida and Mississippi.

Bacterium maculicolum McCul., bacterial leafspot. Nassau County, New York (Long Island).

Caconema radicicola (Greef) Cobb, root knot. Southern Georgia, Texas.

Cercosporella albo-maculans (Ell. & Ev.) Sacc., leafspot, was reported by O. C. Boyd from southern Georgia as follows: "First observed on January 28, on young cabbage in a garden in which turnip tops were heavily affected with the same disease." The Survey has no other record of the occurrence of this fungus on cabbage, but it has been reported on Chinese cabbage from Connecticut, and is rather generally distributed on white turnip.

Sclerotinia sclerotiorum (Lib.) Mass., drop. Eastern Virginia, Florida, Louisiana.

Sclerotium rolfsii Sacc., southern blight. Southern Georgia, Texas.

Mosaic. A disease reported as mosaic occurred in Nassau County, Long Island. (Barrus)

Wilting due to lightning, Wisconsin.

C A U L I F L O W E R

Bacillus carotovorus Jones, soft rot. Indiana.

Bacterium campestre (Pam.) EFS., black rot. Local in Pennsylvania, severe where observed (Beach). Slight damage in Missouri. (Archer).

Bacterium maculicolum McCul., peppery leafspot, was reported by Milbrath (in U. S. Bur. Agr. Econ. Fruit & Veg. Div. Letter 3 (2): 18. Jan. 14, 1927) from Compton, Los Angeles County, California. Goldsworthy (1) says that the disease "appears to be of growing economic importance throughout the cauliflower plantings of the San Francisco Bay Region." Also reported from Monmouth County, New Jersey.

Corticium vagum Berk. & Curt., damping-off, occurred in Erie County, New York, in beds treated with mercuric chloride as well as in untreated beds. (Barrus). Uspulun gave good control in a trial at Norfolk, Virginia (McWhorter). One report from Multnomah County, Oregon - 25 per cent of 35,000 seedlings attacked. (Barss)

Peronospora parasitica (Pers.) D By., downy mildew. At Norfolk, Virginia, Uspulun used to check Rhizoctonia damping-off in coldframes, not only controlled that disease but apparently also prevented the development of downy mildew, since none appeared in the treated frames, although it was abundant in neighboring untreated ones. (McWhorter). Downy mildew was also reported from Passaic County, New Jersey.

Plasmodiophora brassicae Wor., club root. Erie County, New York.

Whiptail (due to malnutrition) caused a loss of probably 15 per cent on Long Island. Perfect control was obtained from applications of hydrated lime just prior to setting out the plants. (Clayton)

CRUCIFERS

Recent literature:

1. Goldsworthy, M. C. Studies on the spot disease of cauliflower, a use of serum diagnosis. Phytopath. 16: 877-884. Nov. 1926.

2. Meer, J. H. H. van der. Rhizoctonia-en Olpidium-aantasting van bloemkoolplanten. Tijdschr. Plantenz. 32: 209-242. Aug. 1926. English abst. pp. 235-240.

3. Weimer, J. L. Ringspot of crucifers caused by Mycosphaerella brassicicola (Fr.) Lindau. Jour. Agr. Res. 32: 97-132. Jan. 15, 1926.

AMERICAN BROCCOLI

This plant is not a form of the ordinary broccoli, but is a distinct variety of Brassica oleracea, probably the same as that called asparagus or sprouting broccoli by Bailey in his "Manual of Cultivated Plants." McWhorter sends the following report from Diamond Springs in the Norfolk section of eastern Virginia:

> "This is a relatively new crop here. It is now (November 30) conspicuously affected with Alternaria brassicae (Berk.) Sacc., but with little or no apparent damage. Black rot (Bacterium campestre (Pam.) EFS.) is far more serious on this host."

BROCCOLI

Alternaria brassicae (Berk.) Sacc., leafspot. A severe fall outbreak in the Norfolk section of eastern Virginia (McWhorter).

Bacterium campestre (Pam) EFS., black rot. Pennsylvania; Virginia, Norfolk section, "More severe than I have ever seen it." (McWhorter).

Plasmodiophora brassicae Wor., club root. New York.

BRUSSELS SPROUTS

Phoma lingam (Tode) Desm., blackleg, Long Island, New York. "Loss varies from none to 90 to 100 per cent. The disease is very destructive where it occurs." (Clayton)

CHINESE CABBAGE

Cercospora bloxami Berk. & Br., leafspot, Florida.

Cercosporella albo-maculans Ell. & Ev., leafspot, has been observed for the past 3 years in gardens at the Massachusetts Agricultural College. (Davis, 1).

Recent literature:

1. Davis, W. H. Cercosporella leafspot of Chinese cabbage. (Abstract). Phytopath. 17: 42. Jan. 1927.

2. Wellman, F. L. Occurrence of club root on Chinese cabbage. Phytopath. 16: 310. Apr. 1926.

HORSERADISH

Alternaria brassicae (Berk.) Sacc., leafspot. Missouri.

Alternaria herculea (Ell. & Mart.) Elliott, leafspot. Connecticut, New Jersey.

Cercospora armoraciae Sacc., leafspot. Missouri.

Bacterial leafspot, organism undetermined. "A bacterial leafspot was found, October, 1926, on several large horseradish plants growing in a greenhouse in the District of Columbia. The leaves were heavily spotted with circular to angular lesions, water-soaked and translucent when young, becoming pale brown to yellowish when old. The roots of these plants were sound. Yellow bacteria, similar to, if not identical with, Bacterium campestre, have been isolated from the leafspots and their pathogenicity proved. Field specimens of this disease will be appreciated by Lucia McCulloch, Laboratory of Plant Pathology, Washington, D. C."

Curly top (?), virus. A destructive disease nearly ruined the horseradish industry in a number of places in western Oregon this year, according to McKay and Dykstra, who state that from symptoms and from circumstantial evidence, "We have every reason to believe that this horseradish disease is due to the (sugar beet) curly top virus, and no reason for doubting it." The sugar beet leafhopper was prevalent in the fields. In one locality at Beaverton (Washington), where the yield from 41 acres would normally be 125 tons of roots, 90 to 95 per cent of the plants were affected and the yield would not be more than 30 tons for the entire acreage. Besides this direct loss it is doubtful whether the roots remaining should be used for replanting. McKay estimates a total loss of 75 per cent.

CRUCIFERS

K O H L R A B I

Fusarium conglutinans Woll., yellows. Tippecanoe County, Indiana.

M U S T A R D

Albugo candida (Pers.) Kuntze, white rust. Florida.
Caconema radicicola (Greef) Cobb, root knot. Missouri.
Peronospora parasitica (Pers.) D By., downy mildew. Florida.

R A D I S H

Actinomyces scabies (Thax.) Güss., scab. Bergen County, New Jersey, on radishes sown in heavily scabbed soil. (Chupp).

Albugo candida (Pers.) Kuntze, white rust. Indiana.

Aphanomyces raphani Kendrick, black root. Kendrick (Phytopath. 17: 43. Jan. 1927) reports that black root is caused by a hitherto undescribed species of Aphanomyces for which he proposes the name A. raphani. Neither Pythium aphanidermatum (Edson) Fitz. nor Aphanomyces euteiches Drechsler proved to be pathogenic to radishes in inoculation tests.

Corticium vagum Berk. & Curt., stem rot. In market gardens in Missouri, mostly of slight importance, but sometimes severe in spots. (Archer).

Sclerotinia sclerotiorum (Lib.) Massee, New Jersey.

R A P E

Bacterium campestre (Pam.) EFS., black rot. Pennsylvania, Indiana.

T U R N I P

Actinomyces scabies (Thax.) Güss., scab. Middlesex County, New Jersey. "All kinds of root crops were planted on a farm that gave very scabby beets in 1925. Apparently the same scab organism attacks many root crops. In an experiment, the average percentage of scab was: Checks, 11.7 on Milan turnip, 9 on Globe. With sulfur 300 pounds per acre, 5 on Milan, 3.8 on Globe. With sulfur 600 pounds per acre, 1.1 on Milan, 3.2 on Globe." (Chupp).

Albugo candida (Pers.) Kuntze, white rust, Florida, Texas.

Bacillus caratovorus Jones, soft rot. Maryland.

Caconema radicicola (Greef) Cobb., root knot. Southern Georgia.

Cercosporella albo-maculans (Ell. & Ev.) Sacc., leafspot. Southern Georgia.

Cylindrosporium brassicae Fautr. & Roum., leafspot. Specimens collected by C. A. Ludwig in Anderson County, South Carolina, November 24 were received. This is apparently the first record from this state. The only other report the Survey has is one made by B. B. Higgins from Spalding County, Georgia, in 1916.

DISEASES OF CUCURBITS

MUSKMELON

LEAFBLIGHT CAUSED BY MACROSPORIUM CUCUMERINUM ELL. & ARTH.

Although it probably occurred much more widely, Macrosporium blight was reported it 1926 only from Connecticut, New Jersey, Delaware, Maryland, Virginia, Georgia, Alabama, Texas, Indiana, and Arizona. Percentage losses reported were large in some cases: 30 in southern Georgia, 20 in Texas, 8 in Maryland, 5 in Alabama, 2 to 3 in New Jersey. Some of the comments of collaborators are as follows:

> New Jersey: Came late, following heavy rains in August. (Dept. Plant Path.)
>
> Delaware: Mature infection observed July 14. Has spread very rapidly. Copper-lime dusting has proved very effective this season when applied two or three times. Focal points of early infections strongly indicate seed transmission. (Adams, Aug. 15).
>
> Maryland: Dusting for control becoming more prevalent. (Temple & Jehle).
>
> Southern Georgia: Early fields underwent from 5 to 25 per cent loss; late fields from 25 to 75 per cent. (Boyd).
>
> Northern Arizona: Has been present in the majority of fields during the later stages of growth. In general the weather has been dry so there has been little spread of the disease. (H. R. Brisley, Sept. 11).

BACTERIAL WILT CAUSED BY BACILLUS TRACHEIPHILUS EFS.

Bacterial wilt of cucurbits occurs generally from the Great Plains eastward, and has been reported occasionally outside of this area. In 1926 it apparently was mostly of slight importance on muskmelon. Reports of its presence were received from Connecticut, Maryland, Alabama, Louisiana, Ohio, Indiana, and Missouri. Losses estimated were 3 per cent in Indiana, 0.2 per cent in Maryland, and traces in Alabama and Missouri. According to E. C. Tims, the disease was quite destructive in some small plantings in Louisiana.

ANTHRACNOSE CAUSED BY COLLETOTRICHUM LAGENARIUM (PASS.) ELL. & HALS.

Anthracnose, which is of general occurrence from the Great Plains eastward, was reported in 1926 from New York, New Jersey, Maryland, Alabama, Ohio, Illinois, Michigan, and Wisconsin. The highest loss reported was 5 per cent from Michigan, where, according to Nelson, anthracnose was the most important leaf disease of the crop. In Alabama the disease was said by Miles to be locally destructive, causing as much as 50 per cent loss in some fields with an estimated loss for the state of 2 per cent. In New Jersey the loss was estimated at a trace to 0.5 per cent, and in Maryland at a trace. G. A. Meckstroth reported from Illinois that, "Near the close of the season, many muskmelons on the market bore numerous cankers; some were literally covered with cankers and were unsalable." The variety Osage was very susceptible, according to Meckstroth.

DOWNY MILDEW CAUSED BY PSEUDOPERONOSPORA CUBENSIS (BERK. & CURT.) ROSTEW.

Downy mildew has been reported generally from the Great Plains eastward, and from California. In 1926 it was reported from Connecticut, Maryland, Georgia, Alabama, Texas, and California. Taubenhaus stated that in Texas the disease was very severe, and in combination with the powdery mildew, almost wiped out the crop in the lower Rio Grande Valley. The loss due to downy mildew was estimated by him at 20 per cent. Other losses reported were one per cent from Maryland and from Alabama, where the disease is most severe near the coast, according to Miles, 0.5 per cent from California, and 0.1 per cent from southern Georgia. Boyd reported from the last-named state: "The combination of moisture-temperature conditions apparently was unfavorable, for the disease was fully a month later than usual (first report this year August 5) in showing up."

MOSAIC (VIRUS)

Mosaic was reported in 1926 from Monroe County, New York, where it was said to be quite severe in greenhouses but not bad in the field, New Jersey, Maryland, the Norfolk section of Virginia, and Indiana, where it caused a loss of 2 per cent. Regarding its occurrence in Virginia, W. W. Gilbert of the Office of Vegetable and Forage Diseases reported as follows:

> "On July 26 F. P. McWhorter of the Virginia Truck Experiment Station and I examined muskmelon crops in several fields north of Norfolk, where an unusual yellowing of the vines, not directly traceable to soil or weather conditions or any known diseases, had occurred in the early part of the season. A spell of extremely hot,

dry weather immediately preceding our visit had caused many of the vines to wilt down so they were in poor condition for examination. A mosaic-like appearance of the vines was found prevalent in portions of the fields near hedges and woods, in the edges of which were numerous plants of pokeweed (Phytolacca decandra), many badly affected with mosaic. The most severely diseased areas in the fields were generally adjacent to these diseased pokeweed plants. Mosaic pokeweeds were found both in and near the coldframes where the melon plants were started, indicating the possibility of very early infection from these sources. Specimens of supposed mosaic muskmelon vines were taken to Washington and inoculations were made on young melon vines in the greenhouse. After about ten days typical mosaic symptoms appeared in some of the inoculated plants."

POWDERY MILDEW CAUSED BY ERYSIPHE CICHORACEARUM DC.

The outstanding fact with regard to powdery mildew in 1926 was the severe outbreak in the Imperial Valley of California. The situation is well summarized in the following quotation from Crops and Markets (July 17).

"According to a review published by the Federal market news reporter at El Centro, commercial yields varied widely on Imperial Valley cantaloupe patches. A few growers, who were favored with ideal soil and cultural conditions and were also able to keep the mildew in partial check, reported very good yields. In some cases, as many as 200 or more crates to the acre were harvested. However, there also were many fields which yielded as low as 80 or 90 crates per acre, or even less, particularly on early patches. The average yield probably was around 110 crates for the Valley as a whole, compared with an average of about 160 crates in most of the past seasons. On many patches, only the crown set was harvested because the vines did not live long after the first picking. If it had not been for the exceptionally heavy crown set, average yields would have been much less than they were.

Last season was the first that powdery mildew caused any serious losses on Imperial cantaloupes. The disease was widespread and serious but was disastrous in only a relatively few patches. This year the fungus attacked cantaloupe plants in almost every field and was very destructive. Prior to last year, the disease was not considered of material consequence to commercial cantaloupe production and, therefore, little work on control measures was done. As a result, growers were unprepared to combat effectively the spread of the parasite this season. Before they realized the seriousness of the situation, the fungus had spread over the entire Valley and had gained such a foothold that control measures in most cases were of little avail. Various dusting materials, mostly containing sulphur in one form or another, were applied to the affected plants. Results were not all encouraging but considerable experimental work was watched by trained observers and they are hopeful that some preventive may be evolved before another season. It is roughly estimated that shipments were reduced 5,000 or 6,000 cars as a direct result of mildew.

> "Quality of cantaloupes shipped from the Imperial Valley was generally the poorest of any recent years. A large percentage of the stock was of low sugar content and lacked palatable flavor. Such melons, from mildew-weakened vines, deteriorated rapidly in transit and reports of poor condition on arrival were numerous. Many housewives refrained from buying cantaloupes after a few trials and the effect of this lessened demand was very noticeable during the latter part of the deal, when light supplies did not produce a normal upward reaction in market prices. Because of the substandard quality, the Federal-State inspection service was able to certify only about 5% of the shipments, compared with about 20% last year."

The total loss was estimated by Milbrath at 45 per cent.

Powdery mildew was destructive in several other localities also. Its appearance in the Yuma Valley of Arizona caused alarm to growers, who feared that it might become as severe as it had in the Imperial Valley. It did cause heavy loss, which was reported by Streets as 25 per cent of the crop of the 300 acres grown. In Maricopa County, where the disease appeared for the first time, the loss was 1 per cent on 5500 acres. The total loss for the state was estimated by Streets at 5.2 per cent, of which 2.2 per cent was due to reduction in yield, and 3 per cemt to loss in grade. H. R. Brisley reported powdery mildew from the Verde Valley in Yavapai County, which he says is the largest cantaloupe growing section in northern Arizona. It did not appear until late in the season however. On September 11 Brisley reported:

> "I have found mildew in practically all fields of cantaloupes for the past two weeks, but as long as the weather stayed dry there was little spread. A few days of rainy weather spread it to a marked degree so that at present in the majority of fields at least 50 per cent of the leaves show decided infection. Just at the time that the disease was becoming severe a very disastrous hail storm visited the main cantaloupe growing section and so leveled the vines that the amount of injury from mildew could not be appreciated."

In a report from Texas, Taubenhaus said:

> "The powdery and downy mildews of cantaloupes were exceedingly bad this year in the lower Rio Grande Valley. In fact they wiped out the entire crop there and not a single car was shipped. The discouraging part about it is that we have as yet no fungicide that we can use that does not burn the foliage."

A loss of 15 per cent for southern Georgia was estimated by Boyd who stated that, "Ordinarily this is more of a 'dry weather' disease here, but this year it became severe during the middle of July when there was moderate rainfall."

Recent literature:

1. Jagger, I. C. Powdery mildew of muskmelons in the Imperial Valley of California in 1925. Phytopath. 16: 1009-1010. Dec. 1926.

OTHER DISEASES

Bacillus carotovorus Jones, soft rot. New Jersey - The melons cracked, due to extremely wet weather. Seventeen to 26 per cent of infection(B. carotovorus ?) was found in the experimental plots on the College Farm. Bordeaux sprays and copper dusts seemed to hold it in check. (Dept. Plant Path.). Also reported from Maryland.

Caconema radicicola (Greef) Cobb, root knot, was reported from Soutn Carolina, southern Georgia, Texas, Arizona, and California. Estimates of loss were 8 per cent in southern Georgia, 1 per cent in Texas, 0.2 per cent in California. H. R. Brisley reported from northern Arizona (July 14), "Root swellings formed much earlier than usual, so that in many instances crops have never reached the bearing age. Found mainly in fields where truck crops have been grown for several years consecutively."

Cercospora sp., leafspot. Colorado - one report.

Cladosporium cucumerinum Ell. & Arth., scab. New Jersey.

Fusarium sp., fruit rot. Maryland - follows skin cracking; 1 per cent loss. (Temple & Jehle)

Pythium debaryanum Hesse, damping-off. Connecticut - one report, in greenhouse. McClintock)

Rhizoctonia sp., damping-off. New Jersey - A few growers complain that they lose many hills because of damping-off. (Dept. Plant Path.)

Sclerotium rolfsii Sacc., southern blight. Texas, 1 per cent loss.

Chlorosis due to excess of lime. Texas.

Curly-top (?). Cantaloupe is one of the hosts which was affected by a disease believed to be due to the virus of sugar-beet curly top in western Oregon, although this has not been proved. (McKay & Dykstra).

C U C U M B E R

BACTERIAL WILT CAUSED BY BACILLUS TRACHEIPHILUS EFS.

In 1926 bacterial wilt was reported on cucumber from Connecticut, New York, New Jersey, Maryland, Georgia, Texas, Indiana, Missouri, and Nebraska. Evidently it was generally of slight importance, the largest loss reported being 2 per cent from Texas. E. E. Clayton estimated the loss on Long Island as perhaps 5 to 10 per cent. Boyd reported a loss of 0.1 per cent for southern Georgia, and stated, "Only one severe case was noted, in Mitchell County, where 50 per cent of the hills showed wilting plants. Spotted cucumber beetles were present in abundance."

S. Marcovitch, of the Tennessee Station, has reported on the control of the cucumber beetle by the use of sodium fluosilicate. (Marcovitch, S. The control of the striped cucumber beetle. Tennessee Agr. Exp. Sta. Circ. 1, pp. 2, 1926.)

CUCURBITS

ANGULAR LEAFSPOT CAUSED BY BACTERIUM LACHRYMANS EFS. & BRYAN

Angular leafspot occurs mostly east of the Great Plains, although it has been found in Colorado and California. In 1926 it was reported from Connecticut, Delaware, Georgia, Florida, Kansas, and, for the first time, from Oregon. The disease was found in an old planting at Salem, and a specimen received from F. D. Bailey was identified in the Office of Vegetable and Forage Diseases as Bactorium lachrymans.

The only loss estimate reported was 0.5 per cent in southern Georgia.

MOSAIC (VIRUS)

Mosaic is an important disease in most of the commercial cucumber growing sections and is the limiting factor in some regions. In 1926 it was reported from Connecticut, New York, New Jersey, Maryland, Texas, Indiana, Wisconsin, Missouri, and Nebraska, and also from Manitoba, Canada. The loss in some fields in Wicomico County, Maryland was as much as 85 to 90 per cent; the total loss for the county was probably 50 per cent, and for the state 6 per cent, accordingly to Jehle. The loss in Indiana was estimated at 5 per cent. Some of the reports from collaborators follow:

New York: Long Island - This disease has reduced crops by 50 to 75 per cent in the previous three years. This year it caused perhaps a 15 to 25 per cent loss. (Clayton)

Nassau County - Present in all plantings, not so serious as in previous years. Monroe County - Is quite severe in greenhouses but not so bad in field. (Barrus)

Maryland: White pickle found very bad in Wicomico County. Some fields showed all of the cucumbers affected and every field examined had some. The disease could be traced to infected pokeweeds along the edges of the fields and was more severe near the pokeweeds than farther from them. Fields near woods or waste land showed more than those in the open and removed from localities where pokeweeds were growing. (Jehle, July 10)

Manitoba: Everywhere around Winnipeg, and very virulent. First evident about a week ago, just as fruit was getting well formed. Has occurred here for the past five to seven years only Apparently not yet present elsewhere in Manitoba than the Winnipeg area. (Bisby, Aug. 12).

Wild host plants are an important factor in the severity of this disease, and their eradication reduces damage greatly, according to Doolittle and Walker (2, 3). Elmer (4) reports a mosaic resistant variety, "Chinese Long", obtained from China. This is an entirely different type of cucumber from that grown in this country. Walker (6) reports the results of a comparative study of the mosaic diseqses of cucumber, tomato, and ground cherry, from which he concludes, "These experiments have shown that the properties of the mosaic virus of a given plant may be decidedly changed by transferring it to another host. The properties of the viruses from mosaic plants of a certain species also appear to be the same, no matter what the source of infection. This fact indicates that there may be a single causal agent for all the mosaic diseases studied here."

Recent literature:

1. Bewley, W. F. Mosaic disease of the cucumber. Ann. Rep. Exp. & Res. Sta. Nursery & Market Gard. Industr. Devel. Soc. 11: 86-89. 1926.

2. Doolittle, S. P., and M. N. Walker. Control of cucumber mosaic by eradication of wild host plants. U. S. Dept. Agr. Bul. 1461: 1-15. Nov. 1926.

3. Doolittle, S. P., and M. N. Walker. Investigations of cucumber mosaic during 1915-1924 for the National Pickle Packers' Association. Fruit Prod. Jour. 6 (3): 20-22. Nov.; (4): 21-23. Dec. 1926.

4. Elmer, O. H. A mosaic resistant variety of cucumbers. (Abstract). Phytopath. 17: 48. Jan. 1927.

5. Johnson, James. Mosaic diseases on differential hosts. Phytopath. 16: 141-149. 1926.

6. Walker, M. N. A comparative study of the mosaic diseases of cucumber, tomato, and Physalis. Phytopath. 16: 431-458. July, 1926.

ANTHRACNOSE CAUSED BY COLLETOTRICHUM LAGENARIUM (PASS.) ELL. & HALST.

Anthracnose has been reported east of the Great Plains, and from Colorado, Arizona, and California. In 1926 what is apparently the first report of its occurrence in Oregon was received. Barss stated that it was serious in a single greenhouse at Ashland. Other states reporting it were Massachusetts, New York, Delaware, Maryland, Florida, and Nebraska.

DOWNY MILDEW CAUSED BY PSEUDOPERONOSPORA CUBENSIS (BERK. & CURT.) ROSTEW.

Downy mildew was reported from Connecticut, Maryland, South Carolina, Florida, and by W. A. Orton from Cuba. A loss of 0.5 per cent was estimated in Maryland. In Florida, according to Weber, there was less than for the last five years, and it was rare until late in the season.

OTHER DISEASES

Caconema radicicola (Greef) Cobb, root knot, caused losses estimated at 10 per cent in southern Georgia and 1 per cent in Texas, and was also reported from Florida, Missouri, and Arizona (see note under muskmelon).

Choanephora cucurbitarum (Berk. & Rav.) Thax., brown rot. Florida.

Cladosporium cucumerinum Ell. & Arth., scab, Maine, New York, Wisconsin. New York - General in western New York; loss 2 to 3 per cent. The Secretary of the Erie County Growers and Shippers Association reports an average loss of 5 per cent to their growers. Very destructive in two or three greenhouses in Monroe County. (Barrus). Wisconsin - Losses vary. Especially bad where rains have been heavy. (Vaughan).

Erysiphe cichoracearum DC., powdery mildew. Massachusetts - Common in greenhouses. (Guba). New York, Long Island - This is the first year that I have seen this disease severe in this locality. Loss probably 20 to 25 per cent. (Clayton). Southern Georgia - Unusually prevalent in July and August; loss 5 per cent. (Boyd). Florida - Worst in last five years. (Weber). Also reported from Delaware.

Macrosporium cucumerinum Ell. & Ev., leafblight. New Jersey, Maryland - 2 per cent loss.

Pythium spp., damping-off, root rot. New Jersey, Connecticut, Virginia.

Curly-top (?). Cucumbers in western Oregon were observed to be affected with a disease believed, but not proved, to be due to the sugar-beet curly top virus. (McKay & Dykstra). Heald and Dana state that in Washington heavy losses of cucurbits, especially squashes and cucumbers, were caused by a disease somewhat similar to the western yellow blight of tomato reported by McKay and Dykstra to be due to the curly top virus. (See tomato western yellow blight, page 257).

PUMPKIN

Leafspot caused by Cercospora sp., powdery mildew caused by Erysiphe cichoracearum DC., and downy mildew caused by Pseudoperonospora cubensis (Berk. & Curt.) Rostow., were reported from Indiana.

Bacterium cucurbitae Bryan, bacterial leafspot. Maryland (See squash).

SQUASH

Bacillus carotovorus Jones, soft rot. Maryland.

Bacillus tracheiphilus EFS., bacterial wilt. New Jersey, Maryland.

Bacterium cucurbitae Bryan, bacterial leafspot. This disease, originally described by Miss Bryan from New York material (1), has been found in Maryland also. Miss Bryan makes the following statement:

CUCURBITS

"Since the publication of a note in Science of February 5, 1926, the bacterial spot of Hubbard squash has been found in the field in Maryland and in the District of Columbia, on Hubbard squash, Boston Marrow, pumpkin, and Yellow Crookneck summer squash, Italian summer squash, and watermelon. There has been no evidence of insect transmission although aphids, squash bugs, and striped cucumber beetles were present on infected plots. Spread of the disease is rapid following rains, causing progressive defoliation. No fruit infection has been observed. The spots, unlike those of angular leafspot of cucumber, do not tear out but coalesce into large brown areas, often involving the whole leaf. A pronounced yellow halo around large and small spots is characteristic. Information and specimens indicating occurrence of the disease in other states are desired."

Caconema radicicola (Greef) Cobb, rootknot. Maryland, Texas, Arizona. A loss of 1 per cent was reported from Texas.

Erysiphe cichoracearum DC., powdery mildew. Connecticut, Arizona.

Fusarium sp., wilt. Texas, loss 1 per cent.

Pseudoperonospora cubensis (Berk. & Curt.) Rostew., downy mildew. Florida.

Pythium aphanidermatum (Edson) Fitz., cottony leak. Maryland (Drechsler & Whitney).

Pythium sp., and Rhizoctonia solani Kuhn, rot. Isolated by Drechsler from rotted squash received from Pennsylvania.

Curly top (virus), reported by McKay and Dykstra (2) to be due to the sugar-beet curly top virus and to be transmitted by the sugar-beet leafhopper, was severe in many places in Oregon, Washington, and Idaho, causing general failure of squash. It had not been observed on squash prior to 1926. In Oregon McKay estimates the loss at 75 per cent. East of the Cascades the loss was probably 90 per cent; west of them it was 90 per cent in Multnomah County, 60 per cent in Washington County. A cannery at Forest Grove lost 600 tons. The disease occurred throughout the state except on the coast. All varieties noted were susceptible, including Boston Marrow, Green Hubbard, Summer Crookneck, Mammoth White Bush Scallop, and Silver Skin.

Mosaic (virus). Texas, Indiana.

Recent literature:

1. Bryan, Mary K. Bacterial leafspot on Hubbard squash. Science n. s. 63: 165. Feb. 5, 1926.

2. McKay, M. B., and T. P. Dykstra. Curly-top of squash. (Abstract). Phytopath. 17: 48-49. Jan. 1927.

WATERMELON

ANTHRACNOSE CAUSED BY COLLETOTRICHUM LAGENARIUM (PASS.) ELL. & HALST.

In 1926, according to the reports received, anthracnose was considerably more prevalent than usual, and also more prevalent than in 1925. Delaware and Illinois report much more than usual; West Virginia and Alabama more; and Maryland and Georgia the average amount. The disease was said to be destructive in central and eastern Texas. There was said to be much less than usual in Florida and less in Arizona. A loss of 25 per cent was reported from West Virginia; 20 per cent, divided equally between reduction in yield and loss in transit, in southern Georgia; 1 per cent reduction in yield and 9 per cent loss in transit in Maryland; 10 per cent in Alabama; 3 per cent in Texas; and a trace from Missouri.

Most reports mention favorable weather conditions. Some of the reports follow:

> Delaware: First infection observed on leaves July 21. Evidence indicates it will be a troublesome disease this season. Heavy rains in July have favored its early establishment. (Adams, Aug. 15).

> West Virginia: More than usual. Wet and hot in midsummer. (Sherwood).

> Southern Georgia: Caused most injury late in season. Combination of temperature and moisture favorable only during latter half of shipping season. (Boyd).

> Alabama: More serious than last year. Apparently much seed sold is infected. (Miles).

> Illinois: General; much more than usual, most injury late in season. Almost daily rains for several weeks. One field near Peoria was a total loss, on ground that had never before been planted to watermelons. The leaves were nearly all spotted and nearly all the melons had many cankers. Evidently a case of seed transmission. (Meckstroth).

Recent literature:

1. Boyd, O. C. Further experiments in the control of watermelon anthracnose with dusts and sprays. (Abstract). Phytopath. 16: 641-642. Sept. 1926.

WILT CAUSED BY FUSARIUM NIVEUM EFS.

Fusarium wilt of watermelon occurs in most commercial melon-growing sections, but is most prevalent in the South. In 1926 it was reported from eleven states east of the Mississippi from Maryland to Illinois southward, and from Missouri and Arizona. Losses were high in some cases. Archer estimated 20 per cent for Missouri, and stated that, "Several thousand acres were lost in southeastern Missouri this season the disease is evidently becoming more serious each year." In West Virginia the development of wilt was favored by the dry and hot spring, and it caused a loss of 10 per cent, according to Sherwood. G. A. Meckstroth reported that in Illinois, "The watermelon acreage in the older sections is now only about one-fifth of what it used to be; the wilt has forced a good many growers to abandon the growing of watermelons. This applies especially to the sandy sections along the Kankakee, Illinois, and Wabash Rivers." The disease was destructive locally in some other states. Besides those already given, the loss estimates received are, 1.5 per cent in Georgia, 1 per cent in Alabama and Texas, and a trace in Maryland.

The following observations regarding susceptibility of varieties were reported:

> Southern Georgia: All varieties common here are susceptible. (Boyd).
>
> Illinois: Conqueror proved resistant in some localities and wilted in others. (Meckstroth).
>
> Missouri: Irish Gray, Tom Watson, Thurmond Gray are the three principal varieties grown. Thurmond Gray seems to be most resistant. (Archer).

In some 4,700 isolations from watermelon vines infected with Fusarium niveum, Porter (1) obtained the fungus from all parts of the plant, including the fruit and probably the seed. He reports that Fusarium niveum pathogenic to watermelon seedlings was isolated from citron vines, which are supposedly immune; and that it was obtained from watermelon vines, apparently healthy, grown on land that had never before produced watermelons; and that it appears to remain alive in soil where watermelons have not been grown for at least 16 years.

Recent literature:

1. Porter, D. H. Watermelon wilt infection studies. (Abstract). Phytopath. 17: 47-48. Jan. 1927.

OTHER DISEASES

Bacillus tracheiphilus EFS., bacterial wilt. New York, Tennessee Missouri.

Caconema radicicola (Greef) Cobb, root knot. Georgia, Texas, Arizona. Southern Georgia - Loss 5 per cent. Watson, Thurmond Grey, Thomas, susceptible. (Boyd). Texas - loss .5 per cent.

Capnodium sp., honeydew. Texas.

Cercospora citrullina Cke., leafspot. Georgia, Florida, Louisiana, Texas. A loss of 5 per cent was reported from Texas.

CUCURBITS

Diplodia sp., rot. Stem-end rot, Maryland, Georgia, Texas, Missouri. Southern Georgia - Frequent rains during shipping season favored infection in field after cutting. Reduction in yield a trace; loss in transit, 3 per cent. (Boyd). Maryland - loss 1 per cent. (Temple & Jehle). Associated with blossom-end rot, Georgia.

Erysiphe cichoracearum DC., powdery mildew. Georgia, Arizona.

Mycosphaerella citrullina (C. O. Smith) Gross., gummy stem blight. Florida, Alabama, Arizona. Alabama - Observed for first time in state this year in Cullinan, Blount, and Elmore Counties. Northern Arizona - This is the first year that the disease has become apparent in this region. A field of one-half acre in Oak Creek Valley was found to have 15 per cent of the vines showing definite symptoms. Another field of one acre in the same locality had 5 per cent of the plants diseased. (Brisley, July 14).

Pseudoperonospora cubensis (Berk. & Curt.) Rostow., downy mildew. South Carolina, southern Georgia, Florida.

Sclerotium rolfsii Sacc., ground rot. Southern Georgia - Frequent warm rains in early July very conducive. Common in almost all fields. Reduction in yield a trace, loss in transit 3 per cent. Thurmond Gray susceptible, Watson and Thomas very susceptible. (Boyd). Also reported from Florida.

Blossom-end rot (non-par.). Southern Georgia - Followed by Sclerotium sp., Diplodia sp., Pythium sp. Less prevalent than in 1925; there was no abrupt breaking of drouth in 1926 as in 1925. Reduction in yield 1 per cent, loss in transit 1 per cent. (Boyd). Alabama - General but not so severe as last year. Less probably 2 per cent. (Miles). Texas - loss 4 per cent. (Taubenhaus). Missouri - Phoma associated in a specimen sent by Archer, determined by W. W. Gilbert.

Internal browning (non-par.). Kansas - In Manhattan trucking district. Very dry at time of maturity of melons, and temperature high, causing rapid transpiration. Reduction in yield a trace; loss in transit, 5 per cent. Monte Cristo immune, Irish Gray resistant, Tom Watson susceptible, Thurmond Gray very susceptible. (White.)

Mosaic (?). A disease reported by Brisley as mosaic was stated by him to be unusually serious this season in northern Arizona. It was found to some degree in every field examined. In some fields as high as 50 per cent of the plants showed decided infection. Without exception these plants were practically devoid of marketable melons.

Recent literature:

1. Cardwell, G. A. Spraying and harvesting the watermelon crop. Florida Grow. 33 (19): 7, 13. May 8, 1926.

2. Ensign, M. R. To spray or not to spray. Florida Grow. 33 (11): 28-29. Mar. 13, 1926.

DISEASES OF CELERY

EARLY BLIGHT CAUSED BY CERCOSPORA APII FRESENIUS

In 1926 early blight of celery was reported from the region included between Connecticut, Michigan, Indiana, and New Jersey and Delaware, and from North Carolina, Florida, Texas, Missouri, and California. For the most part it did not seem to be very important. In Long Island, Delaware, and Ohio there was more than usual, otherwise there was the average amount or less. The highest loss reported was 5 per cent from Ohio, where, according to J. D. Wilson, excess moisture was favorable to the disease in spite of low temperatures. Other losses estimated were 1 to 2 per cent in Pennsylvania, .02 per cent in California, and traces in New York, Michigan, Missouri, and Texas. Some of the remarks of collaborators regarding control, varietal susceptibility, weather relations, etc., follow:

New Jersey: Abundant in all unsprayed fields in south Jersey. Copper-lime dust failed to control while good results followed the use of Bordeaux mixture. (Dept. Plant Path.)

Pennsylvania: All varieties susceptible, Golden Plume very susceptible. (Beach).

Delaware: Giant Pascal and Winter Queen more susceptible than White Plume. (Adams).

Michigan: Not important but noted in nearly all fields at Kalamazoo and Muskegon. Very dry and cool summer unfavorable for the development of the fungus. (Nelson).

Missouri: Spraying is necessary in market gardens for good product. (Archer).

LATE BLIGHT CAUSED BY SEPTORIA APII ROSTR.

Late blight was reported in 1926 from Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Virginia, Florida, Ohio, Indiana, Illinois, Michigan, California, and Oregon, and also from Ontario and Manitoba. Losses reported were 30 per cent in Ohio; 15 per cent in the Philadelphia district, Pennsylvania; 10 to 15 per cent in Michigan; and 2 per cent in New York and California. Some of the reports of collaborators follow:

Pennsylvania: Easy Bleaching susceptible, Golden Plume very susceptible. Great variation in the severity of the disease in different fields. Control work by spraying is improving. (Beach).

Ohio: Severe in northern Ohio. Excessive rains very favorable to the disease. (J. D. Wilson).

Michigan: In the Kalamazoo district caused 30 to 50 per cent loss in the late crop, in the Muskegon district 25 per cent loss. In the Hudsonville and Decatur districts where only one crop is grown the disease has caused only minor losses. Spraying and dusting are practiced more regularly in these celery regions than at Kalamazoo or Muskegon. The summer was very dry so that Septoria did not develop to any extent until September and later. Low temperature and excessive rainfall have provided the necessary conditions for rapid development of the fungus in the winter crop. (Nelson).

Oregon: Apparently general in western Oregon wherever celery is grown. Readily controlled but serious where not controlled. (Barss).

OTHER DISEASES

Bacillus carotovorus Jones, heart rot. Connecticut, Washington.

Bacterium apii Jagger, bacterial blight. New York, Michigan, North Dakota. Losses reported were 1 to 2 per cent in Michigan and a trace in New York.

Caconema radicicola (Greef) Cobb, root knot. Florida.

Fusarium sp., yellows. New Jersey - Found in several cold frames, severe in some instances. (Chupp). Michigan- In general the season has been unfavorable for the development of this disease. Temperature below normal throughout the entire summer. Yellows developed in a number of fields in the Muskegon district in June and these fields were replanted with resistant varieties. In trials at Kalamazoo plantings of susceptible varieties on sick soil developed no signs of the disease during the summer. In Colorado where yellows caused serious losses in some fields the Michigan State College yellows- resistant strain of Golden Self Blanching gave very satisfactory results. Golden Self Blanching and all yellow varieties are susceptible. (Nelson). A disease resembling yellows in some respects developed during the latter part of November in fields near Chula Vista, California, according to Milbrath, who states that a Fusarium was isolated from the roots. (U. S. Dept. Agr. Bur. Agr. Econ. Fruit & Veg. Div. Letter 8 (2): 18. Jan. 14, 1927).

Sclerotinia minor Jagger, pink rot. An occasional plant in a 42-acre field at Bridgeton, New Jersey. (Dept. Plant Path.).

Sclerotinia sclerotiorum (Lib.) Mass., pink rot, was reported from Virginia, Florida, Michigan, and California. Michigan - Late rains favored the development of this trouble and much celery was rotted in trenches and in transit, causing a loss of 25 per cent. (Nelson). California - loss 0.3 per cent. (Milbrath).

Black heart (undet.). Florida - More than usual, heavy rains during March after prolonged drought. Meisek's Special very resistant, the old Golden Self Blanching susceptible. Control on basis of proper irrigation, and drainage during excessive rainfall. (Foster). California - loss 0.3 per cent. (Milbrath).

Cracked stem (non-par), as described with illustrations, in Florida Station Bulletin 173, page 58, was reported in New York for the first time. The County Agent of Oswego County sent in specimens. In addition to cracking of back of stalk, there was a cracking and browning of the inside even on the very young leaves at the center of the bunch. One grower in Steuben County has had the trouble every year." (Barrus).

Curly top (?). Celery was one of several plants affected by a disease believed to be due to the virus of sugar-beet curly top, in western Oregon. (McKay and Dykstra).

Marl disease (undet.). Michigan - In Manchester district this is an important disease. Did not develop in 1925, but reappeared this year, ruining some fields of late celery. The cause of this disease has not yet been established, although it is thought to be in some way related to high soil alkalinity. (Nelson).

Mosaic (virus). Caused a trace of loss in California, also reported from Florida.

DISEASES OF LETTUCE

Bacillus carotovorus Jones, soft rot. Connecticut - One report of severe injury to Big Boston. (Clinton).

Bacterium vitians Brown, bacterial wilt. South Carolina - Found on three acres near Beaufort causing about 3 per cent loss. (Moore).

Botrytis sp., gray mold rot, was reported from New York, New Jersey, Pennsylvania, North Dakota, Kansas, and California. Pennsylvania - Loss about 8 per cent in the Philadelphia section. (Beach). Kansas - In greenhouses at Neodesha, on leaf lettuce. First report from this state, at least on leaf lettuce. (White). California - Botrytis enters tip-burned tissue and causes a rapid rot of the head. Variety New York susceptible. (Rawlins).

Botrytis sp., stem girdle. New York - Formerly thought to be bacterial. In Elba County, according to E. L. Felix, it reduced the stand in several fields greatly. In a few fields it was observed to begin on one side and destroy all the plants in several rows. Moisture seems to favor it. (Barrus).

Bremia lactucae Regel, downy mildew. Oregon - Considerable mildew present on 30,000 seedlings grown near Corvallis. (Barss). California - Loss 0.3 per cent. (Milbrath). Also reported from New York and Florida.

Corticium vagum Berk. & Curt. Bottom rot caused a loss of 5 per cent in New York, according to Barrus, and was reported also from Missouri, in greenhouses. Barrus reports a stem rot from Suffolk County, New York, as follows, "Caused probably by a different strain of Rhizoctonia than the one causing bottom rot. After the seedlings had been set a week or more, affected plants rotted around the stem at surface of the ground and then withered and died. Ten per cent affected." Basal stem rot occurred in Connecticut.

Marssonina panattoniana (Berl.) Magn., anthracnose. Florida.

Ozonium omnivorum Shear, root rot. Texas.

Pythium sp., damping-off. South Carolina.

Sclerotinia sp., drop. Oregon.

Sclerotinia minor Jagger, drop. New Jersey - One field observed showing 5 per cent in wet spots, 1 per cent in the remainder of the field. The field had not been in lettuce for five years, disease severe previous to that time. (Dept. Plant Path.).

Sclerotinia sclerotiorum (Lib.) Mass., drop. New York, New Jersey, Pennsylvania, Delaware, South Carolina, Florida, Louisiana, Missouri, Kansas, Washington, California. Losses reported were 5 per cent in greenhouses in Missouri, 2 per cent in South Carolina, 0.3 per cent in California, and 0.2 per cent in New York.

Septoria lactucae Pass., leafspot. New Jersey.

Brown rot (undet.), caused a loss of 6 per cent in California, according to Milbrath.

Chlorosis due to excess of lime, Texas.

Mosaic (virus). New York, New Jersey, Florida. New York - Loss 2 per cent. Variety New York more resistant than Big Boston. (Barrus). New Jersey- Reported from both north and south Jersey. Some growers are of the opinion that the trouble is only a "sport" of lettuce. Big Boston and Cos (Romaine) susceptible. (Chupp).

Tip-burn (non-par.). Connecticut, New York, Pennsylvania, Missouri, Colorado, Oregon, California. Followed by Botrytis or bacteria in a number of cases. New York - Loss 10 per cent. (Barrus). Pennsylvania, vicinity of Philadelphia - This trouble was especially severe after the heavy rainfall near the middle of June; associated with Botrytis. (Beach). Missouri - This is the limiting factor in the culture of head lettuce. (Archer). Oregon - Lettuce tip burn and slime developed seriously following the advent of very hot weather in early June. (Barss). California - Iceberg and Grand Rapids resistant; New York susceptible. (Rawlins). Milbrath estimated a 1 per cent loss for California.

Yellows (white heart, rabbit ear, Rio Grande disease). New York - Loss 5 per cent. The disease is abundant on milkweed all over the state. Not transmitted through the seed. Iceberg very susceptible. (Barrus). Pennsylvania - Caused a loss of about 50 per cent in the Philadelphia section. This disease has been observed in this locality in previous years. (Beach). Tennessee - In Knox County 15 per cent infection of variety New York was observed. The six-spotted leafhopper was abundant in the fields. (E. L. Felix). Texas - In the vicinity of Laredo and the lower Rio Grande Valley, loss 1 per cent. (Taubenhaus). Kunkel (3) has shown that this disease is caused by the virus of aster yellows.

Recent literature:

1. Beach, W. S. Diseases of certain truck crops caused by Sclerotinia and Botrytis. In Pennsylvania Agr. Exp. Sta. Bul. 204 (Ann. Rept. 39: 1925-26): 16. 1926.

2. Felix, E. L. Correction of unproductive muck by the addition of copper. (Abstract). Phytopath. 17: 49-50. Jan. 1927.

3. Kunkel, L. O. Studies on aster yellows. Amer. Jour. Bot. 13: 646-705. Dec. 1926.

4. LeClerg, E. L. Leaf temperature in relation to tip burn of lettuce. (Abstract). Phytopath. 17: 44-45. Jan. 1927.

5. McGinty, R. A., and R. C. Thompson. Preliminary notes on tip-burn of lettuce. Proc. Amer. Soc. Hort. Sci. 22: 341-346. 1926.

6. Melchers, L. E. Botrytis blossom blight and leafspot of geranium and its relation to the grey mold of head lettuce. Jour. Agr. Res. 32: 883-894. 1926.

7. Thompson, R. C. Tipburn of lettuce. Colorado Agr. Exp. Sta. Bul. 311: 1-31. May 1926.

DISEASES OF PEAS

ROOT ROTS AND WILTS CAUSED BY VARIOUS ORGANISMS

Aphanomyces euteiches Drechs. was reported from New York, New Jersey, Maryland, Michigan, and Wisconsin. New York - In general of minor importance except in low or poorly drained soil. (Leon K. Jones). New Jersey - Less than usual; cold in early part of pea season. Decreased acreage in most severely infected areas and planting of varieties, slightly resistant to disease has reduced losses. World's Record and Sutton's Ideal susceptible, most varieties planted in the state very susceptible. (Haenseler). Maryland - 10 per cent loss. (Temple & Jehle).

Fusarium sp. caused root rot or wilt in Connecticut, Maryland, Indiana, Wisconsin, and Colorado. In Indiana, according to Kendrick, the organism was the same as that reported by Linford as a cause of wilt in Wisconsin. The loss was 5 per cent in Indiana, and 1 per cent in Maryland.

Fusarium martii pisi F. R. Jones, New York.

Corticium vagum Berk. & Curt. New Jersey, Georgia, Louisiana, Minnesota, Washington.

Sclerotinia sclerotiorum (Lib.) Mass. Serious in one field at Mt. Vernon, Washington. (Div. Plant Path.)

Undetermined. South Carolina - Has become the limiting factor in growing peas in this state. Loss 30 per cent. (Moore). Also reported from Massachusetts and Arkansas.

Recent literature:

1. Jones, F. R. Resistance of peas to root-rot. Phytopath. 16: 459-476. July 1926.

2. Togashi, K. On three species of Fusarium which cause the wilt-disease of pea. Jour. Soc. Agr. & For. Sapporo, Japan 18: (149)-(154). July 1926. (In Japanese)

BLIGHT CAUSED BY ASCOCHYTA SPP.

Ascochyta blight was reported in 1926 from New York, New Jersey, Maryland, Florida, Indiana, Wisconsin, and California. Apparently the disease was mostly unimportant. Some of the comments of collaborators follow:

New York: The relatively dry season was unfavorable for its development and in general it did not appear as damaging on upper parts of plants until August 1, at which time practically all the canning peas were harvested. (Leon K. Jones).

Florida: One field of peas, about 3 acres, was practically ruined by pod blight. Pod lesions were so numerous as to render the pods unsalable. Leaf infection was less conspicuous. There is evidence that the organism was prevalent in the soil, as the seed were of the same lot as those planted in another field which showed no pod spot. (W. B. Tisdale).

New Jersey: On fertile soil good yieldsmay be obtained with 100 per cent infected plants. Reduction in yield due to disease difficult to estimate. (Haenseler).

Leon K. Jones (2) reports that Mycosphaerella pinodes (Berk. & Blox.) Stone is the ascigerous stage, not of Ascochyta pisi Lib., but of another closely associated species of Ascochyta which causes a distinct disease of the pea plant. The ascigerous stage of A. pisi has not been found. Both species are carried in the seed.

Recent literature:

1. Gilchrist, G. G. The nature of resistance to foot rot caused by Ascochyta sp. and some other fungi in the epicotyl of the pea. Phytopath. 16: 269-276. April 1926.

2. Jones, Leon K. The relation of Mycosphaerella pinodes to Ascochyta blight of peas. (Abstract). Phytopath. 17: 44. Jan. 1927.

OTHER DISEASES

Bacterium pisi (Sack.) EFS., bacterial blight, was reported from New York, South Carolina, Georgia, Florida, Mississippi, Indiana, and Wisconsin. New York - Prevalent over pea growing area of state, causing about 5 per cent loss to crop. More damage to Alaska and Surprise than to later varieties. (Leon K. Jones). South Carolina - Loss 15 per cent. (Moore).

Caconema radicicola (Greef) Cobb, root knot. What is, so far as known, the first case of nematode attack on a field crop in Wisconsin was reported in 1926. A field of Admiral peas on light sandy soil in Sauk County was severely injured. Specimens were sent by Linford and Vaughan to Doctor Cobb, of the Bureau of Plant Industry, who stated that "Under sufficiently favorable conditions this pest occurs as far north as your latitude, but is infrequent." Polygonum convolvulus and Chenopodium album growing in the pea field were also affected.

Root knot was also reported from Texas, where Taubenhaus estimated a loss of 1 per cent.

Erysiphe polygoni DC., Powdery mildew, was reported from New York, Florida, New Mexico, Washington, and Oregon, and from Sonora, Mexico. Washington - Very prevalent in the Puyallup Valley. Some plantings so heavily infected as to ruin the later pickings. (Div. Plant Path.). Mexico - Six thousand acres of green peas are grown in the Yaqui Valley, State of Sonora, for shipment to the United States during the winter. In that Valley the damage from mildew was complete in fields where sulfur was not used. Very good results were obtained, however, where sulfur was applied. This was done to a considerable extent by use of the airplane, one application of 15 pounds per acre being effective. Where dusting was done by hand from 30 to 40 pounds per acre was used. The airplane method of applying dust seemed very satisfactory. (A. W. Morrill).

Fusicladium pisicola Linford, black leaf, is described from Utah and Idaho. (1)

Peronospora viciae (Berk.) D By., downy mildew. Florida, Wisconsin.

Septoria pisi West., leafspot. Florida, Wisconsin.

Chlorosis due to excess of lime. Texas.

Mosaic(virus). New Jersey, Washington.

Recent literature:

1. Linford, M. B. Black-leaf of peas caused by Fusicladium pisicola n. sp. Phytopath. 16: 549-558. Aug. 1926.

2. Ludwig, C. A. Pseudomonas (Phytomonas) pisi Sackett, the cause of a pod spot of garden peas. Phytopath. 16: 177-183. March 1926.

COTTON

WILT CAUSED BY FUSARIUM VASINFECTUM ATK.

Wilt was reported from practically all of the cotton states as far west as Texas, in the majority as of about the usual prevalence. Losses were estimated as follows: 5 per cent, South Carolina; 3 per cent, Georgia, Mississippi, and Arkansas; 2.2 per cent, North Carolina; 1 per cent, Louisiana and Texas. As high as 50 per cent infection was noted in some Mississippi and Arkansas fields. The fungus is said to be gradually spreading to new areas in South Carolina.

In North Carolina, G. W. Fant reported that Dixie Triumph and the newly developed Super Seven wilt-resistant varieties were being used with good results. In South Carolina these two varieties and also Humco-Dixie 14 are reported to have produced well on wilt infested soil and as a result the demand for seed is increasing. Varieties said to be very resistant are Watson Long Staple and Lightning Express in Mississippi, and Cook, Super Seven, and Dixafifi in Arkansas.

Recent literature:

1. Butler, E. J. The wilt diseases of cotton and sesamum in India. Agr. Jour. India 21: 268-273. July 1926.

ANTHRACNOSE CAUSED BY GLOMERELLA GOSSYPII (SOUTHWORTH) EDG.

Anthracnose was reported from the eastern cotton states in about the same amounts as usual, although in Virginia more, and in North Carolina and Arkansas less, than the average amounts were recorded. Attack on the seedlings by this fungus, causing a damping-off, was reported in some states. Percentage losses were estimated as follows: 5, Tennessee; 3, Alabama; 2, Virginia, Mississippi; 1.6, North Carolina; 1, Louisiana; 0.5, Texas. Neal and Wedgworth of Mississippi stated that the varieties Miller, Acala, Delfos, and Trice showed evidences of being slightly resistant.

G. M. Armstrong, located at Florence, South Carolina remarked that a few years ago anthracnose was thought to have caused considerably greater losses than at present.

ANGULAR LEAF SPOT CAUSED BY BACTERIUM MALVACEARUM EFS.

This disease was more widespread than either anthracnose or wilt, occurring in some of the western cotton states, such as Arizona, as well as in the eastern. It was about as prevalent as last year, although South Carolina reported more and Florida and Arizona less. Armstrong reported it as the most important cotton disease of the year at the Pee Dee Experiment Station in South Carolina, where it caused partial defoliation in some plantings, and the loss was as much as 5 per cent in the most severely affected fields. Considerable defoliation occurred in Mississippi, according to Neal. In Texas, Taubenhaus reported the disease as occurring in epidemic form throughout the state. In Arkansas wet weather early in the season was favorable for it.

Percentage reductions in yield were reported as follows by collaborators: 5, Texas; 2, Georgia; 1.5, North Carolina, Alabama, and Arkansas; 1, South Carolina, Mississippi, Louisiana, Tennessee, and Arizona.

No differences in varietal susceptibility were mentioned except that in Arizona, Streets reported Pima and Acala as susceptible.

In Arizona it was stated that the delinting of 47,000 pounds of seed with sulfuric acid by the Experiment Station gave perfect control. Archibald (1 and 2) has reported that the sulfuric acid seed treatment does not completely disinfect the seed but although not entirely satisfactory, nevertheless is beneficial.

Recent literature:

1. Archibald, R. G. Black arm disease of cotton with special reference to the existence of the causal organism B. malvacearum within the seed. Soil Science 23: 5-9. Jan. 1927.

2. ______________ Sulfuric acid treatment of cotton seed. Soil Science 23: 1-3. Jan. 1927.

ROOT KNOT CAUSED BY CACONEMA RADICICOLA (GREEF) COBB

Root knot probably occurred in all cotton states, causing damage both in itself and in association with wilt on sandy soils. Losses of 2 per cent in Georgia and Arkansas; 1.5 per cent in North Carolina; and 0.5 per cent in Texas were reported.

BLIGHT CAUSED BY ASCOCHYTA GOSSYPII SYD.

This disease, which is known to occur in Virginia, North and South Carolina, Alabama, Mississippi, and Arkansas, was reported in 1926 from three of these states, Virginia, South Carolina, and Alabama. In Virginia specimens were received from a single locality, and in South Carolina only one complaint was brought to the attention of the Experiment Station. In Alabama it was found for the first time in Elmore County and W. L. Blain who made the report remarked that this is the third year that it has been found in the state and each year it has been found further northward. All infections thus far found in Alabama have been localized and did not seem to be doing much damage.

ROOT ROT CAUSED BY OZONIUM OMNIVORUM SHEAR

This disease, which is known to occur in Texas, Oklahoma, New Mexico, Arizona, California, and probably Arkansas, was reported to the Survey in 1926 from Texas and Arizona only although it doubtless occurred in the other states. In these two states it is said to be the most important cotton disease. Favored by wet weather, it occurred in an unusually destructive form in Texas this year. According to Taubenhaus it seemed to be more severe than ever before, and numerous reports from the Bureau of Agricultural Economics and trade papers also indicated serious damage. Taubenhaus estimated a loss of 20 per cent of the crop in Texas from this disease, and R. B. Streets estimated 7.5 per cent reduction in yield in Arizona, where it occurred generally in the southern part of the state.

<u>Recent literature</u>:

1. King, C. J., and A. R. Loding. Experiments in cotton root rot control. U. S. Dept. Agr. Circ. 372: 9, 10. 1926.

2. ______________ and H. F. Loomis. Experiments on the control of cotton root rot in Arizona. Jour. Agr. Res. 32: 297-310. 1926.

3. McNamara, H. C. Behavior of cotton root rot at Greenville, Texas, including an experiment with clean fallows. Jour. Agr. Res. 32: 17-24. 1926.

4. Peltier, G. L., C. J. King, and R. W. Samson. Ozonium root rot. U. S. Dept. Agr. Bul. 1417: 1-25. Aug. 1926.

STEM ROT, SORESHIN, DAMPING-OFF CAUSED BY CORTICIUM VAGUM BERK. & CURT.

In South Carolina, Mississippi, Louisiana, Arkansas, Texas, and Arizona, considerable trouble from this disease resulted. In Louisiana, Arkansas, and Arizona particularly, collaborators remarked that wet and cool weather in the early part of the season caused much rotting of young plants, necessitating a great deal of replanting.

MALNUTRITION "RUST" (NON-PAR.)

In North Carolina, collaborators reported more "rust" than usual, and members of the Office of Soil Fertility, Bureau of Plant Industry, who have had experiments located in that state, reported:

> "Rust was quite prevalent in the state. In an experiment near Wilson it was said to be especially bad. It appeared first about August 15. Plots where 900 pounds of a fertilizer containing 6 per cent potash was used did not show rust." (J. J. Skinner)

In Mississippi and Arkansas it was also said to be rather important. In Texas, 0.1 per cent loss from this cause was estimated.

Recent literature

1. Neal, D. C. Cotton rust. What it is and how to control it. Quart. Bul. Mississippi State Plant Board 6 (2): 5-7. July 1926.

OTHER DISEASES

Alternaria sp., leaf spot. Mississippi - not as serious as during the very dry year of 1924-25; and Porto Rico.

Cercospora sp., leaf spot. North Carolina - prevalent on plots showing "rust" symptoms. Extent of damage questionable. (Fant).

Diplodia gossypina Cke., boll rot. Traces reported in Texas. According to Stevens (8) the perfect stage of this fungus is *Physalospora rhodina* (Berk. & Curt.) Cke.

Cotton - Other Diseases

Dwarfing. South Carolina - a dwarf condition of cotton was very common in parts of the state this spring and caused considerable anxiety and loss to growers. The cause is not known. There seemed to be no fungus concerned and no environmental conditions were present which one would expcet to have serious deleterious effects. Flea hoppers were abundant, and these may be at least partly responsible, but the injury was not of the type usually caused by the attack of this insect. (Ludwig)

Helminthosporium gossypii Tucker, boll spot. This fungus has recently been described by Tucker (9) causing spots on leaves, flower bracts, and bolls in the principal cotton growing sections of Porto Rico.

Kuhneola gossypii (Lagh.) Arth., rust, Porto Rico - occasional but not severe. (Cook).

Macrosporium nigricantium Atk., black leaf spot. South Carolina, Mississippi, Missouri. Damage slight in all cases.

Mosaic (undet.) H. D. Barker (1) reports mosaic of cotton as a very important disease in Haiti. It seems to be worse on certain introduced varieties. Native cottons are not so badly affected. The differences in susceptibility of varieties seem to be marked.

Mycosphaerella gossypina (Cke.) Earle, leaf spot. Porto Rico - the most common disease of cotton on the Island. Texas - trace.

Phoma sp. Traces of a disease which was at first mistaken for Ascochyta blight but later identified as being associated with a Phoma were found in Mississippi. It is possible that it was secondary to lightning injury.

Rhizopus sp., boll rot, was observed in southwestern California by Shapovalov both in 1925 and in 1926. It was found in both the Imperial and San Joaquin Valleys but appeared to be much more active in the latter. Rhizopus rot is well known in Egypt, where, as in the present case, it is considered a wound decay.

Recent literature

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2. Hopkins, J. C. An introductory note on two bacteria causing an internal rot of cotton bolls. Ann. Appl. Biol. 13: 260-265. May 1926.

3. Jones, G. H., and T. G. Mason. On two obscure diseases of cotton. Ann. Bot. 40: 759-772. Oct. 1926.

4. Laycock, T. Preliminary investigations of the parasitism of certain fungi causing boll rots of cotton. Ann. Bul. Agr. Dept. Nigeria 4: 32-49. 1925.

5. Marsh, R. W. Inoculation experiments with Nematospora gossypii Ashby and Nowell. Ann. Bot. 40: 883-889. Oct. 1926.

6. Moore, E. S. Cotton diseases in South Africa. African Sugar and Cotton Plant. 2 (10): 27-29. Oct. 1926.

7. Shapovalov, M. Aspergillus decay of cotton bolls. (Abstract) Phytopath. 16: 75. 1926.

8. Stevens, Neil E. Two species of Physalospora on Citrus and other hosts. Mycologia 18: 206-217. 1926.

9. Tucker, C. M. A leaf, bract, and boll spot of Sea-Island cotton caused by Helminthosporium gossypii n. sp. Jour. Agr. Res. 32: 391-395. 1926.

DISEASES OF TOBACCO

WILDFIRE CAUSED BY BACTERIUM TABACUM WOLF & FOSTER

Wildfire was reported in 1926 from five states, namely, Connecticut, Maryland, Kentucky, Florida, and Wisconsin. In Connecticut it was thought to be about as prevalent as usual, or possibly more so, according to Clinton and Anderson. Jehle and Hunter reported that it was widely distributed in Maryland and caused perhaps 1 per cent reduction in yield and 3 per cent loss in grade. Some fields showed as high as 80 per cent infection. In Maryland as in other Eastern States, dry weather inhibited development in the early part of the season, but rains favored infection later. In Kentucky, Valleau reported infection in several plant beds near Harrodsburg, where it has been common each season since 1920. W. B. Tisdale stated that wildfire occurred in only one seed bed this year in the vicinity of Quincy, Florida, an experimental bed that had had wildfire in it last year. In Wisconsin there was comparatively little spread in the field and the disease caused practically ho damage, due to the absence of storms and to relatively dry weather, according to James Johnson.

E. S. Moore (1) states that wildfire, on account of the rapidity of its spread and the heavy losses it may cause, is one of the most dreaded diseases of tobacco in South Africa.

Recent literature

1. Moore, E. S. Diseases of Virginian tobacco in South Africa. Jour. Dept. Agr. South Africa 12: 428-455. Sept. 1926.

ANGULAR LEAFSPOT CAUSED BY BACTERIUM ANGULATUM FROMME & MURRAY

Connecticut, Virginia, Florida, Kentucky, and Indiana reported angular leafspot in 1926. In Connecticut, seven reports were received. In Virginia where a loss of 2 per cent was estimated, the disease appeared late, following rains in August and caused severe damage to the Burley crop in Russell County. In Washington County the loss was much less and in Charlotte County the disease occurred only locally. In Florida, W. B. Tisdale reported finding angular leafspot in one plant bed where it also occurred in 1925. In Indiana, it was first noted August 12. In Wisconsin, James Johnson observed that the disease was conspicuous by its absence. From Kentucky, W. D. Valleau reported as follows, September 15:

> "This disease was very prevalent in plant beds and, in the Burley section, is now very prevalent in nearly every field, in some cases ruining the crop and on an average causing probably between 5 to 10 per cent injury.
>
> The use of two-year old seed with other sanitary precautions has in some cases given striking results in control both in plant beds and in the field."

BLACK ROOT ROT CAUSED BY THIELAVIA BASICOLA (BERK. & BR.) ZOPF.

McCormick (2) at the Connecticut Experiment Station has concluded that the cause of black root rot is <u>Thielaviopsis basicola</u> (Berk.) Ferraris rather than <u>Thielavia basicola</u>, and that there seems to be no real justification for considering the latter as the perfect stage of the former.

In 1926 black root rot was reported from Connecticut, Virginia, Kentucky, Tennessee and Wisconsin, although it does occur in other tobacco growing states. In Connecticut about the average amount was observed, according to Clinton and Anderson. In Virginia it was noted as severe in one field in Charlotte County and in Kentucky infection was about the same as usual, being most common in the Burley section on limestone soil. In Wisconsin the disease was said to be generally present in old tobacco fields but the damage was apparently below normal.

The use of resistant strains is decreasing the loss considerably in Wisconsin. A resistant selection of Burley is now being widely grown in Kentucky.

Anderson, Osmun, and Doran (1) have reported on the effects of lime on the growth of tobacco and the presence of root rot. On acid soil the immediate effect of liming was to increase the yield of tobacco, but as more lime was added black root rot was favored, with a consequent reduction in yield. It seems to be most injurious in nearly neutral soils.

<u>Recent literature</u>

1. Anderson, P. J., A. V. Osmun, and W. L. Doran. Soil reaction and black root rot of tobacco. Massachusetts Agr. Exp. Sta. Bul. 229: 117-136. Apr. 1926.

2. McCormick, Florence A. Perithecia of Thielavia basicola Zopf in culture and the stimulation of their production by extracts of other fungi. Conn. Agr. Exp. Sta. Bul. 269: 539-554. Aug. 1925.

MOSAIC (UNDET.)

Mosaic was widespread in tobacco sections as usual. Some of the individual state reports are as follows:

Connecticut: Twenty reports; little severe injury. Mostly seen on Broadleaf and Havana. (Clinton & Anderson)

Maryland: General over the tobacco growing section of the state. It is about as prevalent this year as last, but the injury is somewhat greater. Several fields have been found in which 50 per cent of the plants were severely stunted. In numerous fields 100 per cent of the plants show infection. About 10 per cent of the plants were injured by early infection. Mosaic blister is more severe than usual this year. (Jehle & Hunter)

Virginia: Present in practically every field but especially on replants and suckers. (Fromme).

Kentucky: About the usual amount of infection but decidedly less mosaic-burning than last year, apparently because of wet weather. (Valleau).

North Carolina: Very prevalent in eastern Carolina this season. Few if any fields are entirely free from the disease. (Fant).

Georgia: Reduction in yield 0.5 per cent. Loss in grade 1 per cent. Curing tests showed: Healthy leaves, 66 per pound with average price of 32 cents. Mosaic leaves, 85 per pound with average price of 25 cents. (O. C. Boyd).

Wisconsin: Occurring commonly on occasional plants in most fields but not involving much loss except in relatively small number. (James Johnson).

Porto Rico: Common and sometimes abundant. (Cook).

Recent literature

1. Eyles, F. Tobacco mosaic in southern Rhodesia. Selection for resistance. Rhod. Agr. Jour. 23: 248-252. Mar. 1926.

2. Goldstein, Bessie. A Cytological study of the leaves and growing points of healthy and mosaic diseased tobacco plants. Bul. Torr. Bot. Club 53: 499-600. Nov. 1926.

3. Goldsworthy, M. C. Attempts to cultivate the tobacco mosaic virus. Phytopath. 16: 873-875. Nov. 1926.

4. Johnson, J. Mosaic diseases on differential hosts. Phytopath. 16: 141-149. 1926.

5. Jones, P. M. Structure and cultural history of a mycetozoan found in tobacco plants with mosaic-like symptoms. Bot. Gaz. 81: 446-459. June 1926.

6. Link, G. K. K., Philip M. Jones, and W. H. Taliaferro. Possible etiological role of Plasmodiophora tabaci in tobacco mosaic. Bot. Gaz. 82: 403-414. Dec. 1926.

7. McKinney, H. H. Virus mixtures that may not be detected in young tobacco plants. Phytopath. 16: 893. Nov. 1926.

8. Mulvania, M. Studies in the nature of the virus of tobacco mosaic. Phytopath. 16: 853-871. Nov. 1926.

9. ______________ The destructive action of certain bacteria on the virus of tobacco mosaic. Jour. Bact. 11: 98. 1926.

10. Purdy, Helen A. Attempt to cultivate an organism from tomato mosaic. Bot. Gaz. 81: 210-217. 1926.

11. ______________ Multiplication of the virus of tobacco mosaic in detached leaves. (Abstract). Phytopath. 17: 58. Jan. 1927.

12. Valleau, W. D., and E. M. Jones. Commercial tobaccos and cured leaf as sources of tobacco mosaic. (Abstract). Phytopath. 17: 49. Jan. 1927.

OTHER DISEASES

Bacillus carotovorus Jones, hollow stalk. Specimens of tobacco leaves which had dropped off from newly set tobacco plants were received by W. D. Valleau from southwestern Indiana. Regarding it he wrote, "The rot appeared to be bacterial and was killing the plants as well as rotting the base of the leaves. We assume it to be caused by Bacillus carotovorus as it occurred during wet weather and this organism causes a similar disease in topped tobacco."

Bacterium melleum Johnson, bacterial leaf spot. Reported from Kentucky and Tennessee. From the former state, W. D. Valleau reported, "This disease appeared in a small area in a plant bed on the Experiment Station farm after the canvas had been removed. No sign of it was seen before that time. The spots were similar to wildfire but the organism appeared yellow in culture. James Johnson considered it the same as his Bacterium melleum."

Bacterium solanacearum EFS., bacterial wilt. Very common and serious during the dry season in the Philippine Islands. (David & Roland (2).

Brown root rot, undet. This disease has recently been reported by Johnson, Slagg, and Murwin (3). Affected plants are characterized by brown discoloration and decay of the roots. In its behavior with respect to soil sterilization and infection and in certain other respects the disease appears to be of parasitic origin, but no definite causal organism has been found. On the other hand, there are other indications pointing towards the non-parasitic nature of the disease.

In 1926, collaborators reported brown root rot from Connecticut, Kentucky, and Wisconsin. In Kentucky it was observed in several parts of the state but was a very minor factor in the early part of the season when it seems to be most injurious. In Wisconsin, James Johnson reported that it was no doubt the major cause of the poor fields in 1926. He estimated a reduction in yield of from 20 to 25 per cent.

Caconema radicicola (Greef) Cobb, root knot. South Carolina and Georgia reported trouble from root knot. In the latter state it was widely distributed but due to plentiful rains plants withstood the attack better. This disease is very common in parts of the Philippines, according to David and Roldan (2).

Cercospora nicotianae Ell. & Ev., frog-eye. Reported from Georgia by O. C. Boyd who estimated 1 per cent reduction in yield and 3 per cent loss in grade. In Porto Rico, Mel T. Cook reported it common on early leaves but apparently of very little or no importance.

Chlorosis (undet.) Porto Rico.

Curly dwarf (undet.) This disease has recently been described by Slagg (5). It was first observed in the summer of 1922 on a number of adjoining farms in Connecticut and has been present in this locality every year since. It has also been reported from Ontario and Wisconsin. At present it is considered a minor disease, although in one locality in Connecticut it has assumed some importance. The cause is not known. A similar trouble has been reported by Moore (4) from South Africa.

Frenching (undet.) Reported from Maryland and Kentucky. Valleau (8) has obtained results indicating that this is due to a disturbed nitrogen relationship and if a readily available supply of nitrogen is added frenched plants will recover.

Frost mottling. Late frost of June 16 caused an irregular white mottling of the leaves, often followed later by mis-shaping, in Connecticut, according to Clinton and Anderson.

Fusarium oxysporum nicotianae Johnson, Wilt. Traces of this disease were found in most sections of Maryland. As high as 10 per cent infection was observed in one field. Due to the extremely wet weather the plants did not show the typical wilting but the vascular system was distinctly discolored. According to Moore (4) this has occurred for a considerable number of years in South Africa.

Fusarium affine Fautr. & Lamb., leaf spot. Connecticut - 3 reports on old leaves usually in contact with soil, causing little injury. (Clinton & Anderson)

Macrosporium sp., brown spot. This disease, probably caused by M. longipes Ell. & Ev., was reported from South Georgia, by Boyd, who stated that it was considerably less noticeable than in 1925. Many fields, however, showed both leaf and stalk lesions before the first cropping. Many stalk lesions ranged from one centimeter in diameter to cankers completely girdling the stalk.

Marbling (non-par.) One report from Connecticut.

Phytophthora sp., sometimes severe in the seed-bed and common as a field disease in Porto Rico, according to Cook.

Phytophthora nicotinae (Speg.) Van Breda de H., black shank. From Florida, W. B. Tisdale reported that black shank began to appear in the experimental plots and a few commercial fields about April 15. Tisdale and Kelley (7) have recently reported on this disease.

Pythium sp., root rot. A Pythium with spiny oospores was found attacking tobacco September 21 at Windsor, Connecticut, according to F. A. McCormick.

Pythium debaryanum Hesse, damping-off. Connecticut, Porto Rico, Philippine Islands.

Ring spot (undet.) Reported from Connecticut, Maryland, and Virginia. Only slightly important in all cases.

Sclerotinia sclerotiorum (Lib.) Mass., stem rot or soreshin. Connecticut.

Thick leaf (non-par.) Reported by Jehle from Maryland where it was confined to seed beds in which commercial fertilizer containing potassium chlorate was used. Leaves are thick, rolled upward, brittle, and plants stunted.

Recent literature

1. Clara, F. M. Diseases of tobacco (Nicotiana tabacum L.) in the Philippines. Philipp. Agr. Rev. 18: 564-570. 1925.

2. David and Roldan. Philipp. Agriculturist 15: 287-301. 1926.

3. Johnson, J., C. M. Slagg, and H. F. Murwin. The brown root rot of tobacco and other plants. U. S. Dept. Agr. Bul. 1410: 1-29. July 1926.

4. Moore, E. S. Diseases of Virginian tobacco in South Africa. Jour. Dept. Agr. So. Africa 12: 428-441. Sept. 1926.

5. Slagg, C. M. New and unusual diseases and injuries of tobacco. Scient. Agr. 6: 193-198. Feb. 1926.

6. Tisdale, W. B., and J. G. Kelley. Stem injury of tobacco caused by fungi growing on the poison mixture used for controlling budworms. Florida Agr. Exp. Sta. Bul. 182: 279-286. May 1926.

7. ________________ A Phytophthora disease of tobacco. Florida Agr. Exp. Sta. Tech. Bul. 179: 159-219. May 1926.

8. Valleau, W. D., and E. M. Johnson. The relation of nitrates to tobacco frenching. Science n.s. 64: 278-279. Sept. 17, 1926.

DISEASES OF SUGAR CANE

MOSAIC (UNDET.)

This important cane disease was reported by collaborators from Florida, Alabama, Mississippi, Louisiana, and Porto Rico, and also by others from Cuba and Haiti. In Florida, it was of minor importance, as usual, according to Weber. Miles stated that it is general in most plantings in southern Alabama but the loss not appreciated since cane is grown there only for syrup. In Mississippi, Wedgworth reported as follows, August 15:

> "A recent partial survey of the southern and central counties of the state shows mosaic present in all cane fields of the Purple variety. Plantings of Cayana 10 were free of mosaic in all fields visited. The Purple variety showed an average infection of about 65 per cent, ranging from 5 per cent in a few small plantings to 100 per cent in many plantings."

In Louisiana, Tims reported that the disease continued to be moderately important, occurring generally and perhaps causing 10 per cent loss in sugar. Promising results in the selection of resistant strains from susceptible varieties were mentioned. In Porto Rico, Mel. T. Cook reported it as under control in many localities but spreading as a result of neglect in others. In Cuba W. A. Orton reported:

> "The common sugar cane mosaic is widely distributed throughout Cuba but is less prevalent in the western part of the Island than in the eastern. It is most serious on plantations where diseased cane was planted during the period of rapid expansion in 1918-1919."

In Haiti, H. D. Barker reported as follows:

> "One of the most serious diseases in Haiti at present is the mosaic of sugar cane. It is generally distributed and very destructive throughout the Island. Uba, an immune variety, is being grown to a considerable extent by the Haitian-American Sugar Company. The indications are that this or other resistant varieties will greatly relieve the situation. Improved cultural conditions may also greatly aid in keeping the disease under control."

Recent literature

1. Bonazzi, A. Study on sugar cane mosaic. Science n.s. 64: 529-530. Nov. 26, 1926.

2. Bremer, G. Een cytologisch van strepenziekte bij suikerriet en andere planten. Arch. Suikerind. Ind. (Meded.) 1926 (11): 337-371. 1926.

3. Cook, Mel. T. Some effects of mosaic on the content of the cell. (Abstract) Phytopath. 17: 57. Jan. 1927.

4. East, E. M., and W. H. Weston. A report on the sugar cane mosaic situation in February 1924 at Soledad, Cuba. Contrib. Harvard. Inst. Trop. Biol. & Med. 1: 1-52. 1925.

5. Hansford, C. G. The mosaic disease of sugar cane. Microbiol. Circ. Dept. Agr. Jamaica. 6: 1-15. 1926.

6. McRae, W. Mosaic disease of sugar cane in India in 1925. Agr. Jour. India. 21: 198-202. May 1926.

7. Storey, H. H. The cane disease situation. Proc. Ann. Congr. South Afr. Sugar Assoc. 4: 69-73. 1926.

8. Walker, W. N., and C. F. Stahl. Certain grass hosts of the sugar cane mosaic disease and of the corn aphid considered in relation to their occurrence in Cuba. Bul. Trop. Plant Res. Found. 5: 1-14. 1926.

9. Yoder, P. A. Rare cases of mosaic disease in highly resistant varieties of sugar cane. U. S. Dept. Agr. Circ. 392: 1-8. 1926.

ROOT ROT CAUSED BY RHIZOCTONIA, MARASMIUS, AND OTHER ORGANISMS

In Louisiana this continues to be one of the very serious disease problems with sugar cane in the state. According to E. C. Tims a loss of 25 per cent was estimated.

Recent literature

1. Agee, H. P. The root disease complex of sugar cane. Intern. Sugar Jour. 28: 648-650. Dec. 1926.

2. Altson, R. A. Root disease of sugar cane. Plant. & Sugar Manuf. 77: 230-231. Sept. 18, 1926.

3. Earle, F. S. Root disease of cane. Conditions which encourage attack and aggravate its effect. Facts About Sugar 21: 1117. Nov. 20, 1926.

4. Lee, H. A., D. H. Weller, and C. C. Barnum. Fungus root rots in relation to Lahaina growth failure. Plant. and Sugar Manuf. 77: 388-389. Nov. 13, 1926.

5. McGeorge, W. T. A review of soil investigations pertaining to growth failure of sugar cane. Hawaiian Plant. Rec. 30: 259-266. Apr. 1926.

6. Rands, R. D. Root disease of sugar cane in Louisiana. U. S. Dept. Agr. Circ. 366: 1-19. May 1926.

OTHER DISEASES

Bacterium vascularum Cobb, gumming disease. Porto Rico - severe in two locations and slight infections in others. Much less severe than in 1925. (Cook)

Caconema radicicola (Greef) Cobb, and other nematodes. In Hawaii, Muir and Henderson (21, 22) find three species of nematodes in sugar cane roots, namely Caconema radicicola, Heterodera schachtii, and Tylenchus similis. They have been demonstrated to be the cause of growth failure in many cases.

Cercospora vaginae Krueger, red spot. Common but apparently of very little importance in Porto Rico, according to Mel. T. Cook.

Colletotrichum falcatum Went., red rot. Louisiana - unusually heavy again. Severe in planted cane. More than last year and more than usual. (Tims). Porto Rico - common but not important. (Cook).

Helminthosporium sacchari Butl., eye leaf spot. Porto Rico - Abundant and severe on some varieties especially FC 306, D 109, and H 109. (Cook). This disease has been studied and reported on recently in Hawaii by Lee and his associates. (See reference list)

Leptosphaeria sacchari van Breda de Haan, ring spot. Porto Rico - common and abundant. Does not appear to be of much importance.

Plasmodiophora vascularum EFS. dry top rot, Porto Rico - Scattered throughout the greater part of the island, no serious outbreaks recently. (Cook)

Phyllosticta sp., leaf spot. Porto Rico - common but does not appear to be of much importance.

Pokkah bong (undet.) Louisiana - this disease retarded the growth of cane a great deal late in the season. It is rather generally distributed and was more important this year than last. (Tims.)

Recent literature

1. Ashby, S. F. Gumming disease of sugar cane in the British West Indies. Trop. Agriculture 3: 50-51. 1926.

2. Barber, C. A. Rye spot disease on the sugar cane in Hawaii. Intern. Sugar Jour. 28: 585-589. Nov. 1926.

3. Barnum, C. C. Studies on the pathological nature of the Uba node gall disease. Hawaiian Plant. Rec. 30: 510-511. Oct. 1926.

4. Brandes, E. W. History of Kavangire sugar cane in Porto Rico. An account of the introduction and spread of Kavangire, a disease resisting variety. Sugar Bul. 4(14): 1-5. Apr. 1926.

5. Cottrell-Dormer, W. Notes and observations on the red streak associated with Queensland top rot disease. Queensl. Agr. Jour. 25: 406-414. May 1926.

6. Faris, J. A. Cold chlorosis of sugar cane. Phytopath. 16: 885-891. Nov. 1926.

Sugar Cane - Other Diseases

7. ______________ Some serious sugar cane diseases not known to occur in Cuba. Bul. Trop. Plant Res. Found. 4: 1-22. 1926.

8. Goseco, A. P. The transmission of Fiji disease of the sugar cane. Sugar News 7: 736-739. Oct. 1926.

9. Lee, H. A. Evidence of a factor associated with actively functioning tissues which gives to sugar-cane plants resistance to the invasion of fungi and other micro-organisms. Jour. Gen. Physiol. 9: 381-386. 1926.

10. ______________ Report of the Committee on the relation of cane disease to cane varieties. Hawaiian Plant. Rec. 30: 38-48. Jan. 1926.

11. ______________ The history and distribution of eye spot. Hawaiian Plant. Rec. 30: 466-470. Oct. 1926.

12. ______________ Losses caused by eye spot. Hawaiian Plant. Rec. 30: 472-474. Oct. 1926.

13. ______________, C. C. Barnum, and W. C. Jennings. Combating red stripe disease. Sugar 28: 474-476. Oct. 1926.

14. ______________, and J. P. Martin. Description of eye spot as compared with other sugar cane leaf spot diseases. Hawaiian Plant. Rec. 30: 470-471. Oct. 1926.

15. ______________, and J. P. Martin. Progress report of experiments with fungicidal dusts against eye spot. Hawaiian Plant. Rec. 30: 482-484. Oct. 1926.

16. ______________, J. P. Martin, and C. C. Barnum. A method of testing cane varieties for eye spot susceptibility and resistance. Hawaiian Plant. Rec. 30: 487-492. Oct. 1926.

17. Lyon, H. L. Galls on sugar cane in Hawaii. Hawaiian Plant. Rec. 30: 493-506. Oct. 1926.

18. Martin, J. P., and H. A. Lee. The effect of drying on the spores of the eye spot fungus. Hawaiian Plant. Rec. 30: 475-476. Oct. 1926.

19. ______________, and H. K. Stender. The control of eye spot through resistant varieties. Hawaiian Plant. Rec. 30: 484-487. Oct. 1926.

20. McGeorge, Wm. T. Pahala blight and a comparison with other forms of sugar cane chlorosis. Hawaiian Planters' Rec. 30: 293-328. Apr. 1926.

21. ____________. Nematodes considered in relation to root rot of sugar cane in Hawaii. Plant. & Sugar Manuf. 77: 370-371. Nov. 6, 1926.

22. Muir, F., and G. Henderson. Nematodes in connection with sugar cane root rot in the Hawaiian Islands. Hawaiian Plant. Rec. 30. 233-250. Apr. 1926.

23. North, D. S. Gumming disease on the Clarence. Australian Sugar Jour. 17: 661-662. 1926.

24. Serrano, F. B., and S. L. Marques. The red rot disease of sugar cane and its control. Philipp. Agr. Rev. 19: 263-265. 1926.

25. Shepherd, E. F. S. Diseases of sugar cane in Mauritius. Mauritius Dept. Agric. Bul. 32: 1-18. 1926.

26. Stewart, G. R. The possible relation between nematode injury to cane roots and soil conditions. Plant. & Sugar Manuf. 77: 349-350. Oct. 30, 1926.

27. Storey, H. H. Streak disease of Uba cane. Microbiol. Circ. Dept. Agr. Jamaica 6: 38-39. 1926.

D I S E A S E S   O F   S U G A R   B E E T

CURLY TOP (UNDETERMINED)

The year 1926 was one of the worst years in the history of sugar beet growing as far as curly top was concerned. The losses in Utah, Idaho, Oregon, and parts of California were extremely heavy. Eubanks Carsner writing on October 24 says with regard to the situation:

> "The northwestern inter-mountain areas have this year suffered a more destructive outbreak than that of 1924 which, so far as I can ascertain, has not been rivaled since 1905. I think without doubt this is the worst year on record for Utah. The estimated loss for that state in 1924 was 40 per cent. This year the estimated loss is 60 per cent."

Reports from state collaborators and others follow:

Utah: The beet crop in southern Utah was almost a complete failure, though some beets were shipped out of Elsinore, Delta, and a few other localities. The curly top disease was largely responsible, the beet leafhopper, Eutettix tenella Baker, being found breeding in great numbers all through this section of the state in the lowlands. (G. F. Knowlton in U. S. Dept. Agr. Insect Pest Survey Bul. 6: 317. Nov. 1, 1926).

Idaho: Total loss in most sections. Only one factory in operation in state this season. (Hungerford)

(Caldwell-Weiser Section): Eighty-eight per cent plantings abandoned. (R. W. Haegele)

(Twin Falls Factory District): Beds plowed up for the most part in latter part of May and early June. Approximately 90 per cent acreage abandoned. (Walter Carter)

(Burley and Paul Factory Districts): Approximately 80 per cent acreage plowed up or abandoned. Sub-irrigated fields suffered least. (Carter)

(Utah-Idaho Company territory from Pocatello north to Sugar City): Disease serious in south but lessened in severity further north. Disaase patchy, not general. Other conditions, aphis, nematode, old beet fields made accurate estimates impossible. (Carter)

California: There was relatively little loss this year from curly top in the central part of the state, but in southern California the damage was greater than has been known for many years. (Carsner)

McKay and Dykstra (3) have shown that the western yellow blight of tomatoes and diseases of other garden vegetables are also caused by the curly top virus. Compare the distribution of curly top and of the western yellow blight as shown in figures 23 and 24 (page 259).

Recent literature

1. Carsner, E. Resistance in sugar beets to curly top. U. S. Dept. Agr. Circ. 388: 1-7. July 1926.

2. ______________ Seasonal and regional variations in curly top of sugar beets. Science n. s. 63: 213-214. Feb. 1926.

3. McKay, M. B. and T. P. Dykstra. Sugar beet curly top virus, the cause of western yellow blight. (Abstract) Phytopath. 17: 39. Jan. 1927.

NEMATODE, HETERODERA SCHACHTII A. SCHMIDT.

The situation with regard to the sugar beet nematode is well summed up in a recent publication by Gerald Thorne (4). His description of the geographic distribution of the pest is the best that we have on that subject. He reports it as occurring in Nebraska and Montana, which are new states as far as Plant Disease Survey records are concerned. In 1926 D. G. Milbrath reported a loss of 3 per cent for California.

Recent literature

1. Maxson, A. C. The sugar beet nematode. Through the Leaves 14: 125-130. Mar. 1926.

2. Peters, B. G. Heterodera schachtii (Schmidt) and soil acidity. Jour. Helminth. 4: 87-114. Aug. 1926.

3. Stewart, G., and A. H. Bateman. Field studies of sugar beet nematode. Utah Agr. Exp. Sta. Bul. 195: 3-32. 1926.

4. Thorne, Gerald. Control of sugar beet nematode by crop rotation. U. S. Dept. Agr. Farm. Bul. 1514: 1-21. Nov. 1926.

OTHER DISEASES

Bacterium beticolum EFS., Brown, & Town., tuberculosis. G. H. Coons reported this disease, commonly confused with crown gall, as being rather generally found in fields at Rocky Ford and Lamar, Colorado. The losses, however, were very slight.

Bacterium tumefaciens EFS. & Town., crown gall. A few cases of true crown gall were reported from Michigan by Coons. It was of no apparent economic importance, however.

Caconema radicicola (Greef) Cobb, root knot. California.

Cercospora beticola Sacc., leaf spot. Reported from Louisiana, Kansas, Michigan, and Colorado. In northern Colorado abundant rains in the early part of the season favored the disease with the result that it was much more prevalent than usual and was very important, probably causing a loss in sugar yield of about 10 per cent, according to Coons. In the southern portion of the state, however, where the weather was drier it was only of slight importance. One per cent loss was reported in Louisiana, from a trace to 2 per cent in Michigan, and a trace in Kansas.

Phoma betae (Oud.) Frank, root rot and leaf spot. As a leafspot it was reported from Louisiana and as a root rot from Washington. No other data received.

Corticium vagum Berk. & Curt., and other fungi, root rots. This disease occurred generally in the sugar beets planted in Louisiana, being of much greater importance than usual. It was estimated by Tims that probably 50 per cent of the sugar beets were affected with this disease either in the field or after harvest.

In Michigan less damage from fungi of the damping-off type occurred than is commonly the case, the stands being reported rather good everywhere according to Coons.

Sclerotium rolfsii Sacc., stem rot. This disease threatens whole fields in Louisiana with destruction when weather conditions were favorable, according to Tims.

Recent literature

1. Appel, O. Taschenatlas der Krankheiten der Zuckerrübe. Berlin, P. Parey, 1926. (Pareys Taschenatlanten nr. 3).

2. Böning, K. Die Mosaikkrankheit der Rübe. Zeitschr. Pflanzenkr. 37: 19-25. 1927.

3. Coons, G. H. Root rot in sugar beets in Louisiana not dangerous. Plant & Sugar Manuf. 76: 488-489. June 1926.

4. Molz, E. Die Mosaikkrankheit der Zuckerrüben, eine in Deutschland neue und gefahrliche Zuckerrübenkrankheit. Deut. Landw. Presse. 53: 501. Oct. 2, 1926.

DISEASES OF OTHER CROPS

ARTICHOKE, JERUSALEM

Erysiphe cichoracearum DC., powdery mildew. Connecticut, one report, on Station farm at Mt. Carmel. (Clinton).

ASPARAGUS

Cercospora spp., leaf and stem spot. A specimen received from Florida by the Office of Vegetable and Forage Diseases was determined by W. W. Gilbert as C. asparagi Sacc. It was reported as causing considerable damage. C. caulicola Wint. was reported from Florida by Weber.

Fusarium sp. A Fusarium wilt or rot was reported from New Jersey and North Carolina. Stem canker due to a Fusarium occurred in Washington. Red streak caused by Fusarium sp. was responsible for a loss of 3 per cent in California, according to Milbrath.

Puccinia asparagi DC., rust, was reported from Connecticut, Virginia, Texas, Michigan, Missouri, South Dakota, and California, and from Manitoba, Canada. The loss in California was estimated by Milbrath to be 0.5 per cent. J. F. Brenckle reported the disease as very prevalent in South Dakota and Bisby stated that it was rather worse than usual in Manitoba. Nelson reported that one field of Mary Washington in Michigan was quite heavily infected.

BEET

Actinomyces scabies (Thax.) Güss., scab. New York, New Jersey. An experiment with beets in New Jersey gave the following results: Check rows, 43 per cent scab; rows with 300 pounds of sulfur per acre, 38.3 per cent scab; with 600 pounds, 30 per cent, the 600 pounds of sulfur did not seem to injure the beets. This one beet farm has been badly infested for several years. (Chupp).

Bacterium tumefaciens EFS. & Towns., crown gall. Two to 3 per cent infection found in one planting in Bergen County, New Jersey. (Dept. Plant Path.).

Caconema radicicola (Greef) Cobb, root knot. Texas, loss 0.5 per cent. (Taubenhaus).

Cercospora beticola Sacc., leafspot. Connecticut, New York, New Jersey, Florida, Louisiana, Texas, and Indiana. A loss of 1 per cent was reported in Texas.

Phoma betae (Oud.) Frank. The leafspot was reported from New York. In the Norfolk section of Virginia McWhorter stated that "Seedling beets in greenhouse again show much loss from damping-off due to Phoma betae and Rhizoctonia sp. In two large houses more than 80 per cent have died; the stand is hardly more than 15 per cent. Several greenhouses have been planted with organic mercury treated seed and almost perfect control has resulted." (Dec. 1926-Jan. 1927).

Sclerotium rolfsii Sacc., southern blight. Florida, Texas.

Curly top (virus). A report in the Arizona News Letter (State Comm. Agr. & Hort.) for August 31 states that curly top had been reported as especially severe in the vegetable growing districts of Navajo County. The disease was very destructive in Washington and Oregon, according to the following reports:

> Washington: Curly top has apparently been responsible for widespread failure of garden beets in eastern Washington. Abundance of leaf hoppers and favorable season have probably been the major factors in the epidemic nature of the disease. Mangels seem also to be nearly as severely affected as garden beets. (Dept. Plant Path.).
>
> Oregon: Curly top was very destructive in most of the state this year. It has been the worst season in history for this disease. Replanted crops were often totally destroyed also. It probably occurred in all but the Coast counties. The loss was 75 per cent. (McKay)

C A R R O T

Bacillus carotovorus Jones, soft rot. New York, Indiana. Indiana - In many fields in the Indianapolis gardens at least 30 per cent of the carrots were rotted. (Gregory).

Caconema radicicola (Greef) Cobb, root knot. Washington.

Corticium vagum Berk. & Curt. New York.

Macrosporium carotae Ell. & Langl., leaf blight. New York, Maryland, Florida, Ohio.

Rhizoctonia crocorum (Pers.) DC., violet root rot. Specimen received from S. M. Zeller of Oregon.

Sclerotium rolfsii Sacc., southern blight. Texas.

Curly top (?). Carrots were affected by a disease suspected to be due to the sugar-beet curly top virus in Oregon. (McKay).

Recent literature

1. Lauritzen, J. I. The relation of black rot to the storage of carrots. Jour. Agr. Res. 33: 1025-1041. Dec. 1, 1926. Alternaria radicina.

2. White, R. P. Rhizoctonia crown rot of carrots. Phytopath. 16: 367-368. May 1926.

CASTOR BEAN

Ozonium omnivorum Shear, Texas root rot. Texas, prevalent, 10 per cent loss. (Taubenhaus).

EGGPLANT

Alternaria solani (Ell. & Mart.) Jones & Grout, leafspot, New York, Washington; nailhead spot, Florida.

Bacterium solanacearum EFS., bacterial wilt Florida, Porto Rico.

Botrytis sp., stem rot, was present to a very limited extent in the Norfolk section of Virginia this season. (McWhorter).

Phomopsis vexans (Sacc. & Syd.) Harter, leafspot and fruit rot, was reported from Massachusetts, New York, New Jersey, Maryland, Virginia, Florida, and Porto Rico. A loss of 4 per cent was thought to have occurred in Maryland. A. M. Boyce stated that it was found in every planting in Nassau County, New York (Long Island) and was fairly serious in most cases. C. M. Haenseler reported from New Jersey that "Clean picking every seven days on an experimental plot of 400 plants reduced the loss to less than 5 per cent. Unpicked plots adjacent gave 100 per cent rotten fruits. The varieties Long Purple and Florida High Bush were susceptible, and Black Beauty was very susceptible."

Phyllosticta hortorum Speg., leafspot, Florida.

Pythium aphanidermatum (Edson) Fitz. is reported by Drechsler (1) as the cause of a cottony leak of eggplant fruits, which has been found in the field in Tennessee (1923) and Florida (1925).

Sclerotinia sclerotiorum (Lib.) Mass., blight and fruit rot, was reported by Foster as much more prevalent than usual in the Sanford section of Florida, in December. He stated that "The weather was dry but heavy dews at night may account for its appearance." A specimen of stem rot caused by this organism was received from Foster, collected from a field in which 60 per cent of the plants were affected.

Sclerotium rolfsii Sacc., stem rot, Florida.

Verticillium albo-atrum Reinke & Berth., wilt. New Jersey, "Florida High Bush and New York Improved are susceptible, Black Beauty is very susceptible. Wild eggplant (Solanum floridanum) from Florida was found to be too susceptible to be of value in breeding for resistance." (Haenseler). Also reported from Maryland.

Mosaic (virus). Pennsylvania, 10 per cent loss (Beach). Florida.

Recent literature

1. Drechsler, C. The cottony leak of eggplant fruit caused by Pythium aphanidermatum. Phytopath. 16: 47-50. Jan. 1926.

2. Haenseler, C. M. Plant diseases of New Jersey XI. Eggplant diseases. New Jersey Agr. 8 (10): 6-7. Oct. 1926.

ENDIVE

Sclerotinia sclerotiorum (Lib.) Mass., drop. Virginia, in the Norfolk section; Florida.

GARLIC

Tylenchus dipsaci (Kühn) Bast., bulb nematode, caused a loss in California estimated by Milbrath at 2 per cent. C. E. Scott, of the California State Department of Agriculture, sent specimens of garlic affected by this nematode, and said,

> "The specimens were collected in San Benito County June 29, 1926. The disease was first found in 1925 in San Benito, Monterey, and Santa Cruz Counties. In 1925 the disease spread rapidly whenever it appeared in a field. This year, due to the dry season, there has been but little direct injury in any field in the three counties. In practically every case (in 1926) we have traced the origin of the disease to diseased seed or to planting on infested land. The situation is now being handled by certification of all seed garlic (cloves for planting)."

GINSENG

Alternaria panax Whetzel, blight. West Virginia.
Vermicularia dematium (Pers.) Fr., stem anthracnose. West Virginia.
Papery leafspot (Non-par.). Missouri.

MANGEL WURZEL

Cercospora beticola Sacc., leafspot. New Jersey, "Some fields showed severe infection. In one field the beets in adjoining rows showed only slight infection." (Chupp); Ohio.

Curly top (virus). Washington, more important than usual. (Div. Plant Path.).

MUSHROOM

Mycogone perniciosa Magn. Pennsylvania. "It appears that this disease of mushrooms is prevalent to some extent in the houses of nearly all growers of whom there are about 500 near and west of Philadelphia. Loss about 5 per cent." (Beach).

OKRA

Caconema radicicola (Greef) Cobb, root knot. South Carolina, Texas.

Cercospora hibisci Tr. & Earle, leafspot. North Carolina.

Fusarium vasinfectum Atk., wilt. Texas.

Ozonium omnivorum Shear, Texas root rot. Texas, loss 5 per cent. (Taubenhaus).

Rhizoctonia sp., root rot. Texas.

Verticillium albo-atrum Reinke & Berth., wilt. New Jersey.

PARSLEY

Pythium sp., and *Rhizoctonia* sp., damping-off. New Jersey.

PARSNIP

Bacillus carotovorus Jones, soft rot. "Small amounts became evident during a rainy spell in August, in Nassau County, New York." (A. M. Boyce).

Cercospora apii pastinacea Farl., leafspot. Connecticut.

Ramularia pastinacae (Karst.) Lindr. & Vestr., leafspot. Nassau County, New York. "Several pathogenes may be responsible but it is believed that Ramularia is the primary cause of the major part of the injury. Foliage browned considerably during a rainy spell in August." (A. M. Boyce).

Recent literature:

1. Stirrup, H. H., and A. Roebuck. Parsnip canker. Jour. Min. Agr. Great Britain 33: 824-826. Dec. 1926. Primarily non-parasitic.

PEANUT

Botrytis sp., stem rot. Mississippi.

Cercospora personata (Berk. & Curt.) Ell. & Ev., leafspot, caused a loss of 5 per cent in southern Georgia, according to Boyd, and was reported from North Carolina.

Fusarium sp., wilt, or root rot, said to be general in Prince George County, Virginia. (Fromme).

Fusarium sp. and *Phoma* sp., tip blight and leaf spot, Scott County, Missouri. *Fusarium* sp. was isolated from tissue culture. (Archer).

Ozonium omnivorum Shear, Texas root rot. Texas, loss 10 per cent. (Taubenhaus).

Sclerotium rolfsii Sacc., southern blight, caused a loss of 2 per cent in southern Georgia (Boyd). It was reported from Texas also.

Chlorosis (non-par.), due to excess of lime. Texas.

Curly top (?). Peanut was affected by a disease believed to be due to the sugar beet curly top virus in Oregon. (McKay).

Recent literature

1. Ashby, S. F. Transmission of two diseases caused by infective viruses. 2. Rosette of ground-nuts. Trop. Agric. 3: 98. May 1926.
   Review of work in South Africa. Rosette is a virus disease transmitted by *Aphis leguminosae*.

2. Steiner, G. Parasitic nemas on peanuts in South Africa. Centralbl. Bakt. Abt. II, 67: 351-365. July 1926.

PEPPER

Alternaria sp., fruit rot. New Jersey, Florida, Missouri, Porto Rico. A loss of 4 per cent was estimated in Missouri. (Archer).

Bacterium solanacearum EFS., bacterial wilt. Florida, Texas, Porto Rico.

Bacterium vesicatorium Doidge, bacterial spot was reported from New Jersey, Florida, and Missouri. Chupp says that the disease was rather common but not severe on the leaves in southern New Jersey; but was not observed on the fruit.

Botrytis sp., gray mold, on stems and fruit, New Jersey.

Cercospora capsici Heald & Wolf, leafspot. Florida, Texas, Porto Rico.

Cladosporium sp., leaf mold, Mexico, west coast. "This disease was bad in the Fuerte Valley, Sinaloa, on peppers." (A. W. Morrill).

Fusarium sp., wilt. Maryland, Arizona. In the latter state it caused a loss of 3 per cent, according to Streets.

Gloeosporium piperatum Ell. & Ev., anthracnose. Higgins (1) states that while at least five distinct species of Colletotrichum, Gloeosporium, and Glomerella occur on pepper fruits, *Gloeosporium piperatum* is the only one that is actively parasitic. It attacks the fruit in all stages of development, and sometimes also the stems and branches, but is comparatively rare in pepper fields. The other species, including Colletotrichum nigrum Ell. & Halst., Colletotrichum sp., Glomerella piperata (Ston.) Spaulding & Schrenk, and Glomerella sp., are wound parasites, which attack the fruit through blossom-end rot spots and other wounds. They are much more common in the field.

In 1926 collaborators reported anthracnose under a number of different names, viz., Colletotrichum nigrum in South Carolina and Florida, Glomerella piperata in Delaware, Gloeosporium piperatum in Porto Rico, and Glomerella cingulata in New Jersey and Missouri. The loss in South Carolina was estimated at 10 per cent by Moore, and in Delaware Adams reported the canning crop as showing heavy infection.

Ozonium omnivorum Shear, Texas root rot. Texas, 1 per cent loss.

Pythium sp., root rot. Porto Rico, occasional.

Sclerotium rolfsii Sacc., blight. South Carolina, Georgia, Florida, Louisiana, and Texas.

Curly top (?). " A disease believed, but not yet determined, to be due to the sugar-beet curly top virus was unusually abundant in western Oregon. Both the symptoms and circumstantial evidence suggest the curly top virus as the cause and it was most abundant in bad curly top areas. It caused a loss of 75 per cent." (McKay)

Mosaic (virus). Pennsylvania, South Carolina, Florida, Louisiana, Indiana, and Porto Rico. A loss of 10 per cent occurred in Pennsylvania, according to Beach.

Recent literature

1. Higgins, B. B. Anthracnose of pepper (Capsicum annum L.) Phytopath. 16: 333-345. May 1926.

2. Malabanan, D. B. Anthracnose of pepper. Philipp. Agr. 14: 491-501. Jan. 1926.

R H U B A R B

Ascochyta rhei Ell. & Ev., leafspot. Connecticut, Missouri.

Colletotrichum erumpens Sacc., anthracnose. Missouri, loss 5 per cent. (Archer).

Phyllosticta straminella Bres., leafspot. New York, New Jersey, Missouri.

Phytophthora sp., crown rot, was reported from Indiana. Archer reported a foot and crown rot, probably due to Phytophthora, as the cause of a 5 per cent loss in Missouri.

Phytophthora cactorum (Leb. & Cohn) Schröt., crown rot. Pennsylvania. Beach reported that nearly all seriously diseased fields in the vicinity of Philadelphia have been destroyed.

Curly top (?). Rhubarb is another host affected by a disease suspected to be due to the sugar-beet curly top virus, in Oregon. (McKay & Dykstra).

SALSIFY

Albugo tragopogonis (DC.) S. F. Gray, white rust. Iowa.

Curly top (?). Salsify was attacked by a disease believed to be due to the sugar-beet curly top virus, in Oregon. (McKay & Dykstra)

Yellows, due to aster yellows virus. Kunkel (1) reports that aster yellows was successfully transmitted to salsify, and back to aster.

Recent literature

1. Kunkel, L. O. Studies on aster yellows. Amer. Jour. Bot. 13: 646-705. Dec. 1926.

SOUR GRASS OR SCHAFF (RUMEX ACETOSA)

Phyllosticta sp., leafspot. New York, Nassau County.

SPINACH

Caconema radicicola (Greef) Cobb, root knot. South Carolina, southern Georgia. Apparently this nema is not common on spinach, since it has only been reported to the Survey once before, from Indiana in 1921.

Cercospora beticola Sacc., leafspot. Southern Georgia.

Colletotrichum spinaciae Ell. & Halst., anthracnose. Texas.

Fusarium spp., wilt. Fusarium sp. was reported from Arizona. F. solani (Mart. p. par.) Appel & Woll., caused a loss of 5 per cent in Texas. (Taubenhaus). Fusarium wilt, apparently F. spinaciae Sherb., was observed at one point in the central coast district of California on seed spinach, causing complete loss in some small plots. (Horne).

Peronospora effusa (Grev.) Ces., downy mildew, was reported from Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Virginia, South Carolina, Louisiana, Texas, and Indiana. Losses reported were: Texas 8 per cent; South Carolina, reduction in yield 3 per cent, transit loss 1 per cent; Maryland, reduction in yield 1 per cent, transit loss 1 per cent; New York a trace. In the Norfolk section of Virginia the disease was so severe on the early spring crop that its effects resembled those of blight (mosaic). McWhorter states that downy mildew is of more importance than mosaic in that section since the latter has been practically eliminated through the use of the resistant variety Virginia Savoy, and attempts to control the former have proved futile. On Long Island, according to Clayton, "Downy mildew is common and causes considerable loss, measured by crop, but less when measured by dollars, since late in the spring when the disease is most destructive the price is generally low." Jehle reported that in a variety test in Maryland downy mildew was very severe on the varieties King of Denmark, Henderson's Improved Thickleaf, Victoria Thickleaf Virofly, Virginia Savoy, Broomdale, Round Thickleaf, Triumph, Long Season, and Princess Julian. Giant Eskimo and Prickly Winter were not so severely attacked. In Middlesex County, Massachusetts, Victoria and Savoy were badly affected, according to Guba.

Pythium debaryanum Hesse, root rot. Connecticut, one report, on old plants.

Rhizoctonia sp., root rot. In Camden County, New Jersey, in September, a field of young spinach turned yellow and seemed about to die. Rhizoctonia was found abundantly in and on the roots. (Dept. Plant Path.). Taubenhaus reported a loss of 1 per cent from Texas.

Yellows, due to aster yellows virus. Kunkel (1) reports spinach as one of the plants to which aster yellows was successfully transmitted experimentally.

Recent literature

1. Kunkel, L. O. Studies on aster yellows. Amer. Jour. Bot. 13: 646-705. Dec. 1926.

2. Taubenhaus, J. J. Studies of a new Fusarium wilt of spinach in Texas. Texas Agr. Exp. Sta. Bul. 343: 1-23. July 1926.

S W I S S   C H A R D

Cercospora beticola Sacc., leafspot. New York, Texas, Missouri.

Y A U T I A

Macrosporium sp. and *Phyllosticta colocasiae* Höhn., leafspot. Porto Rico, not important.

THE PLANT DISEASE REPORTER

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Supplement 55

Diseases of Forest and Shade Trees, Ornamental and Miscellaneous Plants in the United States in 1926

October 30, 1927

BUREAU OF
PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

DISEASES OF FOREST AND SHADE TREES, ORNAMENTAL AND MISCELLANEOUS PLANTS IN THE UNITED STATES IN 1926

Plant Disease Reporter
Supplement 55

October 30, 1927

Prepared by
G. Hamilton Martin

CONTENTS

F O R E W O R D

This summary of the diseases of forest and shade trees, ornamental and miscellaneous plants in the United States in 1926 follows the same general plan as those of the preceding years. The sources upon which the information is based are as follows: (1) collaborators, (2) specialists in the Office of Forest Pathology, (3) articles in botanical journals, and (4) special reporters.

Many reports of new occurrences were received for 1926 both for individual states and for the United States. In the accompanying summary these first occurrences have been noted by symbols before each individual report. Many occurrences are given which have been obtained from literature, from the Mycological herbarium of the Bureau of Plant Industry, or from past records of the Plant Disease Survey. Many diseases have been omitted due to their unimportance or to the fact that they have been reported in other years. It is not the object of this summary to enumerate all of the diseases that have been reported during the year, but to give facts concerning only some of the more important ones. "Standardized Plant Names" has been used as the source for the names of the hosts.

Where specimens are not indicated the report is based on the authority of the person cited. The date given is that of its earliest reported appearance in 1926. Reports of diseases from British Columbia are given because of their possible occurrence also in Washington and Idaho.

The following symbols are used: * indicates a specimen in the Mycological herbarium; + preceding disease indicates the first report of the disease to the Plant Disease Survey; + preceding state indicates the first report from the state to the Plant Disease Survey; P.r. indicates prior reports of the disease to the Plant Disease Survey or from the Mycological herbarium.

References have been given and in some instances brief abstracts made of recent articles which may be of service to those who do not have access to all botanical journals.

DISEASES OF CONIFERS

ABIES AMABILIS, Cascade fir.
+Dimerosporium abietis Dearn.
Washington - Government Mineral Springs, elevation 1,400 feet, July 1, 1920, Red Mountain, elevation 3,300 feet, August 14, 1924, Skamania County. (Boyce). (Dearness, 25: 243)

ABIES ARIZONICA, cork fir.
+Bifusella abietis Dearn.
New Mexico - Gila National Forest; collected by Hedgcock and Long. (Dearness, 25: 239)

ABIES BALSAMEA, balsam fir.
+Phacidium abietinellum Dearn.
New York - Newcomb, Essex County, August 22, 1924; collected by Orton and Overholts. (Dearness, 25: 237)

ABIES CONCOLOR, white fir.
+Phacidium balsameae Davis (Stegopezizella balsamea Syd.)
Oregon - Wasco, Sherman County; collected by Boyce. (Dearness, 25: 238)
+Phacidium infestans abietis Dearn.
Oregon - White Pine 1913; collected by Weir. (Dearness, 25: 237)

ABIES GRANDIS, great silver fir.
+Corticium racemosum Burt.
Idaho, Washington, British Columbia. (Burt, 17: 287)
+Dimerosporium abietis Dearn.
Washington - Government Mineral Springs, altitude 1,400 feet. August 23, 1924. (Boyce). Red Mountain, Skamania County. (Dearness, 25: 243)
+Phacidium infestans abietis Dearn.
Montana - on blighted leaves among green ones; altitude 2,900 feet; Lincoln County, July 25, 1924. (Boyce). (Dearness, 25: 237)
+Phomopsis sp., twig and branch canker.
Idaho - Clarkia, Shoshone County, elevation 2,800 feet, August 31, December 11. Causing cankers and killing branches up to 1/2 inch diameter inside bark on trees of all sizes from saplings to small poles. Not found on the main stem nor killing tops of small trees. This fungus, while not yet definitely identified, is quite close to Phoma abietina Hartig which commonly kills branches of silver fir (Abies pectinata) in continental Europe. (Boyce)

ABIES LASIOCARPA, Alpine fir.
+Bifusella abietis Dearn.
Colorado - Manti National Forest, Sopris National Forest, Uncompaghre Mountains.

Idaho - parasitic and fruiting on year old and older leaves; Challis National Forest, Bonanza, August 7, 1911, collected by Hedgcock. (Dearness, 25: 239)

+Coniophora corrugis Burt.

Wyoming to Colorado and British Columbia to Arizona. (Burt, 17: 310)

+Cystothyrium abietis Dearn.

Colorado - Rico, Dolores County; collected by Payson and Hedgcock. (Dearness, 25: 240)

+Hypodermella abietis-concoloris (Mayr.) Dearn., needle cast.

Oregon - very sparse; altitude 4,000 feet - Clackamas County, May 2. (Boyce)

Peridermium ornamentale Arth., rust.

+*Wyoming, altitude 8,600 feet; Yellowstone National Park County, September 6. (Conrad)

+Phacidium balsameae Davis, needle blight.

Colorado - Uncompaghre Mountains, July; collected by Hedgcock. (Dearness, 25: 238)

+Phomopsis sp., twig and branch canker.

Idaho - Clarkia, Shoshone County, elevation 2,800 feet, August 31. Cankers similar to those on lowland white fir were found on this host, but it has not been determined yet that cankers on both hosts were caused by the same organism, although this appears probable. (Boyce)

CEDRUS DEODARA, deodar.

+Armillaria mellea (Vahl) Quel., root rot.

Mississippi - A. & M. College, Oktibbeha County, September 6, (Wedgworth)

CHAMAECYPARIS NOOTKATENSIS, Alaska cedar.

+Venturia lanea Dearn.

Washington - on bark; Upper White River, September, 1924; collected by Grant. (Dearness, 25: 246)

CUPRESSUS ARIZONICA, Arizona cypress.

Phomopsis juniperovora Hahn; see Juniperus virginiana.

C. SEMPERVIRENS, Italian cypress.

Phomopsis juniperovora Hahn; see Juniperus virginiana.

CRYPTOMERIA JAPONICA, common cryptomeria.

Phomopsis juniperovora Hahn; see Juniperus virginiana.

JUNIPERUS OCCIDENTALIS, western juniper.

+Dimerium juniperi Dearn.

California - on green branchlets; Big Bear Lake, August 2, 1920; collected by Bethel. (Dearness 25: 244)

JUNIPERUS VIRGINIANA, red cedar.

Phomopsis juniperovora Hahn, nursery blight.

"Cedar blight was reported as being serious in the Middle West in seedling nursery stock of red cedar, Juniperus virginiana. At Dundee, Illinois, excessive moisture during the growing season apparently greatly enhanced the prevalence of the disease. At Freemont, Nebraska, the blight occurred abundantly in seedling beds of red cedar which were left unsprayed with Bordeaux mixture. An ornamental planting of five-year old Savin Juniper, J. sabina, at Newark, Ohio, was generally infected with the blight, entire plants being killed within one to two years.

"In the southern states, the amount of blight, which was so very prevalent in 1924, was very much reduced in 1926. At Greensboro, North Carolina, injury not to exceed 10 per cent of one year old seedlings of Cupressus arizonica and C. sempervirens was reported. Seedlings of Cryptomeria japonica of the same age were also attacked in the same degree. Nursery stock of this last named species was reported as badly infected in southern Alabama. Diagnosis of specimens from this source revealed the presence of Phomopsis.

"From the East specimens were received for examination from Rhode Island (Kingston). The cedar blight organism was found present. Several nurserymen of this state reported the blight as commonly occurring and causing considerable loss among young juniper seedlings both in the seedling and transplant beds.

"Cedar blight continues to be a disease of juvenile coniferous stock which must be dealt with by nurserymen. The control of this disease depends upon thorough and repeated sprayings with Bordeaux mixture, applied under high pressure, so that all the tender young parts of the rapidly growing seedlings are kept as completely covered as possible with a coating of copper spray throughout the growing season. The Bordeaux mixture should contain a good spreader and adhesive such as resin fish-oil soap, or one of the casein soap preparations. The frequency of application required varies with the season; wet weather demands very frequent applications. Spraying should begin very early in the spring.

The distribution of Phomopsis juniperovora has been extended since the report of the fungus in 1924 (Pl. Dis. Reptr. Suppl. 42: 316-319. Sept. 15, 1925) and in 1925 (Pl. Dis. Reptr. Suppl. 50: 416-418. Dec. 1, 1926) to include Rhode Island." (G. G. Hahn)

JUNIPERUS SCOPULORUM, Colorado juniper.
  Gymnosporangium betheli Kern, rust.
    Colorado - April 28, (Learn). P.r.: *Colo., *Mont., *N. M., N. D., Utah.

JUNIPERUS SPP., juniper.
  +Coniophora corrugis Burt.
    Wyoming to Colorado and British Columbia to Arizona; on logs, dead limbs and living trees; May to October; common. (Burt. 17: 310)
  Gymnosporangium clavariaeforme (Jacq.) DC., rust.
    Connecticut - one report, May. (Clinton)
    +Louisiana - Shreveport, Caddo County, April 5. (Tims). P.r.: Ala., Colo., Conn., Ill., *Iowa, *Me., *Mass., *Mich., Minn., *N. H., N. Y., Vt., Wis.

Gymnosporangium germinale (Schw.) Kern, rust.
Connecticut - seven reports; Litchfield and New Haven (Wallingford) Counties, May. (Clinton & Hunt)
*Georgia - Thomasville, Thomas County, February 25. (Boyd).
P.r.: *Ala., Conn., *Del., *D. C., Ga., Ill., Ind., Iowa, Ky., *Me., *Md., *Mass., Mich., *Miss., *N. J., *N. Y., *N. C., Ohio, Pa., *S. C., Tenn., *Texas, *Va., Wis.
Gymnosporangium nidus-avis Thax., rust.
Connecticut - two reports on wild host; Salisbury, Litchfield County, June 2. (Clinton & Hunt). P.r.: Ala., Conn., *Del., D. C., Fla., Ga., *Ill., *Iowa, Md., *Mass., *Miss., Nebr., N. J., *N. Y., N. C., S. C., Vt., *Va.
Winter injury.
Connecticut - serious, caused a browning of the leaves; more prevalent than average year. (Clinton & Filley)
*New York - on J. virginiana; severe in some places; caused the death of some trees, particularly those exposed to the south winds. (Pennington)

LARIX LYALLII
+Lophodermium laricis Dearn.
Idaho - Bitter Root Mountains, September 13, 1911; collected by Hedgcock. (Dearness, 25: 243)

LARIX OCCIDENTALIS, western larch.
+Corticium racemosum Burt.
Idaho, Washington, and British Columbia. (Burt, 17: 287)
+Hypodermella laricis octospora Dearn.
Idaho - St. Maries, September 18, 1911; collected by Hedgcock. (Dearness, 25: 241)
Polyporus sulfureus (Bul.) Fr., heart rot.
+Oregon - White Pine Siding, near Austin, Grant County, elevation 4,600 feet, July 20. Causing a chocolate-brown carbonaceous decay with very heavy mycelium felts in the butt and roots of a living tree 40 inches in diameter breast-high. (Boyce)

LARIX SP., larch.
Razoumofskya laricis Piper, mistletoe witches' broom.
Washington - Whitman County. (Dept. Pl. Path.). P.r.: Idaho, Mont., Wash.

PICEA ENGELMANNII, Engelmann spruce.
+Coniophora corrugis Burt.
Wyoming to Colorado and British Columbia to Arizona. (Burt, 17: 310)
Peridermium coloradense (Diet.) Arth. & Kern, rust.
Oregon - upper Camp Creek, near Whitney, Baker Co., elevation 5,000 feet, July 26. Frequent. Causing witches' brooms.
British Columbia - Anarchist Mt., near Oliver, elevation 3,000 feet, August 22. Rare, sporulating; along Kettle Valley Railway, Glen Fir to Lakevale, elevation 2,600 to 4,150 feet, August 23. Occasional. (Boyce). P.r.: *Colo., *Idaho, *Mont., *Oreg., *Wash., *Wyo.

PICEA MARIANA, black spruce.
Melampsoropsis cassandrae (Pk. & Clint.) Arth. (Chrysomyxa cassandrae (Pk. & Clint.) Tranz.)
+Wisconsin - (Davis, 23: 188). P.r.: *Mich., *Minn.

PICEA RUBRA, red Spruce.
+Corticium vinosuscabens Burt.
Vermont to Wisconsin (Burt, 17: 267)

PICEA SITCHENSIS, Sitka spruce.
+Aleurodiscus subcruentatus (Berk. & Curt.) Burt.
Oregon and California - on bark of living trees; August and September. (Burt, 17: 308)
+Corticium ermineum Burt.
Vermont and Idaho. (Burt, 17: 182)
+Corticium rubicundum Burt.
Colorado - Burt, 17: 235)
Scorch
+Missouri - on Koster's blue spruce (Picea pungens hort. var.) local; damage severe due to spring drouth. (Archer)

PINUS BANKSIANA, jack pine.
Cronartium cerebrum (Pk.) Hedgc. & Long, oak-rust.
+Wisconsin - (Davis, 23: 189). P.r.: Conn., Mich., Minn.

PINUS CARIBAEA, slash pine.
+Hypoderma hedgcockii Dearn., needle cast.
Florida - parasitic on the leaves; Silver Springs, May 15, 1919; collected by Hedgcock. (Dearness, 25: 240)

PINUS CLAUSA, sand pine.
+Hypoderma hedgcockii Dearn., needle cast.
Florida - parasitic on leaves, Bolton. (Dearness, 25: 240)

PINUS CONTORTA, shore pine.
Cronartium comptoniae Arth., rust.
+British Columbia - abundant on seedlings and saplings, elevation 1,200 feet; Daisy Lake, August 17. (Boyce). P.r.: Conn., N. H.
+Hypodermella montivaga concolor Dearn., needle cast.
Montana, Wyoming, Colorado - this form has uncolored apothecia; on branchlets. (Dearness, 25: 242)

PINUS ECHINATA, shortleaf pine.
+Hypoderma hedgcockii Dearn., needle cast.
Virginia - Luray, parasitic on leaves; Murphy.
North Carolina - collected by Hedgcock. (Dearness, 25: 240)
+Hypoderma lethale Dearn., needle cast. (Dearness, 25: 241)
+Lophodermium australe Dearn., needle cast.
Southern States. (Dearness, 25: 242)
+Meliola pinicola Dearn.
North Carolina - on living leaves; Pisgah, Pisgah National Forest, July 6, 1925. (Dearness, 25: 244)

+Pezizella minuta Dearn.
North Carolina - on living leaves, Davidson River; collected by Hedgcock. (Dearness, 25: 236)

PINUS EXCELSA, Himalayan pine.
+Cenangium abietis (Pers.) Rehm, twig blight.
Ohio - several trees in the station arboretum were killed. Wooster, Sept. 20. (May)

PINUS FLEXILIS, limber pine.
+Razoumofskya americana Nutt. (Arceuthobium americanum), mistletoe.
*Montana - Bridger Mountain Range, altitude about 6,200 feet; Bozeman, Gallatin County, July 4. (Haskell & Young)
+Phacidium planum Davis, needle blight.
Colorado - Palmer Lake, July 19, 1917; collected by Hedgcock and Bethel. (Dearness, 25: 238)

PINUS GLABRA, spruce pine.
+Capnodium sp.
Louisiana - Bogalusa, Washington County, Feb. 13. (Edgerton)
+Lophodermium australe Dearn., needle cast.
Southern States - on the leaves. (Dearness, 25: 242)

PINUS MONTICOLA, western white pine.
Cenangium piniphilum Weir, canker.
Idaho - near Nordmann, Bonner Co., elevation 2,700 feet, Sept. 2, 1926. Causing cankers 2 feet long on trunks of 2 living trees 6 and 8 inches diameter breast-high. New host. (Boyce)
Dasyscypha fuscosanguinea Rehm, canker.
Idaho - producing cankers on trees of all ages; most severe on saplings up to 20 to 30 feet, sometimes killing them outright; often attacking the leader and then successive leading branches and producing a deformed or stunted tree. (Dearness 25: 237). Boundary County, July 1924, collected by Boyce. P.r.: Mont., Idaho, Wash.
Sclerodorris bacillifera (Karst.) Sacc., canker.
Washington - Storm King Mt., Lake Crescent, Clallam County, elevation 1,500 to 2,000 feet, Aug. 11. Very heavy infection. Killing many branches on trees up to 40 feet high and some small trees will die. This species may be S. treleasei Sacc., but it has not been possible to study type of S. bacillifera or S. treleasei. (Boyce)
Septobasidium pinicola Snell.
Idaho - (Burt, 17: 331)
Tuberculina maxima Rostrup.
British Columbia - Daisy Lake, elevation 1,400 feet, Aug. 18. Occasional; parasitic on the aecia of Cronartium ribicola. (Boyce)
Tympanis buchsii (Henn.) Rehm.
Idaho - causes cankers on living branches; Stocking Meadows; Aug. 1923; collected by Stillinger. (Dearness, 25: 243)

PINUS NIGRA, Austrian pine.
+Hypoderma brachysporum (Rostr.) Tub., needle cast.
New Jersey - Cologne, Atlantic County, Aug. 11. (Haenseler)

PINUS PALUSTRIS, longleaf pine.
+Cryptosporium acicolum Thüm.
Florida - Silver Springs, Feb. 27, 1919; collected by Hedgcock. (Dearness, 25: 251)
+Hypoderma hedgcockii Dearn., needle cast.
Florida - parasitic on leaves, Croom. (Dearness, 25: 240)
+Lophodermium australe Dearn., needle cast.
Florida - on languishing or partly green leaves; Silver Springs, Feb. 27, 1919; collected by Hedgcock. (Dearness 25: 242)
+Oligostroma acicola Dearn.
Florida - Silver Springs. (Dearness, 25: 251)
Septoria pini Fckl., leaf rust. (Chapman, 18: 351)

PINUS PONDEROSA, western yellow pine.
+Armillaria mellea (Vahl) Quel., root and butt-rot.
Oregon - near Bend, Deschutes Co., elevation 4,000 feet, Oct. 26. Abundant. Killing saplings 2 to 12 feet high on logged off land. No sporophores found, only rhizomorphs. (Boyce)
+Coniophora corrugis Burt
Wyoming to Colorado and British Columbia to Arizona; in mountain forests; on logs and dead limbs and on living trees; common; May to October. (Burt, 17: 310)
Hypoderma deformans Weir, needle cast.
+Oregon - occasional; elevation 4,500 feet; Baker Co., July 23. (Boyce)
+Lentinus lepideus Fr.
Oregon - abundant causing decay of railroad ties in service; elevation 4,600 feet; Grant Co., July 20. (Boyce)
+Polyporus ellisianus Murr.
Oregon - near Austin, Grant Co., elevation 4,300 feet, July 20; near Bend, Deschutes County, elevation 4,000 feet, Oct. 26. Very abundant in limbs, tops, and cull logs above 6 inches in diameter inside bark on cut-over areas. Rotting both sapwood and heartwood but mostly the former. (Boyce)
+Veluticeps fusca Humph. and Long.
New Mexico, Arizona, Washington - (Burt. 17: 329)

PINUS RESINOSA, red pine.
Coleosporium solidaginis (Schw.) Thuem., needle rust.
+Massachusetts - Berkshire County. (Osmun)
+Connecticut - new to state; little injury; Fairfield and Litchfield Counties. (Hunt & Filley)
New York - (Pennington)
P.r.: Minn., N. H., *N. Y., Pa., S. C., Vt.
+Lophodermium australe Dearn., needle cast.
Southern States - (Dearness, 25: 242)
+Fertilizer burn.
Connecticut - bone meal not washed off tops of seedlings when applied; killed the tender leaves; later leaves and roots uninjured. (Clinton)

PINUS RIGIDA, pitch pine.

+Corticium overholtsii Burt.
(Burt, 17: 246)

Cronartium cerebrum (Pk.) Hedgc. & Long, oak rust.
+Connecticut - new host for state; Branford, New Haven Co., June 16. (Clinton & Filley). P.r.: Mass., *N. J., N. Y., Pa.

+Hypoderma hedgcockii Dearn., needle cast.
North Carolina - parasitic on needles; Pisgah National Forest. (Dearness, 25: 240)

+Hypoderma lethale Dearn., needle cast.
New Hampshire to Virginia - N. Y. (Long Island, collected by Latham); Md. (Highfield, July 24, 1914) Severely parasitic on needles. (Dearness, 25: 241)

+Pezizella minuta Dearn.
North Carolina - Avery Creek, Pisgah, July 8, 1925; collected by Hedgcock. (Dearness, 25: 236)

+Phacidium convexum Dearn.
North Carolina - on living needles; Davidson River, Pisgah National Forest, June 7, 1925; collected by Hedgcock. (Dearness, 25: 238)

PINUS SEROTINA, pond pine.

+Hypoderma lethale Dearn., needle cast.
Localities not given - collected by Hedgcock. (Dearness, 25: 241)

PINUS STROBUS

+Corticium canadense Burt.
New Hampshire and Canada. (Burt, 17: 290)

+Corticium fuscostratum Burt.
Canada to Maryland and westward to British Columbia. (Burt, 17: 299)

+Scorias spongiosa (Schw.) Fr., snow mold.
Indiana - (Dietz)

+Hail injury.
Connecticut - one report of injury (cankers on stems 1/4 to 1/2 inches) from storm of preceding year. Winchester, Litchfield Co., July 15. (Clinton & Filley)

Needle blight, cause undetermined.
New York - noticed in many places; particularly prevalent upon trees with a southern exposure; it was not severe enough to cause the death of trees. (Pennington)
P.r.: Conn., D. C., Me., Md., Mass., N. Y., N. J., N. C., Pa., R. I., Vt.

+Salt water injury.
Connecticut - caused by water from ice cream freezers poured on ground at roadside stands; three reports. (Clinton & McCarty)

Winter injury.
Connecticut - a serious trouble. (Clinton & Filley)

PINUS SYLVESTRIS, Scotch pine.

Peridermium sp., Woodgate gall rust.
New York - a new gall rust on Scotch pine (Pinus sylvestris) caused by a species of Peridermium was discovered by Dr. Harlan H. York of the New York Conservation Commission during 1925. This rust was discovered in two regions of New York State; (1) northern Oneida County and Lewis County, (2) Southern Franklin County and Clinton County. Dr. York

states that it may have existed in the state for many years. (Barrus).

First discovered by H. H. York (127) during the first week of June 1925, on Scotch pine bordering Round Lake near Woodgate, N. Y. Scotch pine was in plantings with Pinus strobus and Picea excelsa from seed broadcasted in '74, '79, '80, and '83, with Scotch pine predominating, reproducing itself naturally and quite freely. The trees ranged from one to twenty or more years of age. The seed was imported from Germany by Mr. R. Dallarmi who had made plantings of seedlings which he grew from seed himself of Pinus sylvestris, P. austriaca, P. strobus, and Picea excelsa in 1870. So far as is known no trees from outside sources were brought to this farm. The source of the infection of the Scotch pine is unknown. No other species is affected. No alternate host has been found although careful search has been made, and the Peridermium is undoubtedly autoecious at Woodgate. Infection is distributed throughout both the planted and the natural seeded areas, and is also known to have spread into plantations of Pinus sylvestris 110 miles distant from the Round Lake infection.

In cooperative work conducted by the State Conservation Commission and the U. S. Office of Forest Pathology it has been found that the Peridermium must have been present at Woodgate for at least thirty years. The amount of infection has increased rather rapidly since 1920. Infection apparently takes place on the current season's wood through the epidermis of the twigs and stems. Infections may occur on the axis where the staminate cones are borne. In 1926 aecia began to appear about the middle of May. The climax of aecia production occurred the first week in June. Viable spores were found in a canker August 21, 1926. In the majority of cases the cankers bear their first aecia the third season following infection. Some galls fruit only when two years old.

+Winter injury.

Connecticut - more than average injury. (Clinton & Filley)

PINUS TAEDA, loblolly pine.

Cronartium cerebrum (Pk.) Hedgc. & Long., oak rust.

+South Carolina - found associated rust on the leaves of Quercus spp. in the lowlands; 200 trees near St. Matthews showed severe infection; 42.5 per cent had rust galls; trees measured 5 to 10 inches in diameter, St. Matthews, Orange Co., May 4. (Fenner). P.r.: Fla., La., *Miss.

+Hypoderma lethale Dearn., needle cast.

Localities not given; collected by Hedgcock. (Dearness, 25: 241)

+Lophodermium australe Dearn., needle cast.

Florida - Brooksville; collected by Hedgcock. (Dearness, 25: 242)

+Pezizella minuta Dearn.

North Carolina - Ellijay; collected by Hedgcock. (Dearness, 25: 236)

PINUS VIRGINIANA, scrub pine.

Cronartium cerebrum (Pk.) Hedgc. & Long, oak rust.

Delaware - mature fruiting bodies; Frederica, Kent County, May 12. (Adams)

P.r.: Ala., *Del., *D. C., *Md., *N. J., Ohio, Pa., *Va.

+Hypoderma hedgcockii Dearn., needle cast.

Maryland - parasitic on needles; Garret Park, May 26, 1891; collected by Galloway; Tennessee - Jamestown. (Dearness, 25: 240)

+Hypoderma lethale Dearn., needle cast.

Maryland to South Carolina; collected by Hedgcock. (Dearness, 25: 241)

+Pezizella minuta Dearn.

North Carolina - Andrews; collected by Hedgcock. (Dearness, 25: 236)

PINUS SPP., pine.

Coleosporium elephantopodis (Schw.) Thuem., rust.

+Louisiana - Baton Rouge, March 22. (Tims)

Corticium spp.

+C. bombycinum (Sommerf.) Bres.; +C. macounii Burt, Canada, perhaps N. H. and N. Y.; +C. rubicundum Burt, Wash.; +C. vescum Burt, Md. and Ala. (Burt, 17: 190, 256, 235, 204)

Corticium vagum Berk. & Curt., and Fusarium sp., damping-off.

+Wisconsin - sulfuric acid successful at Trout Lake and unsuccessful at Sturgeon Bay as a control. (Vaughan)

P.r.: for Fusarium sp., Ala., Ill., Iowa, Mo., Nebr., N. J., N. Y., Pa., Vt.

Hypoderma lethale Dearn., needle cast.

A Gloeosporium stage of this species may be the cause of the severe blighting of the needles. "Gray blight" is the name given to it by the Forest Service. (Dearness, 25: 241)

PSEUDOTSUGA DOUGLASII, Douglas fir.

+Aleurodiscus subcruentatus (Berk. & Curt.) Burt.

+Oregon and California - on bark of living trees; August and September. (Burt, 17: 308)

Botrytis spp., gray mold twig blight.

Connecticut - (Clinton)

Corticium pseudotsugae Burt

New York and Idaho. (Burt, 17: 246)

+Corticium racemosum Burt

Idaho, Washington, and British Columbia. (Burt, 17: 287)

Root rot (undet.)

U. S. Dept. Agr. Official Record, March 24, 1926.

"For the last five years a root rot has been causing considerable damage in Douglas fir seed beds at the monument nursery, Pike National Forest, Colo. As an illustration of the damage, 5,760 square feet were sowed to Douglas fir in the fall of 1923. This area would normally produce about 690,000 two-year seedlings. Root rot started during the first year in the seed beds, with the result that there was only 302,000 seedlings alive last fall, only 226,000 of which are considered fit for planting, or about half of the number of healthy germinated seedlings. The soil treatment recommended, aluminum sulfate will apparently control the disease. It not only prevents root rot, but it kills all the weeds, prevents damping-off, and stimulates the growth of the seedlings, producing a dark-green, thrifty plant. The exact treatment to use is still being experimented with, but enough has been determined to indicate that this chemical will control the situation."

TAXUS CANADENSIS, Canada yew.
+Phacidium taxicolum Dearn. & House.
New York - Blue Mountain Lake, Hamilton Co., Sept.; collected by H. D. House. (Dearness, 25: 239)

TAXUS SP., yew.
+Frost injury, caused by late frosts.
Connecticut - injury to young seedlings in a nursery; white specking a result. (Clinton)

THUJA ORIENTALIS AUREA, golden oriental arborvitae.
*+Corticium vagum Berk. & Curt., damping-off.
Virginia - Norfolk, Norfolk County, March 10. (McWhorter)

THUJA PLICATA, giant arborvitae.
+Corticium ermineum Burt
Vermont and Idaho - (Burt, 17: 182)
+Corticium racemosum Burt
Idaho, Washington, and British Columbia. (Burt, 17: 287)
Winter injury.
+Connecticut - more than in average year. (Clinton & Filley)

TSUGA CANADENSIS, Canada hemlock.
+Corticium pseudotsugae Burt
New York and Idaho. (Burt, 17: 246)
+Corticium tsugae Burt
New Hampshire - (Burt, 17: 276)
+Corticium vinososcabens Burt
Vermont to Wisconsin - (Burt, 17: 267)

TSUGA SP., hemlock.
+Corticium pilosum Burt
Missouri - (Burt, 17: 262)

DISEASES OF HARDWOODS

ACER DASYCARPUM, silver maple.
Rhytisma acerinum (Pers.) Fr., tar spot.
+Missouri - Scott Co., Oct. 27. (Archer)
P.r.: Conn., Del., *D. C., *Ga., *Ill., *Ind., *Iowa, *Kans., *Me., Md., *Mass., Mich., *Minn., *Miss., *Nebr., *N. J., *N. Y., *Pa., Vt., *Va., *W. Va., *Wis.
+Sphaeropsis amplispora Dearn. & Barth.
Kansas - Blue Rapids. (Dearness, 25: 254)

ACER NEGUNDO, boxelder.

Phyllosticta minima (Berk. & Curt.) Ell. & Ev., leaf spot.

+Missouri - during the summer there had been a severe drought; Dunklin, Mississippi and Pemiscott Counties, Aug. 2. (Archer). P.r.: Conn.

ACER PALMATUM, Japanese maple.

+Alternaria sp., leaf scorch.

Virginia - Draper, Sept. (Wingard)

+Cytospora sp.

Ohio - (Howard, Hutchinson, and Waterman)

+Phyllosticta sp., leaf spot.

Pennsylvania - District of Columbia (Howard, Hutchinson, and Waterman)

ACER SACCHARUM, sugar maple.

Gloeosporium apocryptum Ell. & Ev.

+Rhode Island - (Howard, Hutchinson, and Waterman). P.r.: Pa., S. C.

Gloeosporium hysterioideum Dearn. & Barth., leaf spot.

Regarding this leaf spot, Van Hook (110) has recently reported in part as follows:

"This species described by Dearness in 1924 has been under our observation since 1920. His type material came from the vicinity of Cincinnati, Ohio, and was collected in September, 1922. While it is of interest as a new species, it is of equal interest as a defoliating fungus, particularly in seasons of great moisture and on younger trees. Those trees up to 50 feet in height are most affected. Our observations have been confined, in the main, to many hard maple trees located in a deep hollow in a practically untouched forest in southern Indiana. By August the spots are quite large and some defoliation sets in, even in dry seasons. In 1920, a wet season, there was almost complete defoliation whereas in 1922, a comparatively dry year, spotting was severe but the injury much less.

"The spots on the leaves in 1922 were entirely different from those on leaves in 1920. In fact, they were quite definite, had broad yellow borders, became quite pale in the center, and did not spread to more than three centimeters in diameter. The unusually dry season at the time of spot development in 1922, doubtless produced a slower and more definite growth of the spots. The difference in this case was so marked that an ordinary examination of the affected leaves of the two seasons, would suggest two entirely different fungi as the cause.......If the spores be examined after August, scarcely a trace of the larger ones (pycnospores) can be found. The smaller, bacterium-like ones are exceedingly numerous after that time."

ACER SP.

Corticium bombycinum (Sommerf.) Bres.

Burt, 17: 190)

Corticium incanum Burt

Canada to North Carolina. (Burt, 17: 205)

+Exosporium sociatum Ell. & Ev.
New Jersey - on twigs; Princeton, Mercer Co., April 10. (Chupp)
Gloeosporium saccharini Ell. & Ev., anthracnose.
Connecticut - Watertown, Litchfield Co., June 22. (Clinton)
P.r.: +Conn., *Iowa, Wis.
Verticillium sp.
Occurs from North Carolina to Canada and westward to Wisconsin. Attacks several species but most destructive to Norway and sugar maples. The fungus enters through wounds. Control measures suggested are sanitary measures such as cutting out and burning infected parts and the protection of wounds. (Gravatt, 44)
+New Jersey - Somerset Co., Oct. 11. (Haenseler)
Gas injury - leaky gas mains.
Connecticut - three reports. (Clinton & Stoddard)
Leaf scorch.
Connecticut (Clinton), New York (Barrus), New Jersey (Dept. Pl. Path.), and Michigan (Nelson).

ALNUS RHOMBIFOLIA, White alder.
+Hypospila californica Dearn. & Barth.
California - parasitic on leaves; Riverside, August 12, 1924; collected by Bartholomew. (Dearness, 25: 248)

ALNUS RUBRA, Alder.
+Hypospila californica Dearn. & Barth.
California - Santa Cruz; collected by Mary S. Clemens. (Dearness, 25: 248)

ALNUS SPP., Alder.
+Corticium bombycinum (Sommerf.) Bres.
(Burt, 17: 190)
+Corticium litschaueri Burt
North Dakota and Oregon (Burt, 17: 259)
+Corticium pilosum Burt
Georgia (Burt, 17: 262)
+Corticium subalbum Burt
Georgia and Alabama. (Burt, 17: 267)

BETULA ALBA, White birch.
+Melanconis decoraensis Ell.
Massachusetts - near Waverly. (Wehmeyer, 115: 261)
+Melanconis stilbostoma (Fr.) Tul.
Massachusetts - Hubbardston. (Wehmeyer, 115: 259)
+Pseudovalsa lanciformis (Fr.) Ces. & DeNot.
Illinois - Quincy. (Wehmeyer, 115: 266)

BETULA PUMILA, Low birch.
+Dothidella betulina (Pers.) Sacc.
Wisconsin - Danbury (Davis 23: 185)

BETULA SPP., Birch.
Corticium bombycinum (Sommerf.) Bres.
(Burt, 17: 190)

Nectria sp., canker.

Vermont - (B. lutea): Massachusetts - (B. lenta)

Perley Spaulding (102) in his paper at the Philadelphia Meeting of the American Phytopathological Society reported that: "During the summer of 1926 a Nectria was found apparently epidemic on B. lutea in Vermont and on B. lenta in Massachusetts. While the disease was not generally serious, it should be watched so that its range, virulence and economic importance can be learned. Any notes concerning it will be much appreciated."

CARPINUS CAROLINIANA, American hornbeam.

Mamiania fimbriata (Pers.) Ces. & DeNot.

Wisconsin - Danbury and Balsam Lake. (Davis, 23: 171)

CASTANEA DENTATA, Chestnut.

Endothia parasitica (Murr.) And. & And., blight.

The following report has been received from the Office of Forest Pathology: "The Chestnut Blight Survey carried on in 1926 by the United States Office of Forest Pathology showed every county within the commercial range of Castanea dentata to be infected. Roughly speaking, everywhere west of a line extending from the southwest corner of Pennsylvania to the northwest corner of Georgia the infection is from 1 to 10 per cent. This approximates one-third of the entire range south and west of Pennsylvania. In 1925 the eastern limits of this class lay more or less along the line from the southwest corner of Pennsylvania to a point a few hundred miles east of the northeast corner of Georgia.

"Much less time was devoted to survey work by the office personnel than in the preceding year. Many reports on prevalence of the blight in different sections were received from state and extension pathologists and foresters, members of U. S. Forest Service, county agents, and many private parties. These reports are combined with the estimates made by members of the office and the results prepared on a county basis. Maps showing the results of this survey were sent to all state authorities in the fall of 1926.

"Survey work to locate blight resistant trees of the American and exotic chestnuts is being increased. Some very resistant exotic chestnuts have been found or reported and nuts and scions have been received from many of these trees for further tests of their resistance.

CASUARINA EQUISETIFOLIA, horsetail-tree.

+Clitocybe tabescens Scop., root rot.

Florida - scattered; of slight importance; Winter Haven, Nov. 12. (West)

CATALPA SP., catalpa.

Microsphaera alni vaccinii (Schw.) Salm., powdery mildew.

+New Jersey - Burlington County, Aug. 10. (Dept. Pl. Path.)

Phyllosticta catalpae Ell. & Mart., leaf spot.

Missouri - very important; often severe in nursery rows, causing a blight; found also on shade trees in southeastern part of state. (Archer)

CELTIS SP.
+Macrophoma sp.
Missouri - (Howard, Hutchinson, and Waterman)

CERCIS CANADENSIS, redbud.
+Sphaeropsis cercidis Dearn. & Barth.
Kansas - Stockton (Dearness, 25: 254)

CINNAMOMUM CAMPHORA, camphor.
Gloeosporium sp. probably G. camphorae Jacq., leaf spot.
*Alabama - Andalusa, Covington County, July 29. (Miles)
P.r.: *Ala., Fla., *Miss., Texas.
*+Physalospora sp.
Mississippi - A. & M. College; Oktibbeha County, Aug. 16. (Wedgworth)

CORNUS ALTERNIFOLIA, pagoda dogwood.
+Ramularia gracilipes Davis.
Wisconsin - Bruce, Sept. 4, 1924. (Davis, 23: 173)

CORNUS SPP., dogwood.
+Corticium subcinereum Burt.
Massachusetts - (Burt, 17: 277)

CRATAEGUS COCCINEA, thicket hawthorn.
Gymnosporangium globosum Farl., rust.
*+Missouri - of general prevalence; Caldwell, June 24. (Archer)
P.r.: Conn., Ill., Ind., Mass., Miss., N. Y., *Pa., Vt.

CRATAEGUS DOUGLASI, black hawthorn.
Gymnosporangium betheli Kern, rust.
Montana - Bozeman, Aug. 9. (Young). P.r.: *Mont., Ore., Wash.
Phyllactinia corylea (Pers.) Karst., powdery mildew.
+Idaho - Elevation 2,800 feet, Shoshone Co., Aug. 31. (Boyce)

ELAEAGNUS ANGUSTIFOLIA, Russian olive.
+Puccinia lolii festucae.
Copiously flecked with pycnidial infection when inoculated with teleutospores of crown rust from Festuca elatior. (Dietz, 26)

EUCALYPTUS SP., eucalyptus.
+Bagnisiopsis eucalypti Dearn. & Barth.
California - San Francisco. (Dearness, 25: 250)
+Phragmidothidea eucalypti Dearn. & Barth.
California - San Francisco. (Dearness, 25: 250)

FRAXINUS OREGONA, Oregon ash.
+Corticium spretum Burt.
Washington - (Burt, 17: 229)

FRAXINUS PENNSYLVANICA, red ash.
*+Phyllosticta fraxinicola (F. Currey) Ell. & Ev., leaf spot.
Missouri - damage very slight; Jackson, Cape Girardeau County, July 29. (Archer)

FRAXINUS VELUTINA, leatherleaf ash.

*+Caconema radicicola (Greef) Cobb, root knot.

Arizona - the trees were growing in nursery rows near the Salt River; the seedlings showed no visible effects of the nematodes which were present on the roots and were first discovered when some of the trees were dug for shipping, Phoenix, Maricopa, March 31. (George)

FRAXINUS SP., ash.

+Aleurodiscus macrodeus Coker.

New Hampshire to North Carolina. (Burt, 17: 307)

Phyllosticta sp.

+Montana - (Howard, Hutchinson, and Waterman)

*+Septobasidium pedicellatum (Schw.) Pat., canker.

Virginia - present throughout tree; many of the branches were killed; Tunstall, Charles City County, July 24. (Wingard)

Sunscorch.

Massachusetts - Ponkapog Station, Oxford Co., August. (Scherer)

Kentucky - quite common in dry seasons; Henderson, Henderson Co., July 1. (Valleau). P.r.: Conn.

GLEDITSIA TRIACANTHOS, honeylocust.

*+Thyronectria denigrata (Wint.) Seaver, (Pleonectria denigrata Wint.)

South Carolina - Clemson College, Oconee Co., Oct. 12. (Rosenkrans)

GREVILLEA ROBUSTA, silk-oak.

+Diplodia sp.

Florida - attacks nursery stock, especially the young trees; causes a witches' broom; Oneco, March 25. (West)

HAMAMELIS VIRGINIANA

Graphium hamamelidis Van Hook

Reported as parasitic in New York, Ohio, and Indiana by Van Hook. (111)

HICORIA ALBA, mockernut.

Gnomonia caryae Wolf, anthracnose.

+Indiana - more or less severe every year, unusually noticeable in Monroe Co. in 1925. (Van Hook, 110: 235). P.r.: Conn., *Ill.

HICORIA CORDIFORMIS, bitternut.

+Fusarium carpineum Davis.

Wisconsin - (Davis, 23: 170)

+Microstroma juglandis (Bereng.) Sacc.

Wisconsin - (Davis, 23: 185)

HICORIA SPP., hickory.

Gnomonia caryae Wolf, anthracnose.

Connecticut - Hamden, New Haven Co., Oct. 1. (Clinton)

New York - fairly abundant. (Pennington)

P.r.: *Ala., Conn., Fla., *Ga., *Ill., Ind., Mass., *Mo., N. J., *N. Y., Ohio, *Pa., S. C.

JUGLANS CINEREA, butternut.

Gnomonia leptostyla (Fr.) Ces. & DeNot., anthracnose.

New York - fairly common. (Pennington)

+Delaware - of moderate importance; more prevalent than average year; Felton, Kent Co., Oct. 8. (Adams)

P.r.: *Ill., Ind., Iowa, *Mass., Mich., *Miss., *N. Y., *Ohio, *Pa., *Wash., W. Va., Wis.

Melanconis juglandis (Ell. & Ev.) A. H. Graves, canker.

Connecticut - one report; moderate injury; Woodbridge, New Haven, May 8. (Clinton)

P.r.: Ala., Conn., Iowa, Me., Md., N. J., N. Y. Pa., R. I., W. Va., Wis.

JUGLANS NIGRA, black walnut.

Gnomonia leptostyla (Fr.) Ces. & DeNot., anthracnose.

New Jersey - this has become such a serious disease by defoliating the trees that farmers say all the nuts are shrivelled and of no value for eating; statewide in distribution; Dunnellen, Middlesex Co., Aug. 30. (Dept. Pl. Path.)

Delaware - more prevalent than in previous years; Felton, Kent Co., Oct. 8. (Adams)

*+Ohio - Brooklyn Heights, Cleveland Co., Sept. 20. (Kohl)

P.r.: Ala., *Ark., Conn., *Del., *Ill., Ind., Iowa, *Kans., *Md., *Mich., *Minn., *Mo., *Nebr., N. J., N. Y., N. D., Pa., *S. C., *Va., W. Va., Wis.

Yellows - undet.

+Delaware - Felton, Kent Co., Oct. 8. (Adams). P.r.: +Md.

LIQUIDAMBAR STYRACIFLUA, sweetgum.

+Botryosphaeria ribis chromogena Stevens.

Florida - collected by Stevens, 1924. (106: 279)

MAGNOLIA GRANDIFLORA, southern magnolia.

Caconema radicicola (Greef) Cobb, rootknot.

Georgia - large infection; roots brought to surface by heavy mulching with no cultivation; Jan. 10. (Boyd)

Colletotrichum sp., anthracnose.

Georgia - heavy infection; general about Thomasville, Jan. 10. (Boyd)

+Exophoma magnoliae Weedon.

Florida - St. Petersburg, Feb. 15, 1923. (Weedon, 114: 221)

+Heterosporium magnoliae Weedon.

Florida - St. Petersburg, Feb. 15, 1923. (Weedon, 114: 222)

Lichen leaf spot - undet.

Georgia - very abundant; Jan. 10. (Boyd). P.r.: S. C., Texas.

MAGNOLIA SP., magnolia.

+Botryosphaeria ribis chromogena Stevens.

Florida - collected by Stevens, 1924. (106: 279)

MYRICA CAROLINENSIS, northern bayberry.

+Haplosporella lathami Dearn.

New York - Mattituck. (Dearness, 25: 255)

NYSSA SP., tupelo.
+Amphisphaeria pelorospora Dearn.
New York - Greenport. (Dearness, 25: 247)

OSTRYA VIRGINIANA, American hophornbean.
Melanconium bicolor Nees.
*+New York - Long Island, Aug. 30. (Martin & Scherer). P.r.: *Iowa.
+Phomopsis sordidula (Sacc. & Speg.) Hoehn.
*New York - Long Island, Aug. 30. (Martin & Scherer)

PLATANUS OCCIDENTALIS, American planetree.
+Cytospora platani Fckl., leaf spot.
R. I., Pa., Va., Texas. (Howard, Hutchinson, and Waterman)

PLATANUS SP., planetree, sycamore.
Gnomonia veneta (Sacc. & Speg.) Kleb., anthracnose.
Massachusetts - severe defoliation throughout the state. (Osmun)
Rhode Island - (Howard, Hutchinson, Waterman)
Connecticut - fifty-seven reports; first appearance noted on June 11, slightly later than last year in appearing; almost as bad as in 1925 when it was very severe. (Clinton)
New York - started later than last year, due to drought, June 8. (Dept. Pl. Path.)
Pennsylvania - Howard, Hutchinson, Waterman)
Virginia - in general caused very little destruction; some few trees were hard hit but most of them have had much less of the disease than in an average year; some trees died the past winter from the cumulative effects of this disease. (Gravatt)
+Mississippi - very serious in vicinity of A. & M. College, June 1. (Wedgworth)
Texas - (Howard)
Arkansas - not as severe as in 1924. (Young)
Indiana - less than in 1925 and average year. (Gardner)
Microsphaera alni (Wallr.) Wint., powdery mildew.
*+Virginia - severe on young trees but old ones do not seem to be affected; Hampton Institute, Elizabeth City Co., July 7. (Turner)

POPULUS BALSAMIFERA, balsam poplar.
Melampsora albertensis Arth., rust.
*+Montana - Bozeman, Aug. 21, 1925. (Young). P.r.: +Colo., Wash.
+Phyllosticta brunnea Dearn. & Barth., leaf spot.
Wisconsin - (Davis, 23: 186)

POPULUS GRANDIDENTATA, large tooth aspen.
+Ceuthospora populi Dearn. & Overh.
Pennsylvania - State College. (Dearness, 25: 253)
Melampsora medusae Thuem., rust.
+Missouri - Jefferson Co. (Archer). P.r.: Pa.
+Phyllosticta maculans Ell. & Ev., leaf spot.
New York - Ithaca, Oct. 1; not serious. (Guterman)

POPULUS TREMULOIDES, quaking aspen.
Marssonia populi (Lib.) Magn., leaf spot.
*+Wyoming - Lincoln Co., Sept. 2. (Zundel)
P.r.: *Idaho, S. D., *Wash., *Wis.
Melampsora albertensis Arth., rust.
Montana - Bozeman, Aug. 9, 1925. (Young)
P.r.: Colo., Idaho, Mont. N. Mex., Ore., Wash., Wyo.
+Sydowia dothideoides Dearn. & Barth.
Wyoming - Jenny Lake. (Dearness, 25: 248)

POPULUS TRICHOCARPA, black cottonwood.
+Corticium granulatum Burt
Idaho - (Burt, 17: 236)
+Corticium ochrofarctum Burt
Idaho - (Burt, 17: 275)

POPULUS SPP., poplar.
+Corticium atkinsonii Burt
New York and Louisiana - (Burt, 17: 208)
+Corticium bombycinum (Sommerf.) Bres.
Burt, 17: 190-191.
Cytospora chrysosperma (Pers.) Fr., canker.
Nebraska - very severe; caused considerable damage to ornamental plantings; particularly severe on trees forced into rapid growth by watering; attacked both trunk and small branches; reported from all over eastern part of state; May 21. (Goss)
Arizona - general; 2 per cent loss. (Streets)
Dothichiza populea Sacc. & H. Briard, canker.
Connecticut - perhaps less severe than in 1925. (Clinton)
New Jersey - Annandale, Hunterdon Co., July 20. (Dept. Pl. Path.)
Marssonia populi (Lib.) Magn., leaf spot.
+New Jersey - one tree died and others were affected; Phillipsburg, Warren Co., Sept. 21. (Dept. Pl. Path.)
Ozonium omnivorum Shear, root rot.
Texas - prevalent; Eastland and Tarrant Counties. (Taubenhaus)
Rhytisma nervale (Alb. & Schw.) Rehm., tar spot.
Michigan - abundant in northern part of state in forests; Cathro, Aug. 5. (Nelson). P.r.: *N. Y.
+Sphaeropsis sp.
New Jersey - Annandale, Hunterdon Co., July 20. (Dept. Pl. Path.)
Canker - undet.
Wisconsin - general in some northern counties. (Chambers & Vaughan)
+Slime flux.
Arizona - found active on a number of cultivated trees in a school yard near Phoenix; in a number of instances the trouble was associated with wounds left after severe pruning and the damage caused by the cottonwood borer. (Arizona News Letter 4 (10): 5. 1926)

PRUNUS DEMISSA MELANOCARPA, black western chokecherry.
+Sydowia dothideoides Dearn. & Barth.
Wyoming - Jenny Lake. (Dearness, 25: 248)

PRUNUS SPP., cherry.
Exoascus pruni Fckl., pockets.
+South Carolina - local; severe; found on early new growth of leaves. (Fenner)

QUERCUS ALBA, white oak.
Gloeosporium septorioides Sacc., leaf spot.
+Wisconsin - Blue Mounds. (Davis, 23: 159). P.r.: *D. C.
Leptothyrium dryinum Sacc., leaf spot.
*Wisconsin - Caryville. (Davis, 23: 156)

QUERCUS COCCINEA, scarlet oak.
Cronartium cerebrum (Pk.) Hedgc. & Long, rust.
+Connecticut - Branford, New Haven Co., July 16. (Filley)
P.r.: *Minn., *Va.
+Pseudovalsa longipes (Tul.) Sacc.
Pennsylvania - on twigs, Scranton. (Wehmeyer, 115: 264)

QUERCUS GAMBELII, gambel oak.
+Corticium rubellum Burt
Florida, Illinois, Colorado, Manitoba. (Burt, 17: 232)

QUERCUS GEMINATA
Cronartium strobilinum (Arth.) Hedgc. & Hunt, rust.
Florida - common; May 21. (Rhoads)

QUERCUS GARRYANA, Oregon oak.
+Coniophora flavomarginata Burt
Washington - (Burt, 17: 311)

QUERCUS PALUSTRIS, pin oak.
*+Auerswaldia quercicola P. Henn.
Ohio - on dead and partially living trees; Kent, Sept. 21. (Martin & Scherer)

QUERCUS RUBRA, red oak.
Taphrina coerulescens (Mont. & Desm.) Tul., leaf blister.
+Connecticut - of slight importance; Litchfield, Litchfield Co., Aug. 2. (Clinton)
+Mississippi - very susceptible. (Wedgworth 113)
P.r.: Ala., *Ga., Iowa, Mich., N. H., *N. Y., *Pa.

QUERCUS VELUTINA, black oak.
Cronartium cerebrum (Pk.) Hedgc. & Long, rust.
+Connecticut - found for first time in state; Branford, July 16. (Filley)
+Wisconsin - (Davis, 23: 189)
+Monochaetia desmazierii Sacc., large leaf spot.
*Massachusetts - Martha's Vineyard, Dukes Co., Aug. 25. (Crowley)
Taphrina coerulescens (Mont. & Desm.) Tul., leaf blister.
+Connecticut - of slight importance; Litchfield, Litchfield Co., Aug. 2. (Clinton)
P.r.: D. C., *Md., *Mass., *N. Y., *Pa., Va.

QUERCUS VIRGINIANA, live oak.
Taphrina coerulescens (Mont. & Desm.) Tul., leaf blister.
+Texas - quite prevalent. (Taubenhaus). P.r.: *S. D.

QUERCUS SPP., oak.
Armillaria mellea (Vahl) Quel., root rot.
Wisconsin - Jefferson, Portage, Rock, Walworth, and Waukesha Counties. (Vaughan)
P.r.: Calif., Del., Ind., Mass., Minn., Oreg., *Wash., Wis.
+Botryosphaeria ribis chromogena Stevens.
Florida - collected by Stevens, 1924. (Stevens, 106: 279)
+Exosporium sp.
Iowa - Iowa City, Johnson Co., Dec. 10. (Loehwing)
+Pseudovalsa longipes (Tul.) Sacc., limb canker.
Virginia - Charlotte Court House, May 19. (Fromme)
+Sebacina (?) cokeri Burt
North Carolina - Chapel Hill. (Burt, 17: 334)
Strumella coryneoidea Sacc. & Wint., canker.
Connecticut - three reports; Hartford and New Haven Counties, May 28. (Clinton)
Taphrina coerulescens (Mont. & Desm.) Tul., leaf blister.
Massachusetts - widespread and serious. (Osmun)
South Carolina - average amount; Pendleton, Anderson Co., May 13. (Ludwig)
Georgia - usual amount, July 16. (Higgins)
Mississippi - many complaints received from owners of valuable shade trees; practically all species of oaks attacked; some species much more susceptible than others; Quercus nigra and Q. rubra very susceptible; Q. phellos has shown marked resistance. Several individuals of this species have been observed to be free of this disease on the Mississippi A. & M. College campus, while adjacent trees of Q. nigra from 50 to 95 per cent of the leaves affected; disease may be checked by spraying with Bordeaux in early spring, dormant spray as for peach leaf curl should be tried. (Wedgworth, 113)
+Louisiana - an extremely heavy infection all over the state; as early as May 22 many trees were shedding their leaves badly. (Edgerton).
P.r.: *Ala., *Colo., *Conn., *Del., *Fla., *Ga., Iowa, La., *Md., *Mass., *Mich., *Miss., N. H., N. J., N. Y., N. C., Ohio, Okla., *Pa., *R. I., *S. C., *Texas, *Va., Wis.
Xylaria polymorpha (Pers.) Grev.
Indiana - (Van Hook, 110: 243)

RHAMNUS ALNIFOLIA, alder buckthorn.
+Microsphaera alni (Wallr.) Wint., powdery mildew.
Wisconsin - Pembine. (Davis, 23: 185)

ROBINIA PSEUDOACACIA, black locust.
+Diplodiopsis robiniae Dearn. & Barth.
Kansas - Stockton. (Dearness, 25: 255)
Fomes robiniae Murr., spongy heart rot.
*Missouri - Humansville, Polk Co., Sept. 12. (Archer)

SALIX ANGUSTIFOLIA
+Melampsora sp., rust.
Utah - found at an altitude of 6,000 feet along the Logan River, July 17; very common in the upper valley of this district. (Burrill)

SALIX DISCOLOR, pussy willow.
+Cytospora sp., canker.
New Jersey - plant 3 or 4 years old; new bushes are affected in the same way as the old ones; twigs have darkened areas, almost resembling fire blight; East Orange, Essex Co., Aug. 6. (Haenseler)

SALIX HUMILIS, prairie willow.
+Septogloeum salicinum (Pk.) Sacc.
Wisconsin - Iron River and Brule. (Davis, 23: 160)
+Septoria salicicola (Fr.) Sacc., leaf spot.
Wisconsin - not previously found in America; appears to be common in Europe; Danbury. (Davis, 23: 171)

SALIX LUTEA
+Rhytisma salicinum Fr., tar spot.
*South Dakota - Butte Co., Aug. 19. (Ball)

SALIX MONTICOLA
Melampsora sp., rust.
*Colorado - Green Mountain Falls, El Paso, Sept. 1. (Ball)

SALIX SPP., willow.
+Aleurodiscus macrodeus Coker.
New Hampshire to North Carolina. (Burt, 17: 307)
+Botryosphaeria ribis chromogena Stevens.
Florida - collected by Stevens. (Stevens, 106: 279)
+Corticium argentatum Burt.
Nebraska - Long Pine; collected by C. L. Shear. (Burt, 17: 256)
+Corticium bombycinum (Sommerf.) Bres.
From Canada to Massachusetts westward to Washington and Arizona, and in Texas; July to March; uncommon. (Burt, 17: 190)
Cytospora chrysosperma (Pers.) Fr., canker.
+Wisconsin, +South Dakota. (Howard, Hutchinson, Waterman)
Cytospora sp.
*+South Dakota - Brookings, Brookings Co., April. (Evans)
Montana - Bozeman, Gallatin Co., Aug. 26, 1926. (Young)
Macrophoma sp.
*+Mississippi - Dunleith, Washington Co., Aug. 16, 1924. (Martin & Neal)
Melampsora humboldtiana Speg.
*+Montana - Bozeman, Gallatin Co., Sept. 6. (Young)

SAMBUCUS SP.
Botryosphaeria ribis chromogena Stevens.
Florida - collected by Stevens. (Stevens, 106: 279)

SCHINUS MOLLE, California pepper tree.
Ozonium omnivorum Shear, root rot.
Arizona - 2 per cent loss average amount. (Streets)

SORBUS AMERICANA, American mountain ash.
+Graphium sorbi Pk.
Wisconsin - Armstrong. (Davis, 23: 186)

SORBUS SCOPULINA
+Dothiorella scopulina Dearn. & Barth.
Wyoming - Jackson Lake. (Dearness, 25: 253)

SORBUS SP., mountain ash.
Bacillus amylovorus (Burr.) Trev., blight.
+New York - frequently observed; not as abundant as in 1925. (Pennington)
Cytospora chrysosperma (Pers.) Fr., canker.
+Nebraska - May 21. P.r.: Mont.

TILIA SPP., linden, basswood.
+Corticium bombycinum (Sommerf.) Bres.
(Burt, 17: 190)
+Corticium rubellum Burt.
Florida, Illinois, Colorado, Manitoba. (Burt, 17: 232)

ULMUS AMERICANA, American elm.
Taphrina ulmi (Fckl.) Johans., leaf blister.
+Wisconsin - Avoca, Edgerton, Madison, Wyeville. (Davis, 23: 155)
P.r.: Mass., *Mo.

ULMUS FULVA, slippery elm.
+Phyllosticta ulmicola Sacc.
Indiana - Monroe Co., July, 1912. (Van Hook, 110: 235)

ULMUS RACEMOSA, rock elm.
+Melasmia ulmicola Berk. & Curt.
Wisconsin - Ingram. (Davis, 23: 185)

ULMUS SP., elm.
Gnomonia ulmea (Sacc.) Thuem., black spot.
Connecticut - less than average. (Clinton)
New York - less abundant than usual. (Pennington)
+New Jersey - probably statewide; severe infection on trees at state farm. (Dept. Pl. Path.)
+Georgia - (Howard, Hutchinson, Waterman)
Texas - on U. pumila; Tarrant Co. (Taubenhaus)
Oklahoma - (Howard, Hutchinson, Waterman)
Michigan - widespread; a general defoliation late in season. (Nelson)
Sphaeropsis ulmicola Ell. & Ev., canker.
Wisconsin - found in seventeen nurseries; 254 trees condemned; six trees condemned which had been shipped in from +Minnesota. (Chambers & Vaughan)

D I S E A S E S   O F   O R N A M E N T A L S

ACONITUM SP., monkshood.
+*Sclerotium delphinii Welch, crownrot.
*Connecticut - more prevalent; New Haven, New Haven County, Aug. 6. (Clinton and McCarty).

ALTHAEA ROSEA, hollyhock.
Cercospora althaeina Sacc., leaf-spot.
Delaware - much more than usual; Millsboro, Sussex County, Oct. 27. (Adams).
Cercospora kellermanii Bub., leaf-spot.
+*Missouri - local; damage severe; Macon County, Aug. 29. (Archer)
Ozonium omnivorum Shear, root-rot.
Texas - quite prevelant; 6 per cent loss; Bell County. (Taubenhaus).
Puccinia hibisciata (Schw.) Kell., rust.
Kansas - specimens received from Kingman County of an aecidial stage of a rust on hollyhock; determined by J. C. Arthur as above, with the statement that so far as he knows this is the second recorded collection of this rust in the U. S., the other being in North Dakota in 1902. (White).
Puccinia malvacearum Bert., rust.
Reported from Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Ohio, Illinois, Michigan, Washington, and Oregon. According to Maneval this rust has never been found in Missouri although an extensive search has been made for it.

AMARYLLIS sp.
+Sclerotium rolfsii Sacc., stem-rot.
Florida - importance moderate; Sanford, Seminole County, June 16. (West).

AMPELOPSIS spp.
Guignardia bidwellii (Ell.) Viala and Rav., black-rot.
Connecticut - on A. tricuspidata; less prevalent; Westville, New Haven County, July 1. (Clinton and McCarty).
New York - on A. tricuspidata; local; leaves heavily spotted regardless of Bordeaux applied the latter part of May; Yonkers, Westchester County, June 3. (Guterman).
Delaware - less prevalent than last year. (Adams).
+Corticium vagum Berk. and Curt.
Connecticut - on A. tricuspidata; one report; considerable injury; attacked seedlings in nursery; Woodmont, July 6. (Clinton).

ANEMONE CORONARIA, poppy anemone.
+Tranzschelia punctata (Pers.) Arth., rust.
Oregon - local; Salem, Marion Co. (Barss).

ANTIRRHINUM MAJUS, snapdragon.

Caconema radicicola (Greef) Cobb root-knot.

+Texas - trace, (Taubenhaus) P. r., D. C., Miss., Nebr.

Colletotrichum antirrhini F. C. Stewart, anthracnose.

Connecticut - one report; moderate injury to certain varieties; Fairfield, Fairfield County, July 23. (Clinton).

New York - Yonkers, Westchester County, Sept. 21. (Guterman).

*Pennsylvania - Loretta, Aug. (Weiss).

Ohio - severe in some plantings. (Tilford).

Phyllosticta antirrhini Syd., leafspot.

New York - Yonkers, Westchester County, July 22. (Guterman).

Indiana - some loss in four greenhouses, 25 per cent in one instance. (Dietz).

Puccinia antirrhini Diet. and Holw., rust.

Reported from Connecticut, New York, Delaware, South Carolina, Texas, *Ohio, Indiana (out of 50 greenhouses visited where host was grown only three houses showed abundant rust. Dietz). Michigan, Kansas, Missouri, Washington and Oregon.

See Bibl. (4,63).

+Sclerotinia sclerotiorum (Lib.) Mass., blossom wilt and stem rot.

Indiana - reported by J. C. Rasmussen of New Albany, as seriously menacing snapdragons. (Kaplan 56).

Sclerotinia sp.

+Texas - a 10 per cent loss under greenhouse conditions; Bell County, (Taubenhaus).

+Sclerotium rolfsii Sacc., stem-rot.

Mississippi - Meridian, Lauderdale County, Aug. 10. (Wedgworth).

Blight, undetermined.

New York - floral spikes were blighted a distance of 4-5 inches down from the tip; a species of Alternaria was isolated but its being the cause of injury is doubted; August, Westchester County, Aug. 15. (Guterman).

North Carolina - stem blighted 2-3 inches above soil line; lower part of stem and roots were normal, grower says, "plants become infected overnight." Wilmington, Jan. 27. (Brierly).

AQUILEGIA sp., columbine.

+Fusarium sp., root-rot.

New Jersey - Summit, Union County, Sept. 13. (Dept.Plant. Path.)

+Sclerotium rolfsii Sacc., root-rot.

Virginia - Danville, July 28. (Brierly).

ASPIDISTRA LURIDA, common aspidistra.

Colletotrichum omnivorum Hals., anthracnose.

+New Jersey - Metuchen, Middlesex County, Aug. 5. (Dept. Plant Path.). P. r.: Mo., *Pa.

Begonia sp., begonia.

Botrytis sp., blight.

+New York - found in a greenhouse; Yonkers, Westchester (Guterman) P. r.: Ill., Ind.

+Phyllosticta sp., leaf-spot.
New Jersey - Cumberland County; Sept. 30., collected by Haenseler. (Dept. Pl. Path.)
Bacterial wilt., undet.
South Carolina - in a greenhouse; humidity, soil moisture and high temperature favored; Camden, Kershaw County, July 14. (Fenner).
+Oedema - moisture conditions.
Connecticut - one report of greenhouse injury; Norwalk, Fairfield County, Dec. 8. (Clinton).

BERBERIS THUNBERGI , Japanese barberry.
+Bacterial leaf-spot, undet.
Wisconsin - produces noticeable spots; Madison, Dane County, July 1, collected by Walker. (Vaughan). P. r.: N. Y. and Minn.
Damping off, undet.
Connecticut - seedlings in nursery; little injury; Woodmont, July 6. (Clinton).
Leaf drop, undet.
New York - hedge affected; leaves small, reddish, finally dropping off; stems shriveled; Corning; Steuben County, June 13. (Barrus).

BERBERIS VULGARIS, barberry.
+Phyllosticta berberdis Rabenh.
Kentucky - (Howard, Hutchinson, Waterman).

BERBERIS sp., barberry.
+Botryosphaeria ribis chromogena Stevens.
Florida - collected by Stevens. (Stevens 106: 279).

BUMELIA LANUGINOSA, chittinwood.
Phyllosticta bumeliae Underw. and Earle, leaf-spot.
+*Missouri - Maries River, Osage Co., May 29. (Burrill).

BUXUS SEMPERVIRENS, box.
Macrophoma candollei (Berk. and Br.) Berl. and Vogl, leaf-blight.
New Jersey - more prevalent than in 1925; Annandale, Hunterdon County, July 20. (Dept. Pl. Path.)
Virginia - Farmville, Prince Edward County, July 30. (Fromme).
*North Carolina - Warrenton, Warren County, Dec. 11 (Kerr).
Nectria rousselliana Tul.
*+New York - Glen Cove, Nassau County, Aug. (Martin and Scherer).
*+North Carolina - Warrenton, Warren County, Dec. 11 (Kerr).
Phyllosticta sp.
New York - Purchase, Westchester County, Aug. 12. (Guterman).
New Jersey - (Howard, Hutchinson, Waterman).
Verticillium buxi (Lk.) Auersw. and Fleisch.
*+North Carolina - Warrenton, Warren County, Dec. 11. (Kerr).
P. r.: *D. C., Ky.
Sun scorch
Connecticut - Lyme. (Clinton).

CAESALPINIA PULCHERRIMA, flowerfence.
+Botryosphaeria ribis chromogena Stevens.
Florida - (Stevens, 106: 279).

CALENDULA OFFICINALIS, calendula.
Yellows - undet.
Virginia - Danville, Aug. 11. (Weiss).
Bud-blast and leaf blight, undet.
New York - Waterville, Oneida County, October 4. (Barrus).
Mosaic, undet.
Minnesota - University Farm, Ramsey County, Aug. 17. (Sect. Pl. Path.)

CALLISTEPHUS CHINENSIS, China-aster.
+Botrytis cinerea Auct., blight.
New York - local; June 21. (Guterman).
Corticium vagum Berk. and Curt., stem-rot.
+Georgia- Newman, Sept. 15. (Drechsler).
+Missouri - moderate damage; in a greenhouse; Audrain County. (Archer).
Erysiphe cichoracearum DC., powdery mildew.
+Nebraska - Freemont, Dodge Co., (Layton). p. r.: Minn., Wash.
Fusarium conglutinans callistephi Beach, wilt.
*+Connecticut; New Haven, New Haven Co., July 12. (Clinton and McCarty). (Brierly).
*New York - serious locally; Yonkers, Westchester Co., July 20. (Guterman). (Brierly).
*+New Jersey - Basbrouck Heights, Aug. 7. (Brierley). Out of three dozen plants, one dozen were killed; soil was of sand and ashes; fertilizer used was sheep and other manure; East Orange, Essex Co., Aug. 6. (Dept. Pl. Path.)
*+Virginia - Norfolk, Norfolk Co., July 29. (McWhorter).
Indiana - general throughout state; a limiting factor in the growing of plants for cut flowers. (Dietz).
*+Georgia- Newman, Sept. 15. (Drechsler).
Michigan - less prevalent than in past or average year. 5 per cent yield reduction; Fenton, June 20. (Nelson).
Minnesota - average amount; general; very important;Mankato; Blue Earth Co., July 14. (Sect. Pl. Path.)
+Missouri - general; moderate amount of damage; Columbia, Boone Co., Aug. 9. (Archer).
General - Aster wilt caused by Fusarium conglutinans callistephi was general and severe, appearing abundantly in many outdoor plantings about mid-July. The wet weather of late summer undoubtedly favored its spread and progress. In a garden of the Thompson Institute, Yonkers, New York, where this disease has been rare or absent for the past two years, it destroyed more than half the plants. Wilting was observed even following heavy rains when the soil was soaked with water and the atmosphere was very humid. (Weiss and Brierly).

+Phytophthora sp., black-leg.
District of Columbia - Sept. 3. (Drechsler).
+Curly top (?) undet.
Oregon - 10 per cent loss, maximum local loss 15 per cent Throughout season. Hot dry season appears to have favored insect carrier. Symptoms and circumstantial evidence suggest that this is due to the curly top virus, but this remains to be proved. McMinnville, Yamhill County, June. (McKay and Dykstra).
Damping off, undet.
*New York - one of the most commonly noted greenhouse diseases; Nassau Co., May 17. (A. M. Boyce). P.r.:Wash.
Drought injury.
Connecticut - July 1 to Aug. 13. (Clinton).
Yellows, undet.
Connecticut - average amount; Branford, New Haven Co., Aug. 12. (Clinton).
New York - rather common in many plantings. (Barrus).
Indiana - more prevalent than in 1925; very important disease (Gardner). General in distribution and a limiting factor in cut flower growing. (Dietz).
Michigan - less important than for last two years; nevertheless the most important aster disease in the state; widespread; 50 per cent reduction in yield. (Nelson).
Missouri - severe to moderate damage locally; in open plantings; Macon, Marion and St. Louis Counties (Archer).
*South Dakota - Wagner, Charles Mix County, Sept. (Evans).

Kunkel (58) has shown that aster yellows is a virus disease, transmitted by the leafhopper Cicadula sexnotata Fall., but apparently not by several other aster insects. It can be transmitted by budding but not by other mechanical means. By means of the leafhopper it was transmitted to more than 50 different species in 23 different families of plants and also back to aster from many of these. The insect does not become inoculative until at least 10 days after feeding on yellowed plants. The disease is not transmitted through the egg of the insect carrier nor through seeds of the aster. It is identical with the white-heart disease of lettuce and with several yellows diseases of garden plants. It overwinters in biennial and perennial hosts, some of the more common of which belong in the genera Chrysanthemum, Sonchus, Asclepias, Erigeron, and Plantago. For control the same author (57) recommends eradication of weed hosts in vicinity of aster beds, destruction of aster plants as soon as they begin to show yellows, and spraying or dusting the beds for insect control.

See Bibl. (34).

CAMELLIA JAPONICA, common camellia.
+Botrytis sp., bud rot
Florida - more prevalent; very important; Gainesville, Alachua County, Feb. 2. (West).
+Phyllosticta camelliae, West. leaf-spot.
South Carolina - Conway, Horry Co., Mar. 15. (determined by N. O. Howard).

CAMPANULA GLOMERATA, danesblood.
Phyllosticta sp., leaf-spot.
New York - not serious, Yonkers, July 31. (Guterman).

CAMPANULA SCOULERI
Puccinia campanulae Carm., rust.
Washington - Spanaway, Pierce Co., July 11. (Zundel).
Also collected by C.V. Piper in 1894 at Seattle. (Martin).

CANNA INDICA, canna.
Bacterium cannae M. K. Bryan, bacterial bud-rot.
District of Columbia - 15 plants in bed all affected in varying degrees in leaves, shoots, and blossoms, July 25. (Brierly).
P. r.: Conn., D. C., Ill.

CASSIA SP.
+Botryosphaeria ribis chromogena Stevens.
Georgia - Collected by Stevens. (Stevens, 106:279).

CENTAUREA CYANUS, cornflower, bachelor button.
+Fusarium conglutinans callestephi Beach, wilt.
Michigan - heavy infection in some cases. (Nelson).
Puccinia cyani (Schl.) Pass., rust.
Connecticut - three reports; New Haven, July 4. (Clinton and Hunt).

CHRYSANTHEMUM SPP., chrysanthemum.
Botrytis sp., blossom blight.
+South Carolina - Clemson College, Nov. 9. (Ludwig).
P. r.: *Ky., Mass., Minn., Mo., N. Y.
Cercospora sp., leafspot.
Texas - trace; unimportant; Bell Co. (Taubenhaus).
P. r.: La.
+Cladosporium sp., sooty mold.
New Jersey - associated with other fungi following aphis; Clinton, Hunterdon Co., Sept. 29. (Dept. Pl. Path.).
+Cuscuta arvensis Bey., dodder.
*Texas - Whitsett, Live Oak County, May. (Brierly).
+*Michigan - Rockwood, Sept. (Brierly).
P. r.: Cuscuta spp., N. J., *Texas, W. Va.
Erysiphe cichoracearum DC., powdery mildew.
New Jersey - of slight importance; Woodbury, Gloucester Co., Dec. 17. (Dept. Pl. Path).
Delaware - very prevalent on fall plantings and in greenhouse propagation. (Adams).
P. r.: Conn., Del., Md., *Mass., Minn., Nebr., N. J., N. Y., N. C., Ohio, Pa., S. C., Utah, Wash., W. Va.
Control method given in an article by Raff (88) is as follows - dust in early morning with naphtha-sulfur mixture, equal parts; or spray in evening with 1 per cent Solbar solution.
Ozonium omnivorum Shear, root-rot.
Texas - 5 per cent loss; Bell Co. (Taubenhaus). P. r.: *Texas.

Puccinia spp., rust
Raff (88) states that proper spraying with Bordeaux controls P. chrysanthemi Roze.
See Bibl. (89, 105).
+Sclerotium rolfsii Sacc., root-rot.
Virginia - Danville, July 28. (Brierly).
Septoria chrysanthemella Cav., leaf-spot.
Connecticut - one report; moderate injury in a greenhouse; Portland, Nov. 8. (Clinton).
+New York - on C. leucanthemum; Yonkers. June 26. (Guterman). on C. segetum; not serious; Aug. 26. (Guterman)..
New Jersey - considerable amount of infection in one planting; Highland Park, Middlesex Co., Nov. 4 (Dept. Pl. Path).
Texas - trace; unimportant; Navarro Co. (Taubenhaus).
Raff (88) says that it appears only on a few varieties such as Wm. Turner; and that the use of Bordeaux, either solution or powder, is a good control.
+Influence of length of day.
Indiana - a practical application of Garner and Allard's work on the effect of the length of day on the blooming period of plants was observed from January until March in the greenhouses of distributors of chrysanthemum plants. Many of the late blooming varieties of chrysanthemums came into bloom in the cutting bench or shortly after they were potted. Pinching out the flower buds merely resulted in the formation of other flower buds in the axils of the leaves or on other short new shoots that were formed so that many of the plants had to be discarded. It was not until bright weather came in April that the trouble stopped. The varieties most seriously affected were Golden Feather, Golden Glory, and Frank Wilcox. (Dietz).
Nematodes, (Raff, 88).
Yellows, undet., Raff (88).
General. See Bibl. Fraigneux (39), Laubert (60), Naumann (79), Raff (88), Schenk (91).

CLEMATIS SP., clematis.
Puccinia clematidis (DC.) Lagh., rust.
+South Carolina - general, severe; Clemson College, Oconee Co., Mar. 30. (Rosenkrans, Fenner and Ludwig).
+Utah - on +C. douglasi; uncommon; Logan, Cache Co., July 11. (Burrill).
+Montana - Bozeman, July 4. (Haskell).

COCOS ALPHONSEI, palm.
+Didymella cocos Weedon.
Florida - St. Petersburg. Aug. 15, 1923. (Weedon 114: 219).
+Hysterographium cocos Weedon.
Florida - St. Petersburg. Aug. 15, 1923. Associated with Didymella cocos. (Weedon 114: 219).

COCOS PLUMOSUS, palm.
+Phyllosticta sp., leaf-spot.
Florida - St. Petersburg, Apr. 24. (Seal).
Bacterial leafspot;
Florida - Odessa, Sept. 29. (Seal).

COREOPSIS SP., coreopsis.
+*Cladosporium herbarum (Pers.) Link.
Kansas - Lawrence, Nov. (Layton).

COSMOS BIPINNATUS, common cosmos.
+*Pythium sp.
District of Columbia - July 8. (Brierly).
+*Rhizoctonia sp.
District of Columbia - July 8. (Brierly).

CURCURBITA SP., gourd.
Colletotrichum lagenarium (Pass.) Ell. and Hals., anthracnose.
+Missouri - on leaves and fruit. (Archer).

CYCLAMEN SP., cyclamen.
+Colletotrichum cyclamenae Hals.
Indiana - 10 to 15 per cent of plants in one greenhouse rendered unsalable because of this disease; 4-4-50 Bordeaux recommended, also withhold water from foliage altogether, watering the pots only; Columbia, Indianapolis and Richmond. (Dietz).
See Bibl. (3,83, 94).

CYDONIA JAPONICA, Japanese quince.
Nectria sp., coral fungus.
Washington - Walla Walla Co., (Div. Pl. Path.)
+Phyllosticta sp., leafspot.
*Missouri - St. Joseph, Oct. (Layton).
*Nebraska - Freemont, Oct. (Johnston).

DAHLIA sp., dahlia.
Aphelenchus sp., nematode.
Wisconsin - found on plants grown on tuber received from California; Janesville, Rock Co., Oct. 1. (Chambers and Vaughan).
Corticium vagum Berk. and Curt., stem rot.
+District of Columbia - (Weiss and Brierly). P. r.: Md.
Entyloma dahliae Syd., rust
See Bibl. (8, 84).
Erysiphe spp., powdery mildew.
+New Jersey, E. polygoni; probably state wide; Bound Brook, Somerset Co., Aug. 21. (Dept. Pl. Path.)
Missouri - Boonville, Cooper Co., Sept. 6. (Archer).
Fusarium sp., wilt.
+District of Columbia (Weiss and Brierly).
+*Missouri - Boonville, Cooper Co., Sept. 6. (Archer)
P. r.: N. J., Pa.

Phoma dahliae Berk., blight
+New Jersey - Bound Brook, Somerset Co., Aug. 21. (Dept.Pl.Path.)
P. r.: Ohio.
Pythium spp., wilt.
District of Columbia - +*P. dactylum and +*P. ultimum. July 10 and 21. (Weiss and Brierly).
+Rhabditis sp., nematode.
Wisconsin - found on plants grown on tuber received from California. Janesville, Park Co., Oct. 1. (Chambers and Vaughan).
Sclerotium rolfsii, Sacc., stem-rot.
+Mississippi - Meridan, Aug. 10. (Wedgworth).
P. r.: Fla.
Fasciation.
See Bibl. Smith (97).
Mosaic, undet.
+Ohio - exceptionally severe; considerable in evidence during a hot period in August; seemingly masked by cool weather. (Tilford).
+Wisconsin - Janesville, Rock Co. (Vaughan and Chambers).
P. r.: Conn., Del., N. J.
See Bibl., Eckerson (34) Goldstein (42).
Runting and Stunt, undet.
Delaware - generally found in all plantings. (Adams).
+*District of Columbia - nearly 175 plants of 60 varieties affected. July 12, (Brierly).
See Bibl. Conners. (21).

DELPHINIUM sp., larkspur.
Bacterium delphinii (EFS.) Bryan, black-spot.
Connecticut - Hartford, Hartford Co., July 1. (Clinton).
New York - very serious around Yonkers; plants cut back for second flowering were also affected; July 20. (Guterman) Long Island. (Weiss and Brierly).
+Delaware - Wilmington, New Castle Co., Oct. 20. (Adams).
+Michigan - generally more prevalent. (Nelson).
Corticium vagum Berk and Curt., stem-rot.
+New Jersey - base of plants affected, finally causing girdling, local; New Brunswick, Middlesex Co., May 31. (Dept. Pl. Path.)
+*Arizona - local; Phoenix, Maricopa Co., Mar. 19; collected by George. (Weiss and Brierly).
Erysiphe polygoni DC., powdery mildew.
New York - local; not serious; Purchase, Westchester Co., July 29. (Guterman).
+New Jersey - probably state wide; one report Old Bridge, Middlesex Co., Aug. 17. (Dept. Pl. Path.)
+Delaware - Wilmington, New Castle Co., Oct. 25. (Adams).
+*Nebraska - Fremont Co., (Layton).
P. r.: *Maine, Connecticut, *New York, *Pennsylvania, Minnesota.
Sclerotium spp., root and crown-rot.
+Connecticut - S. delphinii D. S. Welch; several reports; New Haven, Aug. 6. (Clinton and Mc. C.)

New York -(Long Island and Lower Hudson Valley). (Weiss and Brierly).
Pennsylvania, Maryland, *Virginia. (Weiss and Brierly).
+*Ohio - Gates Mills, Cuyahoga Co., Nov. 12. (Tilford).

DEUTZIA sp., deutzia.
Phyllosticta deutziae Ell. and Ev., leaf-spot.
+*Alabama - Chase, Nov. (Johnston).
+*Iowa - Shenandoah, Nov. (Archer and Muncie).

DIANTHUS BARBATUS, sweet william.
+Fusarium sp., wilt.
Virginia - all plants in a garden at Lynchburg (Aug. 10), were killed; apparently by a Fusarium sp. (Fromme).

DIANTHUS CARYOPHLLUS, carnation.
Corticium vagum Berk. and Curt., stem-rot.
+*Georgia - Newman, Sept. 15. (Drechsler).
+Texas - trace; Bell County. (Taubenhaus).
Indiana - This disease is more troublesome this year than I have ever seen it before. Some growers have lost as high as 50 per cent of their plants and a loss of 10 per cent is not uncommon. I have seen no greenhouse where this disease does not occur this fall. The exceedingly rainy season that began about August 1 this year was probably responsible for the virulence of carnation branch rot. The effect of cloudy weather on carnations was very pronounced from October, 1925 to March, 1926. The plants refused to bloom with any regularity and the buds would remain in an unopened condition on the plant as long as five weeks, then if a clear bright day occurred the buds would burst open, splitting the calyx, thus rendering the flowers useless for funeral design work. The same condition has prevailed since the first of August this year. (Dietz).
Missouri - scattered in northern half of state in the greenhouses; moderate damage. (Archer).
Fusarium sp., wilt
+Missouri - in a greenhouse; St. Louis Co., June 24. (Archer).
Septoria dianthi Desm., leaf-spot.
+South Carolina - 10 per cent loss; 90 per cent infection in one field; on imported greenhouse plants; high temperature and humidity in sprinkled greenhouse; spread rapidly when diseased plant was placed adjacent to non-infected plants; Camden, Kershaw Co., July 14. (Fenner).
See Bibl. Allwood (7).
Uromyces caryophyllinus (Schrank) Wint., rust.
Reported from Maine, Connecticut, New York, New Jersey, Delaware, Texas, *Missouri - Moderate on Nebraska and Enchantress Supreme, slight on White Enchantress. (Archer).
Allwood, (7) says that the red varieties appear to be most susceptible and that as a rule varieties with rich blue glaucous foliage resist rust better while those with light green leaves appear to be more open to attack by this and other fungous diseases.

Cook, (22) states that rust is more prevalent in autumn and usually breaks out after a sudden check or change of cultivation. For control he suggests equal portions of slaked lime and flowers of sulfur dusted on the foliage.
Mains (63) says: "The variety White Matchless has shown a very high resistance to carnation rust."

EUONYMUS JAPONICUS, evergreen burningbush.
Stereum purpureum Pers.
See Bibl. (80).

EUONYMUS sp., burningbush, wahoo.
Bacterium tumefaciens. EFS. and Town. crown gall.
+Mississippi - Ocean Springs, Jackson Co., Aug. 10. (Wedgworth).
P. r.: Conn.
Gloeosporium sp., leafspot.
+Louisiana (Howard, Hutchinson, Waterman).
Oidium euonymi-japonici (Arcangeli) Sacc., powdery mildew.
+Mississippi - Greenwood, Leflore Co., June 10. (Wedgworth).
P. r.: *Iowa, *La.

EUPATORIUM sp., eupatorium.
Sclerotium sp., root-rot.
+*Maryland - Chevy Chase, Aug. 11 (Brierly).

GAILLARDIA ARISTATA, common perennial gaillardia
+*Septoria gaillardiae Ell. and Ev., leaf spot.
Iowa - Shenandoah, Page Co., Sept. (Archer).

GLADIOLUS sp., gladiolus.
Bacterium ummisudans McC. bacterial blight.
+Indiana - well scattered throughout a large garden at Goshen, especially on certain seedling varieties: this planting was on new soil that had never been in gladioli before and the source of the infection was in doubt. Judging from the way it was distributed throughout the planting it was thought to be insect borne and carried in from some other host. July 28. Also found at Indianapolis Aug. 5, and at Plainfield, Aug. 10. (Dietz).
Minnesota - St. Paul, Ramsey Co., July 26. (Sec. Pl. Path.)
Bacterium marginatum McC., stem-rot, scab.
Delaware - (Adams).
South Carolina - found in serious proportions in two widely separated localities; North Augusta July 5, and Clemson College Aug. 8. (Ludwig).
Indiana - 85 per cent infection, Goshen; 50 per cent infection, Indianapolis, Jan. 15; 50 per cent infection, Brazil, Jan. 28; 90 per cent infection, Stroh, Dec. 10. Varieties infected were Marshal Foch, Chris, Concolor and Marie Kunderd. Two of the inspections were shipped in from outside states. (Dietz).
+Wisconsin - local; varieties very susceptible were Marshal Foch, Wilbrinck, Schwaben, 1910 Rose, Halley; Milwaukee Oct. 2. (Chambers and Vaughan).

Michigan - general; 3-5 per cent reduction in yield; most serious disease of gladioli in state; was controlled by standard liquid treatments. (Nelson).
Minnesota - occasionally found; first half of season was too dry; not severe on leaves; light to moderate infection on corms; St. Paul, July 26. (Sect. Pl. Path.)
Washington - Spokane Co., (Div. Pl. Path.)
Bacterium sp., bacterial blight.
+New Jersey - attacked both leaves and flower stalks, quite prevalent in a local planting; Caldwell, Essex Co., Oct. 12. (Dept. Pl. Path.)
+Botrytus sp., rot.
Wisconsin - Janesville, Rock Co., Oct. 1. (Chambers and Vaughan).
Fusarium oxysporum gladioli Massey, rot.
New Jersey, District of Columbia, Indiana, Iowa. (Weiss and Brierly).
Wisconsin - local; Madison, Dane Co., Oct. 1. (Chambers and Vaughan).
Massey (64), lists the disease from California, District of Columbia, Indiana, Maryland, Michigan, Minnesota, New Jersey, Ohio, Wisconsin, and Ontario, Canada.
Fusarium sp., rot.
+South Carolina - North Augusta, Aiken, July 9. (Fenner).
Hexatylus viviparus Goodey, see Bibl. (43).
Macrosporium sp.,
+*Virginia - Herndon, Sept. 23. (Brierly).
Penicillium sp., rot. See Bibl. Smith (96).
P. r.: Colorado, Florida, Mississippi, West Virginia.
Septoria gladioli Pass., hardrot, leafspot.
New Jersey - 100 per cent infection in a planting of Prince of Wales. Bridgeton, Cumberland Co., Aug. 5. (Dept.Pl.Path.)
Indiana - 1, 5, and 50 per cent infection found; moderately severe on Indian Maid and very severe on Souvenir; Andrews, July 27. Goshen, Angola, Dec. 9, Kendallville, Dec.11.(Dietz)
+Wisconsin - general; 2 per cent loss in storage; more prevalent. Varieties very susceptible: Marshal Foch, Halley, 1910 Rose, Schwaben, and Wilbrinck. Milwaukee, Oct. 2. (Chambers and Vaughan).
Minnesota - average prevalence; St. Paul, Sept. (Sect. Pl. Path.)
+Washington - Whatcom Co. (Div. Pl. Path.)
+Oregon - 4-5 per cent local infection. (Zeller).
Dry rot, undet. See Bibl. Drayton (32).
Bulb treatment. See Bibl. Massey (65).

HEDERA HELIX, English Ivy.
+Cuscuta sp., dodder.
Arizona - local; one planting seriously damaged. (Streets).
Vermicularia trichella Fr., leaf-spot.
+New York - local; very common; Yonkers, June 4. (Guterman).
New Jersey - New Brunswick, Oct. 15. (Dept. Pl. Path.)

HELICHRYSUM BRACTEATUM, strawflower.
Curly top (?) undet.

Oregon - Believed from symptoms, distribution etc., to be due to curly top. (McKay and Dykstra).

HIBISCUS SYRIACUS, shrub-althea, rose of Sharon.
+Phomopsis hibisci Dearn.
New York - Orient. (Dearness, 25: 252).

HYDRANGEA sp., hydrangea.
Cercospora hydrangeae Ell. and Ev., leaf-spot.
+*Mississippi - Picayune, Pearl River, July 9. (Wedgworth).
P. r.: Ala., *Texas.

ILEX VERTICILLATA, common winterberry.
+Gloeosporium niveum Davis.
Wisconsin - Bruce, Sept. 4, 1924. (Davis, 23: 171).

ILEX sp., holly.
Physalospora rhodina (Berk. and Curt.) Cke. See Bibl. Stevens (107).

IPOMOEA spp., morning-glory.
Albugo ipomoeae-panduranae (Schw.) Sw., white rust.
+New Jersey - very common; both on wild and cultivated varieties; New Brunswick, Sept. 21. (Dept. Pl. Path.)

IRIS sp., iris.
Bacillus carotovorus L. R. Jones, soft-rot.
New Jersey - small rootlets decayed, leaves yellow, soft and jelly-like at base; Bordentown, Burlington Co., July 2. (Dept. Pl. Path.).
+*District of Columbia - April 22. (Brierly).
Minnesota - Ramsey County, May 21. (Sect. Pl. Path.)
+Caconema radicicola (Greef) Cobb, nematode.
Wisconsin - Madison. (Vaughan. See Bibl.Anon. (2).
Didymellina iridis (Desm.) Hoehn., leaf-spot.
Connecticut - four reports; little injury; Fairfiled, Fairfield Co., July 23. (Clinton and Stoddard).
New York - very common and serious: Yonkers, July 21. (Guterman).
Maryland - first outbreak on lot brought from Providence, Rhode Island; Chevy Chase. May 21. (Brierly).
+Virginia - not as prevalent as in 1925. (McWhorter).
+Mississippi - 2 reports but probably very common; Dixon, June 12. (Wedgworth).
Indiana - more prevalent. (Gardner).
Michigan - general; more prevalent; of moderate importance. (Nelson).
Kansas - Newton, May 26. (White).
*California - Redlands, Jan 20, 1927. (Morrison).
+Macrophomopsis dracaenae Stevens and Baechler.
Florida - St. Petersburg, Mar. 30. (Weedon, 114: 222).
Pseudomonas iridis Van Hall, rhizome rot.
+Virginia - seemingly less prevalent in affected areas than in 1925. (McWhorter).

Puccinia iridis (DC.) Rabh., rust.
Michigan - local; more prevalent; Royal Oak, Oakland County, Aug. 1. (Nelson).
P. r.: *California, *Colorado, *Connecticut, *Michigan, *Oregon, *Washington.
Rhizoctonia tuliparum (Kleb). Whet. and Arth.
(Sclerotium tuliparum Kleb.) See Bibl., Brooks (13).
Sclerotinia sclerotiorum (Lib.) Mass., stem-rot.
See bibl. Pape (82).
P. r.: Wash.
Sclerotium sp., crown rot.
Indiana - The Sclerotium disease of iris has been very abundant throughout the state. It has been observed in ornamental plantings and in the plantings of iris enthusiasts at Indianapolis, Lafayette, Bluffton, Marion, and Remington. No cases where the plants were killed by the disease have been found but it is often followed by soft rot which does kill the plants. It is probable that the Sclerotium disease of iris is referable to the species of S. rolfsii Sacc., which it closely resembles. What is apparently the same disease as on iris has been found on delphinium, columbine, and golden glow, all of these last observations being at Indianapolis. (Dietz).
Diseases. See Bibl. Morrison (75).

KALMIA LATIFOLIA, mountain laurel.
Phyllosticta kalmicola (Schw.) Ell. and Ev., leaf-spot.
Reported from New York, New Jersey, *Pennsylvania, and Virginia.

KENTIA sp., kentia.
+Exosporium palmivorum Sacc., leaf-spot.
Florida - of little importance; Jupiter, Palm Beach County, Dec. 3. (Seal).
Microdipoldia sp., leaf-spot.
Florida - unimportant; Jupiter, Dec. (Seal).

KERRIA JAPONICA, kerria.
Coccomyces kerriae V. B. Stewart, (Cylindrosporium sp.,) canker.
+*Iowa - Shenandoah, Nov. (Martin and Muncie).
+Myxosporium sp.,
Maryland - (Howard, Hutchinson, and Waterman).

LABURNUM VULGARE, goldenchain.
+Irpex tulipiferae Schw.
Connecticut - this fungus probably developed on winter injured branches as a result of and not a cause of the injury; Farmington, Hartford Co., July 4. (Clinton).

LAGERSTROEMIA INDICA, common crapemyrtle.
Uncinula australiana Mc. Alp. ? oidial stage, powdery mildew.
Reported from +Tennessee, South Carolina, Georgia, Florida, Texas.

LATHYRUS ODORATUS, sweetpea.
Ascochyta pisi Lib. - blight.

+*Missouri - damage very slight; Boonville, Sept. 6. (Archer).
P. r.: Minn.
Caconema radicola (Greef) Cobb, root-knot.
New Jersey - Iona, May. (Haenseler).
Texas - Bell County. (Taubenhaus).
Corticium vagum Berk. and Curt., stem rot.
+New Jersey - present to a slight extent in most greenhouse plantings; important in one greenhouse in Sussex Co., (Dept. Pl. Path.)
Erysiphe polygoni DC., powdery mildew.
+Missouri - reported as severe early in season in St. Louis Co., Aug. 24. (Archer).
+Arizona - vines were attacked late in season, damage slight. (Streets).
Fusarium sp., root-rot, wilt.
+New Jersey - small amount of root rot; Iona, May. (Dept.Pl.Path.)
Virginia - a florist at Roanoke (Feb. 27) sent in specimens twice which showed severe wilt. (Fromme).
Microsphaera alni (Wallr.) Wint., powdery mildew.
New York - serious in greenhouses; Nassau County, May 17. (Boyce)
New Jersey- in a greenhouse; New Brunswick, May. (Dept.Pl.Path.)
Pythium sp., root-rot.
+New Jersey - a small amount; Iona, May. (Dept. Pl.Path.)
Thielavia basicola (Berk. and Br.) Zopf., black root-rot.
+New Jersey - Clinton, Hunterdon, Feb. 7. (Haenseler).

LIGUSTRUM JAPONICA.
+Phyllosticta sp.
Virginia (Howard, Hutchinson, Waterman).

LIGUSTRUM sp., privet.
Armillaria mellea (Vahl) Quel., root-rot.
+Arkansas - (62: 44-51).
+Clitocybe monadelpha (Morgan) Sacc., root-rot.
Arkansas (5)
Glomerella cingulata (Ston). Spauld. and Schrenk, anthracnose.
+Missouri - local; severe; 75 per cent infection, Carthage, Jasper Co., July 27. (Scott and Archer).

LILIUM spp., lily.
+Phytophthora cactorum (Leb. and Cohn) Schroet., foot-rot, stem-rot.
*North Carolina - 30 bulbs in one bed killed; bulbs showed discoloration at plate and stem rotted above ground level. (Weiss and Brierly).
See Bibl. (33) Drechsler.

LONICERA HISPIDULA, honeysuckle.
+Guignardia lonicerae Dearn. and Barth., leaf-spot.
California - on living leaves; Palo Alto. (Dearness 25: 245).

LYCIUM HALIMIFOLIUM, common matrimony vine.
+Sphaeropsis lycii Dearn. and Barth.
Missouri - St. Genevieve (Dearness, 25: 254).

MALUS IOENSIS PLENA, Bechtel crab.
+Iowa - (Muncie).
+Missouri (Archer).

MESEMBRYANTHEMUM CRYSTALLINUM, ice plant.
+Caconema radicicola (Greef) Cobb, root-knot.
Texas - Bell Co. (Taubenhaus).

MYSOTIS sp., forget-me-not.
+Sclerotinia sclerotiorum (Lib.) Mass., stem-rot.
*Illinois - collected in a greenhouse at Urbana, March 15. (Kaplan)
Kaplan (56) makes the first report of this fungus on forget-me-not. She states that it causes a wilting of the infected portions, which later turn brown and appear as if scalded. The host is attacked at the soil line and stem tissues invaded. The following control method is suggested: diseased plants should be removed and burned as soon as found; all decaying organic matter should be removed, as it serves as initial point of attack, and the soil should be sterilized before using for another crop where the disease has been severe.

NARCISSUS sp., narcissus, jonquil.
+Aphelenchus subtenuis Cobb., bulb and stem nematode.
North and South Carolina, Georgia, Florida, and Washington. (Cobb)
Botrytis sp.,
+New York - not serious; Yonkers, June 14 (Guterman).
+*Virginia - causes rot of neck, base and scales and seems to be the "fire disease" of narcissus. Portsmouth, Apr. 26. (Brierly).
+Iowa - Osage. (Weiss and Brierly). P. r.: *Michigan and Washington.
See Bibl. Beaumont (8)° Dowson (2).
Fusarium sp., basal rot.
+New York, New Jersey, +Virginia, Florida, +*Alabama, +Iowa, (Weiss and Brierly). This has been frequently encountered in specimens submitted from these and a number of other localities, including Holland, and the Middle West and Far West of the United States. In the field it has been observed in certain varieties, notably Golden Spur, rendering up to 30 per cent and more of the crop worthless. It has been found to be a serious disease also on the varieties Emperor, Empress, Victoria, King Alfred, and Sir Watkin. A comparison of cultures from many sources shows that one species of Fusarium belonging to the section Elegans is chiefly concerned. Inoculations and reisolations show this species to be truly parasitic, being able to invade the uninjured plate and also wounded scales of healthy bulbs. It is much less frequent on polyanthus narcissi, but is able to attack bulbs of Paper Whites when artificially inoculated.
See Bibl. Beaumont (10).
+Sclerotium rolfsii Sacc., stem blight.
Florida - on N. tazatta; has caused considerable loss in some fields, especially to Soleil d' Or; Sanford, Seminole County, June 17. (West).

Tylenchus dipsaci (Kuehn) Bast., bulb nematode.
Virginia, +South Carolina, and +Florida. (Cobb, 19).
Oregon - it is unquestionably true that this trouble has been spreading on narcissus in a number of places, however, we do not have specific figures available on any particular plantings. Most growers are now aware of the necessity of controlling this disease, and are going about the matter in a way to effectively rid themselves of it. (McKay)
California - (Milbrath, 74). See Teasel.
P. r.: Calif., D. C., Ill., Mich., N. J., N. Y., Ore., Va., Wash.
See Bibl. Beaumont (10), Gibson (41), Hodson (50), Southwell (100)
Bulb treatment.
See Bibl. Doucette (28); Weigel (116).

NYMPHAEA sp., waterlily.
+Bacterium sp., bacterial spot.
New York - spots watery, circular, gray-black in center surrounded by a yellow halo; bacteria short rods, single or in chains; local; in late season; Yonkers, Sept. 21. (Guterman).
+Gloeosporium nymphaearum Allesch., leaf-spot.
New York - spots large and light brown; not serious; local; Yonkers, Sept. 21. (Guterman).

ORNITHOGALUM sp., Star of Bethlehem.
+Septoria ornithogali Pass., leaf-spot.
Connecticut - Shelton, May 20. (Clinton and Stoddard.)

PACHISTIMA MYRSINITES, myrtle pachistima.
Mycosphaerella pachystimae Dearn., leaf-spot.
Idaho - Coolin. (Dearness, 25: 246).

PAEONIA sp., peony.
Botrytis paeoniae, Oud., blight.
New York - girdles stem near soil, in some instances blasts young buds; very prevalent and serious; Yonkers, June 10. (Guterman).
New Jersey - state wide; Ocean Grove, Monmouth Co., July 14. (Dept. Pl. Path.)
Michigan - local; average prevalence. (Nelson).
Botrytis sp., blight.
+Connecticut - one report. (Clinton).
Virginia - severe; Norfolk, June 5. (Fromme).
Wisconsin - local; more prevalent; Racine, July 7. (Chambers and Vaughan).
Washington - Granite Falls, Apr. 3. (Div. Pl. Path.)
Caconema radicicola (Greef) Cobb., root-knot.
+Wisconsin - associated with Lemoine disease; scattered throughout state; more prevalent; Felix Crousse very susceptible; Kenosha, Kenosha Co., Sept. 20. (Chambers and Vaughan.)
+*Iowa - Des Moines; Oct. 18. (Brierly).
Cladosporium paeoniae Pass., leaf-mold.
Missouri - damage slight, both in field and greenhouse; Independence, Jackson Co., July 13. (Archer).

Corticium vagum Berk. and Curt., stem-rot.

+District of Columbia, *+Maryland - causal relation doubtful. (Brierly).

Fusarium sp., root-rot.

Missouri - prevalent in beds where plants remain year after year; change of location eliminates disease. Jasper Co., July 27. (Archer and Davis).

Phyllosticta commonsii Ell. and Ev., leaf-spot.

+New Jersey - possibly state wide; New Brunswick, Sept. (Dept. Pl. Path.)

+Sclerotiopsis testudinea Dearn.

New York - Orient. (Dearness, 25: 253).

Lemoine disease, undet.

Wisconsin - scattered; more prevalent; Kenosha, September 20. (Chambers and Vaughan).

Diseases - see bibl. (1).

PAPAVER NUDICAULE, Iceland poppy.

+Rhizoctonia sp., root-rot.

+New York - local; Yonkers, Aug. 4. (Guterman).

PELARGONIUM sp., geranium.

Bacterium erodii Lewis, bacterial leaf-spot.

Connecticut - Winsted, Litchfield Co., May. (Clinton).

Indiana - Rather common throughout the state during February and March, 1926. The varieties most susceptible to attack were Agathea and Beute Poitevine and S. A. Nutt. This disease was recorded from the following localities in Indiana: Bluffron, Marion, North Manchester, Kokomo, Indianapolis, and Columbus. The most serious infections were at Columbus and in several greenhouses at Marion, Kokomo, and Richmond. The losses at Marion and Columbus ranged from 25 per cent to 75 per cent of the plants. (Dietz).

Bacterium pelargoni, Brown, bacterial leaf-spot.

+New York - Yonkers, Sept. 21. (Guterman).

Botrytis sp., gray-mold. See bibl. Melchers (72).

Chlorosis, excess of lime.

Texas - Bell County. (Taubenhaus).

Dropsy - physiological.

Indiana - scattered. (Dietz). P. r.: *La., Ohio.

PETUNIA HYBRIDA, petunia.

Corticium vagum Berk. and Curt., stem-rot.

+Florida - more prevalent; Gainesville, Alachua Co., May 25. (West).

Mosaic, Undet., see bibl., Johnson (54).

PHLOX spp., phlox.

Erysiphe cichoracearum DC., powdery mildew.

Reported from Connecticut, New York, Indiana.

Septoria divaricata Ell. and Ev., leaf-spot.

+*Pennsylvania - on P. drummondi; severe in several localities; at State College a collection of annual phlox was severely injured for the first time; August. (Weiss and Brierly).

Tylenchus dipsaci (Kuehn) Bast., stem nematode.
See bibl. Hodson (50) Schenk (92).

PHOENIX spp., date palm.
+Armillaria mellea (Vahl) Quel., root-rot.
California - on P. canariensis; one palm killed by this fungus at Watsonville. (Thomas).
+Colletotrichum sp., anthracnose.
Texas - Bexar Co., (Taubenhaus).
Exosporium palmivorum Sacc., leaf-spot.
Florida - does most damage to young plants; found on P. canariensis, +P. reclinata, +P. sylvestris, +P. tenuis. (West and Seal.)
Texas - prevalent; unimportant; Galveston and Harris counties. (Taubenhaus).
See bibl. Laubert (60).

PHOTINIA ARBUTIFOLIA, Christmasberry.
+Bacillus amylovorus (Burr). Trev., blight.
California - occurrence reported in city of Alameda, collected by B. Vickers; blight is very rare in immediate coast districts. (Horne).

POINSETTIA sp., poinsetta.
+*Phoma sp., leaf blight.
District of Columbia - Aug. 25. (Drechsler).

PRIMULA ACAULIS, English primrose.
+Erysiphe polygoni DC., powdery mildew.
Connecticut - Branford, New Haven County, Aug. 12. (Clinton).

PRUNUS GLANDULOSA, flowering almond.
+Sphaeropsis sp.,
Ohio - (Howard, Hutchinson, and Waterman).

RHODODENDRON PONTICUM, pontic rhododendron.
+Rhizoctonia sp., damping off.
New Jersey - 1/4 per cent Uspulun solution applied in a sufficient amount to wet the soil gives excellent control; New Rochelle, July 4. (Guterman).

SCHIZANTHUS sp., butterflyflower.
Sclerotinia sclerotiorum (Lib.) Mass., blossom wilt., stem rot.
See bibl. Dowson (30).

SEMPERVIVUM sp., houseleek.
Endophyllum sempervivi (Alb. and Schw.) D By., rust.
*New York - local; Long Island, May 7. (Barrus).

SENECIO sp., cineraria.
Rhizoctonia sp., damping off.
New Jersey - Clinton, Aug. 6. (Dept. Pl. Path.)

SINNINGIA sp., gloxinia.
See bibl. Peperkorn (87).

SMILAX BONA-NOX, greenbrier.
Puccinia smilacis Schw.
+*Illinois - Poke Co., July 1922. (Young).

SOPHORA JAPONICA, Chinese scholartree.
+Corticium vagum Berk. and Curt., damping off.
Connecticut - in a nursery; one report; Woodmont; July 6. (Clinton).
+Frost injury - late frosts.
Connecticut - injury of young seedlings in a nursery caused a white specking of young plants; Woodmont. (Clinton).

SYMPHORICARPOS RACEMOSUS, common snowberry.
+Alternaria sp., fruit rot.
New York - very common, causes a brown rot of the fruit. Yonkers, Sept. 15. (Guterman).
Microsphaeria diffusa Cke. and Pk., powdery mildew.
+*Montana - Bozeman, Aug. 2, 1925. (Young).

SYRINGA VULGARIS, lilac.
+Armillaria mellea (Vahl). Quel., root-rot.
California - San Francisco Bay Region. (Thomas).
+Bacterium sp.,
Illinois - a rather serious outbreak in northern part of state near Lisle; second year that it has been observed. (Anderson).
+Corticium subcinereum Burt.
Kansas (Burt, 17:277).

TAGETES sp., marigold.
Sclerotium rolfsii Sacc., root-rot.
Virginia - Danville, July 28 (Brierly).

TRADESCANTIA FLUMINENSIS, wandering jew.
Caconema radicicola (Greef) Cobb, root-knot.
Texas - Bell Co., (Taubenhaus).

TULIPA sp., tulip.
Botrytis tulipae (Lib.) Hopkins, botrytis blight.
New York - local; many plants killed; Yonkers, June 12. (Guterman)
+New Jersey - more prevalent than in 1925; Cumberland County. Mar. 30. (Dept. Pl. Path.)
+Indiana - serious locally; Indianapolis, May. (Dietz).
+Missouri - locally severe; plants in same soil for several years; severe as early as April. Polk County. Sept. 11. (Archer).
Washington - Kitsap County, April 2. (Div. Pl. Path.)
See bibl. Brooks (13), Codman (20), Laubert (60), Ludwigs (62).
Rhizoctonia sp., bulb rot.
Reported from New York and +District of Columbia.

VIBURNUM sp., viburnum
Phyllosticta sp., leaf-spot.
+Rhode Island - (Howard, Hutchinson, Waterman).

VINCA sp., periwinkle.

Sphaeropsis vincae S. and W.

+New York - considerable trouble with wilting and dying on this particular planting; Monroe Co., Jan. 27. (Chupp).

VIOLA sp., violet.

Cecospora violae Sacc., leaf-spot.

+*Missouri - damage severe, local on wild host, Scott County. Scott County, Oct. 29. (Archer).

Phyllosticta violae Desm., leaf-spot.

+New York on Viola odoratus; Yonkers, July 9. (Guterman). P. r.: Conn., Mass.

Sclerotium rolfsii Sacc., stem-rot.

+Mississippi - Durant, Holmes Co., June 19. (Wedgworth) P. r.: Ala., S. C.

VIOLA TRICOLOR, pansy.

Colletotrichum violae tricolaris R. E. Sm.

Connecticut - one report; Westville, New Haven Co., July 12. (Clinton). P. r.: Mass., N. J., N. Y.

Corticium vagum Berk. and Curt, root-rot.

+New York - common on plants in wet soil; Yonkers, June 14. (Guterman).

Fusarium sp., wilt.

+New York - Yonkers, June 12. (Guterman). P.r.: Del., Minn.

Puccinia violae (Schum) DC., rust.

+Kansas - local; not serious; Riley County, June 7. (White).

WASHINGTONIA sp., palm.

+Colletotrichum sp., leaf-spot.

Florida - Palm Beach County. (Seal).

+Sphaerodothis neowashingtoniae Shear.

California - (Laubert 60).

Bacterial leaf spot - undet.

Florida - Odessa. (Seal).

ZANTEDESCHIA AETHIOPICA, common calla lily.

+Armillaria mellea (Vahl) Quel., root-rot.

California - Monterey Bay region. (Thomas).

ZINNIA ELEGANS, common zinnia.

+Aphelenchus sp., nematode.

*Delaware - Dover, Kent Co., Oct. 7. (Adams).

+Botrytis sp., blight.

New Jersey - severe on stems, buds and leaves in one garden; New Brunswick, Sept. 17. (Dept. Pl. Path.)

Erysiphe cichoracearum DC., powdery mildew.

+Iowa and +Missouri. (Archer).

DISEASES OF MISCELLANEOUS HOSTS

ABUTILON THEOPHRASTI
Macrosporium abutilonis Speg., leaf spot. +New Jersey.

ACTAEA RUBRA NEGLECTA
+Ramularia actaeae Ell. & Holw., leaf spot. Wisconsin. (Davis 23: 160)

AGASTACHE URTICIFOLIA
+Ramularia lophanthi Ell. & Ev., leaf spot. *Montana.

AGRIMONIA GRYPOSEPALA
Peronospora potentillae D By., downy mildew. +Wisconsin. (Davis 23: 158)

AMARANTHUS SP., pigweed.
+Peronospora effusa (Grev.) Ces., downy mildew. New Jersey.
+Curly top, undet. Oregon.

AMBROSIA ARTEMISIAEFOLIA, ragweed.
Erysiphe ambrosiae Schw., powdery mildew. +New Jersey.

A. TRIFIDA
Puccinia xanthii Schw., rust. +New Jersey.

AMHERSTIA SP.
+Corticium salmonicolor Berk. & Broome. (Burt, 17: 228)

ANAPHALIS MARGARITACEA
+Septoria margaritaceae Pk., leaf spot. Wisconsin. (Davis 23: 161)

ANTICLEA ELEGANS
+Urocystis flowersii Garrett, smut. Utah.

ARABIS LAEVIGATA
Peronospora parasitica (Pers.) D By., downy mildew. +Wisconsin. (Davis, 23: 158)

ARCTIUM MINUS
Phyllosticta lappa Sacc., leaf spot. +Wisonsin. P.r.: *Ohio.

ARISTIDA TUBERCULOSA
+Uromyces seditiosus Kern, rust. Wisconsin. (Davis, 23: 162)

ARTEMISIA BIENNIS
+Synchytrium aureum Schroet. Wisconsin. (Davis, 23: 158)

A. CANA
Puccinia absinthii DC., rust. *+Wyoming. P.r.: *S. Dak.

A. CAUDATA
+Ramularia artemisiae Davis, leaf spot. Wisconsin. (Davis, 23: 173)

ARTEMISIA DRACUNCULUS TYPICA
Puccinia absinthii (Hedw. f.) DC., rust. *+Wyoming.

A. LUDOVICIANA and A. SERRATA
Peronospora leptosperma D By., downy mildew. +Wisconsin. (Davis, 23: 155)

A. TRIDENTATA
+Zignoella ostiolata Dearn. & Barth., Wyoming. (Dearness, 25: 248)

ASCLEPIAS TUBEROSA
+Cercospora clavata (Ger.) Pk., leaf spot. Wisconsin. (Davis, 23: 170)

ASTER AZUREUS, A. PANICULATUS, A. SAGITTIFOLIUS, A. TRADESCANTI.
+Ramularia asteris (Phil. & Plowr.) Bubak., leaf spot. Wisconsin. (Davis, 23: 160)

A. SALICIFOLIUS ?
+Septoria atropurpurea Pk., leaf spot. Wisconsin. (Davis, 23: 182)

ASTRAGALUS SP.
Septoria astragalicola Pk., leaf spot. *+Montana. P.r.: *Ariz.

BARBAREA STRICTA
+Ramularia barbareae Pk., leaf spot. Wisconsin. (Davis, 23: 160)

BAPTISIA LEUCANTHA
+Ascochyta baptisiae Davis, leaf spot. Wisconsin. (Davis, 23: 186)

BIDENS SP.
Uromyces bidentis Lagh., rust. +Florida. (Weedon, 114: 221)

BOLTONIA DIFFUSA
+Guignardia boltoniae Dearn. & Barth., anthracnose. Oklahoma. (Dearness, 25: 242)
+Macrophoma boltoniae Dearn., Oklahoma. (Dearness, 25: 245)

CAMPANULA APARINOIDES
+Cercoseptoria minuta Davis, Wisconsin. (Davis, 23: 174)

CAREX PENNSYLVANICA
+Cintractina caricetorum Speg., smut. Pennsylvania. (Spegazzini 104: 145)

CASSIA MARYLANDICA
Cercospora simulata Ell. & Ev., leaf spot. +Wisconsin. (Davis, 23: 162)

CATHARTOLINUM SULCATUM
Melampsora lini (Pers.) Desm., rust. +Wisconsin. (Davis, 23: 187)

CHENOPODIUM HYBRIDUM
Cercospora dubia (Riess) Wint., leaf spot. +Wisconsin. (Davis, 23: 185)
P.r.: *Kans.

CICHORIUM INTYBUS, chicory.
+Oidium sp., powdery mildew. New Jersey.

CICUTA MACULATA
+Ascochyta thaspii Ell. & Ev., leaf spot. Wisconsin. (Davis, 23: 159)
+Plasmopara nivea (Ung.) Schroet., Wisconsin. (Davis, 23: 161)

CINNA LATIFOLIA
+Phyllachora sp., Wisconsin. (Davis, 23: 159)

CIRSIUM ARVENSE
Erysiphe sp., powdery mildew. +New Jersey.
Puccinia suaveolens (Pers.) Rostr., rust. +Oregon.

CLAYTONIA LINEARIS
+Ustilago claytoniae Shear, smut. *Washington.

CYNOGLOSSUM OFFICINALE
+Ramularia lappulae Davis, Wisconsin. (Davis, 23: 173)

DATURA STRAMONIUM
Alternaria crassa (Sacc.) Rands, leaf spot. *+Missouri.

ERECHTITES HIERACIFOLIA
Septoria erechtitis Ell. & Ev., leaf spot. +Wisconsin. (Davis, 23: 161)

ERYTHRONIUM ALBIDUM, white troutlily.
+Botrytis sp., stem and root rot. Illinois.
+Sclerotinia gracilis Clements. Nebraska. (Whetzel, 118: 224)

E. AMERICANUM
+Sclerotinia erythroniae Whetzel, New York. (Whetzel, 118: 232)

EUPATORIUM PURPUREUM
+Ascochyta compositarum Davis, Wisconsin. (Davis, 23: 159)
Cercospora perfoliata Ell. & Ev., leaf spot. +Wisconsin. (Davis, 23: 160)

E. URTICAEFOLIUM
Entyloma compositarum Farl., smut. +Wisconsin. (Davis, 23: 177)

GALIUM APARINE
Puccinia ambigua (Alb. & Schw.) Lagh., rust. +Wisconsin. (Davis, 23: 186)

G. BOREALE
+Septoria psilostega Ell. & Mart., leaf spot. Wisconsin. (Davis, 23: 170)

GENTIANA AFFINIS, G. PUBERULA
Puccinia gentiana (Strauss) Lk., rust. Wisconsin. (Davis, 23: 185).
*+Wyoming.

GERANIUM BICKNELLI
+Plasmopara geranii (Pk.) DeT., Wisconsin. (Davis, 23: 169)

G. MACULATUM
+Sclerotinia geranii Seaver & Horne, Wisconsin. (Davis, 23: 171)

G. MOLLE
+Graphium geranii Vogl., Indiana. (Van Hook, 111: 231)

GEUM CANADENSE, G. STRICTUM, G. VIRGINIANUM
Septoria gei Rob. & Desm., leaf spot. +Wisconsin. (Davis, 23: 159)

HELIANTHUS STRUMOSUS
Coleosporium helianthi (Schw.) Arth., rust. +Wisconsin. (Davis, 23: 187)

HERACLEUM LANATUM
Ramularia heraclei (Oud.) Sacc., leaf spot. *+Montana.

HIERACIUM CANADENSE
Puccinia patruelis Arth., rust. +Wisconsin. (Davis, 23: 185)

LACTUCA CANADENSIS
+Asteroma lactucae nom. herb., Wisconsin. (Davis, 23: 161)

L. VILLOSA
+Puccinia patruelis Arth., rust. +Wisconsin. (Davis, 23: 185)

LAGUNCULARIA RACEMOSA
+Botryosphaeria ribis chromogena Stevens, Florida. (Stevens, 106: 279)

LATHYRUS OCHROLEUCUS
+Cercospora viciae Ell. & Holw., leaf spot. Wisconsin. (Davis, 23: 170)

L. PALUSTRIS
+Ascochyta pisi Lib., leaf spot. Wisconsin. (Davis, 23: 169)

LEPACHYS PINNATA
Septoria infuscata Wint., leaf spot. +Wisconsin. (Davis, 23: 161)

LONICERA HISPIDULA
+Guignardia lonicerae Dearn. & Barth., California. (Dearness, 25: 245)

LUDWIGIA POLYCARPA
Puccinia jussiaeae Speg., rust. +Wisconsin. (Davis, 23: 162)

LYCOPUS AMERICANUS, L. UNIFLORUS
+Septoria lycopi Pass., leaf spot. Wisconsin. (Davis, 23: 159)

MALVA ROTUNDIFOLIA
Septoria malvicola Ell. & Mart., leaf spot. +Wisconsin. (Davis, 23: 182)

MELAMPYRUM LINEARE
+Ramularia melampyri Ell. & Dearn., leaf spot. Wisconsin. (Davis, 23: 162)

MYOSOTIS VIRGINICA
Aecidium myosotidis Burr., rust. +Wisconsin. (Davis, 23: 162)
Peronospora myosotidis D By., downy mildew. +Wisconsin. (Davis, 23: 158)

OENOTHERA PUMILA
+Puccinia peckii (DeT.) Kell., rust. Wisconsin. (Davis, 23: 160)

ONOCLEA STRUTHIOPTERIS
+Taphrina struthiopteridis Nishida, Wisconsin. (Davis, 23: 185)

OSMORRHIZA LONGISTYLIS
+Ramularia reticulata Ell. & Ev., leaf spot. Wisconsin. (Davis, 23: 170)

PERSICARIA PERSICARIA
Septoria polygonorum Desm., leaf spot. +Indiana. (Van Hook, 110: 235)

PETASITES PALMATUS
+Stagonospora petasitidis Ell. & Ev. Wisconsin. (Davis, 23: 186)

PHYTOLACCA AMERICANA, pokeweed.
Mosaic - undet. +Virginia.

PHYTOLACCA SP.
Mosaic - undet. +New Jersey.

PHORADENDRON MACROPHYLLUM
+Chaconia (?) texensis Arth., Texas. (Arthur, 9: 784)

PHYSALIS PUBESCENS
+Tylenchus dipsaci (Kuehn) Bast., nematode. *California.

PLANTAGO MAJOR
Erysiphe cichoracearum DC., powdery mildew. +New Jersey.

PODOPHYLLUM PELTATUM
+Botrytis sp., blight, New Jersey.

POLYGONUM SP.
Melanopsichium austro-americanum (Speg.) G. Beck, smut. +New Jersey.
Septoria polygonorum Desm., leaf spot. +Wisconsin. (Davis, 23: 155)
*+Missouri.

POLYSTICHUM ADIANTIFORME, leather leaf fern.
+Cylindrocladium pteridis Wolf, leaf spot. Florida. (Wolf, 124)

POTENTILLA CANADENSIS
+Marssonina potentillae tormentillae Trail. Wisconsin. (Davis, 23: 159)
+Ramularia arvensis Sacc., leaf spot. Wisconsin. (Davis, 23: 160)

P. FRUTICOSA
Phragmidium andersoni Shear, rust. *+Montana.

PRUNELLA VULGARIS
Septoria brunellae Ell. & Hark., leaf spot. *+Montana.

RANUNCULUS ACRIS
Ovularia decipiens Sacc., leaf spot. +Wisconsin. (Davis, 23: 162)

RIBES NIGRUM
Cronartium ribicola Fisch., blister rust. +Pennsylvania.

RICINUS COMMUNIS
+Botryosphaeria ribis chromogena Stevens, Florida. (Stevens, 106: 279)

RUBUS TRIFLORUS
+Pucciniastrum arcticum (Lagh.) Tranz., rust. Wisconsin. (Davis, 23: 189)
+Septoria rubi West., leaf spot. Wisconsin. (Davis, 23: 170)

RUDBECKIA HIRTA
+Entyloma polysporum (Pk.) Farl., smut. Wisconsin. (Davis, 23: 178)

R. LACINIATA
Entyloma compositarum Farl., smut. +Wisconsin. (Davis, 23: 160)

RUMEX PERSICARIOIDES
Ramularia pratense Sacc., leaf spot. +Wisconsin. (Davis, 23: 162)

RUMEX SP.
Ovularia obliqua (Cke.) Oud., leaf spot. +New Jersey.

SANICULA GREGARIA
+Ascochyta thaspii saniculae Davis, leaf spot. Wisconsin. (Davis, 23: 185)
+Entyloma saniculae Pk., smut. Wisconsin. (Davis, 23: 177).

SCROPHULARIA LEPORELLA
+Peronospora sordida Berk. & Br., downy mildew. Wisconsin. (Davis, 23: 169)

SILENE NOCTIFLORA
Phyllosticta pallida Seym. & Earle, leaf spot. *+Montana.

SISYMBRIUM ALTISSIMUM
Albugo candida (Pers.) O. Kuntze, white rust. +Wisconsin. (Davis, 23: 158)

SMILACINA AMPLEXICAULIS
+Phyllosticta vagans Pk., leaf spot. *Montana.
+Ramularia smilacinae Davis, leaf spot. *Montana.

S. STELLATA
+Ramularia smilacinae Davis, leaf spot. *Montana.
+Vermicularia liliacearum West. *Maryland.

SOLANUM VILLOSUM
+Tylenchus dipsaci (Kuehn) Bast., nematode. *California.

SOLIDAGO JUNCEA SCABERRIMA, S. ULIGINOSA
+Cercosporella nivea Ell. & Barth. Wisconsin. (Davis, 23: 170)

SOPHIA FILIPES
Albugo candida (Pers.) O. Kuntze, white rust. *+Montana.
+Peronospora parasitica (Pers.) D By., downy mildew. *Montana.

STREPTOPUS ROSEUS
Tuburcinia clintoniae Kom. +Wisconsin. (Davis, 23: 176)

SYMPLOCARPUS FOETIDUS, skunk cabbage.
Botrytis sp., gray mold rot. +New Jersey.

THALICTRUM DASYCARPUM
Entyloma sp., smut. +Wisconsin. (Davis, 23: 183)

TRIOSTEUM AURANTIACUM, T. PERFOLIATUM
+Cylindrosporium triostei Kell. & Sw. Wisconsin. (Davis, 23: 185)

VACCINIUM CANADENSE, V. PENNSYLVANICUM
+Ramularia vaccinii Pk., leaf spot. Wisconsin. (Davis, 23: 185)

V. MEMBRANACEUM, +V. SCOPARIUM
Pucciniastrum myrtillii (Schum.) Arth., rust. *+Wyoming.

V. SP., huckleberry.
Calyptospora columnaris (Alb. & Schw.) Kuehn., rust. +Oregon.

VERNONIA SP.
Cercospora vernoniae Ell. & Kell., leaf spot. +Wisconsin. (Davis, 23: 157)

VERONICA VIRGINICA
Cercospora leptandrae Davis, leaf spot. +Wisconsin. (Davis, 23: 162)

VIOLA LANCEOLATA
Septoria violae West., leaf spot. +Wisconsin. (Davis, 23: 159)

VITIS SP.
+Corticium pilosum Burt, Alabama. (Burt, 17: 262)
+Corticium rubellum Burt, Florida, Illinois, Colorado. (Burt, 17: 232)

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THE PLANT DISEASE REPORTER

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THE OFFICE OF MYCOLOGY AND DISEASE SURVEY

Supplement 56

Crop Losses from Plant Diseases in the United States in 1926

November 30, 1927

BUREAU OF

PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

CROP LOSSES FROM PLANT DISEASES IN THE UNITED STATES IN 1926

Plant Disease Reporter
Supplement 56

November 30, 1927.

CONTENTS

INTRODUCTORY STATEMENT

The tenth annual report of losses from plant diseases of some of the more important crops is presented herewith. The accompanying tabulations have been prepared from estimates furnished by the Plant Disease Survey. As has been said before, no claim is made for their accuracy, for at best they can only be approximations, but they represent the combined judgment of the plant pathologists of the country and as such are considered valuable.

The methods of calculation are the same as followed in other years.

Certain symbols have been used frequently in the tables. A dash (-) indicates no data available. A trace (t) in the percentage column indicates that the loss is less than one per cent and in most cases less than 0.1 per cent. A plus sign (+) is used where the percentage reduction in yield is a trace or where the production is too small to calculate the loss.

Estimated reduction in yield of wheat due to scab (Gibberella saubinetii), leaf rust (Puccinia triticina), stem rust (Puccinia graminis), and bunt (Tilletia laevis and T. tritici), 1926.

State	Production: 1926 Bushels (000 omitted)	Estimated reduction in yield due to disease: Scab %	Scab Bushels (000 omitted)	Leaf rust %	Leaf rust Bushels (000 omitted)	Stem rust %	Stem rust Bushels (000 omitted)	Bunt %	Bunt Bushels (000 omitted)
Me.	120	-	-	-	-	t	+	-	-
Vt.	40	-	-	-	-	-	-	-	-
N. Y.	4,887	1.	53	1.	53	0.1	5	.2	11
N. J.	1,320	0.3	4	0.5	7	-	-	-	-
Pa.	23,400	0.5	132	0.5	132	0.1	26	6	1,583
Del.	2,060	-	-	t	+	-	-	3.5	75
Md.	11,960	0.4	52	0.5	65	t	+	3	391
Va.	11,336	t	+	t	+	0.1	12	5	615
W. Va.	2,352	t	+	t	+	t	+	t	+
N. C.	6,303	1	69	t	+	t	+	4	274
S. C.	800	-	-	1	8	-	-	-	-
Ga.	1,710	-	-	-	-	-	-	-	-
Ohio	40,384	t	+	t	+	0.5	207	0.5	207
Ind.	34,048	t	+	5	1,892	0.5	189	4	1,513
Ill.	41,034	0.5	213	1	427	1	427	0.7	299
Mich.	17,998	t	+	2	416	3.5	728	4	832
Wis.	2,599	t	+	1	27	3	82	0	0
Minn.	27,360	t	+	t	+	5	1,506	0.5	151
Iowa	7,364	t	+	6	517	1	86	0.5	43
Mo.	21,474	t	+	0	0	t	+	t	+
N. Dak.	77,224	0.5	423	t	+	1.75	1,481	2	1,693
S. Dak.	10,840	t	+	t	+	1.2	139	1	116
Nebr.	40,035	-	-	t	+	t	+	6	2,559
Kans.	150,084	0	0	t	+	t	+	10	16,863
Ky.	4,773	-	-	t	+	-	-	-	-
Tenn.	7,092	-	-	t	+	-	-	-	-
Ala.	94	-	-	-	-	-	-	-	-
Miss.	102	-	-	-	-	-	-	t	+
Texas	32,796	0	0	1	339	0.75	254	0.5	169
Okla.	73,745	-	-	-	-	0.75	567	0.75	567
Ark.	405	0	0	t	+	t	+	t	+
Mont.	44,665	0	0	0	0	0.1	49	2	972
Wyo.	3,378	0	0	-	-	t	+	-	-
Colo.	18,452	0	0	0	0	t	+	8	1,606
N. Mex.	5,653	0	0	-	-	-	-	-	-
Ariz.	950	0	0	0.5	6	8	89	5	56
Utah	5,505	0	0	-	-	-	-	-	-
Nev.	408	0	0	-	-	-	-	-	-
Idaho	24,633	0	0	t	+	t	+	6	1,606
Wash.	40,271	0	0	t	+	t	+	2	848
Oregon	19,586	0	0	0.5	101	t	+	3	609
Calif.	12,015	0	0	-	-	0.5	64	1	128
U. S.	832,305	0.1	946	0.4	3,990	0.7	5,911	3.8	33,786

Estimated reduction in yield of wheat due to loose smut (Ustilago tritici), and other diseases, 1926.

State	Estimated reduction in yield due to disease							
	Loose smut		Other diseases		Sum of traces and no data		All diseases	
	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
Me.	t	+	-	-	-	-	-	+
Vt.	-	-	-	-	-	-	-	-
N. Y.	1.5	79	3.5	185			7.3	386
N. J.	1.	13	-	-	-	-	1.8	24
Pa.	2	528	2.2	580	0	0	11.3	2,981
Del.	t	+	0.5	11	-	-	4.	86
Md.	3	391	1.4	183	t	+	8.3	1,082
Va.	2.8	345	t	+	-	-	7.9	972
W. Va.	t	+	0.1	2	3	73	3.1	75
N. C.	1	69	2	137	-	-	8	549
S. C.	1	8	1.5	13			3.5	29
Ga.	-	-	-	-	-	-	-	-
Ohio	1	415	0.6	249	-	-	2.6	1,078
Ind.	0.5	189	t	+	-	-	10.	3,733
Ill.	0.5	213	0.2	85	0	0	3.9	1,664
Mich.	2.5	520	1.5	312	t	+	13.5	2,808
Wis.	t	+	1	27	-	-	5	136
Minn.	1	301	1	301	-	-	7.5	2,259
Iowa	1	86	0.2	17	t	+	8.7	749
Mo.	2	457	4	914	-	-	6	1,371
N. Dak.	2	1,693	2.5	2,116	t	+	8.75	7,406
S. Dak.	2	231	2	231	-	-	6.2	717
Nebr.	-	-	t	+	-	-	6	2,559
Kans.	t	+	1	1,686	-	-	11	18,549
Ky.	-	-	-	-	-	-	-	-
Tenn.	t	+	-	-	-	-	-	-
Ala.	-	-	-	-	-	-	-	-
Miss.	t	+	-	-	-	-	-	-
Texas	1	339	t	+	-	-	3.25	1,101
Okla.	1	756	-	-	-	-	2.5	1,890
Ark.	2	3	1	4	-	-	3	12
Mont.	3	1,458	3	1,458	-	-	8.1	3,937
Wyo.	-	-	-	-	-	-	-	-
Colo.	t	+	0.1	20	-	-	8.1	1,626
N. Mex.	-	-	-	-	-	-	-	-
Ariz.	0.5	6	1	11	-	-	15	168
Utah	-	-	-	-	-	-	-	-
Nev.	-	-	-	-	-	-	-	-
Idaho	1	268	t	+	1	268	8	2,142
Wash.	t	+	3	1,272	-	-	5	2,120
Oregon	t	+	t	+	-	-	3.5	710
Calif.	t	+	5	643	-	-	6.5	835
U. S.	0.9	8,373	1.2	10,457	t	341	7.1	63,804

RYE

Estimated reduction in yield of rye due to smut (<u>Urocystis occulta</u>), ergot (<u>Claviceps purpurea</u>), leaf rust (<u>Puccinia dispersa</u>), stem rust (<u>Puccinia graminis</u>), and other diseases, 1926.

State	Production 1926 Bushels (000 omitted)	Estimated reduction in yield due to disease: Smut		Ergot		Leaf rust		Stem rust		Other diseases		Sum of traces and no data		All diseases	
		%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
N. Y.	434	-	-	t	+	t	+	-	-	-	-	-	-	-	-
N. J.	779	-	-	t	+	1	8	-	-	t	+	0.5	4	1.5	12
Pa.	1,488	0.6	9	t	+	0.5	8	t	+	2	31	0	0	3.1	48
Del.	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Md.	170	-	-	-	-	1	3	t	+	t	+	0.25	+	1.25	3
Va.	580	-	-	-	-	t	+	-	-	-	-	-	-	-	-
W. Va.	156	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. C.	1,352	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S. C.	112	-	-	-	-	-	-	-	-	2	2	-	-	2	2
Ga.	264	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ohio	875	-	-	t	+	-	-	t	+	t	+	0.2	2	0.2	2
Ind.	2,102	-	-	0.1	2	0.2	4	0	0	0.1	2	0	0	0.4	8
Ill.	1,245	-	-	t	+	-	-	-	-	t	+	-	-	-	-
Mich.	2,686	t	+	2	55	t	+	t	+	-	-	0.5	14	2.5	69
Wis.	3,840	0	0	1.5	59	t		t		0.5	20	-	-	2	79
Minn.	4,954	t	+	t	+	0	0	0	0	0.5	25	-	-	0.5	25
Iowa	542	-	-	t	+	t	+	-	-	-	-	-	-	-	-
Mo.	310	0	0	0	0	0	0	0	0	4	13	0	0	4	13

State	Production 1926 Bushels (000 omitted)	Smut %	Smut Bushels (000 omitted)	Ergot %	Ergot Bushels (000 omitted)	Leaf rust %	Leaf rust Bushels (000 omitted)	Stem rust %	Stem rust Bushels (000 omitted)	Other diseases %	Other diseases Bushels (000 omitted)	Sum of traces and no data %	Sum of traces and no data Bushels (000 omitted)	All diseases %	All diseases Bushels (000 omitted)
N. Dak.	9,287	0	0	1	94	0	0	t	+	0.5	47	+	-	1.5	141
S. Dak.	546	0	0	1	6	0	0	t	+	1	6	-	-	2	12
Nebr.	2,606	-	-	t	+	t	+	-	-	-	-	-	-	-	-
Kans.	480	0	0	0	0	t	+	0	0	0	0	t	+	t	+
Ky.	279	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tenn.	336	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Texas	380	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Okla.	558	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ark.	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mont.	1,284	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wyo.	714	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Colo.	1,024	-	-	0	0	0	0	0	0	-	-	-	-	-	-
N. Mex.	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Utah	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Idaho	46	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wash.	240	0	0	0	0	0	0	0	0	t	+	t	+	t	+
Oregon	130	0	0	0	0	t	+	t	+	-	-	-	-	t	
U. S.	40,024	t	9	0.5	216	0.1	23	t	+	0.4	146	t	20	1	414

BARLEY

Estimated reduction in yield of barley due to stripe (*Helminthosporium gramineum*), loose smut (*Ustilago nuda*), and covered smut (*Ustilago hordei*), 1926.

State	Production 1926 Bushels (000 omitted)	Stripe %	Stripe Bushels (000 omitted)	Loose smut %	Loose smut Bushels (000 omitted)	Covered smut %	Covered smut Bushels (000 omitted)
Me.	120	-	-	-	-	-	-
Vt.	180	-	-	-	-	-	-
N. Y.	5,066	1	54	2	108	1	54
N. J.	33	-	-	-	-	-	-
Pa.	400	t	+	3.5	15	1.5	6
Md.	343	t	+	2	7	1	4
Va.	434	t	+	1	5	3.3	15
N. C.	390	1	4	-	-	-	-
Ohio	3,712	-	-	-	-	-	-
Ind.	925	-	-	-	-	-	-
Ill.	12,710	2.5	343	4	549	-	-
Mich.	3,790	t	+	2	78	-	-
Wis.	17,974	2.5	472	1	189	0.5	94
Minn.	32,675	1	343	1.5	515	0.75	257
Iowa	6,880	-	-	1	69	1	69
Mo.	216	0	0	0	0	1	2
N. Dak.	21,050	1.5	331	1	220	1	220
S. Dak.	7,858	1	84	2	168	-	-
Nebr.	4,699	-	-	-	-	-	-
Kans.	3,032	0	0	2	63	2	63
Ky.	231	-	-	-	-	-	-
Tenn.	750	-	-	2	16	2.5	20
Texas	7,700	0	0	0.5	39	0.5	39
Okla.	4,752	-	-	-	-	-	-
Mont.	4,296	0	0	3	140	4	187
Wyo.	1,353	-	-	-	-	-	-
Colo.	6,672	0.5	35	t	+	3	207
N. Mex.	208	-	-	-	-	-	-
Ariz.	875	t	+	0.5	5	2	19
Utah	680	-	-	-	-	-	-
Nev.	280	-	-	-	-	-	-
Idaho	4,144	t	+	t	+	1	42
Wash.	2,176	0	0	0	0	t	+
Oregon	2,378	t	+	t	+	0.5	12
Calif.	32,400	2	749	t	+	6	2,247
U. S.	191,182	1.2	2,415	1.1	2,136	1.7	3,557

Estimated reduction in yield of barley due to leaf rust (*Puccinia simplex*,) stem rust (*Puccinia graminis*), and other diseases, 1926.

State	Estimated reduction in yield due to disease									
	Leaf rust		Stem rust		Other diseases		Sum of traces and no data		All diseases	
	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
Me.	-	-	-	-	-	-	-	-	-	-
Vt.	-	-	-	-	-	-	-	-	-	-
N. Y.	-	-	1	54	1	54	-	-	6	324
N. J.	-	-	-	-	-	-	-	-	-	-
Pa.	t	+	t	+	1.5	6	-	-	6.5	27
Md.	-	-	t	+	0.3	1	-	-	3.3	12
Va.	t	+	0	0	0.2	1			4.5	21
N. C.	-	-	-	-	-	-	-	-	.1	4
Ohio	-	-	t	+	-	-	-	-	-	-
Ind.	t	+	0	0	t	+	-	-	-	-
Ill.	0.5	69	0.4	55	-	-	-	-	7.4	1,016
Mich.	t	+	t	+	1.5	59	-	-	3.5	137
Wis.	t	+	0.5	94	0.2	38	-	-	4.7	887
Minn.	0	0	t	+	1.5	515	t	+	4.75	1,630
Iowa	-	-	1	69	0.2	14	-	-	3.2	221
Mo.	0	0	0	0	0	0	0	0	1	2
N. Dak.	0	0	t	+	1	220	t	+	4.5	991
S. Dak.	0	0	0.5	42	3	252	-	-	6.5	546
Nebr.	-	-	t	+	0	0	4	196	4	196
Kans.	0	0	t	+	-	-	-	-	4	126
Ky.	-	-	-	-	-	-	-	-	-	-
Tenn.	-	-	-	-	-	-	-	-	4.5	36
Texas	-	-	0.6	47	0.3	24	-	-	1.9	149
Okla.	-	-	-	-	-	-	-	-	-	-
Mont.	0	0	0	0	1	47	0	0	8	374
Wyo.	-	-	t	+	-	-	-	-	-	-
Colo.	0	0	t	+	-	-	-	-	3.5	242
N. Mex.	-	-	-	-	-	-	-	-	-	-
Ariz.	2	19	3	29	1	10	t	+	8.5	82
Utah	-	-	-	-	-	-	-	-	-	-
Nev.	-	-	-	-	-	-	-	-	-	-
Idaho	-	-	-	-	t	+	0.5	21	1.5	63
Wash.	0	0	0	0	t	+	-	-	-	-
Oregon	t	+	t	+	-	-	-	-	0.5	12
Calif.	-	-	0.5	187	5	1,[illegible]72	-	-	13.5	5,055
U. S.	t	88	0.3	577	1.5	3,113	0.1	217	5.9	12,153

OATS

Estimated reduction in yield of oats due to loose and covered smuts (*Ustilago avenae* and *U. levis*, stem rust (*Puccinia graminis*), crown rust (*Puccinia coronata*), and other diseases, 1926.

State	Production: 1926 Bushels (000 omitted)	Estimated reduction in yield due to disease: Loose and covered smut %	Loose and covered smut Bushels (000 omitted)	Stem rust %	Stem rust Bushels (000 omitted)	Crown rust %	Crown rust Bushels (000 omitted)	Other diseases %	Other diseases Bushels (000 omitted)	Sum of traces and no data %	Sum of traces and no data Bushels (000 omitted)	All diseases %	All diseases Bushels (000 omitted)
Me.	5,168	2	105	-	-	-	-	-	-	-	-	2	105
N. H.	446	-	-	-	-	-	-	-	-	-	-	-	-
Vt.	3,116	-	-	-	-	-	-	-	-	-	-	-	-
Mass.	306	8	28	3	10	t	+	-	-	-	-	11	38
R. I.	96	-	-	-	-	-	-	-	-	-	-	-	-
Conn.	480	2	10	0.5	2	0.5	2	-	-	-	-	3	14
N. Y.	34,578	5	1,879	-	-	2	752	1	376	-	-	8	3,007
N. J.	1,650	1.5	25	-	-	t	+	t	+	0.5	8	2	33
Pa.	35,552	8	3,178	1	397	t	+	1.5	596	0	0	10.5	4,171
Del.	112	t	+	-	-	-	-	0.5	1	-	-	0.5	1
Md.	1,706	3	53	t	+	t	+	-	-	-	-	3	53
Va.	4,836	4	202	0	0	t	+	0	0	t	+	4	202
W. Va.	5,798	1	59	t	+	t	+	t	+	1	59	2	118
N. C.	6,820	2.6	182	-	-	-	-	-	-	-	-	2.6	182
S. C.	10,483	10.	1,165	-	-	-	-	-	-	-	-	10.	1,165
Ga.	11,408	11.	1,410	t	+	-	-	-	-	-	-	11	1,410
Fla.	234	1	2	-	-	-	-	-	-	-	-	1	2
Ohio	75,240	3	2,329	0.1	78	-	-	-	-	-	-	3.1	2,407
Ind.	67,020	-	-	1	677	-	-	-	-	-	-	1	677
Ill.	123,516	3	4,530	15.	22,650	0.2	302	-	-	-	-	18.2	27,482
Mich.	51,810	4	2,382	7.5	4,466	t	+	1.5	893	-	-	13	7,741
Wis.	96,638	3	3,124	3.5	3,645	0.7	729	-	-	-	-	7.2	7,498
Minn.	129,162	5	8,149	10.	16,298	t	+	5.75	9,371	-	-	20.75	33,[illegible]18

State	Production: 1926 Bushels (000 omitted)	Estimated reduction in yield due to diseases: Loose and covered smut %	Loose and covered smut Bushels (000 omitted)	Stem rust %	Stem rust Bushels (000 omitted)	Crown rust %	Crown rust Bushels (000 omitted)	Other diseases %	Other diseases Bushels (000 omitted)	Sum of traces and no data %	Sum of traces and no data Bushels (000 omitted)	All diseases %	All diseases Bushels (000 omitted)
Iowa	195,962	5	11,527	10.	23,054	t	+	-	-	-	-	15.	34,581
Mo.	41,540	4	1,731	t	+	0	0	t	+	-	.	4	1,731
N. Dak.	34,408	2	718	1.1	395	t	+	1	359	-	-	4.1	1,472
S. Dak.	23,213	5	1,297	3.5	908	t	+	2	519	-	-	10.5	2,724
Nebr.	52,516	6	3,352	t	+	-	-	-	-	-	-	6	3,352
Kans.	35,122	0.5	188	t	+	0	0	6	2,254	-	-	6.5	2,442
Ky.	6,346	-	-	-	-	-	-	-	-	-	-	-	-
Tenn.	7,175	-	-	-	-	-	-	-	-	-	-	-	-
Ala.	3,036	-	-	-	-	-	-	-	-	-	-	-	-
Miss.	1,386	2.5	43	-	-	15	258	2	34	-	-	19.5	335
La.	798	t	+	0	0	20.	213	5.	53	-	-	25.	266
Texas	83,666	1	863	-	-	2	1,725	-	-	-	-	3	2,588
Okla.	38,304	-	-	-	-	-	-	-	-	-	-	-	-
Ark.	5,346	4	233	t	+	t	+	4	233	0.2	12	8.2	478
Mont.	16,510	4	750	t	+	0	0	8	1,501	-	-	12	2,251
Wyo.	4,690	-	-	t	+	-	-	-	-	-	-	-	-
Colo.	4,660	1.5	71	t	+	0	0	-	-	-	-	1.5	71
N. Mex.	1,512	-	-	-	-	-	-	-	-	-	-	-	-
Ariz.	525	2	11	0.5	3	t	+	0	0	-	-	2.5	14
Utah	2,280	-	-	-	-	-	-	-	-	-	-	-	-
Nev.	64	-	-	-	-	-	-	-	-	-	-	-	-
Idaho	4,760	1.5	73	-	-	-	-	1	49	-	-	2.5	122
Wash.	9,827	0.5	49	t	+	0	0	t	+	-	-	0.5	49
Oregon	8,816	1.5	134	t	+	t	+	t	+	-	-	1.5	134
Calif.	5,070	-	-	10.	646	1.5	97	10.	646	-	-	21.5	1,389
U. S.	1,253,739	3.6	49,352	5.2	73,229	0.3	4,078	1.2	16,385	t	79	11.3	144,123

Estimated reduction in yield of corn due to smut (*Ustilago zeae*), leaf rust (*Puccinia sorghi*), and rootrot (*Gibberella saubinetti*), 1926.

State	Production: 1926 Bushels (000 omitted)	Estimated reduction in yield due to disease: Smut %	Smut Bushels (000 omitted)	Leaf rust %	Leaf rust Bushels (000 omitted)	Root rots %	Root rots Bushels (000 omitted)
Me.	546	t	+	-	-	-	-
N. H.	705	-	-	-	-	-	-
Vt.	3,[illegible]43	-	-	-	-	-	-
Mass.	2,160	1	22	t	+	t	+
R. I.	432	-	-	-	-	-	-
Conn.	2,700	3	[illegible]4	-	-	0.5	14
N. Y.	23,450	0.5	120	t	+	2	481
N. J.	8,643	2.5	229	-	-	2.5	229
Pa.	57,154	5.5	4,046	t	+	4	2,942
Del.	4,[illegible]73	1	45	-	-	0.5	22
Md.	22,049	1.5	401	t	+	9	2,405
Va.	46,585	2	1,013	t	+	3	1,519
W. Va.	16,467	1	172	-	-	2	343
N. C.	52,272	3.5	2,0[illegible]6	1	596	2.8	1,669
S. C.	22,103	15.	4,197	-	-	-	-
Ga.	55,346	-	-	0	0	-	-
Fla.	7,714	t	0	0	0	-	-
Ohio	145,436	2	3,422	t	+	3.	5,133
Ind.	170,528	0.5	959	0.5	959	6.	11,509
Ill.	310,970	1	3,873	t	+	2.2	8,520
Mich.	54,162	3	1,776	t	+	2.5	1,480
Wis.	73,106	0.5	379	t	+	3	2,275
Minn.	147,662	1	1,554	0	0	1	1,554
Iowa	413,586	5	234,499	t	+	t	+
Mo.*	174,189	3	7,25[illegible]	0	0	*	*
N. Dak.	13,162	.5	966	t	+	t	+
S. Dak.	79,794	1	907	0	0	4	3,627
Nebr.	139,407	-	-	t	+	-	-
Kans.	57,290	3	2,096	t	+	1	699
Ky.	1[illegible]1,277	-	-	-	-	-	-
Tenn.	[illegible]5,222	5	6,0[illegible]7	-	-	15.	18,262
Ala.	45,765	0.1	49	-	-	4.	1,950
Miss.	36,[illegible]26	0.5	218	2	872	5	2,179
La.	19,722	t	+	1	238	5	1,188
Texas	10[illegible],[illegible]63	1	1,079	t	+	-	-
Okla.	61,173	-	-	-	-	-	-
Ark.	41,533	3	1,369	t	+	0	0
Mont.	3,549	t	+	0	0	2	81
Wyo.	3,940	-	-	0	0	-	-
Colo.	10,472	1	106	0	0	0	0
N. Mex.	4,420	-	-	0	0	-	-
Ariz.	1,120	4	47	0	0	0	0
Utah	432	-	-	0	0	-	-
Nev.	48	-	-	0	0	-	-
Idaho	2,706	t	+	0	0	t	+
Wash.	1,715	t	+	0	0	0	0
Oregon	2,475	0	0	0	0	-	-
Calif.	2,[illegible]10	1[illegible].	27[illegible]	t	+	-	-
U. S.	2,645,[illegible]31	2.3	63,35[illegible]	0.1	2,665	2.2	63,081

* Missouri - root and ear rots together caused a loss of 25 per cent.

Estimated reduction in yield of corn due to ear rots, (*Fusarium* sp.) and other diseases, 1926.

State	Estimated reduction in yield due to diseases							
	Ear rots		Other diseases		Sum of traces and no data		All Diseases	
	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
Me.	-	-	-	-	-	-	-	-
N. H.	-	-	-	-	-	-	-	-
Vt.	-	-	-	-	-	-	-	-
Mass.	t	+	t	+	2.	45	3.	67
R. I.	-	-	-	-	-	-	-	-
Conn.	0.5	14	-	-	-	-	4.	112
N. Y.	t	+	-	-	-	-	2.5	601
N. J.	0.5	46	-	-	-	-	5.5	504
Pa.	10.	7,356	2.8	2,060	-	-	22.3	16,404
Del.	2.5	111	-	-	-	-	4	178
Md.	7	1,871	t	+	-	-	17.5	4,677
Va.	3	1,519	0	0	-	-	8	4,051
W. Va.	1	172	t	+	-	-	4.	687
N. C.	5	2,930	t	+	-	-	12.3	7,331
S. C.	5	1,399	1.	280	-	-	21.	5,876
Ga.	6	3,571	1.	595	-	-	7.	4,166
Fla.	-	-	-	-	-	-	-	-
Ohio	5	8,555	5.	8,555	t	+	15.	25,665
Ind.	4.1	7,865	-	-	-	-	11.1	21,292
Ill.	12.5	48,408	4.	15,490	t	+	19.7	76,291
Mich.	3	1,776	-	-	-	-	8.5	5,032
Wis.	t	+	t	+	0.1	76	3.6	2,730
Minn.	3	4,663	t	+	t	+	5.	7,771
Iowa	5	23,499	2.	9,400	-	-	12.	56,398
Mo.	25.*	60,482	t	+	t	+	28.	67,740
N. Dak.	t	+	1.	193	-	-	6.	1,159
S. Dak.	5.	4,534	2.	1,814	0	0	12.	10,882
Nebr.	-	-	-	-	-	-	-	-
Kans.	2.	1,398	12.	8,385	t	+	18.	12,578
Ky.	-	-	-	-	-	-	-	-
Tenn.	10.	12,175	-	-	-	-	30.	36,524
Ala.	1.5	731	0.5	244	-	-	6.1	2,974
Miss.	5.	2,179	3.	1,307	0	0	15.5	6,755
La.	10.	2,376	1	238	t	+	17.	4,040
Texas	-	-	-	-	-	-	1.	1,079
Okla.	-	-	-	-	-	-	-	-
Ark.	4.	1,826	2.	913	t	+	9.	4,108
Mont.	0	0	0	0	t	+	2.	81
Wyo.	-	-	-	-	-	-	-	-
Colo.	0	0	-	-	-	-	1.	106
N. Mex.	-	-	-	-	-	-	-	-
Ariz.	0	0	0	0	0	0	4.	47
Utah	-	-	-	-	-	-	-	-
Nev.	-	-	-	-	-	-	-	-
Idaho	t	+	t	+	0.5	14	0.5	14
Wash.	0	0	t	+	-	-	-	-
Oregon	-	-	t	+	-	-	-	-
Calif.	-	-	-	-	-	-	10.	279
U. S.	6.6	199,506	1.6	494,474	t	135	12.8	383,199

POTATO

Estimated reduction in yield of potato due to mosaic, leaf roll, late blight (*Phytophthora infestans*), rhizoctonia (*Rhizoctonia solani*), blackleg (*Bacillus phytophthorus*), and fusarium wilt (*Fusarium oxysporum*), 1926.

State	Production 1926 Bushels (000 omitted)	Mosaic %	Mosaic Bushels (000 omitted)	Leaf roll %	Leaf roll Bushels (000 omitted)	Late blight %	Late blight Bushels (000 omitted)	Rhizoctonia %	Rhizoctonia Bushels (000 omitted)	Blackleg %	Blackleg Bushels (000 omitted)	Fusarium wilt %	Fusarium wilt Bushels (000 omitted)
Me.	36,830	2.	867	1.	433	7.	3,033	-	-	-	-	-	-
N. H.	1,815	10.	236	5.	118	3.	71	-	-	-	-	-	-
Vt.	3,100	-	-	-	-	-	-	-	-	-	-	-	-
Mass.	2,015	-	-	-	-	-	-	-	-	-	-	-	-
R. I.	450	-	-	-	-	-	-	-	-	-	-	-	-
Conn.	2,170	0.5	11	0.5	11	1.5	34	0.5	11	-	-	-	-
N. Y.	29,016	3.	1,313	3	1,313	25.	10,341	0.5	219	0.2	88	-	-
N. J.	7,250	3.2	315	5.5	542	t	+	3.5	345	0.2	20	-	-
Pa.	22,176	t	+	t	+	20.	6,336	t	+	t	+	t	-
Del.	516	0.5	4	0.5	4	0	0	-	-	-	-	-	-
Md.	3,690	8.	388	2.	97	4.	194	4.	194	1.	49	1.	49
Va.	11,658	t	+	-	-	0.	0	1.	131	-	-	3.	393
W. Va.	4,982	t	+	t	+	t	+	t	+	t	+	-	-
N. C.	7,400	3.	262	1.	87	1.	87	2.	175	1.5	131	t	+
S. C.	3,219	t	+	-	-	-	-	3.	100	-	-	-	-
Ga.	1,197	10.	136	2.	27	0	0	-	-	-	-	-	-
Fla.	2,832	t	+	0	0	10.	315	0.1	3	t	+	-	-
Ohio	10,058	2.	260	5	649	7	908	t	+	-	-	t	+
Ind.	3,840	2.	86	4	173	t	+	-	-	-	-	-	-
Ill.	5,440	-	-	-	-	0	0	-	-	-	-	-	-
Mich.	29,880	1.	314	1.	314	t	+	0.25	78	1.	314	1.	314
Wis.	27,140	t	+	0	0	15.	4,905	1	327	t	+	t	+

State	Production: 1926 Bushels (000 omitted)	Estimated reduction in yield due to disease: Mosaic %	Mosaic Bushels (000 omitted)	Leaf roll %	Leaf roll Bushels (000 omitted)	Late blight %	Late blight Bushels (000 omitted)	Rhizoctonia %	Rhizoctonia Bushels (000 omitted)	Blackleg %	Blackleg Bushels (000 omitted)	Fusarium wilt %	Fusarium wilt Bushels (000 omitted)
Minn.	29,800	1.	387	t	+	t	+	4.	1,548	3.	1,161	-	-
Iowa	6,083	2.	127	-	-	-	-	1.	63	1.	63	-	-
Mo.	6,480	t	+	0	0	0	0	10.	[illegible]	7.	621	t	+
N. Dak.	7,520	1.	84	t	+	0	0	3.5	202	[illegible]	167	1.5	125
S. Dak.	3,500	-	-	-	-	0	0	2.	[illegible]	1.	[illegible]	-	-
Nebr.	5,329	-	-	-	-	0	0	-	-	-	-	-	-
Kans.	3,913	t	+	-	-	0	0	7.	340	3.	146	-	-
Ky.	[illegible],512	7.	509	7.	509	0	0	7.	509	0	0	-	-
Tenn.	2,730	5.	154	1.	31	0	0	-	-	-	-	-	-
Ala.	2,030	-	-	-	-	0	0	-	-	-	-	-	-
Miss.	852	10.	100	t	+	0	0	t	+	t	+	t	+
La.	2,196	10.	258	t	+	0	0	1.	26	t	+	t	+
Texas	2,100	1.	24	0	0	0	0	-	-	-	-	1.	24
Okla.	2,836	-	-	-	-	0	0	-	-	-	-	-	-
Ark.	1,920	15.	379	3.	76	0	0	t	+	-	-	-	-
Mont.	2,975	15.	553	0.5	19	0	0	1.	37	0.5	19	3.	112
Wyo.	1,456	-	-	-	-	0	0	-	-	-	-	-	-
Colo.	11,750	-	-	0	0	0	0	-	-	-	-	-	-
N. Mex.	166	-	-	-	-	0	0	-	-	-	-	-	-
Ariz.	220	t	+	t	+	0	0	15.	45	2.5	[illegible]	t	+
Utah	2,461	-	-	-	-	0	0	-	-	-	-	-	-
Nev.	700	-	-	-	-	0	0	-	-	-	-	-	-
Idaho	16,19[illegible]	8.	1,520	2.	380	0	0	2.	380	.75	143	-	-
Wash.	10,720	10.	1,276	2.	255	t	+	2.	255	t	+	t	+
Oregon	4,500	[illegible]	477	0.5	30	3.	17[illegible]	[illegible]	536	0.5	30	0	0
Calif.	6,323	3.	[illegible]	8.	774	0.1	10	2.	[illegible]	t	+	1.	7
U. S.	[illegible]6,360	2.4	10,3[illegible]	1.3	5,842	6.2	27,013	1.6	6,774	[illegible].7	2,[illegible]	0.2	1,114

406

POTATO (continued)

Estimated reduction in yield of potato due to tipburn and hopperburn, early blight (Alternaria solani), and other diseases, 1926.

State	Production 1926 Bushels (000 omitted)	Tipburn and hopperburn %	Tipburn and hopperburn Bushels (000 omitted)	Early blight %	Early blight Bushels (000 omitted)	Other diseases %	Other diseases Bushels (000 omitted)	Sum of traces and no data %	Sum of traces and no data Bushels (000 omitted)	All diseases %	All diseases Bushels (000 omitted)
				Estimated reduction in yield due to disease							
Me.	36,830	2.	867	-	-	-	-	3.	1,300	15.	6,500
N. H.	1,815	5.	118	-	-	-	-	-	-	23.	543
Vt.	3,100	-	-	-	-	-	-	-	-	-	-
Mass.	2,015	-	-	-	-	-	-	-	-	-	-
R. I.	450	-	-	-	-	-	-	-	-	-	-
Conn.	2,170	0.5	11	-	-	-	-	0.5	11	4.	[illegible]
N. Y.	29,016	2.	875	-	-	-	-	-	-	33.7	14,749
N. J.	7,250	7.	690	0.2	20	6.8	670	-	-	26.4	2,602
Pa.	22,176	t	+	t	+	-	-	10.	3,169	30.	9,504
Del.	516	25.	131	1.5	11	1.	7	-	-	28.5	207
Md.	3,690	1	49	1.	49	2.	97	0	0	24.	1,166
Va.	11,658	5	655	1.	131	1.	131	-	-	11.	1,441
W. Va.	4,982	25.	1,683	t	+	t	+	1.	67	26.	1,750
N. C.	7,400	2.3	245	1.	87	3.	262	t	+	15.3	[illegible]
S. C.	[illegible]	-	-	-	-	-	-	-	-	3	100
Ga.	1,197	-	-	-	-	-	-	-	-	12.	164
Fla.	2,832	-	-	-	-	-	-	-	-	10.1	[illegible]
Ohio	10,098	7.	908	1.5	195	-	-	-	-	22.5	[illegible]
Ind.	3,940	-	-	-	-	5.	216	-	-	11.	[illegible]
Ill.	5,440	-	-	-	-	-	-	-	-	-	-
Mich.	29,830	-	-	0.5	157	-	-	-	-	4.75	1,491
Wis.	27,140	t	+	t	+	t	+	1.	327	17.	5,550

State	Production 1926 Bushels (000 omitted)	Tipburn and hopperburn %	Tipburn and hopperburn Bushels (000 omitted)	Early blight %	Early blight Bushels (000 omitted)	Other diseases %	Other diseases Bushels (000 omitted)	Sum of traces and no data %	Sum of traces and no data Bushels (000 omitted)	All diseases %	All diseases Bushels (000 omitted)
		Estimated reduction in yield due to disease									
Minn.	29,800	15.	5,805	t	+	-	-	-	-	27.	8,901
Iowa	6,083	-	-	-	-	-	-	-	-	4.	253
Mo.	6,480	t	+	t	+	10.	383	-	-	27.	2,317
N. Dak.	7,520	1.5	125	0.5	42	t	+	-	-	10.	835
S. Dak.	3,300	10.	393	1.	39	2.	79	-	-	16.	629
Nebr.	5,320	-	-	-	-	-	-	-	-	-	-
Kans.	3,913	t	+	t	+	7.5	365	2.	97	13.5	648
Ky.	4,512	10.	722	7.	509	-	-	-	-	37.	2,764
Tenn.	2,730	5.	154	0.5	15	0.1	3	-	-	11.6	357
Ala.	2,030	-	-	-	-	-	-	-	-	-	-
Miss.	852	t	+	1.	10	2.	20	2.	20	15.	150
La.	2,196	t	+	1.	26	3.	73	-	-	15.	388
Texas	2,100	1.	24	-	-	10.5	255	-	-	13.5	327
Okla.	2,333	-	-	-	-	-	-	-	-	-	-
Ark.	1,920	5.	126	t	-	1.	25	-	-	24.	606
Mont.	2,975	0	0	0	0	-	-	-	-	20.	745
Wyo.	1,456	-	-	-	-	-	-	-	-	-	-
Colo.	11,760	-	-	-	-	-	-	-	-	-	-
N. Mex.	166	-	-	-	-	-	-	-	-	-	-
Ariz.	220	0	0	1.5	5	8.	24	-	-	27.	82
Utah	2,465	-	-	-	-	-	-	-	-	-	-
Nev.	700	-	-	-	-	-	-	-	-	-	-
Idaho	16,198	0	0	0	0	2.	380	-	-	14.75	2,837
Wash.	10,720	0	0	0	0	2.	255	-	-	16.	2,041
Oregon	4,500	t	+	t	+	3.	179	0.5	30	24.5	1,161
Calif.	5,923	-	-	-	-	14.3	1,305	-	-	28.4	2,747
U. S.	356,360	4.1	15,637	0.3	1,296	1.2	5,517	1.2	5,020	13.2	[illegible]

Estimated reduction in yield of sweet potato due to stem rot (Fusarium hyperoxysporum and F. batatatis), black rot (Sphaeronema fimbriatum), pox (Cystospora batata), other diseases and storage rots. 1926.

State	Production: 1926 Bushels (000 omitted)	Stem rot %	Stem rot Bushels (000 omitted)	Black rot %	Black rot Bushels (000 omitted)	Pox %	Pox Bushels (000 omitted)	Other diseases %	Other diseases Bushels (000 omitted)	All diseases %	All diseases Bushels (000 omitted)	Storage rots %	Storage rots Bushels (000 omitted)
N. J.	2,465	15.	447	0.2	6	2.	60	-	-	17.2	513	-	-
Pa.*	110	-	-	-	-	-	-	-	-	-	-	-	-
Del.	1,251	3.	39	0.5	7	0.5	7	0.5	7	4.5	60	2.	25
Md.	1,815	3.	57	1.	19	0.5	10	0.5	10	5	96	10.	132
Va.	5,375	3.	158	1.	56	t	+	t	+	4.	224	5.	269
W. Va.*	330	-	-	-	-	-	-	-	-	-	-	-	-
N. C.	7,560	5.	413	2.	165	t	+	1.5	124	8.5	702	15.	1,134
S. C.	4,160	t	+	1.	42	-	-	1.	42	2.	84	8.	333
Ga.*	9,460	3.	294	0.5	49	-	-	t	+	3.5	343	12.	1,135
Fla.*	2,800	-	-	-	-	-	-	-	-	-	-	-	-
Ohio*	315	-	-	-	-	-	-	-	-	-	-	-	-
Ind.	330	4.	14	-	-	-	-	-	-	4.	14	-	-
Ill.*	1,430	-	-	-	-	-	-	-	-	-	-	-	-
Iowa	309	8.	27	2.	7	-	-	-	-	10.	34	-	-
Mo.	1,120	10.	124	t	+	0	0	t	+	10.	124	-	-
Kans.	516	6.	34	0.5	3	3.	17	t	+	9.5	54	3.	15
Ky.	2,040	-	-	15.	360	-	-	-	-	15.	360	30.	612
Tenn.	5,535	5.	315	7.	440	-	-	-	-	12.	755	2.	111
Ala.	6,500	4.	280	3.	210	-	-	t	+	7.	490	10.	650
Miss.	6,240	1.	68	5.	339	-	-	2.	136	8.	543	10.	624
La.	7,110	t	+	1.	72	t	+	-	-	1.	72	15.	1,067
Texas	8,556	-	-	3.	273	-	-	3.	273	6.	546	20.	1,711
Okla.*	2,520	-	-	-	-	-	-	-	-	-	-	-	-
Ark.	4,212	3.	137	4.	183	-	-	1.	46	8.	366	30.	1,264
N. Mex.*	135	-	-	-	-	-	-	-	-	-	-	-	-
Ariz.	300	t	+	1.5	5	0	0	6.	19	7.5	24	11.	33
Wash.	-	3.	+	5.	+	-	-	10.	+	13.	+	5.	+
Calif.	1,164	2.	24	2.	24	-	-	-	-	4.	48	3.	35
U.S.	85,658	3.	2,441	2.3	2,260	0.1	94	0.3	657	6.7	5,452	10.3	9,200

* omitted in calculating percentage loss for country.

TOMATO

Estimated percentage reduction in yield of tomatoes due to blight (*Septoria lycopersici*), fusarium wilt (*Fusarium lycopersici*), bacterial wilt (*Bacillus solanacearum*), early blight (*Alternaria solani*) and other diseases, 1926. (Production figures not available.)

State	Estimated reduction in yield due to disease						
	Blight	Fusarium wilt	Bacterial wilt	Early blight	Other diseases	Sum of traces & no data	All diseases
Conn.	1	-	-	-	-	0.5	1.5
N. Y.	t	t	t	t	-	-	t
N. J.	8.	4.5	-	1.	5.	-	18.5
Pa.	t	-	-	-	-	5.	5
Del.	2.	t	-	5.	3.	0	10.
Md.	5.	4.	0.5	6.	6.5	0	22.
Va.	1.	3.	-	5.	3	0	12.
W. Va.	1	t	t	1.	1	1	4
N. C.	2	6.	2.5	t	2	0	12.5
S. C.	t	15.	-	t	3	-	18
Ga.	4	4	-	10.	-	-	18
Ohio	-	1	-	-	3	-	4
Ind.	2	2	-	3	3	0	10
Mich.	3	t	0	t	1	1	5
Wis.	5	t	0	t	t	1	6
Minn.	t	t	0	t	5	-	5
Iowa	12.	t	0	-	-	-	12
Mo.	2.	5.	0	t	10.	0	17
N. Dak.	-	t	0	-	0.75	-	0.75
S. Dak.	1.	-	0	1	2	0	4
Kans.	3	10.	0	-	3	0	16
Ky.	-	-	-	-	-	-	50
Tenn.	20	10	-	-	5	0	35
Ala.	0.5	-	1	-	-	-	1.5
Miss.	t	15.	t	2	2	0	19
La.	0	20	2	5	15	0	42
Texas	2	2	-	1.5	10	0	15.5
Ark.	t	10	-	t	1	0	11
Ariz.	0	14	5	0	30	-	49
Idaho	0	0	0	-	55	0	55
Wash.	0	0	0	0	75	0	75
Oregon	0	0	0	0	90	t	90
Calif.	-	0.3	-	t	10	-	10.3

COTTON

Estimated reduction in yield of cotton due to anthracnose (*Colletotrichum gossypii*), angular leafspot (*Bacterium malvacearum*), wilt (*Fusarium vasinfectum*), rootknot (*Heterodera radicicola*), and other diseases, 1926.

State	Production 1926 Bales (000 omitted)	Anthracnose %	Anthracnose Bales (000 omitted)	Angular leafspot %	Angular leafspot Bales (000 omitted)	Wilt %	Wilt Bales (000 omitted)	Rootknot %	Rootknot Bales (000 omitted)	Other diseases %	Other diseases Bales (000 omitted)	Sum of traces and no data %	Sum of traces and no data Bales (000 omitted)	All Diseases %	All Diseases Bales (000 omitted)
Va.	55	2.	1	t	+	-	-	-	-	t	+	1.	+	3.	1
N. C.	1,250	1.6	22	1.5	21	2.2	30	1.5	21	2.	27	0	0	8.8	121
S. C.	1,030	-	-	1	11	5	55	-	-	1	11	0	0	7	77
Ga.	1,475	-	-	2	32	3	49	2	32	-	-	2.	32	9	145
Fla.	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ill.	-	0	0	t	+	0	0	0	0	1	+	t	+	1	+
Mo.	255	0	0	t	+	t	+	t	+	t	+	0.5	1	0.5	1
Tenn.	475	5	25	1	5	-	-	-	-	-	-	-	-	6	30
Ala.	1,490	3	48	1.5	24	-	-	-	-	-	-	2.5	40	7	112
Miss.	1,930	2	42	1	21	3	64	1	21	2	42	0	0	9	190
La.	820	1	9	1	9	1	9	0	0	2	17	0	0	5	44
Texas	5,900	0.5	41	5	410	1	82	0.5	41	21	1,721	0	0	28.	2,295
Okla.	1,950	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ark.	1,620	t	+	1.5	27	3	55	2	37	5	92	0	0	11.5	211
N. Mex.	72	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ariz.	115	0	0	1	1	t	+	t	+	19.5	28	0	0	20.5	29
Calif.	128	-	-	-	-	-	-	-	-	-	-	-	-	-	-
All others	20														
U. S.	17,618	0.8	138	2.6	561	1.6	344	0.7	152	8.9	1,938	0.3	73	14.9	3,256

BEAN

Estimated percentage reduction in yield of beans due to anthracnose (Colletotrichum lindemuthianum), bacterial blight (Bacterium phaseoli) mosaic, rootrots (Fusarium spp.) and other diseases, 1926. (Production figures are for dry beans)

State	Production (dry beans) 1926	Estimated reduction in yield due to disease													
		Anthracnose		Bacterial blight		Mosaic		Rootrots		Other diseases		Sum of traces and no data		All diseases	
	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
Me. *	85	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vt. *	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conn.				1				-		-		1		2	
N. Y.	1,145	3.5	44	-	-	-	-	-	-	-	-	5	63	8.5	107
Del.		0.5		t						0.5		-		1	
Md.		2		1.5		t		-		1				4.5	
Va.		1		1		t		t		1				3	
W. Va.		t		t		t		t		t		2		2	
S. C.		3		-		-		-		-		-		3	
Ga.		0.5												0.5	
Fla						t								-	
Ind.		-		4		4								8	
Ill.															
Mich.	6,624	0.5	35	3	210	2	140	-	-	t	+	-	-	5.5	385
Wis.	68	t	+	1	1	t	+	t	+	t	+	1	1	2	2
Minn.	34	t	+	1	1	5	4	-	-	t	+			6	5

BEAN (continued)

State	Production (dry beans) 1926 Bushels (000 omitted)	Anthracnose %	Anthracnose Bushels (000 omitted)	Bacterial blight %	Bacterial blight Bushels (000 omitted)	Mosaic %	Mosaic Bushels (000 omitted)	Rootrots %	Rootrots Bushels (000 omitted)	Other diseases %	Other diseases Bushels (000 omitted)	Sum of traces and no data %	Sum of traces and no data Bushels (000 omitted)	All diseases %	All diseases Bushels (000 omitted)
			Estimated reduction in yield due to disease												
Iowa		t				6								6	
Mo.		t		0		0		0		-				t	
N. Dak.		-		-		t		-		t				t	
Nebr.*	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kans.		t				t								t	
Tenn.		0.5		0.5		0.1		0.2		0.5				1.8	
Miss.		1		1		3		3		1				9	
La.		1		4		t		4		1				10	
Texas		0		1.5		-		-		3.5				10.	
Ark.		t		t		-		-		1.				1.	
Mont.	410	0.1	+	.3	14	6	28	2	9	-	-	-	-	11.1	51
Wyo.*	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Colo.*	1,036	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N. Mex.*	838	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ariz.	56	0	0	t	+	1	1	1	1	1	1	t	+	3	3
Idaho	994	-	-	-	-	5	54	2	21	-	-	-	-	7	75
Wash.		0		0		6		-		2				8	
Ore.		0		0		5		0.5		40				45.5	
Calif.	5,460	-	-	-	+	.02	1	0.3	17	5.2	301	-	-	5.52	319
U. S.	17,138	0.5	79	1.4	226	1.4	223	0.3	48	1.9	302	0.4	64	5.9	947

* = States from which no estimates were received omitted in calculating percentage loss for country

Estimated reduction in yield of grape due to blackrot, (*Guignardia bidwelli*), and other diseases, 1926.

State	Production 1926	Blackrot		Other diseases		Sum of traces and no data		All Diseases	
	Tons	%	Tons	%	Tons	%	Tons	%	Tons
Me.*	49	-	-	-	-	-	-	-	-
N. H. *	96	-	-	-	-	-	-	-	-
Vt. *	36	-	-	-	-	-	-	-	-
Mass.*	616	-	-	-	-	-	-	-	-
R. I. *	212	-	-	-	-	-	-	-	-
Conn.	1,275	-	-	1	13	0.5	6	1.5	19
N. Y. *	106,700	-	-	-	-	-	-	-	-
N. J. *	2,820	-	-	-	-	-	-	-	-
Pa. *	25,110	-	-	-	-	-	-	-	-
Del.	1,536	2.	31	-	-	-	-	2.	31
Md.	1,330	12.	157	5.5	87	0	0	15.5	244
Va.	2,790	9	279	1	31	0	0	10.	310
W. Va.	1,696	1	17	1	17	0	0	2.	34
N. C.	6,940	4	291	2	146	0	0	6	437
S. C.	1,785	3	56	1	19	0	0	4	75
Ga. *	1,[illegible]92	-	-	-	-	-	-	-	-
Fla. *	700	-	-	-	-	-	-	-	-
Ohio	29,100	3	900	-	-	-	-	3	900
Ind. *	4,606	-	-	-	-	-	-	-	-
Ill.	6,572	t	+	t	+	-	-	-	-
Mich.	60,900	t	+	2	1,243	t	+	2	1,243
Wis.	409	1	4	1	4	0	0	2	8
Minn.	85	-	-	t	+	-	-	-	-
Iowa	6,052	-	-	t	+	-	-	-	-
Mo.	12,880	t	+	t	+	t	+	t	+
Nebr. *	1,534	-	-	-	-	-	-	-	-
Kans.	3,700	1	38	1	38	0	0	2	76
Ky.*	1,274	-	-	-	-	-	-	-	-
Tenn.	1,672	10	186	-	-	-	-	10	186
Ala. *	913	-	-	-	-	-	-	-	-
Miss.	300	3	9	2	6	0	0	5	15
La. *	42	-	-	-	-	-	-	-	-
Texas	1,200	3	39	5.5	72	0	0	8.5	111
Okla.*	1,300	-	-	-	-	-	-	-	-
Ark.	13,000	3	406	1	135	0	0	4.	541
Colo.*	320	0	0	-	-	-	-	-	-
N. Mex.*	531	0	0	-	-	-	-	-	-
Ariz.	604	0	0	2.5	15	0	0	2.5	15
Utah*	1,300	0	0	-	-	-	-	-	-
Nev. *	230	0	0	-	-	-	-	-	-
Idaho*	300	0	0	-	-	-	-	-	-
Wash.	2,500	0	0	2	51	0	0	2	51
Oregon	1,800	0	0	t	+	t	+	t	+
Calif.	2,040,000	0	0	1.5	31,066	0	0	1.5	31,066
U. S.	2,749,117	0.1	2,415	1.5	32,143	t	6	1.6	35,562

* = Omitted from calculations for U. S. percentage loss

Estimated reduction in yield of apple due to bitter rot (Glomerella cingulata), blackrot (Physalospora cydoniae), blotch (Phyllosticta solitaria), and cedar rust (Gymnosporangium), 1926.

State	Production 1926 Bushels (000 omitted)	Estimated reduction in yield due to disease: Bitter rot %	Bitter rot Bushels (000 omitted)	Blackrot %	Blackrot Bushels (000 omitted)	Blotch %	Blotch Bushels (000 omitted)	Cedar rust %	Cedar rust Bushels (000 omitted)
Me.	2,260	-	-	-	-	-	-	-	-
N. H.	1,240	-	-	-	-	-	-	-	-
Vt.	800	-	-	-	-	-	-	-	-
Mass.	4,100	-	-	-	-	-	-	-	-
R. I.	391	-	-	-	-	-	-	-	-
Conn.	1,900	0	0	1.5	30	-	-	1.	20
N. Y.	40,375	-	-	-	-	-	-	-	-
N. J.	4,310	t	+	-	-	0.5	24	-	-
Pa.	17,000	-	-	1	189	-	-	-	-
Del.	2,376	0.5	12	t	+	t	+	t	+
Md.	3,500	2	85	5.	212	1.	42	.25	11
Va.	19,902	0.5	121	1.5	364	t	+	3.	728
W. Va.	10,875	t	+	t	+	t	+	1	114
N. C.	5,986	3.5	269	2	153	3.5	269	2	153
S. C.	647	2	14	-	-	-	-	t	+
Ga.	1,827	-	-	-	-	t	+	-	-
Ohio	11,900	2	263	2.5	329	1.5	197	0.1	13
Ind.	4,100	1	45	1	45	1.5	68	-	-
Ill.	8,875	t	+	t	+	1	95	1	95
Mich.	9,045	-	-	1	102	-	-	t	+
Wis.	2,158	0	0	0	0	t	+	t	+
Minn.	1,263	0	0	t	+	0	0	t	+
Iowa	3,652	-	-	3	144	t	+	2	96
Mo.	5,015	t	+	t	+	15.	1,157	t	+
S. Dak.	169	t	+	-	-	t	+	1	2
Nebr.	761	-	-	-	-	-	-	-	-
Kans.	1,428	t	+	t	+	4	62	2	31
Ky.	6,408	-	-	-	-	-	-	-	-
Tenn.	5,360	5	320	0.1	6	5	320	0.1	6
Ala.	1,328	1	15	0.75	11	3.5	51	t	+
Miss.	324	1	4	-	-	1	4	t	+
La.	35	-	-	-	-	-	-	-	-
Texas	380	t	+	t	+	1	5	-	-
Okla.	770	-	-	-	-	-	-	-	-
Ark.	[illegible],450	t	+	2	77	1	39	2	77
Mont.	325	0	0	0	0	0	0	0	0
Wyo.	47	-	-	-	-	-	-	-	-
Colo.	3,444	-	-	-	-	-	-	-	-
N. Mex.	1,147	-	-	-	-	-	-	-	-
Ariz.	112	0	0	0	0	0	0	0	0
Utah	817	-	-	-	-	-	-	-	-
Nev.	42	-	-	-	-	-	-	-	-
Ida.	4,200	0	0	0	0	0	0	0	0
Wash.	34,030	0	0	0	0	0	0	0	0
Ore.	[illegible],036	0	0	0	0	0	0	0	0
Calif.	10,360	0	0	0	0	0	0	0	0
U. S.	246,460	0.5	1,148	0.7	1,662	0.9	2,333	0.5	1,346

Estimated reduction in yield of apple due to fireblight (*Bacillus amylovorus*, scab (*Venturia inaequalis*), and other diseases, 1926.

State	Fireblight %	Fireblight Bushels (000 omitted)	Scab %	Scab Bushels (000 omitted)	Other diseases %	Other diseases Bushels (000 omitted)	Sum of traces and no data %	Sum of traces and no data Bushels (000 omitted)	All diseases %	All diseases Bushels (000 omitted)
Me.	-	-	5	119	-	-	-	-	5	119
N. H.	t	+	-	-	-	-	-	-	-	-
Vt.	-	-	-	-	-	-	-	-	-	-
Mass.	-	-	-	-	-	-	-	-	-	-
R. I.	-	-	-	-	-	-	-	-	-	-
Conn.	0.5	10	-	-	1.	20	-	-	4.	80
N. Y.	t	+	3	1,262	-	-	1	421	4	1,683
N. J.	-	-	6	291	4.5	218	-	-	11.	533
Pa.	t	+	3	567	2	378	4	756	10	1,890
Del.	0.5	12	0.5	12	2	49	-	-	3.5	85
Md.	4	170	2.5	106	2.75	117	0	0	17.5	743
Va.	t	+	2	485	11.	2,670	0	0	18	4,368
W. Va.	1	114	t	+	1	114	2	229	5	571
N. C.	3.5	269	6	460	1.5	115	0	0	22	1,628
S. C.	2	14	-	-	2	14	-	-	6	42
Ga.	-	-	-	-	-	-	-	-	-	-
Ohio	1	132	1	132	1.5	197	0	0	9.6	1,263
Ind.	5	225	0.5	23	-	-	-	-	9	406
Ill.	2	191	1	95	1.9	181	-	-	6.9	657
Mich.	5	508	5	508	-	-	-	-	11.	1,118
Wis.	2	47	5	117	t	+	0.5	12	7.5	176
Minn.	3	40	t	+	1	13	1	13	5	66
Iowa	3	144	16	769	-	-	-	-	24	1,153
Mo.	15.	1,157	t	+	5	386	-	-	35	2,700
S. Dak.	3	6	5	10	3	6	-	-	12	24
Neb.	-	-	t	+	-	-	-	-	-	-
Kans.	1	16	t	+	1	16	-	-	8	125
Ky.	-	-	-	-	-	-	-	-	-	-
Tenn.	1	64	-	-	5	320	-	-	16.2	1,036
Ala.	1.5	22	2	29	-	-	-	-	8.75	128
Miss.	6	21	t	+	-	-	-	-	8	29
La.	-	-	-	-	-	-	-	-	-	-
Texas	3	14	-	-	13	60	-	-	17	79
Okla.	-	-	-	-	-	-	-	-	-	-
Ark.	3.5	135	t	+	2	77	-	-	10.5	405
Mont.	1	3	5	17	1	3	0	0	7	23
Wyo.	-	-	-	-	-	-	-	-	-	-
Colo.	-	-	-	-	-	-	-	-	-	-
N. Mex.	-	-	-	-	-	-	-	-	-	-
Ariz.	2	3	0	0	10	13	0	0	12	16
Utah	-	-	-	-	-	-	-	-	-	-
Nev.	-	-	-	-	-	-	-	-	-	-
Ida.	t	+	t	+	2	87	1	43	3	130
Wash.	t	+	t	+	10.	3,781	-	-	10	3,781
Ore.	t	+	2	183	10	913	t	+	12	1,096
Calif.	0.3	34	0.5	55	7	736	0	0	7.8	876
U. S.	1.3	3,351	2.1	5,241	4.2	10,534	0.6	1,474	10.8	27,089

PEACH

Estimated reduction in yield of peach due to leafcurl (Exoascus deformans), brownrot (Sclerotinia fructicola), yellows and little peach, scab (Cladosporium carpophilum) and other diseases, 1926.

State	Production: 1926 Bushels (000 omitted)	Leafcurl %	Leafcurl Bushels (000 omitted)	Brownrot %	Brownrot Bushels (000 omitted)	Yellows and little peach %	Yellows and little peach Bushels (000 omitted)	Scab %	Scab Bushels (000 omitted)	Other diseases %	Other diseases Bushels (000 omitted)	Sum of traces and no data %	Sum of traces and no data Bushels (000 omitted)	All diseases %	All diseases Bushels (000 omitted)
N. H.*	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mass.*	213	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R. I.*	37	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conn.	255	-	-	3	8	-	-	-	-	-	-	1	3	4	11
N. Y.	2,300	t	+	0.5	12	0.5	12	-	-	1	27	-	-	2	47
N. J.	3,000	t	+	5	160	-	-	0.5	16	0.5	16	-	-	6	192
Pa.	2,498	-	-	5	135	0.5	14	1	27	1	27	-	-	7.5	203
Del.	450	t	+	2	10	t	+	1.5	7	2	10	-	-	5.5	27
Md.	700	2	18	15.	133	2.	18	1	9	1	9	0	0	21.	187
Va.	1,176	0.5	6	1.5	18	t	+	0.5	6	1	12	t	+	3.5	42
W. Va.	1,000	t	+	3	32	t	+	1	11	t	+	1	11	5	54
N. C.	2,100	1.5	38	5	126	-	-	2	50	8	201	-	-	16.5	415
S. C.	1,054	-	-	1	11	0	0	-	-	-	-	6	63	7	79
Ga.*	9,400	t	+	-	-	-	-	-	-	-	-	-	-	-	-
Fla.*	125	-	-	-	-	0	0	-	-	-	-	-	-	-	-
Ohio	2,120	0	0	4	91	0.5	11	1	23	1	23	-	-	6.5	148
Ind.	900	1	9	2	19	-	-	-	-	2	19	-	-	5	47
Ill.	2,660	1	27	t	+	0	0	t	+	2	55	-	-	3	82
Mich.	1,564	t	+	10.	183	2	37	1	18	1.5	27	-	-	14.5	265
Iowa*	97	t	+	-	-	0	0	-	-	-	-	-		-	-

State	Production: 1926 Bushels (000 omitted)	Leafcurl %	Leafcurl Bushels (000 omitted)	Brownrot %	Brownrot Bushels (000 omitted)	Yellows and little peach %	Yellows and little peach Bushels (000 omitted)	Scab %	Scab Bushels (000 omitted)	Other Diseases %	Other Diseases Bushels (000 omitted)	Sum of traces and no data %	Sum of traces and no data Bushels (000 omitted)	All diseases %	All diseases Bushels (000 omitted)
Mo.	1,722	5	129	15.	386	0	0	10.	257	3	77	0	0	33	849
Nebr.*	50	-	-	-	-	0	0	-	-	-	-	-	-	-	-
Kans.	266	1	3	1	3	0	0	t	+	-	-	-	-	2	6
Ky.*	1,110	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tenn.	1,860	2	40	5	100	0	0	0.1	2	-	-	-	-	7.1	142
Ala.	1,159	1.5	20	8	106	0	0	2	27	1	13	0	0	12.5	166
Miss.	551	t	+	10.	65	0	0	-	-	5	32	-	-	15	97
La.	228	t	+	25.	82	0	0	5	16	t	+	-	-	30	98
Texas	2,310	0.5	15	t	+	0	0	15.	444	6.5	193	t	+	22	652
Okla.*	180	-	-	-	-	0	0	-	-	-	-	-	-	-	-
Ark.	2,400	2	52	6	157	-	-	t	+	t	+	-	-	8	209
Colo.*	976	0	0	-	-	θ	θ	-	-	-	-	-	-	-	-
N. Mex.*	131	-	-	-	-	0	0	-	-	-	-	-	-	-	-
Ariz.	91	0	0	0	0	0	0	0	0	5.1	5	0	0	5.1	5
Utah *	550	-	-	-	-	0	0	-	-	-	-	-	-	-	-
Nev.*	8	-	-	-	-	0	0	-	-	-	-	-	-	-	-
Idaho*	297	t	+	-	-	0	0	-	-	-	-	-	-	-	-
Wash.	1,222	t	+	t	+	0	0	0	0	5	64	-	-	5	64
Oregon	384	t	+	2	9	0	0	0	0	8	34	t	+	10.	43
Calif.	21,252	0.1	22	0.1	22	0	0	-	-	2.5	546	-	-	2.7	590
U. S.	68,425	0.6	579	3.1	1,368	0.2	92	1.5	913	2.3	1,386	0.1	82	7.8	4,720

*= Omitted in calculating percentage loss for country.

PEAR

Estimated reduction in yield of pear due to fireblight, (*Bacillus amylovorus*), scab (*Venturia pyrina*), leafblight (*Fabraea maculata*), and other diseases, 1926.

State	Production: 1926 Bushels (000 omitted)	Fireblight %	Fireblight Bushels (000 omitted)	Scab %	Scab Bushels (000 omitted)	Leafblight %	Leafblight Bushels (000 omitted)	Other diseases %	Other diseases Bushels (000 omitted)	Sum of traces and no data %	Sum of traces and no data Bushels (000 omitted)	All diseases %	All diseases Bushels (000 omitted)
Me.*	6	-	-	-	-	-	-	-	-	-	-	-	-
N. H.*	10	-	-	-	-	-	-	-	-	-	-	-	-
Vt.*	6	-	-	-	-	-	-	-	-	-	-	-	-
Mass.*	60	-	-	-	-	-	-	-	-	-	-	-	-
R. I.*	12	-	-	-	-	-	-	-	-	-	-	-	-
Conn.	57	2.	1	0.5	+	-	-	-	-	-	-	2.5	1
N. Y.*	2,038	-	-	-	-	-	-	-	-	-	-	-	-
N. J.	645	t	+	5	36	5	36	-	-	-	-	10.	72
Pa.	743	1	8	t	+	-	-	2	15	-	-	3	23
Del.	388	2	8	t	+	t	+	0.5	2	-	-	2.5	10
Md.	394	8	39	1	5	5	24	5	24	0	0	19.	92
Va.	410	1	4	t	+	-	-	1	4	-	-	2	8
W. Va.	100	1	1	t	+	t	+	t	+	1	1	2	2
N. C.	270	20.	68	-	-	-	-	-	-	-	-	20.	68
S. C.	133	-	-	-	-	-	-	-	-	11.	16	11.	16
Ga.*	257	-	-	-	-	-	-	-	-	-	-	-	-
Fla.*	66	-	-	-	-	-	-	-	-	-	-	-	-
Ohio	430	1.5	7	0.5	2	-	-	-	-	-	-	2.	9
Ind.*	328	-	-	-	-	-	-	-	-	-	-	-	-
Ill.	318	10	91	0	0	t	+	t	+	-	-	10.	91
Mich.	889	5	47	t	+	t	+	t	+	-	-	5	47
Wis.	17	t	+	1	+	0	0	t	+	0.5	+	1.5	+

State	Production 1926 Bushels (000 omitted)	Fireblight %	Fireblight Bushels (000 omitted)	Scab %	Scab Bushels (000 omitted)	Leafblight %	Leafblight Bushels (000 omitted)	Other disease %	Other disease Bushels (000 omitted)	Sum of traces and no data %	Sum of traces and no data Bushels (000 omitted)	All diseases %	All diseases Bushels (000 omitted)
Iowa	68	10	3	-	-	-	-	-	-	-	-	10.-	2
Mo.	473	15.	89	0	0	0	0	5	30	0	0	20.	119
S. D.	-	5	+	-	-	-	-	2	+	-	-	7	+
Nebr.*	29	-	-	-	-	-	-	-	-	-	-	-	-
Kans.	186	2	4	-	-	-	-	-	-	-	-	2	4
Ky.*	144	-	-	-	-	-	-	-	-	-	-	-	-
Tenn.	266	25.	95	0	0	2	8	3	11	0	0	30.	114
Ala.*	211	-	-	-	-	-	-	-	-	-	-	-	-
Miss.	189	50.	139	-	-	-	-	-	-	-	-	50	139
La.	71	75.	213	-	-	0	0	t	+	-	-	75	213
Texas	580	2	12	0	0	0	0	2	12	0	0	4	24
Okla.*	81	-	-	-	-	-	-	-	-	-	-	-	-
Ark.	116	30	50	-	-	t	+	t	+	-	-	30	50
Mont.*	3	-	-	-	-	-	-	-	-	-	-	-	-
Colo.*	564	0	0	-	-	-	-	-	-	-	-	-	-
N. Mex.*	42	-	-	-	-	-	-	-	-	-	-	-	-
Ariz.	15	3	1	0	0	0	0	2	+	0	0	5	1
Utah*	80	-	-	-	-	-	-	-	-	-	-	-	-
Nev.*	6	-	-	-	-	-	-	-	-	-	-	-	-
Idaho	69	t	+	-	-	-	-	-	-	-	-	-	-
Wash.	3,230	t	+	0	0	0	0	2	66	t	+	2	66
Oregon	2,100	t	+	1	21	0	0	t	+	-	-	1	21
Calif.	9,000	5.	431	1	96	-	-	0.5	4[illegible]	-	-	6.5	625
U. S.	15,174	6.0	1,416	0.7	160	0.3	68	0.9	212	0.1	17	[illegible].0	1,893

*= Omitted from calculations for U. S. percentage loss.

PLUM AND PRUNE

Estimated percentage reduction in yield of plum and prune due to brown-rot (Sclerotinia fructicola), and other diseases, 1926.

State	Estimated reduction in yield due to disease			
	Brownrot	Other diseases	Sum of traces and no data	All diseases
	%	%	%	%
Conn.	4	0.5	0	4.5
N. Y.	3	2	0	5
Pa.	4	-	-	4
Del.	1	1	0	2
Md.	7	2	0	9
Va.	3	1	0	4
W. Va.	-	-	-	-
N. C.	6	-	-	6
S. C.	-	t	-	t
Ohio	10	1	0	11
Ill.	5	t	t	5
Mich.	10	1	0	11
Wis.	6	t	t	6
Minn.	2.5	1	0	3.5
Mo.	25	t	t	25
N. D.	t	1	t	1
S. D.	1	5	0	6
Kans.	t	t	t	t
Tenn.	5	3	0	8
Texas	-	3.5	-	3.5
Ark.	5	1	0	6
Ariz.	0	1	0	1
Idaho	-	-	-	2
Wash.	t	5	t	5
Oregon	3	1	0	4

CHERRY

Estimated percentage reduction in yield of cherry due to brownrot (*Sclerotinia fructicola*), leafspot (*Coccomyces hiemalis*), and other diseases, 1926.

State	Estimated reduction in yield due to disease				
	Brownrot	Leafspot	Other diseases	Sum of traces and no data	All diseases
	%	%	%	%	%
Conn.	1.5	-	1	-	2.5
N. Y.	t	-	-	-	t
N. J.	5	-	-	-	5
Pa.	5	-	-	-	5
Del.	t	-	0.5	-	0.5
Md.	7	10	t	t	17
Va.	3	1	1	0	5
W. Va.	1	t	t	1	2
Ohio	0.5	-	-	-	0.5
Ill.	1	t	t	-	1
Mich.	3	2	1	0	6
Wis.	0.5	0.5	1	0	2
Iowa	t	1	3	t	4
Mo.	-	10	5	-	15
Kans.	t	t	t	1	1
Tenn.	5	1	-	-	6
Ark.	3	2	1	0	6
Mont.	0	1	3	0	4
Ariz.	0	0	1	0	1
Idaho	-	-	2	-	2
Wash.	t	0	4	t	4
Oregon	2	t	t	1	3
Calif.	1	-	1	-	2

RASPBERRY

Estimated reduction in yield of raspberry due to mosaic and leafcurl (cause unknown), and other diseases, 1926.

State	Estimated reduction in yield due to disease		
	Mosaic and Leafcurl	Other diseases	All diseases
	%	%	%
Me.	-	-	-
Conn.	4	1	5
N. Y.	15	1	16
Pa.	15	6	21
Del.	0.5	0.5	1
Md.	6	6	12
Va.	t	7	7
S. C.	-	t	t
Ohio	13	4	17
Ind.	-	6	6
Mich.	15	10	25
Wis.	5	5	10
Minn.	14.5	5	19.5
Iowa	t	-	t
Mo.	-	25	25
N. D.	2	1	3
S. D.	-	3	3
Kans.	t	8	8
Tenn.	-	1	1
Texas	0	0	0
Ark.	-	25	25
Ariz.	0	1	1
Wash.	5	10	15
Oregon	t	t	t

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Index to Supplements 52-56

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INDEX OF ORGANISMS AND NON-PARASITIC DISEASES
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SUPPLEMENTS LII--LVI, 1927

Plant Disease Reporter
Supplement 57 December 31, 1927

Prepared by Mary G. Van Meter and Rosella C. Loftus

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ERRATA AND EXPLANATION

Page

164. Read "Helminthosporium gramineum" instead of "Heiminthosporium gramineum".

184 Read "Gibberella saubinetii" instead of "G. saubinetti".

199 Read "Tylenchus dipsaci" instead of "Tylenshus dipsaci".

202 Read "Bacterium phaseoli" instead of "B. phaseolii".

206 Read "Scolecotrichum graminis" instead of "Scolectrichum graminis".

206 Read "Chaetochloa italica" instead of "Chaerochloa italica".

248 Read "Bacillus carotovorus" instead of "B. carotovorous".

249 Read "Spondylocladium atrovirens" instead of S. atrovirons".

288 Read "Bacillus carotovorus" instead of B. caratovorus".

311 Read "Kuehneola gossypii" instead of Kuhneola gossypii".

338 Read "Picea engelmani" instead of "P. engelmanii".

344 Read "Pseudotsuga douglasi" instead of "P. douglasii".

349. Read "Cinnamomum camphora" instead of "Cinnamonum camphora".

363 Read "Fusarium conglutinans callistephi" instead of Fusarium conglutinans callestephi".

365 Read "Cucurbita sp." instead of "Curcurbita sp."

367 Read "Dianthus caryophyllus" instead of "D. caryophllus".

369 Read "Botrytis sp." instead of "Botrytus sp."

371 Read "Microdiplodia sp." instead of Microdipoldia sp."

373 "Malus ioensis plena" no fungus given - should be Gymnosporangium juniperi-virginianae Schw.

373 Read "Myosotis sp." instead of "Mysotis sp."

374 Read "Mycosphaerella pachistimae" instead of "M. pachystimae".

378 Read "Erysiphe cichoracearum" instead of "E. cichorocearum".

403 Read "Gibberella saubinetii" instead of G. saubinetti".