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Diseases of Plants in the United States in 1929

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BUREAU OF
PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

DISEASES OF PLANTS IN THE UNITED STATES IN 1929.

Prepared by

R. J. Haskell, Pathologist in Charge, Plant Disease Survey, and Jessie I. Wood, Assistant Pathologist, Plant Disease Survey, Bureau of Plant Industry.

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INTRODUCTION

The summary of plant diseases in the United States in 1929 differs from those of other years both in size and in content. The earlier summaries occupied several separate Supplements of the Plant Disease Reporter, whereas this one is short enough to be contained in one. Previous compilations included the major part of the data collected during the year. In them were reported practically all of the hosts and diseases concerning which information was received, all facts about each disease were considered, collaborators were quoted rather extensively, and in some instances the literature was reviewed and a rather complete bibliography for the year given.

In the present summary, however, only what appear to be the newer, more important, and outstanding facts are featured. New diseases, new hosts, significant deviations from normal prevalence of the common and important diseases, and losses, are emphasized. Quotations and the bibliography are reduced to a minimum.

Practically all of the important information received by the Survey during the growing season of 1929 has been published from time to time in the Plant Disease Reporter, volume 13, 1929. In the present summary these data have therefore been omitted, but in connection with each disease the references to volume 13 of the Reporter are given at the end of the discussion, e.g. P.D.R. pages 56,

86. Other references are listed in the bibliography at the end of the summary, and are indicated in the text by figures in parentheses.

In preparing this summary it has been the intention of the compilers to make the statements for each disease as brief as is consistent with bringing out the essential facts. Therefore, it has been necessary, in most cases, to omit the names of the persons who have contributed the information. Emphasis has been placed on disease distribution and losses. Control measures and varietal susceptibility have not been stressed.

This summary is made possible by the continued cooperation of collaborators of the Plant Disease Survey, whose names and addresses follow. It is very largely a result of their contributions. Considerable information has also been supplied by members of various offices in the Bureau of Plant Industry, located both in Washington and in the field. It is especially desired to thank the Offices of Cereal Crops and Diseases, Horticultural Crops and Diseases, Forage Crops, Sugar Plants, Forest Pathology, Blister Rust Control, Nematology, and Barberry Eradication for furnishing information and for reviewing the sections of this report coming within the field of their activities.

LIST OF COLLABORATORS FOR THE YEAR 1929

* = chief collaborator ° = unofficial

ALABAMA, Agricultural Experiment Station, Auburn - W. A. Gardner, *J. L. Seal.

ARIZONA, University of Arizona, Tucson - *J. G. Brown.
State Commission of Agriculture, Phoenix - D. C. George.

ARKANSAS, Agricultural Experiment Station, Fayetteville - H. R. Rosen, *V. H. Young.
University of Arkansas, Fayetteville - C. Woolsey.

CALIFORNIA, University of California, Berkeley - J. T. Barrett, H. E. Thomas.
Citrus Experiment Station, Riverside - E. T. Bartholomew, *W. T. Horne.
Agricultural Experiment Station, Davis - J. B. Kendrick.
Southern Branch, University of California, Los Angeles - C. A. Plunkett.
State Department of Agriculture, Sacramento - *°D. G. Milbrath.

COLORADO, Agricultural College, Fort Collins - *L. W. Durrell.

CONNECTICUT, Tobacco Experiment Station, Windsor - P. J. Anderson.
Agricultural Experiment Station, New Haven - *G. P. Clinton, E. M. Stoddard.

DELAWARE, Agricultural Experiment Station, Newark - *J. F. Adams.

FLORIDA, Agricultural Experiment Station, Gainesville - *W. B. Tisdale, G. F. Weber.
P. O. Plant City - A. N. Brooks.
P. O. Hastings - L. O. Gratz.
P. O. Cocoa - A. S. Rhoads.

GEORGIA, State College of Agriculture, Athens - T. H. McHatton, M. B. McKay, J. H. Miller.
P. O. Albany - *O. C. Boyd.

IDAHO, University of Idaho, Moscow - *°C. W. Hungerford.

ILLINOIS, University of Illinois, Urbana - *H. W. Anderson, G. H. Dungan, B. Koehler, J. W. Lloyd, G. A. Meckstroth, F. L. Stevens.
State Natural History Survey, Urbana - *L. R. Tehon, G. L. Stout.

INDIANA, Agricultural Experiment Station, Lafayette - *M. W. Gardner.
Purdue University, Lafayette - C. L. Porter.

IOWA, Iowa State College, Ames - *I. E. Melhus, J. C. Gilman, R. H. Porter.
Iowa State Teachers' College, Cedar Falls - C. W. Lantz.
Upper Iowa University, Fayette - G. W. Wilson.

KANSAS, State Agricultural College, Manhattan - O. H. Elmer, *°L. E. Melchers.

KENTUCKY, Agricultural Experiment Station, Lexington - *W. D. Valleau.
University of Kentucky, Lexington - J. S. Gardner, R. Kenney, W. W. Magill.

LOUISIANA, Agricultural Experiment Station, Baton Rouge - *C. W. Edgerton, A. C. Plakidas, E. C. Tims.

MAINE, Agricultural Experiment Station, Orono - *D. Folsom, R. Bonde.

MARYLAND, Agricultural Experiment Station, College Park - J. B. S. Norton.
State Agricultural College, College Park - *R. A. Jehle, C. E. Temple.

MASSACHUSETTS, State Agricultural College, Amherst - *W. H. Davis, W. L. Doran, A. V. Osmun.
Harvard University, Cambridge - C. W. Dodge.
Market Garden Field Station, Waltham - E. F. Guba.

MICHIGAN, State Agricultural College, East Lansing - E. A. Bessey, J. H. Muncie, *R. Nelson.

MINNESOTA, University of Minnesota, St. Paul - Louise Dosdall, J. G. Leach, *°E. C. Stakman.

MISSISSIPPI, Agricultural Experiment Station, A. & M. College - J. M. Beal, L. M. Fenner, *L. E. Miles.

MISSOURI, Missouri Research Museum, Jefferson City - A. C. Burrill.
Agricultural Experiment Station, Columbia - W. E. Maneval, *I. T. Scott.

MONTANA, Agricultural Experiment Station, Bozeman - H. E. Morris, D. B. Swingle, *P. A. Young.

NEBRASKA, State College of Agriculture, Lincoln - R. W. Goss, *G. L. Peltier.

NEVADA, Agricultural Experiment Station, Reno - *P. A. Lehenbaur.

NEW HAMPSHIRE, Agricultural Experiment Station, Durham - *O. R. Butler.
Dartmouth College, Hanover - A. H. Chivers.

NEW JERSEY, Agricultural Experiment Station, New Brunswick - C. M. Haenseler, *°W. H. Martin, R. P. White.

NEW MEXICO, State Agricultural College, State College - *R. F. Crawford.

NEW YORK, New York State College of Agriculture, Ithaca - M. F. Barrus, F. M. Blodgett, *C. Chupp, H. M. Fitzpatrick, L. M. Massey, H. H. Whetzel.
Agricultural Experiment Station, Geneva - W. H. Rankin.
Syracuse University, Syracuse - E. Reed.

NORTH CAROLINA, State College of Agriculture, Raleigh - *G. W. Fant, R. F. Poole.

NORTH DAKOTA, Agricultural Experiment Station, Fargo - H. L. Bolley, *W. E. Brentzel.

OHIO, Agricultural Experiment Station, Wooster - Fredericka Detmers, C. May, R. C. Thomas, P. Tilford, *H. C. Young.
University of Cincinnati, Cincinnati - O. T. Wilson.

OKLAHOMA, Agricultural Experiment Station, Stillwater - *F. M. Rolfs.
Agricultural & Mechanical College, Stillwater - R. Stratton.
P. O. Durant - W. L. Blain.

OREGON, Agricultural Experiment Station, Corvallis - *H. P. Barss, S. M. Zeller.
Experiment Station, Hood River - L. Childs.

PENNSYLVANIA, Pennsylvania State College, State College - F. D. Kern, R. S. Kirby, E. L. Nixon, L. O. Overholtz, *H. W. Thurston, G. L. Zundel.
Field Laboratory, Bustleton - W. S. Beach.

RHODE ISLAND, State College, Kingston - *H. W. Browning.

SOUTH CAROLINA, Agricultural Experiment Station, Clemson College - *G. M. Armstrong.
Agricultural College, Clemson College - D. B. Rosenkrans.
Wofford College, Spartanburg - C. B. Waller.

SOUTH DAKOTA, P. O. Northville - J. F. Brenckle.

TENNESSEE, Agricultural Experiment Station, Knoxville - J. O. Andes, J. L. Baskin, S. H. Essary, H. L. Fackler, J. A. McClintock, *C. D. Sherbakoff.
University of Tennessee, Knoxville - L. R. Hesler, H. M. Jennison, N. D. Peacock.

TEXAS, Agricultural Experiment Station, College Station - *J. J. Taubenhaus.
Substation No. 15, Weslaco - W. J. Bach.
Substation No. 5, Temple - B. F. Dana.
Prairie View Normal School, Prairie View - G. H. Dickerson.

UTAH, State Agricultural College, Logan - *B. L. Richards.

VERMONT, Agricultural Experiment Station, Burlington - *°B. F. Lutman.

VIRGINIA, Agricultural Experiment Station, Blacksburg - R. H. Hurt, A. B. Massey, *S. A. Wingard.
Virginia Truck Experiment Station, Norfolk - F. P. McWhorter.
Hampton Institute, Hampton - T. W. Turner.

WASHINGTON, Agricultural Experiment Station, Pullman - *F. D. Heald, L. K. Jones.
Western Washington Experiment Station, Luyallup - G. A. Newton.
P. O. Long Beach - D. J. Crowley.

WEST VIRGINIA, Agricultural Experiment Station, Morgantown - A. Berg, *C. R. Orton, E. C. Sherwood.
P. O. Martinsburg - F. J. Schneiderhan.

WISCONSIN, University of Wisconsin, Madison - L. R. Jones, G. W. Keitt, *R. E. Vaughan.

WYOMING, University of Wyoming, Laramie - *J. S. Wiant.

HAWAII, Experiment Station Association Hawaiian Pineapple Canners, Honolulu - G. H. Godfrey, M. B. Linford, C. P. Sideris.

HAITI, Service Technique, Port au Prince - H. D. Barker.

CUBA, Central Baragua, Baragua, Province De Camaguey - J. A. Faris.

PHILIPPINE ISLANDS, Bureau of Science, Manila - C. J. Humphrey.

PORTO RICO, Insular Experiment Station, Rio Piedras - *M. T. Cook, J. A. B. Nolla.

WEATHER CONDITIONS

The following brief statement of the outstanding weather conditions affecting crops during the growing season of 1929 is taken from the Weekly Weather and Crop Bulletin of the United States Department of Agriculture, for the week ending January 14, 1930.

"During the growing season there were two outstanding adverse conditions with regard to rainfall. Too much moisture was harmful in the early spring in most central valley sections and greatly delayed the planting of corn; later in the season, especially during the latter part of July and in August, many sections had damaging drought. This latter was most severe between the Mississippi River and Rocky Mountains, but was generally widespread in character, and, as a result, spring-planted crops were rather widely damaged. The fall, however, was unusually favorable for maturing late crops, without widespread, serious damage from frost.

"Winter wheat largely escaped the drought, as it had mostly matured, but spring wheat was caught rather badly, with resulting damage. In the late summer and fall there was considerable delay in the preparation of the soil and the seeding of winter wheat, because of dry weather, but opportune rains and the late fall were favorable and the crop got a good start before the winter set in, except in the dry areas of the far West.

"In the Cotton Belt temperatures during the summer were mostly moderate, and rather uniform from week to week, but there were two outstanding unfavorable aspects with regard to precipitation. In the east heavy rains during the fall months interfered with picking and damaged open staple, and a severe drought in the west the latter part of the season was unfavorable for the growth and development of cotton, but favored holding the boll weevil in check."

A summary for the fall season of 1929 - September to November, inclusive, taken from the December 17, 1929, issue of the same periodical, shows that the outstanding features were the generous to excessive precipitation over large areas east of the Rocky Mountains, and the very large deficiencies west of them. Quoting further:

> "From the Ohio Valley eastward and southward, except locally in the Southeast, the amount of rainfall for the 3-month period was mostly from 150 to as high as 300 per cent of the normal for the season, while nearly all sections between the Mississippi River and Rocky Mountains show excesses, locally amounting to 200 per cent. Between these areas there is charted a belt of somewhat less than the normal amount, and moderate deficiencies appear in the northeast. West of the Rocky Mountains it was one of the driest falls of record, with the percentage of normal precipitation ranging from zero to only 50 per cent over nearly all of the area, and with most of it having less than 25 per cent of the normal amount."

D I S E A S E S O F C E R E A L C R O P S

W H E A T

STINKING SMUTS (Tilletia laevis and T. tritici). These smuts (T. laevis in the East and the Great Plains area; T. tritici chiefly in the Northwest and on the Pacific Coast) continued destructive in 1929. In general, however, the losses (see table 1) were probably lower for the country as a whole than they have been for the last three or four seasons. The epiphytotic of recent years in the Middle Atlantic States continued to subside. For instance, in Pennsylvania stinking smut was approximately one-half as destructive as in 1928, and slightly more than one-fourth as destructive as in 1927. In Kansas, where an outbreak occurred during the period 1924 to 1926, seed treatment has gradually reduced stinking smut until the losses this year averaged about 3 per cent for the State, and these were mostly in non-Farm Bureau Counties where seed treatment has not been urged. From Colorado comes the report that practically every farmer treats his seed with copper carbonate, and the losses were estimated at only 0.2 per cent as compared with 8 per cent in 1926. In California copper carbonate is almost universally used, and seems to have held the losses for the State down to about 0.5 per cent.

One of the outstanding features in connection with this disease has been its increase in durum wheat during the past few years. Ten years ago only from one to 2 per cent of the cars of hard red spring and durum wheat received at Minneapolis graded smutty, but during the last five years there has been a decided growth in the percentage of smutty cars, to about 14 per cent in 1928 and 11.5 per cent for the months of September and October, 1929. It is becoming evident that this increase is due to the spread of specialized physiologic forms of the fungus.

P.D.R. pages 56, 86, 87, 123, 168, 169, 170.

Table 1. Losses from stinking smut of wheat as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
6	Idaho	1	Texas
5	Washington	.5	Delaware, Indiana, California
4	Maryland, North Carolina	.4	Wisconsin
3	Virginia, Nebraska, Kansas, Oregon	.2	Colorado
2	Pennsylvania	Trace	West Virginia, Illinois, Michigan, Iowa, Missouri, Arkansas
1.5	Ohio, Minnesota, North Dakota, Montana		

LOOSE SMUT (Ustilago tritici). The usual situation appeared to exist as far as this disease was concerned, the loss for the country being about average which is slightly over one per cent. Notable exceptions were Missouri, North Dakota and Kansas. In Missouri it was said to have been one of the worst years for loose smut, the estimated losses averaging 4 per cent. In North Dakota favorable weather for infection in 1928 resulted in increased amounts - about 2.5 per cent and as high as 10 per cent was observed in some fields. In Kansas it was more prevalent than usual, especially in the northeastern part, but the losses did not average over a trace for the State as a whole. Field observations in Pennsylvania showed that the varieties Leap and Forward continued to be resistant. Percentage losses are given in table 2.

P.D.R. pages 56, 87, 105, 123.

Table 2. Losses from loose smut of wheat as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
4	Missouri	.5	Maryland, Indiana, Idaho
2.5	Virginia, North Dakota	.1	Montana
1.8	Pennsylvania	Trace	Delaware, South Carolina, Wisconsin, Minnesota, Kansas, Colorado, Washington, Oregon, California
1.5	North Carolina		
1	Texas, Ohio, Iowa		
.7	Illinois		

FLAG SMUT (Urocystis tritici). Figure 1 shows the known geographic distribution of flag smut in the United States as reported up to the present time. In 1929 the Illinois State Department of Agriculture examined a total of 66 fields in areas of Illinois where flag smut has occurred in the past. These fields were located in four counties, as follows: Madison 11, St. Clair 23, Jersey 27, and Logan 5. No flag smut was found. In 1921 inspections in the same areas in Madison County showed 60 per cent infested fields, and in St. Clair County 42 per cent. Since 1921 there have been several winters during which wheat has been killed and consequently flag smut reduced - infected plants being more susceptible to winter killing than uninfected.

No inspections were made and no reports were received from the other two states in which this disease was formerly reported, namely, Missouri and Kansas. Plans are being made for an inspection of these areas in 1930.

P.D.R. pages 29, 168.

STEM RUST (Puccinia graminis tritici). 1929 cannot be considered a stem rust year, as the damage for the country as a whole was comparatively slight. The disease was not so serious as in 1927 but more so than in 1928 when the losses were considerably less than usual. In Minnesota and in parts of North and South Dakota, where the disease is usually most serious, stem rust and drought damage together caused rather heavy losses. A 15 per cent loss was estimated for Minnesota. In northeastern South Dakota losses to spring wheat other than durum in sixteen counties averaged 8 to 10 per cent, but for the State as a whole only 4.14 per cent for these wheats and 3 per cent for all wheat was estimated. The loss for North Dakota was estimated at one per cent as compared with 0.5 per cent in 1928 and 10 per cent in 1927. As will be noted from table 3 the only other states estimating one per cent or more were Ohio with 1.5 per cent, Wisconsin with 4.5 per cent, and Kansas with one per cent. A noteworthy feature of the year was unusual prevalence in some of the Eastern States where stem rust is ordinarily of slight importance. In Pennsylvania it was found in 51 of the 121 fields surveyed. In North Carolina 0.5 per cent loss was estimated as compared with a trace for the three previous years. In parts of Georgia stem rust was said to be very serious, while several very heavy local epiphytotics were reported from Texas. In Kansas, owing to the unusually moist season, the disease was more prevalent than it has been for several years, but infection came very late and the rust did damage only in the central part of the State.

P.D.R. pages 24, 30, 56, 68, 69, 84, 171.

Table 3. Losses from stem rust of wheat as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
15	Minnesota	.5	Pennsylvania, Virginia, North Carolina, Texas, Indiana, Illinois
4.5	Wisconsin		
3	South Dakota	.3	Iowa
1.5	Ohio	Trace	Massachusetts, Maryland, South Carolina, Michigan, Missouri, Nebraska, Arkansas, Montana, Wyoming, Colorado, Idaho, Washington, California
1	North Dakota, Kansas		

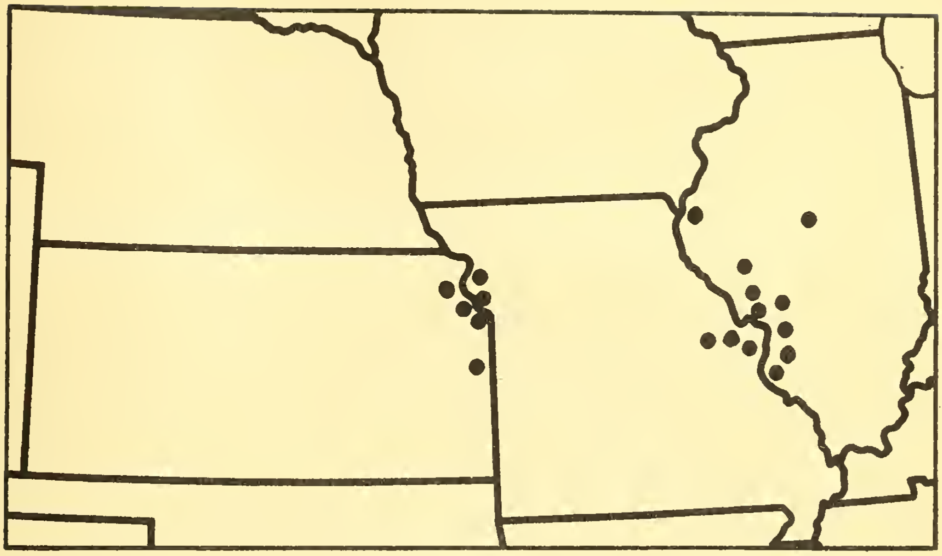


Figure 1. Known distribution of flag smut of wheat in the United States. Each dot represents a county from which the disease has been reported at some time in the past. No flag smut was reported in 1929.

Counties in which flag smut has been found:

Illinois	Missouri	Kansas
Madison	St. Louis	Leavenworth
St. Clair	St. Charles	Atchison
Monroe	Warren	Wyandotte
Jersey	Platte	Miami
Macoupin	Buchanan	
Greene		
Scott		
Logan		
Hancock		

LEAF RUST (*Puccinia triticina*). In prevalence leaf rust was somewhat above the average, more than usual being reported from the majority of the eastern winter-wheat States where it is usually most important. In the Northwest and in California, however, much less than normal occurred, apparently on account of dry weather. Estimated percentages of loss are given in table 4.

In Pennsylvania the most destructive leaf rust epiphytotic of recent years was reported. It became general several weeks earlier than usual and by heading time there was 70 to 100 per cent leaf and considerable stem infection. Leaves were killed two weeks earlier than normal resulting in a general shriveling of the grain and lowering of the test weight. The loss for the State was estimated at 15 per cent or from 4 to 8 bushels per acre.

P.D.R. pages 23, 31, 56, 68, 69, 85.

Table 4. Losses from leaf rust of wheat as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
15	Pennsylvania	1	Michigan, Missouri
8	Iowa	.5	Maryland, Texas, Ohio, Illinois, Minnesota
4	Indiana		
3.5	North Carolina	Trace	Delaware, North Dakota, Nebraska, Arkansas, Montana, Colorado, Idaho, Washington Oregon, California
3	Virginia, South Carolina, Kansas		
1.5	Wisconsin		

SCAB (*Gibberella saubinetii*). In 1928 scab caused considerable damage in the northern tier of eastern wheat States, including the spring wheat area, but in 1929 the area of greatest prevalence was farther south and west, centering in the central Mississippi Valley. The soft red winter wheat States of the Atlantic Coast largely escaped serious damage.

Kansas experienced the most severe outbreak in years. Scab is normally of very slight importance in that State but in 1929 many fields in the eastern half showed 25 per cent infected heads, while 40 to 50 per cent was not unusual. The average loss for eastern Kansas was placed at 10 per cent, and for the entire State at 2 per cent. With Kansas producing some 138,000,000 bushels of wheat this loss would approach 3,000,000 bushels. Extremely wet and unseasonable weather of June was thought to be responsible for this outbreak as well as for the unusual prevalence of certain other diseases.

In Arkansas the disease was much more prevalent than ever noted before. As much as 2 per cent loss occurred in certain fields. In Missouri, where weather conditions were similar to those in Kansas, serious infection also occurred, but relatively late in the season owing to the rather low temperatures of the spring months. From Nebraska the first report since 1923 was received. See also report by Dickson under barley (page 15). Estimated percentages of loss are given in table 5.

P.D.R. pages 56, 68, 85, 86, 122.

Table 5. Losses from wheat scab as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
4	Missouri	1	Ohio, North Dakota
3	Indiana	.5	Pennsylvania, North Carolina, Texas, Wisconsin, Minnesota
2.5	Illinois		
2	Virginia, Kansas	.4	Iowa
1.5	Maryland, Michigan	Trace	Delaware, South Carolina, Arkansas

ANTHRACNOSE (Colletotrichum graminicolum). Anthracnose again caused a decided reduction in yield and shriveled grain in many Pennsylvania fields. It was said to be present in nearly every field. The estimated loss for the State was one per cent. It was said to be prevalent in Illinois but caused only a trace of damage. In Indiana a loss of 0.5 per cent was estimated. It was unusually prevalent and injurious in eastern and southeastern South Dakota.
P.D.R. pages 56, 68, 85.

GLUME BLOTCH (Septoria nodorum). Losses from this disease were estimated as follows: 2 per cent, Pennsylvania and Maryland; 0.5 per cent, Indiana; 0.2 per cent, Missouri; trace, Illinois.
P.D.R. pages 56, 85.

SPECKLED LEAF BLOTCH (Septoria tritici). This disease assumed epidemic proportions in Texas, Oklahoma, Kansas, and in parts of Missouri and Iowa. In Kansas and Oklahoma many fields of hard red winter wheat were practically defoliated long before maturity, resulting in light-weight grain. In Missouri the principal outbreak was in the lowlands of the southeastern part of the State, where many plants were entirely killed or at least so badly damaged early in the season as to seriously stunt them. Losses were estimated as follows: 1 per cent, Indiana and Kansas; 0.5 per cent, Illinois; trace, Pennsylvania, Missouri, and Iowa.
P.D.R. pages 24, 31, 56, 86.

BLACK CHAFF (Bacterium translucens undulosum). This disease, suspected of having been introduced with wheat from Russia some thirty or more years ago, was reported in 1929 as occurring to a very slight extent in Illinois, Wisconsin, Minnesota, Iowa, Nebraska, Kansas, Montana, and Idaho. The only two states reporting it as of any particular importance were North Dakota with an estimate of 0.25 per cent loss, and Kansas, where it appeared late but caused rather serious losses in the central part just before harvest.
P.D.R. page 86.

HELMINTHOSPORIUM FOOT ROT (Helminthosporium sativum and other organisms). One of the most widely prevalent and certainly one of the most destructive diseases of wheat in Minnesota, North Dakota, and South Dakota, in 1929, (moreso in 1928) was that complex roughly classified as "foot rot", but due largely to

Helminthosporium sativum. In my opinion, foot rot causes annually more damage than does stem rust. (H. B. Humphrey)

In portions of Hale and Castro Counties, Texas, in Canadian, Kingfisher and Garfield Counties, Oklahoma, and in Sumner County, Kansas, this foot rot of wheat was very destructive. In some cases losses as high as 90 per cent of the crop occurred. (Summarized by A. G. Johnson from a report by Hurley Fellows)

TAKE-ALL (Ophiobolus graminis). Six areas two to five feet in diameter were found in a wheat field at Bowers, Berks County, Pennsylvania, on June 27, to be infested with take-all. Typical perithecia and ascospores were found. This is the first report of this disease in Pennsylvania. (R. S. Kirby)

Take-all occurred with considerable severity in portions of Grant, Garfield and Kingfisher Counties in Oklahoma; and in the following counties of Kansas: Pottawatomie, Riley, Geary, Dickinson, Saline, McPherson, Rice, Reno, Stafford, Kingman, Harper, Sumner, Sedgwick, Harvey, Marion, and Morris. In some of these counties the disease was very destructive on a number of farms. (Summarized by A. G. Johnson from a report by Hurley Fellows).

P.D.R. page 85.

SCLEROTIUM BLIGHT (Typhula graminum). First reported to the Survey as occurring in the United States in 1922 from Idaho. Since then it has been reported also from Washington and Montana. It is capable of causing considerable damage locally to winter wheat, killing out large patches or sometimes entire fields, early in the season. In 1929 it was reported as occurring locally in Montana and Idaho. In Gallatin County, Montana, it was serious in some fields with estimated losses as follows:

100 per cent	- 80 acres	30 per cent	- 80 acres
95 "	- 80 "	25 "	- 100 "
75 "	- 5 "	15 "	- 145 "
50 "	- 230 "	10 "	- 140 "

P.D.R. 23, 70.

CRINKLE-JOINT (undet.) Considerable damage reported in North Dakota and Kansas. In this disease the straw breaks over between nodes, causing a type of lodging, growth is then resumed resulting in a right-angled bend in the straw at the first node above the break. The heads formed on this straw are usually poorly filled or empty. The exact cause is not known. Farmers have attributed it to hail but it often occurs in the absence of hail. In Kansas some fields showed 4 to 5 per cent of the culms affected in this manner and the reduction in yield for the State is estimated at 1 per cent.

P.D.R. pages 56, 86.

BASAL GLUME ROT (Bacterium atrofaciens). P.D.R. pages 56, 86.

ERGOT (Claviceps purpurea). P.D.R. page 87.

FOOT ROT (Helminthosporium spp.) P.D.R. pages 23, 69, 87.

NEMATODE (Tylenchus tritici). P.D.R. page 105.

POWDERY MILDEW (Erysiphe graminis). P.D.R. pages 22, 86.

ROOT ROT (?) P.D.R. page 31.

R Y E

STEM RUST (Puccinia graminis). Was generally reported as of the usual slight importance or less, all states reporting only a trace of loss.
P.D.R. page 171.

LEAF RUST (Puccinia dispersa). Seemed to be somewhat above the average in prevalence. Losses reported were: 3 per cent in Pennsylvania, 1 per cent in Virginia, South Carolina (includes also leaf rust), Ohio, and Kansas, 0.5 per cent in Indiana, traces in other states reporting.
P.D.R. page 68.

ANTHRACNOSE (Colletotrichum graminicolum). Was reported from Pennsylvania (loss 2 per cent), North and South Carolina, Indiana (loss 1 per cent), Illinois, and Wisconsin.
P.D.R. page 68.

ERGOT (Claviceps purpurea). Losses reported: 2 per cent in Wisconsin, 1 per cent in Indiana and Minnesota, 0.1 per cent in Ohio, traces in Pennsylvania, Iowa, and North Dakota.

LEAF SPOT (Septoria secalis). Ten to 25 per cent infection of the leaves in fields observed in Iowa. (R. H. Porter)

SCAB (Gibberella saubinetii). Was reported in the area from Pennsylvania south to North Carolina and west to Iowa and Wisconsin. Ohio, Indiana, and Michigan reported more than usual; in the other states there was apparently about the average amount. Losses of more than a trace reported were: 3 per cent in Virginia, 2 per cent in Ohio, 1 per cent in Indiana and Michigan.
See reports on scab of wheat and barley for further information.

B A R L E Y

COVERED SMUT (Ustilago hordei) and LOOSE SMUT (U. nuda). These two smuts are always present and in the aggregate cause a very great loss. There is nothing in the 1929 reports to indicate much variation from normal conditions, although

Table 6. Losses from covered smut of barley as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
10	Maryland	1	Texas, Indiana, North Dakota
3	Pennsylvania, Virginia, Oregon	.5	Ohio, Minnesota, Idaho
2.5	North Carolina, Kansas	Trace	Massachusetts, Wisconsin, Iowa, Nebraska, Colorado, Washington, California
2	Montana		

covered smut was only reported more prevalent than usual from Pennsylvania, Maryland, and Kansas, while loose smut was reported more prevalent than usual from the majority of the Upper Mississippi and the Ohio Valley States. In Virginia one field of five acres was observed where these smuts together were affecting 60 per cent of the heads. Estimated losses are given in tables 6 and 7.

Table 7. Losses from loose smut of barley as estimated by collaborators, 1929.

Percentage: loss	States reporting	Percentage: loss	States reporting
6	North Carolina	0.5	Ohio, Indiana, Idaho
4	Pennsylvania	Trace	Massachusetts, Delaware, Missouri, Nebraska, Colorado, Oregon, California
2.7	Illinois		
1.5	Iowa		
1	Maryland, Virginia, Texas, Wisconsin, Minnesota, North Dakota, Kansas, Montana		

P.D.R. pages 23, 33, 60, 104, 107, 123, 169, 171.

STEM RUST (Puccinia graminis). P.D.R. pages 104, 106, 123, 171.

Table 8. Losses from stem rust of barley as estimated by collaborators, 1929.

Percentage: loss	States reporting	Percentage: loss	States reporting
4	Minnesota	Trace	Pennsylvania, Maryland, Indiana, Wisconsin, North Dakota, Colorado, Oregon, California
1	Ohio		
.5	Iowa		

LEAF RUST (Puccinia anomala). About the average conditions seemed to prevail with respect to this disease, although in Pennsylvania the heaviest infection ever recorded was reported and in Idaho it was noted for the first time in recent years on the experimental plots. Iowa and Kansas also reported more than average prevalence, although in neither state was the loss more than a trace.

P.D.R. pages 32, 106.

Table 9. Losses from leaf rust of barley as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
2	Pennsylvania	Trace	Massachusetts, Maryland, Virginia, Illinois, Wisconsin, Minnesota, Missouri, Oregon, California
1	Texas, Ohio		
.5	Indiana		

STRIPE (Helminthosporium gramineum). This is one of the most important of the barley diseases and there are some indications that it is becoming more so, at least in certain sections. Last year collaborators in Kansas reported it as apparently becoming increasingly serious, especially in the northwestern part of the State. In Iowa some fields showed 30 per cent of the plants killed. More than the normal amounts were reported from Pennsylvania, Indiana, Iowa, and Kansas. Other states reported about the usual amount. In California it seemed to be present in the usual quantity, namely, from a trace to 5 or 6 per cent, and the dry season apparently had no effect whatever on the amount of disease to be found in the fields. Losses are given in table 10.

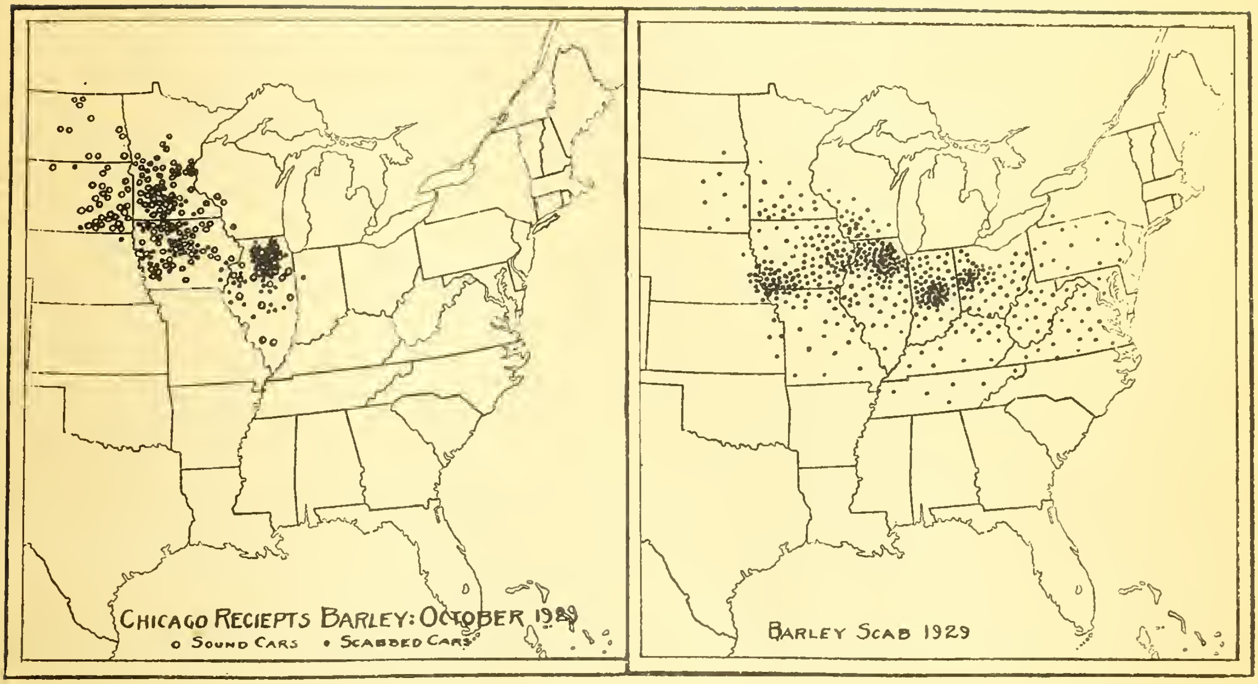
P.D.R. pages 32, 68, 104, 106, 107, 123, 169.

Table 10. Losses from barley stripe as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
6.7	Illinois	1	Virginia, Minnesota, Montana
5	Iowa		
3	California	.7	North Dakota
2.5	South Carolina	.5	Michigan
2	Texas	Trace	Delaware, Maryland, Indiana, Colorado, Idaho, Washington, Oregon
1.7	Pennsylvania		
1.5	Wisconsin, Kansas		

RUSTY BLOTCH (Helminthosporium californicum). This disease, originally reported from California in 1923 and not known to occur outside of that State, was reported by Mackie in 1929 as causing much injury in many fields, by attacking the upper leaves of the plants especially. Rusty blotch seems to be more destructive on plants suffering from drought conditions, such as prevailed last year, or other unfavorable factors. As usual it appeared late in the season, about the time the heads begin to exsert.

P.D.R. page 32.



A. Origins of cars of barley graded sound or scabby on the Chicago market for October, 1929.

B. Distribution according to 1929 field survey by Office of Cereal Crops and Diseases. Each dot represents an infested field.

Figure 2. Occurrence of barley scab. (Maps supplied by J. G. Dickson).

SCALD (Rhynchosporium secalis). Scald, which ordinarily is the most destructive cereal disease in California and which was especially injurious in 1928, was conspicuous by its absence in most areas in 1929. (W. W. Mackie)

ERGOT (Claviceps purpurea). One German variety showing about 25 per cent ergot was observed in Iowa.

P.D.R. page 107.

DOWNY MILDEW (Sclerospora macrospora). This fungus was reported for the first time on barley in this country by W. W. Mackie (41) from Kings County, California. The specimens were collected June 21, 1929. On wheat it has been reported from Tennessee and Kentucky and from this same county in California, but never before on barley.

SCAB (Gibberella saubinetii). The following report and the maps reproduced in figure 2 have been contributed by J. G. Dickson, Office of Cereal Crops and Diseases.

Scab infection on both barley and wheat was much less prevalent than in 1928 but appeared in amounts of economic importance in more or less localized areas. Sections in Virginia and part of West Virginia reported damage on both winter wheat and winter barley; local areas in Ohio and Indiana were severely damaged by scab, especially areas where barley was grown on corn land. Northern Illinois and southwestern Wisconsin were severely damaged where barley was grown on disked corn land. In this area, damage was fully as severe as in the general epidemic on barley the previous year. The scab epidemic of commercial importance during the past season occurred through Iowa, Missouri, and westward into Nebraska, Kansas, and Oklahoma. Most of the scabbed barley causing trouble in the grain trade was shipped from this area early in the season. In general, however, much less scab occurred and over a more localized area in the South Central United States.

P.D.R. pages 68, 83, 104, 107, 123.

NET BLOTCH (Helminthosporium teres). P.D.R. pages 106, 107.

POWDERY MILDEW (Erysiphe graminis). P.D.R. pages 22, 107.

SPOT BLOTCH (Helminthosporium sativum). P.D.R. pages 32, 106, 107.

OATS

SMUTS (Ustilago avenae and U. levis). These smuts, which are generally distributed with the crop, were common as usual, causing more or less damage in the different areas depending on weather conditions and the extent of seed treatment. In Missouri infection was said to be the worst in ten years. In North Carolina fall-sown oats especially were affected, while in Arkansas spring-sown oats showed from 15 to 20 per cent smut. In Kansas, where smut was very prevalent this year, it seems to be increasingly apparent that they are dealing with more than one physiologic form. According to C. O. Johnston the physiologic form which attacks Fulghum and Kanota is spreading rapidly northward and westward. Kanota fields as far north as Manhattan showed considerable smut. The combined losses from these two smuts are given in table 11.

P.D.R. pages 54, 68, 105, 106, 128, 168, 169, 170, 171.

Table 11. Losses from loose and covered smuts of oats as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
11	Missouri	4	Virginia, Ohio, Iowa
10	Pennsylvania	3	Indiana
9	North Carolina	2	Wisconsin, North Dakota, Arkansas, Texas
8	Massachusetts	1.5	South Carolina, Mississippi, Idaho
6.5	Illinois	1	Louisiana, Washington
6	Minnesota, Montana	.1	Colorado
5.2	Kansas	Trace	Delaware, Michigan, Nebraska
5	Maine, Maryland, Florida, Oregon		

STEM RUST (Puccinia graminis). Only in the states north of the Ohio and Missouri Valleys was any particular damage reported. From Pennsylvania westward to Iowa only a trace to 0.7 per cent loss was estimated. In Michigan, Wisconsin, and Minnesota, however, the damage was greater. Some fields in the lower counties of the northern peninsula of Michigan suffered 15 per cent loss, and 6.7 per cent and 3 per cent were estimated for Wisconsin and Minnesota respectively. In general the disease came late in the season and oats in the areas usually affected largely escaped. (Table 12)

P.D.R. pages 105, 106, 123, 171.

Table 12. Losses from stem rust of oats as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
3	Minnesota	Trace	Massachusetts, Maryland, Virginia, Indiana, Illinois, Iowa, Missouri, North Dakota, Nebraska, Kansas, Colorado, Idaho, Washington, Oregon, California
1	Michigan, Wisconsin		
.5	Pennsylvania, Ohio, Texas		

CROWN RUST (Puccinia coronata). Seemed to be of about the average prevalence in 1929, ten states reporting it as of the usual importance, four as less prevalent than normal, and five as more prevalent. As usual the highest percentages of loss reported occurred in the South. In Wisconsin crown rust was said to be most severe in the proximity of Rhamnus bushes, whereas in Kansas no infection could be found on R. cathartica at Manhattan and infection was

apparently all from a uredinial source. In Kansas infection developed late but became very heavy before the crop ripened and susceptible varieties dried up prematurely. (Table 13).
P.D.R. pages 33, 54, 68, 87, 105, 106, 128.

Table 13. Losses from crown rust of oats as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
40	Florida	.5	Maryland
10	Louisiana	.2	Ohio
5	South Carolina	Trace	Maine, Massachusetts, Delaware, Illinois, Michigan, Minnesota, North Dakota, Nebraska, Arkansas, Washington, Oregon, California
3	Kansas, Texas		
2	Wisconsin, Iowa		
1.5	Mississippi		
1	Pennsylvania, Indiana, Missouri		

BLAST (undet.) Reported to be on the decrease in Kansas and California, due to the replacing of white oats by resistant red oats such as Kanota. As usual, blast was one of the two most serious diseases of oats in Illinois, causing a reduction in yield estimated at 3 per cent.
P.D.R. pages 33, 68, 105, 106.

ERGOT (Claviceps purpurea). P.D.R. page 106.

HALO BLIGHT (Bacterium coronafaciens). P.D.R. page 106.

CORN

SMUT (Ustilago zeae). In prevalence smut was about normal, although an unusual amount of ear infection was reported from Connecticut, Pennsylvania, Ohio, and Iowa. In Mississippi and Arkansas it was noted as being especially prevalent in some of the overflowed river valleys where corn was planted late. Sweet corn was mentioned as being injured in Michigan, especially the early varieties, and in Minnesota. (Table 14).
P.D.R. pages 54, 107, 123, 124.

Table 14. Losses from corn smut as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
5	Ohio, Iowa, Nebraska	1	New York, South Carolina, Mississippi, Arkansas
3	Pennsylvania, Virginia, Kansas	.5	New Jersey, Delaware, Missouri, Louisiana, Texas
2.5	Florida		
2	North Carolina, Minnesota, North Dakota	.3	Maryland, Indiana
1.5	Massachusetts, Wisconsin	Trace	Montana, Colorado, Idaho, Washington, Oregon, California

DRY ROT (Diplodia zeae). Losses from dry rot were reported as follows: 7 per cent, Iowa; 3 per cent, Florida; 2 per cent, Ohio and Missouri; 1.5 per cent, Indiana; 1 per cent, Maryland and Kansas. In Florida the losses are complicated by other species of Diplodia. It was estimated that two other species caused 2.5 per cent loss. In Missouri it was thought that the early spring weather was too cool, and in Kansas it was reported that July and September were too dry for development. In both of these states the disease was less prevalent than usual.

ROOT ROTS and EAR ROTS (caused by various fungi). Gibberella saubinetii, Pythium sp., and Fusarium spp. were mentioned as being associated with or causing root or stalk rots. Estimated losses are given in tables 15 and 16. The root rot situation still remains very complicated, and it is desirable that investigators of this problem attempt to discover and evaluate the importance of the causes more exactly. From the disease survey standpoint it would be helpful if the various diseases here concerned, including ear rot, could be separated out on the basis of symptoms, and without respect to cause. If that were done we might have something like the following: root rot, seedling blight, and ear rot.

In general the 1929 season did not seem to be especially favorable for development of these troubles, as only South Carolina out of eighteen states reporting mentioned them as more prevalent than usual.

B. Koehler of Illinois has figured the percentages of ear rot occurring in the various rotations on the University Farm as follows:

	1929	1928
Diplodia zeae	2.84	1.98
Fusarium moniliforme	1.54	3.08
Basisporium gallarum	0.54	0.25
Gibberella saubinetii	0.12	0.02

P.D.R. pages 108, 124.

Table 15. Losses from root rot of corn as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
9	Maryland	1	Wisconsin, Minnesota, Texas
5	West Virginia, South Carolina, Louisiana	.5	Delaware, Ohio
4	Florida, Mississippi	Trace	Missouri, Kansas, Montana, Idaho, Oregon, California
3	Virginia, North Carolina		
2	Pennsylvania, Indiana		

Table 16. Losses from corn ear rots as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
8.5	Iowa	2	Ohio, Missouri, Texas
6.5	Florida	1	Maryland, West Virginia, Wisconsin, Nebraska, Kansas
5	Louisiana		
4	Pennsylvania	.5	Delaware
3	Virginia, Mississippi	.4	Minnesota
2.5	North Carolina	Trace	Oregon, California
2.1	Indiana		

COB ROT (Basisporium gallarum). This was unusually prevalent in Iowa, not only shriveling the ears but also being present in the butts of ears which appeared normal in weight. Iowa corn for 1930 seeding is carrying an abundance of infection. A loss of 5 per cent, including reduction in yield and loss in quality after harvest, was estimated for Iowa. The disease was also reported from Indiana (estimated loss 0.5 per cent), and Kansas.

BACTERIAL WILT (Aplanobacter stewartii). Reported from Massachusetts, New York, New Jersey, Maryland, West Virginia, Ohio, Indiana, Illinois, and Michigan. In New Jersey where 3 per cent loss was estimated, and where some growers lost heavily, concerted efforts are being made to obtain disease-free seed for the 1930 crop. Near Morgantown, West Virginia, fields of sweet corn, planted with seed from New York, and Longfellow field corn, with seed from Connecticut, showed severe damage. One field was reported in Saginaw County, Michigan, where the crop of early sweet corn was an entire loss.
P.D.R. page 124.

BROWN SPOT (Physoderma zeae-maydis). This disease, southern in its range, was reported from North Carolina, South Carolina, Florida, Mississippi, Louisiana, Arkansas, Missouri, and Kansas. Somewhat more than usual was mentioned as occurring in North Carolina and Louisiana, but less than usual in Missouri and Kansas. In Florida the loss was estimated at 5 per cent, with infection running as high as 70 to 90 per cent in some fields continuously cropped to corn. Other losses were: Mississippi, 3; Louisiana, 2.5; and North Carolina, 0.5 per cent.
P.D.R. pages 54, 70, 123.

RUST (Puccinia sorghi). For the country generally there was less rust than usual, probably on account of the dry summer and early fall. More than usual was noted on upland field corn in the vicinity of Athens, Georgia, however, and more than normal on sweet corn in Wisconsin. The loss for the country did not exceed a trace.
P.D.R. pages 54, 107.

LEAF BLIGHT (Helminthosporium turcicum). A very severe outbreak appeared in Florida after the corn had tasseled. In several fields 40 per cent of the plants had some or all of their leaves prematurely killed. (A. H. Eddins)
P.D.R. pages 54, 126.

FALSE SMUT (Ustilaginoidea virens). Reported (26) from Louisiana (1925) and the Canal Zone (1926). It causes excrescences on the tassels somewhat resembling common smut.

DOWNY MILDEW (Sclerospora graminicola). Weston (68) has just reported occurrence on young Golden Bantam sweet corn near Sturgeon Bay, Wisconsin, in the summer of 1921. It did not spread further on corn that summer, nor did it reappear on that host there in 1922 and 1923. The only other state from which this disease has been reported on corn is Iowa.

MOSAIC (virus). Has been reported only from Georgia, Louisiana, Mississippi, and Arkansas. Was said to be much less prevalent in southwestern Louisiana than usual.

F L A X

Wilt (Fusarium lini). Reported in Kansas for the first time last year, was reported again in 1929. From 5 to 10 per cent occurred in one variety on the experimental plots at Rest, and slight amounts were observed also in commercial fields. North Dakota estimated 5.5 per cent loss and about the average prevalence.

RUST (Melampsora lini). Was reported from Oregon for the first time in 1924, and in 1926 it was feared that it might prove a very serious handicap to the fibre-flax industry in that State. It is interesting to note that in 1929 much less than normal occurred. In the southern part of the State the damage was slight in a few fields. In the remainder of the State there was practically no damage. Minnesota reported 3 per cent loss, Iowa 1 per cent, and North Dakota a trace.

PASMO (Phlyctaena linicola). This disease, apparently introduced from South America, was first noted in North Dakota about 1916, and since has been found in South Dakota, Minnesota, Wisconsin, and Michigan. In 1929 it was collected in Kansas for the first time, where it was found by A. C. Dillman in experimental plots at Rest, Wilson County, July 2.

HEAT CANKER (non-par.) P.D.R. page 70.

S O R G H U M

COVERED KERNEL SMUT (Sphacelotheca sorghi). Three physiologic forms of this smut are now recognized in Kansas. Melchers, Ficke, and Johnston (44), using eighty varieties, selections, and hybrids, isolated the three forms as follows: Form 1 does not attack milo, hegari, and feterita. Form 2 attacks milo and hegari, but not feterita. Form 3 attacks feterita and certain feterita hybrids, but not milo. An estimated loss of 3 per cent was reported from Kansas in 1929. The damage was greatest in the western part of the state where no seed treatment campaign has been conducted.

D I S E A S E S O F F O R A G E C R O P S

A L F A L F A

BACTERIAL WILT (Aplanobacter insidiosum). Seems to be the most serious disease of alfalfa and continued destructive in 1929. A loss of 25 per cent was estimated in Iowa. In Missouri it is becoming widespread and, associated with other root troubles, is causing marked damage. Four per cent loss was estimated. In Kansas 150,000 acres had to be plowed up or abandoned apparently due chiefly to wilt. Old stands are being destroyed and new ones are difficult to establish. In Nebraska it can be found in varying amounts in all alfalfa sections. More damage was reported from Idaho this year, wilt being found generally distributed in the Snake River Valley from Twin Falls to the Oregon line. During the year it was reported for the first time from Oregon, where it caused serious reduction in stand in several fields. In California it is one of the outstanding troubles of alfalfa and is quite prevalent and destructive in parts of the San Joaquin Valley, from Bakersfield to Modesto, where it limits the life of the stand to from three to four years.

P.D.R. pages 70, 108, 129, 166.

ROOT ROT (Phymatotrichum omnivorum). Kills entire fields in Cameron and Hidalgo Counties in Texas. Taubenhaus and Dana estimate 40 per cent loss for the entire state.

P.D.R. page 108.

WINTER INJURY. A great deal of damage occurs from winter injury annually. In Many cases it is so closely associated with bacterial wilt and root rots that it is impossible to make a reliable diagnosis. Several collaborators suggest that winter-injured plants are more likely to be attacked by the root-rot producing organisms. In Iowa last winter the snow cover afforded excellent protection so that the crop came through the winter in good condition. Farther south

in Missouri, however, more damage, estimated at 5 per cent, occurred. In eastern Oregon injury was severe, resulting in thin and dwarfed stands.
P.D.R. page 70.

STEM ROT (Sclerotinia trifoliorum). Reported from Missouri for the first time (Pl. Dis. Reptr. 13: 22. 1929) in five fields in the southeastern part of the state. It has probably been present there for some time, but not strikingly evident until this season. It was also commonly reported from parts of western Washington and Oregon.

RUST (Uromyces medicaginis). Was very prevalent in southern California in the autumn. In some fields 75 per cent of the leaves were attacked and stem lesions were abundant.
P.D.R. pages 159, 166.

YELLOWS (due to leafhoppers). Very severe on the second cutting in New Jersey. In some fields nearly every leaf was yellow, the plants stunted, and the crop hardly worth harvesting. In Virginia it is thought to be annually increasing in importance.
P.D.R. pages 88, 166.

GIRDLE (Undet.) A specimen of this disease, first described by Brown and Gibson from Arizona (9), was collected near Little Rock, Arkansas, August 8, by J. G. Horsfall. This is the first report of girdle from that State. Weimer reports a girdle caused by leafhopper as being quite abundant but not of importance in southern California.
P.D.R. page 129, 166.

A BLACK STEM DISEASE (Undet., probably of fungous origin) of alfalfa, sweet clover, and red clover has been under observation in Kentucky during the past seven years (65). Under certain conditions it apparently has caused serious loss to each of the crops mentioned.

ALBINO (undet.) P.D.R. page 159.

ANTHRACNOSE (Colletotrichum trifolii). P.D.R. page 166.

BACTERIAL BLIGHT (Bacterium medicaginis). P.D.R. pages 159, 166.

DOWNY MILDEW (Peronospora trifoliorum). P.D.R. pages 10, 108, 159, 166.

LEAF SPOT (Pleosphaerulina briosiana). P.D.R. page 22.

LEAF SPOT (Pseudopeziza medicaginis). P.D.R. page 159.

WHITE SPOT (non-par.) P.D.R. page 159.

YELLOW LEAF BLOTCH (Pyrenopeziza medicaginis). P.D.R. pages 159, 166.

SWEET CLOVER

BLACK STEM DISEASE (see also under alfalfa). Appears to be the most widespread and destructive disease of sweet clover, according to the Office of Forage Crops and Diseases.

C O W P E A

SCAB (*Cladosporium vignae*). Georgia is now added to the States of occurrence, namely, Alabama, Arkansas, Indiana, Delaware, and Virginia. O. C. Boyd first collected it in the middle part of the State near Albany by June 7. Later it was found in two places in the southern part. Central Georgia growers reported considerable loss. The determination was verified by M. W. Gardner.

WILT (*Fusarium* sp.) A loss of 5 per cent was reported from California, where the disease was said to be prevalent and severe in many fields in the San Joaquin Valley and in Los Angeles and Orange Counties. Fusarium wilts were reported also from Virginia, Texas (*F. tracheiphilum*), and Mississippi (*F. martii*).

S O Y B E A N

DOWNY MILDEW (*Peronospora manshurica* (*P. sojae*, *P. trifoliorum manshurica*). This is a relatively new disease in the United States. It was probably introduced from the Orient, where it occurs in Manchuria, Siberia, Formosa, India, and the Philippines. In this country it was first noted in North Carolina in 1923. In 1924 it was collected in Delaware and Kentucky, in 1925 in Alabama, Mississippi, and Louisiana, in 1927 in Virginia, and in 1928 in West Virginia, Georgia, Ohio, and Indiana. Four new states reported its occurrence in 1929, including Massachusetts, New Jersey, Illinois, and Missouri. The Missouri specimen was collected in the fall of 1928 on the experiment station grounds at Columbia but was not definitely determined until 1929. In Massachusetts the disease was first found on Illini soybeans from Illinois-grown seed in the experiment station plots, and later spread to several other varieties (Pl. Dis. Reptr. 13: 129. 1929). Downy mildew had not been reported from Illinois but a special investigation determined its occurrence also in that State (Pl. Dis. Reptr. 13: 159-160. 1929).

V E T C H

STEM ROT (*Sclerotinia* sp.) H. P. Barss reports a very severe attack in Oregon on *Vicia monantha* and considerable on *V. earvillea*, the former on ground where the same species was grown last year. A little had shown up before. Lodging followed by warm, wet weather appears to have been exceedingly favorable.

K U D Z U

HALO BLIGHT (*Bacterium medicaginis phaseolicola* (*B. puerariae*). Was present as usual in most of the plantings in Georgia but caused less damage than it ordinarily does according to O. C. Boyd.

Miss Hedges (27) reports that *Bacterium puerariae* Hedges is identical with *B. medicaginis phaseolicola* Burkh. On the kudzu vine it is known to occur in Connecticut, Georgia, Florida, and Indiana.

LEAF BLIGHT (Rhizoctonia sp. ?) This thread blight disease of petioles and leaflets seems to be on the increase in distribution and severity in Georgia. It causes more defoliation than bacterial halo blight. It caused at least 10 per cent defoliation in one Grady County field this year. The loss for the state is estimated at 0.5 per cent. (O. C. Boyd)

DISEASES OF FRUIT AND NUT CROPS

APPLE

SCAB (Venturia inaequalis). 1929 is recorded as a bad scab year. In general cool, wet spring weather favored an abundance of early infection, and although dry weather in the summer tended to retard secondary infections, still rainy periods were frequent enough to cause spread and this, but more especially the damage caused earlier in the season, resulted in heavy loss. In some of the eastern states it was one of the worst scab years on record. The increased prevalence extended to states beyond the Mississippi River. Kansas reported considerably more than normal, and in Nebraska it was the worst in fifteen years. Estimated losses are given in table 17.

Nine states reported observations on ascospore discharge. This method of observing the development of the fungus, so that definite spray recommendations based on the actual facts can be made, is being depended on more and more to supplement the spray schedule in the apple sections where scab is important.

P.D.R. pages 4, 12, 34, 48, 64, 78, 100, 112, 133, 145, 153.
P.D.R. 14, No. 7, pages 56-61. Apr. 1, 1930.

Table 17. Losses from apple scab as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
25	Ohio	5	Massachusetts, West Virginia, Missouri, Arkansas
18	Wisconsin		
16	Michigan	4	Maine, Virginia
12	Iowa	3	Maryland, Kansas
10	Georgia	2	North Dakota
8	Indiana	1.5	Delaware
7	Oregon	0.5	Mississippi, Montana
6	North Carolina		

BLOTCH (Phyllosticta solitaria). Indiana, Illinois, and Kansas reported more blotch than usual. In most of the other states where blotch occurs it was of about average prevalence. Among the items of interest is the report of the disease on seedling trees in the Clarke County State Forest in Indiana. It was found at Wapato, Yakima County, Washington, on nursery stock shipped from the East. In Virginia, where there was less than usual, infection on unsprayed trees of Northwestern Greening was 47 per cent as compared with 60 to 80 per cent on the same trees in previous years. (Losses in table 18).

P.D.R. pages 36, 48, 78, 101, 153.

Table 18. Losses from blotch of apple as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
5	Missouri	1	West Virginia, Ohio, Texas
3.5	North Carolina	.5	Maryland
3	Kansas, Mississippi	.3	New Jersey
2	Indiana, Arkansas		

RUST (Gymnosporangium juniperi-virginianae). In general, rainy spring weather favored exudation of the telial horns and infection of apple foliage. In Indiana, Missouri, Kansas, and Nebraska considerably more damage was reported than usual. In Missouri, rust was one of the most serious apple diseases, affecting both foliage and fruit. Nebraska experienced the most severe and widely distributed epiphytotic in ten years. Excellent results from cedar eradication were reported from Virginia, and in one district in Iowa an eradication campaign has resulted in the destruction of 75 per cent of the cedar trees. (See also quince rust on apple). (Losses in table 19).

P.D.R. pages 7, 16, 36, 49, 100, 133.

Table 19. Losses from rust of apple as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
6	Kansas	1.5	Massachusetts, Indiana
2.5	Virginia	.5	Maryland, Mississippi
2	North Carolina, Missouri	.1	Ohio

QUINCE RUST (Gymnosporangium germinale). An outstanding feature of the cedar rust situation in 1929 was the unusual number of reports of the quince rust affecting apple fruit. The significance of this rust on apples has been pointed out by Thomas and Mills (63) in New York. In 1929 there was less than last year on New York apples of susceptible varieties, but it caused damage in Indiana, Tennessee, and West Virginia. The unusual severity of rust on the

Winesap variety in Kansas leads to the suspicion that this rust might also have been the one concerned there, but unfortunately sufficient material was not available for microscopic examination to determine this point.

In Indiana, Miller and Gardner reported much more than usual, probably infecting about 1 per cent of the fruit. In one commercial orchard of Winesap 20 per cent fruit infection was observed. It caused widespread concern because of its severity on Delicious, which is supposed to be resistant to rust. Other varieties affected were: Stayman, Jonathan, Baldwin, Grimes, Winter Banana, and Rome. In 1924 this same rust was found on the variety Gideon in southern Indiana.

In Tennessee, it was prevalent in a commercial orchard near Jackson where the fruit of the varieties Delicious, Stayman, and Winesap were affected, while the leaves were comparatively free. Difficulty was experienced in getting a specimen that would show the aecial stage of the fungus, but finally one was obtained which checked with G. germinale. In West Virginia quince rust was found on Rome Beauty fruit in Mineral County.

P.D.R. pages 7, 36.

BLACK ROT (Physalospora malorum). The leaf spot symptom of this disease was commonly reported, especially in neglected orchards, from eastern apple sections. The most defoliation and damage apparently occurred in the Appalachian section from Maryland southward to northern Georgia, and in the Missouri, Arkansas, and Kansas area. The canker was rated as more important in Missouri, and in Michigan and Virginia fruit rot was especially mentioned. In the latter state it was correlated with unusually heavy codling moth infestation. (Losses in table 20).

P.D.R. pages 17, 36, 79, 100, 153.

Table 20. Losses from black rot of apple as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
5	Maryland	1.3	Virginia
3	South Carolina	1	Kansas
2	North Carolina	.5	Indiana, Michigan, Mississippi
1.5	Missouri		
		.2	Ohio

BITTER ROT (Glomerella cingulata). Reported from the usual range, in most cases as less prevalent or at least not more prevalent than usual. In North Carolina, however, it was favored by the wet season, and was said by R. F. Poole to be more severe than it had been during the past four years. Heavy losses occurred throughout the State, even in the mountain areas where the disease is usually controlled by natural conditions. Only partial control was obtained with Bordeaux mixture and calcium sulfide on the College farm. In Missouri, according to I. T. Scott, bitter rot was particularly severe in commercial orchards in the Missouri River counties. (Losses in table 21).

P.D.R. pages 79, 101, 113, 153.

Table 21. Losses from bitter rot of apple as estimated by collaborators, 1929.

Percentage: loss	States reporting	Percentage: loss	States reporting
10	South Carolina	1	Maryland, Arkansas
5	Georgia, Mississippi	.5	Virginia
3	North Carolina, Missouri	.2	Ohio

BLIGHT (Bacillus amylovorus). Especially the blossom blight symptom was unusually prevalent in the Atlantic Coast States from Delaware to Georgia, and in most of the states northwestward to Minnesota. Twig infection later in the season was more prominent in Michigan and Wisconsin. Reporters mentioned that wet cool weather, accompanied by a prolonged blossoming period, favored infection and advance in susceptible varieties. In Virginia the first heavy blossom infection in seven years was reported. In some Grimes orchards infection amounted to as much as 60 to 100 per cent. In West Virginia a considerable amount of collar blight of Grimes Golden trees, most of which developed in 1928, was observed in a few orchards. One orchard showed 75 per cent of the trees infected with 20 to 25 per cent completely girdled. In North Carolina advance of the organism into the trunks during 1929 was reported commonly. In several commercial orchards in Raben County, Georgia, blossom blight completely ruined the crop. (Losses in table 22).
P.D.R. pages 6, 15, 35, 50, 64, 112.

Table 22. Losses from blight of apple as estimated by collaborators, 1929.

Percentage: loss	States reporting	Percentage: loss	States reporting
10	Georgia, Iowa	1	Maryland, South Carolina, Michigan, Oregon
5	North Carolina, North Dakota, Mississippi, Texas	.5	Delaware, Virginia, Ohio, Wisconsin
2	Missouri	.1	Indiana

SOOTY BLOTCH (Gloeodes pomigena). This disease is one of the most important in Virginia on all varieties. Cessation of spraying on July 1 and poor pruning are important factors in its development. It caused a 4.5 per cent reduction in grade. (F. J. Schneiderhan)

FRUIT SPOT (Cylindrosporium pomi). Was again prevalent and the cause of considerable damage especially on Grimes and other susceptible varieties, particularly in the lower Hudson Valley of New York, southeastern Pennsylvania, New Jersey, Delaware, Maryland, Virginia, and West Virginia. It seems to be increasingly probable that reduced spraying late in the season to avoid the arsenical residue problem is largely responsible for the increased loss from this disease in eastern states during recent years.

BLISTER SPOT (Pseudomonas papulans). This organism was described by Rose (51) in 1917 as the cause of a fruit spot of apples in Missouri. Apparently there have been no authentic reports of its occurrence since. In 1929, M. W. Gardner however reported abundant infection of green Rome apples in the University orchard at Lafayette, Indiana. All lesions examined microscopically showed bacterial ooze.

FRUIT SPOT AND SURFACE ROT due to a strain of Sporotrichum malorum Kidd & Beaumont was reported on stored fruit from southern Indiana by Gardner (20). It was first noticed in 1925.

PERENNIAL CANKER (Gloeosporium perennans). The most serious and widespread disease affecting apple trees in Hood River and adjacent valleys at the present time. (Childs (13).

Table 23. Distribution of perennial canker and apple tree anthracnose in the Pacific Northwest. Prepared by E. V. Shear; data from records of Cooley and Childs.

	Anthracnose	Perennial canker
Oregon:		
Medford District	**	*
Willamette District	***	*
Hood River District	***	***
Mosier District	*	***
The Dalles	-	*
Mill Creek (Section of the Dalles)	-	***
Dufur	-	**
Stanfield	-	**
Milton-Freewater	-	*
Imbler-LaGrande	-	-
Washington:		
Underwood - White Salmon (Across from Hood River)	***	***
Spokane	-	***
Yakima	-	*
Wenatchee	-	**
Walla Walla - Dayton	-	***
Idaho:		
Lewiston	-	*

* means disease found - not economic.
*** serious.
\- not found.

ANTHRACNOSE (Neofabraea malicorticis). (See table 23 above, under perennial canker).
P.D.R. page 64.

TWIG CANKER (Nectria cinnabarina). According to Thomas and Burrell (62) the above fungus in consistently associated with a canker on apple twigs in one orchard in central New York. Infection takes place at or near the point of detachment of the fruit from the cluster base.

HEART ROT (Schizophyllum commune). Reports of this fungus apparently causing damage in North Carolina and North Dakota were received this year. In North Carolina, R. F. Poole reported that trees injured by low temperatures, cultivating implements, and blight were attacked. The fungus was found fruiting on newly blighted twigs during August and September. Large limbs and even trees were killed by the organism working downward from infected areas on the limbs.

SPRAY AND WEATHER INJURY. An excessive amount of injury was reported from New York, Pennsylvania, New Jersey, Delaware, Virginia, West Virginia, Illinois, Michigan, and Arkansas. This was mostly in the form of leaf burning and fruit russeting from applications of lime-sulfur. Weather conditions, especially high temperatures, and in West Virginia, frost were mentioned as largely responsible, but the abundance of scab lesions was also probably a contributing factor. Bordeaux mixture was reported as causing considerable injury in Virginia and Arkansas and copper-lime dust caused severe injury in one New Jersey orchard. In New York too close use of spray gun, spraying in heat of day, and untested lime-sulfur were given as factors. All of the fruit russeting could not be attributed to sprays, because cases of equal damage were observed on unsprayed as well as on sprayed trees.
P.D.R. pages 37, 80.

BROWN ROT (Sclerotinia fructicola). P.D.R. page 79.

LIME CHLOROSIS (non-par.) P.D.R. page 80.

POWDERY MILDEW (Podosphaera leucotricha). P.D.R. pages 17, 36, 64, 79, 100.

MOSAIC (undet.) Has been reported annually from New York during the last few years. In 1929 it occurred in Niagara and Genesee Counties.

P E A R

BLIGHT (Bacillus amylovorus). More damaging than ordinarily in the Middle Atlantic States, the heaviest infection in seven years being reported from Virginia, and in Oregon where the worst outbreaks in recent years occurred in the Rogue and Umpqua Valleys. On the other hand, in Missouri there was said to be less on pears than for a long time. This is always an important disease of pears, especially in the more southern states and in California. Georgia and Louisiana reported the Pineapple variety rather uniformly resistant. (Losses given in table 24).
P.D.R. pages 15, 35, 50, 64, 133.

Table 24. Losses from pear blight as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
80	Georgia	5	Missouri
25	South Carolina, Mississippi	4	Michigan
18	North Carolina	2	Oregon
7	Maryland	1	Massachusetts, Delaware, Ohio, Texas
6	Virginia, Iowa		

SCAB (Venturia pyrina). As in the case of apple scab was rather more abundant than usual. In Virginia the heaviest infecton on record since 1922 took place, the estimated loss for the State being 4.5 per cent. In Ohio the loss was estimated at 1 per cent, Michigan 10 per cent, Wisconsin 5 per cent, and Kansas and Oregon 2 per cent.
P.D.R. pages 38, 65.

LEAF BLIGHT (Fabraea maculata). Has been quite serious in southern Illinois during the last two or three years, even on Kieffer pears. Previous to this the growers have never experienced any particular trouble. (H. W. Anderson). (Losses given in table 25).
P.D.R. page 18.

Table 25. Losses from leaf blight of pear as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
10	Delaware	2.5	Virginia
4	Maryland	.5	Idaho

PERENNIAL CANKER (Gloeosporium perennans). In Oregon fair-sized cankers occurred in Washington County and specimens showing twig infection were collected in Lane County. (See also under apple, p. 28).

BLACK-END (non-par.) Has been reported from all of the Pacific Coast States, mostly on Bartlett pears. The results of investigations in California, where it is very important, indicate that it is associated with the use of Japanese pear root stocks (29). In 1929 a report from Oregon stated that it was gradually increasing in an orchard in Linn County.

BLOSSOM WILT (non-par.) A very widespread and unusual amount of shrivelling of blossom clusters and even early leaves has been noted throughout western Oregon. The conditions responsible for this are not clearly understood. (H. P. Barss)
P.D.R. page 65.

BITTER ROT (Glomerella cingulata). P.D.R. page 38.

INCENSE CEDAR RUST (Gymnosporangium blasdaleanum). P.D.R. page 65.

SEPTORIA LEAF SPOT (Mycosphaerella sentina). P.D.R. page 65.

PEACH

BROWN ROT (Sclerotinia fructicola). Occurred generally in peach orchards. Blossom blight was stated to be especially severe in the southern part of New Jersey and in Michigan, while twig blight was particularly noticeable in Pennsylvania. The other states largely mentioned fruit rot. In Indiana the damage was mostly to the mature or harvested peaches. Injury from codling moth, oriental peach moth, and curculio are especially mentioned by several collaborators as causing injuries through which brown rot infection occurred. (Losses given in table 26).
P.D.R. pages 20, 38, 101, 113, 131.

Table 26. Losses from brown rot of peach as estimated by collaborators, 1929.

Percentage: loss	States reporting	Percentage: loss	States reporting
12	Mississippi	4	Michigan
10	Massachusetts	3	Oregon
9	North Carolina	2	Kansas
6	Missouri	1	West Virginia, Indiana, Iowa, Arkansas
5	New Jersey, Maryland, Virginia, South Carolina, Georgia, Ohio, Texas	.5	Delaware

LEAF CURL (Exoascus deformans). Cool wet weather at the time of bud swelling and subsequent growth in the spring apparently favored curl in the more northern and eastern parts of the country, from New England and New Jersey westward to Kansas. Most of the states in this area reported more than normal amounts. As usual, it was not a factor in the more southern peach districts. In Arkansas it was noted on younger leaves of twigs the older leaves of which were healthy, indicating a late infection. In Illinois there was evidence of secondary spread from unsprayed to adjoining sprayed trees. (Losses in table 27).
P.D.R. pages 18, 37.

Table 27. Losses from peach leaf curl as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
6	Michigan	1	Michigan, Virginia, Illinois, Missouri, Oregon
4	Kansas		
3	Iowa	.5	North Carolina, Idaho
2	Ohio		

SCAB (Cladosporium carpophilum). Losses in table 28.
P.D.R. pages 113, 132.

Table 28. Losses from peach scab as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
3	Virginia, North Carolina South Carolina, Georgia, Mississippi	1.5	New Jersey
		1	Delaware, Maryland, Ohio, Michigan, Missouri, Texas
2	Kansas		

BACTERIAL SPOT (Bacterium pruni). Continued to damage the peach crop very badly, but perhaps not quite so much as during some other recent years on account of somewhat less injury in the North Atlantic States this season. On the other hand, in the lighter sandy soils of the Carolinas and Georgia, and also in the Indiana, Illinois, and Michigan sections, the loss was rather more than usual. In the Sand Hill section of North Carolina, leaf spotting, defoliation, reduction in size, and spotting of the fruit caused an estimated loss of 30 per cent. The average for the State, however, was 17 per cent, as will be seen from the accompanying table. The Elberta and J. H. Hale, were most commonly reported as

Table 29. Losses from bacterial spot of peach as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
17	North Carolina	2	New Jersey, Alabama
15	Indiana	1	Michigan, Kansas, Texas
10	South Carolina, Georgia	.5	Missouri
4	Maryland		

susceptible, but other varieties attacked this year were South Haven, Heath Cling, and Cahmpion in Indiana, Frances, Jersey Gold, and Connett in New Jersey, and Arp and Brackett in North Carolina. Zinc sulfate sprays were tested in several of the states with varying results. (Losses in table 29).

P.D.R. pages 51, 80, 101, 113, 131.

YELLOWS AND LITTLE PEACH (virus). The outstanding features with regard to these diseases seem to be: the occurrence of yellows in Illinois; the increasing importance of little peach and yellows in southwestern Michigan; and the continued decrease in yellows in Pennsylvania, where systematic inspection and eradication has been going on for the last nine years.

The number of trees inspected and the percentage of disease in these three states are given in table 30. (For details see the Plant Disease Reporter Vol. 14, No. 4 (Pennsylvania and Illinois).

Table 30. Results of inspection for peach yellows and little peach in Illinois, Michigan, and Pennsylvania, 1929.

State	Trees inspected	Trees diseased	Percentage of trees diseased
Illinois	375,343	43	.011
Michigan	757,410	(yellows) 2,399	.32
		(little peach) 11,374	1.50
Pennsylvania	1,030,165	1,570	.15

P.D.R. pages 50, 132.

PHONY PEACH (virus). The campaign for the eradication of phony peach being conducted by the Bureau of Plant Industry in cooperation with the Georgia State Board of Entomology, made rapid progress during the 1929 season. Thirty-two inspectors were assigned to this work and up to November 1 this force had inspected over seven million peach trees and had marked 72,418 phony, which were to be removed by digging as soon as possible.

It was thought that this disease was confined to Georgia and a small section of Alabama, but it was found to be more widely spread in Alabama than had been previously supposed and a serious infection was also found in Mississippi. (K. F. Kellerman)

Under provisions of Federal Plant Quarantine 67, effective June 1, 1929, shipments of peach nursery trees from the infested area to places where the disease does not occur is prohibited when phony trees are known to occur within a distance of one mile of the nursery.

P.D.R. pages 19, 66, 171.

ROOT ROT (Armillaria mellea). Widely distributed in North Carolina. It is most prevalent in the commercial plantings in the sand hills. Trees are attacked on the loamy and clay soils, but not so severely. The fungus grows throughout the year, but is most active during the summer and fruits around the tree from September to December. (R. F. Poole)

BLIGHT (Coryneum beijerinckii). Increasing in importance in Idaho due to the substitution of oil for lime-sulfur spray. (C. W. Hungerford)

POWDERY MILDEW (Sphaerotheca pannosa). P.D.R. page 102.

RHIZOPUS ROT (Rhizopus nigricans). P.D.R. page 132.

ROSETTE (Undet.) P.D.R. page 52.

SPRAY INJURY. P D.R. pages 114, 132.

PLUM AND PRUNE

BROWN ROT (Sclerotinia fructicola). See table 31.

Table 31. Losses from brown rot of plum and prune as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
15	Ohio	3	Wisconsin
12	Missouri	2.5	Virginia
10	Massachusetts, North Carolina, South Carolina	2	Kansas
		1	Iowa
6	Maine		
		.5	Delaware
5	Maryland, Michigan, Mississippi		
4	Oregon		

DIAMOND CANKER. A disease of French prune and the variety Standard has been giving trouble in parts of California. The cause is still in doubt. It was reported on during the year by R. E. Smith (57).

CHERRY

BROWN ROT (Sclerotinia fructicola) and BLOSSOM BLIGHT (S. cinerea and S. fructicola) of sweet cherries were more prevalent than usual in western Oregon. The blossom blight was due to both species, cultures from eleven different orchards showing about two-thirds of the blighting due to S. cinerea and one-third to S. fructicola. A heavy bloom in a Napoleon orchard was completely destroyed so that no crop resulted. Bing and Lambert were less affected. There was some fruit rot present at harvest. The loss for the state was estimated at 10 per cent. (H. P. Barss). Losses are given in table 32.
P.D.R. pages 65, 81.

Table 32. Losses from brown rot of cherry as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
20	Oregon	1.5	Virginia, Michigan
2	Ohio	1	Mississippi, Maryland, Kansas, Texas

LEAF SPOT (Coccomyces hiemalis). Caused severe defoliation as far west as Nebraska and Kansas. In general the loss from the disease seemed to be unusually heavy. In Kansas it was estimated at 15 per cent, Georgia, Ohio, Michigan and Missouri at 5 per cent, in Iowa 3 per cent, in Maryland 2 per cent, in Virginia, Wisconsin, and Arkansas at 1 per cent, and in Delaware at 0.5 per cent.

P.D.R. pages 37, 52, 81, 102, 132.

WINTER INJURY. The heavy defoliation of 1928 by leaf spot left many cherry trees in Michigan in a very low state of vigor and as a result of temperatures of 18 to 22 degrees below zero thousands of trees were killed during the winter of 1928-29. (H. H. Wedgworth)

BUD BLIGHT (undet.) P.D.R. page 65.

CORYNEUM BLIGHT (Coryneum beijerinckii). P.D.R. page 102.

G R A P E

BLACK ROT (Guignardia bidwellii). P.D.R. pages 66, 67, 83. See table 33.

Table 33. Losses from black rot of grape as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
20	South Carolina, Arkansas	5	Maryland, North Carolina, Georgia, Michigan, Mississippi
10	Texas		
8	Virginia	2	Wisconsin, Kansas
6	Ohio	.5	Delaware

ANTHRACNOSE (Sphaceloma ampelinum). P.D.R. page 83.

DOWNY MILDEW (Plasmopara viticola). P.D.R. page 83.

POWDERY MILDEW (Uncinula necator). P.D.R. page 67.

ROOT ROT (Phymatotrichum omnivorum). P.D.R. pages 66, 154.

S T R A W B E R R Y

DWARF (Aphelenchus fragariae). A disease apparently caused by the nematode Aphelenchus fragariae and known as "dwarf" in Louisiana and "crimps" in Florida has attracted considerable attention during the past year, both on account of its being a newly recognized trouble and because of its increasing importance. The disease is known to occur in North Carolina, Florida, Louisiana, and Arkansas, authentic specimens having been received by the United States Bureau of Plant Industry from these states. Florida pathologists have evidence of its occurrence also in Tennessee because plants received from that state have evidently been infected. A case of what apparently was the same thing was reported by Orton (48) in 1905 from South Carolina.

In Florida "crimps" is widespread and of major importance. It is estimated that a 2 per cent annual loss of the crop occurs; in individual fields the loss may be as high as 75 per cent of the plants. In Louisiana it is common throughout the whole strawberry district and is believed to be one of the main causes of recent reduction in yield; 10 to 20 per cent infected and consequently worthless plants is not uncommon in unrogued fields.

What is apparently this same disease has been reported from Europe, particularly from England where it is known as "red plant" or "cauliflower disease" and where it has caused increasing damage during recent years.

P.D.R. pages 53, 77, 162.

"MOSAIC" ? This disease seems to be of the virus type but practically nothing is known regarding its transmissibility or nature and so there is some question as to whether the common name "mosaic" is applicable. It is undoubtedly different from the xanthosis or yellows of the Pacific Coast and from the dwarf or crimps of the Southern States. Thus far it has been found only in northern and eastern United States and Canada. During the year it was reported authentically from Ontario, Maine, Massachusetts, New York, New Jersey, and Wisconsin, and what apparently is the same disease has been seen by other workers in Ohio, Illinois, Michigan, and Minnesota. In some plantations and on certain varieties this disease seems to be of considerable economic importance. (Pl. Dis. Reptr. 13: 77, 129-131. Sept. 15, 1929).

GRAY-MOLD ROT (Botrytis cinerea). The worst outbreak of Botrytis on strawberries that he has ever seen in the South was reported by N. E. Stevens in early May. It was by far the worst in the Chadbourn section of North Carolina than it has been during the past four years. This he attributes to unseasonably cool and wet weather.

P.D.R. pages 21, 82.

ANTHRACNOSE (Colletotrichum sp.) P.D.R. page 162.

ROOT KNOT (Caconema radicicola). P.D.R. pages 10, 162.

FRUIT ROTS. P.D.R. pages 53, 163.

LEAF SCORCH (Diplocarpon earliana). P.D.R. pages 39, 53.

LEAF SPOT (Mycosphaerella fragariae). P.D.R. pages 39, 52, 82, 103, 163.

ROOT ROT (undet.) P.D.R. pages 67, 81, 163.

VIRUS DISEASES. P.D.R. pages 129-131.

RASPBERRY

MOSAICS AND LEAF CURL (virus). In New York, yellow mosaic in red varieties is much less important than red raspberry mosaic because in most varieties on the average it does not cause serious injury to the plants. In black varieties it is very injurious. Red raspberry mosaic seems to be of increasing importance in Plum Farmer and other Black varieties in Ontario County.

Leaf curl "No. 1" is rarely found in New York and then mostly on Cuthbert. The leaf curl which is serious on black varieties in Ohio and may be called leaf curl "No. 2" is not found in New York. (W. H. Rankin) Losses are given in table 34.

P.D.R. 82, 83, 103, 114.

Table 34. Losses from raspberry mosaics and leaf curl as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
30	Massachusetts	5	Wisconsin
12	Ohio	4	Kansas, Idaho
11	Maine	3	Maryland
10	Michigan, Iowa	1	Montana, Washington

ANTHRACNOSE (Plectodiscella veneta). P.D.R. pages 39, 53, 82, 103, 115.

ANTHRACNOSE (Gloeosporium allantosporum). Occurring on wild and cultivated black raspberry and St. Regis red raspberry in western Oregon and Washington, was described during the year by Zeller (74).

CANE SPOT (Ascospora rubi). P.D.R. page 82.

POWDERY MILDEW (Sphaerotheca humuli). P.D.R. page 82.

PREMATURE DYING (undet.) P.D.R. page 103.

STREAK (virus). P.D.R. pages 83, 114.

WILT (Verticillium sp.) P.D.R. page 82.

YELLOW RUST (Phragmidium imitans). P.D.R. pages 82, 163.

G O O S E B E R R Y

RUST (Cronartium ribicola). Scattered slight infections occurred in Connecticut on the gooseberry, which is usually considered almost immune. (G. P. Clinton)

LEAF SPOT (Mycosphaerella grossulariae). P.D.R. page 103.

POWDERY MILDEW (Sphaerotheca mors-uvae). P.D.R. page 39.

C R A N B E R R Y

FALSE BLOSSOM (virus). The outstanding cranberry problem at the present time is the control of the disease known as false blossom. During the past year it has been established to the satisfaction of all cooperating agencies that this disease is transmitted by a leafhopper, Euscelis striatulus. The disease is present in all commercial cranberry-growing states except New York which has a small cranberry industry on Long Island. In Washington and Oregon, the disease apparently does not spread and is of little economic importance. In Wisconsin, the disease appears to be gradually increasing in abundance and locally it is very severe. In the largest cranberry-growing areas of the United States, namely, eastern Massachusetts and New Jersey, the disease is severe and is spreading rapidly. The Howes, the standard late variety of cranberry which constitutes about 35 per cent of the crop in Massachusetts and about 30 per cent of the crop in New Jersey, is proving very susceptible to false blossom and unless some effective control is devised this variety is apparently threatened with commercial extinction. (N. E. Stevens and H. F. Bain)

C I T R U S

CANKER (Bacterium citri). There can be no doubt of the success of the campaign for the eradication of citrus canker, a disease which threatened the destruction of the citrus industry, when one considers the rapid reduction of infected trees and the thoroughgoing success in preventing epidemics in commercial regions. Although the disease is not entirely eradicated from the United States, conditions indicate the effectiveness and value of this campaign and support the belief that final and complete eradication of citrus canker will be accomplished.

Florida, with its large citrus holdings, now has just two properties under suspicion because of infections found in 1927, although at various times 515 properties scattered through 25 counties in that State have been found infected with this disease. The following figures give an estimate of the results of the campaign in the number of infected grove trees found in Florida alone:

1916	2,294	1920	540
1917	372	1921	0
1918	15	1922	873
1919	4	1923	11

1924 ---- 0	1927 ---- 85
1925 ---- 5	1928 ---- 0
1926 ---- 2	1929 ---- 0

Alabama has not reported an infection since June, 1927, when one tree was found infected. That the campaign was successful in this state is evidenced by the fact that 621 properties have been found infected at various times and at the present time, the state is believed to be free from canker.

In 1916, Mississippi had 108 properties in 4 counties showing infections. In 1922 there were 8 infected properties. In 1923 all properties were declared "clean" and no infections have been reported since that time.

Citrus canker has been found in 9 counties in Texas but it is believed that it has been eradicated from that state now as no infection has been reported since February, 1929.

Louisiana is still reporting scattered infections, especially in dooryard plantings, but the number of infections is being reduced each year.
(K. F. Kellerman)

GRAPEFRUIT BLOTCH (Undet.) P.D.R. Vol. 14: 68. 1930.

LUMPY RIND (Undet.) P.D.R. Vol. 14: 67. 1930.

ROOT ROT (Phymatotrichum omnivorum). P.D.R. page 154.

SOUR ROT (Oospora sp.) P.D.R. page 53.

F I G

THREAD BLIGHT (Corticium koleroga), a tropical parasite, bids fair to become one of the more serious diseases of figs in Louisiana. This parasite, affecting many plants, has been known in Louisiana for several years, but appears to be spreading rather rapidly.
P.D.R. page 115.

BROWN ROT (Sclerotinia fructicola). Found occasionally on Kadota figs near infected peaches at Riverside, California, following a rain. (W. T. Horne)

P E R S I A N (E N G L I S H) W A L N U T

BACTERIAL BLIGHT (Bacterium juglandis). In 1929 it was reported to the Survey for the first time from Mississippi and Arkansas. This is a very important disease in walnut orchards of California and Oregon and has been frequently reported from several of the Eastern States.
P.D.R. page 22.

F I L B E R T

BACTERIAL BLIGHT (Bacterium sp.) Has been reported frequently from Oregon since 1914. It occurs generally in western Oregon and will probably be found to a greater or less extent wherever filberts are grown in the State. It is the most serious disease of young plantings and nurseries, spotting the leaves and blighting the shoots. In 1929 it was reported to the Disease Survey from Washington for the first time (Cowlitz County). The Bureau of Plant Industry is undertaking investigations of the cause and control of this disease.

DISEASES OF VEGETABLE CROPS

POTATO

LATE BLIGHT (Phytophthora infestans). Estimated percentage losses are given in table 35. In the main-crop, late potato states where blight usually does the most damage, it was conspicuous this year by its scarcity. Dry weather during summer and fall effectively checked it. In New York there was almost no blight to be found in the State, except in a small area south of the Finger Lake region.

The most outstanding fact with regard to the disease in 1929 was its unusual seriousness in some of the early potato sections of the southern states, particularly South Carolina, Georgia, Florida, Louisiana, and Arkansas. In South Carolina, where it is usually rare, it occurred in epiphytotic proportions along the coast during April and May. In the Charleston section practically every field was affected. One owner reported over 40 per cent loss on 490 acres and the loss in Charleston County was estimated to be between 25 and 50 per cent. For the State as a whole 10 per cent loss was estimated. From Savannah, Georgia, specimens and a report of considerable damage were received. In Louisiana it was observed for the first time in several years, in fact, it has only been noted on two previous occasions during the past twenty years, and then only in very mild form. In 1929, however, in the vicinity of Baton Rouge during the latter part of April, it appeared shortly before harvest time in severe form. In Arkansas also it was observed for the first time in several years, diseased material having been sent in from Ozark.

As to the extent to which these southern occurrences were influenced by the planting of infected seed from northern states nothing definite can be said. However, the 1928 crop from the northern seed-producing states carried a large amount of late blight rot, and it is potatoes from these states that are largely planted in the early southern areas. The outbreak at Baton Rouge, Louisiana, occurred on certified Bliss Triumph seed from Eagle River, Wisconsin.

Another interesting occurrence was that reported from Floyd County in southern Indiana, where it caused a severe loss to the late crop and resulted in much storage rot. Late blight is a rather rare disease for Indiana which is on the western and southern border of the normal range of Phytophthora on the late crop.

P.D.R. pages 25, 57, 95, 118, 119, 151, 156.

Table 35. Losses from late blight of potato as estimated by collaborators, 1929.

Percentage Loss	States reporting	Percentage loss	States reporting
10	South Carolina	Trace	Massachusetts, New York, West Virginia, Ohio, Wisconsin, Minnesota, Arkansas, Washington
2	Maine, Maryland, North Carolina		
1	Florida		

SCAB (Actinomyces scabies). More than usual was reported from New Hampshire, New York, Delaware, Arkansas, Ohio, Michigan, Wisconsin, and Idaho. The average amount occurred in Florida, Minnesota, Iowa, Missouri, and California. There was less than usual in Massachusetts, New Jersey, Maryland, West Virginia, Virginia, and Louisiana. Losses reported were 5 per cent in Iowa, 4.5 per cent in Delaware, 4 per cent in Wisconsin, 3.5 per cent in New York (according to Chupp this is probably too low and 5 per cent would be more nearly right), 3 per cent in North Carolina, 2 per cent in Texas and Kansas, 1.5 per cent in Maryland and Missouri, 1 per cent in Minnesota, 0.5 per cent in Massachusetts, 0.3 per cent in Ohio.

The collaborator from New Jersey makes the following report: The hot dry season was very favorable for the development of the disease, some fields showing it where little was present the past two years. This disease, however, is causing the average grower little concern. Through the use of acid fertilizers the soil reaction has been reduced to about Ph 5.2 to Ph 5.4 in most of the potato growing sections. In some instances the reaction has been reduced to as low as Ph 4.6, and in these cases the rye cover crop is yellow and has made poor growth. These growers are being advised to use small amounts of lime. Studies conducted again this year indicate that the use of certain mercurial compounds in the fertilizer greatly reduce both scab and Rhizoctonia. (W. H. Martin)

P.D.R. pages 57, 96, 150,156.

MOSAIC (virus). High summer temperatures resulted in masking of symptoms with the result that it was difficult to detect mild mosaic in particular. In prevalence both the rugose and the mild mosaic were generally reported to be normal or less. Two states reported reduced losses through the use of certified seed, but in one of them this was offset by the increase of mosaic in home-grown seed. (Losses in table 36.)

P.D.R. pages 40, 119, 135.

Table 36. Losses from potato mosaic as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
15	Arkansas	4	Maine, New York
8	Oregon	3.5	Maryland
6	Washington	2	Ohio, Indiana, Iowa, Texas
5	Minnesota, Montana, Idaho	1.5	New Jersey, North Dakota
4.5	North Carolina	Trace	Massachusetts, Delaware South Carolina, Florida, Wisconsin, Missouri, Kansas

LEAF ROLL (virus). Normal or subnormal amounts of leaf roll were reported. The increasing use of certified seed seems to be reducing losses gradually. In New Jersey, for instance, the fact that less leaf roll is being found each year is correlated with the increase in use of certified seed. In Maryland, where much uncertified home-grown Irish Cobbler seed was planted on account of low prices, there was an increase in leaf roll. Losses in the home-grown seed were 15 to 50 per cent, whereas in the northern certified seed they were very small. (Losses in table 37.)

P.D.R. pages 40, 96.

Table 37. Losses from potato leaf roll as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
8	New York	2.5	Maryland
5	Ohio, Indiana	2	North Carolina, Iowa, Idaho, Washington
4	Maine	Trace	Delaware, Missouri, North Dakota, Arkansas, Texas, Montana
3	Massachusetts, New Jersey, Oregon		

SPINDLE TUBER (virus). In studying the rate of spread of potato virus diseases, Goss (21) concluded that spindle tuber, on account of the ease of transmission, is more to be feared under western conditions than leaf roll or either of the mosaics. New Jersey and Minnesota report decline in the amount of spindle tuber in certified stocks. Two per cent loss was reported in Kansas, 1.5 in North Dakota, and 0.5 in New Jersey.

P.D.R. page 120.

A NEW DISEASE(?) of unknown cause, with symptoms somewhat like the psyllid-yellows reported from Utah, was reported from Michigan. No psyllids were observed. The tarnished plant bug (Lygus pratensis) appears to be associated with the trouble (not proved). A maximum of 1.5 per cent was reported in certified fields. As much as 6 per cent was found in single tuber clones of virus-free stock grown under isolation at the Agricultural College. (J. E. Kotila).

SOUTHERN BLIGHT (Sclerotium rolfsii) was prevalent in Texas. In some cases in Hidalgo and Cameron Counties 75 per cent of the vines and 5 to 10 per cent of the tubers were affected. The loss for the State was estimated at 2 per cent. (J. J. Taubenhaus and W. J. Bach).

P.D.R. page 25, 72.

BLACKLEG (Bacillus phytophthorus) was general and more severe than usual in Wisconsin, Idaho, and eastern Oregon. The other states reported either less than the average or normal amounts. (Losses in table 38.)

P.D.R. page 119.

Table 38. Losses from blackleg of potato as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
6	Oregon	.5	Maryland, West Virginia, Ohio, Minnesota
3	Kansas	Trace	New York, New Jersey, Wisconsin, Washington
2	Montana, Idaho		
1.5	North Dakota	1	Maine, North Carolina, Iowa, Missouri

HOPPERBURN AND TIPBURN (leafhoppers and excessive transpiration). Hot dry weather was favorable to these diseases with the result that more than the usual damage was reported in northern and eastern potato states. Several collaborators reported that in fields where Bordeaux mixture was thoroughly and frequently applied the losses were maintained at a minimum. (Losses in table 39).

P.D.R. pages 58, 95, 118, 120.

Table 39. Losses from tipburn and hopperburn of potato as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
31	Arkansas	2	Wisconsin
15	New York, West Virginia	1	North Dakota, Texas
10	Massachusetts, Minnesota	.5	Delaware
9	Ohio	Trace	Maryland, Missouri, Kansas, Montana, Oregon
8	New Jersey, North Carolina		

YELLOW DWARF (Undet.), reported for the first time in 1922 by Barrus and Chupp (6) from several New York counties, but observed by them since the summer of 1917, has since occurred in New Jersey (1922; 1926 in seed from New York), Pennsylvania (1922), Vermont (1922), Florida (1923 northern seed), New Hampshire (1925), Ohio (1926, New York seed), and Virginia (1926, New York seed). In 1929 it was reported from fourteen counties in New York, from New Jersey where it was observed on one plant in a field planted with New York grown seed, and for the first time from Michigan where a few cases were noted.

SCURF, STEM ROT (*Corticium vagum*).P.D.R. pages 57, 96, 119, 150, 156.

Table 40. Losses from Rhizoctonia on potato as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
10	Oregon	2	North Carolina, Ohio, Iowa Missouri, Texas, Washington
9	Kansas		
6	Maine	1	Massachusetts, Wisconsin
5	Maryland	.5	Idaho
3	Montana	Trace	North Dakota, Arkansas

EARLY BLIGHT (*Alternaria solani*). P.D.R. pages 58, 113,119.

Table 41. Losses from early blight of potato as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
1.5	South Carolina	Trace	New York, New Jersey, Delaware, West Virginia, Wisconsin, Minnesota, Missouri, North Dakota, Kansas, Arkansas, Montana, Idaho, Washington, Oregon
1.3	North Carolina		
1	Ohio, Texas		
.5	Maryland		

WILT (Fusarium spp.) P.D.R. page 119.

Table 42. Losses from Fusarium wilt of potato as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
4	Montana	Trace	North Carolina, Minnesota, Missouri, North Dakota, Kansas, Washington, Oregon
1	New Jersey, Maryland, Texas		
.5	New York, Ohio, Iowa, Idaho		

SWEET POTATO

SOIL ROT (*Actinomyces* p.). Until recently this disease has been ascribed to *Cystospora batata* (Ell. & Halst.) Elliott, but it is now attributed to an Actinomyces, which Adams (2) designates as "Actinomyces p."

STEM ROT (*Fusarium* spp.) P.D.R. pages 135, 156, 157.

Table 43. Losses from stem rot of sweet potato as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
7	Iowa	1.5	Missouri
5	Kansas	1.2	Illinois
4	Delaware	1	Maryland
3	North Carolina, Mississippi, Arkansas	Trace	South Carolina
		2	Texas

BLACK ROT (*Ceratostomella fimbriata*) P.D.R. pages 43, 156.

Table 44. Losses from black rot of sweet potato as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
10	Texas	1.5	Maryland
5	Mississippi, Arkansas, Washington	Trace	South Carolina, Missouri
		.5	Iowa
2	Delaware, North Carolina, Kansas		

STORAGE ROTS due to various fungi.

Table 45. Losses from storage rots of sweet potato as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
20	South Carolina	13	Kansas
15	Maryland, North Carolina, Arkansas	10	Texas
		3	Delaware

CHARCOAL ROT (Sclerotium bataticola), JAVA BLACK ROT (Diplodia tubericola) LEAF BLIGHT (Phyllosticta batatas), LEAF MOLD (Choanephora cucurbitarum), LEAF SPOT (Alternaria sp.), MOSAIC (Virus?), SCURF (Monilochaetes infuscans), SOFT ROT (Rhizopus nigricans), SOUTHERN BLIGHT (Sclerotium rolfsii), WHITE RUST (Albugo ipomoeae-panduranae).

P.D.R. pages 156, 157 (reports from Florida).

TOMATO

BLIGHT (Septoria lycopersici). P.D.R. pages 41,42, 90, 94, 136, 155, 164.

Table 46. Losses from tomato blight as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
10	Kansas	2	Missouri
6	Indiana	1.5	South Carolina
5	West Virginia, North Carolina, Texas	1	Maryland, Arkansas
		.5	Delaware
4	New Jersey, Wisconsin		
		Trace	Minnesota, Mississippi
3	Ohio, Iowa		

EARLY BLIGHT (Alternaria solani). P. D.R. pages 40, 90, 94, 134.

Table 47. Losses from early blight of tomato as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
15	Massachusetts	1	North Carolina, Indiana Texas
8	Georgia		
		1.5	New Jersey, South Carolina
5	Maryland		
4	Mississippi	.5	Delaware
2	Missouri, Arkansas	Trace	Wisconsin, Minnesota, Montana

WILT (Fusarium lycopersici). P.D.R. pages 40, 41, 90, 135, 155.

Table 48. Losses from Fusarium wilt of tomato as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
15	Arkansas	2	North Carolina, Missouri, Kansas
10	Georgia, Mississippi		
		1	Maine, Maryland, Ohio
6	New Jersey		
		.5	Indiana
5	South Carolina, Texas		
		Trace	Delaware, Wisconsin, Iowa, Washington

LATE BLIGHT (Phytophthora infestans). Tomato-growing sections along the coast of California have suffered severely during the past few years from epiphytotics of late blight (Phytophthora). Total loss of fruit in some fields has been sustained. Cars of tomatoes shipped to markets have shown 50 to 100 per cent decay. Inspection certificates covering 30 cars shipped east in 1927 showed an average of 40 per cent infection. (G. B. Ramsey and Alice A. Bailey (50).

P.D.R. page 149.

DIE-BACK (cause unknown). In the last few years a disease known in California as die-back or tip blight of tomatoes has been so severe nearly every season in certain coastal sections as to result in practically an abandonment of tomato growing in these regions. Usually only a few sporadic cases have been found in the warmer and drier inland areas, but in 1929 the disease appeared in commercial tomato fields in the vicinity of Merced in the interior of the State, and also occurred near Riverside. (F. S. Beecher and Michael Shapovalov).

P.D.R. page 148.

LEAF SPOT (Stemphylium sp.). This disease, recently prominent in Florida, caused more damage than any other tomato disease during the past season. The lower leaves were "fired" early and at midseason 100 per cent infection was common. It was found on both Coasts in increasing destructiveness. (G.F.Weber)

P.D.R. page 134.

LEAF and STEM SPOT (Ascochyta lycopersici Brun. and Phoma destructiva Plowr.). It is not unlikely that these names represent different phases of the same fungus, which may also be con ected with Didymella lycopersici Kleb. (Diplodina lycopersici (Cke.) Hollos), the cause of tomato stem canker in Europe. In 1929 A. lycopersici was reported from New Jersey and Virginia. A Phoma agreeing very closely with P. destructiva was isolated by Charles Chupp from superficial sunken cankers on the stems and from leaf lesions of plants imported into New York from Georgia.

P.D.R. pages 10, 42, 134.

COLLAR ROT (caused by various organisms, such as Rhizoctonia, Phytophthora, Ascochyta, but especially Alternaria.). Collar rot causes the loss of many young plants annually, and 1929 was no exception. Plants usually become infected near the ground level or higher up on the stem while in the seed beds, and after they are set out in the field, the rot progresses, plants die or are retarded in growth, and uneven stands result. In New York unfavorable weather resulted in plants being held in the beds somewhat longer than usual and much loss resulted. In one county it was estimated that more than a million plants had to be thrown away. In New Jersey and Delaware, collar rot was especially common on southern-grown plants, particularly when they had to be held some time before being set out. In some cases fields had to be reset twice. In Indiana a field set with Illinois plants showed 25 per cent collar rot, while another block in the same field set with Texarkana plants showed none.

P.D.R. page 40.

BACTERIAL CANKER (Aplanobacter michiganense) was reported for the first time from two new States, Maryland and Mississippi. In the latter it was found in a number of properties in the Crystal Springs section. Seventy-five per cent of the fruit from one forty-acre field was unmarketable and the loss was estimated at $15,000. Infection in fields in Indiana and New Jersey was traceable to plants imported from Georgia. Mary K. Bryan (10) reports the organism as the cause of a fruit spot in Georgia and Mississippi.

Table 49. States from which Aplanobacter michiganense has been reported and year of first report.

Year	State	Year	State
1909	Michigan	1927	Georgia, Montana, Utah, Wisconsin
1918	New Jersey, Pennsylvania	1928	California, Washington
1920	Massachusetts, New York	1929	Maryland, Mississippi
1924	Ohio, Connecticut, Indiana Illinois, Iowa		

P.D.R. pages 24, 40, 41, 90.

ROOT PARASITE (Aphanomyces cladogamus Drechsler). This fungus, which affected tomato rootlets in a greenhouse in the District of Columbia, had previously been provisionally referred to A. euteiches. (17).

BACTERIAL SPOT (Bacterium vesicatorium). P.D.R. pages 40, 42, 134.

BACTERIAL WILT (Bacterium solanacearum). P.D.R. p. 135.

BLOSSOM-END ROT (non-par.). P.D.R. page 135, 136.

BROOM RAPE (Orobanche ramosa). P.D.R. page 165.

BUCKEYE ROT (Phytophthora terrestris).P.D.R. page 135.

DAMPING-OFF (various fungi). P.D.R. page 88.

MOSAIC (virus). P.D.R. pages 94, 135, 155.

NAILHEAD (Macrosporium tomato). P.D.R. page 134.

ROOT KNOT (Caconema radicicola). P.D.R. page 40.

SOIL ROT (Rhizoctonia solani). P.D.R. page 134.

SOUTHERN BLIGHT (Sclerotium rolfsii). P.D.R. page 135.

STREAK (virus). P.D.R. page 26.

BEAN

For a summary of conditions in Western States in 1929 see W. J. Zaumeyer, (73).

ANTHRACNOSE (Colletotrichum lindemuthianum). Dry weather in the principal northern dry bean states held anthracnose at a minimum. In the southern states, however, from North Carolina southward, the early snap bean crop suffered to an unusual extent. In some truck sections of the South the outbreak assumed the proportions of an epiphytotic. In Louisiana on some days as high as 25 per cent of the beans offered for shipment were rejected and, as will be noted from table 50, 10 per cent loss was reported from the Carolinas. This prevalence in the South seems to be correlated somewhat with the planting of infected seed from the North. It will be recalled that in 1928 anthracnose was serious in the North Atlantic and Great Lakes States.
P.D.R. pages 42, 58, 94, 120, 135.

BACTERIAL BLIGHTS (caused by various bacteria). The situation with regard to the bacterial blights of beans is becoming more complicated as different organisms are recognized and as some of those which have been recently described become more widely distributed or better known. (Losses in table 51)

Table 50. Losses from bean anthracnose as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
10	North Carolina, South Carolina	.5	Ohio
		1	Georgia
5	Mississippi		
		Trace	New York, Delaware, Maryland, West Virginia, Michigan, Minnesota, Iowa, Kansas
3	Massachusetts, Wisconsin, Missouri		
2	Maine		

Table 51. Losses from bacterial blight of bean as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
10	North Carolina, South Carolina, Minnesota Texas	1.5	Michigan
		2	Maryland, Montana
4	Wisconsin, Mississippi	.5	Ohio
3	New York, Georgia	Trace	Massachusetts, Delaware, Iowa, Kansas, Oregon

Bacterium phaseoli was commonly reported as usual. North and South Carolina especially reported more damage than ordinarily. In dry bean fields of New York there was comparatively little, but in beans grown for canning somewhat more was evident.

Bacterium medicaginis phaseolicola, described by Burkholder (12) from New York in 1926 and reported from Montana and Utah in 1927, and from South Carolina, Georgia, Florida, Wisconsin, Colorado, and Wyoming in 1928, was recognized even more widely in 1929 when it was reported for the first time from Mississippi and Michigan. In New York it was thought to cause about 1 per cent damage, but in general the season was too dry for development. In South Carolina the losses in Beaufort County were about 30 per cent, but for the State as a whole only a trace was reported. While less damaging to the stand in Georgia than in 1928, halo blight developed late in the season and was noted especially in some lots of Bountiful seed from Michigan. Ten per cent loss was estimated. In Michigan it was especially serious in Red Kidneys. It is said to have been increasing in importance there for some time and is now found rather generally in the State.

It is of interest to note that this organism has now been found causing a disease of beans in Germany (58).

P.D.R. pages 42, 58, 91, 94, 96, 120, 121, 135, 155.

MOSAIC (virus) occurred in nearly every field in New York, especially on Refugee Stringless Greenpod, reduction in yield estimated at 10 per cent, resulting from 16 per cent of the plants in the State being diseased. Idaho grown seed especially resulted in severely affected crops. There was not much mosaic on dry beans. (C. Chupp and J. G. Horsfall).

Very serious in Michigan canning crop, especially in Stringless Refugee variety. Disease spread very rapidly in July. Not important in white bean crop. (Ray Nelson).

Zaumeyer (73) reported that mosaic was distinctly more widespread in western states than any of the other bean diseases. Losses are given in table 52.

P.D.R. pages 121, 155.

Table 52. Losses from bean mosaic as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
10	New York	2	Maine, Texas
5	Kansas, Washington, Oregon	1	Massachusetts, Ohio, Michigan, Wisconsin, Minnesota
4	Montana, Idaho		
3	Mississippi	Trace	Maryland, Iowa

ROOT ROTS(various organisms).

ROOT ROT (Fusarium sp.) Dry root rot was very prevalent in the principal bean growing areas of California. It is probably the most serious bean trouble in the State. Some fields were a total loss. No variety appeared to be resistant.

A wilt caused by Fusarium sp. was found on pink beans in the upper Sacramento Valley. In one field there was 2 to 3 per cent loss, but in others, the loss was slight. (J. B. Kendrick).

P.D.R. page 42.

Table 53. Losses from bean root rots, due to various organisms, as estimated by collaborators, 1929.

Percentage loss	States reporting	Percentage loss	States reporting
10	South Carolina	1	Texas, Montana
5	Massachusetts	.5	Ohio
3	Idaho	Trace	Maryland, Wisconsin, Minnesota, Kansas, Washington
2	Oregon		

ASHY STEM BLIGHT (Macrophoma phaseoli). This disease, first reported from South Carolina in 1923 (1), from Georgia and Mississippi in 1926, and reported from these states frequently since, was mentioned in Disease Survey reports in 1929 only from Georgia where it occurred scatteringly in very slight amounts, much earlier in the season than heretofore.

P.D.R. page 42.

"BALDHEAD". Harter (24) has shown that this seedling abnormality in which the plumule is absent is due to injury by the threshing machine and rarely occurs in beans threshed by hand. The epicotyl is fractured just below the plumule. Snap beans are more susceptible to the injury than field beans. Lima beans are also affected.

ROOT ROT (Rhizoctonia sp.) P.D.R. pages 91, 155.

RUST (Uromyces appendiculatus). P.D.R. pages 73, 135.

LEAF SPOT (Cercospora sp.) P.D.R. page 42.

L I M A B E A N

YEAST SPOT (Nematospora phaseoli) was first described from Virginia by Wingard in 1922 (71). Since then it has been found in Illinois in 1923, in Maryland and Mississippi in 1927, and on lima bean seed from Alabama and Tennessee. In 1929 G. W. Fant reported that he received specimens from Elizabeth City, North Carolina.

STEM ROT (Corticium vagum). The unusual prevalence of this disease in New Jersey was accounted for by dry soil conditions. In the case of both potatoes and peas, Rhizoctonia injury has been found to be much more severe in dry than in wet soil. In some fields the crop was a total failure due in part to leafhoppers but mostly to stem rot. In this connection it should be said that the red spider was present in large numbers in these fields. The loss for the State was estimated at 5 per cent. (W. H. Martin).
P.D.R. page 10.

BACTERIAL LEAF SPOT (Bacterium vignae), BLIGHT (Bacterium phaseoli), MOSAIC (virus). P.D.R. page 72. (reports from Maryland).

C R U C I F E R S

MOSAIC (virus). Clayton (14) concludes that crucifer mosaic is and will continue to be, "a minor disease on Long Island because of the natural resistance of the most important economic cricifers, cabbage, cauliflower, and Brussels sprouts and also because these crops are grown during the cool weather of fall, whereas the disease develops best at high temperatures."

C A B B A G E

CLUB ROOT (Plasmodiophora brassicae) has been increasing in New York State but the use of hydrated lime is coming into practice so rapidly that probably there is a fairly large decrease in the losses. (Charles Chupp).
P.D.R. pages 151, 156.

TIP BURN (non-par.). A publication has been prepared recording three years' work showing that a fertilizer with a high phosphorus and low potash content increases tip burn, while about a 1 - 2 - 2 ratio reduces very much the amount of injury. Nearly all the tip burn occurs on Danish Baldhead. (Charles Chupp).

BLACK LEG (Phoma lingam). P.D.R. pages 151, 156.

BLACK ROT (Bacterium campestre). P.D.R. pages 3, 10, 59, 155, 156.

DOWNY MILDEW (Peronospora parasitica). P.D.R. pages 10, 155.

DROP (Sclerotinia sclerotiorum). P.D.R. page 151.

LEAF SPOT (Bacterium sp.). P.D.R. page 59.

SOFT ROT (Bacillus carotovorus). P.D.R. page 156.

YELLOWS (Fusarium conglutinans). P.D.R. pages 3, 156.

C A U L I F L O W E R

CLUB ROOT (Plasmodiophora brassicae). So much hydrated lime is used in nearly all cauliflower fields that club root is not a menace on this crop. It is present in the Schenectady-Albany district where liming is not a common practice. (Charles Chupp).

RING SPOT (Mycosphaerella brassicicola). P.D.R. page 10.

H O R S E - R A D I S H

BACTERIAL LEAF SPOT (Bacterium campestre armoraciae) has been described during the year by Lucia McCulloch. (42). It is known to occur in Virginia, the District of Columbia, Connecticut, Missouri, and Iowa. Morphologically and culturally the organism resembles Bacterium campestre and B. phaseoli, but it is different in its host reactions.

ROOT ROT (Undet.). For the past two years a serious root rot has occurred in commercial beds of horse-radish in two fields in St. Louis County, Missouri. Species of Fusarium have been isolated but the pathogenicity of the forms has not been determined. (I. T. Scott.)

K A L E

YELLOWS (Fusarium conglutinans) is a very important disease in the Petaluma district of California, where kale is widely used as a green food for chickens. Yellows is widely distributed there and is forcing many ranchers to find a substitute crop for poultry greens. (Kendrick (34).)

R A D I S H

A BACTERIAL SPOT (undet.) of radish and turnip was found in Indiana in 1928 and reported by White and Gardner (69). In greenhouse inoculation tests the organism also infected cabbage, Brussels sprouts, cauliflower, mustard, and tomato.

TURNIP

LEAF SPOT (Cercosporella albo-maculans). Large fields grown for canning purposes in George County, Mississippi, were rendered entirely worthless by this trouble. Tests showed that infection did not come from seed. (Miles and Fenner).

ROT (Rhizoctonia sp.). Lauritzen (38) has recently called attention to a storage decay of turnips and rutabagas which he has observed at the Arlington Experimental Farm, Virginia, and on the New York City and other markets. The pathogen is believed to be a strain of Rhizoctonia solani. The losses depend on storage conditions.

CUCURBITS

MUSKMELON

DOWNY MILDEW (Pseudoperonospora cubensis). Severe loss in Wicomico County, Maryland, followed cold foggy weather early in the season. Losses were almost total in fields which were not sprayed or dusted. For the State as a whole the total loss is estimated at 15 per cent, which includes 5 per cent reduction in yield and 10 per cent loss in quality. (R. A. Jehle).

In North Carolina downy mildew was very prevalent and destructive, causing 15 per cent reduction in yield and 5 per cent loss in quality. One application of Bordeaux misture when the disease first appeared greatly reduced losses, while two applications prevented damage. (F. W. Fant).

Infection was heavier and earlier than usual in Georgia, but not so early or damaging as on cucumbers and watermelons. Downy mildew is rarely as destructive as leaf blight or powdery mildew. Loss, a trace. (O. C. Boyd).

P.D.R. page 97.

BACTERIAL LEAF SPECK (Undet.). This disease, observed in previous years and reported to the Survey in 1928 as of undetermined cause, was more prevalent this year than usual in Georgia, causing severe premature defoliation in many smaller plantings. The bacterial character of the disease was confirmed by Miss Mary K. Bryan. Typical "speck" lesions were obtained by inoculating cantaloupes and watermelons with water suspensions from diseased cantaloupe leaves at the Albany field station. (O. C. Boyd).

FRUIT ROT (Phytophthora sp.). Charles Drechsler (18) isolated this organism from decaying tissue of a Honey Dew melon originating presumably in California or Colorado. On inoculation into healthy fruit it proved to be an efficient parasite, causing decay similar to that in the original specimen.

SOUTHERN BLIGHT (Sclerotium rolfsii). Melons rotted badly in some fields in North Carolina, the fungus entering the tissues next to the soil. The ripening and over-ripened melons were attacked. Green melons were not attacked. In some fields the loss of plants amounted to 5 to 10 per cent. (R. F. Poole).

BACTERIAL WILT (Bacillus tracheiphilus). P.D.R. page 122.

LEAF BLIGHT (Macrosporium cucumerinum). P.D.R. page 136.

MOSAIC (virus). P.D.R. page 122.

C U C U M B E R

MOSAIC (virus). R. H. Porter (49) has isolated a virus from mosaic cucumbers growing in a greenhouse at Bettendorf, Iowa. When inoculated into the cucumber variety Chinese Long and watermelons, which are resistant or immune to the ordinary cucumber mosaic, it produced typical symptoms. He calls this the "Bettendorf mosaic" to distinguish it from the common "white pickle mosaic." The two diseases differ with regard to symptoms, period of incubation, and host range.

P.D.R. page 122.

BACTERIAL WILT (Bacillus tracheiphilus). This common disease was reported as occurring widely, but only in two states, Massachusetts and Michigan, was it mentioned as being especially destructive. In Massachusetts it is said to be very important, both in the field and under glass on the fall crop. The growers there are using calcium arsenate-copper lime dust with very good results. In Michigan the most severe epiphytotic affecting the pickle crop in recent years was reported. As high as 50 per cent of the plants were destroyed in many commercial fields.

P.D.R. page 121.

ANGULAR LEAF SPOT (Bacterium lachrymans). P.D.R. page 72.

DOWNY MILDEW (Pseudoperonospora cubensis). P.D.R. page 97.

POWDERY MILDEW (Erysiphe sp.). P.D.R. pages 91, 97.

O T H E R   V E G E T A B L E S

A N I S E

DROP (Sclerotinia sclerotiorum). Anise or sweet fennel, Foeniculum vulgare, is grown extensively as a truck crop in the lower Rio Grande Valley of Texas for shipping to northern and eastern markets. During the year Taubenhaus, Bach, and Ezekiel (60) noticed damage to the crop estimated at from 5 to 10 per cent, apparently caused by Sclerotinia sclerotiorum. This fungus is rather commonly found on various truck crops in south Texas, but this is the first report of its occurrence on this host, not only for Texas, but for the United States.

B E E T

DOWNY MILDEW (Peronospora schachtii). Mildew caused serious losses to seed beet production in California the past year. Many fields were a total loss. The disease was present on sugar beets and garden beets, but the greatest damage was reduction in yield of seed. (J. B. Kendrick).

MOSAIC (virus). Table seed beets in the vicinity of Mount Vernon, Washington, have 100 per cent of the plants affected with mosaic. Mottling and necrosis of leaves and dwarfing of the plants is very evident. Ten plantings representing 30 or 40 acres showed this conditions. It was found in three lots of mother beets from this area that were grown in the greenhouse at Pullman during spring and early summer. (Leon K. Jones, June 28).

NEMATODE (Caconema radicicola). P.D.R. page 27.

CARROT

YELLOWS (virus.) Carrot yellows was reported from Maine, New York, Pennsylvania, and Wisconsin. The disease resembles aster yellows and may be due to the same virus. In Wisconsin there was more infection in carrots than in celery or lettuce, all next to an aster yellows experimental plot.
P.D.R. pages 117, 148, 174.

CELERY

YELLOWS (Fusarium sp.) In Michigan, 1929 was the worst year for yellows since 1921. Susceptible varieties were badly diseased in the Kalamazoo area. The resistant strains from Michigan State College, M.S.C. Golden Self Blanching and Newark Market, stood up well beside commercial varieties that were destroyed. The disease was also reported from a few places in Ramsey County, Minnesota. A new feature with respect to this disease is the report of its occurrence in destructive amounts around Canon City, Colorado. From 40 to 50 per cent of the plants in a few fields were reported affected by Le Clerg.
P.D.R. page 121.

ASTER YELLOWS (virus). Severin (53) has reported that yellows of celery and also of lettuce is identical with the aster yellows and is transmitted by Cicadula sexnotata. Folsom in Maine found what seemed to be this same disease and systematic sweepings resulted in capturing the leafhopper. In Wisconsin the disease was found on celery growing adjacent to an experimental aster yellows plot.
P.D.R. page 148.

EARLY BLIGHT (Cercospora apii). Celery growers have experienced much difficulty in growing the crop in North Carolina because of the Cercospora spot. The Golden Self Blanching varieties are a total loss in some plantings. The coarser green varieties are also badly diseased. Heavy spraying with Bordeaux mixture has been only partly successful in combating the disease. The loss for 1929 is estimated at 5 per cent. (R. F. Poole).
P.D.R. pages 116, 121, 157, 163.

ROOT KNOT (Caconema radicicola). In North Carolina the effect of the disease on celery is so severe that stunting, yellowing, and death are often the results. Several reports complaining of losses due to the nematode have been received from areas where an attempt is being made to grow the crop commercially. The loss for the State is estimated at 10 per cent. (R. F. Poole).
P.D.R. page 27.

TRENCH DECAYS (Bacillus carotovorus, Sclerotinia sclerotiorum, Botrytis sp.) caused a loss in Pennsylvania estimated at 10 to 15 per cent. The loss from this cause is correlated rather directly with warm winter weather. Storage of celery in modern cold storage houses is coming more and more into practice near Philadelphia. The satisfactory results in preventing rots and shrinkage promises a means of overcoming the great storage losses known in the past. (W. S. Beach).

P.D.R. pages 116, 163.

BACTERIAL BLIGHT (Bacterium apii). P.D.R. page 116.

CRACKED STEM (non-par.). P.D.R. page 157.

LATE BLIGHT (Septoria apii). P.D.R. pages 116, 121, 157, 163.

RUST (non-par.). P.D.R. page 163.

E G G P L A N T

WILT (Verticillium albo-atrum) is prevalent in many places where eggplants are being grown commercially. In some of the older sections it is the most important disease and is rendering the crop unprofitable. During the year it was reported to the Survey by Le Clerg (39, p.4) from Colorado for the first time. From 20 to 25 per cent of the plants in a few acres were affected. The New Jersey Agricultural Experiment Station reports that tests of a large collection of varieties from foreign countries have failed to show any prospective resistant types.

BLACK SHANK or BENDING-OFF (Phytophthora nicotianae Breda de Haan) of seedlings occurred in Porto Rico in 1928 and 1929. It was found for the first time in September, 1928. (J. A. B. Nolla).

BLIGHT (Phomopsis vexans), MOSAIC (virus), P.D.R. page 155. (Reports from Texas.).

L E T T U C E

YELLOWS (aster yellows virus), earlier spoken of as Rio Grande disease, rabbits' ear, and white heart, was reported from New Hampshire, New York, New Jersey, Delaware, Pennsylvania, Wisconsin, and Texas, in 1929. In New Hampshire about 50 per cent of plants allowed to go to seed were observed to be affected. In New York it seemed to be more severe than usual. Early lettuce is not usually severely affected, but in 1929 the yields of both early and late crops were much reduced. In Pennsylvania, on the other hand, where yellows causes from 5 to 50 per cent loss of the fall crop annually, much less than usual was noted. In Wisconsin it was noted especially in plants adjacent to affected asters.

P.D.R. paged 116, 149.

SLIMY ROT (bacterial). Brown (8) reports slimy rot to be an important field, transit, and storage disease of head lettuce in Arizona.

BOTTOM ROT (Corticium vagum). P.D.R. pages 95, 115.

DOWNY MILDEW (Bremia lactucae). P.D.R. page 116.

DROP (Sclerotinia spp.). P.D.R. pages 95, 116.

MOSAIC (virus). P.D.R. pages 95, 116.

TIPBURN (non-par.). P.D.R. pages 59, 116.

WILTS (undet.). P.D.R. pages 116, 140.

NEW ZEALAND SPINACH

ROSETTE (?) was reported from Marion County, Indiana, by M. W. Gardner. He stated that it had the appearance of being a virus disease.

OKRA

WILT (Verticillium albo-atrum) was severe in a few fields where okra had not been grown before. One field was observed which had a poor but wilt-free crop of okra the year before. The soil in this field was extremely acid (PH 3.9-4.0). In 1929 the same field was limed and planted to okra again and gave an excellent wilt-free crop. (C. M. Haenseler).

LEAF SPOT (Cercospora sp.), WILT (Fusarium sp.). P.D.R. page 43. (Reports from Georgia.)

ONION

YELLOW DWARF (virus), which was found in Iowa for the first time in 1928, was much less severe in 1929 because growers in the Pleasant Valley district indexed their sets (28) before planting. (R. H. Porter).

PINK ROOT (Phoma terrestris Hansen). During the year Hansen (23) has presented evidence that Phoma terrestris is the cause of pink root in California and also in other States. Inoculation experiments with several species of Fusarium seem to show that these act as secondary parasites and hasten destruction of the host but are not the primary cause of the disease.
P.D.R. page 117.

PURPLE BLOTCH (Macrosporium porri Ell.). Angell (3) points out that this fungus is the primary cause of the widely distributed disease which has frequently been attributed to M. parasiticum (M. sarcinula parasiticum.) His work has shown that the latter fungus is a secondary invader. He considers Alternaria allii Nolla to be the same as M. porri.

BULB DECAY (Fusarium sp.). What appears to be a new disease of stored onions was reported from Colorado by F. L. Wellman (67).

DOWNY MILDEW (Peronospora schleideni). P.D.R. pages 95, 117.

SMUT (Urocystis cepulae). P.D.R. pages 95, 117.

NEMATODE (Tylenchus dipsaci). P.D.R. page 9.

P E A S

WILT (Fusarium orthoceras var. pisi). Linford (40) considers this disease as second in importance only to root rot (Aphanomyces) and in some sections as the most important disease of the crop. In 1929 it was reported to the Survey only from Wisconsin and Minnesota. In the former State it was estimated that a loss of 4 per cent occurred on account of it, and in some fields the percentage of infection was as high as 50. Work on the selection and breeding of resistant canning peas in Wisconsin shows promise.

P.D.R. 73.

ROOT ROT (Aphanomyces euteiches). One of the principal diseases responsible for the very low yield and frequently poor quality of canners' peas in New York was Aphanomyces root rot. It was expecially destructive in the early peas as a result of wet weather immediately preceding and just following plantings. (H. H. Whetzel). The loss in New York was reported at 20 per cent by J. G. Horsfall.

In New Jersey a record-breaking high temperature period during the first week of April caused an unusually early infection. General infection evidently occurred during this warm period since the advanced stage of the disease with abundant mature oogonia was observed on May 3. The application of commercial fertilizers, 1000 to 1600 pounds per acre, reduced losses from root rot as in former years. On infested soil 1600 pounds of 4 - 8 - 5 increased the yield 206 per cent. (C. M. Haenseler)

P.D.R. pages 42, 93.

BLIGHT (Mycosphaerella pinodes). P.D.R. page 93.

ROOT ROT (Fusarium martii). P.D.R. page 73.

ROOT ROT (various organisms). P.D.R. page 59.

P E P P E R S

POD ROT (Phytophthora omnivora). A trace occurred in Cumberland County, New Jersey. The disease was observed for the first time in 1928 when considerable fruit rot resulted. (Dept. Plant Path.)

MOSAIC (virus), SOUTHERN BLIGHT (Sclerotium rolfsii). P.D.R. page 155. (Reports from Texas).

R H U B A R B

MOSAIC (unknown cause). What seems to be a mosaic of rhubarb has been under observation for a number of seasons in a field at Bustleton, Pennsylvania. The disease causes stunting, mottling of leaves, and finally death of the plants. It is spreading, causing dead areas in the field. It does not appear to be transmitted by contact. (W. S. Beach).

S A L S I F Y

YELLOWS (aster yellows virus) was reported from Maryland, Pennsylvania, and Wisconsin during 1929. This seems to be the first year that it has been recognized as a naturally occurring disease of this host. On the other hand, it has been produced experimentally by transfer of the leafhopper, Cicadula sexnotata, from diseased asters to salsify, and visa versa (36). The occurrence in Wisconsin was on salsify planted next to a plot of diseased asters. The effect of yellows on salsify is shown in figure 3. P.D.R. pages 139, 174.

WHITE RUST (Albugo tragopogonis). P.D.R. page 157.

DISEASES OF SPECIAL CROPS

COTTON

ROOT ROT (Phymatotrichum omnivorum). This disease has been known to occur in Texas, Oklahoma, New Mexico, Arizona, and California. In 1929 specimens of diseased cotton from Little River County, Arkansas, were identified by V. H. Young as being affected with Phymatotrichum omnivorum, and the diagnosis was confirmed by B. F. Dana. Apparently this is the first definite report of the disease in Arkansas although its presence there has been suspected for a number of years.

King and Loomis (35) report the discovery of a sclerotial stage of the fungus, with characters that would enable it to live through the winter or through long periods in the field without a supply of food.

P.D.R. 74, 98.

BLIGHT (Ascochyta gossypii). During the latter part of June and early July, an outbreak of this disease occurred in western South Carolina and northern Georgia. In South Carolina the disease looked as if it was going to be very serious for a time. Most fields examined in the area of occurrence showed a considerable number of dead plants. The worst case noted showed the disease on every plant, either leaf, petiole, or stem, and 4 per cent of the plants were dead. In Georgia, severe loss occurred in many fields in the northermost counties. Many fields were observed where the tops of the plants had been killed, but new shoots were sprouting from the base. This is the first authentic report of the occurrence of this disease in Georgia. With the termination of the rainy period in early July, the disease subsided and no further losses were reported.

Ascochyta blight was first reported from Arkansas in 1920 (19), 1921, and 1922, and in occasional years since that time. In 1924 it was reported from Virginia, North Carolina, and South Carolina, in which area there was an outbreak early in the season correlated with rainy weather. In 1925 it was first reported from the States of Mississippi and Alabama. These, together with the present Georgia report, constitute all the States of known occurrence.

P.D.R. pages 74, 88.

WILT (Verticillium albo-atrum) was reported for the first time from California by Shapovalov and Rudolph (54), who found it only in the southern San Joaquin Valley. The first diseased plants were observed in September, 1927, in a field which in the spring of that year had been planted with potatoes. The evidence seemed to indicate the introduction of the fungus with the seed potatoes in the spring of 1927.

Apparently the first report of this fungus occurring naturally on cotton is that of Sherbakoff (55) who found it in September 1927, on plants from Lake

Figure 3. Salsify yellows. One healthy plant and two diseased, from Hagerstown, Md., Sept. 19, 1929. Determination verified by L. O. Kunkel. Note dwarfing effect of disease and development of many yellowed, filamentous leaves on affected plants. (Withering of tips of both diseased and healthy plants is due to the fact that plants were held several days before being photographed.). Photo by Fobert, Sept. 28, 1929.

County, Tennessee. Since that time it has been found to be rather widely distributed and somewhat of a problem in the "gumbo" soils along the Mississippi River.

V. H. Young reported the collection of a few specimens in the northeast corner of Arkansas in 1929. So far as could be determined, however, only very little damage resulted.

P.D.R. page 158.

WILT (undet.). A new cotton wilt has been described by Taubenhaus, Ezekiel, and Rea (61) during the year. It was first brought to their attention in 1927 from Ellis County, Texas, where one field was showing 60 per cent loss. Since then they have found what appears to be the same disease in El Paso and Brazos Counties. Therefore a wide distribution in Texas is indicated, as these three counties are widely separated.

The symptoms of this wilt resemble the common Fusarium wilt to some extent but there are certain very marked differences which the authors describe. Another major point of difference is that this new disease occurs on heavy and alkaline soils, whereas the common Fusarium wilt in Texas occurs on sandy and acid soils.

Several fungi are associated with the disease but their pathogenicity has not been determined. A similar cotton trouble has been described by Fahmy as occurring in upper Egypt.

OTHER DISEASES. P.D.R. pages 43, 74, 91, 98, 149, 158, 194.

T O B A C C O

MOSAIC (virus) is probably the commonest and most widespread of the tobacco diseases. Exact information as to the extent to which it injures tobacco has not been available, but McMurtrey (43), after conducting experiments for three years in southern Maryland, has reported that both the yield and quality are very adversely affected, especially when infection takes place soon after transplanting. In the three-year tests the yield of tobacco inoculated at transplanting time was reduced on the average 30 to 35 per cent, and the gross value of the crop per acre more than 55 per cent. The later the infection the less the injury, but even when inoculated at topping time the quality of the leaf was considerably lowered.

P.D.R. pages 89, 99, 137.

WILDFIRE (Bacterium tabacum) was the cause of some trouble in seed beds in Massachusetts, Pennsylvania, Maryland, and Wisconsin. In the last-named State, heavy infection was observed in a few beds but they were destroyed. Wildfire is only known to occur on 20 farms in Wisconsin. In Virginia and North Carolina it was of only very slight importance. As a field trouble it appeared not to be of consequence in any of the States.

Johnson (32) concludes that wildfire is not likely to be a serious menace to tobacco production as was feared earlier. As far as the individual grower is concerned the potential danger is still large but the likelihood of sufficient crop injury to make the culture of tobacco hazardous in any district seems very small. Fairly reliable methods of prevention are available.

P.D.R. pages 4, 99, 137.

ANGULAR LEAF SPOT (Bacterium angulatum). The Middle Atlantic States from Maryland to South Carolina, and also Wisconsin, reported considerable damage from this disease. In North Carolina it was rather widespread and probably more important than any other tobacco disease in the State. Four per cent reduction in yield and 4 per cent loss in grade was estimated from North Carolina.

Valleau (64) is of the opinion that angular leaf spot is not the same as blackfire. The former is bacterial while the latter is considered to be non-parasitic and associated with nutritional and seasonal conditions. Tobacco pathologists should make an effort to obtain further evidence following this suggestion.

P.D.R. pages 89, 99, 137.

BLACK ROOT ROT (Thielavia basicola). This disease is becoming of greater importance in North Carolina, probably due to the recently and widely used lime products for correcting magnesium deficiency diseases, in which the soil reaction has been changed to neutral or alkaline, and is therefore more favorable for infection. Heavy infection was reported in the Piedmont. As yet the disease has not been reported in the coastal area. Loss, 3 per cent. (R. F.Poole).

In Massachusetts, alfalfa following tobacco on infested soil showed no black root rot. In Pennsylvania the disease was said to be increasing and the suggestion made that resistance on the part of some strains appears to be lost. In Wisconsin injury seems to be gradually diminishing annually, apparently due to increase in the use of resistant strains. A report from Porto Rico mentioned occasional occurrence, but the distribution was limited to a section where the temperature is lower than in the other tobacco sections.

P.D.R. page 137.

BROWN ROOT ROT (undet.). Massachusetts farmers are avoiding brown root rot by not planting tobacco on brown root rot soil or after predisposing crops like corn or timothy. (W. L. Doran).

An unusually large amount of this trouble seems to be present in Wisconsin this year. (James Johnson).

P. D. R. page 137.

FRENCHING (undet.). P.D.R. page 89.

BACTERIAL WILT (Bacterium solanacearum). P.D.R. page 99.

RING SPOT (virus). P.D.R. page 99.

SUGAR CANE

MOSAIC (virus). The introduction and increased use of resistant varieties is rapidly reducing the prevalence of and loss from mosaic in the cane-producing sections of our Southern States and is re-establishing the industry which was gradually going downward (7). In both Louisiana and Mississippi, mosaic infection is general in fields of the old, susceptible varieties but the acreage of these is being replaced with the newer, resistant sorts.

RING SPOT (Leptosphaeria sacchari). Specimens of six different cane varieties affected with ring spot were received from B. A. Bourne of Florida. Although this disease has been mentioned as occurring in the United States before, these are the first specimens to be filed with the Survey.

P.D.R. page 167.

SUGAR BEET

The following report on sugar beet diseases is contributed by G. H. Coons and A. W. Skuderna.

CURLY-TOP (virus), which normally is limited to the area west of the Rocky Mountains, aside from occasional, sporadic cases in the adjoining states, caused much less damage in 1929 than in the previous season. This decrease has been attributed by entomological experts to failure of the vector (Eutettix tenella) to overwinter and the consequent smaller numbers entering the fields.

Eastern Colorado showed, as usual, a trace. In western Colorado, the damage was placed as "slight". This area shows considerable damage about three years out of five. The Montana area reported practically no loss from curly top. In Utah, which normally suffers severe injury about two years out of five, there was only slight damage. The loss in Idaho has been placed at 2 per cent for the entire area, but the situation there is difficult to estimate because some sections where beet culture still persists are near to natural breeding areas and in such cases the curly-top incidence is very high, almost leading to crop failure In California the loss was slight but it must be noted that the areas at present used for sugar-beet production have been restricted to the practically curly-top-free zones; many factories are standing idle. The section about Chino, California, probably suffered 10 to 15 per cent loss. In the new region opening up around Sacramento in the Delta Region there were traces of loss.

SUGAR-BEET NEMATODE (Heterodera schachtii). Soil infestation with the sugar-beet nematode is limited to the western United States. The infested area is approximately the same as before but the situation in general has improved greatly due to curtailment in use of infested land and to the system of crop rotation enforced by nearly all companies. In spite of care, however, some fields in all districts are put in nematode-infested land and sugar beets are allowed to follow sugar beets, in which case nematode loss is severe.

Estimates will place the loss for Colorado and California at approximately 2 per cent, with probably similar figures safe for the Utah and Idaho areas. This figures for loss represents a striking contrast to the situation 5 or 10 years ago, when the infested area in which the growing of sugar beets was actually being attempted mounted into thousands of acres. (c.f. previous plant disease survey reports).

LEAF SPOT (Cercospora beticola), caused, in general, less damage in 1929 than in certain previous seasons, being checked in the extreme eastern section by the drought of long duration. In northern Iowa and southern and eastern Minnesota, the loss, taking into consideration both sugar and tonnage effects, was from 3 to 5 per cent, with the probability that the higher figure more nearly represents the situation. In northern Colorado also, the loss can be placed for this at from 3 to 5 per cent, which was fairly high for that area, since severe leaf-spot damage ordinarily is avoided. The Arkansas Valley of southern Colorado, which suffers severely from leaf-spot in about 8 years out of 10, suffered a loss from 5 to 10 per cent, taking into consideration both sugar and tonnage reductions The Nebraska area showed about a 3 per cent leaf-spot loss.

ROOT ROTS, including rots in storage piles, vary with locality and almost from field to field. Many organisms are concerned, and methods of handling play an important role in determining incidence of these diseases which are to be attributed to Rhizoctonia sp., Phoma betae, and various Fusaria.

The Nebraska area reported more root rot damage than any other, the loss there being estimated at 2 to 3 per cent.

STORAGE ROTS, which in part at least are connected with the root rots which start in the field and continue when the beets are in the storage piles, were reduced to a minimum in 1929, due to the cold weather during the storage period. There were severe freezing losses in all the sugar-beet areas due to early frosts and delayed harvests.

DAMPING-OFF, caused by a number of pathogens, was severe in Michigan where the stand was reduced 30 to 40 per cent. It was almost impossible to find a sugar-beet field with a satisfactory stand. The same situation held in Ohio and Indiana. This seemed to be associated with the unfavorable wet spring conditions. Iowa, Minnesota, Colorado, and Utah had good stands and a minimum of damping-off. Idaho had occasional fields where damping-off loss was found. California showed damping-off in very early plantings and many fields had to be replanted. In Washington heavy losses occurred, but probably less than in previous years.

DOWNY MILDEW (Peronospora schachtii), has so far only been reported from California, and in that State has been limited to the Fog Belt near the coast. In 1927 and 1928 there was a very serious loss from mildew, attributable to the weather in February and March where sunshine was less than normal and rainfall in the coastal area heavy. The 1929 season showed only a trace of mildew and affected plants pretty largely outgrew the early attack.

HOPS

DOWNY MILDEW (Pseudoperonospora humuli) was reported last year from New York State, but the collaborator stated that it was not reported there in 1929. Further information about the occurrence in British Columbia is given by Salmon and Ware (52), who state that the fungus agrees with that which has been so destructive in Europe during recent years. They suggest that it may have been imported into Canada in or on hop sets obtained from Europe.

Oregon has recently restricted the entrance of hop roots from other countries and States.

This disease was seen in Japan as early as 1905, where it was evidently native on wild hops. It was collected on wild hops in Wisconsin in 1909, and at frequent intervals since that year. In England it was first noticed in 1920, but iw was not until 1925 and 1926 that it became conspicuous. Almost simultaneously it was found in other countries of Europe, thus, Germany in 1924; France, Belgium and Russia in 1925; and numerous others in 1926.

CROWNGALL (Bacterium tumefaciens). At Independence, Oregon, a 35-acre plot has about 10 per cent of the plants affected this year. The grower says that the leaves become yellow early the first year that noticeable symptoms are seen, the next year the plants are much dwarfed, and the third year they are usually gone. We do not know how many years this may be after infection first takes place.

This is the first report of crowngall on hops from Oregon. (S.M. Zeller)

GOLDEN SEAL

WILT (Fusarium sp.), which has been causing considerable concern to the golden seal growers in northern New York in the past few years, was found in two gardens, in one of which it was very destructive. (H. H. Whetzel.)

DISEASES OF TREES

CONIFERS

CEDAR BLIGHT (Phomopsis juniperovora). (With figure 4). Cedar blight, primarily a disease of Juniperus virginiana seedlings, is one which is known to practically every grower of nursery cedars. The disease is not a new one, for since 1896 it has been recognized as destructive. Cedar blight is now thoroughly established throughout the nurseries of the middle west where red cedar is grown on a commercial scale. It is also to be found in nurseries and ornamental plantings along the Atlantic seaboard where in certain instances it has been definitely known to have been introduced from the middle western region. A strain of the fungus has been isolated by the author from ornamental Cupressus funebris in California.

Phomopsis juniperovora Hahn is now reported from the following states: Alabama, Connecticut, District of Columbia, California, Florida, Illinois, Iowa, Kansas, Kentucky, Louisiana, Maryland, Missouri, Nebraska, New Jersey, New York, Minnesota, North Carolina, Ohio, Pennsylvania, Rhode Island, Tennessee, and Wisconsin.

Cedar blight has been reported by the author and other investigators upon the following hosts, which are all confined to the Cupressaceae:

Juniperus chinensis, chinensis Pfitzeriana, communis, communis montana, excelsa stricta, horizontalis (J. prostrata), lucayana, pachyphloea, procumbens (J. chinensis procumbens), sabina, sabina tamariscifolia, scopulorum, scopulorum argentea, squamata meyeri, virginiana, virginiana cannartii, virginiana plumosa, virginiana tripartita.

Cupressus arizonica, benthami, funebris, glabra, goveniana, macrocarpa.

Thuja occidentalis, orientalis, plicata (T. gigantea).

Chamaecyparis lawsoniana (Cupressus lawsoniana), obtusa, pisifera plumosa, pisifera squarrosa.

A Phomopsis species very closely related to P. juniperovora, and which is widely distributed among nursery and ornamental stock both in the United States and Europe, may be confused with the cedar blight organism. This species has been identified by Hahn (22) as P. occulta Trav., (Hahn, G. G.) the imperfect stage of Diaporthe conorum (Desm.) Niessl (syn.: D. occulta (Fckl.)Nke.: D. pitya Sacc.). Certain strains of P. occulta may be regarded as slightly parasitic; occasionally this fungus may cause a definite canker or die back on the main stem and laterals. The host genera upon which P. occulta has been found either as a saprophyte or parasite, include: Abies, Cryptomeria, Cupressus, Juniperus, Larix, Picea, Pinus, Pseudotsuga, Sequoia, Taxodium, Taxus, Thuja, Thujopsis, and Tsuga.

Of the genera attacked Juniperus is undoubtedly the most susceptible, although considerable loss has been experienced by certain nurseries in the genus Cupressus. The virginiana types and varieties are decidedly prone to the disease, particularly seedlings from seed collected in the Platte River region. J. sabina and varieties, together with certain varieties of J. chinensis are also to be regarded as quite susceptible. Certain species and varieties, however, have been observed to show varying degrees of resistance. J. virginiana keteleeri has been reported New Jersey Agr. Exp. Sta. Nursery Disease Notes 1 (1): 1-6. July 1928, mimeographed) as one apparently highly resistant. J. chinensis has also been considered as a species showing a good deal of resistance. J. excelsa stricta has been regarded heretofore as immune; despite a single observation of blight on this species in New Jersey by Dr. R. P. White it may be considered as one exceedingly resistant.

During 1929, cedar blight was reported generally throughout New Jersey but it was much less prevalent than in 1928. In southeastern Minnesota where an extremely wet season was experienced, the disease was very prevalent; in Ohio the disease was observed throughout all the nurseries of the state to the extent that nurserymen were experiencing a marked loss of cedar stock. (Glenn Gardner Hahn)

THE EUROPEAN LARCH CANKER (Dasyscypha willkommii (Hartig) Rehm) has long been known in Europe and is one of the most prominent and most studied fungus diseases in European forests. It occurs throughout the range of the European larch, whether natural or planted, and in many places the growing of larch has in consequence been given up as unprofitable. Although American forest pathologists have been on the lookout for this disease for many years, it was not discovered until 1927. Previous reports of the fungus in this country appear to be based on errors of identification. There is now no doubt, however, that the disease found at Hamilton, Massachusetts, and in that general vicinity is the true larch canker of Europe. It has been found in only a limited area in Massachusetts and is well under control. Although there has been extensive scouting since 1927, the disease has not been found on larch outside of this limited territory.

The larch canker has been reported in Europe on other hosts, particularly Douglas Fir and Sitka Spruce, but we have so far been unable to find evidence that these species were seriously damaged. However, in the same locality in Massachusetts where the larch canker occurs another Dasyscypha canker was found seriously affecting planted Douglas Fir and Western Yellow Pine. At first the fungus associated with this trouble was taken to be Dasyscypha willkommii, but further study indicates that it is not this species. Whatever this disease on Douglas Fir is, and whatever its origin, there is no doubt that it seriously affects the trees, and pending further evidence it must be regarded as a serious menace to native as well as planted Douglas Fir. In addition to its occurrence in the general vicinity of Hamilton, Massachusetts, this disease has been found at Groton, Massachusetts, some 40 miles to the West, and in Rhode Island near the town of East Greenwich. Despite general scouting no occurrences of this disease have been found outside the localities mentioned. (Haven Metcalf).

ROOT AND BUTT ROT (Polyporus circinatus Fr.) was observed on living western white pines, Pinus monticola, in northern Idaho. Other conifers including Engelmann spruce, Picea engelmanni, Douglas fir, Pseudotsuga taxifolia, western hemlock, Tsuga heterophylla, and western larch, Larix occidentalis, in the West; and Picea mariana in Minnesota have also been found affected. It has also been reported from Canada. (31)

B A L S A M F I R (Abies balsamea)

BUTT-ROT (Polyporus balsameus Pk.) Hubert (30) reports this rot on balsam fir, Abies balsamea, from Wisconsin and Minnesota. The fungus was first reported from the Adirondack Mountains. It has also been reported from Canada. It seems to be a serious factor in pulp stands, especially following attacks of the spruce bud worm.

Figure 4. One-year old seedling of _Juniperus virginiana_ showing terminal growth attacked by _Phomopsis juniperovora_. Photograph furnished by G. G. Hahn

PINES (Pinus spp.)

WHITE PINE BLISTER RUST (*Cronartium ribicola*) White pine areas in New England and New York totaling 919,755 acres were cleared of Ribes in 1929. Since 1918, control of the rust has been established on 7,757,140 acres of land at an average cost of 20.4¢ per acre. The total number of Ribes bushes destroyed in the Northeastern and Lake States in 1929 amounted to 7,936,245. The forests in this region contain 8,221,167 acres of white pine of sufficient value to warrant protection.

Nurseries in infested regions which produce white pines for ornamental and forestry purposes have been encouraged and aided in establishing a Ribes-free protective zone around their premises to insure the production of white pine planting stock free from blister rust. In this work, good progress has been made in several of the cooperating States. In Connecticut eleven nurseries now have a Ribes-free area of 1,500 feet, and are surrounded by a mile zone within which all *Ribes nigrum* have been removed.

In Pennsylvania the blister rust on pine spread westward and southward, infections being found in the Alleghany National Forest and in Franklin County near Mont Alto in Biesecker's Gap, only five miles north of the Maryland State line. While blister rust was known to be present prior to 1929 on white pine in 10 counties, by the end of 1929 it had been found on pine in 17 additional counties. Exceptionally severe pine infection is found in Cameron and Potter Counties.

In Marquette and Dickinson Counties, in the Upper Peninsula of Michigan blister rust was found to have spread to white pine, the infections dating back to 1915.

In Wisconsin there was some spread of infection in the eastern part in Shawano, Oconto, Forest and Waupaca Counties, while in the western part there was considerable spread in Dunn, Chippewa and Barron Counties.

In Minnesota new infections were found on pine at Mora, Afton, Duluth, Sunrise and Coleraine.

Black currant eradication has been carried on in several of the Eastern States. In Michigan the work was done in 7 counties, 4 of which were completed, viz: Cheboygan, Missaukee, Newaygo and Roscommon. The total number of *Ribes nigrum* destroyed was 5,461. In Rhode Island some 5,703 *Ribes nigrum* bushes were destroyed in 22 townships. After August 20, 86% of these bushes in Rhode Island showed infection.

In the Western States the most striking events were the discovery of pine infections in northern Idaho dating back to 1923, the spread of the rust on Ribes in Curry County, Oregon, the extreme southwestern county in the State, and the enlargement of the known infection area in western Montana.

During the summer of 1929, large-scale application of stream-type eradication was carried out in northern Idaho thus protecting a total of 21,500 acres of white pine of the Clearwater Timber Protective Association, and 57,010 acres of white pine type of the Potlatch Timber Protective Association. Ribes eradication was accomplished by the spraying of chemicals and by hand pulling. The total bushes destroyed by spraying is impossible to estimate but the bushes which were hand pulled number 1,034,517.

In California extensive Ribes eradication experiments were carried on, particularly in the Plumas National Forest, the number of acres worked being 3,660 and the bushes removed 472,406. (R. G. Pierce.)

BLISTER RUST (Cronartium comptoniae) is a serious disease of pitch and hard pines in eastern United States. During the past year Lachmund (37) reported it as indigenous in the Pacific Northwest. It has been found on both Pinus contorta and the alternate host (Myrica gale) in British Columbia and Washington.

WOODGATE RUST (Peridermium sp.) is a gall rust belonging to the form-genus Peridermium and occurring on Scotch pine (Pinus sylvestris L.) It is established over two extensive areas in New York, Clinton, Franklin, and Essex counties in the Northeastern part of the State, and Oneida, Lewis, and Herkimer counties in the central part. It is also reported from the Provinces of Ontario, Quebec, and Nova Scotia in Canada. It spreads directly from tree to tree without any alternate host. It attacks susceptible trees with great virulence, but many individual trees are resistant. Scotch pine is not a timber tree of major importance, and at the present time is probably more utilized in the State of New York than anywhere else, particularly for planting in sandy barren soil in the Black River valley. It has long been planted as a shade tree throughout the United States.

This rust has not yet been identified. We call it Woodgate rust, because it was first (1925) found at Woodgate, N. Y. Evidence to date indicates that it is a stranger in the country. It may have been present for a long time; it certainly has been confused with Peridermium cerebrum by some collectors, although the aecia are not cerebroid. It may possibly be one of the forms of rust native in the West and now passing under the name of Peridermium harknessii, but this is to some extent contradicted by the fact that galls of harknessii found on Scotch pine at Halsey, Nebraska, are different in shape from the Woodgate rust, and in California harknessii has not been observed to pass onto planted Scotch pine. If the rust is a form of harknessii that has found its way East, it might constitute a menace to the eastern hard pines, including the very valuable turpentine pines. If it is a stranger in the country, it is a potential menace to any hard pine, including not only the turpentine pines of the Southeast but the western yellow pine which ranges from Canada to Mexico.

Danger from the Woodgate rust lies in the following facts: (1) It is a Peridermium. Many species of this genus are virulent parasites. (2) Like the White Pine blister rust, it is a stem Peridermium - it attacks the trunk and branches of the tree. (3) It attacks susceptible trees with even greater virulence than the White Pine blister rust. A tree 15 feet high was found by actual count to have over 18,000 galls. (4) The Peridermiums which attack conifers usually attack all members of the group to which their particular host belongs. For example, White Pine blister rust is not confined to Pinus strobus, but attacks all 5-needle pines. The Woodgate rust might be expected to attack any hard pine. It has been shown by inoculations in the field or greenhouse that Woodgate rust can pass to the following pines:

P. canariensis	Canary Island Pine
P. caribaea	Slash Pine
P. densiflora	Japanese Red Pine
P. jeffreyi	Jeffrey Pine
P. muricata	Bishop Pine
P. nigra poiretiana	Corsican Pine
P. pinea	Stone Pine
P. ponderosa	Western Yellow Pine
P. radiata	Monterey Pine
P. sabiniana	Digger Pine
P. sylvestris	Scotch Pine
P. taeda	Loblolly Pine
P. virginiana	Virginia Pine

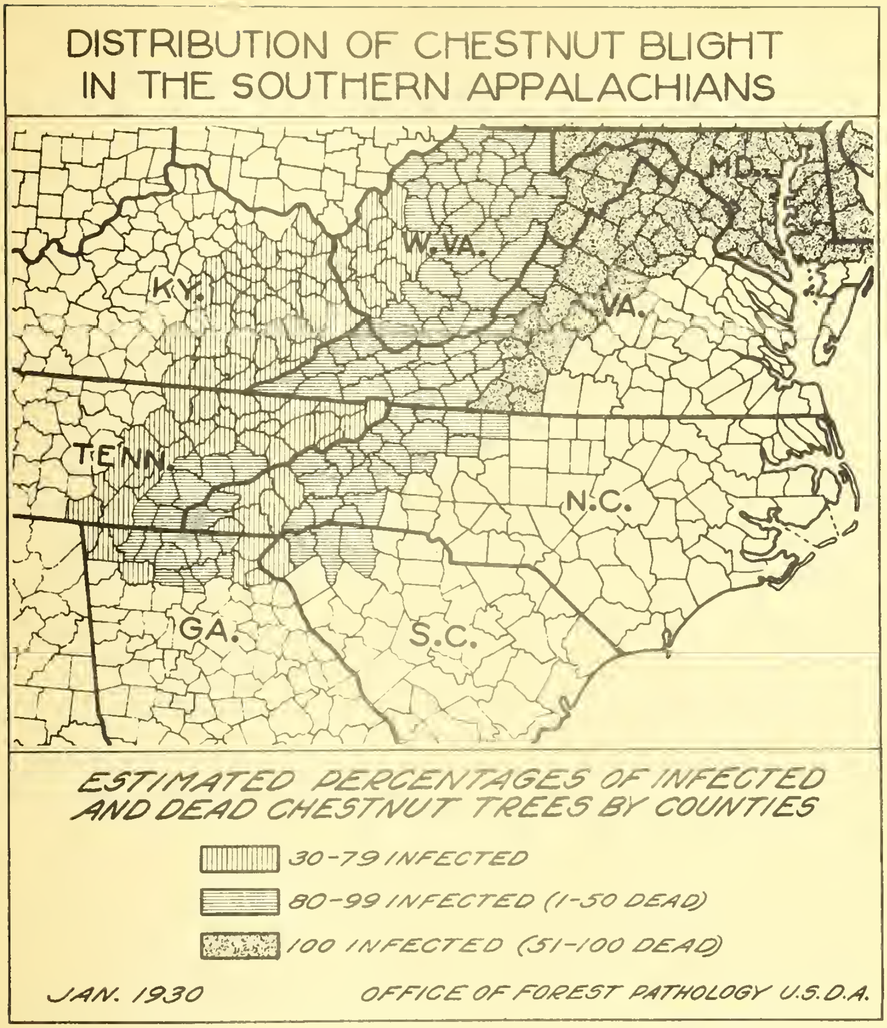


Figure 5. Distribution of chestnut blight (Endothia parasitica) in the Southern Appalachians

Inoculations are in progress, and other hosts may be expected to be added to this list. (5) Any disease that is thriving outside of its natural habitat is potentially dangerous. The Woodgate rust is a stranger in its present range and is growing on an imported host. (6) The Woodgate rust is autoecious. This is a rare condition in the Periderіums. The Woodgate rust will therefore be impossible to control by the method ordinarily used in controlling rusts, viz., destruction of the alternate host.

The prominent symptoms of Woodgate rust consist of galls and usually witches'-brooms. The galls may be scattered, or may occur as thickly as beads on a string. As a rule, the parts of the tree above a gall die sooner or later. In New York the aeciospores are produced in June, and cover the galls more or less thickly with a yellow powder. Federal Quarantine No. 65, effective November 1, 1928, and amended effective April 1, 1929, prohibits the shipment of the hosts of Woodgate rust from the infected areas in New York. Woodgate rust is not likely to find its way into other States otherwise than on nursery stock of Scotch Pine. Inspectors, pathologists, and foresters should look for galls on Scotch Pine everywhere. Differentiating Woodgate rust on any hard pine from other gall-rusts is a task for the specialist. (Haven Metcalf.)

CANKER (Dasyscypha fusco-sanguinea) was reported by Sillinger (59) as being common on western white pine (P. monticola) in the white pine regions of the Inland Empire of Montana, Idaho, Washington, and Oregon. It has many similarities to the white-pine blister rust and is confused with it.

HEART ROT (Lentinus lepideus Fr.) This species, well-known as a saprophyte, is reported by Wagener (66) as the cause of a heart rot of living Pinus ponderosa, P. contorta, P. lambertiana, and P. banksiana. The fungus on living trees seems to be fairly common in the Sierra Nevada in California. It has also been collected on living pines in Arizona and Montana in the West and in Minnesota and the District of Columbia in the East.

H A R D W O O D S

B L A C K   L O C U S T (Robinia pseudacacia)

BROOMING DISEASE (virus.). Hartley and Haasis (25) have reported on this disease during the past year. It has been observed in Virginia, Maryland, Georgia, North Carolina, and Pennsylvania. In 1928 Archer (5, p. 352 and pl. 5) reported it from West Virginia.

C H E S T N U T (Castanea dentata)

BLIGHT (Endothia parasitica). Estimates on the spread of the chestnut blight in 1929 were contributed by Government and State foresters, extension pathologists, county agents, and private parties. The accompanying map (figure 5), on which the percentages of infection are divided into three classes, shows that the lowest infection for any chestnut-producing county in the southern Appalachians was 30 per cent. The blight has been reported by W. D. Valleau as destroying chestnut on estates in the vicinity of Louisville, Ky., thus extending the limit of the disease in that State, 90 miles or more west.

F. C. Strong, of the Michigan State College, reported finding blight-infected American chestnuts between Jackson and Lenawee Junction, Michigan.

In the Plant Disease Reporter, Vol. XIII, No. 13, Nov. 15, 1929, G. F. Gravatt recorded the finding of chestnut blight at Gunter, Oregon. The infection was probably introduced from some of the Eastern States, and the few infected trees have been destroyed. (R. B. Clapper).

E L M (Ulmus spp.)

DUTCH ELM DISEASE (Graphium ulmi) was first found in Holland about twelve years ago. It now occurs throughout northern continental Europe and in the last two years has appeared in Great Britain. It is not known to occur in the United States, but on account of its great destructiveness in Europe, the rapidity of recent spread, and its potential importance to the United States, it is mentioned in this summary. Strict watch should be kept for this disease and suspicious cases reported, so that prompt action may be taken. Metcalf (45) has recently summarized the situation briefly before the fifth National Shade Tree Conference in Brooklyn, New York.

F R A N G I P A N I (Plumeria acutifolia)

RUST (Coleosporium domingense). A specimen of a rust which was defoliating a frangipani tree at Coconut Grove, Florida, has been identified as Coleosporium domingense (Berk.) Arth. (C. plumeriae Pat.). This seems to be the first report of this rust in the United States. It is known to occur on species of Plumeria in the West Indies, Guatemala, Peru, Panama, and Mexico.
P.D.R. page 9.

M A P L E (Acer spp.)

ROOT KNOT (Caconema (Heterodera) radicicola) was reported to the Plant Disease Survey on broad leaf maple (Acer macrophyllum) for the first time. The occurrence was in Lane County, Oregon.
P. D. R. page 174.

CROWN GALL (Bacterium tumefaciens) was reported on sycamore maple (Acer pseudoplatanus) for the first time to the Plant Disease Survey. It occurred in a Michigan nursery plot where slightly over 50 per cent of the trees were affected. The roots showed typical galls and also in many cases a hairy root condition.

S Y C A M O R E (Platanus spp.)

LEAF SPOT (Stigmina platani (Fckl.) was reported on the native sycamore, Platanus racemosa, in California by Apostolides (4). It had already been known on P. orientalis in that State.

W I L L O W (Salix spp.)

BLIGHT (Fusicladium saliciperdum). This disease was first reported in the United States by G. P. Clinton (Plant Dis. Reptr. 11:87. Aug. 1, 1927), who found it causing serious damage around Norfolk, Connecticut. Previous to this it had been reported as occurring only in Germany, Holland, Scotland, and other European countries. Subsequent search in 1928 and 1929 has shown it to be of frequent occurrence in parts of the New England States, New York, and in the eastern provinces of Canada - Nova Scotia, Cape Breton Island, Prince Edward's

Figure 6. Occurrence of willow blight (Fusicladium saliciperdum) in the United States, as reported to the Plant Disease Survey, 1929. (Each dot represents a county where the disease has been collected or observed.).

Island, and New Brunswick. The observations and collections of scouting parties in 1929 considerably extended the known range of occurrence. On the accompanying map (figure 6) are indicated the counties from which the disease has been reported to date.

The disease is capable of causing severe damage. Hundreds of large trees have been killed and seriously injured in New England and in the Canadian Provinces the destruction seems to be even greater.

Many different species of willow are attacked. At least eight species have been found affected in Connecticut. There is considerable variation in the susceptibility of these different species, however. Thus, the large yellow-twigged willow, *Salix alba* var. *vitellina*, is most persistently and seriously injured; the white willow, *S. alba*, so far has been found attacked only rarely; the bayleaf willow, *S. pentandra*, seems somewhat resistant; while the weeping willow, *S. babylonica*, apparently is immune.

An excellent summary of the present situation has recently been given by Clinton (15).

P.D.R. 44, 61, 74, 75, 110, 142, 143, 160; also in P.D.R. 14: 77. 1930.

BLACK CANKER (*Physalospora miyabeana*). This fungus has been found commonly associated with the destructive leaf and twig disease caused by *Fusicladium saliciperdum*. Spaulding and Collins (Plant Dis. Reptr. 13: 142-144) report collecting it in Nova Scotia, New Brunswick, Quebec, Maine, New Hampshire, Massachusetts, Connecticut, and New York. According to Spaulding, the fungus seems to fruit naturally only on young twigs or sprouts. The 1929 season was so dry that there was little natural fruiting. However, in moist chambers, the Gloeosporium stage developed readily on suitably chosen twigs and sprouts.

Nattrass and Hutchinson (46) regard this as of considerable importance in England.

P.D.R. 142, 143.

DISEASES OF WOODY ORNAMENTALS

BOX (*Buxus sempervirens*)

DIE BACK. Every year numerous complaints of dying back of twigs and death of boxwood bushes and trees are received. In the majority of cases either one or both of two fungi are present on the affected leaves, namely, *Macrophoma candollei* and *Volutella buxi*. Occasionally other fungi are found. The exact role of these fungi, as well as the best means of prevention, seem to be very imperfectly known. In 1929 reports were received from the majority of the Eastern States, from Connecticut south to Mississippi and Arkansas.

CRAPE MYRTLE (*Lagerstroemia indica*)

POWDERY MILDEW (*Uncinula australiana*) was recorded in 1929 from the District of Columbia for the first time. The disease has been known in this country since 1924. Since that time it has spread to most of the Southern States, from the Carolinas southwestward to Texas.

LILAC (*Syringa vulgaris*)

BACTERIAL BLIGHT (*Bacterium syringae*). In 1926 C. O. Smith (56) called attention to a bacterial disease of lilac in California apparently caused by the same organism which causes citrus black pit and blast (*Pseudomonas citriputeale*). In 1928 Miss Bryan (11) reported the same lilac disease from Illinois where it had been collected by Anderson in 1925. The disease is known to occur in Germany (1891), the Netherlands (1899) and England (1908).

In 1929 what seems to be this same disease was reported to the Survey from New York, New Jersey, Mississippi and Washington.

BOTRYTIS BLIGHT (Botrytis sp.) which has been previously reported only from New England, New York, and the Pacific Northwest, was reported again from western Washington and what was thought to be the same disease was rather serious in some localities of western Oregon.

BLIGHT (Phytophthora syringae) has been known in Europe since 1905, but it was not until 1929 that it was reported from the United States when it was found in the District of Columbia, May 2. White (70) considers Phytophthora cactorum to be the cause of a blight of lilac, as well as of Rhododendron, in New Jersey.

P.D.R. page 27.

R H O D O D E N D R O N (Rhododendron spp.)

DIE-BACK (Phytophthora cactorum). Reported by White (70) as the cause of serious die-back of native and hybrid Rhododendrons.

WILT (Phytophthora cinnamomi). This fungus has been reported by White (70) as the cause of Rhododendron wilt.

R O S E (Rosa spp.)

INFECTIOUS CHLOROSIS (virus). The rose disease variously termed infectious chlorosis, mosaic, or yellows, has been identified on about 25 varieties of Hybrid Tea roses grown under glass in the following states: Massachusetts, New York, Pennsylvania, New Jersey, Illinois, Indiana, Iowa, Michigan, Wisconsin, Colorado, and Oregon. It has also been found on Manetti understocks in Oregon, Washington, and British Columbia, and on Manetti and Ragged Robin in California. It has been experimentally transferred to Rosa multiflora, but not to R. odorata.

Experiments have shown that the disease is transferred from infected to healthy plants by grafts and buds, and is perpetuated by the use of cuttings from diseased plants. Either the stock or scion may be diseased and cause infection in the other component.

Present indications are that rose stocks from the Pacific Coast have been the most frequent source of the disease in greenhouse roses in the East, but there are indications that foreign stocks also are sometimes infected.

Thorough roguing of infected plants has proved effective in practically eliminating the disease in greenhouse plantings, and in holding it well in check in plantings of understocks. (Freeman Weiss).

BLACK SPOT (Diplocarpon rosae). This common and destructive disease was reported from most all states east of the Great Plains area and from the Pacific Northwest. In general there seemed to be less than the usual damage, probably owing to dry summer weather, but in some states such as Missouri or Kansas it was of more than average destructiveness.

CANE BLIGHT (Leptosphaeria coniothyrium) and BROWN CANKER (Diaporthe umbrina). Both of these troublesome cane diseases were frequently reported in 1929. The former seemed to be the most common cause of complaints.

P.D.R. pages 10, 11.

DISEASES OF HERBACEOUS ORNAMENTALS

CHINA ASTER (Callistephus chinensis)

WILT (Fusarium conglutinans callistephi). Progress in the control of this disease, which was reported in 1929 from fourteen states scattered in all parts of the country, is reported by Jones and Riker (33). Promising resistant strains of all colors have been secured.
P.D.R. page 124.

YELLOWS (virus) continued to be very destructive. In Michigan it was estimated that half of the plants were affected, and cases of 100 per cent loss were observed. A loss of 25 per cent was reported for Kansas. In Oregon considerable trouble was experienced with a disease having symptoms similar to yellows. Jones and Riker (33) continued to obtain effective control by the use of cloth coverings.
P.D.R. pages 10, 124.

DAHLIA (Dahlia sp.)

BACTERIAL WILT (Bacterium solanacearum). This disease, which was first reported by Wolf (72) from North Carolina in 1922, was reported again from several localities in that State in 1929. Dozier (16) has written a short article on the disease and mentions having observed it in Delaware during the years 1927, 1928, 1929.

J. F. Adams reported a heavy infection in one planting in Delaware in 1927.

STUNT AND MOSAIC (virus). This group of diseases, the causes and symptomatology of which are not clearly defined, are becoming increasingly troublesome. In 1929 damage was reported to the Survey from the following states: Connecticut, Pennsylvania, New Jersey, Delaware and Indiana.
P. D. R. page 138.

GLADIOLUS (Gladiolus spp.)

STORAGE ROT (Penicillium gladioli). The cause of this storage rot was first determined in 1923 but previous to that time it had been widely observed both in the United States and in Canada. In 1929 it was reported as becoming a very serious trouble in Michigan in storage. In Indiana it was found abundant only in stock of growers who washed bulbs over a screen.

IRIS (Iris spp.)

NEMATODE (Tylenchus dipsaci) was found on bulbous Iris in Virginia by J. M. R. Adams. It was reported on Iris spp. from Pierce County, Washington.
P.D.R. page 28.

LEAF BLIGHT (Kabatiella microsticta) was reported as causing serious blighting of I. germanica in New Jersey, District of Columbia and New York City.
P.D.R. pages 43-44.

LEAF SPOT (Ascochyta iridis Oud.) on I. germanica, Washington, D. C.
P.D.R. page 109.

LEAF SPOT (Polyspora herbarum var. iridis). P.D.R. page 161.

ROOT KNOT (Caconema radicicola) P.D.R. page 175.

BASAL ROT (Sclerotium delphinii). Reported from New Jersey.

MOSAIC (virus). Reported from New Jersey.

MOSAIC OF BULBOUS IRIS. In a general survey of iris plantings on the Pacific Coast from Washington to California, early in 1929, Mr. Philip Brierley noted the general prevalence of a mosaic or yellow streak disease. The prevalence of mosaic greatly increased the farther south one traveled along the coast and in Southern California it was not uncommon to find stocks which had been in the country for five to six years infected 100 per cent. Iris stocks recently imported from Holland showed much less infection and sometimes none. A forcing test of different iris stocks with various percentages of mosaic showed a very depressing effect of mosaic on the number and quality of flowers produced. Information was given to us that some of the large buyers of iris for forcing purposes are now asking for a guarantee that the stock they purchase is free from mosaic. (Freeman Weiss)

L I L Y (Lilium spp.)

MOSAIC (virus) General in stock forced for Easter trade in New Jersey. From 2 per cent up to 18 per cent counted in various places. (R. P. White). Ogilvie and Guterman (47) have recently published a preliminary report of lily mosaic as observed in Bermuda and in greenhouses in the United States.

FOOT ROT (Phytophthora cactorum) was reported from Indiana and Maryland in the vicinity of the District of Columbia, on various species of Lilium.
P.D.R. page 8.

N A R C I S S U S (Narcissus spp.)

BASAL ROT (Fusarium sp.). The way for control of this disease, which causes great losses to stock and bulbs in storage, has recently been pointed out by Weiss (P.D.R. 13: 160) who recommends cold storage as a satisfactory and feasible method. Several workers have shown that the hot water treatment for nematode favors basal rot and the suggestion has therefore been made that a disinfectant, such as one of the mercuric compounds or formaldehyde, be added to the water.

BULB NEMATODE (Tylenchus dipsaci). During the year specimens of bulbs originating in the following states were examined in the Office of Nematology with positive results: Massachusetts, New York, Virginia, Florida, Ohio, Michigan. It was also found on cut flowers of poeticus ornatus from Canada intercepted at Detroit. Collaborators reported its occurrence in Washington and Oregon, but for Oregon the statement is made that it has been practically eradicated from commercial plantings.
P.D.R. page 9, 28.

MOSAIC OR GRAY DISEASE (virus) was reported in commercial plantings from Virginia, Michigan, Washington, and Oregon. Much difference in the susceptibility of varieties was noted. Apparently the growers are not practicing any control measures to eliminate or reduce it.
P.D.R. page 8.

P H L O X (*Phlox* spp.)

STEM NEMATODE (*Tylenchus dipsaci*) was first found on phlox in this country in 1923 in New Jersey. It was observed in California in 1924 but has not been seen there since. In 1928 it was noted in Connecticut. In 1929 it was reported from these two States and also from New York. In each instance the disease was destructive. In Europe the nematode has been reported on phlox from Belgium, Holland, Switzerland, and Germany. Lately the notes about this pest in central Europe have been becoming increasingly frequent.
P.D.R. pages 43, 60, 109.

S W E E T P E A (*Lathyrus odoratus*)

CROWN GALL (*Bacterium tumefaciens*). One case was observed in a greenhouse in Atlantic County, New Jersey. The grower recalled first observing the condition five years ago. Since then it has gradually become more abundant so that the 1928-29 crop had about 30 per cent of plants with large fascicled outgrowths at base. Apparently it did not affect the growth nor the yield. (C. M. Haenseler).

T U L I P (*Tulipa* spp.)

BREAKING (virus). In Oregon, where commercial bulb growing is on the increase, this is only rarely of much importance. In individual patches where stocks were not properly segregated and aphids were prevalent it was often noticeable, however. (M. B. McKay).

V I R G I N I A B L U E B E L L S (*Mertensia virginica*)

MOSAIC (virus). Whetzel and White (P.D.R. 44) reported the observation of a serious type of mosaic affecting 30 per cent of the plants in a New Jersey garden. This seems to be the first record of mosaic on this host.

L I T E R A T U R E C I T E D

1. Annual Report, South Carolina Agricultural Experiment Station 36: 47. June 30, 1923.
2. Adams, J. F. An actinomycete the cause of soil rot or pox in sweet potatoes. Phytopath. 19: 179-190. Mar. 1929.
3. Angell, H. R. Purple blotch of onion (Macrosporium porri Ell.). Jour. Agr. Res. 38: 467-487. May 1, 1929.
4. Apostolides, C. A. A leaf spot of sycamore caused by Stigmina platani (Fuckel) Sacc. Phytopath. 19: 667-671. July 1929.
5. Archer, W. A. Plant diseases in West Virginia in 1928. U. S. Dept. Agr. Bur. Plant Dis. Rptr. Suppl. 72: 324-365. Dec. 30, 1929.
6. Barrus, M. F., and Charles Chupp. Yellow dwarf of potatoes. Phytopath. 12: 123-132. 1922.
7. Brandes, E. W. Sugar industry saved in Louisiana by using disease-resistant varieties of cane. U. S. Dept. Agr. Year Book 1928: 565-567. 1929.

8. Brown, J. G. Slimy rot of head lettuce. (Abstract). Phytopath. 20: 126. Jan. 1930.
9. Brown, J. G., and Frederick Gibson. Some observations on alfalfa girdle. Phytopath. 12: 188-190. 1922.
10. Bryan, Mary K. A fruit spot of tomato caused by Aplanobacter michiganense. Phytopath. 19: 690. July 1929.
11. Bryan, Mary K. Lilac blight in the United States. Jour. Agr. Res. 36: 225-235. 1928.
12. Burkholder, W. H. A new bacterial disease of the bean. Phytopath. 16: 915-927. Dec. 1926.
13. Childs, Leroy. The relation of woolly apple aphis to perennial canker infection with other notes on the disease. Oregon Agr. Exp. Sta. Bul. 243. 31 pp. 1929.
14. Clayton, E. E. A study of the mosaic disease of crucifers. Jour. Agr. Res. 40: 263-270. 1930.
15. Clinton, G. P. Willow scab blight. Proc. Fifth Nat. Shade Tree Conf. 1929: 61-62. 1929.
16. Dozier, H. L. Bacterial wilt of dahlia. Bull. Amer. Dahlia Soc. 10 (5): 36-37. Oct. 1929.
17. Drechsler, Charles. The beet water mold and several related root parasites. Jour. Agr. Res. 38: 309-361. 1929.
18. Drechsler, Charles. A fruit rot of Honey Dew melons due to a species of Phytophthora. (Abstract). Phytopath. 19: 85. Jan. 1929.
19. Elliott, John A. A new Phoma disease of cotton. (Abstract). Phytopath. 11: 48. Jan. 1921.
20. Gardner, Max W. Sporotrichum fruit spot and surface rot of apple. Phytopath. 19: 443-452. May 1929.
21. Goss, R. W. The rate of spread of potato virus diseases in Western Nebraska. Jour. Agr. Res. 39: 63-74. July 1, 1929.
22. Hahn, G. G. Life-history studies of the species of Phomopsis occurring on conifers. Unpubl. Mss.
23. Hansen, H. N. Etiology of the pink-root disease of onions. Phytopath. 19: 691-704. Aug. 1929.
24. Harter, L. L. Thresher injury a cause of baldhead in beans. Jour. Agr. Res. 40: 371-384. Feb. 15, 1930.
25. Hartley, Carl, and Ferdinand W. Haasis. Brooming disease of black locust (Robinia pseudacacia). Phytopath. 19: 163-166. Feb. 1929.
26. Haskell, R. J., and W. W. Diehl. False smut of maize, Ustilaginoidea. Phytopath. 19: 589-592. June 1929.
27. Hedges, Florence. The relationship of Bacterium medicaginis phaseolicola and Bacterium puerariae. (Abstract). Phytopath. 20: 140. Jan. 1930.
28. Henderson, W. J. Indexing as a control measure for the yellow-dwarf disease of onions. (Abstract). Phytopath. 20: 115. Jan. 1930.
29. Heppner, Meyer J. Pear black-end and its relation to different root stocks. Proc. Amer. Soc. Hort. Sci. 24 (1927): 139-142. 1928.
30. Hubert, E. E. A butt-rot of balsam fir caused by Polyporus balsameus Pk. Phytopath. 19: 725-731. Aug. 1929.
31. Hubert, E. E. A root and butt rot of conifers caused by Polyporus circinatus Fr. Phytopath. 19: 745-747. Aug. 1929.
32. Johnson, James. Tobacco wildfire is less serious menace than it once seemed. U. S. Dept. Agr. Yearbk. 1928: 581-583. 1929

33. Jones, L. R., and Regina S. Riker. Further progress in the control of aster wilt and yellows. Phytopath. 20: 129. Jan. 1930.
34. Kendrick. J. B. Kale yellows (Fusarium conglutinans) in California. (Abstract). Phytopath. 20: 114. Jan. 1930.
35. King, C. J., and H. F. Loomis. Further studies of cotton root rot in Arizona, with a description of a sclerotium stage of the fungus. Jour. Agr. Res. 39: 641-676. Nov. 1, 1929.
36. Kunkel, L. O. Studies on aster yellows. Amer. Jour. Bot. 13: 646-705. Dec. 1926.
37. Lachmund, H. G. Cronartium comptoniae Arth. in Western North America. Phytopath. 19: 453-466. May 1929.
38. Lauritzen, J. I. Rhizoctonia rot of turnips in storage. Jour. Agr. Res. 38: 93-108. 1929.
39. LeClerg, E. L. Notes on some diseases of economic crops in the Arkansas River Valley, Colorado, 1929. U. S. Dept. Agr. Bur. Plant Ind. Plant Dis. Rptr. 14: 1-7. Jan. 1, 1930.
40. Linford, M. B. Pea diseases in the United States in 1928. U. S. Dept. Agr. Bur. Plant Ind. Plant Dis. Rptr. Suppl. 67: 1-14. Mar. 15, 1929.
41. Mackie, W. W. Sclerospora macrocarpa in barley. Phytopath. 20: 107. Jan. 1930.
42. McCulloch, Lucia. A bacterial leaf spot of horse-radish caused by Bacterium campestre var. armoraciae, n. var. Jour. Agr. Res. 38: 269-287. 1929.
43. McMurtrey, J. E. Jr. Effect of mosaic disease on yield and quality of tobacco. Jour. Agr. Res. 38: 257-267. Mar. 1, 1929.
44. Melchers, L. E., C. H. Ficke, and C. O. Johnston. Physiologic specialization in Sphacelotheca sorghi. (Abstract). Phytopath. 20: 142-143. Jan. 1930.
45. Metcalf, H. M. The Dutch elm disease. Proc. Fifth Nat. Shade Tree Conf. 1929: 60-61. 1929.
46. Nattrass, R. M., and H. M. Hutchinson. Black canker of the basket willow. Jour. Min. Agr. Great Britain 36: 363-369. July 1929.
47. Ogilvie, Lawrence, and C. R. F. Guterman. A mosaic disease of the Easter lily. Phytopath. 19: 311-315. March 1929.
48. Orton, W. A. Plant diseases in 1905. U. S. Dept. Agr. Yearbk. 1905: 606. 1906.
49. Porter, R. H. A new mosaic disease of cucumber. (Abstract). Phytopath. 20: 113. Jan. 1930.
50. Ramsey, G. B., and Alice A. Bailey. Late blight tomato rot in California. (Abstract). Phytopath. 20: 115. Jan. 1930.
51. Rose, Dean H. Blister spot of apples and its relation to a disease of apple bark. Phytopath. 7: 198-208. 1917.
52. Salmon, E. S., and W. M. Ware. The downy mildew of the hop in British Columbia. Brewers' Jour. 65 (763): 49. 1929.
53. Severin, H. H. P. Yellows of celery, lettuce, and other plants transmitted by Cicadula sexnotata (Fall.). Hilgardia 3: 543-571. Feb. 1929.
54. Shapovalov, M., and B. A. Rudolph. Verticillium hadromycosis (wilt) of cotton in California. U. S. Dept. Agr. Bur. Plant Ind. Plant Disease Rptr. 14: 9-10. Jan. 15, 1930.
55. Sherbakoff, C. D. Wilt caused by Verticillium albo-atrum Reinke & Berth. U. S. Dept. Agr. Bur. Plant Ind. Plant Dis. Rptr. Suppl. 61: 283-284. July 1, 1928.

56. Smith, C. O. Similarity of bacterial diseases of avocado, lilac, and citrus in California. Phytopath. 16: 235-236. 1926.
57. Smith, R. E. Diamond canker of prune. Phytopath. 19: 1139. Dec. 1929.
58. Stapp, C. Die Fettfleckenkrankheit der Bohne, eine für Deutschland neue, durch Bakterien hervorgerufene Pflanzenkrankheit. Nachrichtenbl. Deut. Pflanzenschutzd. 9: 35-37. May 1929.
59. Stillinger, C. R. Dasyscypha fisco-sanguinea Rehm on western white pine, Pinus monticola Dougl. Phytopath. 19: 575-584. June 1939.
60. Taubenhaus, J. J., W. J. Bach, and W. N. Ezekiel. Anise drop. U. S. Dept. Agr. Bur. Plant Ind. Plant Dis. Rptr. 13: 141. Oct. 1, 1929.
61. Taubenhaus, J. J., W. N. Ezekiel, and H. E. Rea. A new cotton wilt. Phytopath. 19: 171-173. 1929.
62. Thomas, H. E., and A. B. Burrell. A twig canker of apple caused by Nectria cinnabarina. Phytopath. 19: 1125-1128. Dec. 1929
63. Thomas, H. E., and W. D. Mills. Three rust diseases of the apple. New York (Cornell) Agr. Exp. Sta. Mem. 123. 21 pp. 1929.
64. Valleau, W. D. Are blackfire and angular leaf spot of tobacco identical? (Abstract). Phytopath. 19: 93. Jan. 1929.
65. Valleau, W. D., and E. N. Fergus. Black-stem disease of alfalfa, sweet clover, and red clover. Phytopath. 19: 507-509. May 1929.
66. Wagener, W. W. Lentinus lepideus Fr.: a cause of heart rot of living pines. Phytopath. 19: 705-712. Aug. 1929.
67. Wellman, F. L. A new disease of stored onions found in Colorado. U. S. Dept. Agr. Bur. Plant Indus. Plant Dis. Rptr. 13: 3. May 15, 1929.
68. Weston, W. H. The occurrence of Sclerospora graminicola on maize in Wisconsin. Phytopath. 19: 391-397. Apr. 1929.
69. White, H. E., and M. W. Gardner. Bacterial spot of radish and turnip. (Abstract). Phytopath. 19: 97. 1929.
70. White, R. P. Two Phytophthora diseases of Rhododendron. (Abstract). Phytopath. 20: 131. 1930.
71. Wingard, S. A. Yeast-spot of Lima beans. Phytopath. 12: 523-532. 1922.
72. Wolf, F. A. Additional hosts for Bacterium solanacearum. Phytopath. 12: 98-99. Feb. 1922.
73. Zaumeyer, W. J. Bean diseases in Western United States in 1929. U. S. Dept. Agr. Bur. Plant Indus. Plant Dis. Rptr. 14: 38-43. Mar. 1, 1930.
74. Zeller, S. M. Another anthracnose of raspberry. Phytopath. 14: 601-602. June 1929.

CORRECTION

Peronospora effusa (downy mildew) was erroneously reported as occurring on carrots in Indiana (Plant Dis. Rptr. Suppl. 68: 87. May 1, 1929). This fungus was reported on spinach from that State, which can be added to the others listed on page 92 (l.c.)

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Some Special Plant Disease Surveys in New York State in 1929

September 1, 1930

BUREAU OF
PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

SOME SPECIAL PLANT DISEASE SURVEYS IN NEW YORK STATE IN 1929

Prepared by

H. H. Whetzel, Collaborator, Mycology and Disease Survey, and Professor Plant Pathology, Cornell University. Assisted by J. G. Horsfall, A. G. Newhall, D. S. Welch, B. H. Davis and H. J. Lee.

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INTRODUCTION

H. H. Whetzel

With the financial cooperation of the Plant Disease Survey of the Bureau of Plant Industry, United States Department of Agriculture, some special plant disease survey work in the State of New York was undertaken by the writer during June, July, and August, 1929. B. H. Davis, assistant in the Department of Plant Pathology at Cornell University, and J. H. Lee, assistant in the Department of Botany in Wabash College, Indiana, devoted much of their time to the work in the field and in the determination of the specimens collected in the course of the surveys. Dr. J. G. Horsfall, in charge of Investigations on the Diseases of Canners' Crops at the Geneva Experiment Station, assisted with the survey work on these crops; Dr. A. G. Newhall, in charge of Truck Crop Disease Investigations at Cornell University, gave considerable time to the surveys of diseases in crops grown on the muck lands of the State. Dr. D. S. Welch, Forest Pathologist in Cornell University, took notes on the diseases of trees and shrubs that came to our attention during the summer.

The writer made a special study of the occurrence and distribution of willow blight and the bacterial blight of lilac in the State. He also made two trips through the ginseng-growing sections of the State during the summer to study the diseases of this crop. (Dr. Whetzel's observations on ginseng diseases were published in the Plant Disease Reporter 13:136-7.1929.) Special attention was given to the occurrence of leaf rust and loose smut in wheat by Messrs. Davis and Lee.

Specimens of the more interesting and uncommon fungous and bacterial diseases encountered were collected and preserved as herbarium specimens. Duplicates of these have been deposited in the Mycological Collections of the United States Department of Agriculture.

To all those who have assisted and cooperated in the work of the survey the writer is greatly indebted and records his appreciation.

A PLANT DISEASE SURVEY OF MUCK CROPS

A. G. Newhall

Approximately 20,000 acres of muck land in New York are utilized to grow onions, lettuce, celery, and carrots; perhaps 1,000 acres of this are devoted to potatoes, spinach, Chinese cabbage, and other miscellaneous vegetables, such as beets, turnips, and asparagus.

A number of serious diseases annually cause enormous losses to these crops, and the weather largely determines which of them will be the most destructive. Thus a wet spring favors onion smut and a wet summer onion mildew and celery blight. In a dry season onion pink root and lettuce yellows become very prevalent, and tipburn is most severe in a hot summer.

For the State as a whole the season of 1929 was characterized by a very wet spring followed by very dry, cool weather in July and August. Two or three hot periods of short duration occurred. As a result of these conditions onion smut was very severe wherever the formaldehyde treatment was not employed. In many fields the treatment was rendered less efficient than usual due to heavy rai falling immediately after sowing. Onion mildew, though present, was held in chec by the dry weather. Pink root was more common than usual. Lettuce yellows becam very destructive by August 15. Tipburn was severe only in certain regions where heavy fertilization is practiced and hot weather occurred. Bottom rot was again the most destructive disease of lettuce, causing the loss of over one-third of the crop. Mildew of lettuce was prevalent on the early spring and late fall sowings. Celery blights, though present, were held in check by the dry weather, as was true also of spinach mildew. A direct loss to the growers from all causes is estimated at a million and a quarter dollars, of which about half was due to diseases.

Since conditions were not the same in all parts of the State, a more detailed account of the diseases found in the principal muck regions follows. Th is based on the field counts made by the fellowship men in field laboratories in three of the principal muck regions of the State and upon special survey trips to all the important areas.

The Genesee-Orleans Region

In the Elba section, where close to 2,200 acres are nearly evenly divided between lettuce and onions and about 300 more are devoted to carrots, potatoes, spinach, and miscellaneous crops, the chief diseases were bottom rot (Rhizoctoni sp.) and yellows (virus) of lettuce. According to Mr. Cook, our field laborator man stationed at Elba, over 50 per cent of the lettuce crop was destroyed during the season by bottom rot, the heaviest losses coinciding with rains and high temperatures occurring the last weeks of June and July.

Lettuce yellows (virus) appeared two or three weeks earlier than usual (June 23), and due to the dry season favorable for leaf-hopper development becam very prevalent by the middle of August. A 5 per cent loss for the season has been estimated for the disease.

Warm weather the third week of June and last of July caused considerable loss from tipburn, although for the season the disease was less severe than usua the estimated total loss for the Genesee-Orleans region being but 2 per cent.

Mosaic (virus) of lettuce was present in most fields in small quantities, one-half to 3 per cent, but toward the end of the summer it could be found three to four times as abundant.

Mildew (Bremia lactucae) was prevalent on practically all the early sprin and late fall-sown lettuce. Its stunting and discoloring effects together with the fact that affected plants are more subject to transit rots make it of more importance than is usually realized.

A lettuce wilt (cause unknown) was more prevalent than in the past, being present in most fields and often affecting 3 or 4 per cent of the plants.

Gray mold (Botrytis) and a stem girdle of unknown cause together with cut worms further reduced the yield by approximately 16 per cent.

Thus it may be seen that over three-fourths of the lettuce that was sown was destroyed by various diseases and insect pests in the Elba section, which was not especially exceptional. Undoubtedly this amounted to more than $100,00C loss.

Onion mildew (Peronospora schleideni) appeared three weeks later than usual (August 13), but made little progress on account of dry weather, probably causing but 2 per cent loss.

Smut(Urocystis cepulae) has now been found in several places on the Elba muck and caused an appreciable loss on several farms so that control measures wi doubtless be introduced there another year. A 2 per cent loss is estimated for the entire Elba section. It is a remarkable fact that smut has been absent from that region for so many years (over 12).

High temperatures the last week in May caused many onion seedlings to burn off at the surface of the muck. In spite of these handicaps, together with maggots and thrips, a very good crop of onions was harvested, since a dry season is very favorable for this crop.

Pink root (Phoma sp.) was more abundant than usual on account of dry conditions but is estimated to have caused only 4 per cent loss.

A Botrytis neck-rot was found causing perhaps 1 per cent damage, mostly to set onions.

The greatest losses to onions were from maggots, cutworms, and thrips, all of which thrive in a dry summer and which are estimated by Mr. Cook to have cut the yield 20, 15, and 3 per cent, respectively.

Thus, in spite of the fact that 1929 was considered to have been a very favorable one for onions little better than half the possible yield was realized in the Genesee-Orleans region.

The Wayne County Muck

In Wayne County, where over 5,000 acres of muck are said to be in cultivation, celery is the leading crop. Ordinarily late blight (Septoria apii) and bacterial leaf spot (Pseudomonas apii) caused much loss, but on account of drought during the months when celery was growing there was but a trace of early, late, and bacterial blights. The crop was cut about 20 per cent by lack of moisture, and Mr. Gaines, the fellowship man at Williamson, estimated at least a 12 per cent loss from the tarnished plant bug, which was much worse than usual.

Carrots are the next crop of importance in this region, having taken the place of much of the lettuce that used to be grown. The principal reduction in yield was occasioned by the rust fly, which damaged about 10 per cent of the crop. Leaf spot, (Cercospora) soft rot (Sclerotinia and bacteria), a crown rot caused by Rhizoctonia, and yellows (virus) were noted in a few fields, but were not serious.

The onion crop was nearly 20 per cent above normal on account of the dry weather, although smut would have ruined it in this region if the formaldehyde treatment had not been very generally practiced. In one untreated field the stand was reduced about 80 per cent and the yield almost the same. The loss for the county is set at 10 per cent. The treatment doubtless saved the county $80,000 in 1929. Pink root was more abundant than usual, on account of dry soil conditions. Over 80 per cent of the onions were affected, but the loss is estimated at less than 5 per cent. Neck rot (Botrytis) and mildew (Peronospora) were found in a few fields, but caused appreciable loss in only one or two. Maggots and thrips are thought to have reduced the yields by about 15 per cent, the latter being fairly abundant.

There are still hundreds of acres of lettuce grown in the county, but 20 per cent of it was lost on account of tipburn and about 10 per cent from each of the other two major diseases, bottom rot and yellows, which would bring the total loss to the lettuce crop well above $45,000 for the county. Mosaic was present to the usual extent of about 3 per cent for the season, being much more than this on the later crops. A stem girdle of unknown cause and Botrytis gray mold were present in several fields.

The Oswego County Muck

At least four-fifths of the 3,000 acres of tilled muck in Oswego County are devoted to lettuce. The season of 1929 was cooler and drier than usual, although April and May were very wet. Again, nearly a third of the crop was unmarketable on account of bottom rot, according to Mr. Townsend, the fellowship man located at Oswego, who made counts in the field once a week throughout the harvest season. It is likely the county lost over $225,000 from bottom rot and about that sum in 1928. Leaf hoppers (Cicadula sexnotata) became exceedingl abundant, so that yellows (virus) ruined over 50 per cent of some fields by August 15, and the average loss for the season is placed at 10 per cent. Mosaic (virus) also affected as high as 23 per cent of some fields the latter part of the summer and is credited with an average reduction of about 5 per cent of the crop. Drop (Sclerotinia), mildew (Bremia), damping-off (Rhizoctonia), Botrytis rot, and stem girdle (cause unknown) were all found during the season and togeth are believed to have reduced the yield by 4 per cent, since nearly half of the crop was rendered unmarketable on account of one disease or another. It is evident, therefore, that by a conservative estimate the diseases of lettuce cost the county over $300,000.

Little reduction in yield is thought to have occurred to the 200 acres of carrots in the county, although a disease thought to be yellows was present in many fields to a small extent.

A seed-borne Fusarium caused considerable loss to spinach by damping-off the seedlings. It was controlled by soaking the seed one hour in bichloride at 1 to 1,000.

Approximately 100 acres of celery in the county were much damaged by drought. The tarnished plant bug caused heavy losses also by its injury known as black joint. Only a trace of early and late blight was found.

The Orange County Muck

Some 4,000 acres of muck in Orange County are devoted to vegetables, near three-fourths of which are onions. Onion smut probably took 10 per cent of the crop, some growers still refusing to use the formaldehyde treatment. Pink root was more prevalent than usual on account of the dry weather. But in spite of this and of thrips and maggots an exceptionally good crop was harvested. No mildew was seen.

Tipburn of lettuce ruined a number of spring sowings during a very hot period the last week in May and again in the latter part of June. Bottom rot likewise destroyed a high percentage of the heads at these times. The late sowings were badly affected with yellows and mosaic, some fields showing over 30 per cent.

Celery blights were almost unknown this season, but the dry weather reduced the yield approximately 25 per cent, and much loss was reported by grower in February from damping off in the greenhouse seedbeds.

After an absence of four years from the State the writer was impressed by the 1929 muck survey with two interesting things in regard to lettuce tipburn. In the first place, from the fellowship reports of the past two or three season it is evident there is much less tipburn than five years ago. In the second pla a marked change in fertilizer practice has taken place in certain sections where tipburn formerly was very severe. The old formula of 2-8-10 has been replaced with one much lower in potash and higher in nitrogen, such as a 4-8-4 or 5-10-5. In view of the positive correlation between tipburn and fertilizers high in potash, which was pointed out in Wayne County by the author several years ago, and in view of the fact that tipburn is still more severe in those sections of the State where the most potash is used, the improved condition can be attributed to the change in fertilizer practice; a change induced largely by the efforts of the vegetable gardening extension service.

In regard to bottom rot of lettuce, Mr. Townsend is getting considerable evidence of the positive value of cleaning off all refuse from the soil immediately after harvest, in order to remove the sclerotia of Rhizoctonia that formed in the unharvested heads and to avoid turning under any leaves on which the fungus can grow. Certain growers who have been practicing this "clean up" program for several years are notably freer from bottom rot than their neighbors who have been regularly plowing under their refuse.

Increasing evidence is being gathered by Mr. Cook indicating that onion mildew is commonly carried over as mycelium in the seed as well as in the bulbs of set onions.

DISEASES OF CANNING CROPS

J. G. Horsfall

Since the writer was employed early in 1929 to devote his time to studying the diseases of canning crops in New York State, it seemed desirable first of all to learn what diseases are affecting these crops in the State, how serious they are, and how widespread. The survey method was adopted as a means to this end.

Many of the observations, especially near Geneva, were made incidental to other work in the field, but several exploratory trips by automobile were made through the canning-crops area, the most important being a 500-mile trip in company with Prof. H. H. Whetzel and Messrs. B. H. Davis and H. J. Lee, of the Department of Plant Pathology, Cornell University. The major results of this trip have been reported briefly already (Plant Disease Reporter 13:93-95. 1929).

The writer traveled more than 1,500 miles during the summer in making the survey through the canning-crops area in central and western New York, and inspected 143 fields of these crops as well as 25 fields of dry beans and 6 fields of market garden tomatoes for comparison. This mileage was consumed in surveying 32 fields in all parts of Ontario County, 29 fields in Wayne, 7 in Yates, 9 in Steuben, 9 in Livingston, 2 in Wyoming, 12 in Genesee, 18 in Niagara, 19 in Orleans, 10 in Monroe, 6 in Oswego, 2 in Madison, 1 in Onondaga, and 6 in Dutchess.

P E A S

Canners everywhere in the State were bemoaning the poor pea pack of 1929. Almost without exception the men were in agreement that the crop was the poorest that they had had in many years. One individual said that he had been canning peas for 30 years, but he had never had such a poor pack. It seems that two major factors operated in producing this condition--drought as such and disease as aggravated by the drought. A prolonged wet spring retarded planting operations over the entire pea area, and the peas which did go into the ground formed roots only in the upper layers of soil. Then the season turned dry, catching the shallow-rooted peas unprepared. In some cases peas were planted in wet soil and never received enough rain to wet the soil again before they were harvested. Certainly such conditions are not conducive to a bumper crop. The lack of moisture does not tell the whole story. The wet weather in the spring was highly stimulating to the diseases, especially the root rots, to which the pea plant is subjec When dry weather hit the infected peas, their yield was curtailed tremendously.

Altogether 69 pea fields were seen, totaling about 188 acres. Peas as a rule are planted in small patches by the farmer. Usually he grows two varieties, an early and a late, in order to prolong the harvest season and reduce the peak load in the canning factory.

ROOT ROT caused by Aphanomyces euteiches was the most powerful factor among the diseases in curtailing yields, especially of the earlier varieties. It was found in 27 per cent of the 56 pea fields examined, ranging from a trace to 100 per cent of infected plants. Frequently this disease occurs in a field in patches which may be seen from the road as yellowed areas in the peas. These patches cause trouble in determining the percentage of diseased plants in a field. Only one field was seen where the disease was recorded as a trace. On the other hand it was estimated to affect 10 per cent of the plants in one field, 25 per cent in another, 50 per cent in two more, and from 75 to 100 per cent in six fields. In six other fields it was adjudged serious or very serious. Several fields scattere over the State were hardly worth harvesting because of this disease; one was not harvested; and one was plowed up in the spring.

Loss in any field is difficult to estimate. Haenseler (New Jersey Rep. 1928: 275. 1929) states that infected plants produce less seed by 20 per cent than healthy plants, but this seems too conservative, especially where the soil is thoroughly contaminated with the organism. He obtained his figures by mixing naturally contaminated soil with the soil in certain rows of peas as contrasted with adjacent check rows. His reductions in yield probably would have been greate if he could have mixed the inoculum more intimately with the soil. Aphanomyces euteiches causes increased loss from year to year if peas are planted in the same soil. This probably is due to a progressively more thorough contamination of the soil. The yield was reduced almost to the vanishing point, and the quality was very poor in several fields where the plants were affected severely. The writer refrains from offering estimates of actual loss in the State. Suffice it to say that Aphanomyces root rot was the most important malady affecting early peas in the State. It should be said, however, that plants which were infected suffered greatly when the drought struck them.

The disastrous cases of Aphanomyces root rot, in which the pertinent facts concerning the rotation were available, always occurred in fields which had been in peas from once to several times before, usually within two to four years. Several interesting fields came to light in this connection. Near Lyons, in Wayne County, two neighbors agreed to plant their peas cooperatively. Accordingl they fitted their two adjoining fields as one piece the same day with the same machinery. They planted it as one piece the same day with the same drill with the same seed, and yet even a casual observer could detect the difference in the growth of the peas a few weeks after they had been planted. The crop in one fiel had a dark-green color, with large sturdy stalks on white unblemished roots. The crop in the other field had a sickly yellow-green color, with scrawny stems on dark shrunken epicotyls and roots, which contained Aphanomyces oospores in abundance. The first field was growing its first crop of peas; the second had produced several before. On the canning-crops farm of the experiment station peas o soil which had not had the crop before were free of Aphanomyces root rot; peas on soil which had grown peas two years or one year before had from 25 to 50 per cent of the plants affected; and peas on soil which had been planted to the crop for four years consecutively were too poor to be harvested. On the other hand, a fie of peas near the experiment station grounds was so severely infected with Aphanomyces euteiches that it had to be plowed up, and yet it had not had peas for 15 years, according to the local informants.

RHIZOCTONIA ROOT ROT caused by Rhizoctonia solani injured many peas in New York during 1929, but was decidedly of less importance than Aphanomyces root rot. The fungus frequently attacked a few scattered plants in the field without affecting the stand or the yield appreciably. It was found in seven fields where it could be rated as a trace. It affected also 100 per cent of the plants along one side of a field in Ontario County, near Rushville. The plants were simply drying up like newly-cured hay, beginning at the bottom. The cortex of the roots and epicotyl of such plants was full of Rhizoctonia hyphae.

MISCELLANEOUS ROOT ROTS. Peas are almost universally infected in the State with a browning which starts at the decayed seed and spreads both ways in the taproot. No fungus has been found constantly associated with this condition, and the extent of the damage resulting is uncertain. Rhizoctonia and Fusarium have been found, but probably these symptoms result from penetration by various soil organisms through the rotted seed which serves as an excellent infection court.

This year the seed-corn maggot (Phorbia fusciceps) has exceedingly complicated the pea root-rot problem. According to Dr. Hugh Glasgow, the station entomologist dealing especially with canning crops, the seed-corn maggot usually does not attack peas, because the crop is in the ground before the brood of maggots appears. The wet weather this spring delayed planting so long, however, that many of the peas were in the right stage to be attacked. Not infrequently the pea roots were browned and rotted adjacent to the maggot injury much as they were adjacent to the decomposed seed, as described in the last paragraph. This trouble also seems to be caused by various soil organisms which are able to enter the pea root through injuries.

Alaska peas in the vicinity of Geneva occasionally were affected with a disease which caused the roots to shrivel excessively without becoming discolored. This was not attributable apparently to drought, but frequent and careful microscopical examination failed to reveal any causal organism.

MYCOSPHAERELLA BLIGHT caused by Mycosphaerella pinodes was the most serious malady on the late varieties of peas. In the absence of reliable data on losses, it is difficult to decide upon the relative importance of this disease and Aphanomyces root-rot. Certainly both of them together destroyed a large part of the pea crop in 1929. The disease was found in 10 of the 56 pea fields examined. It was rated as unimportant in two fields, 25 per cent infection in one field, 50 per cent in one, 75 to 100 per cent in three others, and serious or very serious in three fields.

The canners' field men, who determine when the peas are just at the right stage for canning, experienced great difficulty as a result of this disease. A field man said that he might see a certain field, say on Monday, and decide that he would order it cut for the viner on Thursday. Then he would go back on Wednesday afternoon to check his judgment only to find that the peas had "gone by." They had become too hard for the best quality pack. Furthermore, they would be undersized, which reduced the yield to the farmer, causing him to say unkind things. Apparently the malady retards the movement of the large quantity of water to the seeds which is necessary for their final enlargement just before reaching the stage for canning. Hence they dry and harden more quickly than normally.

It appears that the whole story of the origin of an infection in a field has not been written. For example, the Geneva Preserving Co. in 1929 used only seed from the dryland Western States, supposedly relatively free of the blight pathogene. Seed from the same lot planted in different places produced plants with different quantities of infection. No peas had been on any of the fields i question for several years, according to the field man. This indicates a local origin of inoculum.

ASCOCHYTA LEAF AND POD SPOT caused by Ascochyta pisi was found occasional but never in a severe amount.

ASCOCHYTA FOOT ROT caused by Ascochyta pinodella also occurred sporadical in pea fields without doing much apparent damage.

B E A N S

In general, beans were comparatively free of the troubles like anthracnos and blight, which canners usually recognize as serious. The exceedingly dry sea during the germination and growth of the beans held the spread of these two diseases to a minimum, so that canners over the State were fairly well pleased with the bean pack. The dry weather reduced the yields some, but the pods were unusually free of spots. Forty-two fields containing 313 acres of canners' bear were examined, as well as 21 fields of field beans for comparison.

MOSAIC, a disease not usually recognized by canners or field men, was the most destructive trouble of string beans in the State in 1929. Several canners, when questioned, averred that their bean crop was singularly free of disease, bu in all cases a short field trip was sufficient to demonstrate that the individua was laboring under a delusion, because mosaic was present in severe form in the neighborhood of all canneries from Mount Morris, in the western part of the Stat to Canastota, in the central. Out of the 42 fields of string beans examined la in July, 32, or 76 per cent, showed mosaic ranging from a trace to 100 per cent (the plants affected. The Idaho-grown seed almost invariably showed large percent ages of mosaic. It is of interest that only 2 out of 21 areas of field beans showed mosaic. One field had only a trace of the trouble, and one field of Genevas had 20 per cent of the plants affected, as shown from an average of thre counts.

Seven fields of string beans showed only a trace of mosaic; three showed 1 per cent of the plants diseased; three showed 5 per cent; five showed 10 per cent; five showed from 20 to 25 per cent; and nine showed practically all the plants affected. By weighing the percentage of diseased plants in the fields o various sizes it was found that an average of 16 per cent of the string beans i the State were affected with mosaic. In the absence of definite information re garding the reduction which mosaic causes in individual plants, it is difficult to say what loss was sustained, but 10 per cent probably is not too high.

BACTERIAL BLIGHTS caused by various bacterial pathogenes were not causin any serious trouble in late July when the majority of the bean fields were surveyed. The blight caused by Bacterium phaseoli was rated as a trace to 1 per cent in nine fields totaling 53 acres. Burkholder's bacterial disease, halo blight caused by Bacterium medicaginis var. phaseolicola, occurred in five fiel totaling 115 acres where it was causing some loss, which, however, was not seri These two bacterial diseases seemed to be somewhat more prevalent in the dry beans.

ANTHRACNOSE caused by Colletotrichum lindemuthianum was not observed in any of the 63 fields of beans examined. It doubtless occurred in very small quantities, but the dry weather reduced its ravages almost to the vanishing point. No anthracnose appeared in one field planted with seed showing 8 per cent infection on the germinator.

DRY ROOT ROT caused by Fusarium martii var. phaseoli occurred in 14 fields containing 167 acres, sometimes only as a trace, sometimes very severe. In some cases the plants had put out adventitious roots above the injury which were allowing them to combat it. Although fields containing 100 per cent infection were not uncommon in the canners' bean area, they were less frequent than they were in the dry bean section in Livingston and Wyoming Counties. Root rot caused by Rhizoctonia solani was found occasionally.

T O M A T O E S

Tomatoes are grown for canning in western New York near Lake Ontario and Lake Erie from Rochester to Buffalo and southwest of the latter city in Erie County. All of this area except Erie County was surveyed, as well as a small section of market-garden tomatoes near Poughkeepsie, in the Hudson Valley. Altogether 44 fields, including about 270 acres, were inspected. In general, tomatoes were decidedly free of diseases. In western New York this condition of affairs seems directly attributable to the meticulous care used by the large plant growers there. The premises are kept scrupulously clean, and all growers use soil which has not had tomatoes on it, certainly not for many years. One man, at least, steams his soil and flats for one hour before using. Several treat their seed with copper sulphate at the rate of 4 pounds in 50 gallons of water, which aids in controlling damping-off when the conditions are unfavorable. Several in Chautauqua County also add charcoal to the soil, thinking that it helps them to control damping-off (according to Chupp, Plant Disease Reporter 13:88. 1929). The source of the seed is not controlled, however.

MOSAIC. Contrary to expectations mosaic was not a serious factor in the tomato industry. Ten fields of 52 acres scattered throughout the tomato area showed a trace of the disease. Counts in several fields planted from seedlings originating in the same greenhouse near Geneva revealed 0.7 per cent in one field, 2.4 per cent in another, and 8.5 per cent in a third. These plants were affected with the fernleaf type of the disease. One field near Ontario Center had 1 per cent of the plants affected with mottled mosaic, and a field near Poughkeepsie had a 30 per cent infection.

SEPTORIA LEAF SPOT (Septoria lycopersici) sometimes called blight, was unimportant in the State as a result of the dry weather which obtained throughout the season. In fact, the writer had difficulty in inducing the disease to spread in some artifically inoculated plots on the station farm. When the majority of the tomato fields were inspected late in July, only traces of the disease were observed in three fields. Near Lockport the only two fields examined had a small amount of infection on the lower leaves. The local county agent thought that Lockport had had more rain than some of the neighboring sections. The farmers owning these two fields probably stood an appreciable loss in yield from the disease. Early in September two small contiguous fields of Landreth and Marglobe were seen near Wilson, in Niagara County. Leaves on Landreth plants were much more severely spotted than those on the Marglobe. In fact, the Landreth plants were almost defoliated, but only a few leaves were gone from the Marglobe plants. Also, near Poughkeepsie one field contained plants which were more than half defoliated by Septoria by September 6.

EARLY BLIGHT caused by Alternaria solani was not seen except as mere traces in western New York, but it caused a peculiar condition in the Hudson Valley near Poughkeepsie where it was called to the writer's attention by E. V. Shear, pathologist in the branch laboratory of the New York State Agricultural Experiment Station dealing with fruit investigations. It appeared shortly after the Georgia-grown plants were set into the field. Different diagnosticians pronounced the disease of different origins. One said it was due to Bacterium vesicatorium or Aplanobacter michiganense. Another said it was due to Phoma destructiva, and still another thought it was caused by Alternaria solani. Ascochyta lycopersici also was suggested as a possible causal agent. A conference between Miss Mary K. Bryan, of the Bureau of Plant Industry, Department of Agriculture, Washington, D. C., Mr. Shear, and the writer at Poughkeepsie early in September resulted in diagnosing the disease as early blight. It had none of the symptoms of the bacterial diseases, and pycnidia were too scarce to admit of a causal relationship with the Phoma or the Ascochyta. Briefly, the symptoms early in the season were sharply delimited spots on stems, usually superficial, but occasionally deep seated, sometimes girdling the stem, causing it to swell above the lesion or to break over and then grow upright again at the end. The lesions were dark brown and frequently zonate. When the writer saw the disease in the field in September, the stems and petioles as well as the leaves were peppered with typical zonate Alternaria lesions. The inclement weather kept many tomato plants in the greenhouse until they were quite large. The result in several cases was a severe attack of Alternaria, which caused the loss of several hundred plots in Chautauqua County.

FUSARIUM WILT caused by Fusarium lycopersici does not occur as a rule in northern and western New York, but one field observed in the Hudson Valley had more than 5 per cent of the plants killed by this vascular parasite. This is the only record which the writer has of this disease in the State in 1929.

BACTERIAL CANKER caused by Aplanobacter michiganense was observed in only one field of the 44 examined in the State. A few plants from Utah seed were affected in an experimental field on the station farm. A survey especially for this disease through the tomato area in company with Miss Mary K. Bryan failed to discover a single trace of the malady.

SUNSCALD was so severe in a field near Egypt, Montoe County, that the local canner sent in specimens for identification. This seemed to be due to a lack of shade for the fruit as a result of early defoliation by Septoria.

LEAF ROLL, which is alleged to be caused by disturbed water relations, occurred occasionally. Two fields in Orleans County and two fields on the station farm showed large percentages of the malady.

S W E E T   C O R N

RUST caused by Puccinia sorghi occurred in a small quantity here and there.

SMUT caused by Ustilago zeae is an almost ubiquitous parasite of sweet corn in the State without resulting in much damage as a rule.

ROOT ROT caused by various pathogenes occurred in a small amount in an experimental field on the station farm. It was rated as a trace in one field near Mount Morris.

C A B B A G E

WIRE STEM caused by Rhizoctonia solani injured about 75 per cent of the seedlings in a plant bed near North Rose, in Wayne County.

BLACK-LEG caused by Phoma lingam was brought in once from Hall near Geneva, and was present in a number of other fields in Ontario County. The source very evidently was the seed bed.

CLUBROOT caused by Plasmodiophora brassicae occurs very commonly in the State on the more acid soils. Growers, however, are coming more and more to realize that lime is a good preventive.

TIPBURN, which is a physiological trouble appearing as dead leaf terminals, was seen in a small area in a field of cabbage on the station farm. It was much less common throughout the State than usual.

BLACK-ROT (Bacterium campestre) was rare in the State. In the Schenectady-Albany district some affected fields were observed. The growers named it yellows, and many had bought yellows-resistant seed to combat it. Apparently the yellows-resistant seed also was free from black rot.

B E E T S

CERCOSPORA LEAF SPOT caused by Cercospora beticola was neglibible near Geneva, probably because of the dry weather.

DAMPING-OFF caused by various pathogenes occurred in a small field of market garden beets with an overhead irrigation system. It ruined the stand completely. In a field of about 160 acres of beets near Mount Morris, in Livingston County, the stand was exceedingly poor a few weeks after planting. The local canner ascribed this condition to the extreme drought which prevailed after planting.

C U C U M B E R S

WILT caused by Bacillus tracheiphilus was destroying 5 per cent of the crop in one 5-acre field examined near Holley, Orleans County.

MOSAIC was a serious factor in several plots of market garden cucumbers near Rochester. This disease was very severe also in certain squash and melon plantings near Geneva. It was more common generally upstate than in 1928.

The cucumber crop was very poor, not due so much to disease as to very strong, dry winds that seemed to scorch the leaves and vines. The plants that grew behind windbreaks looked much better.

The general practice of treating the seed, together with the dry weather, suppressed almost entirely the angular leaf spot.

DISEASES OF WINTER WHEAT

H. H. Whetzel

The leaf rust of wheat, caused by Puccinia triticina, was very general and severe throughout the wheat-growing sections of western New York. Several long trips were made through the wheat sections and many fields examined. In most of the fields the leaves were all more or less rusted and yellowing at blossoming time, the latter part of June. The rust appeared early and developed rapidly.

On the basis of studies made by Mains in Indiana (communicated to the writer by letter) on losses in winter wheat due to leaf rust in 1927 in that State, the writer is of the opinion that the injury to the wheat crop of western New York in 1929 was not less than 15 to 20 per cent. By dusting 5 times with sulphur Mains obtained an increased yield of approximately 11 per cent on plots which at heading time showed from a trace to 10 per cent rusted leaves. At this stage of development of the wheat in New York in 1929 the rust was general and severe in most fields. In fact, in many fields all the foliage was dead or dying by the time blossoming was over. It seems safe to say, therefore, that a loss at least twice as heavy as that recorded by Mains for his plots in 1927 is well within reason for the wheat crop of New York in 1929.

Little or no stem rust was observed in any of the fields examined.

Records taken of counts of smutted heads in 31 wheat fields showed but little loss from loose smut in western New York in 1929. As high as 5 per cent was counted in but 3 or 4 fields. In 11 fields no smut was to be found. The remaining fields showed from a trace to 2 per cent. The average was below one-half of 1 per cent.

IMPORTANT DISEASES OF TREES AND SHRUBS

D. S. Welch

The following is a brief summary of some observations on important diseases of woody plants made during the season of 1929. No attempt has been made to include the score or more of wood-rotting diseases which are constantly present and destructive.

Foliage diseases of the anthracnose group attracted considerable attention during the year. The following cases were observed in the field or were received from correspondents:

Anthracnose of oaks caused by Gnomonia veneta (Sacc and Speg.) Kleb. appeared to be more serious on members of the white-oak group.

Anthracnose of maple, caused by various species of Gloeosporium, was most commonly found on Acer platanoides var. schwedleri and A. palmatum var rubrum.

Serious cases of anthracnose were observed on Fagus grandifolia and Betula lutea, associated in both cases with species of Gloeosporium.

Leaf blotch of horse-chestnut caused by Guignardia aesculi (Pk.) Stewart continues to be epiphytotic and was unusually destructive this year.

The anthracnose of catalpa caused by Gloeosporium catalpae was received from Long Island.

A Gloeosporium has been observed for several years associated with a leaf and twig blight of Salix alba var. vitellina (?). Severe damage to the new growth occurs every [illegible]

A serious anthracnose of European linden, caused by Gloeosporium tiliae was discovered on Long Island. This appears to be the first report of this disease in America.

Other tree diseases of importance are indicated in the following list:

Leaf blister of oak, caused by Taphrina coerulescens (Mont. and Desm.) Tul., was found in abundance on several trees. The actual damage appeared to be slight.

Bacteriosis of walnut (Juglans regia) caused by Bacterium juglandis (Pierce) EFS., was received from several correspondents. This disease of the cultivated walnut appears to be well established in the State.

Leaf scorch of Acer saccharum, cause physiological, was quite prevalent during the year.

Twig blight and die-back of Acer saccharum were found in numerous cases associated with Coryneum negundinis B. and C.

Leaf blister rust of Pinus resinosa caused by Coleosporium solidaginis (Schw.) Thuem. was received from two correspondents in the Hudson Valley. This disease does not appear to be causing much damage.

Dothichiza populea Sacc. and Briard, on Populus nigra var. italica, twig blight.

Guignardia vaccinii Shear on Kalmia latifolia, leaf spot.

Cytospora chrysosperma (Pers.) Fr., on Salix caprea: twig blight and canker.

Dothidea tetraspora B. and Br. on Osage-orange (Maclura aurantiaca).

Cytospora syringae Sacc. on Syringa vulgaris, die-back of twigs.

THE WILLOW BLIGHT

H. H. Whetzel

The pioneer work of Clinton and McCormick, as set forth in Connecticut Bulletin 302, 1929, on the willow "scab" [Venturia chlorospora (Ces.) Karst. (Fusicladium saliciperdum (All. and Tub.) Tub.)] in North America, first stimulated the author to search for the disease in the State of New York. This brief article sets forth the results of a rather limited survey for this disease in the State during the summer of 1929.

As suggested by Haskell (special memo: Willow Scab, June 10, 1929) the disease is a "blight" rather than a "scab" disease. The writer, therefore, proposes the name "willow blight" to designate this disease.

According to Clinton and McCormick (1929:445) the willow blight was reported from "restricted localities" in New York as early as 1927, and was again collected by Miss McCormick along the Hudson-Hillsdale highway and on the road from Pittsfield to Albany in the Hudson Valley region in 1928. Thus, so far as published records go, the disease was unrecorded west of the Hudson River Valley in this State at the beginning of 1929. Our efforts, therefore, were primarily directed to determining if it had spread to the western sections of the State. The shaded portion of the accompanying map will show roughly the area included in our survey. The eastern extension of the survey comprises a narrow strip along the Cherry Valley highway covered by D. S. Welch and the writer returning from the summer meeting of the American Botanical Society held at Hanover, N. H., the latter part of June. Although we were on the sharp lookout for the blight all along the way, it was not picked up until we reached the little village of West Winfield, in the very southwest corner of Herkimer County.

The northwestern part of the State, from Niagara County east to Oswego, was covered by three rather extensive survey trips during the season, the first of which was made July 22 to 28, in connection with the canning-crop survey trip reported on elsewhere in this supplement by J. G. Horsfall. Several survey trips through central New York, the first of which was made early in June, yielded the only records of the disease which we obtained. Only seven stations for the disease were discovered. With one exception all the collections were made during June and early July. The surveys of western New York and the two trips north of Oswego into Jefferson and St. Lawrence Counties were all made after July 15. A newspaper article on the willow blight published the latter part of July brought a considerable number of specimens from different parts of the State, but only one, that from Slaterville Springs, a few miles from Ithaca, proved to be this disease.

It seems improbable that the willow blight in the western half of the State is confined to the south-central area represented by the seven stations where it was taken. Frequent trips were made either by the writer or by Messrs. Lee and Davis during June north and west of Ithaca as far as Batavia in Genesee County, yet the blight was never discovered in that section of the State. There are, however, good grounds for believing that surveys for this disease are likely to prove most fruitful early in the season, in most seasons probably from the middle of May to the first of July. This is illustrated by observations made at South Bay, the locality where the disease was first taken by us. When we first saw this willow swamp at the east end of Oneida Lake on June 13, the bushes appeared as if swept by fire, and the destruction was visible for a long distance. This station was visited again in July and August. The shrubs had put forth new leafy shoots, and the old blighted leaves had largely dried and fallen, so that the bare dead twig tips were almost completely hidden by the new leafage. From a short distance the bushes appeared normal and healthy. One had to go into the swamp to discover the blighted, more or less bare twigs which had stood forth so prominently early in the season. To what extent this "recovery" of blighted willows may have hidden other stations from us during the July and August trips, I can not be sure. It seems highly probable, however, that it did.

It is interesting that in only one case was the disease taken on a tree willow (Salix fragilis). That was on two young trees planted in the Catholic churchyard at West Winfield. In all the other cases it occurred only on shrub willows; five cases on S. cordata and one case on S. sericea. The most general and severe outbreak seen was that at South Bay where the species involved was S. cordata. Here several acres of swamp were covered with this species and practically all the early twig growth on all the plants was killed back more or less completely. It is remarkable that the new twig growth put out during late June and July was practically free from infection. Our collections confirm the observations of Clinton and McCormick (1929:448) that S. cordata is the most susceptible of our willows. S. discolor growing intermixed with badly diseased bushes of S. cordata at Erieville were entirely free of infection.

The accompanying map shows the stations where diseased specimens were collected, and the species of willows affected.

Duplicates of most of the specimens were sent to Dr. Clinton for confirmation, and duplicates of all of them have been deposited in the Mycological Collections of the Bureau of Plant Industry. The host species were in every case determined by Dr. K. M. Wiegand, of the Department of Botany at Cornell University

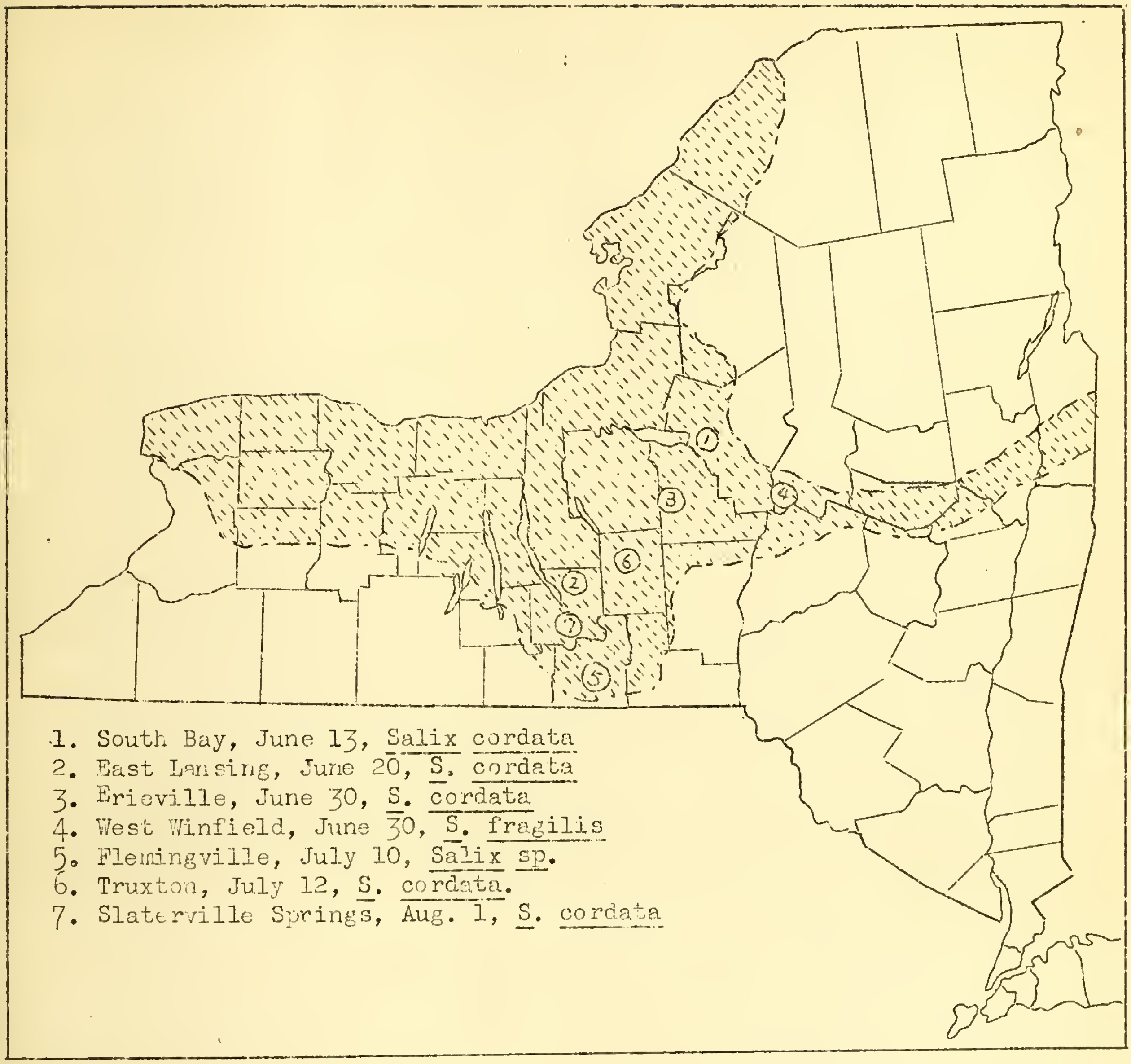

Figure 7. Showing surveyed area and stations for willow blight in State of New York for 1929. By H. H. Whetzel

LILAC BLIGHTS

H. H. Whetzel

The bacterial blight of lilac, caused by *Bacterium syringae*, was widely prevalent in the State during the spring of 1929. In some sections, especially in the northwestern part of the State, it appears to have been very severe. Assistant County Agent E. J. Hamilton, who sent specimens from this section on June 6, wrote: "Practically all the way from Lancaster in Erie County through East Aurora, Colden, Glenwood, and Springville into Cattaraugus County the lilacs appear as if swept by fire. They vary of course in the degree of infestation, some showing only traces of symptoms while others show few green leaves." He found the disease prevalent as far south as Salamanca, beyond which he did not go.

The writer collected or received specimens of this disease from many widely separated sections of the State: Olean, Schenectady, Oswego, Morrisville, Colden, Webster, Camden, West Amboy, and Ithaca.

There seems to be marked variation in the susceptibility of species and varieties of Syringa. There is also a most puzzling variation in the incidence of the disease on individuals of the same variety in any given locality. The common (lilac) variety of Syringa vulgaris appears to be most frequent and severely affected. The white-flowered form is less severely attacked. S. Persica was also found to be affected in one garden, though not nearly so severely as a bush of S. vulgaris standing beside it.

The season, especially during May, was generally wet, which appears to have favored the dissemination of the bacteria. Invasion seems to take place commonly through the stomata into the leaves which are rapidly blighted, the infection proceeding down the petiole into the young rapidly growing shoots. These quickly die back to last season's wood. Infection takes place only when the leaves are quite young. The young shoots or suckers arising from the trunks and main branches are most severely blighted. No case, however, was observed where the infection extended from the blighted sucker into the bark of the limb or trunk. The disease does not appear to cause cankers as does the fire blight of pomaceous trees, with which in other respects the lilac blight is strikingly similar. Blossom infection was bery common, the blossom clusters often being killed when half grown and before the flowers opened. Infection of open blossoms was also common, causing premature browning and fall of flowers.

A severe outbreak of this disease in the writer's own garden afforded excellent opportunities for study and observation on the symptomatology of the bacterial blight.

The Phytophthora blight, caused by Phytophthora syringae, was received from two localities not far from Ithaca. This disease, while somewhat like the bacterial disease in its general aspect, is distinguished by the light brown color of the leaf and stem lesions. The mycelium and conidia of the fungus can readily be detected in the lesions.

THE LEAF SPOT OF THE IRIS

H. H. Whetzel

The leaf spot of the cultivated iris, caused by Heterosporium gracile, the conidial stage of Didymellina macrospora Kleb., was to be observed in every iris plantation in the State.

The disease appeared early in the summer of 1929, and by the middle of June was already very severe on susceptible varieties. The leaves were not only spotted but were already dying back severely from the tips. This disease is clearly more harmful to the iris than is commonly realized by iris growers. While some varieties are almost or quite immune, many of our choice forms are almost always severely affected.

Observations made in a large iris plantation at Ithaca during the summer of 1929 prove beyond question that the disease is really very injurious and incidentally indicate that it may be quite readily controlled. The grower had t plantations of many varieties separated only by a grassy swale. His "show" plot situated on one slope, faced his stock plantings of the same varieties opposite.

Soil conditions, etc., were essentially the same. The show plot had been thoroughly cleaned the previous autumn by the removal and destruction of all diseased leaves. The stock plot had been allowed to go into winter with the blighted and spotted foliage untouched. This was not removed in the spring before culture began. By the middle of June when the iris were in full bloom, the stock plot was brown and ragged, due to the severe spotting and dying back of the foliage. The show plot showed only traces of the leaf spot on the foliage of the more susceptible varieties. The show plot had, it is true, received one good application of copper-lime dust early in May, but this can hardly account for the extraordinary contrast between the two plots. The plants in the show plot were larger and more vigorous, the flowers on the average larger and more numerous for the same variety, foliage more abundant, and the aspect of the two plots a striking and instructive contrast.

The Heterosporium leaf spot appeared in very severe form on the blackberry-lily, (Belamcanda chinensis)in the writer's garden in a planting quite isolated from iris plants. These plants were grown from seed collected from escaped plants in a meadow at Crawfordsville, Ind., some years before. It is interesting that this plant should also be a host for the pathogene. The native wild iris, Iris versicolor, seems to be completely immune to the disease.

TWO WHITE SMUTS OF THE GARDEN

H. H. Whetzel

For a number of years the writer has observed two Entyloma diseases which appear regularly each season in his garden at Ithaca, N. Y.

About 10 years ago he introduced into his garden Physalis pruinosa, the fruits of which make a most tasty jam. Since that time plants of this ground-cherry come up regularly each spring as volunteers all over the garden. For the first year or two the plants were large, spreading, and healthy, producing an abundance of fruit. In 1921 the white smut was observed on several plants. The leaves were covered with rather small white erumpent areas covered with a powdery white coating of the oblong conidia of Entyloma australe Speg. These spots soon turn to a rusty brown. Cross sections of the leaf through these lesions exhibit the brownish globose thick-walled chlamydospores in great abundance in the tissues.

The disease has appeared regularly every summer since, becoming very severe and destructive by August. The affected plants are dwarfed, due to severe leaf injury and defoliation. The fungus apparently winters as chlamydospores in the rotted leaves in the soil. Although no attempt at control has been made it is quite probable that dusting with sulphur or copper-lime dust would largely prevent secondary infections by the conidia.

Entyloma australe Speg. also occurs on another species of Physalis in New York. It has been twice collected on P. subglabràta, in 1922 at Taughannock, N. Y. (C. U. Plant Pathology Herb. 11809) and once 1923 at Auburn, N. Y. (C. U. Plant Pathology Herb. 12538). It has been reported on P. pruinosa in this State only from the writer's garden at Ithaca (C. U. Plant Pathology Herb. 11750, 12439, 12441, 17743). Clinton (N. A. Fl.) reports this fungus on several other species of Physalis, as well as on Solanum nigrum, S. triflorum, and Solanum sp. (From Florida). He does not list it on either P. pruinosa nor on P. subgladràta. It appears to be world-wide in its distribution.

Another white smut also occurs regularly in the writer's garden on a weed, Lobelia inflata. This is caused by Entyloma lobeliae Farl. It has also been take several times on the same host in the fields and forests about Ithaca. It causes circular white patches on the leaves. The lesions are larger than those of E. australe on Physalis. They are fewer in number per leaf and do not appear to seriously injure the plant.

LIST OF SPECIMENS DEPOSITED IN THE MYCOLOGICAL COLLECTIONS OF THE BUREAU OF PLANT INDUSTRY

No. 17531 * Venturia chlorospora (Ces.) Karst on Salix cordata
17539 Venturia chlorospora (Ces.) Karst on Salix cordata
17540 Bacterium syringae (Van Hall) EFS. on Syringa vulgaris
17541 Scolecotrichum graminis Fckl. on Alopecurus geniculatus
17542 Phytophthora syringae Klebh. on Syringa vulgaris
17543 Gloeosporium tiliae Oud. on Tilia cordata
17573 Puccinia cyani (Schleich) Pass. on Centaurea cyanus
17676 Venturia chlorospora (Ces.) Karst. on Salix fragilis
17577 Venturia chlorospora (Ces.) Karst. on Salix cordata
17581 Cintractia caricis (Pers.) Magn. on Carex muricata
17602 Coryneum negundinis B and C. on Acer saccharum
17603 Nectria cinnabarina (Tode) Fr. on Malus malus.
17609 Phacidium tini Duby on Viburnum cassinoides
17611 Fusicladium radiosum (Lib.) Lendr. on Populus grandidentata
17618 Peronospora polygoni Thümen on Polygonum scandens
17620 ? Sphaerotheca humuli (DC) Burr. on Filipendula rubra
17621 Puccinia thalictri Chev. on Thalictrum polygonum
17622 Cercospora zebrina Pass. on Melilotus alba
17623 Phyllosticta lantanoides Pk. on Viburnum dentatum
17625 Ramularia aromatica (Sacc.) V. Höhnel on Acorus calamus
17626 Pseudopeziza trifolii (Fr.) Fckl. on Trifolium pratense
17630 Venturia chlorospora (Ces.) Karst. on Salix sericea
17644 Aphelenchus olesistus Ritz. Bos. on Begonia melior
17743 Entyloma australe Speg. on Physalis pruinosa
17787 Venturia pyrina Aderh., on Pyrus communis
17788 Gloeosporium catalpae E. and E. on Catalpa speciosa
17796 Entyloma alismacearum (Cr.) Sacc. on Alisma phantago-aquatica
17803 Septoria lycopersici Speg. on Lycopersicum esculentum
17804 Bacterium medicaginis Sackett, var. phaseolicola Burk on Phaseolus vulgaris
17805 Bacterium medicaginis Sackett var. phaseolicola Burk. on Phaseolus vulgaris
17806 Fusarium martii var. phaseoli (Burk.) on Phaseolus vulgaris
17807 Aphanomyces euteiches Drechsler on Pisum sativum
17808 Microsphaera alni (Wallr.) Salmon on Lathyrus palustris
17834 Venturia chlorospora (Ces.) Karst. on Salix cordata

* Plant Pathology Herb. Cornell Univ. numbers.

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Supplement 77

Why so much Smut in Spring Wheat?

November 1, 1930

BUREAU OF
PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

Plant Disease Reporter
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WHY SO MUCH SMUT IN SPRING WHEAT?

THE RESULTS OF THE 1930 SURVEY TO COLLECT INFORMATION ON THE PREVALENCE OF STINKING SMUT OR BUNT AND METHODS OF SEED TREATMENT FOLLOWED IN SELECTED SPRING WHEAT COUNTIES

Prepared by

R. J. HASKELL, Extension Plant Pathologist, Office of Cooperative Extension Work and Bureau of Plant Industry cooperating,

R. C. ROSE, Extension Plant Pathologist, University of Minnesota,

W. E. BRENTZEL, Plant Pathologist, North Dakota Agricultural Experiment Station,

E. A. WALKER, Instructor in Botany and Plant Pathology, South Dakota State College of Agriculture, and

WALDO KIDDER, Extension Agronomist, Montana State College of Agriculture.

From data collected by various persons in the above-mentioned institutions as mentioned on pages 98 and 99 of this report.

CONTENTS

INTRODUCTORY STATEMENT

For several years the losses from stinking smut or bunt of wheat in Minnesota, North Dakota, South Dakota, and Montana have been excessive. Previous to 1925 the annual carload receipts of wheat grading smutty at Minneapolis had been considerably less than 1 per cent. Commencing in 1926, however, and continuing in 1927 the receipts of smutty wheat jumped from 1 to more than 11 per cent and for the crop years 1928 and 1929 nearly 15 per cent and 13 per cent respectively graded smutty.

The amount of smut in the present year's crop as shown by wheat receipts in the Minneapolis market cannot definitely be given until after the crop has been received. As an example of what is happening, however, it may be stated that the Minneapolis receipts for July, August, and September, 1930, showed about 21 per cent smut as compared with the receipts in that city for the same months of last year which averaged 13 per cent smutty.

As this rather alarming increase has become evident there has been an extension of research and control activities in the States concerned. Some of them have undertaken additional investigative projects and all of them have devoted greater attention to smut control from the extension standpoint. Business men in Minneapolis became actively interested in smut prevention. Special literature has been prepared and distributed. An increasing number of elevators have adopted the practice of buying wheat on a quality and grade basis and discounting smutty wheat. Demonstration trains emphasizing wheat smut control have been run by certain of the railroads. Community seed cleaning and treating outfits have been operated and extension specialists and county agents generally have given more thought and time to the matter of reducing losses from wheat smut.

These efforts have done much to reduce the loss from this disease. As an instance there may be mentioned the results of the campaign in Brown County, South Dakota, where the farmers, with the aid of the Extension Service and the Northwest Crop Improvement Association and cooperating agencies, put on a rather intensive seed treatment campaign. The following table (Table 54) shows that the total Minneapolis receipts of 1928 wheat from all points in the spring wheat area averaged 15.7 per cent of the crop grading smutty whereas the receipts for Brown County of that year were 41.5 per cent smutty. The campaign was begun in the winter of 1928-29 by the Northwest Crop Improvement Association cooperating with the County Agent of Brown County and the Extension Agronomist of South Dakota with the result that the 1929 crop from Brown County graded only 17 per cent smutty as compared with 12.6 from the entire spring wheat area. Furthermore, the average discount per car was reduced more than one-half during that same period. The 1930 Brown County crop is showing 15.5 per cent smut on the basis of 943 carloads received up to October 28, thus indicating a still further decrease in the face of general increases in the entire spring wheat area.

In general, however, smut still continues as a serious problem in the spring wheat states. Market figures that have been gathered do not show the marked reduction in the amount of smut that would be expected. In fact they show that instead of decreasing the smut is increasing in prevalence in many places.

What is the reason for this continued severity? Are not enough farmers treating their seed? Are those that are treating failing to control, if so why? Are the chemicals that are being used inferior? Are improper methods being followed? Are there other important but less evident factors operating to account for these losses? These are some of the questions raised by Mr. R. H. Sumner, executive secretary of the Northwest Crop Improvement Association, which were considered at a meeting of the Extension and Experiment Station Directors in Chicago, November 11, 1929. They have also been given consideration at other conferences on smut control in the States. In all cases it was pointed out that not enough information was available to answer these questions satisfactorily. It was therefore decided that as a part of the smut control work for 1930, a survey to obtain more facts be included.

Table 54. Percentage of car loads grading smutty and average discount of wheat from Brown County, South Dakota, as compared with average Minneapolis receipts, crops of 1928 and 1929. (Results of a summary by South Dakota Extension Service, U. S. Office of Grain Investigations and Northwest Crop Improvement Association).

Wheat Receipts	Percentage cars grading smutty		Average discount (cents per bu.)	
	1928	1929	1928	1929
Brown County average	41.5	17.0	5.6	2.2
Average Minneapolis receipts	15.7	12.6	4.0	2.3

COOPERATING AGENCIES AND ACKNOWLEDGMENTS

The general plans for the work herein reported were developed by the State Extension and Experiment Station Directors, the extension specialists in plant pathology and agronomy of the United States Department of Agriculture, the Secretary of the Northwest Crop Improvement Association, and others, at the time of the Land Grant College meeting in Chicago, November 11, 1929. The more detailed arrangements were made later by the State extension and research workers, in conjunction with O. S. Fisher, R. H. Black, H. R. Sumner and the senior author.

In Minnesota the Extension Department and the section of Plant Pathology of the College of Agriculture cooperated in financing and conducting the work. R. C. Rose, Extension Plant Pathologist, assisted by Messrs. Holton and Kauffert, devoted three weeks to the business of interviewing wheat growers and making counts in their fields.

In North Dakota, W. E. Brentzel, Plant Pathologist for the Experiment Station, and E. G. Booth, Extension Agronomist for the College, were the principal cooperators. Mr. Brentzel conducted the field work.

In South Dakota, Extension Agronomist R. E. Johnston was in charge. He made the plans and obtained records through the county agents. The field survey was conducted for the most part by E. A. Walker, Department of Botany and Plant Pathology, South Dakota Agricultural College. Mr. Walker also made the survey in Towner County, North Dakota.

In Montana, Waldo Kidder of the Agricultural College was leader of the survey. He was assisted by F. C. Meier, U. S. Bureau of Plant Industry, who worked a week in Gallatin County, H. E. Morris of the Department of Botany and Bacteriology, A. G. Goth, Assistant Agronomist, and by P. A. Young of the Botany Department.

The Northwest Crop Improvement Association, through its Secretary, H. R. Sumner, has encouraged the survey from the outset. Mr. Sumner took a leading part in initiating and laying plans for the work, and personally assisted with the field inspections.

Messrs. F. C. Meier and O. S. Fisher of the U. S. Department of Agriculture, who have devoted much time and effort to the wheat smut control problems, were of primary assistance. They showed the needs for the survey, helped to lay the foundations for it, and have encouraged and promoted it during its entire progress.

Messrs. E. G. Boerner and R. H. Black, Office of Grain Investigations, and M. A. McCall, A. G. Johnson, R. W. Leukel, and others in the Office of Cereal Crops and Diseases, U. S. Department of Agriculture, have rendered very valuable assistance by encouraging and advising with the work, by reading the manuscript of this report, and in other ways.

The Plant Disease Survey, U. S. Bureau of Plant Industry, arranged for and coordinated the survey; paid salaries and expenses for the field work in South Dakota; Towner County, North Dakota; and several counties in Montana; and assisted in the preparation of this report.

OBJECTS OF THE SURVEY

The objects of the survey as finally decided upon were:

1. To determine more accurately the field losses from stinking smut in the spring wheat area.
2. To determine the percentage of farmers treating wheat seed in selected typical counties.
3. To check on the effectiveness of seed treatment, the methods found in use, and if these are not proving thoroughly satisfactory to try to find out why.
4. To learn which varieties are most affected, the relative amount of smut in durum and hard red spring wheat, the influence of date of planting, and other similar facts.

PLAN OF SURVEY

Since no special funds were available to pay the cost of the field work, it was decided to outline a uniform or standard method of procedure that would be acceptable to the States concerned and that could be followed by those cooperating. With all surveyors using the same methods and forms, results in the various States should be comparable.

In North and South Dakota it was thought advisable to divide the survey into two parts: (1) a seed survey in the spring during or immediately after planting to gather detailed facts concerning methods of seed treatment at the time when they were still fresh in the farmer's mind; and (2) a field survey after the wheat had headed, but before harvest, in order to determine percentages of smut in the fields. It was thought that time could be saved in many cases if the county agents obtained seed treatment data and made these available to the field survey men when they made their inspections during the summer. These preliminary records were obtained and used to some extent, especially in South Dakota. A sufficient number of neighboring untreated fields were surveyed at random in order to give a fairly reliable picture of the actual conditions. In general it is thought that the field surveys can be considered as representative of the areas surveyed.

With the assistance of those most concerned, standard forms for recording data were prepared: (1) a seed treatment form and, (2) a field record form. (See specimens on following pages).

STINKING SMUT OF WHEAT

Seed Treatment Survey

Grower:.................................... State:...............................

Address:................................... County:..............................

Variety of wheat:.......................... Date:............................1930

Method of Treatment: Materials used (check which)

Fifty per cent copper carbonate:...........Formaldehyde:................
Twenty per cent " " :...........Other:.......................
Ceresan :...........None:........................

Total amount of treating materials used:................................
Total number of bushels treated:..
Cost of treating materials used: (Per pound or per pint)................

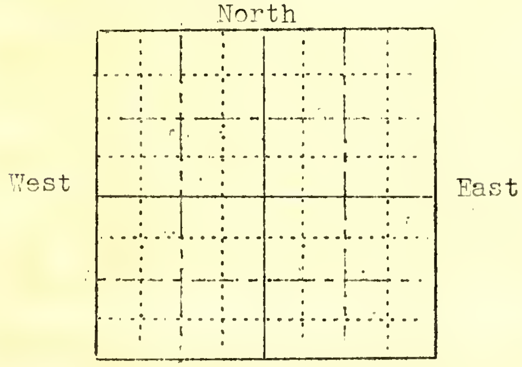
Method of treating seed:..
(Kinds of machines, methods of mixing, etc.)
....

Time required treating each "mix":......................................
Number of bushels in each "mix":..
Method of handling after treating:......................................
Date seed treated:...........1930 Date seed sown:.................1930
Do you treat wheat every year?...... How often?........................

Method of Sowing Seed:

Crop on land 1929:.................. Crop on land 1928...................
Rate of seeding:.....lbs. per acre Drill set at...........lbs. per acre
Was drill injury noted:
Condition of soil at planting time: (check which) Dry...Moist....Wet.....
Acres sown: (a) Treated seed............(b) Untreated seed..............

Location of Field:



On this diagram mark the exact location of acreage sown with treated seed. Each small square represents 10 acres.

Section..........

Township..........Range...............

....
(Miles and direction from Post Office)

Remarks:

Recorded by:..........................

STINKING SMUT OF WHEAT

Field Survey

Grower:.................................. State:..................................

Address:.................................. County:..................................

Variety of wheat:........................ Date:..................................1930

Method of Treatment: Materials used (check which)

Fifty per cent copper carbonate:............Formaldehyde:................
Twenty per cent " " :............Other:........................
Ceresan :............None:........................

Total amount of treating materials used:..............................
Total number of bushels treated:......................................
Cost of treating materials used: (Per pound or per pint)...............

Method of treating seed:..
(Kinds of machines, methods of mixing, etc.)
....

Time required treating each "mix":..
Number of bushels in each "mix":..
Method of handling after treating:..
Date seed treated:................1930 Date seed sown:................1930
Do you treat wheat every year?......... How often?........................

Method of Sowing Seed:

Crop on land 1929:..................Crop on land 1928:....................
Rate of seeding:......lbs. per acre Drill set at.............lbs. per acre
Was drill injury noted:...
Condition of soil at planting time: (check which) Dry....Moist....Wet....
Acres sown: (a) Treated seed............ (b) Untreated seed..............

Smut Infection: Make 10 counts, 1 yard of row for each count.

Count number	Smutted heads
1................	....
2................	....
3................	....
4................	....
5................	....
6................	....
7................	....
8................	....
9................	....
10................	....
Totals............	....
Average	

Stand (Check which)Good..Fair...Poor...
Yield per acre (treated seed)..........
Remarks:

Recorded by..............................

SURVEY METHODS

The men engaged in the field survey, on starting work in any particular county, first made contact with the county agent. In the Dakotas several agents had already obtained seed treatment data. Routes were then planned into several different and representative parts of the county. Traveling by automobile either singly or in pairs, the survey men stopped at farms along the route, found the farmer, obtained the necessary information from him and made counts to determine the percentage of smut in the fields.

In determining percentages of smut a yard of drill row was measured with a yard stick carried by the surveyor and the number of diseased and healthy heads counted in the yard row. (See Plate 1. Photographs by F. C. Meier). This was repeated in 10 different parts of the field, the ten sets of counts totaled and averaged.

In some kinds of wheat smut is much easier to detect than in others. The symptoms in durum, especially when the heads are relatively immature, are often very obscure. Aside from an indefinite bluish tinge of the glumes and stunting of the culm and head, there seem to be no reliable external signs. With durum it was often necessary to pinch or cut open the kernel in several different parts of the head before a definite determination could be made. The heads from a yard row of smutty durum are shown in Plate 2 B. Aside from the shorter growth there is little externally to distinguish the diseased from healthy specimens.

For the reasons stated above, it is easy to understand how a farmer may not realize that there is any smut in his wheat until possibly at threshing time when he examines the grain, and even then if the percentage is small he may think that his wheat is free from smut until it is discounted when he hauls it to the elevator. If his wheat is not discounted, as is still the practice with many elevators, he may think that it is entirely clean and that his seed does not need to be treated for next year's crop. The result may be an unusually heavy infestation of smut. The increasing practice of elevators to discount for smut encourages seed treatment, not only because of the effect on the farmer's pocketbook but because it lets him know when his wheat is smutty.

COUNTIES SELECTED FOR SURVEY

A few typical counties were selected in each State for surveying as follows. The locations of these are shown on the accompanying map (Figure 8).

MINNESOTA: Redwood, Wilkin and Polk.
Redwood County was chosen as an example of an important county that, according to Minneapolis receipts, had a large amount of smut. The other two were selected as examples of counties where considerable seed treatment is being done.

NORTH DAKOTA: Cass, Steele, and Towner.

SOUTH DAKOTA: Brown, Day, Marshall, and Spink.

MONTANA: Gallatin, Cascade, Fallon, Judith-Basin, Fergus, Wibaux, and Yellowstone.

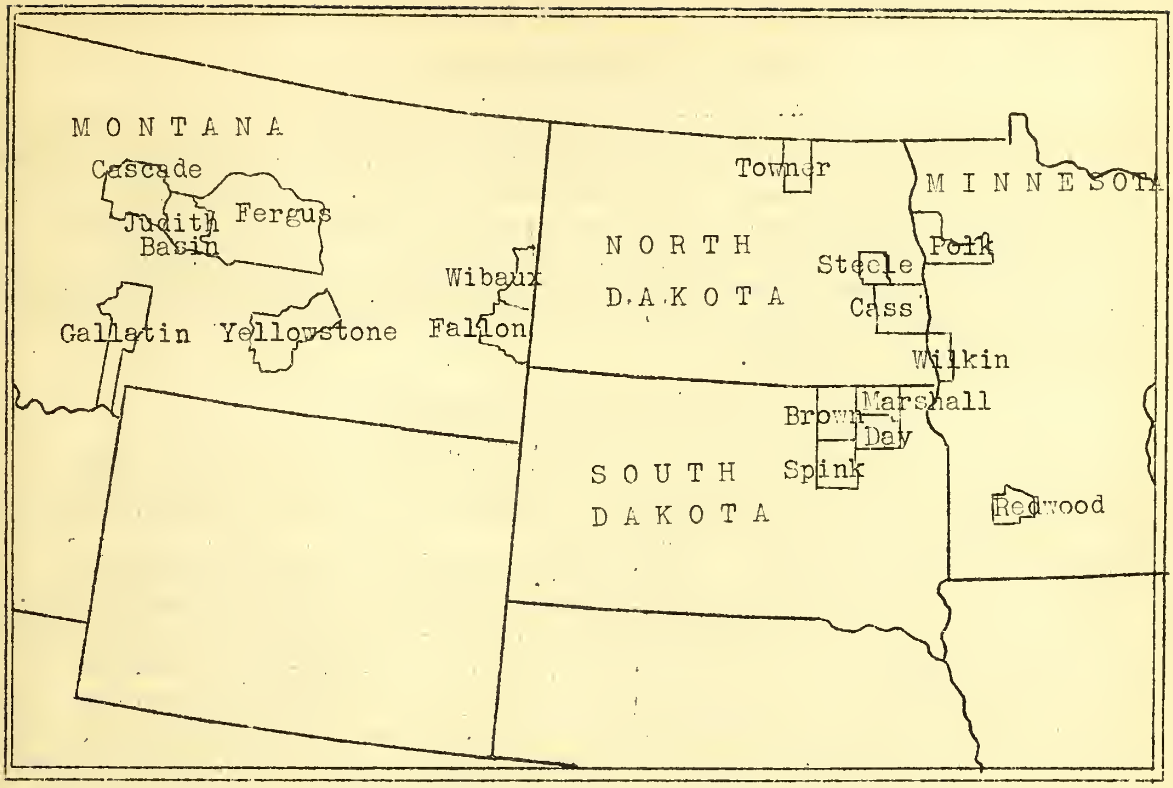


Fig. 8. States and counties where smut surveys were conducted.

TIME REQUIRED

An idea of the amount of work performed, the number of men engaged in the survey and the actual dates of the inspections can be obtained from the following. A rough estimate of the cost of the work, which was borne by several different organizations could also be obtained from these figures if desired.

MINNESOTA: 56 days as follows:
- Three men 16 days each July 10-25 (Redwood, Wilkin, Polk Counties)
- One man 4 days July 16-29 (Wilkin County)
- One man 4 days July 21-24 (Polk County)

NORTH DAKOTA: 20 days as follows:
- Two men 6 days each July 14-19 (Cass and Steele Counties)
- One man 8 days August 7-14 (Towner County)

SOUTH DAKOTA: 36 days as follows:
- One man 33 days each July 1-August 2.
- One man 3 days July 10-12 (Brown County)

MONTANA: 24 days as follows:
- One man 6 days July 23-29 (Gallatin Co.)
- One man 13 days July 21-29, August 7, 9, 16.
- One man 3 days July 23-25
- One man 2 days August 6-7

RESULTS - SPRING WHEAT

Number of Fields Surveyed

During the course of the survey 704 fields of spring wheat totaling nearly 50,000 acres were examined. For the most part these belonged to different farmers but in numerous instances more than one field owned by a single grower was examined. These were distributed as follows among the four states: Minnesota 298, North Dakota 132, South Dakota 227, and Montana 47. All of the 106 winter wheat fields were in Montana where smut in this crop has been recognized for several years as being very serious. The distribution of these fields in the different counties in shown in table 56.

Amount of Seed Treatment Practiced

The survey has shown that seed treatment is being practiced by about two-thirds of the farmers in the areas covered. Sixty-six per cent of the fields examined were sown with treated seed (Table 55).

Of the 298 fields inspected in Minnesota only 116 or 39 per cent were sown with seed that had been treated to prevent smut. This represents considerably less treatment in these three counties than in those surveyed in the other States. It should be mentioned however that at least one of the Minnesota counties was selected because of the large percentage of cars grading smutty originating there.

In North Dakota 115 of the 132 fields inspected or 87 per cent were sown with treated seed. One of the reasons for this high average was that in Towner County, where more than half the inspections were made, all but one of the 81 fields examined were sown with treated seed.

In South Dakota where 227 fields were surveyed, 171 or 75 per cent were found to have been sown with treated seed. In the four counties selected in this State, particularly in Brown County, there has been considerable activity on the part of county agents and others to interest farmers in treating their seed.

In Montana 32 out of 47 fields of spring wheat, or 68 per cent were sown with treated seed, and practically all (92 per cent) of the winter wheat was treated in one way or another.

Table 55. Percentages of farmers treating wheat seed for smut prevention in areas surveyed in four spring wheat States.

State	Per cent farmers treating
Minnesota	39
North Dakota	87
South Dakota	75
Montana (spring wheat)	68
Montana (winter wheat)	92
Average all spring wheat	62
Average all wheat	66

Amount of Smut Found

The average amount of smut found in the spring wheat fields, 704 in number, was 2.8 per cent. The 434 treated fields showed 2 per cent and the 270 untreated fields just double that amount, 4 per cent (Table 56).

The highest percentage of stinking smut found in any spring wheat field during the course of the survey was 51.7 (52) per cent. This was a 20-acre field of durum, the seed for which had not been treated, near Crookston, Polk County, Minnesota.

The same grower had another 120 acre field of the same wheat. The seed had been treated however by spraying with formaldehyde at the rate of one pint of formaldehyde to 4 gallons of water to 40 bushels of wheat and allowing to remain sacked over night. This field had 5.7 per cent smut.

The second smuttiest field was a 9-acre Minnesota field of Marquis, but in this case the seed was supposed to have been treated with formaldehyde applied by the sprinkling and shoveling method. It showed 48 per cent smut.

The field rating third in percentage of smut was 84 acres of durum wheat from untreated seed. It was located near Rothsay, Wilkin County, Minnesota, and showed 42.7 (43) per cent smut when inspected July 19.

The three highest percentages of smut in treated spring wheat were as follows. All seed lots were supposed to have been sprinkled with formaldehyde. Some of them were known to have been very smutty.

Marquis	Minnesota	48 per cent
Durum	Minnesota	33
Marvel	South Dakota	31

In untreated spring wheat fields the maximums were:

Durum	Minnesota	52 per cent
Durum	Minnesota	43
Marquis	Minnesota	37

In Minnesota the treated fields contained an average of 3.6 per cent, with maximum percentages of 48, 33, and 25, as compared with 4.6 per cent in the untreated, maximums 52, 43, and 33. This is entirely too much smut in the treated fields. Much better control than that should have resulted. As is shown later in this report the cause of this is primarily poor methods of seed treatment and lack of sufficient attention to details.

In North Dakota the treated fields contained an average of 1.2 per cent smut, the three maximum percentages being 17, 12, and 8. The untreated fields showed 4.8 per cent with maximums of 20, 13, and 10. This clearly shows that seed treatment was worth while. A reduction in smut of 3.6 per cent in a 100,000,000 bushel crop represents a saving of some two and one-half million dollars even when wheat is selling as low as 70 cents per bushel. On the other hand, the average of 1.2 per cent smut in the treated fields is too high. It has been demonstrated repeatedly that it is possible, through the use of proper methods, to reduce smut to a trace and, in fact, entirely eliminate it.

In South Dakota treated fields the average per cent smut was 1.5 and the three highest percentages 31, 20, and 16. The untreated fields of that State averaged 2.8 per cent with maximums of 20, 15, and 13.

In Montana the fields of spring wheat from treated seed showed only 0.4 per cent smut and the three highest percentages found were 4, 2, and 2. The untreated fields showed 3.1 per cent with 32, 4, and 2 per cent as maximums. This indicates that smut in Montana spring wheat in the areas surveyed is not as serious a matter as in the States farther east.

Further details on the percentages of smut in treated and untreated seed are given in table 56.

Table 56. Average percentage of smut in treated and untreated fields of spring wheat.

State and County	Number of fields inspected	Number of fields treated seed	Average per cent smut treated seed	Number of fields untreated seed	Average per cent smut untreated seed
MINNESOTA					
Redwood	101	41	4.7	60	6.0
Wilkin	94	43	2.8	51	4.9
Polk	103	32	2.1	71	3.2
State	298	116	3.3	182	4.6
NORTH DAKOTA					
Cass	26	14	1.2	12	4.8
Steele	25	21	3.0	4	5.9
Towner	81	80	0.8	1	0
State	132	115	1.2	17	4.8
SOUTH DAKOTA					
Spink	42	38	2.1	4	0
Brown	60	46	1.3	14	1.7
Day	64	40	1.2	24	3.9
Marshall	61	47	1.5	14	3.1
State	227	171	1.5	56	2.8
MONTANA					
Fallon	14	13	.4	1	2.0
Judith Basin	3	1	.8	2	1.4
Cascade	5	4	.6	1	0
Fergus	4	3	.2	1	0
Wibaux	6	5	.8	1	.1
Gallatin	15	6	.5	9	4.5
State	47	32	.4	15	3.1
TOTAL AND AVERAGES ALL STATES	704	434	2.0	270	4.0

Average percentage of smut in all fields both treated and untreated 2.8

Losses

If an average of 2.8 per cent smut can be considered as representative of all four States, and in general we believe it can, and if we regard the percentage of smut in the field as the percentage of reduction in yield, then the loss in yield amounts to about four million dollars.

According to the October 1930 crop estimate the total production of spring wheat and durum in the four States was 178,391,000 bushels. This is 97.2 per cent of what the yield would have been if there had been no smut. The 2.8 per cent smut therefore represents a loss of 5,138,000 bushels. Even at 78 cents per bushel this much wheat would be worth about $4,000,000.

To this loss must be added the discount that the farmers must take for smutty wheat. The indications are that at least one-fifth of this year's spring wheat crop will be discounted about three cents per bushel. If this proves so the total discount will be slightly over $1,000,000, which, added to the loss in yield, brings a total loss of $5,000,000 to spring wheat growers.

Popularity of Different Chemicals for Seed Treatment

Formaldehyde was by far the most common seed disinfectant used, three-fourths of the spring wheat seed treatments recorded being with that chemical. In North Dakota it was employed in 92 per cent of the cases. Montana was the only State where it occupied a position of secondary importance.

Copper carbonate was used in 20 per cent of the cases, the 20 per cent grade in four-fifths of these and the 50 per cent in one-fifth. It was most popular in Montana where it was used in more than half of the treatments. It also apparently has quite a foot-hold in the Minnesota counties studied where it was employed to the extent of 32 per cent.

Ceresan was used in 6 per cent of the cases, being most popular in some of the South Dakota and Montana counties.

Blue vitriol was only used in one case on spring wheat in Montana. With winter wheat, however, it was used in 10 cases.

Two cases of the treatment with hot water were observed in Polk County which had been carried on by a seed grower to control loose smut particularly.

Three instances were recorded of treatment with bluestone and formaldehyde. The growers evidently proceeded on the assumption that if one chemical is good two are better.

Table 57 gives the details on popularity of the different treatments.

Table 57. Number of spring wheat fields sown with treated seed and percentages of those fields treated with various chemicals.

State	Formaldehyde		Copper carbonate 20%		Ceresan		Copper carbonate 50%		Other	
	No. fields	Per cent	No. fields	Per cent	No. fields	Per cent	No. fields	Per cent	No. fields	Per cent
Minnesota	73	65	32	28	5	4	1	1	2*	2
North Dakota	106	92	3	3	2	2	4	3	0	0
South Dakota	125	75	23	14	14	8	4	3	0	0
Montana	11	35	9	28	3	9	8	25	1**	3
All States	315	74	67	16	24	6	17	4	2*	t
									1**	t

* Hot water

** Blue vitriol

Methods of Applying Disinfectants

The number of spring wheat fields treated by different methods are recorded in table 58.

Formaldehyde was applied by the majority of growers by the sprinkling and shoveling method (1 pint of formaldehyde with 40 gallons of water to 50 bushels of seed). In fact nearly one-half of the farmers (196) who did any disinfecting at all, with any chemical, followed this method. In South Dakota it was by far the most common method of treatment, 94 out of 166 growers using it.

The next most popular method was the application of formaldehyde by means of machines. These machines were of several different types, some homemade and some commercial as illustrated in Plates 4 and 5. In general they fall into three classes:

1. The elevator type (Plate 4, A., B., and G.) and (Plate 5, C) which elevates the seed out of the solution by an endless chain with paddles. These machines are usually provided with skimmers which skim off the smut-balls, light grains, and weed seeds that float to the surface of the solution. This is a very desirable feature as it is essential to remove the smut-balls if perfect control is desired. In this connection it might be stated that better control would probably have been obtained in some cases if these skimmers had not been removed from the machines as was noticed.

2. The auger type (Plates 4, C and E and 5, G). With these machines the wheat is emptied into the large hopper. The bottom layers are wet in the solution contained in a receptacle below and then elevated out by an auger or screw-like arrangement operated either by hand or by power. Some 15 or 20 of these were found during the course of the survey. The chief objection to these machines is that there is no chance for the smut-balls, wild oats, etc., to rise to the surface of the solution and be removed. They are imprisoned at the bottom of the pile and elevated out with the treated seed.

3. The automatic sprinkle type (Plates 4, H and 5, B and E). This is a very popular type, probably because of its simplicity and low cost, as well as ease and rapidity of operation. About half of all the formaldehyde machines recorded in the survey were of this type. They were particularly popular in Towner County, North Dakota, where many of them are in use. The seed is shoveled into the hopper and runs slowly out at the bottom where it strikes the blades of a propeller-like part setting it in rotation. The formaldehyde solution, in another receptacle, is allowed to escape by gravity through a rubber tube and stop-cock and also impinges on the rotating disc. The whirling seed is thoroughly wet with the solution and falls into a receptacle or onto the floor below. It will be noted that this is essentially a sprinkling treatment. It is not a soaking treatment. There is no chance for smut-balls to be removed.

Other methods of formaldehyde application were: dipping in tubs or barrels - 20 cases (Plate 4, F and D) and spraying - 6 cases. Various modifications were reported. A few growers sprinkled or sprayed the grain as it fell into the wagon box from the elevator (Plate 5, D). One grower put one spoonful of formaldehyde on grain in the sacks and stood them on end over night. One farmer who had come to the conclusion that seed treatment was "no good" and that he had just as much smut when he treated as when he did not treat, was found to have applied the concentrated formaldehyde directly from the bottle to the top of the wagon load.

Copper carbonate. Of the total number of 67 who used 20 per cent copper carbonate on spring wheat, 33 applied it with a churn or home-made mixer (Plates 3, B and 5, A and F), 24 tried to apply it by dusting and shoveling the seed and only 9 used commercial machines. One man sprinkled it on the grain in the drill box and expected to get control that way. On Plates 3 and 5 various kinds of commercial and homemade dusting machines found in actual use on the farms are depicted. Some of the churns and home mixers were not provided with baffle-boards which are important to insure thorough mixing but in general most of them looked as if they would do the work if rotated a sufficient number of times (40 rotations at moderate speed). One type of machine was found that mixes the dust with the seed as they fall downward together through a series of diagonally placed baffle-boards (see Plate 3, D). How thorough a job this does cannot be stated by the writers as they have not had experience with it.

The 50 per cent copper carbonate that was being used on spring wheat in 17 cases was applied by machines in 11 cases and by shoveling in 6 cases.

Table 58. Numbers of spring wheat fields sown with seed treated by various methods.

State	Formaldehyde				20% Copper carbonate				Ceresan		50% Copper carbonate		Other		Totals		
	Commercial machines	Sprinkle	Dip	Spray	Commercial machines	Churn or home mixer	Shovel	Mix in drill box	Churn mixer or machine	Shovel	Churn, mixer or machine	Shovel	Hot water	Blue vitriol	Total no. treated	Total no. untreated	Total
Minnesota	10	57	3	3	6	15	10	1	4	1	1	0	2	0	113	181	294
North Dakota	67	36	0	3	0	3	0	0	2	0	0	4	0	0	115	17	132
South Dakota	16	94	15	0	1	9	13	0	8	6	2	2	0	0	166	57	223
Montana	0	9	2	0	2	6	1	0	3	0	8		0	1	32	15	47
Total four States	93	196	20	6	9	33	24	1	17	7	11	6	2	1	426	270	696

Ceresan was used in 24 cases, 17 by machines similar to those just described and 7 by hand shoveling.

It is surprising to note not only in the application of the liquid formaldehyde treatment but also in the case of these dust treatments how many farmers try to get results by the sprinkle and shovel method. Practically one-third of them applied the dusts in this way in spite of the warnings that have been broadcast to the contrary. It has been pointed out as an ineffective and at the same time unsafe method from the standpoint of the health of the operators.

The hot water treatments were made with a machine primarily designed for treating seed potatoes with hot formaldehyde. The bluestone treatments were made by dissolving copper sulphate in water until it was "good and blue", then dipping sacks containing one bushel of seed into the solution, allowing them to remain until wet through, draining a few hours and then seeding.

Relative Effectiveness of the Different Methods

The effectiveness of the chemicals and methods, by States, is indicated in table 59. There follows a graphic presentation of the average percentages of smut with the different methods arranged in order of apparent effectiveness.

Aside from hot water and blue vitriol, only three fields of which were observed, the most effective methods were the copper carbonates, either the 50 or the 20 per cent grades, and the formaldehyde, applied with machines. All of these reduced smut to less than 1 per cent. The next most effective was the copper carbonate applied with home-made machines. The third best in smut control seemed to be Ceresan. None of the other treatments can be considered as in any way satisfactory, as they all averaged 2 per cent smut or more.

Does it Pay to Treat Wheat Every Year?

One of the questions asked farmers, the answers to which were recorded in most cases especially in Minnesota and the Dakotas, was "Do you treat wheat every year?" The questionnaires of the farmers who treated their seed this year were therefore gone over with reference to this question and the percentages of smut recorded under the two headings "yes" and "no". Farmers who did not treat this year were not included. The results which are summarized in table 60 show that it does pay in the long run. It does not pay to take a chance. Farmers that

Table 59. Average percentages of stinking smut found in fields of spring wheat the seed for which had been treated by various methods.

State	Formaldehyde				20% Copper carbonate				Ceresan		50% Copper carbonate		Other		No treatment
	Commercial machines	Sprinkle	Dip	Spray	Commercial machines	Churn or home mixer	Shovel	Mix in drill box	Churn, mixer or machine	Shovel	Churn, mixer or machine	Shovel	Hot water	Blue vitriol	
Minnesota	0.7	3.9	3.5	8.5	6.3	1.5	7.4	8.2	0.9	0.3	0	-	0	-	4.6
North Dakota	0.6	2.5	-	0.2	-	0.1	-	-	1.9	-	-	1.3	-	-	4.8
South Dakota	2.3	1.0	2.4	-	1.5	0.6	2.7	-	1.5	1.2	0	10.2	-	-	2.8
Montana	-	0.2	0.2	-	0	0.9	0	-	0.7	-	0.4	-	-	0	3.1
Average four States	0.9	2.1	2.0	4.4	0.5*	1.1	4.6	8.2	1.3	1.3	0.3	3.2	0	0	4.2

*One field averaged 36.7 per cent, without this the average was 0.5, with it the average was 4.6 per cent.

made it a practice to treat every other year had only one-third as much smut as those who only treat every other year, or only when it is thought necessary. The average farmer does not know when it is necessary to treat. He does not see small amounts of smut, either in his field or seed, and even experts have difficulty in detecting traces. Furthermore, he cannot predict weather favorable for smut. Under favorable weather conditions it sometimes happens that the crop will be very smutty even when the seed carried a very small initial spore load. Again, with every year's treatment the farmer improves his methods and is likely to be better equipped. Taking all things into consideration it would seem best to play safe and treat every year.

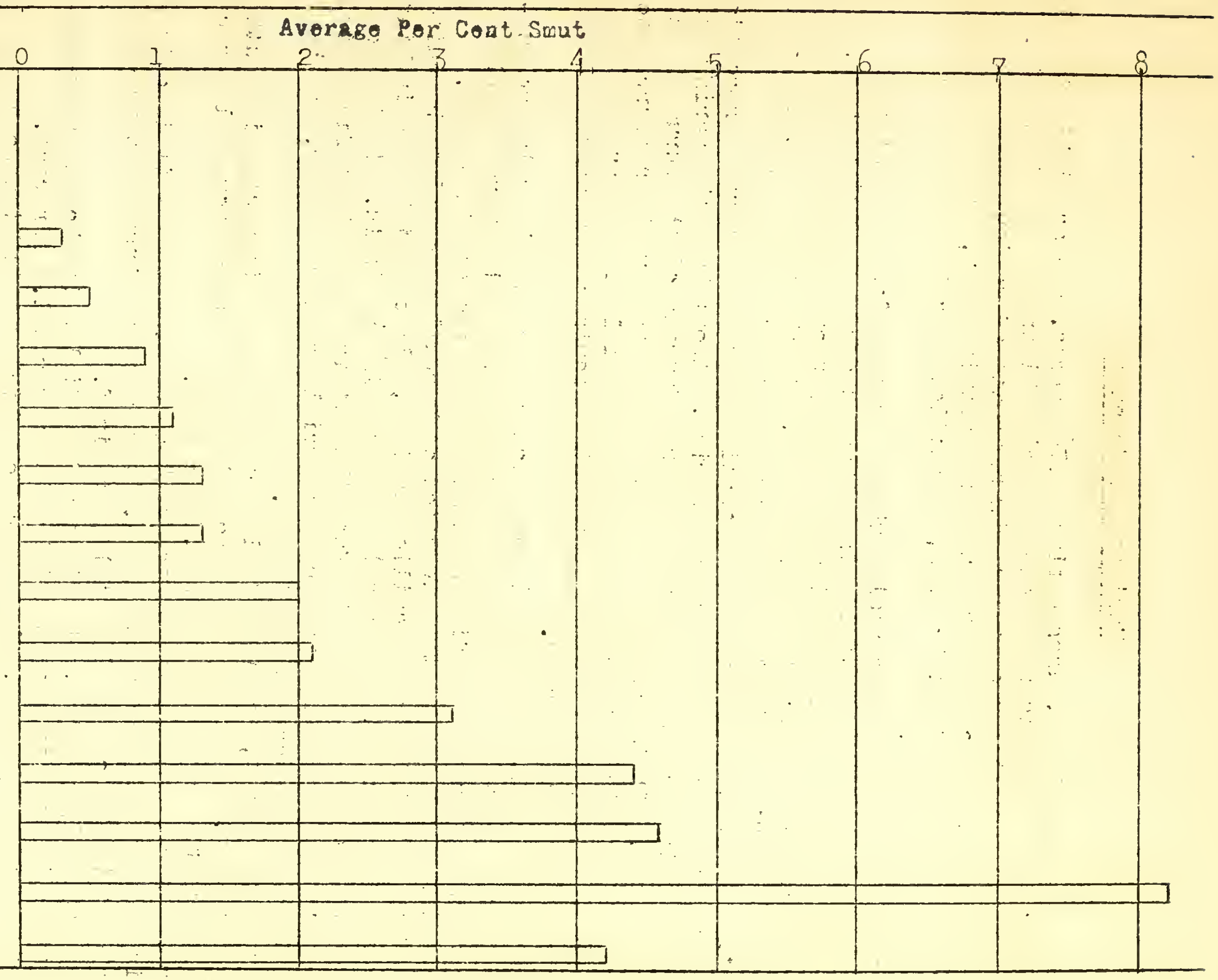
Table 60. Effect of annual and systematic treatment on the percentage of smut.

A summary of replies of farmers, who treated their seed this year, to the question, "Do you treat your seed every year?"

State	Seed treated every year		Seed not treated every year	
	Number fields	Per cent smut	Number fields	Per cent smut
Minnesota	66	1.9	35	7.3
North Dakota	105	1.0	9	2.8
South Dakota	125	1.4	39	2.8
Total and average	296	1.4	83	4.7

Figure 9. Effectiveness of different methods of spring wheat seed treatment.

Treatment	No. fields	Average Per Cent Smut
Hot water	2	0
Blue vitriol	1	0
50% Copper Carbonate, machine	11	0.3
20% Copper Carbonate, machine	9	0.5
Formaldehyde, machine	93	0.9
20% Copper Carbonate, home mixer	33	1.1
Ceresan, machine	17	1.3
Ceresan, shovel	7	1.3
Formaldehyde, dip	20	2.0
Formaldehyde, sprinkle	196	2.1
50% Copper Carbonate, shovel	6	3.2
Formaldehyde, spray	6	4.4
20% Copper Carbonate, shovel	24	4.6
20% Copper Carbonate, Mix in drill	1	8.2
No treatment	270	4.2
Total	696	



Varietal Differences

Records of 694 fields, aggregating 47,764 acres, are available for classifying by varieties. This has been done in tables 61 and 62 and Figure 10. Of the 694 fields, 287 or 41 per cent were durum wheats of various kinds in Minnesota and the Dakotas, 233 or 34 per cent were Marquis wheat, and the remainder were other spring wheats of which Ceres, Marquillo, Marvel and Ruby were the most popular in the order named.

The summaries of the Minneapolis wheat receipts for the past three years have shown considerably more smut in durum than in hard red spring wheat. The field data gathered this summer (Tables 62 and 63) show about twice as much smut in untreated durum as in untreated spring wheat. In the treated durum however the percentage of smut was about the same or slightly less than in the treated spring wheat. It was noted that in the counties surveyed a larger proportion of farmers were treating durum than hard red spring. About half the spring wheat fields were sown with treated seed whereas three-fourths of the durum wheat fields were treated. It is possible that durum growers have been spurred to action by the recent high percentages in untreated fields. The average amounts of smut in all durum and all spring wheat fields examined were about the same, 2.7 and 2.9 per cent respectively.

It is probable that not much information concerning the relative susceptibility of the different wheats can be gained from this survey (Table 62 and Figure 10) as in most cases the fields examined were too few in number. All the leading varieties however with the exception of Marquillo seemed to be quite susceptible. Of the 22 fields of Marquillo examined, all of which were in Minnesota, only a very slight trace (0.1 per cent) was found in one field. It is probable that this may be accounted for by the fact that it is a new wheat first distribute by the Minnesota Experiment Station for commercial growing in 1929, and has not ye had the opportunity to become contaminated.

The variety Marvel, fourteen fields of which were inspected in South Dakota was regularly smutty. One field of supposedly treated seed showed 31 per cent and another 16 per cent. The average was 6.3 per cent.

Marquis is rated as resistant to stinking smut, but that it is only partially so is indicated by the fact that 4.2 per cent was found in untreated fields and 3.6 per cent in all of the 233 fields examined.

Ceres was badly smutted. In 21 untreated fields it showed an average of 8.7 per cent and in the total of 83 fields it averaged 1.7 per cent.

Fourteen fields of Ruby, all but one of which was in Minnesota and all but one of which had been treated, also showed an average of 1.7 per cent smut.

Hope wheat is supposed to resist stinking smut and the survey indicates that it does although percentages of 2, 1.8, 1.0, and 0.3 were observed in four of the 9 fields examined. The average in the 9 fields was 0.2 per cent, in the 3 untreated fields 0.1 per cent.

Table 61. Number of fields, acreage and percentage of smut in different varieties of treated and untreated wheat by States.

Variety and State	Treated			Untreated			Total		
	Number fields	Acres	Per cent	Number fields	Acres	Per cent	Number fields	Acres	Per cent
MARQUIS									
Minnesota	49	1,776	4.6	119	6,260	4.5	168	8,036	4.5
North Dakota	10	713	.1	4	428	1.0	14	1,141	0.1
South Dakota	13	1,237	0.6	3	255	0.6	16	1,492	0.6
Montana	22	5,025	.4	13	1,535	3.9	35	6,560	1.7
TOTAL	94	8,751	2.7	139	8,478	4.2	233	17,229	3.6
CERES									
Minnesota	18	1,046	0.7	11	844	5.8	29	1,890	2.7
North Dakota	20	1,690	.3	6	505	2.1	26	2,195	.7
South Dakota	20	1,268	2.0	4	183	.8	24	1,451	1.8
Montana	4	262	0.5	0	0	0	4	262	0.5
TOTAL	62	4,266	1.0	21	1,532	8.7	83	5,798	1.7
DURUM									
Minnesota	31	1,665	4.2	15	854	16.2	46	2,519	8.1
North Dakota	72	6,934	1.7	9	465	7.2	81	7,399	2.3
South Dakota	115	8,559	1.1	45	2,874	3.4	160	11,433	1.8
Montana	0	0	0	0	0	0	0	0	0
TOTAL	218	17,158	1.8	69	4,193	6.6	287	21,351	2.9

Table 61 (con.) Number of fields, acreage and percentage of smut in different varieties of treated and untreated wheat by States.

Variety and State	Treated			Untreated			Total		
	Number fields	Acres	Per cent	Number fields	Acres	Per cent	Number fields	Acres	Per cent
SUPREME									
North Dakota	4	170	0	0	0	0	4	170	0
Montana	3	240	0	1	10	0	4	250	0
TOTAL	7	410	0	1	10	0	8	420	0
HOPE									
Minnesota	2	14	0	1	10	0	3	24	0
North Dakota	0	0	0	1	25	0	1	25	0
South Dakota	4	76	.5	1	10	.3	5	85	.4
TOTAL	6	90	.3	3	45	.1	9	135	.2
RUBY									
Minnesota	2	53	.2	11	405	2.2	13	458	1.8
South Dakota	1	70	0.5	0		0	1	70	0.5
TOTAL	3	123	.3	11	405	2.2	14	528	1.7
MONTANA KING									
Minnesota	1	120	0	1	60	0	2	180	0
South Dakota	1	50	0	0	0	0	1	50	0
TOTAL	2	170	0	1	60	0	3	230	0

Table 61 (con.) Number of fields, acreage and percentage of smut in different varieties of treated and untreated wheat by States.

Variety and State	Treated			Untreated			Total		
	Number fields	Acres	Per cent	Number fields	Acres	Per cent	Number fields	Acres	Per cent
PROGRESS									
North Dakota	3	410	.4	0	0	0	3	410	.4
CANADA HARD									
North Dakota	1	50	0	0	0	0	1	50	0
BLUESTEM									
North Dakota	1	27	6.8	0	0	0	1	27	6.8
MARVEL									
South Dakota	13	1,132	6.6	1	10	2.3	14	1,142	6.3
RENFREW									
South Dakota	1	75	0	0	0	0	1	75	0
KOTA									
South Dakota	1	50	0	0	0	0	1	50	0
BURBANK									
Minnesota	0	0	0	2	10	0	2	10	0
QUALITY									
Minnesota	0	0	0	4	52	.2	4	52	.2

Table 61 (con.) Number of fields, acreages and percentage of smut in different varieties of treated and untreated wheat by States.

Variety and State	Treated			Untreated			Total		
	Number fields	Acres	Per cent	Number fields	Acres	Per cent	Number fields	Acres	Per cent
MARQUILLO									
Minnesota	7	324	0	15	616	.01	22	940	.004
REWARD									
Minnesota	2	36	0	2	54	.7	4	90	.4
GARNET									
Minnesota	1	60	0	0	0	0	1	60	0
VELVET CHAFF									
Minnesota	1	7	11.2	1	120	4.0	2	127	7.6
OTHER									
Minnesota	1	40	0	0	0	0	1	40	0
TOTAL AND AVERAGES ALL WHEAT	424	33,179	1.9	270	15,585	4.3	694	48,764	2.8

Table 62. Number of fields, acreage, and percentage of smut in varieties of spring wheat found in the survey.

	Treated Seed			Untreated Seed			Treated and Untreated Seed		
	Number Fields	Acres	Percentage Smut	Number Fields	Acres	Percentage Smut	Number Fields	Acres	Percentage Smut
Velvet Chaff	1	7	11.2	1	120	4.0	2	127	7.6
Bluestem	1	27	6.8	0	0	0	1	27	6.8
Marvel	13	1132	6.6	1	10	2.3	14	1142	6.3
Marquis	94	8751	2.7	139	8478	4.2	233	17229	3.6
Ceres	62	4266	1.0	21	1532	8.7	83	5798	1.7
Ruby	13	123	.3	11	405	2.2	14	528	1.7
Progress	3	410	.4	0	0	0	3	410	0.4
Reward	2	36	0	2	54	.7	4	90	.4
Hope	6	90	.3	3	45	.1	9	135	.2
Quality	0	0	0	4	52	.2	4	52	.2
Marquillo	7	324	0	15	616	.01	22	940	.004
Supreme	7	410	0	1	10	0	8	420	0
Montana King	2	170	0	1	60	0	3	230	0
Canada Hard	1	50	0	0	0	0	1	50	0
Renfrew	1	75	0	0	0	0	1	75	0
Kota	1	50	0	0	0	0	1	50	0
Burbank	0	0	0	2	10	0	2	10	0
Garnet	1	60	0	0	0	0	1	60	0
Other	1	40	0	0	0	0	1	40	0
TOTAL AND AVERAGES HARD RED SPRING	206	16021	2.1	201	11392	3.5	407	27413	2.7
DURUM	218	17158	1.8	69	4193	6.6	287	21351	2.9
ALL WHEAT	424	33179	1.9	270	15585	4.3	694	48764	2.8

Figure 10. Percentage smut in untreated fields by varieties

Variety	Number Fields	Per Cent Smut
Ceres	21	8.7
Durum	69	6.6
Marquis	139	4.2
Velvet Chaff	1	4.0
Marvel	1	2.3
Ruby	11	2.2
Reward	2	0.7
Quality	4	0.2
Hope	3	0.1
Marquillo	15	t
Burbank	2	0
Montana King	1	0
Supreme	1	0
All Untreated Wheat	270	4.3

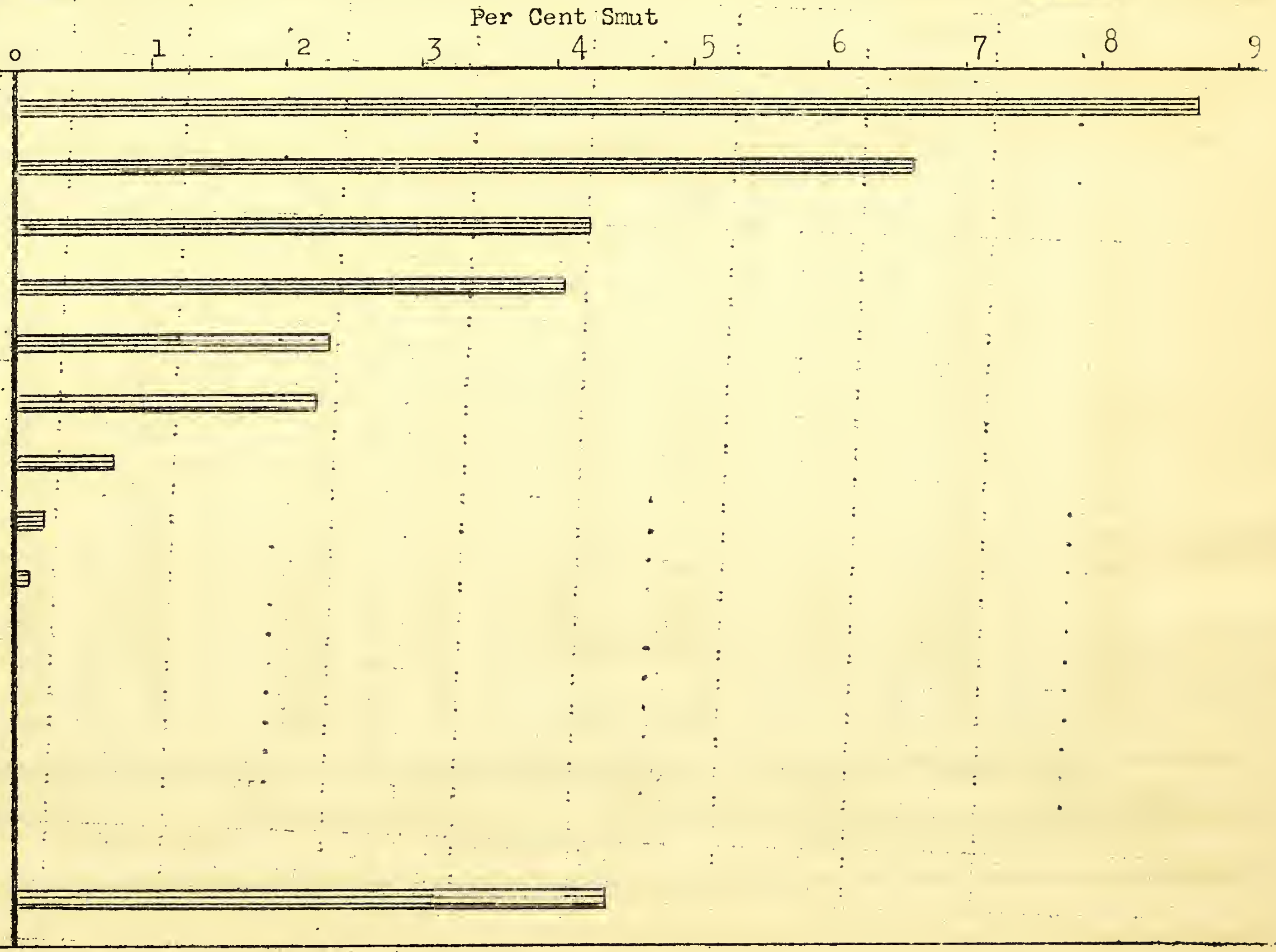


Table 63. Relative amount of smut in treated and untreated hard red spring wheat and durum.

KIND OF WHEAT	TREATED		UNTREATED		TOTAL	
	Number Fields	Per Cent Smut	Number Fields	Per Cent Smut	Number Fields	Per Cent Smut
Hard Red Spring	206	2.1	201	3.5	407	2.7
Durum	218	1.8	69	6.6	287	2.9
TOTAL AND AVERAGES	421	1.9	270	4.3	694	2.8

Amount of Control Being Obtained

In order to have an understanding of just what the situation is with regard to control in any particular area, and also to have a definite goal of complete control towards which to direct our extension activities, it is desirable to have a method of expression, or an index or "yard-stick" of control. We might use the average percentage of smut in a given area as the index. This is the one commonly employed. A method that would give a more exact knowledge of what is actually accomplished, however, might be the following:

Smut control depends on two factors, (1) The percentage of farmers treating their seed, and, (2) the degree or percentage of success being obtained by the farmers who treat their seed. Why not select an index of control based on these two factors? In other words, multiply one by the other.

Percentage of Farmers Treating. These percentages as determined for the areas covered by the present survey are given in Table 55, on page 104.

Percentage of Success. The degree, or percentage, of success may be considered as the percentage by which smut is reduced by seed treatment. For instance, the North Dakota farmers succeeded in reducing smut from 4.8 per cent in the untreated fields to 1.2 per cent in the treated. This reduction of 3.6 per cent is 71 per cent of the total reduction possible. It falls short of complete success by 29 per cent. Seventy-one per cent is therefore the percentage of success. For the other States these percentages are shown in Table 64.

Table 64. Relative success of control methods being used in the four States.

State	Percentage of smut: Treated	Percentage of smut: Untreated	Difference between treated and untreated	Percentage of Success
Minnesota	3.6	4.6	1.0	21
North Dakota	1.2	4.8	3.6	71
South Dakota	1.5	2.9	1.4	48
Montana (Spring wheat)	0.4	3.1	2.7	87
Montana (Winter wheat)	5.7	24.8	19.1	77
All Spring Wheat	2.0	4.0	2.0	50

Index of control. This can now be obtained by multiplying the two foregoing percentages.

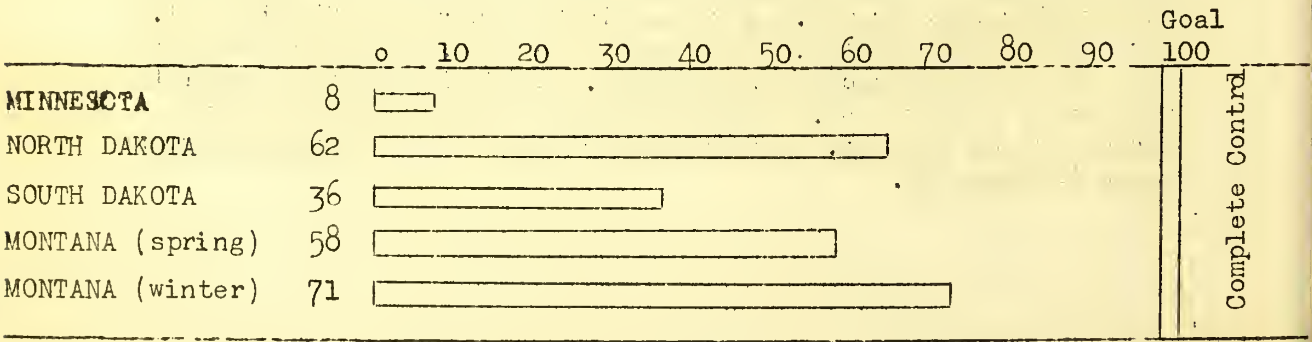
Index of control = Percentage of farmers treating x percentage of success attained by farmers treating.

To illustrate - In South Dakota 75 per cent of the farmers in the areas surveyed treated their seed. This 75 per cent was successful in reducing smut on the average from 2.8 to 1.5 per cent, a reduction of 48 per cent. Index of control= 0.75 x 0.48 = 0.36

If, therefore, we multiply the percentages in Table 55 and Table 64, indexes of control for the areas surveyed are obtained. These are represented graphically in Fig. 11.

By the use of successful methods and by encouraging more farmers to treat, these indexes can gradually be pushed toward the goal of complete control, i. e., 100 per cent.

Figure 11. Percentage of control actually obtained in areas surveyed.



RESULTS - MONTANA WINTER WHEAT

A total of 110 fields of winter wheat, all in Montana, were inspected during the survey. No winter wheat fields were observed in the other States. In the seven Montana counties surveyed, however, winter wheat fields out-numbered spring wheat fields in the proportion of 7 to 3.

Seed treatment of winter wheat was found to be very general. Of the 110 fields all but 9 had been planted with treated seed. The probable reason for this is the very smutty condition of winter wheat. Smut is a much more serious problem in winter than in spring wheat in Montana.

Amount of Smut Found

The treated fields showed an average of 5.9 per cent smut and the untreated 24.8 per cent. The average amount of smut in all fields both treated and untreated was 7.4 per cent.

The highest percentage of stinking smut found in Montana winter wheat, and in fact in any field during the entire survey, was 54 per cent in a fifty-acre field of Turkey in Gallatin County. The seed for this field was said to have been treated with 20 per cent copper carbonate applied with an old type, commercial, dusting machine. Just what was the reason for failure could not be ascertained but the screenings indicated that very smutty seed had been used. It was planted on summer fallowed land, following wheat.

The second highest amount of smut was also in Turkey wheat in Gallatin County. The seed had not been treated but was said to have been well cleaned, and planted on summer fallow, following wheat. The 350 acres showed an average of 50.7 (51) per cent smut.

The field rating third in smut percentage was 100 acres of Kharkof near Moccasin, Judith Basin County. The seed had not been treated and was sown on land that had been in wheat in 1929. It showed 39 per cent smut. Some of the same seed had been sold to a neighbor who treated it and reported no smut in his crop. Since his grain had been cut no counts to verify this were made.

Summarizing the maximum percentages of smut in Montana winter wheat we find the following:

Treated seed -		
Turkey	Gallatin County	54 per cent
Turkey	Fallon County	27 per cent
Turkey	Gallatin County	25 per cent
Untreated seed -		
Turkey	Gallatin County	51 per cent
Kharkoff	Judith Basin County	39 per cent
Turkey	Fergus County	33 per cent

Table 65 shows the number of fields and percentages of smut in treated and untreated fields, by counties.

Table 65. Average percentage of smut in treated and untreated winter wheat fields in Montana

County	Number of Fields Inspected	Number of Fields Treated Seed	Average Per Cent Smut in Treated Flds	Number of Fields Untreated Seed	Average Per Cent Smut in Untreated Fields
Gallatin	38	33	8.2	5	22.6
Cascade	9	9	1.8		
Fallon	20	20	7.6		
Judith Basin	14	12	1.6	2	23.3
Fergus	19	17	6.3	2	31.6
Wibaux	1	1	8.5		
Yellowstone	9	9	2.3		
State	110	101	5.9	9	24.8

Average percentage of smut in all fields both treated and untreated – 7.4

Effectiveness of Seed Treatment Methods Used

Copper carbonate, especially the 50 per cent grade, was the most generally used seed disinfectant, over half of the farmers treating with it. (See Table 66) Formaldehyde was applied, principally by the sprinkling and shoveling method, by about one-fourth of the farmers. More cases of treatment with blue vitriol were observed in Montana than in any other State.

Table 67 and Fig. 12 show the relative effectiveness of the different methods employed. With many of the treatments the fields were not numerous enough to give a dependable rating. In general, however, the results agree rather closely with what might be expected and with similar figures on spring wheat, namely that,

1. The formaldehyde sprinkle and shovel method, and also the formaldehyde dip method, whereby a sack containing about a bushel of seed is dipped in a barrel or tub for a few minutes, are decidedly unsatisfactory for stinking smut control. They do not remove smut-balls.
2. The blue vitriol methods did not control for similar reasons.
3. Formaldehyde applied with good commercial machines is the best liquid treatment.
4. Dust treatments can not be made successfully by the sprinkle and shovel method.
5. The dust treatments gave the best control of any of the treatments when applied with good commercial machines or home mixers.

The results also indicate that even with the best practical treatment much difficulty is experienced in reducing smut to a minimum under Montana conditions, and that other factors such as soil infestation may be at work.

Table 66. Number of fields of Montana winter wheat sown with seed treated by different methods.

County	Formaldehyde			20% Copper Carbonate		50% Copper Carbonate				Ceresan	Blue Vitriol		TOTALS		
	Commercial machines	Sprinkle	Dip	Commercial machines	Method not given	Commercial machine	Homemade mixer	Shovel	Method not given	Homemade mixer	Soak	Sprinkle	Total treated	Total untreated	TOTAL
Gallatin	0	5	0	3	2	14	1	0	1	0	5	2	33	5	38
Cascade	0	1	0	0	0	3	4	1	0	0	0	0	9	0	9
Fallon	1	11	0	0	0	3	5	0	0	0	0	0	20	0	20
Judith Basin	0	2	0	1	0	4	1	1	0	2	0	1	12	2	14
Fergus	1	0	1	4	0	4	4	2	0	0	1	0	17	2	19
Wibaux	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1
Yellowstone	0	5	0	0	0	2	1	0	0	0	1	0	9	0	9
TOTAL	2	24	1	8	2	30	16	4	1	3	7	3	101	9	110

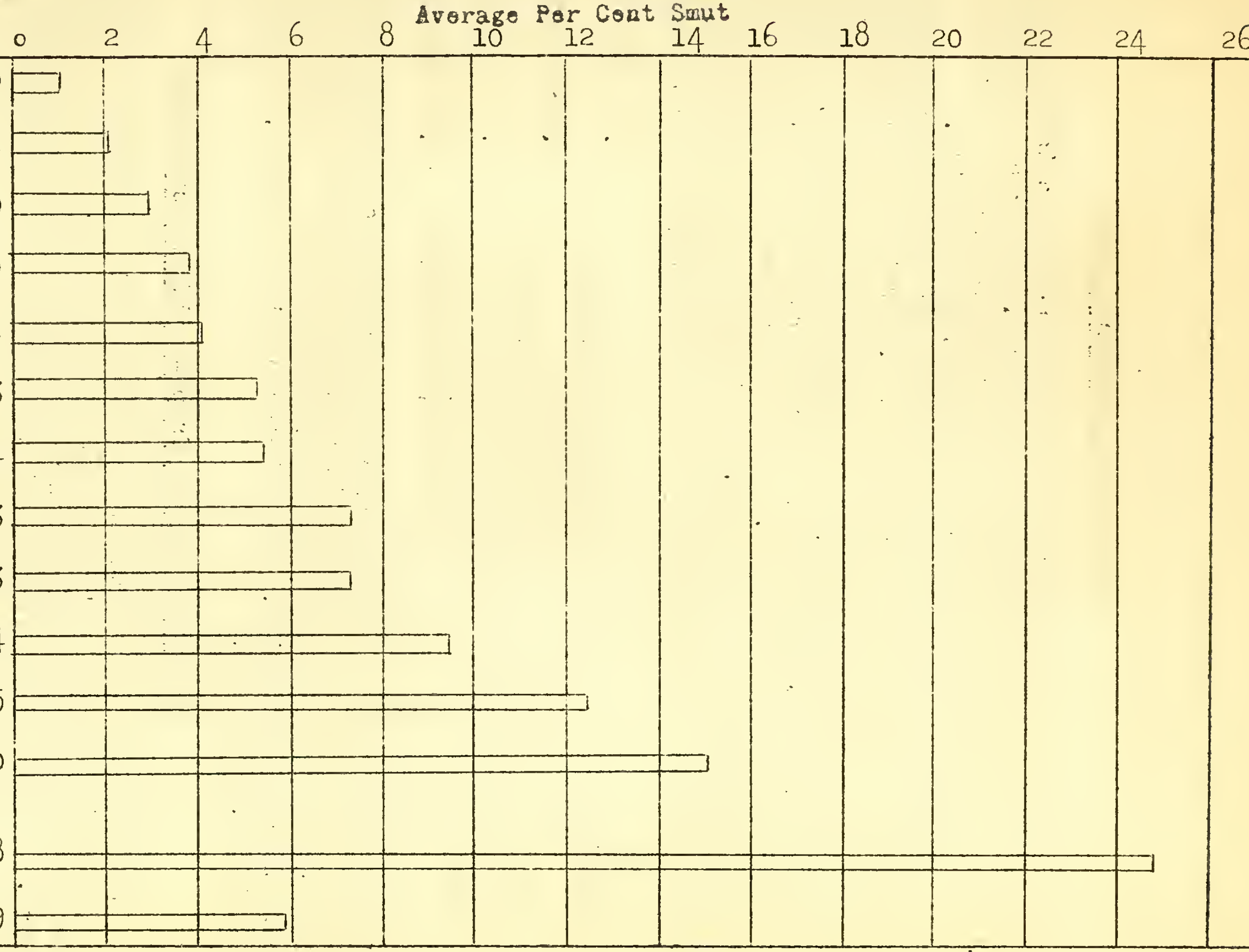
Table 67. Average percentages of smut found in fields of Montana winter wheat the seed for which had been treated by different methods.

County	Formaldehyde			20% Copper Carbonate		50% Copper Carbonate				Ceresan	Blue Vitriol		Average all treated fields	Not treated	Average all fields
	Commercial machines	Sprinkle	Dip	Commercial machines	Method not given	Commercial machine	Homemade mixer	Shovel	Method not given	Homemade mixer	Soak	Sprinkle			
Gallatin	–	16.4	–	*21.2	3.8	5.0	2.5	–	1.0	–	6.0	6.4	8.2	22.6	10.1
Cascade	–	6.7	–	–	–	1.4	0.6	2.9	–	–	–	–	1.8	–	1.8
Fallon	8.0	10.5	–	–	–	1.6	4.6	–	–	–	–	–	7.6	–	7.6
Judith Basin	–	3.8	–	1.4	–	0.8	0.2	0.1	–	2	–	3.5	1.6	23.3	4.8
Fergus	2.5	–	15.0	8.7	–	1.4	1.5	13.1	–	–	16.6	–	6.3	31.6	8.9
Wibaux	–	–	–	–	–	–	–	–	–	8.5	–	–	8.5	–	8.5
Yellowstone	–	2.7	–	–	–	0.7	1.1	–	–	–	4.8	–	2.3	–	2.3
Average Seven Counties	5.3	9.4	15.0	*12.5	3.8	3.0	2.1	7.3	1.0	4.1	7.3	5.4	5.9	24.8	7.4

*The field showing 54 per cent mentioned on page 121 accounts for this high average.

Figure 12. Relative effectiveness of different methods of seed treatment in 110 fields of Montana winter wheat

TREATMENT	Number Fields	Average Per Cent Smut
50% Copper Carbonate, method not given.	1	1.0
50% Copper Carbonate, homemade mixer.	16	2.1
50% Copper Carbonate, commercial machines.	30	3.0
20% Copper Carbonate, method not given.	2	3.8
Ceresan, homemade mixer.	3	4.1
Formaldehyde, commercial machines.	2	5.3
Blue Vitriol, sprinkle and shovel.	3	5.4
Blue Vitriol, soak.	7	7.3
50% Copper Carbonate, shoveled.	4	7.3
Formaldehyde, sprinkle and shovel	24	9.4
*20% copper carbonate, commercial machines.	8	12.5
Formaldehyde, dip.	1	15.0
NO TREATMENT	9	24.8
TOTAL	110	5.9



*These eight fields include the one that showed the most smut in the entire survey - 54 per cent.

Does Seed Treatment Pay?

The answer to this question is readily found by examining Tables 65 and 67, where it is seen that treated fields showed 5.9 per cent smut in comparison with 24.8 per cent in the untreated. An increase in yield of nearly 19 per cent at a cost of about 10 cents per acre is certainly worth while.

Some excellent examples of the benefits of seed treatment were noted. In Gallatin County, Montana, F. C. Meier and H. E. Morris saw a 180-acre field of Turkey wheat the seed for which had been treated with 50% copper carbonate by means of a good commercial machine. It showed an average of 0.7 per cent smut. The same seed, untreated, and sown in a strip across the middle of the field and in two corners showed 13.4 per cent. They also found a field of untreated Turkey wheat that averaged 50.7 per cent smut. On inquiry they learned that wheat comparable to this had also been sown by three other growers each of whom had treated it before planting. An examination of these farms showed the following:

Grower A.	Seed untreated	50.7 per cent smut
Grower B.	50% copper carbonate with machine	4.7 per cent smut
Grower C.	50% copper carbonate with machine	7.1 per cent smut
Grower D.	Blue vitriol. Soaked in sack 5-10 minutes	13.7 per cent smut

In Fergus County Mr. Kidder observed an 80-acre field of Turkey wheat of which 70 acres had been sown with formaldehyde-machine-treated seed and 10 acres with untreated seed that had been dipped in water. It was all the same seed and sown at the same time. The treated portion showed 2.5 per cent smut, the untreated 33.4 per cent.

Effect of Previous Crop - Soil Infestation

Evidences of soil infestation were observed in Montana. The mere fact that it was so difficult to get control by seed treatment points that way. Also the much greater severity on winter than on spring wheat is an indication. Furthermore, studies of conditions on individual farms suggested soil contamination. Mr. Meier found a field where the infection was much heavier in the area in the lee of last year's straw stack.

Most of the fields were sown on land that had been summer fallowed in 1929 and only 12 instances were recorded of wheat following wheat. It may be of interest to note, however, that in these 12 fields the average percentage of smut was 11.8 per cent, while 75 fields definitely recorded as being fallowed in 1929 had an average of only 7.6 per cent smut.

Varieties

Almost all of the winter wheat was of the Turkey variety, although 22 fields of Karmont, 2 fields each of Crail and Montana 36 and one field of Kharkof were recorded.

CONCLUSIONS

The prevalence of smut in the spring wheat area may be accounted for by (1) An insufficient number of farmers treating, and (2) Failure to get results on the part of some of those who do treat. The principal reason for failure seems to be not low grade chemicals, not the weather, and not soil infestation, although the latter may play some part in Montana winter wheat, but rather lack of attention to the details of the standard, recommended methods.

Importance of smut-balls. The most important detail that is neglected, in the opinion of the summarizers, is that of removing smut-balls. It has always been the recommendation of the U. S. Department of Agriculture that smut-balls should be removed by thorough fanning or otherwise; that if liquid treatments such as formaldehyde or copper sulphate are used the seed should be soaked, loose in open vats or tubs, and the smut-balls that rise to the top skimmed off, or else treating machines that remove smut-balls be employed. The sprinkle and shovel method of applying formaldehyde as for oats, never has been advocated for wheat, except possibly in cases where the seed was definitely known to be free from smut-balls, and yet it is surprising to note that nearly two-thirds of those treating with formaldehyde are using that method. This treatment does not remove smut-balls. The dip treatments that were applied for the most part did not take out smut-balls as in most instances the grain was dipped in sacks and then spread out or set aside to dry. The machines of the automatic sprinkle and auger types are unsatisfactory for the same reason. Elevator machines that were in good working condition seemed to be the only ones that fulfilled the requirements.

Several investigations have shown that spores in the interior of unbroken smut-balls are not affected by liquid or dust treatments, and that in the process of handling and drilling the smut-balls may be broken and reinfect formaldehyde-treated seed. Regarding this fact Humphrey (1) writes,

> "Another series of laboratory experiments designed to test the efficacy of various strengths of bluestone, formaldehyde, and other fungicides in killing the spores of unbroken smut-balls has revealed the fact that even though these unbroken smut-balls are soaked until they sink to the bottom of the solution, the contained spores when properly planted in culture dishes will invariably germinate. The membrane which encloses the mass of spores in the smut ball is a very excellent protective device against the entrance of water and it is almost a certainty that hundreds or even thousands of these smut balls pass through the ordinary methods of treatment unbroken, and hence unaffected by the fungicide, later to be crushed by the movement of wheat in the drill at time of seeding. This doubtless accounts in part for the occurrence of smut in fields planted to thoroughly treated seed."

In the case of the dusts there is a rather permanent coating of disinfectant on the outside of the healthy, treated seed that probably tends to partially prevent recontamination even if smut-balls are broken during drilling and viable spores scattered on the seed. This may explain the superiority of the copper carbonate treatment in many cases.

Data on the kind of work done by farm fanning mills and seed-cleaners were not collected but there many indications that many of them do not do a thorough

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Humphrey, H. B. The preventing of the stinking smut of wheat. Washington State Agr. Exp. Sta. Popular Bul. 48:1-4. 1912.

job of cleaning and practically no consideration is given to the removal of smut-balls. It is probable that a special survey of the quality of work done by farm seed-cleaning machinery at the time of seed cleaning and treating would show some interesting results.

Dust Treatments Cannot Be Made by Hand Shoveling. How so many farmers (37) got the idea that they could apply copper carbonate by the sprinkle and shovel method is a question. Very little or no control was obtained nor could it be expected by this method. At least two cases of sickness were reported because the operators inhaled the dust. The dust treatments should always be made in tight commercial or home-made treaters.

Dust or Liquid? The methods that gave the most complete control of smut as shown by the survey were--copper carbonate, both 20 and 50 per cent, formaldehyde and Ceresan all applied by machine. Any of these treatments when properly done have been shown to be effective both experimentally and practically. Of the treatments the balance would appear to be in favor of the copper carbonate. It is known that formaldehyde impairs germination in many cases whereas the dusts do not. As far as the expense is concerned there is not a great deal of difference between copper carbonate and formaldehyde. Formaldehyde is cheaper but both are inexpensive enough. Forty cents worth of formaldehyde will treat 50 bushels of seed, whereas 40 cents worth of copper carbonate will treat eight bushels.

On the other hand, in areas, such as the Dakotas, where the formaldehyde treatment is well known, where it is firmly established, where farmers are getting good results without much seed injury, it is questionable if it would be wise to try to supplant it with copper carbonate immediately.

Recommendations

The following recommendations, all of which have been made many times in the past, may be emphasized again on the basis of the facts collected on this survey.

1. Do not use smutty wheat for seed, unless absolutely necessary.
2. Clean and fan seed very thoroughly before treating with either liquids or dusts. It is very important to remove smut-balls because if left with the seed they may break and reinfect the treated seed. Cleaning and recleaning with efficient apparatus will remove them.
3. Copper carbonate dusts, either the 50 per cent or the 20 per cent, applied with good commercial or home-made machines, seem to be the most satisfactory of any of the treatments.
4. Formaldehyde applied with machines that remove smut-balls seems to be a satisfactory treatment. The matter of seed injury must be taken into consideration, however.
5. Ceresan appears to be slightly less effective than the above in reducing smut but nevertheless gave fairly satisfactory control. It does not reduce germination. It is more expensive than copper carbonate.
6. The formaldehyde treatment should be made using a machine that allows the smut-balls that may remain with the seed, to rise to the top and be skimmed off; or by soaking loose in open tubs or vats, stirring, and skimming off smut-balls.
7. The formaldehyde treatment should not be made by the sprinkling and shoveling method nor by dipping in sacks if smut-balls are not all removed in cleaning.

8. The dust treatments tend to prevent recontamination of seed after treatment and have an advantage over formaldehyde for that reason. They should be made using good rotating, commercial or home-made machines.

9. On no account should dust treatments be applied by the shoveling method.

10. It pays to treat seed every year.

SUMMARY

An examination of 814 wheat fields comprizing 66,729 acres in 17 counties of Minnesota, the Dakotas and Montana in 1930, has shown that:

> Sixty-two per cent of the spring and 92 per cent of the winter wheat growers treated their seed.

The average percentage of smut was: Spring wheat treated 2, untreated 4, total 2.8. Winter wheat, treated 5.9, untreated 24.8, total (110 fields in Montana) 7.4.

Formaldehyde was used on 74 per cent of the spring and 25 per cent of the winter wheat; copper carbonate on 20 per cent of the spring and 55 per cent of the winter wheat.

The percentages of smut in spring wheat following different treatments were: 50% copper carbonate with machine 0.3 smut; 20% commercial copper carbonate, machine 0.5; formaldehyde, machine 0.9; 20% copper carbonate, home-made machine, 1.1; Ceresan, machine 1.3; Ceresan, shoveled 1.3; formaldehyde, dip 2.0; formaldehyde, sprinkle 2.1; 50% copper carbonate, shoveled 3.2; 20% copper carbonate, shoveled 4.6. With winter wheat the results were about the same. Those who treated every year had 1.4 per cent smut. Those that did not had 4.7 per cent. The leading spring wheats showed the following percentages of smut in untreated fields, Ceres 9, durum 7, Marquis 4, Ruby 2.2, Marquillo trace, all hard red spring wheats 2.7, all durums 2.9.

THE MINNESOTA WHEAT SMUT SURVEY

by R. C. Rose

The counties selected for the survey in Minnesota were Redwood, Wilkin, and western Polk in different parts of the Minnesota wheat belt. It was decided that the survey should include approximately one hundred separate fields of wheat in each county. Individual field records were to be made out for each field visited. These records were to contain information on the amount of bunt present in the field and complete data on all factors that might influence the amount of smut. Part of the data on previous history of seed and details of method of treating, if any, were to be secured from the farmer himself.

The survey was started in Redwood County on the morning of July 10 by 3 men from the State College of Agriculture. This group was later joined by Mr. Sumner, of the N. W. Crop Improvement Association, and Dr. Haskell, of the U. S. Department of Agriculture, for short periods, so that there were 4 men in the field most of the time while the survey was made.

Although the number of fields inspected was over 300, the records of many were incomplete because in many cases the owner or operator was not at home at the time of the survey. An attempt was made to complete the records by correspondence through the mail. This resulted in completed records on 298 fields of wheat.

WHAT SEED TREATING METHODS ARE MOST COMMON

The completed records show that only 38 per cent of the fields inspected were from seed treated in 1930. This, no doubt, is partly due to the opinion held by many that it is not necessary to treat their seed grain every year. The formaldehyde method appears to be most common, for 63 per cent of those that treated, used this method, while only 28 per cent used the 20 per cent copper carbonate. Ceresan is not being used to any great extent in the 3 counties surveyed as only 4 per cent of those treating their seed wheat used this material. Two farmers used the hot water method, one used formaldehyde and copper sulphate, and one used the 50 per cent copper carbonate.

WHAT VARIETIES OF WHEAT ARE GROWN IN THE COUNTIES SURVEYED

Twelve different varieties of wheat were found in the fields inspected. The Marquis wheat was most common for 56 per cent of the fields were seeded with this variety while durum occurred in 15 per cent of the fields. Seed treatment was more common on the durum wheat than on any other variety. The survey records show that 67 per cent of the durum fields were treated while only 29 per cent of the Marquis fields were treated. The high discount on smutty durum no doubt has had some influence in raising the percentage of durum that is being treated, over other varieties. The discounts for smut in Marquis wheat have always been lower than that in durum and until recently it has been the practice in many places not to discount for smut in bread wheat. A unified system of smut discounts no doubt will have its effect in interesting more farmers in smut control methods.

WHAT COUNTIES TREAT MOST SEED WHEAT

The results of the survey show that 46 per cent of the fields inspected in Wilkin County were seeded with treated seed. Redwood County data showed that 41 per cent of the inspected fields were treated although very little durum is raised in this County. Records from past years show smaller percentages of smutty wheat coming from the northern part of the Red River Valley so it is not surprising that Polk County showed only 31 per cent of the fields were from treated seed.

HOW WERE THE SEED TREATING CHEMICALS APPLIED

Seventy-seven per cent of the farmers using formaldehyde applied it by the sprinkle method while 14 per cent applied it with commercial machines. Among the farmers using 20 per cent copper carbonate, 45 per cent applied it with barrel churns or cement mixers, 30 per cent applied it by shoveling over the grain and dust,. 21 per cent used commercial machines for dusting while 3 per cent mixed the dust and grain in the drill box. Most of those using Ceresan applied it with a barrel churn. The method of applying the different chemicals is very important in checking results, as even the best of chemicals cannot give satisfactory results if used improperly. It is interesting to note that 30 per cent of the farmers who used 20 per cent copper carbonate mixed it with a shovel although this method of application has been discouraged by agricultural workers since copper carbonate was first introduced in the State. It is to be expected that unsatisfactory results will follow the mixing of dust chemicals with seed grain by the shovel method or stirring them together in the drill box.

WHAT SEED TREATING METHODS GAVE BEST RESULTS

From the data secured in the survey, the commercial machines seem to offer the most uniformly satisfactory method of applying formaldehyde. The average percentage of smut on all fields treated by commercial formaldehyde machines was 0.7 per cent and the range was from 0 to 3.9 per cent.

The sprinkle method seemed to be more erratic, for we find the percentage of smut heads after this method of treatment, varied from 0 to 48 per cent. The average amount of smut on all fields from seed sprinkled with formaldehyde was 3.9 per cent. Here again, in discussing seed treating methods with farmers, we found many who failed to follow directions given out by the College of Agriculture. We found quite a number who seeded the grain immediately after treating without allowing it to stand covered for the required length of time. This, of course, would reduce the effectiveness of the treatment. The spray method averaged 8.5 per cent smut. This method is not recommended for wheat but a few farmers seem to think that they can make it work. The dip method is not popular with many farmers because of the extra labor. Those who used it, however, averaged only 3.5 per cent smut.

With the exception of one field, the seed treated with 20 per cent copper carbonate by commercial machines gave good results. This one field showed 38.7 per cent smut but on further investigation there seems to be some doubt on whether the dust feed was working properly and using sufficient dust to cover the seed. Without this field we find the other fields averaged only .2 per cent, which compares quite favorably with the other methods. When the above-mentioned field was included with the others, the 20 per cent copper carbonate, machine-treated seed averaged 6.3 per cent in the following crop.

The barrel churn or cement mixer was the most common means of applying the 20 per cent copper carbonate dust. The fields from seed treated in this way showed only 1.5 per cent smut heads. This method seems to be quite successful in the hands of most farmers. The ten farmers who mixed the 20 per cent copper carbonate dust and seed wheat by the shovel method had a smutty crop varying from 1.1 per cent to 24.7 per cent. The average on these fields was 7.4 per cent. The method is unreliable and not worth the farmer's effort. Only one farmer included in the survey attempted to mix the dust and seed grain in the drill box. His field showed 8.2 per cent smut. This method is about as good as nothing and any one that tries to get results from it might just as well try a few magic words. Very little smut occurred on the fields treated with Ceresan, but this method is more expensive than the others, and therefore not apt to replace copper carbonate unless the price is lowered. The results on the five fields treated with Ceresan are promising as far as they go.

The average amount of smut on fields not treated in 1930 but treated in 1929 was 2.1 per cent. The fields from seed not treated in 1930, and with no record on previous treatments showed an average of 5.1 per cent smut. Where the seed had been grown for some years without treatment, the fields showed an average of 4.4.

In the durum wheat the amount of smut in the untreated fields was higher than in any of the other varieties. Durum wheat treated in 1929 but not in 1930 averaged 5.3 per cent smut. Durum not treated in 1930 and without record of previous treatment averaged 16.4 per cent smut. Durum wheat not treated in recent years showed an average of 18.4 per cent smut.

SUMMARY

Seed treatment properly applied is good insurance against losses from bunt or stinking smut of wheat.

Many cases of reduced efficiency of seed treatment can be traced to the failure to follow treating directions carefully.

Mixing dust chemicals and seed grain by shovel or in drill boxes is a poor excuse for seed treatment and the results are usually not satisfactory.

Seed treatment every year is a safe practice as smut may reappear in the crop a year after treatment.

Table 68. Materials used in treating seed on Minnesota farms covered by 1930 smut survey.

Materials Used	Fields Treated
Hot water	2
Formaldehyde + copper sulphate	1
Copper carbonate 50%	1
Ceresan	5
Copper carbonate 20%	33
Formaldehyde	74
Total	116

Table 69. Varieties of wheat covered by 1930 smut survey, Minnesota.

Varieties	Number of Fields	Total Acres	Fields from Treated Seed	Fields from Untreated Seed	Percent of Fields Treated	Percent of Fields not Treated
Garnet	1	60	1	0	100	0
Winter	1	40	1	0	100	0
Montana King	2	180	1	1	50	50
Velvet Chaff	2	126	1	1	50	50
Hope	3	24	2	1	66	33
Reward	4	90	2	2	50	50
Quality	6	62	0	6	0	100
Ruby	13	458	2	11	15	85
Marquillo	22	927	8	14	36	64
Ceres	29	1890	18	11	62	38
Durum	46	2519	31	15	67	33
Marquis	169	8051	49	120	29	71
Total	298	14427	116	182	39	61

Table 70. Corelation of the adoption of seed treatment with varieties grown and region surveyed

Counties	Marquis Total Fields	Marquis Treated Fields	Marquis Percent Treated	Durum Total Fields	Durum Treated Fields	Durum Percent Treated	Ceres Total Fields	Ceres Treated Fields	Ceres Percent Treated
Redwood	75	31	41	2	2	100	2	2	100
Wilkin	34	9	26	24	17	71	21	13	62
Polk	60	9	15	20	12	60	6	3	50
Total	169	49	29	46	31	67	29	18	62

Counties	Other Varieties Total Fields	Other Varieties Treated Fields	Other Varieties Percent Treated	All Varieties Total Fields	All Varieties Treated Fields	All Varieties Percent Treated
Redwood	22	6	27	101	41	41
Wilkin	15	4	27	94	43	46
Polk	17	8	47	103	32	31
Total	54	18	33	298	116	39

Table 71. Seed treating methods used on Minnesota farms covered in 1930 smut survey

Varieties	Farms using formaldehyde: Commercial machines	Sprinkle	Spray	Dip	Farms using 20% copper carbonate: Commercial machines	Barrel churn or cement mixer	Shovel	Stir in drill box	Farms using Ceresan: Barrel churn	Shovel	Other methods: Hot water	50% copper carbonate	Formaldehyde and copper sulphate dip	Total
Durum	2	19	1	2	2	3	2	–	–	–	–	–	–	31
Marquis	6	22	2	1	2	6	6	1	1	1	–	–	1	49
Ceres	2	7	–	–	3	3	2	–	1	–	–	–	–	18
Other varieties	1	9	–	–	–	3	–	–	2	–	2	1	–	18
All varieties	11	57	3	3	7	15	10	1	4	1	2	1	1	116

Table 72. Average per cent of bunt found on the different varieties following the different methods of seed treatment in Minnesota.

	Formaldehyde				20% copper carbonate				Ceresan		No treatment in 1930			Hot water	50% copper carbonate	Cop. Sul. + formaldehyde
Variety	Commercial machines	Sprinkle	Spray	Dip	Commercial machine	Churn or mixer	Shovel	Mixed in drill box	Churn or mixer	Shovel	Treated in 1929	No information on past treatments	Not treated in recent years	Commercial machine	Churn or mixer	Sprinkle
Durum	3.9	5.2	5.7	0	.5	4.	1.5	–	–	–	5.3	16.4	18.4			
Marquis	0.	4.7	10.	3.5	18.4	1.8	11.5	8.2	3.6	tr.	1.5	5.0	3.2			
Ceres	0.	1.2	–	–	0.	.7	.9	–	–	–	3.7	6.9	–	–	–	–
Other Varieties	0.	1.2	–	–	–	0.	–	–	0.	–	2.5	.5	0	0	0	7.6
All varieties	.7	3.9	8.5	3.5	6.3	1.5	7.4	8.2	.9	tr.	2.1	5.1	4.4	0	0	7.6

BUNT IN NORTH DAKOTA SPRING WHEAT

By W. E. Brentzel

A smut survey was made in Cass, Steele, and Towner Counties for bunt. During the latter part of July, Dr. Haskell, U. S. Department of Agriculture, and Brentzel, North Dakota Experiment Station, worked in Cass and Steele Counties. Towner County was surveyed by Dr. Walker, Plant Disease Survey, in the early part of August.

In all, 75 wheat growers were visited and their fields, about 131 in number, were studied. Smut was found in abundance. An average of more than one out of every three fields examined were smutty in appreciable amounts. In general the percentage of smutted heads was not high in most of the fields, but if the average of smut found in these counties may be taken as a fair representation of the State, more than 2 percent of the wheat heads produced were smutted. If the yield in North Dakota this year was approximately 100 million bushels of common and durum wheat, the loss might be estimated at more than 2 million bushels, which if sold at 70 cents would have amounted to 1.4 million dollars. If one-third of the wheat sold graded smutty and the average dockage was 3 cents per bushel, another million dollars in dockage was lost. The total would be approximately 3-1/2 percent of the value of the wheat crop.

The survey showed that both common and durum wheat fields were frequently smutty, and that both species of smut, Tilletia laevis and T. tritici occurred in abundance. This was true, although 75 per cent of the growers had treated their seed with chemicals to prevent smut. Almost 90 per cent of the growers who treated, used formaldehyde as the disinfecting chemical. Approximately one-third of the treated fields which were examined were smutty, while two-thirds of the untreated fields were smutty.

The lack of better smut control from the treatment in general practice was due, it is believed, to several factors. Formaldehyde, when properly used, is very effective as a disinfectant for stinking smut. When not properly used it is no better than the method employed. About one-half of the farmers who treated seed, did not use a treating machine, but depended upon a sprinkling can and shovel as their only equipment for treating. The result was that 35 per cent of the fields treated without using machines were smutty, whereas only 15 per cent of those treated with machines were smutty.

The kinds of treating machines used varied from those which were made on the farm to the best types of power machines obtainable. The most common type in use was a small sprinkling machine, more or less automatic in operation; that is, the weight of the grain when shoveled into the hopper, operates a burr-like sprinkling apparatus which sprinkles the solution onto the seed as it escapes. This type of machine seemed to do very good work, is inexpensive and handy to use, but it does not remove smut-balls from the seed. Not many of the machines will remove smut-balls. If all growers had used good machines and had followed directions provided by the Experiment Station and the U. S. Department of Agriculture, it appears that smut would have amounted to practically nothing.

The fact that so much seed is not properly cleaned and graded to remove smut balls before treating probably was another very important factor. Also many growers forgot to cover the seed properly after treating, and thus failed to give the formaldehyde gas an opportunity to act on the smut.

It was observed that in each community the farmers generally followed the same methods of treating and handling seed wheat. It was also apparent that on the smaller farms, where less wheat was grown and a greater diversity of crops was produced, they were more careless about using precautions for smut control. In Towner County where the size of farms average close to 500 acres and wheat is the principal crop, each of the 35 farmers interviewed treated for smut, and more than 70 per cent of them used some type of treating machine. The result of this better practice reduced the amount of smut in Towner County this year to about 0.7 per cent as compared with 2.6 per cent in Cass and 3.4 per cent in Steele County, where the farms are smaller and where a greater diversity of crops are produced.

In all communities satisfactory smut control by means of proper cleaning and treating of the seed seemed to be possible.

SMUT SURVEY IN SOUTH DAKOTA

by E. A. Walker

From intimate contact with the farmers of the spring wheat section of South Dakota I am convinced that they are in sympathy with the work that was conducted the past summer on the smut survey project. The county agents need to be further encouraged along the course of advising the farmers to plant disease-free seed each year. The farmers appreciated the suggestions offered by the county agents and myself in regard to the possibility of having disease-free seed each year by resorting to better methods of seed treatment.

The large wheat farmers are better able to control the disease than are the smaller growers. They have the capital and usually the help to see that the treating operations are performed for the greatest control of the disease. The small farmers are more inclined to use the older and less effective methods of smut control. Only a few of the farmers in South Dakota have smut machines.

Formaldehyde appears to be the most common and most satisfactory material used for treating grain.

Copper carbonate is fast losing favor with South Dakota farmers because of its necessitating a treating machine for best success, and because it harms the drill when becoming exposed to moisture.

Ceresan used for treating wheat gave excellent results in controlling the disease wherever it was applied by the proper method.

The durum wheats show very high percentages of smut in comparison to other varieties. Red durum seems to be infected most severely. The variety Marvel is highly susceptible to smut even when treated properly.

In view of the fact there are many wheat growers in the counties visited in this survey who are disbelievers in the good of treating wheat for the prevention of smut, and some who believe that smut is not caused by an organism, it would be most encouraging for the county agents to get in closer touch with this group and educate and train them to the correct belief.

In South Dakota the old method of treating seed wheat is mostly in practice. The value and use of the smut machine, and newer treating materials are not known and appreciated by a large number of the farmers. There should be demonstrations and instructions to various small gatherings of these farmers whereby they will be able to understand more fully the added advantage of using newer materials and more efficient smut treating equipment.

Table 73. Summary of smut survey of the four counties in South Dakota.

Varieties	Spink Co. Percentage Smut	Brown Co. Percentage Smut	Day County Percentage Smut	Marshal Co. Percentage Smut	Average Percentage Smut
Marquis	0.3	1.9	0.8	--	1.0
Marvel	13.3	2.9	--	--	8.1
Ceres	0.9	4.2	0.9	5.9	2.5
Kota	0.0	0.0	--	0.3	0.1
Hope	1.8	--	0.1	--	0.6
Remfrew	0.0	--	--	--	0.0
Ruby	--	0.5	--	--	0.5
Succotash	--	--	0.0	--	0.0
Montana King	--	--	--	0.0	0.0
Red durum	1.1	1.6	1.2	1.6	1.4
Amber durum	0.0	0.4	0.5	0.5	0.4
Mindum durum	--	0.0	0.3	3.8	1.4
Acme durum	--	1.0	0.6	2.6	1.4
Mixed durum	--	2.3	0.5	2.5	1.8
D-1	--	--	6.7	1.4	4.1
Nodak	--	--	3.1	--	3.1
D-5	--	--	0.3	--	0.3
Average	2.17	1.48	1.25	2.07	1.57

Table 74. Effects of various treating materials and methods on the percentage of smut in South Dakota.

Materials and methods	Percentage of smut				
	Spink County	Brown County	Day County	Marshall County	Average for State
Formaldehyde					
Sprinkle, shovel	0.45	0.99	1.16	0.43	0.76
Auger type	5.5	0.0	0.3	1.0	1.70
Barrel mixed	0.0	0.5	--	0.0	0.17
Automatic sprinkle	--	5.5	--	--	5.5
Pail-dip, drain	2.1	0.05	0.0	0.15	0.57
Hero-elevator type	--	0.0	0.0	5.77	1.92
Sack-dip, drain	--	0.0	0.0	--	0.0
Owen smut machine	--	--	0.0	--	0.0
Average	2.01	1.01	0.24	1.47	1.33
20% copper carbonate					
Dust, shovel	2.07	0.85	--	5.45	2.79
Barrel mixed	0.0	2.55	--	0.0	0.85
Dust, hoe	--	--	--	2.8	2.8
Smut machine	--	--	--	1.5	1.5
Average	1.03	1.70	--	2.44	1.98
50% copper carbonate					
Dust shovel	--	10.2	--	--	10.2
Barrel mixed	0.0	--	--	--	0.0
Average	0.0	10.2	--	--	5.1
Ceresan					
Dust, shovel	0.0	1.9	0.0	--	0.63
Barrel mixed	1.4	1.25	0.0	--	0.88
Average	0.7	1.57	0.0	--	0.75
Not known	--	--	9.3	--	9.3
No treatment	0.15	1.58	2.05	3.8	1.9
Averages	0.65	3.21	2.90	2.57	3.39

W I N T E R   W H E A T   G R O W E R S !

WILL YOU SPEND A DIME TO SAVE $3.50?

by
Waldo Kidder
Extension Agronomist, Montana State College

Much has been said about the need for the control of smut for wheat. The problem of smut control is always a serious one for smut not only reduces yields which increase the production cost per bushel but smutty wheat requires special handling which is expensive, so millers will not pay as much for it--in fact many mills refuse to buy smutty wheat at any price.

With a surplus of wheat to draw on it will possibly be even harder to sell smutty wheat than in the past and discounts for smut may be even greater. With

A FARM STUDY OF TREATING SEED WHEAT

Smut Treatment Material Used	Average per cent of smut found in fields
50% copper carbonate	2.5
20% copper carbonate	11.23
Formaldehyde	0.68
Bluestone	6.95
No treatment	26.21

low prices for good wheat staring us in the face it will stand us in good stead to control the smut losses if we are to stay in the wheat business.

Smut can be controlled even in winter wheat. It may take a few years of careful, systematic work on the part of the growers to absolutely eliminate it but it can be controlled to the point where smut losses are negligible.

We folks working with the colleges and experiment stations have been saying this for quite a few years. This year we wanted to find why Montana wheat growers were still standing a heavy loss. Accordingly, with the cooperation of the county agents, the U. S. Department of Agriculture and the Northwest Crop Improvement Association, a large number of grain fields were visited, the owner consulted about whether the seed grain was treated before planting to prevent smut, how it was treated, variety and a lot of other information relative to causes for smut. This work was carried on as a part of the smut prevention campaign started in Montana by the extension service this spring. The field survey of wheat fields was made in Fergus, Cascade, Judith Basin, Chouteau, Gallatin, Fallon, Wibaux, and Yellowstone Counties and it has showed some mighty interesting things from the farmers' own experience and it proves that smut can be controlled if proper seed treatment is given to seed before planting.

A summary of the results secured from the various methods of seed treatment and no treatment on winter wheat, in the area named, are shown in this article.

The results from this farm study on smut prove that failure to treat seed is too expensive for any farmer in this business of grain growing as the average loss was over 26 per cent. This means not only a 26 per cent loss in yield but also a heavy smut dockage on the small part of the crop harvested. At the current prices of wheat--as low as they are--the loss per acre on average Montana winter wheat yields and with a 10-cent dockage will be over $3.50 per acre! And seed treatment with the best methods costs only less than 10 cents per acre! Surely there is no argument against the best possible treatment of winter wheat seed to prevent this loss.

The farm survey showed that the loss from smut can be largely prevented as the pure copper carbonate, that is, the 52% copper content carbonate, showed only 2-1/2 per cent loss. This is quite small and will undoubtedly show little or no smut dockage. The lighter grade copper carbonate did not show as good control nor did the formaldehyde treatment as the pure stuff, but a great deal better than no treatment.

We have not had time to work up the data to show the effect of different methods of applying the seed treatment nor of the effect of time of planting or dryness of soil on the amount of smut, but from a hurried checkup and from farm experience it would seem that it will be well to again call attention of winter wheat raisers not only to the pure copper carbonate but to mix it on the seed thoroughly in a good seed treater which will not only mix the seed and dust well, but at the same time be tight so that dust does not escape. Trying to mix the dust on the seed in the drill box or by shoveling over does not give good results.

From two to three ounces of the dust should be used on each bushel of seed. Before treating the seed should be thoroughly recleaned. A heaping tablespoonful of copper carbonate weighs approximately an ounce.

Late planted winter wheat and especially that planted in dry soil where germination is slow, favors smut, so treated seed should be planted as soon after September 10 as possible.

Following these practices, which have now been proved not only on the experiment stations, but also on the farms of Montana carefully and year after year, the grain growers can get rid of smut with its attendant loss in yield and value and higher production cost a bushel. If Montana grain growers are to keep in the business against the competition from other areas they must follow the best known methods, and smut control is one of them.

Reprinted from The Montana Farmer

Plate 1. W. Kidder, Extension Agronomist, Montana State College of Agriculture making counts of stinking smut and showing farmer how to recognize it. One yard of drill row is marked off and the number of smutty heads and healthy heads counted. Ten such counts are taken in each field and the average percentage determined.

Plate 2. Smutted heads of wheat. A. - Portion of drill row showing all heads smutty. The paper background was slipped in front of the healthy and in back of the diseased heads. This field showed 14% smut.

B. - Smutty and healthy heads in a yard row of durum. Left 12 smutty heads. Right 37 healthy heads. Picture illustrates relative height of diseased and healthy heads in the field. This field showed 14% smut.

Plate 3. Machines used for applying dust disinfectants to seed wheat found in use on farms in spring wheat area.

Plate 4. Types of formaldehyde machines found in use on farms during the course of the wheat smut survey in the spring wheat States.

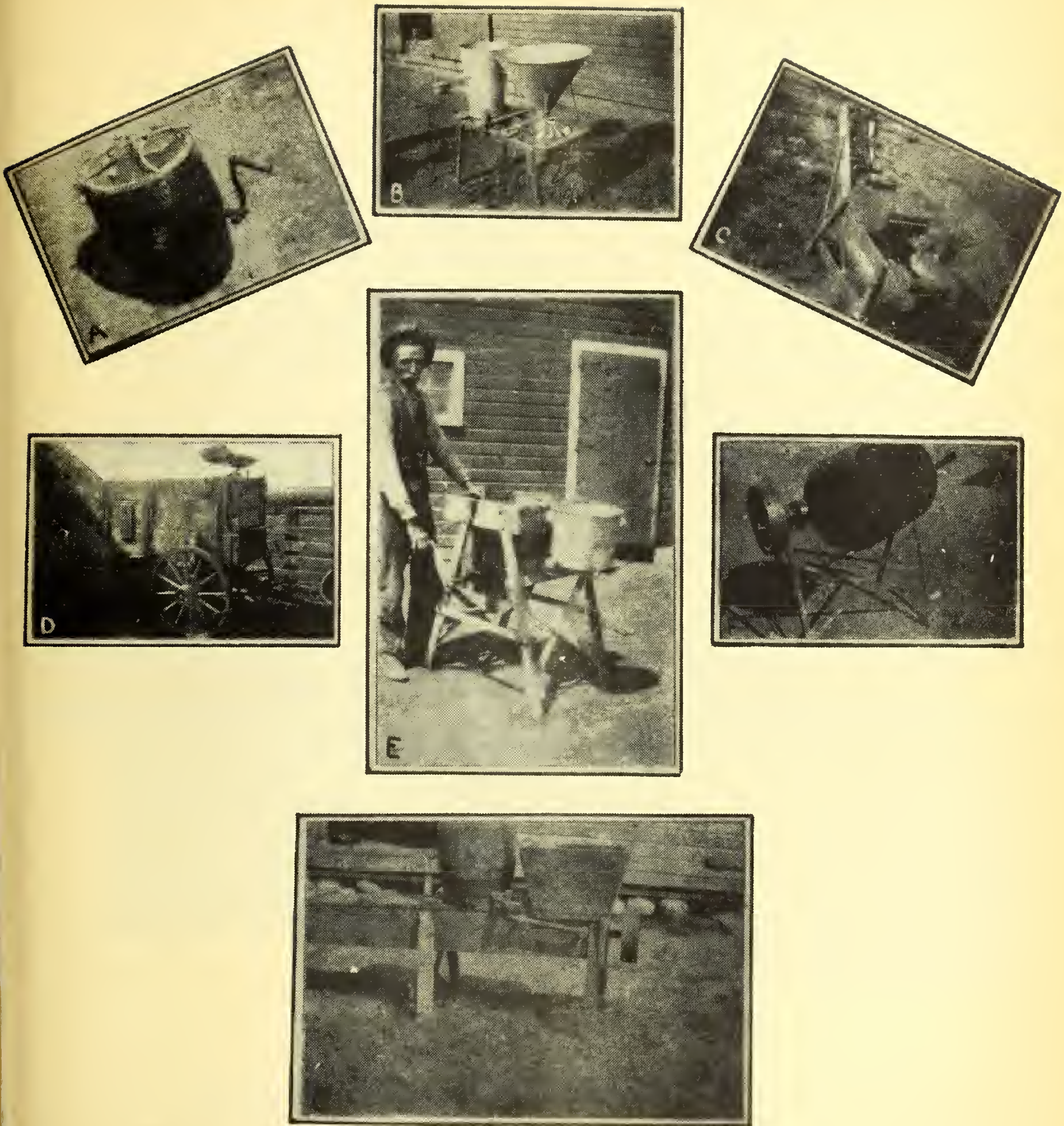

Plate 5. Some formaldehyde and dust machines on farms in the Dakotas.

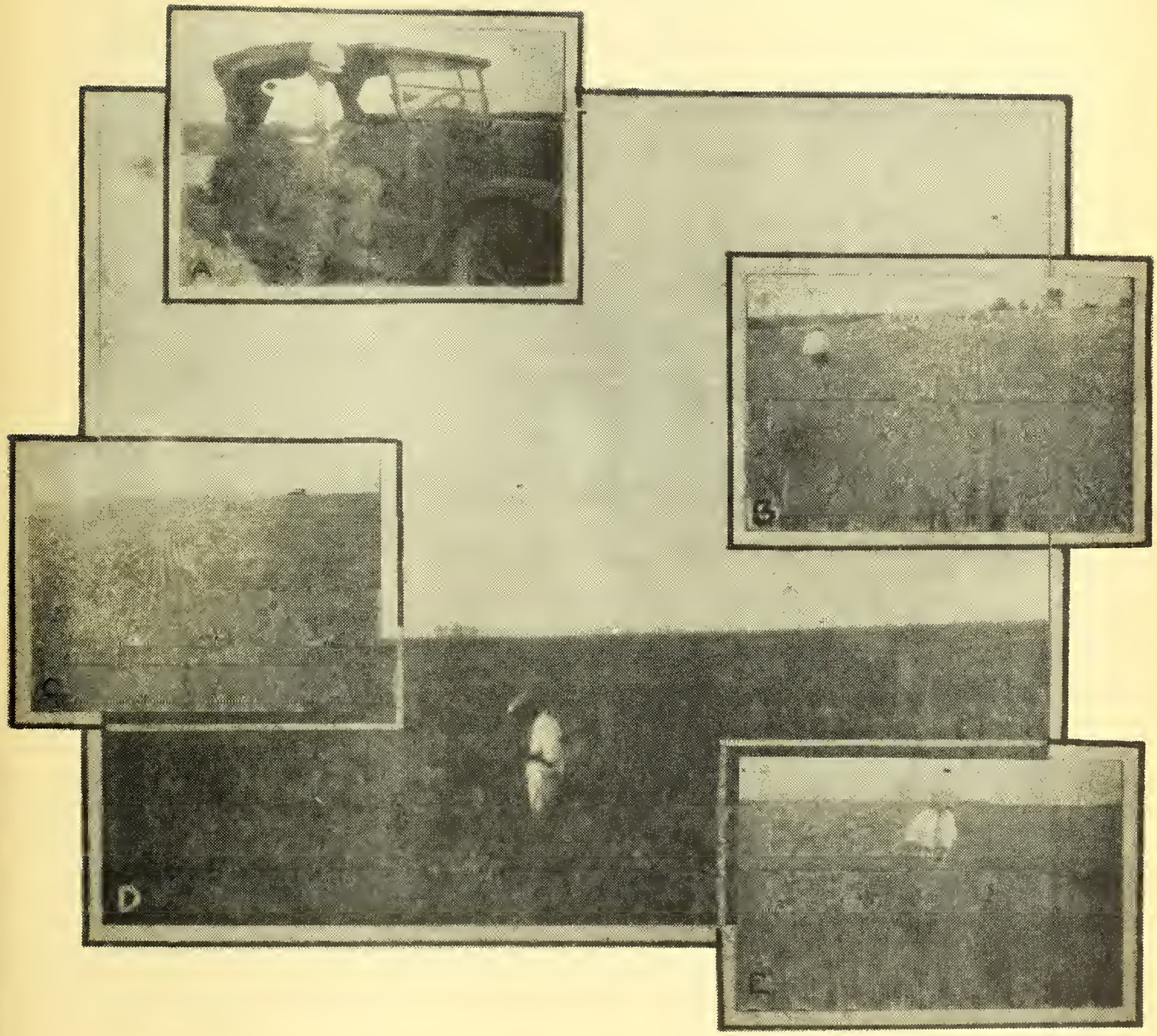

Plate 6. Surveying for stinking smut of wheat - 1930.

Plate 7.

A. This 20 acre field of durum was the smuttiest spring wheat found in the survey. It averaged 51.7 per cent smut.

B. The third smuttiest spring wheat field in the survey. The 84 acres of durum showed 42.7 per cent smut.

C. A field of Marquis which contained 18.7 per cent smut.

THE PLANT DISEASE REPORTER

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Division of Mycology and Disease Survey

Supplement 78

Index to Supplements 75 - 77

December 31, 1930

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

INDEX OF ORGANISMS AND NON-PARASITIC DISEASES IN THE PLANT DISEASE REPORTER SUPPLEMENTS 75 - 77, 1930

Plant Disease Reporter
Supplement 78

December 31, 1930

Prepared by Nellie W. Nance

THE PLANT DISEASE REPORTER

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Supplement 79

Relation Of Stinking Smut Of Wheat In The Field To Smuttiness Of Threshed Grain

June 1, 1931

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

RELATION OF STINKING SMUT OF WHEAT IN THE FIELD TO SMUTTINESS OF THRESHED GRAIN

Prepared by

R. J. Haskell, Extension Plant Pathologist, Office of Cooperative Extension Work and Bureau of Plant Industry; and E. G. Boerner, Senior Marketing Specialist, Bureau of Agricultural Economics.

Plant Disease Reporter
Supplement 79

June 1, 1931

In controlling stinking smut or bunt of wheat, there has frequently been expressed the need for knowing how much smut in the field it takes to cause the threshed grain to grade smutty. Will one per cent affected heads in the field make the grain take a smut discount when sold, or are the limits higher or lower than that amount? The approximate minimum percentage of smut that can be allowed in the field without causing the grain to grade smutty should be known. With this knowledge a farmer could plan to reduce smut by seed treatment, and otherwise, to the point where no discount would be suffered. This information would be helpful to those who have slightly smutty wheat as shown by field counts and who want to remove enough smut during threshing or by means of grain cleaners to reduce the number of smut balls to a point at which the wheat would not grade smutty. It would also be helpful in determining losses from stinking smut.

It is realized that there are several factors which will cause variations and will upset calculations when trying to obtain figures of this kind. For instance, the weather at threshing time will make a difference. Under dry weather conditions and with dry wheat a larger proportion of smut balls will be blown out with the straw than under moist or wet weather conditions. The maturity and variety of grain will cause variations but perhaps the most important factor is the efficiency of threshing machines in removing smut, there being a great deal of variation in different machines.

The Handbook of Official Grain Standards published by the United States Department of Agriculture defines smutty wheat as follows:

> "Smutty wheat shall be all wheat which has an unmistakable odor of smut, or which contains spores, balls or portions of balls, of smut in excess of a quantity equal to two balls of average size in 50 grams of wheat."

It will be noted therefore, that anything in excess of a quantity equal to two smut balls in 50 grams of wheat is enough to make wheat grade smutty.

By making numerous counts of the number of kernels in different sized heads of wheat and by weighing kernels and smut balls, Messrs. R. W. Leukel and J. H. Martin of the Division of Cereal Crops and Diseases, have found that if all of the smut balls remain in the threshed grain, none being removed during threshing process, the number of smut balls in 50 grams of threshed grain would vary all the way from 13 to 50 when there was one per cent affected heads in the field. Theoretically, then, it would be necessary to reduce smut in the field to 0.16 or 0.04 per cent smutted heads in order to obtain two wheat smut balls or less in 50 grams. Practically, however, this is not the case as a great many of the smut balls are blown and screened out during threshing.

During the summer of 1930 a survey was made in 704 fields of spring and durum wheat in Minnesota, North Dakota, South Dakota, and Montana. The growers were consulted regarding their seed treatment practices. The fields were examined and percentages of smut affected heads determined in each. The method used in counting and determining the percentages in the field was to measure off a yard of drill row and count the smutted and healthy heads in that yard. This was repeated in 10 different parts of the field and the average number of smutted heads determined. The results of this survey have been published in United States Bureau of Plant Industry Plant Disease Reporter Supplement 77, entitled, "Why So Much Smut in Spring Wheat?"

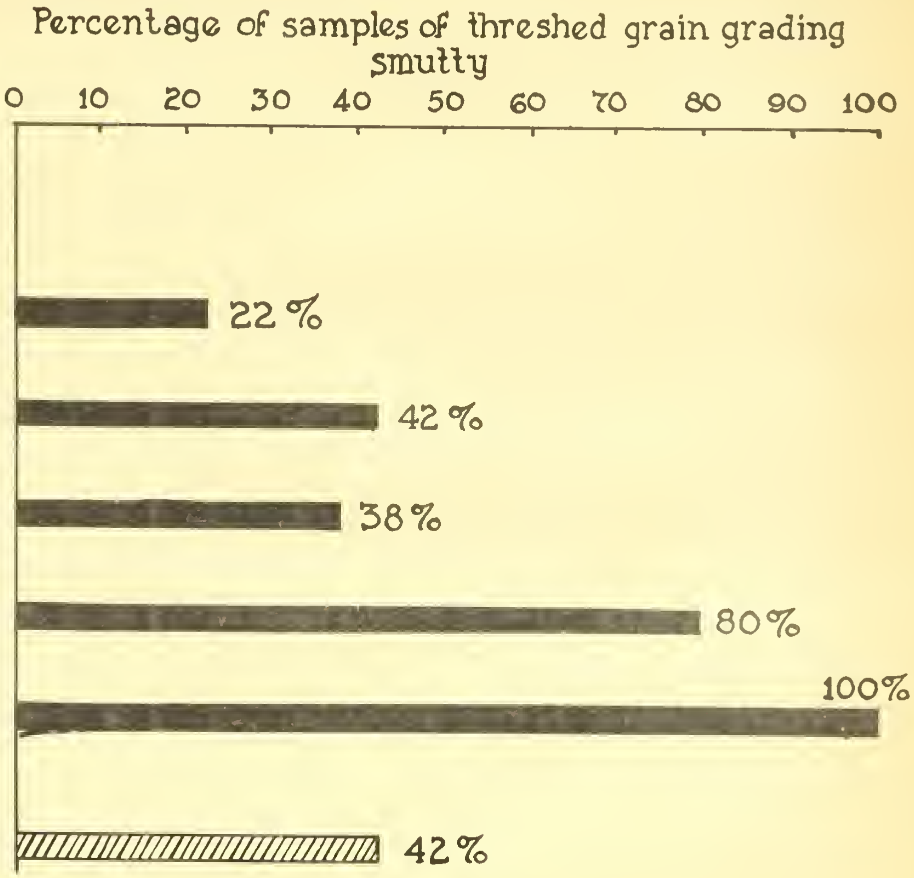
At the conclusion of the survey it was suggested by H. R. Sumner of the Northwest Crop Improvement Association, and by others, that advantage be taken of the opportunity offered to secure samples of threshed grain from these fields in which counts had been made, to have them officially graded as to smut, and to make comparisons between smut in the field and the number of smut balls in the threshed grain from those fields. Consequently, in December, 1930, letters were written to 165 growers, in three States, Minnesota, North and South Dakota, in whose fields smut had been found. In selecting these growers care was taken to see that the list included those who had smutty wheat ranging all the way from 0.1 per cent to as high as 30 per cent or more. The names were grouped according to percentages of smut as shown by field counts. In the first group the percentage of smut ranged from 0.1 to 0.5 per cent and the number of farmers written to were 18. There were nine groups in all as follows:

0.1 - 0.5	per cent	smut	in	field	-	18	farmers
0.6 - 1.0	"	"	"	"	-	10	"
1.1 - 1.5	"	"	"	"	-	17	"
1.6 - 2.0	"	"	"	"	-	14	"
2.1 - 5.0	"	"	"	"	-	35	"
5.1 - 11.0	"	"	"	"	-	32	"
11.1 - 20.0	"	"	"	"	-	26	"
20.1 - 30.0	"	"	"	"	-	6	"
30.1 or more	"	"	"	"	-	7	"

In writing these farmers each was advised as to the percentage of smut that was found in his field during the summer and a sack was enclosed with the request that a sample of the threshed grain from that particular field be sent in for grading as to smut.

RELATION OF STINKING SMUT IN FIELD TO SMUTTINESS OF THRESHED GRAIN

Smut in field (Percentage smutted heads)	Number grain samples graded
Less than 1	9
1 - 1.9	9
2 - 3.9	12
4 - 7.9	8
8 - 15.9	10
16 - 48	4
Total & Average	52



Fifty-two samples were received and officially graded as to smut in the Office of Grain Investigations, Bureau of Agricultural Economics. Those who did the grading had no way of knowing how much smut had occurred in the field, the samples being referred to by numbers only. An appraisal of the samples by buyers would have given a better idea of their relative value but their separation into groups depending on their smuttiness, as shown by the amounts of spores, balls or portions of balls, gives a better idea of their actual smut content.

Comparisons were then made between percentages of smut in the field and the smuttiness of the samples submitted. As was to be expected there were numerous discrepancies that can not be explained with certainty. They might have been due to almost any one of a number of factors such as,- the degree to which the farmer's sample was representative of the field that had been inspected; the accuracy of the field determination itself; or the great variation in the efficiency of the threshing and grain-cleaning machines which may have been used.

The 52 samples were first arranged in the order of smuttiness in the field, those having only fractions of one per cent being listed first and those having high percentages last. They were then divided into six groups as shown in Table 1. Referring to this table we note that there are nine samples from fields having less than one per cent smutted heads and that none of them graded smutty. There are nine samples also that had between 1 and 1.9 per cent smutted heads in the field, and 22 per cent, or two out of the nine samples of grain graded smutty. In the 4 to 7.9 per cent group, 38 per cent, or about one-third of the eight samples graded smutty. The conclusion might therefore be drawn that in the case of a field with from 4 to 8 per cent smutted heads the chances for the grain grading smutty are about one out of three. With less than one per cent in the field the chances for the grain to grade smutty are very slight.

When smutty wheat is officially graded the grain inspectors located in the markets on the Pacific Coast designate the degree of smut in the grain in terms of whole and half per cent by weight. An illustration of a grade designation under this system would be "Grade - No. 1 Hard White Wheat, Smut Dockage .5%." Grain inspectors located east of the Rocky Mountains merely grade smutty wheat as "Smutty" without indicating in the grade designation the degree or amount of the smut in the grain. An illustration of grading smutty wheat under this system would be "No. 1 Dark Northern Spring Wheat, Smutty." However, the grain inspectors who apply this system of grading are permitted, when requested to do so by the applicant for inspection, to indicate the degree of smut on the grade certificate under "Remarks", in terms of "Light", "Medium", or "Heavy" smut. An illustration of this system would be "No. 1 Dark Northern Spring Wheat, Smutty" and in the blank provided on the grade certificate for "Remarks" the term "light smut", "medium smut" or "heavy smut" as the case might be. When wheat is sold on the market any given lot of grain will always sell at the best price when it is free from smut, and a discount in price is always exacted when the grain is smutty, the severity of the discount increasing with the increase in the amount of smut that is present in the wheat. The discount ordinarily amounts to 1 or 2 cents per bushel for slightly smutty wheat and sometimes to as high as 20 cents and more per bushel for heavily smutted grain. Discounts in price for light and medium smutty wheat commonly range from 2 to 10 cents per bushel.

In order to make the opposite kind of correlation from that in table 1, the results of the grading of the 52 samples were arranged according to the number of smut balls found in 50 grams of grain and they were then divided into five groups,- clean, not smutty, light smutty, medium smutty, and heavy smutty. Results of this correlation are shown in table 2. From this it will be seen that 14 samples which had no smut balls in the threshed grain showed a range from 0.2 to 4 per cent smutted heads in the field and an average of 1.5 per cent. On the average the more smut balls that were found in the grain the higher the average of smutted heads in the field. An exception will be noted in the 5 to 10 per cent or "medium smutty" class where there was an average of 14.5 per cent in the field. The reason for this high amount is that in this group is included the field that showed the highest smut count, namely, 48 per cent smutted heads. When that field is omitted the average for this group is 8 per cent smutted heads in the field. This table gives an idea of the amount of smut in the field corresponding to different degrees of smuttiness of the threshed grain.

Table 2. Relation between grade of threshed wheat as to smut and percentage of affected heads in the field.

Number of smut balls in 50 grams of grain.	No. field samples graded	Percentage of smutted heads in field. Individual field counts	Average
None (clean)	14	0.2, 0.3, 0.5, 0.5, 0.7, 0.8, 1.3, 1.5, 1.5, 2.0, 2.3, 2.8, 3.0, 4.0	1.5
2 or less (not smutty)	16	0.1, 0.5, 0.5, 1.2, 1.7, 1.8, 1.9, 2.5, 3.1, 3.4, 5.0, 5.0, 6.1, 6.4, 9.5, 11.3	3.8
2 to 5 (light smutty)	5	2.0, 2.5, 4.8, 10.7, 13.0	6.6
5 to 10 (medium smutty)	6	1.0, 3.0, 6.9, 8.0, 20.1, 48.0	14.5
More than 10 (heavy smutty)	11	1.3, 3.5, 3.6, 6.8, 8.1, 8.2, 12.0, 13.0, 14.0, 16.2, 42.7	11.8

On the basis of these samples it might be assumed that "light" smut is equivalent to a field loss of about 6 per cent, "medium" smut means a field loss of about 8 per cent, and "heavy" smut a field loss of 12 per cent or more. Before any definite correlations of this kind can be made, however, it will be necessary to get many more field records and samples, from widely separated parts of the country and under a variety of conditions. The work here reported is only a beginning. It is hoped that others will accumulate data along similar lines and that some time all the results can be brought together for summarizing.

In spring wheat areas of both the United States and Canada, it has been repeatedly observed during the last few years that durum wheat is on the average smuttier than hard red spring varieties. In the case of these samples therefore it was thought that it might be interesting to classify them by types of wheat. This has been done in Table 3, and from this it will be seen that of the 33 samples of hard red spring varieties, 36 per cent were found to be smutty when graded, and of the 19 durum varieties, 53 per cent, or more than half, were smutty. It will be noted also that a larger proportion of the durum than of the hard red spring wheat showed heavy smut.

Table 3. Degrees of smuttiness of hard red spring wheat and durum compared.

Kind of Wheat	No. of samples graded	Percentage of samples grading: Not smutty	Light smutty	Medium smutty	Heavy smutty	Total smutty
All Hard Red Spring Varieties	33	64	6	12	18	36
All Durum Varities	19	47	16	11	26	53
Totals and Averages	52	58	10	11	21	42

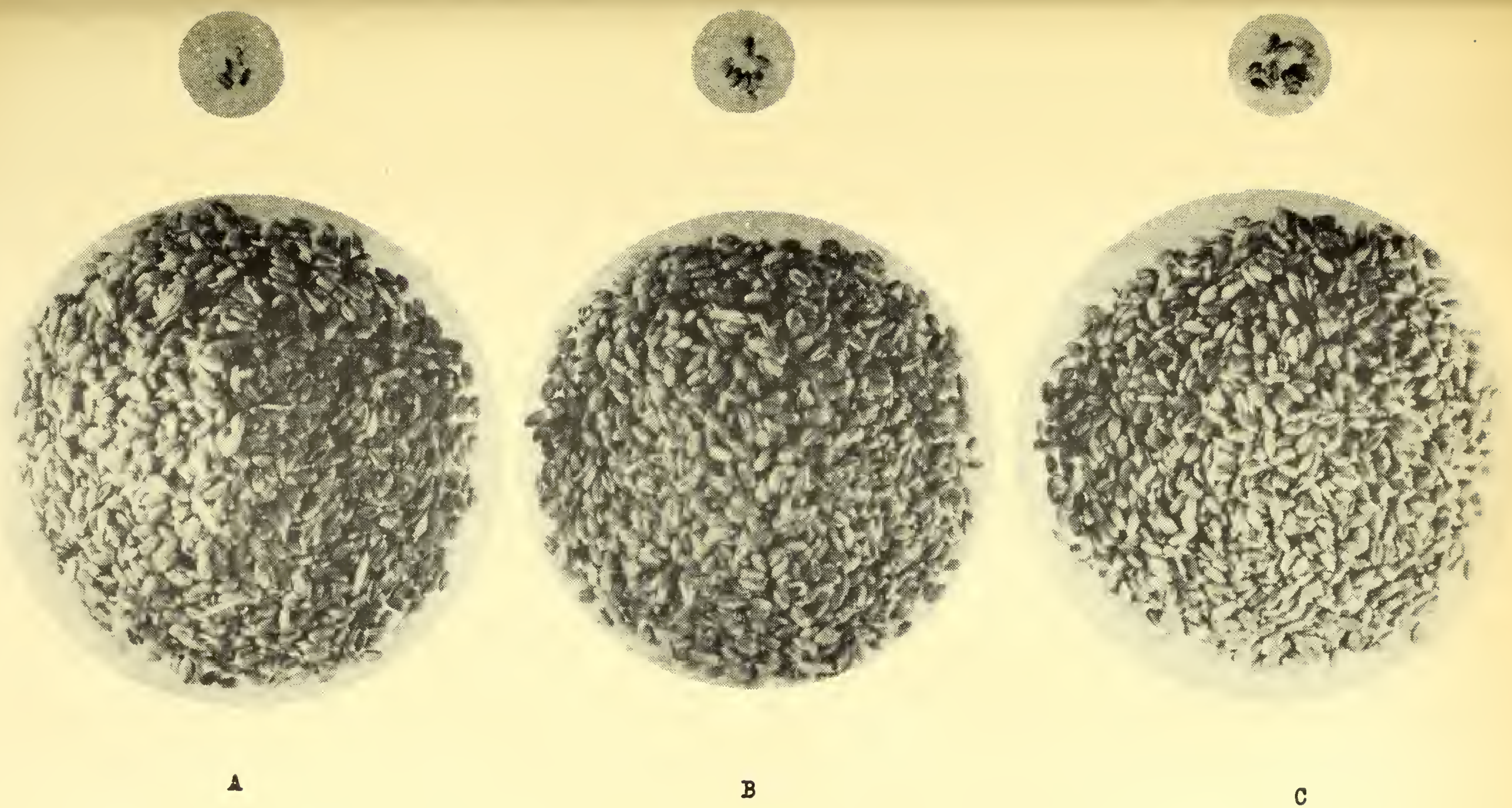


Plate 1. Piles of three 50 gram samples of smutty Marquis wheat with smut balls separated from each.

A. Light smut (4 smut balls)
   4.8 per cent smutted heads in the field

B. Medium smut (6.5 smut balls)
   6.9 per cent smutted heads in the field

C. Heavy smut (12 smut balls)
   13 per cent smutted heads in the field

THE PLANT DISEASE REPORTER

Issued By

Division of Mycology and Disease Survey

Supplement 80

Results Of The Tobacco Disease Survey, 1930

September 1, 1931

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

RESULTS OF THE TOBACCO DISEASE SURVEY, 1930

A Report of the Plant Bed and Field Surveys Conducted by the Divisions of Mycology and Disease Survey and Tobacco and Plant Nutrition, Bureau of Plant Industry, in cooperation with agents and collaborators in various states.

Prepared by

R. J. HASKELL, Extension Plant Pathologist, Division of Cooperative Extension Work and Bureau of Plant Industry cooperating, J. E. McMURTREY, JR., Associate Physiologist, Division of Tobacco and Plant Nutrition, G. W. FANT, Assistant Pathologist, Division of Mycology and Disease Survey, and STATE COLLABORATORS.

Plant Disease Reporter
Supplement 80

September 1, 1931

CONTENTS

OBJECTS OF THE SURVEY

At the Conference on Tobacco Diseases and Nutritional Problems held at Washington, D. C., December 10 to 12, 1929, the need was frequently expressed for more accurate information on the occurrence and severity of tobacco diseases, as well as on cultural and control practices. Dr. James Johnson in his suggestions for cooperation in tobacco work submitted for use at that conference pointed out that "Each pathologist should have more definite current information than is now available about the occurrence and extent of damage resulting from each tobacco disease in the various districts", and suggested that more attention be given to the collecting and reporting of survey information.

With these needs in mind the Plant Disease Survey and the Division of Tobacco and Plant Nutrition of the Bureau of Plant Industry made arrangements with state collaborators and plant pathologists particularly interested in tobacco diseases, for seed bed and field surveys in the tobacco states.

PLAN AND METHODS

Special forms for recording information on conditions in plant beds and fields were prepared and distributed to cooperators together with an outline of methods to be followed. It was suggested that the most intensive and also the most typical tobacco sections be selected for the survey in each state. It was the aim to make the observations in such a way, and in such localities, as to be fairly representative of the actual average conditions. It was requested that record blanks be filled out not only for fields and beds where disease was present but also for those that were disease-free. Average conditions in all beds or fields belonging to one grower were ordinarily recorded on a single sheet, but if locations, treatments, varieties, or other conditions differed, surveyors were asked to make out separate sheets for each.

The number of reports varies with the different states and in some cases is too small to make the results significant. All have, however, been included in the tabulations for the sake of completeness.

A few additional notes have been added to this report from information contained in the annual report cards of the collaborators.

COOPERATORS

The following persons cooperated in the survey. The names marked with an asterisk are of those who were in charge in the different states.

Massachusetts
O. C. Boyd
*W. H. Davis
W. L. Doran
J. P. Jones

Connecticut
*P. J. Anderson

New York
*Charles Chupp
F. M. Clara
*H. E. Thomas

Pennsylvania
*W. S. Beach
F. S. Bucher

Maryland
J. W. Heuberger
*R. A. Jehle
C. E. Temple

West Virginia
*C. R. Orton

Virginia
S. A. Wingard
*James Godkin
R. G. Henderson

North Carolina
*F. A. Wolf
*S. G. Lehman
G. W. Fant

South Carolina
*G. M. Armstrong

Georgia
*J. G. Gaines

Florida
*W. B. Tisdale
R. R. Kincaid

Kentucky
E. M. Johnson
*W. D. Valleau

Tennessee
J. O. Andes
*C. D. Sherbakoff

Ohio
*A. L. Pierstorff

Indiana
*M. W. Gardner
*R. W. Sampson

Illinois
*L. R. Tehon
G. H. Boewe

Wisconsin
*James Johnson

Minnesota
*James Johnson

Porto Rico
*J. A. B. Nolla

In Canada: *T. J. Major

VARIETIES

A record was made of the varieties grown in practically all of the seedbeds and fields. The list of varieties in the accompanying table (Table 4) will serve to show the popularity in each state in so far as the number represented indicates. It must be recognized that the variety occurring under the same name in different states may not be the same strain, for instance, the Broadleaf listed for Maryland is an entirely different strain from the Broadleaf in Connecticut. While the lists are given for the seedbed and the field separately and a total for the two, where both were reported, it is possible that the same growers may be represented in some instances.

Table 4. Varieties of tobacco grown in each state as given in the tobacco disease survey of 1930.

STATE Variety Strain	Number of times occurring Seed bed	 Field	 Total
MASSACHUSETTS			
Havana			
---	40	51	91
Wisconsin 142	1	--	1
Broadleaf	1	3	4
Cuban	--	3	3
CONNECTICUT			
Havana	17	--	17
Broadleaf	25	--	25
Cuban	10	--	10
NEW YORK			
Havana			
Connecticut	10	14	24
Wisconsin	1	8	9
Native	--	1	1
Davis Hybrid	--	2	2
Wilson	--	2	2
Broadleaf			
Connecticut	--	1	1
PENNSYLVANIA			
Havana			
Swaar	6	--	6
Red Rose	1	--	1
Broadleaf			
Weaver	1	--	1
Slaughter	2	--	2
Hibshman	1	--	1
MARYLAND			
Broadleaf			
---	72	13	85
Medium	8	16	24
Thickset	1	6	7
Maryland Mammoth	1	1	2

STATE Variety Strain	Number of times occurring Seed bed	 Field	 Total
WEST VIRGINIA			
White Burley			
---	13	--	13
Lockwood	8	8	16
Kelley	5	8	13
Pepper	2	2	4
Judy's Pride	1	2	3
Root Rot Resistant	--	1	1
VIRGINIA			
Adcock	6	5	11
Big John	1	--	1
Bonanza	--	1	1
Burley	12	16	28
Cash	13	8	21
Crutchen	--	3	3
Fawcett Special	1	1	2
Goldleaf	3	1	4
Jamaica	--	1	1
Kentucky Yellow	2	1	3
Lizard Tail	8	8	16
Long John	2	--	2
Orinoco			
---	2	2	4
Green's Wildfire Resistant	1	--	1
Henry	1	--	1
Silky Pryor	4	--	4
Warne	4	4	8
White Pearl	--	1	1
White Stem Orinoco	2	3	5
Yellow Pryor	1	--	1
NORTH CAROLINA			
Adcock	4	--	4
Bonanza	8	5	13
Cash	15	3	18
Easton Special	1	--	1
Fawcett Special	1	--	1
Gold Leaf	8	--	8
Jamaica	4	14	18
Lizard Tail	1	--	1
Longleaf Gooch	1	--	1
Red Willow	1	--	1
Silk Leaf	4	--	4
Tilley	2	--	2
Virginia Bright Leaf	6	1	7
Wadkins Selection	1	--	1
Warne	11	2	13
White America	2	--	2
White Stem Orinoco	1	2	3
Willow Leaf	1	--	1

STATE Variety Strain	Number of times occurring: Seed bed	Field	Total
NORTH CAROLINA (CONTINUED)			
Yellow Crutchen	1	1	2
Yellow Mammoth	1	---	1
Yellow Stem Orinoco	1	1	2
SOUTH CAROLINA			
Adcock	2	3	5
Bonanza	---	2	2
Cash	2	3	5
Clarks Special	1	---	1
Farmers Delight	---	2	2
Fawcetts	---	1	1
Gold Leaf	5	---	5
Huggins Wrapper	1	---	1
Imperial Hickory Pryor	4	4	8
Jamaica	16	15	31
Lewis Special	---	1	1
Perkins	1	---	1
Turkish	2	---	2
White Pearl	1	---	1
White Stem Orinoco	---	6	6
Willow Leaf	---	1	1
GEORGIA			
Bonanza	36	47	83
Cash	6	4	10
Gold Leaf	1	1	2
Hickory Pryor	5	6	11
Jamaica	4	6	10
Virginia Bright Leaf	6	11	17
Warne	2	1	3
Yellow Mammoth	6	1	7
Yellow Pryor	8	10	18
FLORIDA			
Cash	2	---	2
Connecticut Roundtip	6	---	6
Jamaica	1	---	1
Type 301	8	---	8
Type 94	6	---	6
KENTUCKY			
One Sucker	7	---	7
Turkish	1	---	1
White Burley			
----	48	---	48
Carr	2	---	2
Judy's Pride	23	---	23
Kelley	7	---	7
Kentucky Station Root Rot Resistant	8	---	8

STATE Variety Strain	Number of times occurring: Seed bed	Field	Total
TENNESSEE			
Dark Pryor	1	1	2
Madole	21	32	53
Orinoco	---	1	1
White Burley			
----	7	1	8
Judy's Pride	7	17	24
OHIO			
Broadleaf (Seedleaf)			
----	8	1	9
Lancaster	---	1	1
Pennsylvania	1	3	4
Weaver	---	2	2
Dutch	10	10	20
Havana			
Dark Spanish	26	9	35
White Burley			
----	8	---	8
Canadian	3	---	3
Golden Seedleaf	1	---	1
Kelley	8	4	12
Pepper	2	---	2
Standup	3	4	7
INDIANA			
One Sucker	5	3	8
White Burley			
----	2	9	11
Judy's Pride	10	---	10
Kelley	5	4	9
Shipps Root Rot Resistant	1	1	2
ILLINOIS			
White Burley			
----	6	---	6
Judy's Pride	1	---	1
Shipps Root Rot Resistant	1	---	1
WISCONSIN			
Havana			
----	19	17	36
Comstock Spanish	2	5	7
38	---	12	12
142	---	11	11
MINNESOTA			
Broadleaf	---	1	1
Havana			
----	---	4	4
38	---	2	2
142	---	1	1

PLANT BED SURVEY

Source and Age of Seed

Most of the growers used home-grown seed but about 40 per cent purchased it, mostly from local growers. The seed used ranged in age from one to seven years but as a rule it was from the previous year's crop. The accompanying table (Table 5) gives the details as to source and age of seed in the instances reported.

Table 5. Source of tobacco seed, whether home-grown or purchased, and age of seed as given in the tobacco disease survey of 1930.

State	Number of farms reporting	Home-grown	Purchased	Age of seed
Massachusetts	22	14	9	Apparently all one-year.
Connecticut	36	32	5	6 two-year, 1 four-year, 1 seven-year.
New York	11	6	5	1 four-year, 1 five-year, 1 six-year.
Pennsylvania	66	46	20	38 one-year, 4 two-year, 2 three-year, 2 - 4 several several year:
Maryland	74	60	16	60 one-year, 1 two-year.
West Virginia	23	8	14	13 one-year, 2 two-year.
Virginia	67	46	22	8 one-year, 6 two year.
North Carolina	27	30	20	9 one-year, 1 three-year
(Dr. Wolf)	11	9	2	No information
South Carolina	34	25	9	17 one-year, 4 three-year, 1 four-year.
Georgia	75	23	52	69 one-year.
Florida	16	9	14	All new seed.
Kentucky	61	26	37	58 one-year, 3 two-year.
Tennessee	24	14	10	10 one-year, 2 two-year.
Ohio	50	42	8	19 one-year, 1 three-year, 1 four-year.
Indiana	20	10	10	8 one-year.
Illinois	6	5	1	No information
Wisconsin	17	9	3	4 one-year, 1 two-year.
Totals	640	414	262	

Note: The reason this does not total exactly is that some growers used both their own and purchased seed.

Seed Cleaning

The majority of the growers reported some form of seed cleaning. The method varied from wind blowing and sieving to machine cleaning. It is doubtful if windblown or sieved seed are to be considered as having been cleaned very thoroughly.

Table 6. Seed cleaned, yes or no, and method of cleaning as given in tobacco disease survey, 1930.

State	Number farms reporting	Yes	No	Method of cleaning
Massachusetts	42	8	15	5 machine, 1 hand cleaned, 17 doubtful
Connecticut	-	40	2	Machine blown
New York	14	1	13	Not given
Pennsylvania	70	47	15	30 machine, 8 sieve
Maryland	80	46	34	2 machine, 40 air
West Virginia	28	20	1	Not given
Virginia	63	34	29	15 fanned, 4 blown, 1 machine
North Carolina	93	60	12	13 wind blown, 2 by hand, 20 machine, 25 method not given
North Carolina (Dr. Wolf)	8	8	0	5 fanned
South Carolina	39	20	19	10 electric machine, 3 sieve
Georgia	75	75	-	All by air except 2 used fan
Florida	17	16	-	15 machine, 1 by hand, 1 doubtful
Kentucky	67	43	21	40 separator, 1 fanned
Tennessee	57	17	7	Fanned
Ohio	59	20	37	4 sieve, 2 blown, 3 fanning mill, 3 machine
Indiana	17	11	6	Not given
Illinois	5	1	4	1 by wind, 4 rubbed out by hand
Wisconsin	22	10	1	Majority blower, 10 doubtful
	748	468	217	

Seed Treatment

Seed treatment for the control of bacterial leaf spots was employed to some extent by growers in most of the states. The chemicals used included silver nitrate, formaldehyde, corrosive sublimate, and semesan. Apparently formaldehyde and silver nitrate were the most popular materials. Approximately 40 per cent of those who treated used formaldehyde, 33 per cent silver nitrate, 15 per cent semesan, and 12 per cent corrosive sublimate. Sectional differences in the chemicals used were very evident. In New York and Pennsylvania all those who treated seed used silver nitrate, while in Maryland, semesan, and in Virginia, corrosive sublimate were the materials used. The amount of seed treatment practiced in states in which treatment was reported is shown in the following table. (Table 7)

Table 7. Number of farms using tobacco seed treatment in the various states and the materials employed.

State	Number of farms using: Silver nitrate	Formaldehyde	Corrosive sublimate	Semesan	Total treated	Seed not treated	Per cent treated
Connecticut	1	–	–	1	2	37	5.1
New York	3	–	–	–	3	10	23
Pennsylvania	12	–	–	–	12	50	19.3
Maryland	–	–	–	21	21	56	27.2
Virginia	–	–	11	–	11	70	13.6
North Carolina	–	42	–	–	42	29	59
South Carolina	1	15	–	–	16	24	40
Georgia	31	–	1	–	32	41	43.8
Florida	–	–	2	–	2	15	11.8
Tennessee	–	–	2	–	2	20	9.1
Ohio	–	–	1		1	57	1.7
Indiana	–	–	–	–	9	12	42.3
Totals	48	57	17	22	153	421	

The reports from the various states show that ten minutes was the length of time usually employed for seed treatment. It will be noted that 59 per cent of the growers reporting in North Carolina treated their seed, 43.8 per cent in Georgia, 42 per cent in Indiana, 40 per cent in South Carolina, and 27 per cent in Maryland. Seed treatment was practiced most extensively in the southeastern states where the bacterial leaf spots first made their appearance and were first described. Recommendations for tobacco seed treatment are to treat for ten minutes, then wash thoroughly in water, and dry before planting. No instances were reported of seed injury resulting when treatment was performed in accordance with these directions.

The Location of Plant Beds

Tobacco growers locate their plant beds both in open fields and in the woods. A preference for wooded areas is indicated by the fact that of the 622 plant beds concerning which reports were available, 262 were in fields, while the remaining 360 beds or approximately 58 per cent of the beds reported were on the edges of woods or in wooded areas. Where suitable soils can be found, growers in southern states appear to prefer locations in woods because of the fresh soil, protection from winds, proximity to a wood supply for burning the beds, and comparative freedom from weeds.

The Rotation of Plant Beds

Most growers choose new sites for their plant beds from year to year. Reports were made with reference to plant bed locations on 668 farms. Of the 668 reports, 467 beds or approximately 70 per cent were in new locations, while an additional 16 per cent were in use for the second year. A relatively large proportion of the plant beds which were used for the second time, or which were in use for longer periods, were sterilized with steam or by burning before they were sown. (See also under wildfire, rootknot.)

Seed Bed Sterilization

Some form of seed bed sterilization was practiced by growers on more than half of the farms visited. While in many instances the primary purpose is weed control, numerous cases were reported where the treatment was instrumental in controlling black root rot and other troubles which may originate from the soil in the seed bed. In portions of Pennsylvania, New York, and Connecticut, seed bed sterilization with steam was reported as being almost a universal practice. In Pennsylvania, 68 out of 70 beds examined were sterilized with steam. In all of the states, reports from 842 beds inspected showed that 498 or approximately 59 per cent were either burned or steamed. Of this number 238 were sterilized with steam. Where beds were burned it was found in general that two hours or less was much less effective than a longer period.

Spraying and Dusting

Spraying and dusting the plant beds for the control of bacterial leaf spots was practiced most extensively in sections where these troubles have been encountered commonly in the plant beds in recent years. In the State of Maryland approximately 40 per cent of the beds inspected were sprayed with Bordeaux mixture or dusted with copper-lime dusts. In Connecticut 32 out of 47 beds were either sprayed with Bordeaux mixture or dusted with copper-lime. In New York State more than 50 per cent of the beds inspected were sprayed or dusted. In the southern states the bacterial leaf spots were not reported as being prevalent in seed beds, and consequently the spraying that was undertaken was primarily for the control of insects. In the following table a summary is given of spraying practices for the control of both insects and diseases. Only those states are included which reported spraying practices.

Table 8. Spraying and dusting of tobacco seed beds, 1930.

State	Number of beds reported	Number of beds sprayed	Per cent sprayed	Materials used
Massachusetts	39	10	26	5 Bordeaux mixture
				5 Copper-lime dust
Connecticut	47	32	68	15 Bordeaux
				14 Copper-lime dust
				3 sprayed
New York	14	7	50	7 Copper-lime
Pennsylvania	65	25	38	23 Bordeaux spray
				1 Copper-lime dust
				1 Calomel
Maryland	69	30	43	24 Bordeaux spray
				3 Copper-lime dust
				1 Arsenate of lead
				2 Miscellaneous sprays
North Carolina	102	18	17	6 Arsenate of lead
				8 Arsenate of lead and Paris green
				2 Lime sulfur
				2 miscellaneous sprays
South Carolina	42	4	9	1 Calcium arsenate
				1 Arsenate of lead
				1 Semesan
				1 Semesan and Bordeaux
Florida	17	1	6	1 Paris green mixture
Kentucky	67	11	16	10 Arsenate of lead
				1 Paris green
Tennessee	57	3	5	2 beds Bordeaux spray
				1 Bordeaux dust
Ohio	44	1	2	1 Arsenate of lead

It will be noted that 50 per cent or more of the beds were sprayed or dusted with Bordeaux in Connecticut and New York, while a slightly smaller proportion were sprayed in Massachusetts and Maryland. As pointed out by Orton in the plant bed summary for West Virginia, growers could well afford to spray their plant beds with Bordeaux mixture not only for the control of bacterial leaf spots but also for flea beetles. The survey showed that rather satisfactory control of both angular leaf spot and wildfire in plant beds was being obtained both with this spray and with the copper-lime dusts. Anderson in Connecticut reports that only one case was found where wildfire was present in beds which had been either dusted or sprayed from the first, and this was one small spot infection. He comments further that in a number of cases the growers started an energetic campaign of dusting or spraying after the disease was found. Such measures, however, were found to be of questionable value after infection was well started. Beach in Pennsylvania reports that experimental plant bed spraying tests conducted in 1930 showed such effectiveness that there appears to be sufficient justification for this control measure both in respect to flea beetles and wildfire.

Covers and Frames Used on Beds

With regard to plant bed covers, it was found that both new and old cloth were in use to about an equal extent. Cotton cheese cloth used for covers varied in mesh from 24 x 24 to 40 x 48 strands per square inch. Undoubtedly the heavier grades are much better. Of the beds examined 46 per cent were covered with new canvas, 40 per cent were covered with old cloth unsterilized, 5.5 per cent with used cloth which had been sterilized by boiling in water, while slightly less than nine per cent were protected with sash covers.

Board and log frames were used almost entirely for the 982 beds examined. Several collaborators mentioned the failure of growers to construct tight beds. Openings in the beds permitted the entrance of cold air, insects, and animals.

Diseases in Plant Beds

Drought Effects upon Stands and Condition of Growth:

Approximately one-half of the states reported plant bed injury from drought. In some sections there was ample rainfall, however. Drought injury to plant beds was reported from Maryland, West Virginia, Virginia, North Carolina, Kentucky, Illinois, Indiana, and Ohio. Rainfall was normal during the spring in the other states, although injury was reported to poorly drained beds during extremely wet weather in March and the first week in April.

In North Carolina it was thought that drought together with the abundant use of fertilizers high in chlorine content was responsible for the prevalence of chlorine injury, a condition characterized by unusually thick and brittle leaves on young plants. The leaves, in addition to being thick, were more or less rim-bound, with the margins of the leaves turned upward and inward. In such instances the beds were found to have been fertilized liberally or excessively with potash salts containing chlorine which under conditions of drought resulted in the accumulation of chlorine salts in the soil.

Damping-Off and Bed Rot:

Damping-off injury to seed beds was reported from more than half of the states in which the survey was conducted, and was reported from more than nine per cent of the beds examined. Collaborators reported generally that the disease was less severe in beds in which the soil was sterilized by steaming or burning than in unsterilized beds, and that it was more severe in old beds than in new ones.

Severe injury to the roots of seedlings from fertilizers was reported in some beds in Massachusetts and Connecticut. Bed rot produced by a species of Rhizoctonia was very common and destructive in New England.

P. J. Anderson makes the following distinction between damping off and bed rot.

> "Damping off as applied here refers to the dying off of seedlings when very young (usually caused by Pythium). This disease was found in only a few beds and was not of very serious importance this year.

"Bed rot (caused by Rhizoctonia or Sclerotinia) rots the stalks of the plants in later stages and is usually most prevalent just before or at setting time. Where the plants are too thick in the bed, large areas of them may be completely rotted off. More serious than this however is the loss of plants which are only slightly infected when pulled but which either make a poor slow growth when set in the field or die outright. This means uneven stands, labor losses in restocking, and a crop which is not uniform at harvest time. The disease called 'sore shin' also frequently starts with such plants. Although the worst cases have been in unsterilized beds, it seems to be able to enter the sterilized ones and because of its rapid spread may cause serious injury.

"It is controlled best by avoiding too thick seeding and by keeping the beds well ventilated and not watering too often. Sterilizing the soil and keeping the plants protected by copper lime sprays or dusts are also to be recommended."

A similar trouble with the dying of young plants shortly after setting in the field was reported by Gaines in Georgia. In these cases a species of Rhizoctonia was commonly present, although in some instances other fungi were found. A similar condition was reported in North Carolina although no determination of the organism was made.

A bacterial soft rot of the stems of plants in plant beds was reported by Valleau and Johnson from Kentucky. The disease caused a rotting-off of smaller plants at the ground level but usually rotted only one side of larger plants. The organism was reported as being one of the soft rot organisms very similar to, if not identical with, Bacillus aroideae Towns. in its reactions on various media and in morphology. Plants 8 to 10 inches tall with lesions nearly girdling the stem were found often to survive when set in the field, since the tissues soon appeared to become resistant to the further penetration of the organism. Pure culture isolations inoculated into Turkish tobacco plants killed seedlings within two days. The growers were reported as being familiar with the disease which they said was worse during rainy periods.

Wildfire (Bacterium tabacum Wolf & Foster):

During the survey, wildfire was found to be rather prevalent in the plant beds in certain sections, while in others it occurred very sparingly if at all. The following table summarizes its occurrence as reported.

Table 9. The occurrence and prevalence of wildfire in plant beds.

State	Number of beds inspected	Number of beds with wildfire	Percentage of beds with wildfire	Notes on severity of infection in plant beds
Massachusetts	42	5	12	1 to 10 per cent
Connecticut	53	8	15	Trace to 100 per cent
Pennsylvania	70	23	33	Slight to 80 per cent
Maryland	101	26	25.7	Slight to 95 per cent
Virginia	96	3	3.1	Trace
Kentucky	67	1	1.4	Trace to 5 per cent
Ohio	63	1	1.6	Trace
Indiana	23	4	17.4	Trace to .5 per cent
Wisconsin	20	9	45	Trace to 90 per cent

In Connecticut, collaborators report that in two cases wildfire was considered sufficiently severe to warrant the abandonment of a whole set of beds on the farm, while in others it was necessary to destroy with formaldehyde certain beds of the series or sections of individual beds.

Davis and Boyd in Massachusetts report the transfer of diseased plants from plant bed to field to such an extent that over 30 per cent of the plants in a field of 14 acres were infected. In Maryland, Jehle found that 26 out of 101 beds were infected with wildfire. In Pennsylvania collaborators inspected 70 beds and found that 23, or slightly less than one-third of the beds were affected. Concerning infection in Pennsylvania, Beach states that several types of mulches are applied to seed beds beneath the cloth or glass covers to aid sprouting and the early establishment of the tiny seedlings in beds which are not sown until March. It is suggested that these mulches may provide a very common source of wildfire infection, since they frequently are used from one year to the next.

As previously pointed out (page 15), spraying and dusting plant beds with Bordeaux or copper-lime dusts was found to be effective in preventing the disease where applications were started sufficiently early. In Wisconsin, Johnson states that wildfire is to some extent confined to certain sections and farms, and that special effort has been made for the past several years to eliminate it from these areas. He reports, however, that owing to the dry weather the disease was found to be causing but little damage at the time of the field survey. Collaborators in Pennsylvania and Maryland report that the first infection appears on the plants around the edges of beds and is thought to come either from the aisles and the areas in the immediate vicinity of old beds, or to be carried to the beds during the weeding process. As a result of previous observations on this point, Beach states that in Pennsylvania no practice is so effective in preventing wildfire in plant beds in Pennsylvania as the rotation of sites from one season to the next.

To summarize the control measures with reference to wildfire, it was found that 103 of the 863 beds inspected, approximately 12 per cent, were sprayed with Bordeaux mixture or dusted with copper-lime dust for the control of wildfire and other bacterial leaf spots. One hundred and fifty-three beds, representing approximately 18 per cent of all beds inspected, were planted with treated seed, while as stated previously more than half of the plant beds in use were in new locations and slightly more than half were covered with new covers. Perhaps the more general adoption of control measures of this nature would result in smaller losses from wildfire in the future.

Angular Leaf Spot (Bacterium angulatum Fromme & Murray):

Angular leaf spot was reported from 45 beds, or slightly less than 5 per cent of all beds examined. Apparently the disease was greatly reduced in prevalence by the shortage of rainfall. That it is well distributed is indicated by positive reports of its occurrence from Massachusetts, Maryland, Virginia, North Carolina, South Carolina, Georgia, Pennsylvania, Ohio, Kentucky, Tennessee, Wisconsin, and Minnesota. Angular leaf spot was reported by Sherbakoff as being more prevalent in the fields of eastern Tennessee, where there was somewhat more rainfall, than in central Tennessee where the drought was more severe. In addition to the reports received from the various states, the disease was also reported from Canada late in the season.

Since the same measures of control as for wildfire are recommended rather generally, no special reports were given with reference to control practices and the success met with in reducing or controlling outbreaks of the disease. It was frequently observed as making its first appearance in the field on plants attacked by the tobacco bud worm and horn worm, which suggested the possibility of insect transmission, although no exact data were at hand in this regard. In some sections in the bright belt, growers are of the opinion that Angular Leaf spot can be most effectively controlled by the use of resistant varieties, since some variation in varietal susceptibility exists. No information was at hand as to factors inducing or inhibiting this type of resistance.

Mosaic (virus):

Tobacco mosaic was found in only forty-one plant beds in nine of the states surveyed, yet the disease was reported later as being among the most common and destructive in the field. The states in which mosaic was found in the plant beds together with the number of infested beds are as follows: Massachusetts 6, Pennsylvania 4, Maryland 3, Virginia 3, North Carolina 17, South Carolina 1, Kentucky 2, and Ohio 5. The average was less than five beds out of 100, and indicates that in 1930, at least, the disease was not very prevalent in plant beds. However in several instances a mottling of the leaves of plants in beds was observed, which was not definitely diagnosed as mosaic until these same beds and the fields were visited several weeks later. It is evident that in some instances mosaic may be present in beds, and yet the symptoms may fail to appear to a pronounced extent until after transplanting in the field.

Root Knot (Caconema radicicola (Greef) Cobb):

The root knot nematode which affects a wide variety of host plants was also reported on tobacco. An unusually early infection was reported from Georgia where the disease was repoted from seven beds during the survey conducted between March 21 and April 17. The disease was reported from several other states later in the season. In the field it was reported as producing a burning and firing of the leaves in the case of badly affected plants. In general the experience this year was in accordance with that of previous years, with regard to field infection, in that a two-year rotation with root-knot resistant crops in the field was found to be of some value as a control measure but a three-year rotation system or a longer one was more effective.

Other Plant Bed Diseases:

Several other diseases both of parasitic and non-parasitic nature were reported from plant beds during the survey. In North Carolina, chlorine injury previously referred to (page 17) was reported from 24 of the 84 beds examined. Direct injury to tobacco plants and rots by burning resulting from the excessive use of fertilizers was reported by collaborators in Massachusetts and Connecticut who briefly referred to this condition in their individual reports for the plant bed survey. Potash starvation was observed in plant beds in several of the states, although in only one or two instances were the plants reported as being seriously stunted and injured by potash deficiency. Frost injury to the plants in tobacco beds was reported from Pennsylvania and Georgia.

Among the virus diseases other than mosaic, ring spot was observed to occur in 5 beds in Virginia, while coarse etch was found to occur in one bed in Kentucky.

A leaf spot, which has been previously described as Phyllosticta leaf spot (P.D.R. 14:70, 78) was reported as occurring in beds in North Carolina, South Carolina, Alabama, and Georgia. Although the disease was found rather commonly in beds it was reported as producing no special damage.

Undetermined leaf spots. Bacterial leaf spots, not typical of any of the recognized diseases, were reported from one or more of the states. The following report from Chupp in New York concerns a spotting of this type.

> "On two farms there was very much injury from a leaf spot caused by some bacterium. Apparently it was not wildfire but a type which Mr. Clara of our Department has been working on for several years. He has made isolations and later may be able to determine exactly the type of organism. These two farms have had the same trouble for a number of years. In one case there was one seed bed of 14 sash where approximately 50 per cent of the plants had died or were dying from this spotting. The other bed of the same size had only a trace of the injury. In both beds where the trouble occurred it started from a given center and enlarged in a circular manner so that most of the spots ranged from ten inches to two feet in diameter with the plants in the center of the areas entirely dead and those at the margins more or less spotted with a rather soft rot of the leaves. On the neighboring farm there was the same trouble but only two or three small spots about one foot in diameter in a seed bed of 60 sashes."

In Tennessee a spotting of the leaves was reported as having been observed for several years in the plant beds in the flue-cured section, although it has not caused any special damage. The cause of the spotting has not been determined. The reports indicate that the disease is different from any of the known or commonly recognized leaf spots.

THE FIELD SURVEY

In the field survey collaborators inspected approximately 600 fields in 16 states. The total area included was approximately 5000 acres. The greatest acreage surveyed was in the states of Massachusetts, North Carolina, and Georgia where it totaled slightly more than 2400 acres. As in the seed bed survey, data were obtained with reference to fertilizer practices, crop rotation, and other field practices. The survey started the latter part of June in the earlier section and continued during July and August in sections where the crop was later. In the accompanying table (table 10) are listed the states and counties in which the survey was conducted and the number of fields visited in each count

Table 10. States and counties in which field survey was conducted and number of fields visited in each county.

State and County	Number of fields inspected	State and County	Number of fields inspected
Massachusetts		Georgia	
Franklin	21	Berrien	4
Hampshire	41	Brooks	2
Connecticut		Bulloch	10
New York		Candler	3
Chemung	20	Coffee	5
Onondaga	13	Colquitt	7
Pennsylvania		Cook	3
Chester		Irwin	7
Clinton		Jeff Davis	8
Lancaster		Lowndes	8
Maryland		Mitchell	8
Anne Arundel	4	Pierce	9
Calvert	8	Tattnall	3
Charles	10	Thomas	1
Prince Georges	3	Tift	11
St. Marys	11	Toombs	6
Virginia		Ware	1
Appomatox	7	Worth	4
Campbell	8	Tennessee	
Charlotte	4	Coffee	2
Halifax	4	Grainger	3
Lunenburg	2	Knox	14
Mecklenburg	27	Montgomery	27
Pittsylvania	7	Robertson	5
Washington	16	Kentucky	
North Carolina		West Virginia	
Edgecombe	8	Cabell	7
Johnston	6	Mason	6
Orange	8	Putnam	5
Robeson	3	Wayne	5
Wake	1	Ohio	
Wayne	19	Brown	9
Wilson	8	Darke	10
South Carolina		Miami	11
Darlington	7	Montgomery	9
Willow	5	Indiana	
Florence	8	Clark	5
Horry	13	Floyd	4
Lee	3	Spencer	6
Marion	12	Warrick	4
Sumter	5		

Table 10 (Continued)

State and County	Number of fields inspected	State and County	Number of fields inspected
Wisconsin		Minnesota	
Chippewa	1	Benton	4
Columbia	5	Sherburne	5
Dane	45	Stearns	2
Dunn	1		
Rock	1		
Trempealeau	1		
Vernon	1		

Crop Rotation

Information secured in the field survey showed that the largest portion of the crop was planted on land which had grown other crops the preceding year, since slightly less than 40 per cent of the fields inspected were reported as having been planted to tobacco during the previous season. Crop rotation appeared to have been practiced most extensively in tobacco sections in Ohio, West Virginia, and Georgia. It will be noted from Table 11 that in each of thes states 80 per cent or more of the fields inspected had been planted to other crops during the preceding year. Rather uniform rotation practices with reference to tobacco fields were noted in the flue-cured belt in Virginia, North Carolina, and South Carolina in which the proportion of the fields inspected which had been planted to other crops the preceding year ranged from 45.3 to 51.7 per cent.

Table 11. Crop rotation practices in the various states.

State	Number of fields reported	Percentage of Fields: Tobacco last year	Tobacco past 2 years	Tobacco 3 or more years	Other crops last year	New ground
Massachusetts	6	66.6	16.6		16.6	
New York						
Maryland	34	17.7	2.9	8.8	70.6	
Virginia	63	22.2	4.8	14.3	49.2	9.5
North Carolina	42	21.4	14.3	19	45.3	
South Carolina	29	24.2	17.2	6.9	51.7	
Georgia	92	12	2.2	4.4	80.4	
Tennessee	41	22			78	
West Virginia	21	14.3			85.7	
Ohio	40	15			85	
Indiana	13		15.4	46.1	38.5	
Wisconsin	51	9.8	5.9	49	35.3	
Minnesota	6			83.3	16.7	

Diseases Observed in the Field

Weather Relations and Disease Occurrence:

Unusual weather conditions in 1930 supplied opportunities in several instances for the observation of interesting relations between weather conditions during the growing season and the occurrence of diseases in the field. The season in 1930 was more advanced than usual with the result that transplanting was done somewhat earlier than normal. It was observed by Valleau in Kentucky and Johnson in Wisconsin that early-transplanted tobacco was more subject to attack and injury from black root rot than late-transplanted. This was thought to result from temperature relations during the early stages of growth in the field. Later in the season it was observed that on account of the drought, the bacterial leaf spots were less frequent in occurrence than usual, even on farms and in localities where the leaf spots had been observed to occur with some prevalence in the plant beds. In fields where they did occur, infection was confined largely to the lower leaves, since it failed to progress to the upper leaves formed after drought conditions appeared. An additional weather relation was observed in the case of tobacco frenching which was found to be less prevalent than usual in Kentucky and Wisconsin. This lack of prevalence was thought to have resulted from the dry weather. In Maryland, however, where the drought was severe, frenching was about as prevalent as during an average year.

Virus Diseases:

Tobacco mosaic was reported as being the most common and severe of any of the diseases in eleven of the sixteen states surveyed. It is likely that this disease was more prevalent in tobacco fields throughout the entire United States than any other one disease. In Massachusetts it was reported as occurring in nearly every tobacco field, while in Maryland it was observed to occur in 32 out of 36 fields inspected. In Wisconsin, fields or parts of fields were inspected showing from 50 to 100 per cent infection. In Minnesota, fields were observed showing infections of as high as 90 and 100 per cent of the plants. Severe necrosis or "rusting" of the leaves of plants as an effect of heavy mosaic infection was reported from fields in Wisconsin, Massachusetts, and South Carolina. Mosaic was commonly present in Porto Rico, occurred in California, and was less prevalent than usual in Connecticut.

The spread of tobacco mosaic in the field was observed to be associated with the topping and suckering processes, although such infection appeared late in the season and in most instances did not produce as severe damage as outbreaks which appeared earlier. In some instances mosaic infections appeared to be attributable to tobacco refuse around plant beds, and also to the use of natural leaf by persons working in the beds. In other instances infection was thought to have been carried to the beds during weeding on the hands and clothes of workmen who were engaged in handling the crop of the preceding year, or the virus may have been spread from plant to plant in weeding the beds or in transplanting. As was stated above (page 20), difficulty was experienced in the diagnosing of mosaic in plant beds in some instances. Collaborators noted the occurrence of a faint mottling of the leaves, which could not always be definitely determined as mosaic until after transplanting. In the summary of the seed bed survey for Massachusetts, it was stated that "Our observations lead us to believe that the initial symptoms of mosaic in seedlings are difficult to recognize and distinguish from other chlorotic disturbances."

In at least three states, mosaic-bearing weeds of the night-shade family and pokeweed were observed rather frequently in the close vicinity of plant beds or even in the plant beds themselves. The recent results secured by Johnson (Johnson, E. M., Virus diseases of tobacco in Kentucky. Kentucky Agr. Exp. Sta. Res. Bul. 306. 1930), in connection with host plant studies of tobacco mosaic, indicate that the solanaceous weeds are perhaps of greater importance as carriers of the disease than certain other wild plants.

Some evidence of soil transmission was reported in Wisconsin and Minnesota, where rather severe infestations were reported in fields which had been planted continuously to tobacco for a number of years.

Besides mosaic, ring spot was of rather wide occurrence and appears to be increasing in prevalence. This virus disease was reported as being of importance in more than half of the states in which the survey was conducted. It was observed as being prevalent in sections of Maryland where tobacco has been grown extensively for a number of years. In Indiana Sampson observed fields in which the extent of infection was as high as 50 per cent of the plants. In one instance tobacco ring spot was observed on petunia. No information on control was submitted, although seed transmission as a possible means of spread was reported as under investigation in Kentucky.

Vein banding, in Kentucky, spread rapidly in early set tobacco near potato fields. In one tobacco field, 30 to 50 per cent of the plants were affected.

Bacterial Leaf Spots:

As pointed out previously (page 25) the bacterial leaf spots were less common than usual on account of the drought. Wildfire appeared to have been most common in the states from Maryland, Ohio, and Kentucky northward, and was not reported as occurring in the field in any of the southern states. Very little damage was reported from the disease in most of the states surveyed. Under conditions of normal or excessive rainfall the disease in all probability would have been much more severe.

Angular leaf spot was reported from Virginia, North Carolina, South Carolina, Tennessee, Georgia, Wisconsin, Ohio, and Massachusetts. To all indications it was more prevalent in the southern states than elsewhere. This corresponds with experience in previous years. However, angular leaf spot, as well as wildfire, was reported as being less prevalent than usual as a resul of the dry season, and consequently very little damage was recorded in the fiel

Black Root Rot (Thielavia basicola (Berk. and Br.) Zopf):

Black root rot was reported in the field in Massachusetts, Connecticut, Maryland, West Virginia, Wisconsin, Virginia, Kentucky, and North Carolina. Th disease is reported as having been observed in previous years in Minnesota, although it was not encountered during the survey in 1930. As pointed out elsewhere (page 25) the early-transplanted tobacco was reported as being more severely affected than tobacco set in the field later. Apparently the importance of the disease is increasing in some sections where the soil acidity has been lowered by the application of lime. Marked reduction in the amount of black root rot was reported from Wisconsin and Kentucky from the use of root-rot resistant strains.

Other Diseases:

Black shank (*Phytophthora nicotianae* (Speg.) van Breda de Haan) caused heavy losses in North Carolina where it has existed for eleven to twenty years. It is sometimes severe as a seed-bed disease in Porto Rico but does not occur there in the open field.

Bacterial wilt (*Bacterium solanacearum* E.F.S.) was reported as being severe in North Carolina. It was also reported from Virginia, South Carolina, Georgia, and Ohio.

Fusarium wilt (*Fusarium oxysporum nicotianae* James Johnson), was of the usual slight importance in Maryland and was reported from two Indiana fields.

Sore shin. An additional feature included in the survey was the observation in North Carolina of an unusually severe development of sore shin which was found to be produced principally by *Rhizoctonia solani* Kühn and *Sclerotium rolfsii* Sacc. The occurrence of injury of this type apparently was much more prevalent then usual and it was not held in check to any extent by the dry weather.

Brown root rot (undet.) on tobacco planted on sod land was reported as being one of the more serious and menacing troubles in Wisconsin. Less damage resulted where the crop was planted on land which had grown tobacco during 1929. Brown root rot has been reported in past years not only from Wisconsin but also from Massachusetts, Connecticut, and Kentucky. It was not seen in Minnesota although special watch was kept for it.

Drought spot. A non-parasitic spotting of the leaves attributed to lack of an adequate water supply was reported from Virginia, Ohio, South Carolina and Georgia.

Sand drown (non-par.) was much more prevalent than usual in North Carolina and was especially severe on sandy soils of the Sandhill area. In one field the estimated loss was one thousand dollars. It was also reported from South Carolina where two outstanding cases were observed.

Potash hunger (non-par.) was observed in various parts of North Carolina. In South Carolina it was seen in a mild form in 18 per cent of the fields visited but probably occurs in many others, especially in Horry County. It was much more prevalent than usual in Wisconsin.

In general no other diseases of importance were observed in the field. It is likely that under conditions of wet weather tobacco diseases would have been much more prominent.

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THE PLANT DISEASE REPORTER

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Division of Mycology and Disease Survey

Supplement 81

Plant Diseases in the United States in 1930.

December 31, 1931.

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

DISEASES OF PLANTS IN THE UNITED STATES IN 1930

Compiled by

M. F. Barrus, O. C. Boyd, and Jessie I. Wood

Plant Disease Reporter
Supplement 81

December 31, 1931

CONTENTS

INTRODUCTION

The summary of plant diseases in the United States in 1930 follows closely the plan of the summary of 1929 in both form and arrangement. Information already published in the "Plant Disease Reporter" for 1930, Volume 14, is not repeated but is referred to at the end of the discussion of each disease (P.D.R. page).

As in the summary for 1929, no references are included in the present supplement. The convenience of these citations is appreciated but their inclusion involves considerable difficulty in choosing which papers to cite and is largely a duplication of information already in the hands of readers.

In this connection, it is perhaps worthwhile to call attention to the bibliographic service regularly rendered by the Bureau of Plant Industry. For many years the Bureau of Plant Industry has continued to send, without charge, to botanists the bi-weekly list of botanical literature compiled by Miss Alice Atwood. This service, which may be had on request by any working botanist is one of the quickest and the most satisfactory bibliographic services in the world.

In the actual preparation of this summary the section on vegetable diseases was largely prepared by Dr. O. C. Boyd and those on fruit diseases and truck crops by Dr. M. F. Barrus. The long field experience of these gentlemen and their interest in survey problems has resulted in a much better summary than could have been produced by the staff of the Plant Disease Survey working unassisted. General editorial supervision has been in the hands of Miss Jessie I. Wood, who has prepared the remaining portions of the manuscript.

A list of collaborators of the Plant Disease Survey is given below, as individual contributions cannot well be indicated. The continued cooperation of these investigators makes possible the work of the Plant Disease Survey.

N. E. S.

LIST OF COLLABORATORS FOR THE YEAR 1930

ALABAMA, Agricultural Experiment Station, Auburn - W. A. Gardner
J. L. Seal.

ARIZONA, University of Arizona, Tucson - J. G. Brown.
State Commission of Agriculture, Phoenix - D. C. George.

ARKANSAS, Agricultural Experiment Station, Fayetteville - H. R. Rosen.
University of Arkansas, Fayetteville - C. Woolsey, V. H. Young.

CALIFORNIA, University of California, Berkeley - J. T. Barrett.
Citrus Experiment Station, Riverside - E. T. Bartholomew,
W. T. Horne.
Agricultural Experiment Station, Davis - J. B. Kendrick.
Southern Branch, University of California, Los Angeles -
O. A. Plunkett.
Department of Agriculture, Sacramento - G. L. Stout.

COLORADO, Agricultural College, Fort Collins - L. W. Durrell.

CONNECTICUT, Tobacco Experiment Station, Windsor - P. J. Anderson.
Agricultural Experiment Station, New Haven - G.P.Clinton - E.M.Stoddard.

DELAWARE, Agricultural Experiment Station, Newark - J. F. Adams.

FLORIDA, Lakeland, P. O. Box 522 - A. N. Brooks.
Hastings - L. O. Gratz.
Citrus Blight Laboratory, Cocoa - A. S. Rhoads.
Agricultural Experiment Station, Gainesville - W. B. Tisdale
G. F. Weber.

GEORGIA, State College of Agriculture, Athens - T. H. McHatton,
H. M. McKay, J. H. Miller.

IDAHO, University of Idaho, Moscow - C. W. Hungerford.

ILLINOIS, University of Illinois, Urbana, H. W. Anderson, G. H. Dungan,
B. Koehler, J. W. Lloyd, F. L. Stevens.
State Natural History Survey, Urbana - G. H. Boewe, L. R. Tehon.

INDIANA, Agricultural Experiment Station, Lafayette, M. W. Gardner,
R. W. Samson.
Purdue University, Lafayette - C. L. Porter.

IOWA, Iowa State College, Ames - J. C. Gilman, R. H. Porter.
Iowa State Teachers' College, Cedar Falls - C. W. Lantz.
Agricultural Experiment Station, Ames - I. E. Melhus.
Upper Iowa University, Fayette - G. W. Wilson.

KANSAS, State Agricultural College, Manhattan - O. H. Elmer, L. E. Melchers.

KENTUCKY, University of Kentucky, Lexington - J. S. Gardner, R. Kenney.
College of Agriculture, Lexington - W. W. Magill.
Agricultural Experiment Station, Lexington - W. D. Valleau.

LOUISIANA, Agricultural Experiment Station, Baton Rouge - C. W. Edgerton, A. G. Plakidas, E. C. Tims.

MAINE, Agricultural Experiment Station, Orono - D. Folsom.
College of Agriculture, Orono - F. H. Steinmetz.

MARYLAND, Maryland Agricultural College, College Park - R. A. Jehle.
Agricultural Experiment Station, College Park - J. B. S. Norton, C. F. Temple.

MASSACHUSETTS, Massachusetts Agricultural College, Amherst - O. C. Boyd, W. H. Davis, W. L. Doran, A. V. Osmun.
Harvard University, Cambridge - C. W. Dodge.
Market Garden Field Station, Waltham - E. F. Guba.

MICHIGAN, Michigan Agricultural College, East Lansing - E. A. Bessey, J. H. Muncie, R. Nelson, H. H. Wedgworth.

MINNESOTA, Agricultural Experiment Station, St. Paul - Louise Dosdall.
University of Minnesota, St. Paul - J. G. Leach, E. C. Stakman.

MISSISSIPPI, Agricultural Experiment Station, A.& M College - J. M. Beal, L. E. Miles.

MISSOURI, Missouri Research Museum, Jefferson City - A. C. Burrill.
Agricultural Experiment Station, Columbia, - W. E. Maneval I. T. Scott.

MONTANA, Agricultural Experiment Station, Bozeman - H. E. Morris, D. B. Swingle, P. A. Young.

NEBRASKA, College of Agriculture, Lincoln - R. W. Goss, G. L. Peltier.

NEVADA, Agricultural Experiment Station, Reno.- P. A. Lehenbauer.

NEW HAMPSHIRE, Agricultural Experiment Station, Durham - O. R. Butler.
Dartmouth College, Hanover - A. H. Chivers.

NEW JERSEY, Rutgers College, New Brunswick - C. M. Haenseler.
Agricultural Experiment Station, New Brunswick - R. P. White.

NEW MEXICO, New Mexico Agricultural College, State College - R. F. Crawford.

NEW YORK, New York State College of Agriculture, Ithaca - F. M. Blodgett, C. Chupp, H. M Fitzpatrick, L. M. Massey, H. E. Thomas, Cynthia Westcott, H. H. Whetzel.
Agricultural Experiment Station, Geneva - W. H. Rankin.

NORTH CAROLINA, Agricultural Experiment Station, Raleigh - S. G. Lehman, R. F. Poole.

NORTH DAKOTA, State College Station, Fargo - H. L. Bolley, W. E. Brentzel.

OHIO, Agricultural Experiment Station, Wooster - Fredericka Detmers,
Curtis May, R. C. Thomas, P. E. Tilford, H. C. Young.
Ohio State University, Columbus - A. L. Pierstorff.
University of Cincinnati, Cincinnati - O. T. Wilson.

OKLAHOMA, Durant - W. L. Blain.
Agricultural Experiment Station, Stillwater - F. M. Rolfs.
Agricultural & Mechanical College, Stillwater - R. Stratton.

OREGON, Agricultural Experiment Station, Corvallis - H. P. Barss,
S. M. Zeller
Hood River Company, Hood River - LeRoy Childs.

PENNSYLVANIA, Pennsylvania Field Laboratory, Bustleton - W. S. Beach.
Pennsylvania State College, State College - F. D. Kern,
R. S. Kirby, E. L. Nixon, L. O. Overholts, H. W. Thurston
G. L. Zundel.

RHODE ISLAND, Rhode Island State College, Kingston - H. W. Browning.

SOUTH CAROLINA, Agricultural Experiment Station, Clemson College -
G. M. Armstrong, G. A. Meckstroth.
South Carolina Agricultural College, Clemson College -
D. B. Rosenkrans.
Wofford College - Spartanburg - C. B. Waller.

SOUTH DAKOTA, Northville - J. F. Brenckle.
South Dakota State College, Brookings - E. A. Walker.

TENNESSEE, University of Tennessee, Knoxville - J. O. Andes, J. L. Baskin,
L. R. Hesler, J. A. McClintock.
Agricultural Experiment Station, Knoxville - S. H. Essary,
C. D. Sherbakoff.
Tennessee Horticultural Society, Knoxville - N. D. Peacock.

TEXAS, Sub-Station No. 15, Weslaco - W. J. Bach.
Prairie View Normal, Prairie View - G. H. Dickerson.
Agricultural Experiment Station, College Station - W. N. Ezekiel,
J. J. Taubenhaus.

UTAH, Utah Agricultural College, Logan - B. L. Richards.

VERMONT, Agricultural Experiment Station, Burlington - B. F. Lutman.

VIRGINIA, Virginia Truck Experiment Station, Norfolk - H. T. Cook.
Field Laboratory, Winchester - A. B. Groves.
Agricultural Experiment Station, Blacksburg - R. G. Henderson,
A. B. Massey, S. A. Wingard.
Field Experiment Station, Staunton - R. H. Hurt.
Hampton Institute, Hampton - T. W. Turner.

WASHINGTON, Long Beach - D. J. Crowley.
Agricultural Experiment Station, Pullman - F. D. Heald.
Washington State College, Pullman - L. K. Jones.
Western Washington Experiment Station - Puyallup - G. A. Newton.

WEST VIRGINIA, Agricultural Experiment Station, Morgantown - Anthony Berg, E. C. Sherwood.
West Virginia College of Agriculture, Morgantown - C. R. Orton.
Agricultural Experiment Station, Inwood - F. J. Schneiderhan.

WISCONSIN, Agricultural Experiment Station, Madison - L. R. Jones.
University of Wisconsin, Madison - G. W. Keitt, R. E. Vaughan.
WYOMING, University of Wyoming, Laramie - J. S. Wiant.

HAWAII, University of Hawaii, Honolulu - G. H. Godfrey, M. B. Linford, G. P. Sideris.

HAITI, Port au Prince, Haiti - H. D. Barker.

PHILIPPINE ISLANDS, Bureau of Science, Manila - C. J. Humphrey.

PORTO RICO, Insular Experiment Station, Rio Piedras- M. T. Cook.

WEATHER CONDITIONS

The outstanding feature of the 1930 season was, of course, the severe and widespread drought, and the unusually warm weather which accompanied it throughout most of the country. The drought began as early as December 1929 in Maryland, Delaware, Virginia, and West Virginia, and continued throughout the year, while the area affected increased in extent until it included every State east of the Rocky Mountains. In many sections all previous records for dry weather were broken, both for individual months and for groups of months. (Tables 12, 13, 14 and Figures 1 and 2).

In the area most severely affected, that is, roughly, the region from Delaware south to Virginia, and west to Missouri and Arkansas, the drought was by far the most important factor in crop yields. With many crops the reduction in yield due to dry weather far overbalanced the generally decreased losses from disease. On the other hand, in the case of crops that were harvested before the lack of moisture became too severe, there was an increase in yield. This was true of the small grains and also of potatoes in certain sections. The maps in Figures 3 to 7 show the percentages of reduction or increase in yield per acre of certain crops in 1930 as compared with the average for 1919 to 1928. No assumption that either increase or decrease is due to the drought alone is intended, but comparison of these maps with those showing percentage of normal precipitation (Figures 1 and 2) suggests some interesting correlations.

Table 12. Departures from the normal temperature (F°.) by sections, March to October, 1930. (Figures from Climatological Data, 1930).

Section	March	April	May	June	July	August	Sept.	Oct.
	Departures from the normal temperature							
N.Eng.	+0.1	-1.3	+1.6	+4.6	-0.4	+0.6	+3.2	-0.4
N.Y.	+0.2	-1.2	+2.0	+2.9	+0.2	+0.1	+2.9	-1.1
N. J.	+1.6	-1.7	+2.6	+2.6	+0.9	-0.7	+4.1	-2.3
Pa.	+0.4	-0.6	+1.7	+0.9	+1.1	+0.3	+3.8	-1.6
Md.Del.	-0.2	-1.9	+2.3	+1.3	+1.9	+0.5	+5.5	-2.2
Va.	-1.3	-0.1	+3.3	+0.4	+3.1	+0.5	+5.7	-2.8
W. Va.	-2.3	+1.6	+1.3	-0.2	+1.8	-1.1	+3.5	-4.2
Ky.	-1.8	+2.9	+1.2	-0.7	+3.7	+0.9	+2.2	-2.4
Tenn.	-2.1	+2.5	+1.3	-0.2	+4.3	+1.0	+2.7	-1.9
N. C.	-2.3	+1.1	+2.4	-1.1	+2.2	-1.4	+4.0	-3.4
S. C.	-3.9	+1.1	+1.1	-2.3	+2.1	-1.3	+2.7	-3.1
Ga.	-4.3	+1.5	+2.0	-1.8	+2.6	-0.8	+2.5	-2.4
Fla.	-3.7	+0.2	+1.0	-1.9	+1.2	-0.8	+1.3	-2.0
Ala.	-3.7	+2.0	+1.5	-0.9	+3.6	-0.1	+1.6	-1.9
Miss.	-2.8	+2.3	+1.2	-0.6	+3.6	+0.4	+1.2	-1.6
La.	-4.	+2.2	+0.9	-1.1	+1.8	+0.1	+0.2	-0.8
Tex.	-3.6	+4.1	-0.5	-0.7	+1.1	+1.4	+2.0	-1.5
Okla.	-1.8	+5.9	-0.4	-0.2	+2.4	+2.6	+3.3	-1.2
Ark.	-2.3	+3.5	-0.2	-0.7	+4.7	+2.1	+1.5	-2.1
Ohio	-1.0	+2.4	+2.7	+0.9	+2.2	+0.4	+2.1	-2.8
Ill.	-0.3	+3.2	+1.6	-0.2	+4.2	+2.0	+2.1	-1.7
Ind.	-1.3	+2.0	+1.4	-0.6	+2.1	+1.1	+1.4	-1.7
Mich.	0.0	+0.5	+2.5	+1.5	+0.5	+2.2	+1.7	-1.2
Wis.	+1.2	+1.9	+1.9	+1.7	+1.6	+3.1	+1.1	-1.3
Minn.	+1.7	+3.2	+0.4	+1.3	+2.7	+4.3	+0.3	-1.1
Iowa	+2.7	+3.2	+0.1	-0.3	+4.2	+2.7	+2.0	-1.1
Mo.	-0.7	+4.0	+0.3	-0.8	+3.9	+2.5	+2.3	-2.1
N.Dak.	+3.5	+5.6	-1.8	+0.5	+4.8	+5.0	-0.2	-3.0
S. Dak.	+1.3	+5.4	-0.3	0.0	+6.0	+4.3	+0.7	-2.4
Nebr.	+1.0	+4.6	-1.7	-0.8	+4.1	+1.7	+1.4	-0.6
Kans.	-1.5	+5.0	-0.8	-0.5	+3.2	+2.3	+1.4	-2.0
Mont.	+0.4	+7.4	+0.3	+0.5	+3.4	+4.3	+1.4	-4.3
Wyo.	-0.7	+8.0	-0.3	-0.6	+2.2	+1.3	+0.1	-1.6
Colo.	-1.8	+6.2	-1.9	+0.8	+1.1	+0.7	+0.1	-0.4
N.Mex.	-2.8	+4.6	+2.5	+0.8	-0.6	+0.6	+0.1	0.0
Ariz.	-1.0	+4.0	-4.5	+0.5	-0.8	-0.3	-1.4	-1.4
Utah	+1.2	+6.1	-3.1	+0.7	+1.2	+0.3	-0.2	-1.8
Nev.	+1.2	+4.0	-3.7	+1.5	+0.6	-0.1	-1.0	-1.7
Idaho	+2.0	+5.9	-1.0	-1.1	+1.6	+2.3	+1.2	-1.7
Wash.	+2.2	+3.7	-0.9	-1.7	0.0	+1.9	+1.5	-2.4
Oreg.	+2.5	+3.8	-1.6	-1.1	0.0	+1.5	+1.0	-1.5
Calif.	+1.3	+1.5	-3.7	+0.5	-0.4	-1.1	-3.3	-0.7

Table 13. Departures from the normal precipitation (inches) by sections, March to October, 1930. (Figures from Climatological Data, 1930).

Section	Departures from the normal precipitation							
	March	April	May	June	July	August	Sept.	Oct.
N. Eng.	+0.87	-1.61	+0.23	+0.06	+0.07	-1.33	-1.92	-0.58
N. Y.	+0.52	-0.90	+0.11	+0.63	-0.96	-1.41	-0.74	-1.80
N. J.	-1.32	-1.31	-0.98	+0.47	-0.66	-1.61	-1.44	-1.45
Pa.	-0.51	-0.66	-0.96	+0.10	-2.12	-2.76	-1.03	-2.19
Md.Del.	-1.52	-0.88	-1.38	-0.66	-2.75	-3.15	-1.79	-2.04
Va.	-1.64	-1.06	-1.33	-0.98	-2.83	-2.76	-1.95	-1.76
W. Va.	-0.73	-1.57	-1.74	-1.60	-2.59	-1.95	-1.57	-2.16
Ky.	-2.52	-2.72	-1.04	-2.49	-2.89	-1.48	-0.37	-1.44
Tenn.	-0.61	-2.82	+1.45	-2.90	-2.05	-1.40	+0.23	-0.20
N. C.	-1.50	-1.53	-0.99	-0.10	-2.24	-2.72	-0.44	-1.12
S. C.	-0.57	-0.91	-1.17	-0.44	-1.07	-3.33	+0.39	-0.84
Ga.	+0.98	-0.32	-1.24	-0.57	+0.01	-3.32	+2.54	-1.09
Fla.	+4.31	+0.82	+0.21	+3.99	-2.75	-2.68	+1.88	-1.62
Ala.	-0.09	-2.82	-0.15	-2.31	-1.49	-1.04	+3.11	+0.10
Miss.	-1.70	-3.69	+4.77	-3.70	-2.37	-1.14	+1.58	+0.53
La.	-1.04	-3.32	+1.43	-4.19	-2.43	-0.56	+3.15	+1.32
Tex.	-1.73	-1.30	+1.49	-1.13	-1.55	-1.05	-0.98	+3.65
Okla.	-1.64	-0.74	+1.68	-0.29	-1.63	-1.25	-1.05	+1.09
Ark.	-2.53	-3.47	+5.04	-3.15	-3.08	-1.16	+0.67	+1.92
Ohio	-0.66	-1.12	-1.82	-1.55	-2.30	-1.09	-0.26	-1.35
Ill.	-1.67	-0.73	-2.16	-0.50	-2.27	-1.50	+0.02	-0.40
Ind.	-2.04	-0.94	-2.22	-1.23	-1.62	-1.24	+0.50	-1.15
Mich	-0.56	-0.73	-0.14	+0.30	-1.55	-2.07	-0.91	-0.77
Wis.	-0.45	-0.54	-0.35	+1.30	-1.11	-2.23	-0.56	-0.25
Minn.	-0.64	-0.97	+1.09	-0.24	-1.01	-2.11	+0.46	-0.37
Iowa	-0.88	-0.29	-0.86	+1.33	-2.34	-1.02	-1.36	-0.35
Mo.	-1.65	-1.78	-1.24	-1.04	-3.03	-1.73	+0.34	+0.17
N. Dak.	-0.74	-0.13	+0.07	-0.41	-1.57	-0.83	-0.62	+0.81
S. Dak.	-0.53	+0.01	-0.32	-0.79	-1.85	+0.43	-0.53	+0.87
Nebr.	-0.68	+1.23	+1.57	-0.56	-1.84	+1.33	-0.53	+1.07
Kans.	-1.15	+0.23	+0.57	-0.09	-1.33	-0.24	+0.12	+1.72
Mont.	+0.03	+0.24	-0.88	-1.09	-0.54	-0.13	+0.21	+0.45
Wyo.	-0.10	-0.71	+0.18	-0.46	-0.14	+2.26	-0.46	+0.73
Colo.	-0.44	-0.82	+0.61	-0.77	+0.96	+1.18	-0.34	-0.32
N. Mex.	-0.02	-0.42	-0.01	-0.33	+0.86	-0.34	-0.49	+0.76
Ariz.	+0.92	-0.23	+0.59	+0.07	+0.97	+0.07	-0.10	-0.53
Utah	-0.33	-0.42	+0.38	-0.16	+0.21	+1.37	+0.67	-0.17
Nev.	-0.31	+0.01	+1.34	-0.34	-0.21	+0.36	+0.47	-0.03
Idaho	-0.25	+0.20	+0.50	-0.47	-0.31	+0.58	+0.09	+0.15
Wash.	-0.71	-0.24	+0.11	-0.13	-0.59	-0.70	-0.46	-0.31
Oreg.	-1.39	-0.07	+0.42	-0.49	-0.39	-0.29	-0.02	-0.61
Calif.	-0.56	-0.14	+0.37	-0.28	-0.07	-0.02	-0.02	-0.84

Table 14. Percentage of normal rainfall, 1930. (From Weekly Weather and Crop Bulletin, Oct. 14, 1930). Underlined figures indicate least precipitation of record.

States	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Jan. to Sept.	Mar. to Aug.	July and Aug.
	Percentage of normal rainfall, 1930.											
Ky.	112	101	46	33	73	42	30	60	86	63	47	45
Md. and Del.	82	68	59	74	62	83	37	26	44	58	55	31
Va.	80	48	56	67	65	77	39	40	41	56	56	39
Mo.	221	81	45	53	73	79	24	54	109	75	57	39
Ill.	208	104	48	79	46	87	31	57	101	78	58	44
Ind.	209	98	47	73	45	68	52	63	116	82	58	57
W. Va.	49	85	82	55	56	64	42	54	48	59	59	48
Ohio	162	110	81	65	50	60	40	68	91	77	60	53
La.	166	78	78	29	132	13	61	89	180	89	66	74
Ark.	223	117	47	29	200	22	19	70	121	95	68	44
N. C.	94	33	65	59	76	98	62	50	90	69	68	56
Tenn.	105	94	89	37	134	33	54	65	106	79	69	59
Pa.	68	101	86	80	76	102	51	35	72	73	71	43
Mich.	118	104	75	71	96	109	47	27	69	77	71	37
Ala.	88	43	98	34	96	46	73	77	196	80	72	75
Miss.	107	69	71	23	208	13	52	74	156	81	72	62
S. C.	125	26	86	70	68	91	82	42	110	76	72	62
N. Dak.	54	241	11	91	103	88	40	64	62	76	73	51
Mont.	57	82	103	121	59	58	68	90	114	79	76	77
Oreg.	68	104	55	97	123	61	11	43	96	82	76	28
Minn.	88	171	44	52	136	94	71	34	120	87	77	54
N. J.	81	78	66	64	74	113	86	67	56	76	78	77
Tex.	99	82	84	60	141	66	41	59	67	78	78	50
Wash.	46	129	79	91	105	92	11	24	80	82	80	18
S. Dak.	88	101	50	100	90	77	34	118	76	80	80	72
Iowa	125	55	50	90	81	130	39	70	63	79	81	54
Okla.	173	97	27	80	136	93	38	59	65	84	81	49
Wis.	94	120	74	79	91	133	70	32	84	85	82	52
Ga.	118	32	121	91	65	87	100	36	173	88	84	70
Kans.	148	27	20	109	115	98	60	92	104	90	89	75
Calif.	97	65	85	92	134	10	22	80	100	86	90	53
N. Y.	107	63	117	70	103	117	76	63	84	88	90	69
N. Eng.	79	64	127	50	107	102	102	66	48	83	92	83
N. Mex.	117	37	98	58	99	76	132	86	68	91	97	110
Idaho	71	120	84	114	131	66	54	181	114	101	103	120
Nebr.	140	54	38	150	145	85	45	147	77	102	106	92
Colo.	155	68	67	57	134	49	140	160	72	103	107	149
Wyo.	95	82	90	55	108	70	90	331	61	103	112	191
Fla.	126	99	241	131	105	159	62	62	126	115	113	62
Utah	134	84	77	69	129	74	121	214	162	119	115	172
Nev.	128	75	67	101	256	32	43	182	214	121	122	119
Ariz.	174	41	181	65	269	118	144	103	80	123	135	124
	United States. (State means weighted by respective areas.)											
Average precipit'n	2.6	1.7	2.0	1.8	3.2	2.3	1.8	2.0	2.7	20.1	13.1	3.8
Normal	2.3	2.2	2.4	2.5	2.9	2.9	2.8	2.6	2.4	23.0	16.1	5.4
Percentage of normal	113	77	83	72	110	79	64	77	112	87	81	70

Percentage of Normal Precipitation, 1930, by States

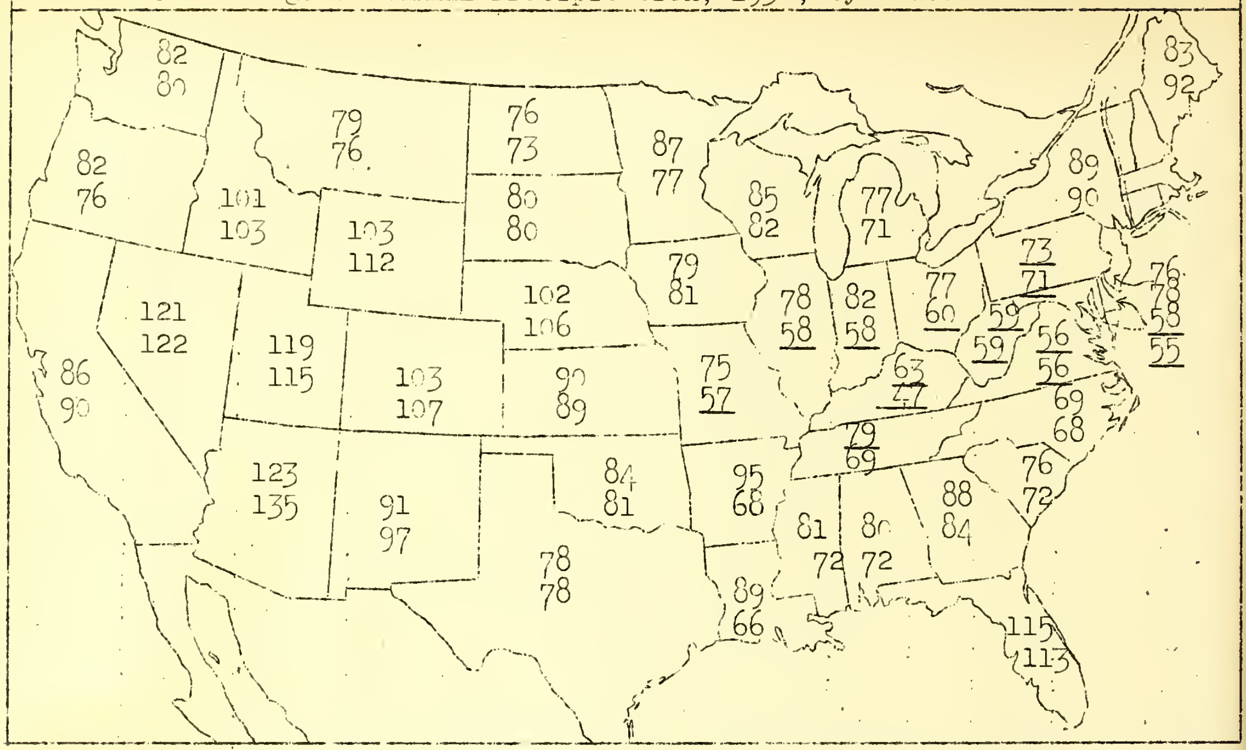

Fig. 1. Upper figures show percentage of normal, Jan. 1 to Sept. 30, lower figures, Mar. 1 to Aug. 31. (Weekly Weather & Crop Bul. Oct. 14, 1930)

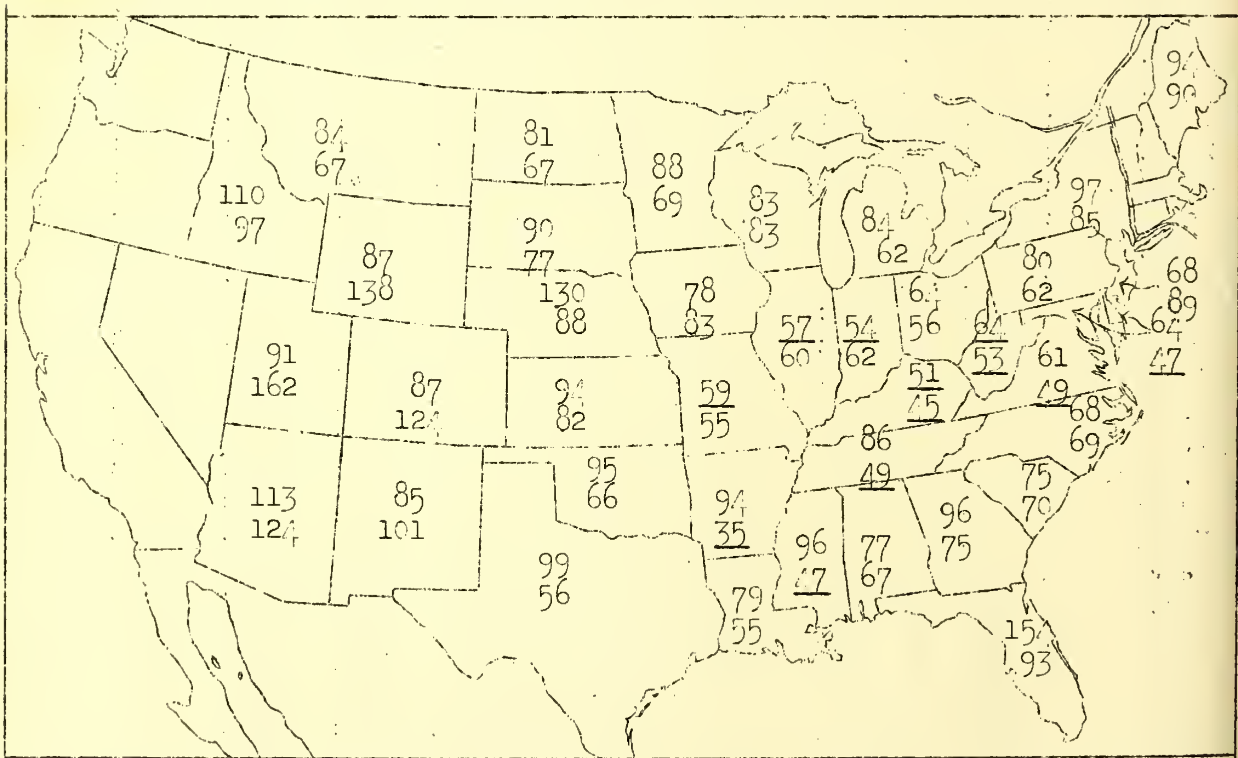

Fig. 2. Upper figures show percentage of normal for the spring of 1930 (March to May, inclusive), lower figures for the summer (June to August, inclusive). (Weekly Weather & Crop Bul., Sept. 9, 1930).

In both maps underlined figures indicate the driest of record.

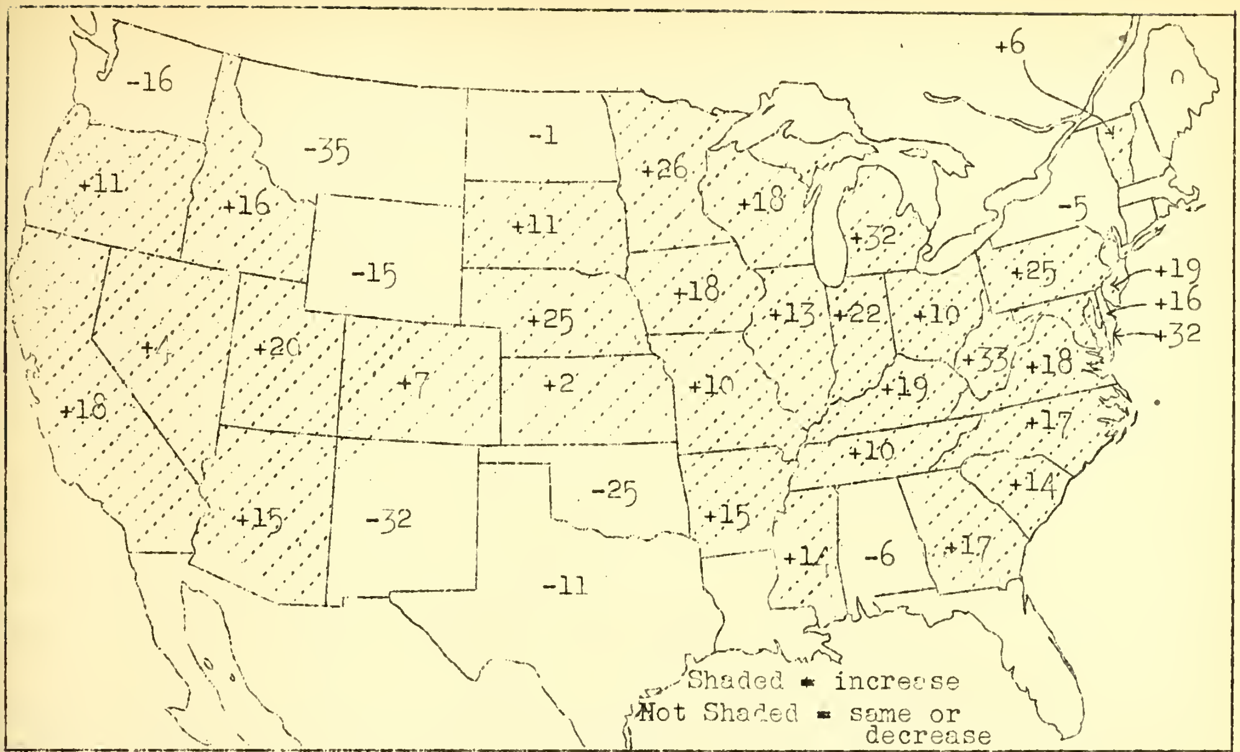

Fig. 3. Percentage reduction or increase in yield per acre of wheat in 1930 from the average 1919-1928.

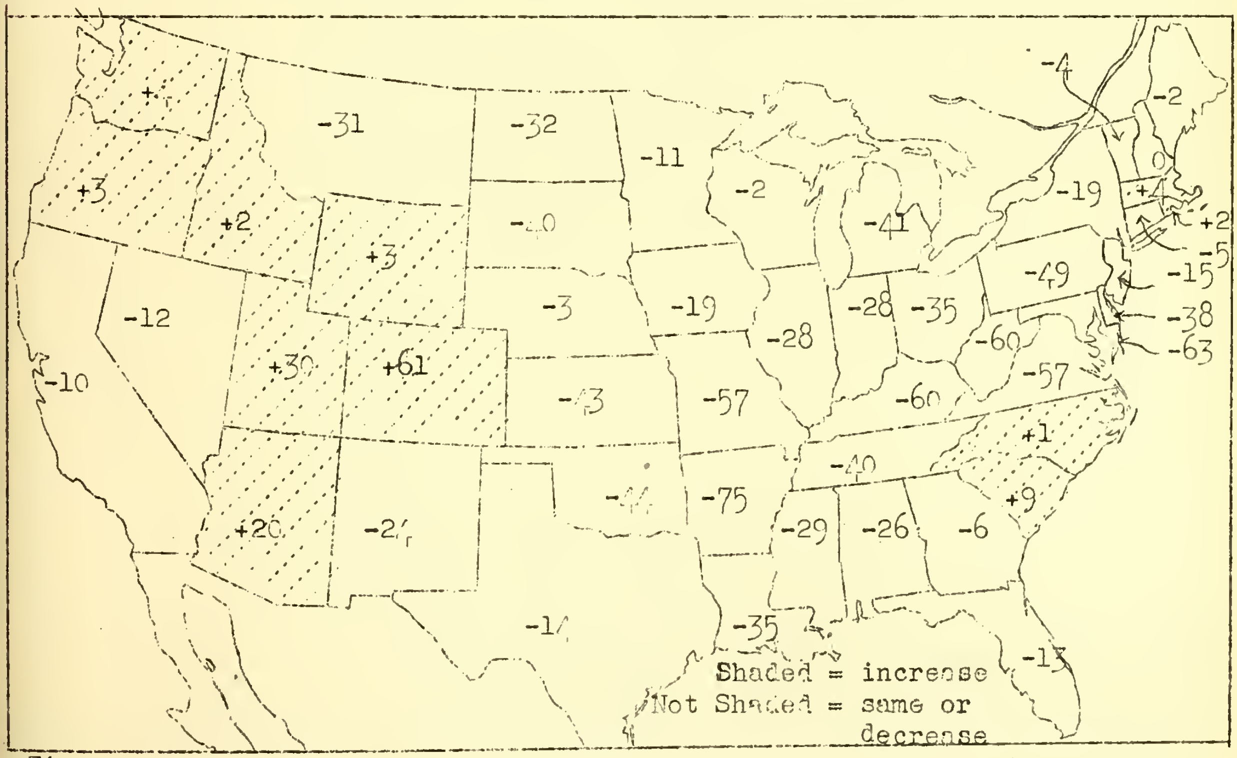

Fig. 4. Percentage reduction or increase in yield per acre of corn from the average 1919-1928.

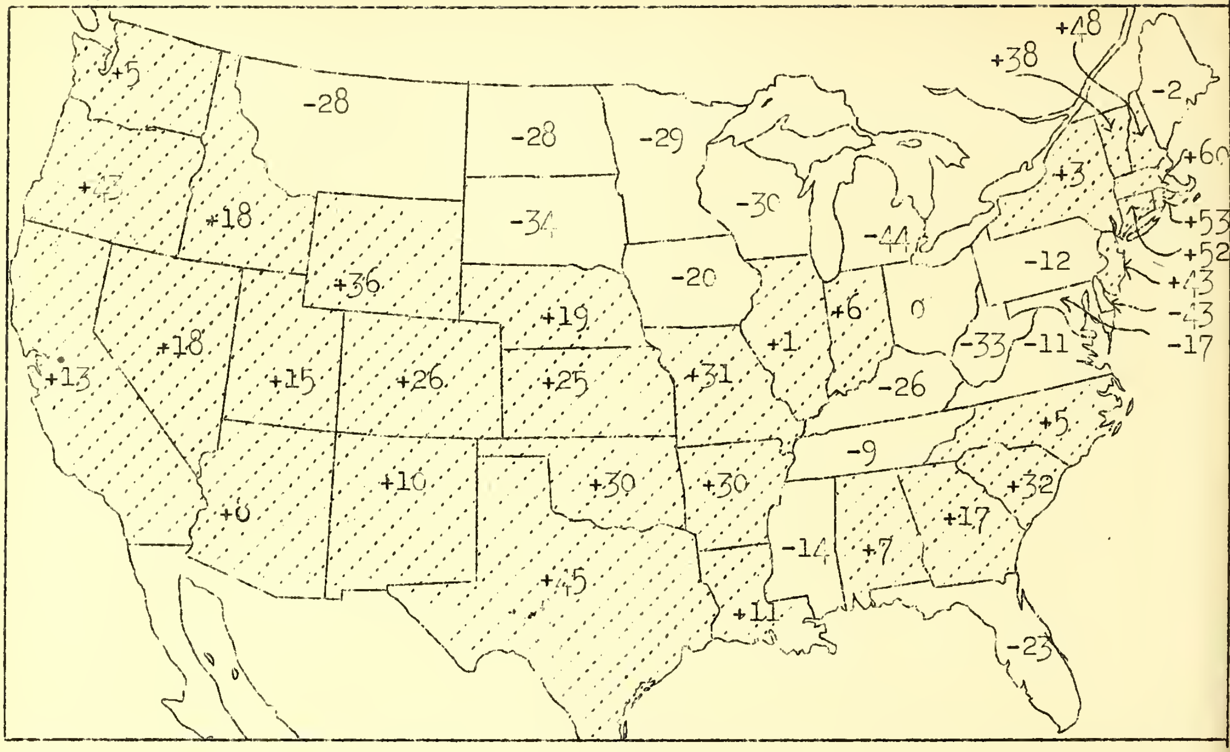

Fig. 5. Percentage reduction or increase in yield per acre of potatoes in 1930 from the average 1919-1928.

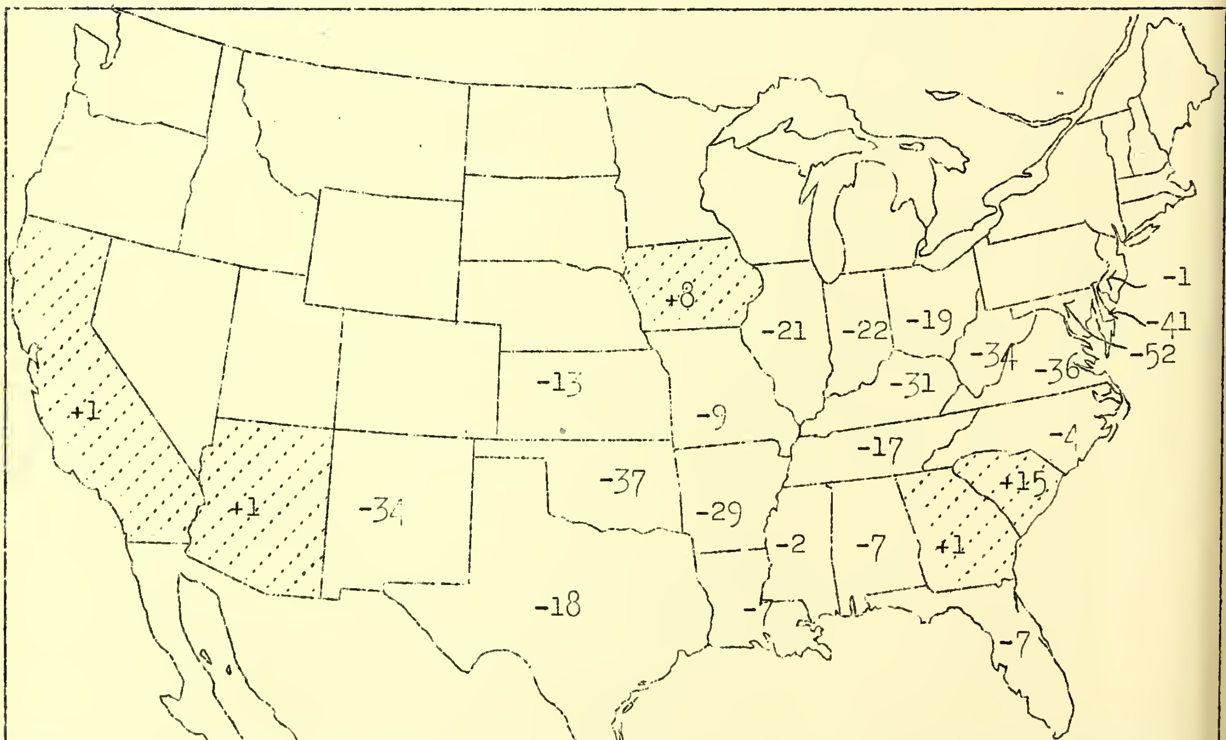

Fig. 6. Percentage reduction or increase in yield per acre of sweet potatoes in 1930 from the average 1919-1928.

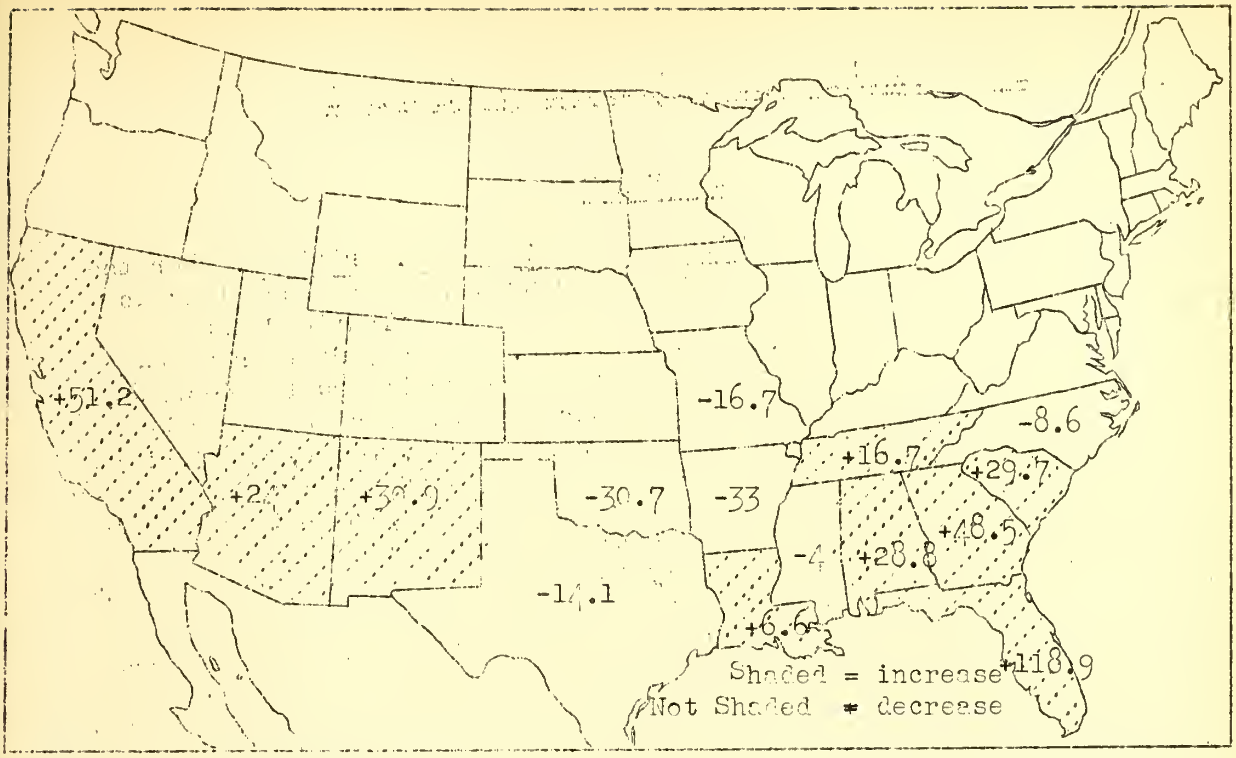

Figure 7. Percentage reduction or increase in yield per acre of cotton in 1930 from average yield per acre 1919-1928.

Losses from disease were generally much less than normal in 1930. Outstanding examples are stem rust, leaf rust, and scab of small grains, potato late blight except in Florida, Septoria blight of tomatoes, apple scab in the drought area, and peach brown rot. Others will be noted in the summary. Certain diseases, however, showed increased destructiveness. These include, naturally, potato tipburn and blossom-end rot of tomato, and also potato scab, non-parasitic "rust" of cotton, and others. The effects of many wilts and root rots were so obscured by the similar symptoms produced by the dry weather and heat that estimates of loss due to these are of very doubtful value.

D I S E A S E S O F C E R E A L C R O P S

W H E A T

STINKING SMUT OR BUNT (Tilletia levis and T. tritici). For the country as a whole this disease probably caused about as much loss as it did in 1929. There was the same amount in the Atlantic Coast States except North Carolina, and in Montana; the only State reporting this year from the Northwest where the disease is usually destructive. The loss of 2 per cent in North Carolina was less than had been reported from that State for several years. Kansas, Texas, and Indiana also reported reduced loss. In Colorado the loss of 2 per cent, although larger than the very small amount reported last year, showed nevertheless a continued reduction from other preceding years since 1925. On the other hand, losses were from slightly to considerably greater in the area from Michigan west to North and South Dakota, in Wisconsin and Minnesota being larger than for ten years past. Nebraska reported that stinking smut was probably the most important disease of the crop in 1930. The loss in that State continues high in spite of seed treatment propaganda. The results of a survey conducted during the summer of 1930 in selected spring wheat counties of Minnesota, the Dakotas, and Montana showed that a large part of the failure to control stinking smut, leading to increased losses in those States, was due to the use of wrong methods of treatment or to the faulty application of approved methods. (A complete report of the results of this survey is given in Supplement 77, "Why so much smut in spring wheat?" November 1, 1930). The contrasting situation of marked decrease in loss in Pennsylvania, Kansas, and Colorado is probably due chiefly to intensive seed treatment with copper carbonate. Seed was treated for over 2,000,000 acres of the 1930 crop in Kansas. The 1930 season was apparently favorable for the development of the disease in Kansas, as much as 80 per cent infection having been observed in individual fields. Losses reported in 1930 are given in Table 15 and Figure 8. The average loss for the ten-year period, 1920-1929 is shown in Figure 9.

The importance of smut in the harvested grain is discussed in Supplement 79 ("The relation of stinking smut in the field to smuttiness of threshed grain," June 1, 1931) which reports an attempt to determine the amounts of smut in threshed wheat likely to result from various percentages of infection in the field. Samples of threshed grain were received from 52 fields that had been inspected during the smut survey and comparisons were made between the percentages of smut in the fields and the smuttiness of the samples. Other factors beside field infection are concerned, but it was found that in this small number of samples

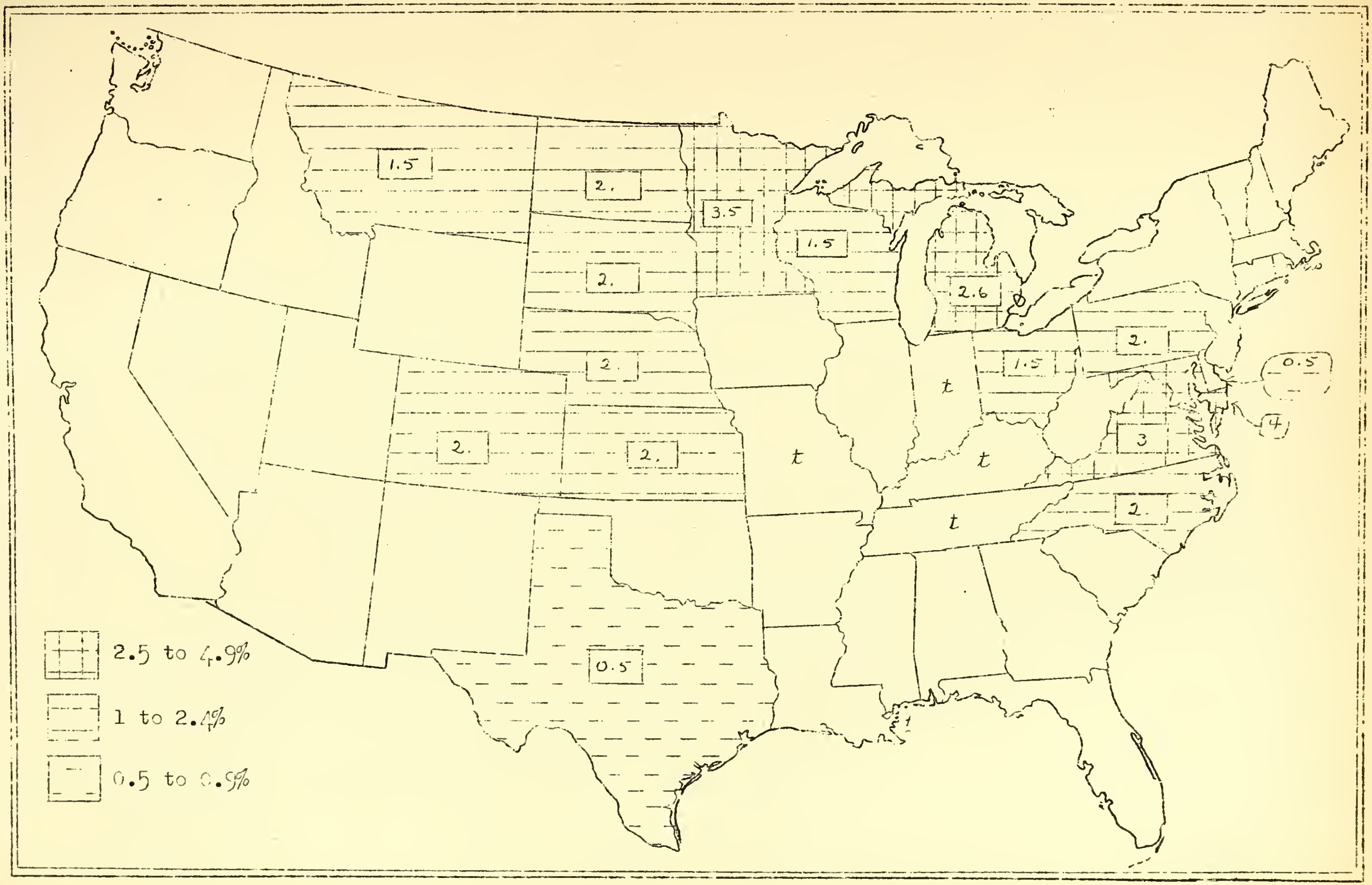

Figure 8. Estimated percentage losses from stinking smut of wheat in 1930, as reported by collaborators.

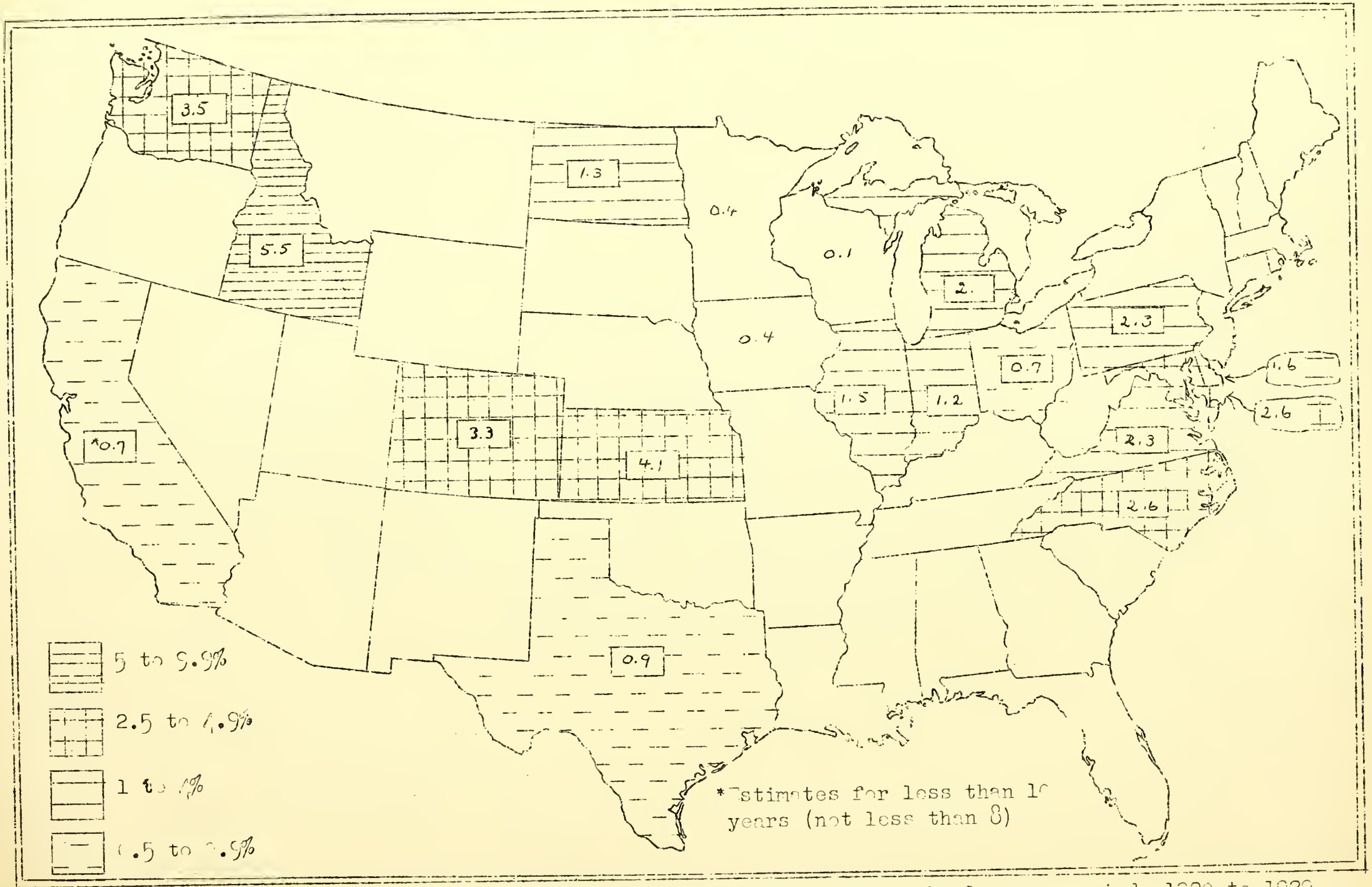

Figure 9. Percentage losses from stinking smut of wheat during the 10-year period, 1920 to 1929.

some correlation did exist. In view of the increasing importance of smut in durum wheat during the last few years the results obtained when these samples were classified according to the types of wheat are interesting. Of the 35 samples of hard red spring varieties, 36 per cent were found to be smutty when graded, and of the 19 durum varieties, 53 per cent, or more than half, were smutty. Besides this, a larger proportion of the durum than of the hard red spring wheat showed heavy smut.

Table 15. Losses from stinking smut of wheat as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
4.0	Maryland	1.5	Wisconsin, Montana
3.5	Minnesota	0.5	Texas, Delaware
3	Virginia	Trace	West Virginia, Tennessee, Missouri, Indiana, Kentucky
2.6	Michigan		
2	Pennsylvania, Nebraska, Kansas, Colorado, North Dakota, South Dakota, North Carolina		

LOOSE SMUT (Ustilago tritici). In general loose smut was of about the normal prevalence. Kansas reported more than for the past ten years, due perhaps to heavy rains at flowering time in 1929. The greatest damage was done to soft wheats in eastern Kansas but unusual amounts occurred on winter wheat throughout the State. In most years heavy infections are observed only in the northeastern counties. The total loss for the State was estimated at 0.25 per cent. The disease was severe in Missouri, causing a loss of 4 per cent, which is much more than usual. On the other hand, in North Dakota there was much less loose smut than last year. In North Carolina, although prevalent, the disease caused less loss than for the past two years. Estimated percentage losses are shown in Table 16.

Table 16. Losses from loose smut of wheat as estimated by collaborators, 193 .

Percentage loss	States reporting	Percentage loss	States reporting
4	Missouri	0.3	Illinois
2 to 3	West Virginia	0.25	Kansas
2	Virginia, Indiana	0.2	Michigan
1.5	New York, Pennsylvania Georgia, South Dakota	0.1	Wisconsin
1	Texas	Trace	Delaware, North Carolina, Minnesota, Nebraska, Colorado
0.5	Maryland, Arkansas, Montana		

FLAG SMUT (Urocystis tritici) is still known to occur only in Illinois, Missouri and Kansas. Results of a brief resurvey conducted during 1930 have been published in the Reporter, Volume 14, Pages 86, 89, 101. The situation as regards flag smut is summarized by A. G. Johnson in a letter dated May 16 as follows: "In general I think the situation is not serious, as most infections are only a trace. It seems to me that the situation can be adequately handled by educational methods - resistant varieties, seed treatment, rotation, and care of infested straw."

STEM RUST (Puccinia graminis). In 1930 losses from stem rust were unusually small as will be seen from a comparison of Figures 10 and 11, showin losses for 1930 and for the period 1920 to 1929, respectively. In the area most affected by the drought, dry weather prevented rust development and hi h temperatures hastened ripening, so that in some States, notably Indiana and Illinois, the crop reached maturity with practically no infection. According to barberry eradication scouts stem rust caused some injury in southern Texas during May and by the end of the month there was more in northern Texas than at the same time last year. About the middle of May small spots of primary infection appeared in southern Kansas but low temperatures prevented spread until just before harvest. At that time the disease appeared in all parts of the State, being heaviest in north-central Kansas. Losses estimated are given in Table 17 and Fi ure 10.

P. D. R. 14: Pages 114, 145, 244.

Table 17. Losses from stem rust of wheat as estimated by collaborators, 1936.

Percentage loss	States reporting	Percentage loss	States reporting
3.7	Minnesota	0.5	Virginia, Ohio
1.5	North Dakota, Kansas	Trace	Pennsylvania, Maryland, North Carolina, Illinois, Indiana, Kentucky, Missouri, Arkansas, Montana, Colorado, Wyoming
1.	Michigan, Texas, South Dakota, Nebraska		
0.7	Wisconsin		

LEAF RUST (<u>Puccinia triticina</u>). Late appearance and lack of spread due to dry weather were responsible for the generally less than average prevalence of leaf rust. Pennsylvania reported much less than last year, when it was very severe in that State. In Kansas there was enough rain in early spring but the weather was too cool for rust development until very late. Early fields escaped but late plantings suffered from heavy infection. In Georgia also there was severe late infection, particularly in southern Georgia. Losses are given in Table 18.

Table 18. Losses from leaf rust of wheat as estimated by collaborators, 1936.

Percentage loss	States reporting	Percentage loss	States reporting
10	Georgia	0.5	Delaware, Maryland, Missouri, Nebraska
3	Kansas	0.1	Texas, Wisconsin, Montana
2	Virginia	Trace	Kentucky, North Carolina, Indiana, Minnesota, Arkansas, North Dakota, South Dakota
1.5	Illinois		

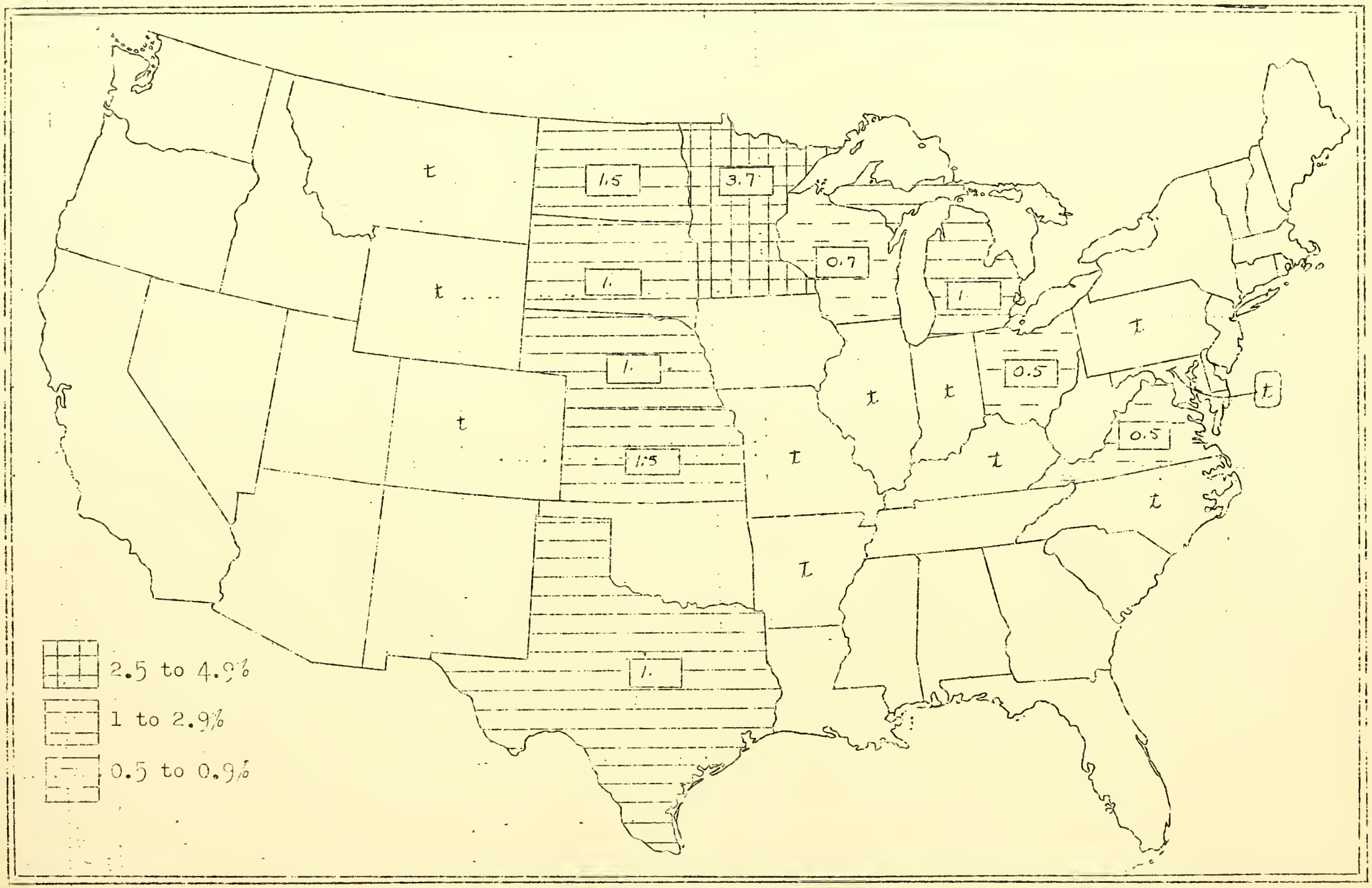

Figure 10. Estimated percentage losses from stem rust of wheat as reported by collaborators, 1930.

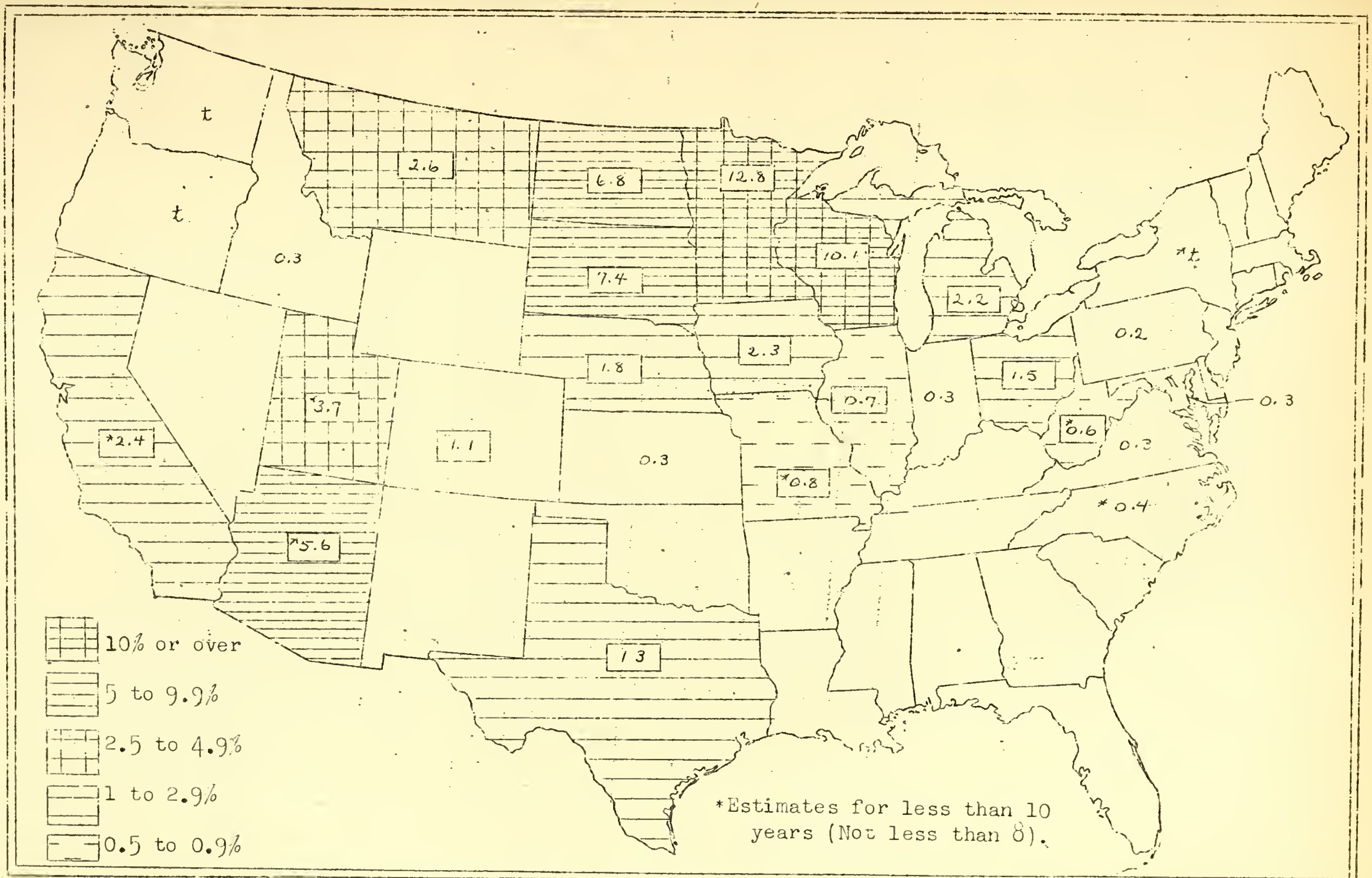

Figure 11. Percentage losses from stem rust of wheat for the ten-year period 1920-1929.

SCAB (Gibberella saubinetii). In Kansas, where an outbreak of scab occurred last year, there was only a slight trace in 1930, even in the eastern part where it usually is most damaging. Missouri also reported scab as less severe than for several years and this was true of the majority of States reporting. Reduction in amount of scab was believed to be partly responsible for increased yields of wheat in Maryland. Losses given in Table 19.

Table 19. Losses from wheat scab as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
1.5	Virginia, Missouri	0.1	Wisconsin
1	Maryland	Trace	Delaware, Kentucky, Michigan, Nebraska, Kansas
0.5	North Carolina, Texas Minnesota, South Dakota		

GLUME BLOTCH (Septoria nodorum) appeared to be exceptionally abundant last spring in Kentucky, in spite of (or because of) the very dry season. As it was practically the only disease on the heads it was particularly prominent. The quality of the wheat was the best in many years. The actual injury from Septoria was probably low except on an occasional spike where the heads were shriveled. (W. D. Valleau). A loss of one per cent was reported from Maryland. P. D. R. 14: Pages 114, 145, 244.

SPECKLED LEAF BLOTCH (Septoria tritici) was severe again on hard red winter wheats in Kansas, causing more loss than it did in 1929. Apparently the very wet weather in early spring and rather low temperatures until June were favorable to its development. Leaves of such very susceptible varieties as Kanred, Turkey, and Blackhull were nearly all killed long before maturity. Oro and Newturk were also susceptible, while Fulhard and Kawvale appeared resistant, and Harvest Queen, Michigan Wonder, and Kooperatorka very resistant. The total loss was estimated at 1.5 per cent. Illinois reported 0.5 per cent loss.

BASAL GLUME ROT (Bacterium atrofaciens) was severe locally in Kansas but the total loss for the State was only a trace. P. D. R. 14: Page 145.

TAKE-ALL (Ophiobolus graminis) was much more prevalent in New York than for several years. Losses as high as 20 per cent were reported in individual fields but in most cases the disease occurred only in small patches in the fields. The loss for the State was a trace (Chupp and Barrus). There was much more than usual in Kansas also. The total loss caused was one per cent but as much as 60 per cent was observed in fields (H. Fellows). A severe outbreak on spring wheat occurred in Jerome County in southern Idaho, the yield in some cases being cut at least 25 per cent. This seems to be the first report of take-all on spring wheat in the United States, although of course it is common in Canada and Australia. (Fellows and Hungerford).

HELMINTHOSPORIUM FOOT ROT (Helminthosporium sativum). Detailed inspections by P. A. Young and Hurley Fellows showed foot rot to be common and destructive in Montana wheat fields. Winter wheat especially was severely damaged to the extent of 10 per cent loss, while the loss in spring wheat was one per cent. Where winter wheat was planted late injury was not so great. Drought and foot rot combined destroyed spring wheat fields in some sections of the State. This combination probably increased losses in other States also. Foot rot was very prevalent in Kansas especially in the south-central and southwestern portions where drought in April injured the crop. In some cases the damage was as much as 60 per cent. The total loss was estimated at 0.3 per cent. In the Panhandle region of Texas the disease caused a loss of 5 per cent and losses of about one per cent were reported from Wisconsin and Minnesota.

FOOT ROTS were reported as becoming more serious each year in western Nebraska. Several organisms are concerned. Foot rot of undetermined cause was found at two places on the Columbia River in Clark and Skamania Counties, Washington.

WINTER BLIGHT (Sclerotium fulvum) was much less serious in Gallatin County, Montana, than it was in 1928 and 1929.

NEMATODE (Tylenchus tritici) was prevalent in certain sections of western North Carolina and northern Georgia. In North Carolina 75 to 80 per cent infection occurred in badly infested areas. In Georgia 15 per cent loss was estimated on three farms. The seed was grown locally and had been badly diseased for the past two years. One grower estimated his loss in 1929 to be much higher, as much as 50 per cent. P. D. R. 14: Page 144.

BREAKING-OVER of the straw and CRINKLE-JOINT (undet.). The breaking-over aroused considerable anxiety in some of the spring wheat States. Crinkle-joint was reported as more prevalent on wheat and barley in western Nebraska than usual. It was also reported from Kansas in connection with foot rots. P. D. R. 14: Pages 145, 157, 224.

MOSAIC (virus). A disease which was not definitely determined but which resembled mosaic was prevalent and destructive in several counties of northwestern Kansas. Many fields were plowed up on account of it. In material sent to him for examination, H. H. McKinney found definite cell inclusions resembling those associated with the wheat mosaic east of the Mississippi River. McKinney found traces of mosaic in all commercial fields examined in Illinois and he also found it in a field near Lexington, North Carolina. P. D. R. 14: Page 158.[1]

RYE

STEM RUST (Puccinia graminis) was even less important than it usually is on this crop. Losses reported did not exceed a trace and in some States there was no loss.

LEAF RUST (Puccinia dispersa) caused 10 per cent loss in Florida; 1 per cent in Virginia and Georgia; of very little importance elsewhere.

ERGOT (Claviceps purpurea) seemed to be much more severe than usual in New York, at least firms who buy the rye said that in cleaning the seed they found an unusually large amount of the sclerotia. It was so common that we received requests for information regarding the sale possibility of this ergot (Charles Chupp). Losses reported: 2 per cent in South Dakota; 1.5 in Wisconsin; 0.5 in Montana; traces in Michigan and Minnesota.

SCAB (Gibberella saubinetii) was very much reduced from last year. No loss greater than a trace was reported.

BARLEY

COVERED SMUT (Ustilago hordei) and LOOSE SMUT (U. nuda). About the normal amount of both smuts was reported from most States in 1930. Covered smut was less prevalent in Kansas than it has been in recent years. Minnesota reported a considerable increase in both diseases, and loose smut was more prevalent than usual in Michigan, Wisconsin, and Kansas also. Wisconsin and Minnesota reported smooth-awned strains as especially susceptible. Concerning control, R. E. Vaughan in Wisconsin remarked, "We greatly need a treatment for loose smut that is better and more easily applied than hot water."

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[1]According to McKinney the disease occurring in northwestern Kansas in 1930 did not recur in 1931. As 1931 was an ideal year for the occurrence of mosaic it leaves some doubt as to whether this disease was a mosaic even though cell inclusions were found to be associated with it.

Losses from the two smuts are shown in Tables 20 and 21.

Table 20. Losses from covered smut of barley as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
10	Maryland	1.0	Kansas, Colorado
3	Virginia	0.5	Texas, Nebraska
2.	Minnesota, Montana	0.3	Michigan
1.5	South Dakota	Trace	Wisconsin

Table 21. Losses from loose smut of barley as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
3.0	Kansas	1	Maryland, Virginia, Texas, Montana, Nebraska
2.5	Minnesota	0.5	Connecticut
2.0	Wisconsin	0.1	Michigan
1.5	South Dakota	Trace	Delaware, Missouri

STEM RUST (*Puccinia graminis*).

Table 22. Losses from stem rust of barley as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
0.5	Texas, Michigan, Minnesota, Iowa	0	Indiana, Montana
0.3	Nebraska	Trace	Maryland, Kentucky, Kansas, Wisconsin, Colorado, Wyoming, North Dakota, South Dakota, Nebraska
0.1	Ohio		

STRIPE (Helminthosporium gramineum).

Table 23. Losses from stripe of barley as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
1	Virginia, Wisconsin, Montana	Trace	Maryland
0.5	Michigan, Minnesota, South Dakota, Nebraska, Kansas		

SCAB (Gibberella saubinetii). In 1930, scab was much less prevalent on barley than during 1928 and 1929. The only appreciable loss reported was 2.5 per cent from Wisconsin. In other States reporting the loss did not exceed a trace.

SCALD (Rhynchosporium secalis) was said to be more prevalent than usual in Wisconsin. It became noticeable at about the beginning of July when hot weather started. The loss was estimated at 2 per cent. It is usually fairly abundant in northwestern Kansas, but only the barest traces were observed in 1930, and most fields seemed to be free.

BACTERIAL BLIGHT (Bacterium translucens) was of considerable importance locally in Minnesota. Twenty to sixty per cent damage was observed in fertilizer plots at Kenyon. The loss for the State was two per cent.

FOOT ROT (Helminthosporium sativum) was common and serious in many fields inspected in Montana.

O A T S

SMUTS (Ustilago avenae and U. levis). The accompanying maps, Figures 12 and 13, show the percentage reported during 1930, and the average for the period 1920 to 1929. Increasing amounts of smut have been reported from certain sections of the Middle West during the last few years. Thus, in Missouri and Kansas, losses reported from 1919 to 1927 had not exceeded 4 per cent. In Missouri, the loss in 1927 was 5 per cent, in 1928 6 per cent, and 1929, 11 per cent. In 1930, 8 per cent loss was estimated, less than in 1929 but still decidedly more than in other years. In Kansas, the loss jumped from only 0.5 per cent in 1925 to 1927, to more than 5 per cent in 1928 and 1929. In 1930, it increased again to 6 per cent. Fulghum and Kanota often were badly smutted. The increased amount of smut in Kansas is believed to be due to the development of some new physiologic strains able to attack varieties hitherto regarded as resistant, together with neglect of seed treatment. In Arkansas, smut was considerably more destructive in 1930 than it had been in recent years. Losses from both smuts are shown in Table 24.

Table 24. Losses from loose and covered smuts of oats as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
10	Massachusetts, Arkansas	3	Wisconsin, Minnesota
8	Missouri	2.5	South Dakota
7	Maine	2	South Carolina, Indiana, Michigan, Texas, Nebraska
6	Kansas, Montana	1	Colorado
5	Maryland, Florida	0.1	Georgia
4	New York, Virginia	Trace	North Carolina, Delaware

STEM RUST (Puccinia graminis) was of unusually slight importance on oats. No loss greater than 1 per cent was reported. The first record of stem rust of oats in the Palouse Country was reported by F. D. Heald, who stated that a field of Markton oats on the College Farm at Pullman, Washington, showed at least 10 percent of the culms infected at harvest time.

Table 25. Losses from stem rust of oats as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
1	Connecticut, Texas	0.1	Ohio
0.5	Michigan, Minnesota	Trace	Massachusetts, Wisconsin, North Dakota, South Dakota, Nebraska, Kansas, Maryland, Arkansas, Montana, Wyoming
0.3	South Carolina		
0.2	Iowa		

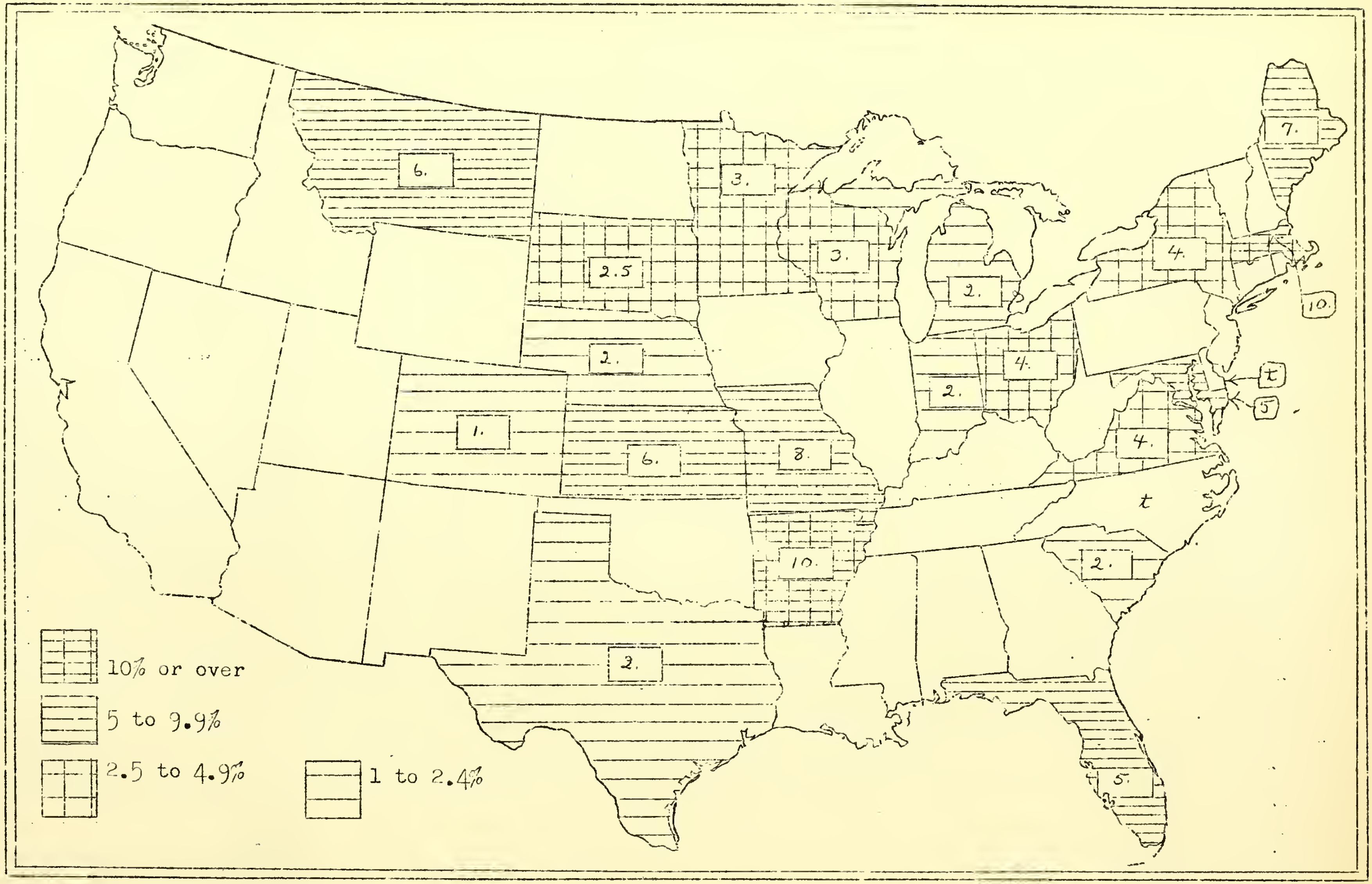

Figure 12. Estimated percentage losses from oat smuts as reported by collaborators, 1930.

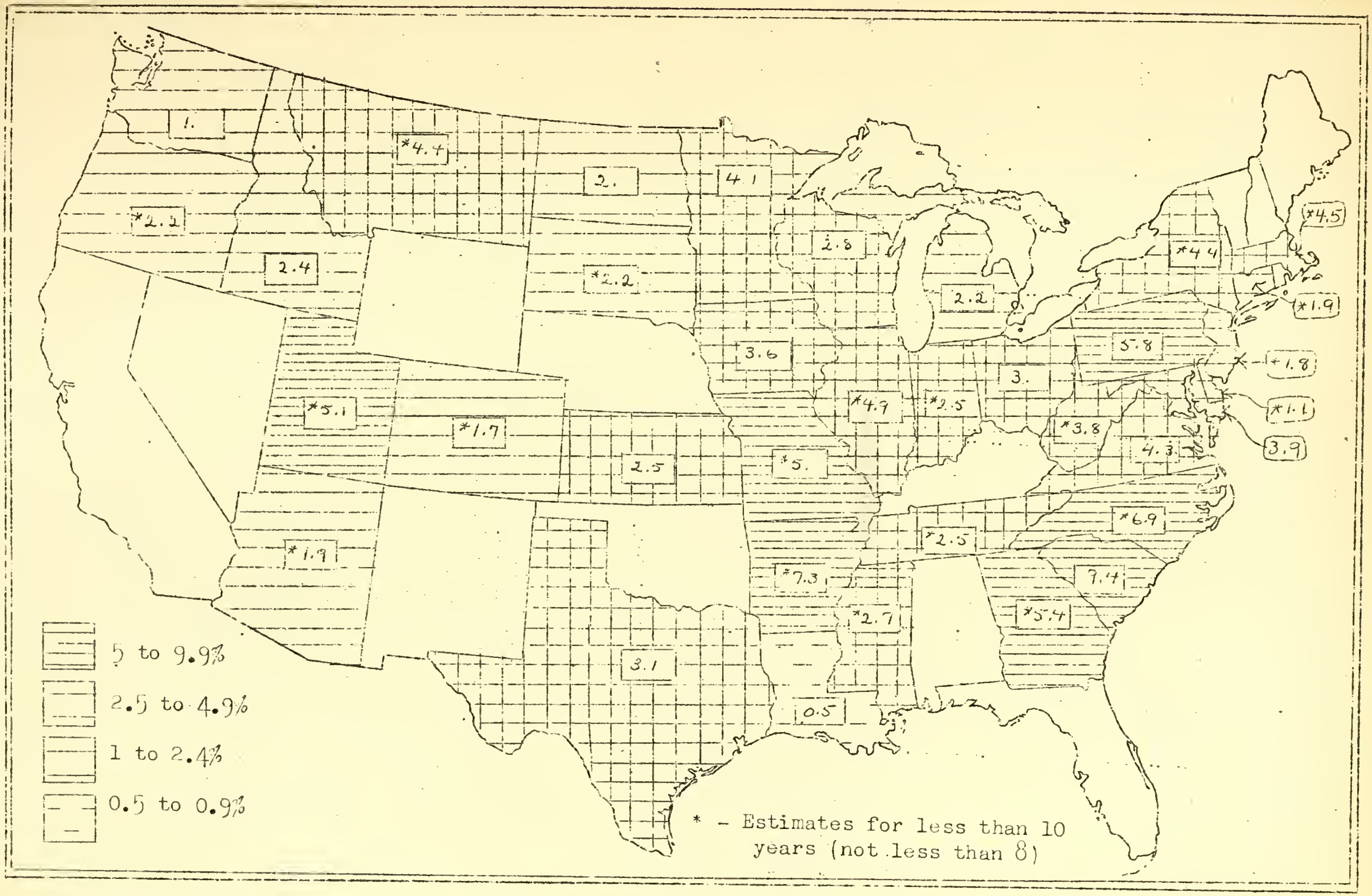

Figure 13. Percentage losses from oat smuts for the period 1920 to 1929.

CROWN RUST (Puccinia coronata).

Table 26. Losses from crown rust of oats as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
30	Florida	0.5	Maryland, Missouri
3	Georgia	0.3	Wisconsin
2	Maine, Texas	Trace	Massachusetts, Connecticut Delaware, Michigan, Minnesota, South Dakota Nebraska, Arkansas
1	Virginia, Kansas		

HALO BLIGHT (Bacterium coronafaciens) was very severe on certain varieties in experimental plantings at Manhattan, Kansas. At Bonners Ferry, Idaho, the variety Garton was badly infected, the stand being reduced materially. It was found only on this variety.

BLAST (Undet.) was severe in Kansas where it caused a loss of 5 per cent. The variety Kanota, which is usually rather free from blast, often showed considerable amounts in 1930.

CRINKLE JOINT (Undet.) was reported on oats from Nebraska.

C O R N

SMUT (Ustilago zeae) occurred in about the normal amounts or more as shown in Figures 14 and 15. Dry hot weather in New York seemed to favor the disease. In West Virginia, one of the States worst affected by the drought, smut was much more prevalent than usual. C. R. Orton reported that "Corn smut was severe in the State, not being adversely affected by the drought at least in the mountainous sections." Smut was more prevalent in the drier parts of Minnesota than in sections with heavy rainfall. It was also more important in central and western Kansas than in the more humid areas of the State. On the other hand, in Georgia there was more than usual but it developed mostly before the drought started. In Texas it became noticeable only after the severe drought of the early part of the season was broken. The disease was said to be increasing in severity in many of the sweet corn growing sections of New Jersey. New York and Minnesota also mentioned it as being most destructive to sweet corn. In Minnesota it has been found that any fertilizer inducing greater vegetative growth results also in more smut. Phosphate fertilizers in general give much less smut. Losses caused by smut are shown in Table 27.

Table 27. Losses from corn smut as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
5	West Virginia	1.5	Wisconsin, Minnesota
3 to 4	Minnesota (sweet corn)	1.	Delaware, Florida, Arkansas, Texas
3	Virginia, Gerogia, Illinois, South Dakota, Nebraska, Georgia	0.5	Indiana, Missouri
		0.3	Maryland
2 to 3	New York (sweet corn)	Trace	Michigan, North Carolina, South Carolina, Louisiana, Montana
2.2	Massachusetts		
2.	Connecticut		

DRY ROT (Diplodia zeae). Losses due to dry rot were reported as 5 per cent in Florida, 4 per cent in Indiana, 1.25 per cent in Missouri, 1 per cent in Kansas, and traces in Maryland and South Dakota. Dry rot was more prevalent than usual in Florida and Indiana. In the latter State dry weather permitted spore development and spread of the organism, according to J. F. Trost. Most collaborators, however, reported less than usual due to lack of moisture. In Florida, besides Diplodia zeae, D. macrospora and D. frumenti are also present, but most of the damage was caused by D. zeae. Early planted and early maturing strains were said to be susceptible in Indiana, while late maturing strains were very resistant.

ROOT ROTS AND EAR ROTS (caused by various fungi). Gibberella saubinetii, Fusarium moniliforme, Fusarium spp., and Pythium spp. were reported as associated with root and stalk rot and seedling blight. Less damage than usual was reported in most sections. However, L. E. Melchers reported that because of the severe drought it was impossible to determine the actual prevalence of root rot in Kansas. This may have been the case in other States also. Injury was said to be most severe to sweet corn in New Jersey, Delaware and Minnesota. In Minnesota the root rot of sweet corn occurs largely in spots which usually show potassium deficiency. When potash fertilizers are applied less root rot develops. North Carolina also reported successful control of the stalk, root and ear rot due to Fusarium moniliforme by the use of potash fertilizers. Losses reported are listed in Tables 28 and 29. The estimates for ear rot include losses from Diplodia zeae.

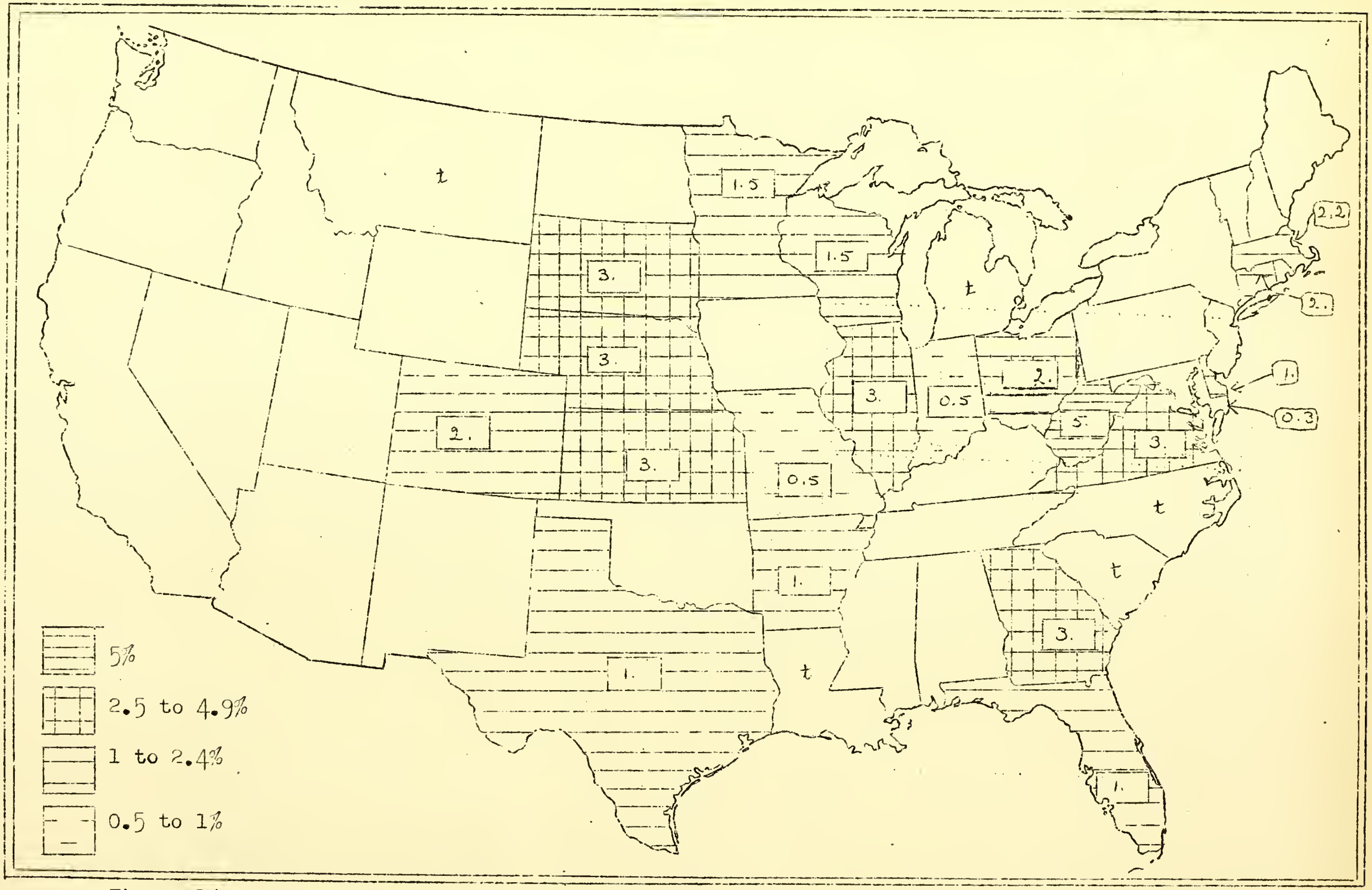

Figure 14. Estimated percentage losses from corn smut as reported by collaborators, 1930.

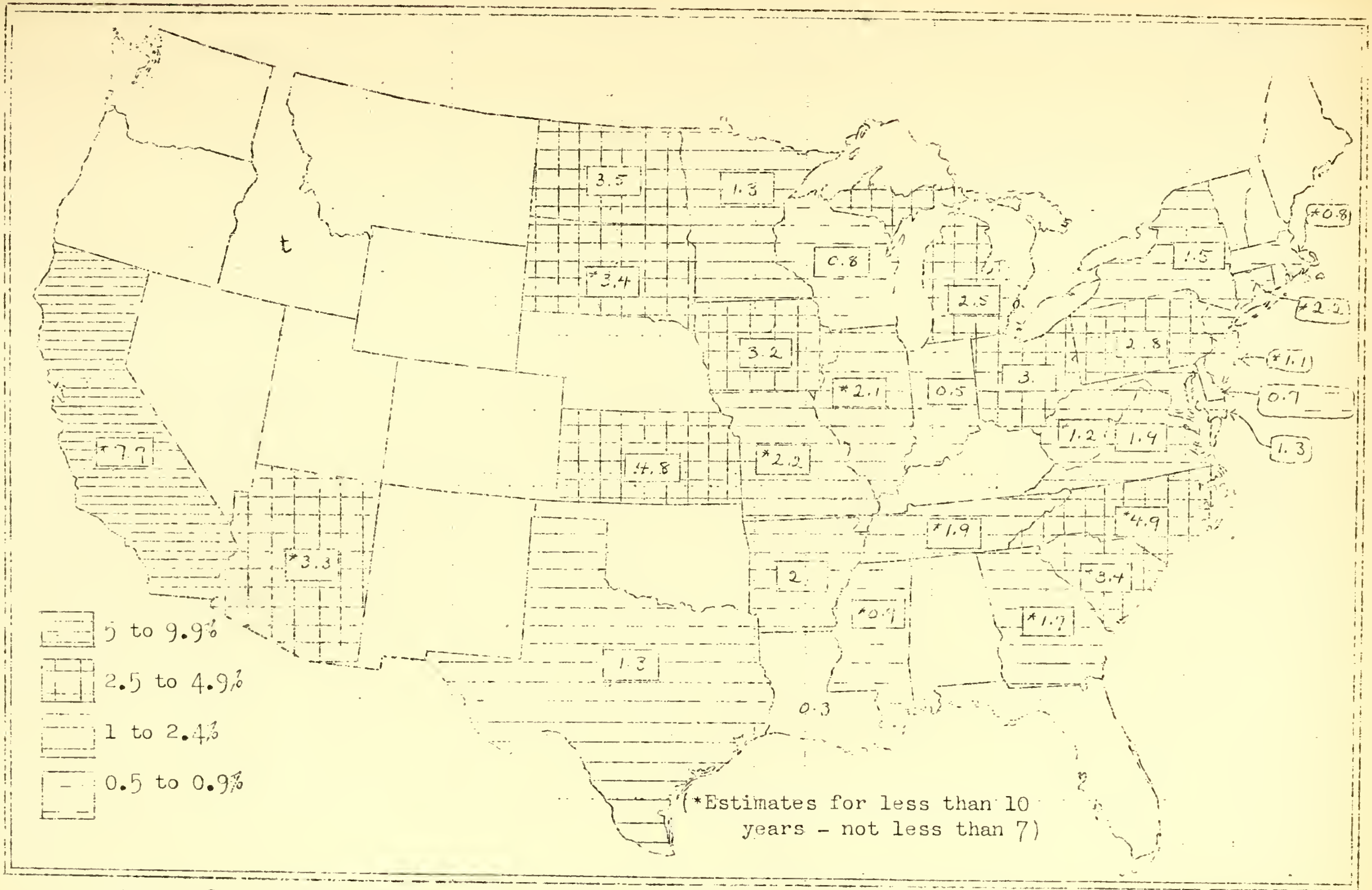

Figure 15. Percentage losses from corn smut for the period 1920 to 1929.

Table 28. Losses from root rot as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
7	Maryland	1.5	Indiana
5	Florida	1	Delaware, South Carolina
3	Kansas, Virginia	0.5	Wisconsin, South Dakota
2	Texas	Trace	Michigan, Missouri, Nebraska

Table 29. Losses from ear rot as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
8	Texas	2	Maryland
6	Louisiana	1.25	Missouri
5	Florida, South Carolina	1	Delaware, Georgia, Kansas, Nebraska
4	Indiana	0.5	South Dakota
3	Virginia	0.1	Wisconsin

BACTERIAL WILT (Aplanobacter stewartii) was reported from New Jersey, Pennsylvania, Maryland, West Virginia, Texas, Ohio, Indiana, Michigan, Missouri, and for the first time from California where it occurred on Golden Bantam in a garden in San Diego County. It was much more prevalent than usual in West Virginia and Indiana, the losses reported being 2 to 3 per cent in West Virginia, and 1 per cent on susceptible varieties in Indiana. As much as 80 per cent infection was observed in the latter State. In West Virginia observations indicated that the disease was seed-borne. Some fields in New Jersey showed severe injury but in general there was much less than in 1929. There seemed to be a correlation between flea-beetle injury and bacterial wilt in that State. As usual Golden Bantam was generally reported to be very susceptible. Other very susceptible varieties mentioned were Aristrocrat, Golden Sugar, and White Cob Cory in West Virginia. Evergreen, Narrow Grain, and Country Gentlemen were said to be immune in Indiana.

BACTERIAL STALK ROT (Bacterium dissolvens) was reported for the first time from West Virginia where it caused even greater damage to sweet corn than the bacterial wilt. The total loss for the State was 5 per cent, but some fields showed complete infection. Apparently this organism also is seed-borne. The varieties Golden Acre, Golden Sunshine, Golden Bantam, Make Good, and Primo Extra Early were very susceptible (C. R. Orton and E. C. Sherwood). In Arkansas extreme drought probably reduced this disease in 1930 to a point where it was not reported for the first time in about eleven years (H. C. Rosen).

BROWN SPOT (Physoderma zeae-maydis) was reported from North and South Carolina, Georgia, Florida, Louisiana, and Arkansas. In Georgia it was found in every field examined but in smaller amounts than usual. Loss estimates are 3 per cent in Florida, 1.5 per cent in Georgia, and a trace in Arkansas.

LEAF BLIGHT (Helminthosporium turcicum) was reported from Massachusetts and Florida. In Florida it was very severe on all varieties grown on the Experiment Farm. It appeared late and in some cases caused premature death. In one field observed in Massachusetts, one-half which was planted to dent corn was free, while the other half in Golden Bantam was infected. Stowell's Evergreen was also said to be susceptible in Massachusetts. Helminthosporium sp. was abundant on leaves of corn in the drought area of North Carolina.

LEAF SPOT (Ophiobolus heterostrophus) was not as common and destructive in Florida as the Helminthosporium leaf blight but was nevertheless prevalent.

ROOT KNOT (Caconema radicicola). Field corn grown on infected soil near Cameron, North Carolina, was attacked and some plants were stunted, probably from the infection (R. F. Poole).

MOSAIC (virus) was less prevalent than usual in Louisiana. The highest infection observed in the field was 5 per cent. This disease is scattered in distribution and is usually of only slight importance (E. C. Tims).

DROUGHT INJURY. A number of collaborators estimated the loss due to drought. These are: Kentucky and Arkansas 60 per cent, Delaware 15 per cent, South Dakota 14 per cent. Valleau in Kentucky reported that "All of the corn on the Experiment Station farm was cut soon after blooming as it failed nearly completely to set a crop. Seed corn will be very scarce over the State because of the drought. The plants made excellent growth but at blooming time the top leaves and tassels turned white and appeared scorched."

DISEASES OF FORAGE CROPS

ALFALFA

Bacterial Wilt (Aplanobacter insidiosum). In 1930, it was reported from Massachusetts and from Wyoming for the first time, although there was evidence that it had been present in both States for several years. In Massachusetts it was found to occur in all the seven counties surveyed. Injury varied in amount from a trace in young fields to from 50 to 90 per cent in older plantings or in young stands reseeded after previous alfalfa crops. The total loss was estimated at 5 per cent. The disease is beginning to cause concern in western Ohio. In Illinois wilt was more important than usual. It was present in most two-year old and in all three-year old fields examined, and contributes to the death of the field after the second year. In Wisconsin wilt was much less prevalent than usual. In Kansas this disease was said to be the chief factor in the reduction of approximately 150,000 acres from the area planted to alfalfa ten years ago. The results of an extensive survey of the important irrigated alfalfa sections of Wyoming showed that bacterial wilt is widespread and very destructive. The annual loss from the disease probably reaches 15 to 20 per cent of the entire crop, considering the number of fields affected, the percentage of infection in the fields, and the loss due to ploughing up poor stands earlier than would otherwise be necessary. Wilt has been on the increase in southern Idaho for several years and has eliminated all of the older stands from the western part of Twin Falls County along the Snake River Valley to the Oregon line. In 1930, however, it was not as prevalent or as severe as previously and field observation indicated that the severe damage of the last four or five years was associated with winter injury. Wilt occurred wherever alfalfa was grown in Colorado. In California the disease is restricted in distribution. There was more than usual in 1930.

An interesting feature with regard to this disease was the report by F. R. Jones of his isolation of an identical or very closely similar organism from roots of alfalfa collected in Turkestan by Westover in November, 1929. Inoculations with this organism produced typical disease symptoms in the greenhouse. (P. D. R. 14: 125) (P. D. R. 14:56, 9, 125, 200, 224, 225).

Yellow Leaf Blotch (Pyrenopeziza medicaginis) is the most common and widespread leaf spot of alfalfa in Kansas. The loss in 1930 was estimated at 5 per cent.

Bacterial Blight (Bacterium medicaginis) was observed in North Carolina this year for the first time. It was found on plants from the test farm at Statesville. (R. F. Poole).

Leaf Spot (Pleosphaerulina briosiana). Rather heavy infection in Georgia in April, about 10 per cent of the leaves, which is unusual. (J. H. Miller).

Root Rot (Phymatotrichum omnivorum) was severe as usual in Cameron and Hidalgo Counties in Texas. The loss was estimated at 10 per cent.

Rust (Uromyces medicaginis). A general epiphytotic occurred throughout the southern two-thirds of Illinois in the fall, dwarfing growth severely. (L. R. Tehon). Also reported from Texas.

Winter injury caused losses reported at 7 per cent in Missouri, 4 per cent Texas, and 3 per cent in South Dakota. Damage from freezing was reported also from Arkansas, Wisconsin, Nevada, and Washington.

Albinism (probably genetic) was again reported from Montana. A new feature was its observation on the second crop. (P. D. R. 14:225).

Fasciation (undet.) This abnormality does not seem to be common on alfalfa. The first report to the Survey was from Montana in 1930. (P. D. R. 14:182).

C L O V E R

Powdery mildew (Erysiphe polygoni) was rather generally reported as less prevalent than usual. In Missouri less was observed than had been seen for the past eleven years, probably due in part to the drought and the hot summer. Some fields in New Jersey showed severe infection. In North Carolina the disease was very abundant on red and alsike clover.

Leaf spot (Cercospora medicaginis). A specimen of crimson clover affected by this fungus was received from Tennessee. This seems to be the first report from the State.

S W E E T C L O V E R

Stem rot (Corticium vagum) affected 75 per cent of the plants in one field of yellow sweet clover in Montana. A 50 per cent infection was observed in a field of yellow sweet clover in Massachusetts, but it appeared too late to cause much loss. Also reported from North Carolina on white sweet clover. (P. D. R. 14:125).

Bacterial wilt (undet.) occurred on yellow and white sweet clover in Ohio. (P. D. R. 14:115).

Wilt (undet.) Kentucky. (P. D. R. 14:115).

Ring spot (virus of tobacco ringspot). About 30 per cent of the plants severely affected in a quarter-acre field of white sweet clover in Montana. This is the first report of ring spot on sweet clover to the Survey. (P. D. R. 14:125).

C O W P E A

Blight (Botrytis sp.). New Jersey. This is the first report to the Survey of Botrytis on cowpeas.

Wilt (Fusarium sp.) was general in Virginia and caused the death of about 2 per cent of the plants. F. tracheiphilum was reported from Texas.

S O Y B E A N

Bacterial Blight (Bacterium sojae) was reported from Massachusetts for the first time. It was observed in a seed source plat on a farm in Franklin County, and in the variety plats on the college farm, Amherst.

Wilt (Sclerotium rolfsii) was severe in Virginia where it caused a loss of 10 per cent. Greatest damage occurred shortly after a heavy rain that followed a drought. It was also reported from Louisiana.

V E T C H (Vicia spp.)

Leaf spot (Pleosphaerulina briosiana) was reported from Georgia on Vicia monantha, which seems to be a new host for the fungus.

Downy mildew (Peronospora viciae) occurred in agronomy plats at Athens, Georgia, on a hybrid between Vicia angustifolia and V. villosa. The hybrid was just covered with downy mildew while the other varieties were not touched. This is rather interesting because the mildew is rather common on the wild V. angustifolia but very rare on V. villosa, and the cross is infected much worse than either parent. (J. H. Miller).

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

A P P L E

Scab (Venturia inaequalis). This disease was generally somewhat less severe than in 1929. In most Northeastern States and in Michigan, Indiana, Nebraska, and Kansas, it was equally as prevalent or more so than usual but in the Middle Atlantic and most Mid-Western States, where apples are grown at all commercially, and in California, the disease was less or much less prevalent than in 1929. In New York and New England unsprayed fruit of susceptible varieties became very badly affected with scab due to the general infection of the leaves during the spring when the weather was favorable for the early maturity, discharge, and germination of the ascospores and periods of rainy weather favorable for infection. Even the hot dry weather of summer did not prevent the development of scab on the fruit in the extreme Northeast. However, good spraying protected even susceptible varieties very satisfactorily under the prevailing weather conditions. South of Pennsylvania and New Jersey the drought, which began rather early in the spring and continued with increasing severity prevented scab infection generally. This is well shown in Figures 16 and 17.

Observations on the development of ascospores were made in twelve States and eight of these reported an earlier development than has occurred for from two to several years. (P. D. R. 53-57, 62, 66, 73-74, 83-84).

Table 30. Losses from apple scab as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
29	Maine	2	Connecticut, Maryland, North Carolina, Minnesota, Missouri
15	Pennsylvania		
12	Wisconsin	2 to 3.5	Illinois
10	New Jersey	1	Delaware, Georgia, Ohio, South Dakota
5 to 10	New York		
		0.5	Virginia
5	Massachusetts, Michigan	Trace	Kentucky, Arkansas, Montana, Nebraska
3	Indiana		

See also P. D. R. 14: 85, 106-107, 116, 126-127, 156, 172, 215, 226.

Blotch (Phyllosticta solitaria). Blotch was less prevalent throughout the country than usual. Delaware is the only state reporting more than usual and there the loss was slight. Apparently dry weather held it in check although the high temperature that prevailed during the summer was favorable for its development. Nevertheless, as high as an 80 per cent infection is reported from one orchard in Virginia and a 25 per cent infection from one in West Virginia. The spray program kept the disease under control in commercial orchards. P. D. R. 14:126.

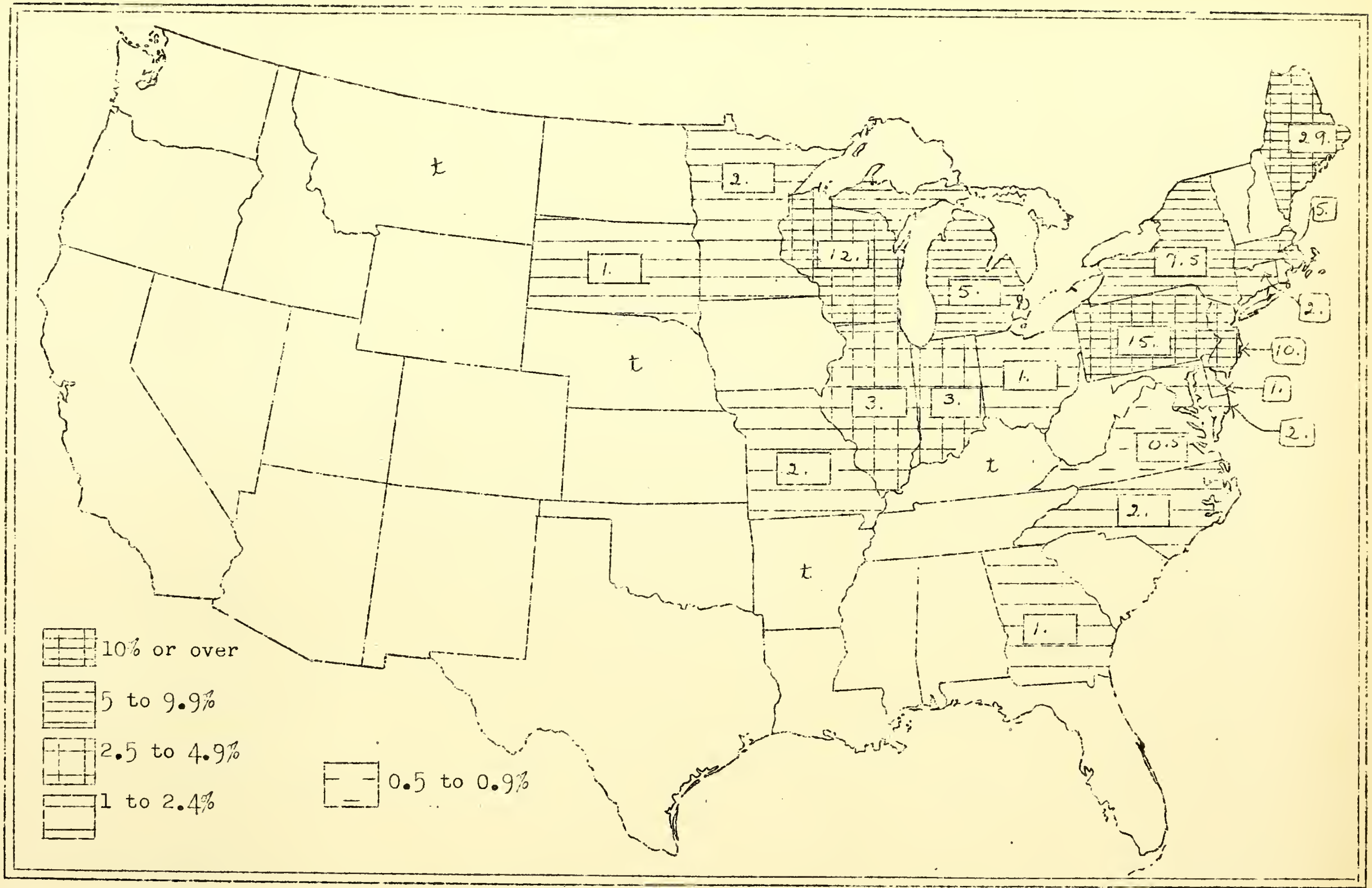

Figure 16. Percentage losses from apple scab in 1930 as estimated by collaborators.

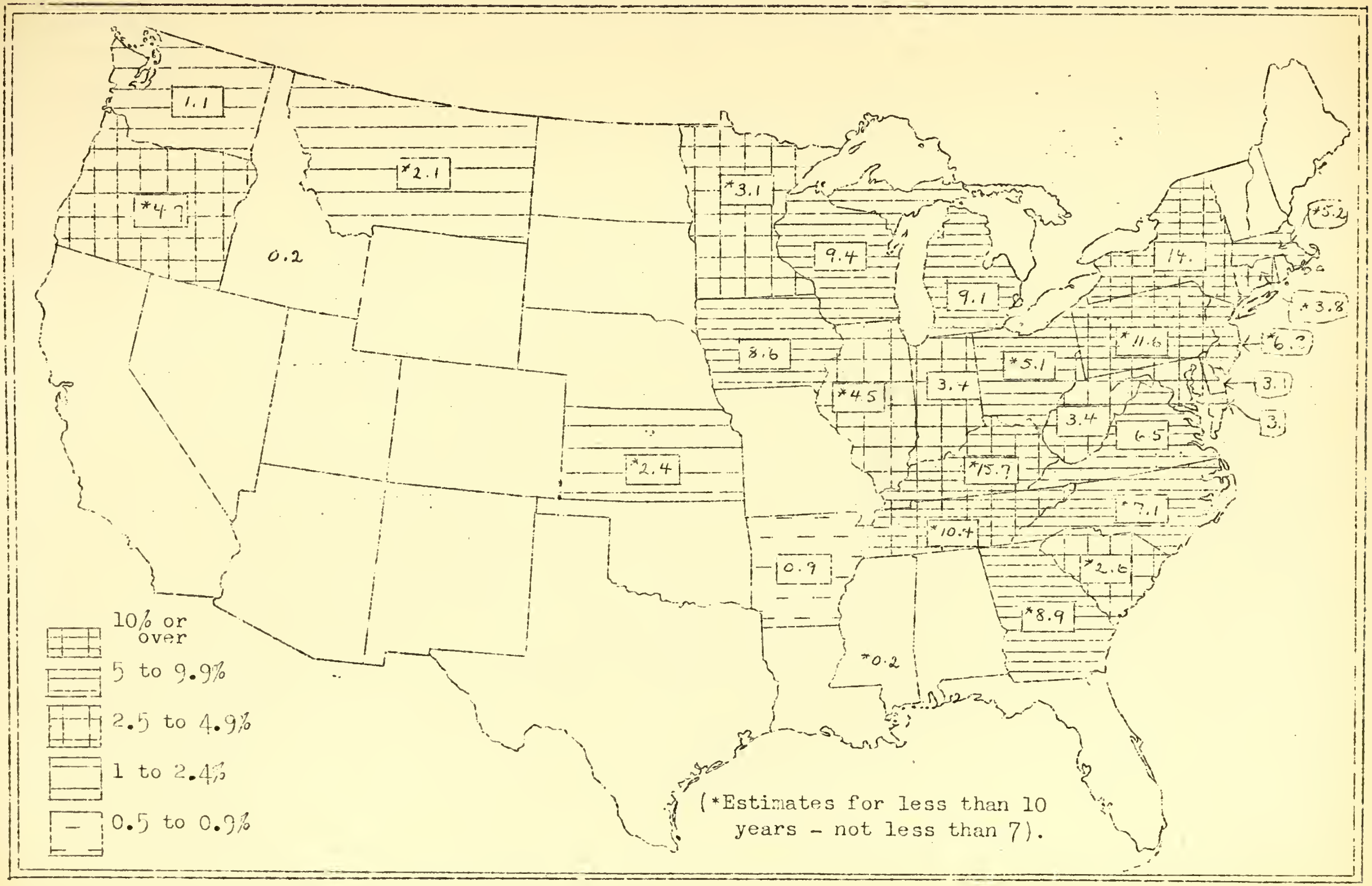

Figure 17. Percentage losses from apple scab for the period 1920-1929.

Table 31. Losses from blotch of apples as estimated by collaborators, 1930.

Percentage: loss	States reporting	Percentage: loss	States reporting
5	Illinois	0.1	Georgia, Ohio, Indiana
3	Kansas, North Carolina	Trace	Massachusetts, New Jersey, Virginia, West Virginia, South Carolina, Kentucky, Michigan, Wisconsin, Minnesota, South Dakota.
2	Missouri		
1 to 2	Texas		
0.5	Delaware, Maryland		

Apple Rust (Gymnosporangium juniperi-virginianae). Favorable spring weather permitted the exudation of the telial horns so that the rust on the leaves, and in some cases on the fruits, of susceptible apples was as prevalent as usual. New Jersey, Delaware, and South Dakota report greater prevalence while the South Atlantic States report less than usual and Arkansas much less. Infections were general and heavy in Alabama with red cedars usually nearby. New York reports greater severity locally of the rust diseases than in 1929 but considerably less than in 1927 and 1928. The loss, in general, was small, due very likely to the dry weather which later prevailed. P. D. R. 107, 126, 156, 184, 214-215.

Table 32. Losses from rust of apple as estimated by collaborators, 1930.

Percentage: loss	States reporting	Percentage: loss	States reporting
5	Minnesota	0.5	Connecticut, New Jersey, Maryland, Arkansas
4	South Dakota	0.1	Georgia
2	Massachusetts, North Carolina, Missouri	Trace	Maine, Delaware, Virginia, West Virginia, Michigan, Wisconsin
1	Nebraska		
0-1	New York		

Quince Rust (Gymnosporangium germinale). This rust is reported from New York as being more prevalent on apple fruit than apple rust but not severe. See P. D. R. 14: 214 for a discussion of affected varieties and prevalence in that State. It was said to be less prevalent than last year in Indiana where it usually is of only moderate importance. It occurs in the Piedmont area of North Carolina but causes much greater injury to cedars than to apples.

Hawthorn Rust (Gymnosporangium globosum). New York reports this rust as being rather generally prevalent in the eastern part of the State but slight on most apple varieties. See P. D. R. 14: 214-215 for list of affected varieties. Mississippi reports it as occurring on apples in Lauderdale County.

Black Rot (Physalospora malorum). Of the twenty-two States reporting this disease, Virginia, North Carolina, Georgia, Arkansas, Indiana, Wisconsin, and Missouri indicate that it was less or much less prevalent than usual, while eleven other States indicate that it was of equal or greater prevalence. In only one State was the loss reported to be greater than one per cent and in most States it was less. In Delaware the heaviest outbreak on fruit ever observed occurred although the total loss was small. Greater loss was caused by defoliation than by fruit rot in Georgia. In Alabama black rot was common in most orchards on leaves near old branches blighted by Bacillus amylovorus in which the fungus overwintered. It was general in Kansas on leaves of even well sprayed orchards but not prevalent on fruit.

Table 33. Losses from black rot of apples as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
5	Maryland	0.1	Georgia, Ohio
1	Connecticut, Virginia, South Carolina, Minnesota, Missouri	Trace	Massachusetts, New Jersey, North Carolina, Arkansas, Illinois, Michigan, Wisconsin, South Dakota, Nebraska
0.5	Delaware, Texas		

Also reported from New Hampshire, Kentucky and Nebraska. P. D. R. 74.

Bitter Rot (Glomerella cingulata). This disease, usually of slight or moderate importance, was even less prevalent this year. Delaware and South Carolina were the only States in which it was as prevalent as in 1929, while in all the other States reporting on its occurrence, it was less or much less prevalent, or not seen at all. The losses reported are: South Carolina 5 per cent, Maryland and Missouri one per cent and the other States 0.1 per cent or a trace. P. D. R. 126, 156, 172.

Blight (Bacillus amylcvorus). This disease, for the past few years of slight or moderate importance in most States, was unusually prevalent during 1929 and 1930. During the latter year it was even more important than in 1929, except in Massachusetts, Mississippi, and Minnesota where it was less. It was very severe in Central and Eastern New York. In Pennsylvania, the collaborator reports a trace to severe infection in every orchard seen. Blossom blight was very prevalent and destructive in many parts of Kentucky. There was a severe and widespread epidemic on various apple varieties in Arkansas where the disease is said to have been more destructive than in any year for which there are records. There is evidence that it was equally prevalent in the Ozarks of Missouri. One Oklahoma grower reported a loss of five hundred dollars in one small orchard. It was present in Washington and was much more prevalent in California than in 1929. Blight, in most localities, first affected the blossoms, in some cases so generally that the crop was reduced or lost entirely. Later twig blight did considerable damage. P. D. R. 85, 107-108, 116-117, 127, 155, 156, 172.

Table 34. Losses from blight of apples as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
15	Georgia	1.5	New Jersey
10	North Carolina, Texas	1	Maryland, Michigan, Wisconsin
5	Arkansas, Missouri	Trace to 1	New York
2.5	Illinois	0.5	South Carolina
2	Ohio, Indiana, Minnesota, South Dakota	Trace	Massachusetts, Delaware, Montana

BITTER PIT OR STIPPEN. Of the ten States reporting this disease, four, New Jersey, Delaware, Maryland, and North Carolina, indicated that it was more prevalent than in 1929 and one, Wisconsin, that it was less prevalent. Connecticut and North Carolina report it as being unusually common on heavily fruited trees. In Indiana it was serious on Grimes which, this year, had a light crop. There are several reports from Massachusetts of heavy development of bitter pit in storage.

INTERNAL BREAKDOWN. Was reported from Virginia and West Virginia as being much more prevalent than usual especially on Ben Davis and Gano, and appearing late. In Indiana it occurred in the early part of the storage season. Breakdown was also reported from Washington.

DROUGHT SPOT was more prevalent than usual in Delaware where it was very common on Ben Davis. This trouble was also reported from Kentucky and Washington. Two cars of Rhode Island Greening shipped to New York from Vermont showed 50 per cent internal browning and several cars of this variety from New York showed as high as 7 per cent. P. D. R. 15: 16.

WATER CORE. This also appeared to be more prevalent than usual in most of the five States reporting its presence. In Delaware it was very common on early varieties. In Virginia it was observed in severe form on drought-affected Winesap and Stayman Winesap trees as well as on well-watered ones. It was much more prevalent than usual in West Virginia where it caused a loss of 5 per cent of the crop, and 40 per cent affected fruit was observed in one orchard.

WINTER INJURY. Rather severe injury occurred to apple trees in the Midwestern States of Indiana, Illinois, Missouri, and Arkansas, and in Kentucky. Some injury was also reported from Washington. The varieties most affected are Delicious, Stayman Winesap, Jonathan, Grimes Golden, King David, Rome Beauty, and Collins. Ben Davis was injured in some orchards and in others appeared to be resistant. The injury, for the most part, occurred in orchards up to ten years of age and especially in those in which late growth had been stimulated. In one Arkansas orchard pruning just previous to the freeze of January 15 resulted in a large percentage of injured trees. Most of the injury reported consisted in a splitting of the bark of the trunk on the south side, sometimes extending nearly around the tree, and, in some cases, injury to the branches, twigs, and buds was reported. In a young orchard in Indiana, only the trees that blossomed were sprayed and these were the only ones that recovered from the bark injury; the injured ones, not sprayed, whose leaves had been badly scabbed, failed to heal well. A collar rot type of winter injury killed 10 per cent of single-worked Grimes Golden and some double-worked trees in southern Indiana. P. D. R. 49-52, 62-65, 71-73.

Drought: caused a marked reduction in size of fruit in southern New Jersey. In Maryland the loss directly due to drought was estimated at 35 per cent. Fruit drop, premature ripening, poor quality, and greatly reduced yields were results of dry weather in Arkansas where both drought and low winter temperatures caused widespread tree injury. The extent of the injurious effect of the prolonged drought will probably not be fully realized until the spring and summer of 1931.

PEAR

Blight (Bacillus amylovorus). Of twenty-four States reporting this disease was more prevalent than usual in five States, less prevalent in five. It was very common and severe in Pennsylvania and North Carolina, severe in Georgia on standard varieties other than Pineapple, common in most of the old groves in Florida. Severe epidemics were reported from California and eastern Texas. In California 75 per cent of the blossoms were blighted on some trees, and the death of entire trees was common. Trees in remote locations were badly affected. Infection took place about April 15, became evident about April 20, and spread rapidly until by April 28 all parts of the State except two or three localities were involved. In a number of States freezing of the blossoms obscured the effects of blight. In Nebraska the disease was rather serious in the spring. In Michigan serious outbreaks occurred early in the spring but were checked later by the severe drought. This was probably true in other States also. Losses are given in Table 36. P.D. R. 155, 157.

Table 36. Losses from blight of pears as estimated by collaborators 1930.

Percentage loss	States reporting	Percentage loss	States reporting
18	North Carolina	4	Maryland
15	South Carolina, Florida, Texas, California	3	Michigan
10	Virginia, Illinois	1.5	Delaware
6	Missouri	1.	Massachusetts, Ohio
5	Louisiana	.5	Connecticut
		Trace	Kentucky, Wisconsin

Scab (Venturia pyrina). In general, this disease was less prevalent than last year, although in Connecticut and Michigan it was equally as prevalent. A 5 per cent loss in Wisconsin was reported, 2 per cent in Maryland, 0.5 per cent in Connecticut, and a trace in Virginia, North Carolina, Ohio and Michigan. It occurred in New Jersey, Kansas, and Washington. In California it was absent or negligible. Massachusetts reports a 50 per cent infection on the fruit of a few Kieffer pear trees, a variety seldom affected by scab. P. D. R. 117.

Leaf Blight (Fabraea maculata). This disease was reported to be of relatively little importance. In Louisiana three Pineapple pear trees at the Hammond Station were affected so severely that they were almost completely defoliated by the end of June. This is apparently the first time it has been reported in Louisiana. The loss amounted to 5 per cent in Florida, 3 per cent in Delaware and Maryland, 0.5 per cent in Connecticut, traces in other States.

Rust (Gymnosporangium germinale). Texas P. D. R. 14: 182.

Sooty Blotch (Gloeodes pomigena). First report from Connecticut to the survey. This disease is not very commonly reported on pears.

Black Rot (Physalospora malorum). North Carolina, Florida, California. P. D. R. 201.

WINTER INJURY (Non-parasitic). Washington, severe. P. D. R. 14: 172.

Root and Crown Rot (Undet.) occurs locally in Washington, St. Tammany, and Tangipahoa Parishes in Louisiana. This disease is either a new one for Louisiana or it has become more noticeable beacuse of the increased planting of pears in recent years. It was brought to the attention of this Department two years ago from Covington. (A. G. Plakidas).

Q U I N C E

Blight (Bacillus amylovorus). More prevalent than usual in the States reporting, New Jersey, Pennsylvania, Delaware and Texas. P. D. R. 127.

P E A C H

Brown Rot (Sclerotinia fructicola). The reduction in the amount of brown rot from 1929 is shown by the fact that in 1929 eleven States, and in 1930 only two, reported losses of 5 per cent or over. The situation with respect to the average year is indicated by Figures 18 and 19. Blossom blight killed 100 per cent of the blossoms of some varieties in Cumberland County, New Jersey, and there was also a heavy loss in Cape May County. In Delaware twig infection was observed to be very common as early as May 7. In California the disease was more prevalent than usual and ripe fruit rot in orchards where no fruit was picked may become a factor next season. In the Middle West, as a result of winter killing, there was little if any fruit to be affected. (P.D.R. 117, 156).

Table 37. Losses from brown rot of peaches as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
12	Massachusetts	2	Ohio
5	North Carolina	1	Connecticut, Illinois.
4	Florida	0.5	Delaware, Georgia, Texas
3	New Jersey, Maryland South Carolina	Trace	Virginia, Arkansas, New York, Michigan.

Leaf Curl (Exoascus deformans). The only State reporting a loss greater than one per cent was Ohio with 3 per cent. In Indiana there was said to be less leaf curl than in any other season during the past five years. In Arkansas it was almost entirely absent.

Scab (Cladosporium carpophilum). P. D. R. 156.

Table 38. Losses from peach scab as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
10	Florida	0.5	Connecticut, New Jersey, Delaware, Ohio, Missouri
4	Texas	0.1	Georgia
2	South Carolina	Trace	Massachusetts, New York, Virginia, Arkansas, Wisconsin
1	Maryland		

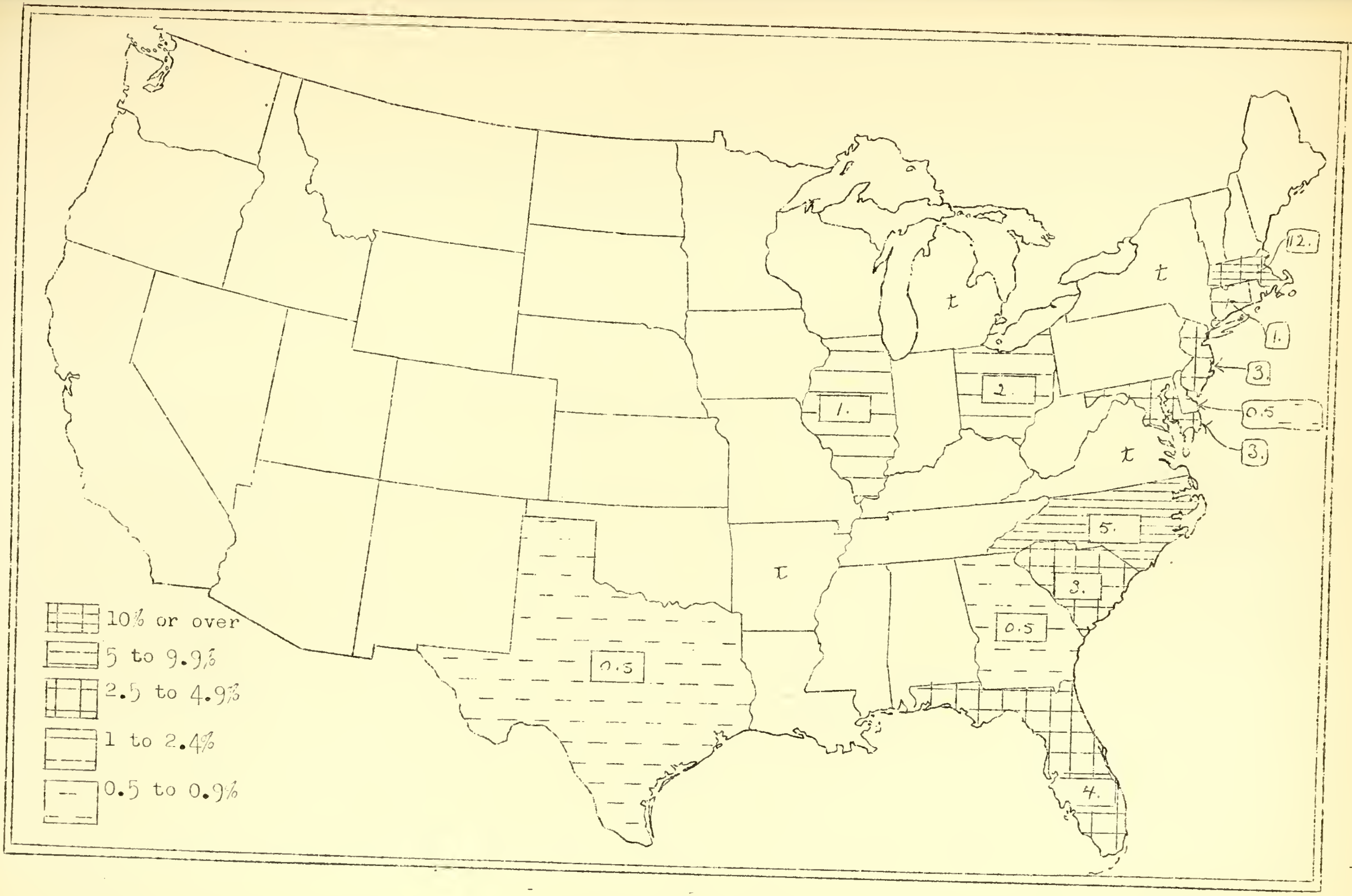

Figure 18. Percentage losses from brown rot of peaches as estimated by collaborators - 1930.

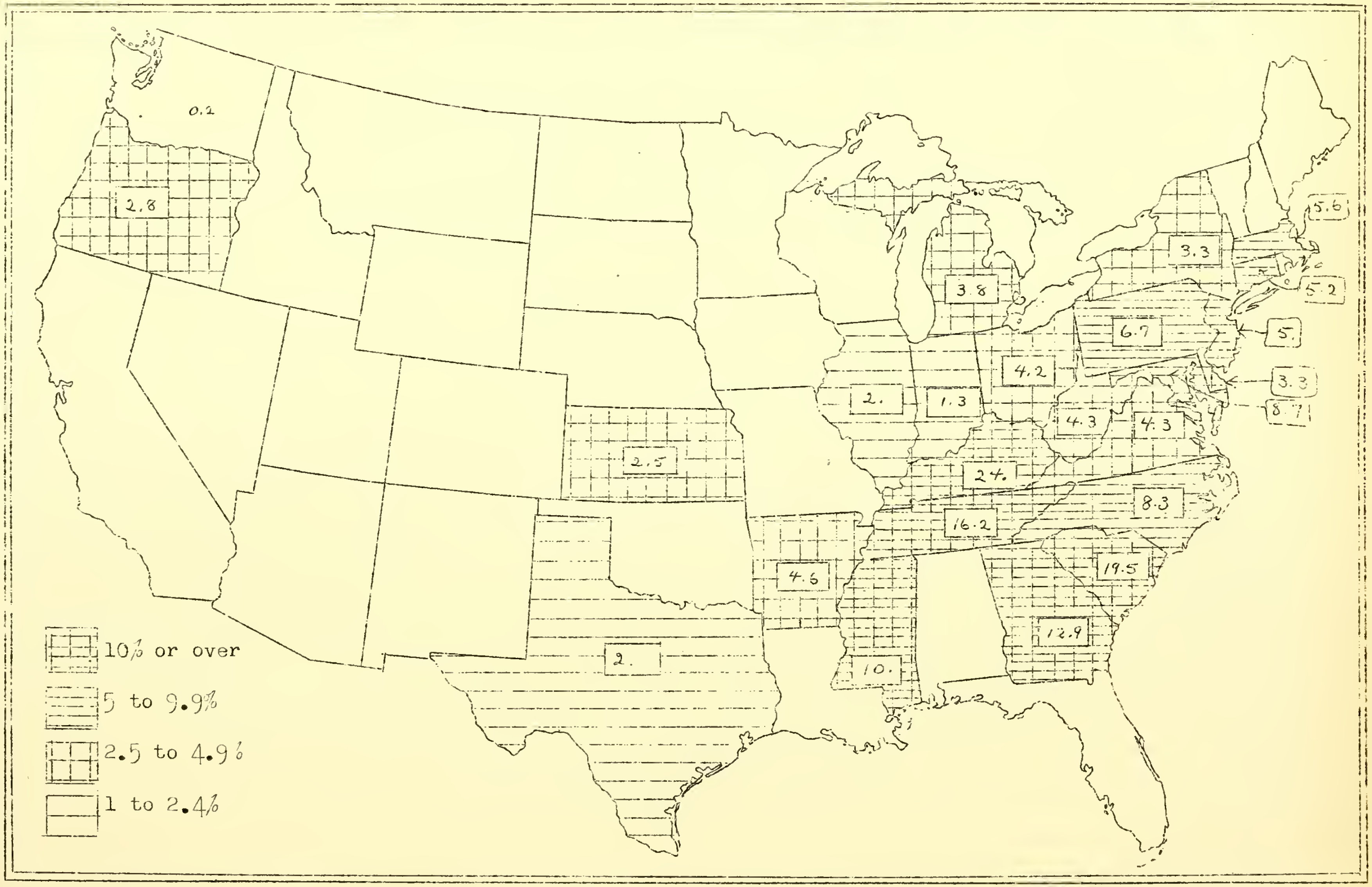

Figure 19. Percentage losses from brown rot of peach for the period 1920 to 1929.

Bacterial Spot (Bacterium pruni) was less or much less prevalent than usual in practically all States reporting. Leaf spot associated with definite cankers containing viable bacteria was found in three localities in southern Illinois on April 25, the earliest record of occurrence in that State. According to Anderson, there seems to be some relation between the cankers and winter injury. Cankers associated with leaf infection were reported from Kentucky also. Poole reported that in North Carolina fruit infection was heaviest on the most vigorous trees. The only losses reported as 1 per cent or more were 2 per cent in South Carolina, 1.5 per cent in Maryland, 1 per cent in New Jersey. P. D. R. 86, 156.

Yellows (Virus). Ten States reported this disease as present but the loss was only a trace to about 0.8 per cent except in North Carolina where a 2 per cent loss was indicated. It was very severe in Huntington County, New Jersey where the increase since 1929 varied from 5 to 40 per cent. It has been gradually decreasing in Pennsylvania since 1921 when there was 4.45 per cent of affected trees. In 1930 only 0.07 per cent of the trees inspected were affected. P.D.R. 172, 213.

Rosette (Virus). P. D. R. 149.

Phony Disease (Virus). The known range of phony disease was considerably extended during 1930. Besides Georgia, Alabama and Mississippi, the disease was found to occur in North and South Carolina, Tennessee, Louisiana, Arkansas, and Texas. P. D. R. 148-149, 171.

Crown Gall (Bacterium tumefaciens) is more prevalent on the peach than was supposed in North Carolina. Trees being removed from lands in the Sand Hills show many galls at the base of the trunk and on the roots. Some of the galls have reached six to ten inches in diameter. Many of the trees have been weak for several years, bearing inferior, prematured peaches. (R. F. Poole).

Black Rot (Physalospora malorum). Abundant on dead twigs in orchards in the Sand Hill area of North Carolina.

Root Rot (Armillaria mellea) killed more trees this year in North Carolina than during the two previous seasons.

Bitter Rot (Glomerella cingulata) New Jersey, severe on fruit grown in greenhouse.

Fruit Rot (Botrytis cinerea). Occasionally found on fallen fruit in North Carolina.

Rust (Tranzschelia punctata) has not occurred in the Sutter-Yuba peach area for the last two years. It has been present but unimportant in other peach districts in California. (Scott and Stout).

WINTER INJURY: Very severe injury to trees and loss of crop was reported from many States, especially in the Midwest, as a result of low temperature during the winter, particularly the freezes of January. These reports are given in P.D.R. 14: 24-27, 44-49, 52, 62-65, 108. Massachusetts and Connecticut report no loss although some buds were killed. In Delaware, the commercial crop in Sussex County was lost and in Kent County there was about a 70 per cent loss. In West Virginia the crop was very light as a result of below zero temperatures on morning of February 18. Washington also reports winter injury.

DROUGHT INJURY: Massachusetts reports a case of transparant spots in the flesh of fruit as a result of drought.

SPRAY INJURY: Severe defoliation and bark injury occurred in some Massachusetts orchards as a result of the first summer sprays or dusts, not in commercial orchards; however. This also occurred commonly in Connecticut and New Jersey where arsenate of lead in either dust or spray was used. A loss of 2.5 per cent of the crop was reported from Maryland and, in Virginia, arsenical injury to the foliage was quite general in most peach orchards. P.D. R. 156.

P L U M and P R U N E

Brown Rot (Sclerotinia fructicola).

Table 39. Losses from brown rot of plum as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
10	Massachusetts, Florida	2.5	Maryland
8	South Carolina	1	Connecticut
5	North Carolina, Illinois	0.5	Delaware
		Trace-10	Minnesota
3	Indiana, Michigan Wisconsin	Trace	Virginia, Arkansas

Bacterial Spot (Bacterium pruni). About as prevalent as usual except in Arkansas where it was much less so. Only a trace to 1 per cent loss was reported. In North Carolina heavy infection on susceptible varieties during the past three years has resulted in ragged trees.

Shot Hole (Cercospora circumscissa). Connecticut. P.D.R. 201.

Leaf Gall (Exoascus mirabilis). Mississippi.

Rough Bark (over-nutrition) on prune. Washington. P.D.R. 172.

DROUGHT INJURY: Tipburn on prune, Louisiana; Gum Pocket and Fruit Necrosis, Washington.

WINTER INJURY: Arkansas, New Mexico. P.D.R. 65.

CHERRY

Brown Rot (Sclerotinia fructicola). About equal in importance to previous years in most States reporting. In Wayne County, New York, many sweet cherry blossoms were killed, causing a material reduction in the crop. Sour cherries were less affected there and throughout the Ontario belt. There was a severe infection on small plantings in Bergen County, New Jersey. A small amount of fruit rot occurred in all the States reporting. P. D. R. 106.

Table 40. Losses from brown rot of cherry as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
5	New York	0.5	Michigan
2	Minnesota	Trace	Massachusetts, Delaware, Arkansas, South Dakota.
1	Connecticut, Maryland Wisconsin		

Leaf Spot (Coccomyces hiemalis) P.D.R. 172.

Table 41. Losses from leaf spot of cherry as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
5	Minnesota	1	North Carolina, Ohio, Wisconsin
3	Michigan, Missouri	0.5	Connecticut, Delaware
2	Maryland, South Dakota	Trace	New York, Kentucky, Arkansas, Nebraska

Fusarium Blight (Fusarium sp.) Washington. This is the first report of this trouble to the Survey.

Root Rot (Phymatotrichum omnivorum). Texas. First report from State on this host.

Winter Injury: Kentucky, Utah, Washington. P. D. R. 63, 65, 86, 172.

APRICOT

Blight (Coryneum beijerinckii) was more important than usual on this host in California. Following unusual late rains, the fruit spot caused heavy loss in some unsprayed groves in the Hemet district, according to Horne. A loss of 5 per cent was estimated by Scott and Stout.

GRAPE

Black Rot (Guignardia bidwellii), P. D. R. 108, 120, 157.

Table 42. Losses from black rot of grape as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
10	South Carolina	1-2	Massachusetts
3-10	Texas	1	Connecticut, North Carolina Nebraska
5	New Jersey, Florida	0.5	Delaware, Arkansas
3	Maryland	Trace	Virginia, Illinois, Michigan, Minnesota
1-3	Wisconsin		

Downy Mildew (Plasmopara viticola). P. D. R. 128, 173.

Ripe Rot (Glomerella cingulata) North Carolina and Texas.

Dead Arm (Cryptosporella viticola) was reported from North Carolina, where it destroyed vines in a vineyard near Hamlet.

FRUIT BREAKDOWN and LEAF BLEACHING is severe in the Sand Hill areas of North Carolina on American and Vinifera varieties, but recovery results from the use of magnesium-potash salts.

DROUGHT INJURY was very prevalent and severe in Arkansas where it caused a great reduction in quality. Many berries either fell off or did not mature.

FROST INJURY: Ohio, considerable to tips of shoots and young beans. P. D. R. 128.

WINTER INJURY: Kentucky, vines severely killed back; Oklahoma, Arkansas, very prevalent and severe injury and killing especially in poorly drained areas; Washington, P. D. R. 63-64.

STRAWBERRY

Dwarf (Aphelenchus fragariae). The results of a survey conducted by the Division of Horticultural Crops and Diseases during the summer of 1930 are shown in the accompanying map, Figure 20. The disease was already known to be abundant in the strawberry growing regions of Florida, Louisiana, and North Carolina. As the map shows, diseased plants were found during 1930 in western Tennessee and northern Arkansas in commercial plantings of standard varieties. Dwarf was found in the Norfolk region of Virginia and on the Eastern Shore (Virginia, Maryland, and Delaware) on plants brought into the region during the spring of 1930 or in experimental plantings. Strawberry growing areas in the following regions were visited but no dwarf disease was found: southeastern Tennessee (Chattanooga) southwestern Missouri (Ozark section), southern Illinois (Anna district), western, north-central, and south-central Kentucky (Paducah, Louisville, and Bowling Green), southern Indiana (New Albany), southwestern Ohio (Cincinnati). The field work was done by Paul V. Mook, and identifications of the nema were made by B. G. Chitwood.

A. N. Brooks reported that care in the selection of out-of-State nursery plants, together with the use of new land in raising plants, has tended to reduce the amount of dwarf in central Florida.

Root Rot (Caconema radicicola) appears to be of importance in Arkansas plants intended for sale, as these must be culled. The loss of whole fields on this account is common (V. H. Young). In heavily infested areas in North Carolina this disease causes much stunting (R. F. Poole). In Florida, due to wet weather prevailing during the spring, the effect of root knot was not noticeable (A. N. Brooks). A specimen received from the State Entomologist at Ames, Iowa, was determined by Dr. G. Steiner as affected with the root knot nema. Also reported from Mississippi and Arizona.

Fruit Rots. Gray mold rot (Botrytis cinerea) is usually very rare in Louisiana. This year, however, about 80 per cent of all the berry rotting was caused by Botrytis (A. G. Plakidas). This rot was abundant in the northern section of Florida around Starke and Lawtey. It was present to some extent in the central area during February and March. (A. N. Brooks). Ten per cent loss was estimated in Massachusetts and 4 per cent in Missouri. Also in New Jersey, Texas, Washington.

Tan brown rot (Pezizella lythri). Due to the wet warm weather of February and March in Florida, this rot showed up in abundance and was the most noticeable of the field rots (A. N. Brooks). Much less than usual in Louisiana.

Hard brown rot (Rhizoctonia sp.) Florida, Louisiana, Texas. Leather rot (Phytophthora cactorum) caused 1 per cent loss in Missouri; also reported from Louisiana. Soft rot or leak (Rhizopus nigricans) North Carolina, Texas.

Anthracnose (Colletotrichum fragariae) was scattered but more widespread in Florida than last year. Bordeaux 4-4-50 was applied to a badly infected patch at ten day intervals during August, with subsequent decrease in the spread of the disease and increase in plant production (A. N. Brooks).

Root Rot (Undet., various fungi associated). P. D. R. 126, 173.

Mosaic (Virus). Tennessee, Wisconsin, P. D. R. 78.

Chlorosis: Texas, Nebraska, Arizona.

Yellows: Nebraska.

Drought Injury: Arkansas, very prevalent and important in cutting stand for coming season.

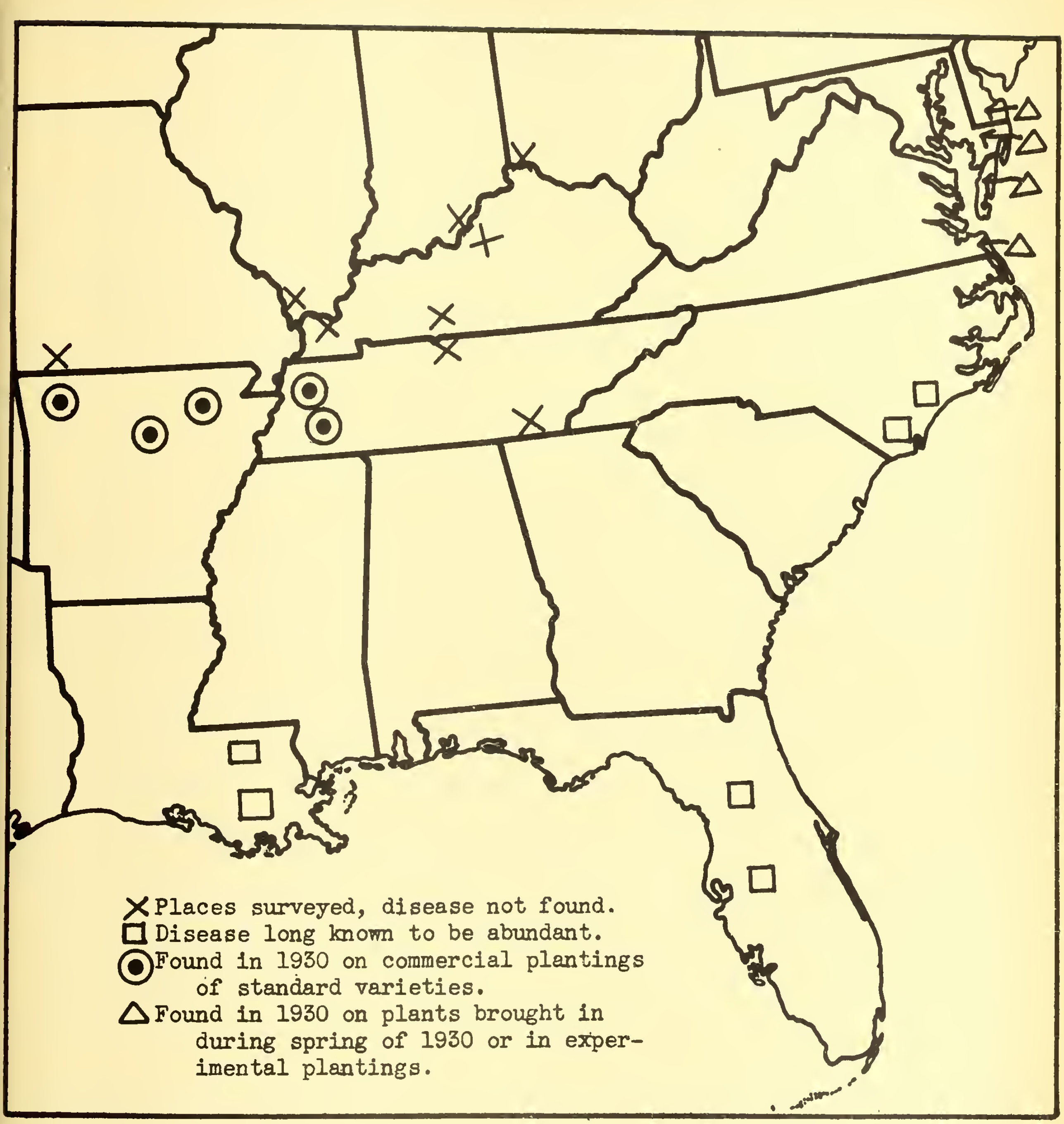

Figure 20. Known distribution of strawberry dwarf caused by *Aphelenchus fragariae*, 1930

RASPBERRY

Mosaic and Leaf Curl (Virus). P. D. R. 127, 157, 200.

Table 43. Losses from mosaic and leaf curl of raspberries as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
20	Massachusetts	3	Connecticut
11	Maine	2	Maryland, Kansas
7	Michigan	1	Montana
5	Virginia, Wisconsin, Minnesota	Trace	Delaware, Indiana

Streak (Virus). More prevalent than usual and much more than last year in Pennsylvania while in New York it was about as prevalent as it has been for several years.

Orange Rust (Gymnoconia interstitialis and Kunkelia nitens) was very important in southwestern Michigan where it is the limiting factor in production. It is very prevalent on wild dewberries there and spreads from them to the cultivated raspberries.

Anthracnose (Plectodiscella veneta). In general, this disease was of equal or greater prevalence than last year in the States reporting except in Ohio and also in Arkansas where it usually is a limiting factor. In Missouri, it seems to be increasing in severity. It was general and serious in eastern Nebraska. The losses estimated by collaborators are: Missouri, 5 per cent; Maryland, 3 per cent; West Virginia, 2 to 3 per cent; and Michigan, a trace. P. D. R. 127, 157, 173.

Blue Stem (Verticillium alboatrum). Massachusetts, New Jersey, Michigan, Washington, and said to occur in California. P. D. R. 157.

Root Rot (Xylaria sp.) Washington on red raspberries.

Crown Gall (Bacterium tumefaciens). P. D. R. 201.

Winter Injury: In Minnesota, winter and drought injury combined was the biggest factor in the low yield obtained this year. Also reported from five counties in Washington.

BLACKBERRY

Double Blossom (*Fusisporium rubi*). New Jersey, North Carolina, Florida, and District of Columbia. P. D. R. 78.

Sooty Blotch (*Gloeodes pomigena*). North Carolina.

Fly Speck (*Leptothyrium pomi*). North Carolina, first report from State to the Survey.

Root Rot (*Collybia dryophila*). North Carolina.

Frost Injury: Arkansas, very prevalent and severe. Crop practically ruined in all sections.

LOGANBERRY

Orange Rust (*Gymnoconia interstitialis*). Mississippi. First report on this host to the Survey.

CURRANT

Gray Mold (*Botrytis cinerea*). New Jersey, causes leaf spots and fruit decay.

CRANBERRY

Fruit Rots (fungi). Massachusetts, various bogs in Wareham area showed 8.9 per cent rot October 15 and 13.1 per cent November 15, as compared to 5.9 and 11.7 per cent in 1929.

Fairy Ring (Mushroom). Massachusetts. Not uncommon in Plymouth County bogs.

False Blossom (Virus). Massachusetts; increasing from year to year. New York; found for the first time. Wisconsin; about as prevalent as usual. P. D. R. 245-246.

Leaf Drop (Undet.). Wisconsin; less than usual.

BLUEBERRY and HUCKLEBERRY

A report on the occurrence of diseases of these hosts in Maine in 1929 and 1930 is given in the "Plant Disease Reporter", Vol. 15, No. 25; pp. 11-14; March 1, 1931.

Stem Rust (*Calyptospora columnaris*) on huckleberry was reported from Washington and on *V. corymbosum* from Connecticut.

MULBERRY

Bacterial Blight (Bacterium mori) was reported from San Diego and Santa Clara Counties, California. (Scott and Stout).

Leaf Spot (Cercosporella mori) attacked 100 per cent of the foliage, causing defoliation a month earlier than usual under conditions at College Station, Texas. (Taubenhaus).

Pop Corn Disease (Sclerotinia carunculoides). North Carolina, Texas.

CITRUS

Canker (Bacterium citri). Found in a nursery at Telferner, Victoria County, Texas. Five grapefruit trees and 15,000 two-year-old plants of C. trifoliata were destroyed immediately after the discovery of the disease. This is the first appearance of the disease in Texas since February, 1929. No other States reported its presence in 1930. P. D. R. 157.

Root Rot (Clitocybe tabescens). Florida, on grapefruit, orange, and tangerine. First report of this disease on citrus. P. D. R. 168.

Blotch. Florida on grapefruit, new and unusual, severe in some cases. P. D. R. 68.

Lumpy Rind. Florida, on grapefruit and sometimes on oranges. Unusually prevalent. P. D. R. 67.

Bark Rot on orange, Florida, P. D. R. 169.

Scaly Bark (psorosis) on grapefruit, becoming severe in Texas.

FIG

Dieback (Sclerotinia sclerotiorum). Texas.

Fruit Rot and Canker (Colletotrichum caricae). Georgia, more destructive of whole limbs than of fruits. The canker starts on large limbs and gradually girdles them (J. H. Miller).

Root Knot (Caconema radicicola) Texas, California. P. D. R. 202.

Nematode (Tylenchus pratensis). California. P. D. R. 202.

Yeast Rot (Yeast) California, fruit rots on tree in moist weather. Rhizopus and other fungi also cause spoilage.

D A T E

The following diseases were reported from southern California by L. J. Klotz.

Inflorescence Decay (Thielaviopsis paradoxa (T. ethaceticus)). Only three palms found infected.

Bud Rot (Thielaviopsis sp. principal fungus present).

Fruit Rots (Alternaria sp., Penicillium sp., Aspergillus niger, Helminthosporium sp.), less than usual, no rains during ripening period. Very important in most years.

Rot of stored dates (Catenularia fuliginea).

Decline of trees (Undet.). Becoming more important, slowly spreading from definite foci. Deglet Noor very susceptible.

P E R S I M M O N

Fruit Spot (Macrophoma diospyri). North Carolina, abundant on heavily fruit-laden trees.

B A N A N A

Wilt (Fusarium cubense). Porto Rico, very severe.

Leaf Scorch (Gloeosporium musarum). Porto Rico, always present on ripe fruit.

P A P A Y A

Soft Root Rot (Pythium sp. associated). California, two small orchards in Orange County have lost many plants in winter and on through summer with a soft rot of roots from which a Pythium was easily isolated. (Wm. T. Horne).

F E I J O A S E L L O W I A N A

Root Rot (Phymatotrichum omnivorum). Texas, first report on this plant.

C O C O N U T

The following diseases are reported from Porto Rico.

Bud Rot (Phytophthora faberi). This disease, which first appeared in Porto Rico in 1923, has gradually extended eastward from the west coast both along the south coast and the north coast until it has reached the eastern shore. A recent survey reports 5,071 infected coconut palms out of 780,888 on farms in the Island and 4,705 infected hat palms out of 418,378. Eradicatory measures are being intensified. P. D. R. 15: 23.

Fruit Drop (Thielaviopsis paradoxa), may be of greater importance than previously supposed.

Little Leaf (Undet.) Common. Occurs on isolated palms, especially on those growing along roadsides.

Wilt "Marchitez" (Undet.) Very common in marshy sites.

Red Trunk, nematode disease (Aphelenchus cocophilus). Rare.

Trunk Rot (Undet.). Common in the vicinity of San Germain. Another trunk rot observed in the vicinity of Mayagüez.

P E C A N

Brown Leaf Spot (Cercospora fusca). Heavy and prevalent on all varieties at station planting at Willard, North Carolina, for past five years, but none at field station at Rocky Mount although same varieties are planted. Reported from Mississippi and Texas.

Kernel Spot (Stink Bug). Very severe in North Carolina, especially on trees in home lots, on which, in many instances, there is a total loss. Unusually common in Texas where the loss to the crop is estimated to be 50 per cent.

Rosette (physiological). Observed in North Carolina and Arkansas. Common and generally distributed in thirteen counties of Texas. Known to be present in certain southern California counties.

A L M O N D

Shot Hole (Coryneum beijerinckii) is gradually becoming important in almond districts in California.

Brown Rot (Sclerotinia cinerea). In California, serious only as a blossom blight in Drake variety.

DISEASES OF VEGETABLES

POTATO

Late Blight (Phytophthora infestans). With the exception of Florida, which reported much more blight than usual, potato-growing States in all sections of the country reported less damage than normal. This is well shown by the maps, Figures 21 and 22. Generally, this reduction in the amount of blight was attributed to the unusually dry growing season.

In Maine, blight made its appearance in Aroostook County unusually early, July 14, and caused moderate losses in that section. (P. D. R. 142). Maine potatoes on the New York market during the first two weeks of January, 1931, showed about the usual amount of late blight tuber rot. (P. D. R.15 (1): 7. 1931).

In Florida, where rainfall was plentiful in the winter and spring months, late blight caused unusually heavy losses during midseason of the growing crop. It was first observed January 15 at Fort Pierce by Gratz, who furnished the loss estimate for the State.

Losses from late blight as estimated by collaborators are included in Table 44.

Table 44. Losses from late blight of potato as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	
15	Florida	1	Maryland, Georgia
8	Maine	Trace	Massachusetts, New York

The following States, which ordinarily report losses for late blight, indicated "no loss", "not seen", or "of no importance", etc.: Connecticut, New Jersey, Pennsylvania, Virginia, North Carolina, South Carolina, Arkansas, Michigan, Minnesota, and Wisconsin.

Early Blight (Alternaria solani). In general early blight caused slight loss, as usual. In Nebraska, it was much more prevalent than usual in early plantings of commercial areas, damaging both the tops and tubers. In Florida, P. M. Lombard reported that early blight appeared in the Wabasso section about February 7-10 and caused heavy damage at Fort Pierce. Pennsylvania reported scattered infections on unsprayed fields of early varieties only. P. D. R. 132.

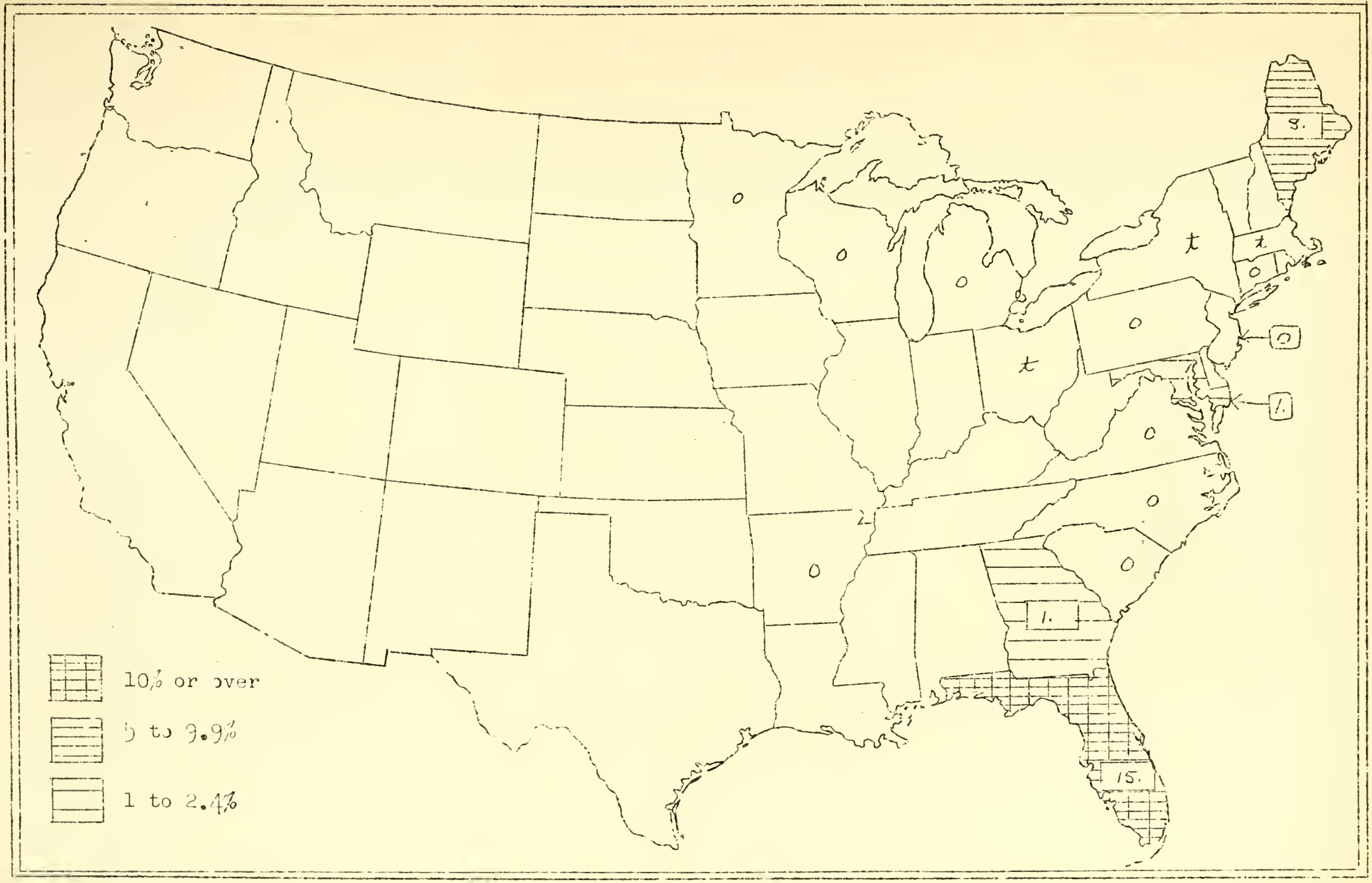

Figure 21. Percentage losses from potato late blight as estimated by collaborators, 1930.

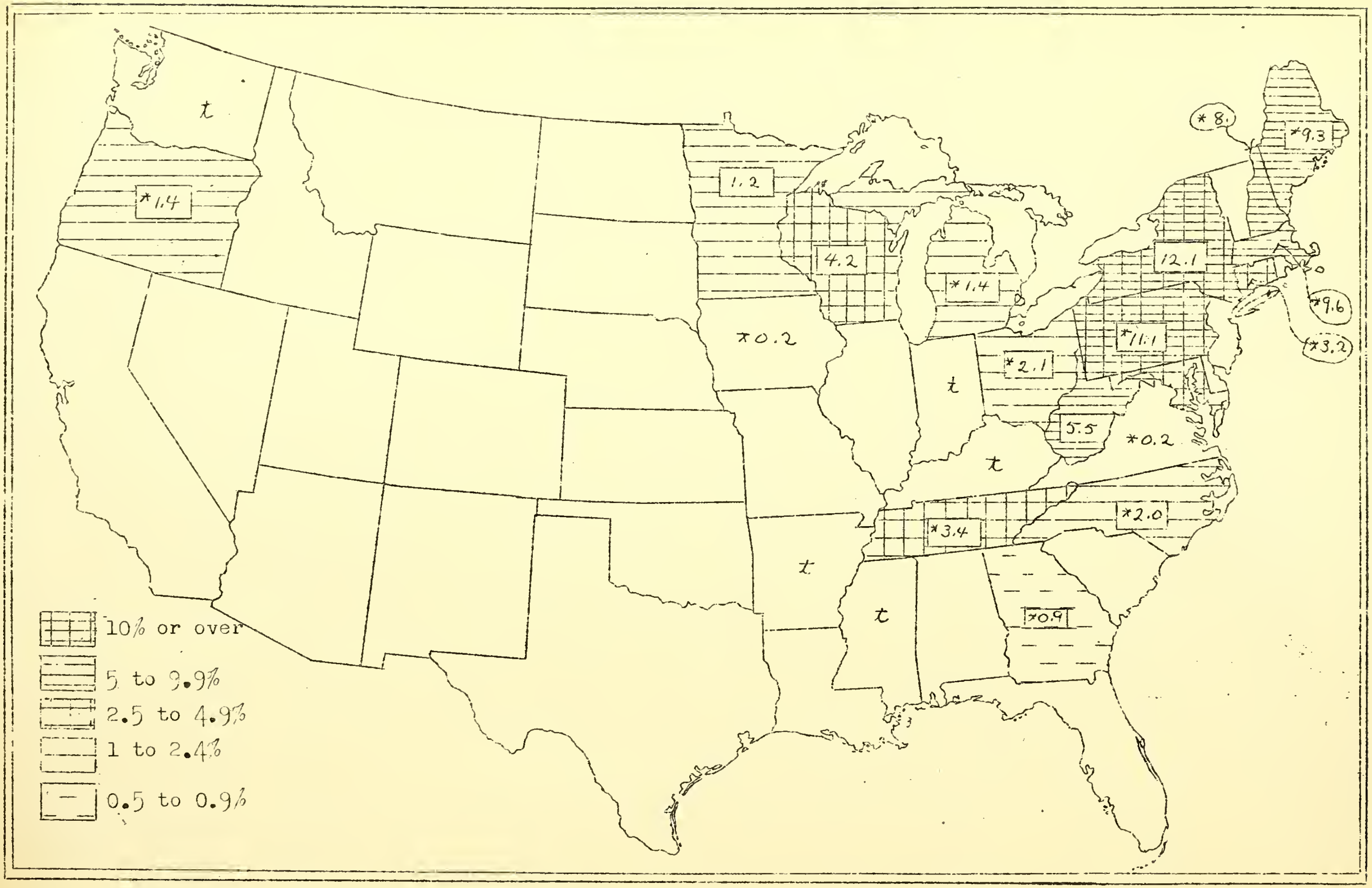

Figure 22. Percentage losses from late blight of potato for the period 1920 to 1929.

Table 45. Losses from early blight of potato as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
3	Louisiana	0.1	Michigan, Montana, Texas
2	Maine	Trace	Massachusetts, Connecticut, New York, New Jersey, Delaware, Virginia, Kentucky, Arkansas, Wisconsin, Minnesota, South Dakota, Nebraska
Trace - 3	Florida		
1.5	South Carolina		
0.5	Maryland		

Stem Rot (Corticium vagum).. In spite of the drought, States that reported loss estimates for this disease indicated quite a variation in the amount of damage as compared with losses in the average year. New York, Florida, Minnesota, Missouri, and Kansas reported normal losses; New Hampshire, New Jersey, Pennsylvania, Maryland, Arkansas, and Nebraska, more than usual; and Massachusetts, West Virginia, and Wisconsin, less than the amount for the average year. Both the sprout-infection and rosette or "Rhizoctonia-hill" stage were reported from Pennsylvania, Arkansas and Massachusetts. Washington and Porto Rico also reported occurrence of the disease. P. D. R. 132, 217.

Table 46. Losses from Rhizoctonia stem rot of potato as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
10	South Carolina	2	Maine, North Carolina, New Jersey, Missouri, Texas, Nebraska
7	Kansas		
6	Maryland	1.5	Wisconsin
5	New York	1	Massachusetts, Florida
4 to 5	Pennsylvania	0.5	Michigan
4	Minnesota	Trace	Connecticut, Delaware, Virginia, Louisiana, Arkansas
3	Montana		
2.5	West Virginia		

Scab (Actinomyces scabies). As in 1929, there appeared to be an increase in the amount of scab in the drought areas. More than usual was reported from New York, Maryland, West Virginia, North Carolina, Wisconsin, and Minnesota; less than the usual amount was observed in Massachusetts, Pennsylvania, and New Jersey; and the usual amount in Florida, Delaware, Arkansas, Missouri, South Dakota, Nebraska, Porto Rico, and Kansas. R. F. Poole reported from North Carolina that scab was more severe than during the past three years in Mt. Olive and other eastern counties, and in the drought areas of the northwestern part the crop was badly scabbed. The estimated losses from scab are indicated in the following table.

Table 47. Losses from potato scab as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
8-9	West Virginia	3	New Jersey
5	New York, Wisconsin	2	Maryland, Missouri, Kansas
4	Minnesota, South Dakota, Nebraska	0.1	Texas
		Trace	Massachusetts, Florida

Mosaic (virus). Reports indicate about the usual prevalence of mild and rugose mosaics, with considerable masking of symptoms due to unusually high temperatures. Nine States reported the same amount of mosaic as in average years; two reported more; and two, less than normal. Loss estimates are included in Table 48. P. D. R. 132, 196.

Table 48. Losses from potato mosaic disease as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
15	Arkansas	2	Maine, North Carolina, Indiana
10	Massachusetts	1.5	New Jersey
5	Louisiana, Minnesota Montana	1	Michigan, Nebraska
4	New York	0.5	Delaware, Texas
2.5	Maryland, West Virginia	Trace	South Carolina, Florida, Wisconsin

Additional States reporting the occurrence of potato mosaic are: New Hampshire, Pennsylvania, Kentucky, Mississippi, Minnesota, Kansas, Oregon, California, and Porto Rico.

W. D. Valleau in Kentucky makes the following statement: "Mosaic (apparently rugose) of Cobbler potatoes was prevalent in first and second crops. It is caused by the tobacco veinbanding virus together with the 'healthy-potato' virus. The veinbanding virus spreads extremely rapidly in tobacco and consequently there appears to be some means (probably insect) for its rapid dissemination in these crops. In a series of planting date trials one series was found to have considerable streak. The veinbanding and the healthy potato viruses were transferred to tobacco from this series. This combination of viruses was likewise found to cause streak in seedling potatoes."

Leaf Roll (virus). Generally, the usual amounts of leaf roll were reported. Losses were above normal in Maryland due to the use of much home-grown seed for the spring crop of Cobblers. New Jersey reported less than usual, and the following States normal losses: New Hampshire, New York, Pennsylvania, West Virginia, Florida, Louisiana, Arkansas, Wisconsin, and Minnesota. Washington reported the disease from the Puget Sound section. P. D. R. 132, 142.

Table 49. Losses from leaf roll of potato as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
10 to 15	Pennsylvania	2	North Carolina
7	New York	1	West Virginia, Michigan
5	Massachusetts	0.5	Delaware
4	Maine, Indiana	0.1	Texas, Montana
2.5	New Jersey, Maryland	Trace	South Carolina, Florida, Louisiana, Arkansas, Wisconsin

Spindle Tuber (virus). Of the six States reporting upon spindle tuber, all indicated normal losses except New Jersey where subnormal amounts occurred. Montana and Kansas reported 2 per cent losses, New Jersey 0.5 per cent, and Florida and New York traces.

Wilt (*Fusarium* spp.) Mostly normal to above normal amounts of Fusarium wilt were indicated by collaborators. Connecticut, New York, Pennsylvania, and Minnesota reported more than the average loss; New Jersey, South Dakota, and Nebraska the same amount as usual; and Missouri, less than usual. Four States indicated the hot, dry weather as favoring the disease. In Nebraska, 4 to 5 per cent infection by F. eumartii occurred in the field and bin, while slight loss resulted from F. oxysporum. Wilt was more common on sandy than loam soils in North Carolina.

Table 50. Losses from potato wilt as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
4	Montana	0.5	New Jersey
3 to 4	Pennsylvania	Trace	Connecticut, New York, Delaware, Florida, Texas, Minnesota, Missouri, South Dakota
2	Maryland		
1	Nebraska		

Blackleg (Bacillus phytophthorus). Reports indicate either normal or subnormal amounts of this disease. States that reported the occurrence of blackleg, other than those included in the accompanying table are: New Hampshire, New Jersey, Mississippi, Indiana, and Nebraska. P. D. R. 82.

Table 51. Losses from blackleg of potato as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
3	Maine	0.5	Wisconsin
2	Kansas, Montana	0.4	Missouri
1	Kentucky, Florida, Michigan, Minnesota	Trace	New York, Maryland, North Carolina, Louisiana, Texas, Arkansas, South Dakota, Nebraska

Tipburn and Hopperburn (climatic and leafhoppers). That these diseases are usually important in many States is shown by the map in Figure 24. Most of the States that submitted reports in 1930 indicated more, or much more, loss than for the average year, and cited the unusually hot, dry season as an important contributing factor. P. D. R. 163, 177, 196.

Table 52. Estimated percentage losses from tipburn and hopper-burn of potatoes in 1930, and comparisons with previous years.

Percentage loss	State Reporting	Comparison with Other Years
30	Arkansas	31 per cent in 1929; 30 in 1928
25	West Virginia	Loss always high; equalled 1930 in 1921 and 1926
15	Massachusetts	10 in 1929
	New York	Same in 1929
	Minnesota	Same in 1924 and 1926
10	Maryland	Much the greatest loss reported since 1920; highest previous 1.5
8	New Jersey	Same in 1929; 7 in 1926
6	Michigan	Much heavier loss in 1921 (20), and 1922 (10)
4	Wisconsin	10 in 1921
3	Connecticut	10 in 1922
	North Carolina	About average; 8 in 1929.
1	Louisiana	About average
0.5	Delaware	25 in 1926 - only high loss. Never much loss reported.

DROUGHT INJURY, FERTILIZER INJURY (climatic, fertilizers). Combined dry weather and fertilizer injury was reported from South Carolina and North Carolina, being more pronounced in poorer, sandy soils. A type of "internal necrosis" observed in Minnesota was thought to have resulted from late rains following the drought. South Dakota reported a loss in storage of 15 per cent from decay which was attributed to fall rains following the drought. In Kentucky, heavy losses of the first crop potatoes, both in the ground and in storage, were considered to be due probably to the extremely hot weather. Fertilizer injury was assigned as the cause of 50 per cent reduction in stand in one Long Island potato field (W. G. Been, New York Weekly News Letter, May 26, 1930). Washington reported a decay of tubers in the Yakima Valley, apparently associated with hot weather.

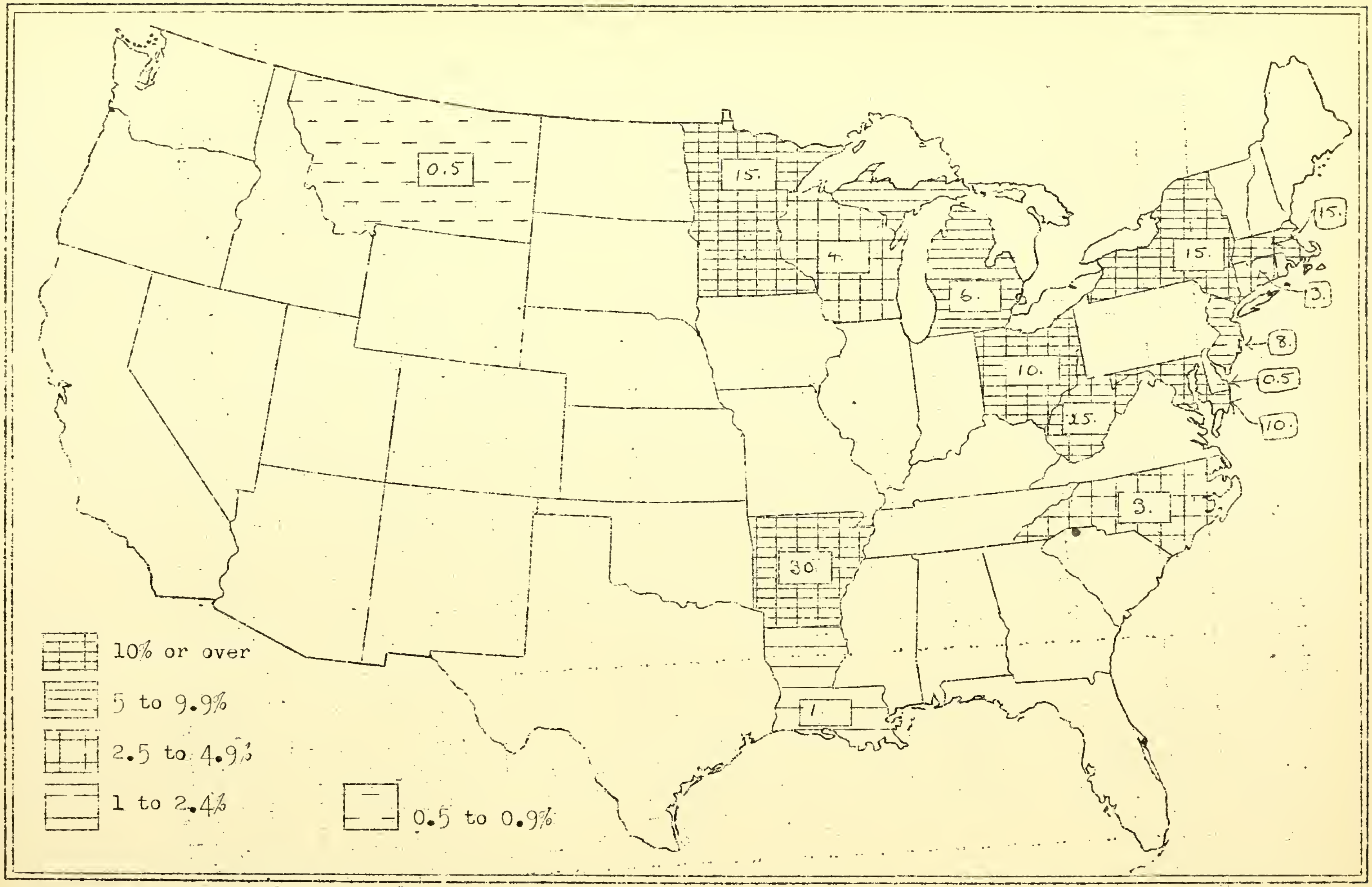

Figure 23. Percentage losses from potato tipburn and hopperburn as estimated by collaborators - 1930

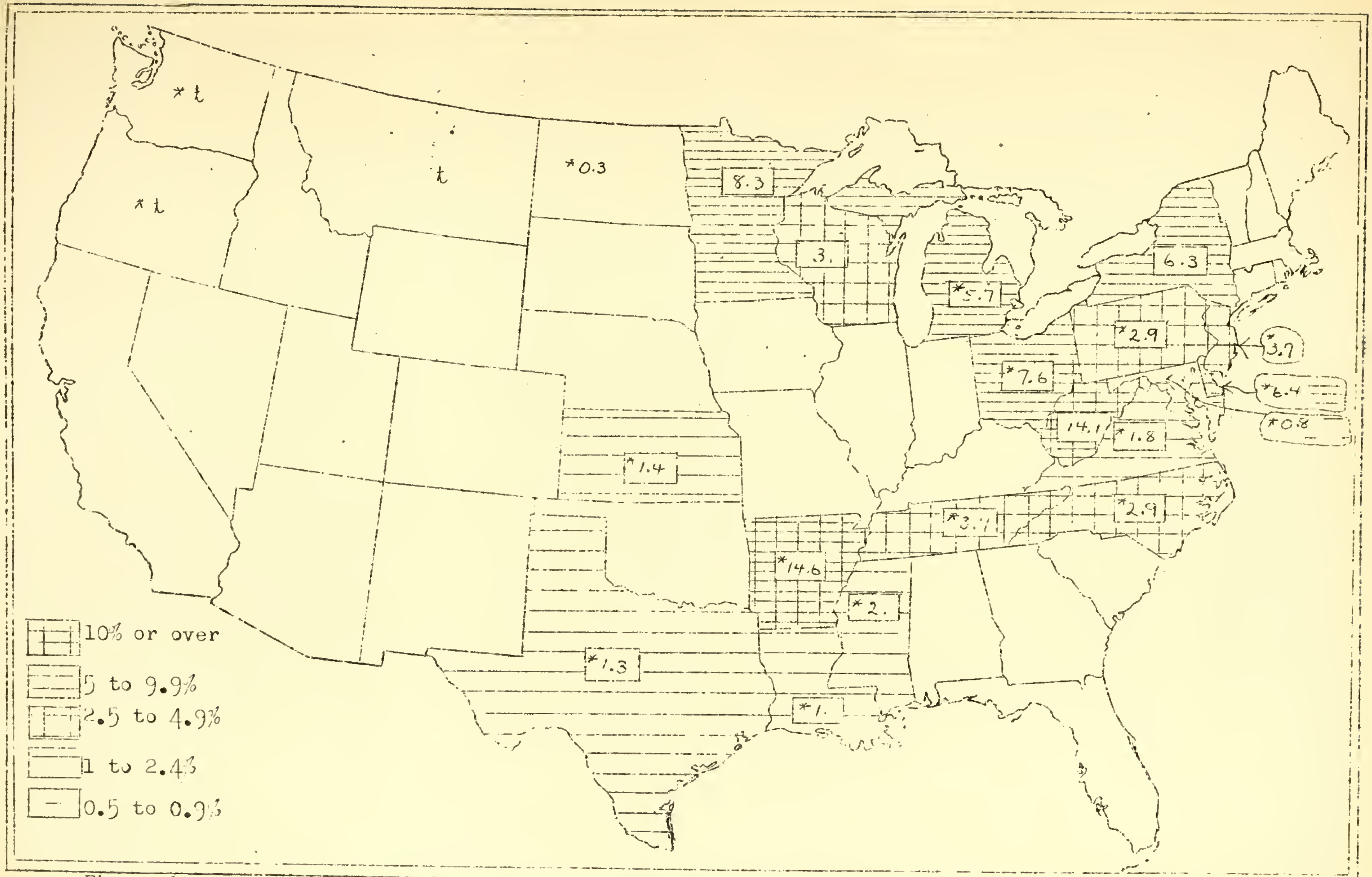

Figure 22. Percentage losses from tipburn and hopperburn of potato for the period 192) to 1929.

Southern Blight (Sclerotium rolfsii). Tennessee, common in spring crop; Arkansas, severe epidemic at Prescott; Florida and Porto Rico, traces; and Texas, 75 per cent and 5 to 10 per cent tuber infection in Hidalgo and Cameron Counties, but only 0.1 per cent loss for the State. P. D. R. 96, 176.

Root Rot (Phymatotrichum omnivorum). Texas, very scarce this year.

Violet Root Rot (Helicobasidium purpureum (Rhizoctonia crocorum), Oregon. P. D. R. 82.

Yellow Dwarf (Undet.) New York, more than usual, trace loss, favored by hot weather.

Psyllid Yellows (potato psyllid). California, severe in San Diego County, also found at Shafter.

Witches' Broom (virus). Washington; Wisconsin, on Montana seed, Triumph susceptible.

Lightning Injury: New York, in one field.

"No Sprout Potatoes" (Undet.). For several years much complaint has been made of poor germination throughout North Carolina. In most cases the trouble is in Irish Cobbler seed from Prince Edward Island. Instead of normal sprouts a small tuber is formed. Losses are readily traced to individual sacks, since potatoes from some sacks germinate perfectly while those from others give scattering stands. There is no evidence of parasites and it is suspected that storage conditions may account for the trouble, since potatoes held in cold storage have shown much less than those in dry storage. (R. F. Poole).

T O M A T O

Wilt (Fusarium lycopersici). Five States reported normal losses from wilt, six indicated less than usual, and two more than for the average year. In some States the disease appeared to be favored by the unusually hot, dry weather, while in others there were indications that the effect of high temperatures was offset by the soil moisture conditions unfavorable to infection. Mississippi and Colorado reported occurrence of the disease. Loss estimates for other States are in the accompanying table. P. D. R. 110, 129, 161.

Table 53. Losses from Fusarium wilt of tomato as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
10	Arkansas	2	Missouri, Kansas
5	South Carolina, Louisiana, Texas, Indiana	1	Massachusetts, North Carolina
		0.5	Maryland
4.5	New Jersey		
		Trace	Delaware, Kentucky, Wisconsin
3	Virginia, Florida, Michigan		

Early Blight (Alternaria solani). Generally, less damage was reported than usual. Normal losses occurred in Louisiana. Both defoliation and fruit rotting were observed in Maine. P. D. R. 110, 129, 130, 176, 177.

Table 54. Losses from early blight of tomato as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
10	Massachusetts	0.5	New Jersey, Texas
3 to 5	New York	0.1	Indiana
2	Florida, Louisiana	Trace	Connecticut, North Carolina, Michigan, Wisconsin, Montana, Porto Rico, Nebraska
1	Maryland, South Carolina, Arkansas		

Blight (Septoria lycopersici). Less, to much less, damage was reported generally for tomato blight as shown in Figures 25 and 26. More than usual was observed in Massachusetts, much less than normal in Maryland and North Carolina, and none in Florida. P. D. R. 110, 130, 160.

Table 55. Losses from Septoria blight of tomato as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
3	Maine	0.5	Delaware, Texas
2.5	New Jersey	Trace	Connecticut, Maryland, Virginia, Kentucky, North Carolina, Louisiana, Indiana, Michigan, Minnesota
2	Wisconsin, Missouri, Kansas		
1	Massachusetts, South Carolina, Arkansas, Nebraska		

Bacterial Canker (Aplanobacter michiganense). Compared with losses in average years, States reported as follows: much more, Massachusetts and Mississippi; more, New Jersey and Minnesota; same, Wisconsin; less, Maryland and California. In Minnesota, canker was observed for the first time, occurring mostly as fruit spots along with Bacterium vesicatorium fruit spots. Fruit-spotting was reported on the Chicago market in shipments from Texas, thus constituting a first report from that State. In Massachusetts, the disease was more widespread and severe in both field and greenhouse tomatoes than ever observed before, causing an estimated loss of about 4 per cent. A detailed account of the severe outbreak of canker in Mississippi occurs on Page 134-140 of the 1930 Reporter. Contaminated and infected seed lots from out-of-State sources were considered responsible for the situation in that State. In California, the decrease in loss from canker is attributed to more care in selection of seed and in attention to seed beds. A loss of 30 per cent in one field in Washington was associated with a certain source of seed; crops from other seed sources remaining canker-free. Additional States that reported the presence of the disease are New York and Michigan. P. D. R. 96, 130, 134-140, 160, 161, 176.

Bacterial Spot (Bacterium vesicatorium). This disease occurred in New Jersey in usual amounts with moderate loss; produced only traces of loss in Maryland and Texas; was more important than usual in Indiana, with an estimated loss of 0.1 per cent; and was observed for the first time in Minnesota occurring along with bacterial canker. A severe outbreak was observed in a localized region in Indiana, with a blighting of the tips of branches. In Florida, it was observed only on the west coast. P. D. R. 110, 130.

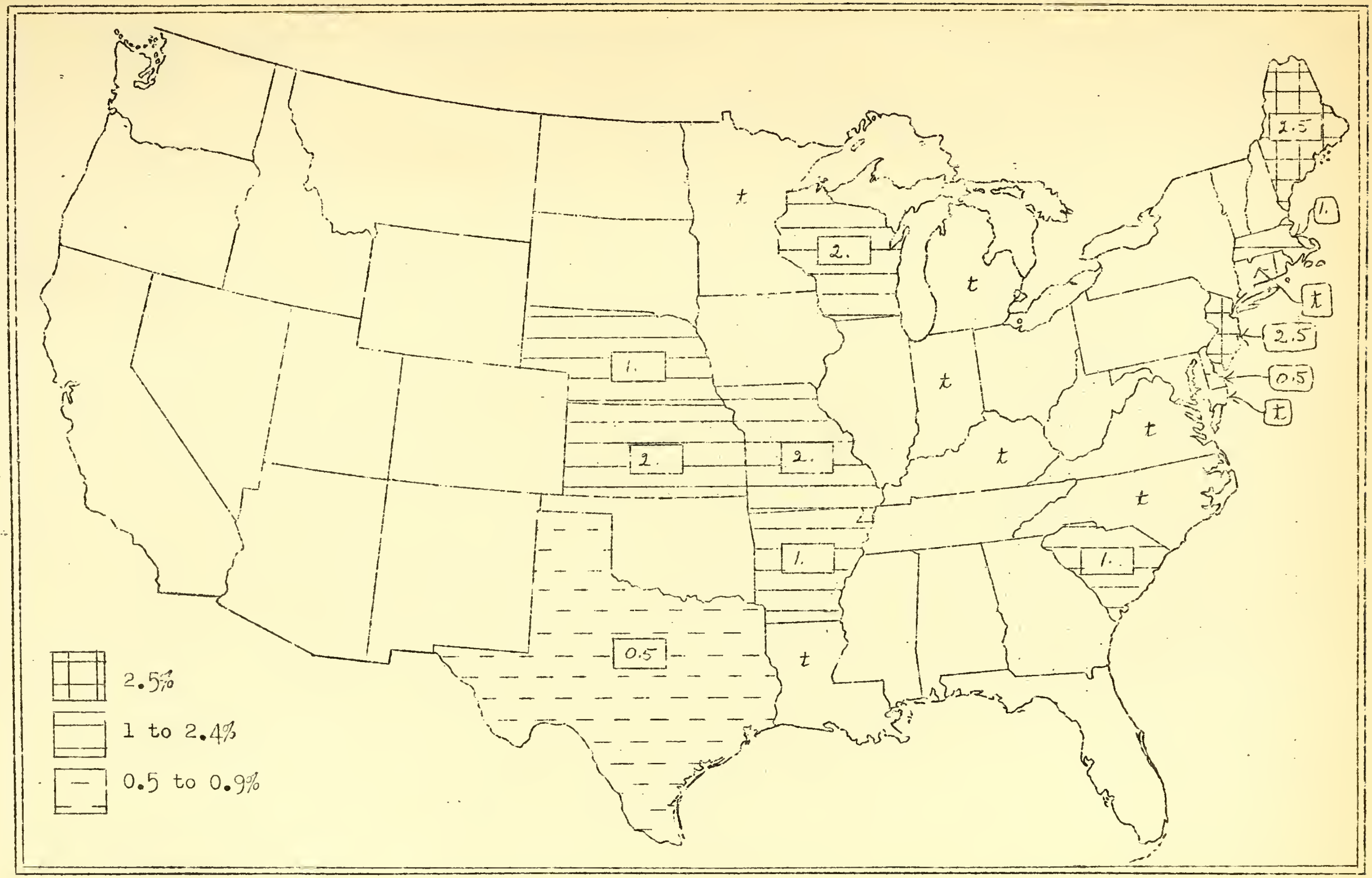

Figure 25. Percentage losses from Septoria blight of tomato as estimated by collaborators - 1930.

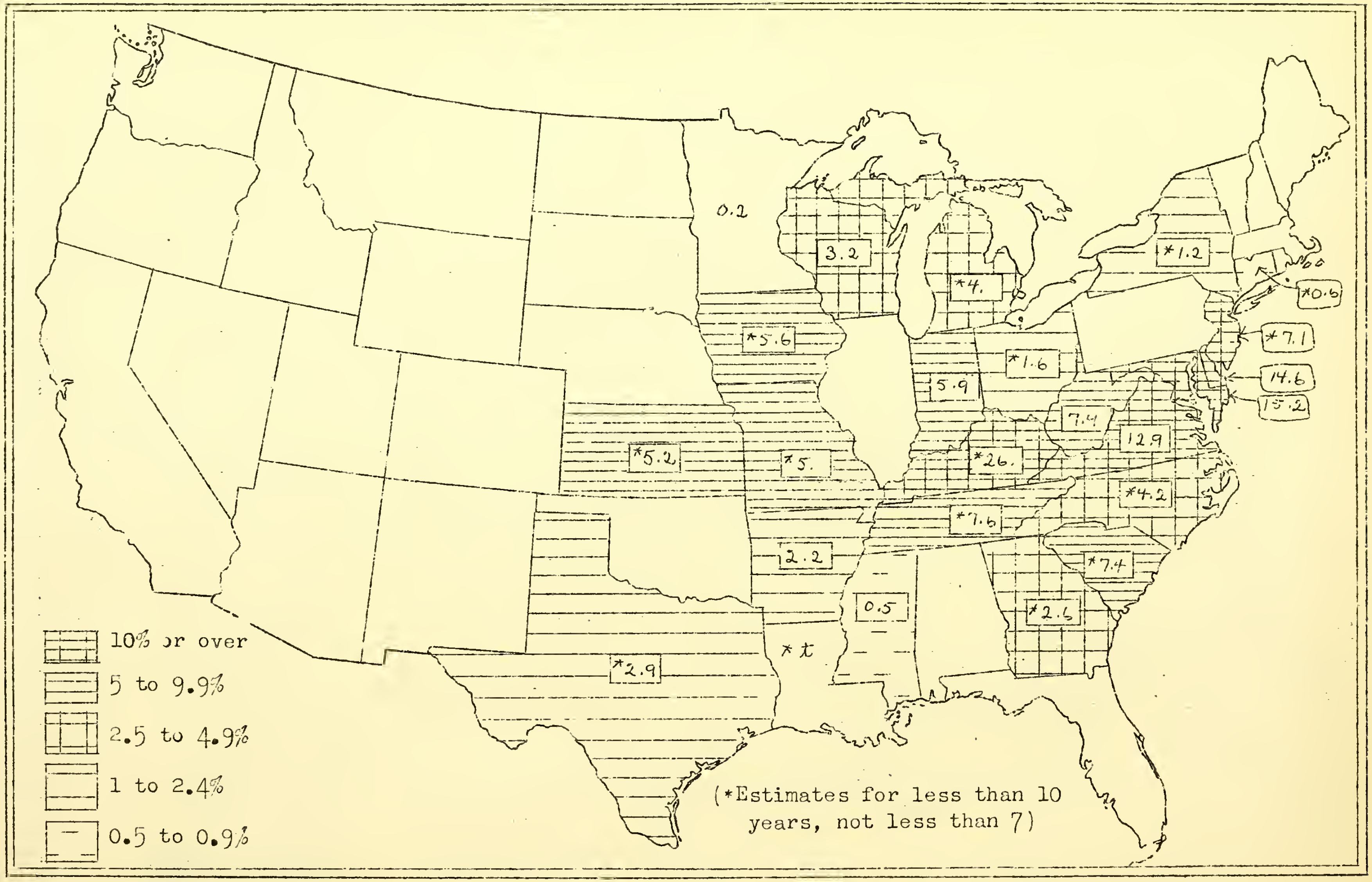

Figure 26. Percentage losses from Septoria blight of tomato for the period - 1920 to 1929.

Leaf Mold (Cladosporium fulvum). About the usual amount of damage occurred in Massachusetts, Maryland, Louisiana, Indiana, and Wisconsin; less than normal in Florida and Michigan. Heavy losses were indicated for greenhouse crops in Massachusetts and Indiana, the former State reporting 5 per cent damage. Other States, including Washington and Porto Rico, indicated only traces, or otherwise slight losses. P. D. R. 176.

Blossom-End Rot (Non-parasitic). Losses above normal were reported from Massachusetts, New Jersey, Delaware, Maryland, Arkansas, Indiana, and Minnesota; and lower than usual from Wisconsin and Kansas. Washington and Mississippi reported its presence. Four collaborators attributed the unusual losses to the extremely hot, dry weather. P. D. R. 162.

Table 56. Losses from blossom-end rot of tomato as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
25	Virginia	2	New Jersey
7	Maryland	1	Connecticut
5	Indiana, Minnesota	0.5	Texas
4	New York	Trace	Massachusetts, Nebraska

Mosaic (virus). About the usual amounts of loss occurred in greenhouses generally, and somewhat less than normal in field plantings. States that reported tomato mosaic, not included in the page-references below are: New Jersey, Maryland, Mississippi, Indiana, Michigan, Wisconsin, Kansas, Montana, Washington, California, and Porto Rico. P. D. R. 110, 129, 160, 175, 177.

Collar Rot (various organisms). Reports from the following States indicate unusual prevalence of the disease: Delaware, very prevalent in late plantings; Indiana, destructive in one county on Arkansas plants; Maryland, general and severe in plant beds, loss 3 per cent; New Jersey, 2 per cent loss, very severe in some beds; Arkansas. P. D. R. 129.

Root Knot (Caconema radicicola). Caused 3 per cent loss in greenhouses in Massachusetts. Carbon disulphide emulsion method for disinfection of soil has given very good control (Guba). Also reported from North Carolina, Mississippi, Texas.

Fruit Spot (Phoma destructiva). Florida, severe; New Jersey; Texas, 1 per cent loss. P. D. R. 130.

Late Blight (Phytophthora infestans). North Carolina, less than usual, little loss; Texas, traces.

Buck-Eye Rot and Blight (Phytophthora terrestris). New York, in greenhouses, first report to the Survey; Florida, more than usual.

Soil Rot (Corticium vagum). Florida, unusually prevalent due to wet season; North Carolina, severe on late crop; Texas, 5 per cent loss.

Wilt (Verticillium alboatrum). Massachusetts, general in field plantings, 2 per cent loss; trace loss in greenhouses. According to E. F. Guba the species is V. ovatum Berkeley.

Stem Rot (Sclerotinia sclerotiorum). Washington, P. D. R. 176.

Fruit Rot (Oospora lactis). North Carolina.

Dodder (Cuscuta sp.). New York, one specimen.

Drought Injury: Great reduction in yield in Kentucky, and 20 per cent loss in Delaware and Arkansas.

Sunscald: Losses of 3 per cent in Missouri and 5 per cent in New Jersey.

Lightning Injury: Connecticut.

PEPPER

Bacterial Spot (Bacterium vesicatorium). Florida; Massachusetts, first report, observed in three counties. P. D. R. 189.

Mosaic (virus). Evidence indicating seed transmission is reported from New Jersey. Mosaic was also reported from Connecticut, Virginia, Porto Rico. P. D. R. 177, 189.

Blossom-End Rot (non-parasitic). Generally more than usual; North Carolina, 1 to 3 per cent loss; Florida, 50 per cent loss; Virginia, 75 per cent loss; Mississippi, Porto Rico. P. D. R. 189.

Fruit Rot (Vermicularia capsici). Porto Rico, traced to Georgia seed.

Fruit Rot (Colletotrichum nigrum) caused 10 per cent reduction in yield in South Carolina; also occurred in Porto Rico.

Twig Blight (Sclerotinia sclerotiorum). Florida. P. D. R. 189.

Dodder (Cuscuta sp.). About one per cent of the plants in one field in Virginia were attacked and seriously stunted. This is the first report to the Survey of dodder on this host.

Sunscald: New York, trace to 2 per cent loss; Florida, New Jersey, Porto Rico; Texas, 2 per cent loss.

E G G P L A N T

Wilt (Verticillium alboatrum). Losses from wilt in Massachusetts and New Jersey were as severe as usual, with 10 per cent reduction of the crop in Massachusetts. In New Jersey, slight degrees of resistance were observed in some of the foreign varieties and species under test. Less than normal in Wisconsin.

Wilt (Rhizoctonia microsclerotia). Porto Rico.

S W E E T P O T A T O

Black Rot (Ceratostomella fimbriata).

Table 57. Losses from black rot of sweet potato as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
10	Texas	2	Delaware, South Carolina
8	Kansas	1.5	Missouri, Maryland
5	Arkansas, New Jersey	1	Florida
3	North Carolina	Trace	Indiana, Virginia

Stem Rot, Wilt (Fusarium spp.)

Table 58. Losses from stem rot or wilt of sweet potato as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
12	New Jersey	1.5	Missouri
5	Arkansas, Kansas, Delaware	1	Indiana, Maryland, Texas
2	North Carolina	Trace	Florida, Kentucky, South Carolina

Scurf (Monilochaetes infuscans). Percentage losses reported are as follows: New Jersey, 4; Virginia, 1; Maryland, 0.5; Texas, trace.

Root Knot (Caconema radicicola). North Carolina reported more loss than usual, and indicated the Jersey and Porto Rico varieties and strains as resistant. Other States reporting: Arkansas, Mississippi, and Texas.

Brown Ring (Tylenchus dipsaci). An account of the first report of this pest on sweet potatoes in New Jersey and Maryland occurs on Page 109 of the 1930 Reporter. In New Jersey affected potatoes were found in two storage houses. Diseased roots when bedded produced few, but clean sprouts.

"Scald and Internal Necrosis" (apparently non-parasitic). Caused a loss of 200 bushels per acre in one field of Yellow Jersey in Indiana. It resembled mottle-necrosis caused by Pythium, but no organism could be isolated. (Gardner).

Brown Rot (Sclerotinia sp. associated). North Carolina, a late storage trouble in houses and banks causing a firm rot on all varieties observed; no external mycelium.

Mosaic (Undet.). Trace in Texas; not observed in Arkansas.

BEAN

For a full account of the bean disease survey of western States, including Colorado, Utah, Montana, Wyoming, Idaho and California, by W. J. Zaumeyer, see Page 228-239 of the 1930 Reporter.

Anthracnose (Colletotrichum lindemuthianum). Losses from anthracnose generally, as indicated by collaborators, were from less to much less than usual. P. D. R. 95, 131, 199.

Table 59. Losses from bean anthracnose as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
3	Missouri	Trace	Delaware, North Carolina, Mississippi, Texas, Arkansas, Michigan, Minnesota
2	Massachusetts, Florida		
1	Maine, Wisconsin		
		None	Virginia, Montana
0.5	Maryland, South Carolina, Louisiana		

Bacterial Blight (Bacterium phaseoli, etc.). Losse from blight in the more severely drought-stricken areas of the East and South were greatly reduced. In parts of New England, and in New York, Wisconsin, and New Jersey, losses were about normal; in West Virginia, North Carolina, South Carolina, and Mississippi, much less than usual. Heavy infections occurred in New York State on Red Kidney beans from California, "but apparently not from the Sacramento Valley." In Louisiana where losses were above normal, blight was most general on Colorado seed. Michigan reported much more infection on Red Kidney than other varieties. Colorado indicated traces of blight in northern sections, and severe infections near Sterling and in the Arkansas Valley.

Halo Blight (Bacterium medicaginis phaseolicola) was reported from Massachusetts where it was more prevalent but less damaging than B. phaseoli. In South Carolina Armstrong reports only a few scattered infections in the College variety tests as compared with heavy damage in 1929. P. D. R. 95, 131, 162, 199.

Table 60. Losses from bacterial blights of bean as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
10	Louisiana	2	Texas, Montana
8	Massachusetts	1	Maryland, South Carolina, Florida
6	Maine		
5	Wisconsin, Michigan	Trace	Delaware, North Carolina, Arkansas
2 to 5	New York	None	Virginia

Mosaic (Virus). Losses were more or less normal generally with the usual emphasis upon the susceptibility of Refugee varieties. P. D. R. 95, 177.

Table 61. Losses from bean mosaic as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
10	New York	0.5	Maryland
4	Montana	Trace	Massachusetts, North Carolina, Florida, Louisiana, Michigan
2	Maine, Minnesota		
1	Virginia, Texas, Wisconsin		

Root Rots (Fusarium spp., Rhizoctonia sp., etc). These diseases were general in New York State, unusually severe and apparently aggravated by the drought in Virginia, Maryland and West Virginia, and caused heavy losses in Louisiana following a long rainy season. In South Carolina normal losses were reported from the lower half of the State. In Texas serious reductions in stand were observed in two counties. P. D. R. 31, 95.

Table 62. Losses from bean root rots as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
10	South Carolina	1	Montana, Minnesota
5	New York, Virginia, Louisiana, Texas	Trace	Massachusetts, Florida, Michigan, Wisconsin
3	Maryland		

Powdery Mildew (Erysiphe polygoni). Unusual severity of this disease was observed in Maryland, Virginia, and North Carolina. In Virginia, prominent infection of stems, leaves, and pods appeared to be favored by heavy dews during the latter part of the growing season, and caused an estimated loss of 12 per cent. In Texas, the disease was severe in Hidalgo and Cameron Counties, and accounted for a loss of 2 per cent for the State. Porto Rico also reported this disease. P. D. R. 217.

Angular Leaf Spot (Isariopsis griseola). One report in each Massachusetts and New Jersey. P. D. R. 199.

Stem and Pod Spot (Sclerotinia sclerotiorum). Massachusetts. P. D. R. 217.

Lightning Injury. New York, in one field.

LIMA BEAN

Bacterial Spot (Bacterium vignae). Slight losses were indicated from Connecticut, Massachusetts (first report), New York, Maryland, and Colorado.

Halo Blight (Bacterium medicaginis phaseolicola). Prominent infection in Massachusetts on bush limas growing beside heavily infected snap beans.

Scab (Elsinoe canavaliae). Reported from Porto Rico and observed in United States on pods shipped from Cuba and Porto Rico. P. D. R. 96, 97.

CRUCIFERS

CABBAGE

Yellows (Fusarium conglutinans). Severe in North Carolina on the summer crop in sandy soil areas; a single specimen received in Pennsylvania and Mississippi; severe in some plantings in New Jersey with losses about normal; much less than usual in West Virginia; rare in Arkansas, and prevalent as usual in Kansas. Other States reported losses as follows: Maryland, 8 per cent; Missouri, 2 per cent; Texas and Wisconsin, 1 per cent; New York and Minnesota, traces; also reported from Indiana and Virginia. P. D. R. 162, 176.

Black Rot (Bacterium campestre) was very common at harvest time in Delaware, and was common and important in Arkansas. Heavy infection was reported on the winter crop in the Mobile section of Alabama with 25 per cent loss in some fields. It was said to be widespread and destructive on young plants in Florida. Two per cent loss was reported in Texas. P. D. R. 141, 162, 176, 209.

Downy Mildew (Peronospora parasitica). Especially severe in seed beds in Virginia and Florida; also reported from Massachusetts (first report to the Survey), Connecticut, New Jersey, and Texas. P. D. R. 141, 217.

Bacterial Spot (Bacterium maculicolum). Slight losses in Massachusetts and Porto Rico (first reports to Survey); scattered but unimportant in Florida. P. D. R. 141.

Rot (Botrytis sp.). Pennsylvania, more than usual due to dashing showers and hot weather.

Head Rot (Rhizoctonia sp.). Texas; Wisconsin, more than usual, late in season.

Lightning Injury. Wisconsin and New York.

CAULIFLOWER

Bacterial Spot (Bacterium maculicolum) and Black Leaf Spot (Alternaria brassicae) were reported from Massachusetts for the first time. P. D. R. 209.

HORSERADISH

Leaf Spot (Bacterium campestre armoraciae). South Dakota, trace loss, first report to Survey.

Fern Leaf (virus?). New York, 100 per cent infection in one field. (Chupp).

RUTABAGA

These diseases were reported from Massachusetts for the first time to the Survey.

Black Leaf Spot (Alternaria brassicae), slight damage. Dark Center (non-parasitic, see turnip), 5 per cent loss in Berkshire County. Black Rot (Bacterium campestre), slight damage in one county.

TURNIP

Black Leaf Spot (Alternaria brassicae), Leaf Spot (Cercosporella albo-maculans) and Dark Center (non-parasitic) were reported from Massachusetts for the first time. Dark center was general, but was more damaging on the Cape where infections varied up to 25 per cent. The total loss was 5 per cent. It is attributed to unfavorable growing conditions.

Basal Rot (Pythium sp.). New York, a semi-firm basal rot observed in several fields.

CUCURBITS

Mosaic (virus). Mosaic was reported to be increasing in importance on all cucurbits in the Imperial Valley. In New York, 100 per cent infection was observed in one field with no weed hosts nearby. P. D. R. 175, 209.

CUCUMBER

Downy Mildew (Pseudoperonospora cubensis). Infections were unusually severe in Virginia and Florida, with losses of 50 per cent and from 33.3 to 50 per cent, respectively. In Massachusetts, the usual amount occurred on the fall crop in greenhouses, where the disease may readily be controlled by proper regulation of temperature and humidity (Guba); in field plantings, less commercial loss than usual, 5 per cent. In Wisconsin, the disease appeared in greenhouses, but was held in check in the field by dry weather. Maryland, New Jersey, South Carolina, and Texas reported minor losses. P. D. R. 143, 188, 189.

Bacterial Wilt (Bacillus tracheiphilus). P. D. R. 131, 177, 197.

Table 63. Losses from bacterial wilt of cucumber as estimated by collaborators, 1930.

Percentage loss	States reporting	Percentage loss	States reporting
10	Massachusetts	0.5	Maryland
5	West Virginia	Trace	Missouri, Texas, Wisconsin
1.5	New York, New Jersey		

Mosaic (virus). In Massachusetts total loss was observed in one greenhouse, following a crop of water cress heavily infested with aphids. Commercial growers in New York secured good control by destroying weed hosts near the greenhouses. P. D. R. 160, 188, 198.

Table 64. Losses from cucumber mosaic as estimated by collaborators, 1930.

Percentage: loss	States reporting	Percentage: loss	States reporting
10 to 15	New York	2	Maryland, Wisconsin
5	Massachusetts, Florida	1	Virginia
		Trace	Texas, Michigan

Angular Leaf Spot (Bacterium lachrymans). This disease appeared to be held in check by dry weather in most of the States reporting. Scattering infections of minor importance were observed in Massachusetts (first report for that State). In New Jersey, severe infections occurred in Atlantic County. P. D. R. 131, 188, 198.

Leaf Blight (Macrosporium cucumerinum). Losses from this disease were reduced to a minimum, apparently by dry weather. P. D. R. 218.

Scab (Cladosporium cucumerinum). A severe outbreak with a loss of 50 to 75 per cent occurred in one greenhouse in Minnesota.

Root Knot (Caconema radicicola). Minor losses occurred in Texas and Washington. In Massachusetts, the disease was important as usual in greenhouses, causing an estimated loss of 3 per cent. Satisfactory control was secured with carbon disulphide emulsion. (Guba).

Snakehead (mechanical injury). Florida. P. D. R. 188.

C I T R O N

Downy Mildew (Pseudoperonospora cubensis). Citron is observed commonly in Florida as volunteer plants growing wild in fields and along woods, and is considered a source of downy mildew inoculum for fall crops of cucumber and other cucurbits. P. D. R. 189.

C A N T A L O U P E

Leaf Blight (Macrosporium cucumerinum). Loss estimates in general from States in the drought area indicated less damage than usual, traces up to 0.5 per cent. Maryland and Wisconsin reported much less blight than normal. In Florida, on the other hand, the disease was destructive. In Colorado, damage was limited to light, local infections in the Arkansas Valley. Massachusetts, New Jersey, North Carolina, Texas, and Arkansas reported unimportant losses. P. D. R. 188, 198.

Downy Mildew (Pseudoperonospora cubensis). In Maryland and North Carolina, where losses of 15 per cent occurred in 1929, the disease was much less important than usual in 1930, causing only 0.5 per cent loss in Maryland. In Massachusetts, the disease was normal, with 5 per cent loss, and caused severe defoliation in many late plantings. Delaware reported more downy mildew than usual. Florida and Louisiana reported heavy defoliation. Texas, also, reported severe infections with 3 per cent loss. Slight losses occurred in other States. The results of a spraying test conducted in 1929 in North Carolina are given on Pages 69-70 of the 1930 Reporter. P. D. R. 69, 143, 188, 198.

Anthracnose (Colletotrichum lagenarium). The unusually dry weather was thought to account for the marked reduction of losses in Maryland and Wisconsin, 0.1 per cent and a trace, respectively. Kansas, also, reported less anthracnose than usual, and Delaware much more. In North Carolina, the disease appeared in many fields but caused little damage.

Mosaic (virus). In Albany and Schenectady Counties, New York, heavy infections were observed on farms where the plants were started in greenhouses and where little attention was given to weed hosts; loss, 3 to 5 per cent. In addition to the "white pickle" mosaic, another kind of mosaic on muskmelons was observed by Chupp: "Two distinct mosaics were present on muskmelon. The most common one was the regular type usually described as white pickle. The second caused dwarf plants, but the affected leaves were not cupped downward nor did they show any rugosity. The leaves were very distinctly mottled but remained perfectly flat. The disease was transmitted by rubbing diseased leaves against healthy leaves on young plants in the greenhouse. It did not seem to go over on cucumbers in the field, even when cucumbers were growing immediately adjoining affected muskmelons. I observed the trouble only in the Lake counties."

Southern Blight (Sclerotium rolfsii). Texas, 2 per cent loss; Arkansas, 10 per cent loss due to fruit rot.

Scab (Cladosporium cucumerinum). Massachusetts, a trace. P. D. R. 198.

Fusarium Wilts. In Missouri the loss of 2 per cent caused by F. niveum was about normal. Chupp reports that "When inoculations were made" with the Fusarium isolated from a wilt in New York, described on Page 160 of the 1930 Reporter, "there was a hundred per cent infection and killing of young plants. Re-isolations of the same Fusarium were made."

Leak (Rhizopus sp.) and Leathery Rot (Fusarium spp.) were reported for the first time from Arizona. P. D. R. 173.

Ring Spot (virus). Virginia, 40 per cent infection in one planting; proved by Henderson to be due to the same virus that causes ring spot of tobacco. P. D. R. 187.

Dodder (Cuscuta arvensis). A specimen collected in Maryland by Dr. Waite.

SQUASH

Powdery Mildew (Erysiphe cichoracearum). Severe infections were reported from Florida, North Carolina, and Texas. Slight losses of both summer and winter squashes occurred in Connecticut and Massachusetts. The disease was less important than usual in New Jersey. P. D. R. 188.

Bacterial Wilt (Bacillus tracheiphilus) was the most important disease of both summer and winter squashes in Massachusetts and caused a loss of 10 per cent. P. D. R. 198.

Mosaic (virus). In Florida, occasionally damaging but generally of little importance; also in New Jersey, Mississippi, Texas.

Leaf Spot (Septoria cucurbitacearum). First report from Massachusetts, 1 per cent loss on winter squash; less severe on summer squash. P. D. R. 199.

Rot (Melanopsamma sp.). Massachusetts, causing decay of fruit.

PUMPKIN

Powdery Mildew (Erysiphe cichoracearum), was severe on the early crop in North Carolina.

Leaf Spot (Septoria cucurbitacearum). Massachusetts, general during latter part of season on all varieties observed.

Bacterial Spot ("Bacterium cucurbitae, presumably"). Indiana, chalky white spots on fruit. (Gardner).

WATERMELON

Anthracnose (Colletotrichum lagenarium) was more abundant than usual in Delaware and was very severe in late maturing crops. It caused a loss of 12 per cent in Florida, was less severe than usual in Maryland with a loss of 5 per cent, and much less than for the average year in Kansas with an estimated loss of 2 per cent. New Jersey also reported less anthracnose than normal, and North Carolina indicated much less damage than usual with only slight infection of even the latest plantings; Texas, 0.1 per cent loss.

Fusarium Wilt (F. niveum). Wilt caused 11 per cent loss in Missouri, attacked about 5 per cent of the acreage in the Imperial Valley of California, and was common and important in Arkansas. In Florida, the use each year of newly cleared land keeps the disease in check, loss 1 per cent. Other States reporting wilt were: Arizona, Indiana, Kansas, Michigan, Mississippi, New Jersey, Washington, Texas, and California. P. D. R. 143, 163, 209.

Bacterial Wilt (Bacillus tracheiphilus) was observed for the first time in Massachusetts, general, 5 per cent loss.

Downy Mildew (Pseudoperonospora cubensis). Massachusetts, Mississippi. P. D. R. 189.

Stem-End Rot (Diplodia sp.). Texas, 1 per cent loss; Missouri, 2 per cent loss.

Proliferation of floral parts, resulting in non-bearing plants, was reported from one locality in South Carolina.

C E L E R Y

Yellows (Aster yellows, virus). In Michigan, high soil temperatures and generally unfavorable growing conditions were factors conducive to a severe outbreak of yellows for the second successive year. It was severe in some fields of yellow varieties. Loss 2 per cent. (R. Nelson). Wisconsin also reported more damage than usual. P. D. R. 177.

Black Heart (non-parasitic). More than usual in Wisconsin, caused a loss of 5 per cent.

Oedema, Cracked Stems (climatic). Attributed in New York to sudden rains following hot, dry weather; local in Massachusetts, accompanied by stunting and heart rot. P. D. R. 217.

P E A

Bacterial Blight (Bacterium pisi). Outbreaks of unusual importance occurred early in the season in New York, Wisconsin, Michigan, Minnesota, and Arizona, following periods of cool, wet weather or driving rains. Infections became less important as the season progressed. Infected pods shipped from Florida were observed on the Cincinnati market. Loss estimates from States are as follows: Michigan, 2 per cent; Minnesota, 0.5 per cent; New York, trace to 1 per cent; Wisconsin, trace.

Root Rot (Aphanomyces euteiches). In Maryland, losses were less than usual, 3 per cent, due to the extremely dry weather. In Wisconsin, the disease was general and normal, with 8 per cent loss, and scattered with normal losses in New Jersey. Minnesota reported much more root rot than usual occurring mostly early in season in the southern part of the State; Alaska and Perfection, susceptible; 0.5 per cent loss. North Carolina reported infections in the eastern part of the State.

Other Root Rots. Fusarium spp. In Minnesota the following varieties were said to be resistant: Horal, Roger's Green, Roger's K; while Perfection and Alaska were susceptible. Scattering infections were indicated in Massachusetts, Arizona, and Washington. A loss of 1 per cent in Colorado was reported to be due to F. martii.

Rhizoctonia spp. Heavy infections in low, wet soil in Massachusetts; caused seedling blight in Minnesota.

Ascochyta pinodella. Washington.

Undetermined. Severe infection of roots and lower stems of seedlings in certain lots of seed in Massachusetts. Three to 5 per cent loss in Tompkins County, New York, on Advancer and Lincoln in soil in which diseased plants were observed last year. Earlier plantings of Alaska and Advancer a few feet away on non-infected soil were affected only slightly.

Wilt (Fusarium spp.). In Minnesota, less damage than usual was reported, with a loss of 0.5 per cent. The following varieties were cited with regard to susceptibility and resistance: Resistant, Admirals, Rice's 13, Horal; susceptible, Badger, Thomas, Santiago, Giants, Telephone; very susceptible, Surprise, Alaska, Perfection. New Jersey reported severe infection, associated with the Aphanomyces root rot, in a few fields where rotation was not practiced, and Washington received one report from an eastern county. F. orthoceras pisi: H. A. Hunter estimated the loss in Maryland at 1.5 per cent but remarked that the crop was so severely injured by dry weather that it was practically impossible to observe the effect of the disease. It occurs principally in western Maryland. A loss of 5 per cent was reported from Wisconsin.

F. tracheiphilum: Wilt reported to be caused by F. vasinfectum tracheiphilum was observed in two counties in Mississippi.

Anthracnose (Colletotrichum pisi) was found for the first time in Maine on the pods, stems, and leaves of Gradus, Dwarf White Sugar, Blue Bantam, and Telephone. This disease has been known in Wisconsin for some time. In recent years it has been observed in Minnesota and Georgia. P. D. R. 182.

Leaf Spot (_Septoria_ sp.). Observed in only one planting in Massachusetts.

"Scorch" (high temperature; low rainfall). Much worse in Wisconsin than usual, causing a total loss of 15 per cent; most severe on sweet varieties during June and July.

OTHER VEGETABLES

ASPARAGUS

Rust (_Puccinia asparagi_). The aecidial stage was observed in Wisconsin on winter onion in one garden.

Stem Rot (_Fusarium_ sp.). General in Massachusetts and worse in drier sections; observed in South Carolina with _F. moniliforme_ and _F. semilectum_ associated. P. D. R. 197.

Blight (_Ascochytula asparagina_). Texas.

BEET

Mosaic (virus). Plantings for seed in Washington showed an average of 60 per cent infection. P. D. R. 176.

Canker (high temperature). Much more severe in Wisconsin than usual, cuasing a loss of 37 per cent; heavy losses in Ontario County, New York. ("Girdle or drought spot"); prevalent in one field in Massachusetts on heavy but moist soil ("root cracks").

CARROT

Leaf Blight (_Macrosporium carotae_) and Leaf Spot (_Cercospora apii carotae_) were reported from California for the first time. They occurred together in Santa Barbara County. P. D. R. 200.

Dodder (_Cuscuta arvensis_). Heavy infection in one twenty acre field in Texas.

Yellows (Aster yellows virus). New York, Wisconsin.

Root Rot (_Phymatotrichum omnivorum_) caused losses of 50 to 100 per cent in some fields in Hidalgo County, Texas, late in the spring.

LETTUCE

Drop (Sclerotinia sclerotiorum). In New York, 10 per cent loss was observed in Orange County with 1 to 2 per cent damage for the State. Local infections were reported from New Jersey and Washington.

Mosaic (virus). Losses of 2 to 3 per cent were reported from New York. Mosaic occurred also on the wild host plants Lactuca scariola and L. scariola integrata. Slight loss as usual in New Jersey.

Bottom Rot (Corticium vagum). Losses in four New York counties of 10, 15, 30 and 40 per cent, respectively, with an estimate of 10 to 15 per cent loss for the State. One per cent loss was reported from Texas.

Wilt (Pythium sp.) New York, trace of loss; Romaine and New York susceptible. One report was received in Washington.

Wilt (Bacterial undetermined). A loss of 30 per cent was observed in one field in Norfolk County, Massachusetts. P. D. R. 199.

Yellows (Aster yellows virus) was much less important than usual in New York with losses up to 3 per cent. Also reported from Massachusetts, Texas, and Wisconsin.

Tipburn (non-par.) More than usual in New Jersey, also in New York where the loss was estimated at 10 per cent; abundant on head lettuce in North Carolina; normal amounts in Wisconsin.

"Strangulation." (Prolonged irrigation plus high temperature). Arizona. P. D. R. 216.

ONION

Downy Mildew (Peronospora schleideni) was severe in Camden County, New Jersey, where it caused 50 per cent loss in some fields. It was severe on the seed crop and caused at least 5 per cent loss in Sacramento and Santa Clara Counties, California. The drought checked infection in New York.

White Rot (Sclerotium cepivorum). Reported from Virginia, the first survey report since 1925 when the disease was reported from Virginia and Kentucky. P. D. R. 82, 83, 104, 105.

Rust (Uromyces bicolor). Texas.

Yellow Dwarf (virus). Observed in one small patch in San Mateo County, California; first report from that State.

Top Blight and Root Rot (Unknown). Common in Massachusetts in the spring on crops grown from sets. Thought to be due to root infection following injury from dry weather and fertilizers.

PARSNIP

Leaf Spot (*Ramularia pastinacae*). First report to the survey from Massachusetts; scattered infections with a trace of loss.

RHUBARB

Crown Rot. *Phytophthora cactorum* caused important loss in Pennsylvania for the first time since 1923. The loss was estimated at 20 per cent. It was most severe in new plantings. *Rhizoctonia* sp. caused 4 per cent loss in Texas.

Root Rot. *Phymatotrichum omnivorum* caused 50 per cent loss in Texas. *Fusarium* sp. was reported from Washington.

SALSIFY

Yellows (aster yellows virus). Slight loss in plantings adjacent to asters in Wisconsin. Trace of loss in Nassau County, New York.

SPINACH

Downy Mildew (*Peronospora effusa*) was more important than usual in Nassau County, New York, where losses ranged from 5 to 90 per cent with an average of 20 per cent. In other parts of the State, however, there was only a trace, and the total loss was between 5 and 10 per cent. Several large plantings on muck soils in Michigan were almost completely destroyed in October. The loss for that State was 10 per cent. Other losses reported were 5 per cent in Virginia and Texas, 2 per cent in Massachusetts, 0.5 per cent in Maryland. The disease was also reported from Pennsylvania, New Jersey, Washington.

Leaf Spot (*Heterosporium variabile*) was general and caused a loss of 20 per cent in Virginia. One report in California.

Wilt (*Fusarium* sp.) caused 4 per cent loss in Virginia.

DISEASES OF SPECIAL CROPS

COTTON

Anthracnose (Glomerella gossypii) was very severe in the extensive cotton growing region of southeastern Missouri, where the loss was estimated at 8 per cent. (I. T. Scott). In other States there was less damage than usual. Losses reported, besides that in Missouri, are 2 per cent in Florida and Louisiana, 0.5 per cent in South Carolina, and traces in North Carolina, Arkansas and Texas.

Angular Leaf Spot (Bacterium malvacearum). This disease, like anthracnose and nearly all other leaf and boll spotting diseases, was reduced to a minimum by the unusual dry weather in the cotton States. Florida and Texas reported 2 per cent loss, North and South Carolina, 1 per cent, other States traces.

Fusarium Wilt (F. vasinfectum). In general, cotton States reported less wilt than usual. However, badly infested soils in North Carolina showed just as much wilt as during the two previous seasons. Wilt was reported on Cecil sandy soils in Piedmont counties this year. Normally it is confined to the Sand Hill and Coastal Plain areas on soils of the Norfolk series. Good soils and poor ones have shown equally high percentages of infection but the more ferile soils yield better than poor sandy soils even when wilt is severe. (R. F. Poole). In South Carolina also there was just as much wilt as usual. The disease is slowly spreading through the Coastal Plains and in sandy spots in the Piedmont. (Geo. M. Armstrong). In Arkansas the incidence of wilt was much reduced due to dry weather. There was a great increase after rains in September but too late to do excessive damage. (V. H. Young). Resistant varieties give satisfactory control and a number of States reported increase in their use. Losses reported are 3 per cent in North Carolina, Louisiana, and Texas, 2.5 per cent in Arkansas, 1 per cent in South Carolina and Florida, 0.1 per cent in Georgia, and a trace in Missouri. P. D. R. 122, 185.

Verticillium Wilt (V. alboatrum) was observed for the first time in several counties in the Delta section of Mississippi. (Miles).

Black Leaf Spot (Macrosporium nigricantium). Hastened defoliation of "rust" plants in North Carolina.

Blight (Ascochyta gossypii) was more severe on young cotton plants in North Carolina than during the past two years. In some fields plants were greatly stunted due to heavy leaf infection before the first blossoms appeared. (R. F. Poole). On the other hand, in South Carolina there was almost entire absence of this disease as compared to widespread occurrence in several Piedmont counties in 1929. The very dry weather was probably a chief factor. (Geo. M. Armstrong). P. D. R. 101.

Root Rot (Phymatotrichum omnivorum). Five per cent loss in Texas. P. D. R. 122, 152, 185.

Damping Off, Sore Shin, Seedling Blight. Corticium vagum was general with considerable early reduction in stand and 1 per cent loss in Arkansas and Texas; also occurred in Louisiana and Mississippi. P. D. R. 101, 122. Cause undetermined. Cool wet weather in the Piedmont area of South Carolina led to the worst seedling losses in years. Actual surveys in two counties, Anderson and Greenwood, showed 40 per cent loss in stand. Later dry weather and no boll weevil damage allowed plants to make late growth and largely overcame ill effects of poor stand. (Geo. M. Armstrong). In Alabama, seedling diseases of all kinds were less than usual. Mississippi reported a stem-girdling of seedlings of unknown cause as common in the State.

Rust (Puccinia hibisciata, (Aecidium gossypii)) Arizona, Texas. The rust completely defoliated plants in spots in one field in Pinal County, Arizona, and probably reduced the crop by one-third. Cerotelium gossypii was reported from Arizona in the Plant Disease Reporter, Volume 14, Page 181. This was an error. The rust was reported to the Survey as Aecidium gossypii, which is the aecial stage of Puccinia hibisciata.

"Rust" (Non-parasitic). This disease was much more pronounced in Arkansas and Mississippi than usual, and more severe than usual in Louisiana, especially on early varieties. It was later than usual in North Carolina, but caused severe damage in some eastern counties. In general, the dry weather was considered as greatly favoring the disease.

Drought Injury. Arkansas and Texas reported from 25 to 30 per cent losses due to dry weather. P. D. R. 184.

Strangulation. Losses of 5 to 25 per cent locally in Texas. P. D. R. 184.

Sand Drown (Malnutrition), similar to the disease on tobacco and other plants, occurred in North Carolina on light sandy soils. The trouble was worse on Norfolk sands.

HOPS

Downy Mildew (Pseudoperonospora humuli). This disease was reported for the first time from Washington and Oregon. Serious local outbreaks occurred in Oregon. P. D. R. 98.

SUGAR CANE

Mosaic (Undetermined). General in Louisiana with moderate losses as usual, 3 to 5 per cent. The disease was reported also from Mississippi and Porto Rico. In Louisiana, the following varieties were cited for resistance and susceptibility: Very resistant, P. O. J. 213, C. O. 281, C. P. 807; resistant, P. O. J. 36, 234; susceptible, Purple. The P. O. J. 213 is the most widely used variety in the sugar belt of that State.

Red Rot (Colletotrichum falcatum). Louisiana reported losses above normal. There was serious damage to cane planted in the fall of 1929, during the early months of 1930, especially in P. O. J. 213, but during the growing season of 1930 there was very little injury. No variety is immune. C. O. 281, P. O. J. 36 are resistant, and C. P. 807 and P. O. J. 213 are susceptible. (E. C. Tims). From extensive surveys in 1929 and 1930 in Louisiana, Dr. E. V. Abbott concludes that C. P. 807 is one of the most resistant varieties under field conditions, although it was found to be very susceptible when artificially inoculated. (R. D. Rands). Also reported from Mississippi and Porto Rico.

Mottled Stripe (Phytomonas rubrisubalbicans). Much less in Louisiana due to substitution of P. O. J. varieties for the D-74 cane.

Red Stripe (Phytomonas rubrilineans). In Georgia and Florida (where it was first observed in 1927) occasional diseased plants noted with little damage to commercial canes, Cayana and P. O. J. 213, which are apparently resistant. (R. D. Rands). Very little, less than usual in Louisiana.

DISEASES OF ORNAMENTALS

ANEMONE (ANEMONE SP.)

Stem Rot (Sclerotium rolfsii) was reported from Ventura and Los Angeles Counties, California, in 1929, but was not found this year. (Stout and Scott).

CALLA LILY (ZANTEDESCHIA AETHIOPICA)

Root Rot (Phytophthora richardiae). New York. P. D. R. 14: 94.

Sclerotium Disease (Sclerotium sp.). Oregon, California. P. D. R. 14: 205-206.

C A R N A T I O N (DIANTHUS CARYOPHYLLUS)

Root Knot (Caconema radicicola). The greatest damage to the carnation plant in greenhouses in North Carolina is due to the root nema. In many instances the value of the crop is completely destroyed, especially when young plants become infected and moisture and temperature conditions in the greenhouse are favorable for the development of the nemas. (R. F. Poole).

Mosaic (undet.) What appeared to be a mosaic disease was observed on plants growing in several greenhouses in New York. Affected plants were noticeably stunted. The mottling which was irregular in type, was most evident on the young leaves. Some varieties were more seriously affected than others (C. Guterman).

C A S T O R B E A N (RICINUS COMMUNIS)

Bacterial Wilt (Bacterium solanacearum). Michigan, one specimen from house plant.

C H I N A A S T E R (CALLISTEPHUS CHINENSIS)

Dodder (Cuscuta sp.). Massachusetts.

Stem Rot (Sclerotium rolfsii), Mississippi. This seems to be the first report on this host to the Survey.

Leaf Spot (Septoria callistephi) was found ruining a ten-acre field in Berks County, Pennsylvania (G. L. Zundel). P. D. R. 14: 202.

Yellows (virus) was widespread and important, as usual. Losses of 60 and 25 per cent were reported from Michigan and Kansas, respectively. Nelson, in Michigan, states that the very dry weather was favorable for leaf hoppers, and the disease appeared early. It was observed on wild lettuce in June.

Wilt (Fusarium conglutinans callistephi). P. D. R. 14: 133, 181, 182.

Stem Blight (Botrytis sp.). Connecticut, New York.

C O S M O S (COSMOS SP.)

Root Rot (Rhizoctonia sp.). See snapdragon.

C R O C U S

Dry Rot (Sclerotium gladioli) on C. nudiflorus from New Jersey.

C Y C L A M E N (CYCLAMEN SP.)

Botrytis sp. STEM ROT reported from Washington. BLIGHT due to soft rot of the flower shoots near the crowns was serious in a greenhouse in New York. Controlled by removal of diseased shoots and lowering of greenhouse humidity. (C. Guterman).

F R E E S I A (FREESIA SP.)

Dry Rot (*Sclerotium gladioli*). New Jersey.

H O L L Y H O C K (ALTHEA ROSEA)

Bacterial Wilt (*Bacterium solanacearum*) was reported from a garden at Ithaca, New York, on young hollyhock plants and on *Hydrangea arborescens*, apparently for the first time on both hosts. The disease was probably introduced with the Hydrangea plants which were obtained from the South. The entire hedge of Hydrangea was destroyed while only occasional plants of the hollyhock were affected. (Charles Chupp, P. D. R. 14: 133).

H Y A C I N T H (HYACINTHUS SP.)

Yellow Disease (*Bacterium hyacinthi*). About 2 per cent of the plants affected in one large greenhouse planting in Detroit, Michigan.

Nematode (*Tylenchus dipsaci*). New Jersey, on greenhouse forcing stock.

I R I S (IRIS SPP.)

Leaf Blight (*Kabatiella microsticta*) on *I. germanica* in Oregon, first report.

Rust (*Puccinia iridis*) on *I. versicolor* in Massachusetts. P. D. R. 14: 202.

Root Rots. The following reports are the first from the respective States to the Survey. Basal Rot (*Sclerotium delphinii*) on *I. germanica* in New York. Crown Rot (*S. rolfsii*) in North Carolina and Kansas.

Mosaic (virus) is rather prevalent on German iris in New York but without much evidence of injury. It causes serious injury to bulbous iris, however, in the form of stunting, distortion, and flower reduction (C. Guterman). Also reported from Montana.

L A R K S P U R (DELPHINIUM SPP.)

Black Spot, Bacterial Blight (*Bacterium delphinii*) was reported from southern New England, New Jersey, New York, Ohio, Michigan, from Nebraska for the first time, and from Washington. In Massachusetts the disease caused blighting of the young stems in some cases. Severe defoliation occurred in the Botanical Garden collection of hybrids in Michigan. It had not been observed previously for several years. It was also seen on seedlings in other plantings.

Rust (*Puccinia clematidis*) is severe in North Carolina. The susceptibility of this plant to rust in the field seriously interferes with its popularity. In the greenhouse the disease also mars the appearance of the plant when a large percentage of the leaves are destroyed. (R. F. Poole).

A Virus Disease, the virus of which caused coarse etch when transferred to tobacco, was reported from Kentucky. P. D. R. 14: 118.

L I L Y (LILIUM SPP.)

Blight. *Botrytis* sp. occurred on *Lilium auratum* in New Jersey and on *L. candidum* (Madonna lily) in Massachusetts, Michigan, and Washington. It is becoming very destructive in the field in Michigan. *Botrytis elliptica* was reported from New York where *L. candidum* was said to be most susceptible, but *L. testaceum* and *L. superbum* were also very susceptible. It was serious on several varieties of *L. longiflorum* under glass.

Gray Mold (*Botrytis cinerea*). Michigan, destructive in greenhouses where careless watering was done.

Mosaic (virus) was reported from Massachusetts, New York, Pennsylvania, and Washington. P. D. R. 14: 201.

M O N K S H O O D (ACONITUM SP.)

Root Knot (*Caconema radicicola*) was reported from an estate in Nassau County, New York.

Base Rot (*Sclerotium delphinii*) was also reported from New York in Westchester County. Both of these seem not to have been reported on Aconitum previously. (C. Guterman).

N A R C I S S U S (NARCISSUS SPP.)

Blight. (*Botrytis* sp.). Washington.

Fire (*Botrytis narcissicola*). Washington.

Ramularia Blight (R. vallisumbrosae). Oregon. P. D. R. 15: 3-4. 1931.

Nematode (Tylenchus dipsaci). Reported from Alabama, Michigan, Washington, and California. One shipment of 2,000 bulbs of King Alfred to Michigan from the West produced badly diseased plants.

Mosaic or Gray Disease (virus). New York, Michigan, Washington. This is the most important disease in some varieties of daffodils in Michigan. As high as 50 per cent of the plants were observed to be affected in several large plantings. (R. Nelson).

P E T U N I A (PETUNIA SPP.)

Ringspot (virus). Virginia, natural infection. P. D. R. 14: 166.

S N A P D R A G O N (ANTIRRHINUM MAJUS)

Root Knot (Caconema radicicola) was reported from New York. Young seedlings in two-inch pots were seriously affected. The plants were stunted and made little or no growth. The leaves were slightly distorted. (C. Guterman). This seems to be the first report on this host from New York.

Root Rot, Collar Rot (Rhizoctonia sp.) of snapdragon, cosmos, marigolds was serious in affected gardens in Brazos County, Texas. In some cases as many as 80 per cent of the plants were killed. Isolations from infected roots produced pure cultures of Rhizoctonia sp. The disease was most prevalent during the summer and was most severe after watering. It subsided with the advent of cooler fall weather. (J. J. Taubenhaus).

S W E E T P E A (LATHYRUS ODORATUS)

Leaf Spot (Isariopsis griseola) was reported from Connecticut, apparently for the first time on this host.

Root Knot (Caconema radicicola) was very serious on the fall crop in Massachusetts, causing heavy loss in many cases. Its prevalence seems to have been due to high temperatures prevailing in August, September, and October. Usually it is not an important disease of sweet peas and is rarely observed. (E. F. Guba).

S W E E T W I L L I A M (DIANTHUS BARBATUS)

Stem Rot (Sclerotium rolfsii) severe in North Carolina.

Anthracnose (Volutella dianthi). New York. P. D. R. 14: 87.

T U L I P (TULIPA SPP.)

Blight (Botrytis tulipae) was reported from New York, Mississippi, Michigan, Nebraska and Washington. In Michigan it was very severe on tulips out-of-doors. The flowers were completely blasted in nearly all plantings observed. The disease was very severe on one large planting at Pullman, Washington. It has been fairly common in western Washington, but this was the first severe case reported for eastern Washington. P. D. R. 14: 181.

Gray Bulb Rot (Rhizoctonia tuliparum). Massachusetts, on bulbs imported from Holland. P. D. R. 14: 78.

W A T E R L I L Y (NYMPHAEA SPP.)

Smut (Entyloma nymphaeae). District of Columbia. P. D. R. 14: 118.

D I S E A S E S O F O R N A M E N T A L S H R U B S

B A R B E R R Y (BERBERIS SPP.)

Wilt (Verticillium alboatrum) on Japanese barberry (B. thunbergi), Hampden County, Massachusetts. P. D. R. 201.

B O X (BUXUS SEMPERVIRENS)

Leaf Blight (Macrophoma candollei) was serious in a large planting in Ste. Genevieve County, Missouri. This is the first time it has been reported in the State (I. T. Scott). In North Carolina the disease was especially prominent on plants severely injured by low temperatures (R. F. Poole).

Winter Injury. Young plants with yellow leaves and dead branches were sent from nurseries in North Carolina during the winter and the same condition was observed on older plants. The injury was caused by sudden low temperatures during the early part of November. (R. F. Poole).

C O T O N E A S T E R

Blight (Bacillus amylovorus). Arizona on C. pannosa. P. D. R. 14: 166, 182.

Sphaeropsis malorum (=Physalospora malorum) on C. franchetti cinerascens, New York. P. D. R. 14: 248.

E U O N Y M U S

Crown Gall (*Bacterium tumefaciens*). Michigan, on *E. radicans*.

H Y D R A N G E A

Bacterial Wilt (*Bacterium solanacearum*). New York, see hollyhock.

L I L A C (*SYRINGA SPP.*)

Bacterial Blight (*Bacterium syringae*). One nursery in New York in which this disease was serious on French hybrids in 1929 cut out all affected shoots that season. This year only one or two plants were affected. (C. Guterman). Also reported from Washington.

Die Back (*Phytophthora cactorum*). Reported from New Jersey.

P A C H Y S A N D R A (*PACHYSANDRA SP.*)

Blight (*Volutella buxi*) caused dying of Pachysandra on an estate at Stamford, Connecticut.

P R U N U S SPP.

Brown Rot (*Sclerotinia fructicola*) was reported on flowering almonds from Connecticut (on *P. glandulosa*) and Illinois (on *P. japonica*); and on the purple leaf plum, *P. cerasifera pissardi*, from Connecticut. P. D. R. 14: 94.

R O S E (*ROSA SPP.*)

Mosaic or Infectious Chlorosis (virus) was reported from Wisconsin, Michigan, and the Pacific Coast. Two new cases in Michigan were traced to diseased stock from Oregon and California. Dr. Freeman Weiss reports the results of a survey in Pacific Coast States and in Texas in the *Reporter*, Volume 14, Pages 203-206. Further observations on the disease in Oregon are given by F. P. McWhorter in Volume 15, Pages 1-3. (Feb. 1, 1931).

S P I R A E A (*SPIRAEA SPP.*)

Blight (*Bacillus amylovorus*). Virginia on *S. vanhouttei*. P. D. R. 14: 133.

DISEASES OF TREES

CONIFERS

White Pine Blister Rust (Cronartium ribicola). The outstanding development in the white pine blister rust situation in the United States during 1930 was the discovery of the rapid increase of the rust in the western white pine region of eastern Washington, northern Idaho, and western Montana. In this region western white pine (Pinus monticola) is the chief commercial timber tree on more than 3,000,000 acres of land that is predominantly unsuited for agricultural use. The economic life of the region is founded upon the forest industries, which do a business of \$35,000,000 to \$40,000,000 annually in white pine products. About 60 per cent of this money is distributed in pay-rolls. White pine is the basis of the industry and constitutes 75 per cent or more of the value of the lumber output of the region. Lumber of the other native tree species does not now sell for enough to pay the costs of logging, manufacture and transportation to the great consuming centers of the country. The loss of the white pine would mean economic disaster to the region. About one-half of the white pine land is government-owned and within the national forests. The remainder is owned by the States and private owners. These areas are intermingled and a large percentage of them bear young stands. Since the future timber supply depends upon the young stands and reproduction, the protection of the young growth is fully as important as the protection of the stands now merchantable.

Scouting during the season resulted in the location of 11 new centers of pine infection in Idaho; 4 near Headquarters and Pierce, 1 on the Clearwater National Forest, 4 in the vicinity of Elk River, 1 near Clarkia, and 1 on the St. Joe National Forest. Diseased Ribes were found at 16 points; 1 on the Clearwater National Forest, 6 on the lands of the Clearwater Timber Protective Association, and 9 in the St. Joe River drainage. In adjacent Montana, new Ribes infections were found at 4 points near Haugan. Both the western white and sugar pine (P. lambertiana) are more susceptible to the disease than the eastern white pine and wild Ribes are generally more numerous than in eastern forests.

In the Pacific Coast Region, a new center of pine infection was located in Oregon on Roaring River, Clackmas County, and another on Minto Creek in Linn County near Independence Ranger Station. The latter is the most southern point in the West at which pine infection has been located. Diseased Ribes were found at two points in Linn County on Thomas Creek and Minto Creek, and on Roaring River in Clackamas County. These infections show that the rust is gradually approachin. the valuable sugar-pine forests of southern Oregon and California.

In the eastern United States there was no change in the infested area during 1930. Limited scouting in the Appalachian region south of Pennsylvania gave negative results. No systematic search of the rust was made in the region south of the Lake States because of drought conditions. Within the infested region the rust causes serious damage to white pines (P. strobus) in unprotected areas. (J. F. Martin)

S A V I N (JUNIPERUS SABINA)

Crown Gall (Bacterium tumefaciens). Specimens of Juniperus sabina showing galls on the crown and roots were received from L. E. Miles of Mississippi. Bacterium tumefaciens was isolated by Miss Nellie A. Brown from the galls on the stock at and below the graft. This report is unusually interesting because of the fact that the host is a conifer. It seems to be the first record of crown gall on J. sabina.

S P R U C E (PICEA SPP.)

Canker (Cytospora sp.) was reported on the Colorado blue spruce (P. pungens glauca) from Massachusetts, and on Koster's blue spruce (P. pungens kosteri) from New Jersey. In Massachusetts the disease was observed by Boyd in three counties and was reported from a fourth. It made rapid progress in some trees in Hampshire County.

H A R D W O O D S

B L U E G U M (EUCALYPTUS GLOBULUS)

Drought. In Southern California drought caused very general dying on non-irrigated trees, affecting windbreak rows or groves in a very scattered way - good trees alternating with dead ones. (Wm. T. Horne).

C H E S T N U T (CASTANEA DENTATA)

Blight (Endothia parasitica). Estimates received by the Division of Forest Pathology in 1930 on the distribution of chestnut blight do not indicate any unusual spread, but the combination of it and drought is expected to work havoc with chestnut in some localities. The full extent of such injury will not be known until reports are received for 1931.

A detailed survey was made in Ohio by O. N. Liming, who estimated that in the eastern half of the State approximately 80 to 99 per cent of the chestnut was infected and 1 to 50 per cent dead.

The accompanying map (Figure 25) shows the estimated distribution of the chestnut blight in the eastern United States. (R. B. Clapper).

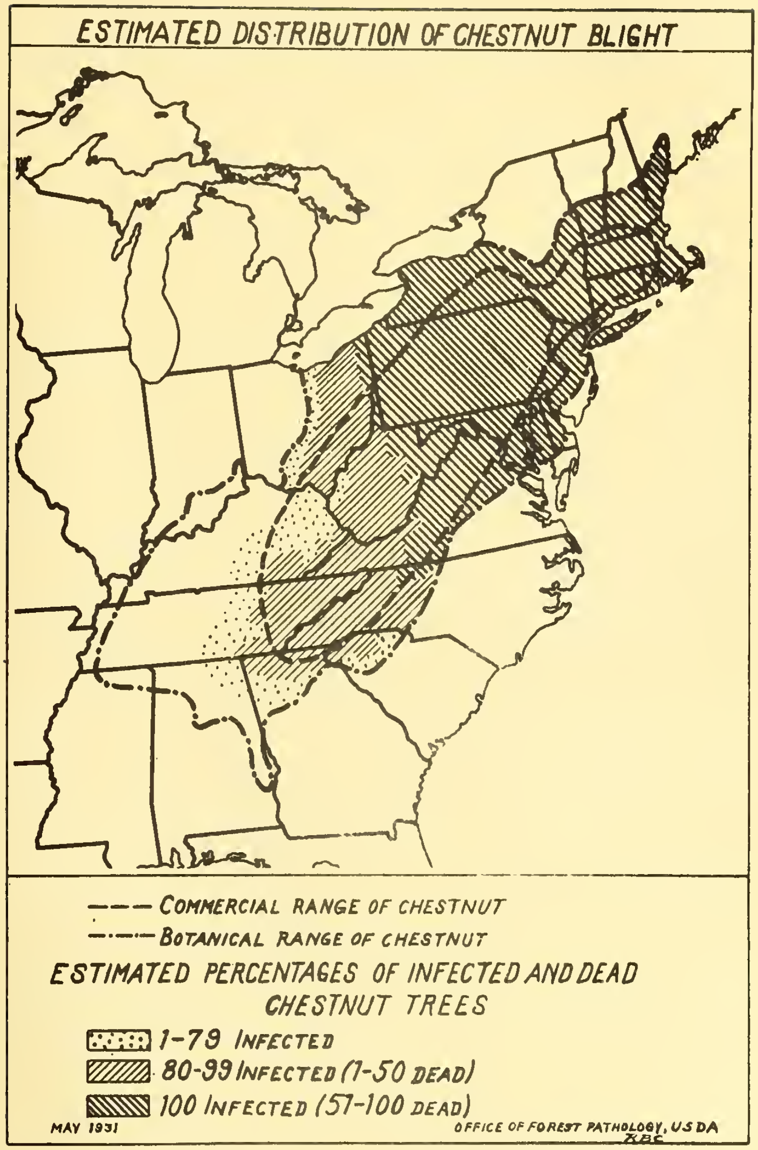

Figure 25. Estimated distribution of chestnut blight in 1930. (Map by R. B. Clapper).

E L M (ULMUS SPP.)

Dutch Elm Disease (Graphium ulmi). For some years plant pathologists in this country have been watching for the Dutch elm disease (Graphium ulmi Schwarz) which has caused the widespread death of elms in various countries in Europe. In the summer of 1930 it was first found in this country at Cleveland, Ohio, and was identified independently by Dr. Christine Buisman, a Dutch plant pathologist then travelling here, and by Curtis May.

During 1930, as a result of survey work and cooperation from plant pathologists, tree surgeons, and others, many specimens of diseased elms were sent to the cooperative laboratory maintained at Wooster, Ohio, by the Ohio Agricultural Experiment Station and the Division of Forest Pathology of the Bureau of Plant Industry, United States Department of Agriculture. From the large number of specimens submitted in 1930, those from only four trees were found to be infected by the Dutch elm disease. Three of these trees were in Cleveland and one in Cincinnati, Ohio.

At present it is often impossible to state from a field examination whether a wilted elm has or has not the Dutch elm disease. The most confusing symptoms were those caused by species of Verticillium and Cephalosporium-like fungus. All of these organisms appeared to be rather virulent parasites on elm. Quite a number of specimens of Sphaeropsis twig blight of the elm were also received.

For further details as to symptoms and other points about the Dutch elm disease, readers are referred to Department Circular 170, entitled "The Dutch Elm Disease."

The results for 1930 and to the present date for 1931 give some indication that there is comparatively little of this disease present in the United States and that there is still some hope of eradicating it. It is requested that pathologists continue to send in specimens of wilted elms to the Dutch Elm Disease Laboratory at Wooster, Ohio, or to culture them in their own laboratories. (G. F. Gravatt)

H A W T H O R N (CRATAEGUS SPP.)

Blight (Bacillus amylovorus). Connecticut, New Jersey, North Carolina, and Nebraska reported this disease. In North Carolina trees in woods showed heavy blossom infection.

Sclerotinia Blight (S. johansoni). Minnesota, on C. rotundifolia.

Rust (Gymnosporangium spp.). G. germinale and G. globosum were very severe on foliage and fruits in both ornamental plantings and in the extensive wild plantings in Missouri. G. germinale was also reported from New Jersey on C. occidentalis, from Washington on C. oxyacantha, and from North Carolina and Texas. G. globosum was reported from Long Island and North Carolina. P. D. R. 190, 241.

MAPLE (ACER SPP.)

Crown Gall (Bacterium tumefaciens) was reported again this year on the sycamore maple (Acer pseudoplatanus). Several more young trees which had been planted on the streets of Lansing were removed due to galls on the root systems. Dr. J. H. Muncie originally confirmed the diagnosis of this disease in 1929 (F. C. Strong). P. D. R. 14: 119.

Canker (Phomopsis sp.). On Japanese maple (A. palmatum rubrum), causing death of young stock and of branches on older stock, was reported from New Jersey.

MOUNTAIN ASH (SORBUS SPP.)

Blight (Bacillus amylovorus). Connecticut.

Crown Gall (Bacterium tumefaciens). Connecticut, on S. aucuparia.

Black Rot (Physalospora malorum). New Jersey, on S. americana. First report to the Survey on this host.

Brown Bark Spot (non-par.). Washington.

OAK (QUERCUS SPP.)

Anthracnose (Gnomonia veneta) was reported from New England and New Jersey west to Wisconsin and Indiana, in almost all cases as more prevalent than usual and as particularly abundant on white oaks. Some white oak trees in Massachusetts showed as high as 90 per cent defoliation. Michigan reported it to be severe and more abundant than for the past ten years on white oaks, although there was very little on sycamores which are usually severely attacked every year. P. D. R. 14: 133, 152.

Chestnut Blight (Endothia parasitica). One report in Connecticut, on Quercus rubra, semi-saprophytic. (G. P. Clinton).

WILLOW (SALIX SPP.)

Scab (Fusicladium saliciperdum). Clinton and McCormick reported that in Connecticut willow scab seemed to be on the decline in 1929 and 1930, apparently due to the dry seasons. At Norfolk the only willows left alive were sprayed trees, and these had better foliage than when spraying was started three years ago. The disease was also reported from Massachusetts where there was said to be more than usual in 1930. P. D. R. 14: 77, 118, 132, 153, 226.

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Prepared by Nellie W. Nance

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Errata and Explanation

p. 118. Aster yellows in Michigan is not a virus disease but is due to a Fusarium.

p. 23. Table 10, first column under, South Carolina, read Dillon instead of Willow County.