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Pea Diseases in the United States in 1928

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PEA DISEASES IN THE UNITED STATES IN 1928

A report of a field study of pea diseases in the major canning and seed-producing areas of the United States made during the summer of 1928 for the Bureau of Plant Industry of the United States Department of Agriculture.

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INTRODUCTION

During the summer of 1928 the writer made an extended field study of the diseasesof peas (Pisum sativum L.) in canning and seed-producing States for the Bureau of Plant Industry, United States Department of Agriculture. A detailed report of this survey has been prepared, and copies have been deposited in the following places where they may be examined by persons particularly interested: Department of Plant Pathology, University of Wisconsin, Madison, Wisconsin; Office of Horticultural Crops and Diseases (Vegetable Diseases), Bureau of Plant Industry, Room 234, West Wing, Washington, D. C. In this summary, the attempt is made to present those findings which will be of most interest to canners, seedsmen, and plant pathologists generally.

This survey included the examination of peas for disease in each of the following 15 States: Maryland, Delaware, New Jersey, New York, Pennsylvania, Ohio, Indiana, Michigan, Illinois, Wisconsin, Minnesota, Utah, Idaho, Wyoming, and Montana. In three of these - Delaware, New York, and Wyoming - not enough fields were examined to be representative. Obviously it was impossible to make an exhaustive survey in each of the States entered, but it is believed, nevertheless, that a fairly reliable picture has been obtained of the pea-disease problems in the 12 other States listed.

Observations were made in a total of 330 fields. In all, 18 distinct diseases were recognized, many of them minor, but several of them very important factors in pea production. Fourteen was the greatest number of diseases seen in any one State.

During the progress of this study the writer received the very best of cooperation from State agricultural workers and from representatives of the commercial interests concerned. This made it possible to go directly to the most significant fields in each locality visited, including fields, frequently of known history, that were diseased or showed some abnormal condition, and fields that appeared strictly clean. Because of the selection that was thus exercised, the percentage figures in Table 1, summarizing the records of disease in different States, can not be taken as directly representative of the areas surveyed.

In the body of this report, the findings of the survey are discussed under the heading of the disease, and the diseases are arranged in order of the taxonomic position of the causal agent. This results in the intermingling of major and minor diseases. In the Discussion and Summary there is a brief capitulation based upon geographic units.

THE DISEASES

BACTERIAL BLIGHT (Bacterium pisi). Bacterial blight was found in every State surveyed during 1928 and is the only disease so distinguished. In spite of this it was relatively minor in importance this year and probably is generally of much less relative importance among diseases of the pea than the corresponding bacterial diseases are among the bean diseases. Sixty-one fields, or 18.5 per cent of all fields examined by the writer in 1928, were infested, but only a few of these contained more than traces. Some few fields, chiefly in Idaho and

Montana but not exclusively there, were damaged to the extent of 1 to 5 per cent of the yield. In such fields there was usually some complicating factor or group of factors, such as hail injury. The maximum severity observed was in one field in Illinois where Alaska peas were almost wholly ruined and Perfection peas were severely injured.

Since this disease is known to be seedborne, its frequent occurrence in the seed-producing areas of Idaho and Montana is of peculiar interest. At the present moment, however, the rather minor importance of this disease in pea-canning areas makes the seed infection problem appear rather minor too. The relation of factors other than seed infection to severe outbreaks of bacterial blight needs to be determined, for it now appears probable that such favoring factors are essential to a severe outbreak even in addition to an original source of inoculum such as the seed may provide.

During this survey, none of the stem-blight phase of the disease described by Sackett and later observed by the writer and others in Wisconsin and elsewhere has been seen. Characteristically, this year, the infection was in the form of a leaf and pod spot disease, and, when it was not limited strictly to the lower leaves of plants which appeared to have come from infected seed, its spread to other plants appeared to have occurred rather late, at a time when the infected plants were not easily damaged to a serious extent. The one notable exception to this generalization was a field in Illinois which appeared as if it had been swept by wind-blown inoculum and in which the upper and exposed plant parts more than the protected parts were almost completely covered with numerous small blight lesions.

ROOTROT (Aphanomyces euteiches). This disease, commonly known simply as pea rootrot, is perhaps the most widely known disease of peas in this country, and has been for several years the most destructive disease in pea-canning States. Its most serious development comes in those old intensive pea areas where heavy soil, poor drainage, relatively high precipitation, excessive application of irrigation water, or combinations of these provide the conditions of too wet soil which favor its development. Rootrot is notably a disease which becomes troublesome where peas are grown repeatedly, and hence it rarely assumes importance in new pea-growing districts.

Rootrot, as distinguished here, is a soft rot of the cortex of the root and of the base of the stem to a little above the ground line, and characteristically it affects the entire root system within a few days after infection occurs. This is in sharp contrast with the other root decay diseases spoken of here chiefly as footrot diseases, in that they are fairly localized in their attack, infecting the plant chiefly at and near the union of the taproot with the stem; in other words, in the region of the old seed. Rootrot frequently occurs in association with other diseases, including footrot, Rhizoctonia injury, and Fusarium wilt, as will be discussed under these headings. Observations on this disease made by several workers up to the present time have indicated that, in general, it is the most widespread and important factor in the phenomenon of pea-sick soil.

TABLE 1. - General summary of findings of the 1928 pea disease survey showing, by States, the number of fields examined and the number and per cent of fields infested with each disease separately.

State	Total fields examined	Bacterial blight		Rootrot		Downy mildew		Black rootrot		Powdery mildew		Mycosphaerella blight		Black-leaf		Anthracnose		Ascochyta leaf and pod spot	
	No.	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Md.	29	2	6.9	20	69.	9	31.			1	3.4	19	65.5						
Del.	2	2	100.	2	100.	1	50.					1	50.					1	50.
N. J.	6	1	16.7	6	100.	1	16.7					3	50.						
N. Y.	2	1	50.	2	100.	1	50												
Pa.	13	2	15.4	4	30.8	2	15.4					3	23.1						
Ohio	10	4	40.	3	30.	3	30.											1	10.
Ind.	18	1	5.6	2	11.1														
Mich.	15	2	13.3	4	26.6	1	6.7											6	40.
Ill.	18	9	50.	4	22.2					3	16.7	3	16.7						
Wis.	42	2	4.8	21	50.	18	42.8					2	4.8			4	9.5	2	4.8
Minn.	10	1	10.	5	50.	4	40.			1	10.	1	10.						
Utah	16	1	6.2	12	75.	7	43.7							1	6.2				
Idaho	89	22	24.7	19	21.4	16	18.	1	1.1					8	9.				
Wyo.	3	2	66.6																
Mont.	57	9	15.8	30	52.7	10	17.5					3	5.3	2	3.5			4	7.
Totals and averages	330	61	18.5	134	40.6	73	22.1	1	0.3	5	1.5	35	10.6	11	3.3	4	1.2	14	4.2

TABLE 1. - Continued

States	Ascochyta pinodella blight		Leaf - blotch		Fusarium wilt		Footrot		Stem canker		Rootknot		Intumes- cences		Mosaic		Streak		Total diseases observed
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.
Md.	1	3.4			5	17.2	12	41.4							15	51.7	12	41.4	10
Del.																	1	50.	6
N. J.							4	66.6	1	16.7			1	16.7	3	50.	3	50.	9
N. Y.																			3
Pa.	2	15.4	4	30.8	6	46.2	3	23.1											8
Ohio	1	10.			5	50.	2	20.	2	20.									8
Ind.					4	22.2	15	83.4	1	5.6					2	11.1			6
Mich.	2	13.3	2	13.3					2	13.3									7
Ill.			2	11.1	14	77.8	2	11.1											7
Wis.	11	26.2	8	19.	22	52.4	9	21.7					1	2.4	1	2.4	1	2.4	13
Minn.			1	10.			4	40.	4	40.					1	10			9
Utah															6	37.5	4	25.	6
Idaho			7	7.9	8	9.	12	13.5	4	4.5	1	1.1			8	9.	10	11.2	12
Wyo.															2	66.6			2
Montana	5	8.8	27	47.4	3	5.3	3	5.3	2	3.5			1	1.8	8	14.	11	19.3	14
Totals and averages	22	6.7	51	15.5	67	20.3	66	20.	16	4.8	1	0.3	3	0.9	46	13.9	42	12.7	18

Rootrot was found more widespread and abundant in 1928 than any other disease, occurring in almost as many fields as any other two diseases together. In all, 134 fields were found infested, or 40.6 per cent of all fields examined; and in 50 per cent of the diseased fields over half the area was infested. With the exception of Wyoming, where only three fields were examined, rootrot was seen in every State visited.

In the area comprising New Jersey, Delaware, and the Eastern Shore of Maryland, rootrot was abundant in old pea fields, occurring more frequently than any other disease and often in very heavy infestation. In spite of this, however, losses generally were relatively mild. In Maryland, rootrot and Mycosphaerella blight frequently occurred together, and of the two the latter was the more important this year, as, in the opinion of A. D. Radebaugh, it has been for several years. In a few fields rootrot took losses of 50 per cent of the crop, but at the other extreme some infested fields were scarcely damaged at all. In Delaware, the only two fields examined were heavily infested with rootrot, but the injury was slight. In New Jersey, rootrot was abundant and, in some instances, severe; but the work of C. M. Haenseler is showing that with proper culture and fertilization the losses are not so severe as to make the crop unprofitable.

The situation in western Maryland and southern Pennsylvania was distinctly different. Rootrot was present in several fields, causing losses which amounted to as much as 20 per cent of some crops, but in such fields the Fusarium wilt was almost always much more destructive, making rootrot relatively minor in local importance. Serious pea failures here in recent years appear to have been the result of wilt rather than rootrot.

In New York, where observations were limited to two plantings, both were infested. A commercial field at Geneva was almost completely destroyed by this disease, and a garden planting at Yonkers was distinctly weakened.

In the areas visited in southern Ohio, northern Indiana, and central and northern Illinois, rootrot was found widely distributed and sometimes important in association with other diseases, notably Fusarium wilt. Important losses from rootrot were limited to fields that had been replanted many times with peas and chiefly to fields that were excessively wet - too wet for the best growth of peas anyway.

Rootrot was the one important disease seen in Michigan this year, and it was apparently not a very serious factor. Root drowning in excessively wet soil led to serious losses in the absence of the rootrot fungus.

In Wisconsin, conditions were not notably changed from those observed during recent years, except that rootrot was distinctly less severe in north-central Wisconsin under the influence of a season somewhat drier than usual during the critical period. In the limited area of south-central Wisconsin that was examined this year, rootrot was seen repeatedly but seldom in very severe development. Wilt was here more important by far than this disease. In the extreme eastern part of the State, excessive rainfall combined with naturally wet soil types to make the injury from rootrot most extreme.

In Minnesota, rootrot was seen in five of the ten fields examined, but in the State as a whole it was of practically negligible importance, for the survey included the fields and localities most likely to be infested. The one field that was thoroughly infested had suffered only moderate injury up to the time it was examined.

In the past, rootrot has been regarded as of minor importance in the Rocky Mountain States generally. This present survey indicates both greatly increased prevalence and greater severity than heretofore observed, especially in Utah and Montana.

In Utah in 1928, rootrot was distinctly more abundant than recorded by the writer for 1927, infesting many fields thoroughly and causing injury which varied from that so slight as to be negligible up to the utter destruction of the crop; losses of 20 to 40 per cent were frequent in these fields. In the Weber and Ogden valleys, every field examined was infested. This marks a pronounced increase since 1921 and 1923, when Fred R. Jones found the rootrot parasite here in small amounts only. The Cache Valley still appears entirely free from this disease, though there is no reason to think it will long remain so.

In Idaho, rootrot was important in very few fields. Although it is scattered sparingly over practically the entire upper Snake River Valley wherever peas have been grown many years, only very few fields are infested and no locality shows any threat of severe infestations. In only a single field did the loss amount to 25 per cent of the crop, and this was a field that had been notoriously overcropped with peas. As in Utah, rootrot has been known here since 1921, but unlike in that State there has been no notable increase. This year only 19 fields were seen to contain even a trace, and visible injury was limited to wet fields and wet parts of fields, which are not common in this part of Idaho. Cropping practices which would be suicidal in other parts of the country are often followed here without trouble from rootrot.

Montana presented a set of conditions more like those described for Utah. Of the 57 fields examined in this State, 30 fields or 52.7 per cent were infested, and of these infested fields, 80 per cent were diseased throughout at least half of their area. These diseased fields were scattered through all the districts included in this survey, including the Gallatin Valley, the Paradise Valley, and the districts around Red Lodge and Bridger. In each of these areas, fields were observed in which the crop was almost wholly destroyed, and, while the severity of injury was highly varied from field to field, it was clear that this disease is notably reducing the average yield per acre in this State. Since earlier surveys in Montana in 1921 and 1923, the amount of this disease has increased greatly, until now it appears that cropping practices must be revised if pea culture is to continue without the handicap of an annual toll levied by rootrot.

Considering as a unit the entire area covered by the survey, rootrot was distinctly the most destructive disease affecting the pea crop in 1928. Its local importance frequently escapes the attention of pea growers and even field supervisors of canning and seed companies. In the irrigated districts, for example, it is the common thing to attribute the injury done by rootrot to excessive irrigation or to the crowding of weeds. Evidence gathered during this survey indicates that the rootrot fungus is still spreading and suggests that it may continue to spread until those areas in which environmental conditions and cropping practices favor its development become thoroughly infested. On the other hand, it appears that certain areas, such as parts of south-central Wisconsin, are now pretty thoroughly infested but still are not subject to severe losses from rootrot except in very wet years. There is pressing need for an analysis of the factors which lead to the notable variations in severity of injury from rootrot even in the presence of thorough decortication of the roots, with the hope that some means may be devised for the avoidance of the more severe types of injury.

DOWNY MILDEW (Peronospora viciae). This is one of the most widespread and least important diseases of the pea. During 1928 it was seen in all States surveyed except Indiana, Illinois, and Wyoming, and in 22.1 per cent of all fields examined. In nearly all of these fields it occurred in mere traces, and the maximum injury noted was only 2 per cent. In most of the infested fields this disease occurred only in the form of rectangular conidial patches on the leaf laminae, varied by the occasional occurrence of yellowish-white, porcelaneous, slightly swollen areas on leaves, stems, and pods, where the oospores of the fungus are developed. A further variation is the development of an apparently systemic infection, but this was seen less frequently this year than formerly in Utah and Wisconsin. One of the most interesting consequences of this disease is the facility with which other organisms enter downy mildew patches as secondary parasites, leading to early necrosis of the infected tissue, which ordinarily does not follow the invasion of Peronospora alone. The secondary invaders observed during the survey are: Ascochyta pisi, A. pinodella, Bacterium pisi sp., and Cladosporium sp. For the present, at least, there is no reason why this mildew should be of concern to either seedsman or canner.

BLACK ROT (Thielavia basicola). A few plants affected with a black rootrot collected in a field at Rexburg, Idaho, proved upon microscopic examination, to bear chlamydospores of Thielavia in great numbers upon the blackened surfaces. Although the writer examined many other root collections from this same locality, no other spores of this fungus were encountered. This fungus has been reported on peas several times without adequate evidence that it is ever aggressively pathogenic, but this is the first time the writer has observed it.

POWDERY MILDEW (Erysiphe polygoni). This disease was observed in traces only in a total of five fields in Maryland, Illinois, and Minnesota. Its known range is much wider than this.

MYCOSPHAERELLA BLIGHT (Mycosphaerella pinodes). During these present studies this blight, which formerly was confused with the disease caused by Ascochyta pisi, was found in 8 of the 15 States visited, as listed in the general tabulation of survey findings, Table 1. These States do not represent the total known range of the fungus in this country. As with other seedborne diseases, this blight is probably very widespread, but in recent years generally it has not been conspicuously important except in a few localities. L. K. Jones reported severe outbreaks in New York State in 1926, unequalled there since that year.

In 1928 the only destructive local outbreaks were found in eastern Maryland and vicinity. Here it was the most destructive disease present, causing losses estimated to be as great as 35 per cent in some fields. In the opinion of A. D. Radebaugh this has been the most important disease factor in this area for several years. In other parts of the country Mycosphaerella blight was both rare and mild. The only other noteworthy occurrence was in Montana, where it was not expected at all and where three fields were lightly infested.

Although the seedborne nature of this disease has been clearly established and was supported by additional observations during this survey, still it is obvious that the planting of infected seed was not the most important immediate factor this year inducing the destructive development of this blight. The seed used in the badly blighted fields of eastern Maryland and vicinity came almost exclusively from Idaho and Montana, where this disease is very rare. On the other hand, the severe outbreaks occurred almost exclusively where peas had been grown repeatedly on the same field or on adjoining fields. It seems clear that the neglect of crop rotation and reasonable farm sanitation are more important in the development of severe outbreaks of this disease than the simple use of infested seed. Infested seed may introduce the fungus, but faulty cropping practices coupled with favorable weather will give it an opportunity to increase to the point of becoming destructive.

BLACK-LEAF (Fusicladium pisicola). Black-leaf was observed in traces only in a total of 11 fields in Utah, Idaho, and Montana. This is the first time it has been found in Montana. Areas in Idaho and Utah where it has been seen in past years were practically or completely free from it.

ANTHRACNOSE (Colletotrichum pisi). Anthracnose was found only within its formerly known range in Wisconsin, and was not seen to cause any important injury.

ASCOCHYTA LEAF AND POD SPOT (Ascochyta pisi). This disease, until recently confused with the Mycosphaerella blight, was of very minor importance in the area surveyed during 1928. It was seen in only 14 fields, and was abundant in only two fields of a seed-trade variety in the Paradise Valley of Montana. In several fields this disease occurred chiefly or exclusively in association with downy mildew.

ASCOCHYTA PINODELLA BLIGHT (Ascochyta pinodella). This blight is closely similar to that caused by Mycosphaerella pinodes but is less destructive; in fact, it appears to be almost negligible. It was seen during 1928 in only six States, although formerly observed also in Utah by the writer. Apparently the parasite is not an aggressive invader of the healthy pea foliage, for in several fields the only points of infection seemed to be within downy mildew patches from which the blight lesion then extended into healthy tissue. The chief interest in this disease lies in the fact that the parasitic fungus is one of the most widespread causes of footrot, and that the pod infection sometimes associated with this blight is a factor in the seedborne aspect of the footrot disease.

LEAF-BLOTCH (Septoria pisi). Leaf-blotch was relatively minor in most of the States surveyed in 1928, but developed so abundantly in Montana that in the country as a whole it was the third most frequently observed disease of aerial parts. Of the 51 fields which were seen to contain this disease, over half were in Montana, where 47.4 per cent of all examined fields were infested. In the country as a whole, both downy mildew and bacterial blight were seen in more fields, but neither was as important as this blotch. Throughout most of its range only traces of blotch were found; in Wisconsin, however, several fields were damaged very badly, and in Montana important injury was seen in many fields. The actual injury could not be estimated because in every case of severe leaf-blotch other diseases, such as rootrot and wilt, occurred with it in destructive infestation, but the condition of almost complete defoliation before the seed crop was mature was observed repeatedly. Whether this disease is favored by a weakened condition of the plant or whether its frequent occurrence with other diseases results simply from the fact that all are more frequent where peas have been grown too intensively remains to be determined.

FUSARIUM WILT (Fusarium orthoceras var. pisi). Fusarium wilt, a disease that has been under observation only since 1924, when it was first differentiated from the pea failure complex in Wisconsin, is now, next to rootrot, the most destructive disease of peas in this country and, from the standpoint of its potential importance to the pea industry, it is at least equal to rootrot. Previous to this survey wilt had been reported only from Wisconsin, Michigan, and Indiana, but now it is known to occur in nine States, including,in addition to the three mentioned, Maryland, Pennsylvania, Ohio, Illinois, Idaho, and Montana. Unconfirmed reports suggest that it occurs also in California.

Sixty-seven fields, or 20.3 per cent of all fields examined, contained wilt. Two diseases were found more frequently: Rootrot and downy mildew; and footrot was found almost as often. But losses from wilt are much greater in proportion to the number of fields infested than in the case of these other diseases, for wilt infestations are frequently heavy, and in the infested fields or parts of fields the crop is usually a total loss.

In the survey of 1928, wilt was not found in New Jersey, Delaware, and Eastern Maryland. In western Maryland and southern Pennsylvania, however, it was the one outstandingly important disease. In the survey of this area wilt was found in 11 fields, causing losses of over 50 per cent in several fields and as much as 80 per cent in one large planting. In the opinion of A. D. Radebaugh and certain canners, this is the one disease that has caused trouble here for several years.

While no wilt was seen in New York State, observations were too limited to indicate its absence. L. K. Jones, who has followed pea-disease developments for several years, has reported none of it.

In southern Ohio, northern Indiana, and central and northern Illinois, rootrot and wilt were both found in 1928, but wilt appeared to constitute the major pea-disease problem. Wilt caused heavy losses in some areas in each of these States and apparently has been doing so to an increasing extent for some years. In areas of northern Illinois where a few years ago there was no important disease problem, wilt is now causing heavy losses. In one district where the writer saw several fields that were almost totally ruined, it was reported that 200 acres were severely damaged by this disease. In Michigan, although wilt is known to occur on the Northern Peninsula, none was found in the areas surveyed this year.

As has already been pointed out, wilt in Wisconsin in 1928 showed a distinctly increased prevalence over the conditions observed in 1924 and 1925. No attempt was made to cover new territory in this State; attention was concentrated in localities with which the writer was familiar from earlier field studies. A trace of wilt was found in 1928 in one area in north-central Wisconsin where none was formerly present, and in the more southern districts where wilt was known earlier it was found in greater abundance than formerly. It is of special significance that in these districts certain fields that had contained small amounts of the disease in 1924 or 1925 were this year thoroughly infested, even though no peas had been grown there during the interval of years. In no case did crop rotation appear to be of any assistance after the wilt fungus was once established in the field.

None of this wilt disease could be found in either Minnesota or Utah.

One of the most significant and perplexing results of the survey was the finding of wilt in both Idaho and Montana, the States which supply the bulk of the seed used in the pea-canning industry. Wilt was not known formerly to occur in any of the Rocky Mountain States. In the upper Snake River Valley of Idaho it was seen in two localities. In one it was found on two nearby farms; in the other it was abundantly distributed over numerous farms, causing the complete destruction of the crop in one large field and the loss of parts of several other crops. In Montana, wilt was seen in two widely separated localities in the Gallatin Valley: a mere trace in one, and two infested farms in the other. At present the losses from wilt in these two States are not startling, and yet the severity of injury in infested fields is the same as in Wisconsin and elsewhere: susceptible varieties are eliminated completely. It is clear, therefore, that nothing in soil or climate stands in the way of very destructive development of this disease. Opportunities for the dissemination of the wilt fungus seem rather unusual here, arising from the practice of irrigation and from the use of pea-vine straw as feed and bedding for livestock.

There is no experimental evidence to indicate that the wilt fungus is ever carried with pea seed, but this question has not yet been adequately studied. Nevertheless, the establishment of so destructive a disease in the heart of two major seed-pea areas is of direct concern to both seedsmen and canners, and serves to emphasize the need for speedy perfection of suitable wilt-resistant varieties of peas.

FOOTROT (Ascochyta pinodella, Fusarium martii var. pisi, and other fungi). Several fungi, of which the two named here predominate in this country, produce disease symptoms that can not be differentiated in field examination, and therefore they are considered together here. Under this name of footrot are grouped those cortical rot diseases in which the injury is more or less localized, beginning as a dark brown decay in the region of the old seed and spreading upward onto the base of the stem below ground and downward over the hypocotyl a short distance onto the roots. The Ascochyta pinodella disease, at least, is seedborne to some extent.

Footrot is frequently associated with and confused with wilt and rootrot, but it is much less important than they are. During 1928 it was seen in 66 fields, or 20 per cent of all fields examined, occuring in traces in most of these but in heavy infestations in a few. Footrot may be expected almost everywhere that peas have been grown for a period of years, although it may not be recognizable if associated with rootrot. In general its importance is very minor, but in one field in Idaho a very severe footrot, caused apparently by a species of Fusarium, had caused a 60 per cent loss of stand and a notable weakening of the surviving plants.

STEM CANKER (Rhizoctonia). This disease was found widely distributed but nowhere very abundant. It was recorded in seven States from New Jersey to Montana in 4.8 per cent of all fields examined. In only a few of these did it cause any apparent independent injury. In making microscopic examinations of roots affected with various diseases, mycelium of Rhizoctonia is frequently observed. Its significance when associated with Aphanomyces and with the footrot fungi is not understood.

ROOTKNOT (Heterodera radicicola). This nematode injury was observed in a single field near Idaho Falls, Idaho, where it occurred in a small area within an old potato field. Affected plants were stunted and yellow.

INTUMESCENCES (Water relations). This curious condition, described by Sorauer, was seen on a few plants in a single field of Alaska peas in each of New Jersey, Wisconsin, and Montana. On affected plants all the pods usually develop succulent, prong-like outgrowths of variable form and size. Other parts of the plant are sometimes affected similarly.

MOSAIC (Cause undetermined). Mosaic of the pea has been known for some years but has not been important in commercial plantings. In 1928 it was widely distributed; it was seen in 46 fields, 13.9 per cent of all examined, in nine States from the Atlantic Coast west to Utah and Montana. Both in abundance and severity it reached its maximum in Maryland and New Jersey. From there west to the Rocky Mountains it was very rare; and then in Utah and Montana it was moderately abundant. Except in a few eastern fields, however, where infestations sometimes exceeded 5 per cent and where diseased plants showed diminished yields of deformed pods, the occurrence of this disease was of no economic importance in 1928.

One special case of unusual mosaic symptoms that merits mention was observed in New Jersey. In a single field there was found an area about one rod in diameter in which a large percentage of the plants showed a brilliant yellow and green calico mottling of a type quite different from the usual mosaic mottling on peas. This calico effect was noted even on the pods which showed less striking color contrasts but which were conspicuously discolored and deformed. Even the peas within these pods were yellow or mottled yellow and green. This trouble was of such apparent severity as to be cause for concern if it should reappear and spread in subsequent years.

STREAK (Cause undetermined). This little known disease, which bears a marked resemblance to certain virus diseases of other plants, was found throughout essentially the same range as pea mosaic. It occurred in somewhat fewer fields, but in infested fields the amount of streak averaged greater than of mosaic. Streak is characterized by necrosis of pods and of the phloem in stems and leaves, and, occasionally, necrosis of the entire upper portion of the plant. No micro-organisms have been found associated with this condition.

DISCUSSION AND SUMMARY

For the convenience of the reader, the following recapitulation presents the major disease problems, as observed in 1928, by States or larger geographic units:

In eastern Maryland and vicinity, Aphanomyces rootrot and Mycosphaerella blight are the two outstanding diseases and frequently occur together. In some localities rootrot occurs alone; and in some the Mycosphaerella blight is the most destructive disease. Footrot was abundant in a few fields, and mosaic and streak were more prevalent here than anywhere else in the States surveyed.

In western Maryland and southern Pennsylvania, Fusarium wilt was the one seriously destructive disease. Rootrot was distinctly less abundant than farther east, and Mycosphaerella blight was almost absent.

In southern Ohio, northern Indiana, and central and northern Illinois, rootrot and wilt occurred together, but wilt appears to have been the major disease problem for some years. Rootrot appears to be limited to fields wetter than average and to be generally of minor importance. Of the minor diseases sometimes found, footrot was especially abundant in one locality in Indiana, and bacterial blight was seriously destructive in a large field in Illinois.

In Michigan and parts of Wisconsin, rootrot is the most destructive disease of the pea. In other parts of Wisconsin, Fusarium wilt is unrivaled by other diseases. In some areas wilt has increased notably in its prevalence since 1924 and 1925. Many other diseases occurred in Wisconsin this year as formerly, but most of them were of no great economic importance although a few became destructive locally.

In Minnesota, very little disease was found. Rootrot was seen several times, but the injury apparent at the time of the survey was slight. Footrot and some other diseases were noted, but no wilt was seen.

Rootrot was distinctly more abundant in Utah than reported by the writer to have been in 1927. In some localities practically every field was infested, but the severity of injury was highly varied. No wilt was detected, and diseases of aerial parts were relatively rare, with the exceptions of the unimportant downy mildew, mosaic, and streak.

The States of Idaho and Montana are of special interest because of their being centers of pea seed production. As might fairly be expected, these States are no longer free from disease. They were, in fact, among the three States which displayed the greatest numbers of different diseases. Most of these diseases, however, were present in relatively small amounts, and some of them in mere traces. Of the major diseases, rootrot was the most prevalent, especially in Montana, where it caused heavy losses in some fields. In the larger portion of the seed area, however, it is rare or absent. Fusarium wilt was found to be established in both States and constitutes a problem that must be given attention to insure the permanence of profitable pea production. Of the several diseases which are known to be carried on the seed, only bacterial blight occurred frequently. In Montana, the leaf-blotch disease reached its maximum destructiveness, and constitutes a problem that needs local study. Mosaic, streak, footrot and other minor diseases were recorded frequently.

To summarise the outstanding points of this field study, rootrot and Fusarium wilt were found to be the two most important diseases of the pea throughout the area studied, although many other diseases ocurred occasionally and sometimes became troublesome locally. Rootrot has been known to occur widely for some years, and the present findings indicate that while certain areas are now free, it is still spreading, and that in certain areas where it occurred in small amounts only a few years ago it has increased markedly in prevalence and severity. On the other hand, in some areas where it has long been known, rootrot has not become an important factor.

Fusarium wilt, which formerly was reported only from Wisconsin, Michigan, and Indiana, has now been found widely distributed. Throughout much of its range it occurs sparingly and appears to be of recent introduction, but wherever it has been found it shows its normally great severity. In central Wisconsin, where wilt has been known longest, it has shown a marked increase in prevalence during the five years since it was first discovered. It is clear that wilt has not yet attained its ultimate geographic range. Its potential importance is such that wilt, more than any other disease of peas, demands immediate attention looking towards the perfection of disease-resistant varieties and the devising of supplementary means to avoid losses.

THE PLANT DISEASE REPORTER

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SUPPLEMENT 68

Diseases of Vegetable and Field Crops (Other than Cereals)

In the United States in 1928

May 1, 1929

BUREAU OF
PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

DISEASES OF VEGETABLE AND FIELD CROPS (OTHER THAN CEREALS)

IN THE UNITED STATES IN 1928

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Plant Disease Reporter
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INTRODUCTION

For several years past, the writer, as a collaborator with the Plant Disease Survey, has been concerned in the preparation of a number of annual state reports. At times, the preparation of these has seemed somewhat burdensome but when once compiled and especially when accumulated over a series of years, these reports have proved valuable in many ways.

The compilation of the state reports into an annual summary is valuable mainly in proportion to the amount and completeness of the data available. This summary appears to be less complete than those of former years for the reason that fewer state reports seem to be available. It is hoped that there will not be any lessening of interest on the part of the collaborators in this important project which is dependent upon successful state cooperation. Since it is not possible for one to do another's work in this mutually helpful disease reporting service, each of us should make our contributions as fully and as promptly as possible.

The state collaborators' reports make up the bulk of the present summary. In addition to these, material was also secured from the literature and from persons within the Bureau of Plant Industry.

In preparing this report, a number of items have impressed the writer:

1. It is very apparent that the loss from the potato virus diseases in recent years is only a fraction of that experienced six to ten years ago. The use of better seed supported by extensive investigations has been responsible for reduction in prevalence and severity of these diseases to an extent that makes this one of the most notable achievements in agriculture in recent years.

2. Sweet potato storage losses, as reported from the producing states, seem to be unnecessarily high and point out the need for improvements in handling the crop.

3. Yellow dwarf, a new disease of onions, has been found in the Middle West. The sudden advent of this disease shows that the time is not past when new diseases may be expected to appear.

4. The reports on non-parasitic diseases are not very frequent. The importance of this class of diseases demands that greater consideration be accorded to investigation and extension of information concerning them.

5. In connection with the use of resistant varieties, the suggestions occur, (1) that more attention could well be given to the dissemination of information on available resistant varieties and strains of tomatoes thereby reducing the present high loss; (2) that the curcurbit diseases offer a very important field for the development of resistance in the various members of the group; and (3) that the production of disease resistant varieties of such crops as tomato, cabbage and sugar cane constitute distinct accomplishments that point the way to still greater achievements in the control of plant diseases.

DISEASES OF POTATO

LATE BLIGHT, PHYTOPHTHORA INFESTANS (MONT.) D BY.

Late blight occurred in the Atlantic Coast States and those bordering the Great Lakes. Heavy losses are reported only from New York, Wisconsin, Michigan and New Hampshire. Within individual states the occurrence of the disease was not unusual.

The first reported occurrence in northern states was on June 22 from Long Island, New York. This is unusually early even for Long Island. Clinton (Connecticut) reported the disease as having been found on July 11, the earliest record for that state. An interesting report of occurrence in Western Canada is given by Bisby (1) who found it in Manitoba at Portage la Prairie, Otterburne, and Miami.

Losses from late blight as estimated by collaborators appear in the accompanying table. Chupp of New York reports the disease as causing more damage in the state than for four or five years. Clayton of New York also reports that the disease caused greater losses on Long Island than had occurred for the past thirty years. Losses of 50 per cent in certain localities were reported from Maryland and Michigan.

Table 2. Percentage losses from late blight of potato as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
30	Massachusetts	4	Maryland
20	New York, Wisconsin	2	North Carolina, Michigan
15	Tennessee	1	Iowa
10	West Virginia	.75	New Jersey
8	Minnesota	Trace	Connecticut, Virginia, North Carolina, Mississippi, Ohio, Washington
5	New Hampshire, Wisconsin		

The origin of first infections has been mentioned in reports from the following collaborators:

Connecticut: On July 11 we found the late blight on the lower leaves in an Irish Cobbler potato field in Woodmont. It occurred only on the lower leaves of plants which were otherwise healthy. These leaves had all been in touch with the ground, showing that infection came from zoospores which had developed through the tubers, thus confirming my theory that this is the ordinary method of primary infection. (Clinton)

Maine: On July 25 to 26 a number of fields were examined in Washington County in eastern Maine. Not a trace of late blight was found except in one small seed plot, otherwise completely disease-free, planted with seed grown in central Maine in 1927 with late blight there causing severe injury generally. Source of seed seems to have been the determining factor in 1928, since even 400 feet distant from the infected piece there was no disease in native-grown seed though the plants were in the same stage of growth and apparently in the same cultural conditions. (Folsom)

Environmental factors are recognized as greatly influencing the occurrence of late blight. A number of collaborators noted that weather conditions were as favorable early in the season for severe infection but that the disease was checked by dry weather or was rendered less destructive due to temperatures too high for germination of the spores. Jehle of Maryland reported fog as a factor increasing the severity of the disease in certain areas.

Jersey Red Skin was reported again as resistant in Maryland. Reddick (2) has reported 46 resistant hybrids resulting from crossing the resistant variety Ekishirazu with various other varieties. Some of these may prove commercially useful.

Recent literature: Pl. Dis. Reptr. 12: 43, 53, 66, 74-75, 94, 106, 118, 118, 125, 131.

1. Bisby, G. R., and I. L. Conners. Plant diseases new to Manitoba. Sci. Agr. 8: 456-458. Mar. 1928.

2. Reddick, D. Blight-resistant potatoes. Phytopath. 18: 483-502. June 1928.

EARLY BLIGHT, ALTERNARIA SOLANI (ELL. & MART.) JONES & GROUT

Early blight was reported as more or less general over the potato producing sections of the country. In most cases where it was present it did but little damage. The greatest loss reported in one field was from Missouri where 18 per cent loss occurred in one instance. The average for the State, however, was not over 1 per cent. New York and Michigan reported similar percentages for general losses. Two per cent loss, the highest in any state, was reported from Florida.

Early maturing varieties were reported to be more seriously affected than late varieties by several collaborators. This disease was reported to attack early varieties near the end of the growing season and in some cases to be the cause of premature death of the vines. In the Norfolk Section of Virginia, McWhorter reported it of great importance on the second crop but of minor importance on the first.

May 30 was the earliest reported occurrence in Georgia while July 5 was the earliest appearance reported in the Northeastern States.

Table 3. Percentage losses from early blight of potato as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
2	Florida	Trace	Tennessee, New Jersey, Indiana, Mississippi, Colorado, Iowa, New Hampshire, West Virginia, Wisconsin, Arkansas, Montana, Utah
1.5	North Carolina		
1	Missouri, New York, Michigan, Minnesota, Arizona		
.5	North Dakota, Maryland		

SCAB, ACTINOMYCES SCABIES (THAX.) GÜSSOW

Common scab was reported from all parts of the country as causing moderate losses in most cases. The most serious losses were reported from Massachussetts by W. H. Davis who stated that scab was found in every field and was especially severe in low places. He also reported 100 per cent loss of commercial grade in a single field since the crop had to be culled and fed to stock. R. A. Jehle of Maryland reported the amount of scab in the spring crop about the same as for 1927, but that less scab was found in the fall crop. McWhorter (Va.) has not observed much yearly variation in prevalence. L. O. Gratz from Florida reported scab of no consequence because of the reaction of the soil which ranged from pH 5.2 upwards. R. H. Porter of Iowa found scab to be serious in peat land which was known to be acid. Taubenhaus (Texas) reported it as very prevalent in the lower Rio Grande Valley. R. F. Crawford of New Mexico reported it present wherever potatoes were grown in the state attributing the prevalence to alkaline soils. Losses over the country ranged from a trace to a maximum of 6 per cent reported from Colorado.

Some interesting notes on varietal susceptibility were contributed by H. G. MacMillan (1) from observations in Nevada. He found Russet Burbank or Netted Gem free from scab, while the thin-skinned varieties were susceptible under the same conditions. Le Clerg (Colorado) reported Cobblers and Triumph more seriously affected than others.

Collaborators contributed some interesting notes on control. R. E. Vaughan (Wisconsin) reported hot formaldehyde and corrosive sublimate satisfactory but that "Semesan bel" and "Dip dust" were less effective. Martin (N. J.) reported satisfactory results with organic mercury dip treatment and acid fertilizers. T. Dykstra (Oregon) reported that crop rotation and seed treatment were effective control measures in that state. Investigations on control were carried on at various places. Moore and Wheeler (2) reported interesting results in a comparison of corrosive sublimate and organic mercury compounds for both scab and Rhizoctonia.

Recent literature

1. MacMillan, H. H. The V & F Pathologist 1 (20): 78. Oct. 1, 1928.

2. Moore, H. C. and E. J. Wheeler. Seed potato disease controls compared. Michigan Agr. Sta. Quart. Bul. 10 (4): 163-165. 1928.

BLACKLEG, BACILLUS PHYTOPHTHORUS APPEL

Table 4. Percentage losses from blackleg of potato as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
15	South Dakota	1	West Virginia, New Hampshire, Michigan, Minnesota, Washington
10	Iowa	.5	Maryland, Arizona, Utah
5	Colorado	Trace	New Jersey, New York, Georgia, Florida, Mississippi, Arkansas, Ohio, Indiana, Wisconsin
3	Kansas, Oregon		
2.5	North Dakota		
2	Montana, North Carolina, Missouri		
1.5	Virginia		

Blackleg was reported from each of the major potato sections in most cases causing minimum losses. Chupp (New York) reported it as causing 1 per cent loss on Long Island whereas for the rest of the State there was only a trace. Archer (West Virginia) found it particularly serious on early Irish Cobblers. In Arkansas it was more destructive than at any time during the previous ten years. (Rosen). Tilford (Ohio) mentioned rains as favoring the disease. Vaughan (Wisconsin) gave the highest estimate of maximum losses which reached 50 per cent in a few fields. Porter (Iowa) noted blackleg particularly prevalent in home gardens. Streets (Arizona) reported it decreasing with the use of better seed.

The relation of certified seed to the prevalance of disease was mentioned by several collaborators. Crops from certified seed in more than one instance contained little or none of the disease while considerable quantities occurred in common or non-certified stocks.

Vaughan (Wisconsin) reported marked control in one case by seed treatment.

Literature during the year has contained an important contribution from Bonde (1) on the relation of seed corn maggot to the spread of the trouble.

Recent literature: Pl. Dis. Reptr. 12: 23, 35-36, 75, 132.

1. Bonde, R. The transmission of potato blackleg by the seed corn maggot in Maine. Phytopath. 18: 459. May 1928.

RHIZOCTONIA, CORTICIUM VAGUM BERK. & CURT. (RHIZOCTONIA SOLANI KÜHN)

The Rhizoctonia disease was reported from all sections of the country, principally as a stem rot trouble. In many sections it was prevalent in practically every field without noticeable damage. Severe stem lesions accompanied by aerial tubers were reported from Wisconsin and Florida. The aerial tubers, however, were found only after the stems were practically girdled. It is interesting to note from reports that the severest, general occurrence of Rhizoctonia was in states where potatoes are grown under irrigation. The alkaline reaction of some of the soils in these areas seems to favor the parasite. Streets of Arizona found Rhizoctonia causing less in 400 acres when treated, certified Nebraska seed was planted on new land. This would indicate the indigenous occurrence of the fungus in such soils. MacMillan reported Rhizoctonia to be the most destructive potato disease in Nevada. Le Clerg (Colorado) reported it most prevalent at high altitudes.

Table 5. Percentage losses from Rhizoctonia of potato as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
12	California	3	Utah, North Dakota, New Jersey, Colorado
10-25	Oregon		
8	Arizona	2	Missouri, Iowa, Minnesota, North Carolina.
7	Kansas		
5	New York	1	Wisconsin, Michigan, Massachusetts
4	Maryland		
		Trace	Ohio, Tennessee

Brentzel (North Dakota) mentioned an increase of Rhizoctonia due to wet weather. Dykstra (Oregon) also reported it as severe only under irrigation or where moisture supplies were abundant. Minnesota reported increase of Rhizoctonia due to use of peat land and lack of rotations.

Potato - Rhizoctonia

Conflicting reports have been received on the effectiveness of control measures. Kotila (1) of Michigan has secured effective control with corrosive sublimate and has also tested organic mercury compounds which he finds not superior to the standard corrosive sublimate treatment. MacMillan (2) reports seed treatment ineffective in control. Young (Montana) reports Rhizoctonia equally prevalent in fields grown from treated and untreated seed. Martin (New Jersey) reported favorably on organic mercury treatment.

<u>Recent literature</u>: Pl. Dis. Rep r. 12: 23.

1. Kotila, J.E.: Black scurf of potatoes is controlled by corrosive sublimate. Michigan Agr. Sta. Quart. Bul. 10 (4): 184-186. 1928.

2. MacMillan, H. G. The V&F Pathologist 1 (20): 80. Oct. 1, 1928.

3. Martin, W. H. Efficiency of organic mercury compounds in potato seed treatment. Proc. Ohio Veg. Grow. Assoc. 13: 19-23. 1928.

4. Stallings, J. H. Result of some seed potato treatments. Test shows effect on germination and yield. Florida Grow. 36: 30-31. June 1928.

5. Moore, H. C., and E. J. Wheeler. Seed treatment experiment in Michigan. Amer. Potato Jour. 5 (4): 100-103. 1928.

6. Orton, C. R., and G. F. Miles. Seed potato treatments in 1927. Amer. Potato Jour. 5 (5): 131-136. 1928.

WILT, FUSARIUM OXYSPORUM SCHL.

The status of the occurrence of Fusarium wilt in the United States for 1928 can be gauged from the following quotations:

New York: This disease seems to have disappeared almost entirely from the state. The inspectors state that they did not see one-half dozen affected hills all summer. (Chupp)

West Virginia: This year a scattered infection occurred and doubtlessly was traceable to seed infection. (Archer)

Missouri: Seems to be largely confined to tuber injury. So far very slight damage (wilting) has been found and reported on plants in field. (Scott)

Utah: Reported from the warmer counties where the dry season and scarcity of irrigation water were favorable for the disease. (Richards)

Nevada: Usually follows older culture. The whole seed was showing better returns, as might be expected, and indicated that soil infection of the cut seed was the origin of the Fusarium trouble. (MacMillan)

Losses where the disease occurred ranged from a trace to as much as 4 per cent. It is very evident that the disease is not a great factor in potato production.

Weiss, Lauritzen and Brierley (2) have published a paper during the year on the factors influencing the occurrence of Fusarium rot in stored potatoes. Varietal susceptibility is the subject of a paper by Goss (1) of Nebraska.

Recent literature

1. Goss, R. W. Varietal susceptibility of potatoes to Fusarium wilt and stem end rot. Phytopath. 18: 307-309. Mar.1928.

2. Weiss, Freeman, J. I. Lauritzen, and Philip Brierley. Factors in the inception and development of Fusarium rot in stored potatoes. U. S. Dept. Agr. Techn. Bul. 62: 35 p. May 1928.

BACTERIAL WILT, BACTERIUM SOLANACEARUM EFS.

Bacterial wilt of potatoes was reported from only a few states and in every case a trace only of the disease was found. North Carolina, Georgia, Florida and Mississippi were the only states reporting its presence.

VIRUS DISEASES

Virus diseases were generally prevalent in 1928. In general large losses from virus diseases are confined to fields planted with non-certified or common seed stocks. The general recognition of these diseases by the best seed growers has also done much to eliminate former excessive losses. It is noticeable that those sections using better seed report less loss than other sections in which the use of certified seed is not common. The following virus diseases were recognized and reported by collaborators and others.

Potato - Virus Diseases

1. Mild mosaic
Rugose mosaic
Leaf roll
(a) Net necrosis
Spindle tuber

Psyllid yellows*
Yellow dwarf*
Witches' broom
Apical leaf roll

Recent literature: Pl. Dis. Reptr. 12: 23, 132.

1. Hadfield, J. W., and J. H. Claridge. Certification of seed potatoes. New Zealand Jour. Agric. 37: 8-18. 1928. (Abstract Rev. Appl. Myc. 7: 801. Dec. 1928)

2. Thung, T. H. Over knolentingen, die ter bestudeering der virus-ziekten van de aardappelplant worden uitgevoerd. (On tuber grafts carried out for the study of the virus diseases of the potato plant.) Tijdschr. over Plantenziekten, 34 (7): 195-199. 1928. (French summary). (Abstract Rev. Appl. Myc. 7: 801. Dec. 1928)

3. Tucker, J. Canadian certified seed potatoes. Rules and regulations governing their production. Canada Dept. Agric. Pamphlet 84, N.S. 11 pp. 1927. (Abstract Rev. Appl. Myc. 7: 533. Aug. 1928.)

4. Band, P. Over invloed van de grondsoort op het pootgoed bij aardappelen. (On the influence of the type of soil on seed potatoes.) Tijdschr. over Plantenziekten 34 (4): 147-153. 1928.

5. Davidson, W. D. A review of literature dealing with the degeneration of varieties of the potato. Econ. Proc. Roy. Dublin Soc. 2: 331-389. June 1928.

6. Gilbert, A. H. Net necrosis of Irish potato tubers. Vermont Agr. Exp. Sta. Bul 289, 36 pp. Sept. 1928.

7. ____________ Production of potato tuber necrosis. Science n.s. 57 (1740): 464-465. 1928.

8. Goss, R. W. Transmission of potato spindle tuber by grasshoppers (Locustidae). Phytopath. 18 (5): 445-448. 1928.

9. Schander, R. and Bielert. Nekrose und andere Degenerationserscheinungen im Phloem der Kartoffelpflanze. (Necrosis and other degeneration phenomena in the phloem of the potato plant.) Arb. Biol. Reichsanst. fur Land.-und Forstwirtsch. 15 (5): 609-670. 1928.

10. Smith, J. H. The transmission of potato mosaic to tomato. Ann. Appl. Biol. 15: 517-528. Nov. 1928.

* Included here although there is some question as to the true nature of the troubles.

MILD MOSAIC (VIRUS)

Mild mosaic appears to be prevalent wherever potatoes are grown although in many cases the symptoms are masked by high temperatures and droughty conditions. Traces of the disease were reported from the following states: Massachusetts, New Jersey, Virginia, North Carolina, West Virginia, Florida, Texas, Minnesota, North Dakota, Kansas, Montana, Arizona, Utah, Colorado and Oregon. Sup rior roguing methods used by seed growers have lowered prevalence in certified seed. Reports of the value of certified seed and the influence of environment were made from the following states:

Maryland: Use of certified seed has greatly reduced the losses from this disease. (Jehle)

West Virginia: Affected plants were reported rather frequently even in fields planted with certified seed. (Archer)

Florida: Loss practically negligible. (Gratz)

Texas: Seventy-five per cent in some fields in Hidalgo and Cameron Counties affected. (Taubenhaus and Bach)

Iowa: Cloudy days and cool, rainy weather developed mosaic more than is common in Iowa. Not so much masking as usual. (Porter)

Varietal susceptibility was mentioned in reports from Wisconsin and Oregon.

Wisconsin: Present in varying amounts especially on Triumph, Cobbler, and Green Mountain varieties. Rarely found on Ohio and Rural. (Vaughan)

Arizona: Estimated loss 1 per cent. (Streets)

Oregon: The temperature was quite low this summer and therefore favorable for the expression of the symptoms. Irish Cobbler appears to be immune. Controlled by rigid roguing. (Dykstra)

The use of indexing tubers as a means of eliminating mild mosaic was reported from Wisconsin where 200 bushels of seed of the Triumph variety were indexed for Wisconsin growers from which 4,000 bushels of seed stock were grown.

RUGOSE MOSAIC (VIRUS)

Rugose mosaic is more easily recognized than mild mosaic and was reported generally from all sections of the country. Traces only were reported from most states with New Jersey and New York estimating the highest losses of 3 and 5 per cent respectively.

A note on varietal susceptibility was contributed from Oregon: "The disease spreads more rapidly in varieties like Garnet Chili, and Bliss Triumph than in Burbank and Netted Gem and it appears that there is a difference in the degree of susceptibility among different varieties." (Dykstra). In Minnesota mild mosaic affected only Triumph and Green Mountains.

The value of certified seed and varietal selection was reported from Maryland, New Jersey, and Iowa.

New Jersey: Found only in fields planted with non-certified seed. (Martin)

Maryland: Field losses were reduced by use of certified seed and the Jersey Redskin variety, and further lessened by the decreased use of the McCormick variety. However, these gains in the field were somewhat offset by an increased amount of mosaic in the Cobbler seed potatoes. (Jehle)

Iowa: Rugose mosaic is seldom seen in Iowa but this year it could be found in many fields especially those planted with uncertified seed. (Porter)

The use of the seed plot with the tuber unit method of planting and severe roguing during season as a means of eliminating rugose mosaic in foundation stocks was reported from Oregon.

LEAF ROLL (VIRUS)

The story of leaf roll occurrence is similar to that of mild and rugose mosaic. This disease is fast becoming eliminated from better seed stocks. The reports of excessive losses are in most cases from non-certified or common seed used in garden plantings. New York reported the highest loss, 10 per cent, New Jersey 8 per cent, Arizona 6 per cent, Maryland 2 per cent, and Utah 1 per cent.

The relation of net necrosis to leaf roll was reported by Gilbert (1 and 2).

Recent literature: Pl. Dis. Reptr. 12: 23, 75, 132.

1. Gilbert, G. H. Net necrosis of Irish potato tubers, Vermont Agr. Exp. Sta. Bul. 298: 1-36. Sept. 1928.

2. Gilbert, G. H. Net Necrosis of Irish potato tubers. (Abstract) Phytopath. 19: 82 Jan. 1929.

SPINDLE TUBER (VIRUS)

The occurrence and losses from spindle tuber are noted in the following table:

Table 6. Percentage losses from spindle tuber of potato as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
2	Kansas	Trace	New York, Florida, Mississippi, Nebraska, Montana, Nevada, Oregon
1-2	California		
1.5	New Jersey		

Distribution of spindle tuber within the states seems to be erratic as can be seen in the following quotations from collaborators:

New York: Small loss on Long Island, not important in any other section of the state. Cobbler seed now much more nearly free than in past years. (Chupp)

Montana: Seen in small amounts in many fields of Netted Gem potatoes in western edge of state. (P. A. Young)

California: Found in Delta region near Stockton and around Porterville. (Kendrick)

Oregon: Found this year in western Oregon in one field. The original seed stock came from one of the neighboring states. This is the first time that this disease has been encountered in commercial fields in western Oregon. It has been found only a few times and in small amounts in eastern Oregon in stocks recently brought in from the outside. (McKay & Dykstra)

Transmission of spindle tuber has been secured experimentally by Goss (1) and was mentioned incidentally by MacMillan (2).

Potato - Spindle Tuber

Recent literature: Pl. Dis. Reptr. 12: 132.

1. Goss, R. W. Transmission of potato spindle tuber by grasshopper (Locustidae). Phytopath. 18: 445-448. May 1928.

2. MacMillan, H. G. The V & F Pathologist 1 (20): 80. Oct. 1, 1928.

PSYLLID YELLOWS (CAUSE UNDETERMINED)

Psyllid yellows appears to be largely confined to Utah and adjacent states, although in 1928 it was also reported from California. This disease has been definitely determined by Richards to be transmitted by the potato psyllid, Paratrioza cockerelli Sulc. Its severity seems to depend very largely on the prevalence of these insects in the potato fields. Since this disease has been recognized only recently the reports by pathologists in affected regions will be of interest.

Utah: Losses from psyllid-yellows in Utah were greatly reduced over those experienced in 1927. While the potato psylla this year was almost coextensive with potato culture in the state, the damage was but slight in most of the areas where in 1927 it was disastrous. The total loss for 1928 would probably not exceed 7 per cent, while in 1927 the decrease in yield from psyllid yellows ranged between 25 and 30 per cent. This decreased loss was undoubtedly due to the fewer number of insects present in the various areas.

Damage to the potato crop during the year varied greatly in the different districts within the state. In Washington County the destruction, as in 1927, was complete. The entire crop planted between February 15 and March 10 was plowed up, except for 2 experimental plots, by June 10.

Davis and Weber Counties, wherein the loss in 1927 amounted to 75 per cent of the crop, suffered between 10 and 12 per cent loss during the past season. In the survey of Hunter and Magna districts of Salt Lake County, made during August, 72 per cent of the fields showed yellows with an average of 16 per cent of the plants affected. An average of 9.5 per cent of plants in all the fields visited showed the trouble.

Some loss occurred in other potato-growing areas although there exists but little data to indicate the approximate amount. In Cache County the losses were felt in the early garden crop which was largely destroyed, and in the late commercial plantings. Sanpete and Sevier Counties are reported to have suffered severely.

Interest lies in the fact that the potato psylla overwintered throughout its entire 1927 range. In Washington County, in the extreme southwest part of the state, psyllids were first noted in serious numbers by May 10. However, judging from the stage of disease at this date, the insect had evidently appeared as early as March 15. Psyllids were found throughout Salt Lake, Davis, Weber, and Boxelder Counties on volunteer potato plants as early as June 12 to 15. Here again the stage of progress of the disease indicated their appearance on potatoes from 10 to 15 days earlier than these dates. On the Station experimental plats at Logan, in the extreme northern part of Utah, psyllids in the nymph stage were collected from the matrimony vine on May 14.

The progress of the disease, in certain localities, and its relation to the tomato psyllid (Paratrioza cockerelli Sulc.), was identical with the development in 1927. (B. L. Richards)

Idaho: We have not noted this disease in Idaho this year. Personally, I have been over the potato-growing regions of southern Idaho several times. (Hungerford)

Colorado: The psyllid yellows was first seen in Colorado in 1926 about June 18 on the early potato crop and caused a loss of two-thirds of the early crop in the Fruita district. In the same district in 1927 the disease was more severe and was also found in Delta, Montrose, and Garfield Counties. The disease was not reported in fields above 6,000 feet. In 1928 the disease was not as prevalent as in the two previous years although as much as ten per cent of the acreage of early potatoes was plowed up and replanted to other crops, the remaining plantings showing infestations of 0 to 10 per cent. (From a special report by C. H. Metzger, Assist. in Hort. and A. M. Binklay, Assoc. Hort. Colorado Agricultural College.)

California: The serious potato disease reported and named by Dr. Richards and his co-workers as "PSYLLID YELLOWS" has recently been discovered in Southern California. The first specimens of this kind were brought to the writer early in December from the Lake Elsinore district in Riverside County. This district was visited a few days later and the entire fall crop of potatoes in that area appeared to be severely affected. The symptoms in every detail closely corresponded with those formerly described on potatoes in Utah. Yellowing, rolling and purpling of the leaves was quite pronounced. The growth ceased, the internodes were shortened and the tuberization was well marked at the nodes and at the apexes. The latter had also a rosette appearance. The psyllid adults and nymphs were abundant. The infection evidently took place before the tubers were formed since not many tubers larger than walnuts could be found. The owners were plowing the fields under without attempting to dig.

In this connection it is interesting to recall that the early spring crop of 1926 in the coastal section of northern San Diego County was a complete failure on account of a disease characterized by all the peculiar symptoms now attributed to the psyllid infection, but at that time the disease was not properly identified. White Rose and, in part, British Queen are practically the only varieties grown in these sections.

The tomato psyllid (Paratrioza cockerelli Sulc.) has been very abundant in Southern California this season, and damage to tomatoes and peppers was likewise reported, but it has not been possible to ascertain how much of this damage is due to a possible virus carried by these insects and how much to the injury caused by their feeding. (Shapovalov)

References: Pl. Dis. Reptr. 12: 21, 43.

YELLOW DWARF (CAUSE UNDETERMINED)

Yellow dwarf was reported only from New York State where traces were found in a few fields.

WITCHES' BROOM (VIRUS)

The disease was reported from Michigan, Minnesota, Montana, Washington, and Oregon. In one Montana field, of one-half acre, however, 3 per cent was found and tuber indexing work also revealed the disease in selected seed stocks. In general it caused only slight loss.

APICAL LEAF ROLL

Apical leaf roll, a new disease of the leafroll group, which can be transmitted by tuber grafts has been described by Schultz and Bond4 (1) in Maine.

Recent literature

1. Schultz, E. S., and Reiner Bonde. Apical leaf roll of potato. (Abstract) Phytopath. 19: 82. Jan. 1929.

TIPBURN

Special comments by collaborators were as follows:

New York: Statewide occurrence was reported with a total loss of about 7 per cent. Rains first part of season delayed appearance of severe tipburn. The earliest occurrence reported was on July 20. Rurals were resistant; Cobblers and Bliss Triumphs very susceptible. Loss in an average field often reached 25 per cent. (Chupp)

Mississippi: While localized in occurrence tipburn was very severe. The earliest date of appearance noted was May 5. (Neal, Wedgworth, & Miles)

New Mexico: One of the most important potato troubles in the State. (Crawford)

HOPPERBURN

Hopperburn which may in some cases be confused with tipburn was reported from many states. The distribution and severity is noted in the following table. In addition to the states mentioned in the table the disease was reported as severe in Mississippi, Ohio, and New Mexico.

Table 7. Percentage losses from hopperburn of potato as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
30	Arkansas	1	Missouri, Minnesota
7	New York	.5	Maryland
5.5	New Jersey	Trace	North Carolina, Massachusetts, Tennessee, Florida, Louisiana, Michigan, Iowa, Kansas
5	West Virginia		
2	Wisconsin, Indiana		

Special notes on occurrence were contributed by collaborators.

New Jersey: Good control followed spraying with Bordeaux mixture (5-7-50) made with hydrated lime. (Martin)

Delaware: More than last year. Satisfactory control with 3-5 sprayings with Bordeaux. (Adams)

Maryland: Very destructive on some unsprayed fields this year. (Jehle)

West Virginia: During July hopperburn was general and rather severe on unsprayed fields. In commercial fields the regular spray schedules controlled the trouble efficiently. (Archer)

Arkansas: Irish Cobbler resistant; Bliss Triumph very susceptible. The most common and the most destructive disease on Irish potatoes in the state. (Rosen)

Ohio: September 1. Due to extremely dry and hot weather, hopperburn has developed in severe form during the last three weeks. Fields that have not been sprayed or dusted are practically dead. (Tilford).

Wisconsin: Earliest occurrence August 1. Early varieties very susceptible. (Vaughan)

Iowa: Somewhat delayed this year although common on Triumphs and Ohios. Cool nights held trouble in check and with abundant June and July rains favored development of crop. (Porter)

MISCELLANEOUS PARASITIC DISEASES

Disease	Cause	State reporting	Remarks
Eelworm	Caconema radicicola (Greef)Cobb	Nevada	Serious in Newlands Project.
		Florida	Common on Bliss variety in certain types of soil usually late in spring. (Weber)
		Mississippi, Texas, Arizona	Earliest appearance June 7.
Silvery scurf	Spondylocladium atrovirens	New York, New Jersey, Washington	Traces
Slime mold	Stemonites splendens	Florida	Found in few fields; not parasitic; no damage. (Weber)
Wilt	Verticillium albo-atrum	Utah	General, causing 1 per cent loss.
		Oregon	Appears to be much less prevalent in western Oregon than was true a few years ago. (McKay)
		Massachusetts: Colorado	Trace
Root rot	Phymatotrichum omnivorum	Texas	Restricted to South Texas.
Stem rot	Sclerotium rolfsii	Texas	

Recent literature

1. Brierley, P. Pathogenicity of Bacillus mesentericus, B. aroideae, B. carotovorus, and B. phytophthorus to potato tubers. Phytopath. 18: 819-838. Oct. 1928.

2. Burr, S. Sprain or internal rust spot of potato. Ann. Appl. Biol. 15: 563-585. Nov. 1928.

3. Bryan, H. Wart disease infection tests. Jour. Agr. Sci. 18: 507-514. July 1928.

4. Drechsler, Charles. A diplanetic species of Phytophthora causing pink rot of potato tubers. (Abstract) Phytopath. 19: 92. Jan. 1929.

5. Ducoment, V., and Foex, Et. Essais effectuées en 1927 au champ d'expériences établi par l'Institut des recherches agronomiques à Russ-Hersbach (Bas-Rhin) en vue de l'étude de la maladie verruqueuse (Synchytrium endobioticum (Schilb.) Perc.) de la pomme de terre. Compt. Rend. Acad. Agr. France 14: 442-445. Mar. 14, 1928.

6. Esmarch, F. Untersuchungen zur Biologie des Kartoffelkrebses. III. (Investigations on the biology of potato ward.) Angew. Bot. 10(3): 280-304. 1928. (Abstract Rev. Appl. Myc. 7: 738. Nov. 1928).

7. Hodson, W. E. H., and Gibson, G. W. Some experiments with calcium cyanide as a control for plant parasitic nematodes. Ann. App. Biol. 15: 639-648. 1928.

8. Kingma, F. H., and Thoe, Van Beijma. Ueber ein Kartoffelfaule verursachendes Verticillium, Verticillium foexii nov. spec. Med. Phyt. Lab. Willie Commelin Sch. 12: 31-35. Sept. 1928.

9. Müller, K. O., Ueber den "echten mehltau" der kartoffel. Nachrichtenbl. Deut. Pflanzenschutzd. 8: 19-20. Mar. 1928. (Abstract Rev. Appl. Myc. 7: 534. 1928).

10. Noble, R. J. Root knot and other eelworm diseases. Agr. Gaz. New South Wales 39: 546-550. July 1928.

11. Quanjer, H. M. Een aaltjesziekte van de aardappelplant... (An eelworm disease of the potato plant, the mode of infection and the source of its cause, Tylenchus dipsaci Kuhn.) Tijdschr. Plantenz 33: 137-172. 1927.

12. Reiling. Kringelsucht der Kartoffel. (Sprain of potatoes) Illus. Landw. Zeit. 48 (9): 121. 1928. (Abs. Rev. Appl. Myc. 7: 597. Sept. 1928)

13. Roach, W. A., and M. D. Glynne. The toxicity of certain sulphur compounds to Synchytrium endobioticum, the fungus causing wart disease of potatoes. Ann. Appl. Biol. 15: 168-190. May 1928.

14. Schlumberger, O. Krankheiten und ihre Bekämpfung. In Versuchsergebnisse auf dem Gesamtgebiete des Kartoffelbaus in den Jahren 1923-1926. Mitt. Biol. Reichsanst. Land. u Forstwirtsch. 36: 102-113. Jan. 1928.

15. Weiss, F., and P. Brierley. Factors of spread and repression in potato wart. U. S. Dept. Agr. Bul. 56: pp. 14. 1928.

MISCELLANEOUS NON-PARASITIC DISEASES

The following miscellaneous non-parasitic diseases were reported from the states indicated.

Disease	State reporting	Remarks
Black heart	New York Washington	Small amounts reported
Fertilizer injury	New York	High analysis fertilizer placed in row too near seed.
Frost injury	New York	Small, mottled, distorted leaves and stunted plants.
Drought injury	New York	Reduced yield
Hail injury	New York	Observed in three fields.
Hollow heart	Wisconsin, Washington	Associated with over-development at end of season.
Internal brown spots	Washington	Associated with light soils and irregular moisture.
Lightning injury	New York	Two cases observed
Pitting	Washington	Sub-oxidation
Poor Germination	Kentucky, New York	Excessive moisture at time of planting and unfavorable storage of seed

Disease	State reporting	Remarks
Sprout tubers	Kentucky	Tubers formed directly from seed piece with no top growth.
Walnut injury	New York	Observed in two counties

Recent literature

1. Gericke, S. Die Erforschung der Urbarmachungskrankheit. Die Umschau 32: 278-279. Mar. 31, 1928.

   Also called Heidemoorkrankheit. A disease affecting almost all cultivated crops in Holland and Germany on newly cleared land. Similar disease apparently to trouble affecting crops on muck land in U. S. Control in this case was obtained by broadcasting copper sulfate crystals.

2. Moore, H. C. Further studies of potato hollow heart. Proper cultural practices lessen percentage of tubers affected. Michigan Agr. Exp. Sta. Quart. Bul. 11: 20-24. Aug. 1928.

DISEASES OF TOMATO

FUSARIUM WILT CAUSED BY FUSARIUM LYCOPERSICI SACC.

Wilt was reported as serious only in certain southern and central states. Destructiveness in northern states appears to be confined largely to greenhouse-grown tomatoes. Damage in Mississippi was reported to be greatly lessened by the use of wilt-free seed. (Neal, Wedgeworth, Miles). Louisiana Pink and Louisiana Red were reported to be resistant in Louisiana (Tims). All varieties yet tested seemed to be more or less susceptible at the Virginia Truck Station. (McWhorter). Marvel, Marvelosa, and Marglobe were reported to be resistant in Missouri but resistance was expressed in delay of infection. (Scott). Resistant varieties are reported to have given favorable results in New Mexico (Crawford). Wilt in Marglobe, a resistant variety, was just as severe on new land as on land previously cropped to tomatoes in the lower Rio Grande Valley of Texas (Bach).

Losses from the disease are given in the accompanying table. It was also reported as severe or general in Florida, Louisiana, Arkansas, and New Mexico.

Table 8. Percentage losses from Fusarium wilt of tomato as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
30	Texas	4	New Jersey, North Carolina
15	Arkansas	3	Kansas
12	Louisiana	2	Maryland, Ohio, Utah
10	Tennessee, Florida, Mississippi	Trace	New York, West Virginia, Indiana, Wisconsin, Iowa, Texas, Nebraska, Washington, California, Michigan
9	Arizona		
5	Georgia, Missouri, Virginia, Texas		

Recent literature: Pl. Dis. Reptr. 12: 22, 118, 133.

1. Haymaker, H. H. Relation of toxic excretory products from two strains of Fusarium lycopersici Sacc. to tomato wilt. Jour. Agr. Res. 36: 697-719. Apr. 15, 1928.

2. Haymaker, H. H. Pathogenicity of two strains of the tomato-wilt fungus, Fusarium lycopersici Sacc.-- Jour. Agri. Res. 36: 675-695. 1928.

LEAF SPOT, SEPTORIA LYCOPERSICI SPEG.

The distribution and importance of leaf spot is shown by the following table. In addition, Pennsylvania and Ohio reported severe infections but gave no estimates. The time of appearance and behavior is shown by reports from several collaborators.

West Virginia: The Septoria leaf spot is the most severe disease of the tomato in West Virginia. It occurred widely and by September 1 practically all plants had lost half their leaves. In many cases the vines were killed outright. The larger commercial growers suffer little loss because they expect to harvest only a few crops before the spring market is flooded and the price drops. The infection usually comes after the larger growers have completed their harvest. The smaller growers, however, who maintain wayside markets and the home gardener suffer considerable loss. (Archer)

Delaware: Weather favorable for late infection but yield not reduced as much as last year. (Adams)

Tomato - Leaf Spot

Georgia: Ordinarily becomes noticeable during the last of the early crop (July) and is most severe on the following or late summer crop planted out in July. Was held in check on one farm by spraying. (Boyd)

Ohio: Caused rather severe losses in a large number of fields in Ohio this year, even where spray programs were used, due probably to the late start in spraying. (J. D. Wilson)

Indiana: Worst it has been in ten years. Loss for state carefully estimated for early Septonia is 8.7 per cent or a money value of $171,000. (Gardner and Brown)

Table 9. Percentage losses from leaf spot of tomato as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
15	West Virginia	3	Texas, Virginia, Iowa
10	Kansas	2.5	North Carolina
8.7	Indiana	1	New York, Michigan, Arkansas
8.	Utah		
7	New Jersey	0	Pennsylvania
5	Maryland, Iowa, Tennessee	Trace	Georgia, Mississippi, Nebraska, New Mexico, Minnesota
4	Wisconsin, Missouri		

EARLY BLIGHT, ALTERNARIA SOLANI (ELL. & MART.) JONES & GROUT

The occurrence of early blight in severe form as shown by the table was not general. In addition to the states named general occurrence or severe infection was reported from Connecticut, Massachusetts, Florida, and Mississippi. Nearly every case of severe infection was reported to have followed wet weather and several collaborators stressed the importance of this climatic factor.

In Delaware the organism caused much damage as a stem or collar blight. Some plants were killed outright and many others were stunted.

Table 10. Percentage losses from early blight of tomato as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
15	Maryland	3	Ohio
10	Massachusetts, Louisiana	2	Indiana
		1.5	North Carolina
8	Virginia	1	New Jersey, Florida, Arkansas
5	Missouri, Tennessee, Mississippi	Trace	Delaware, West Virginia, Wisconsin, Iowa, Minnesota, Montana
4	Georgia		

References: Pl. Dis. Reptr. 12: 21, 66.

CURLY TOP (WESTERN YELLOW BLIGHT)

This disease, formerly known as western yellow blight, later as yellows (4), but now spoken of by most western workers as curly top, was reported as severe only in certain localities. The prevalence of this disease appears to depend entirely upon the occurrence of the beet leaf hopper (Eutettix tenellus), the disseminating agent, and for this reason the factors influencing the insect are very important. Severe localized infection was reported from Mesilla Valley, New Mexico (Crawford); Arizona 25 per cent loss (Streets); southern Utah 7 per cent loss (Richards); and eastern Oregon (Dykstra). Washington reported 15 per cent loss and California ten per cent loss.

Concerning the disease in Utah, Richards reports: Yellows (curly top) was found in 15 of the 17 fields visited. The maximum infestation observed in any one field was 81 per cent. Six of the 15 fields ranged above 50 per cent, with a total average for the diseased fields of 44.3 per cent. Yellows is the most serious disease of the tomato in the Hunter and Magna districts, although in 1927 canker ranked about equal in destructiveness.

Recent literature: Pl. Dis. Reptr. 12: 22, 97, 108, 118.

1. McKay, M. B. The curly top disease. Seed World 23 (13): 38, 40, 72, June 29, 1928.

2. Severin, H. H. P. Transmission of tomato yellows or curly top of the sugar beet by Eutettix tenellus (Baker). Hilgardia 3: 251-271. May 1928.

3. ______________ Tomato yellows or tomato curly top. Phytopath. 18: 709-710. Aug. 1928.

4. Shapovalov, M. Yellows, a serious disease of tomatoes. U. S. Dept. Agr. Misc. Publ. 13, 4 p. Feb. 1928.

LEAF MOLD, CLADOSPORIUM FULVUM CKE.

Leaf mold was reported in traces from the southern states where it is troublesome as a field disease. The really serious occurrences were reported from greenhouses in the northern states. It is not uncommon for a large proportion of foliage to be destroyed indirectly affecting fruit production and causing heavy losses. Estimated losses in greenhouses are Oregon 20 per cent, Michigan and Wisconsin 5 per cent, and Massachusetts 3 per cent.

A variety resistant to leaf mold was reported to be under trial in Oregon (McKay). Newhall and Wilson (3) have reported on the introduction of forced-air ventilation systems in greenhouses for control of this disease.

Recent literature: Pl. Dis. Reptr. 12: 22, 70, 133, 146.

1. Gregory, C. T. Controlling tomato leaf mold in greenhouses in Indiana. Proc. Indiana Acad. Sci. 37: 382-385. 1927.

2. Newhall, A. G. The relation of humidity and ventilation to the leaf mold disease of tomatoes. Ohio Agr. Sta. Bimo. Bul. 13 (3): 119-122, 1928.

3. ______________ and J. D. Wilson. A preliminary report on forced air ventilation for the control of Cladosporium leaf mold of greenhouse tomatoes. (Abstract) Phytopath. 19: 83. 1929.

4. Rice, W. H. Control of tomato mildew. Trials in Auckland District, season 1927-28. New Zealand Jour. Agr. 36: 99-102. Feb. 1928.

5. Small, T. Tomato leaf mould. Ann. Rep. Exp. & Res. Stat. Nursery & Mark, Gard. Industr. Devel. Soc. 13: 46-51. 1928.

BACTERIAL CANKER, APLANOBACTER MICHIGANENSE EFS.

This tomato disease was reported from Georgia, the northern States, Utah, and California, as reference to the table of loss estimates will show. In New York it was found mostly in the counties bordering on Lakes Erie and Ontario.

Georgia: On June 15, it was more prevalent than in 1927. Manure seemed to be a source of infection. The disease was first observed April 12 in a plant bed. A field of 30 acres of plants from this seed bed sustained a loss of 85 per cent. Other fields showed 5 to 75 per cent plant infection. The disease was observed in Tift and Thomas Counties in 1928. On September 15, 250 acres of Globe variety in Coffee County had suffered 42 per cent loss. Tests showed that the organism remained viable in compost 7 to 8 months. The results of another test indicate seed transmission. (Boyd)

Michigan: Appeared in many fields set with southern grown plants. (Nelson)

Wisconsin: Reported for the first time, probably seed-borne. (Vaughan).

California: Found August 28 in San Joaquin Valley and on September 4 in the Santa Rosa Valley causing relatively light losses in each case. (Shapovalov)

Utah: Linford (1927) reported this disease from seven counties with an average crop loss for the state of 12 per cent. During 1928 serious damage was noted by the writer in Utah, Weber, Davis, Boxelder, and Salt Lake counties. In Hunter and Magna districts of Salt Lake County the bacterial canker was found in four out of 17 fields visited. In these four fields an average of 30 per cent of the plants showed the trouble. One field exhibited the disease to the extent of 90 per cent of the plants. The disease in these districts, however, was less severe than in 1927. During the summer of 1927, 52 per cent of the fields studied in Hunter and Magna showed canker with an average infestation in the diseased fields of 26 per cent of the plants.

Table 11. Percentage losses from bacterial canker of tomato as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
5-10	Michigan	Trace	Ohio, Indiana,
8	Utah		Wisconsin, Washington,
.5	New York		California

Recent literature

1. Bisby, G. R., and I. L. Conners. Plant diseases new to Manitoba. Sci. Agr. 8: 456-458. Mar. 1928.

2. Bryan, M. K. Bacterial canker of tomatoes. U. S. Dept. Agr. Circ. 29: 8 pp. 1928.

BACTERIAL WILT, BACTERIUM SOLANACEARUM EFS.

This tomato disease was reported by Poole (North Carolina)and Boyd (Georgia) to have caused 2.5 and 1 per cent loss respectively in 1928 while collaborators in Massachusetts, Maryland, North Carolina, Tennessee, Georgia, Florida, Mississippi, and Louisiana reported only small amounts.

Virginia: Not seen in Tidewater, Virginia. (McWhorter)

West Virginia: During the past 15 years bacterial wilt has been observed only in 6 or 7 scattered cases. It was not seen in 1928. (Archer)

North Carolina: Severe in heavy, sandy soil areas. (Poole)

Georgia: Distribution nearly as wide as Fusarium wilt, but not so prevalent or severe. More prevalent, however, in the larger commercial planting than Fusarium wilt. (Boyd)

Florida: Not so common as previously. (Weber)

Mississippi: Not reported last year but has been rather prevalent this year. (Neal, Wedgworth, & Miles)

BLOSSOM-END ROT, NON-PARASITIC

The distribution and severity is indicated in the accompanying table. West Virginia, Georgia, Florida, and Missouri reported less loss than usual while Utah reported the trouble much more serious than for years, especially on the early crop. An unusually severe occurrence was reported from Arkansas (July 15, V. H. Young) where loss in an 18 acre field was 75 to 80 per cent.

Utah: This trouble was reported as being especially severe throughout the state. In the Hunter and Magna districts it was found especially severe on the early crop and continued to appear in considerable quantity through the entire season. One farmer reported a loss of 35 per cent in his early crop from this trouble alone. (Richards)

Ohio: Bad in greenhouses where it was more severe on light soils and after steam sterilizing. (Wilson)

Table 12. Percentage losses from blossom-end rot of tomato as estimated by collaborators, 1923.

Percentage loss	States reporting	Percentage loss	States reporting
5	Tennessee	Traces	New York, Massachusetts, North Carolina, New Jersey, Mississippi, Louisiana, Arkansas, Michigan, Wisconsin, Washington, North Dakota, Minnesota, Florida
2	Maryland, Georgia		
1.5	Iowa		
1	Missouri, Kansas, Utah, Arizona		
0.5	Ohio		

Recent literature: Pl. Dis. Reptr. 12: 66.

STREAK (VIRUS)

Streak in tomatoes has been reported from a few northern states, New York, Ohio, Michigan, Wisconsin, and from California with no state reporting more than a slight amount of the disease. The following notes from collaborators are interesting and show to what extent streak is important in field and greenhouse.

Ohio: Very damaging in certain greenhouses on heavy soil where early spring crop is forced with large quantities of fertilizer. Not as severe this year due to letup on heavy fertilizing. Has been found abundant on the first crop in a new house built over a potato field. Not troublesome on lighter soils at all. Common in milder form on outdoor crop but losses there very light. (Newhall)

Michigan: Found in College greenhouse in November affecting 10 per cent of plants. (Nelson)

Wisconsin: More than last year. Of growing concern to gardeners near Milwaukee. Greenhouse damage moderate, field damage slight. (Vaughan)

California: This disease which as a rule is of a very secondary importance in the San Fernando Valley this year destroyed in some fields 50 per cent of the crop or more. (Shapovalov)

Tomato - Streak

Recent literature: Pl. Dis. Reptr. 12: 108, 109, 133.

1. Anon. Botany and plant pathology. Ohio Agr. Exp. Sta. Bul. 417: 34-41. 1928.

2. Blood, H. L. A "streak" of tomatoes produced by a disturbing principle from apparently healthy potatoes in combination with tomato mosaic virus. Phytopath. 18: 311. Mar. 1928.

3. Doolittle, S. P. Soil transmission of tomato mosaic and streak in the greenhouse. (Abstract) Phytopath 18: 155. 1928.

MOSAIC (VIRUS)

Under this heading is considered the group of tomato "mosaic" diseases rather than any particular form.

The distribution and importance is shown to some extent in the accompanying table. In many cases mosaic was prevalent but did not cause large losses. In Massachusetts, Michigan, Washington, and Oregon, it was reported as serious in greenhouse-stock. The importance of volunteer plants, weeds, and other infected crops was mentioned by collaborators as sources of inoculum for general infections. Marglobe was reported very resistant by Essary (Tennessee).

A new form has been described as Aucuba mosaic by Bewley (1, 2). Kraybill, Brewer, Samson and Gardner (3) reported experiments on the relation of the filiform symptoms to the mottling symptoms.

Table 13. Percentage losses from mosaic of tomato, as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
5	Tennessee, Arizona		Louisiana, Arkansas,
1	Maryland, Iowa, Utah		Michigan, Wisconsin,
Trace	Vermont, Massachusetts		Montana, Washington,
	Delaware, West		California, New Jersey,
	Virginia, Mississippi,		North Carolina, Kentucky,
			Minnesota, Indiana

Tomato - Mosaic

Recent literature: Pl. Dis. Reptr. 12: 21, 108, 109, 146.

1. Bewley, W. F., and W. Corbett. "Mosaic" diseases of the tomato. Ann. Rep. Exp. & Res. Nursery & Mark, Gard. Industr. Devel. Soc. 13: 51-59. 1928.

2. ______________ "Mosaic" disease of the tomato. Thirteenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1927: 51-59. 1928.

3. Brewer, P. H., H. R. Kraybill, and M. W. Gardner. Purification and certain properties of the tomato mosaic virus. (Abstract) Phytopath. 19: 108. Jan. 1929.

4. Clayton, E. E. Increasing stands from vegetable seeds by seed treatment. New York (Geneva) Agr. Exp. Sta. Bul. 554: 16 pp. 1928.

5. Doolittle, S. P. Soil transmission of tomato mosaic and streak in the greenhouse. (Abstract) Phytopath. 18: 155. 1928.

6. Kraybill, H. R., P. H. Brewer, R. W. Samson and M. W. Gardner. The separation from mosaic tomato plants of toxins which produce some of the typical mosaic symptoms. (Abstract) Phytopath. 19: 108. Jan. 1929.

7. Smith, J. H. Experiments with a mosaic disease of tomato. Ann. Appl. Biol. 15: 155-167. May 1928.

8. Valleau, W. D., and E. M. Johnson. Observations and experiments on the control of true tobacco mosaic. Kentucky Agr. Exp. Sta. Bul. 280: 145-174. 1927.

9. Blood, H. L. A 'streak' of tomatoes produced by a disturbing principle from apparently healthy potatoes in combination with tomato mosaic virus. Phytopath. 18: 311. 1928.

10. Smith, J. H. The transmission of potato mosaic to tomato. Ann. Appl. Biol. 15: 517-528. Nov. 1928.

MISCELLANEOUS PARASITIC DISEASES OF TOMATO

Disease	Cause	State reporting	Remarks
Fruit spot	Bacterial	Georgia, New Jersey, Texas	
Southern Sclerotium rot	Sclerotium rolfsii	Georgia,	Seen only in one field. (Boyd)
		Florida,	Not common on early crop. Usually severe during late spring and early summer. (Weber)
		Texas	
Late blight	Phytophthora infestans	Delaware,	Common but little loss. (Adams)
		Florida,	Localized areas. (Ramsey)
		California	Causing heavy losses in vicinity of Oxnard (Ramsey) and serious in southern California (Milbrath).
Leaf spot	Stemphyllium sp.	Florida	Reported in literature (9). (Weber)
Rhizoctonia	Corticium vagum	Washington, Florida,	Scattered infections.
		New Jersey,	Damping off in seed beds. (Martin)
		Texas	
Root knot	Caconeman radicicola	Massachusetts,	
		Georgia,	5 per cent loss in Georgia. (Boyd)
		Texas, Washington	
Root rot	Phymatotrichium omnivorum	Texas,	Serious, 5 per cent loss.
		Arizona	0.4 per cent loss.
Wilt	Sclerotinia sclerotiorum	Washington,	One report.
		Texas	Serious.
Wilt	Verticillium alboatrum	Washington,	Three reports.

Tomato - Parasitic Diseases

Disease	Cause	State reporting	Remarks
Wilt (cont.)	Verticillium albo-atrum	Massachusetts,	Serious in greenhouse and field. 3 per cent loss. (Guba)
		New York	Present in Eden section.
Anthracnose	Colletotrichum phomoides	New Jersey, Indiana,	
		West Virginia	Few fruits on market.
Bacterial spot	Bacterium vesicatorium	Delaware,	First report for state Introduced with plant.
		Tennessee, and Indiana	Traces
Nail head spot	Macrosporium tomato	Arkansas,	Common on early shipping varieties.
		Mississippi,	Not serious.
		Florida,	
		North Carolina and Tennessee,	Traces.
		Georgia,	One per cent loss greatest damage in form of collar rot seedlings.
		Texas	
Fruit rot	Phoma destructiva	New York,	Following sunscald.
		Florida,	Serious spotting of leaves and some of fruit.
		Texas	Traces in South Texas.
Buckeye rot	Phytophthora terrestris	Florida, Arkansas	Localized.
Buckeye rot	P. parasitica	Indiana	In greenhouses.
Fruit rot	Macrosporium sp.	Wisconsin	Stem-end and side spot rot destroying one planting of two acres (Vaughan)

Recent literature: Pl. Dis. Reptr. 12: 21-22, 66, 69, 71, 76, 97, 108, 109, 118, 143-144.

1. Brown, N. A. Tomato losses from center rot heavy in several states. U. S. Dept. Agr. Yearbook 1927: 628-630. 1928.

2. Carne, W. M. Spotted wilt of tomatoes. Jour. Dept. Agr. West. Australia II, 5: 58. Mar. 1928.

3. Doran, W. L. Acetic acid as a soil disinfectant. Jour. Agr. Res. 36: 269-280. 1928.

4. Hill, J. B. The migration of Bacterium tumefaciens in the tissue of tomato plants. Phytopath. 18: 553-563. 1928.

5. Milbrath, D. G. Late blight of tomato. Month. Bul. Dept. Agr. California 17: 271-274. Apr. 1928.

6. Noble, R. J. Spotted wilt in tomatoes. Agric. Gaz. New South Wales 34: 59-63. 1928.

7. Pritchard, F. J. Tomatoes resistant to nailhead rust now widely planted. U. S. Dept. Agr. Yearbook 1927: 630-633. 1928.

8. Rice, W. H. Control of tomato mildew. Trials in Auckland district, season 1927-28. New Zeal. Jour. Agr. 36: 99-102. Feb. 1928.

9. Weber, George F. A Stemphylium leaf spot of tomatoes. (Abstract) Phytopath. 19: 92. Jan. 1929.

10. Williams, P. H. The effect of some compounds on Verticillium wilt of the tomato. Ann. Rep. Exp. & Res. Stat. Nursery & Mark. Gard. Industr. Devel. Soc. 13: 38-41. 1928.

MISCELLANEOUS NON-PARASITIC DISEASES OF TOMATO

Disease	State reporting	Remarks
Hollow stem	Arkansas	One report of severe occurrence on early shipping crop (Young).
Cat face	Arkansas	Serious at one point.

Disease	State reporting	Remarks
Yellowing	Florida	In the Everglades, yellowing with poor growth more pronounced in heavily fertilized fields. (Pritchard)
Leaf roll	New York	Caused by excess moisture.
Fruit cracking.	Massachusetts	Cracking followed by rotting.
Oedema	Ohio	Present in houses where tomatoes were forced too hard. (Newhall)
Puffing	Texas	Very prevalent. Fifty per cent loss of full crop in Valley.
Center rot	Arkansas	On Acme variety.
Fumigation injury	Indiana	Fumigation of plants coated with copper-lime dust caused injury.

Recent literature: Pl. Dis. Reptr. 12: 133.

DISEASES OF SWEET POTATO

BLACK ROT, CERATOSTOMELLA FIMBRIATA (E. & H.) ELLIOTT

Black rot was fairly generally distributed over the sweet potato growing sections of southern United States. Previous estimates for this disease for past three years in Georgia have been too low, (Boyd). Porter (Iowa) reported 90 per cent infection in a 20 acre field. Efforts toward eradicating this disease in southeastern Missouri are meeting with excellent results, (Scott). North Carolina losses in storage and field have been heavy, (Poole). In Delaware there was a decided increase over the past few years (Adams). From Virginia and Maryland, J. I. Lauritzen reported as follows:

"On the eastern short of Virginia black rot is the most severe storage trouble (Jan. 1929), many houses showing 10 to 25, and higher per cent of this disease. In Maryland the disease is also bad but somewhat less than in Virginia. The situation has become so acute that through the activities of county agents and others a vigorous campaign is being initiated to control and eradicate black rot from the territory."

Table 14. Percentage losses from black rot of sweet potato as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
8	Texas	2	Missouri, Kansas, Arizona
7	Georgia	1.5	Maryland
5	Arkansas, Mississippi, New Jersey, North Carolina, Tennessee	.5	Iowa
		Trace	Indiana, New Mexico
3	Delaware, Georgia		

Recent literature: Pl. Dis. Reptr. 12: 134, 142-143.

STEM ROT, FUSARIUM BATATATIS WOLL.

As seen in the loss estimates, stem rot is of importance in certain sections of central and southeastern United States. Reports indicate that the disease first appears in May or June. The heaviest loss, 10 per cent, occurred in Georgia, where the disease has been more serious than previous reports indicate, and in New Jersey. Dry hot weather at setting time was favorable for infection in Iowa (Porter). Eight large plantings in southeastern Missouri were rejected by inspectors because of stem rot (Scott). General and damage severe in California (Kendrick).

Table 15. Percentage losses from stem rot of sweet potato, as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
10	Georgia, New Jersey	2	Arkansas, Tennessee
7	Iowa	1.5	Maryland
5	Kansas, Indiana	1	North Carolina
3	Missouri, Mississippi	Trace	Florida

Recent literature: Pl. Dis. Reptr. 12: 134, 142-143.

1. Martin, W. H. Studies of sweet potato stem rot control. Ann. Rep. New Jersey Agr. Exp. Sta. 48: 225-232. 1928.

2. Poole, R.F. Further studies on the control of stem rot of sweet potatoes. (Abstract) Phytopath. 19: 84. Jan. 1929.

SCURF, MONILOCHAETES INFUSCANS HALS.

Scurf was about as generally distributed as the more serious sweet potato diseases but seemed to be doing but slight damage. In Delaware it was said to be very prevalent at harvest time (Adams). Slight amounts were reported from Maryland, Virginia, New Jersey, North Carolina, Georgia, Florida, Mississippi, Texas, Iowa, Arkansas, New Mexico, and Arizona. White varieties were reported most affected in New Mexico (Crawford). Inhibited by acid soil. Seed selection from disease-free area important. J. I. Lauritzen reported as follows, February 1, 1929:

"The outstanding malady of the Raleigh, North Carolina, section is scurf where the infection is general and severe without reference to either variety or the form from which the stock came. Potatoes in this region are generally stored in tobacco houses which serve very well. Diseases other than scurf were observed but no great amount of damage was being caused by them."

Recent literature: Pl. Dis. Reptr. 12. 134.

MOSAIC (VIRUS?)

Mosaic was reported as scattered but not causing any serious damage in Florida and Mississippi. In Texas it was said to be increasing.

Recent literature: Pl. Dis. Reptr. 12: 134.

OTHER DISEASES

Actinomyces sp., (Cystospora batata (E. & H.) Elliott) soil rot. Traces in New Jersey, Delaware, Maryland, North Carolina, Tennessee, Florida, Kansas, Texas, Arkansas.

Albugo ipomoeae-panduranae (Schw.) Sw., white rust. New Jersey.

Caconema radicicola (Greef) Cobb, root knot. Arkansas, North Carolina, New Jersey.

Diplodia tubericola (Ell. & Ev.) Taub., Java black rot. Florida, Texas.

Fusarium oxysporum Schl., surface rot. Mississippi. J. I. Lauritzen reported as follows from North Carolina:

"In the vicinity of Goldsboro, North Carolina, a striking example of the effect of rough handling on the occurrence of disease was noted. In one of the storage houses visited the potatoes were in very good condition with practically no disease and showing that they had been handled with extreme care during the harvest period and during subsequent curing and storage. In a second house, quite the reverse was true. The roots were generally bad and showed markedly the effects of rough handling, resulting in heavy infection of surface rot. Rhizopus soft rot was also abundant following wounds made by rats and mice." (January 1929).

Phyllosticta bataticola Ell. & Mart. Common in Florida; trace in Iowa.

Phymatotrichum omnivorum (Shear) Duggar. Root rot. Texas - prevalent in black lands with 10 per cent loss, Arizona - 1 per cent loss.

Plenodomus destruens Harter, foot rot. Traces from Maryland, Florida, Mississippi. A few outbreaks always occur in Princess Anne County, Virginia, according to McWhorter.

Pythium sp., mottle necrosis. Maryland (trace).

Rhizopus nigricans Erhnb. and Rhizopus spp., storage rots. Maryland; Mississippi (general); Kansas; Georgia; Texas; Arkansas; Mississippi; Kansas; New Jersey.

Sclerotium bataticola Taub., charcoal rot. Traces in Maryland, North Carolina, Georgia, Florida, Mississippi, Texas, Arkansas.

Sclerotium rolfsii Sacc., stem rot. Georgia (1 per cent loss); Mississippi (trace).

Recent literature: Pl. Dis. Reptr. 12: 134.

DISEASES OF BEAN

ANTHRACNOSE, COLLETOTRICHUM LINDEMUTHIANUM (SACC. & MAGN.) BRIOSI & CAV.

Anthracnose was serious only in the states bordering the Great Lakes and the Atlantic Coast States north of Maryland as will be noted from table of loss estimates. General occurrence was reported from many states giving only a trace of loss. In Massachusetts, Guba reported differences in varietal susceptibility. In tests in Maryland the use of western seed gave 0.38 per cent and eastern seed 22.19 per cent disease (Hunter). Arkansas, Wisconsin, and New Mexico reported the disease worse than for 1927.

Table 16. Percentage losses from anthracnose of bean, as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
25	New Hampshire	1	Michigan, Georgia, Louisiana
12	Massachusetts	0.1	Ohio
7	New York, Wisconsin	Trace	West Virginia, Texas, Arkansas, Iowa, Kansas, New Mexico, New Jersey, Indiana, North Dakota
5	Minnesota, Tennessee		
3	Florida, Mississippi		
1.5	Maryland		

Recent literature: Pl. Dis. Reptr. 12: 8-9, 23, 36, 64, 70, 96, 106.

1. Gloyer, W. O. Two new varieties of red kidney bean: Geneva and York. New York (Geneva) Agr. Exp. Sta. Tech. Bul. 145: 51 pp. July 1928.

2. Reddick, Donald. Building up resistance to diseases in beans. New York (Cornell) Agr. Exp. Sta. Memoir 114. 15 p. Mar. 1928.

BACTERIAL BLIGHT, BACTERIUM PHASEOLI EFS.

Blight caused by Bacterium phaseoli was general in its occurrence, the majority of states reporting it. Some interesting notes from collaborators were received.

Florida: Much worse than in previous years with a loss of 50 per cent in Gainesville section. Especially severe on account of wet weather. (Weber)

Louisiana: Very severe in Livingston Parish destroying entire fields. (Tims)

Michigan: Subnormal temperatures held blight infections down under favorable moisture conditions. (Nelson)

Wisconsin: More than usual, especially on Kidney wax and Giant Green Pod. (Vaughan)

Texas: Fairly prevalent. Very severe, probably transmitted by bean leaf hopper. (Taubenhaus & Bach)

Colorado: Seems most serious on plants frosted previously. (LeClerg)

Montana: Common in eastern half of state. (Young)

Table 17. Percentage losses from bacterial blight (Bacterium phaseoli) of beans as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
10	Florida, Louisiana	1-3	New York
6	Wisconsin	1	Michigan, Arizona
5	Georgia, Minnesota	Trace	Massachusetts, New Jersey, West Virginia, Virginia, Indiana, Washington, Oregon
4	Montana		
3	Mississippi		
2	Maryland, Kansas		

Recent literature: Pl. Dis. Reptr. 12: 8-9, 23, 36, 95, 96, 107, 121-122.

1. Zaumeyer, W. J. Seed infection by Bacterium phaseoli. (Abstract) Phytopath. 19: 96. Jan. 1929.

HALO BLIGHT, BACTERIUM MEDICAGINIS PHASEOLICOLA BURK.

Halo blight was reported from Georgia, Florida, Wisconsin, and Montana. Plants of Bountiful snap beans suspected as being affected with this disease were also collected near Norfolk, Va. From Georgia O. C. Boyd reported as follows:

"This is the first year this disease has been reported from Georgia. It was very destructive to the early snap bean crop. Damage in individual fields ranged from a tract to 100 per cent, with all intermediate gradations. Red Valentine, Burpee's Stringless Green Pod, Bountiful and Masterpiece susceptible. Refugee not so badly affected."

Miss Hedges (1) reported on the prevalence of this disease.

Recent literature: Pl. Dis. Reptr. 12: 36, 95, 121-122.

1. Hedges, Florence. Bacterial diseases of beans in some western commercial seed growing and canning areas and southern trucking sections in 1927 and 1928. Pl. Dis. Reptr. 12(11): 121-122. October 15, 1928.

MOSAIC (VIRUS)

Mosaic of bean was reported as general in many States. As noted in reports of previous years the disease appeared to be more serious in the Western States. Special notes from some of the collaborators are of interest.

Delaware: Several commercial plantings were seriously stunted and yields greatly reduced. (Adams)

Maryland: Found only in the Refugee variety. (Hunter & Jehle)

West Virginia: As usual the infection was slight and scattered. (Archer)

Georgia: Observed more serious in Refugee variety. (Boyd)

Michigan: Losses now largely confined to canning crop and garden varieties. Stringless Refugee strains always show percentage of mosaic. (Nelson)

Wisconsin: More on Refugee than other varieties. (Vaughan)

Texas: Very prevalent in lower Rio Grande Valley following leaf hopper injury. (Taubenhaus & Bach)

Montana: Disease particularly common and destructive on Great Northern variety. (Young)

Utah: In Hunter and Magna districts mosaic was found in every one of the 7 fields visited. Although at times difficult to diagnose in the presence of chlorosis so prevalent in these districts, it was evident that serious losses resulted. As high as 83 per cent of the plants with mosaic were noted in one field. (Richards)

Table 18. Percentage losses from mosaic of bean as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
8	Utah	1	Massachusetts, Wisconsin
5	Kansas, Washington	Trace	New York, New Jersey, Maryland, West Virginia, Georgia, Indiana, Michigan, Florida
4	Montana		
3	Mississippi, Arizona		

Recent literature: Pl. Dis. Reptr. 12: 64, 95, 107.

1. Dufrenoy, J. Modifications des mitochondries et des plastides dans les cellules de feuilles de haricots affectees de mosaique. (Modifications in the mitochondria and plastids of the leaf cells of beans affected by mosaic). Comptes Rendus Soc. de Biol. 98: 373-374. 1928.

2. Fajardo, T. G. Progress on experimental work with the transmission of bean mosaic. (Abstract) Phytopath. 18: 155. 1928.

3. Harter, L. L. The bean disease situation in some western states. The V & F Pathologist (Mimeographed) 1 (19): 23. Sept. 15, 1928.

4. Clayton, E. E. Toxicity of mercury and copper compounds in relation to their use for seed treatment and spraying. (Abstract) Phytopath. 19: 86. 1929.

RUST, UROMYCES APPENDICULATUS (PERS.) LINK

Rust was reported as causing slight losses from Massachusetts, New York, New Jersey, Maryland, West Virginia, Georgia, Mississippi, Indiana, Wisconsin, Texas and California. In many cases it appeared too late in the season to cause any loss.

Recent literature: Pl. Dis. Reptr. 12: 36.

1. Waters, C. W. The control of teliospore and urediniospore formation by experimental methods. Phytopath. 18: 157-213. 1928.

DRY ROOT ROT, FUSARIUM MARTII PHASEOLI BURK. & FUSARIUM SPP.

Fusarium root rots were reported as causing slight losses in Massachusetts, Tennessee, Maryland, West Virginia, Florida, Michigan, Montana, New York, Virginia, Georgia, Mississippi, Iowa, Utah, and California. Severe infections were in all cases reported to be localized in particular fields. General occurrence was reported from eastern Montana and California. A new Fusarium disease was reported from California by Harter (1).

Recent literature: Pl. Dis. Reptr. 12: 54.

1. Harter, L. L. A Fusarium disease of beans. (Abstract) Phytopath. 19: 84. Jan. 1929.

OTHER DISEASES

Botrytis cinerea Pers., grey mold rot. Maine, first report for state. (Folsom)

Caconema radicicola (Greef) Cobb, root knot. Georgia, less serious in commercial plantings than usual; 2 per cent loss. (Boyd). Trace in Mississippi, prevalent in Texas (Taubenhaus).

Cercospora cruenta Sacc., leaf blotch. Georgia - only mere traces but ordinarily quite prevalent in late plantings. (Boyd). Florida - common but not serious. (Weber)

Erysiphe polygoni DC., powdery mildew. District of Columbia, Texas. Utah - found in a single field (Richards). California - general along coast section, not serious (Kendrick).

Isariopsis griseola Sacc., angular leaf spot. Slight infections in West Virginia, Pennsylvania and Indiana.

Macrophomina phaseoli (Maubl.) Ashby, stem and root rot. Traces only in Georgia where disease was especially injurious in 1927. Also reported from Mississippi where earliest occurrence was July 25.

Phoma sp., root rot. Isolated case of wilting plants from which Phoma was isolated in Georgia (Boyd).

Phyllosticta phaseolina Sacc., leaf spot. Scattered infections in West Virginia and Florida.

Rhizoctonia sp., root rot. Delaware, Mississippi, Florida, Georgia, Maryland, North Carolina, West Virginia, New Jersey, Texas.

Sclerotinia sclerotiorum (Lib.) Mass. Trace in New York, West Virginia, Washington.

Sclerotium rolfsii Sacc., southern sclerotium rot. Georgia - one per cent loss; least amount of the disease yet observed (Boyd.). Mississippi.

Curly top (virus). More often noted seriously affected than any other crop besides tomatoes.

Chlorosis. Texas - considerable in lower Rio Grande Valley. Utah - Chlorosis is by far the most serious trouble on the bean in the Hunter and Magna districts. Every field visited exhibited serious trouble and in some cases total failure resulted. The major part of the trouble seemed to result from an alkalin condition of the soil. (B. L. Richards)

Hopperburn. New Jersey.

Lightning Injury. New Jersey.

Recent literature: Pl. Dis. Reptr. 12: 23, 36, 106, 121-122, 144.

1. McKay, M. B. The curly top disease. Seed World 23 (13): 38, 40, 72. June 29, 1928.

2. Severin, H. H. P., and C. F. Henderson. Some host plants of curly top. Hilgardia 3: 339-392. June 1928.

3. Small, W. Mycological notes (13). Further notes on Rhizoctonia bataticola. Trop. Agr. Ceylon 70: 227-231. Apr. 1928.

DISEASES OF LIMA BEAN

Bacterium phaseoli EFS. Georgia - more prevalent than usual. (Boyd). Maryland - present but causing little damage (Whitney).

Bacterium vignae Gard. & Kend. (Bacterium viridifaciens T. & W.), bacterial spot. Maryland - reported from eastern Maryland and from Long Island, New York, as general, but causing only little damage. Georgia - common on early and spring crop but more injurious to summer planting or fall crop causing marked defoliation (Boyd). Indiana.

Colletotrichum lindemuthianum (Sacc. & Magn.) B. & C., anthracnose, Georgia - common but not destructive in early crop, most injurious in fall crop, causing 2 per cent loss.

Diaporthe phaseolorum (C. & E.) Sacc., pod blight. common on Eastern Shore in Maryland. Also in New Jersey. Slight damage.

Erysiphe polygoni DC., powdery mildew. New Jersey.

Phytophthora phaseoli Thax., downy mildew. Reported from Maryland, Ohio, New York.

Phymatotrichum omnivorum (Shear) Duggar. Root rot. Texas.

Rhizoctonia solani Kühn, stem rot. Maryland - prevalent but doing little damage. (Hunter)

Leaf-scorch (non-parasitic). New York.

Curly top (virus). Oregon.

Recent literature: Pl. Dis. Reptr. 12: 37, 96, 110, 116, 117.

MUNG BEAN

Phyllosticta phaseolina Sacc., leaf spot. New York, first report to survey.

Phymatotrichum omnivorum (Shear) Duggar, root rot. Texas, first report to survey.

DISEASES OF ONION

SMUT, UROCYSTIS CEPULAE FROST

Onion smut was reported from New York, Maryland, Ohio, Wisconsin, Minnesota, Iowa and Oregon. In every case it was said to be localized and in most cases losses were being reduced through the formaldehyde drip planting practice.

Ohio: Estimated reduction in yield 5 per cent.

Iowa: Formaldehyde reduced infection from 80 to 10 per cent. (Porter)

Recent literature: Pl. Dis. Reptr. 12: 66, 107.

DOWNY MILDEW, PERONOSPORA SCHLEIDENI UNG.

Traces of downy mildew were reported from Maryland, Colorado and Oregon, 1 to 2 per cent from Massachusetts, New York, and Michigan and per cent from California. Most collaborators mentioning the disease indicated that it was much less prevalent than usual.. Wisconsin: Onions not grown this year on marsh where the disease has been previously reported (Vaughan). In Oregon this disease was not much of a problem in commercial plantings where it is effectively controlled by Bordeaux. (Dykstra). In California it was widely distributed on seed crop; loss about 5 per cent (Milbrath).

Recent literature: Pl. Dis. Reptr. 12: 107.

PINK ROOT, FUSARIUM MALLI TAUB. OR PHOMA SP.

Pink root was reported as causing slight losses in Massachusetts, New York, Maryland, Missouri and Minnesota, and as causing about 2 per cent loss in Ohio. In addition to these cases the disease was reported on Bermuda plants shipped into Arkansas where the injury does not seem to be outgrown. It was found for the first time in Iowa causing severe loss at Clear Lake in north central part of state. In Colorado the disease caused considerable damage about Littleton on late planted stock (LeClerg). A similar disease was reported from Oregon but had not been identified as *F. Malli*. In California it was reported by Kendrick under the name Phoma sp. as general wherever onions are grown.

Recent literature: Pl. Dis. Reptr. 12: 36, 107.

BOTRYTIS STORAGE ROTS, BOTRYTIS SPP.

Botrytis squamosa Walker, small sclerotial neck rot. Reported for first time as causing soft rot of leaves in Maine (Folsom). Also contributed to a 2 per cent loss in white sets from several sections in Wisconsin (Wellman). First occurrence also reported from Iowa.

Botrytis allii Munn, neck rot. One case in New Jersey and a 6 per cent loss in Colorado also reported by Wellman (Wisconsin) as contributing with *B. squamosa* and *B. byssoides* to a 2 per cent loss in white sets grown near Kenosha. He has made the following comment:

"It is interesting to note that two Chicago concerns, shippers of onion sets, have been drying all white sets they are shipping or storing. Drying of white sets, so the writer was informed by the head of one of the firms, will be considered a standard treatment every year in the future."

A more complete statement concerning the neck rot situation was contributed by Wellman in the Plant Disease Reporter (12: 123-124, October 15, 1928). In this connection, attention is called to the error that was made in publishing this report whereby the name of J. C. Walker appears as the author rather than that of F. C. Wellman.

Botrytis byssoidea Walker, mycelial neck rot. Associated with B. allii and B. squamosa in causing loss in Wisconsin.

Botrytis cinerea Pers. and Botrytis sp., gray mold rot. New York - a trace found (Chupp). Virginia - more prevalent than usual (Wingard). Also reported from Louisiana and Illinois.

Recent literature: Pl. Dis. Reptr. 12: 107, 124.

YELLOW DWARF (VIRUS)

This disease has been recognized as a virus disease by Iowa workers (1 and 3) and was reported from that state early in 1928 (2). The same disease was brought to the attention of the Plant Disease Survey in a special report from J. C. Walker, extracts from which follow:

"During the last of July a careful survey was made by L. J. Alexander of onions in southeastern Wisconsin where plants are grown for bulbs from sets and seed ...... Seventy-five fields of bulb onions from seed (about 350 acres) and 19 fields of bulb onions from sets (about 65 acres) were visited. Three fields from seed and two from sets were apparently free from the disease. Seventeen fields from seed and seven from sets showed only a trace. Thirteen fields from seed and two fields from sets showed more than 1 per cent diseased plants. Of those showing over 1 per cent disease, among those from seed one showed 25 to 40 per cent, two showed 33 per cent, and one showed 19 per cent, and one showed 15 per cent; among those from sets one showed 50 per cent.

"It is important to note that this disease is prevalent throughout this district and, though mild in its effects at present, is widespread and should be watched for carefully next season here as well as in other regions."

According to a recent statement from Giddings this disease appears to be similar to if not the same as that reported to the Plant Disease Survey from West Virginia in 1917 and 1918 as mosaic.

Yellow dwarf is characterized by marked yellow streaks up and down the stems and leaves followed by loss of turgidity to the extent that the tops lop over on the ground. Such plants do not die at once but linger along without growth. The bulbs are stunted. The disease is carried in the vegetative stage, in sets, and in mother bulbs but does not appear to be seed-borne. It has been transmitted to the growing point of bulbs by juice transfers, symptoms appearing after an incubation period of about twelve days which indicates that it is a virus trouble.

It was first found in Iowa in the Pleasant Valley section during the latter part of May and on July 2 in the onion growing region of southeastern Wisconsin. In both cases the disease appears to be localized but losses in individual cases have reached 25 to 50 per cent.

Recent literature: Pl. Dis. Reptr. 12: 93.

1. Melhus, I. E., and W. J. Henderson. The yellow dwarf of onions. (Abstract) Phytopath. 19: 86. Jan. 1929.

2. ___________, C. S. Reddy, W. J. Henderson, and E. Vestal. A new virus disease epidemic on onions. Phytopath. 19: 73-77. 1929.

3. Porter, R. H. New onion disease in Iowa. The Plant Disease Reporter 12: 93. Sept. 1, 1928.

OTHER DISEASES

Aspergillus niger Tiegh., black mold. Ohio, on Cincinnati market.

Colletotrichum circinans (Berk.) Vogl., smudge. Wisconsin.

Macrosporium porri Ell., purple blotch. Virginia, Illinois, Wisconsin, Iowa.

Macrosporium sarcinula parasiticum Thuem., black stalk rot. New York, Washington.

Sclerotium cepivorum Berk., white rot. Ohio, on Cincinnati market.

Flooding damage. New York, in Elba district, 50 to 75 per cent loss, in Wayne and Oswego Counties, 15 per cent.

White blast (non-parasitic). General in Connecticut Valley, Massachusetts. On Portugese onions grown near Boston (Guba).

Recent literature: Pl. Dis. Reptr. 12: 107,119, 124.

1. Ayyangar, C. R. A leaf spot and blight disease of onions caused by Alternaria palandui nov. sp. Bul. Agr. Res. Inst. Pusa 179: 14 p. 1928.

2. Gilbert, B. E., and F. T. McLean. A 'deficiency disease': the lack of available manganese in a lime-induced chlorosis. Soil Science 26 (1): 27-31. 1928.

3. Palo, Macario A. A Fusarium causing bulb rot of onion in the Philippines. Philipp. Agr. 17: 301-316. Nov. 1928.

4. Sackett, W. G. Report of Bacteriologist. Ann. Rept. Colorado Agr. Exp. Sta. 40: 20-24. 1927.

5. Ramsey, G. B., and L. F. Butler. Injury to onions and fruits caused by exposure to ammonia. Jour. Agr. Res. 37: 339-348. Sept. 15, 1928.

DISEASES OF CRUCIFERS

CABBAGE

BLACKLEG, PHOMA LINGAM (TODE) DESM.

Like the other cabbage diseases reported this year blackleg was present in isolated cases only in the various states named in the table. Seed treatment was mentioned in New York and Wisconsin reports as materially lowering the amount of disease.

Table 19. Percentage losses from blackleg of cabbage, as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
1.5	Maryland		Florida, Mississippi, Louisiana, Arkansas, Ohio, Indiana, Wisconsin, Minnesota, Iowa, Nebraska, Colorado, Oregon
1	Massachusetts, New York		
Trace	New Jersey, West Virginia, Tennessee, North Carolina,		

Recent literature: Pl. Dis. Reptr. 12: 122-123, 134.

1. Clayton, E. E. Seed treatment for blackleg disease of crucifers. New York State Agr. Exp. Stat. Techn. Bul. 137: 58 p. May 1928.

YELLOWS, FUSARIUM CONGLUTINANS WOLL.

The reports indicate (see table 20) that yellows was most prevalent in Maryland. In West Virginia the disease is reported to be held in check by rotation (Archer). In Wisconsin the disease occurred in destructive amount only on "sick" soils where non-resistant seed was used (Vaughan). Cool weather in Iowa from May 25 to harvest prevented the development of yellows (Porter). In southeastern Missouri the disease was unusually severe because of reluctance of growers to use control measures.

Table 20. Percentage losses from cabbage yellows as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
8	Maryland	Trace	West Virginia, Tennessee, North Carolina, Florida, Mississippi, Ohio, Indiana, Wisconsin, Minnesota, Colorado
3	Iowa		
2	Missouri		
1	Kansas		
Trace	North Carolina,		

Recent literature: Pl. Dis. Reptr. 12: 96, 122-123, 134.

1. Gregory, C. T. New yellows resistant varieties of cabbage in Indiana. Proc. Indiana Acad. Sci. 37: 381-383. 1928.

2. Thomas, R. C., and R. Magruder. Early cabbage resistant to the yellows disease. Ohio Agr. Exp. Sta. Bimonth. Bul. 13: 142-144. July-Aug. 1928.

3. Walker, J. C., and F. L. Wellman. A survey of the resistance of subspecies of Brassica oleracea to yellows (Fusarium conglutinans). Jour. Agr. Res. 37: 233-241. Aug. 15, 1928.

BLACK ROT, BACTERIUM CAMPESTRE (PAM.) EFS.

Black rot was reported only from the eastern half of the United States with severe losses reported only from New York, Tennessee, and Louisiana. In most cases there was only localized infection. In Virginia, it occurred in most fields in Washington County. Ten per cent of the plants were affected in some fields. One field in Smyth County had 95 per cent plants affected (Wingard). In Louisiana the disease was severe in cabbage and cauliflower where seed treatment was not practiced (Tims). In Iowa rainy weather in June favored development of the disease (Porter). Wellman (2) has reported successful control of black rot in southeastern Wisconsin and northern Illinois by means of seed treatment. Chupp (New York) reported the organic mercury compounds less effective for seed treatment than corrosive sublimate.

Cabbage - Black Rot

Table 21. Percentage losses from black rot of cabbage as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
19	Tennessee	Trace	West Virginia, Virginia, Florida, Mississippi, Indiana, Wisconsin, Minnesota, Texas.
5-10	Louisiana		
1-3	New York		
.5	Iowa		
Trace	New Jersey, Maryland		

Recent literature: Pl. Dis. Reptr. 12: 122, 134.

1. Chupp, Charles. Club root in relation to soil alkalinity. Phytopath. 18: 301-306. 1928.

2. Wellman, F. L. Plant Disease Reporter 12 (11): 122-123. Oct. 15, 1928.

CLUB ROOT, PLASMODIOPHORA BRASSICAE WOR.

During the past year club root was of very minor importance as it was reported as severe in isolated cases only from Massachusetts, New Jersey, Maryland, North Carolina, Ohio, Minnesota, and Wisconsin, with the heaviest infections occurring in New York where 2 to 3 per cent loss was reported by Chupp. In Ohio 1 per cent loss was estimated. In New York and Wisconsin the disease is reported to be growing more serious from year to year. Wellman (Wisconsin) in a special report says:

"Hydrate of lime at the rate of two tons to the acre has proved a successful inhibitant and appears to remain effective for a number of years. Pure carbonate of lime, ground limestone, or burnt lime fully airslaked, appear practically incapable of disease inhibition."

Recent literature: Pl. Dis. Reptr. 12: 110,123, 134.

1. Blunck, H. Versuch zur vergleichenden Prufung chemischer Mittel gegen Kohlhernie. Gartenbauwissensch. 1: 154-176. June 1928.

2. Chupp, C. Club root in relation to soil alkalinity. Phytopath. 18: 301-306. Mar. 1928.

3. Kindshoven, J. Entseuchung des Bodens und Bekämpfung der Kohlhernie mit Kalkstickstoff. Mitt. Deut. Landw. Ges. 43: 522-523. June 2, 1928. (Abs. Rev. Appl. Myc. 7:

4. Kohne. Kohlhernie-Bekämpfung mit Uspulun. Nachricht. uber Schädlingsbekämpf. 3 (2): 61-65. 1928. (Abs. Rev. Appl. Myc. 7: 757. Dec. 1928.)

5. Preston, N. C. Experiments on the control of finger and toe in cabbages by the use of mercuric chloride and other substances. Welsh Jour. Agric. 4: 280-295. 1928. (Abs. Rev. Appl. Myc. 7: 756. Dec. 1928.)

OTHER DISEASES

Alternaria brassicae (Berk.) Sacc., black leaf spot. New Jersey, Massachusetts, New York, West Virginia, Florida, Texas, Indiana, Louisiana.

Bacillus carotovorus L. R. Jones, soft rot. Massachusetts.

Bacterium maculicola McC. peppery leaf spot. Trace in New York and 2 per cent loss in Georgia. McCulloch (3) has recently called attention to the correct spelling for this organism.

Corticium vagum B. & C. and Rhizoctonia spp., damping off and wire stem. Wisconsin, and Illinois (2 to 10 per cent loss in seed beds). Washington, Massachusetts, New York (1 per cent loss). New Jersey (trace) and Texas (common in seed beds). Rhizoctonia also caused decay of foliage leaves touching the ground and a few affected heads were found in cabbage sections of Illinois, Indiana, and Wisconsin. The perfect stage was found under cabbage plants in several fields in Wisconsin (Wellman).

Peronospora parasitica (Pers.) DeBy., downy mildew, New York, trace on seed cabbage; New Jersey, trace; Georgia, unusually widespread and severe as seedling disease causing 5 per cent loss. The variety Succession appears most susceptible. Late seedlings are worst affected and severe attack of aphis seemed to increase damage from the disease (Boyd). In Texas it was very prevalent on early cabbage and in seed beds.

Sclerotinia sclerotiorum (Lib.) Mass., drop. Localized occurrence in Massachusetts and Florida.

Sclerotium rolfsii Sacc., stem rot. Mississippi, Texas.

Head cracking, non-parasitic. Massachusetts.

Internal black spot, non-parasitic. Washington.

Oedema, non-parasitic. New Jersey, Texas.

Tipburn, non-parasitic. New York in late cabbage.

Cabbage - Other Diseases

Recent literature: Pl. Dis. Reptr. 12: 96, 123.

1. Lauer, K. W. An organic mercury compound for the control of damping off of seedlings grown under glass. Proc. Pennsylvania Acad. Sci. 2: 37-39. 1928.

2. Miller, L. P. Manganese deficiency in sand cultures. Amer. Fertilizer 68(7): 21-22. 1928.

3. McCulloch, L. Bacterium maculicola (McC.) nom. emend. syn. Bacterium maculicolum. Phytopath. 18: 460. May 1928.

BROCCOLI

Alternaria brassicae (Berk.) Sacc., black leaf spot. Texas.

Plasmodiophora brassicae Wor., club root. New York.

BRUSSELS SPROUTS

Bacterium campestre (Pam.) EFS., black rot. New York, more common than usual in newly planted fields of brussels sprouts. (Clayton, August 15)

CAULIFLOWER

Alternaria brassicae (Berk.) Sacc., black leaf spot. New Jersey, Texas.

Bacterium campestre (Pam.) EFS., black rot. New York, causing 1 to 2 per cent loss, New Jersey.

Bacterium maculicola McC., peppery leaf spot. New York, trace.

Caconema radicicola (Greef) Cobb. Root knot. New Jersey.

Fusarium conglutinans Woll. Yellows. New Jersey.

Peronospora parasitica (pers.) D.By. Downy mildew. New Jersey.

Plasmodiophora brassicae Wor., club root. New York, trace; New Jersey.

Rhizoctonia sp., wire stem. New York, 1 to 2 per cent loss.

Cauliflower

Recent literature

1. Quanjer, H. M. De invloed van kaligebrek op de vatbaarheid van bloemkool voor Peronospora parasitica. (The influence of potash deficiency on the susceptibility of cauliflower to Peronospora parasitica). Tijdschr. Plantenz. 34: 254-256. Oct. 1928.

CHINESE CABBAGE

Cercosporella albo-maculans (Ell. & Ev.) Sacc., leaf spot. Massachusetts on Petsai variety.

Plasmodiophora brassicae Wor., club rot. Ohio.

Erysiphe polygoni DC., powdery mildew. Reported by Davis (1) from Massachusetts. First report to Survey.

Recent literature: Pl. Dis. Reptr. 12: 110.

1. Davis, W. H. A powdery mildew parasitizing Chinese cabbage. Phytopath. 18: 611-615. July 1928.

COLLARDS

Fusarium conglutinans Woll., yellows. Mississippi.

HORSERADISH

Bacterium maculicola McC., peppery leaf spot. Connecticut.

Caconema radicicola (Greef) Cobb, root knot. Mississippi.

Cercospora armoraciae Sacc., leaf spot. West Virginia, and Indiana, trace.

Recent literature: Pl. Dis. Reptr. 12:77.

KALE

Bacterium campestre (Pam.) EFS., black rot. New York, trace.

KOHLRABI

Plasmodiophora brassicae Wor., club root. New Jersey.

MUSTARD

Albugo candida (Pers.) O. Kuntz, white rust. Florida, common; Texas.

RADISH

Aphanomyces raphani Kend., black root. Indiana, California, White Icicle variety.

Bacterium campestre (Pam.) EFS., black rot. Iowa, one report.

Recent literature

1. White, H. E., and M. W. Gardner. Bacterial spot of radish and turnip. (Abstract) Phytopath. 19: 97. Jan. 1929.

RUTABAGA

Recent literature

1. Anon. Mottled heart of swedes. New Zealand Jour. Agr. 35(6): 404. 1927.

2. Bartlett, A. W. Olphidium radicicolum De Wildeman and the "hybridisation nodules" of swedes. Trans. Brit. Mycol. Soc. 13: 221-233. Oct. 1928.

3. Dawson, M. L., and A. H. Povah. A new Rhizopus rot of rutabaga. Science n.s. 68: 112. Aug. 3, 1928.

4. Jorgensen, C. A. Gulspidssygen. Dens Udbredelse, Aarsager og Bakaempelse. (Yellow tip disease. Its distribution, causes and control.) Tidsskr. for Planteavl. 34(1): 76-116. 1928. (Abs. Rev. Appl. Myc. 7: 396. June 1928)

5. Murphy, P. A. The connexion between dry rot of swedes in New Zealand and British seed. Nature 122: 13-14. July 7, 1928.

6. Paine, S. G., and R. L. Nirula. Studies in bacteriosis. XV. A disease of swedes and turnips. Ann. Appl. Biol. 15: 45-56. Feb. 1928.

TURNIP

Albugo candida (Pers.) O. Kuntz, white rust. Texas.

Bacterium campestre (Pam.) EFS., black rot. Mississippi.

Caconema radicicola (Greef) Cobb, root knot. Georgia, Texas.

Cercosporella albo-maculans (Ell. & Ev.) Sacc., leaf spot. Georgia, causing 1 per cent loss through defoliation in garden and commercial plantings (Boyd). Mississippi, seen first March 26.

Cercospora sp., leaf spot. Georgia.

Erysiphe polygoni DC., powdery mildew. Indiana.

Fusarium spp., stem rot. Washington.

Macrosporium sp., leaf spot. Georgia, of little importance.

Peronospora parasitica (Pers.) D.By., downy mildew. West Virginia, found in one field only.

Sclerotinia sclerotiorum (Lib.) Mass., Mississippi.

Sclerotium rolfsii Sacc., stem rot. Florida, several reports on late crop.

DISEASES OF CUCURBITS

CUCUMBERS

BACTERIAL WILT, BACILLUS TRACHEIPHILUS EFS.

The distribution and severity is indicated in the table. Adams (Delaware) reported less than last year. McWhorter (Virginia, July 21) reported the disease more severe than in 1927, the severity not being correlated with the presence of beetles which were relatively few but an unusually large proportion appeared to be active carriers. Wilson (Ohio, September 1) reported a loss of 10 per cent in many fields. In Michigan and Wisconsin, the injury is principally in greenhouses.

Table 22. Percentage losses from bacterial wilt of cucumber as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
5	Massachusetts, West Virginia	Trace	Maine, Connecticut, Indiana, New Jersey, Michigan, Wisconsin, Minnesota, Missouri, Colorado, Delaware, Georgia
3	Iowa		
2	New York		
1	Ohio, Kansas		
0.1	Maryland		

Recent literature: Pl. Dis. Reptr. 12: 65, 110.

ANTHRACNOSE, COLLETOTRICHIUM LAGENARIUM (PASS) ELL. & HALS.

Anthracnose was reported on August 15 as being prevalent in Delaware on leaves but causing no losses. McWhorter (Virginia) mentioned it as being important in hotbed crops. It was reported as being more prevalent than in 1927 in some localities in Florida but causing slight general loss. In Ohio it was present in occasional outdoor plantings but was more common under glass, caused little loss. In Indiana the disease occurred in greenhouses only. It was found also in Minnesota.

Recent literature: Pl. Dis. Reptr. 12: 24.

ANGULAR LEAFSPOT, BACTERIUM LACHRYMANS EFS & MKB.

Serious infections of angular leafspot on cucumber were reported from Florida where the yield was cut ten per cent and the grade fifteen per cent, influenced by favorable moisture and temperature as reported by Weber. Chupp reported the disease general in the western half of New York with 1 to 2 per cent loss. Traces were reported from Delaware, Virginia, Indiana, Michigan, Wisconsin, Illinois, Minnesota, and Oregon.

Recent literature: Pl. Dis. Reptr. 12: 24, 125.

MOSAIC (VIRUS)

Mosaic was the most serious of the cucumber diseases reported in 1928. Losses appear in the accompanying table. Some interesting points are brought out in the following comments by collaborators.

New York: Mosaic appeared on Long Island late in July and by August 15 many fields are 100 per cent affected. Eradication of perennial weed hosts failed to give any control, either in 1927 or 1928. (Clayton). Much less upstate, still severe on Long Island (Chupp).

Maryland: Has been reduced by destruction of weed carriers and roguing of cucumber fields (Jehle).

Virginia: Has so far proven of little or no importance on cucumbers in Tidewater Virginia this season (McWhorter).

West Virginia: One case of severe infection in 1928 (Archer).

Kentucky: Cucumber mosaic collected in western Kentucky proved to be tobacco ring spot when inoculations were made on tobacco (Valleau).

Florida: Not yet important but apparently on the increase (Weber).

Ohio: Present on fruits in a number of fields in central Ohio (Wilson).

Iowa: Cucumbers are not grown as extensively now as in 1920-1923 due to mosaic and bacterial wilt (Porter).

Missouri: Was quite severe in several local plantings, the fruit showing severe infection (Scott).

New Mexico: Unusually severe on the fruit but not on vines (Crawford).

Cucumber - Mosaic

Oregon: Typical mosaic or white pickle collected for the first time in Oregon (Barss).

Table 23. Percentage losses from mosaic of cucumber as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
15	New York	Trace	New Jersey, Virginia, West Virginia, Kentucky, Florida, Mississippi, Texas, North Dakota, Minnesota, Missouri, Oregon
10	Kansas		
8	Massachusetts		
5	Wisconsin, Iowa		
3	Maryland		
0.5	Ohio		

Recent literature: Pl. Dis. Reptr. 12: 54, 65, 96, 119, 135, 146.

1. E. E. Clayton. Breeding for resistance to cucumber mosaic disease. (Abstract) Phytopath. 19: 85. Jan. 1929.

2. R. H. Porter. Reaction of Chinese cucumbers to mosaic. (Abstract) Phytopath. 19: 85-86. Jan. 1929.

DOWNY MILDEW, PSEUDOPERONOSPORA CUBENSIS (BERK. & CURT.) ROSTEW.

Reported to have caused as much as 30 per cent loss in scattered locations in Massachusetts. It appeared in Florida as early as May 10 and by June 10 had killed all the plants in certain fields. It was prevalent in the lower Rio Grande Valley of Texas, according to Taubenhaus. Traces of the disease were found in West Virginia, Maryland, North Carolina, and Georgia.

Recent literature: Pl. Dis. Reptr. 12: 24, 199.

SCAB, CLADOSPORIUM CUCUMERINUM ELL. & ARTH.

Reported by Folsom to be the only severe disease of the crop in Maine. Also prevalent in Massachusetts with 5 per cent loss. The heaviest losses were experienced in New York with state wide distribution and a 15 per cent loss estimated by Chupp. A 5 per cent loss was given by Nelson for Michigan while scattered infections only were mentioned by Vaughan (Wisconsin) and Wilson (Ohio).

Recent literature: Pl. Dis. Reptr. 12: 97.

OTHER DISEASES

Caconema radicicola (Greef) Cobb. Root knot. New Jersey, Severe in greenhouses; Florida, common; Georgia, common; Texas, Arizona, Washington, one report.

Erysiphe cichoracearum DC. Powdery mildew. Massachusetts, common in greenhouses causing 2 per cent loss. New York, trace; New Jersey, Florida, less than last year; Iowa, first report from state; Texas, 1 per cent loss.

Macrosporium cucumerinum Ell. & Ev., leaf blight. Traces in New York, New Jersey, Florida, Louisiana, Texas, Ohio, Minnesota, Iowa, and 2 per cent loss in Maryland.

Pythium sp., damping off. New Jersey, general under field conditions.

Sclerotinia sclerotiorum (Lib.) Mass., timber rot. Washington, one report.

Mycosphaerella citrullina (COS.) Gross, gummy stem blight. New Jersey.

Curly top (Virus). Limiting factor in culture of crop in areas where leaf hoppers are bad. Reported for Oregon.

Recent literature: Pl. Dis. Reptr. 12: 24, 146.

1. Beck, A. Verhütung und Bekämpfung der an den Treibgurkenpflanzen auftretenden Pilz-oder Fleckenkrankheiten. Möllers Deut. Gärtn.-Zeit. 43: 195-196, 235-236. 1928.

2. Guba, E. F. Control of cucumber powdery mildew in greenhouses. Phytopath. 18: 847-860. 1928.

M U S K M E L O N

BACTERIAL WILT, BACILLUS TRACHEIPHILUS EFS.

Traces of bacterial wilt were reported from Massachusetts, New Jersey, Virginia, West Virginia, Louisiana, Ohio, Indiana, Wisconsin, Missouri, Kansas, Colorado, and Oregon. Maryland reported 0.5 per cent loss; Virginia, 7 per cent; and Ohio, 1 per cent. Iowa-- Wilt is less severe than normal due to favorable weather for host before beetles came in abundance. Loss for the season 2 per cent (Porter). Missouri - rather severe in home gardens, commercial plantings relatively free (Scott).

LEAF BLIGHT, MACROSPORIUM CUCUMERINUM ELL. & EV.

In addition to the reports noted in the table, leaf blight was reported as severe without estimate of losses from New Jersey, North Carolina, Florida, and Indiana. Adams (Delaware) reported that it failed to develop as usua. Jehle (Maryland) reported that spraying and dusting prevented greater losses. Porter (Iowa) reported the first severe occurrence of the disease in that state.

Table 24. Percentage losses from muskmelon leaf blight as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
25	Georgia	2	Iowa
10	Texas	Trace	Massachusetts, New York, Delaware, North Carolina, Arkansas, Wisconsin, Colorado
8	Maryland		
2-5	Michigan		

Recent literature: Pl. Dis. Reptr. 12: 37, 70.

ANTHRACNOSE, COLLETOTRICHUM LAGENARIUM (PASS.) ELL. & HALS.

Severe infections of anthracnose were reported from Kansas and Iowa with 10 and 8 per cent loss respectively. Traces of the disease were found in New York, New Jersey, West Virginia, North Carolina, Florida, Arkansas, Ohio, and Wisconsin. A note on effectiveness of spraying was contributed by Porter (Iowa) showing that Bordeaux reduced losses from 50 to 15 per cent on plots where cantaloupes had been grown for four consecutive years.

Recent literature: Pl. Dis. Reptr. 12: 76.

DOWNY MILDEW, PSEUDOPERONOSPORA CUBENSIS (BERK. & CURT.) ROSTEW.

Traces of downy mildew on cantaloupe were reported from Delaware, Virginia, West Virginia, Georgia, Florida, Texas, Iowa, and Missouri. Adams (Delaware) reported the first heavy attack in three years, the disease appearing following the peak of the harvest. McWhorter (Virginia) reported a late attack and estimated a 3 per cent loss. Boyd (Georgia) reported that the disease appeared in epidemic form too late in the season to be of much consequence on cantaloupes, but estimated 1 per cent loss. Weber (Florida) reported that this was the most serious disease of the host in the state. Porter (Iowa) reported that it was found for the first time in that state.

Recent literature: Pl. Dis. Reptr. 12: 110.

MOSAIC (VIRUS)

Milbrath (California) reported 100 acres in the Imperial Valley a complete loss from mosaic and Chupp (New York) reported a 5 per cent loss for the state from the opposite end of the country. Traces to 1 per cent were reported from Massachusetts, New Jersey, Maryland, Virginia, Ohio, Wisconsin, Iowa, Kansas, and Oregon. Contributions concerning the hosts other than cucurbits are very desirable.

Recent literature: Pl. Dis. Reptr. 12: 76.

POWDERY MILDEW, ERYSIPHE CICHORACEARUM DC.

A 12 per cent loss was reported by Boyd from Georgia where the disease was more destructive in some fields than leaf blight. A 25 per cent loss was the maximum for any field. This disease was also reported as abundant in Florida but doing little damage, and causing about 2 per cent loss in Texas. The first occurrence of the disease in Iowa was noted by Porter. In the Imperial Valley of California, it was widely distributed but held in check by dusting; loss 3 per cent. (Milbrath).

The following observations were made at the Market Garden Field Station at Waltham, Massachusetts, August 1928 and reported by Guba:

Cucumis melo chito (vine peach)	susceptible
C. melo culta (cantaloupe)	"
C. sativus (lemon cucumber)	"

C. anguria (gherkin) resistant
Sicyos angulatus (star cucumber) "
Echinocystis lobata (mock-cucumber) "

Recent literature: Pl. Dis. Reptr. 12: 65, 70, 146.

1. Guba, E. F. Significant practices in the control of diseases of greenhouse cucumbers and tomatoes. Amer. Prod. Grow. 3(9): 7, 15. Sept. 1928.

2. Harrigan, B. A. Cantaloupe mildew in Imperial Valley. California Dept. Agr. Mo. Bul. 17 (8): 473-474. Aug. 1928.

OTHER DISEASES

Bacterium lachrymans EFS. & M. K. Bryan, angular leaf spot. In Iowa from one location only.

Caconema radicicola (Greef) Cobb, root knot. Eight per cent loss reported from Georgia.

Fusarium niveum EFS., wilt. Three per cent in Missouri and a trace in Pima and Maricopa Counties, Arizona.

Sclerotium sp., rolfsii or delphinii. Arkansas - a severe epidemic has appeared in the region around Hope and Ft. Smith largely in the form of a soft mushy rot of fruit. (Rosen) Virginia - a two-acre field near Norfolk following infected eggplants and carrots showed 100 per cent infection, occurring as a fruit rot. H. H. Whetzel has identified the fungus as Sclerotium delphinii (McWhorter). Texas - prevalent, 1 per cent loss.

Curly top (virus) - Reported in 1928 only from Oregon, but literature has contained some references to this disease on cantaloupes as well as other hosts.

Leaf spot (undet.) - Reported by Boyd (Georgia) as scattered infections.

Ring spot (virus) - West Virginia, determination verified by S. A. Wingard.

Recent literature: Pl. Dis. Reptr. 12: 37, 64-65, 69, 75.

1. Drechsler, Charles. A fruit rot of honey dew melons due to a species of Phytophthora. (Abstract) Phytopath. 19: 85. Jan. 1929.

2. McKay, M. B. The curly top disease. Seed World 23 (13): 38, 40, 72, June 29, 1928.

3. Severin, H. H. P., and C. F. Henderson. Some host plants of curly top. Hilgardia 3: 339-392. June 1928.

P U M P K I N

Cercospora cucurbitae Ell. & Ev., leaf spot. Virginia.

Erysiphe cichoracearum DC., powdery mildew. Maine. Traces in West Virginia, and Colorado.

Curly top (virus). Oregon.

Ring spot (virus). West Virginia, one case only.

Recent literature: Pl. Dis. Reptr. 12: 109-110.

S Q U A S H

Curly top (sugar beet virus). B. L. Richards reported as follows concerning this disease (February 11, 1929).

"Curly top on the squash, was found during August and early September, 1928, in Cache, Boxelder, Davis, and Salt Lake Counties. The disease was especially severe in the Hunter and Magna districts of Salt Lake County. Of the 11 fields visited in this period, eight showed the disease in a severe form. An average of 38.1 per cent of the plants in these fields were affected at the time of the survey. In one field of the Hubbard variety, 91 (88.5 per cent) of the 102 plants which had survived bacterial wilt exhibited the disease. Many of these plants had spread less than three feet and none severely affected had set fruit. The degree of severity in Hunter and Magna districts, however, cannot be taken as an indexto the damage caused by curly top in Utah. Curly top of sugar beets, tomatoes, and squash, is usually more severe in these areas than most other parts of the State. The nearness to native desert vegetation and absence of barriers to the migration of the Eutettix tenellus probably accounts for this fact. Linford (P.D.R. Supplement 59:100) states 'that the disease in 1927 varied from a trace up to a maximum infection of 12 per cent; in the state as a whole it causes less than 1 per cent loss.'"

, Wilt (possibly bacterial in nature.) This disease was reported from Utah again by B. L. Richards (February 1, 1929) as follows:

"Linford (Pl. Dis. Reptr. 59:100) reports this disease as usually associated with the squash bug in Salt Lake, Davis, and Weber. In addition, during 1928 the writer observed the trouble in Boxelder and Cache counties. To the writer's knowledge, this is the first time the disease has been reported from the latter county. Of the 11 fields studies in Hunter and Magna districts during September, 1928, but one field was found free from the wilt. Of the ten infested fields, two showed 100 per cent infection; four more than 50 per cent; five between 25 per cent and 50 per cent; and but a single field less than 25 per cent. An average of 56.2 per cent of the plants in the ten diseased fields showed wilt. It is evident that this percentage would indicate a loss far below the actual loss at harvest time as the disease was spreading rapidly at the time these data were taken.

"In previous years the disease has been so severe in Davis, Weber, and Boxelder counties that growers have practically ceased planting the crop. Wilt has not only become a limiting factor in squash production in certain local areas, but seriously threatens the entire industry in the state. It is by far the most important disease affecting the squash in Utah. In Cache County the disease as in most cases where it has been observed in Utah, was found constantly associated with the squash bug (Anasatristis) and possibly functions as a carrier of the casual factor.

"A number of facts justify the assumption that this particular disease is not the same as the wilt caused by Bacillus tracheiphillus. Wilt has not been found in Utah on the cucumber, cantaloupe or muskmellon, the three most susceptible plants to Bacillus tracheiphillus. Neither have the two principal carriers of Bacillus tracheiphillus, the striped cucumber beetle or the twelve spotted cucumber beetle, been located in the districts in which the Utah type of wilt is so prevalent."

Recent literature: Pl. Dis. Reptr. 12: 96, 126.

Phymatotrichum omnivorum (Shear) Duggar, cotton root rot. Texas, one case on yellow crookneck.

Bacillus tracheiphillus EFS., bacterial wilt. New Jersey.

Erysiphe cichoracearum DC., powdery mildew. New Jersey, Texas.

Fusarium sp., wilt. Texas, prevalent.

Pseudoperonospora cubensis (Berk. & Curt.) Rostew., downy mildew. Texas.

Sclerotinia sclerotiorum (Lib.) Mass., rot. Maine.

Mosaic (virus). New Jersey, Texas, Montana.

Curly top (virus). New Mexico, Oregon.

Recent literature

1. Bryan, M. K. Squash of Hubbard variety attacked by new leaf spot. U. S. Dept. Agr. Yearbook 1927: 599-600. 1928.

W A T E R M E L O N

ANTHRACNOSE, COLLETOTRICHUM LAGENARIUM (PASS.) ELL. & HALS.

An examination of the figures in the table will show that anthracnose was severe in widely separated states. In the case of Delaware, Georgia, Florida, Iowa, Missouri, and Kansas the disease was said to be more prevalent than usual. In Delaware the injury was principally to the fruit. In Georgia field infections were most prevalent on leaves but heavy infection developed in transit causing one-third of the total loss given. All varieties were reported susceptible. In New Mexico the disease was prevalent and Bordeaux gave good control if applied soon enough but in the absence of control measures whole fields were destroyed overnight (Crawford).

Table 25. Percentage losses from watermelon anthracnose as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
30	Georgia, Kansas	5	West Virginia
11	Iowa	1	Missouri
8	Maryland	Trace	Virginia, New Jersey, Tennessee

Recent literature: Pl. Dis. Reptr. 12: 24, 37, 70, 76, 95, 119.

WILT, FUSARIUM NIVEUM EFS.

Wilt in watermelons as seen in the loss table below was serious in widely separated sections of the country. It appears to have been fully as important as anthracnose. Many collaborators reported it as serious except on new land. Resistant variety work was reported in the literature for the year.

Watermelon - Wilt

Table 26. Percentage losses from wilt of watermelons as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
50	Iowa	3	Texas
10	West Virginia, Missouri	2	Georgia
		1	Kansas

Recent literature: Pl. Dis. Reptr. 12: 24, 37, 66, 96.

1. Porter, D. R. Infection studies with watermelon wilt caused by Fusarium niveum EFS. Iowa Agr. Exp. Sta. Res. Bul. 112: 347-368. May 1928.

2. ___________ and I. E. Melhus. Further studies on watermelon wilt in Iowa. (Abstract) Phytopath. 19: 84. Jan. 1929.

OTHER DISEASES

Bacillus tracheiphilus EFS., bacterial wilt. Traces reported from Maryland, Virginia and Colorado.

Caconema radicicola (Greef) Cobb, root knot. Georgia - less prevalent than usual but causing 4 per cent loss.(Boyd). Mississippi, Texas, Arizona.

Cercospora citrullina Cke, leaf spot. Georgia, more prevalent than usual causing slight to complete defoliation of individual plants and accounting for a .5 per cent loss. Mississippi, Texas.

Diplodia sp., blossom end rot. Georgia, on poorly developed fruits; Texas.

Macrosporium cucumerinum Ell. & Ev., leaf blight. Common in Georgia, and New Mexico.

Mycosphaerella citrullina (C. O. Smith) Gross., gummy stem blight. Florida, not as common or prevalent as in 1927. Georgia, general in distribution, causing loss especially as leaf spot on all varieties amounting to 5 per cent loss for the state (Boyd).

Pseudoperonospora cubensis (Berk. & Curt.) Rostew., downy mildew. Georgia, became epidemic at end of season, burning foliage in earliest sections and leading to defoliation, reduction in size, and sunburning of fruit in later section; 1 per cent loss for state (Boyd).

Pythium sp., blossom end rot. Georgia and New Mexico on poorly developed fruits.

Rhizoctonia sp., blight. Georgia, attacking leaves and runners causing defoliation; Texas.

Sclerotium rolfsii Sacc., stem rot. Georgia, causing 3 per cent loss in transit.

Sclerotium sp., blossom end rot. Georgia, on poorly developed fruits.

Curly top (virus). Serious in Oregon (McKay).

Fruit pimple, non-parasitic. Georgia, an excrescence or outgrowth from rind of melons of different ages in form of a pimple often cracking open; found in few fields (Boyd).

Lightning injury. Georgia, one spot seen.

Mosaic-like diseases. Georgia, Texas (not proved to be transmissible).

Recent literature: Pl. Dis. Reptr. 12: 24, 37, 67, 70, 76, 95.

1. Gilbert, W. W., and F. C. Meier. Chemical injury to watermelons in transit -- results of shipping tests. (Abstract) Phytopath. 19: 84. Jan. 1929.

DISEASES OF CELERY

LATE BLIGHT, SEPTORIA APII ROSTR.

Late blight was found in a number of states, see table 27, but was limited in seriousness in most cases. Heavy losses were reported from Massachusetts where early varieties suffered the heaviest losses but late varieties were also severely attacked. In New York it started seriously but became less so as the season progressed. In Virginia, where they are trying to introduce the crop this disease is a menace. Ohio reported general occurrence but light losses. Heaviest losses were reported from Michigan where 40 to 50 per cent of the late crop in the Kalamazoo, Muskegon, and two other crop districts was destroyed. The early crop was nearly disease-free in that state. Milbrath (California) reported the disease localized in the southern part of the state.

Celery - Late Blight

Table 27. Percentage losses from late blight of celery as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
50-60	Michigan (late crop)	Trace	Maine, Pennsylvania, New Jersey, West Virginia, Florida, Colorado, Wisconsin, Montana, Utah, Idaho, Tennessee, Indiana, Minnesota, North Dakota
5	Massachusetts, New York, California (southern)		
1	Iowa		
0.5	Ohio		

Recent literature: Pl. Dis. Reptr. 12: 108, 119, 134.

1. Coons, G. H., Ray Nelson and E. A. Walker. Celery blight control measures compared. Dusting and spraying tested in Kalamazoo experiments. Michigan Agr. Exp. Sta. Quart. Bul. 10: 172-175. May 1928.

2. Wilson, J. D. Celery dusting in 1927. Ohio Sta. Bimo. Bul. 13 (3): 122-124. 1928.

EARLY BLIGHT, CERCOSPORA APII FRES.

Early blight was reported as serious in Massachusetts; 10 per cent loss in Florida and Iowa; 1 per cent loss in New Mexico, and 0.5 per cent loss in Ohio. Traces in New York, New Jersey, Delaware, Pennsylvania, West Virginia, Tennessee, Texas, Wisconsin, Minnesota, Colorado.

Recent literature: Pl. Dis. Reptr. 12: 106, 134.

1. Dye, H. W. Control of celery blight. Fruit Grow. Fruiterer & Mark. Gard. 66: 191-192. Aug. 16, 1928.

2. Wilson, J. D. Celery dusting in 1927. Ohio Sta. Bimo. Bul. 13 (3): 122-124. 1928.

OTHER DISEASES

Bacillus carotovorus Jones, heart rot or soft rot. Prevalent in Massachusetts, New York, and Minnesota.

Celery - Other Diseases

Bacterium apii Jagger, bacterial blight. Traces in Ohio and New York.

Caconema radicicola (Greef) Cobb, root knot. Ohio, New Mexico.

Fusarium sp., yellows. Reported from Michigan as more serious than at any time since 1921. Especially serious on yellow kinds while green varieties appear resistant (Nelson). In Ohio, 1 per cent loss was estimated and as high as 25 per cent loss was observed in one field. Traces in Minnesota and New York.

Sclerotinia sclerotiorum (Lib.) Mass., pink rot. Florida and New York.

Black heart, non-parasitic. Reported from Wisconsin on clay soil.

Recent literature: Pl. Dis. Reptr. 12: 108, 135.

1. Coons, G. H., R. Nelson, and E. A. Walker. Celery blight control measures compared. Dusting and spraying tested in Kalamazoo experiments. Michigan Agr. Exp. Sta. Quart. Bul. 10: 172-175. May 1928.

2. Helm, A. Der Sellerieschorf. (Celery scab). Gartenwelt 32 (4): 50. 1928. (Abs. Rev. Appl. Myc. 7: 421. June 1928.)

3. Schenk, P. J. Bladvlekkenziekte van de selderie. Floralia 49: 154-155. Mar. 9, 1928.

4. Wilson, J. D. Celery spraying and dusting. Proc. Ohio Veg. Grow. Assoc. 13: 92-102. 1928.

DISEASES OF LETTUCE

Botrytis spp., gray mold rot. Also known as side rot, stem girdle, Botrytis rot, etc. Two per cent loss from "Botrytis rot" and trace of "stem girdle" reported from New York and locally severe cases in Pennsylvania; also local occurrence in New Jersey and western Washington.

Bacterium viridilividum N. A. Brown, rot. New York, trace.

Bremia lactucae E. Regel, downy mildew. Massachusetts, Common on outdoor lettuce and now rather common on Belmont variety under glass (Guba, November 15). Traces also reported from New York, Indiana, Wisconsin, Texas, Arizona, Washington, and California.

Caconema radicicola (Greef) Cobb, root knot. Reported from two localities in New York on outdoor lettuce.

Lettuce

Corticium vagum Berk. & Curt., bottom rot. A 12 to 15 per cent loss occurred in New York State. Sanitary measures consisting of gathering and destruction of all refuse as soon as crop was harvested and control of weeds along margins of field and ditches increased the yield as much as 500 crates per acre (Chupp). Texas.

Marssonina panattoniana (Berl.) Magn., anthracnose. Reported from Texas and western Washington, and a specimen was sent in from Missouri.

Septoria lactucae Pass., leaf spot. Reported for first time from West Virginia on older leaves (Archer); Wisconsin, quite prevalent in scattered locations on New York and Wonderful types (Vaughan). Also occurred in New Jersey.

Sclerotinia spp., drop. New York, 1 per cent loss. California, general occurrence with considerable damage. Trace in New Jersey and Indiana.

Brown blight (undet.) Reported from Arizona where it is said by Streets to cause serious losses where lettuce is grown continuously on the same land. In the Imperial Valley of California resistant strains are being developed by Jagger.

Mosaic (virus). Reported as present in Montana and as causing 1 to 2 per cent loss in New York. According to A. C. Foster (2), it is present in all the western lettuce growing sections. Since the disease is considered to be seed borne its presence in seed growing sections may become an important factor affecting control. Trace in New Jersey.

Pythium root rot, Pythium sp. Reported only as a trace from New York where a maximum infection of 10 per cent has been seen.

Rust (aecial stage, species undetermined). Noticed June 20 - July 4 at Madison (Vaughan).

Slimy soft rot (bacterial). Commonly associated with tipburn probably found to a greater or less extent wherever lettuce is grown. It was reported from South Carolina, Texas, Arizona, Montana, and Washington.

Tipburn (non-parasitic). New York, 1 to 2 per cent loss. South Carolina, one report only. Arizona, July 1 heavy losses in various sections where tipburn and slimy root rot ruined 50 to 90 per cent of the crop in some sections (Streets). Scattered occurrence in New Jersey.

Yellows or rabbit's ear (virus). New York, seven per cent loss for state. Pennsylvania, general occurrence with 35 per cent loss (Beach). Texas, traces in the Rio Grande Valley. Found by Kunkel (3) to be caused by the same virus as causes aster yellows.

Recent literature: Pl. Dis. Reptr. 12: 65, 146.

1. Connor, S. D., and C. T. Gregory. Excess soluble salts as the cause of vegetable diseases in greenhouses. Proc. Indiana Acad. Sci. 37: 385-390. 1928.

2. Foster, A.C. The V & F Pathologist 1 (9): 36. Apr. 16, 1928.

3. Kunkel, L. O. Flor. Rev. 62 (1608): 35-36. Sept. 20, 1928.

4. Weber, G. F. Diseases of lettuce, romaine, escarole, and endive. Florida Agr. Exp. Sta. Bul 195: 303-333. Apr.1928.

DISEASES OF PEAS

See report of M. B. Linford on pea diseases in the United States in 1928. (Pl. Dis. Reptr. Suppl. 67: 1-14. Mar. 15, 1929.)

Recent literature: Pl. Dis. Reptr. 12: 23-24, 37, 54, 71, 119.

1. Haenseler, C. M. Effect of organic mercury seed treatments on germination and yield of peas. Ann. Rept. New Jersey Agr. Exp. Sta. 48: 232-238. 1928.

2. Jorgensen, C. A. Gulspidssygen. Dens Udbredelse, Aarsager og Bekaempelse. (Yellow tip disease. Its distribution, causes, and control.) Tidsskr. for Planteavl. 34 (1): 76-116. 1928.

3. Linford, M. B. A Fusarium wilt of peas in Wisconsin. Wisconsin Agr. Exp. Sta. Res. Bul. 85. 44 p. June, 1928.

4. Togashi, K. Three Fusaria which cause the wilt disease of pea. Japanese Jour. Bot. 4: 153-188. Oct. 1928.

5. ________, and E. Tsukamoto. On the three species of Fusarium which cause the wilt disease of pea (Preliminary report II). Jour. Soc. Agr. & For. Sapporo, Japan 19: 409-419. Mar.1928.

DISEASES OF MISCELLANEOUS VEGETABLE CROPS

ASPARAGUS

Puccinia Asparagi DC., rust. Traces of rust were reported from New Jersey, Virginia, Texas, Minnesota, Michigan, Iowa, North Dakota, Colorado, and Arizona, and a 2 per cent loss was estimated in Maryland. The general use of the Washington resistant selections was noted in many states as responsible for the relatively small amount of the disease although in Michigan rust resistant strains showed some disease.

Cercospora asparagi Sacc., leaf spot. Texas, common in lower Rio Grande Valley on stems and leaves, 0.1 per cent loss.

Recent literature:

1. Jones, H. A., and Robbins, W. W. The asparagus industry in California. California Agr. Exp. Sta. Bull. 446. 105 p. Jan. 1928.

BEETS (GARDEN)

Actinomyces scabies (Thax.) Gues. Scab. New Jersey, Texas.

Bacterium tumefaciens EFS. & Town., crowngall. New Jersey.

Cercospora beticola Sacc., leafspot. Traces in New York, New Jersey, West Virginia, Texas, Colorado, and 2 per cent loss in Kansas.

Curly top (virus). Twenty per cent loss was reported from Arizona. Washington.

Phymatotrichum omnivorum (Shear) Duggar, root rot. Texas.

CARROTS

Alternaria radicina Meier, Drechs. and Eddy, black rot. New York, 3 to 5 per cent loss.

Bacillus carotovorus Jones, soft rot. New York, 2 to 3 per cent loss, Texas, New Mexico.

Caconema radicicola (Greef) Cobb, root rot. New York, Kansas and New Mexico.

Cercospora apii carotae Pass., leaf spot. New York and New Jersey.

Cuscuta arvensis Bey., dodder. Mississippi.

Macrosporium carotae Ell and Langl., leaf blight. New Jersey, Ohio, West Virginia, and Massachusetts.

Peronospora effusa (Grev.) Ces., downy mildew. Indiana.

Phymatotrichum omnivorum (Shear) Duggar, root rot. Texas.

Rhizoctonia sp., rot. New York.

Sclerotinia sclerotiorum (Lib.) Mass., rot. New York.

Yellows (undet.). New York.

Recent literature: Pl. Dis. Reptr. 12: 110.

EGGPLANT

Alternaria solani (Ell. & Mart.) Jones and Grout, leaf spot. Florida.

Bacterium solanacearum E.F.S., bacterial wilt. Florida.

Phomopsis vexans (Sacc. & Syd.) Harter, leafspot. New Jersey, trace; Florida, 10 per cent; West Virginia, on markets; Texas, common on fruit and leaves, 1 per cent loss.

Rhizoctonia solani Kuehn, damping off and ground rot. New Jersey and Florida.

Sclerotium rolfsii Sacc., stem rot. Florida.

Verticillium alboatrum Reinke and Berth., wilt. New Jersey, Massachusetts, and Pennsylvania.

Hopperburn, leaf hoppers. New Jersey, severe on Long Purple var.

Mosaic like disease. Texas.

Recent literature: Pl. Dis. Reptr. 12: 69, 119.

ENDIVE

Puccinia hieracii (Schum.) Mart., rust. California.

Rhizoctonia solani Kuehn, bottom rot. Texas.

Macrosporium sp., leaf spot. New York.

Recent literature

1. Weber, G. F., and Foster, A. C. Diseases of lettuce, romaine, escarole and endive. Florida Agr. Exp. Sta. Bull. 195: 303-333. April 1928.

GINSENG

Rhizoctonia spp., stem rot. Washington.

Phytophthora cactorum (Lib. & Cohn) Schroet., blight. Iowa.

Recent literature: Pl. Dis. Reptr. 12: 71.

1. Whetzel, H. H. Ramularia rust on ginseng. Spec. Crops. 27: 235-237. September 1928.

2. Whetzel, H. H., S. E. A. McCallan, and T. C. Loh. Calcium arsenate as a fungicide. (Abstract) Phytopath. 19: 83. Jan. 1929.

HOPS

Pseudoperonospora humili (Miyabe and Tak.) Wils., downy mildew. In Europe this disease has been causing much damage during the last few years and has been regarded as an introduction from some other country. This year it was reported from New York State for the first time indicating that it has but recently become established there. It was found on a Bavarian hop farm in Otsego County, New York. The mildew has recently become destructive in British Columbia, Canada.

Recent literature: Pl. Dis. Reptr. 12: 53.

1. Blattny, C. Beitrag zur Frage der Düngung des Hopfens als Mittel gegen die Hopfenperonospora (Pseudoperonospora humuli). Ernähr. Pflanz. 24: 140-142. May 1, 1928. No. 9.

2. Korff, G., and F. Zattler. Die Peronosporakrankheit des Hopfens. Arb. Bayer. Landesanst. für Pflanzenbau und Pflanzenschutz 5: 42. 1928.

3. Salmon, E. S., and Ware, W. M. Inoculation experiments with the downy mildews of the hop and nettle (Pseudoperonospora humuli (Miy. et Taka.) Wils. and P. urticae (Lib.) Salmon et Ware) Ann. Appl. Biol. 15: 352-370. Aug. 1928.

4. Salmon, E. W., and Ware, W. M. The mosaic disease of the hop; grafting experiments I - Ann. Appl. Biol. 15: 342-351. August 1928.

5. Wormald, H. The parasitism of the hop leaf-spot fungus Cercospora cantuariensis. Trans. Brit. Mycol. Soc. 13: 32-39. March 1928.

MUSHROOMS

Recent literature

1. Beach, W. S. Mushroom diseases. Pennsylvania Agr. Exp. Sta. Bul. 230. July 1928.

2. Charles, V. K., and C. H. Popenoe. Some mushroom diseases and their carriers. U. S. Dept. Agr. Circ. 27: 9 p. Feb. 1928.

OKRA

Ascochyta abelmoschi Harter, pod spot. New Jersey.

Cercospora hibisci, Tr. & Earle, leaf spot. Mississippi.

Fusarium vasinfectum, Atk, wilt. Delaware, Texas.

Phymatotrichum omnivorum (Shear) Duggar, root rot. Texas.

Rhizoctonia sp., root rot. Texas.

Verticillium alboatrum, Reinke and Berth, wilt. New Jersey.

PARSLEY

Cercospora apii Fresen., leaf spot. New Jersey.

PARSNIP

Cercospora apii pastinacae, Farl., leaf spot. West Virginia.

Sclerotinia sclerotiorum (Lib.) Mass., watery soft spot. Louisiana.

PEANUT

Cercospora personata (Berk. & Curt.) Ell. & Ev., leaf spot. Florida, Georgia, Mississippi, Texas, New Mexico. Five per cent loss estimated in Georgia (Boyd).

Corticium vagum (Berk. & Curt.), stem rot. Florida.

Phymatotrichum omnivorum (Shear) Duggar, root rot. Texas (very susceptible host).

Sclerotium rolfsii Sacc., stem rot. Florida, Mississippi, Texas.

Recent literature: Pl. Dis. Reptr. 12: 117.

1. Storey, H. H., and A. M. Bottomley. The rosette disease of peanuts (Arachis hypogaea L.). Ann. Appl. Biol. 15: 26-45. February 1928. No. 1.

PEPPER

Alternaria sp., fruit rot. Ohio, Texas, New Mexico.

Bacterium solanacearum EFS., bacterial wilt. Texas.

Bacterium vesicatorium Doidge, bacterial spot. New Jersey, Delaware (common), Georgia (10 per cent loss), Florida and New York.

Botrytis cinerea Auct., gray mold. New Jersey.

Caconema radicicola (Greef) Cobb., root knot. Mississippi.

Cercospora capsici Heald & Wolf., leaf spot. New York, Florida, Texas.

Colletotrichum nigrum E. & H., anthracnose. Mississippi.

Fusarium annuum Leonian, wilt. New Mexico.

Gloeosporium piperitum Ell. & Ev., anthracnose. Florida, Texas.

Phoma destructiva, Plow., rot. Delaware.

Phytophthora capsici Leonian, blight. New Jersey, and New Mexico.

Rhizoctonia sp., damping off. New Mexico.

Sclerotium rolfsii Sacc., stem rot. Florida, Georgia (5 per cent loss), Mississippi.

Blossom end rot, non-parasitic. Delaware, Georgia (2 per cent loss), Mississippi, Texas.

Leaf spot (undet.). Georgia.

Mosaic (virus). New York, New Jersey, Georgia, Florida, Mississippi, and Texas.

Sunscald. Georgia, 5 per cent loss.

Recent literature: Pl. Dis. Reptr. 12: 24, 70,76.

R H U B A R B

Ascochyta rhei E. & E., leaf spot. New Jersey and West Virginia.

Erysiphe cichoracearum DC., powdery mildew. New Jersey.

Phyllosticta straminella Bres., leaf spot. Montana.

Phymatotrichum omnivorum (Shear) Duggar, root rot. Texas.

Phytophthora spp., crown rot. Washington.

Sclerotium rolfsii Sacc., stem rot. Mississippi.

ROMAINE

Sclerotinia sclerotiorum (Lib.) Mass., soft rot. Louisiana.

Recent literature

1. Weber, G. F., and A. C. Foster. Diseases of lettuce, romaine, escarole and endive. Florida Sta. Bul. 195: 299-333. 1928.

SALSIFY

Albugo tragopogonis (DC.) Gray, white rust. New Jersey.

Alternaria sp., leaf spot. Virginia.

Sporodesmium scorzonerae Aderh. West Virginia, 2 per cent loss. Apparently first report of disease in United States (Archer).

SPINACH

Cercospora beticola Sacc., leaf spot. Texas.

Colletotrichum spinaciae Ell. & Hals., anthracnose. Texas.

Peronospora effusa (Grev.) Ces., downy mildew. Massachusetts, New York, New Jersey, Maryland, Virginia (10 per cent loss, worst disease problem in this crop), Florida, Louisiana, Texas, Wisconsin, Colorado, and Washington.

Mosaic (virus), New York, Maryland, Virginia (apparently as severe as usual but consistent use of Virginia Savoy keeps it in check), and Tennessee.

Rhizoctonia sp., root rot. New York.

Yellows (undet.). Virginia.

Recent literature

1. Gilbert, B. E., and F. T. McLean. A 'deficiency disease': the lack of available manganese in a lime-induced chlorosis. Soil Science 26: 27-31. 1928.

DISEASES OF OTHER FIELD CROPS

DISEASES OF COTTON

ROOT ROT, PHYMATOTRICHUM OMNIVORUM (SHEAR) DUGGAR

Root rot was general in occurrence over the greater part of Texas and in the valleys of Arizona and New Mexico and was noted fifty miles north of the Red River in southcentral Oklahoma. Well authenticated reports located the disease at points ranging from the eastern to the western parts of old Mexico and from 50 to 150 miles south of the United States border. Previous reports have located the disease in California across the Colorado River from Yuma and in the Palo Verde Valley. Pathologists in Texas estimated a 15 per cent loss of the total crop in that State, and those in Arizona estimated a 7 per cent loss.

Taubenhaus, Ezekiel and Killough (2) have found a definite relationship between the pH of the soil and the occurrence of root rot. In general, soils with an alkaline reaction are favorable while those with an acid reaction are unfavorable to root rot. They have demonstrated that subsoil acidity is important in this connection.

In Arizona, Streets states that the disease is serious in the valleys below the 5,000 foot level. Temperature is probably one of the factors there as well as in the northern extension of the disease since it is much less severe in the northern portion of its geographic range.

Rainfall and temperature were shown by Taubenhaus and Dana (1) to have a distinct influence on the spread of the disease.

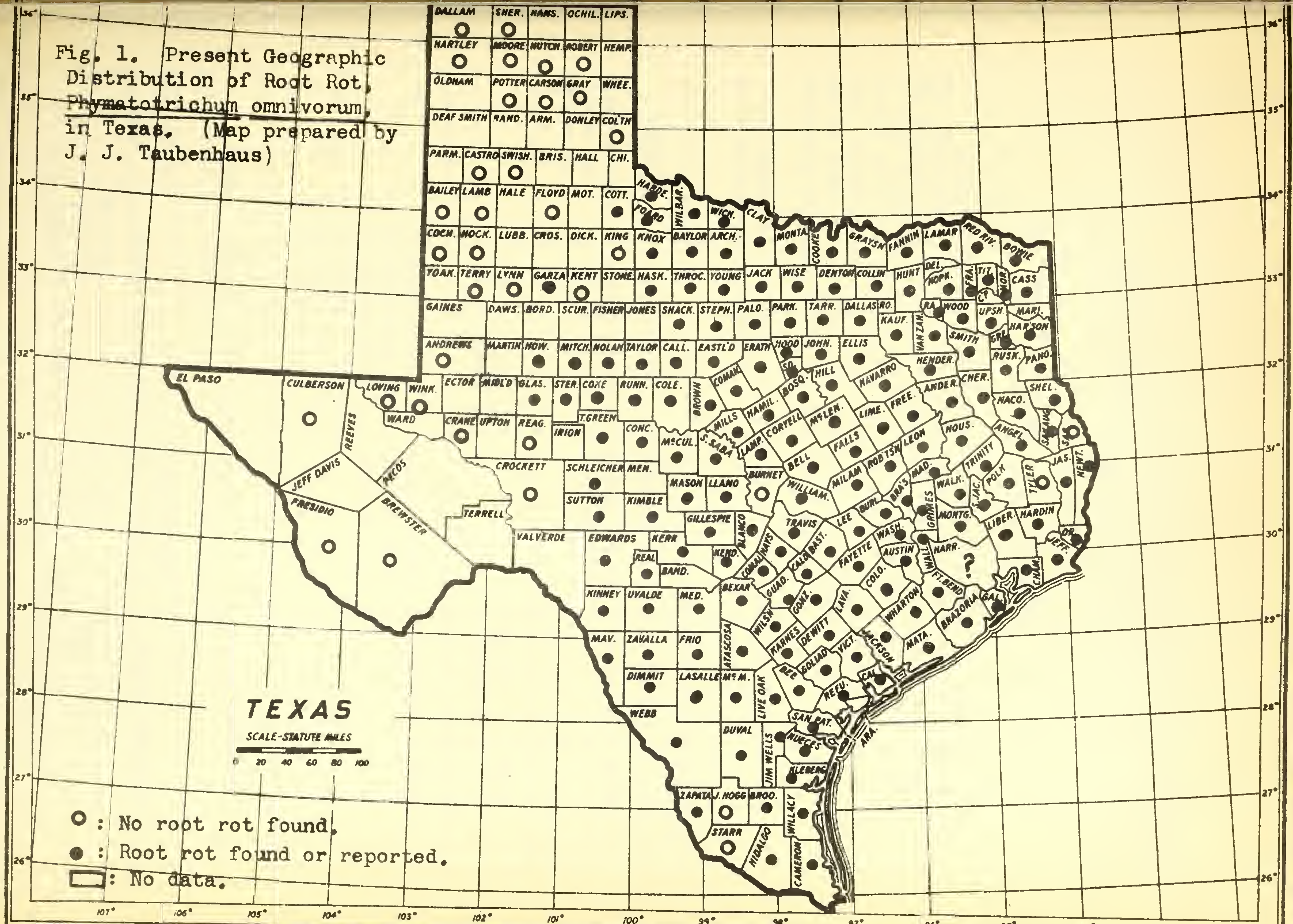
Among the hosts for root rot are numbered many of the most important of our crop and ornamental plants. A recent publication by Taubenhaus, Dana, and Wolf (3) names some 518 species of plants susceptible to Phymatotrichum omnivorum. Of these 274 were cultivated and 244 non-cultivated.

Recent literature: Pl. Dis. Reptr. 12: 67, 118.

1. Taubenhaus, J. J., and B. F. Dana. The influence of moisture and temperature on cotton root rot. Texas Agr. Exp. Sta. Bul. 386: 1-23. 1928.

2. ________________, W. N. Ezekiel, and D. T. Killough. Relation of cotton root rot and Fusarium wilt to the acidity and alkalinity of the soil. Texas Agr. Exp. Sta. Bul. 289: 1-19. 1929.

Fig. 1. Present Geographic Distribution of Root Rot, Phymatotrichum omnivorum, in Texas. (Map prepared by J. J. Taubenhaus)



○ : No root rot found.

● : Root rot found or reported.

▭ : No data.

3. ________________, B. F. Dana, and S. E. Wolf. Plants susceptible or resistant to cotton root rot and their relation to control. Texas Agr. Exp. Sta. Bul. 393. 1929.

WILT, FUSARIUM VASINFECTUM ATK.

Losses from wilt are partially represented by the figures in table 29. Individual field losses up to 75 per cent were reported from Florida. The disease is mentioned as being particularly prevalent in the sandy soils of east Texas and also in sandy soils of Louisiana and Tennessee, while alluvial soils are mentioned in connection with occurrence of wilt in Arkansas. Varietal resistance and susceptibility was mentioned in state reports and is given in table 28. The use of wilt resistant seed was reported as receiving increased attention in North Carolina.

Table 28. Variety, susceptibility and resistance to wilt as reported by collaborators, 1928.

Immune	Resistant	Susceptible	State	Reported by
Dixie Triumph, Dixie 14, Cooke 307	Express, D&Ph. No. 4, Cleveland	Delfos, Trice, Half & Half	Louisiana	Brown
	Dixie Triumph, Super seven		North Carolina	Fant
	Super seven, Lightning Express, Miller, E& P.L., No.6, Rowder 40, Express	Acala, Trice, Half & Half, Delfos	Arkansas	Young

Table 29. Percentage losses from wilt of cotton as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
10	Florida	2.5	North Carolina
4.5	Arkansas	2.3	Louisiana
3	Georgia, Mississippi	2	Texas (east)
		Trace	Tennessee, Missouri

Recent literature: Pl. Dis. Reptr. 12: 67, 97, 113, 118, 132

1. Fahmy, T. The Fusarium disease of cotton (wilt) and its control. Bul. Min. Agr. Egypt. Tech. & Sci. Serv. 74. 106 p. 1928.

2. Rosen, H. R. A consideration of the pathogenicity of the cotton wilt fungus, Fusarium vasinfectum. Phytopath. 18: 419-438. May 1928.

3. Young, V. H. Cotton wilt studies I. Arkansas Agr. Exp. Sta. Bul. 226. 50 p. June 1928.

ANGULAR LEAF SPOT, BACTERIUM MALVACEARUM EFS.

Reports were received from Virginia, North Carolina, Tennessee, Georgia, Florida, Mississippi, Louisiana, Arkansas, Texas, and Arizona with estimated losses as given in table 30. During the early part of the growing season the disease assumed epidemic proportions in Texas. Continued dry weather, however, checked the trouble and reduced losses to a minimum. Boyd (Georgia) also reported severe infection in the Coastal Plain section with the greatest damage in the form of the dead arm stage. Streets (Arizona) found delinting with sulfuric acid controlled the disease.

Table 30. Percentage losses from angular leaf spot of cotton as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
10	Tennessee	1.0	Texas
4	Georgia	.5	Arkansas, Louisiana, Arizona
1.5	Mississippi, North Carolina, Alabama	Trace	Virginia, Florida

Recent literature: Pl. Dis. Reptr. 12: 54, 97, 118, 125, 132.

1. Blackman, V. H. Report on the sulphuric acid treatment of cotton seed. Empire Cotton Growing Review 5 (3): 240-241. 1928.

2. Findlay, W. P. K. Some conditions influencing the development of the bacterial disease of cotton (Bacterium malvacearum). Empire Cotton Grow. Rev. 5: 29-39. Jan. 1928.

3. Sibilia, C. Batteriosi del cotone. Boll. R. Staz. Patol. Veg. Roma. n.s. 8: 93-96. Jan.-Mar. 1928.

4. Stoughton, R. H. The influence of environmental conditions on the development of the angular leaf spot disease of cotton. Ann. Appl. Biol. 15: 333-341. Aug. 1928.

ROOT KNOT, CACONEMA RADICICOLA (GREEF) COBB

Losses of 2 per cent were reported from Arkansas, 1 per cent from Georgia and North Carolina, and traces in Florida, Missouri, Mississippi, and Texas. In North Carolina and Arkansas root knot was mentioned as general on light soils.

Recent literature: Pl. Dis. Reptr. 12: 132.

ANTHRACNOSE, GLOMERELLA GOSSYPII (SOUTHWORTH) EDG.

Anthracnose was reported as serious in a number of Southern States as will be seen by reference to table 31. In North Carolina injury to seedlings was of greater importance than boll rot (Fant). In Georgia, it occurred as a seedling blight and was much more prevalent and injurious in the Piedmont section than in the Coastal Plains section. Varieties resistant were Dixie Triumph and Lewis 63 (Boyd). In Mississippi rainy weather favored an abundance of the disease with a 10 per cent loss (Miles). Essary (Tennessee) stated that seed treatment gave good control.

Table 31. Percentage losses from anthracnose of cotton as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
10	Mississippi, and Tennessee	2	Florida, Virginia, North Carolina
2	Georgia	1.3	Louisiana
		Trace	Missouri, Arkansas

Recent literature: Pl. Dis. Reptr. 12: 98, 125, 132.

BOLL ROTS (VARIOUS FUNGI)

Losses of 12 per cent were reported for Georgia and 10 per cent for Florida. In a special report, G. M. Armstrong, commenting on boll rots in the Coastal Plains region of South Carolina, gave estimates of 15 to 48 per cent of the total number of bolls rotten in different areas of this section, and stated that the season was generally a wet one and that the tropical hurricane in the early fall was a factor which favored boll rots. Rhizopus boll rot following bacterial rot was common in Texas.

Angular leaf spot lesions and lesions produced by insects seem to be the avenues of entrance of most of the boll rotting fungi and bacteria.

Diplodia gossypina is reported by Walker as the cause of the most serious boll rot in Florida with Fusarium moniliforme second. Traces found in Texas.

Penicillium, Aspergillus, Alternaria, Glomerella, and Bacteria also caused rotting of bolls but were of minor importance.

Nematospora sp., was reported as causing a boll rot in the Imperial Valley of California.

Recent literature: Pl. Dis. Reptr. 12: 97-98, 125, 145-146.

STEM ROT, SORESHIN, DAMPING OFF, CORTICIUM VAGUM BERK. & CURT

Severe seedling injury was reported from North Carolina, Mississippi, Louisiana, Texas, Arkansas, New Mexico and Arizona. In Texas, Taubenhaus and Bach, and in Arizona, R. B. Streets, estimated a 2 per cent reduction in stand.

Recent literature: Pl. Dis. Reptr. 12: 37, 118.

OTHER DISEASES

Puccinia hibisciata (Schw.) Kellerm., rust. Several counties in Texas

Ramularia areola Atk., frosty mildew. Georgia.

Hail injury. Severe in section of Hidalgo County, Texas.

Lightning injury. Mississippi. South Carolina.

Rust (non-parasitic). North Carolina, general; Georgia, 2 per cent loss; Florida, restricted to fields of low vigor and generally poor care (Walker); Louisiana, 2.3 per cent loss; no varieties immune but vigorous growing varieties appear to be somewhat resistant (Brown); Arkansas, less important; Tennessee, 5 per cent loss.

Verticillium albo-atrum, wilt. Sherbakoff (3) has given additional data concerning this disease. He finds it rather widespread along the Mississippi River on "gumbo" soils. It is characterized by shedding of the leaves and bolls, withering of leaves and tips of branches, production of new shoots from the base and a distinct discoloration of the cambium.

Wilt (undet.) Taubenhaus, Ezekiel, and Rea (4) have reported a new wilt in Texas, distinct from that caused by Fusarium vasinfectum.

Recent literature: Pl. Dis. Reptr. 12: 67, 98, 132.

1. Guilliermond, A. Recherches sur quelques ascomycètes inférieurs isolés de la stigmatomycose des graines de cotonnier. Essai sur la phylogénie des ascomycètes (cont.). Rev. Gén. Bot. 40: 606-624. Oct. 1928.

2. Neal, D. C. Cotton diseases in Mississippi and their control. Mississippi Agr. Exp. Sta. Bul. 248, 30 p. Feb. 1928.

3. Sherbakoff, C. D. Verticillium wilt of cotton. (Abstract) Phytopath. 19: 94. Jan. 1929.

4. Taubenhaus, J. J., W. N. Ezekiel, and H. E. Rea. A new cotton wilt. Phytopath. 19: 171-173. 1929.

DISEASES OF TOBACCO

WILD FIRE, BACTERIUM TABACUM WOLF & FOSTER

Wild fire occurrence and losses are given in the accompanying table. Seed bed infection was mentioned as an important factor in spread of the disease during the season. Seed bed spraying and dusting was said by Davis to have decreased the prevalence of wild fire in Massachusetts. Jehle (Maryland) also observed that spraying or dusting of seed beds was more effective if applied before the disease appeared. Beach (Pennsylvania) reported 15 per cent of the farms affected. Tisdale found the disease confined to seed beds in Florida. A report was received from T. D. Major of the occurrence of the disease in Rouville and Montcalm Counties of Quebec, Canada. Occurrences of the same or a similar disease are reported in the literature for several foreign countries.

Table 32. Percentage losses from wild fire of tobacco as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
25	Maryland	.2	Wisconsin
15	Tennessee	Trace	New York, Pennsylvania, Virginia, Florida, Kentucky
2	Massachusetts		

Recent literature: Pl. Dis. Reptr. 12: 24, 98, 111, 112, 116.

1. Beach, W. S. Tobacco Wildfire. Pennsylvania Agr. Exp. Sta. Bul. 230. July 1928.

2. Hill, J. Ben. Migration of Bacterium tabacum through the leaf tissues of Nicotiana tabacum. (Abstract) Phytopath. 19: 97. January 1929.

3. Hopkins, J. C. F. Wildfire and angular spot of tobacco. Rhodesia Agr. Jour. 25: 139-143. Feb. 1928.

4. Kotte, W. Der Bakterienbrand des Tabaks als Samlingskrankheit. Deutsche Landw. Presse 55: 525. Sept. 8, 1928.

ANGULAR LEAFSPOT, BACTERIUM ANGULATUM FROMME & MURRAY

Angular leafspot was epidemic in Virginia causing a total loss in yield and grade estimated by Wingard to be 25 per cent. A 4 per cent loss was estimated by Henderson and Boyd for Georgia and a 5 per cent loss by Andes for Tennessee. Wet weather was mentioned as favoring severe infection in a number of states. Severe infections without estimates of actual losses were noted in reports from Pennsylvania, Maryland, North Carolina, South Carolina, Kentucky and Wisconsin. This trouble appears to be the most important disease on tobacco this season. It was also reported by Major in the Ontario and Quebec districts of Canada.

Recent literature: Pl. Dis. Reptr. 12: 24, 68, 98, 111, 112, 114, 116.

1. Valleau, W. D. Are blackfire and angular leafspot of tobacco identical? (Abstract) Phytopath. 19: 93. January 1929.

MOSAIC (VIRUS)

Loss estimated for mosaic appear in table 33. Spreading of the trouble by field operations where plants are handled was mentioned in several reports. Valleau of Kentucky reported a field with 6 per cent infection which was traced to a man smoking natural leaf which was crushed in the hands. He also stated that the practice of furnishing workers with sterile chewing tobacco and requiring thorough washing of hands with soap and water before pulling had controlled the disease. Boyd (Georgia) reported that curing tests in Thomas County indicated an 18 per cent reduction in weight for mosaic leaves and a total value loss of 55 per cent as compared with healthy leaves of the same field. James Johnson (Wisconsin) reported the apparent overwintering of mosaic in some soils. Richards reported practically 100 per cent of the plants affected in a small field in Salt Lake County, Utah. Major (Canada) reported less loss than in previous years.

Table 33. Percentage losses from mosaic of tobacco as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
15	Wisconsin	2	West Virginia, North Carolina
12	Kentucky		
5	Maryland, Tennessee	1	Virginia, Georgia.

Recent literature: Pl. Dis. Reptr. 12: 67, 68, 69, 98, 111, 112, 114, 116.

1. Dunlap, A. A. Effects of mosaic upon the chlorophyll content of tobacco. Phytopath. 18: 697-700. Aug. 1928.

2. Holmes, F. O. Local symptoms of mosaic in the leaves of some Nicotiana species. (Abstract) Phytopath. 19: 92-93. Jan. 1929.

3. Hopkins, J.C.F. Mosaic disease of tobacco. Rhodesia Agr. Jour. 25: 188-194. Feb. 1928.

4. Purdy, Helen A. Immunologic reactions with tobacco mosaic virus. Proc. Soc. Exper. Biol. and Med. 35: 702-703. 1928.

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6. Purdy, Helen A. The improbability of tobacco mosaic transmission by slugs. Amer. Jour. Bot. 15: 100-101. 1928.

7. Valleau, W. D., and E. M. Johnson. Observations and experiments on the control of true tobacco mosaic. Kentucky Agric. Exper. Sta. Bull. 280: 145-174. 1927.

8. Vinson, C. G., and Petre, A. W. Progress in freeing the virus of mosaic disease of tobacco from accompanying solids. (Abstract) Phytopath. 19: 107-108. Jan. 1929.

BLACK ROOT ROT, THIELAVIA BASICOLA (BERK. & BR.) ZOPF.

The only serious infection for the year was reported from Wisconsin and Kentucky, in the latter state causing a 5 per cent loss. Scattered occurrence, generally in old fields, was noted in reports from Massachusetts Indiana, Virginia, West Virginia, North Carolina and Missouri. Connecticut Round Tip and Havana No. 142 were mentioned as resistant in Florida and Wisconsin, respectively. New Burly Hybrids and air cured hybrids were mentioned as resistant in Kentucky. T. B. Major also reported this disease from the Quebec and Ontario districts. According to Archer, the report of Fusarium oxysporum nicotianae from West Virginia in Pl. Dis. Reptr. 12: 98, September 1, 1928, is in error. The fungus was Thielavia basicola and this is the first report for the State.

Recent literature: Pl. Dis. Reptr. 12: 67, 98, 112, 115.

1. Doran, W. L. Acetic acid as a soil disinfectant. Jour. Agr. Res. 36: 269-280. 1928.

2. Johnson, J. Tobacco breeding for root-rot resistance paying good returns. U. S. Dept. Agr. Yearbook. 1927: 622-625. 1928.

3. Jones, J. P. Influence of cropping systems on root-rots of tobacco. Jour. Amer. Soc. Agron. 20: 679-685. July 1928.

OTHER DISEASES

Alternaria sp., leafspot. Loss of 7 per cent in Georgia and trace in Florida.

Bacterium solanacearum EFS. Bacterial wilt, also known as Granville wilt from its prevalence on soils of the Granville series. Reported from Virginia, North Carolina and Georgia.

Tobacco - Other Diseases

Caconema radicicola (Greef) Cobb, root knot. Fifteen per cent loss in Georgia and trace in Florida.

Cercospora nicotianae Ell. & Ev., frog-eye. Trace in Florida and North Carolina and loss of 8 per cent in Georgia.

Corticium vagum Berk. & Curt., soreshin. West Virginia, Georgia, and Tennessee. Also in Kent County, Ontario, Canada.

Fusarium affine Fautr. & Lamb., leafspot. Kentucky, in plant beds.

Fusarium oxysporum nicotianae Johnson, wilt. Traces only in Maryland.

Phytophthora nicotianae (Speg.) Van Breda de Haan, black shank. Trace in Georgia and 5 per cent loss in Florida.

Brown root rot (undet.) Reported from Massachusetts, Kentucky and Wisconsin. The effect of the preceding crop is important. In Massachusetts it appeared following timothy, in Kentucky following sod. This was was said by James Johnson to be one of the most important troubles of tobacco in Wisconsin.

Frenching, non-par. Reported from Maryland, Georgia, Kentucky, and Canada. Lime was said to aggravate the disease while side application of quickly available nitrate fertilizer corrected the condition.

Ring spot (virus). Traces were reported from New York, Maryland, West Virginia, Virginia, North Carolina and Georgia.

Sand drown, non-par. North Carolina.

Storm injury. Caused 20 per cent loss in Maryland (Jehle).

Recent literature: Pl. Dis. Reptr. 12: 65, 67, 68, 69, 70, 98, 111, 112, 114. 115, 116.

1. Ashby, S. F. The oospores of Phytophthora nicotianae Br. de Haan, with notes on the taxonomy of P. parasitica Dastur. Trans. Brit. Mycol. Soc. 13: 86-95. Mar. 1928.

2. Doran, W. L. The growth of tobacco and brown root rot of tobacco as affected by timothy infusions of different ages. Jour. Agr. Res. 36: 281-287. 1928.

3. Hopkins, J. C. F. Frenching of tobacco. Rhodesia Agr. Jour. 25: 588-591. May 1928.

4. Miller, L. P. Manganese deficiency in sand culture. American Fertilizer 68(7): 21-22. 1928.

5. Nolla, J. A. B. The black-shank of tobacco in Porto Rico. (Abstract) Phytopath. 19: 93-94. January 1929.

6. Priode, C. N. Further studies in the ring-spot disease of tobacco. Amer. Jour. Bot. 15: 88-93. Jan. 1928.

7. Tisdale, W. B. Progress in the control of black shank of tobacco through disease resistance. (Abstract) Phytopath. 19: 93. January 1929.

8. Tisdale, W. B. A disease of tobacco seedlings caused by Septomyxa affinis (Sherb) Wr. (Abstract) Phytopath. 19: 90. Jan. 1929.

9. Valleau, W. D., and Johnson, E. M. Tobacco frenching - nitrogen deficiency disease. Kentucky Agri. Exp. Sta. Res. Bul. 281: 179-253. 1927.

10. Wingard, S. A. Hosts and symptoms of ring spot, a virus disease of plants. Jour. Agr. Res. 37: 127-153. 1928.

DISEASES OF SUGAR CANE

MOSAIC (VIRUS)

Traces of mosaic were reported by collaborators from Georgia, Florida, and Mississippi, and 5 per cent loss from Louisiana. Some comments of interest from collaborators follow:

Georgia: Most commercial acreage is planted to resistant varieties (Boyd).

Florida: Apparently diminishing in importance (Weber).

Mississippi: One hundred per cent infection on purple, none on Cayana, 10 in fields observed (Neal, Wedgworth, and Miles).

Louisiana: There was less of disease because of increasing amounts of resistant varieties planted (Tims).

Recent literature

1. Anon. Disease control in Hawaii. Eye spot and mosaic reduced in past year by control measures. Facts about Sugar 23 (28): 657. 1928.

2. Alfaro, J. Statement on mosaic control by Senor J. Alfaro. Proc. Conf. Intern. Soc. Sugar Cane Techn. 2: 91-99. 1927.

3. Dufrenoy, J. Le vacuome des cellules de canne a sucre affectées de mosaique. Compt. Rend. Soc. Biol. Paris 99: 503-505. July 13, 1928.

4. Gouaux, C. B. Sugar cane test field work. Louisiana Agr. Exp. Sta. Bul. 202. 32 pp. 1928.

5. Hadden, F. C. Sugar cane mosaic and insects. Hawaiian Planters' Record 32 (1): 130-142. 1928.

6. Hernandez Torres, O. Control del "mosaico" o "rayos amarillas" de la cana de azucar. Rev. Agr. Com. y Trab. 10 (4): 16. Oct. 1928.

7. McClean, A. P. D. Mosaic disease of sugar cane. With special reference to its eradication in Natal. South African Sugar Jour. 12: 483, 485, 487, 489. Aug. 31, 1928.

8. McRae, W., and L. S. Subramaniam. A further note on the mosaic disease of sugar cane. Agr. Jour. India 23: 239-255. July 1928.

9. Venkatraman, T. S., and R. Thomas. A leaf adaptation conducive to mosaic resistance in the sugar cane. Agr. Jour. India 23: 56-57. Jan. 1928.

OTHER DISEASES

Bacterium sp., red stripe. Louisiana.

Bacterium sp., top rot. Louisiana.

Colletotrichum falcatum Went., red rot. Florida, Mississippi, and Louisiana (there was less of the disease because there was much less of the susceptible varieties planted) (Tims).

Helminthosporium stenospilum Drechsler, brown stripe. Louisiana, less this year because less of the susceptible varieties were planted. Not less on susceptible varieties (Tims).

Melanconium sacchari Mass., rind disease. Mississippi.

Pythium sp., root rot. Louisiana, 12 per cent loss (Tims).

Pokkah bong (undet.). Louisiana, the disease is general in P.O.J. 234, Louisiana Purple. Much less in P.O.J. 213 and 35 (Tims).

Tall multiple bud (undet.). Louisiana, P.O.J. 234, 979, 2725 susceptible (Tims).

Recent literature

(Note: In Suppl. 61: 294. 1928, the articles on eye-spot (15, 16, 17) should be credited to H. A. Lee. The correct citations are given below (11, 12, 13)).

1. Anon. The new Java P.O.J. 2878 cane. Internat. Sugar Jour. 30 (350): 61-62. 1928.

2. Anon. Disease control in Hawaii. Eye spot and mosaic reduced in past year by control measures. Facts about Sugar 23: 657. July 14, 1928.

3. Bolle, P. C. Verdere onderzoekingen over pokkah boeng en toprot. (Further investigations on pokka boeng and top rot.) Arch. Suikerind. Nederl. Indië, I Deel 36 (6): 116-129. 1928.

4. Carpenter, C. W. Temperatures favorable to zoospore development in Pythium aphanidermatum. Hawaiian Plant. Rec. 32: 394. Oct. 1928.

5. ________________ Notes on Pythium root rot IV. Hawaiian Plant Rec. 32: 461-474. Oct. 1928.

6. Ciferri, R. Preliminary observations on sugar cane mycorrhizae and their relationship to root disease. Phytopath. 18: 249-261. Mar. 1928.

7. Cook, M. T. The development of the spores of Plasmodiophora vascularum. (Abstract) Phytopath. 19: 91-92. Jan. 1929.

8. Cook, M. T. The gummosis of sugar cane. Jour. Dept. Agr. Porto Rico 12: 143-179. July 1928.

9. Drechsler, C. A species of Helminthosporium distinct from Helminthosporium sacchari, causing brown stripe of sugar cane. (Abstract) Phytopath. 18: 135-136. 1928.

10. Faris, J. A. Brown stripe of sugar cane in Cuba. (Abstract) Phytopath. 18: 135. 1928.

11. Lee, H. A. The effect of potash fertilizers on eye spot at the Waimanalo sugar company. Hawaiian Plant. Rec. 31: 284-287. July 1927.

12. __________ The susceptibility to eye spot of H 109 ratoons as compared with plant cane. Hawaiian Plant. Rec. 31: 296-299. July 1927.

13. __________ The effect of frequency of irrigation applications on eye spot at the Lihue plantation company, Ltd. Hawaiian Plant. Rec. 31: 292-296. July 1927.

14. Lee, H. A., and W. D. Pierce. Bacterial red stripe disease of sugar cane in countries of the Pacific. Phytopath. 18: 945. Nov. 1928.

15. Martin, J. P. Tests of varying amounts of nitrogen and potash in relation to eye spot during the 1927-1928 eye spot season. Hawaiian Plant. Rec. 32: 475-481. Oct. 1928.

16. __________ The control of eye spot disease by two-year cropping. Hawaiian Plant. Rec. 32: 391-394. Oct. 1928.

17. Orian, G. Le "pokkah bong" de la canna ã sucre. Rev. Agr. Ile Maurice 41: 208-213. Sept.-Oct. 1928.

18. Shepherd, E. F. S. La gommose de la canne à sucre. Rev. Agr. Ile Maurice 40: 173-176. July-Aug. 1928.

19. Shepherd, E. F. S. Le "leaf scald." Rev. Agr. Ile Maurice 40: 176-178. July-Aug. 1928.

20. Stewart, G. R., and F. Hansson. Study of the effect of nematodes upon cane roots in sterilized soils. Hawaiian Plant. Rec. 32: 217-223. Apr. 1928.

21. __________, F. Muir, R. H. Van Zwaluwenburg, G. H. Cassidy, and Fred Hansson. The relation between soil treatments and nematode attacks to cane roots in central Maui soils. Hawaiian Plant. Rec. 32: 205-216. Apr. 1928.

22. Vizioli, J. Estudo preliminar sobre um novo pyrenomyceto parasita da canna. (Preliminary study on a new Pyrenomycete parasitic on the cane.) Bol. Agr. Sao Paulo, Ser. 27a, (1-3): 60-69. 1926.

23. Wood, E. J. F. Cane varieties grown in Queensland, their resistance to disease. Queensl. Agr. Jour. 29: 261-270. Apr. 1928.

DISEASES OF SUGAR BEETS

CURLY TOP (VIRUS)

In Utah, curly top was epidemic, causing an estimated loss of 30 per cent. Leaf hoppers overwintered in abundance because of the favorable winter (C. M. Tompkins). In New Mexico, the crop was not attacked by curly top as in previous years (Crawford). In Oregon sugar beets are not a commercial crop and so curly top is not a problem. The disease is severe on many other crops, however (Dykstra). In Arizona a 20 per cent loss was estimated and the statement made that beet growing is being abandoned on account of this disease (Streets).

Recent literature: Pl. Dis. Reptr. 12: 119.

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3. Knowlton, G. F. The beet leafhopper in Utah, a study of its distribution and the occurrence of curly-top. Utah Agr. Exp. Sta. Bul. 205. 23 p. June 1928.

4. McKay, M. B. The curly top disease. Seed World 23(13): 38, 40, 72. June 29, 1928.

5. Severin, H. H. P., and C. F. Henderson. Some host plants of curly top. Hilgardia 3 (13):339-392. June 1928.

6. ____________, and O. Swezy. Filtration experiments on curly top of sugar beets. Phytopath. 18: 681-690. Aug. 1928.

7. ____________, Transmission of tomato yellows, or curly top of the sugar beet, by Eutettix tenellus (Baker). Hilgardia 3: 251-271. May 1928.

OTHER DISEASES

Heterodera schachtii Schmidt, nematode. Utah (same as usual).

Phoma betae (Oud.) Frank, root rot and leaf spot. Massachusetts, Louisiana, Ohio, Michigan, Wisconsin, Montana, Colorado, Arizona and Utah.

Sugar Beets - Other Diseases

, Rhizoctonia sp., root rot. Wisconsin.

Cercospora beticola Sacc., leaf spot. Traces in Massachusetts, Louisiana, Texas, Ohio, Indiana, Wisconsin, Colorado, Wyoming, Arizona, and Utah, with estimated losses of 2 per cent in Kansas, 4 per cent in Ohio, 5 per cent in Michigan, and 8 per cent in Iowa.

Peronospora schachtii Fckl., downy mildew. California (not severe).

Sclerotium rolfsii Sacc., stem rot. Louisiana (30 per cent).

Uromyces betae Pers., rust. California (along coast).

Mosaic (virus). Texas, Utah.

Bacterium tumefaciens, crown gall. Texas.

Bacterium beticolum, Smith, Brown, & Town., tuberculosis or bacterial pockets. Texas.

Recent literature: Pl. Dis. Reptr. 12: 132.

1. Brown, N. A. Bacterial pocket disease of the sugar beet. Jour. Agr. Res. 37: 155-168. Aug. 1, 1928.

2. Costa, T. Contributo allo studio della "Cercospora beticola" (Sacc.) nella bassa vallata Padana. Nuovo Giorn. Bot. Ital. n.s., 35: 25-27. 1928.

3. Diffloth, P. L'assolement dans la lutte contre les parasites de la betterave. Vie Agr. et Rur. 32: 20-22. July 8, 1928.

4. Dreschler, C. The occurrence of Aphanomyces cochlioides n. sp. on sugar beets in the United States. (Abstract) Phytopath. 18: 149. 1928.

5. Ducomet, V. La cercosporiose de la betterave. Rev. Path. Veg. et Entom. Agr. 15: 110-120. April and May 1928.

6. __________ La mosaique de la betterave. Rev. Path. Veg. et Ent. Agric. 15: 24-29. 1928.

7. Esmarch, F. Die Herz- und Trockenfäule der Rüben. Kranke Pflanze 5: 161-163. Oct. 1928.

8. Gäumann, E. Ueber die Bekämpfung des Wurzelbrandes des Zuckerrüben. Landw. Jahrb. Schweiz. 42: 571-582. 1928.

9. McWhorter, F. P. Control of beet seedling diseases under greenhouse conditions. Virginia Truck Exper. Sta. Bul. 58: 525-544. 1927.

10. Murav'ev, V. P. Mehltau auf der Zuckerrübe. Bolezni Rast. (Morbi Plant) 16: 175-178. 1928.

11. Nuckols, S. B., and C. M. Tompkins. Delayed thinning as a means of controlling damping-off of sugar beets. (Abstract) Phytopath. 19: 95. Jan. 1929.

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14. Stewart, G., and D. W. Pittman. Predisposition of sugar-beets to late root rot. Phytopath., 18: 263-276. 1928.

15. Tompkins, C. M. Further studies on the dry-rot canker of sugar beets. (Abstract) Phytopath. 19: 94-95. Jan. 1929.

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Supplement 69

Plant Diseases in Montana in 1928

May 15, 1929

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

PLANT DISEASES IN MONTANA IN 1928

A report of a plant disease survey made by the Botany Department of the Montana Agricultural Experiment Station, cooperating with the Office of Mycology and Disease Survey of the United States Bureau of Plant Industry.

prepared by

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Plant Disease Reporter
Supplement 69

May 15, 1929.

TABLE OF CONTENTS

INTRODUCTION

This report on a preliminary survey of the plant diseases of Montana is based chiefly on field surveys by the authors made between May 15 and October 1, 1928.

The main agricultural districts were visited one or more times, but the following of the 55 counties in the state were not entered: Beaverhead, Glacier, Lincoln, Toole, Liberty, Pondera, Teton, and Powder River. The authors drove more than 8,000 miles in automobiles, and collected about 1,200 specimens and a large amount of information. Duplicates of most of the specimens were sent to the United States Department of Agriculture, Office of Mycology and Disease Survey. Special attention was given to small grains, alfalfa and beans.

While this report is primarily for 1928, all available records and observers were consulted in order to include all the parasites and diseases known to occur in Montana, and to give the available history of the serious diseases. This information has not been previously assembled. Many of the diseases were listed by Anderson, et al (1926) in U. S. Department of Agriculture Bulletin 1366. Plant disease surveys somewhat like this one were conducted in 1927 by Linford (1928) in Utah and Archer (1928) in Iowa.

The summers in Montana are semi-arid and sometimes very dry. This condition is shown in figures by Burke and Pinkney (1919) from which the following averages are taken. Good agricultural regions in Montana have more rain than is indicated by these figures.

Driest season. 4 inches of rain during growing season; total 11 in.
Average season. 7 inches of rain during growing season; total, 15 in.
Wettest season. 11 inches of rain during growing season; total, 19 in.
Growing seasons are usually short and relatively cool.

In this climate, therefore, plant parasites are less abundant than in more humid regions supporting more abundant vegetation. Rusts, virus diseases, and physiological abnormalities are abundant in Montana. The serious diseases in the state are especially indicated in the table of contents, besides being discussed in the text.

This report considers 435 parasitic diseases, 29 virus diseases, and 34 non-parasitic diseases of 95 species and varieties of economic plants in Montana. A host index including 1075 diseases of non-economic plants in Montana has been prepared separately. These 1573 listed parasites and diseases occur on 831 species and varieties of plants. Card indexes of these plant diseases and parasites have been prepared and arranged on the basis of hosts and parasites.

Professor D. B. Swingle, who has observed plant diseases in Montana during the last 22 years, pointed out that some dangerous parasites on Montana crops now appear to be unadapted to do serious damage here, although they are occasionally introduced. Examples are bean anthracnose and cherry brown rot which have not been reported for many years, although they were once locally abundant.

The acreage, total yield, and value of crops on December 1, 1928 given herein were estimated by J. G. Diamond, Senior Agricultural Statistician, U. S. Bureau of Agricultural Economics, cooperating with the Montana State Division of Publicity at Helena, Montana.

Besides those indicated in "Literature Cited", the authors wish to acknowledge the aid of the following people who collected and classified Montana fungi and furnished other information: Dr. H. M. Jennison, Dr. J. C. Arthur, and Dr. H. S. Jackson (North American Flora), Dr. H. B. Humphrey, J. W. Blankinship, R. B. Streets, E. R. Norris, W. W. Diehl, Vera K. Charles, Florence Hedges, Dr. C. L. Shear, et al. The exsiccati of Elam Bartholomew (Fungi Columbiani), David Griffiths (West American Fungi), and A. B. Seymour and F. S. Earle (Economic Fungi) were used to the extent of their availability.

Brief references are made to reporters of many fungi considered here. In these, "U. S. Bulletin 1366" refers to this bulletin by Anderson, et al. (1926) as mentioned in "Literature Cited". "N.A.F." refers to volumes of the North American Flora by Arthur (1907-1927).

References to diseases pertain to 1928 unless otherwise stated.

Many names of host plants were taken from Bailey's Manual of Cultivated Plants and the New Manual of Rocky Mountain Botany by Coulter and Nelson. Names of parasites and other hosts were taken from U. S. Bureau of Plant Industry Bulletin 1366 and articles mentioned in "Literature Cited".

NEW DISEASES AND ORGANISMS IN MONTANA

According to available records, the following diseases and parasites, except some that were reported in brief survey notes, are here reported as occurring in Montana for the first time. This list is probably incomplete. A new disease is defined as a new combination of a species of a host with a species of parasite or virus, or physiological abnormality not previously reported on the host.

CEREAL AND GRASS CROPS

WHEAT (*Triticum aestivum* L.)

Winter wheat. 1928. 810,000 acres. 12,150,000 bushels. Worth $9,760,000.
Spring wheat. 1928. 3,410,000 acres. 64,790,000 bushels. Worth $54,424,000.

(Table 42 summarizes losses in wheat).

STINKING SMUT OR BUNT (Tilletia laevis Kuehn). Stinking must is the most destructive plant disease in Montana and will probably remain so. It is conservatively estimated to have caused a loss of more than one million dollars in Montana in 1928. The basis for estimating this loss is as follows:

Losses in yield:

3.6% or 437,400 bu. winter wheat at 80 cents per bu.	$349,920.
0.63% or 408,177 bu. spring wheat at 80 cents per bu.	326,541.
Loss by dockage (as in Table 35) 9,463,620 bu. at 4 cents per bu.	378,545.
Total dockage and yield losses	$1,055,006.

To this last figure there might be added the cost of chemicals and labor used in treating seed wheat on a large scale but this amount is not known. Many growers use treating machines.

Field Losses

Special effort was made to determine the amount of stinking smut in Montana wheat fields. The above estimates are based largely on field inspections made in the counties indicated in Figure 2. The winter wheat was nearly all Turkey Red wheat and its subvarieties (except 2 fields of Crail Fife wheat). The spring wheat was mostly Marquis.

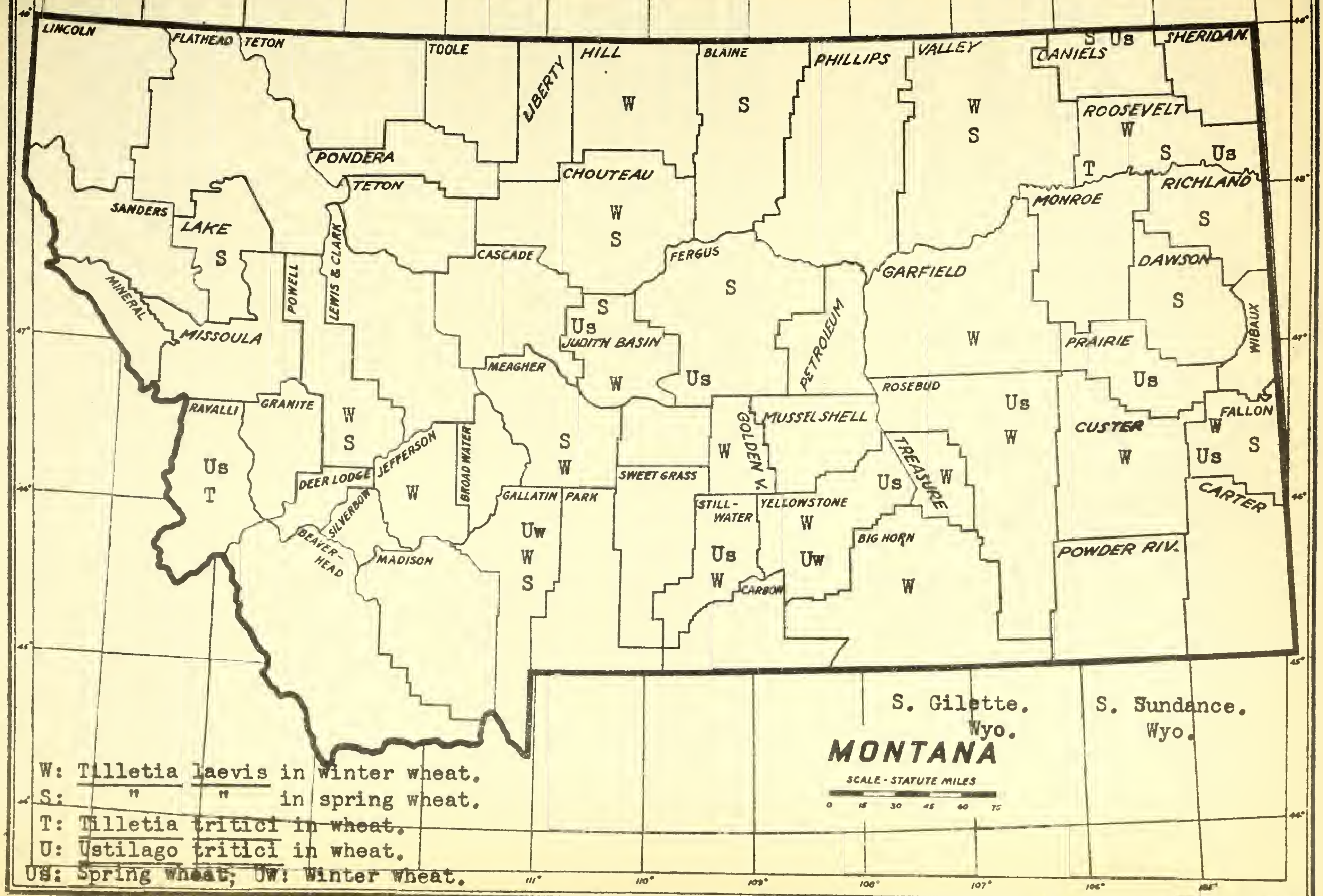
Winter wheat - 180 fields; 20,050 acres; average 3.6 per cent bunt.
Spring wheat - 55 fields; 9,930 acres; average 0.63 per cent bunt.

Some fields of winter wheat contained 25 to 60 per cent bunt and some fields of spring wheat contained 5 to 17 per cent bunt. The infestation of stinking smut was less in spring than in winter wheat because the bunt spores do not overwinter in the soil to an economic extent. Bunt was serious in spring wheat only in regions producing smutty winter wheat. In such places, some extra inoculation of spring wheat occurs in threshing, etc.

Many observations and experiments have shown that the spores of Tilletia laevis in the soil are important sources of infection of winter wheat in Gallatin and some other counties. The treated winter wheat in this region averaged 10 to 25 per cent stinking smut in 1927 and 1928, in comparison to 52 to 92 per cent in untreated wheat, so soil infestation is a serious factor. Volunteer, harvested stands of wheat, sowed by destruction of the parent crops by hail, contained no bunt or only traces of it, even when the parent crops contained more than 1 per cent of bunt. Probably little inoculation and early planting accounts for this.

Comparative Data for 1927. In the northern part of Gallatin Valley, 43 fields of Turkey Red wheat aggregating 1100 acres were inspected. The average percentage of stinking smut (Tilletia laevis) was 7.4 per cent. One field of 150 acres on badly infested soil contained an average of 23 per cent of stinking smut based on a count of 4300 heads. All the seed in this field had been

Fig. 2. Smuts of Wheat in Montana, 1928.



treated. One-third of the field with seed treated with 50 per cent $CuCO_3$ averaged 19 per cent bunt. Prevalence of bunt in other fields on this farm in 1928 was very similar to that in 1927.

Species of Tilletia in Montana Wheat. Specimens from 56 fields of winter and spring wheat were examined microscopically. All but three were *Tilletia laevis*. Two specimens of durum wheat from Roosevelt County, and one specimen of Marquis wheat from Ravalli County were *Tilletia tritici* (Bjerk.) Wint. In Roosevelt County, 100 acres of durum wheat contained 25 per cent of the heads with *T. tritici*. Further spread of *T. tritici* is liable to occur in Montana. It was found in spelt at Gustave, South Dakota, which is near the Montana line.

Tilletia laevis was found in the following varieties of wheat: Turkey Red, Montana 36, New Turk, Karmont, Kharkof, Crail Fife, Club hybrid 128, Kota, Burbank Super, Marquis, Supreme, Red Bobs and Ruby.

Dockage

Figures 3 and 4 and Tables 35, 36 and 37 show the stinking smut in cars of Montana wheat received at Minneapolis, Minnesota and Portland, Oregon. At these terminals, cars of wheat are graded as smutty or not smutty. Figures on smut dockage per car are not available. Very valuable information on amounts of smut dockage per car could be secured readily at the terminal elevators. It is hoped that hereafter grain supervisors will be instructed to secure such information thoroughly and completely, or that other organizations will be provided for acquiring it.

Calculations of Smut Dockage by Wheat Buyers. Since a relatively small percentage of the people interested in smut dockage know how it is calculated or estimated, the methods now used are explained here. Much of the following information was kindly supplied by Professor W. O. Whitcomb, Superintendent of the Grain Laboratory, Montana Agricultural Experiment Station, Mr. R. B. Whitlock, Federal Grain Supervisor at Portland, Oregon and Mr. R. C. Miller, Grain Inspector at Minneapolis, Minnesota.

Farmers pay the entire loss due to smut in wheat, for smut dockage is large enough to make it safe and even attractively profitable for buyers to deal in smutty wheat. Although buyers sometimes use "horse-trading" methods in purchasing very smutty wheat, smut dockages are usually estimated by the methods given in the "Handbook of Official Grain Standards" by Boerner (1924). Section (a) is followed at Portland and section (b) is followed at Minneapolis.

Removal of smut by washing instead of scouring has developed greatly during the last three years. Washed wheat gains a little weight instead of losing weight like scoured wheat, which lowers the test weight. However, the gain is slight for grain is washed quickly in cold water and is dried before much absorption occurs. Very smutty wheat sometimes acquires a rancid odor in storage after washing. Wheats with wrinkled bran coats become badly wrinkled after washing. Most of the wheat milled on the Pacific Coast is scoured or washed first because smutty wheat is so common. Wheat for export is scoured in case it is smutty. Some wheat is exported as "sample grade", without inspection, but such shipments of sample wheat rarely have more than 0.5 per cent smut.

Black point and similar discolorations due to bacteria, Helminthosporium, and some other dematiaceous fungi have been confused with discolorations caused by bunt.

The dampness of wheat and bunt at threshing time affects the dockage on the threshed grain, for the spores in damp smut balls are smeared onto the grain, while dry smut balls contaminate wheat by powdered spores and large parts of smut balls, and thus are less injurious than damp smut balls.

Calculation of Smut Dockage at Portland, Oregon. At Portland where smutty wheat is handled in large quantities, smut dockage is calculated by running a 500 gram sample through a dockage tester which grinds off the surface of the grain in removing the smut. The dockage is computed on the basis of loss in weight of the sample. Thus, a dockage of 1 per cent is made for each 5 grams that the sample loses weight. Slightly smutty wheat is cleaned by a single passage through a dockage tester, while badly smutty wheat is run through the dockage tester or scouring mill two or more times before it is cleaned, which increases the dockage because each time it passes through the mill, more of the grain is ground off in removing the smut. Smut dockage is subtracted after deduction for foreign material has been made. Commercially, the work of the dockage tester is done in a cleaning mill. A fixed smutting charge (cleaning charge) is made per ton based upon the smut dockage (see schedule below).

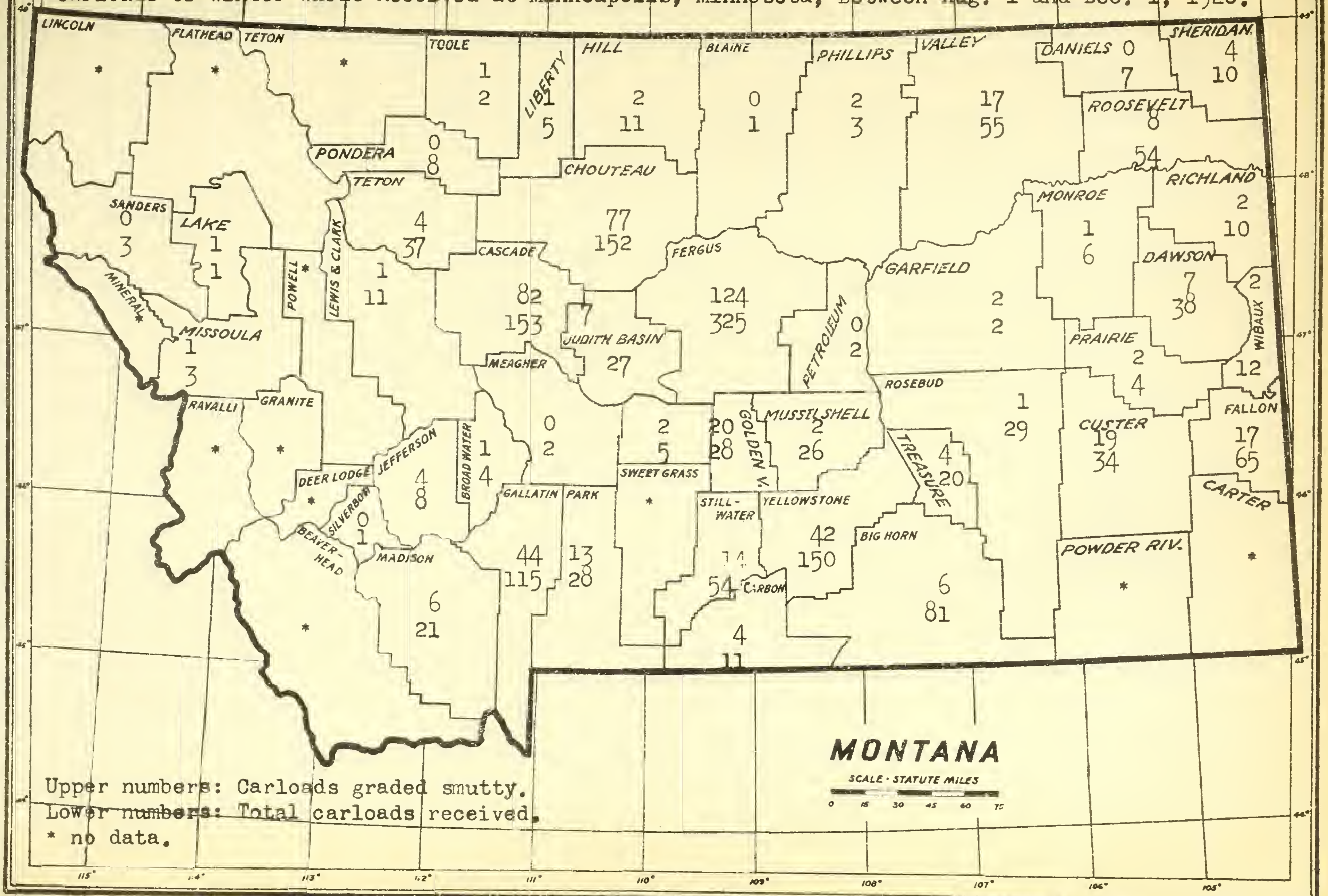
Important elevators use the following schedule (Table 34) prepared by the Merchants Exchange of Portland. This may not correspond exactly to schedules used by other concerns.

Table 34. Schedule - Cleaning Charges for Smutty Wheat at Portland, Oregon.

Smut dockage as determined by dockage tester (per cent)	Smutting charges (dollars per ton)	
	Sacked Grain	Bulk Grain*
0.5 to 1.	0.75	0.45
1.5 to 3.	0.80	0.50
3.5 to 7.	1.10	0.80
7.5 to 15.	1.30	1.00

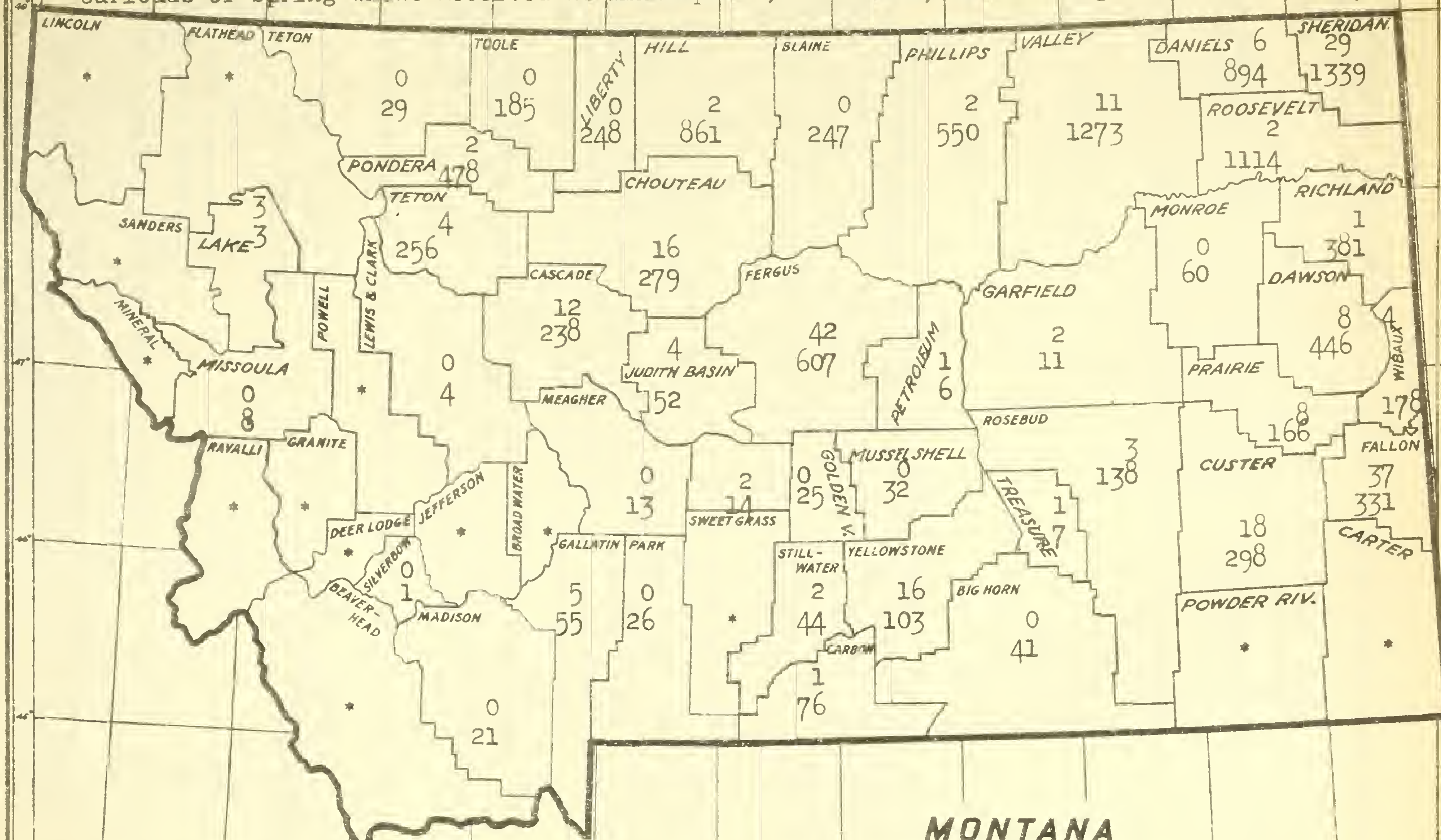
*Three cents per bushel are deducted for bulk grain for storage and handling.

Fig. 3. Stinking Smut of Winter Wheat in Montana,
Carloads of Winter Wheat Received at Minneapolis, Minnesota, Between Aug. 1 and Dec. 1, 1928.



Upper numbers: Carloads graded smutty.
Lower numbers: Total carloads received.
* no data.

Fig. 4. Stinking Smut in Spring Wheat in Montana, Carloads of Spring Wheat Received at Minneapolis, Minnesota, Between Aug. 1 and Dec. 1, 1928.



Upper numbers: Carloads graded smutty.
Lower numbers: Total carloads received.
* No data.

Example: Calculated price of a car of sacked smutty wheat versus clean sacked wheat at Portland.

	Smutty	Clean
Total amount of wheat	100,000 lb.	100,000 lb.
1% dockage for foreign material, weed seeds, dirt, etc.	1,000 lb.	1,000 lb.
2% smut dockage, determined by dockage tester	1,980 lb.	
Wheat after subtracting dockages	97,020 lb.	99,000 lb.
Value at 80 cents a bushel	$1,293.60	$1,320.00
Subtract smutting charge**	39.60	
Actual sale price	$1,254.00	$1,320.00
Difference (loss)	$66.00 (about 5%).	

Estimating Price of Smutty Wheat at Minneapolis. Wheat is graded smutty on the basis of paragraph (b) in the standards (Boerner, 1924) relative to the grading of smutty wheat. Buyers estimate the amount of smut by sight and odor as slight, medium, and very smutty. There is a daily variation in smut dockages made by this method. The variable factors are: (1) smut predominating as smut balls; (2) smut predominating as spores smeared onto the wheat; and (3) the amount and degree of contamination of smutty wheat on the market.

In 1928, wheat with traces of smut (line grade for smut) was discounted 1 to 3 cents per bushel. Most smutty wheat was docked 2 to 5 cents per bushel. Wheat with heavy smut was docked 7 to 10 cents per bushel. Scouring and washing was done by commercial flour milling companies and two elevators which merchandised smutty wheat. When they handled large quantities of smutty wheat, they made less dockage for heavily smutty wheat. Plump wheat with smut took a lower dockage than shrunken wheat equally affected with smut.

Smut Dockage at Duluth, Minnesota. There is a smut dockage of 10 to 15 cents per bushel at Duluth when much smut is received. When fewer cars of smutty wheat are received, the dockage rate is lower. This information was furnished by W. H. O'Shea, Grain Supervisor at Duluth.

Table 35. Method of estimating losses from smut dockage in Montana wheat, 1928.

Kind of wheat and receiving point	Number of cars: Total	Number of cars: Graded smutty
Wheat - Portland	5,168	1,395
Spring wheat - Minneapolis	11,170	272
Winter wheat - Minneapolis	1,635	541

Percentage cars graded smutty - 12.3.
12.3 per cent of 76,940,000 bushels of wheat = 9,463,620 bushels.
Dockage loss at rate of 4 cents per bushel = $378,545.

**The smutting (milling) charge is $0.80 per ton on all the wheat after the dockage for foreign material, etc. is taken out. In this case the smutting charge is based on 99,000 pounds.

Table 36. Smutty wheat from Montana received at Portland, Oregon from July 1, 1927 to July 1, 1928. (Reported by R. L. Baldwin, Grain Supervisor).

Shipping Point	Total Cars	Cars with Smut	Per cent Smutty
Great Falls	6,437	1,259	19.6
Bozeman	656	286	43.6
Total, 1927 crop.	7,093	1,545	21.7

Table 37. Smutty wheat in 1928 crop from Montana received at Portland, Oregon from July 1, 1928 to December 1, 1928. (Reported by R. L. Baldwin, Grain Supervisor).

Shipping Point	Total Cars	Cars with Smut	Per cent Smutty
Great Falls	2,967	689	23.2
Bozeman	456	197	43.2
Harlowtown	1,745	534	30.6
Total, 1928 crop	5,168	1,400	27.08

Foster (1894, 1895, and 1896), Morris and Ogaard (1925), Morris and Kurtz (1929), and Swingle (1917) described wheat bunt in Montana.

Whitcomb (1926) showed that bunt on wheat has little effect on the protein test.

LOOSE SMUT (Ustilago tritici (Pers.) Rostr.). This smut is common and widely distributed in Montana but is usually not destructive. In 1928, it was found in the counties indicated in Figure 2. Traces were found in 29 of the 42 fields inspected for it. These fields included 3,200 acres. It was not noticed in 200 other fields covering about 30,000 acres.

One field of 80 acres of spring wheat at Culbertson contained 10 per cent of loose smut. In 1927, 20 acres of Supreme wheat contained 25 per cent.

Although loose smut is sometimes destructive in wheat proposed for registration, it was not serious in 1928. Registration rules tolerate no more than 1 per cent. No fields were refused registration due to loose smut in 1928.

STEM RUST (Puccinia graminis Pers.). Puccinia graminis appeared in the wheat fields of Montana too late to do serious damage in 1928. It was found in the counties indicated in Figure 5. Some of the locations and results of field inspections were supplied by W. L. Popham, W. L. Jellison, and James Bradbury of the Barberry Eradication Project.

Stem rust was found in 11 fields of winter (mostly Turkey Red) wheat. One field in Chouteau County had 100 per cent of the stems and 3 per cent of the leaf area spotted. One field in Daniels County had 100 per cent of the stems and traces of the leaf area spotted.

One hundred and fifty fields of spring wheat, (mostly Marquis) aggregating about 8,000 acres, were inspected for Puccinia graminis. Traces or slightly more occurred in 5,600 acres. Nine fields in Chouteau, Daniels, Philips, Valley, Mineral, and Ravalli Counties showed all the stems bearing Puccinia graminis. The rust on the leaves varied from traces to 40 per cent. Most of the other affected fields showed only traces of stem rust.

Table 38 gives estimates of losses from Puccinia graminis. The decrease in losses during the last five years has probably been influenced by the destruction of more than 14,000,000 barberry bushes (including 34,089 in Montana) in the 13 wheat growing states in the Barberry Eradication Campaign.

Apparently the weather in Montana in most years is too dry to permit destructive spread of Puccinia graminis early enough to do great damage. Tehon and Young (1924) and Tehon (1927) showed a correlation between the weather and black stem rust.

Morris and Popham (1925, 1926) and Swingle and Morris (1907-1922) described black stem rust and barberry eradication in Montana.

Table 38. Estimated losses in wheat, oats, barley and rye, caused by Stem rust in Montana. (Courtesy of W. L. Popham, State leader, Barberry Eradication, United States Department of Agriculture).

Year	Wheat	Oats	Barley	Rye	Total Bushels	Total Value
1916	3,000,000					
1917	45,000	71,000	No report	No report	116,000	143,910
1918	No report	No report	No report	No report	No report	- -
1919	0	No report	0	0	- -	- -
1920	0	Trace	Trace	Trace	Trace	- -
1921	857,000	150,000	0	0	1,007,000	779,450
1922	0	0	0	No report	- -	- -
1923	10,472,000	0	No report	0	10,472,000	8,587,040
1924	260,000	0	0	0	260,000	322,400
1925	Trace	No report	0	0	Trace	- -
1926	46,000	Trace	0	0	46,000	50,400
1927	80,000	Trace	0	0	80,000	80,000
1928	78,000	0	0	0	78,000	70,000
Total	11,837,000	221,000	Trace	Trace	12,059,000	$10,033,200
Average	986,000	18,000			1,049,000	$ 989,000

LEAF RUST (Puccinia triticina Eriks.). Presumably this rust occurs in every county in the state in which large fields of wheat are grown, but is rarely serious. Figure 5 shows the known distribution of the leaf rust in 1928. Some of the locations were supplied by Mr. W. L. Popham, State Leader in Barberry Eradication, United States Department of Agriculture, and his assistants, W. L. Jellison and James Bradbury. From Table 40 it will be seen that the average percentage of leaf area destroyed was estimated at 11.8 per cent.

Turkey Red wheats appear to be less susceptible to Puccinia triticina than Marquis and some other varieties in Montana.

Estimation of damage caused by leaf diseases. Tehon (1927) has described a method of computing the percentage of leaf area destroyed in a field by a leaf-spotting fungus such as *Puccinia triticina*. By using Tehon's method, with the addition of appropriate decimal points for the sake of clearness, data from field inspections for this fungus are assembled in Tables 39 and 40.

Table 39. Puccinia triticina in wheat in Fergus County, Montana. 1928.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
County	No. of fields observed	Acres examined	Prevalence: Per cent diseased plants			Destructiveness: Leaf area affected		
			Per cent	Per cent x acres	Weighted per cent	Per cent	Per cent x Column 5	Weighted per cent
Fergus	1	100	100	100.00		10	10.0000	
"	1	160	100	160.00		70	112.0000	
"	1	80	100	80.00		10	8.0000	
"	1	40	100	40.00		35	14.0000	
"	1	60	100	60.00		85	51.0000	
"	1	20	100	20.00		40	8.0000	
"	7	310	0.5	1.55		0.5	.775	
"	5	540	0	.00		0	0	
(Total):	18	1310		461.55	35.2		203.775	15.5

Explanation of Tables 40 to 47.

The columns in Table 40 contain the same type of information as those in Table 39 except in the following details:

Relative to Columns 4 and 7. When the fields inspected in a county did not have the same percentage of diseased plants and the same percentage of leaf area destroyed, figures were not given in Columns 4 and 7. Instead, the data for such counties were summarized as in Table 39 to give the weighted percentages in Columns 6 and 9.

Relative to Column 6. Part of the inspection records from some counties gave only percentages of destructiveness. Hence no figures could be given for such counties in Columns 4, 5 and 6, nor in the summaries of these columns.

Relative to Column 9. For individual fields or subgroups, this percentage is derived by multiplying the percentages of prevalence and destructiveness (Column 4 x Column 7). This product is written in parentheses because it is not used in calculating the weighted percentage of destructiveness for the entire state or region. Parentheses are used in Column 6 for the same reason.

Although Column 9 in Table 40 gives the percentage of the leaf area destroyed by *Puccinia triticina*, this percentage does not directly represent reduction in yield. The correlation between reduced leaf area and reduced yield has not been determined in Montana, but observations on Puccinia triticina in southern Illinois in 1921 and 1922 indicated a commercial loss in yield and value of about 25 per cent when the weighted percentage of destructiveness was about 50 per cent. Red leaf rust is rarely if ever this severe in Montana.

Table 40. Puccinia triticinia in wheat in Montana. 1928.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
County	No. of fields observed	Acres examined	Prevalence: Per cent of diseased plants			Destructiveness: Leaf area affected		
			Per Cent	Per cent x acres	Weighted per cent	Per Cent	Per cent x Column 5	Weighted per cent
Ravalli	77	1160	-	-	-	-	396.70000	(34.4)
Lake	2	100	10	10.00	(10)	10	1.0000	(1)
Missoula	3	160	-	84.00	(5.3)	-	.4020	(.25)
Mineral	25	125	-	-	-	-	16.4500	(13)
Flathead	1	2	100	2.00	(100)	20	.4000	(20)
Gallatin	7	682	-	282.20	(41.4)	-	30.1100	(4.4)
Yellowstown	14	1145	-	379.35	(33.1)	-	107.6763	(9.4)
Fergus	18	1310	-	461.55	(35.2)	-	203.7750	(15.5)
Judith Basin	4	220	-	60.60	(28)	-	.3030	(.14)
Wheatland	2	230	-	-	-	-	.2300	(.1)
Carter	2	120	10	12.00	(10)	1	.1200	(.1)
Rosebud	8	550	-	40.80	(7.2)	-	2.4110	(.44)
Garfield	2	70	0.5	.35	(0.5)	0.5	.00175	(.0025)
Prairie	4	190	-	10.75	(6)	-	4.0038	(2)
Big Horn	10	3290	-	2048.25	(62.2)	-	504.1460	(15.3)
Custer	3	200	-	-	-	-	.2000	(.1)
Valley	18	2180	-	56.55	(2.6)	-	3.0070	(.14)
Treasure	2	50	-	-	-	-	.0500	(.1)
Phillips	7	410	-	-	-	-	1.2300	(.3)
Fallon	3	220	-	-	-	-	.4400	(.2)
Chouteau	14	1260	-	480.85	(38.1)	-	48.0040	(3.8)
Dawson	1	200	100	200.00	(100)	15	300.0000	(15)
Richland	1	200	100	200.00	(100)	5	100.0000	(5)
Roosevelt	4	320	100	320.00	(100)	-	24.40000	(7.6)
Hill	6	250	-	-	-	-	.7500	(.3)
Blaine	3	160	-	-	-	-	.3200	(.2)
Totals	241	14,804					1746.111	11.8

YELLOW STRIPE RUST (Puccinia glumarum (Schm.) Eriks.). Yellow stripe rust was found in the counties indicated in Figure 5. It was first found in Montana in 1915 by Dr. F. K. Ravn.

Most of the numerous fields of Jones Fife wheat in Flathead County had all of the plants affected with yellow stripe rust, from 50 to 90 per cent of the leaves being killed prematurely, according to W. L. Popham, who made a careful inspection. Glume infection was common. Raeder (1928) also reported this epidemic. This wheat yielded well even though badly infested with stripe rust.

The injurious effect of Puccinia glumarum was similar to that of P. triticina. The epidemic became severe too late to reduce the yield very seriously. It also occurred on Hordeum jubatum in Flathead County.

At Bozeman, 40 acres of Crail Fife wheat had stripe rust on all the stems in the field, about 60 per cent of the leaf tissues being destroyed. It was not seen in two other fields of Crail Fife wheat near this one. Puccinia glumarum was abundant in only the margins of the plots of Jones Fife wheat, and was not seen in other varieties of wheat on the Agricultural Experiment Station at Bozeman.

Stripe rust was abundant in an experimental plot of Crail Fife wheat at Havre. Traces were seen in fields of Marquis wheat in Hill and Chouteau Counties It has occurred in Jones Fife wheat on the Experiment Station at Bozeman for thirteen years. In 1927, a 60 per cent leaf infestation of stripe rust was found on a velvet chaff wheat in Lake County.

Since Puccinia glumarum was not seen in Turkey Red wheat and was not serious in Marquis wheat, it does not threaten to be very destructive in Montana.

FOOT ROT (Helminthosporium sativum Pam., King, and Bakke). Specimens of wheat were sent to this laboratory from the Experiment Station at Moccasin, Montana in November, 1927. These specimens had foot rot, and bore many yellow leaves. They exemplified the fall symptoms of Helminthosporium foot rot that became epidemic in winter wheat in central Montana in 1928. Bayles and Sutherland (1928) found correlation between foot rot, drouth injury and winter killing. Young (1928) described foot rot.

In 1928, wheat before heading in many fields was chlorotic, dwarfed, upright, and had some yellow to brown leaves, brown roots, and too many stems. Mottling, streaking and leaf spotting were associated symptoms. The most severely affected fields developed so poorly that some of them were plowed without harvesting.

Severe damage in central Montana was closely correlated with early planting. This evidence supports the statements of some authors that relatively high temperatures favor infection by Helminthosporium. This correlation with early planting was observed during the epidemics of foot-rot in central Montana, about 16 years ago. Then, farmers planted wheat between July 15 and August 15. Authorities from Montana State College advocated late planting. Farmers followed this advice, and foot rot was thereafter not serious for many years.

In 1927, however, many farmers planted wheat between July 15 and August 20. That fall was unusually long and rather dry. Wheat grew too large, and seriously reduced the amount of soil moisture. Some fields showed symptoms of foot rot in the fall. Many of the early-planted fields showed severe symptoms in the spring of 1928. A temperature of -5° F. on April 13, 1928 caused unexpected winter injury. A drouth in May and early June did not permit the wheat to recover from foot rot and winter injuries. Early planted wheat developed to a stage in which it demanded much water during the drouth in May. With roots badly damaged by foot rot, such wheat became yellowed and dwarfed with many brown lower leaves at heading time. Poor cultural conditions increased the injury done by foot rot. The worst fields died prematurely instead of ripening properly, and had a gray color unlike yellow, normally ripe fields. Such fields bore low yields of shrivelled grain and the heads in some were covered with a mold which, in most cases, appeared to be <u>Fusicladium alopecuri</u>.

In contrast to the affected early planted fields, other fields planted early in September, 1927 had wheat that germinated in cooler soil and were only slightly injured by foot rot. It remained green during the drouth.

Wheat planted on July 15 and August 1, 1928 in plots at the Moccasin Agricultural Experiment Station was nearly dead by November 1, 1928, chiefly through the severe attack by Helminthosporium. Wheat planted on September 1, 1928 and a little later, showed very little injury by November 1. Commercial fields also exemplified these results.

According to a recent estimate by J. G. Diamond, Agricultural Statistician, Montana farmers reduced their acreage of winter wheat 40 per cent in 1928, most of which was planted around September 1. He estimated that only about 481,000 acres will be harvested in 1929. The reduction in acreage was due mainly to low prices, and losses caused by foot rot in the 1927-1928 crop.

Just as devastation of some wheat fields by Helminthosporium foot rot has been ascribed to black stem rust, so black point of kernels caused by the same fungus has been carelessly or conveniently ascribed to stinking smut. Thus, records of Helminthosporium are incomplete, and too low in their estimates of losses.

Data from field inspections are summarized in Table 41. The weighted average percentages are too large to represent the whole state because foot rot was not serious in the extensive region of spring wheat in northeastern Montana, as represented in the table by Daniels County. Daniels County was included in the table to call attention to this fact, although it made the average percentages too low to represent the winter wheat region of central Montana.

Because fields severely affected with foot rot are easily detected from a distance of more than 100 yards, and because determination of damage was the main object in this preliminary survey, records of severely affected fields predominate in Table 41.

Probably foot rot will continue to reduce yields of wheat seriously in Montana.

Table 41. Field inspections for wheat foot rot. Montana, 1928.

County	Variety	No. of Fields	Acres	Per cent prevalence	Per cent loss
Hill	Marquis	6	600	80	20
Hill	Marquis	6	400	50	10
Chouteau	Spring	6	600	30	10
Roosevelt	Durum	1	100	20	4
Fergus	Marquis	1	100	20	5
Fergus	Turkey Red	10	800	70	20
Fergus	Turkey Red	3	380	50	10
Fergus	Turkey Red	1	15	100	85
Fergus	Turkey Red	1	40	50	25
Judith Basin	Turkey Red	7	900	5	1
Judith Basin	Turkey Red	1	100	50	15
Judith Basin	Turkey Red	1	40	100	100
Judith Basin	Turkey Red	2	100	100	85
Gallatin	Turkey Red	2	10	100	50
Daniels	Marquis	30	5000	0	0
Rosebud	Marquis	1	200	5	1
Cascade	Winter	100	10000	75	25
9 Counties		179	19385	48.7	11.8

Averages computed as in Table 40, but acreage-percentage products omitted.

BLACK CHAFF (Bacterium translucens undulosum S., J., & R.). This disease is common in the eastern half of Montana, but usually is not serious. Figure 5 shows its distribution in 1928.

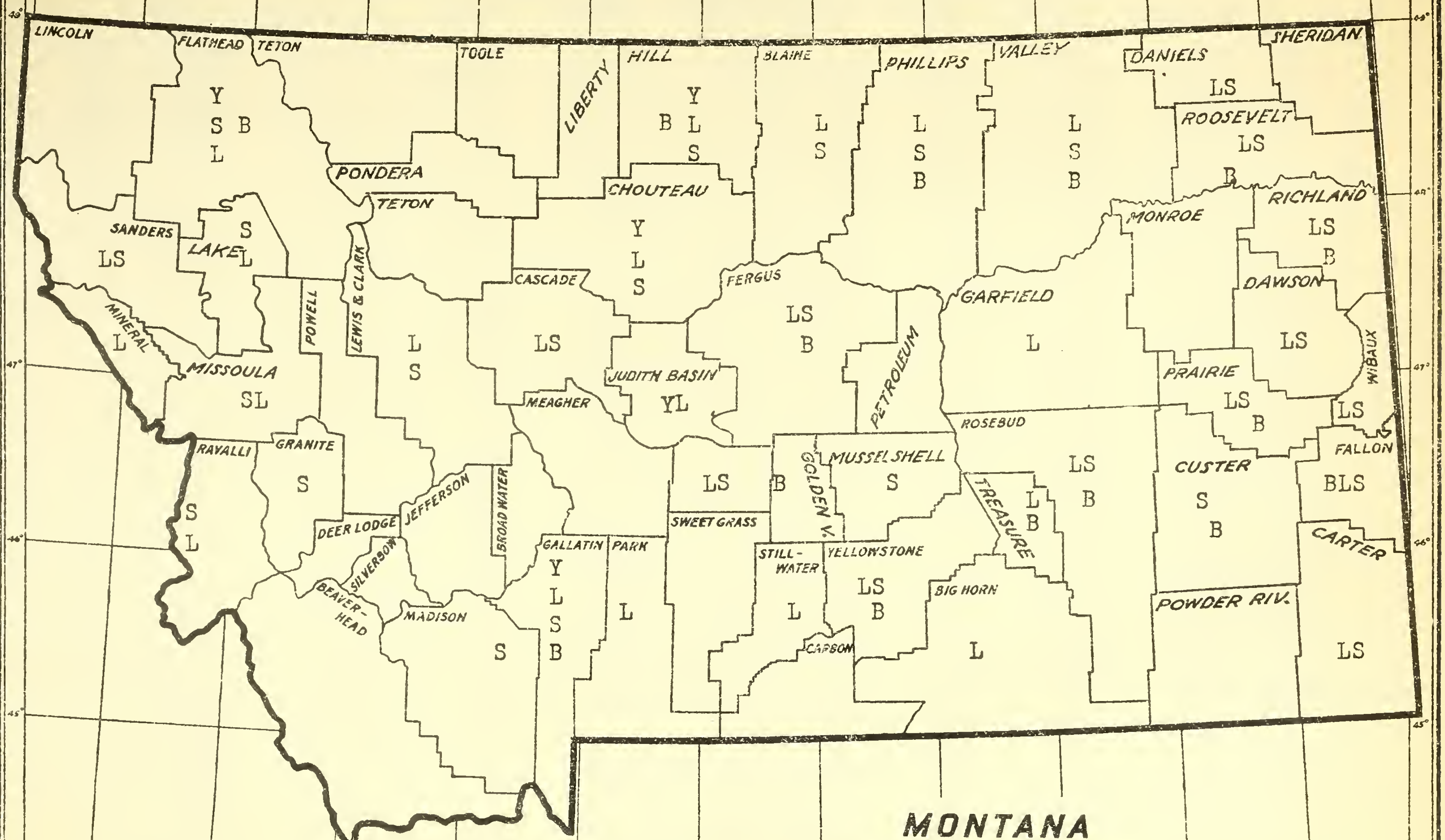
In Richland County, black chaff was severe on most of the heads of spring wheat in ten fields aggregating about 3,000 acres. The damage in this region is estimated as 12 per cent. The fields were abnormally dark colored, due to black chaff when they ripened. The grain was shrivelled.

In Prairie County, six fields of Marquis wheat aggregating 770 acres were inspected. They showed 1, 5, 10, 18, 50, and 75 per cent of the heads affected with black chaff respectively, but the damage was severe only in one field that had been sowed into stubble.

In Fergus County, the disease was common. Traces to 20 per cent of the heads were diseased in six fields of Turkey Red wheat aggregating 520 acres. The damage was probably about 1 per cent.

BASAL GLUME ROT (Phytomonas atrofaciens (MC C.) Com. S. A. B.). One collection of wheat heads from Judith Basin County was identified by Miss Lucia McCulloch as having basal glume rot. Probably the disease occurs elsewhere, but was not separated from black chaff, and the diseases caused by Septoria nodorum and Helminthosporium.

Fig. 5. Black Chaff and Rusts of Montana Wheat, 1928.



B: Black chaff (Bacterium translucens undulosum).
S: ~~Stem rust~~ (Puccinia graminis).
L: Leaf rust (Puccinia triticina).
Y: Yellow stripe rust (Puccinia glumarum).

GLUME BLOTCH (Septoria nodorum Berk.). Glume blotch was found in Fergus, Roosevelt, Richland, Garfield, Prairie, Daniels, and Hill Counties in 1928.

Two fields in Daniels and Hill Counties showed infestations of 100 per cent, but suffered little damage. Only traces to 5 per cent were seen elsewhere. Glume blotch is not serious in Montana.

SPECKLED LEAF BLOTCH (Septoria tritici Desm.). Septoria tritici was found in mild infestations in Turkey Red wheat in four fields and the Agronomy Department plots at Bozeman, Montana. Traces were found in a field of Marquis wheat in Rosebud County.

It was first reported in Montana in 1927 when a 100 per cent mild infestation occurred in two small plots of Turkey Red (Montana 36) wheat in the Agricultural Experiment Station at Bozeman.

POWDERY MILDEW (Erysiphe graminis DC.). Mildew was found in Gallatin, Yellowstone, Ravalli, and Petroleum Counties. It was not noticed in the northeastern part of Montana. Heavy infestations have occurred on the lower leaves and internodes of several varieties of wheat in the Agronomy Department plots at Bozeman during the last four years. In 1928, Turkey Red, Albit, Regal, Ridit, Crail Fife, Marquis, Federation, Reliance, Ceres, and Supreme wheats were affected, but little damage was done (Powers and Clark, 1929).

Mildew was abundant in a 40 acre field of Kharkof wheat at Huntley, according to A. E. Seamans, Agronomist at the Experiment Station there. Subsequent drouth caused most of the mildew to become inconspicuous, so it probably did little damage.

HEAD MOLDS (mostly Fusicladium alopecuri E. & E.). Head molds were common on ripening Turkey Red wheat in Fergus, Gallatin, Judith Basin, Wheatland, Yellowstone, and Big Horn Counties.

In Fergus and Judith Basin Counties, the head mold was associated with foot rot and many heads were examined microscopically. Fusicladium was abundant while Helminthosporium and Alternaria were seen too rarely to be significant. Fusicladium probably did some damage as a facultative parasite. It was seriously abundant on wheat sent from Great Falls in 1927. In this case, it was associated with shrivelled grain.

Taxonomy. The above determination is not definite. Fusicladium alopecuri has mostly one celled spores and occurs on old leaves of Alopecurus. The Fusicladium on wheat has one to three celled, sometimes echinulate spores, so it may be a new species. The spore sizes are 15-35 x 8-13 microns.

Alternaria tenuis Nees occurred on some wheat heads.

SCAB (Gibberella saubinetii (Mont.) Sacc.). Scab was found in 1928. It was determined by Dr. H. B. Humphrey. It is probably rare in Montana.

ERGOT (Claviceps purpurea (Fr.) Tul.). Traces of ergot in wheat were collected in Ravalli County by W. L. Jellison in 1928, and in Hill County by D. A. Savage in 1927.

SCLEROTIUM ROOT ROT (Typhula graminum Karst.). One farmer in Gallatin County has suffered from Typhula graminum heretofore called Sclerotium rhizodes, attacking one field of winter wheat in the spring before the heads appear. Detailed observations are planned for next spring.

CRINKLE JOINT (Nonparasitic). Small numbers of crinkle joint wheat stems were found in 1928. It occurs each year, but usually is not destructively abundant. H. L. Seamans found it in Flathead County in 1916.

The symptom is the "N" shaped (crinkled) stems usually broken (sometimes just bent or sharply curved) generally above the second nodes of the stems. The stems are bent upward in an acute angle at the nodes above the broken internodes. The unequal growth of a node in returning the top of a grass to an erect position is a common phenomenon. and readily accounts for crinkle joint of wheat on a physiological basis. Bolley (1913, Figure 12) illustrated crinkle joint.

In a special survey in 1926, crinkle joint was found in Marquis wheat in Valley, Daniels, Sheridan, and Roosevelt Counties. Heads on crinkle joint stems were often poorly filled and were so low that many are not harvested. Some fields suffered 5 to 10 per cent damage from crinkle joint, but the damage was less in most fields. It was also destructive in this region in 1927. In one field, 15 per cent of the stems were distorted by crinkle joint.

Wind is probably the chief agent that breaks the crinkle joint wheat stems. Many farmers in 1926 blamed hail for the damage, but few were able to collect hail insurance on this basis. In the most seriously injured field, one to five stems per stool had crinkle joint while the rest were normal. Maybe the second internodes were abnormally weak in these broken stems.

PHYSIOLOGICAL LEAF SPOT. A serious abnormality has been present in the plots of the Agronomy Department of the Montana Agricultural Experiment Station during the last four or more years. The leaf spots are oval to elongate, light brown and have narrow, yellow margins. Superhard, Black Hull, Ridit, and Nebraska 60 were the varieties most seriously affected. In the plots of Superhard and Black Hull varieties of wheat, 50 to 75 per cent of the leaf area was destroyed by this abnormality in 1927 and 1928. Wheat in experimental plots of the Moccasin Agricultural Experiment Station was similarly spotted. No parasites were found to be associated with this type of leaf spot. Dr. H. B. Humphrey suggested that varietal (genetic) weakness might cause such spots.

Powers and Clark (1928) report that the Superhard and Black Hull plots of wheat described above yielded more than other varieties of wheat in 1928.

These are excellent varieties to yield so well when much of the leaf area was destroyed by the physiological leaf spot.

BROWN LEAF SPOT (Undetermined). Brown leaf spots, oval to circular in outline and 1 to 2 mm. in diameter were common in fields of Turkey Red wheat in Fergus County. They were associated with Helminthosporium foot rot. Many of the spots had light brown to gray centers and dark brown margins. In one field of 40 acres, 100 per cent of the leaves and 25 to 50 per cent of the leaf area was spotted. Traces to 1 per cent of such leaf spots were found in six other fields.

MOTTLE AND CHLOROTIC STRIPE (Undetermined). Fields of Turkey Red wheat affected with foot rot in Fergus, Judith Basin and Cascade Counties exhibited two peculiar related symptoms. Many of the leaves of chlorotic plants (before heading) exhibited leaves that bore long, chlorotic stripes or mottled spots. Specimens with these symptoms were examined by Dr. A. G. Johnson and H. H. McKinney who decided that the cause of the abnormality was neither mosaic nor rosette. Foot rot and drouth probably caused these symptoms. They occurred on 1 per cent of the plants in eight fields.

LEAF GIRDLE (Nonparasitic). Seedlings of spring wheat sent to Bozeman in 1928 showed one or two white, constricted, twisted regions about 1 cm. long in each of several leaves. There were yellow borders at the ends of the injured spots. The other parts of the leaves were normally green. Wind or frost probably caused this injury. It resembles leaf girdle in barley.

BLAST (Nonparasitic). Two plots of Supreme and Pelisse wheat at the Huntley Agricultural Experiment Station showed 20 to 30 per cent of the heads partly blasted. Hot, dry winds during the booting stage may have caused this blasting.

Table 42. Estimated percentages of losses from serious diseases of wheat in Montana, 1928.

Disease	Type of Loss	Kind of wheat	Percentage of Loss	Total Percentage Loss
Bunt	Dockage Loss	All Wheat	-	0.5
Bunt	Yield Loss	Spring Wheat	0.63	-
Bunt	Yield Loss	Winter Wheat	3.6	-
Bunt	Yield Loss	All Wheat	-	1.1
Loose Smut	Yield Loss	All Wheat	-	0.1
Foot Rot	Yield Loss	Winter Wheat	10.	-
Foot Rot	Yield Loss	Spring Wheat	1.	-
Foot Rot	Yield Loss	All Wheat	-	2.7
Red Leaf Rust	Yield Loss	All Wheat	-	1.
Stem Rust	Yield Loss	All Wheat	-	0.1
Other Diseases	Yield Loss	All Wheat	-	1.
Total Losses			-	6.5

Loss figures adjusted to acreages of crops.

OATS (*Avena sativa* L.)

1928: 554,000 acres; 20,221,000 bushels; $8,291,000.

SMUT (*Ustilago levis* (K. & S.) Magn. and *U. avenae* (Pers.) Jens.). Oat smuts are destructive in Montana. *U. levis* is the more abundant of these two, although both are widely distributed in the state and often occur in the same fields. *Ustilago levis* was collected in 16 counties, and *U. avenae* was found in seven counties (Figure 6). Most farmers do not treat their seed to control oat smuts.

Table 43 shows the results of the preliminary field survey made in 1928. An average of 5.7 per cent of the heads were smutty in 36 fields aggregating 1486 acres. Applying this percentage to the valuation of the crop in Montana calculates a loss of $472,587.

Table 43. Oat smuts. Montana, 1928.

County	Acres	Per cent	County	Acres	Per cent
Judith Basin	200	17	Yellowstone	91	14.6
Wheatland	40	0.25	Stillwater	42	0.38
Chouteau	50	10.	Garfield	60	0.17
Valley	170	0.97	Prairie	60	0.66
Roosevelt	40	8	Fallon	60	0.25
Daniels	200	7	Powell	78	0.51
Blaine	35	25	Gallatin	35	3
Rosebud	210	0.8	Ravalli	40	0.75
Big Horn	60	0.17	Deer Lodge	15	0

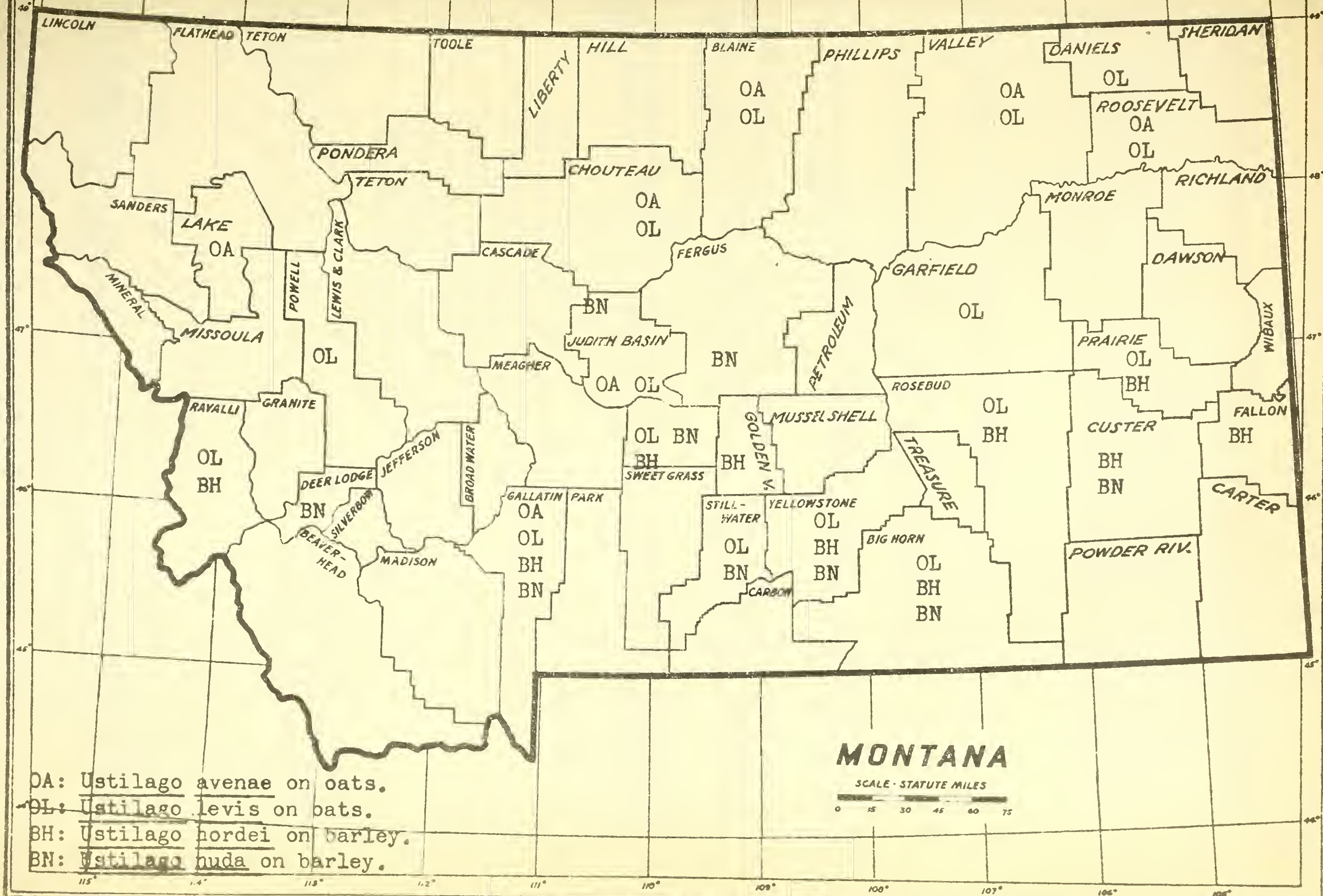
Totals: 1,486 acres; acreage-percentage product is 84.41; average percentage for the 18 counties is 5.7 per cent. Calculations like those in Table 40.

STEM RUST (*Puccinia graminis* Pers.) of Oats. Traces of black stem rust were found in cultivated oats in Yellowstone, Valley and Roosevelt Counties. A 100 per cent infestation on *Avena fatua* was found in Valley County. Traces were also found on wild oats in Blaine County. Arthur reported it on wild oats (N. A. F. 7: 296). *Puccinia graminis* usually does little damage in cultivated oats in Montana. (Table 38).

CROWN RUST (Puccinia coronata Cda). Dr. H. B. Humphrey found a serious amount of crown rust in one field in Sheridan County. W. L. Jellison found traces of crown rust on oat panicles in Flathead County. It usually is not destructive in Montana and is rarely seen.

HALO BLIGHT (*Phytomonas coronafaciens* (Elliott) Com. S. A. B.). Traces of halo blight were found in Swedish Select oats in Judith Basin County (Experiment Station at Moccasin), and on Green Russian (C. I. 2344) oats in an

Fig. 6. Smuts of Oats and Barley in Montana, 1928.



OA: Ustilago avenae on oats.
OL: Ustilago levis on oats.
BH: Ustilago hordei on barley.
BN: Ustilago nuda on barley.

experimental plot at Bozeman. In 1928, H. M. Jennison collected it in Stillwater and Park Counties.

Under some conditions typical halos do not occur on the leaf spots. Elongate brown leaf spots, 1 to 10 cm. long, that had no halos, but sometimes had red margins, occurred in Montana. They destroyed half the leaf area of 10 per cent of the leaves in an 80 acre field of oats in Rosebud County. Smaller amounts were found in Gallatin and Stillwater Counties. These bacterial leaf spots were possibly halo blight.

OTHER PARASITES. Macrosporium avenae Oud. was found on oat leaves at Bozeman in 1925.

Colletotrichum graminicolum (Ces.) Wils., anthracnose. Collected at Bozeman in 1918. Apparently first record for state.

Heterosporium phragmitis (Opiz.?) Sacc. occurred on oat leaves in Prairie County in 1928. It resembles Fusicladium destruens Pk. except in echinulation of its spores.

BLAST (Nonparasitic). This abnormality is very destructive throughout the state. It did about 10 per cent damage in 1928. Inspections revealed it in nine widely separated counties this year. It was more severe than in 1927, and less severe than in 1926.

Percentages found in field inspections are exemplified by fractions such as 1-3/10 which means 1 to 3 sterile spikelets on 10 per cent of the stems in the field.

Rosebund County: 230 acres, 1-3/10 per cent; 30 acres, 5/90 per cent.
Garfield County: 40 acres, 1-5/80 per cent.
Yellowstone County: 40 acres, 1-5/75 per cent; 100 acres, 3/50; 10 acres, 1-8/100.
Wheatland County: 15 acres, 1-5/100 per cent.
Park County: 10 acres, 2/100 per cent.
Prairie County: 20 acres, 5/90 per cent.
Missoula County: 20 acres, 3-5/100 per cent.
Stillwater County: 2 acres, 1-10/100 per cent.

Since cultivated oats bear about 75 spikelets per panicle, the inspection percentages indicate a loss of about 5 per cent due to blast. These inspections did not cover the main region of production of oats in northeastern Montana in which the damage was estimated as 10 per cent.

BARLEY (Hordeum vulgare L.)

1928: 209,000 acres; 6,374,000 bushels; $3,569,000.

COVERED SMUT (Ustilago hordei (Pers.) Kell. & Sw.). Covered smut was found in the counties shown in Figure 5.

Table 44 based on inspections of 24 fields showed an average of 2.8 per cent of covered smut in 626 acres. Covered smut regularly does serious damage to barley in Montana.

LOOSE SMUT (Ustilago nuda (Jens.) Kell. and Sw.). Loose smut of barley is serious in Montana. It was found in the counties shown in Figure 6. Table 45 based on inspections of 16 fields, showed an average of 3.4 per cent loose smut in 465 acres.

Table 44. Ustilago hordei in barley in Montana. 1928*.

(1) County	(3) Acres	(4) Per cent	(5) Acres x per cent	(6) Average Per cent
Gallatin	20	0		
Yellowstone	121	0-10	3.56	(3)
Wheatland	135	0-2	2.30	(1.7)
Golden Valley	20	1	.20	
Garfield	5	0		
Prairie	40	0.25-9	1.85	(4.6)
Fallon	160	0-3	2.65	(1.7)
Treasure	40	0.25	.1	
Rosebud	15	25	3.75	
Custer	50	5	2.50	
Ravalli	20	3	.60	
Totals	626		17.42	2.8

*Calculations like those in Table 40.

Table 45. Ustilago nuda in barley in Montana. 1928*.

(1) County	(3) Acres	(4) Per cent	(5) Acres x per cent	(6) Average Per cent
Yellowstone	90		.53	(.58)
Stillwater	10	2	.20	
Fergus	40	1	.40	
Big Horn	230		8.83	(3.84)
Gallatin	70		5.70	(8.14)
Deer Lodge	25		.15	(0.4)
Totals	465		15.81	(3.4)

*Calculations like those in Table 40.

STEM RUST (Puccinia graminis Pers.). Traces of black stem rust of barley were found in Fallon, Richland, and Flathead Counties, (Table 38).

STRIPE RUST (Puccinia glumarum (Schm.) Eriks.). Traces were seen on beardless cultivated barley and Hordeum jubatum in Flathead County.

STRIPE (Helminthosporium gramineum Rabh.). Barley stripe destroyed 13 per cent of the leaf area in 70 acres of barley in Richland County. It was abundant in a 6 acre field in Stillwater County. It destroyed 30 per cent of the leaf area in a 40 acre field in Ravalli County. It also occurred in Gallatin, Judith Basin and Dawson Counties. It was destructive in an experimental plot of Hannchen barley at Bozeman in 1926. While barley stripe is common, its annual damage is small.

FOOT ROT (Helminthosporium sativum Pam., King, and Bakke.). Foot rot of barley is probably more serious than records show. A 10 acre field of barley in Lake County had 10 per cent of the plants injured by foot rot.

LEAF SPOT (Hormodendron hordei Bruhne). This fungus destroyed 20 per cent of the leaf area on all the stems in a 5 acre field of barley in Yellowstone County. It was identified by Dr. Charles Drechsler. It is probably common in central Montana.

LEAF SPOTS (due to Helminthosporium teres, H. gramineum and H. sativum, Hormodendron, et al.). Leaf spots, with causes not definitely determined, were abundant in Big Horn and Wheatland Counties. Traces were seen in Stillwater and other counties.

LEAF GIRDLE (Nonparasitic). Specimens of barley seedlings collected in Glacier County in 1927 showed peculiar symptoms. Some leaves showed white, shrivelled, twisted regions 1 cm. long, with green or brown tissues in the rest of the leaves between the injuries and the tips. Wind or frost probably caused these injuries. These symptoms are like those of leaf girdle in wheat.

OTHER PARASITES OF CULTIVATED BARLEY. Bacterium translucens Jones, Johnson and Reddy. (U. S. Bulletin 1366); Claviceps purpurea (Fr.) Tul. Hill County, 1927; Helminthosporium teres Sacc. Gallatin County in 1916; Puccinia simplex Pk. Stillwater County.

RYE (Secale cereale L.)

1928: 154,000 acres; 2,156,000 bushels; $1,488,000.

One hundred and eighty acres of rye in nine fields in Custer, Rosebud, Yellowstone, and Treasure Counties showed no diseases.

LEAF RUST (Puccinia dispersa Eriks.). Traces of leaf rust were found on rye at Bozeman.

ERGOT (Claviceps purpurea (Fr.) Tul.). Traces of rye ergot were found in Ravalli and Flathead Counties. It was found in Richland County in 1924, and in Hill County in 1927.

CRINKLE-JOINT (Nonparasitic). Traces of crinkle joint were seen in rye in Park County.

CRESTED WHEAT GRASS (Agropyron cristatum J. Gaert.)

Traces of Claviceps purpurea (Fr.) Tul. occurred in Hill County in the Agronomy Plots, according to D. A. Savage, Agronomist.

FIELD CORN (Zea mays L.)

SMUT (Ustilago zeae (Beckm.) Ung.). Traces were found in Gallatin, Yellowstone, and Ravalli Counties. At Huntley in 1927, 3 per cent of the corn in two plots was smutty.

PURPLE SHEATH SPOT (various facultative parasites). Traces were found at the Experiment Station at Huntley in 1927 and 1928. Microscopical examination revealed no Physoderma.

BLACK BUNDLE DISEASE (Cephalosporium acremonium Cda.). Typical symptoms were found in a stalk of corn in a plot at the Huntley Experiment Station in 1927. It was not seen there in 1928.

SWEET CORN (Zea mays rugosa Bonaf.)

BLACK BUNDLE DISEASE (Cephalosporium acremonium Cda.). Black bundles occurred in about 1 per cent of the stems in two fields in Yellowstone and Flathead Counties. In Missoula County, 15 per cent of the stalks in a 1 acre field had typical black bundles. It was not found at Bozeman.

SORGHUM (Holcus sorghum L.).

LEAF SPOT (Bacterium holci Kendrick). Traces occurred in 90 per cent of the leaves in a half acre plot in the experimental plots at Huntley (Yellowstone County).

TRANSLUCENT BACTERIAL STRIPE (Unnamed). This disease was identified by Dr. Charlotte Elliott. She has submitted a preliminary description of it for publication; (Elliott, 1929). It was found in Yellowstone and Dawson Counties.

COVERED SMUT (Sphacelotheca sorghi (Lk.) Clint.). First reported from Carbon County in 1912, and in Flathead County about 1916.

BLAST (Nonparasitic). Traces were seen in Yellowstone County.

SUDAN GRASS (Holcus sudanensis Bailey).

LEAF SPOT (Bacterium holci Kendrick). This disease destroyed half the leaf area in 0.5 acre of plots at Huntley (Yellowstone County).

MILLET (Setaria italica Beauv.)

DOWNY MILDEW (Sclerospora graminicola (Sacc.) Schroet.). This disease was first found in Montana in 1928 when it was collected in Big Horn, Garfield, Prairie, Fallon, and Carter Counties. It was also collected at Devil's Tower, Wyoming, and at Gustave, South Dakota (Southwest corner of state). The identifications were checked by Dr. W. H. Weston, Jr.

Only the leaf spot stage of the disease was found. Conidiophores and spores were abundant. It occurred as traces on 1 to 20 per cent of the plants in seven fields aggregating 70 acres. It was not destructive, but was interesting as a new disease in Montana.

Sclerospora graminicola was abundant on Setaria viridis in Stillwater, Yellowstone, Treasure, Rosebud, Fallon and Custer Counties. It was also found at Sundance, Wyoming, and at Gustave, South Dakota. Usually, only spore-bearing leaf spots were found, but in Yellowstone County, several collections were made of shredded leaves containing oospores. The identification was checked by Dr. W. H. Weston, Jr. and Dr. H. R. Rosen.

LEAF SPOT (Pseudomonas alboprecipitans Rosen). All the fields of millet seen showed a common bacterial leaf spot. Dr. Charlotte Elliott identified the cause of Pseudomonas alboprecipitans in specimens as millet collected in Prairie and Fallon Counties. The spots were mixed with leaf spots caused by Sclerospora. Similar bacterial leaf spots, supposedly due to the same cause, were found in Garfield, Big Horn, and Carter Counties.

TIMOTHY (Phleum pratense L.)

STEM RUST (Puccinia graminis Pers.). Timothy rust was abundant in the Agronomy Department at Bozeman, and occurred in Yellowstone, Missoula, and Flathead Counties. W. L. Jellison and James Bradbury found it affecting 10 to

100 per cent of the stems in six fields of timothy in Ravalli County. It was found in Stillwater County in 1918.

SMUT (Ustilago striaeformis (West) Niessl.). D. B. Swingle found timothy smut at Bozeman in 1914.

QUACK AND WHEAT GRASSES (Agropyron spp.)

Claviceps purpurea (Fr.) Tul. Common. Hill and Yellowstone Counties.
Erysiphe graminis DC. (United States Bulletin 1366).
Puccinia agropyri E. & E. (Jones, 1910; N.A.F. 7:335).
P. graminis Pers. (N.A.F. 7: 296).
P. montanensis Ellis (N.A.F. 7:331).
P. obliterata. Arth. Yellowstone County.
P. pattersoniana Arth. (N.A.F. 7:330).
P. rubigo-vera (DC.) Wint. (Anderson, 1889).
Ustilago hypodytes (Schl.) Fr. Billings, 1900 (Griffiths, West American Fungi No. 201.)

VEGETABLE CROPS

BEAN (Phaseolus vulgaris humilis Alef. and spp.)

1928: 43,000 acres; 624,000 bushels; $2,402,000.

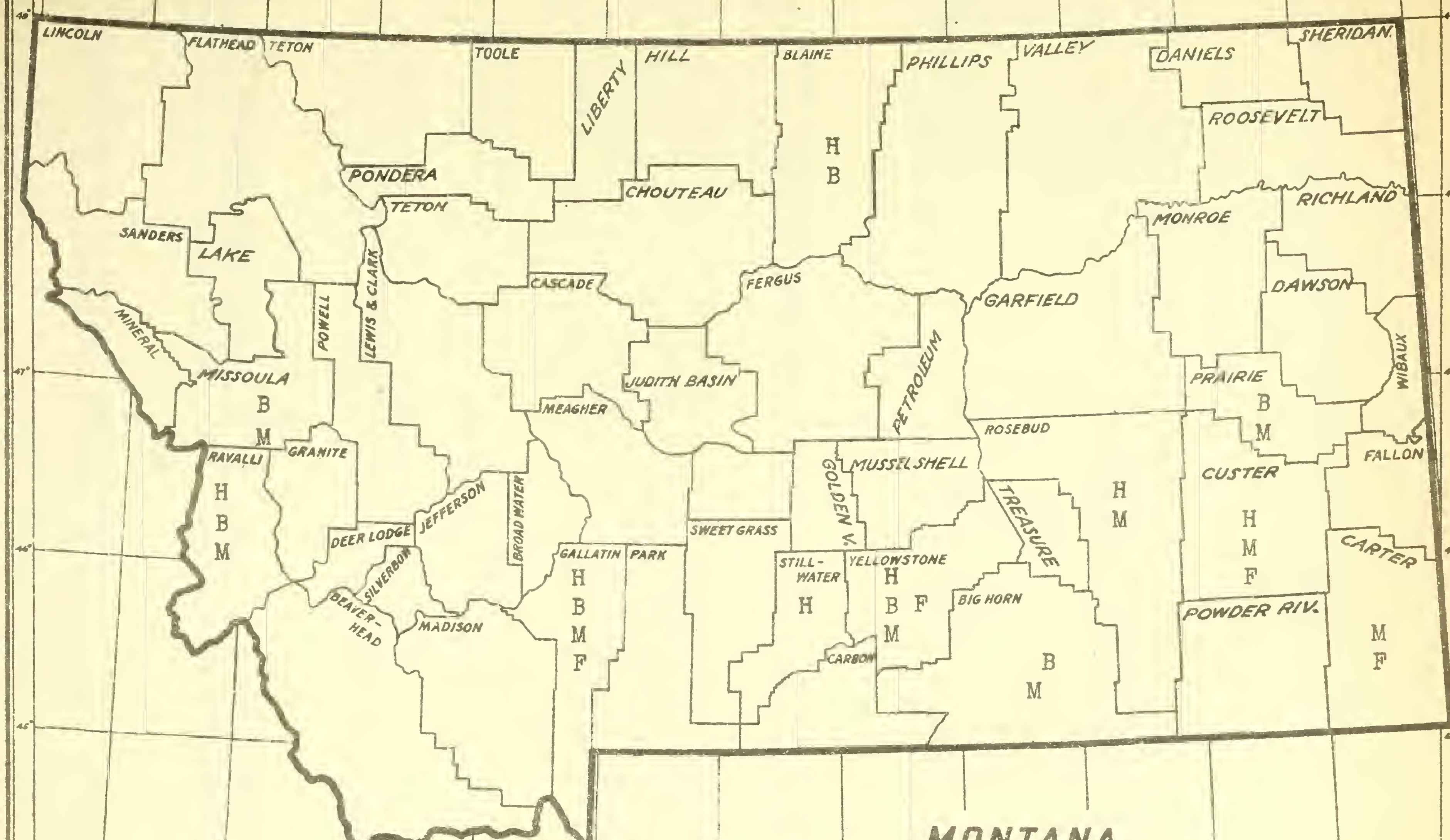
HALO BLIGHT (Phytomonas medicaginis phaseolicola Burkholder). Halo blight was found to be destructive in garden and canning varieties of beans at Huntley (Yellowstone County) in 1927. This was the first record of its occurrence in destructive form in Montana. Isolations made by Professor D. B. Swingle in 1926 did not reveal it at Bozeman. Figure 7 gives its known distribution in 1928. It has not been definitely identified yet in Great Northern beans.

Halo blight threatens to become more serious in canning beans such as Golden Wax, Black Wax, and Burpee's Stringless Green Pod.

Table 46 shows the estimated percentages of leaf area destroyed. Such reduction is not directly correlated with reduction in yields, which is less than the calculated percentages. However, the actual loss is increased by the spotted pods, discolored seeds, and girdled stems. Attacks upon young bean plants are often fatal.

A correlation between halo blight and inoculation of beans with Bacillus radicicola was established by Dr. Wilbur Brotherton at Bozeman. He inoculated with Bacillus radicicola the Burpee's Stringless Green Pod beans, in a one-acre field, and did not inoculate the beans of this variety in an adjacent, three-acre field. Halo blight was much more abundant in the field with the inoculated

Fig. 7. Bean Diseases in Montana, 1928.



H: Halo blight (Phytomonas medicaginis phaseolicola).
B: Blight (Bacterium phaseoli)
M: Mosaic.
F: Root rot (Fusarium martii phaseoli).

seed.

Dr. Brotherton reduced the spread of halo blight in the field by severe roguing.

Table 46. Halo blight of canning beans. Montana, 1928*.

(1) County	(2) No. of Fields	(3) Acres	(4) Per cent	(5) Acres x per cent	(6) Weighted percentage	(7) Per cent	(8) Per cent x Column 5	(9) Weighted percentage
Yellowstone	4	27		6.85	(25)		.8955	(3.3)
Gallatin	15	100		15.15	(15)		3.6750	(3.7)
Blaine	5	15		11.01	(73)		3.3001	(22)
Custer	3	11		6.45	(59)		2.1500	(20)
Rosebud	1	20	75	15.00	(75)	5	.7500	(3.75)
Stillwater	1	1	30	.30	(30)	25	.075	(7.5)
6 counties	29	174		54.76	(31.5)		10.8456	6.2

*Calculations like those in Table 40.

BLIGHT (Phytomonas phaseoli (E.F.S.) Com. S.A.B.). Blight is common and sometimes destructive in Great Northern beans. Figure 7 shows the counties where it was found in 1928.

It was found in 11 fields aggregating 240 acres of Great Northern beans in Yellowstone County. In most fields there were traces to 15 per cent of the plants affected, with only slight visible damages. The loss was about 2 per cent in four fields, in one of which each plant bore one to five leaf spots. Only slight damage from light infestations was found in Missoula, Gallatin and Prairie Counties. There was a loss of 5 per cent in a 30 acre field in Big Horn County.

Professor D. B. Swingle made many isolations of bacteria from blighted beans at Bozeman in 1926. Phytomonas phaseoli predominated in his cultures.

BACTERIAL WILT (Phytomonas flaccumfaciens (Hedges) Com. S.A.B.). This parasite was identified by Miss Florence Hedges in Great Northern bean seed grown at Billings (Yellowstone County) in 1927. She reported it in seed from Montana in (1925) 1926.

RUST (Uromyces appendiculatus (Pers.) Lk.). Bean rust was found as a mild infestation in 5 acres of Great Northern beans at the Experiment Station at Huntley (Yellowstone County) in 1927. It was not seen in the same field nor elsewhere in 1928.

ANTHRACNOSE (Colletotrichum lindemuthianum (Sacc. & Magn.) Briosi & Cav.). Anthracnose has been introduced occasionally into Montana in infected seed but apparently has not overwintered or spread here seriously.

Anthracnose was abundant in gardens at Bozeman in 1912 as a result of planting diseased seed but has not been reported since. Professor D. B. Swingle identified it then in his garden and furnishes this information.

MOLD (Cladosporium herbarum phaseoli). This fungus was tentatively identified on bean leaves from Gallatin County by Dr. L. L. Harter.

ROOT ROT (Fusarium martii phaseoli Burk.). Figure 7 shows the counties where root rot was found in 1928. Field inspections of 14 fields aggregating 120 acres showed infestations of 1 to 5 per cent. It was not seen in the other bean fields considered in Tables 46 and 47.

ROOT NODULES (Rhizobium leguminosarum Frank). Root nodules occur on beans in Gallatin County. These are general in distribution, but rarely reported.

Root nodules or tumors caused by R. leguminosarum (Bacillus radicicola) represent diseases like the diseases caused by Phytomonas tumefaciens and Caconema radicicola. The essential difference is that R. leguminosarum usually benefits its hosts more than it injures them. Palladin and Livingston (1918) state that late season infections may be injurious because the bacteria are parasitic.

MOSAIC (Virus). Bean mosaic is abundant and destructive in Montana (Figure 7). It will probably continue to be serious. Dr. T. G. Fajardo in Wisconsin separated the primary (current season) and secondary (typical) symptoms of bean mosaic. The early canning and garden beans in Montana usually show only primary symptoms which are general chlorosis and prominent rugosity with yellow tops on the rugose blisters. Often mosaic in this form does not reduce the yield greatly, although the secondary (typical) form decreases the yield very much when the symptoms are severe. Great Northern beans exhibit both primary and secondary symptoms of mosaic. Vascular streaking (hypophyllous) was associated with mosaic.

Table 47 shows the result of field inspections. Many of the percentages of prevalence were too low because about half of the inspections were made before the maximum number of plants shows symptoms. Mosaic attracted most attention by its abundance after August 15, 1928.

In 1917, 100 acres of Great Northern beans contained 2 per cent mosaic.

Table 47. Bean mosaic. Montana, 1928*.

(1) County	(2) No. of Fields	(3) Acres	(5) Acres x Per cent	(6) Average Per cent
Yellowstone	56	942.6	40.85	(4.3)
Big Horn	6	110	3.05	(2.7)
Rosebud	4	92	.14	(.15)
Custer	3	11	.35	(3.2)
Prairie	2	50	.75	(1.5)
Carter	1	2	.01	0.5
Gallatin	5	11.05	1.95	(17.7)
Ravalli	1	1	.05	(5)
Missoula	2	10.13	.5	(5)
Totals	81	1,229.8	47.66	3.9

*Calculations like those in Table 40.

CALICO (Undetermined). Many Great Northern beans in Yellowstone County showed prominent yellow blotches in the leaves that suggested calico in potatoes. The symptoms were associated with mosaic.

PSEUDOMOSAIC (Genetic). Prominent symptoms of this abnormality occurred in two crosses of hybrid beans (Rogers' Stringless Refugee X Davis White Wax) made by Dr. Wilbur Brotherton. The 4th and 6th generations were grown in 1928. Burkholder and Muller (1926) described this abnormality.

DWARF LIMA BEAN (Phaseolus limensis limenanus Bailey).

BLIGHT (Phytomonas phaseoli (E.F.S.) Com. S.A.B.). Blight caused a serious spotting of lima bean pods at the Experiment Station at Huntley (Yellowstone County).

PEAS (Pisum sativum L.)

Seed peas (1928: 19,000 acres; 332,000 bushels; $664,000.
Canning peas (1928: 3,500 acres; 3,800 tons; $209,000.

Most of the information concerning pea diseases in Montana in 1928 is drawn by permission from a report prepared by Dr. M. B. Linford, Associate Pathologist, United States Department of Agriculture, following a special survey of pea diseases which he made for the Office of Vegetable and Forage Diseases, Bureau of Plant Industry. He inspected 57 fields in Gallatin, Park, and Carbon Counties. (Linford, 1929).

BACTERIAL BLIGHT (Phytomonas pisi (Sack.) Com. S.A.B.). This disease has been common in Montana since 1916. It occurred in epidemic form in 1918 causing a 25 per cent reduction in yield. In 1927, it was found in Yellowstone County and did serious damage in Gallatin County. Near Manhattan, in 85 acres of peas in five fields of different varieties, there was an average of 53 per cent of the plants diseased, 36 per cent were damaged causing a loss of 8 per cent in yield.

It was found in Gallatin, Park, Stillwater, Judith Basin and Carbon Counties in 1928. Dr. Linford found it in 9 of the 57 fields which he examined. Reduction in yield was slight, but there was considerable seed infection.

Evidence indicates that serious infestations and losses are associated with foliage injury caused by hail, wind-blown rain, or wind-blown sand which furnishes infection courts. The character of the season is an important factor in the occurrence and destructiveness of this disease and for this reason it may be expected to occur sporadically.

ROOT ROT (Aphanomyces euteiches Drechs.). Root rot was abundant and destructive in 1928. Dr. Linford found it in 30 of the 57 fields that he inspected. In 80 per cent of these infested fields, more than half of the plants were infected. The effects were variable, however, for some infestations of 100 per cent caused only small reductions in yield, while others practically caused crop failure.

Aphanomyces root rot was first found in Montana in 1921 by Dr. F. R. Jones who detected it in Park County. In 1928, it did great damage in Park County where 7 of the 8 fields examined were heavily infested. One extensive grower of peas stated that the yield of peas had decreased more than 50 per cent in the last ten years in this county, until now growers sometimes fail to get even their seed back. Root rot appears to have been the main factor in this decline.

In Gallatin County root rot was found in 19 of the 39 fields inspected, although Dr. F. R. Jones could find scarcely any of it here in 1921 and 1923. Pea fields that had not produced peas before 1928 seldom contained this disease, but most of those that had produced two or more crops during recent years were heavily infested. Apparently, soil infestation with Aphanomyces increases rapidly.

Root rot was present but not yet serious at Bridger (Carbon County) where peas have been grown during only a few years. Fields around Red Lodge and Roberts in this county were severely infested.

In Gallatin and Carbon Counties, root rot was closely correlated with continuous cropping. In one field, the fourth successive crop of peas was a failure mainly due to root rot, showing a very rapid increase in soil infestation. Growers misinterpret losses from root rot as due to over-irrigation for the initial severe development of root rot seems to occur promptly after the first irrigation. Weeds often outgrow peas, particularly peas weakened by disease.

DOWNY MILDEW (Peronospora viciae (Berk.) Doby.). Downy mildew was found in Gallatin, Park and Carbon Counties, affecting 11 of the 58 fields inspected. Dr. Linford found it in 10 of the 57 fields that he inspected. One infestation of 100 per cent in a 25 acre field was found in Gallatin County. The leaf spots were not abundant on the plants so the damage was not great.

MYCOSPHAERELLA BLIGHT (Mycosphaerella pinodes (B. & B.) Stone). Dr. Linford found this blight in 3 fields in Carbon County. It caused only slight loss, although two fields contained foci of heavy infestation. Since these fields were planted from local seed, the disease evidently perpetuates itself here, and may possibly become more abundant and widely distributed.

ASCOCHYTA LEAF AND POD SPOT (Ascochyta pisi Lib.). Linford and Sprague (1927) separated this disease from the one caused by Mycosphaerella. Dr. Linford and the authors found it in four fields of seed peas in Park County and one field in Carbon County. It was serious on the pods in two fields, but only traces occurred in the other fields. It was first reported in Montana in 1918.

LEAF SPOT (Ascochyta pinodella L. K. Jones). Dr. Linford reported this disease in four fields in Gallatin County and one in Park County. Jones (1927) describes this disease.

LEAF BLOTCH (Septoria pisi West). Leaf blotch is common in pea fields in Montana and has been observed at Bozeman since about 1918. Dr. Linford found it in 27 of the 57 fields he inspected. It was destructive in one field in Carbon County and caused serious leaf injury in old pea fields in both Gallatin and Park Counties.

BLACK LEAF (Fusicladium pisicola Linford). Dr. Linford found traces of this disease in one field in Gallatin County and one in Carbon County. No former observations of it have been reported from Montana.

FUSARIUM WILT (Fusarium orthoceras var. Pisi Linford). Dr. Linford found this disease in Montana for the first time in 1928 in three fields in Gallatin County. He isolated and identified the causal organism. One field of Alaska peas was extensively spotted. Five acres of a large field of Perfection peas were destroyed by wilt. This field had previously grown some crops of peas. This is a very destructive disease and demands close watching.

FOOT ROTS (Ascochyta pinodella L. K. Jones, Fusarium martii pisi F. R. Jones, and other fungi). Since these diseases do not have practically distinguishable symptoms, Dr. Linford considers them together, reporting them from three fields in Gallatin County. They probably occurred elsewhere but were not distinguished from Aphanomyces root rot. It damaged most of the plants in one field without producing very conspicuous aerial symptoms. Few, if any peas had grown previously in this field.

STEM CANKER (Rhizoctonia). This disease was serious in several pea fields in Gallatin County in 1927 and was also seen in Yellowstone County. Near Manhattan, three fields aggregating 45 acres had 92 per cent of the stems badly cankered with a loss of 50 per cent. Another field on higher ground had only 1 per cent of the stems cankered. The species of the causal fungus should be identified.

Dr. Linford in 1928 reported that Rhizoctonia reduced the stand in one field in Gallatin County and occurred on 10 per cent of the plants in one field in Carbon County. He found Rhizoctonia hyphae many times in examining pea roots for oospores of Aphanomyces occurring on and in the decaying roots.

MOSAIC (Virus). Mosaic of field peas has occurred in Gallatin County for more than four years. In 1928, traces of it were found in Gallatin, Carbon and Yellowstone Counties. One variety in the experimental plots at Bozeman has shown 75 to 100 per cent of mosaic during the last two years. It was too mild to be serious, however.

INTUMESCENCES (Water relations). Dr. Linford found traces of this abnormality in one field of Alaska peas in Gallatin County. Some green pods bore succulent, elongate outgrowths.

OTHER PARASITES.

Erysiphe polygoni DC. Found by Dr. H. M. Jennison in Bozeman in 1913.

Pythium spp. (United States Bulletin 1366).

Rhizobium leguminosarum Frank, (Bacillus radicicola Beij.) causing legume tubercules. Dr. Wilbur Brotherton found these tubercules in field peas in Park, Gallatin, Madison, Jefferson, Powell, and Ravalli Counties during the last five years. Their occurrence is probably coextensive with that of pea culture in this state.

POTATO (Solanum tuberosum L.)

1928: 37,000 acres; 4,255,000 bushels; $2,340,000.

EARLY BLIGHT (Alternaria solani (E. & M.) J. & G.). In 1927, early blight did serious damage in Yellowstone County. Alternaria attacked five rotation plots of 0.25 acres each of Triumph potatoes on the Huntley Agricultural Experiment Station about August 1, 1927. By September 19, three plots were dead and half the leaf area on the other two plots was destroyed. Early blight reduced the yields of these plots 50 to 75 per cent.

A vine or two in each plot had symptoms of giant hill. Such vines were only slightly spotted by Alternaria while the other vines were badly diseased or dead, so these resistant vines were saved for seed and increased. They deviate from normal only slightly in agronomic characters, so their resistance to early blight will be tested further in 1929.

Early blight damaged four fields of potatoes near Billings in 1927. It was controlled by Bordeaux mixture in Carbon County in 1917.

In 1928, early blight was found in Yellowstone, Stillwater, Big Horn, Dawson, Blaine and Flathead Counties. Five rotation plots (0.25 acres each) of Triumph potatoes on the Huntley Agricultural Experiment Station were less severely damaged than in 1927, although all the vines were spotted. Alternaria destroyed 30, 90, 15, 10 and 15 per cent of the leaf area in the five plots respectively by September 1, 1928 being worst in the continuous cropping plot that it prematurely killed in 1927. These plots were not sprayed for early blight in 1927 or 1928. According to Professor C. C. Starring, Horticulturist of Montana State College, it reduced the yield 15 per cent in 2 acres of potatoes at Billings. It did similar damage to 20 acres of potatoes in Big Horn County and spread rapidly in four other fields.

Early blight is becoming serious in Montana so that growers will soon need to begin to spray to control it.

SCAB (Actinomyces scabies (Thax.) Gues.). Potato scab is common and destructive throughout Montana. (See Wilcox (1899) and Foster (1896).

RHIZOCTONIA (Corticium vagum Berk. & Curt.). Rhizoctonia is common and destructive to potatoes in Montana. In 1928, it was found in Ravalli, Missoula, Wheatland, Gallatin, Stillwater and Yellowstone Counties. Most of the infestations were not serious.

The white mold, Corticium was seen on the bases of potato stems in Gallatin and Stillwater Counties. Large sclerotia occur in Montana. The largest one seen was 2.5 x 2 x 0.5 cm.

An unusual development of aerial tubers occurred in 1916. Aerial tubers were unusually numerous and abundant on affected plants. They resembled bunches of grapes on the potato stems which bore from 50 to 200 aerial tubers each. Dr. H. M. Jennison decided that Rhizoctonia was the chief cause. It was serious in 1911 and 1912.

WILT (Fusarium oxysporum Schlecht.). Fusarium wilt causes an estimated annual loss of about 4 per cent in Montana potatoes. It is troublesome in light soils where the soil temperature is comparatively high and moisture content is low. This was described by Morris (1926).

STORAGE ROTS (Fusarium spp.). Storage rots are common and destructive in Montana; they were described by Morris (1926). A serious epidemic of dry rot occurred in 1928. One grower in Gallatin County lost 15 per cent of a car of certified Irish Cobbler potatoes.

Species of Fusarium found in potato tubers in Montana by Morris and Nutting (1923):

Fusarium trichothecioides Woll., F. subulatum brevius Sherb., F. subpallidum roseum Sherb., F. discolor Ap. & Woll., F. gibbosum Ap. & Woll., F. oxysporum-asclerotium Sherb., F. clavatum Sherb., F. solani (Mart.) A. & W., F. discolor-sulphureum (Schl.) A. & W., F. coeruleum (Lib.) Sacc., F. sclerotioides-brevius Sherb., F. arthrosporioides Sherb., F. anguioides Sherb., F. bullatum Sherb., and F. culmorum (Sm.) Sacc.

LEAK (Pythium debaryanum Hesse). Present in Montana (United States Bulletin 1366).

BLACK LEG (Erwinia atroseptica (Van Hall) Com. S.A.B.). The history of the black leg disease of potato in Montana is very interesting. It was introduced about 1912, presumably in potato seed imported from the East. In the Twenty-third Annual Report (1916) of the Montana Experiment Station this statement appears "The diseases of the potato most important in Montana are wilt and dry rot. Black leg is rapidly spreading and is likely to be equally important if not checked." A year later (Twenty-fourth Annual Report) it is stated "The bacterial disease of potatoes known as black leg is increasing in this state to an alarming extent. We believe it is not an overstatement to say that since the introduction of the disease into Montana, it has doubled in prevalence every year. Black leg, therefore, will be given special attention next year."

A campaign of publicity was conducted regarding the nature and control of black leg which resulted in some control measure becoming adopted; consequently this disease, while present, has never been very destructive. It varies in severity from year to year. The average loss from black leg is estimated at 2 per cent.

Swingle (1917 and 1918) described its spread in the state. The following are some records of its occurrence in 1928:

Gallatin County	0.1 acres	4 Per cent
Ravalli County	6 acres	1 Per cent
Sweet Grass County	2 acres	12 Per cent
Wheatland County	5 acres	11 Per cent
Yellowstone County	8 acres	1 Per cent

Black leg overwinters in diseased tubers. While the seed corn maggot (Hylemyia cilicrura Rond.) has been collected in Yellowstone, Fallon, and Big Horn Counties and was locally destructive in beans, it is not known to have an important connection with potato black leg in Montana. This entomological information was supplied by W. B. Mabee, Extension Entomologist of the Montana Agricultural Experiment Station.

VIROSES. Viroses appear to be the most serious diseases of potatoes in Montana. They are widely distributed and often spread rapidly when not controlled. They caused little loss in 1920. Since then, they have caused an annual reduction in yield of about 10 per cent. The mosaics are the most destructive of the viroses in Montana. They have been discussed by Whipple (1919) and Morris and Young (1929).

Solanum nigrum L., S. triflorum Nutt., S. douglasii Dunal., S. dulcamara L., and S. rostratum Dunal. occur in Montana but are not known to be important in the spread of potato viroses.

MOSAICS (Viruses). Rugose mosaic, crinkle mosaic, and mild mosaic are common and destructive in potato fields in Montana. In this preliminary survey of 16 fields in 10 counties, there was an average of 4.2 per cent of rugose and crinkle mosaics in 39 acres. Some of these fields had been planted with certified potatoes.

Mosaics caused most of the 10 per cent annual loss from viroses in Montana since 1921.

CURLY MOSAIC (Virus?). What appears to be a new mosaic disease was found at Bozeman in Bliss Triumph potatoes in 1927. Its symptoms are prominent curling and marginal flavescence (chlorosis), dwarfing and diffuse mottling of the leaves, dwarfing and brittleness of the stems, and severe reduction in yield (Plate I, A). Only a few plants were found. Attempts to transmit this disease are in progress. A similar disease was seen in experimental plots at Corvallis, Oregon, in 1928.

WITCHES' BROOM (Virus). Witches' broom has become common in Montana potato fields in recent years, but usually it is not sufficiently abundant to be serious and generally does not spread rapidly. A severe infestation occurred in Yellowstone County in which 18 acres of Triumph potatoes had 10 per cent of the hills affected with witches' broom. In Wheatland County, a 5 acre field had witches' broom in 1 per cent of the hills and 4 per cent of the potatoes in a half-acre field in Sweet Grass County had this disease. Young (1927) and Young and Morris (1926, 1928) have described witches' broom in Montana.

LEAF ROLL (Virus). Low percentages of leaf roll commonly occur in many potato fields in Montana, but it usually is not serious. There was 1 per cent leaf roll in a 1 acre field in Yellowstone County. Traces to 2 per cent were found in fields in three other counties. Leaf roll caused about a 2 per cent loss in Montana potatoes in 1921.

SPINDLE TUBER (Virus). Spindle tuber is common and destructive in Montana. Nine fields in 8 counties averaged 5 per cent spindle tuber of discernible severity.

CALICO (Undetermined). Traces of calico were seen in Yellowstone, Stillwater, Gallatin, and Ravalli Counties.

It was found in Netted Gem potatoes in Missoula County in 1924.

GIANT HILL (Undetermined). Low percentages of giant hill plants commonly occur in potato fields in Montana. Potatoes affected with it were grown experimentally at Bozeman in 1928.

TIP BURN (Sun burn and leaf hoppers). Tip burn occurs in eastern Montana, but usually is not serious. It was not reported in 1928.

HOLLOW HEART (Nonparasitic). This injurious condition commonly occurs in large potato tubers throughout the state.

TOMATO (Lycopersicon esculentum Mill.)

EARLY BLIGHT (Alternaria solani (E. & M.) J. & G.). A mild infestation of early blight was found in a 2 acre field of tomatoes at Billings in 1927. It was not seen in 1928.

WILT (Fusarium lycopersici Sacc.). Wilt caused a loss of .3 per cent in a three acre field of Bonny Best tomatoes in Flathead County in 1924.

MOSAIC (Virus). A one acre field of tomatoes at Miles City contained 26 per cent of mild mosaic. Bonny Best and Earliana tomatoes in the greenhouse of the Montana Agricultural Experiment Station at Bozeman have been affected by mild mosaic. This mild form of mosaic does not appear to reduce tomato yields seriously.

WITCHES' BROOM (Virus). This disease occurred under experimental conditions in the greenhouse of the Montana Agricultural Experiment Station at Bozeman from 1927 to 1928. It was described by Young and Morris (1927, 1928).

NEMATODES (Species undetermined, probably Caconema radicicola (Greef.) Cobb). A serious infestation of nematode galls appeared on the roots of Bonny Best and Earliana tomatoes in the greenhouse at Montana State College in 1927. They caused severe chlorosis. They were not seen after the application of drastic control measures.

TOBACCO (*Nicotiana tabacum* L.)

WITCHES' BROOM (Virus). Witches' broom appeared in White Flowering tobacco plants grafted onto tomatoes with witches' broom in the greenhouse at Montana State College. It was described by Young (1929).

CABBAGE (Brassica oleracea L.)

WATERY SOFT ROT (Sclerotinia libertiana Fckl.). This soft rot was found at Bozeman in 1922.

LETTUCE (*Lactuca sativa capitata* L.)

MOSAIC (Virus). Mosaic of lettuce was found in Montana for the first time in 1928.

At Bozeman, 5 acres of young head lettuce contained 3 per cent mosaic. Traces were seen in an old half-acre field and in a field at Billings. The plants were very chlorotic and exhibited prominent intervenal mottling. Affected plants were dwarfed.

HEAD ROT (Bacterial spp. Undetermined). Bacterial head rot of lettuce was destructive in Montana. In Ravalli County, 75 per cent of the plants in 0.5 acres of head lettuce were damaged. In Gallatin County, it destroyed 75 per cent of the heads in a quarter-acre field. About 40 per cent of the heads were rotted in an old 1-acre field. It was abundant in a field in Flathead County. The grower there said that he lost $100.00 from this disease one year. A mild infestation was found in a field in Yellowstone County. Identification and control work is needed for this disease.

DROP (*Sclerotinia libertiana* Fuckel). Sclerotinia was experimentally transferred from sunflowers to lettuce in the greenhouse and field at Bozeman. Young and Morris (1927) have discussed Sclerotinia and the reason for retaining the commonly known specific name, libertiana.

FRENCH ENDIVE (*Cichorium endivia* L.)

CENTER ROT (*Phytomonas cichori* D. B. Swingle and *P. intybi* D. B. Swingle). These diseases were described by Swingle (1925). An extensive grower in Flathead County reported serious damage from center rot. He found that the disease was most serious when the roots were grown in damp soil during the summer.

WATERY SOFT ROT (*Sclerotinia libertiana* Fckl.). This soft rot occurred in French endive roots grown in Bozeman near a plot of sunflowers seriously affected with Sclerotinia. It was a serious storage rot.

SALSIFY (Tragopogon porrifolius L. and T. pratensis L.).

Albugo tragopogonis (DC.) S.F.G. is common in Montana.

PARSNIP (Pastinaca sativa L.)

Botrytis cinerea Auct. caused a soft rot of parsnips, locally grown, in Bozeman.

CARROT (Daucus carota sativa DC.)

Sclerotinia libertiana Fckl. occurred on locally grown carrots in storage at Bozeman.

CELERY (Apium graveolens Dulce DC.)

LATE BLIGHT (Septoria apii Rostr.). At Hamilton, one-half acres of Golden Plume celery showed 10 per cent of the plants spotted by Septoria apii, but there was little damage because Bordeaux mixture was controlling the disease. A gardener at Billings reported that late blight occurred in his celery in 1927.

ONION (Allium cepa L.)

SMUDGE (Vermicularia circinans Berk.). This disease occurred as a 1 per cent infestation in a half-acre field at Billings.

DODDER (Cuscuta arvensis Beyrich and C. gronovii Willd.). Dodder was found on onions at Missoula in 1927.

HORSERADISH (Radicula armoracia (L.) Rob.).

LEAF SPOT (Ramularia armoraciae Fckl.). A mild infestation of this fungus was found at Kalispell.

WILD CUCUMBER (Echinocystis lobata Torr. & Gray)

MOSAIC (Virus). Cucumber mosaic was collected in Bozeman in 1927.

SUGAR BEET (*Beta vulgaris* L.)

CURLY TOP (Virus). Curly top was found in sugar beets by Walter Carter in Yellowstone County in 1926. He transmitted it from collected material to prove its identity.

W. B. Mabee, Extension Entomologist, M.S.C., reported that *Eutettix tenella* Baker has been found in Stillwater, Park, Jefferson, Lewis and Clark, Ravalli, Missoula, Lake and Sanders Counties during the last few years.

With both curly top and its insect vector in the state in widely separated localities, it is feared that serious spread of curly top may occur. It has not yet done recorded economic damage in Montana. It was found in red beets and mangel wurzels in western Montana.

BLACK ROOT (Probably *Phoma betae* (Oud.) Frank (*Mycosphaerella tabifica* P. & D. Johns). Black root was found in three plots at the Agricultural Experiment Station at Huntley in large beets on July 29, 1928. An average of 1 per cent of the roots were ruined by black root. Presumably the percentage of seedling infestation was higher. Superintendent Dan Hansen stated that black root sometimes spoils stands of sugar beets in Yellowstone County. Traces of black root were found in two fields in Yellowstone County. Although black root was not seen in Rosebud County on July 30, a farmer there said that it sometimes was destructive. The leaf spot stage (*Phyllosticta betae* Oud.) was collected at Billings in 1916 and 1927.

LEAF SPOT (*Gloeosporium betae* Dearn. and Barth.) (Fungi Columbiani No. 5023); described from Billings in 1913.

RED BEET (*Beta vulgaris* L.)

CURLY TOP (Virus). R. W. Haegele made two collections of curly top in red beets in Sanders County in 1926.

LEAF SPOT (*Cercospora beticola* Sacc.). A 100 per cent infestation was found to be doing slight damage in a garden near Billings.

MANGEL-WURZEL (*Beta vulgaris macrorhiza*)

CURLY TOP (Virus). Curly top was found in mangels in Ravalli County in 1927 by W. B. Mabee, Extension Entomologist of Montana State College, and Walter Carter, Assistant Entomologist, United States Department of Agriculture.

FORAGE CROPS

ALFALFA (Medicago sativa L.)

Alfalfa seed - 1926. 16,500 acres; 39,600 bushels; $543,000.
Alfalfa hay: 610,000 acres in 1926.

YELLOW LEAF BLOTCH (Pyrenopeziza medicaginis Fckl.).
Yellow leaf blotch is common and destructive in Montana. It was found in Park County.in 1925. Pyrenopeziza kills the tops of severely affected plants. It did great damage in some plots at Moccasin and in a field at Bozeman.

Thirteen fields covering 169 acres in the counties shown in Figure 7 contained yellow leaf blotch as the predominating serious disease. In these, 83 per cent of the plants were affected by Pyrenopeziza, which destroyed 40 per cent of the leaf area. These inspections involved the first two crops.

Pyrenopeziza was serious in combination with Pseudopeziza in eight other fields covering 270 acres. In these, 83 per cent of the plants with 16 per cent of the leaf area were affected by these fungi. Since destruction of leaf area is not directly correlated with reduced yields, losses cannot be determined readily. However, these fungi cause serious, premature shedding of the leaves, so they probably cause an economic loss of at least 5 per cent in Montana. They are most destructive in seed fields, since cutting hay crops at the proper time usually prevents serious damage from them in Montana and seed fields are not thus protected.

The average infestation for the state is probably a little lower than the percentages summarized from the limited field inspections.

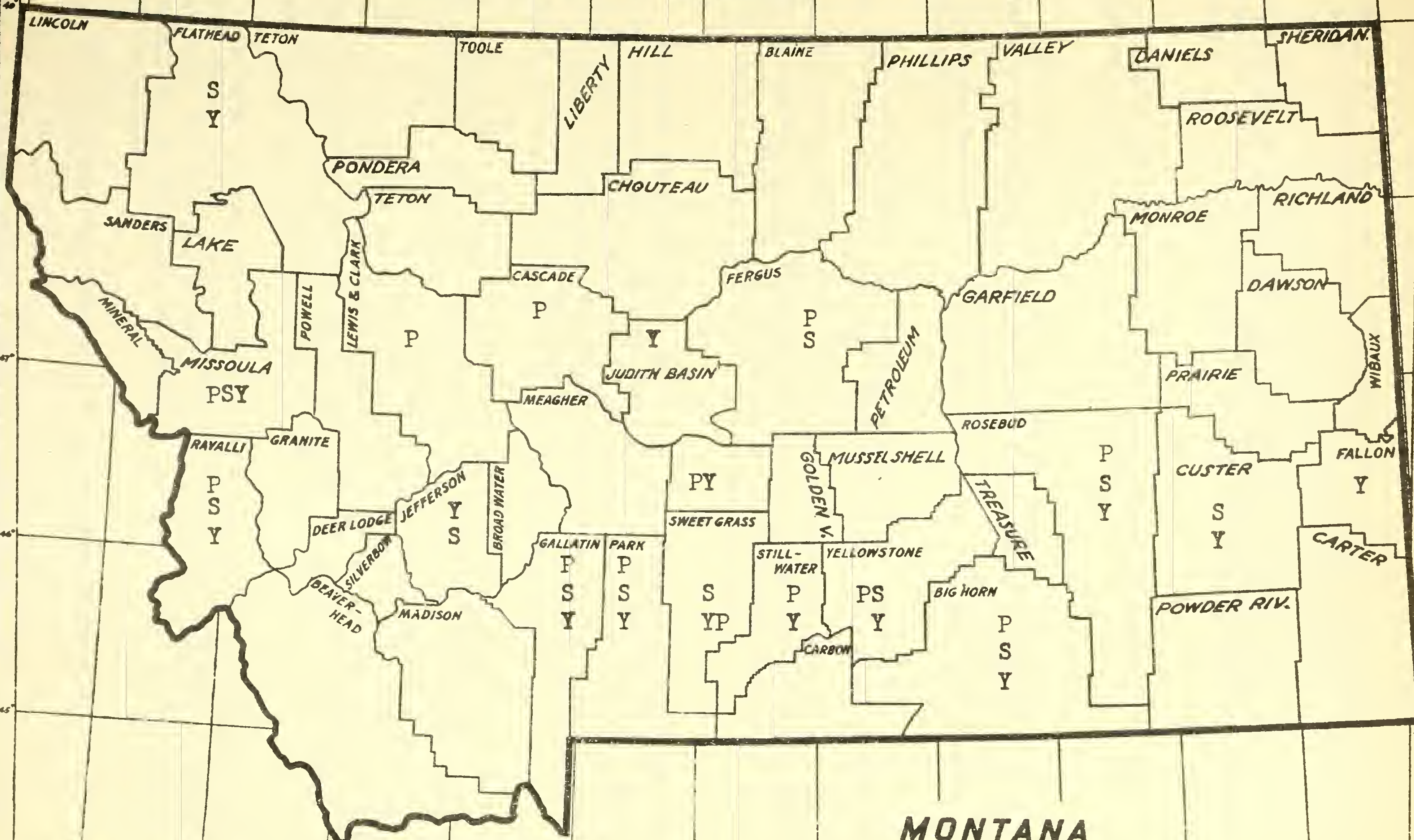
LEAF SPOT (Pseudopeziza medicaginis (Lib.) Sacc.). This disease is common and sometimes destructive in Montana. Its prevalence and destructiveness in combination with Pyrenopeziza is discussed under Yellow Leaf Blotch.

In 15 fields covering 338 acres in the counties shown in Figure 7, Pseudopeziza was the only parasite present in destructive abundance. All the plants were diseased by it. Although most of the spots were on the lower half of the leaves, about 29 per cent of the leaf area of the plants was destroyed by the spots, exclusive of the premature partial defoliation due to this leaf spot.

Pseudopeziza and Pyrenopeziza are most injurious in seed fields where cutting is too late to control them.

DOWNY MILDEW (Peronospora trifoliorum Deby.). This common disease is usually not very destructive in Montana. It was found in 19 fields covering 474 acres in the counties indicated in Figure 8. In eight of these fields,

Fig. 8. Alfalfa Diseases in Montana, 1928.



P: Downy mildew (Peronospora trifoliorum).
S: Leaf spot (Pseudopeziza medicaginis).
Y: Yellow leaf blotch (Pyrenopeziza medicaginis).

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50 to 100 per cent of the plants bore one to 15 spots of downy mildew per plant. The other infestations were milder than these.

BACTERIAL BLIGHT (Phytomonas medicaginis (Sack.) Com. S.A.B.). A mild infestation of bacterial blight was found in a 15 acre field in Sweet Grass County.

MOSAIC (Virus). Traces of alfalfa mosaic were found in Gallatin and Fergus Counties.

WHITE SPOT (Unbalanced water relationships). Specimens of white spot of alfalfa were collected in Lewis and Clark, Gallatin, Park, and Sweet Grass Counties in 1928. It was not previously reported in Montana. This disease was described by Richards (1929) who kindly checked the identification of one Montana sample.

In Park County, 1 per cent of the plants in a 40 acre field had white spot. In other fields, scattered groups of plants were found to be affected.

Plants severely affected by white spot were abundant in a non-irrigated field in Gallatin County, so this abnormality is not always associated with irrigation. However, it was found only in an irrigated spot in a field near Helena. White spot was found only during May and June.

TIP BURN (Drouth?). The tips of the leaflets were brown and nearly dead on 0.25 per cent of the alfalfa plants in a 20 acre field in Lewis and Clark County. The plants occurred only in the unirrigated part of the field in contrast to plants with white spot which were found only in an irrigated part of this field. No serious amount of tip burn was found elsewhere. This resembles the marginal injury described by Richards (1929).

ALBINISM (Non-parasitic). This peculiar abnormality has occurred in Park County for more than ten years. G. A. Rassley, County Agricultural Extension Agent, sent in one collection of albino plants from Yellowstone County. Albino plants have been found only in the first crops of alfalfa each year, so calling the trouble a genetic abnormality is rather uncertain. However, since there are usually some normal leaves and stems produced by alfalfa plants that bear albino stems and leaves, perhaps these aberrant plants have the abnormality in genetic form, and express it only under the growing conditions of the first crop.

In severe cases, the stems and leaves are greatly dwarfed and slender, and are white, yellow, pink or purple in color. Such stems sometimes die prematurely, for they are entirely dependent upon the plants to which they are attached. In milder cases, normally green stems bear one to many white or yellow leaflets.

Albino plants were transplanted to the greenhouse in 1926. The new crop of stems and leaves were all normal and like the check plants so their behavior in the greenhouse was the same as it was in the field.

Albino plants were found in five fields of alfalfa in Park County in 1928. Traces to 1 per cent of albino plants occurred in four of these fields In the other field, 25 per cent of the plants in one acre at one end of the field were albino.

DODDER (Cuscuta sp.). R. B. Streets found alfalfa dodder at Bozeman in 1916, 1917, 1918. It was also found in western Montana.

OTHER PARASITES OF ALFALFA.

Urophlyctis alfalfae (Lagerh.) Magn. was found in Lake County by Braff (1928).

Rhizobium leguminosarum Frank commonly causes nodules on alfalfa roots.

SWEET CLOVER (Melilotus alba Desr., M. officinalis Lam. and M. indica All.)

1928: 7,000 acres; 31,500 bushels; $135,000.

Fields of yellow sweet clover exhibited no diseases.

LEAF SPOT (Septoria meliloti (Lasch.) Sacc.). Septoria leaf spot was found in white sweet clover growing along roads in Yellowstone and Treasure Counties. This appears to be the first report of it in Montana.

ALBINISM (Undetermined). In Sweet Grass County, one plant of white sweet clover showed symptoms of albinism resembling albinism of alfalfa. No previous reports of this abnormality are available.

WILT (Sclerotinia libertiana Fckl.). Diseased roots of sweet clover were sent to the laboratory in 1927. Cultures revealed Sclerotinia libertiana as the cause of the disease.

STEM ROT (Corticium vagum B. & C.). Reported in United States Department of Agriculture Bulletin 1366.

MOSAIC (Virus). Traces of mosaic were found in white sweet clover in Lewis and Clark Counties.

RED CLOVER (Trifolium pratense L.).

POWDERY MILDEW (Erysiphe polygoni DC.). Clover mildew was found in Gallatin, Ravalli, Missoula, and Flathead Counties. It was abundant at Bozeman and Missoula. Probably it is widely distributed in Montana. It is not serious.

ANTHRACNOSE (Gloeosporium caulivorum Kirch.). Anthracnose did great damage in three plots of red clover of the Agronomy Department at Bozeman. All the stems and most of the leaves, especially the upper ones, were affected. Spores finally appeared on the lesions in September, permitting the identification of the causal parasite. Anthracnose was so destructive that it is hoped that it will not invade commercial fields. Seed from Tennessee may have brought this disease into Montana.

RUST (Uromyces fallens (Desm.) Kern.)(Nigredo). Reported by Arthur (North American Flora 7: 830).

LEAF SPOT (Pseudopeziza trifolii (Biv.) Fckl.). Leaf spot was abundant on red clover in an apple orchard in Ravalli County. It is regarded as a dangerous parasite.

MOSAIC (Virus). Traces of mosaic were found in red clover in Gallatin and Ravalli Counties.

RING SPOT (Possibly virus). Traces of ring spot in red clover were found in an Agronomy Department plot at Bozeman. The identification of the disease was checked by Dr. S. A. Wingard, Plant Pathologist of the Virginia Experiment Station. Its affinities are unknown.

NODULES (Rhizobium leguminosarum Frank) are common on red clover. They are mainly beneficial.

ALSIKE CLOVER (Trifolium hybridum L.).

Erysiphe polygoni DC. in Gallatin County in 1919.
Septoria compacta Sacc. in Stillwater County.
Uromyces trifolii (Hedw.) Lev. Fifteen per cent of the plants in a 2 acre field in Stillwater County were rusted. The damage was slight.

WHITE CLOVER (Trifolium repens L.) pasture crop.

Erysiphe polygoni DC. in Sanders County in 1901.

Phyllachora trifolii (Pers.) Fckl. in Gallatin County.
Pucciniola nerviphila (Grognot) Arth. N.A.F.7: 843).
Uromyces trifolii (Hedw.) Lev. in Gallatin County in 1915 and 1928.

SUNFLOWER (*Helianthus annuus* L.)

The acreage of sunflowers in Montana has become very small.

WILT (*Sclerotinia libertiana* Fckl.). A few wilted plants were found in a small plot of sunflowers at Bozeman in 1928. Young and Morris (1927), Morris and Swingle (1921), and Swingle (1921) described this disease in Montana. The name *S. sclerotiorum* (Lib.) Mass. is incorrect on the basis of priority became *S. sclerotiorum* (Lib.) Schroet is two years older. This is not in common use, so the commonly known name, *S. libertiana* Fckl., is retained.

DOWNY MILDEW (*Plasmopara halstedii* (Farl.) Berl. & Detoni). Traces of downy mildew were found at Bozeman in 1928. This is quite a contrast to the condition in 1927 when 5 per cent of the plants in 5 acres of Mammoth Russian sunflowers at Bozeman were mottled and dwarfed by Plasmopara, with 25 per cent of the plants affected in one part of the field. This field was summer fallowed in 1928. Young and Morris (1927) and Young, Jellison and Morris (1929) described this disease in Montana.

RUST (*Puccinia helianthi-mollis* (Schw.) Jackson). Sunflower rust was found in Prairie County in 1928. It was previously reported in Gallatin, Ravalli, and Yellowstone Counties. It is not serious.

OTHER PARASITES OF CULTIVATED SUNFLOWERS.
Botrytis cinerea Pers. (head rot). Gallatin County in 1925.
Entyloma compositarum Farlow. (Kelsey, 1889).
Entyloma polysporum (Pk.) Farl. (United States Department of Agriculture Bulletin 1366).
Erysiphe cichoracearum DC. (Griffiths, 1899).
Macrosporium inquinans C. & E. (Anderson, 1889).
Penicillum sp. (green head mold). Gallatin County 1925.
Septoria helianthi E. & K. Yellowstone County in 1915. (Bartholomew, Fungi Columbiani No. 4984).

OTHER FIELD CROPS

FLAX (*Linum usitatissimum* L.)

1928: 196,000 acres; 1,666,000 bushels; $3,199,000.

No diseases were seen in four fields of flax aggregating 135 acres in Fallon and Rosebud Counties.

WILT (Fusarium lini Bolley). Flax wilt occurs in the eastern part of Montana and causes an annual loss of about 1 per cent. It was found in Roosevelt County in 1928. It was determined and studied experimentally at Bozeman in 1914 and 1915. Wilt damaged some common flax in Judith Basin County in 1926 according to A. C. Dillman, Flax Investigator, United States Department of Agriculture.

ANTHRACNOSE (Colletotrichum linicolum Peth. and Laf.). Anthracnose occurs in the eastern part of Montana, but serious damage is not ascribed to it. It was not reported in 1928.

HEAT CANKER (Nonparasitic). Although occasionally destructive, heat canker is usually not very serious. It occurs in the eastern part of Montana. Traces were found in Judith Basin County in 1928.

RUST (Melampsora lini (Schum.) Desm.). Mr. L. D. Kurtz, Extension Agronomist of Montana State College, found an infestation of 100 per cent rust in 40 acres of Budda flax in Roosevelt County. Traces of rust were found in the adjacent edge of a 125 acre field of Reserve flax. No rust was seen in a 6 acre field of Newland flax near the above fields.

Flax rust is common, but is usually not destructive. Melampsora lini occurs on Linum lewisii in Gallatin County. Flax rust was considered by Atkinson and Swingle (1911).

SAFFLOWER (Carthamus tinctorius L.).

BLACK ROOT (Undetermined). Black root disease was seriously abundant in 1927 and 1928 in experimental plots of safflowers on the Agricultural Experiment Station at Huntley. The symptoms consist of blackening of the tap roots, decay of branch roots, and browning and drying of the leaves. A species of Alternaria was isolated from diseased roots.

In 1928, three plots of one-quarter acre each at Huntley showed 2, 2, and 10 per cent of the plants killed by this disease. A species of Cladosporium was abundant on the dead leaves.

Research work on this root rot will be necessary when safflowers are grown commercially.

VETCH (Vicia spp.)

Aecidium porosum Pk. (Kelsey, 1889).
Kabatiella nigricans (Atk. & Edgert.) Karak.
Erysiphe polygoni DC. (Anderson, 1889).
Microsphaera alni Wallr. (Jones, 1910).
Nigredo fabae (Pers.) Arth. (N.A.F. 7:761).
Uromyces albus D. & H. Gallatin County 1900. (N.A.F. 7:450).
Uromyces hedysari-obscuri DC. Gallatin County 1898.

HEMP (Cannabis sativa L.)

WILT (Sclerotinia libertiana Fckl.). Resulted from root inoculations at Bozeman in 1925. It was described by Young and Morris (1927).

FRUITS

Swingle (1914) described fruit diseases in Montana.

APPLE (Pyrus malus L.)

SCAB (Venturia inaequalis (Cke.) Aderh.). Apple scab is abundant in western Montana. The annual damage in sprayed orchards is 5 to 8 per cent and is 25 per cent or more in unsprayed orchards. Scab caused about 5 per cent damage in sprayed orchards in 1928 in Ravalli, Lake, and Flathead Counties.

Thirteen apple orchards aggregating 835 acres were inspected in western Montana in 1928. Only traces of scab were seen in the well sprayed orchards in Ravalli County.

Morris (1914), Morris and Parker (1914), Cooley and Swingle (1912), Swingle and Morris (1907-1922), and Swingle (1909-1911) give information concerning apple scab in Montana.

BLIGHT (Erwinia amylovora (Burr.) Com. S.A.B.). In Bozeman, 20 to 70 per cent of the twigs on 175 trees were killed by blight. Near Missoula, 50 per cent of the twigs were killed in a 1-acre orchard, but none was seen in two orchards covering 120 acres. Near Hamilton, 70 per cent of the twigs were killed in a 1-acre orchard. However, little or no blight was seen in the large commercial orchards of western Montana in 1928. Blight has caused little commercial damage in this region since the most susceptible varieties were removed. Swingle (1910, 1911, 1914, 1921) described fire blight in Montana.

CANKER (*Valsa* spp.) (Cytospora spp.). Cytospora cankers were found in three orchards in Ravalli County. This disease is common in commercial orchards and is sometimes destructive. *Valsa leucostoma* is common.

CROWN GALL (*Phytomonas tumefaciens* (E.F.S. & Town.) Com. S.A.B.). Although crown gall did some damage in western Montana due to the importation of poor nursery stock, it has not been serious in recent years. It is present in many orchards. It was described by Swingle and Morris (1918).

BITTER PIT (Abnormal water relationship). Bitter pit was serious on scattered trees in an orchard in Ravalli County in 1910. The spots were large, and so severe that the apples were badly distorted. It was found at Billings in 1913.

WATER CORE (Physiological). Water core was found in Northwest Greening apples in Flathead and Ravalli Counties in 1910.

FRUIT CRACKING (Nonparasitic). Scattered trees in a few commercial orchards in Ravalli County bore some badly cracked fruit (Plate I,B). Spray burn was eliminated as a cause in most cases. This cracking was probably due to frost injury when the fruit was very small. McLarty (1928) has described such fruit cracking.

BROWN BARK SPOT (Nutritional disorder). Brown bark spot was abundant and destructive in western Montana for five years about 1910, but thereafter ceased to be destructive. It was described by Swingle and Morris (1921).

BLACK HEART (Winter injury). Blackening of apple heart wood is commonly seen in western Montana in most years and was abundant in 1906, 1910, 1917, and 1924 following severe winter injury to orchards.

OTHER PARASITES OF APPLES IN WESTERN MONTANA.

Neofabraea malicorticis (Cordley) Jack. (United States Department of Agriculture Bulletin 1366).

Fomes fomentarius (L.) Fr. (United States Department of Agriculture Bulletin 1366).

Podosphaera leucotricha (E. & E.) Salm. or *P. oxyacanthae* (DC.) DeBy. In western Montana.

PEAR (*Pyrus communis* L.)

Few pear trees grow in Montana. The following diseases have been reported on pears in western Montana.

BLIGHT (Erwinia amylovora (Burr.) Com. S.A.B.). Serious several years ago.

Fabraea maculata (Lev.) Atk. Leaf blight.
Venturia pyrina Aderh. scab. First found in western Montana in 1912.
Brown bark spot (Nutritional disorder).

SOUR CHERRY (Prunus cerasus L.)

POWDERY MILDEW (Podosphaera oxyacanthae (DC.) DeBy. Cherry mildew occurs as mild infestations in western Montana.

YELLOW LEAF (Nonparasitic). This abnormality has resulted in 5 to 25 per cent defoliation in a few Morello orchards in Ravalli County during recent years. It is practically absent in most orchards. Yellow leaf seems to be associated with winter injury and infertility of the soil.

GUMMOSIS (Sun scald and winter injury). Serious gummosis affects cherrie in Ravalli County, especially trees from 1 to 3 years old. Most of the injuries occur on the south and west sides of the trunks.

BROWN BARK SPOT (Nonparasitic). Reported by Swingle and Morris (1921).

LEAF SPOT (Undetermined). Leaf spots were common in one orchard of English Morello cherries in Ravalli County. They probably were not caused by Coccomyces. They were associated with the yellow leaf abnormality.

SWEET CHERRY (Prunus avium L.)

LEAF SPOT (Coccomyces hiemalis Hig.). Coccomyces was seriously abundant in Flathead County in about 1924. Partial defoliation injured some trees.

BROWN ROT (Sclerotinia fructicola (Wint.) Rehm.). Professor D. B. Swing found brown rot damaging sweet cherries along Flathead Lake in 1908. The seaso was unusually rainy and Sclerotinia grew in cracks in the ripening fruit. Brow rot has not been reported in Montana since that time. Apparently S. fructicola is usually unadapted to the conditions where cherries grow in Montana.

GUMMOSIS (Nonparasitic). Gummosis does annual damage to sweet cherries Flathead County.

CHOKE CHERRIES (Prunus melanocarpa (Nels.) Rydb.)

BLACK KNOT (Plowrightia morbosa (Schw.) Sacc.). Black knot is common on choke cherries in Gallatin County, Flathead County and in western Montana, and is sometimes destructive to this valuable species of native fruit tree. However, black knot has not been reported on Prunus cerasus or P. avium. Perhaps these cultivated species of Prunus are not susceptible to the form of Plowrightia morbosa that occurs on Prunus melanocarpa.

OTHER PARASITES ON CHOKE CHERRIES.

Coccomyces hiemalis Hig. Gallatin County, 1925. Flathead County, 1928.

Creonectria purpurea (L.) Seaver. Gallatin County.

Cytospora chrysosperma (Pers.) Fr. (United States Department of Agriculture Bulletin 1366).

Monilia seaveri Reade. Madison County, 1914.

Phyllosticta destruens Desm. Carbon County, 1915.

Phyllosticta virginianae (E.& H.) Seaver. (United States Department of Agriculture Bulletin 1366).

Phytomonas pruni (E.F.S.) Com. S.A.B.

Podosphaera oxyacanthae (DC.) DeBy. (Jones, 1910).

PLUM (Prunus domestica L. & P. americana Marsh.).

POWDERY MILDEW (Podosphaera oxyacanthae (DC.) DeBy.). Plum mildew was found in Flathead County in 1908 by Professor D. B. Swingle.

BLIGHT (Erwinia amylovora (Burr.) Com. S.A.B.). Fire blight damaged De Soto plums slightly at Bozeman in 1928.
It was serious on another tree of P. americana.

BACTERIAL SPOT (Phytomonas pruni (E.F.S.) Com. S.A.B.). Bacterial spot destroyed 60 per cent of the leaf area on two trees of compass plums at Billings in 1928.

POCKETS (Exoascus pruni (Berk.) Fckl., & E. communis Sadeb.). Swingle and Morris (1918) described the damage these fungi do in Montana. Specimens of E. pruni were collected in Yellowstone County in 1927.

LEAF CURL (Exoascus decipiens Atk.). Prunus americana in Fergus County was severely affected by leaf curl in 1928. It was described by Swingle and Morris (1918).

YELLOWS (Undetermined). One hybrid plum at the Agricultural Experiment Station at Corvallis, Ravalli County, bore clusters of yellow, dwarfed leaves.

These are like the symptoms of peach yellows.

PEACH (Amygdalus persica L.).

Peaches were cultivated near Flathead Lake about 1908, but are now rather rare in Montana.

MILDEW (Podosphaera oxyacanthae (DC.) DeBy.). Peach mildew was found in Flathead County in 1908.

BACTERIAL SPOT (Phytomonas pruni (E.F.S.) Com. S.A.B.). Bacterial spot was found on peach leaves in Flathead County in 1908.

LEAF CURL (Exoascus deformans (Berk.) Fckl.). Peaches in Flathead County were seriously injured by leaf curl in 1908 and 1912.

BLACK RASPBERRY (Rubus occidentalis L.).

MOSAIC (Virus). Mosaic was found in Yellowstone and Ravalli Counties in 1928. It was not serious.

RUST (Gymnoconia interstitialis (Schl.) Lagh.). Rust was found in Bozeman in 1910.

LEAF SPOT (Didymosphaeria manitobensis E. and E.). Collected in Lake County, August 28, 1928 by W. L. Jollison on Rubus leucodermis Dougl. which is considered by some as a variety of R. occidentalis. First report from Montana.

BRAMBLE STREAK (Virus). Bramble streak was found on two stems of black cap raspberries at the Agricultural Experiment Station at Huntley.

RED RASPBERRY (Rubus idaeus L.)

MOSAIC (Virus). Mild mosaic affected 90 per cent of the plants in a one-acre field of Latham and King raspberries at Missoula, but appeared to be doing no serious damage yet. Mosaic was also found in red raspberries at Billings.

PURPLE RASPBERRY (Rubus neglectus Peck.)

MOSAIC (Virus). Mosaic was found in a small patch of purple raspberries in Ravalli County.

DEWBERRY (Rubus flagellaris Willd.)

LEAF SPOT (Mycosphaerella rubi Roark) Collected by H. M. Jennison, August 25, 1916, at Glendive. Determined by P. A. Young, April 22, 1929. Apparently first authentic record for state.

MOSAIC (Virus). Mosaic was found in Ravalli County.

LOGANBERRY (Rubus loganobaccus Bailey).

Mosaic was found on Loganberry in Ravalli County.

BLACKBERRY (Rubus allegheniensis Porter).

CROWN GALL (Phytomonas tumefaciens (E.F.S. & Town.) Com. S.A.B.). Crown gall was found on blackberries in Ravalli County in 1916. It was also found in Flathead County. Swingle and Morris (1918) discussed crown gall.

RUST (Gymnoconia interstitialis (Schl.) Lagh.). Rusted blackberries were found in Bozeman in 1908.

STRAWBERRY (Fragaria vesca L. in part)

YELLOWING (Virus). Yellow, Everbearing strawberries were found in Ravalli, Gallatin and Yellowstone Counties in 1928. A few yellow Parson's Pride strawberries were found in Flathead County. Yellow strawberry plants have occurred in Ravalli County for more than five years. They were found in Lewis and Clark Counties in 1925 and in Pondera and Sweet Grass Counties in 1926.

Everbearing strawberries from Ravalli and Gallatin Counties were grown in the greenhouse at Bozeman for six months and constantly showed the symptoms of general and marginal flavescence (Young and Morris (1928)) and diffuse mottling.

Yellowing caused considerable damage in Ravalli County in 1928. There the strawberries in six fields aggregating 25 acres showed some yellowing in 39 per cent of the plants. This percentage was probably too low because the inspections were made in August when the symptoms were partially masked by hot weather.

A garden patch of strawberries in Missoula County showed yellowing in 30 per cent of the plants. Some yellow plants were found in a truck garden near Billings. These plants had come from Ravalli County. Two garden patches of strawberries near Bozeman contained so many yellow plants that they were nearly worthless.

The characteristic symptoms of the yellowing disease are marginal flavescence and diffuse mottling of leaves, dwarfing, reduced yields, too many stems, and usually a general flavescence of the plants. Stunting is severe in badly affected plants. These symptoms are very similar to those described by Plakidas (1927) for strawberry xanthosis. Experiments are now planned to determine if this yellowed condition and xanthosis are identical. Controlled transmission experiments in Montana have not yet been made.

BACTERIAL LEAF SPOT (Undetermined). A bacterial leaf spot of standard varieties of strawberries was found in Ravalli County in 1927 and 1928, and in Gallatin County in 1928. It is not yet serious. All the plants were affected by this disease in a small patch at Hamilton. It resembles the strawberry leaf spot described by Linford (1928).

The leaf spots are brown and angular, single spots often affecting half or large parts of the leaflets. Yellow droplets of bacterial exudate sometimes occur hypophyllously on the main veins. Large hypophyllous areas are brown or purple.

LEAF SPOT (*Mycosphaerella fragariae* (Tul.) Lind.). Mild infestations of strawberry leaf spot were found in Rosebud and Flathead Counties. It was previously found in Sanders (in 1909) and Ravalli Counties. A similar leaf spot is common on wild strawberries in Gallatin County.

LEAF SCORCH (*Diplocarpon earliana* (E. & E.) Wolf). W. L. Jellison found wild strawberries in Flathead County affected with leaf scorch. It is reported in United States Department Bulletin 1366.

POWDERY MILDEW (*Sphaerotheca humuli* (DC.) Burr.). Powdery mildew was found in Bozeman (greenhouse) in 1928 and in Ravalli County in 1916.

ASCOCHYTA COLORATA Pk. Dr. F. D. Kelsey found it on *Fragaria vesca* in Helena in 1888.

SERVICE BERRY (*Amelanchier alnifolia* Nutt. and *A.* spp.)

This is a valuable native fruit tree.

Aecidium cornutum (Jones, 1910).

Dimerosporium collinsii (Schw.) Thuem. Gallatin County. Common.

Erysiphe polygoni DC. (Kelsey, 1889; U. S. D. A. Bulletin 1366).

Fabraea maculata (Lev.) Arth. (Kelsey, 1889).

Gymnosporangium clavariaeforme (Jacq.) DC. (N.A.F. 7: 825, Seymour, 1889).

Gymnosporangium nelsoni Arth. (N.A.F. 7: 826; Gallatin County in 1898, Jones, 1910).

Plowrightia morbosa (Schw.) Sacc. (U. S. D. A. Bulletin 1366).

HAWTHORN (*Crataegus spp.*)

Cylindrosporium brevispina Dearn. (U.S.D.A.Bulletin 1366).
Gymnosporangium betheli Kern. (N.A F.).
Gymnosporangium germinale (Schw.) Kern. (N.A.F. 7: 739).
Gymnosporangium tubulatum Kern. Gallatin County, 1898. (N.A.F.).
Phyllactinia corylea (Pers.) Karst. Gallatin County, 1919. (Griffiths, 1889).
Roestelia lacerata (Sow.) Fr. (Seymour, 1889).
Roestelia tubulata Kern. (Jones, 1910).

CURRANT (*Ribes sativum* Syme)

ANTHRACNOSE (*Pseudopeziza ribis* Kleb.). Found in Gallatin County in 1926 and in Chouteau County in 1927. Common on *Ribes saxosum* in Gallatin County.

POWDERY MILDEW (*Saphaerotheca mors-uvae* (Schw.) B. & C.). A serious mildew occurred on the fruit of red currants in Ravalli County in 1927.

NECTRIA CINNABARINA (Tode) Fr. On currant stems in Bozeman, 1928. Silver Bow County, 1926.

MOTTLED LEAVES. Prominently mottled currant leaves were collected in Meagher and Silver Bow Counties in 1926.

BLACK CURRANT (*Ribes nigrum* L.)

POWDERY MILDEW (*Microsphaera grossulariae* (Wall.) Lev.). F. W. Anderson collected it in Cascade County about 1888.

GOOSEBERRY (*Ribes grossularia* L.)

POWDERY MILDEW (*Sphaerotheca mors-uvae* (Schw.) B. & C.). Reported from Yellowstone County in 1908 and Missoula County in 1915.

HUCKLEBERRY (*Vaccinium spp.*)

The berries of Vaccinium are valuable as wild fruit in Montana. The parasites are:

Calyptospora columnaris (A. & S.) Kuehn. Gallatin (Jones, 1910; N.A.F. 7: 682 and 819).
Exobasidium vaccinii (Fckl.) Wor. Gallatin County 1898.

Pucciniastrum myrtilli (Schum.) Arth. (N.A.F. 7: 818).
Rhytisma vaccinii (Schw.) Fr. Gallatin County.

ORNAMENTAL PLANTS

BUFFALOBERRY (Shepherdia argentea Nutt. & S. canadensis (L.) Nutt.). Buffaloberries are commonly used in jellies.

Dicaeoma allenii (Clint.) A.& F. Gallatin County 1900. (N.A.F. 7: 786).
Puccinia coronata Cda. (N.A.F. 7: 313).
Sphaerotheca humuli (DC.) Burr. (U.S.D.A. Bulletin 1366).

CARNATION (Dianthus caryophyllus L.)

Uromyces caryophyllinus (Schrank.) Wint. In greenhouse at Bozeman. Common.

CHINA ASTER (Callistephus chinensis Nees.)

YELLOWS (Virus). A few asters with yellows were found at Billings. The florist said that it sometimes destroyed his patches of asters.

COLUMBINE (Aquilegia spp.)

Dicaeoma clematidis (DC.) Arth. (N.A.F. 7: 333).
Erysiphe polygoni DC. (Before 1928).
Puccinia elymi Westend. (N.A.F. 7: 333).
Puccinia obliterata Arth. Gallatin County. (Before 1928).
Sphaerella aquilegiae E. & G. (Ellis & Galloway, 1889).

GLADIOLUS (Cultivated species)

MOSAIC (Virus). Mosaic was present in 1 per cent of the gladiolus plants in one nursery at Billings in 1928.

GOLDEN GLOW (*Rudbeckia laciniata* L.)

The following parasites have been collected on golden glow in Montana during previous years:

Aecidium compositarum Mart. (Before 1928).
Ramularia rudbeckiae Pk. (U. S. D. A. Bulletin 1366).
Uromyces perigynius Hals. (U.S.D.A.Bulletin 1366). (N.A.F. 7: 752).
Uromyces rudbeckiae A. & H. (N.A.F. 7: 519).

HOLLYHOCK (*Althaea rosea* Cav.)

RUST (*Puccinia malvacearum* Bert.). Serious on the hollyhocks on the Experiment Station at Huntley. It was also found in Ravalli, Lewis and Clark, Missoula, and Flathead Counties.

IRIS (*I. missouriensis* and cultivated spp.)

Didymellina iridis (Desm.) Hoehn. Yellowstone, Missoula and Ravalli Counties.
Macrosporium iridis C. & E. (Anderson, 1889).
Macrosporium iridicolum E. & E. Gallatin County 1928.

LARKSPUR (*Delphinium sp.*)

Puccinia clematidis (DC.) Lagh. (U.S.D.A. Bulletin 1366).

LIGUSTRUM SP.

Puccinia ligustri E. & E. (N.A.F. 7: 552).

RED OSIER (*Cornus stolonifera* Michx.)

Phyllosticta corylea (Pers.) Karst. (Seymour, 1889).
Puccinia acuminata Pk. (On *Cornus canadensis* L.) (Jones, 1910).
Septoria cornicola Desm. Gallatin County, 1913.

PETUNIA (*P. violacea* Lindl.)

Mosaic. A mild mosaic of petunia is common in the greenhouse at Bozeman.

ROSA (Cultivated and Wild Species)

The following species of fungi were collected on roses in Montana between 1888 and 1928.

DWARFING RUST (Ameris rosicola Arth). (Uromyces). Two stems of a wild rose near Bozeman were severely rusted and dwarfed in both stems and leaves, resembling raspberries rusted by Gymnoconia in their dwarfing and distortion.

OTHER FUNGI.

Diplocarpon rosae Wolf. Park County. In greenhouses. Not serious.
Phragmidium disciflorum (Tode) James. Ravalli County, 1914.
P. montivagum Arth. Common. (Jones, 1910).
P. mucronatum (P.) Lk. (Seymour, 1889).
P. rosae-acicularis Liro. Sanders County, 1901. (N.A.F.).
P. rosae-arkansanae Diet. on Rosa woodsii. Common.
Collected in Gallatin, Flathead, Blaine and Phillips Counties in 1898 to 1915. Determined by J. C. Arthur and H. S. Jackson in 1915. (N.A.F.7:823).
P. rosae-setigerae Diet. Gallatin County.
P. subcorticinum Mull. (Jones, 1910).
Sphaerotheca pannosa (Wall.) Lev. Park County.

SNAPDRAGON (Antirrhinum majus L.)

RUST (Puccinia antirrhini Diet. & Holw.). Collected at Billings in 1928. Occurs in a greenhouse at Bozeman.

WILT (Undetermined). A florist at Billings said that this disease is very destructive with him, and is serious elsewhere in the United States. Only one specimen was found then.

SNOWBERRY (Symphoricarpos albus Blake and spp.)

Native and cultivated snowberries in Montana bear the following fungi:
Aecidium abundans Pk. (Kelsey, 1889; Jones, 1910).
Cercospora symphoricarpi E. & E. Gallatin County, 1913; Valley County, 1900.
Microsphaera diffusa C. & P. (Kelsey, 1889; Anderson, 1889).
Plowrightia symphoricarpi E. & G. (Anderson, 1889).
Puccinia crandallii P. & H. Gallatin and Missoula Counties. (N.A.F. 7: 328).
Puccinia symphoricarpi Hark. (Jones, 1910; N.A.F. 7: 570).
Septoria symphoricarpi E. & E. Gallatin County, 1913. (U.S.D.A. Bulletin 1366).

SPIRAEA (S. lucida Dougl. and Sp.)

Cylindrosporium filipendulae Thuem. Gallatin County, 1913.
C. salicifoliae (Tul.) Davis. Gallatin County.
Septoria salicifoliae (Trel.) E. & E. (Jones, 1910).

VIOLET (Viola spp.)

Puccinia violae DC. (Kelsey, 1889) (Jones, 1910; N.A.F. 7:393).

TRADESCANTIA (Cult. sp.)

Leaf spot. A translucent (bacterial?) leaf spot was common in the greenhouse at Bozeman from 1925 to 1928.

DECIDUOUS TREES EXCEPT FRUIT TREES

ALDER (Alnus tenuifolia Nutt. and Sp.)

Cylindrosporium sp. (U.S.D.A. Bulletin 1366).
Cytospora umbrina (Bon.) Sacc. Gallatin County, 1913. (Fungi Columbiani No. 4317).
Exoascus spp. (U.S.D.A. Bulletin 1366).
Fomes igniarius (L.) Fr. (U.S.D.A. Bulletin 1366).
Microsphaera alni (Wallr.) Lev.
Phyllactinia corylea (Pers.) Karst. (Griffiths, 1899).

ASH (Fraxinus campestris Britt. & F. lanceolata Borck).

Puccinia fraxinata Arth. Big Horn County, 1901. (N.A.F. 7: 316).

BIRCH (Betula fontinalis Sarg. (B. occidentalis).

Fomes igniarius (L.) Fr. (U.S.D.A. Bulletin 1366).
Melampsoridium betulae (Schum.) Arth. (N.A.F. 7: 680).
Phyllactinia corylea (Pers.) Karst. (Kelsey, 1889; U.S.D.A. Bulletin 1366).

RIVER BIRCH (Betula glandulosa Michx.)

Daldinia concentrica (Bolt.) Ces. & deNot. Gallatin County, 1928.
Melampsoridium betulae (Schum.) Arth. (Jones, 1910; N.A.F. 7:818).

MAPLE (Acer glabrum Torr)

LEAF SPOT (Phyllosticta minutissima E. & E.).
Common and sometimes destructive in Gallatin and Park Counties.
Cylindrosporium acerinum Tracy & Earle. Gallatin County 1898.
Cytospora chrysosperma (Pers.) Fr. (U. S. Bul. 1366).
Phyllosticta minutissima(E. & E.).
Rhytisma acerinum (Pers.) Fr. Gallatin County. (Before 1928).
Septoria saccharina occidentalis E. & E. (Jones, 1910).

VINE MAPLE (Acer circinatum (Pursh)

Cytospora chrysosperma (Pers.) Fr. (U. S. Bulletin 1366).

BOX ELDER (Acer negundo L.)

Septoria acerella Sacc. (U.S. Bulletin 1366).

MOUNTAIN ASH (Sorbus spp.)

Cytospora chrysosperma (Pers.) Fr. Gallatin County, 1916. Common and serious disease.
Eutypella sorbi (Schm.) Sacc. Park County, 1927.
Gymnosporangium cornutum (Pers.) Arth. (U.S. Bulletin 1366).
G. nelsoni Arth. (N.A.F. 7:742).
G. juniperinum (L.) Mart. Gallatin County, 1892.
Valsa leucostoma (Pers.) Fr. (U.S. Bulletin 1366).

POPLARS (Populus spp.)

CANKER (Cytospora chrysosperma (Pers.) Fr.). Cytospora canker is common and very destructive to poplars in Montana. Kelsey (1889) reported it.

BLIGHT (Undetermined). A serious leaf and twig blight occurs on Populus tremuloides Michx. in Gallatin County.

CROWN GALL (Phytomonas tumefaciens (E.F.S. & Town.) Com. S.A.B.). Crown gall was reported by D. B. Swingle on Populus angustifolia James in Yellowstone County several years ago.

OTHER PARASITES

Achlya americana Humph. - (Graff, 1928).
Blastocladia ramosa Thax. - (Graff, 1928).
Cenangium sp. - Gallatin County, 1899.
Chlorosis (Physiological). Common and serious. Gallatin County.
Cryptosphaeria millepunctata Grev. - (Anderson, 1889).
Dermatea populina Schw. - (Kelsey, 1889).
Diatrype bullata (Hoff.) Fr. (In herbarium at Bozeman).
Dimerosporium populi E. & E. (Kelsey, 1889).
Fomes everhartii (E. & G.) Schrenk. (U.S.D.A. Bulletin 1366).
Hypocrea richardsoni B. & M. (Kelsey, 1889).
Marssonia castagnei (D. & M.) Sacc. Gallatin County. (Before 1928).
Melampsora albertensis Arth. (N.A.F. 7: 665). Gallatin and Ravalli Counties.
M. medusae Thuem. (Jones, 1910) et al. Bozeman, 1898.
M. occidentalis Jackson (N.A.F. 7:666).
M. populina (Jacq.) Lev. (Kelsey, 1889).
Phyllosticta brunnea Dearn. & Barth. (U.S.D.A. Bulletin 1366: N.A.F. 6: 70).
Septoria musiva Pk. (In Bozeman, 1928).
Uncinula salicis (DC.) Wint. (Kelsey, 1889).
Valsa nivea (Hoff.) Fr. (Gallatin County, 1899).
Zygodesmus obtusus E. & E. (Anderson, 1889).

WILLOWS (Salix spp.)

Cenangium sp. Gallatin County, 1899.
Lachnella flammea (A. & S.) Fr. Gallatin County, 1898.
Marssonia apicaulis E. & E. Gallatin County, 1899.
Melampsora albertensis Arth. Gallatin County. Fungi Columbiani Nos.4329, 4548.
M. arctica Rostr. Gallatin County, 1898 and 1907.
M. bigelowii Thuem. Gallatin County, 1898. (N.A.F. 7: 100,666).
M. confluens (Pers.) Jackson. (N.A.F. 7:667). (Jones, 1910).
M. humboldtiana Speg. (N.A.F. 7:669).
M. salicina (Seymour, 1889).
M. salicis (Anderson, 1889).
M. salicis capreae (Pers.) Wint. at Helena, 1888.
Rhytisma salicinum Fr. (Kelsey, 1889). Gallatin County, 1900.
Septogloeum maculans. Hark. Gallatin County, 1925.
Septoria salicis Westd. Gallatin County.
Uncinula salicis (DC.) Wint. (Kelsey, 1889; Anderson, 1889).
Valsa salicina (Pers.) Fr. Gallatin County. (Before 1928).
Volutella occidentalis minor E. & A. (Ellis and Anderson, 1891).

CONIFERS

LIMBER PINES (Pinus flexilis James and P. albicaulis Engelm.)

Arceuthobium cyanocarpum Nels. Gallatin County.
Herpotrichia nigra Hart. Gallatin County.
Lophodermium pinastri (Schr.) Chev. Gallatin County.
Razoumofskya laricis Piper. (U.S.D.A. Bulletin 1366).

WESTERN WHITE PINE (Pinus monticola Dougl.)

Dasyscypha fuscosanguinea Rehm. Mr. C. R. Stillinger, Associate Pathologist, U. S. Department of Agriculture, kindly loaned a manuscript in which he has described the ravages of this parasite. He found 50 per cent of the trees in one group damaged by Dasyscypha in Glacier National Park in 1921. It is a facultative parasite causing a disease with symptoms similar to those of blister rust.

Other parasites on western white pine are:
Lophodermium pinastri (Schrad.) Chev. (U.S.D.A. Bulletin 1366).
Rhizina inflata (Schaeff.) Sacc. (U.S.D.A. Bulletin 1366).
Sparassis radicata Weir. (U.S.D.A. Bulletin 1366).

LODGEPOLE PINE (Pinus murrayana Oreg. Comm.)

Arceuthobium americanum Nutt. Gallatin County.
Coleosporium solidaginis (Schw.) Thuem. (U.S.D.A. Bulletin 1366 and N.A.F. 7:655.).
Cronartium coleosporioides (Diet. & Holw.) Arth. (U.S.D.A. Bulletin 1366).
C. harknessii (Moore) Mein. (U.S.D.A. Bulletin 1366).
C. pyriforme (Pk.) Hedge. & Long. (U.S.D.A. Bulletin 1366).
C. stalactiforme Arth. Glacier County.
Didymosphaeria euryasca E. & G. (Anderson, 1889).
Fomes pinicola Fr. (U.S.D.A. Bulletin 1366).
Peridermium montanum A. & K. Gallatin County, 1900.
Rhizina inflata (Schaeff.) Sacc. (U.S.D.A. Bulletin 1366).
Trametes pini (Brot.) Fr. (U.S.D.A. Bulletin 1366).

WESTERN YELLOW PINE (Pinus ponderosa Dougl.)

Arceuthobium americanum Nutt. (U.S.D.A. Bulletin 1366).
Cenangium abietis (Pers.) Rehm. (U.S.D.A. Bulletin 1366).
C. piniphilum Weir. (U.S.D.A. Bulletin 1366).
Cronartium pyriforme (Pk.) Hedge. & Long. (U.S.D.A. Bulletin 1366).

Cronartium filamentosum (Pk.) Hedgc. & Long. (U.S.D.A. Bulletin 1366).
C. stalactiforme Arth. (U.S.D.A. Bulletin 1366).
Hypoderma deformans Weir. (U.S.D.A. Bulletin 1366).
Olpidium pendulum Zopf. (Graff, 1928).
Polyporus schweinitzii Fr. (U.S.D.A. Bulletin 1366).
Peridermium pini. (Jones, 1910).
Rhizina inflata (Schaeff.) Sacc. (U.S.D.A. Bulletin 1366).
Trametes pini (Brot.) Fr. (U.S.D.A. Bulletin 1366).

SPRUCES (Picea pungens Engelm. and P. engelmannii (Par.) Engelm.)

Chrysomyxa weirii. Jackson (N.A.F. 7:690).
Echinodontium tinctorium E. & E. (U.S.D.A. Bulletin 1366).
Fomes pinicola Fr. (U.S.D.A. Bulletin 1366).
Herpotrichia nigra Hart. Gallatin County.
Melampsoropsis pyrolae (DC.) Arth. (N.A.F. 7: 688).
Peridermium coloradense (Diet.) Arth. (N.A.F. 7:647).
Razoumofskya douglasii microcarpa Engelm. (U.S.D.A. Bulletin 1366).
R. laricis Piper. (U.S.D.A. Bulletin 1366).
Sparassis radicata Weir. (U.S.D.A. Bulletin 1366).
Trametes pini (Brot.) Fr. (U.S.D.A. Bulletin 1366).

JUNIPERS (Juniperus Spp.)

Cenangella deformata (Pk.) Sacc. Madison County.
Crucibulum vulgare Tul. (Anderson, 1889).
Herpotrichia nigra Hart. Gallatin County.
Gymnosporangium botheli Kern. Gallatin County.
G. clavariaeforme (Jacq.) DC. (N.A.F. 7:825.)
G. juvenescens Kern. (N.A.F. 7:824).
G. nelsoni Arth. (N.A.F. 7:742).
G. tubulatum Kern. (N.A.F. 7:738).

WESTERN LARCH (Larix occidentalis Nutt.)

Dasyscypha fuscosanguinea Rehm. Reported in Glacier National Park by C. R. Stillinger. (See western white pine).
Fomes officinalis Fr. (U.S.D.A. Bulletin 1366).
Hypodermella laricis Tub. (U.S.D.A. Bulletin 1366).
Razoumofskya laricis Piper (U.S.D.A. Bulletin 1366).
Sparassis radicata Weir. (U.S.D.A. Bulletin 1366).

DOUGLAS FIR (Pseudotsuga mucronata (Raf.) Sudw.)

Echinodontium tinctorium E. & E. (U.S.D.A. Bulletin 1366).
Fomes officinalis Fr. (U.S.D.A. Bullotin 1366).
Herpotrichia nigra Hart. Gallatin County, 1925.
Melampsora albertensis Arth. (N.A.F. 7:665).
Polyporus schweinitzii Fr. (U.S.D.A.Bulletin 1366).
Rhabdocline pseudotsugae Syd. Gallatin County, 1928. (First Report).
Sapromyces reinschii (Schr.) Frit. (Graff, 1928).
Sparassis radicata Weir. (U.S.D.A. Bulletin 1366).
Trametes pini (Brot.) Fr. (U.S.D.A. Bulletin 1366).

HEMLOCK (Tsuga heterophylla (Raf.) Sarg.)

Echinodontium tinctorium E. & E. (U.S.D.A. Bulletin 1366).
Uredo holwayi Arth. (N.A.F. 7:606).

GIANT ARBORVITAE (Thuja plicata Donn.)

Poria weirii Murr. U.S.D.A. Bulletin 1366 reports it throughout range of host. This is a forest tree in western Montana.

GREAT SILVER FIR (Abies grandis Lindl.)

Calyptospora columnaris (Alb. & Schw.) Kuehn. (U.S.D.A. Bulletin 1366).
Echinodontium tinctorium E. & E. (U.S.D.A. Bulletin 1366).
Melampsora arctica Rostr. (U.S.D.A. Bulletin 1366).
Pucciniastrum pustulatum (Pers.) Diet. (U.S.D.A. Bulletin 1366; N.A.F. 7:677).
Rhizina inflata (Schaeff.) Sacc. (U.S.D.A. Bulletin 1366).
Uredinopsis pteridis Diet. & Holw. (U.S.D.A. Bulletin 1366).

ALPINE FIR (Abies lasiocarpa (Hook.) Nutt.)

Calyptospora columnaris (Alb. & Schw.) Kuehn. (N.A.F. 7: 682).
Echinodontium tinctorium E. & E. (U.S.D.A. Bulletin 1366).
Melampsora arctica Rostr. (U.S.D.A. Bulletin 1366).
Melampsorella elatina (Alb. and Schw.) Arth. (U.S.D.A. Bulletin 1366).
Peridermium ornamentale Arth. (N.A.F. 7:646).
Pucciniastrum pustulatum (Pers.) Diet. (N.A.F. 7:677).
Razoumofskya laricis Piper. (U.S.D.A. Bulletin 1366).

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Explanation of Plate I.

A. Left, leaf of Bliss Triumph potato showing symptoms of curly mosaic. Right, leaf of a normal Bliss Triumph potato.

B. McIntosh apples showing nonparasitic cracking and dwarfing.

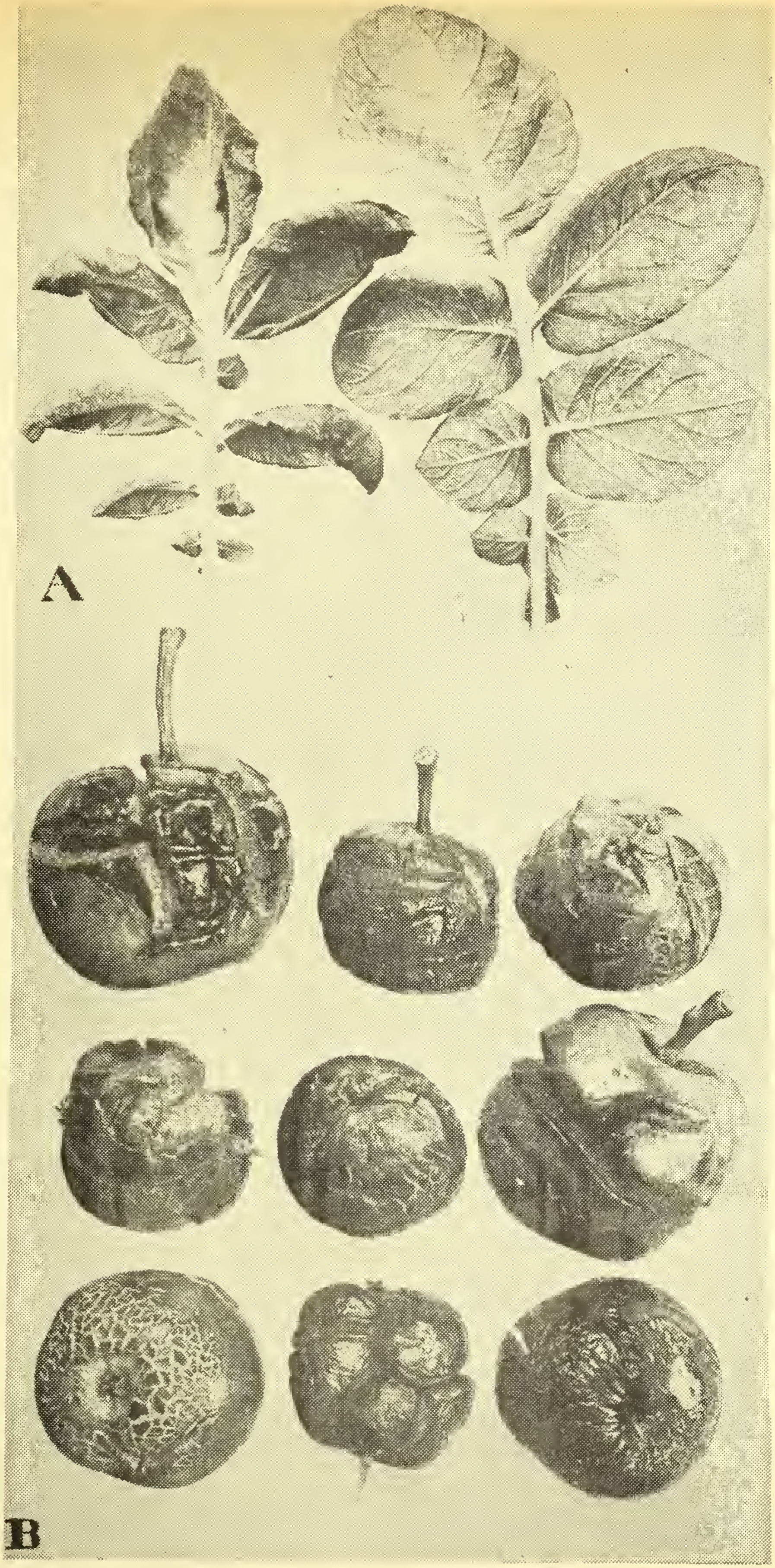

PLATE I

THE PLANT DISEASE REPORTER

ISSUED BY

THE OFFICE OF MYCOLOGY AND DISEASE SURVEY

Supplement 70

Diseases of Fruit and Nut Crops

In the United States in 1928

June 1, 1929

BUREAU OF
PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

DISEASES OF FRUIT AND NUT CROPS IN THE UNITED STATES IN 1928

Prepared by

R. J. Haskell, Pathologist in Charge,
Plant Disease Survey, Office of Mycology and Disease Survey,
Bureau of Plant Industry

Plant Disease Reporter
Supplement 70

CONTENTS

INTRODUCTION

In this summary, an attempt has been made to present as true a picture of the fruit disease situation in 1928 as the information received by the Plant Disease Survey will permit. Naturally, accuracy in the reproduction of such a picture depends not only on the summarizer but on the quantity and quality of information available. In the case of several of the more important diseases of common crops sufficient data are available to warrant some general conclusions with regard to their prevalence, but in many cases, the information is inadequate for such generalities and only fragments of what is considered the more important matter can be presented. Brevity and the reduction of the length of the report have been borne in mind.

This summary is based principally on reports from the following sources: collaborators of the Plant Disease Survey; other plant specialists working for the States or the Federal government in the States, and articles in the literature of the year.

The persons mentioned in the following list have furnished practically all of the original data for this particular summary on fruit diseases. Names with an asterisk (*) are of those who do not hold official appointments as collaborators.

Collaborators and Cooperators

Maine
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*D. C. Neal

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*D. F. Fisher

Oregon
H. P. Barss
S. M. Zeller
*F. C. Reimer

California
*D. G. Milbrath

FRUIT DISEASES OF 1928

DISEASES OF POME FRUITS

APPLE

SCAB, VENTURIA INAEQUALIS (CKE.) ADERH.

Scab was considerably more prevalent and destructive in the northeastern section of the country and in the Great Lakes Region than usual. In New England and the Hudson Valley it was very abundant and the cause of much loss. This was largely true of the other eastern sections although the commercial orchards in the Shenandoah Valley area around Winchester and Martinsburg seemed to be relatively free. Some of the following collaborators' reports will give an idea of the situation with regard to prevalence.

Massachusetts: Unusually prevalent on McIntosh during 1928 season. Only those orchardists who have used utmost precautions have secured good control. (W. H. Thies)

New York: Serious losses in both western New York and Hudson Valley. About same as 1927 in western New York, much more in Hudson Valley. (W. D. Mills)

New Jersey: A survey of 118 orchards in 17 counties showed an average of 5.2 per cent scab. Most of these orchards were sprayed under the general direction of the county agents. The amount of scab varied from 0.7 to 12.5 per cent in the various counties. Spore discharge took place earlier than 1927. This year the delayed dormant application was important in the control of the disease. (W. H. Martin)

Maryland: In all unsprayed orchards scab is very severe and most fruit is worthless. There was very little scab in most commercial orchards where information sent out by the spray service was used. The total loss from scab in the State will be very small.

Virginia: Has developed rapidly during June as a result of heavy rainfall and cool weather. The Winchester section is notably free from scab but the lower sections of the Valley of Virginia will probably suffer greater losses this year than in any year since 1924. A very heavy secondary infection appeared about July 6. (Schneiderhan)

West Virginia: In the earlier part of the season the infection was fairly abundant on the leaves and seemed to point toward severe damage. At the end of the year, however, infection was not as severe as had been expected. The commercial crop showed a low percentage of damaged apples and even in some neglected orchards much of the fruit was clean. The wild crab Pyrus coronaria, was moderately infected. (Archer)

North Carolina: Much more severe in mountain orchards as well as throughout the State than during 1927. In some unsprayed orchards the infection amounted to 100 per cent with very poor quality fruit resulting. (Poole & Fant)

Apple - Scab

Arkansas: Very abundant on fruit and leaves. More on fruit stems than usual.

Indiana: Calyx and 2 weeks sprays important this year because of incessant rains beginning during full bloom and lasting about 6 weeks. Winesap receiving pink but no calyx spray, 38 per cent fruit scabby; Winesap receiving pink + calyx spray, 1.7 per cent fruit scabby; Stayman no calyx spray, 12 per cent scab; Stayman sprayed, 1 per cent scab. (Gardner)

Illinois: Very serious now throughout the State. Dry weather early in the season prevented early scab infection except in extreme south where pedicel infection was common. Heavy rains in late May and early June started another infection period which became extremely serious since orchardists are not able to spray. Leaf and fruit infection both serious. (H. W. Anderson, July 1)

Minnesota: First reported July 2. Both primary and secondary infestation present at this time. Dry weather up to week of June 16 prevented development. Common in orchards at present time but doing little damage. (Sect. Pl. Path., Aug. 1)

Wisconsin: Very little early scab. Development dependent on rains. One or two additional sprays in July resulted in good control. Regular 4-spray program gave poor control. (Vaughan)

Iowa: Very prevalent and severe on unsprayed trees. It came on early and has been increasing in severity. (R. H. Porter, Aug. 20)

Missouri: Found to be quite generally present in home orchards where little effort is made to control it. Commercial orchards show but slight infection. (Scott)

Montana: Well controlled in sprayed orchards in Bitter Root and Flathead Sections, but serious in unsprayed orchards. No late-season infections seen. (H. E. Morris & P. A. Young)

Washington: None east of the Cascades. (Dept. Pl. Path.)

Oregon: Loss this year due mostly to infection of floral parts during blossom period preventing set of fruit. Much more severe in Willamette Valley than other localities. (Zeller)

Apple - Scab

Table 48. Percentage losses from apple scab as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
35	Georgia	3	Maryland, Ohio, Indiana
30	New York, New Hampshire	2.5	Virginia
17	Michigan	2	Kansas, Montana, North Dakota
10	Kentucky, Tennessee	1.5	Arkansas
8	Massachusetts, New Jersey	1	West Virginia, Missouri
7	Iowa	.5	Mississippi

Data on ascospore discharge will be found in The Plant Disease Reporter (12: 1-6, 14-15, 25-27, 37-38. 1928.)

Table 49. Data on varietal susceptibility of apples to scab as compiled from collaborators' reports, 1928. (It will be noted that the same varieties are sometimes rated differently by collaborators of different States.)

Varieties very susceptible	Susceptible	Resistant
McIntosh (1) (2) (3) (4) (6) (7)	Stayman (5)	Baldwin (1)
Ben Davis (4)	Arkansas Black (5)	Yates (5)
Gano (4)	Winesap (5) (7)	Terry (5)
Delicious (6)	Wealthy (6)	Yellow Transparent (6)
Stayman (6)	Duchess (6)	Golden Delicious (6)
Winesap (6)	Northern Spy (6)	
Rome (6)	Golden Delicious (7)	
Bonum (6)	Turley (7)	
	Grimes (7)	

(1) O. Butler - New Hampshire.
(2) W. H. Davis - Massachusetts.
(3) G. P. Clinton - Connecticut.
(4) W. D. Mills - New York.
(5) C. H. Alden and O. C. Boyd - Georgia.
(6) R. F. Poole and G. W. Fant - North Carolina.
(7) M. W. Gardner - Indiana.

Recent literature: Pl. Dis. Reptr. 12: 1-6, 14-15, 25-27, 37-38, 48-49, 78-79, 88-89, 104, 126, 135, 140-141.

1. Anderson, H. W. Apple scab control in northern Illinois. Trans. Illinois State Hort. Soc. 61: 282-293. 1928.

2. Goodwin, W., E. S. Salmon, and W. M. Ware. Control of apple scab on Allington Pippin and Newton Wonder by two types of Bordeaux mixture. Jour. Mins. Agr. Great Britain 35: 226-235. June 1928.

3. Hamilton, J. M. Studies of the fungicidal action of certain dusts and sprays in the control of apple scab. (Abstract) Phytopath. 19: 87. Jan. 1929.

4. Howitt, J. E. Another season's experience with apple scab. Canad. Hort. 51: 139-140. May 1928.

5. Hurt, R. H. Calcium monosulphide, a substitute for lime-sulphur for summer spraying. (Abstract) Phytopath. 19: 106. Jan. 1929.

6. Keitt, G. W., and E. E. Wilson. Third progress report of studies of fall applications of fungicides in relation to apple scab control. (Abstract) Phytopath. 19: 87-88. Jan. 1929.

7. Martin, W. H., and E. S. Clark. Apple scab studies. Ann. Rep. New Jersey Agr. Exp. Sta. 48: 218-221. 1928.

8. Williams, R. C., and H. C. Young. Chemistry of the toxic factor of sulphur. (Abstract) Phytopath. 19: 89. Jan. 1929.

9. Wilson, E. E. Studies of the ascigerous stage of Venturia inaequalis (Cke.) Wint. in relation to certain factors of the environment. Phytopath. 18: 375-418. May 1928.

10. Young, H. C. Dusts composed of lime sulphur and sulphur. (Abstract) Phytopath. 19: 88. Jan. 1929.

BLOTCH, PHYLLOSTICTA SOLITARIA ELL. & EV.

In Illinois and Indiana, and also in Iowa, blotch was evidently more prevalent than usual. In the former States the excessive rainfall of June provided many infection periods with the result that the disease became very prevalent even on well-sprayed trees. In the larger commercial areas of Virginia and West Virginia blotch is not important according to collaborators as the more important varieties grown are not susceptible and the ordinary spray schedule holds it well in check. In some of the neglected orchards of susceptible varieties, however, especially in the southern parts of these States blotch is a factor. In Ohio, H. C. Young reported the disease of only comparatively minor importance this year.

Some of the collaborators' reports are as follows:

Virginia: Found wherever Northwestern Greenings and Limbertwigs are grown. It is not uncommon to see 100 per cent of infection on these varieties which are of minor importance. (Schneiderhan)

Apple - Blotch

West Virginia: Severe this year only in southern neglected orchards. In the commercial areas, i.e., in the eastern panhandle, infection was controlled perfectly by spray. Northwestern Greening, Smith Cider, Duchess, Stark, and Winter Banana are considered to be most susceptible; Rome Beauty and Ben Davis only moderately so. (Archer)

North Carolina: Conditions were very favorable for this disease during 1928. There was an unusually heavy infection of twigs as well as fruit. (Poole)

Indiana: Dates of infection were determined at Lafayette and Mitchell as in previous years by exposing potted trees during each rain. At Lafayette, petal fall occurred during 7 rains previous to May 18. Infection occurred during 22 out of the 23 rains, between May 18 and June 19, covering a period from 4 days after petal fall to 9-1/2 weeks after petal fall. At Mitchell, petal fall occurred about May 9. A trace of infection occurred May 5, none May 11 or May 15, and then infection occurred during each of the 23 rain periods between May 17 and July 22 (10-1/2 weeks after petal fall). This season was characterized by an unusually large number of infection periods covering an unusually long interval of time. No evidence was obtained, however, to indicate the standard spray program (petal fall, 2, 4, and 6 weeks) was not reliable under these conditions. (Gardner)

Illinois: The first infection was noticed at Ozark on May 24, but this was very light. The main infection took place during early June, when, during two weeks, twelve inches of rain fell. The disease appeared in severe form about June 16. If the three and four-weeks' spray had been applied according to our schedule, the fruit would have been well protected at this time. But the heavy rains of early June washed off much of the spray materials, and consequently, blotch was abundant in many well-sprayed orchards.

The northward advance of blotch cannot be questioned in the light of our observations during the last ten years. We are constantly receiving specimens of blotch from the central and northern sections of the State, and the spray program for central Illinois must now contain a warning that blotch susceptible varieties must have the regular blotch sprays applied. Fortunately, the central Illinois orchards do not contain many blotch susceptible varieties.

Blotch was rather common on the Jonathans this season. While this variety has not been classed as very resistant, we have never considered it susceptible. It is probable that a special warning will be necessary in regard to spraying this variety for blotch in those orchards where it is near blotch cankered trees of other varieties. Unfortunately, this variety is especially susceptible to Bordeaux russeting and care must be taken where this fungicide is used. (H. W. Anderson)

Apple - Blotch

Table 50. Percentage losses from apple blotch as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
5	Kentucky	1.5	Ohio
4.5	Missouri	1	Maryland, Iowa, Arkansas, Texas
4	Kansas		
3	Mississippi	.3	New Jersey

The following varieties were reported as susceptible or very susceptible in 1928:

Ben Davis (New Jersey, Virginia, West Virginia)
Duchess (New Jersey, West Virginia, Illinois)
Golden Delicious (Indiana)
Limbertwig (Virginia)
Maiden Blush (New Jersey)
Northwestern Greening (Virginia, West Virginia)
Pippen (Virginia)
Smith Cider (New Jersey, West Virginia)
Stark (West Virginia)
Tulpahocken or Fallawater (Indiana)
Winesap (New Jersey)
Winter Banana (West Virginia)
Yates (North Carolina)
York (Virginia)

W. H. Martin (1) in New Jersey reported that in 1925 and 1926, as a result of experiments on the dates of infections, it is not apparent that the 17 and 28-day spray applications are important in control in New Jersey and that as a spray Bordeaux mixture was superior to lime-sulphur. Fruit given the 7 and 17-day spray with Bordeaux showed 70.4 per cent clean fruit as compared with 45.1 per cent on lime-sulphur treated trees, and 12.2 per cent on trees (picked fruit).

Recent literature: Pl. Dis. Reptr. 12: 29,39, 51, 70, 91, 126, 136.

1. Martin, W. H. Apple blotch control studies. Ann. Rep. New Jersey Agr. Exp. Sta. 48: 216-218. 1928.

CEDAR RUSTS, GYMNOSPORANGIUM JUNIPERI-VIRGINIANAE, G. GLOBOSUM AND G. GERMINALE

At the New York meeting of the American Phytopathological Society, Thomas and Mills (1) pointed out that not only is the ordinary Gymnosporangium juniperi-virginianae destructive in New York but also that the quince rust (G. germinale) and the hawthorn rust (G. globosum) are also of importance on apple in that State. They found the quince rust on the fruit of five varieties of apples, causing heavy losses, and they found the hawthorn rust on the foliage of 13 varieties with infection severe in some instances.

Gymnosporangium germinale according to Kern (N. A. Flora 7 (3): 197-198. 1912) occurs from Maine west to the northern peninsula of Michigan and to Iowa, south to Texas and northern Florida (see plate). This refers to the occurrence on Juniperus. On apple he only records it from Massachusetts. To this must now be added the 1928 occurrences in New York. There are also specimens from Rhode Island and Virginia on file in the Mycological Collections of the Bureau of Plant Industry.

Gymnosporangium globosum is recorded in North American Flora (7 (3): 204-206) as occurring from Maine west to southeastern South Dakota and south to northern Florida and Texas; but on the apple the range is limited to Maine, Vermont, Massachusetts, Connecticut, and New York (see map). In addition to this the Survey has what seem to be reliable reports of occurrence on apple from New Hampshire and Pennsylvania.

It will be seen therefore that the definite records of occurrence of these two rusts on apple are for the extreme northeastern United States. On juniper, however, their range is almost, although not quite as wide as the commoner G. juniperi-virginianae which occurs on both apple and red cedar from Massachusetts and Vermont west to southeastern South Dakota and south to eastern Texas and northern Florida. (see map, figure 9).

Owing to the similarity of these three rusts of apple, and because of the variation in symptoms displayed on different varieties and different parts of the host, it is probable that numerous wrong identifications have been made in the past. In regions where all three rusts occur care in diagnosis is especially necessary. Thomas and Mills (1, 2) say that the terminal peridial cells of the aecidium seem to offer the best diagnostic character.

For the purposes of the remainder of this section of the summary all three rusts will be treated together except where specifically mentioned.

The year was notable for the unusual prevalence of rust, Rainy weather in May and June favored teliospore germination and infection. Most of the States from Massachusetts and New York westward to Iowa and Missouri reported more rust than usual. In the former State it was said to be the worst in five years, and in New York, Vermont, Connecticut, and Iowa it was the worst in many years. Indiana (Gardner) reported the heaviest foliage infection in ten years. On the other hand in commercial sections in Maryland, Virginia and West Virginia where cedar eradication has been in progress for several years rust was not as severe as has often been the case. Schneiderhan in Virginia reported a relatively small loss in areas where cedars have been cut. In one section, however (Cedar Creek - Strasburg), where cedars have not been cut and are growing in close proximity to apple trees some of the heaviest infections on record were noted. This is probably an indication of what would have happened in Virginia if cedars had not been generally removed from the important apple sections. Archer from West Virginia reported less than the normal amount of rust in commercial areas where cedar eradication has been practiced. He reported some damage in the southern sections.

Apple - Cedar Rusts

A few collaborators' reports on prevalence are as follows: Losses are given in table 51.

New York (Green Co.): Cedar rust infection is unusually severe this year. Most varieties of apples are affected. Counts on McIntosh on June 27 ran as high as 65 per cent near cedars. Those a mile away from cedars only had 9 per cent infection. A count on dropped fruit near cedars showed 47 per cent had rust spots. Rust spots on McIntosh leaves are beginning to die out. An occasional cedar rust lesion is found on pear leaves. (New York Week. News Letter, July 2).

I have had two collections from Vermont and Massachusetts but I have no extensive records outside of New York State. At Orwell, Vermont, six of seven varieties bore G. globosum. Collections by Burrill. (Thomas)

Indiana: Worst foliage infection in 10 years. Calyx spray of lime-sulphur important in preventing leaf infection on Winesap and Stayman, Lawrence County. Trace noted on fruit of these varieties and Jonathan, on 7-12. (Gardner)

Illinois: In 1925 a dry growing season reduced infection on the cedar trees to such an extent that it was rare to find cedar apples during the season of 1926-27. In the late summer of 1926, abundant rains gave heavy infections on the cedars, and in the spring of 1928, the cedar apples were so abundant that thousands could be obtained on a tree no higher than one's head. During April, the spore horns of the cedar apples did not expand, and consequently, there was no early infection. In May, no rain fell in the neighborhood of Ozark, and yet we find infection on the leaves in abundance on June 5. Infected leaves from northern Illinois (Blackstone) were received on June 19. As was to be expected, the rust infection was extremely severe. (H. W. Anderson)

Michigan: Found in one orchard affecting foliage of Jonathan and fruit of Hubbardston, (Nelson)

Minnesota: Very severe locally but did little general damage. (Sect. Pl. Path.)

Iowa: Most severe of all foliage troubles on apples in the nursery during 1928. Bechtel's Crabs were a complete loss due to excessive stem cankers and rust lesions on the buds, petioles and leaves. Although found on small red cedars in nursery rows, cedar rust was not a limiting factor in the growth of these trees. Large trees in the vicinity were heavily loaded with rust galls. (Bliss)

Missouri: Unusually severe throughout the State this season. Numerous complaints have come in from all sections especially from the apple-growing region of southwest Missouri. Pycnial stage is now (June 23) quite well developed, the leaves being well covered with lesions. Pycnia are abundant on crabs and species of Crataegus. The last of May and June has been marked by heavy rainfall, the total for the central part of the State being nearly 11 inches for June alone. High humidity with considerable wind throughout this period has probably contributed to the wide dissemination of inoculum. (Scott)

Apple - Cedar Rusts

Table 57. Percentage losses from rust diseases of apple as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
7	Tennessee	.5	Maryland, Mississippi, Indiana
5	Virginia	Trace	New Hampshire, New Jersey, West Virginia, Kentucky, Michigan, Wisconsin, Missouri, North Dakota
2.7	North Carolina		
2	Massachusetts, Arkansas, Kansas		

W. D. Mills of New York has supplied the following information concerning the occurrence of the three rusts on different varieties.

Gymnosporangium globosum: Identified on leaves of Baldwin, Esopus, Spitzenberg, Fameuse, Hubbardston, Jonathan, McIntosh, Northern Spy, Northwestern Greening, Rhode Island Greening, Rome Beauty, Tallmon Sweet, Tompkins King, and Winesap. Not found on apple fruit.

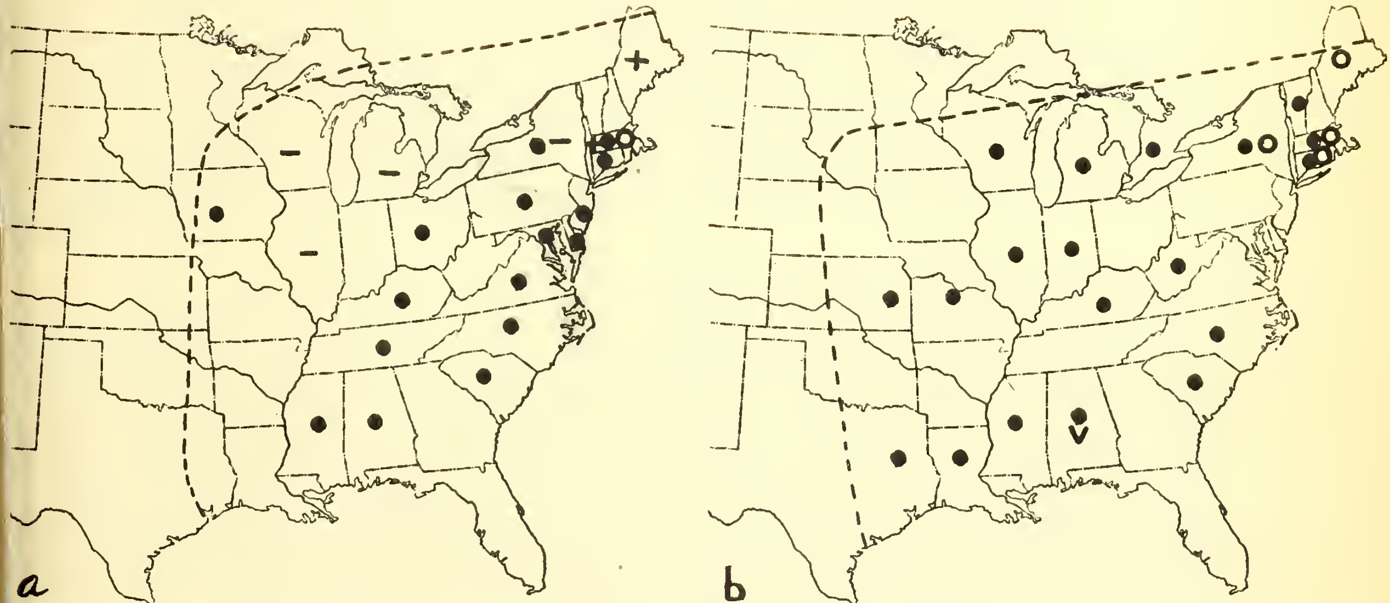
Gymnosporangium germinale: Counts in 14 orchards in 4 counties showed fruit infection on Fameuse (1 count) 21 per cent; Hubbardston (1 count) 28 per cent; McIntosh (15 counts) 18 per cent average; Winesap (2 counts) 74 per cent; Yellow Transparent (1 count) 84 per cent; Delicious (3 counts) 60 per cent. Specimens were from 6 or 7 counties. Not found on foliage or twigs.

Gymnosporangium juniperi-virginianae: Counts of infection of 17 varieties showed the following percentages: Johathan (2 counts) 25 per cent; Rome Beauty (4 counts) 30 per cent; Spitzenberg (1 count) 95 per cent, Sutton Beauty (1 count) 27 per cent; Twenty Ounce (1 count) 18 per cent; Wealthy (6 counts) 25 per cent; Winter Banana (2 counts) 12 per cent.

Varieties mentioned by collaboratorsas susceptible in 1928 were Wealthy in Massachusetts, New York, New Jersey, and Iowa; Rome in New Jersey and Indiana; Winter Banana in New Jersey; York in Virginia; and Johathan, Early Harvest, Golden Delicious, Winesap, Grimes and Duchess in Indiana. The varieties Delicious, Ben Davis and Turley were reported resistant in Indiana and the Northwestern Greening in Virginia. D. E. Bliss of Iowa noted that in apple nurseries of Iowa some of the varieties that suffered the most were Benoni, Yellow Bellflower, Bayfield, Twenty Ounce, Wealthy and Jonathan; and that the more resistant sorts were Northwestern Greening, Anesim, Wisconsin Russet and Delicious.

Recent literature: Pl. Dis. Reptr. 12: 30, 39, 50, 70, 79, 89, 104, 137-138, 141.

1. Thomas, H. E. And W. D. Mills. Rust diseases of the apple. (Abstract) Phytopath. 19: 87. Jan. 1929.



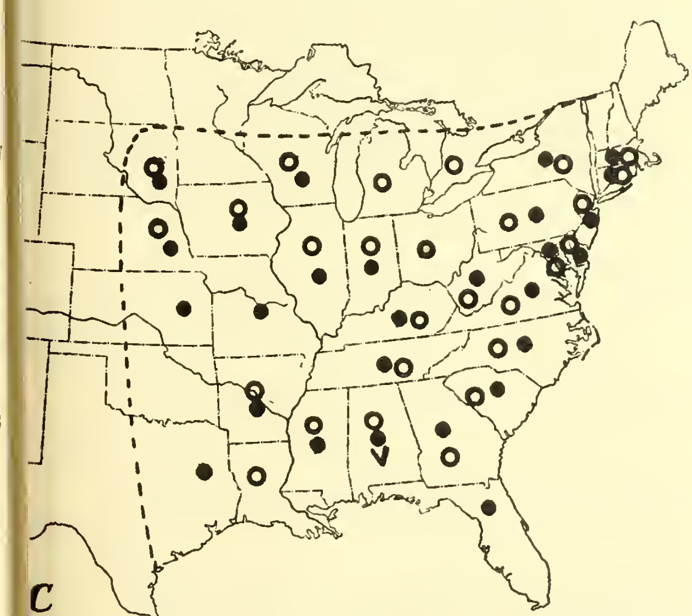


Fig. 9. Geographic distribution of three apple rusts according to North American Flora (7 (3): 197-198, 204-206, 209-210. Apr. 15, 1912).

a. Gymnosporangium germinale
b. G. globosum
c. G. juniperi-virginianae

O : Apple
+ : Juniperus communis
— : J. sibirica
o : J. virginiana
V : J. barbadensis

2. Thomas, H. E., and W. D. Mills. Three rust diseases of the apple. Cornell Univ. Agr. Exp. Sta. Mem. 123: 1-21, Mar. 1929.

BLACK ROT, PHYSALOSPORA MALORUM (PK.) SHEAR

Black rot was reported from the majority of the eastern apple States and as far west as Texas and Kansas. As usual it was most abundant in unsprayed and unpruned orchards. The regular spray schedule followed in most commercial orchards seems to control it fairly well. In Wayne County, New York, the observation was made by E. E. Frane that dusted orchards showed more black rot leaf spot than those that were sprayed. W. A. Archer reported that a large proportion of what has been called "frog-eye" in West Virginia is probably due to Illosporium malifoliorum Sheldon. He reports as follows regarding this:

"While the well known frog-eye leaf spot occurs in West Virginia quite abundantly, there is another leaf spot described by Sheldon (Torreya 8: 141. 1908). The two types of spots are distinct although they may at times occur together on the same leaf. The common frog-eye disease is supposedly caused by an initial infection of Sphaeropsis followed by secondary organisms, such as Phyllosticta, Coniothyrium, Alternaria, etc. It is characterized by more or less definitely circumscribed, concentric, brownish spots of about 3 mm. diameter. The leaf spot described by Sheldon is grayish, irregular in shape, with a scalloped margin, 5-20 mm. diameter often involving the major portion of the leaf. The sporodochia of the Illosporium malifoliorum are found abundantly on the under surface of such leaves. The appearance of the frog-eye spot in West Virginia is well depicted by plate 3, fig. 1, B.P.I. Bul.121, Pt. 5. The Iliosporium spot is well represented in plate 7, fig. 1, Jour. Agr. Res. Vol. 2, 1914. The frog-eye spot is widespread in the State and is responsible for considerable defoliation. The Illosporium spot is most abundant in the southern part of the State, where it ordinarily brings about severe defoliation."

In Virginia, Schneiderhan rates the disease as of comparatively minor importance except in poorly sprayed and poorly pruned orchards particularly of Ben Davis and Stayman varieties.

The States of Illinois, Missouri and Arkansas reported more trouble from black rot than usual.

Delaware: Pink and calyx sprays important in checking leaf infection. (Adams)

Virginia: The disease is nearly always associated with worm or insect injury on fruits in general. On Ben Davis it is very common as a follow-up disease after calyx and spray injury. (Schneiderhan)

North Carolina: Leafspot severe throughout the State, especially so in the mountain areas. Causing considerable defoliation and probably of equal importance this year to the fruit rot. (Fant)

Table 52. Percentage losses from black rot of apple as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
5	Maryland	1	Massachusetts, Virginia
4	Missouri		Arkansas, Kansas
3	North Carolina	.5	Indiana, Ohio

Indiana: Calyx spray reduced foliage infection on Stayman. Pycnidia with spores found on dead fruit spur in October, and also in a 1928 fire blight canker. Frog-eye followed rust lesions. (Gardner)

Illinois: This disease has rarely been serious in Illinois orchards probably due to our dry summers. It is one of the major diseases of apple foliage throughout the east. The past season showed that the frog-eye leaf spot could cause serious injury in our orchards. Fortunately, the spray schedule followed by Illinois growers seems to have kept the disease in check. Unsprayed orchards suffered severely. One uncared for orchard near Nooga was observed to be completely defoliated by the middle of the summer, largely on account of this disease. As many as 65 spots were counted in a single leaf in this orchard. (Anderson)

Arkansas: Leaf spot stage very common. Little on fruit, less codling moth accounts for this. (V. H. Young)

Missouri: More detailed check-up on black rot infection in Missouri shows that it is more widespread than it was thought to be. Many commercial plantings are suffering from cankers. (Scott)

Recent literature: Pl. Dis. Reptr. 12:40, 60-61, 135, 140.

BITTER ROT, GLOMERELLA CINGULATA (STON.) SPAULD. & SCHRENK.

Considerably more than the usual damage was reported from most States reporting in 1928. A slight outbreak started in Ohio about August 1 but dry weather checked it and prevented spread so that the actual loss was slight and then only on the most susceptible varieties.

Delaware: Later in appearance than usual. Heavy outbreak in some plantings of King David and Stark.

West Virginia: Limited to a local infection in a few orchards in the eastern panhandle. It has never had an important status since it seems always to be slight and limited to localized areas. In a rare year it has occurred severely in restricted areas on a few susceptible varieties, such as King David. (Archer)

North Carolina: In the college orchard this disease caused severe injury to late apple varieties. It was more destructive than during the two previous seasons. (Poole)

Indiana: 1-3-50 Bordeaux mixture too weak to control on Grimes near Ohio River, Perry County. Known to be very severe in 4 large commercial orchards. Caused loss of entire crop of Grimes in one. No cankers could be found. (Gardner)

Illinois: During a season when abundant rainfall occurs throughout the summer months, bitter rot may be expected. Such was the situation in 1928. The heavy rains of June started an early infection which threatened to become an epidemic. With few exceptions, however, no great loss was experienced. This is probably due to the fact that most growers used Bordeaux mixture in the second brood codling moth spray, and took the usual precautions of spraying with special care in that part of the orchard where bitter rot was commonly found in former years. Bitter rot is becoming a disease of more importance in the Calhoun County area. In grading unsprayed fruit this season, a number of specimens were found. The disease was also found in abundance in the unsprayed blocks in the University orchard. It is probable that bitter rot will stage a come-back if conditions favorable for its development are experienced during the next season. Orchardists should not neglect the addition of a fungicide to the second and third brood codling moth sprays. (Anderson)

Arkansas: More present than in any year since 1923. Rather late appearing but losses often amounted to 20 per cent of crop. Warm wet weather in August combined with lighter spraying than usual on account of the spray residue regulations probably accounts for this outbreak. (V. H. Young)

Missouri: Where no effort has been made to control bitter rot serious damage has resulted. Many cankers present in old orchards. (Scott)

Table 58. Percentage losses from apple bitter rot as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
5	Northern Georgia Mississippi	1	Maryland, Arkansas, Massachusetts
4.2	North Carolina	0.8	Virginia
3	Missouri	0.5	Ohio
2	Indiana	0.1	New Jersey

In Northern Georgia, C. H. Alden and O. C. Boyd reported the varieties Yates and Terry resistant; Stayman and York Imperial, susceptible; and Ben Davis, Black Ben and Gano, very susceptible. The last three varieties in Georgia usually suffer moderate to heavy losses each year in spite of the usual control measures.

In New Jersey, W. H. Martin mentioned Maiden Blush, Winter Banana and Gravenstein as susceptible. In Indiana, Gardner reported Winesap resistant, and Grimes, Ben Davis, Jonathan, Rome, King David and Golden Delicious as susceptible. In Virginia, Schneiderhan reported as follows:

"Found on Grimes, Stayman, Winesap, York, Mother, Pippin and Ben Davis. We have never seen bitter rot on Grimes and Staymans in Virginia before this year."

Recent literature: Pl. Dis. Reptr. 12: 79, 135, 141.

BLIGHT, BACILLUS AMYLOVORUS (BURR.)TREV.

For the country as a whole blight was probably subnormal in prevalence. However, in parts of the southern Appalachian apple section, also in Indiana, Illinois, and Iowa it was reported as more prevalent than last year and the average. In Oregon according to the pathologists there was far less blight than usual.

New York: Even less than in 1927 which was exceptionally light. (Mills)

Delaware: Cool weather of May apparently kept this disease in check.

New Jersey: Severe in some orchards in Burlington County. (Martin)

Virginia: Not important. (Schneiderhan)

West Virginia: Blossom and twig blight severe over entire State. Wild crab and English hawthorn severely affected. (Archer)

North Carolina: Much worse than during the past five seasons and probably any previous year. Infection was through the blossoms, since there is very light twig infection except where the organism has worked into the twigs from the spurs.--- On some of the susceptible varieties there is a total loss on some limbs, while others show from 50 to 85 per cent blighted spurs. Will greatly reduce apple crop. (Poole)

Georgia: Slight injury every year. (Alden & Boyd)

Indiana: Much infection on leaf twigs but not as much floral infection as in 1926. (Gardner & McCown)

Illinois: Since my previous report on the scarcity of this disease, it has become abundant and serious. Twig blight in Transparent and Jonathan is especially serious in southern Illinois. Fruit blight on apples an inch or so in diameter is very common. Northern Illinois has more blight on apples than usual judging from report. (Anderson, July 1)

Michigan: As a rule blossoms infection in both apples and pears has been light. (Bennett)

Developed to an unusual extent in nurseries following heavy fall rains and mild temperature. (Nelson)

Wisconsin: Very light infection. Associated with lack of rain during early growing period. (Vaughan)

Minnesota: Absent until middle of June. Did damage only in a few localities. Dry cool weather up to middle of June apparently checked it. (Sect. Pl. Path.)

Iowa: Early and severe. (R. H. Porter)

Colorado: Present in some orchards this year, but it is not causing nearly as much damage as it did last season. (LeClerg, Sept. 1)

New Mexico: Extremely severe in northern part of State around Espanola. Of little importance in Mesilla and Pecos Valleys. (Crawford, Sept.10)

Utah: Blossom blight on the apple has been reported from practically all parts of the State and in some cases will seriously decrease yield. In a few orchards in Boxelder and Weber Counties the trouble has become so severe as to discourage further culture of the orchard for the season. (Richards, June 25)

Oregon: During 1928 there was far less blight than usual. The weather conditions seemed to be favorable for its development but probably there was very little hold-over blight left from 1927 when we had practically no blight. (F. C. Reimer)

Table 54. Percentage losses from blight of apple as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
5	Tennessee, Mississippi, Iowa, North Dakota	.5	Ohio, Wisconsin, Missouri
4.2	North Carolina	Trace	New Hampshire, Massachusetts, New York, Virginia, Kentucky, Georgia, Arkansas, Michigan, Kansas, Montana, Washington, Oregon
3	West Virginia		
1.5	Arizona		
1	Maryland, Indiana, Colorado, Utah		

Table 55. Varieties listed as susceptible by collaborators, 1928.

Very susceptible	Susceptible
Jonathan (2, 3)	Greening (1)
San Jacinto (4)	Alexander (1)
Red June (4)	Winesap (4, 6)
Yates (4)	Delicious (4, 6)
Bonium (4)	Jonathan (6)
Golden Delicious (5)	Transparent (6)
Wild Crab (3)	Maiden Blush (6)
English Hawthorn (3)	Rome (6)
King (1)	
Yellow Transparent (1)	Note: Found on Golden Delicious in Indiana.

(1) W. D. Mills, New York.
(2) J. F. Adams, Delaware.
(3) W. A. Archer, West Virginia.
(4) R. F. Poole, North Carolina.
(5) J. A. Andes, Tennessee.
(6) M. W. Gardner, Indiana.

Monroe McCown (1) in Indiana has reported reduction of blossom blight in Grimes by spraying with Bordeaux at the full bloom stage. This is based on field experiences and a test conducted at Lafayette in April 1927. In the latter test one hundred blossom clusters were sprayed. Fifty of these were inoculated immediately after spraying by atomizing them with a suspension of B. amylovorus. Twenty-five were inoculated in the same manner 24 hours later and twenty-five 48 hours later. The results follow:

Interval elapsing after spraying with Bordeaux	Per cent infection in sprayed clusters	Per cent infection in checks
Immediately	8.3	87.5
After 24 hours	70.8	95.8
After 48 hours	75	88

In other tests (2) "Bordeaux (1-3-50) applied when the clusters were opening into full bloom reduced natural infection [illegible] per cent and 52 per cent respectively, in two field tests with Jonathan apple and [illegible] per cent in one test on pear."

The work of P. W. Miller (3, 4) Wisconsin, coupled with the results of other investigators who have obtained results along somewhat similar lines indicates the need for a revision of the generally prevalent idea that B. amylovorous is disseminated principally by insects and that infection is through wounds or through the nectary. Miller has concluded that under Wisconsin conditions meteoric water is an important agent of inoculation in both primary and secondary infections; that it may infect unwounded, young leaves and unopened blossoms; and that infection may take place through the stomata.

In Pennsylvania, Nixon and his associates have continued their studies on migration of the organism in the tissues of various organs of the host, and also on immunity studies of apple seedlings and varieties.

Recent literature: Pl. Dis. Reptr. 12: 27-29, 38-39, 49-50, 60, 79, 104.

1. McCown, M. Spraying for the control of fire blight in the apple. Trans. Indiana Hort. Soc. 67: 129-133. 1928.

2. McCown, M. Bordeaux spray in the control of fire blight of apple. Phytopath. 19: 285-300.

3. Miller, P. W. Progress report on studies of fire blight of apple. (Abstract) Phytopath. 19: 8. Jan. 1929.

4. ____________ A preliminary report on studies of fire blight of apple. Science 68: 386-388. Oct. 19, 1928.

CROWN GALL, BACTERIUM TUMEFACIENS EFS. & TOWN.

Beyond what is reported in the literature, very few field reports of especial interest on crown gall of apple have been received by the Survey. R. B. Streets of Arizona reported the disease as general and estimated a loss of about 5 per cent for the State. The following references indicate that a considerable amount of work is being done on this and related problems.

Recent literature

1. Kauffman, F. Über die Veränderlichkeit von Tumefaciens-bacillen. (On the variability of tumefaciens bacilli.) Zeitschr. für Krebsforsch., 26 (4): 330-332. 1928.

2. Levine, Michael. The chromosome number in crown gall and cancer tissues. (Abstract) Phytopath. 19: 97. Jan. 1929.

3. Muncie, J. H., and M. K. Patel. Potency and specificity of a lytic principle (bacteriophage) obtained from Pseudomonas tumefaciens. (Abstract) Phytopath. 19: 98. Jan. 1929.

4. ____________ Crown gall and callus knots on nursery apple trees. Rep. Iowa State Hort. Soc. 62: 23-26. 1928.

5. Patel, M. K. A study of pathogenic and non-pathogenic strains of Pseudomonas tumefaciens Sm. & Town. Phytopath. 28 (4): 331-343. 1928.

6. Riker, A. J. Notes on the crown gall situation in England, France and Holland. Phytopath. 18: 289-294. Mar. 1928.

7. Siegler, E. A. Studies on the entiology of apple crown gall. Hour. Agr. Res. 37: 301-313. Sept. 1, 1928.

8. Wright, W. H., A. J. Riker, H. E. Sagen and W. M. Banfield. Studies on the bacteriological differentiation of the crown gall and hairy root types of bacteria. (Abstract) Phytopath. 19: 97-98. Jan. 1929.

9. Wright, W. H., A. J. Riker and H. E. Sagen. Studies on the differentiation of the crown gall type of bacteria from non-pathogenic bacteria of the radiobacter group. (Abstract) Phytopath. 19: 98. Jan. 1929.

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

These two diseases increased in prevalence in the northeastern quarter of the United States in 1928 and in some States assumed the rôle of the most important apple diseases. It seems to be the prevalent opinion that the increase is due to the omission of the late summer sprays from the schedule.

Losses were estimated as follows: Maryland, 4 per cent; Virginia, 3 per cent; West Virginia, 2 per cent; Tennessee, Indiana, 1 per cent; Missouri, trace.

Light colored varieties show the blemish much more than darker skinned sorts.

New York: Largely in orchards with poor air drainage and where summer sprays are omitted. Most noticeable on light colored varieties, Greening, Newtown, etc. (Mills)

New Jersey: Present, but not severe in south Jersey. Common in north Jersey where summer sprays are often omitted. (Martin)

Delaware: Wet weather during August and September favored development. Very little observed where summer sprays or dusts were applied. (Adams)

Virginia: Caused more loss than any other in Virginia. The cessation of spraying early in July on account of the arsenical residue problem has given this disease a chance to spread rapidly in recent years. (Schneiderhan)

West Virginia: Fly speck and sooty blotch ware unusually severe, especially in home orchards. In commercial areas they were adequately controlled by the regular spray schedule, but where the late spray applications were omitted considerable damage occurred in low-lying orchards. (Archer)

North Carolina: Abundant throughout State on unsprayed fruit. In this State this disease injures the market value of otherwise good marketable fruit. (Poole)

Indiana: Necessary to use sulphur dust late in summer on Golden Delicious to prevent sooty blotch. (Gardner & Zaring)

Kentucky: Readily controlled by 1st to 15th August sprays. (Magill)

Illinois: Prevalent in many orchards this season, especially in those where no fungicide was added on the second brood codling moth sprays. (H. W. Anderson)

Recent literature: Pl. Dis. Reptr. 12: 126, 140.

FRUIT SPOT, PHOMA POMI PASS.

An increase in the amount of damage from this disease seems to be apparent. Whether this is due to weather conditions favorable to infection, or to the reduced spraying late in the season on account of the arsenic residue problem, or to other factors, is not entirely evident. In 1928 an increase was reported from several important apple States from Ohio and Virginia northeastward to New England. A loss of 5 per cent was reported in New Jersey and 1 per cent in Maryland and West Virginia. Some of the collaborators' reports are as follows:

New York: Much more fruit spot in lower Hudson Valley than for several seasons. (Mills)

New Jersey: Reported on Grimes, Winter Banana, Wilson's Early June, Jonathan, King David, Rome Beauty, Rhode Island Greening, Golden Delicious, Baldwin. Summer applications of sulphur sprays or dusts failed to control this disease. Good control followed the use of 2-6-50 (hydrated lime) Bordeaux mixture. Fruit spot was the most serious disease of the year and next year many of the growers will use Bordeaux mixture for its control. (Martin)

Delaware: The most conspicuous disease experienced by orchardists during the season. Heaviest outbreak ever observed with late apples. Heavy rains in August and September associated with outbreak. No late variety found without evidence of infection. (Adams)

West Virginia: Losses from this source have never been more than a trace except in 1923 when it was considered to be 2 per cent. In 1928 infection appeared late and caused considerable damage. (Archer)

North Carolina: Observed on Rome Beauty in Henderson County. (Poole)

Ohio: Very severe in southern Ohio. Inspectors' reports indicate that the loss due to this disease alone in 4 counties in southeastern Ohio, will be $750,000. In many orchards every variety is attacked and many of these completely so. It is causing the bulk of what should be No. 1 fruit to go into No. 2 and culls. (H. C. Young)

Recent literature: Pl. Dis. Reptr. 12: 136.

1. Adams, J. F. Sulphur sprays in relation to control of fruit spot. Trans. Peninsular Hort. Soc. 17 (3): 23-26. 1928.

BITTER PIT (NON-PARASITIC)

Of the 16 States reporting bitter pit, only Delaware, Maryland and Virginia reported more than the average amount. In Virginia 1.5 per cent loss was estimated and as high as 85 per cent affected fruit were noted in a single orchard. The varieties York, King David and Black Twig were listed by Schneiderhan as particularly susceptible. Regarding the situation he reported:

"Bitter pit was more severe in apples of the Winesap group than during the past seven years. Entire crops of King David apples had to be sold as canners this year due to bitter pit."

In North Carolina R. F. Poole observed it as severe on King David and slight on Delicious in the mountain area. In Georgia Alden and Boyd reported a trace of loss for the State with Jonathan and King David susceptible. In Indiana, Gardner noted the surface type on Ben Davis, Stayman and Grimes. He reported the disease as less prevalent than usual. Losses of 0.5 per cent were indicated for Ohio and Arizona.

Valleau in Kentucky (2) has recently advanced the theory that this disease and possibly others such as cork, drought spot, dieback, and rosette may be due to nitrogen deficiency more than to unfavorable water relations. In his plant disease survey report he states that, "During the past three years bitter pit has been completely controlled by growing sweet clover in a Grimes orchard where formerly the disease had been severe for years. This in in uniformity with the nitrogen starvation theory, as explained in Kentucky Bulletin 281. It is severe each year in a clean cultivated orchard of Polly Eads (a local late summer variety) near Henderson, Kentucky." Butler (1) has conducted studies which are said to indicate more trouble from bitter pit during years of light bearing of Baldwin trees than when there is a heavy crop.

Recent literature: Pl. Dis. Reptr. 12: 140.

1. Anon. Plant disease investigations at the New Hampshire Station. New Hampshire Agr. Sta. Bul. 232: 10, 22, 29., 1928.

2. Valleau, W. D., and W. M. Johnson. Tobacco frenching - a nitrogen deficiency disease. Kentucky Agr. Exp. Sta. Res. Bul. 281: 179-253. 1927.

EUROPEAN CANKER, NECTRIA GALLIGINA BRES.

No reports received in 1928 although the disease is known to occur in parts of eastern United States and on the Pacific coast.

Apple - European Canker

H. Richter (1) in Europe has found by inoculation that the following species of Nectria can infect apple:

Nectria galligena Bres.(true canker and an active fruit rot)
N. ditissima Tul. (typical cankers and active fruit rot)
N. " Tul. var. major Wr. (canker and also fruit rot)
N. coccinea (Pers.) Fr. (slow fruit rot)
N. coccinea (Pers.) Fr. var. longiconia Wr. (active fruit rot)

The fungus causing canker in this country has generally been considered as Nectria galligena Bres.

Recent literature

1. Richter, H. Die wichtigsten holzbewohnenden Nectrien aus der Gruppe der Krebserreger. (The most important wood-inhabiting Nectriae of the group of organisms causing canker.) Zeitschr. für Parasitenkunde 1 (1): 24-75. 1928.

BLACK ROOT ROT, XYLARIA MALI FROMME

In a recent publication F. D. Fromme (1) has described the fungus causing black root rot of apple under the above name, it having been referred to previously as X. hypoxylon. It has also been called X. digitata (Ell.) Grev. but an examination of this latter species shows it to be distinctly different.

Fromme reports that X. mali has been collected in Virginia, West Virginia, North Carolina, South Carolina, Kentucky, Tennessee, Indiana, Illinois, and Arkansas. The accompanying map shows the more exact distribution. Another species, Xylaria polymorpha is said to occur rarely on apple in Virginia but is more common in the northern States, especially New York.

Orchard studies in the Shenandoah Valley indicate black root rot to be the most important single cause of apple tree death according to Fromme. In the average infested orchard the loss has equaled 18 per cent at 21 years of age. Replants usually die before reaching bearing age. Virginia and West Virginia were the only States reporting this disease in 1928.

Apple - Black Root Rot

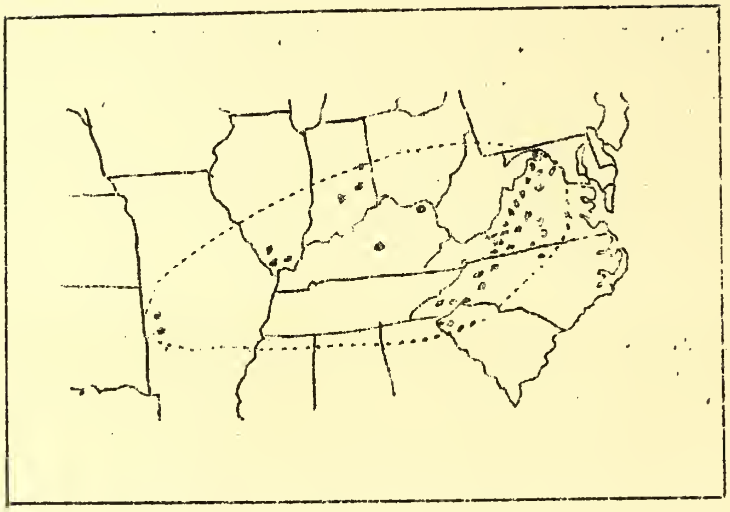


Figure 10. Geographic distribution of black root rot of apple according to Fromme. (1, p. 32)

Recent literature

1. Fromme, F. D. The black root rot disease of apple. Virginia Agr. Exp. Sta. Tech. Bul. 34. 52 pp. Mar. 1928.

POWDERY MILDEW, PODOSPHAERA LEUCOTRICHA (ELL. & EV.) SALM.

D. F. Fisher reported an unusually heavy loss from this disease in Washington. It was much more prevalent than usual in the central part of the State and throughout the Wenatchee and Okanogan district. In the latter sections it was especially bad on Jonathan and Spitzenberg causing blighting of twigs and russetting of fruit.

Three States in the east reported slight trouble from powdery mildew of the terminal growth. In NewYYork it was rather common but not of economic importance. In Virginia it was more severe than ordinarily especially on one-year twigs of Jonathan. On young trees of that variety it was thought to be the most important factor in the retardation of growth. In West Virginia it was also more prevalent than usual on certain varieties of young unsprayed trees, especially Jonathan, Gano and Stayman Winesap.

Recent literature: Pl. Dis. Reptr. 12: 15, 126.

SCALD, NON-PARASITIC

In spite of the fact that oiled wrappers and shredded oil paper have done a great deal in reducing the amount of scald the losses are still high. Brooks, Cooley and Fisher (1) in their revised Farmers' Bulletin have recently reported new evidence to show that maturity and color af apples at picking time are very important factors in determining the susceptibility of apples to scald, the more mature and better colored fruit scalding less than that which is green.

Recent literature

1. Brooks, C., J. S. Cooley, and D. F. Fisher. Apple scald and its control. U. S. Dept. Agr. Farm. Bull. 1380. 17 p. Sept. 1928.

WEATHER INJURY

Winter injury

New York, Arkansas and Washington were the only States reporting winter injury in 1928 and in none of these was the damage of great importance.

Frost injury

Considerable russetting thought to be due to spring frost and probably associated with other weather conditions was reported from New York, particularly on Ben Davis, Gano, Baldwin, Greening, Wolf, Piven, Rome, Twenty Ounce and McIntosh. Five per cent loss in grade was estimated from this cause. Considerable injury to leaves and young apple fruits also occurred in Pennsylvania, Maryland and Virginia. In Michigan frost damaged blossoms were common. Two freezes seemed to be involved, one when the buds were in prepink and the other when in full bloom. The variety Duchess was especially susceptible to that injury.

In Montana, P. A. Young reported a considerable amount of damage from cracking of fruit, some of which was thought to be caused by late frost. In the State of Washington, D. F. Fisher noted that the frosts of April 29 and 30 when the trees were in full bloom reduced the crop somewhat and caused considerable russetting of fruit.

Sun scald

More or less sun scald of McIntosh was reported from New York. Injury was most noticeable on the southwest side of trees. (W. D. Mills)

Hail injury

Considerable in Clinton and Essex Counties, New York, according to W. D. Mills.

Apple - Weather Injury

Recent literature: Pl. Dis. Reptr. 12: 29.

SPRAY INJURY

Sulphur injury

In New York this injury occurred wherever lime sulphur sprays were applied during very hot weather. Also occurred under the same conditions with dry mix sulphur lime and sulphur dust (W. D. Mills). In New Jersey it was more or less general in the southern part of the State. Effects showed as small leaves with margins burned, heavy leaf fall and fruit russetting. In Virginia it was particularly damaging to Ben Davis and Grimes and serious losses have occurred during the past few years. The use of lime sulphur and lead arsenate in combination during hot weather has been the main cause. The use of an excess of lime in this spray has been helpful in reducing injury. (Schniederhan)

Arsenical injury

Rather general and widespread in Massachusetts, according to McLaughlin and Davis. In Delaware it was responsible for several cases of leaf and fruit injury according to Adams.

Copper injury

Severe burning noted to leaves and buds with copper lime and calcium arsenate, especially on the variety Duchess, according to W. D. Mills of New York. In Delaware cooper dust used as a summer application caused spotting of leaves and fruit russetting. More trouble from Bordeaux injury was reported from Arkansas than usual. Colloidal copper injury in the form of a conspicuous flecking of the fruit of King David was mentioned by Adams of Delaware.

Butler (1) in New Hampshire has reported that foliage injury from Bordeaux is dependent on rain or dew. When these were absent no injury followed spraying. Increasing the proportion of lime reduced this injury in the presence of dew or rain.

Oil injury

Less in the Hudson Valley in New York than in 1927. Cases of severe injury reported in two orchards. (W. D. Mills)

Recent literature: Pl. Dis. Reptr. 12: 51.

Anon. Plant Disease investigations at the New Hampshire Station. New Hampshire Agr. Sta. Bul. 232: 10, 22, 29. 1928.

MISCELLANEOUS PARASITIC DISEASES

Cercospora mali Ell. & Ev., leaf spot. Reported from two places in Texas.

Cytospora sp., canker. D. F. Fisher of Wenatchee, Washington, reported cankers at base of leaf buds, pruning cuts and crotches, also girdling of young trees and branches in Douglas County, Washington. While infection at leaf buds indicates a strictly parasitic nature the trees have been devitalized by drought and winter injury in the past and no doubt this is a predisposing factor according to Fisher. Found on Northern Spy, Delicious and Winesap. This canker was also collected a number of times by P. A. Young in Montana.

Gleosporium perrenans Zeller & Childs, perennial canker. The Department of Plant Pathology at Pullman, Washington, reported this as scattered in occurrence in the eastern half of the State. Zeller in Oregon mentioned it as occurring in the Hood River section only, but very important there. Some spread was noted in 1928 due to freezes and woolly aphis injury. He states that the loss from fruit rot was considerably diminished by mechanical removal of spores in washing processes employed for spray residue removal.

Glutinium macrosporum Zeller, canker. Oregon- "Cankers observed in previous years have enlarged and several new infections found. By correspondence this disease has been reported to me from England." (Zeller)

Hypochnus sp., rot. A decay of apples has been noted on the market which somewhat resembles pink mold rot or anthracnose but which is due to a species of Hypochnus according to market pathologists. Spots are usually tan in color with a brown or black border. The disease tissue is rather tough and stringy in consistency and the spots somewhat sunken. When infected apples are kept in a moist chamber the mycelium spreads over their surfaces radiating uniformly from the lesions and forming a characteristic, fine closely appressed white mucelial mass.

Illosporium malifoliorum Shel., leaf spot. Reported from West Virginia in the southern part of which most of the unsprayed orchards are severely defoliated on account of this leaf spot. This is a different leaf spot from that caused by the black rot fungus. (See more extensive report under black rot).

Myxosporium corticolum Edg., superficial bark canker. Reported as common in New Jersey, especially on Rome, Gravenstein, McIntosh, Twenty Ounce, Duchess, and Missouri Pippin. (Martin)

Nectria cinnabarina (Tode) Fr., twig blight. H. E. Thomas and W. D. Mills report the occurrence of a twig blight constantly associated with a fungus which is very close to, if not identical with, N. cinnabarina. It occurred commonly in one variety, Rome Beauty, in a single orchard in Onondaga County. Cultural and inoculation studies are in progress.

Neofabraea malicorticis (Cordley) Jack., anthracnose. More than the usual number of cankers developed in Oregon this year following the long, rainy fall of 1927. The increase was particularly noticeable in western Oregon and Hood River Valley where summer Bordeaux has not been applied regularly. In orchards where spraying is neglected for one or two years it becomes prevalent. S. M. Zeller states that the fruit rot was materially reduced by the washing process employed for spray residue removal.

Nummularia discreta Schw. (Tul.), blister canker. New York, West Virginia, Missouri and Kansas reported it in the same amounts as usual which for the most part is in neglected orchards of susceptible varieties. New York and West Virginia reported a trace loss, Missouri, 3 per cent, and Kansas, 2 per cent.

Phymatotrichum omnivorum (Shear) Dug., root rot. Taubenhaus, Bach, Lusk and Dana reported that in the black lands of Texas apples cannot be grown on account of this disease. Fifty per cent loss in nurseries of that State. Streets of Arizona estimated a 3 per cent loss.

Phytophthora cactorum (Leb. & Cohn) Schroet., fruit rot. In Indiana, Gardener and McCown found this rot on young fruit of Grimes which were 1 to 2.5 centimeters in diameter and which were growing on lower limbs near the ground. They also found it on drops in another locality.

Sclerotinia fructicola (Wing.) Rehm., brown rot. Massachusetts (trace); New Jersey (trace); Delaware, somewhat more prevalent especially on Williams; North Carolina, common on mechanically injured fruit; Kentucky, very rare; Tennessee (trace); Ohio, (of no consequence).

Septobasidium pseudopedicellatum (Schw.) Pat., limb blight. Mississippi.

Volutella fructi Stevens & Hall, spongy dry rot. Prevalent on unsprayed fruit and wild fruit in Massachusetts according to W. H. Davis.

Recent literature: Pl. Dis. Reptr. 12: 15, 104, 135, 141.

1. Boyle, C., M. Murphy, and H. A. Cummins. "Blossom Wilt" of apple trees and "wither tip" of plum trees, with special reference to two biologic forms of Montilia cinerea Bon. Sci. Proc. Roy. Dublin Soc. n.s. 19: 63-76. Sept. 1928.

2. Gardner, M. W. Apple diseases, 1927. Trans. Indiana Hort. Soc. 67: 27-30. 1928.

3. Heald, F. D. Blue mold in relation to fruit cleaning methods. Proc. Washington State Hort Assoc. 23: 143-148. [1928.]

4. Newton, G. A. Some fungi of the Stemphylium type and their relation to apple rots. Phytopath. 18: 565-578. 1928.

5. Thomas, H. E. Root and crown injury to apple trees. Phytopath. 18: 547-551. June 1928.

MISCELLANEOUS NON-PARASITIC DISEASES

Brown bark spot (undet.) Still present in same orchard in Brown County where it was noted in 1921. (Gardner) An undetermined bark spot is also noted as present in northern Texas.

Black lenticels. An unusual amount of blemish on account of small fly-speck-like spots around the calyx end was noted in New York according to W. D. Mills. It was especially prevalent on Greenings.

Burr knot (non-par). Encountered a number of times in West Virginia this year, according to reports to the Plant Disease Survey by W. A. Archer. Specimens from Alexandria, Virginia, representative of the condition on several trees were brought into the Washington office March 6. Recent work in this country and abroad has shown this disease to be non-parasitic and a peculiarity of certain varieties.

Chlorosis, caused by excess lime. Prevalent in limestone regions of Texas according to Taubenhaus and Lusk.

Cork and drought spot. These diseases, generally attributed to water supply factors and recently mentioned by Valleau (7) as possibly being caused by nitrogen deficiency, was reported from New York and Washington. This group of diseases was also mentioned by McLarty as causing more economic loss to the apple industry of the Okanogan section of British Columbia than any other. He suggested that the cause might be an unbalanced food supply due to excessive root killing by dry conditions. In the Champlain Valley of New York, where the disease is most troublesome for that State, it was much less prevalent than usual. A. B. Burrill stated that he thought the reason for this was the wet, late spring and early summer conditions. These diseases are usually most serious in years when dry weather prevails during that period.

Cracking of fruit. In Delaware and Virginia considerable trouble was reported by cracking of apples, particularly Staymans. It was associated with excessive rainfall during the month previous to harvest. In Montana a cracking accompanied by russetting was common and serious on McIntosh in Ravelli County according to Young. Since he observed it in a few unsprayed orchards the theory of spray burn does not entirely explain the condition.

Core molds (various fungi). More of this trouble was reported from Indiana than usual this year especially on Stayman.

Flap tumor (undet.). In West Virginia, near Morgantown, an example was observed of this peculiar malformation. All the branches of a single tree were involved. It has been observed once or twice in past years. Unquestionably this is the disease described by Reed and Crabill (Virginia Tech. Bul. 8: 42-44. 1915.) (Archer)

Jonathan spot (undet.). New Jersey, Delaware, Virginia, Kansas and Washington. The loss for the State was estimated at 0.1 per cent in New Jersey and 2 per cent in Kansas. It was said to be more prevalent in Virginia and Delaware than usual.

Measles. Reported as occurring scatteringly in West Virginia and Illinois and locally in Mississippi. In Illinois, according to Anderson, the disease seems to be increasing locally especially on Delicious and Rome Beauty. The cause of this disease has never been reported definitely.

Mosaic (virus). Reported from 8 separate New York counties in about the same amount as usual. Some orchards exhibit the trouble year after year in varying intensity. It does not appear to be increasing according to W. D. Mills.

Ring spot. Crescent shaped sunken areas becoming circular in some cases were noted on fruit of certain varieties especially Winter Banana, Maiden Blush, and Newtown Pippin in the lower Hudson Valley, New York. Many early fruit dropped because of this. It appeared to be unusually conspicuous this year, according to Mills.

Root rot, apparently influenced by excess of bone meal at time of planting, was responsible for the death of 500 Cortlandt trees in a newly planted orchard in Ulster County, New York. (Mills)

Target canker. In the southern part of West Virginia there occurs moderately a type of canker which seems to be the target canker described recently by Roberts (Phytopath. 17: 735-738). (Archer)

Water core. Noted on Yellow Transparent, McIntosh and Greening in New York where it was said to be much less common than usual, and in one orchard in New Jersey where it was severe on Transparent and moderately so on Red Astrachan.

Recent literature: Pl. Dis. Reptr. 12: 71, 89-90, 91, 140.

1. Carne, W. M. Burr-knot and stem-tumour of apple and quince trees. Jour. Dept. Agr. West. Australia II, 5: 123-126. Mar. 1928.

2. Fisher, D. F., and C. Brooks. Apple water-core theories revised. Better Fruit 22 (6): 5, 21, 1927 (7): 14, 15, 22, 24, 25, 1928.

3. Kidd, Franklin and Cyril West. Two types of storage internal breakdown in apples. Rept. Food Invest. Bd. Great Britain 1927: 42-43. 1928.

4. McLarty, H. R. Some observations on physiological diseases in apple in British Columbia. Scient. Agr. 8: 636-650. June 1928.

5. Plagge, H. H., and T. J. Maney. Soggy breakdown of apples and its control by storage temperatures. Iowa Agr. Exp. Sta. Res. Bul. 115: 61-116. 1928.

6. Ramsey, G. B., and L. F. Butler. Injury to onions and fruits caused by exposure to ammonia. Jour. Agr. Res. 37: 339-348. Sept. 15, 1928.

7. Smith, R. E., and H. E. Thomas. Copper sulphate as a remedy for exanthema in prunes, apples, pears and olive. Phytopath. 18: 449-454. May 1928.

8. Valleau, W. D., and E. M. Johnson. Tobacco frenching - a nitrogen deficiency disease. Kentucky Agr. Exp. Sta. Res. Bul. 281: 179-253. 1927.

9. Whipple, O. B., and G. G. Melhart. More about water-core in apples. Better Fruit 22 (9): 9. Mar. 1928.

DISEASES OF PEAR

BLIGHT, BACILLUS AMYLOVORUS (BURR.) TREV.

Of the many States reporting blight only four, Virginia, Tennessee, Utah and California, reported more than during the average year. The losses for the country as a whole therefore can probably be considered as below normal. As given by collaborators they are listed in table 56.

Some of the collaborators' reports on prevalence are as follows:

Virginia: The worst disease of pears in State. Causes severe dwarfing of trees and acts as centers of infection for nearby apple orchards. (Schneiderhan)

North Carolina: Very destructive this year. Observed on young fruit and pedicles approximately one week after petal fall. (Fant)

Kentucky: For the past three seasons on Kieffers controlled completely by cutting in winter. Yellow Transparents in adjacent planting protected in this way. (Valleau)

Michigan: Heavy fall rains and mild temperature resulted in considerable development of blight in nursery stock during September and October. (Nelson)

Missouri: As in previous year not so severe over the State. Hold-over cankers apparently have not been so abundant for the past two years. (Scott)

Table 56. Percentage losses from pear blight as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
50	Georgia	6	Maryland
25	Tennessee	5	Iowa
20	North Carolina	3.5	Arizona
11	Missouri	2.5	Virginia
10	West Virginia, Utah	1.5	Michigan
		1	Ohio, Kansas

Colorado: Not seen nor reported to staff. (LeClerg)

New Mexico: Not common in Mesilla Valley but causing damage in places where fruit was not killed by frost. (Crawford)

Oregon: Far less blight than usual. Weather conditions seemed favorable for development but probably there was very little hold-over left from 1927 when we had practically no blight. (Reimer)

California: Developed for the first time in several counties. Condition about the same as in 1927. (Milbrath)

In last year's supplement the extremely heavy losses from pear blight in California were estimated by Milbrath at about one million dollars. With more complete data at hand Milbrath estimated on June 15, 1928 that the loss was probably nearer two million dollars. This included trees eradicated, blight cutting work and crop loss, counting the average value of a tree at ten dollars and including all labor items. In certain individual counties as many as 40,000 trees were grubbed out.

The Pineapple and Sand pear varieties were mentioned as very resistant in Georgia and Louisiana and in Tennessee, Pyrus calleryana was mentioned as resistant. The Kieffer was especially mentioned as susceptible in Georgia, Louisiana and Arkansas.

In parts of New Zealand, where this disease has been introduced and has become serious, the problem is considerably complicated by the establishment of infection in hawthorn much of which is used as hedges. In order to control the disease in apple and pear sections where hawthorns grow an eradication campaign aimed against that host seems necessary. (Hyde, 4).

Recent literature: Pl. Dis. Reptr. 12: 7, 27-29, 38-39, 61.

1. Becker, G. G. Non-pear zones and blight eradication. Jour. Econ. Entom. 21: 485-487. June 1928.

2. Day, L. H. Pear blight control in California. Univ. California Coll. Agr. Ext. Serv. Circ. 20, 50 p. June 1928.

3. Howard, F. L. Disinfectants in fire blight eradication work. Phytopath. 18: 710-711. Aug. 1928.

4. Hyde, W. C. Replacing the hawthorn hedge. New Zealand Jour. Agr. 36: 92-95. Feb. 1928.

5. Reimer, F. C. Pear blight control. Better Fruit 22 (11): 9, 10, 28. 1928.

6. Rosen, H. R., and A. B. Groves. Studies on fire blight: host range. Jour. Agr. Res. 37: 493-505. Oct. 15, 1928.

SCAB, VENTURIA PYRINA ADERH.

Scab was mentioned as being especially troublesome in important pear sections of New York, southwestern Michigan and the Pacific Coast. In New York it was occasionally serious in Bartlett orchards of Wayne and Onondaga County. Twenty per cent of fruit infection of Bartletts was noted in one orchard. In Michigan there was an unusual development in the southwestern section. Heavy rainfall and temperatures favorable to scab in June apparently favored the establishment of general twig infection according to Nelson. In Wisconsin very few pears are grown but the late fruit was said to be unusually scabby. In the Willamette Valley of Oregon according to Zeller late spring rains prevented effectual spraying and the loss was due mostly to blossom infection preventing set of fruit. Losses were estimated as follows: Michigan, 13 per cent; New Hampshire, 10 per cent; Wisconsin and Oregon, 5 per cent; Kansas and California, 2 per cent; Massachusetts and New York, 1 per cent; Maryland, 0.5 per cent. Flemish Beauty was mentioned as very susceptible in New York and Michigan. Bartlett was listed as susceptible in the same States and Keiffer was said to be very resistant in Michigan.

Recent literature: Pl. Dis. Reptr. 12: 61, 79, 137.

LEAF BLIGHT, FABRAEA MACULATA (LEV.) ATK.

More than usual and more than last year was mentioned as occurring in the New Jersey, Maryland, Delaware, Virginia and Tennessee regions. More than last year was also mentioned as occurring in Michigan in unsprayed orchards. In Delaware both leaf and fruit infection were very heavy according to Adams. In Virginia, Schneiderhan reported it as always present on old Seckel pears and when the leaves are heavily infected defoliation results. In West Virginia severe defoliation was noted on many unsprayed trees and in some localities the fruit was badly spotted. In Illinois some damage occurred even to resistant Keiffers. The disease is not a factor of importance in the extreme western part of the United States.

Summer sprays with Bordeaux mixture are supposed to give good control but no experimental data covering this point was reported in 1928.

Recent literature: Pl. Dis. Reptr. 12: 126.

LEAF SPOT, MYCOSPHAERELLA SENTINA (FR.) Schroet.

In New York this leaf spot was said to be more common than last year being especially severe on Seckels which were defoliated in many cases in the western part of the State. In West Virginia slight to moderate defoliation was also observed in various localities on account of this spot. In Georgia it is said to be decidedly more prevalent than usual and causing a loss estimated at about 5 per cent. Traces were reported from Kansas.

Recent literature: Pl. Dis. Reptr. 12: 79-80, 126.

MISCELLANEOUS DISEASES AND INJURIES

Bacterium tumefaciens EFS. & Town., crown gall. Occurred locally in New Jersey, and generally in Arizona. In Maricopa County of the latter State a loss of 5 per cent in 50 acres was reported.

Bitter pit (non-par.). Walla Walla, Washington.

Brown bark spot or measles (undet.). Reported by Gardner from Putnam Co., Indiana on Flemish Beauty.

Brown blotch (undet.). "Reported for the first time from West Virginia although undoubtedly it has been present previously. Many varieties were attacked but seemingly the market value of the fruit was not damaged. In fact the blotched appearance is generally considered to be the natural condition of the fruit." (Archer)

Corticium koleroga, thread blight. Observed in June in Baton Rouge, Louisiana.

Gloeodes pomigena (Schw.) Colby, sooty blotch. Noted in West Virginia in one locality on an early yellow variety which was severely blotched.

Glomerella cingulata (Stone.) Spauld. & Schrenk., bitter rot. Reported Massachusetts and Mississippi.

Gymnosporangium globosum Farl., rust. Leaf infection but not fruit infection noted in Duchess and Greene County, New York where it was unusually prevalent according to W. D. Mills.

Phyllosticta pyrorum CKE., leaf spot. Mississippi.

Podosphaera leucotricha (E.& E.) Salm, powdery mildew. Serious on D'Anjou pears in central Washington causing a russetting of the fruit, according to D. F. Fisher. This is the only variety observed seriously affected and it was worst on it when planted among susceptible varieties of apples from which the disease undoubtedly spread.

Sclerotinia cinerea (Bon.) Schroet., blossom blight. Considerably more of this disease was reported from Oregon. Near Roseburg in one D'Anjou group of 34 trees only one-quarter of the crop was harvested due to this spur blight. Winter Nelis was also severely affected in the same locality. The disease was probably more or less general all through western Oregon. (Barss)

Xylari mali Fromme, black root rot. In his recent bulletin (1) Fromme reports artificial infection of pear seedlings. Five out of 72 Pyrus communis trees became infected and died as a result of inoculation by inserting mycelium in a wound in the root.

Recent literature: Pl. Dis. Reptr. 12: 15, 79, 126.

1. Fromme, F. D. The black root rot disease of apple. Virginia Agr. Exp. Sta. Tech. Bul. 34. 52 pp. Mar. 1928.

DISEASES OF QUINCE

BLIGHT, BACILLUS AMYLOVORUS (BURR.) TREV.

The quince is an especially susceptible host of Bacillus amylovorus. However, it is not an especially important fruit crop and is only grown commercially in a few sections. The majority of the trees are in home orchards.

As in the case of blight on pears and apples in 1928 it was generally relatively slight on quince. No State reported more than usual. A loss of 10 per cent was estimated in West Virginia, 5 per cent in Maryland, and 1 per cent in Ohio. More damage was indicated in West Virginia than any other State.

OTHER QUINCE DISEASES

Cephalothecium roseum Cda., pink rot. Collected on the Cincinnati market by O. T. Wilson.

Botrytis sp., fruit rot. Reported from Connecticut by Clinton and McCormick.

Fabraea maculata (Lev.) Atk., leaf blight and fruit spot. This, one of the commonest quince diseases was reported from New York, New Jersey, Delaware, West Virginia, Michigan and Mississippi. Heavy defoliation and moderate spotting of the fruit was reported from Delaware and West Virginia and severe defoliation with 2 per cent reduction in yield was mentioned as occurring in Michigan.

Glomerella cingulata (Ston.) Spauld. & Schroet., bitter rot. Noted in several localities in the eastern panhandle of West Virginia where it was causing some damage.

Gymnosporangium germinale (Schw.) Kern, rust. Massachusetts, New York, New Jersey, West Virginia and Mississippi. In West Virginia, Archer reported only a slight amount but mentioned that in 1924 it was epidemic on quince fruits causing a loss of about 3 per cent. In New York it was reported only from the Hudson Valley and in Dutchess County the percentage of infected fruit was estimated at 3 per cent. This is a heavier infection than ordinarily occurs there.

Phoma pomi Pass., fruit spot. Specimens of badly affected quince fruits which had been grown in West Chester County, New York, were received in Washington October 25. Practically all of the fruit on 40 trees in the orchard were badly affected. The disease also occurred scatteringly in New Jersey according to W. H. Martin.

Physalospora malorum (Pk.) Shear, black rot. General and severe in West Virginia causing a loss of possibly 2 per cent according to W. A. Archer. This seems to be the first report of this disease to the Plant Disease Survey from West Virginia although it undoubtedly has occurred there for many years.

Podosphaera oxycanthae (D.C.) D By., powdery mildew. According to W.A. Archer it occurred abundantly on lower leaves in parts of West Virginia. First report to Survey from that State.

Recent literature: Pl. Dis. Reptr. 12: 126-127.

1. Carne, W. M. Burr knot and stem tumour of apple and quince trees. Jour. Dept. Agr. West. Australia 2 (5): 123-126. Mar. 1928.

DISEASES OF STONE FRUITS

PEACH

BROWN ROT, SCLEROTINIA FRUCTICOLA (WINT.) REHM.

Favored by a wet June and July in eastern United States, brown rot was more common and destructive in 1928 than usual, not only in the field, but also in transit and on the market. Blossom infection was apparently not so bad as is sometimes the case but there was enough of it to provide plenty of inoculum for twig and fruit infection. In Illinois and Indiana the stage seemed to be set for an epidmic but such did not materialize. H. W. Anderson pointed out that uninjured, green fruit is highly resistant to brown rot and that as the crop was relatively free from injury only a small percentage of brown rot developed on the fruit. In Virginia, Schneiderhan report that the disease is on the increase because of infection through the wounds caused by the oriental peach moth. In the Willamette Valley of Oregon the twelve spotted cucumber beetle was said to be responsible for making punctures through which infection occurred. Losses were estimated as given in table 57.

One grower in Orange County, New York, lost 80 per cent of his early peaches on account of this disease. Heavy losses occurred in many orchards in North Carolina according to Fant. In the Fort Valley section of Georgia an unusual amount of damage occurred. Cloudy and wet weather of June and July resulted in a large amount of rot. The fruit in some orchards was abandoned on account of the disease.

Notes on apothecial development were received from Pennsylvania and Indiana. In the former State, R. S. Kirby reported on April 12 as follows:

"Apothecia have been observed on peach mummies in the following counties during the past ten days: Delaware, Chester, Montgomery, Bucks. The stalks were observed to be forming 7 to 10 days ago but the first fully opened apothecia were observed at Media, Delaware County on April 9."

Leslie Pierce of Vincennes, Indiana, found the first apothecia on April 3 under a seedling tree. Spores from these apothecia germinated within 24 hours when placed on slides. About 95 per cent of the blossoms of Hale and Elberta in this orchard were open at the time."

Table 57. Percentage losses from brown rot of peaches as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
40	Tennessee	6.5	New Jersey
15	Georgia, Kentucky, Mississippi	5.	Michigan, Missouri
		4	Maryland, Kansas
10	Massachusetts, Ohio, Oregon	3	Virginia
		1	West Virginia, Arkansas
8	North Carolina	.5	Delaware, Indiana

Recent literature: Pl. Dis. Reptr. 12: 40, 61, 70, 80-81, 92, 142.

1. Pierce, L. Brown rot and shothole. Trans. Illinois State Hort. Soc. 61: 405-418. 1928.

2. Wormald, H. Further studies of the brown-rot fungi. III. Nomenclature of the American brown-rot fungi: a review of literature and critical remarks. Trans. British Mycol. Soc. 13: 194-204. Oct. 1928.

3. Wormald, H. The present distribution of the brown rot fungi: its economic significance. Jour. Min. Agr. Gt. Brit. 35: 741-750. Nov. 1928.

LEAF CURL, EXOASCUS DEFORMANS (BERK.) Fckl.

Collaborators in New England, Georgia, Illinois and on the Pacific coast reported more leaf curl than usual. Infection of the fruit was unusually prevalent in parts of Georgia and in California. In Arkansas particular mention was made of a late infection with the earliest leaves free from curl while later ones were badly deformed. Some of the collaborators reports are as follows:

Indiana: Dry April and March. All growers able to get spraying done on time. (Gardner)

Illinois: Appeared late this season. Severe in parts of central and southern Illinois. (H. W. Anderson)

Michigan: Not causing much injury this season. The most severely affected area is a narrow strip along the shore of Lake Michigan. Much less curl away from the Lakes. (Bennett)

Missouri: Appears to be decreasing as a whole. The most conspicuous cases are on seedlings growing along fence rows, etc. (Scott)

California: General on unsprayed trees. Loss on such trees very heavy. Much fruit infection. (Milbrath)

Estimated percentage losses as given by collaborators are: 5 per cent in Tennessee and North Georgia; 2 per cent, Virginia; and 1.5 per cent, North Carolina.

As regards control, Gardner in Indiana reported "On Elberta at Vincennes, Leslie Pierce sprayed November 26, 1927 with Bordeaux plus oil, copper sulphate plus oil, and oil alone and obtained control only with the Bordeaux plus oil." In Illinois, H. W. Anderson statedtthat the control with Bordeaux plus oil emulsion gave perfect control although some injury resulted when applied in the fall. In Oregon, Zeller reported that Bordeaux mixture 6-6-50 applied in winter gives satisfactory control and is generally used.

Recent literature: Pl. Dis. Reptr. 12: 30-31, 62, 70.

1. Mix, A. J. Further studies on Exoascaceae. (Abstract) Phytopath. 19: 90. Jan. 1929.

2. Sansone, F. Una speciale deformazione dei frutti de mandorlo dovuta and attacco dell'Exoascus deformans (Berk.) Fuck. Boll. R. Staz. Patol. Veg. Roma. n.s.8: 291-299. July-Sept.1928.

SCAB, CLADOSPORIUM CARPOPHILUM THUEM.

Rainy weather in eastern United States during a large part of the peach growing season favored scab with the result that several of the States reported more trouble from this disease than usual. A few collaborators reported that even in orchards which were thought to be fairly well sprayed or dusted, scab was a factor. Ordinarily it is very easily controlled by the ordinary spray schedules. In Virginia, Schneiderhan stated that it is becoming of more importance due to more stringent grading rules, and that it was very severe in certain parts of the Piedmont Section of Virginia. In Illinois it was usually very rare in commercial orchards but last year it was fairly common although the damage was negligible.

Losses were estimated by collaborators as shown in table 58.

Table 58. Percentage losses from peach scab as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
6	Kentucky	1.5	New Jersey
5	North Georgia, Michigan	1	Massachusetts, Delaware, West Virginia, Ohio, Missouri
4	North Carolina		
2	Virginia, Kansas, Tennessee, Mississippi	.5	Maryland
		Trace	Arkansas

Peach - Scab

Recent literature: Pl. Dis. Reptr. 12: 70, 91, 142.

1. Bensaude, M., and G. W. Keitt. Comparative studies of certain Cladosporium diseases of stone fruits. Phytopath. 18(4): 313-329. 1928.

BACTERIAL SPOT, BACTERIUM PRUNI EFS.

During recent years Bacterium pruni seems to be becoming increasingly troublesome. In 1928 it was probably the most serious it ever has been for the country as a whole. Of the peach diseases, it appeared to be second only to brown rot which also was unusually abundant. In all the Coastal States from New Jersey to Georgia and also in Kentucky, Tennessee, Indiana, and Iowa, bacterial spot was more or much more prevalent than usual. Some of the collaborators' reports are as follows:

New Jersey: Severe on both leaves and fruit. One of the most serious outbreaks in years. Many orchards were almost completely defoliated. (Martin)

Delaware: Most disturbing disease throughout peach orchards in Sussex County. Trees at this time showing 50 per cent defoliation. Twig infections more common than ever observed. Can consider it in epidemic form this season. (Adams)

Maryland: Unusually severe on Eastern Shore and in Washington County. Many cases of severe defoliation and fruit infection severe in some instances. (Jehle)

Virginia: More than in any year since 1923. Frequently mistaken for spray injury. (Schneiderhan)

Kentucky: Fruit spotting severe in starved orchards and negligible in well cared for orchards. Defoliation appears to be largely a nutritional response. (Valleau)

North Carolina; South Carolina and Georgia: In the Sandhill Section of the Carolinas and also in some Georgia orchards Bacterium pruni caused much damage. It presents the most important problem to the peach growers in the former States. The injury took the form of leaf spotting with defoliation, fruit spotting, cankers on new shoots and weakening of trees. (Haskell & Poole)

Illinois: About the usual damage was done by bacterial spot of peach this year. The outstanding difference this year was the appearance of the disease on very young fruit in sufficient quantities to cause heavy loss in some orchards. The fruit was more generally infected this year than in previous years, but the loss of foliage was much less in spite of rather severe infection. This was probably due to the abundance of moisture in the ground throughout the season and the well distributed rains which prevented "shocks" to the trees. In other words, the twigs made a normal, uniform growth throughout the season with no sudden checks.

Peach - Bacterial Spot

The orchards where bacterial spot was most destructive this year were those where cultural conditions were such as to cause sudden changes in the growth of the trees. In one orchard under observation the trees were nitrated and cultivated in May in order to bring them out of a weak condition following a bad case of leaf curl the preceding season. The trees made a very excellent growth following the heavy rains of June, but in July and August they were somewhat neglected. Severe leaf spotting resulted and defoliation was pronounced. In this case another application of nitrate and cultivation during July was indicated by the response of the trees. (Anderson)

Missouri: Only noted in two localities this year. Does not seem to be increasing to any extent. (Scott)

Table 59. Percentage losses from bacterial spot of peach as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
12	North Carolina	1	Virginia, Ohio
6	Indiana	.1	Iowa
4	Maryland, Georgia		

The disease was most commonly reported on the Elberta as it is one of the most susceptible varieties and very widely growh. Carman, Hale and Early Rose were mentioned as especially susceptible in Georgia.

Roberts and Pierce (1) have reported on a new spray for the control of this disease. Two formulas that gave good results are as follows:

Formula 1.

Zinc sulphate - 4 pounds
Hydrated lime - 3 pounds
Casein lime - 1/2 pound
Water - 50 gallons

Formula 2.

Zinc sulphate - 4 pounds
Hydrated lime - 4 pounds
Alum - 1-1/2 pounds
Water - 50 gallons

In 1928 in southern Indiana six applications were made at intervals of 2 weeks beginning at petal fall. Care was taken to cover fruits and the under side of leaves. Spotting of leaves and defoliation were markedly less on these leaves and the leaves were a deeper green and larger than those of trees sprayed or dusted with sulfur.

Recent literature: Pl. Dis. Reptr. 12: 16, 30, 40, 51, 62, 69, 80, 100-102.

1. Roberts, J. W., and Leslie Pierce. A promising spray for the control of peach bacterial spot. (Abstract) Phytopath. 19: 28. Jan. 1929.

2. Valleau, W. D. Bacterium pruni problem in Kentucky. U. S. Dept. Agr. Plant Dis. Rep. 12: 100-102. Sept. 15, 1928.

YELLOWS (VIRUS)

Six States reported the occurrence of yellows in 1928. In New York it was reported to the Survey for the first time from Tompkins County and was thought to be somewhat more prevalent in the State generally. In Wayne County some of the growers thought that it was increasing. In New Jersey scattered cases were observed, as high as 10 per cent being found in one orchard, according to W. H. Martin. In Maryland a loss of about 0.5 per cent for the State was estimated by Jehle but he thought that there was less evidence of the disease than usual. In West Virginia it has not been observed by pathologists since 1925 when a few scattered occurrences were noted. From Kentucky, W. D. Valleau sent in specimens on August 11 showing typical fruit characters of yellows as determined by M. B. Waite. In Illinois, the Natural History Survey made a special survey to determine the extent of yellows. According to H. W. Anderson the disease seems to be confined to small regions south of Centralia but presence in other sections may also exist.

In Pennsylvania the State Department of Agriculture continued their inspection and examined orchards especially in counties which they had not covered earlier. The results have been given by W. A. McCubbin as follows in a statement and two tables:

"In summing up the results of the year's results it may be seen from the accompanying tables that yellows inspection was carried on in 19 counties in 1928; in these 533 orchards containing 922,540 trees were examined; and diseased trees to the number of 1317 were marked for the owner's attention. The amount of yellows found this year is much lower than ever before, reaching only the small proportion of 0.142 per cent, or less than 3 trees in 2,000.

"In the six new counties 94 orchards containing 104,250 trees were examined and many others located and listed for future visits. In those inspected, 51 yellows trees were marked, which indicates the rather low percentage of .25 per cent for those orchards.

Table 60. Peach yellows inspection over the eight year period in Pennsylvania, 1921-1928.

Year	Orchards inspected	No. trees inspected	No. trees blazed	Per cent yellows
1921	324	287,456	17,376	4.45
1922	422	442,507	11,052	2.50
1923	417	422,614	10,698	2.21
1924	456	476,012	6,064	.89
1925	408	655,495	2,326	.35
1926	390	624,743	2,524	.40
1927	447	802,033	1,846	.23
1928	533	922,540	1,317	.14
	3,397	4,891,408	53,203	1.08

Table 61. Summary of yellows inspection in all counties inspected in Pennsylvania in 1928.

County	Orchards inspected	No. trees inspected	No. trees blazed	Per cent yellows
Adams	56	79,986	31	0.038
Berks	49	128,070	155	0.121
Bucks	43	53,890	177	0.328
Cumberland	31	54,793	82	0.149
*Columbia	11	13,582	18	0.139
*Carbon	5	28,568	61	0.210
Chester	36	29,160	24	0.082
Dauphin	22	19,897	36	0.180
Delaware	17	13,601	24	0.176
Franklin	75	238,235	296	0.124
Lancaster	27	39,806	41	0.103
Lebanon	14	25,470	17	0.066
Lehigh	11	52,120	57	0.109
Montgomery	18	33,698	55	0.163
*Northumberland	5	9,570	30	0.313
*Perry	9	11,700	20	0.170
*Schuylkill	35	16,501	83	0.503
*Snyder	29	24,329	49	0.201
York	40	49,564	61	0.123
19 counties	533	922,540	1,317	0.142

* Counties inspected in 1928 for first time.

Valleau (4) has suggested a possible relationship between peach yellows and leaf roll of potatoes.

Recent literature: Pl. Dis. Reptr. 12: 102-103, 103.

1. Ferraris, T. Peach yellows; peach rosette e l'arricciamento del pesco in Piemonte. Curiamo le Piante. 6: 101-114. June 28, 1928.

2. McCubbin, W. A., and F. L. Holdridge. Observations on peach yellows. Proc. Pennsylvania Acad. Sci. 2: 82-83. 1928.

3. __________ Peach yellows report. Bul. Pennsylvania Dept. of Agric. 11 (6): 25 pp. 1928.

4. Valleau, W. D. Peach yellows and potatoes. U. S. Dept. Agr. Plant. Dis. Reptr. 12: 102-103. Sept. 15, 1928.

LITTLE PEACH (VIRUS)

During 1928 little peach was reported to the Survey from 3 additional New York counties, Suffolk, Dutchess, and Chautauqua. In the two latter counties an estimate of 1 per cent infected trees was made by W. D. Mills. In New Jersey the disease continued about the same or less according to Martin and in Delaware and Maryland traces were noted. Both L. M. Hutchins and Ray Nelson mention the fact that for the past few years this disease has been increasing in the Michigan peach district along Lake Michigan. Hutchins adds that losses will be severe unless vigorous action toward eradication is undertaken.

Recent literature: Pl. Dis. Reptr. 12: 103.

ROSETTE (VIRUS)

Rosette was reported from Illinois for the first time in 1928 by H. W. Anderson. It was a case of a single tree in Madison County. A new location was also found in Tate County, northern Mississippi. This case was reported by Neal, Wedgworth and Miles and observed July 29. In 1927 the disease was first reported from Kentucky. In 1928 many more peach trees as well as wild and cultivated plums were found affected in McCracken County of that State, according to Valleau. In Tennessee a trace of this disease was reported by McClintock from Knox County.

On June 16, specimens of rosette were received at the Bureau of Plant Industry from the Experiment Station orchards at Clemson College, South Carolina and were determined as rosette by M. B. Waite. Wild plums in the vicinity were also found affected later on. Hutchins reported on August 29 that this disease was more serious in Georgia than it has been for some years. From 200 to 300 cases were noted in one locality. He observed, however, that the loss over the entire State remains only a trace.

Recent literature: Pl. Dis. Reptr. 12: 62-63, 90, 103, 142.

PHONY DISEASE (VIRUS)

The situation with regard to this increasingly important disease in Georgia is well given in a paper (1) by L. M. Hutchins before the American Phytopathological Society at New York, December 30, 1928. The Plant Quarantine and Control Administration held a hearing to consider the advisability of prohibiting the shipment of peach nursery stock from outside of the present known infested areas in Georgia and Alabama. The action taken on this hearing has not been announced to date.

Recent literature: Pl. Dis. Reptr. 12: 70.

1. Hutchins, Lee M. Phony disease of the peach. (Abstract) Phytopath. 19: 107. Jan. 1929.

2. ________ Peach orchards in Georgia menaced by phony disease. U. S. Dept. Agr. Yearbook 1927: 499-503. 1928.

BLIGHT, CORYNEUM BEIJERINCKII OUD.

This disease is of more economic importance in California than all of the other States put together but during 1928 no reports concerning its prevalence were received from that State. It was mentioned by Barss in Oregon as causing serious fruit spotting there and that it was apparently favored by late rains in the spring. In Utah, Richards reported a trace of damage but less than the usual amount on account of dry weather.

Recent literature: Pl. Dis. Reptr. 12: 81.

WINTER INJURY

Considerable trouble from winter injury was reported from some of the more Southern States of the peach growing area.

Georgia: Winter injury to the trunks of peach trees is more severe than usual. In one orchard near Griffin approximately 75 per cent of the trees are killed and practically all are severely injured. The trees are three-year-old Elbertas in high state of cultivation. Other growers report Elbertas less severely injured than other varieties. In one orchard that I visited a high percentage of the Early Rose trees are killed while Elbertas show little injury. In this case the Early Rose trees are headed unusually high, exposing long shan[ks] to the weather. (Higgins)

Illinois: A large number of trees were killed in various sections of th[e] State by the past winter, perhaps as a result of adverse weather conditions the preceding winter. These winter-killed trees were found in widely separated localities. In general, the injury was confined to the area near the ground line where the bark was brown and water-soaked. This condition on account of the location of the injury was frequently ascribed to injury from paradichlorobenzene, but the evidence was such as to eliminate this as a factor in most cases at least. Usually lack of drainage or other soil conditions could be assigned as the most important factor in this injury, but a few orchards in remarkably well drained and fertile soil were seriously injured. This was especially true in the orchards of southern Jackson County near Kamanda. (H. W. Anderson)

Arkansas: A relatively large number of young and old peach trees are reported to have died out in the main peach section of the State. No specimens have been received but the following symptoms are noted: A killing of the bark around the base of the tree, discoloration and dropping of the foliage, prematu[re] ripening and lack of quality in the fruit. Growers insist it is not winter injury because the disease did not appear until late in the growing season, but i[t] is to be questioned if this would entirely exclude winter injury. It has been ascertained by extension workers that the crown injury was not due to paradichlorobenzene, to oil emulsion, or to any peach borer effects. (Rosen)

Recent literature: Pl. Dis. Reptr. 12: 69, 80.

SPRAY INJURY

During recent years more or less trouble has been experienced from spray injury. A considerable amount of this both to the leaves and twigs is a result of the arsenicals in the sprays. Less trouble than in previous years was reported from New Jersey by Martin. In Maryland it continued as a rather serious factor and Jehle estimates about 4 per cent loss on account of it. In Ohio H. C. Young reported arsenical injury to small twigs very severe. Schneiderhan and Wingard made a study of the situation in Virginia orchards and have reported as follows:

"Widespread reports of injury on fruit and foliage of peach trees have been coming in. A special inspection trip covering the entire Valley of Virginia from Roanoke to Winchester, a distance of 185 miles was made to determine the extent of the injury and to identify the causes.

"We found that a small percentage of the trouble was caused by a bacterial shot hole. In fact this disease was strictly secondary as a cause of defoliation and leaf injury. The inspection of many peach orchards indicates quite clearly that the injury on the fruits which may be described as sunken brown areas usually surrounded by a halo even though the peaches are still green and followed by gummosis, is caused by the improper use of spray equipment and spray materials. On the leaves, the injury is of a shot hole nature but largely marginal. The lower margin of leaves was usually brown and disintegrated with a ragged edge. In extreme instances, heavy defoliation followed. On the twigs, typical dark brown areas especially at the union of petioles of leaves and usually accompanied by heavy gummosis, was observed.

"Upon reviewing the history of the spray schedule and the equipment used we found that the heaviest injury followed the use of guns instead of rods in the orchard. Furthermore, it seems that most of the damage is caused by lead arsenic wherever it was used without an excess of lime. We also found injury of the same type following the use of dry-mix sulphur lime, self-boiled lime-sulphur and sulphur dusts.

"A correlation of this injury with weather conditions is quite probable. During the month of June we had heavy and continuous rains. The heaviest rainfall in a decade was recorded at Winchester during June. The periodicity of rainfall was one rain every two days in June. This resulted in a heavy development of tender foliage which may have been more susceptible to spray injury than normally.

"Striking instances of spray injury were noted in one orchard near Winchester. Unsprayed parts of one side of a row of trees bordering a corn field showed no injury on fruit or foliage while the other half of the same trees was nearly defoliated. Wherever the growers used the prescribed 1 pound of lead arsenate to 50 gallons of water and added 4 pounds of either slaked lime or hydrated lime, the injury wasnegligible. Foliage injury amounted to 90 per cent in some orchards. In one orchard 85 per cent of peaches were injured. No varietal difference was noted."

Recent literature: Pl. Dis. Reptr. 12: 90-91, 102, 142.

MISCELLANEOUS DISEASES AND INJURIES

Armillaria mellea (Vall.) Quel., Texas.

Cephalothecium roseum Cda., pink rot, New Jersey.

Clitocybe tabescens Berk., root rot. Florida, in several instances on East Coast of Florida this fungus has killed peach trees usually in the vicinity of diseased Guava clumps (Psidium guajava). (West)

Caconema radicicola (Greef.) Cobb., root rot. Mississippi and Texas.

Phymatotrichum omnivorum (Shear) Dug., root rot. Texas, traces but unimportant on this host; Arizona, moderate importance, 1 per cent of 200 acres in Maricopa County.

Bacterium tumefaciens (EFS.) Town., crown gall. Quite prevalent in Texas according to Taubenhaus and Bach. In Arizona, Streets estimated a loss of 5 per cent for the State.

Sphaerotheca pannosa (Wallr.) Lev., powdery mildew. General and severe in California according to Milbrath. Leaves, twigs and fruit were attacked. When the attack occurs early in the season the fruit can outgrow the effects but if late in the season the epidermis is brown. Milbrath estimated a loss of about 0.5 per cent. Other States reporting a slight amount of this disease were New York, New Jersey, Texas and Washington.

Tranzschelia punctata (Pers.) Arth., rust. Louisiana, Texas, and California reported rust. It is always a more important factor in California than anywhere else. On July 1 Milbrath reported it as severe on leaves in that State.

Chlorosis (excess of lime), Texas.

Canker (non-par.) Mississippi.

Premature dropping (non-par.) Quite prevalent in Texas.

Sun scald (non-par.) Scattered cases on Elberta in Delaware.

Recent literature: Pl. Dis. Reptr. 12:62.

1. Anon. 1929 spray calendar for peaches. New Jersey Agr. Exp. Sta. Circ. 214: 4 p. Dec. 1928.

2. Blake, M. A. and A. J. Farley. The Elberta and its near kin lack hardiness. New Jersey State Hort. Soc. News 9: 234. June 1928.

3. __________ Peach fruits must grow at certain rate or drop. New Jersey State Hort. Soc. News 9: 233-234. June 1928.

4. Brooks, C. and J. S. Cooley. Time-temperature relations in different types of peach rot infection. Jour. Agr. Res. 37: 507-543. Nov. 1, 1928.

5. Carne, W. M. Leaf rust of stone fruits (Puccinia prunispinosae). Jour. Dept. Agr. West. Austral. II, 5: 177-178. June 1928.

6. Fant, G. W. The development of peach sooty mold at normal and low temperatures. Jour. Elisha Mitchell Sci. Soc. 43 (3-4): 217-219. 1928.

7. Talbert, T. J. Serious peach pests and their control. Amer. Fruit Grow. Mag. 48 (6): 6-7, 14. June 1928.

8. Duruz, W. P., and M. C. Goldsworthy. Spraying for peach rust. Proc. Amer. Soc. Hort. Sci. 24 (1927): 168-171. 1928.

DISEASES OF PLUM AND PRUNE

BROWN ROT, SCLEROTINIA FRUCTICOLA (WINT.) REHM.

For the country as a whole there was probably somewhat more brown rot than usual. The States of New York, Delaware, Virginia, Tennessee, North Carolina and Ohio, reported more or much more fruit rot than the average. As high as 80 per cent rot was noted on unsprayed trees in Delaware, 75 per cent in Virginia, 95 in Ohio, and 40 in Missouri. Infection through injuries caused by cucurlio and bacterial spot was noted in Delaware. In Ohio losses of 10 per cent in the orchard and 10 per cent after picking were estimated.

In the Oregon prune orchards less brown rot occurred than usual on account of dry weather.

Table 62. Percentage losses from brown rot of plum and prune as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
30	New Hampshire	4	Kansas
25	Massachusetts	3	New York
20	Ohio	2.5	Michigan
9	North Carolina	2	Texas
7	Missouri	1	Oregon
6	Wisconsin, Mississippi	.5	Delaware
5	Maryland, Virginia, Iowa		

Recent literature: Pl. Dis. Reptr. 12: 137.

1. Curtis, K. M. The morphological aspect of resistance to brown rot in stone fruit. Ann. of Botany 42 (165): 39-68. 1928.

2. Wormald, H. The present distribution of the brown rot fungi: its economic significance. Jour. Min. Agr. Great Britain 35: 741-750. Nov. 1928.

BLACK KNOT, PLOWRIGHTIA MORBOSA (SCHW.) SACC.

Reported generally from the Eastern States and as far West as Kansas and Colorado on both wild and cultivated plums. In Maine it is thought that this disease is one of the factors limiting the cultivation of plums. In West Virginia it is thought to be one of the most important diseases. Damson was mentioned as susceptible in Tennessee and Indiana.

POCKETS, EXOASCUS PRUNI FCKL.

In Massachusetts this disease was observed in one orchard according to Davis. In Mississippi it was found in Yazoo County. In Minnesota more specimens and inquiries were received concerning this disease than have been received for the past four years. In Iowa it is said to be severe on unsprayed trees. In Kansas it was somewhat more prevalent than usual although the total loss was estimated at only a trace by O. H. Elmer. In Texas it was very prevalent according to Taubenhaus. Observed in Oregon according to Zeller.

Recent literature: Pl. Dis. Reptr. 12: 32.

LEAF SPOT, COCCOMYCES PRUNOPHORAE HIG.

Much more than last year and much more than usual in New York. It was especially severe in the commercial areas of Niagara County and western New York. All varieties appeared to be susceptible and probably a loss of from 25 to 30 per cent occurred. (W. D. Mills) In Ohio it was quite prevalent doing considerable damage according to Mendenhall. In Iowa it was severe on some varieties and seedlings according to R. H. Porter. Reports of occurrence were received also from Minnesota, Kansas, and Nebraska.

MISCELLANEOUS DISEASES

Bacterium pruni EFS., bacterial spot. One case of injury to leaves in Connecticut (Stoddard). Heavy twig foliage and fruit infection in Delaware (Adams). Traces of injury in Maryland (Jehle). Severe throughout North Carolina causing heavy defoliation (Poole). Fruit infection noted on variety Abundance in Indiana (Gardner). More than last year causing a trace of loss in Iowa (R. H. Porter). Only one case reported with slight damage in Missouri (Scott). The fruit of some Japanese varieties rather heavily infected in Kentucky. (Valleau). Traces of injury in Mississippi, Tennessee and Texas.

Bacterium tumefaciens EFS., & Town., crown gall. Fifteen States reported that it had not been seen nor collected during the year on this host. Streets in Arizona reported a 10 per cent loss of trees in Pinal County and a total loss of trees on 6 acres.

Cercospora circumscissa Sacc., shot hole. One case observed in Massachusetts. (Doran)

Exoascus mirabilis Atk., hypertrophy. A specimen was sent in to Washington by J. A. McClintock of Tennessee, also it was reported by Neal, Wedgworth and Miles as being somewhat more plentiful than usual in Mississippi.

Fumago vagans Pers., sooty mold. King County, Washington.

Leptothyrium pomi (Mont. & Fr.) Sacc., flyspeck. Collected in several counties in West Virginia by W. A. Archer.

Phyllosticta sp., blotch. Traces reported from five counties in Texas. (Taubenhaus)

Phymatotrichum omnivorum (Shear) Dug., root rot. Reported from two counties in Texas (Taubenhaus & Bach), and from Arizona (Streets).

Podosphaera oxyacanthae (DC.) D By., powdery mildew. Mississippi and Washington.

Tranzschelia punctata (Pers.) Arth., rust. Mississippi and Texas.

Chlorosis (excess of lime) Texas.

Gum spot (non-par.) Reported from Oregon but probably less abundant thar usual. (Barss)

Spray injury, estimated loss of 1 per cent in Iowa. Weather conditions of June and July favored injury.

Diamond canker (undet.) Doing considerable damage to French prunes in Napa County, California. It is transmitted by budding and grafting. Apparent has spread from one orchard. (1)

Recent literature:

1. Baade, J. H. Diamond canker in Nappa County. California Cult. 71: 494. Nov. 17, 1928.

2. Boyle, C., M. Murphy, and H. A. Cummins. "Blossom-wilt" of apple trees and "wither-tip" of plum trees, with special reference to two biologic forms of Monilia cinerea Bon. Sci. Proc. Roy. Dublin Soc. n.s. 19: 63-76. Sept. 1928.

3. Marsh, R. W., and R. M. Nattrass. Investigations on die-back of fruit trees. I. A preliminary experiment and some field observations on Diaporthe perniciosa as a cause of 'die-back' of plum trees. Ann. Rept. Agric. & Hort. Res. Stat., Long Ashton, Bristol, for 1927: 93-98. 1928.

4. Maynard, B. D. Prune die-back conquered. California Cult. 71: 78. July 28, 1928.

5. Smith, R. E., and H. E. Thomas. Copper sulphate as a remedy for exanthema in prunes, apples, pears, and olives. Phytopath. 18 (5): 449-454. 1928.

6. Wormald, H. On the cause of "die-back" in plum trees. Gard. Chron III, 84: 372-373. Nov. 10, 1928.

DISEASES OF CHERRY

BROWN ROT, SCLEROTINIA FRUCTICOLA (WINT.) REHM.

Brown rot was said to be more prevalent than usual in New York, Virgini and Kansas. In Virginia it was said to be one of the commonest causes of loss In California, according to Milbrath, it was about as severe as in 1926 and 19 affecting twigs, blossoms and fruit. The percentage losses were estimated as follows by collaborators: Tennessee, 40; New Hampshire, 30; Massachusetts, 20 New York and New Jersey, 5; Virginia, 3.5; Oregon, 3; Iowa and Kansas, 2; Maryland, Indiana, Michigan, and California, 1.

Recent literature

1. Curtis, K. M. The morphological aspect of resistance to brown rot in stone fruit. Ann. of Botany 42 (165): 39-68. 1928.

LEAF SPOT, COCCOMYCES HIEMALIS HIG.

This disease along with brown rot is regarded as one of the most important cherry diseases. Defoliation usually accompanies this disease but the question as to whether the fungus is the entire cause of the defoliation has been raised. In his survey report, W. D. Valleau of Kentucky raises the question, and in a recent bulletin from the Geneva Experiment Station, Gloyer and Glasgow (3). mention lack of vigor as a cause of yellow leaf and leaf dropping.

The States reporting more leaf spot than average are: New York, Ohio, Illinois, Indiana, Michigan, Wisconsin and Kansas. Five other States reported average prevalence. In New York, according to W. D. Mills, all varieties appeared to be susceptible, but particularly the English Morello. Severe defoliation occurred in most cases where the petal fall spray was omitted and the disease was regarded as the worst in five seasons. The effect on this year's crop was not great but the effect on future crops is liable to be considerable. Mills states that the petal-fall, two maggot sprays and after-picking spray are all necessary in western New York. In West Virginia, Archer reported that by mid-autumn infection and defoliation were severe. In Arkansas, it is said to be very serious in poorly sprayed orchards. In Michigan, R. Nelson reported as follows:

"Leaf spot was the outstanding plant disease of 1928 in Michigan. In the Traverse region and northward there was less leaf spot than usual. This was due to light initial infections. The temperature was low and precipitation deficient after blossoming. While the disease made considerable later developments no serious defoliation occurred, which is unusual for the Traverse district. In the southern half of the lower peninsula unsprayed trees were generally defoliated by August, resulting in the most serious epidemic of leaf spot in years. In the regions of severe defoliation the initial infections were heavy as rainfall was generally abundant at the critical periods for infection. Thus we have this year a reversal of conditions as usually found since defoliation normally occurs most severely in the Traverse and other more northerly regions."

In Iowa, according to D. E. Bliss, this disease was considered as probably the most serious of all diseases in the nurseries. By August 20, untreated trees were completely defoliated and dusted plants were only slightly better. Liquid Bordeaux 4-4-50 proved considerably more effective for control[illegible] than other treatments.

Percentage losses were estimated by collaborators as follows: Tennessee, 30; Maryland, Kansas, Kentucky, 10; Michigan, Missouri, 8; Ohio, 5; Arkansas, 4; Iowa, 3; Virginia, Wisconsin, Oregon, 1; Delaware, .5.

Recent literature: Pl. Dis. Reptr. 12: 52, 81, 137.

1. Anderson, H. W. Cherry leaf spot. Trans. Illinois State Hort. Soc. 61: 119-123. 1928.

2. Bradford, F. C. Cherry trees defoliated by leaf spot. Future fruit crops threatened by failure of trees to store food. Michigan Agr. Exp. Sta. Quart. Bull. 11: 7. Aug. 1928.

3. Gloyer, W. O., and Hugh Glasgow. Defoliation of Cherry Trees in Relation to Winter Injury. New York State Agr. Exp. Sta. (Geneva) 555: 3-27. Aug. 1928.

WINTER KILLING

Cherry trees are very subject to winter killing particularly when weakened by other causes such as leaf spot. Reports of it were received from New York, Arkansas, Illinois and Washington. In Illinois, H. W. Anderson reported the sour cherry, which is supposed to be resistant to winter injury, dying by the thousands during the year on account of the abnormal weather conditions of 1927-28. In 1927 leaf spot defoliated many trees which stimulated them to development in the fall and they entered the winter in a weakened condition. Death of several cherry orchards in the vicinity of Fort Collins, Colorado, was reported as due to winter killing.

Recent literature: Pl. Dis. Reptr. 12: 63, 92.

MISCELLANEOUS DISEASES

Armillaria mellea (Vahl.) Quel., root rot. Several cases in western Washington.

Bacillus amylovorus (Burr.) Trev., fire blight. This disease has been reported on sweet cherry before from the Pacific Coast. This year it was reported to the Survey for the first time from New York where W. D. Mills mentione it as occurring in some orchards in Ontario County, June 25.

Bacterium cerasi Griffin, bacterial gummosis. Skagit and Benton Countie Washington. In New Jersey the Department of Plant Pathology reported as follow

"In one orchard in Burlington County the Bing variety showed serious twig injury and also heavy cankering at the base of fruit spurs. Isolation showed the presence of a Bacterium similar to Bacterium cerasi. The trouble ma have followed winter injury but this point has not yet been determined."

Bacterium pruni EFS., bacterial spot. Reported as causing considerable leaf spotting in the Hudson Valley and in western New York.

Cherry - Miscellaneous Diseases

Bacterium tumefaciens, EFS. and Town., crown gall. Arizona.

Cercospora circumscissa Sacc., shot hole. Delaware, on sand or wild cherry, not of economic importance. (Adams)

Cladosporium carpophilum Thuem., scab. Reported from New York. Severe in one unsprayed orchard.

Coryneum beijerinckii Oud., blight. Asotin County, Washington.

Plowrightia morbosa (Schw.) Sacc., black knot. A few heavily infected sour cherry orchards in Hudson Valley. In one case sweet cherries were unaffected while adjoining sour cherries showed 100 per cent infected trees.

Podosphaera oxyacanthae (DC.) D By., powdery mildew. New York, Kentucky, Tennessee, Indiana, Michigan, Wisconsin, Iowa, Kansas, Colorado and Montana. For the most part only a trace reported but in Iowa it was severe on nursery stock where it probably caused about 2 per cent loss.

Brown spots. In Columbia County, New York, brown spots in the flesh of Early Richmonds gave the fruit a knotty, dimpled appearance. The cause of this was not definitely determined but was attributed to cold and possibly to wet weather at the time of setting of fruit.

Splitting. A large amount of rain caused considerable injury to sweet cherries in the Ontario Peninsula of Canada by inducing fruit splitting.

Recent literature:

1. Faes, H., and M. Staehelin. La maladie criblée du cerisier (Clasterosporium carpophilum) et la tavelure (Fusicladium dendriticum-pirinum) des pommes et poires. Ann. Agr. Suisse,29: 83-92. 1928.

2. ________ Un champignon parasite de cerisier: le Clasterosporium carpophilum. Pomol. France. 1928: 175-177. Sept. 1928.

3. Goodwin, W., E. S. Salmon, and W. M. Ware. The spraying of cherry orchards against "leaf scorch." Jour. S. E. Agr. Coll. Wye. 25: 147-151. 1928.

4. Wilson, E. E., and G. W. Keitt. The effect of sprays on the weight of cherry fruit. (Abstract) Phytopath. 19: 10. Jan. 1929.

5. Gloyer, W. O., and High Glasgow. Defoliation of Cherry Trees in Relation to Winter Injury. New York State Agr. Exp. Sta. Bul. 555: 3-27. Aug. 1928.

DISEASES OF APRICOT

Bacterium tumefaciens EFS., and Town., crown gall. Arizona, in Maricopa County, 4 per cent loss in 700 acres. (Streets) An orchard near Scottsdale showed galls reducing water supply so that foliage was being badly sunburned. (Ariz. News Letter 6 (6): 3, June 30, 1928.)

Cladosporium carpophilum, Thuem., scab. Indiana, canker on twigs; and Texas, quite prevalent.

Phymatotrichum omnivorum (Shear), Dug., root rot. Arizona, more than last year, possible 2 per cent loss. (Streets)

Recent literature

1. Duruz, W. P. Coryneum of apricots and its control. Proc. Amer. Soc. Hort. Sci. 24: 176-179. 1928.

2. Fish, S. Scab or shot hole of apricots. Control experiments in the Goulburn Valley. Jour. Dept. Agr. Victoria 26: 310-312. May 1928. Coryneum beijerinckii Oud. (Clasterosporium carpophilum (Lev.) Aderh.)

DISEASES OF SMALL FRUITS

GRAPE

BLACK ROT, GUIGNARDIA BIDWELLII (ELL.) VIALA & RAVAZ

Reports seem to be in general agreement that black rot was worse than usual in the areas where it occurs. In some sections particularly those further south it is liable to be very bad on unsprayed vines when weather conditions are favorable. In Ohio it was said to be very severe on home vines but not of much importance in commercial plantings. In Michigan low June temperature prevented serious outbreak. In Virginia it was the worst grape disease and much more prevalent than usual. In some southern sections of West Virginia fully half the crop was rotted. In Georgia, according to Boyd, the heaviest early leaf infection ever noted occurred; also more fruit rot on wild grapes, Scuppernongs and on vineyard varieties. In Arkansas the wet weather in mid-summer threatened very serious loss but sudden, dry spell checked disease before it became serious. Losses are estimated as follows:

Table 62. Percentage losses from black rot of grapes as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
40	Tennessee	3	Maryland
10	Virginia, West Virginia,	2.5	New York
6	Kentucky	2	Wisconsin, Kansas,
6	North Carolina,		Texas, Arkansas
	Mississippi	1	Massachusetts, Ohio,
5	Michigan	.5	Delaware
4	Utah		

Recent literature: Pl. Dis. Reptr. 12: 63, 127.

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

More downy mildew than usual was reported from New England, New York, Ohio and the Virginias and North Carolina. In Massachusetts some vines showed 50 per cent defoliation and a crop not worth harvesting. In Chautauqua County, New York, growers who claimed never to have been troubled before were observing it in their vineyards. Leaves and shoots and more than half the berries in a cluster were affected. The disease caused many growers to spray. In West Virginia, Archer reported it abundant for the first time in four years but stated that it was not usually of economic importance on account of scarcity or lateness of infection.

Bisby and Conners (1) noted the occurrence of downy mildew in Manitoba for what they think is the first occurrence.

Recent literature: Pl. Dis. Reptr. 12: 71, 127.

1. Bisby, G. R., and I. L. Conners. Plant diseases new to Manitoba. Sci. Agr. 8: 456-458. Mar. 1928.

2. Gladwin, F. E. Downy and powdery mildew of the grape and their control. New York (Geneva) Agr. Exp. Sta. Bul. 560: 1-14. Dec. 1928.

3. Moreau, L., and E. Vinet. Le mildiou. Evolution et traitements èn 1927. Conclusions pratiques. Rev. de Vitic. 68 (1764): 255-258; (1765): 269-274; (1766): 285-287. 1928.

POWDERY MILDEW, UNCINULA NECATOR (SCHW.) BURR.

This disease is annually much more important in California than all of the other States put together but this season the Survey has received no reports from that State. The outstanding feature as indicated by the reports that were received is the increased amount in New York where a 20 per cent loss was estimated and where it was probably the most severe it has been for many years.

Recent literature: Pl. Dis. Reptr. 12: 127.

1. Bonnet, L. O. Enemies of the flower and fruit. California Grape Grow. 9(3): 6-7. Mar. 1928.

2. Gladwin, F. E. Downy and powdery mildew of the grape and their control. New York (Geneva) Agr. Exp. Sta. Bul. 560: 1-14. Dec. 1928.

3. Jacob, H. E. Powdery mildew of the grape and its control in California. California Agr. Ext. Serv. Circ. 31: 18 p. Mar. 1929.

4. Johnstone, H. W. Controlling grape mildew. California Cult. 70: 322-323. Mar. 17, 1929.

ANTHRACNOSE, SPHACELOMA AMPELINUM D BY.

Several States from Maryland, Ohio and Iowa southward reported anthracnose but all are in agreement that it was of about average or less than the average prevalence. In Arkansas, V. H. Young mentioned its occurrence in severe form on the varieties Ellen Scott, Albania, Armalaga, Muscat Rose, Christine and only slight infection on America and R. W. Munson. Salamander was noted affected in Ohio.

Recent literature: Pl. Dis. Reptr. 12: 10.

BITTER ROT, MELANCONIUM FULIGINEUM (SCRIB. & VIALA) CAV.

Only four States reported bitter rot, New Jersey, Georgia, Florida and Ohio. In the two Southern States it was said to be abundant and serious on the common cultivated varieties. A 10 per cent loss was estimated for Georgia. In Ohio four samples were received at the Experiment Station for identification.

Recent literature: Pl. Dis. Reptr. 12: 70.

CROWN GALL, BACTERIUM TUMEFACIENS EFS. & TOWN.

Out of 17 States returning report cards on this disease, 13 reported that the disease had not been observed and only 4, Maryland, Kansas, Utah, and Arizona mentioned occurrence in very small amounts. In Utah it was said to be fairly prominent and thought to be causing perhaps as much as 2 per cent loss. In Arizona a loss of 0.5 per cent was estimated.

OTHER DISEASES

Cryptosporella viticola (Reddick) Shear, dead arm. New York - found in several counties was the cause of some fruit rot. A specimen was sent in to Washington from Ohio.

Glomerella cingulata (Ston.) Spauld. & Schrenk, ripe rot. Mississippi.

Isariopsis clavispora (Berk. & Curt.) Sacc., leaf spot. Slight premature defoliation observed in several instances in Georgia where it was thought to be more prevalent than usual. Specimens collected at Quincy, Florida, July 14.

Pestalozzia uvicola Speg., leaf blight. Reported for the first time to the Disease Survey from Connecticut.

Phymatotrichum omnivorum Shear & Dug., root rot. Fairly prevalent in Texas being very severe in Hidalgo County.

Rhytisma vitis Schw., tar spot. New York.

Recent literature: Pl. Dis. Reptr. 12: 70, 71, 127.

1. Barnett, R. J. Grape growing in Kansas. Kansas Agr. Exp. Stat. Circ. 134, 32 p. Jan. 1928.

2. Battail, J. Contribution aux recherches sur le court-noué. Progr. Agr. et Vitic. 89: 600-602. June 17, 1928.

3. Genes, G. Le court-noué. Prog. Agr. et Vitic. 90: 13-16. July 1, 1928.

4. ________ Le court-noué (cont.) Progr. Agr. et Vitic. 90: 37-39. July 15, 1928.

5. Bonnet, L. O. Enemies of the flower and fruit. California Grape Grow. 9 (3): 6-7. Mar. 1, 1928.

6. Coleman, L. C. The dead arm disease of grapes in Ontario. A preliminary study. Scient. Agr. 8 (5): 281-315. 1928.

7. Gandhi, Sohrab R. A grape vine disease new to India. "Dematophora necatrix Hartig." Poona Agr. Coll. Mag. 19: 205-207. Feb. 1928.

8. De Castella, F. Sulphuring and spraying vines. Jour. Dept. Agr. Victoria 25 (12): 732-735. 1927.

9. Limouzy, J. Le rot blanc. Progr. Agr. et Vitic. 90: 3-4. July 1, 1928.

10. Manns, T. F. Grape disease control in Delaware. Delaware Agr. Exp. Sta. Bul. 154: 37 p. Feb. 1928.

11. Muth, F. Die melanose der amerikanerreben. Mitt. Deut. Landw. Ges. 43: 1063-1066. Nov. 24, 1928.

12. Osterwalder, A. and H. Schellenberg. Ueber den falschen Meltau und Rotbrenner der Reben und die Bekämpfung dieser Krankheiten. Schweiz. Zeitschr. Obst. u. Weinb. 37: 172-176. May 12,1928.

13. Ravaz, L. Un cas special de chlorose des vignes américaines greffées. Prog. Agric. et Vitic. 89 (1): 10-12. 1928.

14. ________ Recherches sur le court-noué. Bull. Soc. Dép. Encouragement Agr. Herault. 35: 117-128; Aug. 1928.

15. Viala, P. Recherches sur les maladies de la vigne. Nouvelles observations sur l'esca. Rev. Vitic. 69: 229-235. Oct. 11, 1928.

STRAWBERRY

LEAF SPOT, MYCOSPHAERELLA FRAGARIAE (TUL.) LINDAU

Leaf spot occurred generally as indicated by reports from a majority of States. For the most part it seemed to be of only slight economic importance, only the older leaves and older beds being seriously affected. However, losses of 5 per cent and 6 per cent were estimated in Louisiana and Iowa, respectively. Mississippi, Illinois, Minnesota, and Missouri estimated more than the average prevalence. The variety Lupton in New Jersey and Gandy in Kentucky were mentioned as susceptible.

Recent literature: Pl. Dis. Reptr. 12: 77.

LEAF SCORCH, DIPLOCARPON EARLIANA (ELL. & EV.) WOLF

Florida, Mississippi, Louisiana, Texas, Arkansas, Missouri and Oregon are the only States definitely reporting leaf scorch to the Survey during 1928. Four per cent loss was estimated from Louisiana and 1 per cent from Texas.

Florida: It appeared on old plants in April and in the nursery plants from May to September. Spraying nursery beds every two weeks with Bordeaux 4-2-50 from May 1 to October 1 gave complete control. (A. N. Brooks)

Arkansas: Appears to be increasing in importance. Aroma, resistant; Klondike, susceptible. (V. H. Young)

Oregon: A strain of this disease is common on the wild hosts, Fragaria chiloensis and F. cuneifolia but does not affect our commercial varieties except the Clark Seedling grown in Hood River Valley and some new Oregon Station hybrids which have F. chiloensis as one parent. (Zeller)

Recent literature: Pl. Dis. Reptr. 12; 77.

POWDERY MILDEW, SPHAEROTHECA HUMULI (DC.) BURR.

In Chautauqua County, New York, an infection of 3 per cent of the leaves was estimated. In Orange County of that State several patches were affected and copper-lime dust that was applied was not effective. In Ohio, C. W. Bennett reported that it is rarely observed except on the Mastedon variety and not even very injurious on this. A. G. Plakidas stated that he has never observed this in Louisiana.

FRUIT ROTS

Botrytis cinerea Auct., grey mold rot. Reported from several States and the cause of considerable loss. Said to be unusually abundant in New England, New York, New Jersey, Delaware, Illinois and Missouri. It affected the berries both on the vine and after picking. Davis in Massachusetts reported 10 to 23 per cent infection of the berries on the vines in some patches. Rainy weather in May and June favored development of this disease. Eight per cent loss for the State was estimated in Missouri and the crop in southern Illinois was far below standard on account of this and other fruit rots.

Phytophthora cactorum (Leb. & Cohn) Schroet., leather rot. In one field in Mississippi twelve long rows receiving drainage showed 75 per cent loss from leather rot while the remainder of this particular field showed only 10 per cent loss. Less than the normal amount was reported by Plakidas from Louisiana. A dry, cool picking season resulted in only about 1 per cent loss. I. T. Scott reported that this is a serious disease in the southwestern sections of Missouri and that last year probably about 5 per cent loss occurred.

Rhizoctonia sp., hard rot. Reported from Florida and Louisiana by Brooks and Plakidas but in both of the States it appeared to be less prevalent than is often the case.

Rhizopus nigricans Ehr., leak. A. N. Brooks of Florida reported that dry, cool weather which prevailed throughout most of the fruiting season resulted in firm fruit and less leak in transit. In the southern Illinois sections this is one of the diseases that is seriously interfering with production. It is reported also from southern Texas by W. J. Bach.

Recent literature: Pl. Dis. Reptr. 12: 77.

BLACK ROOT AND OTHER ROOT ROTS

Connecticut: As in past years we have had a complaint or two of root rot of strawberry plants. Mycelium is often associated with these rots but as no fungus has been definitely accused of the trouble we report it as winter injury until we learn differently. (Clinton)

New York: Several reports commencing June 12. The varieties Jumbo and Glen Mary susceptible. (Mills)

New Jersey: Moderately to very important. Slight differences in varietal susceptibility but no resistant sorts have been obtained. (Dept. Pl. Path.)

Virginia: Numerous complaints of root rot during June. (McWhorter)

Illinois: Very common this year. Seems to be associated with winter injury. (Anderson)

Florida: Moderately important. Less than usual. (Brooks)

Mississippi: Average prevalence; first noted March 26. (Neal, Wedgworth and Miles)

Louisiana: Average prevalence. Moderately important. (Plakidas)

Wisconsin: Average prevalence. Limiting factor in securing full stand of plants. Needs investigation. Associated with winter injury. (Vaughan)

Recent literature: Pl. Dis. Reptr. 12: 63-64, 77, 78.

1. Thomas, H. E. Killing of strawberry roots. Phytopath. 18: 245-246. Feb. 1928.

OTHER DISEASES

Armillaria mellae (Vahl.) Quel., root rot. Some damage on newly cleared land in three localities on Marshall variety in Oregon, according to Zeller; also reported from Washington.

Caconema radicicola (Greef.) Cobb., root knot. Florida, Mississippi, Wisconsin, Kansas and Arizona. In Florida 60 per cent of plants observed in a single field. Brooks reported that dry weather resulted in a higher percentage in death of affected plants. This disease was observed in Wisconsin for the first time. The variety Mastedon reported affected in Michigan.

Colletotrichum sp., anthracnose. Abundant from July to September in Florida. It attacks runners and where severe interferes with production of new plants. (A. N. Brooks)

Dendrophoma obscurans (Ell. & Ev.) And., angular spot. Appeared in isolated spots in Florida and was widely distributed in Oregon on the native host Fragaria chiloensis. It did not attack the commercial varieties however.

Pezella lythri (Desm.) Shear & Dodge., stem rot. Florida - although fruit rots were scarce during the past season this one was noted more often in the field than were the others. (A. N. Brooks). Louisiana - less than usual, moderately important, only a trace of loss (Plakidas)

Strawberry - Other Diseases

Phyllosticta fragaricola Desm. & Rob., leaf spot. Collected at Quincy, Florida, but not common.

Rhizoctonia solani Kuehn, crown rot. Western Washington.

Tylenchus dipsaci (Kuehn) Bast., stem nematode. In Oregon, according to Zeller, it is found on wild strawberry Fragaria chiloensis along the ocean beach from the California line to Winchester Bay.

Dwarf (virus). Average prevalence in Louisiana. Klondike is very susceptible. (Plakidas).

French bud, crimps, or briar bud (undet.) Florida - much more than last year and more than the average. Generally distributed and moderately important. As high as 90 per cent infected plants noted in one field. Apparently there is no varietal resistance but disease is more abundant in plants raised from stock that have been in Florida for several seasons than in those raised from stock secured from the North in the spring.

Xanthosis or yellows. Plakidas (3) has selected the name "Xanthosis" for the California disease formerly called yellows. This is the most important strawberry disease in California. There seem to be other diseases of the same general type but their identity is uncertain. In 1928, Doran of Massachusetts reported a disease of this nature from Concord, Mass. Considerable trouble is being experienced particularly with the variety Howard 17. In Montana many patches were observed with plants having symptoms of virus disease. High percentages of yellows plants were seen. A similar condition occurred in southwestern Washington. Recent work of Kunkel has shown that aster yellows can not be transmitted to strawberry.

Recent literature: Pl. Dis. Reptr. 12: 7, 41, 71, 77, 92.

1. Anon. Aster yellows yields to science. Flor. Rev. 62 (1608): 35-36. Sept. 20, 1928.

2. O'Brien, D. G. and E. J. M'Naughton. Disease in strawberries. Scottish Jour. Agr. 11 (3): 286-297. 1928.

3. Plakidas, A. G. Strawberry xanthosis (yellows), a new insect-borne disease. Jour. Agr. Res. 35 (12): 1057-1090. 1927.

4. Plakidas, A. G. Strawberry dwarf. Phytopath. 18: 439-444. May 1928.

5. Small, T. A disease of the strawberry plant. Ann. Rep. Exp. & Res. Stat. Nursery & Mark. Gard. Industr. Devel. Soc. 13: 45-46. 1928.

6. Smith, R. E. and H. E. Thomas. Copper sulphate as a remedy for exanthema in prunes, apples, pears, and olives. Phytopath. 18: 449-454. May 1928.

7. Thomas, H. E. Killing of strawberry roots. Phytopath. 18: 245-246. 1928.

8. Wardlaw, C. W. The Lanarkshire strawberry industry. Recommendations for the treatment of diseased fields and for effecting improvement in the cultivation of the strawberry. 53 pp., Glasgow, R. MacLehose & Co., 1928.

9. __________ Lanarkshire strawberry disease. Further observations on its biology. Scott. Journ. Agr. 11: 65-71. Jan.1928.

RASPBERRY

ORANGE RUST, GYMNOCONIA INTERSTITIALIS (SCHL.) LAGH.

This rust was reported from Massachusetts, Pennsylvania, Delaware, Maryland, Indiana, Michigan, Wisconsin, Minnesota, and Iowa, on black cap raspberries. The usual prevalence was indicated except in the case of Michigan where it was much more prevalent than usual and where as high as 60 per cent of the plants in some fields of Cumberland were infected, and also in Iowa where it was general, severe and much more prevalent than usual. In Michigan this disease is worse in the southeastern corner of the State. Losses of 5 per cent were reported in Michigan, 2 per cent in Iowa and 1 per cent in Maryland. Varieties mentioned as susceptible by collaborators were Early Harvest in Delaware, Cumberland in Michigan, and Gregg in Minnesota.

Recent literature: Pl. Dis. Reptr. 12: 31-32, 40.

ANTHRACNOSE, PLECTODISCELLA VENETA (SPEG.) BURK.

This disease, which is probably the most important fungous disease of black raspberries, was reported to the Survey for 1928 only from New York, New Jersey, Pennsylvania, Maryland, Illinois, Indiana, Iowa, Nebraska, Kansas and Texas. In Pennsylvania it was said to be very severe in the unsprayed patches in northwestern counties. In New Jersey on July 19, C. M. Haenseler determined that 85 per cent of the new canes on certain unsprayed plots were infected while only 11 per cent of the canes on the sprayed plots showed infection. The spray used, however, caused apparent injury. In West Virginia heavily infected canes were observed in several localities and a loss of 2 per cent was estimated for the State. In Illinois, H. W. Anderson stated that anthracnose was the outstanding disease of black caps. In the Peoria region the growing of black caps has been abandoned by some growers on account of anthracnose and crown gall. The tendency there now is to abandon standard black cap varieties and grow either reds or anthracnose resistant blacks. In Arkansas it is very serious and destructive and is said to be the greatest obstacle to raspberry growing in the State.

Recent literature: Pl. Dis. Reptr. 12: 78.

1. Colby, A. S. Anthracnose of our black raspberries. Illinois Farmer 76 (6): 7, 19. Mar. 15, 1928.

VIRUS DISEASES

Mosaic. Bennett (2) distinguishes three types of mosaic namely red raspberry mosaic, mild mosaic and yellow mosaic. W. H. Rankin of New York in his report to the Plant Disease Survey for 1928 mentions four types, namely, red mosaic (the original mosaic described on red varieties), mild mosaic of red raspberries, yellow mosaic of black and purple varieties and mild mosaic of black and purple varieties. Concerning these he reports as follows:

"Red mosaic was about as prevalent as usual being first observed by July 1 and as high as 50 per cent infected plants observed in a single field. Apparently the temperature was unfavorable as cool weather masked symptoms and reduced injury. The varieties Latham and Ranere were very resistant to the red mosaic, Cuthbert, June, Ontario, and Columbian were susceptible, while Plum Farmer was very susceptible.

"Mild mosaic of red raspberries was much more prevalent than usual but the loss was practically nil. General growth conditions including continued cool weather in June caused mild mosaic to show very strongly in red varieties. Leaf symptoms as strong as red mosaic were common in Cuthbert thus causing confusion in diagnosis.

"Yellow mosaic of black and purple raspberries has become more prevalent during the past two years in New York in the Plum Farmer and Columbian varieties. It spreads rapidly and the effect on the crop is severe.

"Mild mosaic of black and purple varieties is generally prevalent. The varieties Columbian and Plum Farmer are susceptible but there is no apparent injury to them. The symptoms were very pronounced this year on account of low temperatures in June."

Mosaic was rather generally prevalent where raspberries are grown in eastern United States. In Massachusetts it was said to be the worst ever seen and in Connecticut it was reported very common as a result of favorable conditions last season for infection. In Pennsylvania, Zundel reported severe late infection this year. In Georgia a trace of loss for the State was estimated but in one highly susceptible variety from Minnesota 90 per cent of the plants were observed heavily affected. The canes were stunted, leaves distorted and the fruit undersize. In Indiana what seemed to be the yellow mosaic was noted particularly on Cumberland. The variety Ranere (St. Regis) was said to show resistance to the virus diseases in general. In Wisconsin normal prevalence was indicated and the statement made that all three forms of the disease occurred. In Oregon, S. M. Zeller stated that the black and red raspberry mosaics do not occur in western Oregon and that the symptoms called mosaic a few years ago are not transmissible.

Leaf curl

In New York, according to W. H. Rankin, curl was rarely found except in some plantings of red varieties from Canadian stock. It was not found in black or purple varieties. In Pennsylvania according to Zundel it was much more prevalent than usual. At Bellwood 25 per cent was noted and in Warren County a patch of 100 per cent infected plants was observed. This disease is regarded as one of the most serious of the raspberry diseases in Pennsylvania. In Maryland 3 per cent loss was estimated, and in Ohio, where the usual prevalence was indicated, 5 per cent. The disease was noted at Lafayette, Indiana, on the varieties Cumberland and Plum Farmer and a red variety at South Bend was affected. In Wisconsin it was generally present to a slight extent throughout the whole season. Slight amounts were reported from Minnesota and the statement was made that the disease did not occur in Oregon.

Bennett in Ohio lists the following varieties with regard to their susceptibility: Ranere (St. Regis) immune; Plum Farmer and King very resistant; Gregg and Latham susceptible; and Cumberland and Cuthbert very susceptible.

Streak

New York, Ohio, and Oregon are the only States mentioning the occurrence of this disease. In New York it was prevalent in about the usual amounts on black varieties, according to Rankin, the variety Giant being very susceptible and the Plum Farmer resistant. In Ohio Bennett estimated a loss of about 1 per cent for the State with about the average prevalence. In one 2-acre field he noted a spread presumably in 1927 to about 2 per cent of the plants. In Oregon, S. M. Zeller stated that as far as he knew only one planting in the State had the disease and that it had been practically eliminated except from this one planting of Cumberland black caps.

Recent literature: Pl. Dis. Reptr. 12: 64.

1. Bennett, C. W. Some raspberry mosaic symptoms. (Abstract) Phytopath. 19: 89. Jan. 1929.

2. ____________ Michigan Raspberry diseases. Michigan Agric. Exper. Stat. Special Bul. 178, 52 pp. 1928.

3. Berkeley, G. H. Raspberry mosaic and its eradication. Canad. Hort. 51: 33-34. Feb. 1928.

4. Smith, Floyd F. Some life habits of Aphis rubiphila Patch. Proc. Pennsylvania Acad. Sci. 2: 83-84. 1928.

LEAF SPOT, MYCOSPHAERELLA RUBI E. W. ROARK.

Reported from New York, New Jersey, Mississippi, Texas, Iowa, and Kansas. In New York, according to W. D. Mills, this is found in every planting of a variety known as Adams 87 which has recently been imported from Canada because of its resistance to mosaic. Every planting of this variety observed showed the lower leaves badly spotted. Other varieties grown beside this did not show the disease. In New Jersey the variety Herbert showed severe defoliation at the College Farm, New Brunswick. In Iowa this spot killed the leaves on many plantations in the western part of the State, according to R. H. Porter and in Kansas a 2 per cent reduction in yield is estimated by collaborators.

Recent literature: Pl. Dis. Reptr. 12: 78.

CANE BLIGHT, LEPTOSPHAERIA CONIOTHYRIUM (FCKL.) SACC.

Several States in the eastern part of the country as far west as Kansas mentioned the occurrence of the disease, and Maryland and Kentucky estimated somewhat more than usual. In New York, Mills reported very severe injury in two plantings that had been affected previously by winter injury. Nearly all of the new canes showed some lesions. It was common in both the Hudson Valley and western New York section. From Ohio, specimens were received with a notation that it was causing injury to 50 or more plants in a patch of the variety King. Vaughan in Wisconsin mentioned the fact that this may weaken the patch so that other diseases may obtain a foothold. In Colorado the disease was said to be very prevalent affecting all the plants in many plantations. It was not reported from Washington nor was it found in Oregon.

Recent literature: Pl. Dis. Reptr. 12: 92.

CROWN GALL, BACTERIUM TUMEFACIENS EFS., & TOWN.

Several States reported crown gall but Pennsylvania was the only one reporting more than usual. In that State, Zundel is of the opinion that it is becoming general in the northwestern counties. In Illinois, crown gall together with anthracnose has been forcing growers to abandon raspberry growing in the Peoria section. Losses of 3 per cent were estimated for the State of Michigan where it was serious on red varieties and 1 per cent was estimated in Iowa where it was said to be common on black caps. In Oregon, Zeller states that it is occasionally found as a root or a cane gall but is not usually serious.

Recent literature: Pl. Dis. Reptr. 12: 78.

OTHER DISEASES

Ascospora rubi (Westend.) Zeller, cane spot. According to Zeller this disease occurs generally with the host west of the Cascade Mountains in Oregon. Growers think it does considerable damage to canes during their second or fruiting season.

Botrytis cinerea Auct., gray mold rot. Destroyed small percentages of fruit in New Jersey.

Mycosphaerella rubina (Pk.) Jacz., spur blight. Severe at College Farm and in other localities in New Jersey. Reported also from Indiana, Wisconsin and Oregon. In the latter State it is of considerable importance in the Ashland district, southern Oregon.

Phragmidium imitans Arth., leaf rust. Washington and Oregon. S. M. Zeller reports for Oregon:

"In some localities this year certain plantings are reported to have serious uredinial infections on canes. In the worst cases 40 per cent of canes have been lost as a result of these lesions near the ground."

Phymatotrichum omnivorum (Shear) Dug., root rot. Texas, two counties.

Sphaerotheca humuli (DC.) Wint., powdery mildew. From New Jersey the Department of Plant Pathology gives the following notes on susceptibility based on observation of varieties at the college farm, New Brunswick:

Slightly resistant - Ranere, Newman, Cuthbert, Viking, Ohta, Star light, Columbian, Herbert.

Somewhat resistant - Newman, Twenty Three, Sunbeam, # 167.

Susceptible - Fewthorn, Spineless, Twilight, Smooth Cane.

Very susceptible - King, Latham and Cardinal.

Verticillium albo-atrum Reinke., wilt. New York (1 per cent Chautauqua County); Ohio (1 per cent observed in one field); Washington (Lewis County); Oregon (more than average, 5 per cent loss, serious when black caps are planted on infested land, especially following potatoes).

Fruit rots in general. From Michigan, Nelson reported about a 25 per cent loss from fruit rots caused by various fungi. They were very much more prevalent than usual. Heavy rainfall at harvest combined with over-maturity resulted in the loss of thousands of cases.

Recent literature:

1. Bennett, C. W. Michigan raspberry diseases. Michigan Agr. Exp. Sta. Spec. Bul. 178: 1-52. June 1928.

2. Harris, R. V. Raspberry cane spot and its control. Ann. Rep. East Malling Res. Stat. 1927: 57-63. May 1928.

3. Peterson, P. D., and H. W. Johnson. Powdery mildew of raspberry. Phytopath. 18: 787-796. 1928.

B L A C K B E R R Y

ORANGE RUST, GYMNOCONIA INTERSTITIALIS (SCHL.) LAGH.

Fourteen States reported this rust on wild and cultivated blackberries. In New Jersey one three-acre field of Mersereau blackberries was discarded on account of severe infection. In Delaware it was plentiful, the Early Harvest variety was especially susceptible. In Mississippi one patch showed 100 per cent infected plants and in central Missouri several plantings were seen where all plants were infected. In Michigan, C. W. Bennett reported that it was more prevalent than for a number of years, plantings of all ages being attacked. Evidence pointed to heavy spread in spring of 1928. As in many plantings only the new shoots were infected. One five-year old Mersereau blackberry planting of 400 plants from which 12 rusted plants were removed last year had 194 plants affected this year. Adjoining this patch was a planting of 200 Eldorado plants of which only 4 were affected and in a planting of seven-year old Cumberland raspberry 417 out of 1,472 plants were affected.

In Arkansas, V. H. Young reported that what appears to be the short cycle form of this rust (Kunkelia nitens) was very abundant and severe on some varieties and was the worst disease of blackberry in most localities. In Oregon, S. M. Zeller noted its occurrence in one planting at Salem on the Kittatinny variety and stated:

"Seems to work out from a center in the planting. In past years has done considerable damage but now only at the margins of the area; plants at center of area seem to be recovering."

Recent literature: Pl. Dis. Reptr. 12: 31-32.

OTHER DISEASES

Bacterium tumefaciens EFS., & Town., crown gall. New York, Texas and western Washington.

Fusisporium rubi Wint., double blossom. About 50 per cent of crop lost in one field of Black Diamond, New Jersey. In Mississippi it was said to be general in the southern part of State and very severe in Hinds County.

Plectodiscella veneta (Speg.) Burk., anthracnose. New York, trace; New Jersey, moderately important on Russell; Washington.

Kuehneola uredinis (Lk.) Arth., yellow rust. Noted on variety Russell in New Jersey.

Leptosphaeria coniothyrium (Fckl.) Sacc., cane blight. Two reports in New Jersey, one case being that of heavy loss in small plantation.

Phymatotrichum omnivorum (Shear) Dug., Texas root rot. Texas, 2 per cent loss.

Mycosphaerella rubi E. W. Roark, leaf spot. Texas and Kansas.

Mosaic (undet.). New Jersey variety Russell susceptible.

D E W B E R R Y

Fusisporium rubi Wint., double blossom. Occasional plants affected in New Jersey.

Gymnoconia interstitalis (Schl.) Lagh., orange rust. Observed in Ocean and Middlesex Counties, New Jersey.

Mycosphaerella rubi E. W. Roark, leaf spot. New Jersey, Mississippi, Texas.

Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.

Plectodiscella veneta (Speg.) Burk. General in New Jersey. Lucretia variety very susceptible.

Mosaic (undet.). Specimens sent in from Montana.

L O G A N B E R R Y

Bacterium tumefaciens EFS. & Town., crown gall. Western Washington.

Mycosphaerella rubi E. W. Roark, leaf spot. According to S. M. Zeller this leaf spot is of general distribution on all species and varieties of the host but most serious on loganberries and blackberries, not particularly reducing yields of the current season but affecting vigor of the fruiting canes for next season.

Plectodiscella veneta (Speg.) Burk, anthracnose. Western Washington.

Mosaic (undet.). Specimens sent in from Montana.

C U R R A N T

Botryosphaeria ribis Gross. & Dug., cane blight. In 1928 N. E. Stevens noted cane blight as being practically absent in the Hudson Valley, whereas a few years ago it was common and destructive there. In New Jersey it was reported by the Department of Plant Pathology as severe in old plantations and in West Virginia Archer mentioned it as being the worst disease of currant.

Botrytis sp., leaf blight. Noted at College Farm, New Brunswick, N.J. No injury.

Cercospora angulata Wint., leaf spot. Practically complete defoliation noted by Arc- r in a number of cases in West Virginia.

Mycosphaerella grossulariae (Fr.) Lindau, leaf spot. Slight injury in lower Hudson Valley, New York, according to W. D. Mills. Only a few cases of premature defoliation noted. Reported also from Indiana.

Pseudopeziza ribis Kleb., anthracnose. The Department of Plant Pathology, New Jersey Experiment Station, reported complete defoliation late in the season but only little apparent injury. Reported also from western Washington.

Sphaerotheca mors-uvae (Schw.) Berk. & Curt., powdery mildew. Specimens sent in from Montana. Bisby and Conner (3) in Canada reported that this fungus was probably introduced into Manitoba about 1924 and has since been injurious to black currants each year. The gooseberry powdery mildew they regard as another physiologic form.

Recent literature: Pl. Dis. Reptr. 12: 52-53.

1. Amos, J. and R. G. Hatton. "Reversion" in black currants. II. Its incidence and spread in the field in relation to possible control measures. Jour. Pomol. & Hort. Sci. 6: 282-295. Feb. 1928.

2. ______________ R. C. Knight, and A. M. Massee, "Reversion" in black currants. Its causes and eradication. Ann. Rep. East Malling Res. Stat. 1927: 43-46. May 1928.

3. Bisby, G. R. and I. L. Conners. Plant diseases new to Manitoba. Sci. Agr. 8: 456-458. Mar. 1928.

GOOSEBERRY

Mycosphaerella grossulariae (Fr.) Lindau, leaf spot. Indiana.

Puccinia grossulariae (Schum.) Lagh., rust. Reported from widely scattered points in Wisconsin indicating that it was more prevalent than usual. (Vaughan)

Pseudopeziza ribis Kleb., anthracnose. New Jersey.

Sphaerotheca mors-uvae (Schw.) Berk. & Curt., powdery mildew. Pierce County, Washington.

Recent literature

1. Nattrass, R. M. The control of American gooseberry mildew: trials with sulphur in the Bristol province. Jour. Min. Agr. Great Britain 35: 161-167. May 1928.

2. Salmon, E. S. A die-back disease of gooseberries. Leafl. Min. Agr. & Fish. Great Britain 234: 4 p. Dec. 1927.

CRANBERRY

False blossom (virus). H. J. Franklin of the Cranberry Experiment Station, East Wareham, Massachusetts, estimated a reduction in yield of about 7 per cent to Massachusetts growers on account of this disease in 1928 and stated that it is general, more provalent than usual, and a very important trouble. He pointed out that it is insect borne and that the weather is not a material factor. Flooding and spraying with pyrethrum - soap to kill the insect carriers is being practiced. Susceptible varieties are Howe, Centennial, Bennett's Jumbo and Wales Henry. Varieties that are very resistant are McFarland and Early Black.

Charles S. Beckwith of the New Jersey Cranberry Substation at Pemberton, New Jersey has reported:

"False blossom is more important this year than last, as it has made further progress on New Jersey bogs. Last year, definite information was presented showing that the blunt-nosed leaf hopper could carry this disease. During the year we have checked this information and have found in addition that the other common leaf hoppers do not carry it. For all practical purposes at any rate, the blunt-nosed leaf hopper may be considered the only carrier of false blossom."

Kunkel (1) has demonstrated that aster yellows can not be transmitted to cranberry and that false blossom is therefore another disease.

Exobasidium vaccinii (Fckl.) Wor., red leaf. H. P. Barss of Oregon reported this as much more prevalent than usual it being general along the coast. It was noticed especially in a bog at Bandon, Coos County.

Recent literature

1. Anon. Aster yellows yields to science. Flor. Rev. 62 (1608): 35-36. Sept. 20, 1928. (Work of L. O. Kunkel.)

2. Beckwith, C. S. False blossoms. Proc. Amer. Cranberry Grow. Assoc. 59: 10-11. 1928.

3. Bain, H. F. Storage losses in cranberries. Ann. Rept. Wisconsin State Cranberry Grow. Assoc. 41: 22-33. 1928.

4. Dobrosky, I. D. Insect studies in relation to cranberry false blossom disease. Proc. Amer. Cranberry Grow. Assoc. 58: 6-7, 10-11. 1928.

5. Franklin, H. J. False blossom. Ann. Rept. Wisconsin State Cranberry Grow. Assoç. 41: 10-17. 1928.

M U L B E R R Y

Bacterium mori (Boyer & Lambert) EFS., blight. Indiana on drooping mulberry used for ornamental planting.

Cercospora sp., leaf spot. Specimens collected near Tifton, Georgia.

Phymatotrichum omnivorum (Shear) Dug., root rot. Prevalent in the black lands of Texas.

Sclerotinia sp., canker and swelling of berries. Texas.

Recent literature

1. Ciferri, R. Dominican Republic; A disease of the mulberry new to the country. Intern. Rev. Agr. n.s. 19: 210. Feb. 1928. (Bacterium mori)

2. __________ Dominican Republic: a disease of the mulberry new to the country. Internat. Bul. Plant Protect. 2 (2): 18. 1928.

3. Takimoto, S. A bacterial disease on mulberry and its causal organism. Bul. Kjusu Univ. Sci. Fak. Terkult. 2: 317-323. 1927. (Japanese with English summary.) (Ab. in Japanese Jour of Botany 4(1): 27. 1928.)

D I S E A S E S O F S U B T R O P I C A L F R U I T S

C I T R U S

Alternaria citri Pierce, black rot. Texas - common on all fruits; Arizona about 0.1 per cent loss especially on Navel orange.

Citrus

Bacterium citri (Hasse) Jehle. No new outbreaks were reported to the Survey. The present situation seems to be about the same as recently reported by Kellerman (15).

Colletotrichum gloeosporioides Penz. dieback and wither tip. Florida (wither tip favored by drought and hurricane, dieback disappears with adoption of better cultural practices - Debusk), Mississippi; Texas (wither tip occasionally severe on young neglected trees - W. J. Bach).

Diplodia natalensis Ev., stem-end rot. Florida (much more than usual, favored by wind injuries of the September hurricane - Debusk); Texas.

Nematospora sp., on fruit. Reported from Imperial County in California. (H. S. Fawcett)

Penicillium spp., blue-mold rot. General.

Phymatotrichum omnivorum (Shear) Dug., root rot. Texas (on various species and varieties. Severe in nurseries on young trees - W. J. Bach).

Phytophthora terrestris Sherb., foot rot. Florida (local, on sweet orange root. Sour stock almost resistant, lemon stock resistant, grapefruit susceptible and sweet orange very susceptible - DeBusk). Texas (traces, reported as Phytophthora sp.?).

Pythiacystis citrophthora S. & S. brown rot. Texas (severe on lemons, 1 per cent loss - W. J. Bach), Arizona (trace loss to orange and grapefruit).

Sclerotinia sclerotiorum (Lib.) Schroet. Texas (common on lemons, .01 per cent loss - W. J. Bach).

Sphaceloma fawcetti Jenkins, scab. Florida (on grapefruit, orange, King orange, Satsuma and tangerine - DeBusk). Mississippi, Texas (occasionally severe in nurseries on sour orange. Occurs on lemon, grapefruit, lime, Temple orange and tangerine. Not severe in groves. - W. J. Bach).

Chlorosis (non par.). Texas.

Dieback (undet.). Florida (disappears with adoption of better cultural practices - DeBusk), Texas.

False canker (undet.). Mississippi.

Frenching (undet.) Florida (more prevalent following drought or frost injury - DeBusk).

Greasy spot (undet.) Texas (traces - Bach).

Gummosis (undet.). Texas (severe in some groves - Bach).

Citrus

Psorosis, California scaly bark (undet.). Texas (appears to follow injuries to trunk and branches, especially those caused by fruit pickers - Bach).

Recent literature: Pl. Dis. Reptr. 13: 145-146.

1. Bach, W. J. and Wolf, F. A. The isolation of the fungus that causes citrus melanose and the pathological anatomy of the host. Journ. Agr. Res. 37: 243-252. Aug. 15, 1928.

2. Barger, W. R. Washing oranges in soda solution arrests decay. Citrus News. 4 (5): 3-4. May 1928.

3. Barger, W. R. Sodium bi-carbonate as citrus fruit disinfectant. Calif. Citrograph, 13 (5): 164, 172-174. 1928.

4. Bahgat, M. The action of Phomopsis californica in producing a stem-end decay of citrus fruits. Hilgardia. 3: 153-181. Apr. 1928.

5. Bartholomew, E. T. Internal decline (endoxerosis) of lemons V. Concerning the comparative rates of water conduction in twigs and fruits. Amer. Journ. Bot. 15: 497-508. Oct. 1928.

6. Bartholomew, E. T. Internal decline (endoxerosis) of lemons VI. Gum formation in the lemon fruit and its twig. Amer. Journ. Bot. 15:548-563. Nov. 1928.

7. Carne, W. M. Crinkle of oranges. Journ. Dept. Agr. West. Australia II, 5: 292-293. Sept. 1928.

8. Cook, S. A. Rind marking of citrus fruits. Finding the cause. Journ. Dept. Agr. Victoria. 26: 549-556. Sept. 1928. Caused by wind and rain storms.

9. Cunningham, H. W. Histology of the lesions produced by Sphaceloma fawcettii Jenkins on leaves of citrus. Phytopath. 18: 539-545. June 1928.

10. De Vries, E.
Een nieuwe ziekte bij djeroek-keprok. (A new disease of oranges.) Indische Culturen (Teysmannia), 13 (5): 226-228, 1928.

11. Doidge, E. M. Citrus scab or verrucosis. Farming South Africa. 3: 1031-1032. Oct. 1928.

12. Fawcett, H. S. Nematospora fungus found in citrus, pomegranate, cotton boll. Calif. Citrograph 14: 124. Feb. 1929.

13. Fulton, H. R. Decay in citrus fruit in transit. Proc. Florida State Hort. Soc. 41: 186-192. 1928.

14. Fulton, Harry R. and John J. Bowman. Decay of citrus fruits in transit. (Abst.) Phytopath. 19: 89-90. Jan. 1929.

15. Kellerman, K. F. Citrus canker under control and final eradication expected. U. S. Dept. Agr. Yearbook. 1927: 183-184. 1928.

16. Reichert, I. and J. Perlberger. The blast disease of citrus-- a new Citrus disease in Palestine. Reprinted from Palestine Citrograph, 1: 1-11. 1928.

Resembles disease known as blast in California (Bacterium citriputeale), and as 'mal secco' in Italy. Bacterial organism isolated.

17. Rhoads, A. S. Water injury to citrus trees in Florida. Citrus Indust. 9: 7-11, 31. May 1928.

18. Smith, R. E. and H. E. Thomas. Phytopath. 18: 449-454. May 1928.

19. Stevens, H. E. Citrus diseases affecting the production of better fruit. Proc. Florida State Hort. Soc. 41: 176-179. 1928.

20. Thomas, E. E. and A. R. C. Haas. Injection method as a means of improving chlorotic orange trees. Bot. Gaz. 86: 355-362. Nov. 1928.

AVOCADO

Colletotrichum gloeosporioides, anthracnose. Florida (several reports and specimens have been received recently where anthracnose was causing considerable damage. The organism closely resembles Colletotrichum gloeosporioides if it is not identical. The disease affects the fruit spurs and causes the fruit to drop. Many of the fruit subsequently rot with the same organism. --Erdman West).

Gloeosporium sp., anthracnose. Texas.

Pestalotia sp., blight. Texas (trace).

Recent literature: Pl. Dis. Reptr. 12: 7-8, 64.

1. Horne, W. T. Note on the experimental inoculation of avocado seedlings with the pear blight organism, Bacillus amylovorus (Burr.) Trev. U. S. Dept. Agr. Plant Dis. Rep. 12: 7-8. May 15, 1928. (Avocado not susceptible.)

B A N A N A

Recent literature:

1. Ogilvie, L. "Black tip," a finger-tip disease of the Chinese banana in Bermuda. Phytopath. 18: 531-532. June 1928. (Cercospora musarum)

2. Ward, F. S. Preliminary report on Fusarium cubense causing Panama disease in Malaya. Malayan Agr. Journ. 16: 76-87. March 1928.

D A T E

Colletotrichum sp., anthracnose. Texas (traces)

Exosporium palmivorum Sacc., leaf spot. Texas(prevalent).

Graphiola phoenicis (Moug.) Poit., false smut. Texas (quite prevalent, unimportant).

Pestalotia sp., blight. Texas (trace, unimportant).

F E I J O A   S E L L O W A Y A N A

Botrytis sp., California (occurred on crowded seedlings in greenhouse - W. T. Horne).

F I G

Cercospora sp., (probably Cercospora fici Heald & Wolf), leaf spot. Texas (prevalent, unimportant).

Caconema radicicola (Greef) Cobb, root knot. Texas (prevalent, 1 per cent loss).

Cerotelium fici Heald and Wolf., rust. Florida (always common and destructive; first infection reported first of June - Weber). Texas (traces, very serious in unsprayed orchards).

Colletotrichum elasticae F. Tassi, anthracnose. Mississippi (slight), Texas (trace, reported as Colletotrichum sp.).

Corticium koleroga, thread blight. Louisiana.

Fig

[illegible] sp. Texas (serious limb canker - Taubenhaus).

Macrophoma fici Alm and Cam., canker. Texas (trace).

Nectria fici, canker. Texas (trace).

Phymatotrichum omnivorum (Shear) Dug., root rot. Texas (prevalent in black lands). Arizona.

Sclerotinia sclerotiorum (Lib.) Schroeter. Texas (serious limb canker).

Premature dropping (non. par.) Texas (very prevalent, 1 per cent loss).

Recent literature

1. Hansen, H. N. Endosepsis and its control in caprifigs. Phytopath. 18: 931-938. Nov. 1928.

L O Q U A T

Bacillus amylovorus (Burr.) Trev., fire blight. This was reported for the first time from Arizona by J. G. Brown who found one tree affected at Tucson, September 24, 1928.

Recent literature: Pl. Dis. Reptr. 12: 127.

1. Nicolas, G. & Mlle. Aggery. Un nouveau parasite d'Ériobotrya japonica Lincl. Rev. Path. Vég. et Entom. Agr. 15: 102-105. Apr./May 1928. (Phyllosticta fusiformis, nov. sp.)

M A N G O

Colletotrichum sp., anthracnose. Florida (many mangoes in southern Florida are spotted by anthracnose and are rotting soon after picking. The fungus resembles Colletotrichum gloeosporioides or is identical with it. - Erdman West).

Recent literature: Pl. Dis. Reptr. 12: 92.

1. Clara, F. M. Control measures for the anthracnose disease of the mango. Philipp. Agr. Rev. 21: 81. 1928.

P I N E A P P L E

Recent literature

1. Godfrey, G. H. Preliminary report on chemical treatments for nematode control. Pineapple News. 2: 55-60. Apr. 1928.

2. Godfrey, G. H. Legumes as rotation and trap crops for nematode control in pineapple fields. Bull. Exp. Stat. Assoc. Hawaiian Pineapple Canners. 10: 1-21. Mar. 1928.

3. Godfrey, G. H. A nematode root lesion of pineapple and other crops. (Abst.) Phytopath. 19: 94. January 1929.

4. Godfrey, G. H. Root-knot, an isolated "Center of infection." Pineapple News. 2: 8-9. 1928.

5. Illingworth, J. F. Further notes on the biological cause of wilt. Pineapple News 2: 23. Feb. 1928.

6. Johnson, M. O. Control of chlorosis of the pineapple and other plants. Industr. & Engin. Chem. 20: 720-722. July 1928.

7. Morita, H. T. Some nematode problems in the pineapple industry. Journ. Pan-Pacific Res. Inst. 3(4): 14-16. 1928.

8. Serrano, F. B. Bacterial fruitlet brown-rot of pineapple in the Philippines.--Philipp. Journ. of Sci., 14: 271-305, 1928.

9. Sideris, C. P. In causes of crop failure and methods of attacking the problems involved. Proc. Pineapple Men's Conf. Apr. 2-3, 1928.

10. Sideris, C. P. Fungus parasites of pineapple roots. Pineapple News. 2: 61-63. Apr. 1928.

11. Tryon, H. Pineapple disease investigations. Interim report. Queensland Agr. Jour. 30: 23-34. July 1928.

12. Waldron, G. C. Relation of pH of pineapple fruit and susceptibility to disease. Pineapple News. 2: 6-7. Jan. 1928.

13. Waldron, C. C. Imperfections of pineapple fruit. Proc. Pineapple Men's Conf. 7: 20-23. 1928.

P O M E G R A N A T E

Gloeosporium sp., fruit rot. Florida (a fruit rot attacking the blossom end has been rather prevalent this year. The causal organism is similar to Gloeosporium rufomaculans).

Pomegranate

Nematospora sp.; on fruit. Reported from Imperial County, California (H. S. Fawcett).

Mycosphaerella lythracearum Wolf. (Cercospora lythracearum Heald and Wolf.) blotch. Florida (about as prevalent as usual - Erdman West), Texas.

Recent literature: Pl. Dis. Reptr. 12: 145-146.

DISEASES OF NUTS

PECAN

SCAB, CLADOSPORIUM EFFUSUM (WINT.) DEMAREE

Demaree (2) has recently demonstrated that this fungus is more properly classified as a Cladosporium than as a Fusicladium.

The disease was reported from a majority of southern states where pecans are grown. A report on prevalence in Georgia has already been given by O. C. Boyd. He estimated the loss in Georgia at 10 per cent reduction in yield and 4 per cent loss in grade and stated that it was difficult to control the disease in commercial orchards with either dust or spray because heavy rains prevented an early start of applications and also washed off the copper. In North Carolina, Fant mentioned it as important on seedling pecans. In Florida, Weber stated that it was very prevalent on all susceptible varieties. In Mississippi and Louisiana it was said to be more prevalent than usual. The susceptibility of varieties was reported as follows: by O. C. Boyd from Georgia and R. E. Nolan from Florida.

Varieties very susceptible - Delmas in Georgia and Florida; Schley, Alley, and Bolton in Florida; and Georgia in Georgia.

Varieties susceptible - Van Deman in Georgia and Florida; Schley, Alley, and Pabst in Georgia; Curtis, and Moore in Florida.

Varieties resistant - Stuart, Success, Moneymaker in Georgia and Florida; Frotscher, Nelson, Teche, and Moore in Georgia.

Varieties very resistant - Curtis in Georgia and Frotscher and Teche in Florida.

Recent literature: Pl. Dis. Reptr. 12: 93, 136.

1. Boyd, O. C. Progress report on the experiments in the control of pecan scab and leaf case-bearer, and on the occurrence of an undescribed leaf spot of pecans. Proc. Nat. Pecan Grow. Assoc. 26: 30-46. 1927.

2. Demaree, J. B. Morphology and taxonomy of the pecan-scab fungus, Cladosporium effusum (Wint.) comb. nov. Jour. Agr. Res. 37: 181-187. Aug. 1928.

3. Demaree, J. B. and J. R. Cole. Some new ideas regarding pecan scab. Proc. Nat. Pecan Grow. Assoc. 26: 22-30. 1927.

4. Gladney, H., R. P. Colmer, J. P. Kislanko, and G. E. Miles. Controlling pecan scab and other pests. Quart. Bul. Mississippi State Plant Bd. 8(3): 1-7. Oct. 1928.

OTHER DISEASES

Bacterium tumefaciens EFS. & Town., crown gall. Mississippi and Texas.

Cercospora fusca (Heald & Wolf) Rand, brown leaf spot. More than usual noted in Florida on varieties Stuart, Curtis and Success according to Nolan. In Georgia, Boyd reported it as prominent on impoverished and rosetted trees, but of little importance on healthy, vigorous trees. Also reported from Mississippi and Texas.

Cylindrosporium caryigenum Ell. & Ev., leaf spot. According to O. C. Boyd this disease was less prevalent than in either 1926 or 1927 in Georgia in spite of the fact that the spring and summer months were wetter than in 1927. He listed the following varieties in order of susceptibility:

Very susceptible - Delmas.

Susceptible - Moneymaker, Frotscher and Stuart.

Resistant - Mobile, Van Deman, Schley and Alley.

Very resistant - Moore, Success, Pabst, Teche, Curtis.

Microsphaera alni (Wallr.) Wint., powdery mildew. Florida, Louisiana, Mississippi and Texas. In the latter State where it was very prevalent it was said to cause premature setting of fruit. In the other States not much damage was indicated.

Microstroma juglandis (Bereng.) Sacc., leaf spot. Specimen received from Mississippi.

Mycosphaerella convexula (Schw.) Rand, leaf blotch. In Georgia leaf blotch developed during the latter half of the growing season according to Boyd. It was more destructive in nurseries where a considerable premature defoliation may occur. The regular dust or spray schedule for scab usually controls.

Phyllosticta caryae Pk., nursery blight or leaf spot. Florida, Mississippi and Texas. In Florida, Nolan stated that all budded or grafted trees were free from the disease but nursery seedlings were very susceptible.

Pecan - Other Diseases

Phymatotrichum omnivorum Shear & Dug., root rot. Texas.

Septobasidium pseudopedicellatum, limb blight. Specimen received from Mississippi.

Black pit, insect punctures, etc. Georgia, Florida and Mississippi.

Mouse ear. Weber in Florida stated that it was plentiful but widely distributed especially in towns and cities and in poorly kept groves.

Kernel spot, southern stink bug. Noted especially in thinner shelled varieties in Georgia, Florida, and Texas.

Rosette (undet.) North Carolina, Georgia, (more prevalent than usual especially on summer growth, estimated loss 12 per cent. All cultivated varieties apparently susceptible - Boyd), Florida (more plentiful than last year, widely distributed - Weber), Mississippi, Louisiana, and Texas.

Shedding and cracking of nuts. Prevalent this season throughout the Gulf Coast area. See report of J. B. Demaree (Pl. Dis. Reptr. 12: 127-128, Oct 15, 1928). Other collaborators in the pecan States mentioned unusual trouble of this kind.

Recent literature: Pl. Dis. Reptr. 12: 10, 127-128, 136, 150.

1. Boyd, O. C. A new leaf spot of pecan. Georgia State Bd. Entom. Circ. 40: 1-8. Feb. 1928. (Yellow leaf spot, fungus undet.)

2. ________ Progress report on the experiments in the control of pecan scab and leaf case-bearer, and on the occurrence of an undescribed leaf spot of pecans. Proc. Nat. Pecan. Grow. Assoc. 26: 30-46. 1927.

WALNUT

Bacterium juglandis (Pierce) EFS., bacterial blight. New York, Oregon and Washington reported this trouble on English walnut. In Oregon the disease was much less serious than during recent years especially the last two. S. M. Zeller estimates the loss from 10 to 15 per cent in that State, the highest actual count being 61 per cent infected walnuts in an orchard in September.

Gnomonia leptostyla (Fr.) Ces. & DeNot., anthracnose. New York and Delaware.

Microstroma juglandis (Bereng.) Sacc., leafspot. Specimen received from Mississippi.

Nectria sp., twig canker. Reported from Monroe County, New York, on English walnut.

W A L N U T

Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.

Rosette (undet.). Mississippi.

Recent literature: Pl. Dis. Reptr. 12: 81, 92, 113, 137.

1. Haas, A. R. C., L. D. Batchelor, and E. E. Thomas. Yellows or little leaf of walnut trees. Bot. Gaz. 86: 172-192. Oct. 1928.

A L M O N D

Bacterium tumefaciens EFS. and Town., crown gall. Moderately important in Arizona where a loss of about 4 per cent was indicated.

Exoascus deformans (Berk.) Fckl., leaf curl. Thurston County, Washington.

Coryneum beijerinckii Oud., blight. General in central part of California. Worse than 1927. Loss for State 2 per cent. (Milbrath)

F I L B E R T

Bacterium sp., blight. Reported only from Oregon where it was much less prevalent than usual for some reason according to Barss.

Cryptosporella anomala (Pk.) Sacc., blight. Reported from New Hampshire on the wild hazel nut and specimens sent in from Illinois where the disease was found in a large filbert plantation. This disease has been reported previously from the northeastern section of the United States and from Wisconsin. The Illinois occurrence is a new one as far as Survey records are concerned.

Nut blight (undet.). A blighting of the nuts possibly of insect origin, but the exact cause of which is unknown, was reported from Oregon by H. P. Barss. It has existed in negligible amounts ever since filberts have been grown in Oregon but this year the damage is widespread in the western part of the State; In a few groves 75 per cent loss occurred, in many others 50 per cent loss, while in others damage was slight.

Recent literature: Pl. Dis. Reptr. 12: 16, 68, 92.

C O C O N U T

Recent literature

1. Seal, James L. Coconut bud rot in Florida. Florida Agr. Exp. Sta. Techn. Bul. 199: pp. 87. Sept. 1928.

Coconut.

Found in vicinity of Miami in January 1924; since then has been found in an area 140 miles along the southeastern coast of Florida. Believes Phytophthora spp. described as causing coconut bud rot are only physiologic strains within a species. Agrees with Leonian in placing all these strains in the group species P. omnivora De Bary.

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Supplement 71

Diseases of Cereal and Forage Crops

In the United States in 1928

September 1, 1929

BUREAU OF
PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

DISEASES OF CEREAL AND FORAGE CROPS IN THE UNITED STATES IN 1928

Prepared by

R. J. Haskell, Pathologist, and Jessie I. Wood,
Assistant Pathologist, Plant Disease Survey.

Plant Disease Reporter.
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CONTENTS

INTRODUCTION

The following report has been prepared in the same manner as have those that have preceded it. It is based chiefly on reports of the Plant Disease Survey collaborators. Members of the Office of Cereal Crops and Diseases, particularly E. B. Mains, who reported on leaf rusts, and Hurley Fellows, who prepared a statement on the wheat foot rots, have also furnished information.

Special surveys were made during the year in West Virginia and Montana and further details concerning the cereal disease situation in those states can be obtained from the reports of those surveys (Pl. Dis. Reptr. Suppls.)

DISEASES OF CEREAL CROPS

WHEAT

STINKING SMUT OR BUNT, TILLETIA TRITICI AND T. LAEVIS

Bunt continued to be more prevalent than usual in Pennsylvania, Delaware, Maryland, Michigan, Wisconsin, and Minnesota. The states of North Carolina, Iowa, and Utah reported about average amounts and the remainder of those reporting mentioned it as less prevalent than normal. The only states reporting more than last year were Maryland, Wisconsin, Minnesota, Iowa, and Utah. In general, a reduction in the prevalence and severity of bunt was indicated. This was particularly true for the Middle Atlantic States where bunt has been of outstanding importance during the last few years and for the Pacific Northwest. Several collaborators attribute the reduction to weather favorable for seeding and rapid germination in the fall of 1927, and unfavorable for bunt infection and development. Undoubtedly the large amount of seed treatment that was accomplished was also an important factor.

Table 63. Percentage loss from bunt of what as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
4	Pennsylvania, Maryland	1	New York, Ohio, Michigan, Minnesota
3	Virginia, North Carolina, Colorado, Arizona, Utah, Oregon	.5	Indiana, Wisconsin, Texas, California
2.86	Kansas	.2	Iowa
2	Delaware, North Dakota, Washington		
1.1	Montana		

It is of interest to note some of the highest percentages of bunt that were observed and reported by collaborators. In a demonstration field in Ford County, Kansas, 74 per cent infected heads occurred in untreated seed. In Pennsylvania, 61 per cent was observed, in North Dakota and Colorado 60 per cent, New York 35 per cent, Maryland 25 per cent, Minnesota and South Dakota 20 per cent, Delaware and Iowa 8 per cent, Wisconsin 2 per cent, Missouri 1 per cent, and Illinois only 0.3 per cent.

In addition to making estimates on losses in yield several collaborators estimated losses on account of dockage as follows: Maryland 4 per cent, North Carolina and Utah 1 per cent, North Dakota, 0.5 per cent, Wisconsin and Kansas 0.3 per cent.

As usual, the most prevalent species of Tilletia was T. laevis. Collaborators in Massachusetts, New York, Pennsylvania, Virginia, West Virginia, Illinois, North Dakota, Kansas, and Colorado all reported this species and stated that T. tritici was not observed. In Montana, P. A. Young found that the smooth-spored species, T. laevis, was by far the more common. Out of specimens from 56 fields of winter wheat that he examined microscopically, only three showed T. tritici.

From Pennsylvania, R. S. Kirby reported on the prevalence of bunt in treated and untreated fields:

"Untreated fields - Bunt occurred in 75 out of 87 surveyed or 86.2 per cent of the fields. Average 4.94 per cent.

"In fields planted with seed that was treated with 18 to 20 per cent copper carbonate, bunt occurred in 7 out of 15 fields, or 46.7 per cent of the fields, surveyed. Average infection .337 per cent.

"In fields planted with seed that was treated with 55 per cent copper carbonate bunt occurred in 7 out of the 52 fields surveyed, or 13.4 per cent of the fields. The total amount of bunt in the 52 fields was 10 bunted wheat heads in several fields and 12 bunted wheat heads in one field where the grower had shoveled the dust into the wheat instead of using a treating machine."

The situation in Montana is reviewed by P. A. Young in Pl. Dis. Reporter Supplement 69: 115-119. May 15, 1929.

In Maryland it was estimated by Jehle that about 211,000 bushels of seed were treated. This was enough for one-third of the acreage. In Virginia, S. A. Wingard reported as follows:

"The copper carbonate treatment for bunt, I believe, will eventually solve the bunt problem in Virginia. This treatment is being used extensively in Virginia and the growers are getting splendid results. The millers of the state are cooperating with the county agents. Many mills have put in treating machines. Our records show that 28,000 pounds of copper carbonate were used for treating seed wheat in 1927 and 17,525 pounds for the 1928 crop. Our records for 1928 were not so complete as for 1927. I think there was considerably more dust used in 1928 than was reported to us."

Brentzel in North Dakota reported Hope and a few hybrids as very resistant. The Section of Plant Pathology, Minnesota Agricultural Experiment Station, reported Marquis as resistant and Kota and Preston susceptible. Field observations of the Illinois Natural History Survey showed the following order of susceptibility:

Kanred 0.3 per cent, Fultz 0.05 per cent, Red Wave, trace. The percentage figures are the average per cent of bunt found in the particular variety. The same applies to the Pennsylvania figures, as follows: Berkley Rock (0), Pennsylvania 44 (2.4), Purkoff (resistant), Fulcaster (8.3), Fultz (3.2), Red Rock (very susceptible), Leap (7.6), Forward (8.3).

Recent literature

1. Dillon Weston, W. A. R. Resistance of wheat varieties to bunt (Tilletia caries). Nature 123: 243. Feb. 16, 1929.

2. Fromme, F. D. The effect of washing the seed on infection of wheat by stinking smut. Phytopath. 18: 711-713. Aug. 1928.

3. Gaines, E. F. New physiologic forms of Tilletia levis and T. tritici. Phytopath. 18: 579-588. July 1928.

4. Lungren, E. A., and L. W. Durrell. Seed treatments for stinking smut of wheat. Colorado Agr. Exp. Sta. Bul. 333. 12 p. Jan. 1928.

5. McCubbin, W. A., and G. A. Stuart. Studies in wheat smuts. Harrisburg, Pa., Department of Agriculture, (1928).

6. Mourashkinsky, K. E. (Effect of the source of origin of Tilletia tritici and T. levis spores on the susceptibility of wheat to infection with bunt.) (Trans. Siberian Inst. of Agric. and Forestry) 9: 3-10. 1928.

7. Nattrass, R. M. Report on bunt prevention trials, 1927. Ann. Rept. Agric. & Hort. Res. Sta., Long Ashton, Bristol, for 1927: 104-106. 1928.

8. Niethammer, Anneliese. Bemerkungen zur Ermittlung der Dosis toxica bei den Steinbrandbeizmitteln. (Observations on the determination of the dosis toxica in bunt disinfectants.) Fortschr. Landw. 3: 551-552. 1928.

9. Peltier, G. L. Control of bunt of wheat in Nebraska. Phytopath. 18: 921-929. Nov. 1928.

10. Reed, G. M. Physiologic races of bunt of wheat. Amer. Jour. Bot. 15: 157-170. 1928

11. Reichert, I. Comparative bunt resistance of wheat in Palestine. Zionist Organ. Inst. Agric. & Nat. Hist. Agric. Exper. Sta. Bul. 9. 29 p. 1928.

12. Sampson, K., and D. W. Davies. The germination and early growth of wheat treated with copper carbonate and tillantin R. Ann. Appl. Biol. 15: 403-422. Aug. 1928.

13. Stirrup, H. H., and H. T. Cranfield. Attempts to control bunt (Tilletia tritici Wint.) in wheat with a formalin-gypsum dust. Ann. Appl. Biol. 15: 245-250. May 1928.

14. Straib, W. Versuche mit Düngemitteln sur Steinbrandbekampfung des Weizens. (Experiments with fertilizers for the control of wheat bunt.) Fortschr. Landw. 3: 110-114. 1928.

15. Tapke, V. F. Wheat stinking smut control by copper carbonate method. U. S. Dept. Agr. Yearbook 1927: 707-708. 1928.

16. Tennent, R. B. Copper carbonate dust treatment for seed wheat. Otago farmers' experience. New Zeal. Jour. Agr. 37: 35-36. July 1928.

LOOSE SMUT, USTILAGO TRITICI (PERS.) ROSTR.

Of the twenty-five states reporting loose smut, fourteen collaborators mentioned it as about as prevalent as last year, four reported less, and only three reported more than last year. The reports would indicate that prevalence in general was somewhat below the average. The following are a few of the more comprehensive reports of collaborators:

New York: Sixty-seven fields in western New York were examined on a recent trip. The disease never occurred in more than amounts of one per cent, which was found in 1 field two miles west of Savannah in Wayne County and in 1 field two miles south of Sodus, Wayne County. A trace of it occurred in six other countries. (Horsfall)

Pennsylvania: Found in 98 per cent of the 154 fields examined. Occurrence in 36 fields Forward .13 per cent; in 51 fields Leap .39 per cent; in 53 fields Pennsylvania 44 2.61 per cent; in 6 fields Fulcaster 3.40 per cent. (Kirby)

Delaware: Very troublesome in some sections of Sussex County with fields showing 5 to 8 per cent. In other sections of the state the disease was less common. (J. F. Adams)

Virginia: Inspectors for the Virginia Crop Improvement Association inspected 2,706 acres of wheat in the state and rejected 325 acres on account of loose smut infection which ran 1 per cent or over for the crop. The percentage of loose smut infection in 9 fields averaging 10 to 45 acres ran as follows: 2.0, 1.6, 1.2, 5.0, 3.0, 2.0, 1,0, 1.0, 2.0. V.P.I. 112 showed the greatest susceptibility to loose smut infection.

The wheat inspected by the Virginia Crop Improvement Association was being grown by men who were desirous of having their grain certified for seed purposes and for that reason one should expect their crops to run lower in loose smut infection than those of the average farmer. Some of the certified wheat growers treat with hot water but the method is too difficult for the average grower. (Wingard)

Table 64. Percentage losses from loose smut of wheat as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
2.5	Virginia		Minnesota, Iowa, Missouri
2	Michigan, North Dakota, Utah	.5	Maryland, Indiana
1.5	Pennsylvania	.4	Illinois
1	North Carolina, Ohio,	.3	Arizona

Varietal susceptibility was reported as follows:

Table 65. Data on susceptibility of wheat varieties to loose smut as compiled from collaborators' reports, 1928.

Varieties very resistant	Varieties resistant	Varieties susceptible	Varieties very susceptible
Leap (1)	Forward (1)	Pennsylvania 44(1)	Red Rock (1)
Gold Coin (1)		Fulz (, 3)	Dawson (1)
Progress (4)		Fulcaster (1)	V.P.I. 112 (2)
Marquis (5)		Marquis (3)	Valley (3),
Pentad (5)		Red Wave (3)	Ill. No. 1 (3)
		Turkey (3)	Kanred (3)
		Kota (5)	
		Reward (5)	

Numerals indicate states and collaborators from which data were received, as follows:

(1) R. S. Kirby, Pennsylvania.
(2) S. A. Wingard, Virginia.
(3) G. L. Stout, Illinois.
(4) R. E. Vaughan, Wisconsin.
(5) Section of Plant Pathology, Agricultural Experiment Station, Minnesota.

Recent literature

1. Tapke, V. F. The role of himidity in the life cycle, distribution, and control of the loose smut fungus of wheat. (Abstract) Phytopath. 19: 103. Jan. 1929.

2. Kliusknikova, E. S. (Le mycelium de l'Ustilago tritici, son extension dans les tissus du froment, et les altérations qu'il provoque dans la structure de la plante nourricière.) Bolezni Rast. (Morbi Plant.) 16: 1-25. 1928.

3. Kourssanow, A. L. De l'influence de l'Ustilago tritici sur les fonctions physiologiques du froment. Rev. Gén. Bot. 40: 277-302, 343-371. May, June 1928.

FLAG SMUT, UROCYSTIS TRITICI KOERN.

No flag smut was reported in 1928. P. A. Glenn reported that he had made a limited number of observations in wheat fields in the formerly infested territory of Illinois, but that none of the disease was seen. Leonard Haseman of Missouri stated that no special scouting was done and that no flag smut was seen or reported as far as he knew.

The following counties are those from which flag smut has been reported at some time in the past:

Illinois: Madison, St. Clair, Monroe, Washington, Jersey, Macoupin, Greene, Scott, Logan, and Hancock.

Missouri: St. Louis, St. Charles, Warren, Platte, and Buchanan.

Kansas: Leavenworth, Atchison, and Wyandotte.

STEM RUST, PUCCINIA GRAMINIS PERS.

In prevalence and severity stem rust was unusually slight. Of the 19 states reporting on prevalence the majority reported less than normal, while only two, Maryland and Virginia, estimated more than the average. All of the states in the barberry eradication area, excepting Ohio, reported less, and the important spring wheat states, Minnesota and the Dakotas, reported much less. Losses were estimated as in table 66.

Table 66. Percentage losses from stem rust of wheat as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
11	Arizona	.25	Ohio
2	Minnesota, Wyoming, California	.2	Utah
1.5	Maryland	trace	Pennsylvania, North Carolina, Indiana, Illinois, Michigan Missouri, South Dakota, Nebraska, Kansas, Colorado, Washington
1	Texas		
.5	Virginia, Wisconsin, North Dakota		

A few collaborators' remarks on the general situation follow:

Pennsylvania: Found in only 5 out of the 154 wheat fields surveyed or 3.2 per cent of the fields surveyed. Average percentage of infection .09 per cent. (R. S. Kirby)

West Virginia: First appeared in extreme southern counties during early July and at this time the initial infection centers were plainly evident in practically all fields. The damage was negligible because the crop was nearly ready for harvest when infection appeared. The rust was not seen elsewhere in the state. (W. A. Archer)

Virginia: Rather severe in counties in southwestern Virginia. Barberry is plentiful in this section of the state. (S. A. Wingard)

North Carolina: Occurrence in state confined to mountains. (Lehman & Fant)

Ohio: General in prevalence in state this year but was severe locally in only a comparatively few places. It is my idea that damage to wheat due to black stem rust in Ohio for 1928 did not exceed one-fourth of one per cent of the crop. Most prevalent this year in parts of Mercer, Auglaize, Preble, Logan, and Lucas Counties respectively. (J. W. Baringer)

Indiana: Very light on all grains and it came in very late. I did not personally inspect a field where I thought the rust had caused appreciable damage. No shriveling was noted in any field. I would not estimate the prevalence or severity at more than a trace. (W. E. Leer)

Iowa: In general there was less stem rust on both winter and spring wheat than last year. In one or two localities in northern Iowa there were fields with 5 to 10 per cent infection but such cases were exceptional. On the average there was only a trace of stem rust for the state as a whole. The loss was nothing. This situation was undoubtedly due in part to the exceptionally dry weather from the early part of May up to the middle of June. By the time humidity was favorable for infection, it was too late for any damage to be done. (R. H. Porter)

Missouri: Up to the present time it is doubtful that this disease is causing much loss in yield in this state as injury is never pronounced. (I. T. Scott).

South Dakota: The amount of loss due to this disease in this state when compared with that of 1927 is very much less. Only in a few isolated spots over the state were heavy infections found. (H. A. Elcock)

Kansas: Very little stem rust occurred in state in 1928. A light infection developed in the northwestern part after June 25. This was too late to do much damage. (C. O. Johnston)

Montana: Losses from black stem rust in state this year have been very light. A number of local spreads of minor severity were recorded, but in only a few cases did these extend over an area of any size. The little damage occurring from this source was on late maturing fields of Supreme wheat. Supreme wheat showed a more severe infection of stem rust than did Marquis, in every case where a comparison was possible. (W. L. Popham)

California: While rust has been found as usual in nearly every area there will be no epidemic of stem rust anywhere in the state this year. (W. W. Mackie)

Recent literature

1. Bailey, D. L., and F. J. Greaney. Sulfur dusting for the control of leaf and stem rust in Manitoba: Field trials with horse-drawn and aeroplane dusters. (Abstract) Phytopath. 18: 480. May 1928.

2. Craigie, J. H. Sexual behavior of Puccinia graminis. (Abstract) Phytopath. 18: 479. May 1928.

3. Goulden, C. H., K. W. Neatby, and J. N. Welsh. The inheritance of resistance to Puccinia graminis tritici in a cross between two varieties of Triticum vulgare. Phytopath. 18: 631-658. Aug. 1928.

4. Harrington, J. B., and W. K. Smith. The reaction of wheat plants at two stages of growth to stem rust. Scient. Agr. 8: 712-725. July 1928.

5. Hutton, L. D. Barberry eradication reducing stem rust losses in wide area. U. S. Dept. Agr. Yearbook 1927: 114-118. 1928.

6. Newton, M., T. Johnson, and A. M. Brown. Physiologic forms of wheat stem rust in Canada. (Abstract) Phytopath. 18: 478. May 1928.

7. Patch, E. M. Bread or barberries. U. S. Dept. Agr. Misc. Pub. 7: 2-14. 1928.

8. Richardson, J. L. The work of barberry eradication. Northwest. Miller 155: 630-631. Aug. 15, 1928.

9. ______ The barberry battle. Better Crops 11 (3): 5-8, 59-61. Sept. 1928.

10. Stewart, G. Origin of a segregate resistant to black stem rust in a cross between two susceptible plants. Amer. Nat. 62: 188-191. Mar.-Apr. 1928.

LEAF RUST, PUCCINIA TRITICINA ERIKS.

This disease was less prevalent than is often the case. More than the average amount was reported from the New York, Pennsylvania, Delaware section, and from Michigan. In the other states that reported, however, it occurred in average, or less than the average, amounts. Concerning the general situation E. B. Mains reported as follows:

"In general the leaf rust of wheat was late in starting and slow in development. Consequently, as in the south-eastern states and from central Indiana and Illinois northward, it did not reach a maximum, while in southern Indiana, Illinois, Nebraska, and Kansas heavy infection developed very late. Undoubtedly the severe winterkilling throughout most of the soft winter wheat area resulted in but little overwintering of the rust with consequent reduction in inoculum for initiating infection throughout that territory. Where overwintering was abundant as in Texas and Oklahoma the development reached an earlier maximum."

There follow a few reports from state collaborators:

New York: Wet spring favored urediniospore dissemination. Very few fields which showed none of it. Frequently all the leaves were severely diseased. (J. G. Horsfall)

Pennsylvania: In the southeastern part of the state this rust has been the most destructive for several years. It killed the leaves of the wheat plants and 60 to 95 per cent infections were common. First observed at Millerstown, Perry County, May 18. In the northern and western part of the state the infection is considerably less (R. S. Kirby)

Delaware: Infection late in appearing. Very heavy as grain was maturing but not enough to affect yield. (J. F. Adams)

West Virginia: Until about the first of July the majority of the fields had only a scattered infection but during the short intervening period before ripening of the crop may fields developed a moderate amount. The damage to the grain was undoubtedly negligible in general and only slight in a few isolated cases of severe infection. This has been practically the situation for the past 5 years. (W. A. Archer)

Kentucky: Wet cold season delayed its appearance. (W. D. Valleau)

North Carolina: Rather general this year. Wheat growing has been practically abandoned in at least one of the mountain counties during the past few years on account of leaf rust. (G. W. Fant)

Ohio: General and is moderate to heavy in severity all over state. (Cereal Courier 20 (17): 211. July 20, 1928)

Indiana: Winter wheat was badly winterkilled. There was very little overwintering of leaf rust and the weather unfavorable for development. (E. B. Mains)

Minnesota: Abundant but became heavy late in season. (Dept. Pl. Path.)

Missouri: Rather widespread in central and northern part of state, but along with crown rust of oats seemed to be rather less severe than usual. (I. T. Scott)

Kansas: Came rather late in season. Western half of state had more and eastern half had less than usual. (C. O. Johnston)

Utah: Possibly more important than indicated. No specific data. (B. L. Richards)

Table 67. Percentage losses from leaf rust of wheat as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
5	New York	1	Indiana, Montana, California
4.5	Pennsylvania	.5	Maryland, Ohio, Minnesota, Texas
4	Kansas	trace	Delaware, West Virginia, Wisconsin, Missouri, North Dakota, South Dakota, Colorado, Arizona, Utah, Washington, Oregon
3	Virginia, Iowa		
2.5	North Carolina		
1.5	Michigan		

Notes on varietal susceptibility were received from Pennsylvania, Illinois, Minnesota, and Oregon.

Pennsylvania: Susceptible - Leap (38.5)*, Forward (48.1), Pennsylvania 44 (48.2). Very susceptible - Red Rock (76.6).

Illinois: Resistant - Kanred (trace)*, Illinois No. 1 (3), Marquis (1.4), Susceptible - Fultz (10.3), Red Wave (9.5), Turkey (11.4)

*Figures in parentheses indicate (1) In Pennsylvania average percentage of infection. (2) In Illinois average percentage leaf area infected.

Minnesota: Resistant - semi-Marquis and durum. Susceptible - Kota.

Oregon: Resistant - Haynes Bluestem.

Recent literature

1. Bailey, D. L., and F. J. Greaney. Dusting with sulfur for the control of leaf and stem rust of wheat in Manitoba. Scient. Agr. 8: 409-432. Mar. 1928.

2. Greaney, F. J. Studies on the toxicity and fungicidal efficiency of sulfur dusts in the control of some cereal rusts. Scient. Agr. 8: 316-331. 1928.

STRIPE RUST, PUCCINIA GLUMARUM (SCHM.) ERIKS. & HENN.

This rust was reported to the Survey only from Utah, Montana, Idaho, Washington, Oregon, and California. In Utah about the usual small amounts occurred with a trace of loss estimated. In Montana, P. A. Young (4) and also J. M. Raeder (3) reported an epiphytotic on winter wheat in the Flathead Valley. Practically every field of Jones Fife in that Valley showed 100 per cent infected plants with from 50 to 90 per cent severity according to the scale for estimating cereal rusts. Turkey wheat in the same Valley showed only traces of infection. Young (4) also reported other occurrences in central and western Montana on Jones Fife, Crail Fife, and Marquis.

In Idaho, Raeder (3) reported on the relative susceptibility of 30 winter wheat varieties. Among those that showed resistance were Mosida, Red Russian, Crimean, Sherman, Hussar, Turkey, Kanred, Blackhull, Ridit, and Triplet.

In Washington Dr. Humphrey noted traces, and at Corvallis, Oregon, he noted stripe rust on several varieties in the wheat class nursery, especially on Red Clawson and White Odessa. In California heavy infection was noted in some instances on some Early Indian varieties and hybrids.

Stripe rust has been reported from Alberta, Canada (2) where it was first observed in 1926.

Recent literature

1. Allen, R. F. A cytological study of Puccinia glumarum on Bromus marginatus and Triticum vulgare. Jour. Agr. Res. 36: 487-513. 1928.

2. Johnson, T., and M. Newton. The occurrence of yellow stripe rust in western Canada. (Abstract) Phytopath. 18: 481. May 1928.

3. Raeder, J. M. Cereal Courier 20: 235-236. Aug. 10, 1928.

4. Young, P. A., and H. E. Morris. Plant Diseases in Montana in 1928. Pl. Dis. Reptr. Suppl. 69: 110-175. May 15, 1929.

SCAB, GIBBERELLA SAUBINETII (MONT.) SACC.

Scab assumed unusual importance throughout most of its normal range in 1928. Favored by the exceptionally frequent and heavy rains of late May and June, infection occurred rather generally in the Corn Belt States with the result that most of them reported more than the average and in some cases considerable damage. The accompanying map (fig. 10) shows not only the states from which scab was reported in 1928, but also the degree of prevalence as compared with the average year.

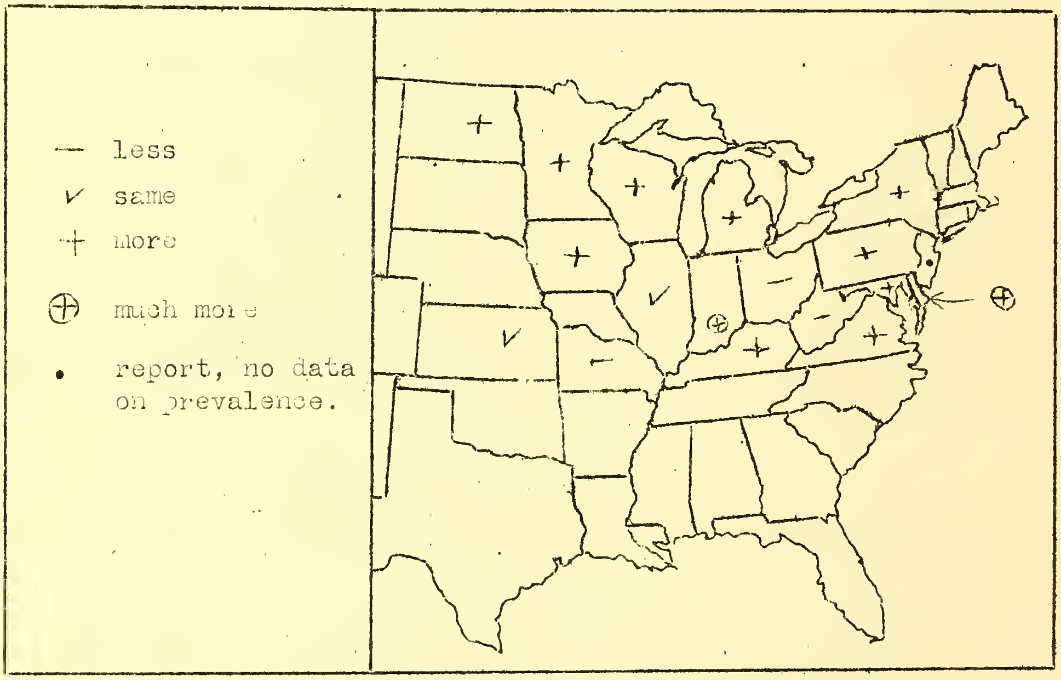


Fig. 10. Prevalence of wheat scab in 1928 as compared with the average year.

New York: Bad this year on the heads. An unusual number of complaints. Cladosporium was a common follow-up organism. (J. G. Horsfall)

Pennsylvania: Found in 150 out of the 154 wheat fields surveyed (97.4 per cent). Average percentage affected spikelets in all fields 3.9. Counts showed that 15 per cent infected spikelets equalled about 66 per cent of infected heads. This is the third highest loss reported in Pennsylvania since 1910. (R. S. Kirby)

Indiana: In experimental plots many of the spring and late winter varieties were especially susceptible. In one durum variety, 43.7 per cent kernel infection was noted. (E. B. Mains)

Illinois: In one field of spring wheat, 92 per cent of the heads were infected and on these, 53 per cent of the spikelets were infected - percentage of infected spikelets, in field, 48.7. (G. L. Stout)

Missouri: Not nearly so severe as last year when quite an epidemic occurred. Rainfall and temperature in general seemed fairly satisfactory for infection this year however. (I. T. Scott)

Kansas: Only a few reports, mostly on soft winter wheats in southeastern Kansas. (C. O. Johnston)

Some of the dates when it was first observed on wheat were June 10 in Boone County, Missouri; July 5 in Cumberland County, New Jersey; July 10 at Madison, Wisconsin and St. Paul, Minnesota; July 16 at Fargo, North Dakota.

Table 68. Percentage losses from wheat scab as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
15	Indiana	2.2	Illinois
6	Maryland	1.25	North Dakota
5	New York	1	Delaware, Virginia, North Carolina, Michigan, Wisconsin Minnesota, Iowa
3.5	Pennsylvania		
2.5	Missouri		
		.1	Ohio

Table 69. Data on susceptibility of wheat to scab as compiled from collaborators' reports, 1928.

Varieties very resistant	Varieties susceptible	Varieties very susceptible
Norka (2)	Marquis (2)	Marquis (3, 4, 5)
Illinois #1 (2)	Forward (6)	Mindum (3)
Resaca (2)	Valley (6)	Red Rock (6)
Progress (2)	Turkey (5)	Leap (6)
Haynes Blue Stem (3)	Red Wave (5)	Pennsylvania 44 (6)
	Kanred (5)	Fultz (5)
		Illinois #1 (5)

Numerals indicate states and collaborators from which data were received, as follows:

(1) I. T. Scott, Missouri.
(2) E. B. Mains, Indiana.
(3) Section of Plant Pathology, Minnesota.
(4) R. H. Porter, Iowa.
(5) G. L. Stout, Illinois.
(6) R. S. Kirby, Pennsylvania.

Recent literature

1. Bennett, F. T. On two species of Fusarium, F. culmorum (W. G. Sm.) Sacc. and F. avenaceum (Fries) Sacc. as parasites of cereals. Ann. Appl. Biol. 15: 213-244. May 1928.

2. Dickson, J. G. Wheat scab control effected by cleaning up refuse of crops. U. S. Dept. Agr. Yearbook 1927: 702-706. 1928.

3. Dickson, J. G., P. E. Hoppe, J. R. Holbert, and George Janssen. The influence of environment during maturation upon predisposition to seedling blight in wheat and corn strains. (Abstract) Phytopath. 19: 79-80. Jan. 1929.

4. Dickson, J. G., E. B. Mains and Helen Johann. Progress report on cereal scab development during the season of 1928. (Abstract) Phytopath. 19: 108. Jan. 1929.

ERGOT, CLAVICEPS PURPUREA (FR.) TUL.

Slight amounts reported from Indiana, Michigan, North Dakota, and Idaho. More than usual in North Dakota where an estimated loss of 0.3 per cent occurred. Five or six cars containing badly infested Marquis wheat were shipped to Spokane from Bonners Ferry, Idaho.

Recent literature

1. Ponsard, J. L'ergot du blé. Jour. Agr. Prat. n.s. 49: 413-414. May 26, 1928.

ANTHRACNOSE, COLLETOTRICHUM GRAMINICOLUM (CES.) WILS.

Reported from New York, Pennsylvania, Maryland, and Illinois. In Pennsylvania, where it seemed to be less prevalent than normal, it was found in 38 or 24.7 per cent of the 154 wheat fields surveyed. The average percentage of infected plants was estimated at 0.4 per cent and the loss at 0.2 per cent. In Illinois more than the usual amount occurred, especially in the southern part, but the state loss was only estimated at a trace. The maximum infection in any one field was 100 per cent of infected culms. Field examinations showed the following percentages of infected culms on four varieties: Valley, 24; Fultz, 54.4; Marquis, 63.2; Turkey, 62.8. In the other two states only traces were reported.

GLUME BLOTCH, SEPTORIA NODORUM BERK.

More glume blotch than usual was reported from New York, Pennsylvania, Maryland, West Virginia, Wisconsin, North Dakota, and Kansas. It appeared to be most destructive, according to reports, in the Middle Atlantic States, where it assumed major importance among the wheat diseases.

Percentage reductions in yield in these states were estimated as follows: New York, 1; Pennsylvania, 1.5; Maryland, 10; West Virginia, 5. In all other states reporting, the loss was thought to be not more than a trace. In Maryland this is said to be one of the worst wheat diseases. In West Virginia it became generally severe before harvest and the threshing grain had a shriveled appearance for which glume blotch was probably responsible, since no other diseases were prevalent.

The following are percentages of infected spikelets in four varieties surveyed in Pennsylvania and two in Illinois.

Pennsylvania - Forward, 36 fields, 15.91 per cent.
Leap, 51 fields, 13.68 per cent.
Pennsylvania 44, 38 fields, 14.84 per cent.
Red Rock, 6 fields, 19.6 per cent.

Illinois - Fultz, 3.1 per cent.
Turkey, 10.4 per cent.

SPECKLED LEAF BLOTCH; SEPTORIA TRITICI DESM.

This disease was reported from several widely scattered states, from the Middle Atlantic States to California. In western New York it was very widespread and destructive to the foliage, causing an estimated reduction in yield, according to Horsfall, of 8 per cent. In Maryland the loss was estimated at 0.5 per cent. In Indiana, where the disease was very abundant, killing the leaves of susceptible varieties early, a loss of 3 per cent was estimated. In California it was especially severe in the northern portions of the state, particularly in early-sown grain. The injury began at germination and continued up until maturity. The loss for that state was estimated by Mackie at 4 per cent. Other percentage losses were: Illinois, 0.6; Kansas, trace; North Dakota, trace.

Field observations in Illinois showed the following percentages of leaf area infected in various varieties: Marquis, 11.6; Illinois No. 1, 13; Red Wave, 33.7; Turkey, 42.3; Valley, 65.8; Fultz, 34; and Kanred, 96.1.

In California, Mackie reports certain hybrids as immune and Defiance and certain selections from it resistant. All the common varieties there are susceptible.

BLACK CHAFF, BACTERIUM TRANSLUCENS UNDULOSUM SMITH, JONES, & REDDY

Black chaff was reported from States in the North-central portion of the country, from Wisconsin and Illinois southward to Kansas and westward to Montana. In Iowa and Kansas and particularly in Minnesota and North Dakota more than the usual amount of this disease occurred. In the two latter important spring wheat states a 1 per cent reduction in yield was estimated and as high as 100 per cent infected plants were noted in individual fields. In the other states the reduction in yield probably did not exceed a trace.

In eastern Illinois it was found only twice, in spring wheat, and in one of these fields 99.3 per cent of the heads showed 57.5 per cent infected spikelets.

Northern Minnesota, western Iowa, eastern Kansas, and eastern Montana are the geographic areas where the disease was reported as being most prevalent.

The variety Hope In Minnesota and the variety Marquis in Illinois were reported as susceptible.

Recent literature

1. Anon. Pathologie végétale. Rapp. Fonct. Inst. Recherches Agron. France 1927: 185-202. 1928.
   A disease appearing not to differ from black chaff has existed in France for several years.

2. Godkin, James. Physiological studies of Bacterium translucens and Bacterium translucens var undulosum. (Abstract) Phytopath. 19: 99. Jan. 1929.

POWDERY MILDEW, ERYSIPHE GRAMINIS DC.

Reported from New York, Pennsylvania, New Jersey, Maryland, West Virginia, Kentucky, Missouri, Kansas, Montana, and Utah. It was said to be very widespread in western New York. In Pennsylvania it occurred in 15, or 10 per cent, of the 153 wheat fields surveyed. The average infection in infested fields was 2 per cent and the estimated reduction in yield for the state 0.25 per cent. In West Virginia it severely attacked plants in the experimental plots at Morgantown, elsewhere about the state it was only rarely seen. The same situation was noted in Montana where experimental plots of Federation and Reliance wheat at Bozeman were rather severely injured. It was not considered of much economic importance in that state. In Kansas considerable of it occurred in lodged bottom fields of the southwestern part of the state. In Utah some damage was evident in the Hunter and Magna districts according to Richards. In 5 out of the 8 fields examined there powdery mildew was severe, occurring on practically every plant and causing marked yellowing which could be seen from a considerable distance.

FOOT ROTS CAUSED BY VARIOUS ORGANISMS

According to Dr. Hurley Fellows in charge of food rot investigations for the Office of Cereal Crops and Diseases, five different kinds of foot rots are recognized in the United States - take all (Ophiobolus graminis), Helminthosporium foot rot (H. sativum), two distinct Fusarium foot rots, and a foot rot the cause of which is unknown. The situation with regard to them can best be stated by quoting from a summary prepared by him.

Oregon-Washington Section

"The destructive foot rot occurring in Oregon and Washington is of a type different from that found anywhere else in the United States. The cause is not yet known. The occurrence of the disease has been recognized for about 12 years. This foot rot ordinarily does not show its effects until the wheat is headed. In some years, however, there is a killing before heading, but that is the exception. Before maturity, the stems buckle or crinkle at the base, fall over, and lie flat on the ground. At the point of buckling the stem is shrunken and disintegrated. Losses are due chiefly to two things, difficulty in harvesting the wheat, and some decrease in yield of grain.

"In Oregon in 1928 this foot rot occurred abundantly in Wasco and Union Counties and there was a trace in Umatilla County. In Wasco County, where the disease was first recognized this year, the loss was about 15,000 bushels. In Union County, where it has been known for several years, about 22 per cent of the total 30,000 acres of winter wheat were infested. The estimated average annual loss in each of the last four years is about 75,000 bushels.

"In Washington the foot rot occurred in Klickitat and Spokane Counties. Foot rot had not been reported from Klickitat County before 1928, although farmers there claim they have seen some evidence of it as long as 15 years ago. Of 51,000 acres of wheat in Klickitat County about 6 per cent was infested, with a loss of about 8,000 bushels. Spokane County has had foot rot for several years. In 1928 about 4 per cent of the 125,000 acres were infested. The estimated average annual loss in the last four years is about 20,000 bushels yearly."

Montana-Wyoming-Colorado Section

"Helminthosporium foot rot is the type found in this section. It attacks all parts of the wheat plant but the most severe losses are caused by attacks on the roots and lower portions of the stem. In 1928 the disease was confined chiefly to fields sown early. In many cases the entire field was destroyed. Death of the plants occurred at all stages of development but mostly shortly after growth had commenced in the spring.

"In Montana in 1928 the Judith Basin was the principal district affected. This includes the Judith Basin County and portions of Fergus and Wheatland Counties. The estimated loss is from 7 to 10 per cent of the entire crop, which would mean about 100,000 bushels. Many individual farmers suffered losses of 80 to 90 per cent of their crop. There were reports of the same sort of trouble in other parts of Montana but it was not possible to survey them.

"Wyoming was not visited because of lack of time, but agronomists in Colorado and Montana reported the presence of the disease in that state.

"In Colorado in 1928 the most severe damage was done in Weld County. This county ordinarily threshes about 1,500,000 bushels of wheat. The estimated loss is about 175,000 bushels. Individual farmers lost 100 per cent of their crop. Many plowed up their fields of winter wheat and sowed spring wheat with the hope of making some crop. The same sort of trouble was reported in localities farther south in Colorado but time did not permit visiting them."

Dakotas-Minnesota District

"Two chief types of foot rot occur in this district, namely Helminthosporium foot rot and one of the Fusarium foot rots. The general symptoms of the two types of diseases are similar. Wheat plants may be killed at any stage of development, from seedling to maturity. If not killed, they may be so weakened that production is lowered. Losses of this kind are difficult to estimate and also may be confused with the losses caused by stem rust and leaf rust.

"It was not possible to make a survey in this district in 1928. State officials in North Dakota and Minnesota have submitted preliminary estimates of state losses from foot rots in 1928. The estimated loss in Minnesota is 1 per cent, or 250,000 bushels. That in North Dakota is 1.5 per cent, or 2,110,000 bushels, an enormous loss. Another investigator making a different survey in South Dakota reported foot rot in eight counties in northeastern South Dakota. The average estimated loss on 20 farms was 81 per cent. Farmers, agronomists, and pathologists in the states are much concerned with the problem."

Kansas-Oklahoma District

"Two distinct types of foot rot occur, take-all and one Fusarium foot rot.

"Take-all occurs in more or less circular spots in the field. These spots may vary in diameter from one foot to many feet. They often become joined forming large diseased areas. Ordinarily all the plants within a spot are killed. There occurs also a scattered infestation, not necessarily in spots, in which the plants are not killed but the yield is distinctly lowered. This condition sometimes is difficult to distinguish. In 1928 take-all was found in 19 counties in central Kansas. The estimated loss is from 15,000 to 20,000 bushels of wheat. In Stafford and Morris Counties it was not uncommon to find fields in which a loss of 50 to 75 per cent of the crop had occurred.

"The Fusarium foot rot found in this district occurs in western Kansas (Clark, Ellis, and Thomas Counties), western Oklahoma (Beaver, Custer, and Woodward Counties), and adjacent eastern Colorado (Washington County). It is distinctly a disease of dry land wheat. The plants may show the disease at any time from the beginning of growth in the spring up to harvest time. Plants attacked when young are killed, whereas those attacked later are stunted and the yield reduced. The disease may occur in spots, or individual plants here and there may become diseased. This Fusarium foot rot has been but little investigated and its full distribution and destructiveness are not known."

Take-all, Ophiobolus Graminis Sacc.

Aside from the reports by Fellows above, collaborators in New York, Kansas, Oregon, and California reported its occurrence. Maryland, Virginia, North Carolina, and Arkansas from all of which the disease has been reported in the past sent in negative reports for 1928. In New York, J. G. Horsfall reported more than last year and estimated a possible loss of about 1 per cent. In Kansas much more than last year was reported with a possible loss of 0.5 per cent for the state. In Oregon it was locally severe but probably only a trace of loss occurred for the state as a whole, according to Barss. In California, W. W. Mackie estimated a 4 per cent loss for the state with an infection as high as 50 per cent in some fields. All varieties of wheat appear to be susceptible to Ophiobolus, but Russell (4) has recently noted slight differences in susceptibility although they did not appear to be marked enough to be of any immediate practical importance.

Fellows has recently reported on control by the application of organic matter to infested soil. He also has reported results with placing the inoculum at various depths in the soil. The optimum depth for infection was 2 inches. When the inoculum was placed at 4 inches the plats were not injured.

Recent literature

1. Fellows, Hurley. Some chemical and morphological phenomena attending infection of the wheat plant by Ophiobolus graminis Sacc. (Abstract) Phytopath. 19: 103-104. Jan. 1929.

2. ________________ Studies of certain soil phases of the wheat take-all problem. (Abstract) Phytopath. 19: 103 Jan. 1929.

3. Foex, E. Essais de lutte contre la maladie par les pulvérisations a l'acide sulfurique. Grande Rev. Agr. 1928: 408-410. Feb. 1928.

4. Russell, R. C. The reaction of wheat varieties to inoculations with Ophiobolus graminis Sacc. (Abstract) Phytopath. 18: 477. May 1928.

OTHER REPORTS ON HELMINTHOSPORIUM SATIVUM

In addition to the above report collaborators reported Helminthosporium sativum as a cause of foot rot from New York, Pennsylvania, Michigan, Wisconsin, Minnesota, North Dakota, South Dakota, Nebraska, Kansas, Colorado, Montana, Washington, and Oregon. In New York one field at Ithaca was severely affected and small losses were also frequently noted throughout western New York. In Pennsylvania, Kirby estimated somewhat more than the average with a loss of perhaps 0.65 per cent. He found the disease in 43 out of 153 fields surveyed. Where wheat followed wheat or other small grains this was one of the most destructive diseases. In Michigan and Wisconsin it was observed locally. In Minnesota, a loss of 1 per cent was estimated with as high as 95 per cent infection observed in some fields. In North Dakota, 1.5 per cent loss was estimated. Kansas reported a trace of loss, while Montana reported 10 per cent loss on winter wheat and 1 per cent in spring wheat. Since the latter predominated the state loss for all wheat was placed at 2.7 per cent. In Colorado, where much more than the usual amount occurred, LeClerg estimated the loss at about 25 per cent and stated that it was limited to late planted dry-land wheat. Fields were seen that produced less than four bushels per acre because of this foot rot. In Oregon, Barss reported the total loss for the state slight (trace) but locally some few fields lost as high as 75 per cent of the value of the crop.

NEMATODE, TYLENCHUS TRITICI (STEIN.) BAST.

According to Jehle and Oldenburg, wheat nematode occurred in Maryland in greater amounts than usual, it being actually observed in 4 fields this year. Reports of occurrence in other fields in the vicinity of Gaithersburg were also received. In Virginia a slight infestation was reported from one field. From West Virginia, where in previous years traces have been found in some of the eastern counties, none was observed in 1928.

Recent literature

1. Samuel, G. Two 'stunting' diseases of wheat and oats. Jour. Dept. Agr. South Australia 32: 40-43. 1928.

2. Thorne, G. Heterodera punctata n. sp., a nematode parasitic on wheat roots from Saskatchewan. Scient. Agr. 8: 707-710. July 1928.

OTHER DISEASES

Alternaria sp., moldy head, Montana.

Bacterium atrofaciens McCul. (Phytomonas atrofaciens (McCul.) Comm. S.A.B.), basal glume rot. A few heads showing symptoms of this disease were collected by Kirby in York County, Pennsylvania, June 28, and in Cumberland County, June 29. In southern Illinois a considerable number of collections were made. Field observations showed the following percentages of spikelets infected in five varieties: Marquis, trace; Red Wave, trace; Fultz, 0.1; Turkey, 0.1; Kanred, 0.3. Collections were also made in Montana.

Fusarium sp., pink root. One per cent reduction in yield in California, according to Mackie. All varieties susceptible.

Fusicladium alopecuri E. & E., moldy head, Montana.

Helminthosporium sp., moldy head, Montana.

Marasmius tritici Young. Found infecting a few plants in fields in three different Illinois counties. First collected June 3 at Vergennes. The varieties affected were Turkey and Fultz.

Mycosphaerella tulasnei Jacz. The conidial stage of this fungus, Cladosporium herbarum (Pers.) Lk., occurred commonly in New York on wheat heads following scab or glume blotch. Several instances of considerable amounts but of slight damage were observed in the eastern panhandle of West Virginia.

What is probably this same fungus but reported under the name of Hormodendron cladosporioides Sacc., is an important factor in production in certain of the coastal areas of California, affecting all varieties according to Mackie. Some fields showed 100 per cent infected heads.

Typhula graminum Karst., reported from Gallatin County, Montana, in one field of winter wheat.

Black point, associated with Helminthosporium spp. Nebraska.

Crinkle joint, non-par. Small amounts found in Montana.

Leaf spot, non-par. Several non-parasitic or undetermined leaf lesions were reported from Montana by P. A. Young (7).

Stripe, undet. Pennsylvania and Illinois causing traces of loss in each state, prevalent in about the same amounts as usual.

Recent literature

1. Bennett, F. T. On Cladosporium herbarum: the question of its parasitism, and its relation to "thinning out" and "deaf ears" in wheat. Ann. Appl. Biol. 15: 191-212. May 1928.

2. Lacoudre, M. Note sur le piétin du blé. Jour. Agr. Prat. n.s. 49: 414-415. May 26, 1928.

3. Samuel, Geoffrey. Two stunting diseases of wheat and oats. Jour. Dept. Agr. South Australia 32: 40-43. Aug. 1928.

4. Subramaniam, L. S. Root rot and sclerotial diseases of wheat. Bull. Agr. Res. Inst. Pusa 177, 7 p. 1928.

5. Thorne, Gerald. Heterodera punctata n. sp. A nematode parasitic on wheat roots from Saskatchewan. Scient. Agr. 8: 707-711. July 1928.

6. Webb, R. W. Further studies on the soil relationships of the mosaic disease of winter wheat. Jour. Agr. Res. 36: 53-75. Jan. 1, 1928.

RYE

STEM RUST, PUCCINIA GRAMINIS PERS.

Stem rust on rye occurred only in very slight amounts and for the country as a whole, caused practically no damage. For the most part, the crop matured early enough to escape and the losses that were reported were in fields with barberry bushes in the vicinity. A loss of 0.1 per cent was estimated by the collaborators from Ohio; traces, or less than 0.1 per cent of loss were estimated for Massachusetts, New Jersey, Maryland, Indiana, Wisconsin, North Dakota, Kansas, Texas, and California. It was estimated not to have caused any loss in Pennsylvania, Virginia, West Virginia, Illinois, Michigan, Minnesota, Iowa, South Dakota, Nebraska, Montana, Colorado, Wyoming, and Arizona. The states of New York, Pennsylvani West Virginia, Mississippi, Louisiana, Arkansas, Illinois, Colorado, Arizona, and Washington reported that the rust had not been observed. In Illinois no record of its observation since 1924 is available in the National History Survey Files according to G. L. Stout.

LEAF RUST, PUCCINIA DISPERSA ERIKS.

Collaborators in Pennsylvania, Delaware, and Ohio, reported more of this leaf rust than the average. Those in West Virginia, Illinois, Michigan, Wisconsin, Minnesota, Kansas, and Colorado reported the usual amounts while those in Indiana reported less. Reports of non-observation were received from Massachusetts, New York, Maryland, Mississippi, Louisiana Texas, Iowa, North Dakota, and Arizona.

In general, leaf rust damage was very slight and, as a factor in reduction of the rye crop, was not of importance. Losses were estimated as in Table 70.

Table 70. Percentage loss from leaf rust of rye as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
5	Florida	Trace	West Virginia, Indiana, Michigan, Wisconsin, Minnesota, Kansas, Mississippi, Colorado, Illinois.
1	Pennsylvania, Virginia, Ohio	0	Iowa, North Dakota, South Dakota, Montana, Arizona, California.

SCAB, GIBBERELLA SAUBINETTI (MONT.) SACC.

More scab than usual occurred on rye particularly in Delaware, Indiana, Michigan, Wisconsin, and Minnesota. Estimates of 5 per cent loss were received from Indiana, 1 per cent from Michigan, 0.2 per cent from Wisconsin, and trace from Pennsylvania, Maryland, and Minnesota.

ERGOT, CLAVICEPS PURPUREA (FR.) TUL.

Ergot was reported as occurring widely with the crop, and in general it seemed to be considerably more prevalent than usual. Several collaborators mentioned the fact that the weather conditions at flowering time were favorable for infection. The Bureau of Agricultural Economics, United States Department of Agriculture, issued a statement October 19 that in the grading of rye, the outstanding problem was the abnormal amount of ergot. Of the 682 cars of rye received for September (at Chicago), 35 per cent were graded ergoty. This situation resulted in a heavy discount for rye bearing the ergoty notation.

Among the states reporting more ergot than usual were some of those which are most important in rye production, North Dakota, Minnesota, Wisconsin, Michigan, and Pennsylvania. In North Dakota, which produced over twelve million bushels in 1928 or more than one-third of the total United States crop, much more than usual was generally reported and the loss in yield was estimated at 2 per cent which would be equivalent to about 259,000 bushels. Other losses were estimated by collaborators as follows: 2.5 per cent, Wisconsin; 1 per cent Indiana, Michigan, Minnesota; 0.5 per cent, Ohio; trace Massachusetts, Pennsylvania, Maryland, Oregon. In Pennsylvania, the infection was said to be the heaviest seen there for five years.

In connection with the losses from this disease, a significant statement is made by R. E. Vaughan of Wisconsin who says that the low yield in 1928 may be more due to ergot than is generally estimated on account of possible sterility brought about by the causal fungus.

SMUT, UROCYSTIS OCCULTA (WALLR.) RABH.

Only five states, Delaware, West Virginia, Wisconsin, Minnesota, and Iowa, reported this disease. Fifteen other states reported its absence or non-observation. It was not a factor of any economic importance.

ANTHRACNOSE, COLLETOTRICHUM GRAMINICOLUM (CES.) WILS.

Anthracnose was reported from Pennsylvania and Virginia westward to Wisconsin. In general, only traces reduction in yield were reported but in Pennsylvania, which produced about 1,500,000 bushels in 1928, the loss was estimated at 2 per cent. The average percentage of infected plants in the fields surveyed there was 9.1 per cent.

OTHER DISEASES

Erysiphe graminis DC., powdery mildew. New Jersey, Pennsylvania, West Virginia. In Pennsylvania, R. S. Kirby noted an average of 10 per cent infected plants in the fields surveyed and estimated a loss of about 0.5 per cent. In West Virginia, it was noted severely attacking the lower leaves in experimental plots at Morgantown but elsewhere about the state it was only rarely observed.

Rhizoctonia sp. Noted February 29, Ocean Springs, Mississippi.

Septoria secalis Prill. & Del., leaf blotch. Trace in Iowa.

Crinkle-joint, non-par. Montana, trace.

Recent literature

1. Brooks, F. T. Observations on Rhynchosporium secalis (Oud.) Davis, leaf blotch of barley and rye. New Phytol. 27: 215-219. Nov. 1928.

2. Pfeil und Klein-Ellguth, H. A. Graf v. Beitrag zur Kenntnis der Roggenfusariose. (Contributions to the knowledge of the rye fusariosis.) Centralbl. Bakt., Ab. II, 73: 347-373, 1928. (Abstract in Rev. Appl. Myc. 7: 505. Aug. 1928.)

B A R L E Y

COVERED SMUT, USTILAGO HORDEI (PERS.) KELL. & SW.

This smut was reported from several states with loss estimates as shown in the following table:

Barley - Covered Smut

Table 71. Losses from covered smut of barley as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
10	Maryland	1	Texas, Indiana, Iowa, North Dakota, Kansas, Utah.
5	California	0.75	Minnesota
3	Virginia, North Carolina, Montana	0.6	Wisconsin
2	Massachusetts, Oregon	0.5	Ohio
1.5	Pennsylvania, New Mexico.	trace	New York, West Virginia, Colorado, Washington.

Maximum percentages of infection were reported as follows: 40, California; 30, West Virginia (on late crop planted for forage); 25, Virginia; 23, Washington; 10, Minnesota; 6, Pennsylvania.

Leukel (2) has recently reported successful control with certain liquid and dust seed treatments.

Recent literature:

1. Hewlett, C. H. Hot-water treatment of seed barley. New Zealand Jour. Agr. 36 185-186. 1928.

2. Leukel, R. W. Experiments with liquid and dust seed disinfectants for controlling covered smut of barley and stinking smut of wheat, 1926-1928. (Abst.) Phytopath. 19: [illegible]1. Jan. 1929.

LOOSE SMUT, USTILAGO NUDA (JENS.) KELL. & SW.

This smut appeared to be prevalent in about the normal amount and for the country as a whole probably caused about the same losses as did the covered smut. It was reported from the states listed in the following table.

Table 72. Losses from loose smut of barley as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
3	North Carolina	0.6	Wisconsin
3.5	Pennsylvania	0.5	Ohio, Arizona, California.
3	Massachusetts	Trace	Delaware, Maryland, Mississippi, Michigan, Iowa, Oregon.
2	New York		
1	Virginia, Texas, Minnesota, North Dakota, Kansas, Montana, Colorado.		

Maximum percentages of infection amounting to 25 per cent were noted in Pennsylvania, 12 per cent in California, and 10 per cent in Minnesota.

In North Carolina loose smut appears to be of considerable economic importance. According to G. W. Fant, it was observed in all fields examined and in many instances was seriously reducing yields. One field in Davidson County which was sown with formaldehyde-treated seed produced at least 20 per cent loose smut.

The hot water treatment was employed for what appears to be the first time in North Carolina on some half-dozen farms in the fall of 1928. Growers of certified seed in New York State also used the hot water treatment and this method of control was followed more or less in West Virginia.

The variety Alpha was mentioned as especially susceptible in New York and Pennsylvania.

STEM RUST, PUCCINIA GRAMINIS PERS.

Stem rust caused only slight damage to barley in 1928. It was a year when the losses from this disease approached the minimum. Late planted fields and those near barberries seemed to be the only ones that suffered much injury. The only states reporting losses of more than a trace were Ohio, Iowa, South Dakota, and Arizona, in all of which about 0.5 per cent loss was thought to have been sustained. The states reporting a trace of loss were Massachusetts, Pennsylvania, Maryland, Indiana, Illinois, Michigan, Wisconsin, North Dakota, Nebraska, Colorado, Wyoming, Utah, Oregon, and California. States reporting no loss were Virginia, West Virginia, Minnesota, Kansas, and Montana.

LEAF RUST, PUCCINIA ANOMALA ROSTR.

This rust was reported from New York, Pennsylvania, Maryland, Tennessee, Ohio, Illinois, Indiana, Michigan, Wisconsin, Minnesota, Iowa, South Dakota, Kansas, Colorado, Washington, Oregon, and California. It was said not to have been observed by collaborators in Massachusetts, West Virginia, Mississippi, Louisiana, North Dakota, and Arizona. Kansas was the only state reporting somewhat more than average amounts. The others reported the same or less than the average. In only one state did the loss exceed a trace, and that was California where Mackie estimated the reduction in yield at 0.5 per cent.

Recent literature

1. Brown, A. M. and M. Newton. The dwarf leaf rust of barley in Western Canada (Abstract). Phytopath. 18: 481. May 1928. Sci. Agr. 8: 463. Mar. 1928.

SCAB, GIBBERELLA SAUBINETII (MONT.) SACC.

Reports of barley scab received by the Survey indicate clearly that the disease was more prevalent and destructive than in any other year since records have been kept. In 1919 and again in 1924 it was considerably more common than usual, but the circumstances of 1928, whereby an unusually large acreage of barley was planted on corn or wheat land in the Corn Belt, and when weather conditions were especially favorable for scab development, resulted in what was probably the greatest epiphytotic of this disease yet experienced.

The situation was well stated by J. G. Dickson, Madison, Wisconsin, October 1:

"Practically all of the barley grown in Indiana and Illinois was very heavily scabbed, frequently ranging as high as 50 to 60 per cent, and I visited some fields especially of smooth-awned barley or beardless barley where there was 100 per cent infection with approximately 90 per cent damage. Southeastern Iowa and southwestern Wisconsin were damaged to the extent of 15 to 20 per cent and in a few fields as high as 30 per cent scab was counted. This is especially serious inasmuch as the barley acreage in Indiana and Illinois was more than doubled during the past season. The increase was due to the emphasis placed upon barley culture in connection with the corn borer and to the fact that a large percentage of the winter-killed winter wheat acreage was replanted to oats or barley. Scab, therefore, has done a great deal of damage to spring wheat, barley, and in certain sections, oats."

Reports by individual states follow:

Pennsylvania: Same as usual, trace loss, 6 per cent maximum infection. (R. S. Kirby).

New Jersey: Occurred locally. (Dept. Plant Path.)

Delaware: Much more. Observed in general plantings. (J. F. Adams).

Maryland: Same as usual, only trace loss. (R. A. Jehle).

Ohio: Very prevalent, heavy losses due to shriveled grain (R. C. Thomas, Sept. 25).
More abundant than usual; Franklin, Putnam, Wayne Counties. (W. G. Stover, Aug. 15).

Indiana: Showing to a considerable extent on a number of varieties in the leaf rust nursery. (E. B. Mains, July 10).
Very severe. Counts in experimental plots showed over 70 per cent kernels badly infected. (E. B. Mains, Sept. 25).
Very prevalent in this state this year especially on barley. Several varieties in our experimental plots showed over 70 per cent of kernels infected and some of the hooded varieties will probably show a higher percentage. While this probably represents extreme severity, the reports and samples which have been

coming to the state since harvesting indicate that heavy infection occurred commonly throughout the state. (E. B. Mains, Sept. 28).

Much more than average. Estimated loss for state 20 per cent. Maximum infection in one field 75.1 per cent. Very wet during blossoming. All hooded varieties susceptible. (E. B. Mains).

Illinois: Severe throughout Illinois. (Benj. Koehler, Sept. 26).

Michigan: More than usual, general, trace loss. (W. F. Reddy).

Wisconsin: Developing extensively on barley, up to 50 per cent of heads affected in a few fields in southern Wisconsin seeded on poorly prepared corn stubble. (R. E. Vaughan, Aug. 1).

More, trace loss. Scab reported from elevators seems to have originated in other states. (R. E. Vaughan).

Minnesota: Worst epidemic on barley recorded in Minnesota. Many fields with 5 to 20 per cent of heads affected. (Sect. Plant Path., Aug. 15).

About 10 per cent heads, southern Minnesota, affected with scab. (E. C. Stakman, Sept. 25).

Much more than average. 1 per cent loss for state general but more especially in southern half of state. Peatland very resistant, Manchuria 184 resistant, and Velvet and Glabron susceptible. (Sect. Plant Path.).

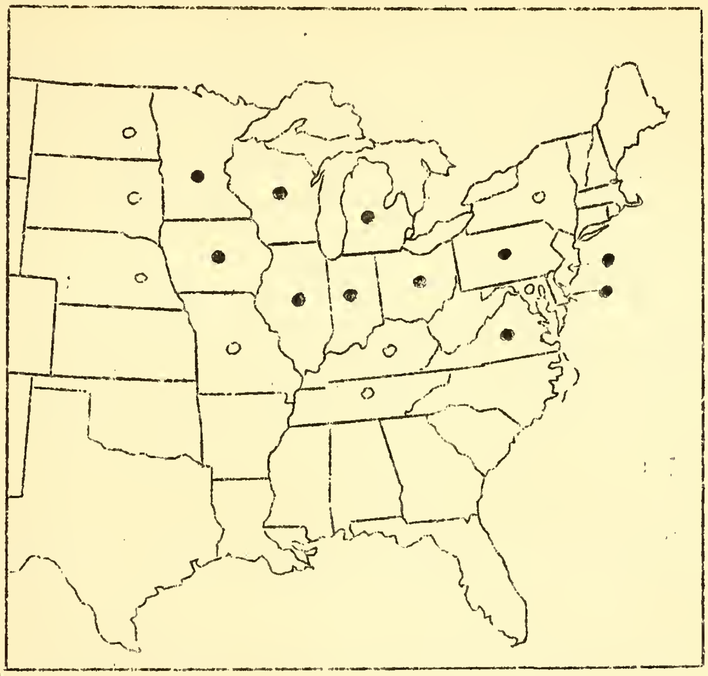
Iowa: Quite common on Velvet and other barleys. About 1.5 per cent damage for state. (R. H. Porter, July 1).

More prevalent than for a number of years. Barley and wheat in western Iowa are suffering most, but oats show a trace to 2 per cent. (R. H. Porter, July 10).

Unusually severe this year and its prevalence on Velvet may have been due more to favorable environment rather than any unusual susceptibility of that variety. Estimated loss for state, 8 per cent. (Four per cent reduction in yield and 4 per cent loss in grade.) Maximum in any one field, 50 per cent. Barley production has been on the increase during the last 3 years due largely to poor corn crops and to the introduction of smooth bearded varieties of barley, such as Velvet. (R. H. Porter).

Collaborators in the states of Massachusetts, New York, West Virginia, Mississippi, Louisiana, and Arkansas reported the non-observation or non-occurrence of scab on barley.

Figure 11. States from which barley scab has been reported to the Survey in the past. States marked with a solid dot (.) are those that reported it in 1928 as well as in other years.



Recent literature:

1. Christensen, J. J., H. A. Rodenhiser, and Chih Tu. Susceptibility of barley varieties to Fusarial head blight in Minnesota. (Abst.) Phytopath. 19: 80. Jan. 1929.

2. Dickson, James G., E. B. Mains, and Helen Johann. Progress report on cereal scab development during the season of 1928. (Abst.) Phytopath. 19: 108. Jan. 1929.

STRIPE, HELMINTHOSPORIUM GRAMINEUM RABH.

Considerably more than the average amount of stripe was reported from several states, most of which are important in barley production, as follows: Pennsylvania, Virginia, Ohio, Michigan, Wisconsin, Iowa, Kansas, and Colorado. In Pennsylvania, it was noted in 80 per cent of the fields examined and in Virginia it was found in practically every field. In Utah it was said to be by far the most destructive disease of barley.

Table 73. Losses from barley stripe as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
5	Utah	1	Virginia, Minnesota, Kansas.
4	Iowa		
3	Wisconsin, California	0.5	Michigan, North Dakota.
2	Pennsylvania, Montana	0.1	Texas, Ohio
		Trace	New York, Maryland, West Virginia, Indiana, Colorado, Arizona, Washington, Oregon.

Barley - Stripe

Maximum percentages found in any one field as reported by the states were: Iowa 40, Utah 29, Illinois 20, Minnesota, Colorado and California 15, Pennsylvania and Virginia 10, West Virginia, North Dakota, and Arizona 5.

In addition to the reports on control by seed treatment mentioned in the references below, Vaughan in Wisconsin reported that the new organic mercury treatments showed encouraging promise of control and R. H. Porter in Iowa reported that certain dust fungicides greatly reduced stripe on Oderbrucker and Manchuria varieties but had little effect on Velvet.

Varietal susceptibility was reported on as follows:

Minnesota:	Resistant - Velvet Susceptible - Svansota and Minsturdi
Iowa:	Susceptible - Velvet and Minsturdi
Kansas:	Resistant - Vaughn and Flynn Susceptible - Stavropol and Mariout

Recent literature

1. Howitt, J. E., and R. E. Stone. Results of experiments on the control of barley stripe. (Abstract). Sci. Agr. 8: 459-460. March 1928. (Abstract) Phytopath. 18: 477. May 1928.

2. Leukel, R. W., J. G. Dickson, and A. G. Johnson. Experiments on stripe disease of barley and its control. (Abstract) Phytopath. 19: 81. Jan. 1929.

3. Nisikado, Y., and C. Miyake. Studies on the uspulun treatment of cereal seeds against the Helminthosporioses. Agric. Studies 11: 36-64, 1927. (Japanese). (Abs. in Jap. Jour. Bot., 1: 19-20. 1928.

4. Rodenhiser, H. A. Experiments on the control of barley stripe. Phytopath. 18: 295-300. Mar. 1928.

5. Tisdale, W. H., and W. N. Cannon. Ethyl mercury chloride as a seed grain disinfectant. (Abstract) Phytopath. 19: 81. Jan. 1929.

SPOT BLOTCH, HELMINTHOSPORIUM SATIVUM P. K. & B.

Reports of spot blotch were received from New York, Pennsylvania, Wisconsin, Iowa, Kansas, Utah, and California. In most cases, it was not of very great importance, although in California, which ranks fourth in barley production, 2 per cent loss was estimated, and in Iowa and Pennsylvania, 1 per cent loss.

NET BLOTCH, PYRENOPHORA TERES (DIED.) DRECHS (HELMINTHOSPORIUM TERES SACC.)

Traces of damage from this fungus were reported to the Survey from Pennsylvania, Wisconsin, Montana, Idaho, and California, and a loss of 2 per cent was estimated from Iowa.

Recent literature

1. Geschele, E. (The response of barleys to the parasitic fungus Helminthosporium teres Sacc.) Trudy Prikl. Bot., Gen. i Sel. (Bull. Appl. Bot., Gen. & Plant Breed.) 19(1): 371-384. 1928. (Russian with English summary).

SCALD, RHYNCHOSPORIUM SECALIS (OUD.) DAVIS

Although the occurrence of this disease was reported from Wisconsin, the only states reporting real destruction were Oregon and California. In the former state, there was more than the usual amount, an especially heavy attack being reported from some Oregon fields of winter barley.

In California, particularly in the Sacramento Valley and the northern half of the state, very severe damage occurred, according to Mackie. As usual it continued to be the most destructive cereal disease in California. Less scald was noted in the irrigated fields of the San Joaquin Valley.

Recent literature

1. Caldwell, Ralph M. Preliminary results from cross inoculation and culture studies upon the fungus Rhynchosporium secalis (Oud.) Davis causing scald of cereals and other grasses. (Abstract) Phytopath. 104. Jan. 1929.

2. Brooks, F. T. Observations on Rhynchosporium secalis (Oud.) Davis, leaf blotch of barley and rye. New Phytol. 27: 215-219. 1928.

POWDERY MILDEW, ERYSIPHE GRAMINIS DC.

Traces of powdery mildew were widely reported in 1928 but only a few states reported it of any particular importance. In California, a loss of 4 per cent of the crop was estimated and in western Oregon it damaged some barley fields considerably. From the eastern part of the country reports of 0.5 per cent loss in Massachusetts and Pennsylvania were received. Other states mentioned only a trace of damage.

The variety Sacramento is immune in California according to Mackie while the California Mariout and other common varieties are very susceptible.

Recent literature

1. Mackie, J. R. Localization of resistance to powdery mildew in the barley plant. Phytopath. 18: 901-910. Nov. 1928.

Bacterium translucens Jones, Johnson, and Reddy, bacterial blight. Texas.

Claviceps purpurea (Fr.) Tul., ergot, was reported in barley from Massachusetts, Ohio, Indiana, Michigan, Wisconsin, Minnesota, Iowa, and North Dakota. In none of these states was it of more than occasional occurrence.

Colletotrichum graminicolum (Ces.) Wils., anthracnose. Traces reported from Pennsylvania and Wisconsin.

Helminthosporium californicum Mackie and Paxton, rusty blotch. California, 1 per cent loss, 100 per cent maximum infection observed.

Recent literature

1. Bennett, F. T. On two species of Fusarium, F. culmorum (W. G. Sm.) Sacc. and F. avenaceum (Fries.) Sacc., as parasites of cereals. Ann Appl. Biol. 15: 213-244. May, 1928.

2. Mackie, W. W. Inheritance of resistance to rusty blotch in barley. Journ. Agr. Res. 36: 965-975. June 1, 1928.

O A T S

LOOSE SMUT, USTILAGO AVENAE (PERS.) JENS., AND COVERED SMUT, U. LEVIS (KELL. AND SW.) MAGN.

Of these two smuts, the loose smut seemed to be the more common through the country as a whole, although in Montana and Oregon the covered smut was reported as causing more damage, and in Colorado they were reported as of equal prevalence. For the most part, pathologists do not distinguish between these two smuts in the field, hence they are usually reported together.

According to collaborators' reports, smuts were of about the usual prevalence, but in Wisconsin, Minnesota, and Missouri they were more prevalent than usual and in Iowa and Kansas much more prevalent. In Iowa, R. H. Porter reported the worst epidemic observed for many years. It occurred generally over the state but was more severe in some regions than others. For example, in northeastern Iowa, fields showed as high as 50 per cent infected plants. In Kansas it also assumed epidemic proportions, C. O. Johnston reporting it as more severe than he has ever seen it before. He attributes this to the introduction of a possible, new, southern, physiologic form which is rapidly increasing in the state. One reason for believing this is that the variety Kanota, which is resistant to the common Kansas form, shows as much as 40 per cent smut in many fields this year. If this theory of increased prevalence is true in Kansas, it might also provide a reason for the increased infection in the other western states mentioned.

Oats - Loose smut

Table 74. Losses from loose and covered smuts of oats as reported by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
10	Massachusetts, West Virginia, Wisconsin.	4	Virginia, Colorado.
8	Pennsylvania, North Carolina.	3	Florida, Mississippi, Indiana
7	Iowa, Utah.	2	New York, Texas, Arkansas, North Dakota, Arizona.
6	Missouri, Montana.	1	New Jersey, Louisiana, Michigan, Washington.
5	Maryland, Georgia, Ohio, Minnesota, Kansas, Oregon.	0.5	Delaware

Maximum percentages were reported from the states as follows: 60 Minnesota, Kansas, and Colorado; 50 Wisconsin, Iowa; 43 Pennsylvania; 36 Montana; 30 New York, West Virginia, North Carolina.

In Pennsylvania, R. S. Kirby made counts in 80 oat fields and found smut in 95 per cent of them. The 5 per cent of fields without smut were all planted with seed treated by the dry formaldehyde method, which is being recommended in Pennsylvania because it gives fine control and farmers are satisfied with it. The average percentage of smut found in all fields was 8.3.

The following varieties were reported very susceptible: Liberty, Hulless, and Anthony in Minnesota, and Iogold, Early Champion, and Swedish Select in Iowa. In the latter state, Iowa 103 and Kherson were said to be susceptible and Iowa 105 resistant.

Why farmers should tolerate these high losses from a disease which is so easily controlled by a variety of dust and liquid treatments still remains somewhat of a mystery.

Recent literature:

1. Gage, G. R. Studies on the life history of Ustilago avenae (Pers.) Jensen and of Ustilago levis (Kell. & Swing.) Magn. Cornell Agr. Exper. Sta. Mem. 109 33 pp. 1927.

2. Hayes, H. K., F. Griffee, F. J. Stevens, and A. P. Lunden. Correlated studies in oats of the inheritance of reaction to stem rust and smuts and of other differential characters. Jour. Agr. Res. 36: 437-457 1928.

3. Kharbush, S. S. Contribution a l'etude des phenomenes sexuels chex les Ustilaginees. Ann. Sci. Nat. Bot., Ser. X, 9: 285-297. 1927.

4. Maschmeier, W. Eine neue Trockenbeize zur Bekämpfung des Haferflugbrandes. Nachricht. Schädlingsbekämpf. 3 (1): 1-4, 1928.

5. Moldenhauer, J. Untersuchungen über die Empfänglichkeit der Wildund Kulturhaferformen für Ustilago avenae mit besonderer Berücksichtigung des Infektionsvorganges. Kühn-Arch., 15: 349-409, 1927.

6. Pierstorff, A. L., and J. D. Sayre. Further results of oat-smut control in Ohio. (Abst.) Phytopath. 19: 102-103. Jan. 1929.

7. Reed, G. M. The inheritance of resistance of oat hybrids to loose and covered smut. Ann. New York Acad. Sci. 30: 129-176, 1928.

8. Sampson, K. The biology of oat smuts I. Ann. Appl. Biol. 15: 586-612. Nov. 1928.

9. Sayre, J. D. and R. C. Thomas. Formaldehyde and iodine dusts for the control of oat smut. Ohio Agr. Exp. Sta. Bi-month. Bull. 13: 19-21. Jan./Feb. 1928.

10. Tapke, V. F. Formaldehyde seed treatment for oat smuts. U. S. Dept. Agr. Misc. Pub. 21: 4 pp. 1928.

STEM RUST, PUCCINIA GRAMINIS PERS.

On oats, stem rust was less prevalent than last year and the average year. Of the 14 states reporting on prevalence, only one, New York, mentioned the occurrence of more than last year and none mentioned more than the average. For the most part, it was scattered in its distribution. Several states including Ohio and Iowa mentioned its occurrence in severe amounts only near barberries.

In Wisconsin and Minnesota, however, it was said to be generally distributed. In Kansas it appeared too late to do any damage. California was the only state reporting the disease as of much economic importance. In that state, according to W. W. Mackie, it limits the production of oats in certain areas. The loss last year was estimated at 5 per cent of the crop in that state and fields were seen of 100 per cent infection. Mackie mentions the Richland 320a and some of its hybrids as immune from stem rust with all other varieties especially susceptible.

Losses are given in Table 75.

Table 75. Percentage loss from stem rust of oats as estimated by collaborators, 1928.

5	California.
1	Texas, Massachusetts.
0.75	North Dakota.
0.5	Pennsylvania, Ohio, Wisconsin.
Trace	Maryland, Virginia, Georgia, Indiana, Illinois, Michigan, Missouri, South Dakota, Nebraska, Kansas, Mississippi, Wyoming, Colorado, Arizona, Washington, Oregon.

Recent literature:

1. Gordon, W. L. Physiologic forms of Puccinia graminis avenae Erikss. and Henn., in Canada. (Abst.) Phytopath. 18: 479. May 1928.

2. Greaney, F. J. Studies on the toxicity and fungicidal efficiency of sulphur dusts in the control of some cereal rusts. Scient. Agr., 8: 316-331, 1928.

3. Hayes, H. K., F. Griffee, F. J. Stevenson, and A. P. Lunden. Correlated studies in oats of the inheritance of reaction to stem rust and smuts and of other differential characters. Jour. Agr. Res., 36:437-457. 1928.

CROWN RUST, PUCCINIA CORONATA CDA.

Crown rust was considerably less prevalent than in 1927 and somewhat less prevalent than normal according to reports of collaborators in 1928. In general, it developed too late in the season to do much damage in the more important oat states and late planted oats suffered the most. As usual, some of the highest losses were reported from the southern states where winter oats are grown.

Table 76. Percentage losses from crown rust of oats as estimated by collaborators, 1928.

Percentage loss	States	Percentage loss	States
30	Florida	0.5	Massachusetts, Georgia, Ohio, Texas
10	Louisiana	0.1	Oregon
1	Virginia, Mississippi, Indiana, Wisconsin, North Dakota, Kansas.	Trace	Pennsylvania, Delaware, Maryland, Illinois, Michigan, Missouri, Arkansas, Washington, California

The relation to buckthorn was especially mentioned in Wisconsin where several cases of spread from buckthorn to oats were noticed in the southern part of the state.

Considerable variation in the susceptibility of oat varieties was noted in Florida and Arkansas. In the latter state, according to H. R. Rosen, the following percentages of loss in yield were calculated: Arkansas Selection, 10 per cent; Iowa 105, 10 per cent; Iogren, 3 per cent; Oklahoma Red Rust Proof 5 per cent, Fulghum, 10 per cent. Under Louisiana conditions, E. C. Tims reported that the Texas Red Rust Proof is not resistant.

SCAB, GIBBERELLA SAUBINETII (MONT.) SACC.

On oats, this disease was reported to the Survey from New Jersey, Delaware, Maryland, Pennsylvania, Ohio, Indiana, Wisconsin, Minnesota, and Iowa. As in the case of the other cereals, it was more prevalent than normal. Losses were reported as follows: Pennsylvania, trace; Ohio, 0.1 per cent; Indiana, 3 per cent; Wisconsin, trace; Iowa, 0.5 per cent.

Recent literature:

1. Bennett, F. T. On two species of Fusarium, F. culmorum (W. G. Sm.) Sacc. and F. avenaceum (Fries.) Sacc., as parasites of cereals. Ann. Appl. Biol. 15: 213-244. May, 1928.

2. Simmonds, P. M. A seedling blight disease of oats caused by Fusarium culmorum. (Abs.) Phytopath. 18: 480. May 1928. (Abs.) Sci. Agr. 8: 463. March 1928.

OTHER DISEASES

Bacterium coronafaciens Elliott, halo blight. Reported from Pennsylvania, Indiana, Wisconsin, Kansas, and Montana in about the same amounts as usual. The state losses did not exceed a trace. In Kansas, Johnston reported that it appeared in small amounts in nearly all fields late in the season. He mentioned Liberty and Hull-less oats as susceptible.

Colletotrichum graminicolum (Ces.) Wils., anthracnose. Slight amounts reported from Arkansas, Texas, and Wisconsin.

Erysiphe graminis DC., powdery mildew. Washington.

Helminthosporium avenae Eidam, leaf spot. In 1928, this disease was only reported from Connecticut, West Virginia, Florida, and Indiana. In the first three states, it was said to occur commonly. In West Virginia, it was thought to have caused a loss of about 10 per cent. By July practically all fields had lost all the leaves on the lower half of the plants, while even the upper leaves showed considerable infection. In some low, moist fields, seedling blight occurred. This disease has not been recognized heretofore as causing serious injury to oats in West Virginia, and this observation suggests that perhaps damage due to it may be overlooked in other states.

Tylenchus dipsaci (Kühn) Bast. In the Plant Disease Reporter 12: 20, June 15, 1928, what appears to be the first report of this nema on oats in this country is recorded from California. Since that time, Harold E. Thomas has sent in more detailed information concerning the occurrence. He states that the ranch has been cropped to oats almost continuously for the last twenty years, with an occasional summer fallow pasture or crop of wheat. The trouble was first noticed by the grower about ten years ago in a small spot in one field. Now it is widely scattered over the ranch. Another diseased condition was observed on the same ranch, the symptoms of which appear to be different from the one just mentioned, and which is causing much more damage. Specimens of this sent in to Washington showed Tylenchus dipsaci in the roots, and in addition, Cephalobus elongatus, another somewhat doubtfully parasitic nema commonly associated with decaying tissue. In one field, over 50 per cent of the crop was lost on account of this latter condition.

Blast (Non-par.). This common sterile condition of oat spikelets doubtless occurred more or less wherever oats were grown but it was only reported to the Survey from Pennsylvania, Arkansas, Kansas, and Montana. In Arkansas, two observers independently estimated the percentage reductions in yield in several varieties with the following results: Kherson, 3; Richland, 2; Gopher C. I. 2027, 1: Swedish Select, 5; Burt, 5; Iowar C. I. 847, 3; Iogren, 2; Nebraska 21, 5. In Kansas, Kherson was susceptible and Kanota very resistant, and the increased acreage of Kanota has brought about a reduction in the amount of blast. Losses were estimated as follows: 5 per cent, Montana; 3 per cent, Kansas; and one per cent, Pennsylvania.

Recent literature:

1. Godfrey, G. H. The susceptibility of certain grasses to nematodes. Pineapple News 2: 42. 1928.

2. Robertson, D. Observations on the disease of oats caused by the stem eelworm Anguillulina dipsaci (Kühn, 1857) Ann. Appl. Biol. 15: 488-498. Aug. 1928.

3. Samuel, Geoffrey. Two stunting diseases of wheat and oats. Jour. Dept. Agr. South Australia 32: 40-43. Aug. 1928.

4. Samuel, Geoffrey. Grey speck (manganese deficiency) disease of oats. Jour. Dept. Agr. South Australia 31: 696-705, 789-799. 1928.

C O R N

SMUT, USTILAGO ZEAE (BECKM.) UNG.

About the average amounts of corn smut were reported by collaborators, although in the corn belt from Ohio westward to Kansas and in some of the dry land areas of western states such as Colorado, Arizona, and California more than last year and more than the average year was reported. The estimates of losses in the accompanying table will show that the damage in these states particularly was considerable. In this connection, Immer and Christensen (5) in determining losses from smut infections have concluded that, in general, estimates of losses from corn smut by pathologists have been too low.

Table 77. Losses from corn smut as estimated by collaborators, 1928

Percentage loss	States reporting	Percentage loss	States reporting
15	California	2.5	Pennsylvania, Tennessee, Missouri
6	Kansas		
5	Arizona	2	Massachusetts, Minnesota
4	Ohio, Iowa, North Dakota	1.5	Utah, Wisconsin
		1.25	New York
3	Virginia	1	Colorado, Michigan
		0.5	Delaware, West Virginia, Mississippi, Louisiana, Texas
		0.3	Maryland, Indiana

The following maximum percentages observed in individual fields emphasize the fact that this disease can cause a considerable amount of damage: Colorado 75, Minnesota 70, California 65, Arizona 50, Kansas 40, Pennsylvania 15, West Virginia 10, Florida 7. In Iowa counts made of 894 infected plants showed 9 per cent with ear infection only. The year before that counts made of 627 infected plants in the same locality showed only 1.1 per cent with ear infection only. General observations about the state also indicated that ear infection was more prevalent than in 1927. The average percentage of infected plants in the state was estimated as 8 and as will be seen from Table 77 the consequent reduction in yield was placed at 4 per cent.

Identical observations that smut was worst in the dry-land areas of Colorado and California are worthy of note.

Another significant observation is that of J. T. Trost of Indiana, who reported that the general condition of nitrogen starvation in the crop before tasselling was unfavorable for infection.

Recent literature

1. Eddins, A. H. Pathogenicity of multisporidial and monosporidial cultures of Ustilago zeae (Beckm.) Ung. (Abstract) Phytopath. 19: 91. Jan. 1929.

2. Garber, R. J., and M. M. Hoover. The relation of smut infection to yield in maize. Jour. Amer. Soc. Agron. 20: 735-746. July 1928.

3. Griffiths, M. A. Smut susceptibility of naturally resistant corn when artificially inoculated. Jour. Agr. Res. 36: 77-89. January, 1928.

4. Hanna, W. F. Studies in the physiology and cytology of Ustilago zeae and Sorosporium reilianum. (Abstract) Phytopath. 19: 91. Jan. 1929.

5. Immer, F. R., and J. J. Christensen. Determination of losses due to smut infections in selfed lines of corn. Phytopath., 18: 599-602, 1928.

6. Immer, F. R., and J. J. Christensen. Influence of environmental factors on the seasonal prevalence of corn smut. Phytopath., 18: 589-598. 1928.

7. Platz, G. A. The relation of oxygen to the germination of the chlamydospores of Ustilago zeae (Beck.) Unger. Iowa State Coll. Jour. Science, 2: 137-143. 1928.

8. Stakman, E. C., J. J. Christensen, and W. F. Hanna. Mutation in Ustilago zeae. (Abstract) Phytopath. 19: 106. Jan. 1929.

ROOT, STALK, AND EAR ROTS ASSOCIATED WITH FUSARIUM MONILIFORME, GIBBERELLA SAUBINETII, FUSARIUM SPP, PYTHIUM ARRHENOMANES DRECHS., AND POSSIBLY OTHER ORGANISMS.

More light is gradually being thrown on this complex of diseases whereby some of the individual diseases may be distinguished. The work of Valleau, Karraker and Johnson (4), Branstetter (1), Johann, Holbert and Dickson (3) and Drechsler (2) has resulted in the separating out of Pythium arrhenomanes as a cause of root rot. Just how widespread and how important this is as a cause of root rot remains to be seen. The causes of the seedling blights and also the ear rots are gradually becoming better known. Taken all together they caused a very considerable loss in 1928 as evidenced by the figures in table 78.

Corn - Root - Stalk - and ear rots

Table 78. Estimated losses from ear rots and root rots of corn as reported by collaborators, 1928.

State	Estimated percentage loss		Total
	Root rots	Ear rots	
Massachusetts	1	t	1 +
Pennsylvania	3	3.5	6.5
Delaware	1.5	1.5	3
Maryland	5	7	12
Virginia	3	3	6
West Virginia	3	2	5
Georgia	1	-	1
Florida	5	5	10
Ohio	1	1	2
Indiana	1	4.5	5.5
Michigan	t	t	t
Wisconsin	2	2	4
Minnesota	t +	1	1 +
Iowa	0	11.5	11.5
Missouri	1.5	t	1.5 +
Kansas	5	4	9
Mississippi	5	2	7
Louisiana	5	5	10
Texas	1	5	6
Montana	t	0	t
Arizona	0	0	0
Washington	t	t	t
Oregon	t	0	t
California	-	10(pink rot)	10

Recent literature

1. Branstetter, B. B. Corn root rot studies. Missouri Agr. Exp. Sta. Res. Bul. 113: 1-80. Nov. 1927.

2. Drechsler, C. Pythium arrhenomanes n. sp., a parasite causing maize root rot. Phytopath. 18: 873-875. Oct. 1928.

3. Johann, H., J. R. Holbert, and J. G. Dickson. A Pythium seedling blight and root rot of dent corn. Journ. Agr. Res. 37: 443-464. Oct. 15, 1928.

4. Valleau, W. D., P. E. Karraker and E. M. Johnson. Corn root-rot, a soil-borne disease. Jour. Agr. Res. 33: 453-476. Sept. 1, 1926.

BACTERIAL WILT, APLANOBACTER STEWARTII (EFS.) McCUL.

Reported from Maryland, West Virginia, Indiana, Iowa, Missouri, Kansas, and Texas. The most interesting fact reported was the unusual prevalence of the disease in Iowa, Missouri, and Kansas. According to the collaborators of those states, the area where the disease occurred was more or less continuous, as in Iowa it was reported only from three southern counties next to the Missouri line, and in Kansas it occurred particularly in fields in the northeastern part of the state. The reports of the three collaborators from those states are as follows:

> Missouri: First serious outbreak of this disease in Missouri for several years. One field showed at least one-half of stand wilted with probably more going down later. Had not occurred here heretofore (i. e., in the same field). Organism easily isolated. (I. T. Scott)
>
> Iowa: Specimens received from three counties next to the Missouri line. This is the first collection of this disease in Iowa in recent years. It was present only on the sweet corn and is doing great damage. Seed source has not been traced down as yet. (Porter)
>
> Kansas: This disease more severe in garden grown sweet corn than ever reported before. (Johnston)

Golden Bantum and Country Gentleman sweet corn were the varieties reported especially susceptible. In Indiana Evergreen and Narrow Grain were said to show resistance.

Recent literature:

1. Reddy, C. S., and J. R. Holbert. Differences in resistance to bacterial wilt in inbred strains and crosses of dent corn. Jour. Agric. Res., 36: 905-910. 1928.

DRY-ROT, DIPLODIA ZEAE LEV.

The states reporting occurrence and estimates of losses are given in the following table:

Table 79. Losses from dry-rot of corn as estimated by collaborators, 1928.

Percentage loss	States reporting	Percentage loss	States reporting
5	Iowa, Florida	1	Maryland, Ohio
3	Indiana	t	Pennsylvania, Missouri
2	West Virginia (includes Gibberella), Mississippi, Kansas		

Corn - Dry-rot, Diplodia zeae Lév.

Delaware, Mississippi, and Indiana reported more than the average, on account of warm and rainy weather, and in Delaware and Florida the statements are made that it was commonly associated with corn which had been blown down by hard winds. In the latter state it was said to be probably the most destructive ear rot disease.

Late Reid and Johnson County White were reported by Trost as very resistant in Indiana, while the sweet corns and early maturing dents were very susceptible.

Seed treatments continued to result in reductions in the amount of this disease (1, 2, 3).

Recent literature

1. Holbert, J. R., C. S. Reddy, and B. Koehler. Chemical-dust seed treatments for dent corn. U. S. Dept. of Agric. Circ. 34. 5 pp. 1928.

2. Melhus, I. E., C. S. Reddy, W. P. Raleigh, and L. C. Burnett, Iowa Agr. Exp. Sta. Circ. 108: 16 pp. 1928.

3. Reddy, C. S. and J. R. Holbert. Further experiments with seed treatments for sweet-corn diseases, Jour. Agr. Res. 36: 237-247. 1928.

BROWN SPOT, PHYSODERMA ZEAE-MAYDIS SHAW

Brown spot was reported from the southern states of North Carolina, Georgia, Florida, Mississippi, and Louisiana and from Iowa, Missouri, and Kansas. As usual the greatest damage occurred in the Gulf Coast States, with 5 per cent estimated loss in Florida, 3 in Mississippi, and 1.6 in Georgia. Only traces of loss were reported from the other states, with the exception of Louisiana, where the disease was said to be very general but no attempt was made to estimate the loss.

On an inspection trip in northern and western Florida, A. H. Eddins observed the highest percentage of infection on a local strain of the variety Hastings at Gainesville, where 48 per cent of the plants were infected. He estimated the average percentage of infection for the state at 15, and the loss at 5.

The occurrence in Iowa, where it was found in two fields, is the first observed during recent years.

RUST, PUCCINIA SORGHI SCHW.

Rust was reported from widely scattered states, from Maine to Florida and westward as far as Colorado. No reports were received from the Pacific Coast. The report from Maine stated that it has not been considered common in that state but with the adoption of the Golden Bantam for commercial canning more complaints of severe injury are being received. Sweet corn was commonly reported as more severely affected than field corn. The only state reporting losses of over a trace was Iowa with 0.2 per cent.

Recent literature

1. Stakman, E. C., J. J. Christensen, and H. E. Brewbaker. Physiologic specialization in Puccinia sorghi. Phytopath. 18: 345-354. 1928.

OTHER DISEASES

Bacterium dissolvens Rosen, bacterial stalk-rot. Reported from Mississippi and Arkansas. As high as 10 per cent observed in one Arkansas field.

Basisporium gallarum Molliard, cob rot. Indiana, Iowa, and Kansas. In the two former states it occurred generally, causing total losses estimated at 1 and 5 per cent respectively. In Kansas a trace of loss was estimated. Inbred strains of Johnson County White were said to be very susceptible in Indiana. In Iowa it was associated with down corn resulting from severe hail and wind storms.

Cephalosporium acremonium Cda., black bundle. New York, Pennsylvania (0.5 per cent loss), Indiana (general, trace loss), Kansas (slight amounts in nearly all river-bottom fields of northeastern Kansas, trace loss), Montana.

Helminthosporium turcicum Pass., leaf-blight. Reported from Connecticut, New York, Pennsylvania, Virginia, West Virginia, Indiana. In Virginia one case was observed where three acres in the middle of a field was almost a total loss on account of this leaf blight. The loss for the state however was estimated at only a trace. In West Virginia it was reported by Archer as being one of the most severe diseases of corn of the year. It was widely distributed and in the southern part of the state especially it resulted in premature ripening. The loss was estimated at 6 per cent for the state. In Indiana it appeared to be confined more or less to the southern portion. Some fields were observed with all plants infected but the state loss was estimated at merely a trace.

Sorosporium reilianum (Kühn) McAlp., head smut. This smut is spreading in California, according to Mackie. Five per cent infection observed in one field.

Mosaic (virus). Reported from southern Louisiana and Mississippi, fields relatively near infected sugar cane.

Translucent leaf spot, non-par. Generally distributed and rather common in West Virginia fields, according to Archer. It has the appearance of being a bacterial disease but detailed examinations failed to reveal bacteria.

Corn - Other diseases

Recent literature

1. Branstetter, B. B. Corn root rot studies. Missouri Agr. Exp. Sta. Res. Bull. 113. 30 pp. Nov., 1927.

2. Burger, A. A. Corn root rot. Successful Farm. 26 (4): 11, 25. Apr. 1928.

3. Dickson, James G., P. E. Hoppe, J. R. Holbert, and George Jansen. The influence of environment during maturation upon predisposition to seedling blight in wheat and corn strains. (Abstract) Phytopath. 19: 79. Jan. 1929.

4. Gilbert, B. B., and F. T. McLean. A 'deficiency disease': the lack of available manganese in a lime-induced chlorosis. Soil Science 26: 27-31. 1928.

5. Holbert, J. R., and W. L. Burlison. Studies of cold resistance and susceptibility in corn. (Abstract) Phytopath. 19: 105 Jan. 1929.

6. Holbert, J. R., C. S. Reddy and B. Koehler. Chemical-dust seed treatments for Dent corn. U. S. Dept. Agr. Circ. 34. 5 p. Feb. 1928.

7. Hoppe, P. E. Inheritance of resistance to seedling blight of corn caused by Gibberella saubinetii. (Abstract) Phytopath. 19: 79-80. Jan. 1929.

8. Ireland, J. C. Controlling influences in corn rot problems. Bot. Gaz. 86: 249-269. Nov. 1928.

9. Johann, Helen. Further studies on Penicillium injury to corn. (Abstract) Phytopath. 19: 105. Jan. 1929.

10. Johann, Helen. Penicillium injury to corn seedlings. Phytopath. 18: 239-242. Feb. 1928.

11. Melhus, I. E., C. S. Reddy, W. P. Raleigh, and L. C. Burnett Iowa Agr. Exp. Sta. Circ. 108. 16 pp. 1928.

12. Melhus, I. E., F. H. Van Haltern and D. E. Bliss. A study of Sclerospora graminicola (Sacc.) Schroet. on Setaria viridis (L.) Beauv. and Zea mays L. Iowa Agr. Exp. Stat. Res. Bull. 111: 297-338. Apr. 1928.

13. Miller, L. P. Manganese deficiency in sand cultures. Amer. Fertilizer, 63 (7): 21-22. 1928.

14. Stahl, C. F. A mosaic on corn. Proc. Conf. Intern. Soc. Sugar Cane Techn. 2: 85-87. 1927.

15. Storey, H. H. Transmission studies of maize streak disease. Ann. Appl. Biol. 15: 1-25. Feb. 1928.

F L A X

Fusarium lini Bolley, wilt. Wisconsin, Minnesota, Iowa, North Dakota, Kansas, and Montana. The only states estimating more than a trace of loss were North Dakota with 5 per cent and Minnesota with 1 per cent. As high as 75 per cent infected plants were noted in one Minnesota field, and 10 per cent in a Kansas field. In Iowa, where flax is increasing as a crop, only one case of wilt came to attention. Pathologists there are indexing the various varieties for their resistance.

Melampsora lini (Schum.) Desm., rust. Wisconsin, Minnesota, North Dakota, Montana, and Oregon. It was said to be much more prevalent in Minnesota than usual, especially in the southern half of the state. Ten per cent reduction in yield was estimated. In North Dakota it occurred generally on the susceptible varieties, the newly developed varieties showing good resistance. Three per cent loss was estimated in that state. In Oregon, Barss estimates 0.1 per cent loss.

Phlyctaena linicola Speg., pasmo. Unusually severe in Minnesota where the damage ranged from a trace to 20 per cent in individual fields. The injury took the form of blighting of the bolls as well as of the stem. Traces of loss were estimated in Wisconsin and North Dakota.

Heat canker, nonpar. Montana.

Tipburn, undet. Tipburn of young plants from 10 to 15 inches high were reported affecting 10 per cent of the plants in a North Dakota field. The young growing tips and flower buds were affected. It is uncertain as to whether or not this disease is caused by an organism.

Recent literature

1. Henry, A. W. Reaction of Linum species of various chromosome numbers to rust and powdery mildew. (Abstract) Scient. Agric. 8: 460-461. 1928.

2. Hiratsuka, N. Studies on the flax rust. Reprinted from Trans. Sapporo Nat. Hist. Soc. 10 (1): 1-27. 1928.

3. Homma, Yasu. On the powdery mildew of flax. Bot. Mag. Tokyo 42: 331-334. 1928.

S O R G H U M

COVERED KERNEL SMUT, SPHACELOTHECA SORGHI (LINK) CLINTON

Covered kernel smut was reported from the following states. The figures in parentheses indicate estimated percentages reduction in yield. Wisconsin (trace), Missouri (trace), Texas (2), Louisiana, Arkansas (3), Colorado (1.5), New Mexico, California (2). Maximum percentages of infection in individual fields were reported from Kansas, Colorado and California, as 45, 30 and 60 per cent respectively.

In New Mexico Crawford reports that the disease is becoming eliminated by the use of copper carbonate dust. Only a trace of it can now be found. In Kansas, Johnston states that physiologic forms which attack Milo, Hegari, and Feterita, which were formerly thought to be immune, have been isolated. In California, Feterita still seems to be immune but the formerly immune dwarf milos are becoming attacked to some extent.

Recent literature

1. Johnston, C. O., and L. E. Melchers. The control of sorghum kernel smut and the effect of seed treatments on vitality of sorghum seed. (Kansas Agr. Exp. Sta. Tech. Bul. 22: 37 pp. 1928.

HEAD SMUT, SOROSPORIUM REILIANUM (KÜHN) McALP.

In Kansas, occasional smutted heads were found, especially in the western part of the state, and mostly in the sorgos. In Texas a trace was reported. It was also found to a slight extent in eastern New Mexico. From California W. W. Mackie reported that it is increasing in amount and range, being found from Los Angeles County to Yolo County. The milos were said to be immune while all of the saccharine sorgos were very susceptible.

R I C E

Helminthosporium oryzae Van Breda de Haan, blight. Common in all fields in Florida. Very destructive in seedling stage (Weber).

Piricularia oryzae Br. & Cav., blast. Florida, Texas, and Arkansas. In Florida it seemed to be common wherever the host was grown and in Arkansas it was found to a limited extent particularly in fields affected with stem rot.

Sclerotium oryzae Catt., stem rot. Arkansas. Losses severe in occasional fields but on the whole not very much damage.

Tilletia horrida Tak., black smut. Arkansas. Traces found in the fields examined but of no particular economic importance. The variety Fortuna appears most susceptible.

Ustilaginoidea virens (Cke.) Tak., false smut. V. H. Young reported that he has never seen this disease in Arkansas, although he has looked for it carefully. The disease has been reported from Louisiana but was not observed in 1928, according to Tims.

Straighthead, non-par. Patches of rice showing straighthead observed in some fields in Arkansas, but no considerable loss this year. (E. C. Tullis)

Glume blotching and spotting, cause unknown. Blotching and spotting of glumes accompanied by kernel discoloration or sterility observed in Arkansas, according to Tullis.

Recent literature

1. Abe, T. Experimentelle Studien über die Pilzschäden von Reissämlingen. IV. Jour. Plant Protect., 14: 1-12. 1927. (Japanese.) (Abs. in Japanese Journ. of Botany, 4: 1. 1928).

2. Hemmi, T. and T. Abe. An outline of the investigations on the seed and seedling-rot of rice caused by a watermould, Achlya prolifera Nees. Jap. Jour. Bot. 4: 113-123. Oct. 1928.

3. Hemmi, T., and F. Seto. Experiments relating to stimulative action by the causal fungus of the 'bakanae' disease of rice. (Preliminary report.) Proc. Imper. Acad. (Tokyo). 4: 181-183. 1928.

4. Nisikado, Yosikazu. Comparative studies on the Helminthosporium diseases of rice in the Pacific regions (Abstract) Proc. Third Pan-Pac. Sci. Cong. Tokyo II: 2113. 1928.

5. Nisikado, Y., and C. Miyake. Studies on the uspulun treatment of cereal seeds against the Helminthosporioses. Agric. Studies 11: 36-64. 1927. (Japanese). (Abs. in Jap. Jour. Bot. 4 (1): 1928.

6. Tuteff, I. Ein Versuch zur Bekampfung der Fleckenkrankheit des Reises. Zeitschr. Pflanzenkr. 38: 279-284. 1928.

DISEASES OF FORAGE CROPS

ALFALFA

LEAFSPOT, PSEUDOPEZIZA MEDICAGINIS (LIB.) SACC.

Pseudopeziza leafspot was reported from sixteen states scattered throughout the country. In most cases it was of slight importance, but in Iowa it probably caused a loss of 3 per cent, according to R. H. Porter. Early cutting to reduce loss was necessary both in Iowa and Virginia.

YELLOW LEAF BLOTCH, PYRENOPEZIZA MEDICAGINIS FCKL.

Only four states reported this disease in 1928, West Virginia, Iowa, Kansas, and Montana. It has not been reported from West Virginia before. According to Young, it was common and sometimes serious in late-cut fields in western Montana.

BACTERIAL WILT, APLANOBACTER INSIDIOSUM MCCULLOCH.

Bacterial wilt was reported from Wisconsin, Iowa, Missouri, Kansas, Colorado, and Utah, and a wilt occurring in New Jersey was reported as being caused by Bacterium sp. In Wisconsin, where it is important only in the southern counties, there was more than usual following severe winter injury. R. H. Porter estimated that bacterial wilt and crown rot together caused a loss of 25 per cent in Iowa, and reported that it was found in several new localities in the state. Weimer, in a report to the Office of Vegetable and Forage Diseases, said that bacterial wilt appeared to be more prevalent in eastern Kansas than at any time since its discovery. It was by far the most important disease of alfalfa in that section. Many plants, in fact whole fields, were destroyed during the winter, apparently by this disease. The amount of wilt decreases toward the west and there is very little in upland alfalfa in the drier sections of the State. The winter-hardy variety Grimm is one of the most susceptible to bacterial wilt. In Colorado, the loss was estimated at 2 per cent. Richards reported that the disease was very important in alfalfa under irrigation in the northwestern portion of Salt Lake County, Utah. He says, "In a survey on the dates of August 25 to 27 . . . a total of 28 fields were visited. Twenty-five (90 per cent) showed the bacterial wilt. Of these 25 fields, 19 showed the trouble in quantities varying from 1 to 70 per cent of plants affected. Two fields were found which were very severely affected with from 60 to 70 per cent of plants either dead or diseased. . . . With further spread, bacterial wilt may become a very important factor in Utah alfalfa hay and seed production. Damage is especially evident in areas with abundant water supply."

Recent literature

1. Jones, F. R. Development of the bacteria causing wilt in the alfalfa plant as influenced by growth and winter injury. Jour. Agr. Res. 37: 545-569. Nov. 1, 1928.

2. Jones, F. R., and J. L. Weimer. Bacterial wilt and winter injury of alfalfa. U. S. Dept. Agric. Circ. 39. 8 pp., 1928.

LEAF AND STEM NEMATODE, TYLENCHUS DIPSACI (KÜHN) BASTIAN

Colorado, Utah, New Mexico, and Oregon reported Tylenchus dipsaci in 1928.

Utah: Of the 67 fields studied in the Hunter, Magna, and Murray districts of Salt Lake County in 1928, 27 fields or 48 per cent showed the nematode. Three of the 27 infested fields showed the disease in every plant examined. A number of the others exhibited heavy percentages. Poor stands and stunted plants characterized most of the fields in which the disease was severe. The studies show the disease to be an important factor in decreasing yields in fields older than three or four years. One 2-year-old field was observed showing practically 100 per cent infection. With a more thorough study of the fields, traces of the nematode would be found without doubt in a much greater percentage than is here indicated. Total loss 0.5 per cent. (Richards).

Oregon: Occurs in four counties. Loss 0.5 per cent, maximum infection observed 90 per cent. This disease is gradually spreading to new districts and new fields. The damage in some cases is very heavy. Some growers are becoming alarmed. Some fields have dropped in yield from eight tons of hay to one ton per acre because of the nematode. (McKay).

Recent literature:

1. Noble, R. J. Root knot and other eelworm diseases. Agr. Gaz. New South Wales 39: 546-550. July 1928.

WITCHES' BROOM, CAUSE UNKNOWN.

The following description of a "witches' broom" disease of alfalfa occurring in Utah is by B. L. Richards:

This disease has not been reported previously from Utah and so far as the writer is aware, no reference has been made to it from other districts.

The disease was first observed by the writer in two fields in Salt Lake County in 1924 although, owing to the small number of plants involved, little attention was given to it. Attention was again focused upon the trouble during the survey in the Murray district, Salt Lake County, between the dates of August 26 and 27 in 1928 at which time it was discovered in four of the eighteen fields visited. In three of these fields, affected plants were found in such numbers as to indicate rather clearly that the disease was an important factor in reducing the stand. One of the three fields observed showed an average infestation of approximately 15 per cent with local spots exhibiting as high as 50 per cent affected plants.

The disease expresses itself in a marked increase in number of stems which arise from the axis of the leaves, from the axis of the scales at the base of the stem, and adventitiously throughout the whole circumference of the crown. Several shoots in fact might develop from a single leaf axis along the old stem stalks left from a first or second cutting. The stems from a single diseased crown may vary in number from 50 to as high as 300. These features justify the name "witches' broom."

Alfalfa - Witches' Broom.

Diseased stems are uniformly shorter than stems from healthy plants and in the advanced stages of the disease may not exceed 3 to 5 inches in height. Diseased stems also become very spindly and may be so reduced in diameter as to be unable to maintain an upright position. Leaves of affected plants are uniformly small and more rounded than normal. Definite marginal yellowing and purpling of the leaves also characterizes the disease in its advanced stages.

The trouble appears to arise rather suddenly as a systematic type of disease in which all stems are equally affected and all meristematic tissue in the plant is stimulated into activity, thus resembling somewhat certain diseases of the virus type. The various stages of the disease exhibited by the affected plants, from slight injury to severe stunting and early death, indicate that the trouble is a specific disease and not a genetic variation to which it was earlier attributed.

A more detailed description of the disease is being prepared for publication in Phytopathology.

It may be mentioned that in 1925 Hungerford reported under the name of a "witches' broom" a disease causing slender bushy growth of alfalfa in a few fields in Elmore County, Idaho. This is the only other report of a similar trouble in the Survey files.

CROWN AND ROOT ROTS AND WINTER INJURY.

Winter injury and crown and root rots following it and associated with various organisms were responsible for very severe damage in some states. The heaviest loss, 50 per cent, was reported from West Virginia where the crop is comparatively new and little is known regarding suitable varieties. According to Archer, all fields in the mountainous parts of the State were severely affected by crown rot but those in the eastern Panhandle were practically free. Plants in a certain type of shale soil are particularly liable to heaving which makes them more subject to crown rot. In one place, a two-year old field in the shale soil was nearly dead while a three-year old field on a black limestone ridge a short distance away was in perfect condition.

Other percentages of loss reported are Utah 15, Iowa 12, Maryland 10, Missouri 4, Colorado 3, Texas and North Dakota 1. The trouble was also said to be important in Virginia, Kentucky, Arkansas, Wisconsin, and Minnesota. Richards states that root rots of various types are an important factor in reducing alfalfa yield in Utah, especially in the older fields. Observations in 1928 in the Hunter and Magna districts indicate that not more than 60 per cent of the possible yield is being obtained by growers, due largely to lack of proper rotation. Heavy losses are sustained through neglect to break up and reseed fields when the stand becomes so thin as to be unprofitable.

Valleau and Fergus in Kentucky report that winter killing was severe in 1927-28. They state that "The most severe injury appeared to be in the fall-developed shoots which furnished buds for the next spring's growth. Death appeared to have resulted from infection by the 'black-stem' organism (common on clovers, alfalfa, and sweet clover) which weakened the shoots sufficiently to cause their death during the winter. Vigorous plants on fertile soil withstood damage and survived better than plants on poorer soil."

In Wisconsin, Vaughan reported that the Agronomy Department estimated 100,000 acres killed out because of lack of snow cover and complication with wilt in some sections.

Recent literature

1. Jones, F. R. Winter injury of alfalfa. Jour. Agr. Res. 37: 189-211. Aug. 15, 1928.

OTHER DISEASES

Ascochyta imperfecta Pk., leafspot. West Virginia: first report for the state, many fields with all the lower leaves affected. (W. A. Archer).

Bacterium medicaginis (Sack.) EFS., bacterial blight. The only report of this disease this year is from Utah, where, according to B. L. Richards, it caused a loss of 1.5 per cent. The maximum infection observed was practically 100 per cent.

Caconema radicicola (Greef) Cobb (Heterodera radicicola (Greef) Müll.). Root knot is important in Texas except where the Hairy Peruvian variety is grown. Loss 0.5 per cent. (J. J. Taubenhaus).

Cercospora medicaginis Ell. & Ev., leaf spot, was reported from West Virginia for the first time. Infection was scattered and slight. (W. A. Archer). The disease also occurred in Texas and Mississippi.

Colletotrichum trifolii Bain, anthracnose. New Jersey, Mississippi.

Cuscuta sp., dodder, reported from Texas and Wyoming.

Fusarium spp., Fusarium wilt. (See also crown and root rots and winter injury above). "This is believed to be the most serious disease of alfalfa in Missouri. Causal organisms have been isolated. Loss 4 per cent." (I. T. Scott).

Fusarium oxysporum var. medicaginis Weimer was described (7) as the cause of a typical Fusarium wilt of alfalfa in northeastern Mississippi. As many as 15 per cent infected plants have been found in a field. Due to its limited distribution, the disease is not of very great economic importance at the present time, but no soil or climatic factor is known which would prevent its spread to other alfalfa growing regions.

Alfalfa - Other Diseases.

Macrosporium sp., leaf spot. West Virginia: Slight occurrence in several fields in the Eastern Panhandle. Associated with Phleospora hyalospora Ell. & Ev. (W. A. Archer).

Peronospora trifoliorum D By., downy mildew. Loss 0.5 per cent in Utah, also reported from New Jersey, Mississippi, and Montana.

Phymatotrichum omnivorum (Shear) Duggar (Ozonium omnivorum Shear), root rot, caused 30 per cent loss in Texas according to Taubenhaus and Dana. Crawford stated that it was severe in the Pecos Valley in New Mexico. Considerable acreage was plowed up. The Arizona News Letter reports the disease from Arizona and California. In California, according to the issue for September 30 (page 2) "Mr. Scott reports that the thorough survey made in the Coachella and Imperial Valleys resulted negatively as far as root rot was concerned. However, the disease was found quite widespread in the Palo Verde Valley and in the Bard district. Cotton and alfalfa were the crops attacked most severely."

Rhizoctonia sp. J. E. Kotila (4) describes a Rhizoctonia isolated in 1934 from root rot diseased alfalfa plants in Michigan. A culture of a similar Rhizoctonia was received from Minnesota. The mycelium is hyaline and cannot be mistaken for that of R. crocorum. The perfect stage formed in pure culture differs in many respects from Corticium vagum.

Urophlyctis alfalfae (Lagh.) Magn. In 1928 reported to the Survey from Utah only. Richards stated that the disease was found in 34.3 per cent of the 67 fields examined in the Hunter and Magna districts of Salt Lake City. In some fields it was very severe, from 70 to 80 per cent of the plants being affected. It was especially prevalent in some old alfalfa fields and is undoubtedly an important factor in decreasing the stand. The loss for the State was estimated by Richards at 2 per cent. Graff (3) reports the disease from Montana, which is a new record as far as the Survey files are concerned.

Albino plants (cause unknown), Park County, Montana, apparently not so abundant as usual. The white, purple, or yellow stems and leaves are very conspicuous. Affected stems bear both normal and albino leaves. Affected plants bear some stems that show no albino symptoms. Since the abnormality does not seem to appear in the second and subsequent cuttings, it is probably not genetic. (P. A. Young.)

Curly top (due to sugar beet curly top virus). Natural and artificial infection of Hairy Peruvian was reported from California (6).

Leaf hopper injury. General but of slight importance in New Jersey, most severe in southern part.

Streak, said to be of bacterial origin, was reported from Texas.

White spot (non-par.), reported from Iowa, Montana, Washington.

Yellow top (cause unknown), Washington.

Recent literature on other diseases:

1. Bisby, G. R., and I. L. Conners. Plant diseases new to Manitoba. Sci. Agr. 8: 456-458. Mar. 1928. Pleosphaerulina briosiana Poll.; Peronospora trifoliorum D By.

2. Carne, W. M. Additions to the plant diseases of south-western Australia. Jour. Roy. Soc. Western Australia, 14: 23-28. 1927. Rhizoctonia bataticola.

3. Graff, P. W. Contributions to our knowledge of Western Montana fungi - II. Mycologia 20: 158-179. 1928. Urophlyctis alfalfae, Peronospora trifoliorum.

4. Kotila, J. E. Concerning a Rhizoctonia which forms hymenial cells and basidiospores in culture. Science n. s. 67: 490. May 11, 1928.

5. Monteith, J. Clover anthracnose caused by Colletotrichum trifolii. U. S. Dept. Agr. Techn. Bul. 28. 26 pp. 1928.

6. Severin, Henry H. P., and Charles F. Henderson. Some host plants of curly top. Hilgardia 3: 339-392. June 1928.

7. Weimer, J. L. A wilt disease of alfalfa caused by Fusarium oxysporum var. medicaginis, n. var. Jour. Agr. Res. 37: 419-433. Oct. 1, 1928.

CLOVER

ANTHRACNOSE DISEASES, COLLETOTRICHUM TRIFOLII BAIN AND GLOEOSPORIUM CAULIVORUM KIRCH.

The Colletotrichum was reported from West Virginia, Kentucky, Mississipp and Texas. In West Virginia it was generally distributed and caused severe damage to the crop. In many fields the second crop was a complete failure. Many plants were completely killed owing to attack of the crown. A loss of 20 per cent was estimated for the State.

Varietal tests at Morgantown showed variations in susceptibility, and in Kentucky also various strains of clover showed marked differences. Minnesota and Michigan strains were killed out on experimentation farms at Lexington, Kentucky while southern strains and locally adapted Kentucky strains were very resistant.

From Maine the report was received that anthracnose injured clover severely in the varietal test plots there. It was reported under the name Gloeosporium caulivorum.

Clover

Recent literature

1. Monteith, J. Jr. Clover anthracnose caused by Colletotrichum trifolii. U. S. Dept. Agr. Techn. Bull. 28: 26 pp. Feb. 1928.

2. Sampson, K. Comparative studies of Kabatiella caulivora (Kirchn.) Karak. and Colletotrichum trifolii Bain and Essary, two fungi which cause red clover anthracnose. Trans. Brit. Mycol. Soc. 13: 103-143. Mar. 1928.

OTHER DISEASES

Bacterium trifoliorum L. R. Jones et al. District of Columbia on white clover.

Caconema radicicola (Greef) Cobb (Heterodera radicicola (Greef) Muell.), root knot. Washington.

Cercospora medicaginis Ell. & Ev., leaf spot. Severe infection seen in one field of red clover in West Virginia. First report for the state to the Survey. (Archer)

Cercospora zebrina Pass., leaf spot. Serious on alsike clover in eastern New York. (Horsfall)

Erysiphe polygoni DC., powdery mildew. Massachusetts, New Jersey, West Virginia, Mississippi, North Dakota, South Dakota, Montana, Washington. Dates of earliest recorded appearance reported are early in June, West Virginia; June 7, New Jersey; July 3, Mississippi; July 26, Massachusetts.

Macrosporium sarcinaeforme Cav., leaf spot. Widespread infection in West Virginia, with moderate to severe damage to the leaves. Volunteer plants were seemingly more susceptible to infection. Total loss a trace. (Archer)

Phyllachora trifolii (Pers.) Fckl., sooty spot. New Jersey, on alsike and white clovers. Common in West Virginia on white clover, first report for the State. On white and red clover in Montana.

Phymatotrichum omnivorum (Shear) Dug., rootrot. Texas.

Pseudopeziza trifolii (Biv.) Fckl. West Virginia on red clover, Washington.

Sclerotinia trifoliorum Eriks., root rot. Washington.

Stagonospora carpathica Baeuml., leaf spot. Apparently the first report for West Virginia on white clover. Infection slight.

Uromyces fallens (Desm.) Kern, rust. On red clover in New Jersey, and West Virginia.

Uromyces nerviphilia (Grognot) Lagh. (Pucciniola nerviphila (Grognot) Arth.), rust. On white clover, Mont.

Uromyces trifolii (Hedw. f.) Lév. (U. hybridi Davis), rust. On alsike clover, Massachusetts, New York, Montana. On white clover, West Virginia, Montana.

Mosaic (virus). Reported from West Virginia on red clover, New Jersey, South Dakota on red clover, Montana on red and alsike clovers.

Recent literature

1. Alcock, N. L. & Martin, M. S. A seed-borne disease of clover (Trifolium repens L.) Trans. Bot. Soc. Edinburgh. 30: 13-18. 1928.
   Sclerotinia sp.

2. Bisby, G. R., and I. L. Conners. Plant diseases new to Manitoba. Sci. Agr. 8: 456-458. March 1928.
   Erysiphe polygoni, Uromyces fallens

3. Campbell, C. Sull 'albinismo nei fiori del "Trifolium incarnatum" L. e in altre piante coltivate e sul valore sistematico della diversa pignentazione. Arch. Bot. Sistem. Fitogeogr. e Gen. 4: 87-91. June 1928.

4. Mains, E. B. Observations concerning clover diseases. Proc. Indiana Acad. Sci. 37 (1927): 355-364. 1928.

5. Neuweiler, E. Switzerland: a new red clover disease. Internat. Bull. Plant Protect. 2: 2. 1928.
   Fusarium trifolii, hitherto known only in Russia.

6. Severin, Henry H. P., and Charles F. Henderson. Some host plants of curly top. Hilgardia 3: 339-392. June 1928.

7. Taslim, Md. Stem-rot of berseem caused by Rhizoctonia solani Kühn. Bull. Agr. Res. Inst. Pusa. 180. 8 p. 1928.
   Trifolium alexandrinum.

C O W P E A

Bacterium vignae Gardner & Kendrick, bacterial spot. Florida, Indiana.

Cercospora sp., leaf spot. Georgia - common and causing defoliation in some older plantings. Texas - fairly prevalent.

Erysiphe polygoni DC., powdery mildew. Texas.

Fusarium sp., root rot. California, general in the San Joaquin valley, causing severe damage. (Kendrick).

Helminthosporium sp., leaf spot. Georgia. Spread rapidly through a late planting which followed a vegetable garden. Caused 25 per cent loss of leaves and also affected stems. A species of Helminthosporium was found consistently associated with the spot. (Boyd)

Phymatotrichum omnivorum (Shear) Dug., root rot. Texas: Very suscepible host.

Rhizoctonia sp., Georgia: First time observed in state. Caused severe spotting of leaflets and stems in one small field where cowpea followed vegetables in rotation. Resembled Rhizoctonia blight reported on beans and kudzu. A Rhizoctonia sp. was also reported from Texas.

Uromyces vignae Barclay, rust. Texas, very prevalent. Kansas, small amount on late cowpeas at Manhattan, October 2.

Mosaic (virus). New Jersey, Indiana: transmitted through seed of Arlington variety collected from mosaic plants in 1926 (Gardner). Louisiana, Kansas: considerable in experimental plots at Manhattan.

Recent literature

1. Severin, Henry H. P., and Charles F. Henderson. Some host plants of curly top. Hilgardia 3: 339-392. June 1928.

2. Tehon, L. R., and Stout, G. L. An ascomycetous leaf spot of cowpea. Phytopath. 18: 701-704. Aug. 1928. Leptosphaerulina vignae.

S O Y B E A N

Bacterium phaseoli sojense Hedges, bacterial pustule. North Carolina; wherever soybeans are grown, on all common varieties. Indiana; slightly important. Mississippi; 3 per cent reduction in yield estimated. Louisiana; occurs generally over sugar cane belt, but less conspicuous than Cercospora diazu.

Cercospora diazu Miura, leaf spot. This comparatively new disease was more widely recorded than heretofore. North Carolina: Found abundantly on pods as well as leaves of Otootan variety at Raleigh, caused much defoliation on this which seems to be the most susceptible variety. Georgia: Common in fields of Habersham County, causing premature defoliation in some cases. First observed July 21. Mississippi: From 60 to 75 per cent of the leaves in a 35-acre field showed spots. Louisiana: Quite widespread over southwestern part of the state, where very few plants are entirely free. Considerable defoliation especially on the Laredo variety.

Peronospora manshurica (Naoum.) Syd. in lit (P. sojae Wolf) The first report from West Virginia was sent in by W. A. Archer, who reported it as occurring rather generally throughout the state and in southeastern Ohio. S. G. Lehman of North Carolina reported its observation in every field of the Herman (Haberlandt) variety visited. The disease was collected at Experiment, Georgia, July 11, and M. W. Gardner reported its first observation in Indiana.

Phymatotrichum omnivorum (Shear) Dug., root rot, Texas.

Sclerotium rolfsii Sacc., Stem-rot. Mississippi, Louisiana, much less observed than usual.

Septoria glycines Hemmi, brown spot. North Carolina: Abundant on the unifoliate and first trifoliate leaves of Herman variety but failed to develop on the foliage later in season. Apparently checked by a period of drought in July. Indiana: sent in July 27 from Jasper County.

Mosaic (virus). New Jersey, North Carolina, Tennessee, Indiana, Louisiana. From the last-named state, Tims, Edgerton, and Christopher reported as follows:

> "Soybean mosaic found quite generally over the cane belt where the Biloxi variety is grown in the rotation. There was not a very high infection percentage, in any one field, approximately 10 to 15 per cent. The disease is apparently more common in the Biloxi than in the Laredo or Otootan variety, and is generally associated with injury from the bean leaf beetle."

Hopperburn caused by leafhoppers. New Jersey.

Recent literature:

1. Lehman, S. G. Studies on bacterial pustule of soy bean. (Abstract Phytopath. 19: 96. Jan. 1929. Bacterium phaseoli var. sojens.

2. Lehman, S. G. Frog-eye leaf spot of soy bean caused by Cercospora diazu Miura. Journ. Agr. Res. 36: 811-833. 1928.

SWEET CLOVER

Cercospora davisii Ell. & Ev., leaf spot. West Virginia on white sweet clover first report to the Survey from this state. Infection slight. (Archer)

Cercospora sp., leaf spot. Causing some defoliation on the Experiment Station Farm in Kentucky (Vallean).

Corticium vagum Berk. & Curt. Five per cent of plants infected around Ames, Iowa. (J. C. Gilman)

Mycosphaerella lethalis Stone, stem spot. First report to the Survey from West Virginia, on white sweet clover. Infection severe and general; loss for the state a trace. (Archer).

Phymatotrichum omnivorum (Shear) Duggar, root rot. Texas

Stagonospora carpathica Baueml., leaf spot on white sweet clover. Montana.

Mosaic (virus). Kentucky, Iowa, North Dakota.

Albino plants (undet.) Montana.

Recent literature:

1. Severin, Henry H. P., and Charles F. Henderson. Some host plants of curly top. Hilgardia 3: 339-392. June 1928. Artificial infection.

V E T C H (Vicia spp.)

Ascochyta pisi Lib., leaf and pod spot. North Carolina, caused serious damage.

Kabatiella nigricans (Atk. and Edg.) Karak. (Protocoronospora nigricans Atk. and Edg., Exobasidium viciae Karak.) On V. villosa, Montana.

Mycosphaerella pinodes (Berk. & Blox.) Stone. Delaware.

Phymatotrichum omnivorum (Shear) Duggar, root rot. On joint-vetch, Texas.

Recent literature

1. Severin, Henry H. P., and Charles F. Henderson. Some host plants of curly top. Hilgardia 3: 339-392. June 1928. Artificial infection of V. atropurpurea, V. villosa, V. sativa, V. faba

V E L V E T B E A N

Phymatotrichum omnivorum (Shear) Duggar, root rot. Texas.

Velvet bean

Recent literature:

1. McCulloch, L. Bacterium stizolobii (Wolf) comb. nov. syn. Aplanobacter stizolobii. Phytopath. 18: 460. 1928.

P I G E O N P E A (Cajanus indicus)

Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.

K U D Z U (Pureraria thunbergiana)

Bacterium puerariae Hedges, bacterial halo spot, was less conspicuous in Georgia in the fall than in former years, although it caused the usual amount of injury in the spring and summer. Loss for the state a trace. Obtained infection of snap beans with the organism. (Boyd)

Phymatotrichum omnivorum (Shear) Duggar, root rot. Texas, very important on this host.

Rhizoctonia sp., leaf blight. Georgia: This "thread blight" was observed in 1926 in a single field, this year occurred in several fields. It caused a 25 per cent loss of foliage in one 15-acre field. Loss for state 0.5 per cent. (Boyd)

Recent literature

1. Hedges, F. Bacterial halo spot of kudzu caused by Bacterium puerariae Hedges. Jour. Agr. Res. 36: 419-428. Mar. 1, 1928

G R A S S E S

Blast (undet.)
Avena fatua: Montana

Claviceps sp.
Elymus sp.: Montana
Paspalum sp.: Maryland

Claviceps purpurea (Fr.) Tul.
Agropyron repens: Maryland, Pennsylvania.
Phalaris arundinacea: Pennsylvania.

Colletotrichum sp.
Holcus halepensis: Texas.

Grasses.

Colletotrichum graminicolum (Ces.) Wils.
  Holcus sorghum sudanensis: Missouri, caused serious losses in many fields. Total loss for state 5 to 10 per cent. (Scott).

Epichloa typhina (Pers.) Tul.
  Indiana

Helminthosporium turcicum Pass.
  Halcus sorghum sudanensis: Texas.

Phyllachora graminis (Pers.) Fckl.
  Agropyron repens: Pennsylvania
  Panicum sp.: Ohio

Physarum cinereum (Batsch.) Pers.
  Poa sp. and other grasses: New Jersey, several reports of its causing injury to lawn grass in patches. (Dept. Pl. Path.) Ohio, very prevalent and unsightly in vicinity of Cincinnati (Wilson)

Piricularia grisea (Cke.) Sacc.
  Chaetochloa italica (millet): Delaware.
  Chaetochloa viridis: Indiana
  Syntherisma sanguinalis: New Jersey

Puccinia epiphylla Wetts. (P. poarum Niels.)
  Poa pratensis: Montana

Puccinia glumarum (Schm.) Eriks. & Henn.
  Agrostis alba: Montana (Cereal Courier 20: 193.)

Puccinia graminis Pers.
  Agropyron repens: Wisconsin, Minnesota (Cereal Courier 20: 212, 191.)
  Agrostis alba: Wisconsin (Cereal Courier 20: 212)
  Hordeum jubatum: Wisconsin, Minnesota (Cereal Courier 20: 191, 212)
  Phleum pratense: West Virginia, Montana, Wyoming, Washington.

Puccinia purpurea Cke.
  Holcus halepensis: Texas

Rhizoctonia sp. (brown patch)
  Agrostis sp.: New Jersey.

Sclerospora graminicola (Sacc.) Schroet.
  Chaetochloa sp.: Montana, Wyoming
  Chaetochloa italica: South Dakota, Montana, Wyoming
  Chaetochloa viridis: Pennsylvania

Sclerotium rhizodes Auers.
  Widespread and destructive on hay crop in Massachusetts. (Davis)

Grasses

Scolecotrichum graminis Fckl.
Dactylis glomerata: New York
Poa pratensis: West Virginia

Septoria bromi Sacc.
Bromus inermis: Montana

Sphaceloteca sorghi (Lk.) Clint.
Halcus halepensis: Texas

Ustilago bromivora (Tul.) Fisch.
Bromus tectorum: Montana, Washington

Ustilago neglecta Niessl
Chaetochloa lutescens: Maryland.

Ustilago rabenhorstiana Kuhn
Syntherisma sanguinalis: New Jersey

Ustilago striaeformis (West.) Niessl
Dactylis glomerata: New York
Phleum pratense: Pennsylvania

Recent literature:

1. Allen, R. F. A cytological study of Puccinia glumarum on Bromus marginatus and Triticum vulgare. Jour. Agr. Res. 36: 487-513. Mar. 15, 1928.

2. Caldwell, Ralph M. Preliminary results from cross inoculation and culture studies upon the fungus Rhynchosporium secalis (Oud.) Davis causing scald of cereals and other grasses. (Abstract) Phytopath. 19: 104. Jan. 1929.

3. Dahl, A. S. Snow-mould. Bull. U. S. Golf Assoc. Green Sect. 8: 198-200. Oct. 1928. Caused by Fusarium nivale.

4. Davis, W. H. Reaction in agronomic strains of timothy to Ustilago striaeformis (Westd.) Niessel. (Abstract) Phytopath. 19: 105. Jan. 1929.

5. Drechsler, C. Zonate eyespot of grasses caused by Helminthosporium giganteum. Jour. Agr. Res. 37: 473-492. O. 15. 1928.

6. Durrell, L. W. Smuts of Colorado grains. Colorado Agr. Exp. Sta. Bul. 334. 24 pp. Feb. 1928.
Ustilago crameri on Chaetochloa italica.

7. Fenaroli, L. Un nouvel hote de l'Ustilago ischaemi Fuck. Bull. Soc. Mycol. France. 43: 43: 280-281. Ja. 1928.
Andropogon distachyum L.

8. Fourneau, L. Note sur une affection cryptogamique du petit mil (Panicum spicatum Roxb.) causée par un hyphomycete. Rev. Bot. Appl. 8: 681-683. O.1928.
Le parasite observé est très vraisemblablement le Fusarium roseum Link ou une espèce affine. Quelques mycologistes le rattachenet a un hypocréacée: le Gibberella saubinettii.

9. Johnson, T. and M. Newton. The Occurrence of yellow stripe rust in western Canada. (Abstract) Phytopath. 18: page 481. May, 1928.

10. Kharbush, S. S. Etude cytologique sur le Phyllachora graminis (Pers.) Fcl. Rev. Path. Vég. & Entom. Agr. 14: 267-271. Oct./ Dec. 1927.

11. Melhus, I. E., F. H. Van Haltern, and D. E. Bliss. A study of Sclerospora graminicola (Sacc.) Schroet. on Setaria viridis (L.) Beauv. and Zea mays L. Iowa Agr. Exp. Stat. Res. Bull. 111: 297-338. Apr. 1928.

12. Monteith, J. Jr. Fall treatments for snow-mold. Bull. U. S. Golf Assoc. Green Sect. 8: 192-193. Sept. 1928.

13. Monteith, J. and A. S. Dahl. The control of snow-mold. Bull. U. S. Golf Assoc. Green Sect. 8: 200-204. illus. Oct. 1928.

14. Nisikado, Y. Leaf blight of Eragrostis major Host., caused by Ophiobolus kusanoi n. sp., the ascigerous stage of a Helminthosporium. Japan. Jour. Bot. 4: 99-112. 1928.

15. Porter, A. B. Brown-patch experiments and notations made at Kittansett Club, Marion, Mass., during season of 1927. Bull. U. S. Golf Assoc. Green Sect. 8: 105-107. May 1928.

16. Porter, R. H., T. F. Yum, and H, K. Chen. The effect of seed disinfectants on smut and on yield of millet. Phytopath. 18: 911-191. Nov. 1928.

17. Proichov, G. (Inheritance of rust resistance in selfed lines of timothy.) Spisan. Zemled. Izpitat. Inst. L'lgariia (Rev. Inst. Rech. Agron. Bulgarie) 4(3): 1-24. 1928.
Bulgarian with English summary.

18. Sanford, G. B. Cereal diseases in Alberta in 1928. (Abstract) Phytopath. 18: 481. May 1928.

19. Stone, R. E. Treatment of millet seed to prevent smut. (Abstract) Phytopath. 18: 479. May 1928.

20. Stone, R. E. Treatment of millet seed to prevent smut (Abstract) Scient. Agric. 8: 462. 1928.

21. Weston, W. H. and G. F. Weber. Downy mildew (Sclerospora graminicola) on everglade millet in Florida. Journ. Agr. Res. 36: 935-963. June 1, 1928.

S U N F L O W E R

Phymatotrichum omnivorum (Shear) Dug., root rot. Texas

Plasmopara halstedii (Farl.) Berl. and De Toni, downy mildew. Montana. Young, Jellison, and Morris (5) have obtained evidence that the fungus overwinters by means of oospores in sunflower refuse in the soil instead of being seed-borne as indicated in previously published statements (1, 4, 6).

Puccinia helianthi-mollis (Schw.) Jack., rust. New Jersey, Kansas, Montana, California. In Kansas, according to C. O. Johnston, rust was very severe on the large cultivated sunflower and nearly all wild sunflowers.

Sclerotinia sclerotiorum (Lib.) Massee, stem rot, wilt. Maine, Montana, Washington. The report for Maine seems to be the first for that state. Donald Folsom reported that the fungus attacked the stems at various distances above the soil in a college field grown for silage at Orono.

Septoria helianthi Ell. & Kell., leaf spot. West Virginia: Infection of giant sunflower was severe and general. Commonly half of the leaves were killed and frequently in southern localities plants were killed. (Archer) Also reported from Montana.

Recent literature:

1. Pl. Dis. Reptr. Suppl. 62: 350. 1928.

2. Bisby, G. R., and I. L. Conners. Plant diseases new to Manitoba. Sci. Agr. 8: 456-458. Mar. 1928.
   Plasmopara halstedii

3. Small, W. Mycological notes (14). Further notes on Rhizoctonia bataticola (Taub.) Butler. Trop. Agric. Ceylon 71: 77-80. Aug. 1928.

4. Young, P. A. Downy mildew of sunflower. Pl. Dis. Reptr. 11: 65. 1927.

5. Young, P. A., W. L. Jellison, and H. E. Morris. Plasmopara mildew of sunflower. Science n. s. 79: 254. Mar. 1, 1929.

6. Young, P. A., and H. E. Morris. Plasmopara downy mildew of cultivated sunflowers. Amer. Jour. Bot. 14: 551-552. Nov. 1927.

THE PLANT DISEASE REPORTER

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Supplement 72

Flant Diseases in West Virginia in 1928

December 30, 1929

BUREAU OF
PLANT INDUSTRY
UNITED STATES DEPARTMENT OF AGRICULTURE

PLANT DISEASES IN WEST VIRGINIA IN 1928

With 4 plates, 5 figures and 8 tables.

This report is the result of a survey of the diseases of plants occurring in West Virginia in 1928. During the period of the survey, March 15, 1928 to March 15, 1929, the writer was employed jointly by the Bureau of Plant Industry, U. S. Department of Agriculture, and the Department of Plant Pathology of West Virginia Agricultural Experiment Station.

By

W. A. Archer, Assistant Pathologist,
Office of Mycology and Disease Survey,
Bureau of Plant Industry.

Plant Disease Reporter
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TABLE OF CONTENTS

INTRODUCTION

The principal records of West Virginia fungi and diseases have been made by Millspaugh (15), Giddings (9), Giddings and Berg (10), Millspaugh and Nuttall (16), Sheldon, Clara F. (21), Sheldon, J. L. (22, 23) and Sherwood and Peairs (25).

The two lists, Millspaugh (l.c.) and Millspaugh and Nuttall (l.c.) contain much of the data of the earlier collections made by Nuttall and by Sheldon. The later collections of Nuttall are unpublished but the West Virginia University does possess a check list made by Mr. Nuttall. This consists of a copy of the host index by Farlow and Seymour (7) in which was entered check marks and in many cases interpolated sheets of new additions for the state. Likewise specimens of Sheldon are unrecorded except indirectly by Clinton (6), Arthur (3) and Anderson et al (2). Incidently, various people have contributed numbers of West Virginia specimens of wood-destroying fungi to the herbarium of the U.S.D.A. Office of Forest Pathology and likewise to the Lloyd collections now under the direction of the U.S.D.A. Office of Mycology and Disease Survey.

The collections of Nuttall were given to the University of West Virginia recently and thus the present author had the opportunity of studying these specimens. The collection was entirely re-organized and finally changed into new packets for entry in the herbarium. Where duplicate material was available, extra packets were made for the mycological collections of the U. S. Department of Agriculture. Also, a number of specimens from duplicate material was sent to the mycological herbarium at the University of Michigan. In this manner, this extremely valuable collection has been made available for future study at these different places. The collection of Sheldon, especially rich in parasitic and unusual fungi, is not at present available for study but is stored in the home of Dr. Sheldon at Morgantown.

The author, during the season of 1928, traveled extensively through the state making observations and collecting specimens of diseases of economic crops. In addition, considerable attention was given to collecting various parasitic fungi. In this manner, a total of 2,000 specimens was obtained for study.

This report can be considered as an attempt to summarize briefly the data on plant diseases in the state for 1928, but to a slight extent information for the past years has been given. The chief source of earlier information has been the West Virginia file of annual reports of the Plant Disease Survey Collaborator. These reports are by no means complete for various crops in consecutive years and in many cases the data are scanty for individual years.

Out of the 437 plant diseases in this list, 227 are new to the state or, at least, they represent the first report for the state to the Plant Disease Survey. These new reports are marked in the list by an asterisk. The numbers which appear in parentheses after the fungous name refer to the author's collection number of the specimen.

The writer is indebted to Dr. N. J. Giddings of the Department of Plant Pathology of West Virginia University for assistance in making this survey possible. Appreciation is expressed to Dr. P. D. Strasbaugh, Botany Department of the University of West Virginia, for his identification of host plants; to Mr. E. C. Sherwood for disease survey data relating particularly to apples and potatoes; to Mr. E. E. Berkeley for identification of grasses; and to Mr. R. W. Davidson for identification of the rusts. Obligations are due to Mr. Gibbs (cfr. 8) for the use of certain of his illustrations now comprised in text figures 12 to 16 of this publication.

D I S E A S E S O F P O M E F R U I T S

APPLE

ARMILLARIA MELLEA (Vahl.) Quel. (root rot). Occasionally losses have been reported from this source, especially in young trees planted in newly cleared land. The disease was not observed in 1928.

BACILLUS AMYLOVORUS (Burr.) Trev. (fire blight). Estimated loss 3 per cent. Blossom and twig blight were severe over the entire state. Jonathan was especially susceptible although varieties like York, Grimes and Ben Davis were rather severely affected locally. The wild crab and the English Haw also were severely affected.

CYLINDROSPORIUM POMI Brooks (fruit spot). Loss 1 per cent. Losses from this source have never been more than a trace except in 1923 when it was considered to be 2 per cent. In 1928 infection occurred late and caused considerable damage in storage.

VALUE OF CROPS RAISED ON W. VA. FARMS
$74,969,600 AV 1923-27

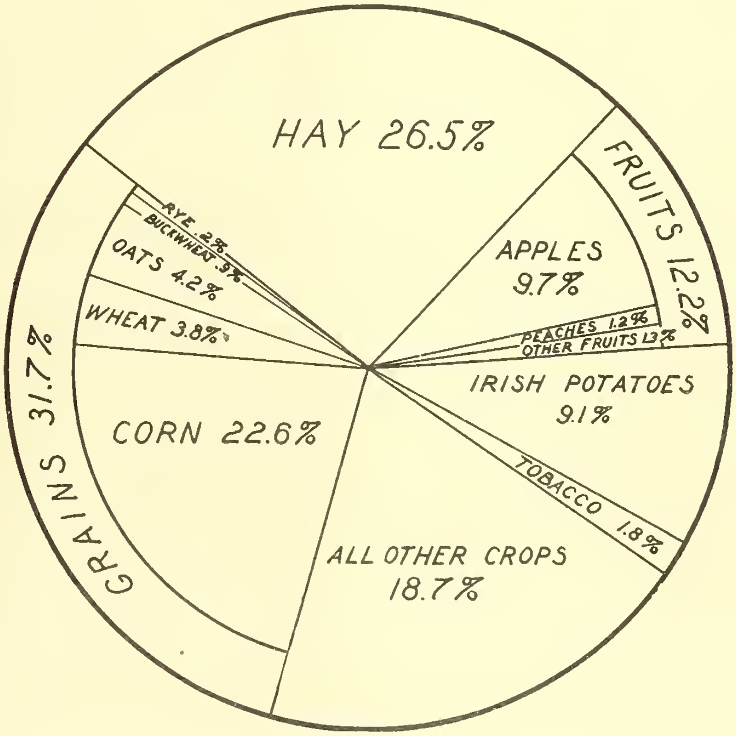

Fig. 12. Production statistics for West Virginia crops. (After Gibbs, 8)

GLOEODES POMIGENA (Schw.) Colby (sooty blotch). Unusually severe this year, especially in home orchards. In commercial areas it was adequately controlled by the regular spray schedule, but where the late spray applications were omitted considerable damage occurred in low-lying orchards.

GLOMERELLA CINGULATA (Ston.) Sp. & Sc. (bitter rot). Loss a trace. This disease was limited locally to a few orchards in the state. It has never had the status of an important trouble since it seems usually to occur only slightly in localized areas. In a rare year it has been severe in restricted areas on a few susceptible varieties, such as King David.

GYMNOSPORANGIUM JUNIPERI-VIRGINIANAE Schw. (rust). Loss a trace. The first infection of the season was observed June 20, occurring as a few pycnia in Hampshire County. In comparison with the average situation the disease throughout the season of 1928 was constantly unimportant no doubt as a direct result of unfavorable weather conditions. Some damage occurred in southern orchards. Cedar eradication during the past ten years has done much to eliminate the trouble from commercial orchards

ILLOSPORIUM MALIFOLIORUM Sheld. (leaf spot) (3261, 3270). Loss a trace. While the well known frog-eye leaf spot occurs in West Virginia quite abundantly, there is another leaf spot described by Sheldon (24) and said to be caused by Illosporium malifoliorum. The two types of spots are distinct although they may at times occur together on the same leaf. The common frog-eye disease is supposedly caused by the initial injury of Sphaeropsis followed by secondary organisms, such as Phyllosticta, Coniothyrium, Alternaria, etc. This spot is characterized by more or less definitely circumscribed, concentric, brownish spots of about 3 mm. diameter. The leaf spot described by Sheldon is grayish, irregular in shape, with a scalloped margin, 5-20 mm. diameter often involving the major portion of the leaf. (See Pl. II). The sporodochia of the Illosporium malifoliorum are found abundantly on the under surface of such leaves. The appearance of the frog-eye spot in West Virginia is well depicted by Scott and Rorer (20, Pl. 3, fig. 1). The Illosporium spot is well represented by Roberts (18, Pl. 7, fig. 1). The frog-eye spot is widespread in the state and is responsible for considerable defoliation. The Illosporium spot is most abundant in the southern part of the state, where it ordinarily brings about severe defoliation. (See Pl. III, A).

LEPTOTHYRIUM POMI (M. & F.) Sacc. (fly speck). Loss 2 per cent. Fly speck was unusually severe, especially in home orchards. In commercial areas the regular spray schedule controlled it adequately, but where the late spray applications were omitted considerable damage occurred in low-lying orchards.

NUMMULARIA DISCRETA (Schw.) Tul. (blister canker). Loss a trace. As usual this disease attracted attention only as an occasional dead branch in old neglected Ben Davis orchards.

*PHYLLOSTICTA PRUNICOLA (Opiz.) Sacc. (leaf spot) (4041, 4095, 4096, 4109). This organism was common late in the season on both sprayed and unsprayed trees. The exact nature of the fungus as a pathogen has not been fully determined but it is suspected to be the cause of considerable defoliation that occurred in 1928. The fungus was also found on pear, on Prunus americana, on Prunus serotina, and on Pyrus coronaria.

PHYLLOSTICTA SOLITARIA E. & E. (blotch). Loss a trace. Blotch was severe this year only in southern, neglected orchards. In the commercial areas, i.e. in the Eastern Panhandle of the state, it was controlled perfectly by spray. Northwestern Greening, Smith Cider, Duchess, Stark, and Winter Banana are considered to be most susceptible; Rome Beauty and Ben Davis only moderately so.

PHYSALOSPORA MALORUM (Pk.) Shear (black rot, frog-eye). Not of much economi importance in 1928. (See also under Illosporium).

PODOSPHAERA OXYACANTHAE (DC.) D By. (powdery mildew). Loss a trace. In certain localities this year the disease was more severe than usual, on some varieties. In the past it has been important mostly on young, unsprayed trees. Jonathan, Gano and Stayman Winesap seem to be the susceptible varieties.

SCLEROTINIA FRUCTICOLA (Wint.) Rehm. (brown rot). Once or twice in the past this disease has been reported to be slight. Ordinarily, however, it is not seen.

VENTURIA INAEQUALIS (Cke.) Aderh. (scab). Loss 1 per cent. In the earlier part of the season scab was fairly abundant on the leaves and seemed to point toward severe damage. At the end of the year, however, the damage was not as severe as had been expected. The commercial crop showed a low percentage of damaged apples and even in some neglected orchards much of the fruit was clean. The wild crab, Pyrus coronaria, was moderately infected.

VOLUTELLA FRUCTI Stevens (dry rot). In a few years this rot has occurred to a slight extent on Northwestern Greening but it was not seen in 1928.

XYLARIA SPP. (root rot). This disease seems to be limited in occurrence to the Eastern Panhandle. A few definite examples are found from year to year.

BITTER PIT (undet.) In the past bitter pit has caused losses in York Imperial varying from a trace to 4 per cent. This year the disease was absent.

BURR KNOT (undet., possibly aerial crown gall). In the past this branch gall has attracted considerable attention because of its unusual prevalence in localized areas. It is encountered in sparse examples on certain varieties one year or another, throughout the state.

FLAP TUMOR (undet.) (2067). Near Morgantown an example was observed of this peculiar malformation. All the branches of a single tree were involved. It has been observed once or twice in past years. Unquestionably this is the disease described by Reed and Crabill (17, p. 42-43, fig. 4-5).

JONATHAN SPOT (undet.) The occurrence of this disease has always been scattered and slight. It was not observed in 1928.

MEASLES (undet.) (2063). Occurs in scattered counties throughout the state and appears to be of increasing importance. It was noted to be severe on a few trees in various localities this year. The trees were marked by stunted growth and sparse foliage.

TARGET CANKER (Undet.) (4125). In the southern part of the state there occurs moderately a type of injury which seems to be the target canker described recently by Roberts (18).

Table 80. Estimated percentage losses from apple diseases in 1928.

Disease	Percentage loss	Disease	Percentage loss
Bitter rot	Trace	Scab	1
Black rot	Trace	Fly speck	2
Blotch	Trace	Fruit spot	1
Cedar rust	Trace	Other diseases	Trace
Fire blight	3	All diseases (total)	7

PEAR

BACILLUS AMYLOVORUS (Burr.) Trev. (blight). Loss 10 per cent. The severity this year fully equals that of last year.

FABRAEA MACULATA (Lev.) Atk. (leaf blight) (4050). Loss 4 per cent. On unsprayed trees this leaf spot caused severe defoliation and also in many localities the fruit was badly spotted. (See Pl. III, B).

*GLOEODES POMIGENA (Schw.) Colby (sooty blotch). The loss is estimated as a trace. In one locality a yellow, early variety was severely blotched.

MYCOSPHAERELLA SENTINA (Fr.) Schroet. (leaf spot) (4097). In various localities this leaf spot appeared in a severe form, although defoliation was only slight or moderate.

*PHYLLOSTICTA PRUNICOLA (Opiz.) Sacc. (leaf spot) (4098). See under apple.

VENTURIA PYRINA Aderh. (scab). Severe cases have been observed occasionally but in 1928 the disease did not appear. Losses have never been more than 1 per cent.

*BROWN BLOTCH (undet.) This disease is reported for the first time in the state, although undoubtedly it has been present previously. Many varieties were severely attacked but seemingly the market value of the fruit was not damaged. In fact the blotched appearance is generally considered to be the natural condition of the fruit.

Table 81. Estimated percentage losses from pear diseases in 1928.

Disease	Percentage loss	Disease	Percentage loss
Fire blight	10	Other diseases	Trace
Scab	0	All diseases (total)	14
Leaf blight	4		

QUINCE

BACILLUS AMYLOVORUS (Burr.) Trev. (blight). The quince suffered severely from twig blight throughout the state. The loss was about 10 per cent.

FABRAEA MACULATA (Lev.) Atk. (leaf blight) (4063, 4064). Loss a trace. As usual this leaf spot was severe. It caused heavy defoliation and moderate spotting of the fruit.

GLOMERELLA CINGULATA (Ston.) Sp. & Sc. (bitter rot) (4121). Severely infected trees were noted in several localities in the Eastern Panhandle.

GYMNOSPORANGIUM GERMINALE (Schw.) Kern (rust). In 1924 an unusually severe occurrence was reported on quince fruits. The loss was estimated at 3 per cent. Ordinarily the rust is slight or absent as in 1928.

PHYSALOSPORA MALORUM (Pk.) Shear (black rot) (4094). Probably 2 per cent loss. Fruit rot was severe and general.

*PODOSPHAERA OXYACANTHAE (DC.) D By. (Powdery mildew) (4065). It occurred abundantly especially on lower leaves.

DISEASES OF STONE FRUITS

PEACH

BACTERIUM PRUNI EFS. (bacterial spot). This disease is probably common but only a few reports of occurrence are on file and it was not definitely observed in 1928.

CLADOSPORIUM CARPOPHILUM Thuem. (scab). Loss 1 per cent. Unsprayed fruit was severely attacked, in fact considerably more than usual. Leaves were affecte scantily. The disease was controlled perfectly in commercial orchards.

EXOASCUS DEFORMANS (Berk.) Fuck. (leaf curl). Severe infection resulting in considerable damage to the trees has occurred in previous years. In 1928, how ever, the disease was not seen except on some unsprayed trees.

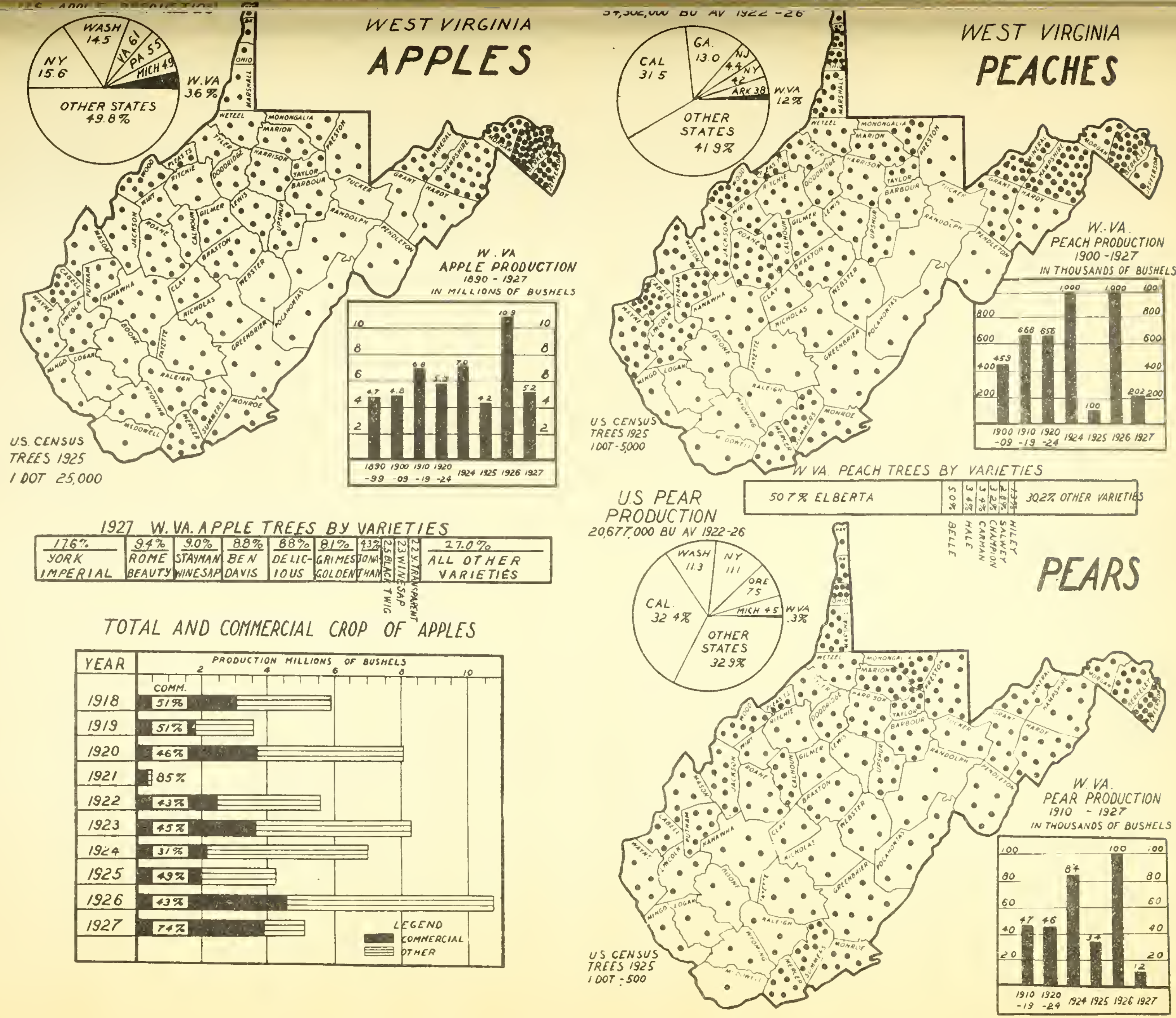

Fig. 13. Production statistics for apples, peaches and pears. (After Gibbs, 8)

PODOSPHAERA OXYACANTHAE (DC.) D By. (powdery mildew). Slight traces have been reported before 1915, but apparently in more recent years the disease has not occurred.

SCLEROTINIA FRUCTICOLA (Wint.) Rehm. (brown rot). The loss is considered to be a trace. Losses as high as 10 and 5 per cent were reported before 1924 but in more recent years they have been estimated as a trace to 1 per cent. In 1928 only scattered examples were observed.

YELLOWS (undet.) In 1922, this disease was reported to occur generally with a loss estimated at 2 per cent. The disease has not been of any great importance since that time but is to be found locally throughout the state.

Table 82. Estimated percentage losses from peach diseases in 1928.

Disease	Percentage loss	Disease	Percentage loss
Leaf curl	Trace	Scab	1
Brown rot	1	Other diseases	0
Yellows and little peach	0	All diseases (total)	2

PLUM

EXOASCUS PRUNI (Berk.) Fuck. (plum pockets). Slight traces of this disease are known to appear in isolated areas. The disease was not seen this year.

PLOWRIGHTIA MORBOSA (Schw.) Sacc. (black knot). This is the most important disease of the plum, excepting brown rot. Losses as high as 5 per cent have been reported. In 1928 the disease did not attract particular attention.

SCLEROTINIA FRUCTICOLA (Wint.) Rehm. (brown rot). Ordinarily losses from this source are estimated between 3 to 5 per cent. In 1928, however, the disease was not significant, the loss being a trace.

CHERRY

COCCOMYCES HIEMALIS Higg. (leaf spot) (4110). Loss a trace. During mid autumn defoliation was severe. This was true also of the wild cherries, Prunus serotina and P. pennsylvanica.

PLOWRIGHTIA MORBOSA (Schw.) Sacc. (black knot). This disease has been reported as severe a few times in the past. This year it was not reported or observed except on the wild hosts.

SCLEROTINIA FRUCTICOLA (Wint.) Rehm. (brown rot). This disease has been the cause of considerable damage in some years. It was not noted in 1928.

DISEASES OF SMALL FRUITS

RASPBERRY

BACTERIUM TUMEFACIENS EFS. & Towns. (crown gall). Crown gall has been reported in amounts ranging from a trace to 1 per cent before 1925. The disease has not been definitely reported since that time but a few cases have been observed each year.

GYMNOCONIA INTERSTITIALIS (Schl.) Lagh. (orange rust). Moderate amounts have occurred in some years but in the present season none was observed.

LEPTOSPHAERIA CONIOTHYRIUM (Fuck.) Sacc. (cane blight). Formerly this was considered to be the most important disease of raspberries in the state but more recently its importance has not been evident. It was not observed this season.

MYCOSPHAERELLA RUBI Roark. (leaf spot) (2080). Moderate importance.

PLECTODISCELLA VENETA (Speg.) Burk. (anthracnose). Loss 2 per cent. This is an important disease of the raspberry but the losses are erratic, varying from a trace to 4 per cent. The loss in 1928 probably lies close to 2 per cent. Canes were observed severely attacked in a number of localities.

*MOSAIC (virus). A slight amount was observed in a few plants in a planting of black raspberries.

BLACKBERRY

GYMNOCONIA INTERSTITIALIS (Schl.) Lagh. (orange rust). In a few years of the past the orange rust has been reported as rather severe although it has not caused noticeable damage. In 1928 it was conspicuously absent.

PLECTODISCELLA VENETA (Speg.) Burk. (anthracnose). The disease has been reported in past years but apparently it has slight importance in the state. It was not observed in 1928.

CURRANT

BOTRYOSPHAERIA RIBIS Gross. & Dug. (cane blight). This disease is the most severe one of currant, but exact information on distribution and loss is not available.

CERCOSPORA ANGULATA Wint. (leaf spot) (3069). Practically complete defoliation of red currants was observed in a number of cases.

GRAPE

GUIGNARDIA BIDWELLII (Ell.) V. & R. (black rot). This year the loss was about 10 per cent. This disease was an important factor for the first time since 1924. In some southern sections fully half of the crop was rotted. In past years losses of 10 to 25 per cent have been common.

PLASMOPARA VITICOLA (B. & C.) B. & D. T. (downy mildew). This disease was abundant this year for the first time in four years. Infection occurred rather late in the season. The disease is not economically importance in the state because infection is too scanty or else occurs too late in the season to cause much injury.

UNCINULA NECATOR (Schw.) Bur. (powdery mildew). Not important.

STRAWBERRY

DENDROPHOMA OBSCURANS (E. & E.) Ander. (leaf spot) (3301, 4117). This leaf spot was seen in various localities in slight to moderate amounts. The damage was slight in all cases.

MYCOSPHAERELLA FRAGARIAE (Tul.) Lind. (leaf spot). This leaf spot was generally distributed as usual but apparently less severe this year. The damage was negligible.

DISEASES OF CEREALS

BARLEY

*HELMINTHOSPORIUM GRAMINEUM Rabh. (stripe) (2046). Loss about a trace. In general barley was remarkably free from disease; although in scattered eastern fields severe cases were observed.

USTILAGO HORDEI (Pers.) Kell. & Sw. and U. NUDA (Jens.) Kell. & Sw. (covered and loose smut) (2045). Loss a trace. In the early crop, harvested for grain, smut was extremely slight; most fields showing only a trace and only a few with as much as 0.5 per cent. However, in the late crop, planted for forage, as high as 30 per cent was sometimes found.

CORN

DIPLODIA ZEAE Lev., GIBBERELLA, and FUSARIUM SP. (ear rot). Loss 2 per cent. Corn, though widely planted, is a neglected crop from the standpoint of modern farm practice. Corn remains in the shock and is harvested during the winter. Seed selection is not practiced generally.

FUSARIUM MONILIFORME Sheld. and GIBBERELLA SAUBINETII (Mont.) Sacc. (root rot). Loss 10 per cent. Observations throughout the year lead to the conclusion that root rot is constantly associated with unfavorable crop conditions, i.e., root worm injury, poor soil, insufficient drainage, etc. During the early season in the Eastern Panhandle, fully half of the plants showed signs of disease in nearly all fields when the seedlings were about six inches high. Elsewhere in the state the infection ranged mostly between 1 to 5 per cent. Later in the season, during August, continued rains kept low ground and bottom land continually flooded so that fully 25 per cent of the crop was yellowed and dwarfed. During late season in the Eastern Panhandle most of the diseased plants apparently had outgrown their seedling infection because only a small percentage showed evident signs of disease. Isolations from diseased plants throughout the year yielded commonly Fusarium moniliforme or Gibberella saubinetii and less frequently F. culmorum.

HELMINTHOSPORIUM TURCICUM Pass. (leaf blight) (3273). Loss 3 per cent. This has been one of the most severe diseases of corn this year. It was widely distributed over the state and in southern portions it resulted in general premature ripening of the crop. In the more severe cases the fungus killed all the leaves of the plants at least a full month before the usual ripening period.

PUCCINIA SORGHI Schw. (rust). Rust was not observed until September. It was extremely slight and ordinarily only a few scattered plants were affected.

USTILAGO ZEAE (Beckm.) Ung. (smut) (2086). Loss 0.5 per cent. Careful counts made throughout the state indicated only a slight loss from smut. Ten per cent was the highest percentage of infection observed in any one field. Ear infection was computed to be considerably less than 1 per cent for the state. Early in the season the unusual occurrence of a smut boil on the root of a six inch seedling was noted.

*TRANSLUCENT SPOT (undet.) (3269, 4036). This leaf spot was generally distributed and rather common in most fields. In fact, at least 2 per cent of the plants were affected in some southern localities. Miss Florence Hedges of the U.S.D.A. Pathological Laboratory, who examined West Virginia collections, reports that despite the striking resemblance to bacterial lesions no bacteria were found. It seems that this is the non-parasitic leaf spot which has been reported to the Plant Disease Survey office from several other states.

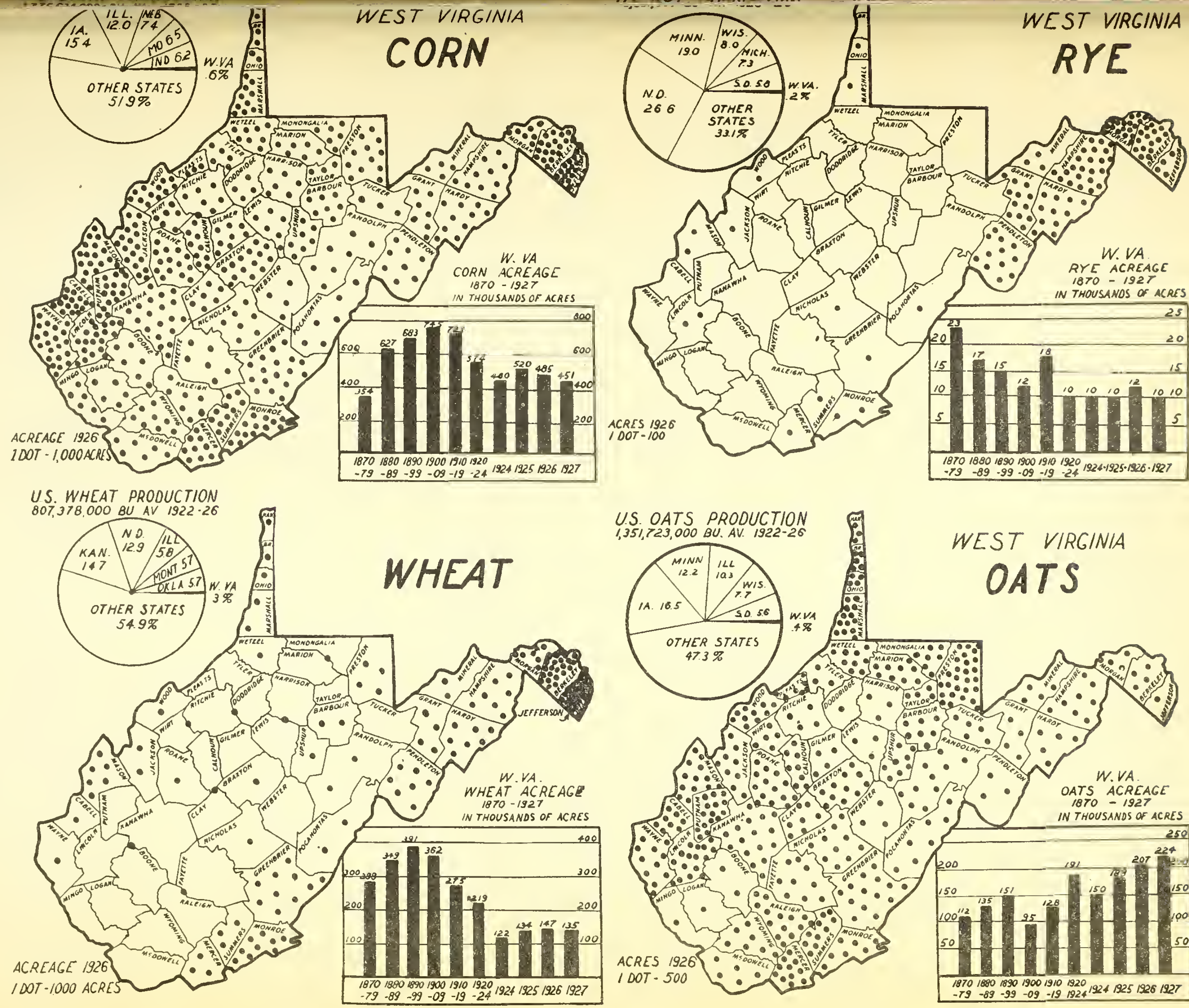

Fig. 14. Production statistics for corn, rye, wheat and oats. (After Gibbs, 8)

Table 83. Estimated percentage losses from corn diseases in 1928.

Disease	Percentage loss	Disease	Percentage loss
Smut	0.5	Leaf blight	3
Leaf rust	0	Other diseases	0
Root rot (Gibberella, Fusarium)	10	All diseases (total)	13.5
Ear rots (Fusarium, Diplodia)	2		

BROOM CORN

*COLLETOTRICHUM LINEOLA Cda. (anthracnose) (4113). All fields were affected at least slightly although a few were moderately attacked.

SWEET CORN

APLANOBACTER STEWARTII (EFS.) McC. (bacterial wilt). Only a few scattered examples were noted.

*EPICOCCUM NEGLECTUM Desm. and PHOMA ZEICOLA E. & E. (leaf blight) (3049, 4032, 4062). On diseased sweet corn leaves these two organisms occurred rather constantly associated. In one case most of the plants in a garden plot were severely affected but in this instance the affected leaves in their early stages resembled a condition of genetical mosaic. Such leaves were marked by distinct, yellowed and parallel stripes. In the latter condition these yellowed areas were dry and dead and bore profuse fruitings of the two fungi.

*HELMINTHOSPORIUM TURCICUM Pass. (leaf blight) (4086). Slight or moderate in only a few fields.

OATS

HELMINTHOSPORIUM AVENAE Eidam (leaf spot) (3009, 3044). The occurrence of this disease was widespread. By July, practically all fields had lost all the leaves on the lower half of the plants, while the upper leaves showed a plentiful infection. In some fields seedling blight occurred in low, moist ground. By harvest time the disease had progressed to a stage that probably reduced the yield by at least 5 per cent.

PUCCINIA CORONATA Cda. (crown rust). In an average year, crown rust has been rather abundant but usually the losses have never been considered to be more than a trace. In 1928, late in the season, it appeared moderately in the experimental plots at Morgantown but none was observed in commercial fields over the state.

USTILAGO AVENAE (Pers.) Jens. and U. LEVIS (K. & S.) Magn. (loose and covered smuts). The loss for the state was about 5 per cent. In southern localities and in the Eastern Panhandle, fields were found frequently with as high as 20 to 30 per cent of the plants affected.

Table 84. Estimated percentage losses from oat diseases in 1928.

Disease	Percentage loss	Disease	Percentage loss
Loose and covered smuts	5	Leaf spot	5
		Other diseases	0
Stem rust	0		
		All diseases (total	10
Leaf rust	0		

RYE

CLAVICEPS PURPUREA (Fr.) Tul. (ergot). Not observed since 1923.

ERYSIPHE GRAMINIS DC. (powdery mildew) (2000). In the experimental plots of the agronomy farm at Morgantown all lower leaves were severely attacked and mostly killed, but elsewhere in the state the mildew occurred not at all or only rarely to a slight extent.

*HELMINTHOSPORIUM (?) TRITICI-REPENTIS Died. (leaf blight) (2021). In one field all leaves were killed or heavily infected. The cause of the trouble seemed due principally to the Helminthosporium although the sori of Puccinia dispersa Eriks. were plentiful. The organism was examined by Charles Drechsler who reported: "As the spores are dead and thus somewhat collapsed, accurate determination is difficult. Certainly not H. sativum nor any of the Ophiobolus series. Very evidently a member of the Pyrenophora series; and shape and size of basal cell suggests H. tritici-repentis."

PUCCINIA DISPERSA Eriks. (leaf rust). Loss a trace. A few severe examples were seen but most fields were extremely free from disease.

PUCCINIA GRAMINIS Pers. (stem rust). Not observed this year. In some years a slight attack occurs.

UROCYSTIS OCCULTA (Wallr.) Rabh. (stem smut) (2033). Observations this year were limited to a few infected plants in a single field in Berkeley County in the Eastern Panhandle. Past observations have recorded the same slight occurrence every year in this one county. Only rarely has it been found elsewhere.

WHEAT

CLAVICEPS PURPUREA (Fr.) Tul. (ergot). Ergot has been reported in an occasional year but it was not seen this year.

ERYSIPHE GRAMINIS DC. (Powdery mildew) (2001). In the agronomy experimental plots at Morgantown during June all plants were severely attacked, with younger shoots entirely killed. Elsewhere in the state, however, the disease was observed as usual only rarely and then merely as a trace.

GIBBERELLA SAUBINETII (Mont.) Sacc. (scab). The crop ripened this year with only scattered traces of scab. Evidently it has been slightly important in late years. Previous to 1920 high losses were reported.

MYCOSPHAERELLA TULASNEI Jacz. (sooty mold) (2049). In several instances in the Eastern Panhandle there were indications of considerable infection but even then the damage was slight. In general the disease was not encountered throughout the state.

PUCCINIA GRAMINIS Pers. (stem rust). The rust appeared first in extreme southern counties during early July and at this time the initial infection centers were plainly evident in practically all fields. The damage was negligible because the crop was nearly ready for harvest when the infection occurred. The rust was not seen elsewhere in the state.

PUCCINIA TRITICINA Eriks. (leaf rust). Loss a trace in 1928. Until about the first of July, only scattered traces of the rust occurred in the majority of the fields but during the short intervening period before ripening of the crop it had developed moderately in many fields. The damage to the grain was undoubtedly negligible in general because there were only a few isolated cases of severe attack. This has been practically the situation for the past 5 years. However, in the years 1918, 1919, 1921, 1922 losses were rather high, 18 per cent being reported in 1922.

SEPTORIA NODORUM Berk. (glume blotch) (3001, 3011, 3041). Loss 5 per cent. This disease occurred extensively over the state and in the majority of the fields all the heads were affected at least slightly. In some examples there was a 100 per cent infection. The attack became generally severe before harvest and it seems likely that glume blotch was responsible at least partly for the shriveled appearance of some of the threshed product, since no one other disease was prevalent this season. Despite the prevalence of the disease in previous years it has not been considered important.

TILLETIA LAEVIS Kuehn (bunt). In years previous to 1920, moderate losses were frequently reported but in more recent times losses have been considered to be only a trace. In 1928 the disease was not observed to occur.

TYLENCHUS TRITICI (Stein.) Bast. (nematode). In previous years traces of nematode have been reported from eastern counties bordering on Virginia. In 1928 no cases were observed.

USTILAGO TRITICI (Pers.) Rostr. (loose smut). Loss a trace. Loose smut was remarkably slight this year, the highest infection seen being only 2 per cent. Most fields showed only a trace. The scarcity of smut this year is thought to have been influenced by the slight seed infection of last year brought about by the dry early summer of 1927, during blossoming time. In other words, it is probable that the seed used for the 1928 crop was practically free from smut infection.

Table 85. Estimated percentage losses from wheat diseases in 1928.

Disease	Percentage loss	Disease	Percentage loss
Scab	0	Loose smut	Trace
Leaf rust	Trace	Glume blotch	5
Stem rust	0	Other diseases	0
Bunt	0	All diseases (total)	5+

DISEASES OF FORAGE AND FIELD CROPS

ALFALFA

*ASCOCHYTA IMPERFECTA Peck (leaf spot) (2021, 3042). Loss a trace. In many fields all lower leaves were affected.

*CERCOSPORA MEDICAGINIS E. & E. (leaf spot) (3148a). Scattered and slight.

MACROSPORIUM sp. (leaf spot) (3148). Slight occurrence in several fields. Associated with Phleospora hyalospora E. & E.

PSEUDOPEZIZA TRIFOLII (Lib.) Sacc. (leaf spot). The loss was about a trace. In most fields the damage was slight but in some cases the lower half of the plants was defoliated in the first crop.

PYRENOPEZIZA MEDICAGINIS Fuck. (yellow leaf spot) (3071). This spot was found in one field which had suffered severely from winter injury.

*WINTER INJURY (undet.) (2064). The loss for the state is about 60 per cent. All alfalfa fields in the mountainous parts of the state are severely affected by crown rot but fields in the Eastern Panhandle were practically free from the trouble. Alfalfa is comparatively a new crop to the state and consequently very little is known regarding suitable varieties. The soil type varies considerably. Plants often "heave" out of the ground during the winter, thus becoming more subject to crown rot. This is particularly true of fields in a certain type of shale soil.

Near Parkersburg, a 2-year old field in shale soil was nearly dead but a short distance away a 3-year old plot on a black limestone ridge was in perfect condition.

CLOVER, HOP (MEDICAGO LUPULINA)

*CERCOSPORA MEDICAGINIS E. & E. (leaf spot) (3039). One field showed slight amounts.

CLOVER, RED

CERCOSPORA MEDICAGINIS E. & E. (leaf spot) (3151). Severe in one field.

COLLETOTRICHUM TRIFOLII Bain (anthracnose) (2027). Loss 20 per cent. This disease is generally distributed and causes severe damage to the crop. In many fields the second crop is a complete failure. The chief loss occurs when the plant crown is affected, thus bringing about the death of the plant. In the agronomy experimental plots, tests with several varieties would indicate the practical use of strains resistant to anthracnose.

ERYSIPHE POLYGONI DC. (powdery mildew). Though prevalent generally appreciable damage to the crop did not result.

MACROSPORIUM SARCINAEFORME Cav. (leaf spot) (3128, 3229, 4040). Loss a trace. Widespread with moderate to severe damage to leaves. Volunteer plants seemingly were more susceptible.

PSEUDOPEZIZA TRIFOLII (Biv.) Fuck. (leaf spot) (2062). In 1919 losses from this disease were estimated at 5 per cent. In other years, however, it has been slight or scattered resulting in negligible losses. In 1928 one field in Preston County was severely attacked.

UROMYCES FALLENS (Desm.) Kern (rust). Once or twice in the past this rust has been prevalent enough to cause slight damage but usually, as in 1928, it is absent.

* MOSAIC (virus) (3036). Occasionally a plant is found stunted and with mottled leaves.

CLOVER, WHITE SWEET (MELILOTUS ALBA)

*CERCOSPORA DAVISII E. & E. (leaf spot) (2034). Slight.

*MYCOSPHAERELLA LETHALIS Stone (stem spot) (4115). Severe and general causing a loss of a trace.

*PSEUDOPEZIZA MEDICAGINIS (Lib.) Sacc. (leaf spot) (4075). Moderate in one field. (See Jones, (13, p. 5 and 21).

CLOVER, WHITE (TRIFOLIUM REPENS)

*CERCOSPORA HELVEOLA Sacc. (leaf spot) (3230). A moderate amount was found in one locality.

PHYLLACHORA TRIFOLII (Pers.) Fuck. (sooty spot) (2050). Common.

*STAGONOSPORA CARPATHICA Baeuml. (leaf spot) (3005). Slight.

UROMYCES TRIFOLII (Hedw. f.) Lév. (rust) (3038). General distribution.

CLOVER, YELLOW SWEET (MELILOTUS INDICA)

*SEPTORIA MELILOTI (Lasch.) Sacc. (leaf spot) (2022). First report for the United States. Common in fields but not important.

SORGHUM

*CLADOSPORIUM SP. (marginal leaf spot) (3274). Infection slight.

COLLETOTRICHUM LINEOLA Cda. (anthracnose) (3272). Loss a trace. In many fields of southern counties all the leaves on the lower half of the plants were killed.

GRASS, BLUE

*SCOLECOTRICHUM GRAMINIS Fuck. (leaf spot) (2010). Moderate in several fields in the Eastern Panhandle.

GRASS, TIMOTHY

PUCCINIA GRAMINIS Pers. (rust) (3340, 3107). Stem rust was common and especially severe on volunteer plants. A few cases were observed of parasitism on the rust by Fusarium parasiticum.

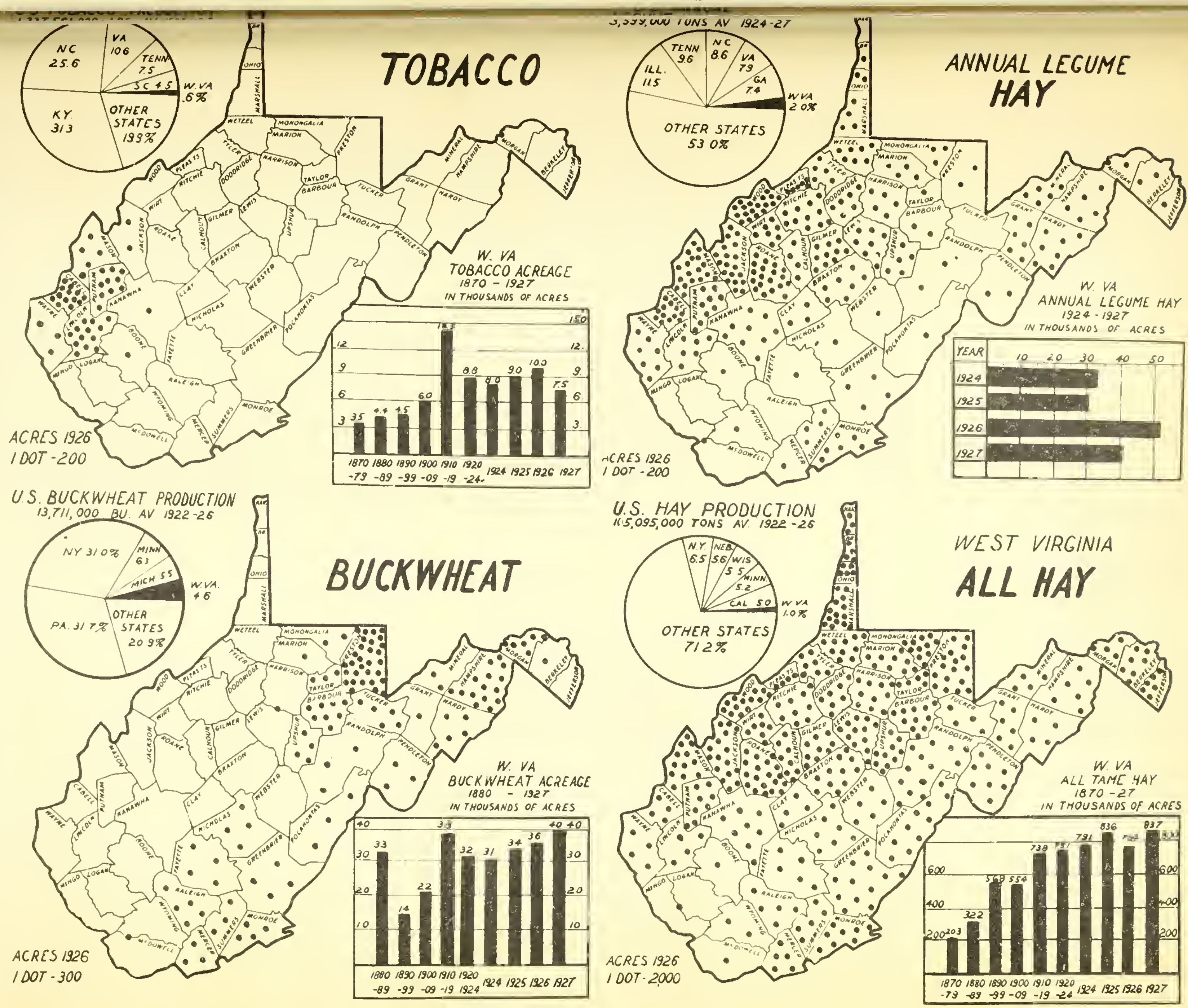

Fig. 15. Production statistics for tobacco, buckwheat and hay.
(After Gibbs, 8)

SOYBEAN

*BACTERIUM SP. (bacterial spot) (3004, 3007). This disease could be found in most of the fields but always was slight.

*PERONOSPORA MANSHURICA (Naoum.) Sydow (downy mildew) (3003, 3112). Usually the mildew occurs on small areas on the leaves and is well distributed over the field. The disease occurs throughout the state and in southeastern Ohio.

BUCKWHEAT

*PHYLLOSTICTA POLYGONORUM Sacc. (leaf spot) (3347, 3372). A fairly severe leaf infection evidently caused slight damage because it appeared late just before harvest.

TOBACCO

*CORTICIUM VAGUM B. & C. (soreshin). A few scattered plants were seen.

*THIELAVIA BASICOLA (black root rot). The majority of infected plants occurred in low portions of the fields. In the experimental plots at Point Pleasant the disease was extremely severe. For the entire tobacco district, however, the infection percentage was probably less than 1 per cent, causing a loss of about a trace. In the Plant Disease Reporter 12, p. 98, this disease was reported erroneously under the name of Fusarium oxysporum nicotianae.

*LEAF SPOT (probably physiological) (3281). Common, especially on lower leaves.

*MOSAIC (virus) (3093). Loss 2 per cent. Mosaic was distributed generally although some fields seemed to be comparatively free. The American Pride is evidently most susceptible; some fields showed at least 50 per cent. Usually the size of the infected plant seemed to be unaffected but the leaves were quite yellowed and crinkled.

*RING SPOT (virus). This disease occurred generally in the tobacco district on scattered plants.

DISEASES OF VEGETABLES

BEAN

BACTERIUM PHASEOLI EFS. (bacterial blight). Usually the bacterial blight occurs commonly in scattered areas. Losses in the past have varied between a trace to 1 per cent. The disease was not seen in 1928.

COLLETOTRICHUM LINDEMUTHIANUM (S. & M.) B. & C. (anthracnose). In an average year losses have been estimated at about 4 per cent, although in 1919, 20 per cent loss was reported. This year infection was slight and occurred late in the season.

FUSARIUM MARTII PHASEOLI Burk. (dry root rot). As usual this rot was scattered and slight.

ISARIOPSIS GRISEOLA Sacc. (angular leaf spot) (4140). Only a few cases were observed in scattered localities.

PHYLLOSTICTA PHASEOLINA Sacc. (leaf spot) (3226, 3329). A few diseased leaves were found in various scattered localities.

SCLEROTINIA SCLEROTIORUM (Lib.) Mass. (stem rot). In the past this disease has been known to occur in the central portion of the state in the higher altitudes. Sometimes all the plants of a garden have been destroyed. Not observed in 1928.

UROMYCES APPENDICULATUS (P.) Lk. (rust). Appeared late and was slight. It occurred mostly on pole beans.

MOSAIC (virus) (3227). Slight and scattered as usual.

BEAN, LIMA

PHYTOPHTHORA PHASEOLI Thax. (downy mildew). There are reports of occurrence in 1920 and 1922 but the disease has not been observed since that time.

BEET

CERCOSPORA BETICOLA Sacc. (leaf spot). Loss from this source is estimated as a trace.

CABBAGE

ALTERNARIA BRASSICAE (B.) Sacc., (black leaf spot) (3262, 3373). In general confined to a few lower leaves.

BACTERIUM CAMPESTRE (Pam.) EFS. (black rot). Mostly in gardens.

FUSARIUM CONGLUTINANS Woll. (yellows). The loss for the state is probably a trace. Ordinarily the heaviest losses occur in home gardens although sometimes local and severe attacks have been seen in commercial plots, especially near Wheeling. The disease is kept in check mainly by rotation. This year in Calhoun County a 50 per cent infection occurred.

PHOMA LINGAM (Tode) Desm. (blackleg). Usually this disease is distributed widely although most of the damage has been on young plants. In 1928 the disease was not seen.

PLASMODIOPHORA BRASSICAE Wor. (club root). Losses from this cause have never been more than a trace because the disease has been confined to scattered areas. In 1928 club root was not observed.

CANTALOUPE

BACILLUS TRACHEIPHILUS EFS. (bacterial wilt). A 25 per cent loss was reported in 1921 and 1 per cent in 1927. No data have been preserved for other years but it is apparently the most important disease of this crop.

COLLETOTRICHUM LAGENARIUM (Pass.) Ell. & Hals. (anthracnose). Fragmentary data would imply that the prevalence of anthracnose had been erratic in the past. The highest recorded loss (10 per cent) occurred in 1927. This year the disease was observed on scattered leaves.

MACROSPORIUM CUCUMERINUM Ell. & Ev. (leaf blight). This leaf spot was reported as the cause of serious trouble in 1904 by Sheldon (22). No reports are available since that time. The disease was not observed in 1928.

PSEUDOPERONOSPORA CUBENSIS (Berk. & Curt.) Rostew. (downy mildew). The first report of the disease on this host is that of Sheldon (22, p. 125) in 1904 who found a slight infection in one locality. In 1914 a field near Morgantown was severely affected.

*RING SPOT (virus) (4057). This seems to be the first collection of this disease under natural conditions. (Cfr. under pumpkin).

CARROT

*CERCOSPORA APII-CAROTAE Pass. (leaf blight) (3085). A few infected plants found.

*MACROSPORIUM CAROTAE E. & E. (leaf blight) (3067). The disease was seen in one small truck garden where it had caused considerable damage to the foliage.

CELERY

CERCOSPORA APII Fresen. (early blight). Severe in several localities but the loss was undoubtedly slight.

SEPTORIA APII Rostr. (late blight). Moderate amounts were seen on local produce in market.

CUCUMBER

BACILLUS TRACHEIPHILUS EFS. (bacterial wilt). Considered to be the most important disease of cucumbers. In many localities it is impossible to grow the crop. In 1928 a few diseased plants were seen in greenhouse crops.

COLLETOTRICHUM LAGENARIUM (Pass.) Ell. & Hals. (anthracnose). Occasionally this disease has caused severe losses in cucumbers but ordinarily the fungus is observed merely as a leaf parasite. In 1928 only scattered cases occurred.

MACROSPORIUM CUCUMERINUM Ell. & Ev. (leaf spot). In 1904 Sheldon (22, p. 125) reported the occurrence of this leaf spot. He considered the cucumber to be resistant and the cantaloupe to be quite susceptible. No observations on the disease are available since that time.

PSEUDOPERONOSPORA CUBENSIS (Berk. & Curt.) Rostew. (downy mildew). In a few years this organism has been rather prevalent, but ordinarily it is found not at all or only rarely. Losses have always been insignificant. In 1928 only a few diseased leaves were found.

MOSAIC (virus). Judging from the scant reports in the past this disease occurs but rarely and then is only slightly significant. One severe case was reported in 1928.

EGGPLANT

PHOMOPSIS VEXANS (S. & S.) Harter (fruit spot). Common on produce in markets and causing unsightly decay.

HORSERADISH

CERCOSPORA ARMORACIAE Sacc. (leaf spot) (4054). Severe in scattered localities.

LETTUCE

*SEPTORIA LACTUCAE Pass. (leaf spot) (3027). Loss a trace. The organism occurred mostly on older leaves.

ONION

MOSAIC (undet.) This disease observed in scattered localities in 1917 and 1918 and reported to the Plant Disease Survey as "mosaic" is considered now by N. J. Giddings to be the trouble recently described by Melhus and Henderson (14) as the yellow dwarf of onion.

PARSNIP

CERCOSPORA APII PASTINACAE Farl. (leaf spot) (3267, 4071). The disease was observed commonly in various localities. The damage was negligible.

PEA

MYCOSPHAERELLA PINODES (B. & B.) Stone (blight) (2087). A moderate amount was observed on local produce in the markets.

PEPPER

*PHYLLOSTICTA CAPSICI Speg. (leaf spot) (3291). This disease occurred in one locality. The organism probably is the same as that described as Phyllosticta sp. by Halsted (11, page 360). In the files of the Plant Disease Survey at Washington, there are reports of a Phyllosticta leaf spot from Georgia, Alabama, and New Jersey.

Saccardo in Sylloge 16, page 840 cites spores of P. capsici with measurements of 7-8 x 3-4 microns. In the West Virginia material they measured 5-6 x 2-3 microns.

POTATO

ACTINOMYCES SCABIES (Thax.) Gues. (scab). Scab occurred mostly in home gardens but even there it did not cause appreciable loss.

ALTERNARIA SOLANI (E. & M.) J. & G. (early blight). The entire loss for the state was probably not more than a trace. The majority of loss occurred in Cobblers and in plants on low ground.

BACILLUS PHYTOPHTHORUS Appel (black leg). Black leg was generally distributed; particularly on early varieties, i.e., Irish Cobblers. According to counts during July, the loss averaged about 0.5 per cent but the inclusion of early losses would run the estimate to 1 per cent.

CERCOSPORA CONCORS (C.) Sacc. (leaf spot). Occasionally this leaf spot has occurred slightly in Tucker County at high altitudes. Not found in 1928.

CORTICIUM VAGUM Berk. & Curt. (scurf, stem rot). As usual, this disease occurred early as stem rot. It caused a loss of perhaps a trace.

FUSARIUM OXYSPORUM Schl. (wilt). Loss, a trace. This year, wilt occurred scatteringly and doubtlessly was traceable to seed infection.

PHYTOPHTHORA INFESTANS (Mont.) D By. (late blight). The loss for the state was 10 per cent. In the past, late blight has been erratic in its behavior. In many years it has appeared too late to cause severe damage but some years the losses have run as high as 25 per cent of the crop.

In 1928, the blight appeared first in the higher mountain sections and spread rather slowly. Ordinarily, it is severe and general by August 1, but this year conditions for infection seemed to be erratic. By July 15, scattered, unsprayed fields were severely blighted and in many cases the crop was reduced 50 to 75 per cent. In the commercial fields generally the losses were reduced to the minimum by proper spray applications. An unusual condition was noted, - that in most cases the unsprayed plants were killed early but that the tubers did not rot. This, of course, reduced the percentage of loss but resulted in uniformly small sized tubers.

HOPPERBURN Loss, 5 per cent. During July, hopperburn was general and rather severe on unsprayed fields. In commercial fields, the regular spray schedules controlled the trouble effectively.

LEAF ROLL (virus). Loss, a trace. Leaf roll was scattered throughout the state. In one plot of about 2 acres at least 50 per cent of the plants were affected. In some cases, infected plants appeared in fields planted with certified seed.

MOSAIC (virus). Loss, a trace. The disease was unusually evident but this may be explained in part by the fact that the ordinary masking effect was eliminated by the low temperatures which prevailed during the spring season. Affected plants were reported rather frequently, even in fields planted with certified seed.

Table 86. Estimated percentage losses from potato diseases in 1928.

Disease	Percentage loss	Disease	Percentage loss
Mosaic	Trace	Fusarium wilt	Trace
Leaf roll	Trace	Tipburn and hopperburn	5
Late blight	10	Early blight	Trace
Rhizoctonia	Trace	Other diseases	Trace
Blackleg	1	All diseases (total)	16

PUMPKIN

*CERCOSPORA CUCURBITAE E. & E. (leaf spot) (4059). A slight occurrence was found in one locality in the Eastern Panhandle.

*ERYSIPHE CICHORACEARUM DC. (powdery mildew). Slight in various localities.

*RING SPOT (virus) (4056). One plant affected with ring spot was noted in a home garden. The leaves were smaller and the vines shorter than the adjoining healthy plants. (Cfr. Wingard (26)).(See also cantaloupe)

RHUBARB

ASCOCHYTA RHEI E. & E. (leaf spot) (3068, 3326). Common but not important.

RUTABAGA

*CERCOSPORELLA ALBO-MACULANS E. & E. (3371). Slight in one locality.

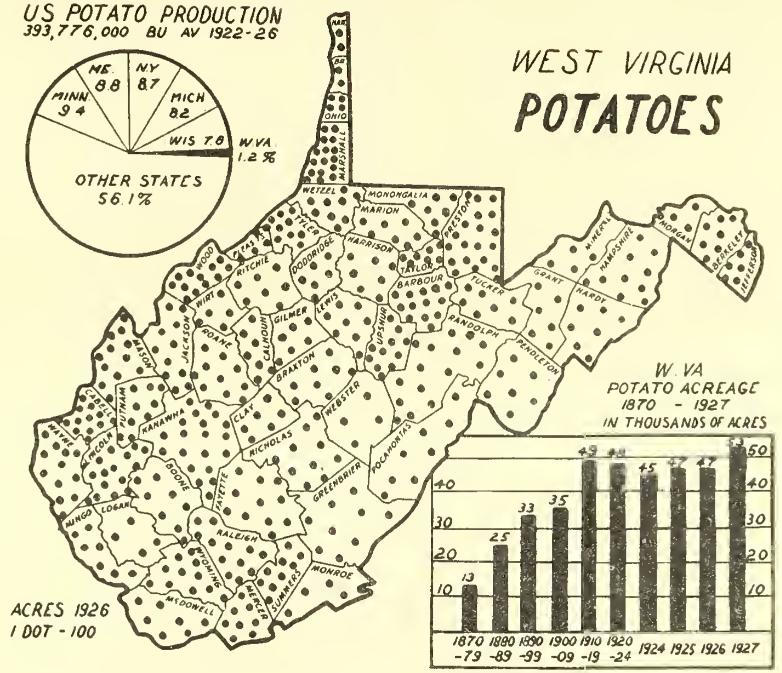

Fig. 16. Production statistics for potatoes.
(After Gibbs, 8)

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SAGE (SALVIA OFFICINALIS)

*CERCOSPORA SALVIICOLA Tharp. (leaf spot) (3289). Evidently this is the first report of this organism on the cultivated sage. It caused a leaf spot of minor importance in a garden.

SALSIFY (TRAGOPOGON PORRIFOLIUS)

*SPORODESMIUM SCORZONERAE (?) Aderh. (blight) (4070, 4145, 4146, 4147, 4148, 4150, 4153). In 1928, in the Eastern peninsula near Inwood, a small truck garden was affected by a trouble which had killed nearly 10 per cent of the plants. The incipient stages appeared as elongated, brownish spots on the leaves. Evidently, as the condition progressed, the leaves became entirely blighted and then died. In the final stages, all or nearly all of the leaves were dead and the root was either undeveloped or else blackened. The latter condition may have been due to an invasion by the fungus from the leaves.

In 1929, R. J. Haskell and the author made a further survey through Maryland and Pennsylvania and determined that apparently the same disease occurred in practically every planting of salsify. During that season, however, the damage was slight.

The fungus fruits abundantly on the dead leaves. So far as can be determined from the literature, this may be the same, or at least similar to, the organism mentioned by Chupp (5, p. 475-476) and Aderhold (1) as occurring on black salsify (Scorzonera hispanica) in Germany. The spores of the American material correspond morphologically to those represented by Aderhold but the spore measurements do not agree. Those given by Aderhold are 50-75 x 13.5-16.5 microns while in the American collections they are 18-54 x 7.5-8 microns. Whether this difference in size implies merely the physiological variation of a single species or the existence of two species can be determined only by further study.

Incidently, Bolle (4) considers the genus Sporodesmium to be untenable and in the group Phaeodictyae distinguishes Alternaria, Macrosporium and Stemphylium

SQUASH

PSEUDOPERONOSPORA CUBENSIS (B. & C.) Rost. (downy mildew). In scattered years, downy mildew has been abundant in various localities but it was not seen in 1928.

TOMATO

ALTERNARIA SOLANI (E. & M.) J. & G. (early blight). Before 1924, losses from early blight were reported frequently as high as 10 per cent. In recent years, however, losses have been considered to be only a trace or 1 per cent. In 1928, the disease was observed only to a slight extent in fields near Morgantown.

BACTERIUM SOLANACEARUM EFS. (bacterial wilt). During the past 15 years bacterial blight has been observed only in 6 or 7 scattered cases. It was not seen in 1928.

COLLETOTRICHUM PHOMOIDES (S.) Chest. (anthracnose). The disease was observed only on local produce in the market. Only a few fruits were affected.

FUSARIUM LYCOPERSICI Sacc. (Fusarium wilt). Not seen in 1928. In past years, it seems to have been only slightly important and confined to scattered localities.

PHYTOPHTHORA INFESTANS (M.) D.B. (late blight). Not observed in 1928. Before 1923, the disease was reported often as occurring late in the season with considerable damage to the crop.

SEPTORIA LYCOPERSICI Speg. (leaf spot) (3066, 3328). Loss, 15 per cent. This was the most severe disease of the tomato. It occurred widely and by September 1 practically all plants had lost half their leaves. In many cases, the vines were killed outright. The larger commercial growers suffer little loss because they expect to harvest only a few crops before the spring market is flooded and the price drops. The damage usually comes after the larger growers have completed their harvest. The smaller growers, however, who maintain wayside markets and the home gardener suffer considerable loss.

BLOSSOM-END ROT (non-par.). Not observed in 1928. In some years, the losses have been estimated at 2 per cent.

MOSAIC (virus). As usual, mosaic appeared only in a few scattered plants.

Table 87. Estimated percentage losses from tomato diseases in 1928.

Disease	Percentage loss	Disease	Percentage loss
Septoria blight	15	Other diseases	0
Fusarium wilt	0	All diseases (total)	15
Early blight	0		

TURNIP

PERONOSPORA PARASITICA (P.) D By. (downy mildew) (4061). Only a few diseased leaves observed in one field.

WATERMELON

COLLETOTRICHUM LAGENARIUM (Pass.) Ell. & Hals. (anthracnose). Loss, 5 per cent.

FUSARIUM NIVEUM EFS. (wilt). Losses are generally prevented by crop rotation. This year about 10 per cent loss occurred.

DISEASES OF ORNAMENTALS

AESCULUS HIPPOCASTANUM L. (HORSECHESTNUT)

*UNCINULA FLEXUOSA Peck (powdery mildew) (4073). Severe and general.

ALTHAEA ROSEA L. (HOLLYHOCK)

*ASCOCHYTA ALTHAEINA Sacc. & Bizz. (leaf spot) (4030). Moderate.

PUCCINIA MALVACEARUM Bert. (rust) (2084). Moderate amounts were seen on volunteer plants.

AQUILEGIA SP. (COLUMBINE)

*ERYSIPHE POLYGONI DC. (powdery mildew) (4031). Infrequent.

BERBERIS THUNBERGII DC. (JAPANESE BARBERRY)

*BACTERIAL LEAF SPOT (undetermined) (3062). This disease was common at Morgantown where most plants were affected slightly.

CALLISTEPHUS CHINENSIS NEES. (CHINA ASTER)

FUSARIUM CONGLUTINANS CALLISTEPHI Beach (wilt) (3061). Many plantings were entirely blighted early in the season. Ten per cent of infected plants are estimated for the state.

YELLOWS (virus). Fully 50 per cent of the blossoms were ruined by yellows.

CASTANEA DENTATA (MARSH.) BORKH. (CHESTNUT)

ENDOTHIA PARASITICA (Murr.) Anders. (blight) (3020). Occurred commonly throughout the state, especially in wooded sections. Practically all young trees showed one or two blighted branches. Many older trees dead.

SEPTORIA OCHROLEUCA B. & C. (leaf spot) (3019). Slight.

CHRYSANTHEMUM SP.

SEPTORIA CHRYSANTHEMELLA Cav. (leaf spot) (4078). Slight.

COSMOS SP.

*PHOMOPSIS STEWARTII Peck (canker) (4139). At Morgantown, affected plants were common in one garden.

CRATAEGUS OXYACANTHA L. (ENGLISH HAW)

*BACILLUS AMYLOVORUS (Burr.) Trev. (fire blight) (2028). An old tree was severely attacked with twig blight.

* PHYLLOSTICTA RUBRA Peck (leaf spot) (4116). Found once.

DELPHINIUM SPP. (PERENNIAL LARKSPUR)

BACTERIUM DELPHINII (EFS) Bryan (black spot). Rather common and destructive.

*ERYSIPHE POLYGONI DC. (powdery mildew). On a few plants decided stunting occurred.

GLADIOLUS SP.

*ALTERNARIA FASICULATA (C. & E.) Jones & Grout. (leaf blight) (4033).

HEDERA HELIX L. (ENGLISH IVY)

*PHYLLOSTICTA CONCENTRICA (Sacc. (leaf spot) (2024). This disease occurs widely on the host which is planted commonly. Ordinarily the blighted plants are partially defoliated. A twig blight, seemingly due to the same organism, was observed. During the summer, pycnidia formed abundantly but it was difficult to find spores. These develop after the leaves fall to the ground.

HELIANTHUS GIGANTEUS L. (GIANT SUNFLOWER)

*PUCCINIA HELIANTHI-MOLLIS (Schw.) Jack. (rust).(3266). Plants moderately attacked.

*SEPTORIA HELIANTHI E. & K. (leaf spot) (3265). Severe and general. Commonly half of the leaves were killed and frequently in southern localities plants were killed.

IRIS SP.

BACILLUS CAROTOVORUS Jones (soft rot). At Charleston, this disease was troublesome, especially on a white variety. Semesan treatment was practiced.

DIDYMELLINA IRIDIS (Desm.) Hoehn. (leaf spot) (2076). Slight occurrence.

LATHYRUS ODORATUS L. (SWEET PEA)

*ERYSIPHE POLYGONI DC. (powdery mildew). Plants were infected rather late in the season.

MONARDA DIDYMA L. (RED MINT)

*PUCCINIA MENTHAE Pers. (rust) (3287). Found in one garden.

MORUS RUBRA L. (MULBERRY)

*PHLEOSPORA MACULANS (Bereng.) All. (leaf spot) (4092). Slight.

PAEONIA SP. (PEONY)

*ALTERNARIA SP. (leaf spot) (3294). A few plants were found bearing this organism in leaf spots.

BOTRYTIS PAEONIAE Oud. (blight) (2088). The leaves were commonly attacked and on some varieties there was considerable bud blight.

*PHYLLOSTICTA COMMONSII E. & E. (leaf spot) (4142).

PELARGONIUM SP. (GERANIUM)

*STEM CANKER (undetermined) (2082). In one greenhouse, there occurs annually a stem canker on the pink varieties. The canker occurring at the surface of the soil is filled with a whitish mycelial growth and there is a tendency toward callus formation. The causal organism was not determined.

PHLOX SP.

*CERCOSPORA OMPHACODES E. & H. (leaf spot) (3184). Slight.

ERYSIPHE CICHORACEARUM DC. (powdery mildew). Moderate.

PLATANUS OCCIDENTALIS L. (SYCAMORE)

GNOMONIA VENETA (Sacc. & Speg.) Kleb. (anthracnose). Affected trees were found rather generally throughout the state. The effects of the disease seem to be slow. A tree is weakened gradually by the continued killing of branches and loss of leaves. After a number of years of such infection, the foliage will be scanty and the branches and twigs sparse, even on large plants. Such trees succumb each year to the fresh attacks of the fungus.

*SEPTORIA PLATANIFOLIA Cooke (leaf spot) (3090). Syn. (Phleospora multimaculans Heald & Wolf. p. p.; Phyllosticta platani Sacc. & Speg.). The West Virginia collection resembles in part the Ravenel, Fungi Amer. Exsicc. 27 (Septoria platanifolia) and in part, the type and co-type collections of Heald and Wolf. The Phyllosticta is closely associated with the Septoria and, in light of the work of Higgins, Klebahn, and others with related groups on other hosts, there is small doubt of the relation here.

POPULUS ALBA L. (SILVER POPLAR)

*MARSSONINA POPULI (Lib.) Sacc. (leaf spot) (3186, 3388). All trees seen were attacked rather severely. Twig blight was common.

POPULUS CANADENSIS MOENCH. (CAROLINA POPLAR)

*MARSSONINA POPULI (Lib.) Sacc. (leaf spot) (4066). Most trees are severely attacked with subsequent defoliation in late fall.

PRUNUS GLANDULOSA THUNB. (FLOWERING ALMOND)

*SCLEROTINIA FRUCTICOLA (Wint.) Rehm. (twig blight) (2078). In one locality, a plant showed severe twig blighting.

PSEDERA QUINQUEFOLIA (L.) GREENE (VIRGINIA CREEPER)

CERCOSPORA AMPELOPSIDIS Peck (leaf spot) (3056).

QUERCUS SP. (OAK)

*GNOMONIA VENETA (Sacc. & Speg.) Kleb. (anthracnose). Infected trees were first noticed during August. In many cases, they were severely damaged, but in general, most trees showed only a few blighted twigs.

ROBINIA PSEUDACACIA L. (BLACK LOCUST)

FOMES RIMOSUS Berk. (wood rot) (4155). Common throughout state.

*PHLEOSPORA ROBINIAE (Lib.) v. H. (3102, 3122, 3348, 3153). The locust was severely attacked and heavy defoliation resulted.

BROOMING DISEASE (undetermined). The disease (recently described by Hartley and Haasis, 12) was noted by F. J. Schneiderhan near Winchester, Virginia. Fresh material was sent to Dr. L. O. Kunkel for further study. It was later observed in several localities in West Virginia (See Pl. IV).

Apparently the same disease was reported from West Virginia to the Plant Disease Survey in 1920 by J. L. Sheldon. His record is as follows: "Typical witches' broom from stumps and exposed roots. I found insect larvae in some of them."

ROSA SP. (ROSE)

CERCOSPORA ROSICOLA Pass. (leaf spot). The disease is widespread. Ramblers are sometimes entirely defoliated.

DIPLOCARPON ROSAE Wolf. (black spot) (2039). Greenhouse plants are generally attacked and defoliation is the cause of considerable concern among growers.

LEPTOSPHAERIA CONIOTHYRIUM (Fuck.) Sacc. (cane blight) (2091).

*LEPTOTHYRIUM ROSARUM Cooke (flyspeck) (3188).

*PHOMA SP. (tip blight) (2089). Found once on Crimson Rambler.

*PHOMOPSIS SP. (canker) (2066).

PHYSALOSPORA MALORUM (Pk.) Shear) (die-back) (2090). On a white rambler this organism caused a moderate blighting of canes.

*YELLOWS (undetermined) (2048). In a patch of escaped roses by a roadside a number of plants were affected by yellows.

SORBUS AUCUPARIA L. (MOUNTAIN ASH)

*VALSA LEUCOSTOMA (Pers.) Fr. (die-back) (3118). Slight damage.

SPIRAEA SP. (SPIREA)

*LEPTOTHYRIUM VULGARE (Fr.) Sacc. (flyspeck) (3187). In one nursery, the leaves were specked with this organism.

VIBURNUM SP.

*CERCOSPORA VARIA Pk. (leaf spot) (3189). Nursery plants commonly show a moderate attack.

*CLADOSPORIUM SP. (leaf spot) (3189 b).

*MONOCHAETA SP. (leaf spot) (3189 a).

DISEASES OF NON-CULTIVATED PLANTS

ACER SP.
*Cladosporium humile Davis (3310, 3242, 3169). Severe on seedlings.
*Phyllosticta sp. (3219). Severe on seedlings.

ACER PENNSYLVANICUM L.
Rhytisma punctatum (Pers.) Fr. (3351).

ACER RUBRUM L.
*Cladosporium humile Davis (3354, 3172). Severe and generally distributed.

ACER SACCHARUM MARSH.
*Gloeosporium saccharinum E. & E. (3033).
*Phleospora aceris (Lib.) Sacc. (3394).

ACTINOMERIS ALTERNIFOLIA
*Gloeosporium exitiosum Dearness pro tem (3238). Collected at Racine September 6. New species according to Dearness.

AESCULUS GLABRA WILLD.
*Guignardia aesculi (Pk.) Stewart (3081).

AGRIMONIA GRYPOSEPALA WALLR.
Pucciniastrum agrimoniae (Schw.) Tranz. (3246).

AGROPYRON REPENS (L.) BEAUV.
*Cladosporium herbarum (Pers.) Lk. (2029).
*Phyllachora graminis (Pers.) Fuck. (4103).

AGROSTIS ALBA L.
Fusarium parasiticum E. & K. on Puccinia graminis (3106).

AILANTHUS GLANDULOSA
*Gloeosporium ailanthi Dearn. & Barth. (3191).

ALNUS RUGOSA (DU R.) SPR.
*Gnomoniella tubiformis (Tode) Sacc. (3344).

AMBROSIA ARTEMISIIFOLIA L.
*Albugo tragopogonis (Pers.) Gray (3073).

AMBROSIA TRIFIDA L.

*Cercospora racemosa E. & M. (3014, 3260).

Erysiphe cichoracearum DC. (3282).

AMELANCHIER CANADENSIS (L.) MEDIC.

*Dimerosporium collinsii (Schw.) Thuem. (4029).

AMPELOPSIS SP.

*Linospora psederae Dearness protemp. (4011). Specimen sent to J. Dearness who determined it tentatively as a new species. Collected at Parsons, September 15.

AMPHICARPA MONOICA (L.) ELL.

*Colletotrichum amphicarpae Dearness (3123). Specimen sent to J. Dearness, London, Ontario who determined it as a new species. Collected at Clarksburg, September 3.

*Synchytrium decipiens Farl. (2079).

ANEMONE VIRGINIANA L.

*Puccinia anemones-virginianae Schw. (2095).

APOCYNUM CANNABINUM L.

*Cylindrosporium apocyni E. & E. (3182).

ARALIA SPINOSA L.

*Cercospora atromaculans E. & E. (3316, 4007). General.

ARCTIUM MINUS BERNH.

Puccinia bardanae Corda. (4111).

ARISTOLOCHIA MACROPHYLLA

*Ovularia aristolochiae Dearness. (3387). Collected at Kerens, September 9. New species according to Dearness.

ARTEMISIA SP.

*Albugo tragopogonis(Pers.) Gray (3048).

ASCLEPIAS INCARNATA L.

Cercospora clavata (Ger.) Pk. (3078, 3299).

ASCLEPIAS SYRIACA L.

*Botrytis hypophylla E. & K. (4006 b).

*Cercospora clavata (Ger.) Pk. (3374).

*Phyllosticta cornuti E. & K. (4006).

Uromyces asclepiadis Cke. (4045).

ASIMINA TRILOBA DUNAL

*Phleospora asiminae E. & K. (3196, 3232, 3297). Often severe causing heavy defoliation.

ASTER SP.

Coleosporium solidaginis (Schw.) Thum. (3333, 4093).
Ophiodothis haydeni (B. & C.) Sacc. (3055).
Puccinia asteris Duby. (4090).

ASTER MACROPHYLLUS L.

Coleosporium solidaginis Thum. (3358).

ASTER MULTIFLORUS AIT.

**Ophiodothis haydeni* (B. & C.) Sacc. (3228).
**Septoria atropurpurea* Pk. (3231).

ASTER PUNICEUS L.

Coleosporium solidaginis Thum. (3334).

BETULA LENTA L.

**Microsphaera alni* (Wallr.) Wint. (3376).
**Phyllosticta betulae* E. & E. (3377). Severe in some localities causing moderate defoliation.
Septoria microsperma Pk. (3256).

BIDENS VULGATA GREENE

**Plasmopara halstedii* (Farl.) B. & D. T. (3177, 4084).
**Sphaerotheca castagnei* Lev. (4087, 3361).

BROMUS JAPONICUS

**Septoria bromi* Sacc. (2047).

BROMUS PURGANS L.

Puccinia clematidis Lagerh. (3174).

CACALIA ATRIPLICIFOLIA

**Septoria cacaliae* E. & K. (3385).

CAREX LURIDA WAHL.

**Puccinia sambuci* (Schw.) Arth. (3397).

CASTANEA DENTATA (M.) BORK.

**Leptothyrium castaneae* (Spr.) Sacc. (3309).
Microsphaera alni (Wal.) Wint. (4128).

CELTIS OCCIDENTALIS L.

**Pseudoperonospora celtidis* (Waite) Wilson (4079, 4047). Evidently this is the first report of the fungus since the original discovery in the District of Columbia.

CERCIS CANADENSIS L.

**Cercospora cercidicola* Ell. (3257, 3164, 3243). Seedlings severely attacked.

CHENOPODIUM ALBUM L.

Cercospora dubia (R.) Wint. (3032).
**Peronospora effusa* (G.) Rabh. (3375, 2030).

CHRYSANTHEMUM LEUCANTHEMUM L.
*Septoria chrysanthemi All. (2019).

CICUTA MACULATA L.
*Cylindrosporium cicutae E. & E. (3108).

CIRCAEA LUTETIANA L.
Puccinia circaeae Pers. (3378, 3249).

CIRSIUM SP.
*Septoria cirsii Niessl. (3345).

CLEMATIS VIRGINIANA L.
*Cylindrosporium clematidis E. & E. (4014).

CONVOLVULUS SP.
Septoria convolvuli Desm. (4043).

CONVOLVULUS SEPIUM L.
Puccinia convolvuli (Pers.) Cast. (2075)
Septoria convolvuli Desm. (3180, 2007).

COREOPSIS TRIPTERIS L.
*Coleosporium inconspicuum (Long) Hedg. (3208).

CORNUS FLORIDA L.
*Septoria cornicola Desm. (3161).

CRATAEGUS SP.
Gymnosporangium germinale (Schw.) Kern (4118).
*Leptothyrium pomi (Mont. & Fr.) Sacc. (4129, 4130). Common; associated with sooty blotch.
*Phyllosticta solitaria E. & E. (4003). Moderate in some localities.

CYPERUS STRIGOSUS L.
*Phyllachora cyperi Rehm. (3167).
Puccinia cyperi Arth. (3192).

DACTYLIS GLOMERATA L.
*Scolecotrichum graminis Fuckel (2092, 3031).

DANTHONIA COMPRESSA AUCT.
*Balansia hypoxylon (Pk.) Atk. (2060). Plentiful.

DANTHONIA SPICATA (L.) BEAUV.
*Ustilago residua Clint. (2097, 2059).

DESMODIUM CANESCENS (L.) DC.
Uromyces hedysari-paniculatae (Schw.) Farl. (3126, 3111, 3278, 3115).

DIOSPYROS VIRGINIANA
Cercospora diospyri? (3076).

DIPSACUS SYLVESTRIS MILL.
*Cercospora elongata Pk. (3080).

ELEPHANTOPUS CAROLINIANUS WILLD.
Coleosporium elephantopodis (S.) Thum. (3239).

ELYMUS CANADENSIS L.
Phyllachora graminis (Pers.) Fuckl. (4009).

ERECHTITES HIERACIFOLIA (L.) RAF.
*Septoria erichtitis E. & E. (3320).

ERIGERON SP.
*Cercosporella cana (Pass.) Sacc. (4107).

ERIGERON RAMOSUS (WALT.) B.S.P.
*Cercosporella cana (Pass.) Sacc. (2056). Common and severe.
*Leptothyrium punctiforme B. & C. (3027).
*Puccinia asterum (Schw.) Kern (2052).

EUPATORIUM PURPUREUM L.
*Ascochyta compositarum Davis (3141, 4027).
*Erysiphe cichoracearum DC. (3338). Severe.

EUPHORBIA HETEROPHYLLA L.
*Uromyces proeminens (DC.) Pass. (4102).

EUPHORBIA PRESLII GUSS.
*Uromyces proeminens (DC.) Pass.

FRAGARIA SP.
Ramularia tulasnei Sacc. (3342, 2025).

FRAXINUS AMERICANA L.
*Piggotia fraxini B. & C. (3121).
*Vermicularia herbarum West. (3248). Uncommon.

GALIUM PARISIENSE L.
*Cercospora galii E. & H. (4010).

GAYLUSSACIA BACCATA (WANG.) KOCH
*Pestalozzia guepini Desm. (3216). Common, causing defoliation.

HAMAMELIS VIRGINIANA L.
*Gonatobotryum maculicolum (Wint.) Sacc. (4020). Common in some localities.

HELIOPSIS HELIANTHOIDES (L.) SWEET
*Puccinia helianthi Schw. (3125).

HEUCHERA AMERICANA L.
*Pestalozzia heucherae Tehon & Dan. (3250).
*Vermicularia dematium (P.) Fr. (4143).

HOLCUS LANATUS L.
Puccinia coronata Cda. (3396).

HYDRANGEA ARBORESCENS L.
Pucciniastrum hydrangeae (B. & C.) Arth. (3255, 3311). This host generally is affected severely.

HYPERICUM PUNCTATUM LAM.
*Uromyces hyperici-frondosi (Schw.) Arth. (3367).

IMPATIENS SP.
*Mycosphaerella impatientis (P. & C.) House (3117).

IMPATIENS BIFLORA WALT.
*Gloeosporium impatientis Anders. (3337).

IPOMOEA HEDERACEA JACQ.
Albugo ipomoeae-panduranae (F.) Sw. (3109).

JUGLANS NIGRA L.
Gnomonia leptostyla (Fr.) Ces. & DeN. (3199, 3308). Severe defoliation was commonly encountered, especially on young plants.

JUNCUS EFFUSUS L.
Uromyces junci-effusi Syd. (3099).

JUNCUS TENUIS WILLD.
Darluca filum (Biv.) Cast. on Uromyces silphii (3077).

LACTUCA SP.
*Pleospora lactucicola E. & E. (4119).

LACTUCA SCARIOLA L.
*Septoria lactucae Pass. (3015).

LEPIDIUM CAMPESTRE (L.) R. BR.
*Albugo candida (P.) Kuntze (2016).

LESPEDEZA REPENS (L.) BART.
Uromyces lespedezae-procumbentis (Schw.) Curt. (3114, 3143).

LESPEDEZA VIRGINICA (L.) BRITT.
*Uromyces lespedezae-procumbentis (Schw.) Curt. (3129).

LIRIODENDRON TULIPIFERA L.
*Cylindrosporium cercosporoides E. & E. (3258). Severe defoliation in southwestern part of state.
Phyllosticta liriodendrica Sacc. (3312). Severe leaf spotting.

LYCIUM HALIMIFOLIUM MILL.
*Cercospora lycii E. & H. (4100).
*Puccinia globosipes Pk. (4101).

MAGNOLIA ACUMINATA L.

*Cercospora magnoliae E. & Hark. (3206). Severe and common on young plants.

Phyllosticta magnoliae Sacc. (3370).

MALVA ROTUNDIFOLIA L.

*Cercospora althaeina Sacc. (4083).

MENTHA SPICATA L.

Puccinia menthae Pers. (3116).

MIMULUS RINGENS L.

*Septoria mimuli E. & K. (3096, 3237).

MUHLENBERGIA MEXICANA (L.) TRIN.

*Phyllachora graminis (Pers.) Fuck. (3285).

Puccinia hibisciata Kellerm. (4114).

MUHLENBERGIA SCHREBERI GMEL.

Puccinia hibisciata (Schw.) Kellerm. (4105).

NYSSA SYLVATICA MARSH

*Phyllosticta nyssae Cooke (3203, 3211, 4001). Severe and general.

OENOTHERA SP.

*Septoria oenotherae West. (3147, 2036).

PANICUM CLANDESTINUM L.

*Septoria graminum Desm. (2096).

PANICUM DICHOTOMIFLORUM MICH.

*Cercospora fusimaculans Atk. (3154).

PANICUM GATTENGERI NASH

*Puccinia emaculata S. (4089).

PANICUM HUACHUCAE ASHE

Phyllachora puncta (S.) Orton (3089).

PANICUM LATIFOLIUM L.

*Phyllachora puncta (S.) Orton (3355).

PANICUM MICROCARPON MUHL.

*Phyllachora puncta (S.) Orton (4008).

PHLEUM PRATENSE L.

Ustilago striaeformis (W.) Niessl. (2003).

PHYSOCARPUS OPULIFOLIUS (L.) MAX.

*Pestalozzia monochaetoides S. & E. var. parasitica (4015).

PHYTOLACCA DECANDRA L.

*Mosaic (2077). Plants severely attacked throughout the state.

PLATANUS OCCIDENTALIS L.

*Pestalozzia funerea Desm. (3200). Common on young growth.
*Septoria platanifolia Cooke (3259). Moderate defoliation occurred.

POA COMPRESSA L.

*Ustilago striaeformis (W.) Niessl. (2061).

PODOPHYLLUM PELTATUM L.

Septoria podophyllina Pk. (2072).

POLYGONUM SP.

*Peronospora polygoni Thum. (2071).

POLYGONUM AVICULARE L.

*Uromyces polygoni (P.) Fckl. (3181, 3185).

POLYGONUM HYDROPIPER L.

*Cercospora hydropiperis (Thum.) Speg. (3368).

POLYGONUM PENNSYLVANICUM L.

*Septoria polygonorum Desm. (3166).

POTENTILLA CANADENSIS L.

*Phragmidium potentillae-canadensis Diet. (3247, 2002).
*Ramularia arvensis Sacc. (3357).

POTENTILLA MONSPELIENSIS L.

*Ramularia arvensis Sacc. (2051).

PRUNELLA VULGARIS L.

*Septoria brunellae E. & H. (3252).

PRUNUS AMERICANA M.

*Leptothyrium pomi (Mont. & Fr.) Sacc. (3283). General occurrence.
*Phyllosticta prunicola (Opiz.) Sacc. (3205). Severe defoliation was noted in many cases. (See apple).

PRUNUS PENNSYLVANICA L.

*Coccomyces hiemalis Hig. (3362, 3398, 3363). Defoliation severe.
Plowrightia morbosa (S.) Sacc. (3364). Common.

PRUNUS SEROTINA EHR.

Coccomyces hiemalis Hig. (3163, 3331). Defoliation severe, especially on young plants.
*Phyllosticta prunicola (Opiz.) Sacc. (3335). Moderate, especially on upper leaves. (See apple).
*Pleurotus ostreatus Fr. (3380).

PSEDERA SP.

*Plasmopara viticola (B. & C.) B. & deT. (4013). Common.

PYCNANTHEMUM FLEXUOSUM (WALT.) B.S.P.

*Puccinia menthae Pers. (3135).

PYCNANTHEMUM PYCNANTHEMOIDES (L.) FER.

*Puccinia menthae Pers. (3241).

PYRUS CORONARIA L.

Bacillus amylovorus (B.) Trev. (fire blight). Severe examples were seen.

Gymnosporangium juniperi-virginianae Schw. (3132).

*Illosporium malifoliorum Sheld. (leaf spot) (3133). Moderate.

*Marssonina coronariae Sacc. & Dearn. (3330). Caused severe defoliation.

*Phyllosticta prunicola (Opiz.) Sacc. (3332). In some cases severe defoliation occurred. (See apple).

*Venturia inaequalis (Cke.) Aderh. (2068). Severe defoliation.

QUERCUS SP.

*Actinopelte japonica Sacc. (3218, 3350). Severe on seedlings.

*Gnomonia veneta (S. & S.) Kleb. (3336).

QUERCUS ALBA L.

Microstroma alba (Desm.) Sacc. In 1920, J. L. Sheldon reported the occurrence of this disease to the Plant Disease Survey. He stated that several "brooms" were to be found on a single tree. He had observed the condition over a period of years and finally secured diseased leaves showing the fungus. In 1928, the writer visited the location and photographed the original tree which still retained three of the "brooms" (Pl. V) of varying sizes. The intermediate size (see arrow in plate) measured about five feet in length.

Polyporus sulphureus (Bull.) Fr. (3379). Several trees attacked by this fungus were seen.

QUERCUS MARILANDICA MUEH.

*Actinopelte japonica Sacc. (3207. Severe on seedlings.

QUERCUS PRINUS L.

*Actinopelte japonica Sacc. (3212).

RHUS SP.

*Wilt (undetermined). Plants with wilted terminals were observed commonly throughout the state. Similarly affected plants have been observed in Iowa and New York.

RHUS COPALLINA L.

*Cercospora rhuina C. & E. (3136, 3098). Severe defoliation occurred.

RHUS TOXICODENDRON L.

*Uromyces toxicodendri Berk. & Rav. (4038). Common and plentiful in some localities.

RHUS TYPINA L.

*Pezizella lythri (Desm.) Shear & Dodge (3346, 3104). Moderate defoliation.

RUBUS SP.

*Botrytis cinerea Auct. (4017).

*Caeoma nitens Burr. (2004).

*Cercospora rubi Sacc. (3130, 3131).

*Kuehneola uredinis (Link) Arth. (3305).

RUBUS HISPIDUS L.

*Mycosphaerella rubi Roark (2055).

RUBUS ODORATUS L.
*Phyllosticta rubi-odorati Bub. & Kab. (3319).

SALIX SP.
*Cylindrosporium salicinum (Pk.) Dearn. (3234, 4022, 3150). Severe defoliation throughout the state.
Rhytisma salicina (Pers.) Fr. (4024).

SAMBUCUS CANADENSIS L.
*Cercospora depazeoides (D.) Sacc. (3095, 3324).

SCROPHULARIA MARILANDICA L.
*Septoria scrophulariae Westd. (3236).

SETARIA VIRIDIS (L.) BEAUV.
*Piricularia grisea (C.) Sacc. (4042). Common.

SMILAX HISPIDA M.
*Cercospora smilacina Sacc. (3170, 3100).
*Sphaeropsis cruenta (Fr.) Gilm. & Arch. (3175, 3137).

SOLIDAGO SP.
Coleosporium solidaginis (Schw.) Thum. (3091, 2008).
*Rhytisma solidaginis S. (3197, 3016).

SOLIDAGO CAESIA L.
*Coleosporium solidaginis (S.) Thum. (3353).

SOLIDAGO JUNCEA AIT.
*Leptothyrium tumidulum Sacc. (3159).

TECOMA RADICANS (L.) JUSS.
*Cercospora sordida Sacc. (3280).

TEUCRIUM CANADENSE L.
*Cercospora teucrii (S.) E. & K. (4044).

TINIARIA SCANDENS (L.) Small.
*Puccinia polygoni-amphibii P. (4021).
Ustilago anomala Kunze (4154).

TRIDENS FLAVUS (L.) HITCHC.
Puccinia windsoriae Schw. (4067).

TRIFOLIUM HYBRIDUM L.
*Pseudopeziza trifolii (Biv.) Fuck. (3028)
Uromyces hybridi W. H. Davis (3225).

ULMUS AMERICANA L.
*Mycosphaerella ulmi Kleb. (3392). Moderate.

ULMUS FULVA MICHX.
*Gnomonia ulmea (Sacc.) Thum. (4019, 3295). Slight.

VACCINIUM PENNSYLVANICUM LAM.
*Pucciniastrum myrtilli (Schum.) Arth. (3215, 4002). General and severe.

VACCINIUM STRAMINEUM L.
*Rhytisma vaccinii (S.) Fr. (3209). Severe on some plants.

VERNONIA NOVEBORACENSIS WILLD.
Coleosporium carneum (Bosc) Jackson (3064).

VITIS SP.
*Guignardia bidwellii (E.) V. & R. (3352). Severe on fruits and leaves.

VITIS AESTIVALIS MICHX.
*Plasmopara viticola (B. & C.) B. & DeT. (3315).

VITIS BICOLOR LE C.
*Guignardia bidwellii (E.) V. & R. (3018).

XANTHIUM CANADENSE MILL.
*Puccinia xanthii Schw. (4108).

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EXPLANATIONS OF PLATES

II

Stages in development of spot and in disintegration of apple leaves caused by Illosporium malifoliorum.

III

A. Defoliation of apple tree caused by Illosporium malifoliorum.

B. Severe defoliation in pear orchard, caused by Fabraea maculata.

IV

Witches' broom of Quercus alba caused by Microstroma alba.

V

Brooming disease of black locust. Terminal portions of two affected branches.

PLATE 2

PLATE 3

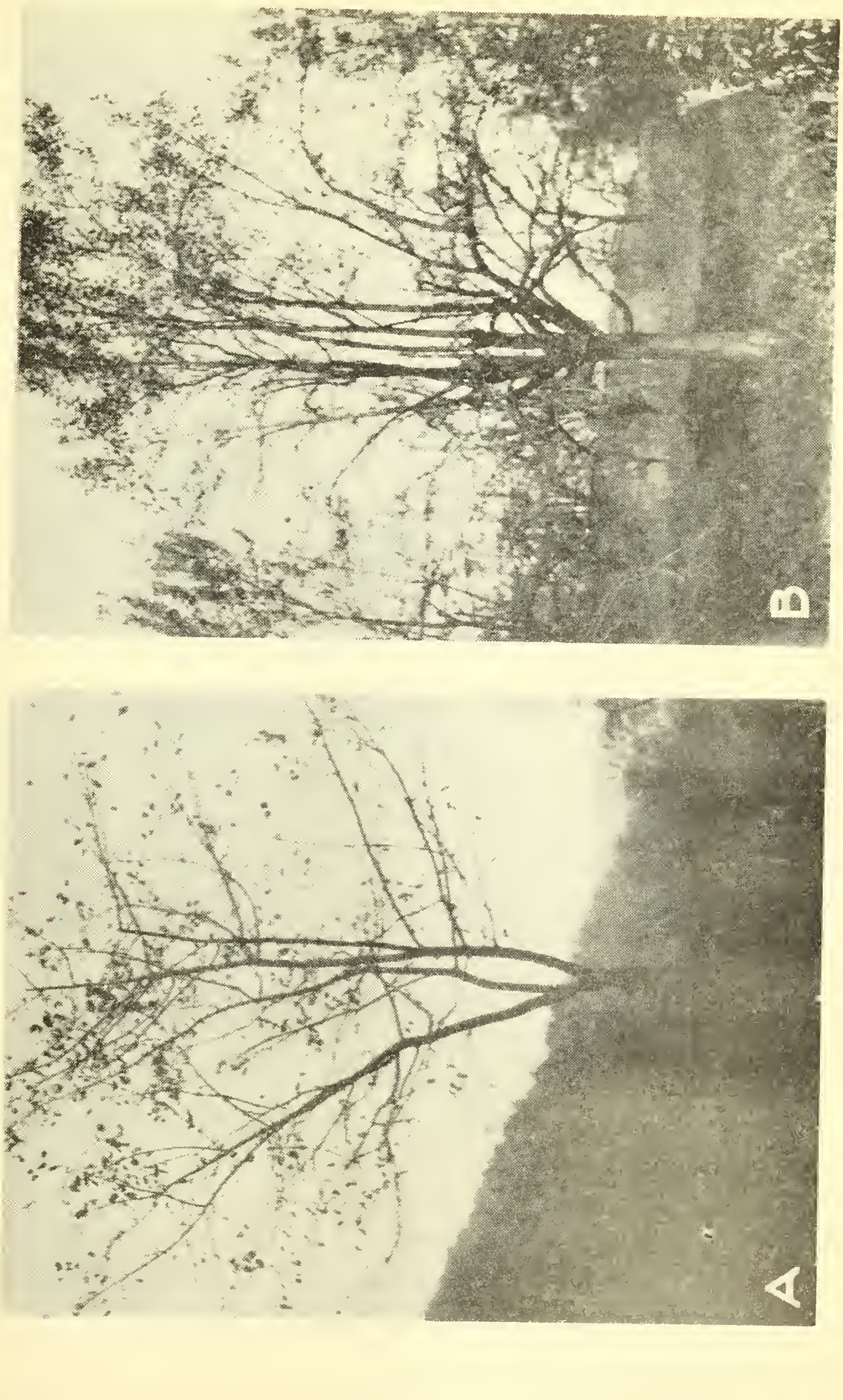

PLATE 4

PLATE 5

THE PLANT DISEASE REPORTER

ISSUED BY

THE OFFICE OF MYCOLOGY AND DISEASE SURVEY

Supplement 73

Diseases of Forest and Shade Trees, Ornamental and Miscellaneous

Plants in the United States in 1928

December 30, 1929

BUREAU OF

PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

DISEASES OF FOREST AND SHADE TREES, ORNAMENTAL AND MISCELLANEOUS PLANTS IN THE UNITED STATES IN 1928

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Prepared by
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Bureau of Plant Industry.

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FOREWORD

This summary of the diseases of forest and shade trees, ornamental and miscellaneous plants in the United States in 1928 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 1928 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 1928. 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 SP.
Fusarium sp., graft canker.
+New Jersey - Cumberland County, May 29. (White)
+Lophodermium abietis Rostr., needle cast.
Western United States - on A. amabilis, A. concolor, A. grandis. (Boyce, 1)

ABIES BALSAMEA, balsam fir.
Polyporus balsameus Pk., brown butt rot.
+Wisconsin - Garrett Bay, 1923 and 1924. (Hubert)
Minnesota - Grand Marais, 1923 and 1924. (Hubert)
A common butt rot resulting in rapid decay of the lower trunk and causing severe windfall.

ABIES GRANDIS, great silver fir.
+Polyporus erubescens Fr., bark rot.
Idaho - found on stumps, attacking bark and slight attack on sapwood; Moscow, 1926. (Hubert)
+Scleroderris bacillifera (Karst.) Sacc., canker.
Oregon - many cankers on the trees in one locality of Tillamook County. (Zeller)

CUPRESSUS SPP., cypress.
+Coryneum sp., coryneum canker.
California - on C. macrocarpa and C. sempervirens; found in Alameda, Santa Clara, and San Mateo Counties, also reported from Sacramento County. Seemingly has been present in certain localities for four or five years; origin unknown. (Wagener, 21)

JUNIPERUS PROCUMBENS
Phomopsis juniperovora G. G. Hahn, nursery blight.
+*Maryland - Rockville, September 22. (Martin)
+*Pitya cupressi (Batsch) Rehm.
District of Columbia - October 20. (Martin)
Maryland - Rockville, October 26. (Martin)
Plant Disease Reporter 12: 139. 1928.

PICEA SPP., spruce.
+Fusarium sp., graft canker.
New Jersey - 90 per cent loss in all spruce grafts; local; Cumberland County, March 30. (White)
+Melampsoropsis cassandrae (Pk. & Clint.) Arth., rust.
Wisconsin - occasionally found on blue spruce when located near bogs; Milwaukee, July 25. (Vaughan)
+Phacidium infestans Karst.
Northeastern United States - (Faull, 7).
Phomopsis occulta Bubak.
+Rhode Island - (Waterman)

PICEA ENGELMANNI, Engelmann spruce.
+Fomes annosus Fr., spongy sap rot.
Idaho - caused serious root and butt rot in living trees; Coeur d'Alene, 1927. (Hubert)
+Phomopsis occulta Bubak, blight.
New Jersey - Passaic, July 9. (White)

PICEA PUNGENS, Colorado spruce.
+Melampsoropsis cassandrae (Pk. & Clint.) Arth., leaf blister rust.
Wisconsin - (Waterman)
+Phomopsis occulta Bubak, blight.
New Jersey - (Waterman)

PICEA PUNGENS KOSTERI, Koster blue spruce.
+Phomopsis occulta Bubak, blight.
New Jersey - Mercer County, July 3. (White)

PINUS FLEXILIS, limber pine.
Hypodermella sulcigena (Link.) Tub., needle cast.
+*Montana - Gallatin County, August 5. (Young)

PINUS MONTANA MUGHUS, mugho pine.
+Sphaeropsis sp., leaf cast.
New Jersey - Monmouth County, October 16. (White)

PINUS MONTICOLA, western white pine.
Cronartium ribicola Fisch., blister rust.
The following report has been received from Dr. J. F. Martin, Office of Blister Rust Control. See map. Figure 17.

Scouting during 1929 has shown that the area infected with white pine blister rust in the United States has been increased as a result of the natural advance of the disease into new territory. The accompanying map shows the extent of the infected area in the West at the end of 1928.

This year infection on Ribes, which apparently is blister rust, was found in Curry County, Oregon, at two points about 7 and 15 miles respectively south of Port Orford. This represents a substantial extension in the southward spread of the disease on the Coast being less than 50 miles from the Oregon-California line.

Another important factor in the Western blister rust control situation was the finding of the rust for the first time firmly established on western white pine in four localities in Idaho. In this region of valuable forests, host plant associations are exceptionally favorable for rapid spread of the disease and severe damage to pine, unless effective control is applied promptly.

Two of the pine infection centers were discovered in the vicinity of Elk River, Clearwater County, one at the junction of Elk and Deep Creeks where five infected trees with five cankers of 1923 and 1927 origin were found, the other at the junction of Long Meadow and Three Bear Creeks where an extensive infection area was located comprising 60 acres of white pine with approximately 5 per cent of the trees infected. Here there were apparently three waves of infection which occurred in 1923, 1926 and 1927, respectively.

A third center of pine infection was found in Clearwater County 1-3/4 miles south of Headquarters, Idaho, on the North Fork of Reed's Creek. Fifteen infected trees with 23 cankers of 1927 origin were located. All infected trees and those nearby were destroyed on September 13. The Ribes in this vicinity were eradicated by the application of chemicals during the 1929 field season.

The fourth center of infection was discovered in Sections 8 and 11, T. 42 N., R. 2 E., on the Middle Fork of the St. Maries River in the Clarkia region, Shoshone County. In Section 8, 10 infected trees were found with 10 cankers, one of 1923 origin, and 9 of 1927 vintage. In Section 11, 30 infected trees were located with cankers which originated in 1927.

Diseased Ribes were found in the vicinity of all pine infection centers with the exception of the one near Headquarters where the bushes had been eradicated. In addition, Ribes infection was discovered at 6 points distributed over Clearwater County, and at two points in Latah County in the vicinity of Bovill, Idaho. In Montana one infected bush of R. petiolare was located in Mineral County on Upper Randolph Creek about 9 miles airline from the Savanac Nursery at Haugan. The bush was uprooted and all infected leaves were destroyed by burial in the soil.

In the Eastern infected states the disease is constantly increasing in amount and spreading locally in white pine areas which have not yet been protected by the application of control measures. The outstanding features with respect to the spread of the disease in the East was the discovery of the rust on white pines in the Upper Peninsula of Michigan, and in several additional counties in Pennsylvania. Also it was apparently located on cultivated black currants at two points in the State of Iowa. In certain sections of the Upper Peninsula the disease was well distributed on cultivated black currants and wild Ribes. In Pennsylvania blister rust infection was known to occur on white pine prior to 1929 in the following ten counties: Berks, Cambria, Montgomery, Clarion, Potter, Susquehanna, Cameron, Clinton, Lycoming and Wayne. During the past season it was found on white pine in 17 additional counties. This makes a total of 27 counties with pine infection out of the 67 in the State.

+Fomes nigrolimitatus (Rom.) Weir, white pocket rot.
Idaho - Coeur d'Alene, Harvard, and Priest River. 1927. (Hubert)

PINUS MURRAYANA, lodgepole pine.
Lophodermium pinastri (Schrad.) Chev., needle cast.
Ohio - almost total defoliation of this host at state experiment station arboretum; disease noted past two years, defoliation increasing since then; Himalayan pine adjoining not infected. (May, Pl. Dis. Reporter 12: 56. 1928).
P.r. *Colorado

PINUS NIGRA, Austrian pine.
Cronartium comptoniae Arth., sweet fern rust.
+New Jersey - Mercer County, May 25. (White)
Sphaeropsis sp., leaf cast.
+New Jersey - Monmouth County, October 10. (White)
+Sphaeropsis ellisii Sacc.
Pennsylvania - (Waterman)

PINUS PARVIFLORA, Japanese white pine.
+Lophodermium pinastri (Schrad.) Chev., needle cast.
New Jersey - Monmouth County, August 16. (White)

FIGURE 17

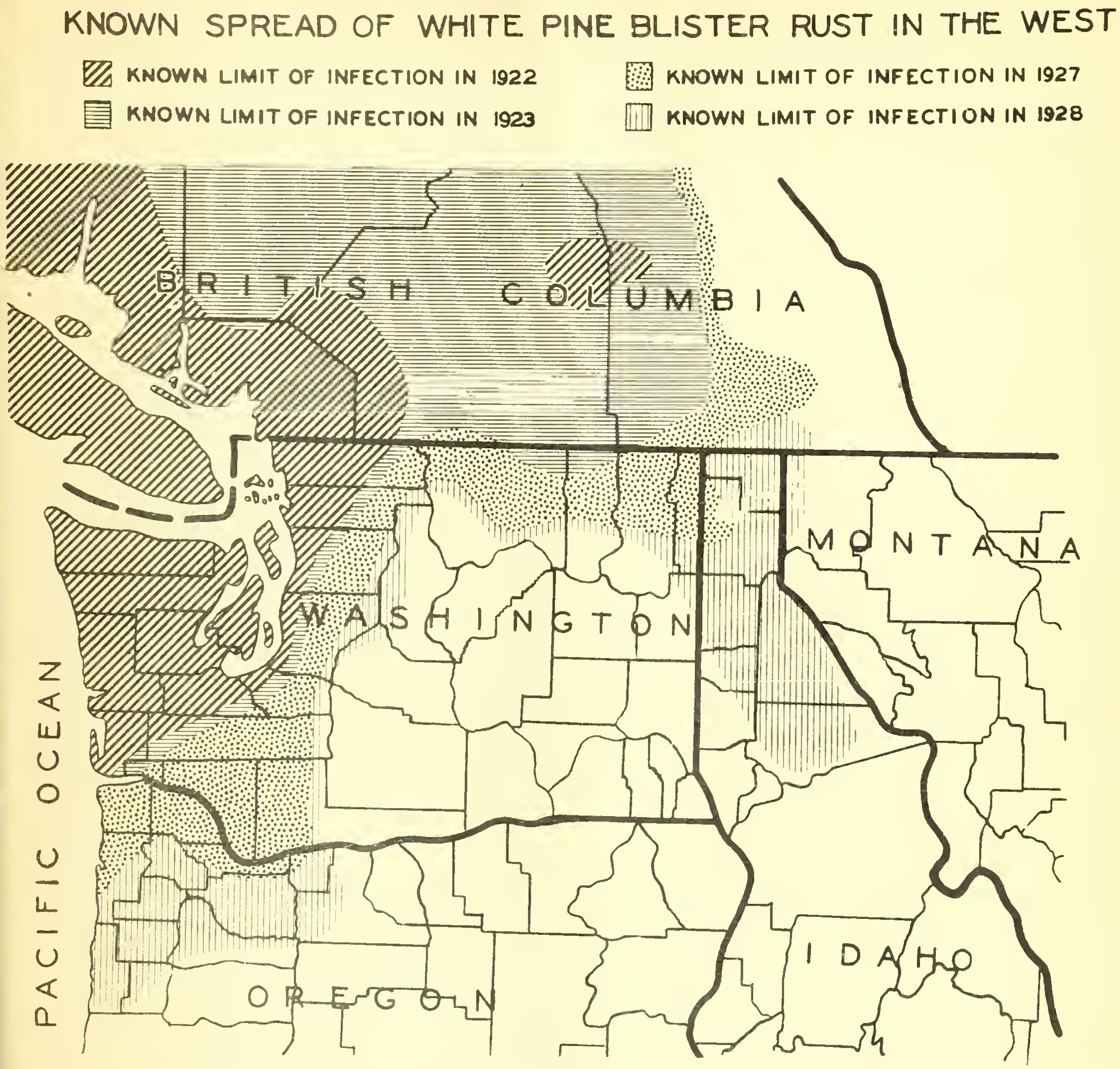


Figure 17. Map showing the known spread of blister rust on Ribes.
The situation with respect to pine infection previous to this season was as follows:

- Heavy - Western British Columbia
- Medium and general - Eastern British Columbia and Western Washington.
- Light and scattered -Eastern Washington and Northwestern Oregon.

PACIFIC NORTHWEST

SCALE-1 INCH = 92 MILES

6-28-29

PINUS PONDEROSA, western yellow pine.
Armillaria mellea (Vahl) Quel., root rot.
+Idaho - in living trees; Coeur d'Alene, Pierce, and Priest River. (Hubert)
+Washington - groups of trees infected, some dying; Northport, 1927. (Hubert)
Cronartium harknessii (Moore) E. P. Meinecke, rust.
+*Montana - Carter County, August 1. (Young)
+Polyporus anceps Pk., red ray rot.
Idaho - Boise, Harvard, Santa, and Winchester, 1927.
Washington - Northport, 1927.
Causing considerable cull in the heartwood of tops of living trees and developing rapidly on cull logs, tops, and stumps. (Hubert)

PINUS RESINOSA, red pine.
Coleosporium solidaginis (Schw.) Thuem., needle rust.
+New Jersey - Bergen County, July 3. (White)

PINUS STROBUS, white pine.
Cronartium ribicola Fisch., blister rust.
(See Pinus monticola)

PINUS SYLVESTRIS, Scotch pine.
Cytospora pinastri Fr., needle blight.
New Jersey - Bergen County, June 12. (White)
+Lophodermium pinastri (Schrad.) Chev., needle cast.
New Jersey - Monmouth, October 16. (White)
+Sphaeropsis ellisii Sacc.
New York - (Waterman)

PSEUDOTSUGA DOUGLASII, Douglas fir.
+Dasyscypha calycina (Schum.) Fckl., European larch canker.
Rhode Island - (Martin, J. F. Pl. Dis. Reporter 12: 9. 1928).
+Polyporus circinatus Fr., white pocket rot.
Idaho - Coeur d'Alene, 1927. (Hubert)
+Polyporus leucospongia Cke. & Hark., sap rot.
Idaho - Avery, 1927. (Hubert)

RETINOSPORA SQUARROSA, retinospora.
+Phomopsis juniperovora G. G. Hahn, nursery blight.
New Jersey - Union County, July 16. (White)

THUJA SP., arborvitae.
Phomopsis juniperovora G. G. Hahn., nursery blight.
+*Virginia - Onley, July 13. (Pl. Dis. Reporter 12: 113. 1928).
+Phymatotrichum omnivorum (Shear) Dug., root rot.
Texas - severe on both nursery and home plantings; 10 per cent loss; Hidalgo County. (Bach)

DISEASES OF HARDWOOD

ACER SPP., maple.
+*Colletotrichum., leaf blight.
North Carolina - Albermarle, October 23. (Martin)
Gloeosporium sp., leaf blight.
+*North Carolina - Albermarle, September. (Forest Pathology)
Gloeosporium apocryptum Ell. & Ev., leaf blight.
+Massachusetts - more than usually severe throughout the state, July 11. (Osmun)
Phyllosticta minima (Berk. & Curt.) Ell. & Ev., leaf spot.
+Colorado - very abundant. (LeClerg)
Rhytisma acerinum (Pers.) Fr., tar-spot.
Maine - (Waterman)

ACER DASYCARPUM PYRAMIDALE
+*Kabatiella polyspora (Bub. & Syd.) Karak.
Virginia - Winchester. Collected by Haskell, Schneiderhan, and Archer; isolated by Leonian; determined by G. Hamilton Martin.

ACER PALMATUM, Japanese maple.
Nectria cinnabarina Fr., canker
+New Jersey - Atlantic County, September 20. (White)
+*Phomopsis sp.
Pennsylvania - (Waterman)
Virginia - Falls Church, September. Collected and determined by G. Hamilton Martin.

ACER PALMATUM RUBRUM, Japanese red maple.
Verticillium sp., wilt.
+New York - Nassau County. (Welch)

ACER PLATANOIDES, Norway maple.
+Pestalozzia sp., leaf spot.
New Jersey - Ocean County, October 7. (White)
Verticillium alboatrum Reinke & Berth., wilt.
+Oregon - three-year nursery stock planted on land in potatoes three years before, now has about a 50 per cent stand; up to 15 per cent of this stand gave Verticillium symptoms verified by cultures; seedlings on land not in potatoes the year before show little, if any, wilt or skips; observed in only two nurseries. Multnomah County. (Zeller)

ACER PENNSYLVANICUM, striped maple.
Rhytisma punctatum (Pers.) Fr., black-specked leaf spot.
+Pennsylvania - less than average year. (Overholts)

ACER RUBRUM, red maple.
Cytospora chrysosperma Fr., canker.
+New Jersey - Morris County. (White)

ACER SACCHARUM, sugar maple.
Gloeosporium apocryptum Ell. & Ev., anthracnose.
+Maine, +Vermont, Virginia. (Waterman)
Phyllosticta minima (Berk. & Curt.) Ell. & Ev., leaf spot.
+Maine, +New York, New Jersey, and +Virginia. (Waterman)
Verticillium sp., wilt.
+New Jersey - Belvidere and Summit. (White)
Virginia - this disease is apparently getting a good foothold in the state. (Wingard)

AESCULUS HIPPOCASTANUM, horse chestnut.
Guignardia aesculi (Pk.) V. B. Stewart, leaf blotch.
Reported from Maine, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, +Kentucky, +Tennessee, +Texas, +Missouri, Kansas.
Uncinula flexuosa Pk., powdery mildew.
+*West Virginia - general and severe; September 24. (Archer)
+Slime flux, undetermined.
New Jersey - Passaic County, June 6. (White)

AILANTHUS GLANDULOSA, ailanthus, tree of heaven.
+Verticillium alboatrum Reinke & Berth., wilt.
Pennsylvania - several trees on the University of Pennsylvania campus were becoming defoliated and were dying; the above organism was isolated from wood and bark of the twigs. (Beach)

BETULA SP., birch.
+Cylindrosporium betulae Davis.
Delaware - "First report on this disease which was found to cause heavy defoliation. The disease behaves much like the cherry leaf spot and it would be advisable to destroy all overwintering leaves early in the spring." (Adams)

BETULA ALBA LACINIATA, cutleaf weeping birch.
+Melanconium bicolor Nees, canker.
New Jersey - Union County, August 16. (White)

CARAGANA ARBORESCENS, Siberian pea shrub.
+*Botrytis sp.
Massachusetts - pods are killed and many times the seeds are rendered useless. Amherst, July 22. (Davis)

CASTANEA DENTATA, chestnut.
Endothia parasitica (Murr.) P. J. & H. W. Anderson, blight.
The following report has been received from R. B. Clapper, Office of Forest Pathology:

"Only very limited inspection work incidental to other work in the Southern Appalachians was carried on by members of the Office of Forest Pathology. Government and state foresters, county agents and private parties contributed estimates used in the preparation of the map showing the intensity and distribution of the chestnut blight. The survey revealed no unusual developments. The blight seems to have progressed at the usual steady rate. The lightest infection was in nineteen chestnut producing counties in Kentucky, where the percentage of infection was a minimum of ten per cent to twenty-nine per cent. There are one or more counties in Tennessee, Georgia, North Carolina and South Carolina where the infection has reached eighty per cent to ninety-nine per cent and blight-killed chestnut trees range from one per cent to fifty per cent.

"A number of sprouts from blight-killed chestnuts were reported as producing nuts in the Northern States and seedlings from some of these sprouts are now being grown at Washington to test their resistance to the disease."

(See Figure 18.)

CATALPA OVATA, catalpa.
  Caconema radicicola (Greef) Cobb, root knot.
    Maryland - Bell, November 24. Collected by A. J. Bruman, determined by N. A. Cobb.

CELTIS OCCIDENTALIS, hackberry.
  +Macrophoma sp.
    Nebraska - (Waterman)

CINNAMOMUM CAMPHORA, camphor-tree.
  +Myxosporium sp.
    Georgia - (Waterman)

CORNUS SP., dogwood.
  +*Phomopsis sp.
    District of Columbia - August 19. (Martin, Pl. Dis. Reporter 12: 113. 1928).

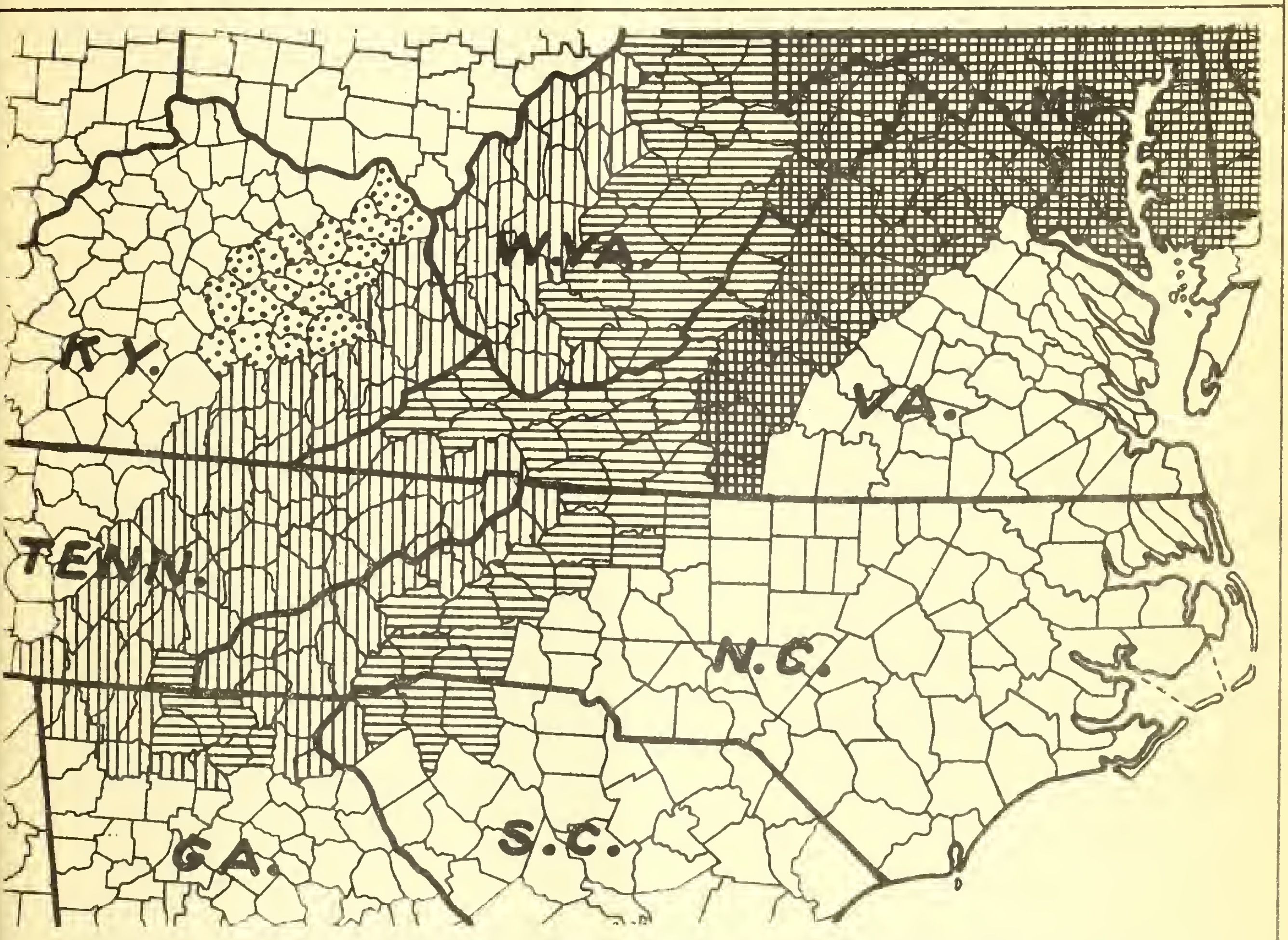
CRATAEGUS OXYACANTHA, English hawthorn.
  Bacillus amylovorus (Burr.) Trev., blight.
    +New Jersey - heavy infection; cankers on lower branches; Somerset County, August 1. (White)
    +*West Virginia - an old tree 18 inches diameter severely infected; Ridgeway, June 20. (Archer)
    +Indiana - prevalent on this species but none on nearby C. crusgalli; Marion County, August 8. (Gardner)
  +Gymnosporangium germinale (Schw.) Kern, rust.
    New Jersey - Ocean County, July 23. (White)

ELAEAGNUS ANGUSTIFOLIA, Russian olive.
  +Cytospora elaeagni Allesch.
    Oklahoma - (Waterman)

FRAXINUS LANCEOLATA, green ash.
  +Phymatotrichum omnivorum (Shear) Dug., root rot.
    Texas - 2 per cent loss. (Bach)

FIGURE 18

DISTRIBUTION OF CHESTNUT BLIGHT IN THE SOUTHERN APPALACHIANS



ESTIMATED PERCENTAGES OF INFECTED AND DEAD CHESTNUT TREES BY COUNTIES

10-29 INFECTED

30-79 INFECTED

80-99 INFECTED

100 INFECTED

(1-50 DEAD)

(51-100 DEAD)

FEB. 1929

OFFICE OF FOREST PATHOLOGY U.S.D.A.

FRAXINUS OREGONA, Oregon ash.
    Septogloeum fraxini Hark.
        +*Washington - Thurston County, July 29. (Zundel)

GLEDITSIA TRIACANTHOS, honeylocust.
    +Phymatotrichum omnivorum (Shear) Dug., root rot.
        Texas - Bell and Hill Counties. (Taubenhaus and Dana).

LIRIODENDRON TULIPIFERA, tuliptree.
    Cylindrosporium cercosporoides Ell. & Ev., leaf spot.
        +*West Virginia - severe defoliation in southeastern corner of state; Logan, September 6. (Archer)

MAGNOLIA SP., magnolia.
    Cladosporium fasciculatum Cda.
        +Maryland - (Waterman)
        +Georgia - on M. grandiflora; general in southern part of state, disfiguring the leaves; Thomasville, January. (Boyd).
    +Gloeosporium sp., anthracnose.
        New Jersey - Cumberland County, October 4. (White)
        Maryland - (Waterman)
    Phyllosticta sp., leaf spot.
        +Virginia - (Waterman).
    +Tubercularia sp.
        New York - (Waterman)

MALUS CORONARIA, wild sweet crab apple.
    +Illosporium malifoliorum Sheldon.
        *West Virginia - moderate infection; Parkersburg, September 3. (Archer)
    +Venturia inaequalis (Cke.) Aderh., scab.
        *West Virginia - moderate infection; Morgantown, June 21. (Archer)

MALUS FLORIBUNDA, Japanese flowering crab.
    +Bacillus amylovorus (Burr.) Trev., blight.
        New Jersey - Union County, June 19. (White)

MALUS IOENSIS, prairie crab.
    +Gymnosporangium juniperi-virginianae Schw., rust.
        Massachusetts - 70 per cent leaf infection in an experimental bed consisting of 30 plants. (Davis)
        Alabama - on M. ioensis var. plena. (Waterman)

NANDINA DOMESTICA, nandina.
    +*Caconema radicicola (Greef) Cobb, root knot.
        North Carolina - Winston Salem, March 24. (Cobb)
    +Lophiostoma sp.
        *Mississippi - Greenwood, June 26. Received from H. H. Wedgworth, determined by G. Hamilton Martin.

NERIUM SP., oleander.
    +Phymatotrichum omnivorum (Shear) Dug., root rot.
        Texas - Bell County. (Taubenhaus and Dana)

PLATANUS OCCIDENTALIS, American planetree, sycamore.
Gnomonia veneta (Sacc. & Speg.) Kleb., anthracnose.
Reported from Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, +Kentucky, Tennessee, Ohio, Indiana, Iowa, Utah, +Oregon, Washington.
+Phymatotrichum omnivorum (Shear) Dug., root rot.
Texas - Bell County. (Dana)
Septoria platanifolia Cke., leaf spot.
+*West Virginia - Charleston, August 11. (Archer)

POPULUS SPP., poplar.
Cytospora chrysosperma (Pers.) Fr., canker.
Reported from New Jersey, Pennsylvania, Texas, Wisconsin, and Utah.
Dothichiza populea Sacc. & H. Briard, canker.
Reported from Massachusetts, New York, Pennsylvania, Delaware, Kentucky, Louisiana, Ohio, Indiana, Wisconsin.
Fusicladium tremulae Fr.
Reported from New Hampshire, Massachusetts, Connecticut. (Clinton, Pl. Dis. Reporter 12: 55. 1928).
Marssonina populi (Lib.) Sacc.
+*West Virginia - on P. alba and P. deltoides; September. (Archer)

POPULUS LASIOCARPA, Chinese poplar.
+Cytospora chrysosperma (Pers.) Fr., canker.
*California - Shafter, December 10; collected by C. D. Neal, determined by J. A. Stevenson.
+Dothichiza populea Sacc. & H. Briard, canker.
Ohio - (Curtis May, Pl. Dis. Reporter 12: 55. 1928).
+Physalospora sp.
*Mississippi - Poplarville, March; collected by D. C. Neal; determined by N. O. Howard.

POPULUS MAXIMOWICZI, Japanese poplar.
+Botryosphaeria fuliginosa (M. & N.) Ell. & Ev., canker.
*Louisiana - Baton Rouge, March; collected by C. W. Edgerton and R. A. Young; determined by G. G. Hedgcock.

POPULUS NIGRA, black poplar.
+Botryosphaeria ribis Gross & Dug.
Georgia - (Waterman)

POPULUS TREMULOIDES, quaking aspen.
+Sclerotium bifrons Ell. & Ev., leaf spot.
New York - Oneida County. (Welch)

POPULUS TRICHOCARPA, western balsam poplar.
+Cenangium populneum (Pers.) Rehm, canker.
British Columbia - Kelowna, 1925. (Hubert)

QUERCUS SPP., oak.
+Cylindrosporium sp., leaf spot.
New Jersey - Milford, September 8. (White)
Gnomonia veneta (Sacc. & Speg.) Kleb., anthracnose.
Reported from Massachusetts, Connecticut, Pennsylvania, Virginia, Ohio, Illinois, Wisconsin, and Iowa.

+Physalospora rhodina (B. & C.) Cke.
*Iowa - Fayette County, June 22, 1927. (Archer)
Taphrina coerulescens (Mont. & Desm.) Tul., leaf blister.
Reported from New Jersey, Pennsylvania, North Carolina, Georgia, Florida, Mississippi, Louisiana, Texas, and Ohio.

QUERCUS PALUSTRIS, pin oak.
+Phymatotrichum omnivorum (Shear) Dug., root rot.
Texas - Bell and Falls Counties. (Taubenhaus and Dana)

QUERCUS RUBRA, common red oak.
+Diplodia longispora Cke. & Ell., twig blight.
*Ohio - Cincinnati, August, Collected by D. C. Grove; determined by G. Hamilton Martin.

ROBINIA PSEUDACACIA, black locust.
+Phleospora robiniae (Lib.) v. Höhn.
*West Virginia - severe; Milton, August 11. (Archer)

SALIX SP., willow.
Cytospora chrysosperma (Pers.) Fr., canker.
+New York - Suffolk County. (Welch)
+Oregon - Condon. (Zeller)
+Phymatotrichum omnivorum (Shear) Dug., root rot.
Texas- (Taubenhaus)

SALIX BABYLONICA, Babylon weeping willow.
+Cytospora chrysosperma (Pers.) Fr., canker.
Tennessee - (Waterman)

SALIX LASIANDRA
+Marssonina sp., twig blight.
Oregon - heavy infection on a few trees; Canyonville. (Zeller)

SCHINUS MOLLE, California peppertree.
+Caconema radicicola (Greef) Cobb, root knot.
Texas - Dimmit County. (Taubenhaus)

SORBUS AMERICANA, American mountain ash.
+Fusicladium dendriticum var. orbiculatum Desm., leaf blight.
New York - Tioga County. (Welch)

SORBUS AUCUPARIA, European mountain ash.
+Bacterium tumefaciens EFS. & Towns. crown gall.
New Jersey - Essex County, September 15. (White)
+Valsa leucostoma (Pers.) Fr.
*West Virginia - Morgantown, August 15. (Archer)

TILIA SP., linden, basswood.
Massariella curreyi (Tul.) Sacc.
+*New Jersey - Trenton, July, Collected by C. M. Scherer, determined by Vera K. Charles and G. Hamilton Martin. (Pl. Dis. Reporter 12: 83. 1928.

P.r.: Porto Rico, District of Columbia, Pennsylvania.
+Phymatotrichum omnivorum (Shear) Dug., root rot.
Texas - 1 per cent loss, Bell County. (Taubenhaus and Dana)
+Strumella sp.
*New Jersey - Trenton, July. Collected by C. M. Scherer, determined by G. Hamilton Martin. (Pl. Dis. Reporter 12: 113. 1928).

ULMUS SPP., elm
Gnomonia ulmea (Sacc.) Thuem.,black spot.
+Mississippi - Grenada County, May 25. (Neal, Wedgworth, and Miles).

DISEASES OF ORNAMENTALS

ACONITUM, monkshood.
+Botrytis sp., stem rot.
New Jersey - local; Summit, Union County, August 1. (White)
Erysiphe polygoni DC., powdery mildew.
+New York - especially prevalent on plants growing in the shade; Yonkers, September 14. (Guterman)
Sclerotium delphinii D. S. Welch, crown rot.
+*District of Columbia - August 16. (Fenner, Pl. Dis. Reporter 12: 113, 1928)
+Mosaic (undetermined)
New York - local; Yonkers, May 12. (Guterman)

ACTINIDIA SPP., actinidia.
+Caconema radicicola (Greef) Cobb, root knot.
*Maryland - on A. chinensis x arguta and A. purpurea, November 21. (Cobb)

ALETRIS SP., stargrass.
+*Gloeosporium aletridis P. Henn., leaf spot.
Mississippi - Forest County, June 16. Collected by H. H. Wedgworth, determined by G. Hamilton Martin.

ALTHAEA ROSEA, holyhock.
Ascochyta althaeina Sacc. & Bizz.
+*West Virginia - Morgantown, September 16. (Archer)
Caconema radicicola (Greef) Cobb, root knot.
+Mississippi - local, July 19. (Neal, Wedgworth, and Miles)
Colletotrichum malvarum (Braun & Casp.) E. A. E. Southworth, anthracnose.
+Mississippi - Macon, July 17. (Neal, Wedgworth, and Miles)
+Septoria althaeae Thuem., leaf spot.
Ohio - Cincinnati, fall. (Wilson)

ALYSSUM MARITIMUM, sweet alyssum.
+Pythium sp., damping-off.
New Jersey - Essex, April 27. (White)
+Rhizoctonia sp., damping off.
New Jersey - Essex, April 27. (White)

AMPELOPSIS TRICUSPIDATA, Japanese creeper.
+Cercospora ampelopsidis Pk. (leaf spot)
Mississippi - Canton, May 25. (Neal, Wedgworth, and Miles)
Guignardia bidwellii (Ell.) Viala and Ravaz, black rot.
+Tennessee - (Waterman)

ANDROMEDA SP., bog-rosemary.
+Pestalozzia sp., leaf spot.
New Jersey - local; Deerfield, June 21. (White)

ANTIRRHINUM MAJUS, snapdragon.
+*Bacterium tumefaciens EFS. and Towns.
New York - North Germantown, February 7. (Weiss)
Phyllosticta antirrhini Syd., damping off.
+Washington - 66 per cent of Golden Monarch variety were killed or seriously affected; local; Spokane, November 24. (Dept. Pl. Path.)
Rhizoctonia sp.
+Texas - Williamson County. (Taubenhaus)
Verticillium sp., wilt.
+Massachusetts - severity increased by heavy watering; general. (Guba)

AQUILEGIA SP., columbine.
Erysiphe polygoni DC., powdery mildew.
+*West Virginia - Morgantown, September 16. (Archer)
+Marssonina aquilegiae (Rbh.) Rostr., leaf spot.
New Jersey - local; Middlesex County, September 15. (White)
*Pennsylvania - State College, October 6. Collected by H. W. Thurston, determined by G. Hamilton Martin. (Pl. Dis. Reporter 12: 139. 1928).
Mosaic (undetermined)
+New York - seen on a few clumps of plants in a single garden; mottling very pronounced with some leaf distortion; Yonkers, May 23. (Guterman)

ASPARAGUS PLUMOSUS, fern asparagus.
+Ascochytula asparagina Petr., blight.
Texas - local. Collected and determined by W. J. Bach, verified by F. A. Wolf.
Cladosporium sp.
+*Mississippi - Attala County, July 2. Received from H. H. Wedgworth, determined by G. Hamilton Martin.
+Didymosphaeria brunneola Niessl.
*Florida - Winter Garden, September 14. Collected and determined by Anna E. Jenkins. (Pl. Dis. Reporter 12: 144. 1928).

AZALEA INDICA, indica azalea.
Exobasidium vaccinii (Fckl.) Wor., gall.
+Georgia, +Michigan - (Waterman)

AZALEA KAEMPFERI, torch azalea.
+Botrytis sp., rot of cuttings.
New Jersey - Deerfield, March 15. (White)
Exobasidium vaccinii (Fckl.) Wor., gall.
New Jersey - Deerfield, March 15. (White)

AZALEA SP., azalea.
+Ramularia angustata Pk., leaf spot.
Mississippi - Pearl River County, June 19. (Neal, Wedgworth, and Miles)

BEGONIA SP., begonia.
Bacterium sp., leaf spot.
+New Jersey - Peerless variety very resistant; Melior very susceptible; local; 50 to 60 per cent loss; Bergen County, February 4. (White)
Caconema radicicola (Greef) Cobb, root knot.
Washington - in greenhouse; Whitman County. (Dept. Pl. Path.)

BUDDLEIA STENOSTACHYS, butterflybush.
Caconema radicicola (Greef) Cobb, root knot.
+Maryland - Prince Georges County, November 24. (Cobb).
Phymatotrichum omnivorum (Shear) Dug., root rot.
Texas - 2 per cent loss; Bell County. (Dana)

BUXUS SEMPERVIRENS, common box.
Guignardia buxi (Fckl.) Feltz, leaf blight.
+*Massachusetts - March 22. Collected by E. F. Guba, determined by W. W. Diehl.
Macrophoma candollei (Berk. and Br.) Berl. and Vogl., leaf blight.
First reports for Connecticut, Delaware, Kentucky, Alabama. (Waterman)
Nectriella rousseliana (Mont.) Sacc., canker.
First reports for Connecticut, Delaware, Alabama. (Waterman)
+*District of Columbia - Montrose Park, October 20. Collected and determined by G. Hamilton Martin. (Pl. Dis. Reporter 12: 139. 1928)
+*Virginia - both Verticillium and Volutella phases present. Orange County, November 19. Collected by Mrs. J. J. Woodruff, determined by G. Hamilton Martin. (Pl. Dis. Reporter 12: 150. 1928).
+*Phomopsis stictica (B. & Br.) Trav.
District of Columbia - November. Collected and determined by G. Hamilton Martin.
Phomopsis sp.
District of Columbia - (Waterman)
Phyllosticta auerswaldii Allesch., leaf spot.
+*District of Columbia - October 20. Collected and determined by G. Hamilton Martin. (Pl. Dis. Reporter 12: 139. 1928).
+Tubercularia sp.
Kentucky - (Waterman)

CALENDULA OFFICINALIS, calendula.
+Cladosporium sp.
Ohio - in a greenhouse; Cincinnati, fall. (Wilson)
+Sclerotium rolfsii Sacc., stem rot.
Texas - prevalent in sandy soils; 2 per cent loss; Lee County. (Taubenhaus)
Yellows (undetermined)
Delaware - much more prevalent. (Adams)
Virginia - in hot beds. (Pl. Dis. Reporter 12: 9. 1928) (McWhorter)

CALLISTEPHUS CHINENSIS, China aster.
Coleosporium solidaginis (Schw.) Thuem., rust.
+*Ohio - quite prevalent in Greene, Miami, Montgomery Counties, September 8. (Pl. Dis. Reporter 12: 113. 1928) (Mendenhall)

+Wisconsin - Madison, August 1. (Vaughan)

Fusarium conglutinans callistephi Beach, wilt.

Reported from New Hampshire, Massachusetts, New York, New Jersey, Pennsylvania, Delaware (more prevalent than in 1927 in home plantings. Adams) West Virginia (many plantings were entirely blighted early in the season; 10 per cent infection was common throughout the state. Archer, Pl. Dis. Reporter 12: 130. 1928), +Kentucky, Indiana, Michigan (marked increase in the severity due to favorable temperature conditions and congenial soil condition for infection, Nelson), Wisconsin, Minnesota, Iowa, Missouri, Kansas, Utah, Oregon.

Fusarium spp.

Reported from Maine, New Hampshire, and Washington.

See Bibl. Jones (8), Kunkel (10)

Phoma sp.

+*Mississippi - Greenwood, September 12. Received from H. H. Wedgworth, determined by G. Hamilton Martin.

Yellows (undetermined)

Massachusetts - very important; 10 per cent reduction, less than in 1927. (Davis)

Connecticut - appears to be prominent this year. (Clinton)

New York - very prevalent in many gardens; seen in several commercial plantings. (Guterman)

New Jersey - general; 100 per cent infection on seedling plants set in field at Summit; June 5. (White)

*Pennsylvania - more prevalent; local infection 100 per cent; no resistant varieties. (Thurston)

Delaware - much more prevalent; most plantings a failure. (Adams)

Maryland - (Norton)

*Virginia - Richmond, August 15. (Fenner)

+West Virginia - fully 50 per cent of the blossoms were ruined. (Archer)

+Kentucky - extensive injury in two small plantings at Lexington. (Valleau)

Michigan - 10 to 20 per cent reduction; more severe than in 1927, general. (Nelson)

Wisconsin - widespread. (Vaughan)

Minnesota - general; usual prevalence. (Sect. Pl. Path.)

Iowa - general; 15 per cent loss; quite severe wherever asters were grown.

North Dakota - general.

Kansas - 25 per cent loss; usual prevalence. (Elmer)

Utah - 16 per cent infection in a local field of 1 1/2 acres. (Richards)

+*Montana - Billings, August 1. (Young)

+Oregon - local; Roseburg. (Barss)

See Bibl. Jones (8), Kunkel (11) (12), Ogilvie (17).

CALYCANTHUS SP., sweetshrub.

+Bacterium tumefaciens EFS. & Towns., crown gall.

Mississippi - Bolivar County, February 13. (Neal, Wedgworth, and Miles).

CAMELLIA JAPONICA, common camellia.

Pestalozzia inquinans Cke. & Hark.

+Georgia - (Waterman)

CANNA SP., canna.
Bacterium cannae M. K. Bryan, bacterial bud rot.
+New Jersey - 15 per cent total loss; more prevalent; Middlesex County, August 13. (White)

CHEIRANTHUS CHEIRI, common wallflower.
+Rhizoctonia sp., damping off.
New Jersey - local; 8 per cent loss; Middlesex County, February 3. (White)

CHRYSANTHEMUM SP.
Botrytis sp., leaf spot and blight.
+*Virginia - Sedley, November 3. (Weiss)
Caconema radicicola (Greef) Cobb, root knot.
+*Iowa - DeWitt, February 8. (Cobb & Steiner, Pl. Dis. Reporter 12: 10. 1928)
Fusarium sp., wilt.
+Virginia - more or less common each year in a local greenhouse. (Wingard)
Phyllosticta chrysanthemi Ell. & Ev., leaf spot.
+Mississippi - Pearl River County, June 19. (Neal, Wedgworth, and Miles)
Septoria chrysanthemella Cav., leaf spot.
+Ohio - Cincinnati, fall. (Wilson)

CLARKIA SP., clarkia.
+Botrytis sp., stem canker.
New York - severe locally in greenhouses. (Massey)

CLEMATIS INTEGRIFOLIA
+*Caconema radicicola (Greef) Cobb, root knot.
Maryland - Prince Georges County, February 21. (Cobb and Steiner, Pl. Dis. Reporter 12: 10. 1928)

CLERODENDRON SPP., glorybower.
+*Caconema radicicola (Greef) Cobb, root knot.
Maryland - on C. fargesii, C. gaetidum, C. trichotomum, Prince Georges County, November 24. (Cobb)

COLOCASIA SP., elephants ear, taro, dasheen.
Sclerotium rolfsii Sacc., southern blight.
+Florida - the fungus followed the petioles of ripened leaves to the bulb, killed the plant and caused a soft pulpy rot. (West)

COSMOS SP., cosmos.
+Phymatotrichum omnivorum (Shear) Dug., root rot.
Texas - 10 per cent loss; Bell and Dallas Counties. (Taubenhaus and Dana)
Phomopsis stewartii Pk., stem canker.
+New Jersey - Cape May, August 2. (White)
+*West Virginia - 15 per cent plants severely cankered; Morgantown, October 31. (Archer)
+Yellows (undetermined)
Delaware - much more prevalent; most plantings a failure. (Adams)

COTONEASTER SP., cotoneaster.
+Pestalozzia sp.
*Mississippi - Jackson, December. Received from H. H. Wedgworth, determined by G. Hamilton Martin.

CRYPTOGRAMMA ACROSTICHOIDES, American rockbrake.
+Pestalozzia sp., leaf blight.
New Jersey - Mercer County, February 20. (White)

CYCLAMEN SP., cyclamen.
+Bacterium sp., bacterial rot.
New Jersey - Ocean and Somerset Counties, July 2. (White)
Caconema radicicola (Greef) Cobb, root knot.
+Mississippi - Grenada County. (Neal, Wedgworth, and Miles)

CYDONIA SPP., quince.
+Pestalozzia sp., blight.
Virginia - Blacksburg, September 19. (Wingard)

DAHLIA SP., dahlia.
+Alternaria sp., leaf spot.
Mississippi - Clay County, July 24. (Neal, Wedgworth, and Miles)
Caconema radicicola (Greef) Cobb, root knot.
Georgia - (Cobb and Steiner, Pl. Dis. Reporter 12: 10. 1928)
Erysiphe cichoracearum DC., powdery mildew.
+Mississippi - Carroll County, October 6. (Neal, Wedgworth, and Miles)
+Utah - severe in several gardens visited. (Richards)
Stunt, dwarf.
Delaware - very general; many plantings a complete failure; commonly observed that on light or well-drained soil the growth of plants were most successful. (Adams)
Maryland - average prevalence. (Norton)
+Georgia - Sparta, July 10. (Haskell, Pl. Dis. Reporter 12: 69. 1928)
+Utah - Salt Lake County. (Richards)
Bibl. Kunkel (11) states that stunt has been considered as possibly identical with aster yellows, but that experiments have proved that aster yellows cannot be transmitted to dahlia.

DELPHINIUM SP., larkspur.
Bacterium delphinii (EFS.) Bryan, black spot.
Delaware - Wilmington, June 26. (Adams)
New York - slight in vicinity of New York City, May 24. (Guterman)
New Jersey - average prevalence; Somerset County, June 14. (White)
Pennsylvania - Center and Luzerne Counties. (Thurston)
Erysiphe polygoni DC., powdery mildew.
Reported from New York, +New Jersey, Washington.
Sclerotium delphinii D.C. Welch, root and crown rot.
New York - most serious on plants in wet, poorly drained soils; Yonkers, June 25. (Guterman)
New Jersey - average prevalence; Union County, August 15. (White)
*Virginia - on D. Belladonna; Warrenton, July 3. (Weiss)

Sclerotium rolfsii Sacc., stem rot.
+Mississippi - Washington County, May 22. (Neal, Wedgworth, & Miles)
+Texas - 5 per cent loss; Lee County. (Taubenhaus)

DEUTZIA LONGIFOLIA, long leaf deutzia.
+*Aphelenchus sp., nema.
District of Columbia - May 15. (Cobb)

DEUTZIA LONGIFOLIA VEITCHII
+Cephalobus spp., nema
*Maryland - Prince Georges County, November 21. (Cobb)
Tylenchus sp., nema
+*Maryland - Prince Georges County, November 21. (Cobb)

DIANTHUS BARBATUS, sweet william.
+Volutella dianthi (Hal.) Atk., anthracnose.
Delaware - New Castle, May 30. (Adams)

DIANTHUS CARYOPHYLLUS, carnation.
Alternaria dianthi F. L. Stevens & J. G. Hall, leaf spot and branch rot.
+Massachusetts - general; disease begins on young plants in field; yield of blooms in greenhouse considerably lowered. (Guba)
New York - Nassau County, August 6. (Massey)
New Jersey - most severe after field-grown plants are moved to greenhouse; 80 per cent maximum infection in one planting; Burlington County, July 23. (White)
+Wisconsin - serious locally; Eau Claire, September 15. (Vaughan)
+Virginia - 80 per cent loss to a local crop; Roanoke. (Wingard)
Bacterium woodsii EFS., bacterial spot.
+New York - general; Enchantress variety resistant; Matchless, Spectrum, Septa, Eldora, and Rosalind varieties very susceptible. (Massey)
Caconema radicicola (Greef) Cobb, root knot.
+Mississippi - Lee County, November 6. (Neal, Wedgworth, & Miles)
Fusarium sp., wilt.
Reported from Massachusetts, New York, Pennsylvania, Delaware, +Virginia.
+Sclerotium rolfsii Sacc., stem rot.
Mississippi - Greenwood, June 20. (Neal, Wedgworth, & Miles)
Sporotrichum poae Pk., bud rot.
+Virginia - Newport News, November 23. (McWhorter, Pl. Dis. Reporter 12: 149. 1928).
Uromyces caryophyllinus (Schrank) Wint., rust.
Reported from +New Hampshire, Massachusetts, New Jersey, Pennsylvania, Delaware, North Carolina, Mississippi, Texas, Ohio, Wisconsin, Iowa, Missouri, Kansas, Colorado, Washington, Oregon.

DIANTHUS CHINENSIS Hort. var. heddewigi, Heddewig pink.
Rhizoctonia sp., root rot.
New York - found twice; serious in one garden; Yonkers, May 12. (Guterman)

DIERVILLA SPP., bush-honeysuckle.
+Caconema radicicola (Greef) Cobb, root knot.
*Maryland - Prince Georges County, November 23. (Cobb)

EUONYMUS SP., euonymus.

Bacterium tumefaciens EFS. & Towns, crown gall.

+New Jersey - local; 10 per cent loss; 300 plants 18 years old showed large galls at crown and smaller ones on the stems; Essex County, August 24. (White)

+Cytospora euonymella Pass., leaf spot.

New Jersey - local; Essex, May 25. (White)

Phyllosticta euonymi Sacc., leaf spot.

+New Jersey - Essex County, May 25. (White)

EUONYMUS ATROPURPUREUS, wahoo.

Marssonina thomasiana Sacc., leaf spot.

+Ohio - Cincinnati, fall. (Wilson)

EUONYMUS JAPONICA, evergreen burningbush.

+Gloeosporium frigidum Sacc., anthracnose.

Arkansas - (Waterman)

+Phyllosticta euonymi Sacc., leaf spot.

Virginia and Mississippi - (Waterman)

FORSYTHIA SP., forsythia.

+*Sclerotium rolfsii Sacc., stem rot.

Georgia - killing two shoots from base of one plant. Experiment, July 11. (Haskell, Pl. Dis. Reporter 12: 69. 1928)

GALAX SP., galax

Phyllosticta galactis (Cke.) Ell. & Ev., leaf spot.

+New York - serious for past two years; leaf spot on leaves in cold storage, 32 - 35° F. (Massey)

GARDENIA FLORIDA, cape jasmine.

Caconema radicicola (Greef) Cobb, root knot.

Washington - King County. (Dept. Pl. Path.)

+Phymatotrichum omnivorum (Shear) Dug., root rot.

Texas - Bell and Hidalgo Counties. (Dana & Bach)

GLADIOLUS SP., gladiolus.

Alternaria fasciculata (Cke. & Ell.) Jones & Grout.

+*West Virginia - Morgantown, September 16. (Archer)

Bacterium marginatum McC., stem rot, scab.

+New Jersey - general; more prevalent than average year. (White)

Delaware - more prevalent than usual; very severe on Mrs. Francis King; Seaford, September 7. (Adams)

Maryland - College Park, August 17. (Weiss, Pl. Dis. Reporter 12: 130. 1928)

Mississippi - general; Poplarville, May 9. (Neal, Wedgworth, & Miles)

Michigan - general; less important than usual probably due to very favorable growing conditions for host. (Nelson)

Wisconsin - general; average prevalence; Madison, June 15. (Vaughan)

+Colorado - very prevalent. (LeClerg)

Fusarium oxysporum gladioli Massey, fusarium rot.

New Jersey - general. (White)

+Penicillium gladioli McC. & Thom, corm rot.
McCulloch and Thom (13) give a detailed account of investigations on this disease. They found in experiments that the sclerotia of the fungus are rather resistant to corrosive sublimate and commercial fungicides. It has been found in Indiana, Iowa, Kansas, Minnesota, New Mexico, New York.

+Sclerotium gladiolii Massey, corm dry rot.
Important in United States and Canada, has also been found in specimens from England, France, and Holland (Massey, 16).

Septoria gladioli Pass., hard rot, leaf spot.
New Jersey - general. (White)
+Pennsylvania - becoming quite general. (Thurston)
+*South Carolina - Mayesville, June 2. (L. M. Fenner)
Mississippi - Pearl River and Scott Counties, June 4. (Neal, Wedgworth, & Miles)
Wisconsin - important locally. (Vaughan)

+Mosaic
New York - seen in occasional plantings; caused severe distortion of the flowers and abnormal coloration; Yonkers, April 23. (Guterman)
New Jersey - several varieties including America, Marshall Foch, and Peace were exhibited by R. P. White at the field meeting of the Phytopathological Society at Rutherford. (Haskell)
Washington - King and Whitman Counties. (Dept. Pl. Path.)
*Montana - Yellowstone County, July 28. (Young, Pl. Dis. Reporter 12: 139. 1928.
See Bibl. Dosdall (6)

HEDERA HELIX, English ivy.
Phyllosticta concentrica Sacc., leaf spot.
+*West Virginia - observed throughout state; causes plant to have a bedraggled appearance; severe leaf casting is the common result of infection; a twig blight seems also to be caused by this organism; Morgantown, June 10. (Archer)

HELIANTHUS GIGANTEUS, giant sunflower.
Puccinia helianthi-mollis (Schw.) Jack., rust.
+*West Virginia - moderate infection, Hamlin, September 7. (Archer)
+*Septoria helianthi Ell. & Kell., leaf spot.
West Virginia - causing death of some plants; Hamlin, September 7. (Archer)

HELICHRYSUM SP., everlasting.
+Fusarium spp., stem rot.
Washington - Clallam County. (Dept. Pl. Path.)

HELICHRYSUM BRACTEATUM
+*Aster yellows, undetermined.
District of Columbia - Washington, August 8. (A. Fenner)
Curly top
Washington and California - (McKay, 14)

HELIOTROPIUM PERUVIANUM, common heliotrope.
Verticillium alboatrum Reinke & Berth., wilt.
District of Columbia - Washington, (Bryan, 3)

HYACINTHUS SP., hyacinth.
Bacterium sp., rot.
+New Jersey - on forced bulbs; often able to pick out center flower stalk when the slimy bacterial decay developed; Middlesex County, April 14. (White)
Bacterium hyacinthi J. H. Wakker, yellow disease.
+Washington - Pierce County. (Dept. Pl. Path.)

HYDRANGEA SP., hydrangea
Cladosporium sp.
District of Columbia - July. (Martin)
Missouri - (Pl. Dis. Reporter 12: 113. 1928)
Colletotrichum sp., anthracnose.
+Delaware - on variety Otaksa; Milford, August 16. (Adams)
+*District of Columbia - Washington, September. (Martin)
+*Glomerella cingulata (Ston.) Spauld. & Schrenk, anthracnose.
Missouri - Jefferson, September 5. Obtained from culture of Colletotrichum sp. Collected by A. C. Burrill, determined by G. Hamilton Martin.
Phyllosticta hydrangeae Ell. & Ev., leaf spot.
+New York - general; a wet season, Erie County, May 2. (Massey)
New Jersey - more prevalence than average year; Monmouth C ounty, February 11. (White)
+Delaware - on variety Baby Bimbenet. (Adams)
+*District of Columbia - Washington, July. (Martin)
+*Missouri - Jefferson, September 5. Collected by A. C. Burrill, determined by G. Hamilton Martin.

ILEX SPP. holly.
+Physalospora ilicis Schleich., leaf spot.
New Jersey - on cuttings of Ilex acuifolium, I. crenata, I. opaca; local; very severe; Cumberland County, May 14. (White)
Sphaeropsis sp., leaf spot.
New Jersey - local; Middlesex County, September 17. (White)

INDIGOFERA SP., indigo.
+Phymatotrichum omnivorum (Shear) Dug., root rot.
Texas - Bell County (Dana)

IRIS SPP., iris
Bacillus carotovorus L. R. Jones, soft rot.
+Mississippi - Warren County, September 25. (Neal, Wedgworth, & Miles)
Caconema radicicola (Greef) Cobb, root knot.
+Washington - Pierce County. (Dept. Pl. Path.)
Didymellina iridis (Desm.) Hoehn., leaf spot,
+Massachusetts, New York, New Jersey, Pennsylvania, Delaware, District of Columbia, Virginia, West Virginia, Mississippi, Michigan, Wisconsin, Minnesota, Utah, Montana, Washington, Oregon.
+*Leptosphaeria heterospora (De Not.) Niessl.
District of Columbia - Washington, February 17. Collected by R. J. Haskell, determined by W. W. Diehl.
Penicillium sp., rot.
+Oregon - general. (Brierley)
Scolecotrichum iridis Fautr. & Roum., leaf spot.
+Nebraska - Burt and Lancaster Counties. (Goss)

+Sclerotium delphinii D. S. Welch, crown rot.
New York - New York Botanical Garden, August 21. (Haskell)
New Jersey - Monmouth, July 27. (White)
Septoria sp., leaf spot.
+Colorado - Fort Collins, June 12. (LeClerg)
Mosaic
+New Jersey - local; on many varieties; Middlesex County, June 5. (White)
+Washington - Pacific and Pierce Counties. (Dept. Pl. Path.)
+Oregon - general; on bulbous varieties; Benton County. (Brierley)

KALMIA LATIFOLIA, mountain laurel.
Phomopsis kalmiae Enlows, leaf blight.
+New York - general; more prevalent. (Massey)
New Jersey - scattered; average prevalence; Union County, June 19. (White)
Phyllosticta kalmicola (Schw.) Ell. & Ev., leaf spot.
New York - more prevalent than last three years; in many instances almost complete defoliation resulted; Yonkers, May 16. (Guterman)
Maryland - (Waterman)

LAGERSTROEMIA INDICA, crapemyrtle.
Uncinula australiana McAlp. powdery mildew.
Georgia - (Haskell, Pl. Dis. Reporter 12: 70. 1928)

LATHYRUS ODORATUS, sweet pea.
+*Erostrotheca multiflormis Martin & Charles (Cladosporium album Dowson), white blight.
New York - severe in several greenhouses in Nassau County, April 10. (Massey)
Pennsylvania - a number of growers in Lancaster County had considerable trouble with this disease, March 1. (Martin)
See Bibl. Martin & Charles (15)
Glomerella cingulata (Ston.) Spauld. & Schrenk, anthracnose.
+Maine - (Folsom, Pl. Dis. Reporter 12: 82. 1928)
+*Vermont - Middleburg, August 2. (A. Fenner)
Mosaic, virus
Reported from New York (Guterman), and New Jersey (White)

LANTANA SP., lantana
+Macrosporium sp., leaf spot.
Texas - unimportant. (Bach)
+Phymatotrichum omnivorum (Shear) Dug., root rot.
Texas - Bell and Bexar Counties. (Taubenhaus & Dana)

LIGUSTRUM SPP.,
+Caconema radicicola (Greef) Cobb, root knot.
*North Carolina - on L. lucidum; Winston-Salem, April 24. (Cobb and Steiner, Pl. Dis. Reporter 12: 10. 1928)
*Maryland - on L. yunnanensis; Bell, November 24. (Cobb)
+Colletotrichum sp., anthracnose.
Texas - on L. lucidum; Bexar County. (Taubenhaus)
+Pezizella lythri (Desm.) Shear & B. O. Dodge.

*District of Columbia - on L. ovalifolium; June. Collected and determined by G. Hamilton Martin.

Phyllosticta ovalifolii Brun., leaf spot.

+*District of Columbia - Georgetown, June 4. Collected and determined by G. Hamilton Martin.

+*Mississippi - Perkinston, March 6. Received from H. H. Wedgworth, determined by A. E. Jenkins.

LILIUM SPP., lily.

Botrytis spp., blight.

Reported from New York (Guterman), +*Alabama, +*Ohio (Charles & Martin, Pl. Dis. Reporter 12: 82. 1928), +Washington (Dept. Pl. Path.)

+Cladosporium sp.

Reported from *District of Columbia, *Virginia, *Alabama, *Ohio (Charles & Martin, Pl. Dis. Reporter 12: 82. 1928)

Fusarium sp.

Reported from+*District of Columbia, +*Virginia, +*Ohio (Charles & Martin, Pl. Dis. Reporter 12: 82. 1928)

Kabatiella microstricta Bub.

Reported from *Virginia (Charles & Martin, Pl. Dis. Reporter 12: 82. 1928)

Phytophthora cactorum (Leb. & Cohn.) Schröt.

+Indiana - (Drechsler, Pl. Dis. Reporter 13: 8. May 15, 1929)

+Sporotrichum sp., blossom and twig blight.

Virginia - Roanoke, June 15. (Wingard, Pl. Dis. Reporter 12: 35. 1928)

Uromyces holwayi Lagh., rust.

+Oregon - on L. washingtoniana (Washington lily); Douglas County, June 22. (Zeller). P.r.: California.

Mosaic - virus.

+New York - Silver Creek, July 18. (Massey)

+Mississippi - A. & M. College, February 4. (Neal, Wedgworth, & Miles)

MATTHIOLA SP., stock.

+Fusarium sp., root rot.

Delaware - very severe in plantings; June 15. (Adams)

MENTZELIA AUREA, blazing star.

+Rhizoctonia sp., root and stem rot.

New Jersey - local; on cuttings; Essex County, April 27. (White)

MIRABILIS JALAPA, four o'clock.

+Phymatotrichum omnivorum (Shear) Dug., root rot.

Texas - 2 per cent loss; Bell County. (Dana)

NARCISSUS SPP., narcissus.

+*Aphelenchus apiculatus Cobb, nema.

Illinois - Paxton, May 18; collected by P. A. Glenn, determined by N. A. Cobb (Pl. Dis. Reporter 12: 35. 1928)

+*Aphelenchus modestus De Mau, nema.

Wisconsin - Madison, May 8; collected by E. L. Chambers, determined by N. A. Cobb.

+*Aphelenchus parietinus Bast., nema.
New York - Riverhead, Long Island, March 22; received from Bureau of Entomology, determined by N. A. Cobb.
Fusarium sp., root rot.
+*Mississippi - general; caused practically a failure of 3,000 plants at A. & M. College, February 4. (Neal, Wedgworth, & Miles)
Washington - Pierce County. (Dept. Pl. Path.)
Oregon - severe at Corvallis. (Brierley)
See Bibl. Weiss (23), (24); Wedgworth (22).
+Sclerotium delphinii D. S. Welch, crown rot.
Virginia - collected by F. P. McWhorter, determined by H. H. Whetzel.
+Stagonospora curtisii (Berk.) Sacc.
North Carolina - Wilmington, April 13. Collected by Bruman, determined by F. Weiss.
Washington - (Weiss)
Oregon - general; Corvallis, March 23. (Weiss & Brierley)
Tylenchus dipsaci (Kuehn) Bast., bulb nematode.
Reported from *New York, New Jersey, +*North Carolina, +*Ohio, *Michigan, *Illinois, *Washington, and Oregon. Determinations made by N. A. Cobb and G. Steiner, Pl. Dis. Reporter 12: 35. 1928.
See Bibl. Poos (18).
+Verticillium foexii Kingma.
Kansas - collected by R. P. White 1925. (Kingma, 9)
Mosaic (gray disease), undetermined.
+Mississippi - general; A. & M. College, February 4. (Neal, Wedgworth, & Miles)
+Michigan - general; 2 to 5 per cent total loss. (Nelson)
+Washington - Pierce County. (Dept. Pl. Path.)
Oregon - general. (Brierley)
California - general; considerable increase over 1927. (Milbrath)

NERIUM OLEANDER, common oleander.
Pseudomonas savastanoi var. nerii C. O. Smith.
+California - C. O. Smith (20)

OXALIS STRICTA, common yellow oxalis.
Ustilago oxalidis Ell. & Tracy, smut.
+*Pennsylvania - Blair and State Counties, July 21. Collected and determined by G. L. Zundel, Pl. Dis. Reporter 12: 71. 1928.

PAEONIA SPP., peony.
Botrytis paeoniae Oud., blight.
Reported from New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, Michigan, Wisconsin, Minnesota, +Missouri, Colorado, Washington, +Oregon.
Caconema radicicola (Greef) Cobb, root knot.
New Jersey - local; Norwood, April 13. (White)
Maryland - bad on eastern shore. (Norton)
Michigan - reports from growers indicate that this disease is on the increase; serious in Wayne County, also in southwestern part of state on lighter soils. (Nelson)
Washington - Snohomish County. (Dept. Pl. Path.)

Cladosporium paeoniae Pass., leaf mold.
District of Columbia - severe, September 9. (Martin, Pl. Dis. Reporter 12: 113. 1928)
Michigan - (Nelson)
+Colletotrichum sp., anthracnose.
*District of Columbia - (Martin, Pl. Dis. Reporter 12: 139. 1928)
Fusarium sp., stem rot.
+Colorado - caused some damage; local; June 12. (LeClerg)
+*Glomerella cingulata (Ston.) Spauld. & Schrenk, anthracnose.
District of Columbia - Washington; September 9. Obtained from culture of Colletotrichum sp. Collected and determined by G. Hamilton Martin.
Phyllosticta commonsii Ell. & Ev., leaf spot.
Reported from +*District of Columbia (Martin) and +*West Virginia (Archer)
Phytophthora paeoniae Cooper & Porter, blight.
Indiana - (Cooper & Porter, 4)
+Verticillium sp., wilt.
Reported from New York (Massey) and District of Columbia (Martin)
Lemoine's disease, undetermined.
+Wisconsin - Felix Crousse very susceptible; Kenosha, September 15. (Vaughan)
See Bibl. S., G. R. (19)
+Ring spot, undetermined.
Michigan - resembles tobacco ring spot; found in a number of plantings in June and July. (Nelson)

PASSIFLORA SP., passionflower.
+*Gloeosporium sp., anthracnose.
Florida - West Palm Beach, August. Determined by G. Hamilton Martin, Pl. Dis. Reporter 12: 113. 1928.

PELARGONIUM SP., geranium.
Bacterium pelargoni N. A. Brown, bacterial leaf spot.
New Jersey - scattered occurrence; Freehold, October 19. (White)
Pennsylvania - Pittsburgh. (Thurston)
Cladosporium sp., leaf spot.
District of Columbia - Washington, July; collected and determined by G. Hamilton Martin.
Pythium sp., stem rot.
*Ohio - caused considerable damage in commercial plantings; Doylestown, August 18. (Stover)

PETUNIA HYBRIDA, petunia.
+Caconema radicicola (Greef) Cobb, root knot.
Washington - Snohomish County. (Dept. Pl. Path.)

PHILADELPHUS SP., syringa, mockorange.
+*Caconema radicicola (Greef) Cobb, root knot.
Maryland - Bell, November 24. Collected by A. J. Bruman, determined by N. A. Cobb.
Septoria philadelphi Ell. & Ev., leaf spot.
+*Montana - collected by P. A. Young, determined by G. Hamilton Martin.

PHLOX SPP., phlox.
Cercospora omphacodes Ell. & Holw., leaf spot.
+*West Virginia - Charleston, September 3. (Archer)
Tylenchus dipsaci (Kuehn) Bast., stem nematode.
+*Connecticut - New Haven, July 3. Collected by G. P. Clinton, determined by G. Steiner.
+Mosaic
New York - Steuben County, September 1. (Massey)

PITTOSPORUM SP., pittosporum
+Cercospora sp., leaf spot.
Georgia - in severe infections a marked yellowing and a subsequent dropping of leaves is produced; Thomasville, January. (Boyd)

POINSETTIA PULCHERRIMA, poinsettia.
Phymatotrichum omnivorum (Shear) Dug., root rot.
+Texas - Gollard and Hidalgo Counties. (Taubenhaus)

POLYSTICHUM ACROSTICHOIDES, Christmas fern.
Taphrina filicina Rostr.
+*Maine - York, June. Received from W. T. Councilman, determined by Freeman Weiss.

PRIMULA OBCONICA, top primrose.
+*Tylenchus dipsaci (Kuehn) Bast.
Pennsylvania - Willow Grove, February 28. Collected by F. F. Smith, determined by N. A. Cobb, (Pl. Dis. Reporter 12: 11. 1928)

RHODODENDRON SPP., rhododendron.
+Botrytis cinerea Auct., tip blight.
New Jersey - Cumberland County, May 29. (White)
+Cercospora rhododendri March & Verpl., leaf spot.
New Jersey - Cumberland County, June 21. (White)
Gloeosporium sp., anthracnose.
+New York - September 10. (Massey)
+Gloeosporium rhododendri Berk. & Curt.
Maryland - (Waterman)
+Pestalozzia macrostricha Kleb., leaf spot.
New Jersey - Cumberland, June 21. (White)
+Phytophthora cactorum (Leb. & Cohn) Schroet., die-back.
New Jersey - Bergen County, June 15. (White)

ROSA SPP., rose.
Bacterium tumefaciens EFS. & Towns., crown gall.
Reported from Massachusetts, Pennsylvania, Mississippi, Texas, Iowa, +Kansas, Michigan, Wisconsin, Arizona, +Utah.
Botrytis sp., cinerea type, bud blight.
Reported from New York, Virginia, Mississippi, Texas, Washington.
Cylindrocladium scoparium Morgan, crown canker.
New York - local; heavy loss; on Supreme roses under glass; Suffolk County. (Massey)
Diaporthe umbrina Jenkins, brown canker.
Reported from Rhode Island, New York, New Jersey, Pennsylvania, Delaware, District of Columbia, Maryland, Virginia, Florida, Mississippi, +Arkansas.

Diplocarpon rosae Wolf, black spot.
Reported from Massachusetts, Rhode Island, New York, New Jersey, Pennsylvania, Delaware, District of Columbia, Maryland, Virginia, West Virginia, North Carolina, Florida, Tennessee, Alabama, Mississippi, Louisiana, Texas, Oklahoma, Arkansas, Ohio, Indiana, Michigan, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Montana, Washington, Oregon.
Gloeosporium rosae Hals., twig blight.
Reported from Pennsylvania +Florida, Mississippi, Texas.
+*Hyaloceras depazeoides (Otth.) Berner.
Kansas - (Martin)
Leptosphaeria coniothyrium (Fckl.) Sacc., cane blight.
Reported from +Rhode Island, New Jersey, Pennsylvania, Maryland, District of Columbia, Virginia, West Virginia, Mississippi, Texas, Indiana, Minnesota.
+Myxosporium rosae Fckl.
*Connecticut - Washington. Received August 1927. (Martin)
Sphaerotheca pannosa (Wallr.) Lev., powdery mildew.
Reported from Massachusetts, +Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, District of Columbia, Maryland, Virginia, West Virginia, Tennessee, North Carolina, Florida, Mississippi, Louisiana, Texas, Arkansas, Ohio, Michigan, Wisconsin, Iowa, Missouri, Kansas, Colorado, New Mexico, Arizona, Utah, Washington, Oregon.
Tubercularia sp.
+*New York - on foliage; Bronx Park, September. Collected by B. O. Dodge, determined by Anna E. Jenkins.
+*Florida - on foliage; Oneco, September 13. Collected and determined by Anna E. Jenkins. Pl. Dis. Reporter 12: 126. 1928.
P.r.:-on stems, West Virginia.
Chlorosis - undetermined.
A report on this disease has been published by R. P. White, New Jersey Experiment Station (Pl. Dis. Reporter 12: 33-34. 1928).
It has also been reported from Massachusetts (White), Pennsylvania (McCubbin) and West Virginia (Archer).

RUDBECKIA LACINIATA, golden glow.
Erysiphe cichoracearum DC., powdery mildew.
+New Jersey - local; Middlesex County, September 11. (White)
+*Montana - Yellowstone County, July 28. (Young)

SALVIA SPP., sage.
+Aphelenchus sp., leaf spot.
Delaware - Wilmington, October 7. (Adams)
+Sphaeropsis salviae Hollos.
Mississippi - Brookhaven, July 30. (Martin, Pl. Dis. Reporter 12: 81. 1928).

SEDUM TELEPHIUM, live forever.
+Pleospora sp., leaf spot.
*New York - New York City, September 18. (A. Fenner)

SPIRAEA SP., spiraea.
+Leptothyrium vulgare (Fr.) Sacc.
*West Virginia - Charleston, September 4. (Archer)

SYMPHORICARPOS SPP., snowberry.
+Cladosporium sp.
Maryland and Virginia - (Martin)
+Glomerella cingulata (Ston.) Spauld. & Schrenk., anthracnose.
Massachusetts - general. (Davis)
Maryland - Rockville, November 6. (Martin)
Virginia - Falls Church, September 21. (Martin)
See Bibl. Davis (5)
+Sphaceloma symphoricarpi Barrus & Horsfall, anthracnose.
New York - scattered; Ithaca, June 1. (Horsfall)
*Maryland - Grantsville, August 25, 1927. Collected and determined by Anna E. Jenkins.

SYRINGA VULGARIS, lilac.
Bacterium syringae C. O. Smith, blight.
+Maine - Castine, August 15. (Folsom), (Bryan, Pl. Dis. Reporter 12: 99. 1928).
+New Jersey - general; Summit, June 5. (White)
+Washington - King, Kitsap, Pacific, and Pierce Counties, April 10. (Dept. Pl. Path.)
See Bibl. Bryan (2)
Botrytis cinerea Auct., blossom blight.
+Massachusetts - (Waterman)
+New York - Genesee, July 21. (Massey)
+Caconema radicicola (Greef) Cobb, root knot.
*Maryland - on S. dilatata; Bell, November 22. Collected by Bruman and Sanford, determined by N. A. Cobb.
+Phymatotrichum omnivorum (Shear) Dug., root rot.
Texas - (Taubenhaus and Dana)

TAMARIX SP., tamarix.
+Phymatotrichum omnivorum (Shear) Dug., root rot.
Texas - very common in nurseries. (Taubenhaus and Dana)

TELANTHERA BETTZICKIANA, garden alternanthera.
+Fusarium sp., elegans sect., wilt.
New Jersey - local; Essex County, January 30. (White)

TULIPA SP., tulip.
Botrytis tulipae (Lib.) E. F. Hopkins, botrytis blight.
Reported from Massachusetts, +Connecticut, New York, New Jersey, Delaware, Virginia, Michigan, Wisconsin, +North Dakota, Washington, Oregon.
Penicillium sp., rot.
Oregon - general. (Brierley)
+Sclerotium rolfsii Sacc., stem rot.
*Georgia - Atlanta, July. (Weiss)
Mosaic - undetermined.
+New York - not prevalent or serious; some "breaking" of the flowers noted; Yonkers, May 24. (Guterman)

+Oregon - general; Corvallis, March 2. (Brierley)

VIBURNUM SPP., viburnum.
+Cladosporium sp.
*Mississippi - Columbia, November. (Martin)
+Coniothyrium sp., leaf spot.
*New York - Dutchess County. (Welch)

DISEASES OF MISCELLANEOUS HOSTS

AMBROSIA ELATIOR
Aster yellows, +*District of Columbia (Ludwig, Pl. Dis. Reporter 12: 30. 1928)

BRASSICA NAPUS
+Plasmodiophora brassicae Wor., club root. New Jersey.

CHAMAECRISTA NICTITANS
+Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.

CIRSIUM ARVENSE
Sclerotinia sclerotiorum (Lib.) Massee, drop. +*Montana.

CROTALARIA SPP.
+Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.

ELEPHANTOPUS SP.
Coleosporium elephantopidis (Schw.) Thuem., rust. +*Georgia.

HUMULUS LUPULUS
Plasmopara humuli Miyabe & Tak., downy mildew. +New York.

LAVATERA SP.
+Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.

PHYTOLACCA SP.
+Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.
Mosaic, undetermined. +Delaware.

RIBES ODORATUM
+Pseudopeziza ribis Kleb., leaf spot. *Montana.

SESBANIA SP.
+Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.

SHEPHERDIA ARGENTEA
+Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.

SOLANUM CAROLINENSE
+Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.
+Verticillium alboatrum Reinke & Berth., wilt. New Jersey.

TRAGIA SP.
+Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.

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12. ____________ Wire-screen fences for the control of aster yellows. (Abst.) Phytopath. 19: 100. 1929.

13. McCulloch, L., and C. Thom. A rot of gladiolus corms caused by Pennicillium gladioli L. McC. and Thom. Jour. Agr. Res. 36: 217-224. 1928.

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18. Poos, F. W. Bulb sterilizers used in Virginia. Flor. Rev. 62 (1591): 29-30. 1928.

19. S., G. R. Nematode gall and Lemoine disease. Flow. Grow. 15: 357. 1928.

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23. Weiss, Freeman. The basal rot of narcissus bulbs caused by Fusarium sp. (Abst.) Phytopath. 19: 99-100. 1929.

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BUREAU OF
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UNITED STATES DEPARTMENT OF AGRICULTURE

INDEX OF ORGANISMS AND NON-PARASITIC DISEASES IN THE PLANT DISEASE REPORTER SUPPLEMENTS LXVII - LXXIII, 1929

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Prepared by Mary G. Van Meter

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ERRATA AND EXPLANATION

Page

38 Read "Eutettix tenella" instead of "E. tenellus".

45 Read "Caconema radicicola" instead of "Caconeman".

57 Read "Diaporthe phaseolorum" instead of "D. phaseolarum".

78 Read "Bacillus tracheiphilus" instead of "B. tracheiphillus".

88 Read "Pseudoperonospora humuli" instead of "P. humili".

91 Read "Gloeosporium piperatum" instead of "G. piperitum".

146 Read "Bacterium spp." instead of "Bacterial spp."

210 Read "Xylaria mali" instead of "Xylari".

236 Read "Pezizella" instead of "Pezella".

244 Read "Gymnoconia interstitialis" instead of "G. interstitalis".

266 Read "Puccinia graminis" instead of "Puccini".

283 Read "Gibberella saubinetii" instead of "G. saubinetti".

315 Read "Uromyces nerviphila" instead of "U. nerviphilia".

320 Read "Epichloe typhina" instead of "Epichloa".

Read "Holcus" instead of "Halcus", also page 321.

321 Read "Sphacelotheca sorghi" instead of "Sphaceloteca".

349 Read "Alternaria fasciculata" instead of "A. fasiculata".

350 Read "Cercospora omphakodes" instead of "C. omphacodes", also page 391.

360 Read "Septoria prunellae" instead of "S. brunellae".

361 Read "Rhus typhina" instead of "Rhus typina".

387 Read "Erostrotheca multiformis" instead of "E. multiflormis.

394 Read "Coleosporium elephantopodis" instead of "C. elephantopidis".