THE PLANT DISEASE REPORTER

ISSUED BY

THE OFFICE OF MYCOLOGY AND DISEASE SURVEY

Supplement 60

Diseases of Fruit and Nut Crops

In the United States in 1927

June 1, 1928.

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

DISEASES OF FRUIT AND NUT CROPS IN THE UNITED STATES IN 1927

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Plant Disease Reporter
Supplement 60

June 1, 1928

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INTRODUCTION

The chief function of the supplements of the Plant Disease Reporter is to present summaries of plant disease injuries and losses as they occurred in the country during the time covered by the respective reports. For these supplements it is extremely desirable to have reports from the various collaborators as complete as possible in order to present a summary approaching a true representation of conditions. The service which may be rendered in this respect is in direct proportion to the completeness and accuracy of the reports.

The limiting factors at the present time in the presenting of a satisfactory picture of disease conditions is the lack of reports from a sufficiently large number of states and the incompleteness of information on a large number of diseases. For very natural reasons, the diseases which are most severe receive the greatest amount of attention. However, it is just as important to know that a disease caused little or no injury as to know that it was very destructive. This knowledge is important in balancing factors, in permitting generalizations and in obtaining a more accurate conception of the nation-wide importance of a particular disease.

More detailed and accurate information regarding specific diseases should be made available. More data regarding moisture and temperature influences in disease production could be profitably included. In a greater number of cases, the correlation between the development of host and parasite in different states would be interesting. In many instances, dates of fungous development would mean

much more if the stages of development of the host plant could also be included. Dates of first observation of occurrence of disease are in many cases obviously much later than the actual time of first occurrence. Information regarding the susceptibility of varieties is extremely valuable. The collection of more data on varietal susceptibility would be well worth while.

It would seem that loss estimates do not in all instances receive the careful consideration which they merit. In a few cases different loss estimates are given in different statements regarding the same disease. These and other inconsistencies in estimating losses have a tendency to decrease confidence in value of estimates presented. The criticism may be made that loss estimates are not accurate and no amount of care can make them so. This is admittedly true, however, careful estimates by those in closest touch with the disease situations in the various states would seem to provide a reasonable indication of losses. At least these estimates constitute the best available information on the subject and as such they have a distinct value.

The references to recent literature included in this summary have been considerably decreased in number as compared with some of those of previous years. The foreign references, unless they seemed to have a special bearing or importance, have been left out.

FRUIT DISEASES OF 1927

DISEASES OF POME FRUITS

APPLE

SCAB CAUSED BY VENTURIA INAEQUALIS (CKE.) ADERH.

In 1927 apple scab was very severe in all or nearly all of the states bordering on the Great Lakes. In general, in this region reports of collaborators indicate that the disease was more destructive than it has been in a number of years. Scab also caused heavy losses in Maine, Kentucky, New Jersey, Tennessee, and North Dakota. In the Southern States and in the Pacific Northwest there was in general less scab than usual. Table 25 shows the importance of scab in 1927 as compared with last year and the average year.

In the northern apple belt, and especially in the Great Lakes region, much of the first infection took place very early in the season, in most cases in the "delayed dormant," "prepink," or "pink" stages of host development.

Apple - Scab

Table 25. Prevalence of apple scab in 1927 as compared with the average year and with 1926, as reported by collaborators.

Prevalence compared with average			:: Prevalence compared with 1926			
Much more	More	Same	Less	:: Much more	More	Same	Less
Ky.	Mass.	N. J.	Va.	:: Pa.	Mass.	Del.	Va.
Ark.	Conn.	Del.	N. C.	:: Ky.	Conn.	Ga.	N. C.
Ind.	N. Y.°	Md.	Iowa	:: Tenn.	N. Y.°	Colo.	Mo.
Mich.	Pa.	W. Va.	Mo.	:: Ark.	N. J.	Wash.	S. D.
Wis.	Tenn.	Ga.	S. D.	:: Ill.	Md.		Oreg*
N. D.	Ill.	Colo.	Oreg.	:: Ind.	W. Va.		
Neb.	Kans.	Wash.		:: Mich.	Iowa		
				:: Wis.	Kans.		
				:: Minn.			
				:: N. D.			
				:: Neb.			

°Much more to more. *Much less.

Cool weather and prolonged rains were more common than usual over this area during the early spring, leading to a heavy infection from ascospores and later in some cases to a heavier conidial infection. An outstanding feature of this attack was the heavy leaf infection of a type in which the scab fungus grew profusely over the leaf surface. This phase led to considerable defoliation in orchards in several states. The following remarks regarding leaf injury are selected from reports of collaborators:

Maine: Injury is (September 15) unusually severe causing defoliation and fruit dropping in the more susceptible varieties. (Folsom)

New York (Onondaga Co.): Scab infection is (July 11) severe on the foliage in most sections of the county. (Ward)

(Greene Co.): Infection is (June 13) severe on the leaves in unsprayed orchards. (A. S. Mills)

West Virginia: While the fruit was kept clean, scab developed later to a considerable extent on leaves, becoming especially severe in sectionswhere fruit had been killed by low temperatures. (Sherwood)

Arkansas: The crop was light and fruit injury was not serious but there was much leaf injury. (Young)

Illinois: Seems to be so severe in many orchards that serious injury is being done to leaves where spraying is practiced. Continuous rains made it impossible to control the disease early in the season. As a result the diffused type of scab has developed over the entire surfaces of the leaves and when the sprays are applied killing of the leaf tissue results. (Anderson)

Apple - Scab

Michigan: There was much injury from leaf infection, Some unsprayed orchards were practically defoliated by the middle of the summer. In many sprayed orchards the reduction in leaf area, due to scab and spray burn which followed, amounted to as much as 50 per cent. (Bennett)

Wisconsin: By far the most striking disease of the season. Many trees are half defoliated now (July 1). (Vaughan)

Minnesota: A diffused type of scab was common on Florence Crab. Some trees were nearly defoliated. (Sect. Pl. Path.)

Idaho: Found only in northern Idaho, usually most severe in Kootenai County. (Hungerford)

Other reports, especially from the Middle West States, indicate heavy infestations. New York reports the heaviest loss since 1922. In Indiana the worst attack of scab in the last five years was experienced, according to Gardner. In Michigan, Bennett states that scab was more destructive this year than during any season of the last ten years. In Wisconsin, Vaughan says that it was the outstanding disease of the year. In Minnesota although late in starting, it "caused more damage than at any time during the last three years" according to the Department of Plant Pathology. States in which scab was of little or no importance include North Carolina, South Carolina, Georgia, Oregon, and Washington. There was a very light infection in North Carolina, according to Poole, who suggests unusually early ascospore discharge and warm spring weather as possible causes, as follows:

"It is interesting to record here that scab was not found on the leaves of any variety this year. One diseased apple each was found on Florence Crab and Winesap. Whether or not the emergence of spores was earlier than the foliage is not known but it seems possible in view of the fact that emergence occurred much earlier in Northern States than in normal seasons. While spraying could have prevented some infection it could not have given such complete control as existed. It may have been a case of unfavorable temperatures for infection since the past spring was more or less warm in comparison with the average season."

In South Carolina there were no reports of scab, and in Oregon Zeller states that there was less than usual. In Washington it was not important in commercial sections.

Estimated losses are presented in table 26.

Table 26. Percentage losses from apple scab as estimated by collaborators, 1927:

Percentage loss	States reporting	Percentage loss	States reporting
20-30	New York	4	North Carolina
20	Michigan, Maine	3	Maryland
15	Wisconsin	2	Connecticut, Delaware, Minnesota, South Carolina
10	Montana		
8	Indiana, Kentucky		
		1.5	Virginia
7.5	New Jersey		
		1	Arkansas
7	Tennessee, North Dakota		
		.8	California
5	Massachusetts, Oklahoma, Iowa	.2	Oregon
		Trace	Missouri, Colorado, Illinois, West Virginia, Mississippi

Ascospore discharge and time of infection

The importance of the proper timing of the early sprays in apple scab control has led to the keeping of more or less complete records of ascospore development and discharge in a number of the more important apple producing states. Rather complete reports have been received from nine states and partial reports, involving in most cases the time of first infection, have been received from a number of others. One of the important features of the behavior of the scab fungus was the early maturing of ascospores in a number of places. In Maine, Illinois, and Wisconsin ascospores were mature several days before there was any evidence of growth in the host, and in Maine and Wisconsin the first ascospore discharge occurred before susceptible host parts were exposed. In North Carolina, Poole states that ascospores "probably emerged too early to seriously affect the crop." Barss, in a letter dated April 23, states:

> "The beginning of ascospore discharge occurs so early under Oregon conditions that spores are in the air every rainy spell long before the winter buds on the trees begin to break. No check is made as a rule on the date of earliest spore maturity. Desiring some cultures the other day (about April 15) leaves were obtained and spores were discharged at once. (Apples are mostly two weeks from bloom yet.)"

Table 27. Data on time of ascospore maturity, discharge and infection, and on host development and time of first appearance of disease, as reported by collaborators, 1927.

Place	Time of observation of first mature ascospores	Time of first ascospore discharge	Stage of host at time of first ascospore discharge	Time of first infection	Stage of host at time of first infection	Time of first observed occurrence of disease
Monmouth Co., Me.	April 17	April 22	Previous to delayed dormant	Probably April 22		May 31
Middlesex Co., Mass.	April 30	May 4-5	Pink	Probably May 4-5	Pink	June 15
New Haven, Conn.	May 3	May 9-10	Early bloom	May 9-10	Early bloom	May 17
Bridgeton, N.J.	March 23*	April 9			*	May 10
State College, Pa.	April 14	April 21	Early pink to pink	April 21	Early pink to pink	May 13 (1)
Caroline Co., Md.	April 5	April 5	Pre-pink	April 5	Pre-pink	May 3
Winchester, Va.	March 31	April 1-2-3	Pre-pink	May 7-8	Petal fall	May 16
Urbana, Ill.	March 19	March 20-21	Dormant			April 16
Fennville, Mich.	April 1	April 19	Early pre-pink	April 19	Early pre-pink	May 5
Madison, Wis.	March 11	April 5	Buds swelling (2)	April 19-21	Late delayed dormant	May 9
Stungeon Bay, Wis.	April 3	April 16	Early green tip	May 9-10	Medium closed cluster	May 25

*Atlantic Co.

(1) Snyder Co.

(2) No leaf or sepal parts exposed.

Records of ascospore discharge in Massachusetts over a period of seven years are supplied by Osmun, Doran, and Guba as follows:

1921	First discharge of ascospores (Middlesex Co.)	April 26
1922	" " " " "	May 2
1923	" " " " "	May 2
1924	" " " " "	May 3
1925	" " " " "	April 30
1926	" " " " "	May 3
1927	Mature spores in asci (Hampshire Co.)	April 22
1927	" " " " (Middlesex Co.)	April 30
1927	First discharge of ascospores (Hampshire Co.)	April 23

In table 27 are compiled the data on ascospore maturity, discharge, and infection together with data on host development and time of first observation of disease, as reported by collaborators in states in which records were kept and made available.

Factors in perithecial development

Detailed studies on the factors of importance in perithecial development have been continued at the University of Wisconsin. Wilson (10) states that in 1926 and 1927, "ascospores matured earlier in leaves which were placed on the ground in September than those similarly placed later in the autumn. The delay in maturation did not, however, correspond to the delay in leaf fall, as a delay in leaf fall was followed by a shortening in the time between leaf fall and maturation of ascospores." The most interesting result of Wilson's work, however, has to do with the finding that perithecia seem to be formed only in lesions or near the margins of lesions. Regarding this he states:

> "The type and abundance of leaf lesions appeared to bear a direct relationship to the quantity of perithecia produced. No evidence was found that perithecia were produced at points remote from lesions or that the fungus spread to uninfected leaves and there produced perithecia."

Varietal susceptibility

The severe attack of apple scab over a large proportion of the apple belt of the eastern part of the United States in 1927 afforded unusual opportunities for observation on the behavior of varieties under extremely favorable conditions for infection. Several collaborators have supplied information on this question. Their data are tabulated in table 28. Extreme susceptibility of foliage was noted in the case of the Florence Crab in Minnesota, the McIntosh in Wisconsin, and the Winter Banana in Michigan. It will be noted that there is much difference of opinion regarding the susceptibility of Grimes Golden. Schneiderhan says regarding this variety:

> "Grimes Golden is usually considered to be one of the most scab resistant varieties grown in this section, yet, we have found numerous apples infected by scab. Grimes foliage also is very resistant to scab infection but this year it is heavily infected. This is noteworthy because such

susceptible varieties like Stayman, Roma, and Winesap are only slightly infected. It would seem as an offhand observation, that in abnormally cool, wet seasons, Grimes Golden is particularly disposed to scab infection."

Table 28. Data on varietal susceptibility of apple to scab as compiled from collaborators' reports, 1927.

Varieties very susceptible	Varieties susceptible	Varieties resistant	Varieties very resistant
McIntosh (1)(5)(7)(8)	Rome (1)	Grimes Golden (5)	Grimes Golden (2)
Stayman (1)	Smith Cider (1)	Rhode Island Greening (5)	Northwestern Greening (8)
Paragon (1)	Grimes Golden (1)	Northwestern Greening (5)	
Winesap (2)	Ben Davis (2)		
Rome Beauty (2)	York (2)		
Stayman (2)	Delicious (3)(8)		
Delicious (2)	Winesap group of varieties (3)		
Yates (4)	Wagener (5)		
Snow (5)(6)			
Winter Banana (5)			
Florence Crab (8)			
Virginia Crab (8)			
Red June (9)			

Numerals indicate the collaborator and state from which data were received as follows:

(1) W. H. Martin - New Jersey
(2) F. J. Schneiderhan - Virginia
(3) W. W. Magill - Kentucky
(4) C. H. Alden and O. C. Boyd - Georgia
(5) C. W. Bennett - Michigan
(6) P. W. Miller - Wisconsin
(7) R. E. Vaughan - Wisconsin
(8) Section of Plant Pathology - Minnesota
(9) M. W. Gardner - Indiana

Control

In the Great Lakes region the early sprays, delayed dormant, pre-pink, and pink sprays, were more important than usual. This was also true for several eastern states. In Iowa infection came later and sprays in the calyx and ten days later gave good results according to Archer. Other remarks by collaborators follow:

New York (Ulster Co.): There was serious apple scab infection in many orchards, particularly where the delayed dormant and pink sprays were not thorough or were omitted or where oil was used without a fungicide. In one McIntosh orchard that received oil-lime sulphur in the delayed dormant and three timely dust applications, about 95 per cent of the leaves are (June 13) badly scabbed and about 60 per cent of the fruits are affected. (Boyce)

Apple - Scab

Maryland: Growers on the eastern shore were warned to spray before trees reached the pink stage, otherwise scab would have been much worse. (Jehle)

Wisconsin: Dusts were not so effective as wet sprays. Most growers used liquid lime-sulphur. Additional sprays between prepink and pink gave increased control. Due to the cool season development was slow. (Vaughan)

Indiana: Sulphur dust failed to control in an experimental orchard. (Gardner)

Hamilton and Keitt (4) report on control of scab by various fungicides applied at different intervals before and after inoculation. The materials used controlled the disease excellently when applied within 24 hours before inoculation, but there was considerable difference in effectiveness when fungicides were applied after inoculation.

Experiments on the fall application of fungicides in relation to control of apple scab were continued in Wisconsin by Keitt and Wilson (6). They report that, "Marked reduction in perithecial development followed the use of calcium arsenate and Paris green, respectively, each in various combinations with other materials. In certain cases the treated leaves developed less than 10 per cent as many perithecia as untreated. Calcium arsenate unless modified by adding appropriate materials caused considerable host injury." Silico-fluorides and chlorophenol mercury are said to have been less effective.

Recent literature

1. Ballou, F. H., and I. F. Lewis. Standard and dilute sprays in apple scab prevention. Amer. Fruit Grow. Mag. 47 (3): 28-29. Mar. 1927.

2. Brown, E. Effect of shade on apple scab. Gard. Chron. III, 81: 305-306. Apr. 30, 1927.

3. Dutton, W. C. Notes on some of the newer spray materials. Quart. Bul. Michigan Agr. Exp. Sta. 9: 117-120. 1927.

4. Hamilton, J. M., and G. W. Keitt. Certain sulphur fungicides in the control of apple scab. (Abstract) Phytopath. 18: 146. 1928.

5. Hockey, J. F. Apple scab. Canada Dept. Agr. Pamph. 82: 7 pp. 1927.

6. Keitt, G. W., and E. E. Wilson. Fall applications of fungicides in relation to apple scab control. (Abstract) Phytopath. 18: 146. 1928.

7. Laubert, R. Altes und Neues über das Apfel- und Birnen-Fusicladium und seine Bekämpfung. Obst. u. Gemüseb. 73: 84-85. Mar. 24, 1927.

8. Martin, W. H., and E. S. Clark. Apple scab studies. New Jersey Exp. Stat. Ann. Rep. 47: 332-334. 1927.

9. Whetzel, H. H. Apple scab. Proc. New Jersey Hort. Soc. 52: 175-184. 1927.

10. Wilson, E. E. Factors important in the development of perithecia of Venturia inaequalis. (Abstract) Phytopath. 18: 145. 1928.

11. Young, H. C., and C. May. The timing of apple scab sprays. Ohio Agr. Exp. Stat. Bul. 403: 28 pp. Mar. 1927.

BLOTCH CAUSED BY PHYLLOSTICTA SOLITARIA ELL. & EV.

The reports on apple blotch, received from 26 states during 1927, indicate a considerable variation in severity of the attacks of this disease in different states. In the Eastern States conditions were apparently unfavorable for abundant development. Infestations lighter than usual were reported from Pennsylvania and Virginia. Schneiderhan attributes the light infestation in Virginia to insufficient moisture for spore emission early in the season and to unusually cool weather during the growing season. The most severe attacks were reported from Illinois, Indiana, Arkansas, and Kansas, all of these states reporting more blotch than usual. In Illinois all of the fruit in some orchards was affected, according to Anderson. In Indiana, Gardner (3) states:

> "Blotch has been a serious disease this year also, due to the rainy season early in the year. Fruit not properly sprayed certainly showed the ravages of this disease."

Young in Arkansas states that although there was more blotch than usual it was difficult to estimate losses on account of the light apple crop. Losses reported are shown in table 29.

The following reports indicate the degree of severity in some of the states which did not have general infestation:

> North Carolina: Very severe on Limbertwig at North Wilkesboro. The heavy setting of fruit on some trees was entirely and severely diseased. (Poole)
>
> Texas: Fairly prevalent and important. (Taubenhaus)
>
> Missouri: Blotch was very severe in the southern part of the state but about as usual in the central and northern portions. The loss for the entire state is not high but may

Table 29. Percentage losses from apple blotch as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
20	Oklahoma	1	Maryland, Arkansas, Texas
5	Tennessee, Illinois, Missouri, Kansas	.3	New Jersey
3.5	North Carolina	Trace	Delaware, Wisconsin, Iowa, Virginia,
3	Kentucky, Indiana		West Virginia
2	Mississippi		

reach 15 to 20 per cent in individual orchards where no attempt has been made to control the disease. (Scott)

Isolated occurrences of blotch in sections outside of the area in which this disease is common were reported in two instances. Thomas in New York states:

> "On cankered seedlings planted May 1924 there was some spread from old cankers. Only occasional new cankers have been formed and none were found which seemed to have been produced in 1927."

Blotch was also found on Northwestern Greening in Fayette and Calhoun Counties in the northern half of Iowa. Archer points out that the reports extend considerably the known distribution of blotch in that state.

Kohl (4) in Indiana has contributed evidence showing that the cycle of infection is at least two years.

Data on spore emission and periods of infection for 1927 are very meager, comprehensive records being available from only two states. Kohl (4) reported on periods of infection in Indiana as follows:

> "By the use of potted trees it was found that infection at Lafayette, Indiana, occurred during 18 out of 27 rain periods between 3 days and 7 weeks after petal fall (May 7). At Mitchell, Indiana, in 1927 infection occurred during 15 out of 17 rain periods between 5 days and 6 weeks after petal fall (April 25)."

Schneiderhan in Virginia compared spore emission records of 1926 with those of 1927 as follows:

Apple - Blotch

"In regard to the blotch spore emissions, I find that in 1926 we recorded 9 between May 19 and July 10, the individual dates of these emissions being May 19, June 5, 12, 13, 15, 23, July 4, 5, and 10. Compared with this record we find that in 1927 there were only 7 emissions between May 10 and June 12, the dates being May 10, 14, 18, 25, and 29, June 3, 4, and 12."

Varietal susceptibility

So far as reports would permit varieties are arranged in table 30 in order of their susceptibility to blotch as classified by collaborators. Some of the information could not readily be tabulated in this way and such reports are given by states as follows:

North Carolina: In the College orchard, blotch was severe on Yates, Rome Beauty, Bonum, Terry, Shockley, San Jacinto, Helm, and Black Ben Davis. The fruit on the San Jacinto was badly infected and rotting. The large limbs on the susceptible varieties were badly blotched, being rough and having a burnt appearance. The Black Ben Davis was an exception, for the limbs and trunk of the tree were healthy, while the younger twigs and limbs were severely blotched. Stayman, Winesap, Delicious, King Crab, Williams, Hudson, Red June, Arkansas, and York Imperial were not attacked, nor were there any signs of old blotch cankers on these trees. All other varieties showed moderate to light infection. (Poole)

New Jersey: Slight infection on Duchess, severe on Smith Cider. (Martin)

Pennsylvania: Only on Smith Cider and Krauser. (Thurston)

Illinois: Very abundant in some orchards on Yellow Transparent, a variety which usually shows no blotch. (Anderson)

Table 30. Comparative susceptibility of apple varieties to blotch as reported by collaborators, 1927.

Very susceptible	Susceptible	Resistant	Very resistant
Northwestern Greening (1)(4)	Rome Beauty (1)	Wealthy (5)	York Imperial (4)
Smith Cider (1)(2)	Ben Davis (1)(4)		
Limbertwig (4)	Golden Winesap (2)		Stayman (4)
Duchess (5)	Duchess (3)		Winesap (4)
Ben Davis (5)	Maiden Blush (5)		Rome Beauty (4)

Numerals indicate states and collaborators from which data were received, as follows:

Apple - Blotch

(1) E. C. Sherwood - West Virginia
(2) M. W. Gardner - Indiana
(3) W. H. Martin - New Jersey
(4) F. J. Schneiderhan - Virginia
(5) H. W. Anderson - Illinois

Recent literature

1. Ballou, F. H., and I. F. Lewis. Spraying for prevention of apple blotch and apple scab. Ohio Agr. Exp. Sta. Bul. 413: 32 pp. Oct. 1927.

2. ---------- Dilute versus standard sprays for apple blotch. Amer. Fruit Grow. Mag. 47 (2): 4, 18, 43. Feb. 1927.

3. Gardner, M. W. Apple blotch canker eradication. Phytopath. 17: 185-188. 1927.

4. Kohl, E. J. The cycle of infection in apple blotch. (Abstract) Phytopath. 18: 145. 1928.

5. Martin, W. H. Apple blotch studies. Ann. Rep. New Jersey Agr. Exp. Sta. 47: 329-332. 1927.

6. Schneiderhan, F. J. Recent developments in the control of fruit diseases. Proc. Virginia State Hort. Soc. 31: 145-157. Feb. 1927.

CEDAR RUST CAUSED BY GYMNOSPORANGIUM JUNIPERI-VIRGINIANAE SCHW.

In 1927 there was apparently about the usual amount of cedar rust in the eastern half of the United States. Five states, Pennsylvania, Virginia, South Dakota, Nebraska, and Kansas, reported more and Minnesota much more than in the average year. Iowa and Indiana reported less, New Jersey, West Virginia, North Carolina and Minnesota reported severe leaf infection.

New Jersey: In Essex County, in one orchard, the apple trees were completely defoliated on the side towards a stand of cedars. (Martin)

West Virginia: Rather serious infection of leaves where cedars were near orchards. Some infection on the fruit. (Sherwood)

Apple - Cedar Rust

North Carolina: Rust was more severe this year than last. In the eastern part of the state, as in the Piedmont, leaf infection was abundant this year. In some cases the fruit was badly diseased. (Poole)

Minnesota: This year Wealthy trees near cedars, especially those to the southwest of cedars, were defoliated completely. (Sect. Pl. Path.)

In Green County, New York, A. S. Mills estimates that a 5 per cent loss was caused in the case of the Wealthy, and in Orange County a 15 per cent loss was caused in some orchards of the same variety, according to Blauvelt. In the Hudson River valley of New York, Thomas and W. D. Mills observed a peculiar pitting and malformation of McIntosh believed to be caused by rust infection. (See Pl. Dis. Reptr. 11 (9): 107-108. 1927). The loss to the McIntosh variety in some orchards from this type of injury amounted to 10 per cent and in a few instances to as much as 50 per cent. Thomas states that this pitting on McIntosh is probably identical with that described in 1924 by Gardner (1) as occurring on Rome Beauty.

Loss estimates are given in table 31.

Table 31. Percentage losses from cedar rust on apple as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
4	Virginia	5	Maryland, Tennessee, Mississippi
3	North Carolina		
1	Connecticut, South Carolina, Illinois, Minnesota, Arkansas	Trace	Massachusetts, New York, New Jersey, West Virginia, Michigan, Wisconsin, Iowa, Missouri, Kentucky

In Virginia, according to Schneiderhan, cedar rust was favored by cool weather and abundant rainfall early in the season. These conditions were responsible for an extended period of sporidial infection. In relation to liberation of sporidia in 1926 and 1927 Schneiderhan makes the following comparison:

"In regard to the cedar rust emission, the 1926 record shows that between April 11 and July 4, ten emissions occurred, the dates being April 11 and 31, May 16 and 19, June 5, 12, 13, 15 and 23, July 4. In 1927 we recorded thirteen emissions between April 9 and June 12, the dates of the various emissions being April 9, 21, 29 and 30, May 7, 8, 10, 14, 18, 25 and 29, June 3, 4, and 12."

Apple - Cedar Rust

Poole, in North Carolina, tells of a general and uniform leaf infection on susceptible varieties in an orchard near Raleigh from "cedar apples" a mile away although the cedar trees in question had only from 1 to 5 "cedar apples" each. Regarding infection in other parts of the state he says:

> "There was a heavy emergence of spores about May 6 in the vicinity of Charlotte, Greensboro and Davidson. The emergence of spores began early in the vicinity of Raleigh. Some were escaping the latter part of March and others during April. Infection of apple leaves in the orchard at Raleigh was observed the latter part of April."

Anderson states that there was a general scarcity of "cedar apples" in Illinois due to previous dry seasons.

Varietal susceptibility

A part of the data on varietal resistance is compiled in table 32. The wide differences in classification of some varieties as to resistance, as in the case of Duchess, which is reported as both very resistant and very susceptible, suggests a considerable variation in host or fungus, or both, in different situations.

Table 32. Data on varietal susceptibility of apple to cedar rust as compiled from reports of collaborators, 1927.

Very susceptible	Susceptible	Resistant	Very resistant
Duchess (4)	Wealthy (1)	Brett (7)	Stayman (4)
York Imperial (4)(5)	McIntosh (1)		Grimes Golden (5)
Rome Beauty (4) (5)	Twenty Ounce (1)		Winesap (5)
Winter Banana (5)	Winter Banana (1)(2)		Northwestern Greening (7)
Wealthy (7)(8)	Grimes Golden (2)		Duchess (7)
Bechtel's Flowering Crab (7)(8)	Rome Beauty (3)(6)		Delicious (7)
	Early Ripe (3)		Patten Greening (7)
	Winesap (4)		Golden Delicious
	Delicious (4)		
	Ben Davis (5)		
	Benoni (6)		
	Jonathan (6) (7)		
	Scott Winter (7)		

Numerals indicate states and collaborators from which data was received as follows:

Apple - Cedar Rust

(1) Charles Chupp - New York
(2) W. H. Martin - New Jersey
(3) J. F. Adams - Delaware
(4) F. J. Schneiderhan - Virginia
(5) E. C. Sherwood - West Virginia
(6) M. W. Gardner - Indiana
(7) Section of Plant Pathology - Minnesota
(8) W. A. Archer - Iowa

The following report of conditions in the College orchard was received from Poole of North Carolina:

> "Rust was severe on the leaves of Bonum, King Crab, Summer Banana, Red June, and Shockley. It was found on the fruit of Red June, King Crab, and Shockley. It was not found on Stayman, Winesap, Delicious, Rome Beauty, Yates, Florence Crab, Williams, Hudson, Arkansas, Terry or Black Ben Davis."

Archer states that in Iowa the leaves of the wild crab, Malus ioensis, were severely attacked, hypertrophied twigs also occasionally being produced. Young (3) has recently published on the extreme susceptibility of the variety Ada Red to twig infection in Arkansas. He states that cankers formed on the wood of one year old whips led to the breaking of the stems at or near the point of infection.

Recent literature

1. Gardner, M. W. Indiana plant diseases 1924. Proc. Indiana Acad. Sci. 35: 237-257. 1925.

2. Stakman, E. C. The control of apple rust. Minnesota Hort. 55: 234-238. Oct. 1927.

3. Young, V. H. Varietal susceptibility of Ada Red and certain other apple varieties to cedar rust, with special reference to twig infections. Phytopath. 17: 541-543. 1927.

BLACK ROT CAUSED BY PHYSALOSPORA MALORUM (PK.) SHEAR

Black rot in 1927 was more severe than usual in six states, Connecticut, North Carolina, Michigan, Arkansas, Nebraska, and Kansas, but of these states only North Carolina and Arkansas reported appreciable losses. Dry weather during midsummer held the disease in check in Virginia, West Virginia, Tennessee, and Iowa. Fall rains produced favorable conditions for fruit infection in Virginia, Indiana, and Michigan and considerable rotting of wind-falls and of fruit in storage occurred in these states. Poole in North Carolina reported the abundant occurrence of the perfect stage of the black rot fungus in an orchard at Raleigh during the fall of 1926. Leaf injury was severe in Arkansas where leaf spot was associated with spray injury resulting in considerable defoliation according to Young. It was also severe in Pennsylvania and more prevalent than usual in a number of other states.

Apple - Black Rot

Black rot was not reported from Florida, South Carolina, Louisiana, Colorado, Idaho, and Washington, and Zeller states that it was extremely rare in Oregon.

The following statements of collaborators indicate the phases of the disease which were of importance in the different states and some of the factors influencing the prevalence of black rot.

Pennsylvania: Not of importance; less "frog-eye" than for several years. (Thurston)

Virginia: Severe in proportion to the severity of codling moth injury. The abnormally cool weather caused an unusually light codling moth infestation. (Schneiderhan)

West Virginia: Rather heavy infection on leaves but not severe on the fruit. (Sherwood)

North Carolina: The canker form was severe in orchards of young trees in Lee County. The development of the perfect and imperfect stages of the causal fungus on limbs killed by fire blight is a very important aid to the overwintering of the fungus in many orchards in this state. (Poole)

Arkansas: Frog-eye leaf spot was worse than for many years. The crop was very light but the foliage was affected and a high percentage destroyed on some susceptible varieties. Next year's crop will be affected. (Young)

Indiana: Leaf spot severe on Rome Beauty, Jonathan, and Wealthy. It was worse on Rome Beauty than on the other Varieties. (Gardner)

Illinois: Mostly on wormy, injured or fallen fruit. (Stout)

Michigan: The usual number of cankers was present in neglected orchards and in those which had been affected by fire blight. Black rot was more common on stored fruit than it has been for several years. In some storehouses it was almost equal to blue mold in the amount of injury produced. (Bennett)

Wisconsin: Not seen or reported. It was probably present in Racine County as in other years. (Vaughan)

Minnesota: Mostly present as bark cankers. It develops on apples, especially windfalls, when they are kept in warm storage. It frequently causes frog-eye on Hibernal. (Sect. Pl. Path.)

Apple - Black Rot

Iowa: Of slight importance, in part due to the failure of the apple crop. Slight to moderate leaf infection observed generally. In Keokuk County a very severe infection occurred in some varieties. (Archer)

Missouri: Does not seem to be severe in well managed orchards. It is always present in old orchards, particularly the frog-eye phase. Some rotted fruits were brought in this season. (Scott)

Kansas: Considerable leaf infection. (Elmer)

Loss estimates are given in table 33.

Table 33. Percentage losses from black rot of apple as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
10	Oklahoma	.5	Indiana
5	Maryland, Arkansas	Trace	Maine, Massachusetts, New York, New Jersey,
2.5	North Carolina		Delaware, Minnesota,
2	Connecticut, Tennessee		Iowa, Missouri, Kentucky, Mississippi, West Virginia
1	Virginia, Illinois, Michigan		

Several reports of early occurrence of black rot in 1927 were received. These with other data are presented in the accompanying table 34.

Table 34. Dates and places of first observation of black rot on apple as reported by collaborators, 1927.

Date	Place	County	State
April 20	-----	Alcorn	Mississippi
May 10	-----	Calvert	Maryland
May 11	Dover	Kent	Delaware
May 15	New Bedford	Middlesex	New Jersey
May 26	Lafayette	Tippecanoe	Indiana
June 17	Marion	Tolland	Connecticut
June 20	-----	Ulster	New York
July 7	Winchester	Frederick	Virginia
July 11	Hardin	Calhoun	Illinois

Apple - Black Rot

The Ben Davis is generally considered to be one of the varieties most susceptible to black rot. It is again reported to be very susceptible by Schneiderhan in Virginia, and Young in Arkansas where its close relative the Gano is said to be equally susceptible. Schneiderhan lists Stayman and Rome Beauty as susceptible and York Imperial as very resistant. Martin in New Jersey observed black rot on Red Astrachan, Rome Beauty, Maiden Blush, Ben Davis, Twenty Ounce, Smith Cider, Winesap, Starr, and Red June.

Poole in North Carolina from observations on black rot made in the College orchard at Raleigh has the following report regarding varietal susceptibility, susceptibility of different host parts, and factors, especially fire blight, which influence occurrence of disease.

> "This disease occurs severely on the twigs of some trees which show no signs of frog-eye, and in some cases where there is no twig infection the leaves are badly infected, possibly from infected twigs on adjacent trees. For example, the Yates variety shows heavy infection of the twigs, but no frog-eye of the leaf. The Florence Crab, York, Helm, and San Jacinto show the same condition. On the other hand, the Shockley and Ben Davis show no twig infection but severe frog-eye. Stayman, Winesap, Delicious, King Crab, Summer Banana, Winter Banana and Hudson were not attacked. In nearly every case these varieties were resistant to fire blight. There is another point here worth mentioning, and that is the source of leaf infection. In every case where this occurred the inoculum came from the infected twigs on trees which were badly blighted. There was a slight infection of apples which had fallen to the ground but only occasionally was an infected apple seen on the tree."

Gardner reports control of the leaf phase of black rot on Duchess in Indiana with the Bordeaux mixture sprays which are used for blotch in that state.

Recent literature

1. Preti, G. Studio interno al cancro del melo ed allo Sphaeropsis malorum. Ann. R. Ist. Sup. Agr. Portici. III, 1: 25-41. 1926.

2. Swartout, H. Blister and black rot cankers. Missouri Agr. Exp. Sta. Bul. 248. 15 p. Mar. 1927.

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

Collaborators' reports indicate that bitter rot was not an especially important disease in 1927. Of the more important apple states in which bitter rot is usually most severe, namely, Virginia, North Carolina, Tennessee, and Maryland, the highest reported losses were 5 per cent in Tennessee and 3.5 per cent in North Carolina. In Virginia, Schneiderhan found that the disease was three weeks later in appearing

than in 1926 and was held in check during mid-season by dry weather and low temperatures. In Georgia, the temperature was favorable for rot development but the summer was exceptionally dry, and in Indiana the weather was too cold to be favorable. Loss estimates are given in table 35.

Table 35. Percentage losses from apple bitter rot as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
5	Georgia, Tennessee, Mississippi	.3	Virginia
3.5	North Carolina	Trace	Massachusetts, New Jersey, Delaware, Illinois, Missouri, Kentucky, Arkansas
1.5	Maryland		

On the overwinteringof the bitter rot fungus Hurt and Schneiderhan (1) report:

> "The fungus causing bitter rot of apples overwinters on fruit mummies resulting from bitter rot infection or drying up of small apples on twigs killed by fire blight or other causes. Overwintering on twigs was first observed in 1926 and only in the Smokehouse varieties. Mummies are by far the most important means of harboring the fungus and they are seemingly the sole means in the Pippin variety."

Regarding the length of time the bitter rot fungus remains alive in mummies Schneiderhan states:

> "Last year we demonstrated that the bitter rot fungus survived in the mummies for a period of two years. Mummies of the 1924 crop which have been exposed for three years were brought into the laboratory and used for purposes of inoculation. No infection resulted after using the same technique of former years. In this instance, we conclude that the bitter rot fungus did not survive for three years."

The dates which are given for the first appearance of disease are later than usual, which would seem to constitute additional evidence that conditions for bitter rot development were less favorable than in the average year. Data on the date and place of first appearance are presented in talbe 36.

Table 36. Dates and places of first observation of bitter rot on apple as reported by collaborators, 1927.

Date	Place	County	State
July 3	Tunnel Hill	Johnson	Illinois
July 18	Winchester	Frederick	Virginia
August 6	Bridgeton	Cumberland	New Jersey
August 9	Georgetown	Sussex	Delaware
September 14	Milford	New Haven	Connecticut
November 17	Utica	Hinds	Mississippi

No varieties were indicated as being especially resistant, though several are said to be very susceptible. Blauvelt reported considerable injury to the Strawberry variety in Orange County, New York. Varieties which are considered to be very susceptible are Pippin, Smokehouse (Virginia), Ben Davis (Georgia), and Lowell (Illinois). In Georgia the Delicious, Winesap, and Stayman are susceptible but more resistant than Ben Davis and Terry. The varieties Yates and Rome Beauty are said to have a certain amount of resistance. In New Jersey the Maiden Blush is susceptible as is the King David in Delaware.

Control

Hurt and Schneiderhan (1) have found that removal of mummies is an important auxiliary measure in control of bitter rot in Virginia. As a complete control program they recommend the removal of mummies, where conditions warrant, and making two applications of 3-5-50 Bordeaux mixture, one in the five-weeks, and another in the seven-weeks, spray periods.

Recent literature

1. Hurt, R. H., and F. J. Schneiderhan. New methods of bitter rot control. Virginia Agr. Exp. Stat. Bul. 254. 22 pp. 1927.

BLIGHT CAUSED BY BACILLUS AMYLOVORUS (BURR.) TREV.

Blight is subject to variations in severity of attack, perhaps to a greater extent than most other fruit diseases. A severe outbreak one year may be followed the succeeding year by a very mild attack. Reports indicate that blight on apple was at a very low ebb over almost the entire United States during 1927. The loss estimates are apparently lower this year than for any year since estimates have been made with the possible exceptions of 1919 or 1925. The following figures indicate the estimated annual losses for the years 1918 and 1926:

Apple - Blight

1918	1919	1920	1921	1922	1923	1924	1925	1926	Average
1.5%	.69%	1.2%	1%	2.4%	2.71%	1.61%	.5%	1.3%	1.4%

A comparable estimate has not yet been made for 1927 but it seems probable from data available that the 1927 estimate will fall close to, and possibly below, those of 1919 and 1925.

In 1927, eleven states, New Jersey, South Carolina, West Virginia, New York, Pennsylvania, Kentucky, Indiana, Michigan, Iowa, Missouri, Utah, and Idaho reported less blight than usual. Only three states, Virginia, Arkansas, and Kansas indicated more. Losses are given in table 37.

Table 37. Percentage losses from blight on apple as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
6	Mississippi	.5	Connecticut, Delaware, Tennessee
5	North Dakota, Texas	.2	Utah
4	Maryland, North Carolina	.1	Oregon
2	Illinois, Minnesota, Kansas, Arkansas, Oklahoma	Trace	Massachusetts, New York, Virginia, Iowa, Kentucky, Colorado, Idaho, West Virginia, California
1	South Carolina, Michigan, Wisconsin, Missouri, Montana		

Factors influencing the prevalence of blight

Under most conditions blossom infection is generally considered to be a necessary step for heavy twig infection. Blossom blight was much less common in the majority of states than usual, and to this in most cases is attributed the light blight infection of 1927. A number of factors are mentioned as influencing the amount of blossom and twig blight. Thomas states that "Oozing of hold-over cankers was not common" in New York and Crozier notes that in Wayne County, New York, dry weather up to July 22 checked spread of blight which had developed earlier in the season. Dry weather is considered to have been responsible for the light infestations in Wisconsin and Minnesota. Lack of exudate on hold-over cankers in Missouri is mentioned by Scott.

The role of disseminating insects in 1927 is not clear. Unfavorable weather for insect activity during the blossoming period is mentioned as a possible factor in the light infestation in Missouri and Michigan.

Apple - Blight

Anderson in Illinois states that in spite of what seemed favorable conditions for infection blossom blight did not develop and the twig blight which was observed later in the season was attributed in part to the spread of disease by aphids and flea beetles. Blight did not follow heavy infestation of sucking insects in New York and Michigan. Scott suggests that the light aphid infestation in Missouri may have been responsible in part at least for the scarcity of blight in that state.

Varietal susceptibility

Very little new data were supplied by collaborators on disease resistance. The crab varieties as usual are considered very susceptible. Jonathan, Northwestern Greening, Rhode Island Greening, Maiden Blush, and Willowtwig are other varieties named as very susceptible.

Control

Scott in Missouri states, "The absence of hold-over cankers of blight suggests the possibility of eliminating the disease over quite a large area in this state for several years to come by rigid application of surgical measures to trees with cankered wood." Likewise in a number of other states it would seem that 1928 would offer unusual opportunities for placing blight under control.

After several years of blight investigation in Pennsylvania, Nixon (4) states that in relation to control his results indicate the following:

> "1. That where fire blight is troublesome a system of culture or fertilization restricting growth to a conservative or controlled degree may be adopted which will render the trees less susceptible to disease. Any system of culture or fertilization which stimulates excessive growth not only renders the tree more susceptible to disease but renders the attack more severe."
>
> "2. That it is impracticable to attempt to cut out blighted twigs during the growing seasons."
>
> "3. That it is a practical method of control to cut out hold-over cankers during the dormant period thereby removing the immediate sources of infection."
>
> "4. That under no conditions are crab apples of any variety recommended for root stocks."

Recent literature

1. Anderson, H. W. Fire blight of apples and pears. Tree Talk 8 (2): 10-13. 1927.

2. Bryan, M. K. The flagella of Bacillus amylovorus. Phytopath. 17: 405-406. June 1927.

3. McCown, M. Fireblight. Hoosier Hort. 9: 57-62. Apr. 1927.

4. Nixon, E. L. The migration of Bacillus amylovorus in apple tissue and its effect on the host cells. Pennsylvania Agr. Exp. Sta. Bul. 212. 16 pp. Apr. 1927.

CROWN GALL CAUSED BY BACTERIUM TUMEFACIENS EFS. & TOWN.

Crown gall on apple is chiefly observed as a disease of nursery stock. Until recently this disease has undoubtedly been confused with certain types of wound overgrowths and the losses actually caused by this trouble both in the nursery and in the orchard are at present a subject of considerable speculation. Probably for these reasons collaborators are very cautious regarding their estimates of losses due to this disease.

In 1927 reports on crown and root overgrowths were received from 27 states. Loss estimates were made in only five states, Massachusetts, Maryland, Virginia, Michigan, and Missouri. In each instance loss was recorded as a trace.

The following are some of the remarks by collaborators on the prevalence and importance of crown gall. In a number of cases collaborators have evidently not distinguished between true crown gall and wound overgrowths:

Massachusetts: One horticulturist reported crown gall as prevalent in one nursery. (Doran)

Delaware: Common in light soil types and a general problem. (Adams)

Virginia: Unimportant in Virginia. (Schneiderhan)

North Carolina: Several reports were received from mountain growers. (Poole)

Mississippi: Frequently encountered on nursery stock. (Wedgworth)

Arkansas: Loss great in nurseries. Reports of 50 per cent on some varieties were common. Dipping with Semesan appears to decrease the amount of gall. (Young)

Michigan: Important in some nurseries. (Bennett)

Wisconsin: A nursery problem. From 5 to 50 per cent on the nursery stock which has been dug, but due to poor growths not many trees have been removed from the nursery rows so observations have been limited. (Vaughan)

Minnesota: From 3 to 5 per cent of the apple nursery stock discarded on account of gall. One case was reported in which all of the seedlings in a single row were galled. (Sect. Pl. Path.)

Missouri: Crown gall is fairly well under control over the state. Rigid inspection of nurseries has been responsible. Only scattered cases are observed. There is some "wound-gall" or "graft-knot" not caused by Bacterium tumefaciens. (Scott)

The following statement regarding the prevalence of crown gall and overgrowths in Wisconsin is taken from the Biennial Report for 1925-26 of the Wisconsin State Department of Agriculture:

"During both 1925 and 1926 the packing houses of the larger nurseries carrying a large line of fruit trees were visited during the early part of the winter to check up on the sorting out of crown gall. During 1925 approximately 125,000 apple, plum and pear trees were examined. There was less crown gall than usual that year and very little of it was missed by the nurseries during the sorting and less than 10 per cent was thrown out of most varieties by them and all of the trees showed remarkable growth. During 1926, however, the crown gall on apple appeared unusually severe again and some varieties such as Red Wing and Bayfield showed from 50 to 75 per cent affected. No attempt was made to determine how much was actually associated with Bacterium tumefaciens since both were recognized as making the tree equally unsalable when the tree was from one-half to two-thirds girdled by it."

Crown gall was not observed by collaborators in Connecticut, South Carolina, Florida, Louisiana, Illinois, North Dakota, Kansas, Colorado, and Washington.

Riker (3) has reported on the prevalence of wound overgrowth and crown gall in Europe. Patel (2) has recently isolated 15 non-pathogenic strains of Pseudomonas tumefaciens. He reports loss of virulence in the case of one pathogenic strain after it was kept for two years on a common laboratory medium.

Recent literature (See also references under "Non-parasitic diseases.")

1. Patel, M. K. Longevity of Pseudomonas tumefaciens Sm. & Town. in various soils. (Abstract) Phytopath. 18: 129. 1928.

2. ---------- Strains of Pseudomonas tumefaciens Sm. & Town. and their prevalence in various soils. (Abstract) Phytopath. 18: 129-130. 1928.

3. Riker, A. J. Correlation of the wound overgrowths and crown gall of apple in parts of Europe and of the United States. (Abstract) Phytopath. 18: 128. 1928.

4. ----------, W. M. Banfield, and G. W. Keitt. Studies of the history of development of wound overgrowths on apple grafts and of the influence of wrappers on their suppression. (Abstract) Phytopath. 18: 128. 1928.

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

The data on the general prevalence and importance of blister canker in 1927 are very meager, but as a whole those which are available indicate a decrease in injury caused by this disease and general success in control. Missouri reported a loss of 2 to 5 per cent; Kansas 2 per cent; and Iowa a trace.

The following statements by collaborators have been received:

Delaware: Generally found but not increasing. (Adams)

Iowa: Becoming less important than formerly because very susceptible varieties are more rarely planted. (Archer)

Missouri: Very severe in old orchards. Commercial growers are using available methods to eradicate cankers from their orchards and are having considerable success. Blister canker is widely distributed over the state, being found in nearly all home orchards. (Scott)

Nebraska: Continues to be a severe disease where careful handling of trees is not practiced. (Goss)

Recent literature

1. Swartwout, H. G. Blister and black rot cankers. Missouri Agr. Exp. Sta. Bul. 248. 15 pp. 1927.

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

These two diseases, often associated, have a wide distribution but are reported as causing losses in 1927 only in three states. Estimates are Virginia and North Carolina, 2 per cent, and Maryland, 0.6 per cent. In New York, sooty blotch was more common than usual in Green County according to A. S. Mills. Adams in New Jersey reports that it was common in unsprayed orchards.

Apple - Sooty Blotch and Flyspeck

In North Carolina, according to Poole, "This disease was very severe on unsprayed fruit. In the vicinity of North Wilkesboro the Willow Twig variety showed severe infestation during September." Schneiderhan in Virginia lists the York Imperial, Black Twig, and Stayman as very susceptible to blotch and states that "This disease has been increasing in importance since the arsenical residue problem has caused all spray operations to cease about July 1."

FRUIT SPOT CAUSED BY PHOMA POMI PASS.

Records of the occurrence of fruit spot in 1927 were received from only five states, Connecticut, New Jersey, New York, Delaware, and Missouri. Losses are estimated as a trace in New York and 1.3 per cent in New Jersey where Martin observed a 95 per cent infection of the fruit of one orchard. According to Martin:

> "Very little of this disease was apparent this year at the time the fruit was ripe. This is in contrast to 1926 when infection was severe several weeks before the crop was harvested. It is apparent that the time of infection varies greatly from year to year."

Varieties which are reported as susceptible are Baldwin, Jonathan, Grimes Golden, and King David.

During the past year Martin in New Jersey has obtained some very striking results from spray and dust experiments on control of this disease. The accompanying comparative data are taken from a record of results which he has supplied. In the sprayed and dusted blocks four applications, 7-, 17-, and 28-day and summer spray (July 6) were made. Copper seemed to be superior to sulphur and liquid sprays much more effective than dust. Both the copper dust and Bordeaux mixture caused considerable russetting of the fruit. Regarding control Martin states:

> "The present indications are that sulphur will not control this disease. In one orchard which was thoroughly sprayed with commercial lime-sulphur, the growers harvested and stored a perfect crop. However, when the fruit was removed from storage approximately 95 per cent showed infection."

Apple - Fruit Spot

Table 38. Fruit spot control experiments in 1927 in New Jersey as reported by W. H. Martin.

Fungicidal material used	Percentage fruit spot		
	Clean	Slight	Severe
Lime sulphur 1-40	46.7	50.8	2.5
Bordeaux mixture 2-6-50	100	0	0
Kolo dust	30.2	58.2	11.1
Copper dust	37.4	51.3	11.3
Unsprayed	8	71.6	20.4

BITTER PIT, NON-PARASITIC

In general bitter pit apparently caused only a small amount of loss in 1927, in spite of the uneven distribution of rainfall reported in a number of states. The largest loss estimate is 2 per cent, recorded from Virginia and California. In Virginia, Schneiderhan found the York Imperial, Black Twig, and King David varieties very susceptible and Rome Beauty very resistant. In Michigan, according to Bennett, the disease was more serious than usual causing a loss of 1 per cent chiefly on Baldwins and Northern Spy. In Ontario County, New York, according to Bullock it was present especially on Baldwin trees bearing a light crop. Thurston in Pennsylvania states that Baldwin was worse affected than usual but that other varieties had less. In Indiana, a surface type of bitter pit occurred on Rome Beauty and Grimes Golden, according to Gardner. Varieties which are considered susceptible by Martin in New Jersey are Winter Banana and Starks Delicious. Bitter pit was common on cellar-stored apples in Delaware, according to Adams. In Maryland the loss is estimated at 0.5 per cent and smaller losses occurred in Massachusetts, New Jersey, New York, and West Virginia. The disease was not observed in Connecticut, Florida, South Carolina, Louisiana, Arkansas, Wisconsin, Iowa, North Dakota, South Dakota, Colorado, and only two cases were reported in Minnesota.

Recent literature

1. Carne, W. M. A preliminary note on a theory as to the origin of bitter pit in apples. Jour. Dept. Agr. Western Australia II, 4: 382-385. Sept. 1927.

2. Wickens, Geo. W., and W. M. Carne. Bitter pit in apples. Its occurrence in store in relation to dates of picking. Jour. Dept. Agr. Western Australia II, 4: 354-357. Sept. 1927.

SPRAY INJURY

Considerable injury to foliage due in most cases to lime-sulphur applications following severe scab infection was reported from a number of states bordering on the Great Lakes. W. T. Mills observed a case of severe injury due to calcium arsenate in one orchard in New York. He states:

> "The orchard was a sorry sight. Many of the leaves were lost during winds. The grower applied 3 gallons of home-made lime-sulphur plus calcium arsenate (Kolonox) to a 200 gallon tank. Where 1 pound of calcium arsenate plus 3 pounds of lead arsenate, were used in 200 gallons of spray, the orchard looked much better."

Bullock in Ontario County, New York, noted injury due to lead arsenate applied on a hot day. Other reports were received as follows:

> New Jersey: Severe leaf injury and russetting of fruit followed sprays of Bordeaux mixture 2-4-50 and colloidal copper. Serious injury was likewise observed following the use of lime-sulphur 1-40. In one orchard where four rows were sprayed with this mixture in 1926 there was a considerable decrease in the number of blossoms in 1927. Trees sprayed with lime-sulphur 1-40, this year, in south Jersey showed serious burning of the leaves. (Martin)

> Washington: Calyx burns due to arsenic freed by rains and weathering, and after picking due to the washing process, was noted. This was first called "acid burn." (Dept. Pl. Path.)

In Virginia, colloidal lime sulphur caused considerable burning of leaves especially on Rome Beauty trees.

Literature on the removal of spray residue is included in the following list of references:

Recent literature

1. Heald, F., J. R. Neller, F. L. Overley, and H. J. Dana. Arsenical spray residue and its removal from apples. Washington Agr. Exp. Sta. Bul. 213. 55 pp. Mar. 1927.

2. Herman, F. A., and A. Kelsall. The determination of arsenical residues on apple foliage. Scient. Agr. 7: 290-291. Apr. 1927.

3. MacLeod, G. F., D. E. Haley, and R. H. Sudds. A study of arsenical residue on apples in Pennsylvania with respect to efficient spraying practices. Jour. Econ. Entom. 20: 607-614. Aug. 1927.

4. Potts, E. C. Spray tolerance regulations fixed. Better Fruit 21 (3): 7, 19. Mar. 1927.

5. Robinson, R. H., and H. Hartman. A progress report on the removal of spray residue from apples and pears. Oregon Agr. Exp. Sta. Bul. 226. 46 pp. Feb. 1927.

INJURIES DUE TO LOW TEMPERATURE

Some damage was caused by winter injury in New York, Michigan, Iowa, and Wisconsin although in general there was less than during the preceding two years.

Frost injury was general in the upper Mississippi River valley and was of some importance in other sections. The crop was very much reduced in Illinois, Missouri, Iowa, Arkansas, and New Mexico.

More or less unusual injuries were reported from Pennsylvania, and Michigan and ascribed to frost.

> Pennsylvania: A heavy frost on April 23-26 and a lighter one May 28 have left traces in various plants of an injury which did not kill the tissues but distorted them, very often, apparently, through the mere formation of ice in the tissues. The earlier apple leaves have been particularly affected, but injuries were also noted in tulips, Japanese maples, Norway maples and boxwood, which were apparently due to ice formation and consequent rupture of the tissues. (McCubbin)

> Michigan: Both apples and pears have shown an unusual type of blossom-killing in the southwestern parts of the state. Dead blossom clusters were noted on Wealthy trees, at the time they were in full bloom. The blossom clusters had been dead several days and had apparently been killed in the pink stage. A similar trouble was noted on Bosc pear. In one orchard approximately 90 per cent of the blossom clusters of this variety were dead and in most cases the new growth was killed back to the old wood of the spur. Other varieties were not affected. The injury has been attributed to late frosts. (Bennett)

Recent literature

1. Burkholder, C. L. Inarching against collar rot. Amer. Fruit Grow. Mag. 47 (3): 24. Mar. 1927.

2. Hildreth, A. C. Determination of hardiness in apple varieties and the relation of some factors to cold resistance. Minnesota Agr. Exp. Stat. Techn. Bull. 42. 37 pp. June 1926.

MISCELLANEOUS PARASITIC DISEASES

Cephalothecium roseum Cda., pink rot. This rot was found by Gardner in Indiana to be prevalent on Grimes Golden and Rome Beauty in the orchards of the University of Indiana at Lafayette. In most cases the rot was not following scab. It is suspected that the fungus invaded bitter pit lesions. Total loss is estimated at 0.5 per cent.

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

Fumago sp., sooty mold. This mold which grows abundantly on honey-dew was so abundant in Connecticut that some growers contemplated spraying to kill the fungus on the fruit in order to facilitate washing off by rains. (Clinton)

Gloeosporium perennans Zeller & Childs, perennial canker. This disease was reported from Washington and caused considerable loss in Oregon. Zeller states that "This disease is the greatest limiting factor to successful apple orcharding in the Hood River Valley of Oregon. Many orchards are reduced almost to decrepitude by its ravages. Infection is tied up with wooly aphis infestation. Freezing cracks in wooly aphis spongy tissue are infection courts. Control of wooly aphis would largely prevent canker."

Glutinium macrosporium Zeller, canker. This fungus, according to Zeller (8) is a wound parasite and causes a canker of apple limbs. It produces a rot when artificially inoculated into apples.

Hypochnus sp., fruit rot. Butler (2) isolated a species of Hypochnus from fruits from various parts of the United States. It is said to have been more prevalent on fruit on the markets during the past two years than has pink rot.

Myxosporium corticolum Edg., surface bark canker. Observed by Martin in New Jersey on a number of varieties of apples.

Neofabraea malicorticis (Cordley) Jack., anthracnose. Reports of the occurrence of this disease were received from Washington and Oregon. In the latter state anthracnose combined with fruit rot caused by Gloeosporium perennans, produced a loss of 0.6 per cent according to Zeller.

Podosphaera leucotricha (Ell. & Ev.) Salm. and P. oxyacanthae (DC.) DBy., powdery mildew. A disease caused by one or the other or both of the above named organisms was reported from Connecticut, New York, New Jersey, Delaware, Virginia, West Virginia, Minnesota, Pennsylvania, Kansas, Utah, Idaho, California, and Washington. Injury was apparently much less common than usual. No mention was made of severe infestations in any of the states in which the disease occurred. A loss estimated at 0.5 per cent occurred in California.

Apple - Parasitic Diseases

Phymatotricum omnivorum (Shear) Dug, Texas root rot. This disease is said to be very important on the black lands of Texas where it is so severe that apples cannot be grown in some areas.

Phytophthora cactorum (Leb. & Cohn) Schroet., fruit rot. Gardner in Indiana found this disease on the fallen fruit and lower limbs of trees of Grimes Golden and Rome Beauty.

Septobasidium sp., canker. Reported by Neal as quite common in Mississippi.

Sporotrichum malorum Kidd & Beaumont, fruit spot. This fungus or one similar to it was reported by Gardner (4) in Indiana as causing round, slightly sunken, brown lesions on the fruit of the varieties Grimes Golden, Ben Davis and Winesap.

Recent literature

1. Childs, L. Perennial canker mysteries solved. Better Fruit 22 (3): 5-6. Sept. 1927.

2. Butler, L. F. Increasing prevalence of Hypochnus rot of apples. Phytopath. 17: 743-744. Oct. 1927.

3. Fromme, F. D. Studies of black root rot of apple. (Abstract) Phytopath. 18: 145. 1928.

4. Gardner, M. W. Sporotrichum fruit spot of apple. (Abstract) Phytopath. 18: 145. 1928.

5. Hesler, L. R. The perfect stage of Hendersonia mali. Mycologia 19: 222-227. July-Aug. 1927.

6. Nattrass, R. M. The white root rot of fruit trees caused by Rosellinia necatrix (Hart.) Berl. Jour. Bath. & West & South. Co. Soc. VI, 1: 169-175. 1927.

7. Woodward, R. C. Studies on Podosphaera leucotricha (Ell. & Ev.) Salm. Trans. Brit. Mycol. Soc. 12: 173-204. June 1927.

8. Zeller, S. M. A canker of apple and pear trees caused by Glutinium macrosporium n. sp. Jour. Agr. Res. 34: 489-496. Mar. 1, 1927.

MISCELLANEOUS NON-PARASITIC DISEASES

Baldwin blotch. A. B. Burrell and W. D. Mills of New York have observed an unusual type of fruit trouble said to be confined so far to the Baldwin variety. They state:

"A peculiar disease, distinct from anything hitherto observed in New York State and possibly elsewhere, has appeared on Baldwin apples this year in western New York. In the basin of affected apples may be seen from one to five very superficial, irregular, dark green or brown blotches. Frequently one such blotch extends from each of the five natural protuberances at the blossom end of the apple, almost, but not quite to a sepal. In a few cases, the five separate blotches have coalesced, forming a ring. In some cases, not more than 8-10 cell layers are involved, and the cuticle is intact except in the later stages. The affected apples are generally but not always, unusually large specimens. The average size of all Baldwin apples in the territory was large this year.

"During a recent trip to Wayne County, eight lots of Baldwin apples were inspected. Of these, seven lots included some fruits exhibiting this peculiar blotch. In one lot about 4 per cent of the apples were affected, while in three other lots, 1 to 2 per cent were affected. No estimate of the percentage was obtained for the remaining three lots. In no case was this blotch observed on any variety other than Baldwin. Three orchards were inspected but no abnormality in the trees which bore the blotched apples was detected. The occurrence of this blossom end blotch appears not to be correlated with any particular soil type or drainage condition.

"The commercially packed fruit exhibited at the Rochester meeting of the New York State Horticultural Society was examined for this disease. Eighteen of the twenty-two barrels of Baldwin apples in the exhibit showed varying amounts of this blotch on the fruit. None of the other varieties in the exhibit were affected. Fruit showing the injury came from the following towns in western New York: Sodus, North Rose, Union Hill, and Ontario, in Wayne County; Morton, in Monroe County; Kendall, and Albion, in Orleans County. Affected fruits have also been sent in from Covert, Seneca County.

"Four things, when taken together, strongly suggest that this disease is of non-parasitic origin. They are, (1) the characteristics of the blotch, (2) the fact that it occurs so consistently in a given position on all affected apples, (3) the fact that it is restricted to variety Baldwin, and (4) the fact that no fungus has been found in association with it. Occasionally the same apple shows both this peculiar blotch and bitter pit, but such is rarely the case. Some similarity in symptoms has been noted between this blotch and drought spot (Stevehs disease) which occurs on McIntosh apples in the Champlain Valley."

Apple - Non-Parasitic Diseases

Chlorosis. Linford in Utah states that this is widely prevalent and one of the most serious menaces of apple culture. Taubenhaus in Texas reports chlorosis due to excess lime as common in limestone regions.

Cork, drought spot, and die-back. Early stages of cork development were observed by Burrell in New York but the disease was of very little importance. He states that die-back was observed commonly in some orchards of McIntosh and Fameuse in Clinton County, New York. Stevens disease, a type of drought spot, is estimated by Burrell to have caused a 4 per cent loss in the Champlain Valley of New York. In that section the disease was found in about the same number of trees as in 1926.

Internal browning and breakdown. In Utah, according to Linford, internal breakdown has been troublesome on stored apples, particularly on large specimens of the Jonathan variety. In Indiana, Grimes Golden was affected. Milbrath reported that internal browning caused an estimated loss of 3 per cent in California.

Jonathan spot. This disease was reported only from New Jersey, Kansas, and California. Estimated losses are 2 per cent in Kansas and 0.5 per cent in California.

King David Spot. Spotting of the King David variety was reported from Missouri and Virginia. It is not clear that the cause is the same in both cases. Scott states that only the King David is affected in Missouri. He estimates the loss at 20 per cent in the case of this particular variety. Schneiderhan, regarding the type of trouble with which he is familiar in Virginia, states:

> "Several instances of King David spot, which is the terminology adopted by some pathologists to denote good old-fashioned spray burn on King David, have come to our attention this week. This variety is particularly susceptible to spray injury and in the instances reported, the difficulty resulted from the application of lime-sulfur in warm weather."

Leaf scorch. Scorching of McIntosh leaves following a hot wind occurred in New York. According to Ludwig in South Carolina a disease similar to drouth injury, preceeded by Physalospora spot, appeared on some trees but there was no drouth period to account for the trouble.

Measles. Specimens were received from South Carolina and Mississippi. It also occurred in Indiana and California but apparently caused no serious injury.

Mosaic. The disease which has been reported as mosaic in New York is apparently becoming more common. Blodgett in New York states that "Trees showing this disease have been located in 18 orchards (1 to 20 trees per orchard) in the following counties: Ontario, Wayne, Monroe, Orleans, Sullivan, and Clinton." Stoddard in Connecticut has found a mosaic-like disease "common, especially on young trees and rapidly growing older trees. This trouble was found in 1926 but has not been reported from this state before."

Apple - Non-Parasitic Diseases

Rosette. According to Burrell, in Clinton County, New York, "Rosette, which was prevalent in 1925, was practically absent in 1926 and was only occasionally encountered in 1927."

Target canker. Roberts (7) has recently described a superficial bark canker which he first found at Arlington Farm, Virginia, in 1922. Specimens have been received by him from Kentucky and West Virginia. The disease has been observed on Jonathan, Delicious, and Grimes Golden varieties of apples and is also known to have occurred on pear trees in Georgia and Colorado. Regarding the cause Roberts states:

> "The relatively small number of cankers on the more vigorous of the Delicious and Jonathan trees, the greater prevalence of cankers on the west and north sides of trees, the frequent restriction of the cankered areas to certain limbs, which may be almost completely covered with them, and the apparent internal origin of the cankers indicate that the disease is of non-parasitic nature."

Recent literature

1. Fisher, D. F., and C. Brooks. Apple water-core theories revised. Better Fruit 22 (6): 5, 21. Dec. 1927.

2. Kidd, F., and C. West. The development of internal breakdown in cold-stored apples. Rep. Food Invest. Bd. Great Britain 1925-26: 45-47. 1927.

3. Melhus, I. E. Crown gall and graft knots of apples. Amer. Fruit Grow. Mag. 47 (3): 4, 41. Mar. 1927.

4. Melhus, I. E., J. H. Muncie, and Vernon C. Fisk. Grafting as a further means of preventing callus knots on apples. (Abstract) Phytopath. 18: 127. 1928.

5. Muncie, J. H., and W. B. Shippy. Overgrowths and hairy root on nursery apple and quince trees. (Abstract) Phytopath. 18: 127. 1928.

6. Riker, A. J., W. M. Banfield, and G. W. Keitt. Studies of the history of development of wound overgrowths on apple grafts and of the influence of wrappers on their suppression. (Abstract) Phytopath. 18: 128. 1928.

7. Roberts, J. W. "Target canker" of apples and pears. Phytopath. 17: 735-738. Oct. 1927.

8. Schneiderhan, F. J. The black walnut (Juglans nigra L.) as a cause of the death of apple trees. Phytopath. 17: 529-540. Aug. 1927.

9. Swingle, C. F. Burrknot formations in relation to the vascular system of the apple stem. Jour. Agr. Res. 34: 533-544. Mar. 15, 1927.

10. Wallace, R. H. The production of intumescences in Transparent apple by ethylene gas as affected by external and internal conditions. Bull. Torr. Club. 54: 499-542. June 1927.

P E A R

BLIGHT CAUSED BY BACILLUS AMYLOVORUS (BURR.) TREV.

In America blight has been one of the chief limiting factors in pear production and large annual losses occur as a matter of course. Loss estimates involving 50 per cent or more of the crop in some states have been made in recent years and comparatively high losses are common. Apparently losses have been much more severe in the southern states and in California than in other parts of the United States. Figure 5 shows graphically and also by means of loss estimate figures, the importance of this disease as estimated by collaborators 1921 to 1927 inclusive. Some of these estimates at first thought seem rather high but, startling as they may appear, it is possible that even these figures do not fully represent the importance of this disease in reducing yields if we take into consideration the fact that pear growing has been practically abandoned in certain areas on account of the ravages of blight.

In 1927 a severe outbreak of blight occurred in California. W. T. Horne states that this disease invaded the Sacramento Valley in the most destructive attack which has been experienced since 1904-5. The southern part of the state, however, was less severely affected. Milbrath states regarding losses in California:

> "I have been making a survey of the number of trees pulled out and the general expenditures in fighting pear blight. The figures appear rather astounding for it now looks that at least $1,000,000 losses and expenditures were sustained by the growers in this state in 1927. About 60,000 trees were pulled after having been killed by the disease."

In other parts of the United States blight on pear as well as on apple was apparently less common than usual. As would probably be expected, the same factors which operated to reduce the disease on apple have apparently served to decrease its prevalence on pear. Not including California, only three states, Delaware, Virginia, and Tennessee, reported more blight than in the average year; while Massachusetts, New Jersey, North Carolina, Florida and Michigan reported less and Kentucky and Missouri much less than usual. It will be observed by

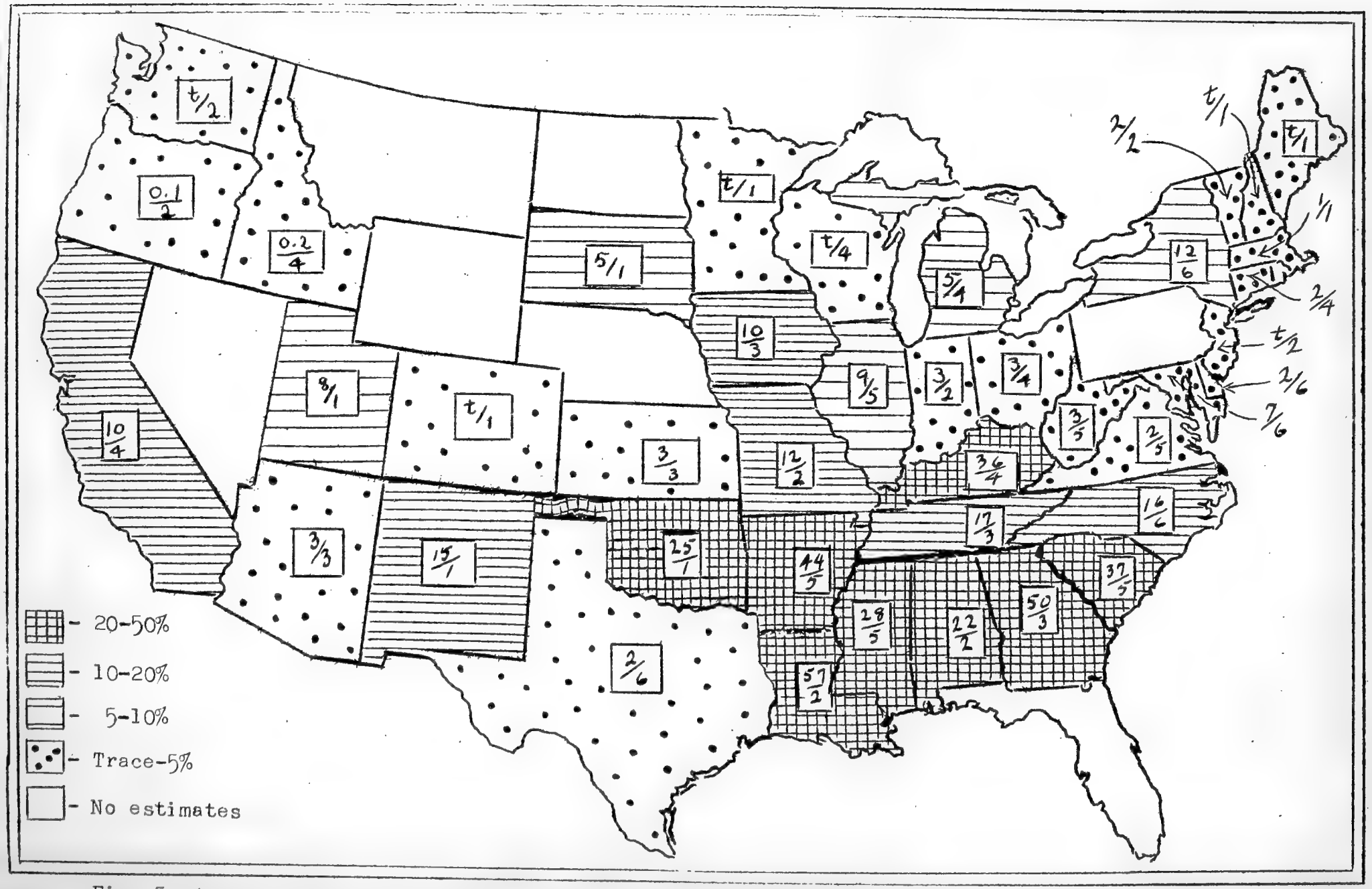

Fig. 5 Average losses from pear blight as estimated by collaborators, 1921 - 1927 inclusive The figure above the line indicates average loss estimate and the figure below the line the number of estimates from which the average was calculated.

referring to table 39 and to figure 5, that loss estimates for the eastern half of the United States were lower than for the average year although estimated losses of as high as 25 per cent of the crop in some states are recorded.

Table 39. Percentage losses from pear blight as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
25	Oklahoma, Tennessee	3	Michigan
15	Mississippi	2	Virginia, Texas
10	Iowa, Missouri, North Carolina, South Carolina	1.5	Connecticut, Delaware
		1	Massachusetts
8	Maryland, Utah	1-3	New York
6	Illinois	.2	Oregon
4	Kansas, California*	Trace	Wisconsin, Colorado, Idaho

*Milbrath states that this estimate is probably low.

Few reports on varietal resistance were received. Kieffer (Michigan) and the sand pear (Mississippi) are recorded as resistant, and Seckel (Virginia) and Bartlett (Michigan) are susceptible. Archer has prepared the following report from observations made in Iowa:

> "In scion orchards at Shenandoah, moderate loss occurred in Clapp's Favorite and Flemish Beauty; severe loss in Bartlett, Beurré d'Anjou, Duchess, Kieffer, Lincoln, and Worden.
>
> "In the horticultural experimental orchard at Ames considerable varietal susceptibility was noted this year on seedling trees and hybrids as follows:

None	Slight	Moderate	Severe
Chinese	Aebley	Alamo	Emil de Hiyst
Dearborn Sdlg.	Bezi de La Motte	Ames	Flemish Beauty
Fluke	Lawrence	Orlando	Howell
McElroy	Lincoln		Longworth
New Orleans			Worden Seckel
Sheldon			
Walenta #1			

Reimer (4) states:

"...up to this time no desirable commercial varieties have been found. It is true that during recent years a few have been introduced which do not blight seriously. The most resistant among these are Lincoln, Longworth, German Sugar, Burkett, Kieffer, Old Home, Douglas and Estella. The fruit of these varieties, however, is of such poor quality that with the exception of Kieffer they have not been extensively planted. Kieffer is a hybrid between the Chinese Sand pear and Bartlett and has proved much more resistant to blight than the standard, French varieties. Under certain conditions, however, Kieffer blights vigorously and the fruit is poor in quality."

Day (2) has published on the use of zinc chloride in blight control. The blight bacteria are said to be killed by penetration of this compound from a surface covering rendering the canker harmless as a source of inoculum. In some cases, however, injury is produced in the uninfected bark. The formula for preparing the zinc chloride solution is as follows:

"Solvent:

1 gallon denatured alcohol
1 pint water
3 ounces concentrated hydrochloric acid

Solution:

1 pint above solution
1 pound dry zinc chloride

Mix the solution and the zinc chloride together in an enameled kettle and stir thoroughly until dissolved. Crush all hard lumps with the stirring stick. Keep in bottle well corked."

It is recommended that orchards be inspected once a week during the summer and the surface of each canker painted with the above mixture.

Recent literature

1. Day, L. H. Winter precautions against pear blight. Amer. Fruit Grow. Mag. 47:(2): 9, 43. Feb. 1927.

2. --------- Zinc chloride stays canker blight. Better Fruit. 22 (3): 9, 21. Sept., 1927.

3. --------- Additional advice on the use of zinc chloride for pear blight cankers. Blue Anchor 4 (11): 22-25. Nov. 1927.

4. Reimer, F. C. Blight resistance in pears. Fruit Belt 25 (3): 7, 24. March, 1927.

5. Thomas, H. E. Kieffer pear seedlings and fire blight resistance. Bull. Torr. Bot. Club 54: 583-585. Oct. 1927.

SCAB CAUSED BY VENTURIA PYRINA ADERH.

If the reports of the collaborators of the Plant Disease Survey during the last five years may be taken as being representative of the facts over the country as a whole, scab on pear is not a destructive disease except possibly in parts of the Pacific Coast States. The 1927 reports seem to bear out this conclusion. Even in states which suffered a heavy infection of apple scab and in which conditions for pear scab infection and development were apparently very favorable, the disease caused little damage. With the exception of a single state, Oklahoma, and the single variety, Flemish Beauty, no heavy infestations are reported. Estimated losses are, Oklahoma 20 per cent; Wisconsin 2 per cent; Maryland, Massachusetts and California 1 per cent; New York 0.5 to 1 per cent; Connecticut and Michigan 0.5 per cent; and Maine and Virginia a trace. In fourteen states pear scab was not observed nor was it even recorded as unimportant. Probably the disease did as much damage in California as anywhere.

Recent literature:

1. Milbrath, D. G., and C. E. Scott. Some diseases of the pear. Mo. Bul. Dept. Agr. Calif. 16: 445-452. 1927.

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

In some orchards in Illinois and Maryland considerable loss was observed to be due to leaf blight. Severe fruit infection was noted in each state and 2 per cent storage loss is estimated for Maryland. Total loss estimates are Maryland 5 per cent; Oklahoma 2 per cent; Connecticut and Tennessee 1 per cent; and Massachusetts, Delaware, Illinois, Michigan and Iowa a trace.

Tennessee: Severe on Japanese varieties. (McClintock).

South Carolina: Some exotic varieties on the station farm became defoliated. Kieffer and some other varieties in another location, but near badly affected quinces, were free from this disease. (Ludwig)

Iowa: Found only in nursery rows. Observations in September indicated considerable varietal differences in susceptibility as follows:

No infection. Patten, Keiffer, Duchess Dwarf, Bartlett. Infection but no defoliation. Wilder 5 per cent; Garber 10 per cent; French 5 per cent; Clapp's Dwarf 5 per cent. Infection with defoliation. Flemish Beauty, 10 per cent and variety with name unknown, 60 per cent defoliated. (Archer)

MISCELLANEOUS DISEASES AND INJURIES

Bacterium tumefaciens EFS. and Town., crown gall. Reported from Mississippi and Michigan. A 10 per cent infection was observed in one lot of 200 nursery trees in the latter state.

Mycosphaerella sentina (Fr.) Schroet., leaf spot. An unusually severe infection was observed by Schneiderhan in Virginia. By June 9, 80 per cent of the leaves of some trees near Opequon were infected, some leaves having as many as fifty lesions. Severe local infestation and defoliation was reported from Kansas.

Nummularia discreta (Schw.) Tul., blister canker. Reported by Archer as occurring in one nursery in Iowa.

Physalospora malorum (Pk.) Shear, black rot. New York, Massachusetts.

Phytophthora cactorum (Leb. and Cohn) Schroet., rot. A species of Phytopthora believed to be P. cactorum was observed in Columbia County, New York. A slight to moderate infection in a single tree followed excessive rainfall according to Thomas. This disease was also reported from Massachusetts.

Sclerotinia cinerea (Bon.) Schroet., blossom blight. Reported from Washington.

Sphaerotheca humuli (DC.) Burr. Bender in Connecticut found a powdery mildew on pear and tentatively identified it as the above.

Bitter pit. This disease was reported from Washington. A similar trouble caused considerable loss to the Beurre d' Anjou crop in California according to Milbrath and Scott (3).

> "A peculiar condition on the fruit of Beurre d'Anjou has been rapidly increasing. The surface is rough through numerous elevations and depressions, the elevations having a wartlike appearance. Internal tissues directly under depressions are hard, white and dry, most frequently in the shape of a cone with apex pointed toward core.
>
> "In 1926, much of the d'Anjou fruit which showed raised and correspondingly depressed areas of the surface, was affected with a peculiar form of internal browning in place of the white, hard and dry tissues noted before.

In addition to the location of browned masses of tissue directly under the skin, similar masses were scattered throughout the interior of the pear."

Black end rot. In Washington, a single report of occurrence of this disease was received. Heppner (1,2) states that this disease appears in nearly every Bartlett pear growing section in California.

Chlorosis (excess of lime). Common on the black lands of Texas according to Taubenhaus. Crawford states that chlorosis is very severe in some parts of New Mexico.

Heat canker. Oregon: Fourteen per cent injury in one lot of seedlings of Chinese stock (Pyrus ussuriensis). Pestalozzia hartigii Tubeuf was associated with the cankers which appeared just above the soil line. (Zeller)

Target canker. (undet.) According to Thomas, specimens of this disease were received from Wayne County, New Jersey.

Recent literature:

1. Heppner, M. J. Study of Bartlett pear black-end undertaken in California. Science n.s. 65: 280-281. Mar. 18, 1927.

2. Heppner, M. J. Bartlett pear black-end rot investigations. Blue Anchor 4 (2): 8, 30. Feb. 1927.

3. Milbrath, D. G., and C. E. Scott. Some diseases of the pear. Mo. Bul. Dept. Agr. Calif. 16: 445-452. Aug. 1927.

QUINCE

Bacillus amylovorus (Burr.) Trev., blight. The losses reported in 1927 are, Maryland 5 per cent; New York 3 to 5 per cent; Michigan 1 per cent; and Tennessee a trace. Thurston in Pennsylvania states that due to blight, the crop in one five acre orchard was not marketable.

Fabraea maculata (Lev.) Atk., leaf blight. McClintock states that this disease is severe in Tennessee every season and practically defoliates all varieties of quinces. Regarding this disease in Iowa Archer states, "In nursery rows this year there was severe defoliation on all of the varieties grown as follows: Angers and Meech, 95 per cent, Orange 85 per cent, and Osthern 55 per cent."

Glomerella cingulata (Ston.) Spauld. and Schrenk, bitter rot. One report from Connecticut.

Gymnosporangium germinale (Schw.) Kern., rust. Serious injury was produced in one planting in Orange County, New York, according to Blauvelt.

Quince - Diseases

Phoma pomi Pass., fruit spot. Stoddard states that a slight amount of injury was caused in Connecticut by this disease.

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

Recent literature:

1. Wormald, H. A leaf blotch of quince trees. Ann. Rep. East Malling Res. Stat. 13 (Suppl.): 87-88. Mar. 1927. Sclerotinia cydoniae

DISEASES OF STONE FRUITS

PEACH

BROWN ROT CAUSED BY SCLEROTINIA FRUCTICOLA (WINT.) REHM (S. Americana (Wormald) Norton & Ezekiel)

Conditions were favorable in 1927 for development of brown rot in greater than average amounts, in Delaware, Maryland, Pennsylvania, Illinois, Northern Georgia, and Missouri, while in New York, Michigan, and Arkansas less rot than usual occurred. Blossom blight was common in New York, Indiana, and Illinois and was severe in some parts of North Carolina and New Jersey. In the last named state practically all of the blossoms in some orchards were affected according to Martin. In New Jersey, Illinois, Indiana, and North Carolina considerable twig injury was caused by infection through blossoms and fruits.

The oriental peach moth is said to have been a serious factor in brown rot development in Pennsylvania, Maryland, and Virginia. Schneiderhan states that for the first time the Piedmont section of Virginia reports a direct correlation between oriental peach moth injury and brown rot occurrence. The curculio was an important factor in rot occurrence in Maryland, but according to Anderson this insect was less common in Illinois than usual and apparently did not markedly increase losses in that state.

The following statements regarding brown rot were received from collaborators:

> Pennsylvania: Especially severe following injury from oriental peach moth. This was one of the worst years for brown rot development which we have noted. This is especially true for the northeastern part of the state. (Thurston and Nixon).
>
> Maryland: In the eastern part of the state brown rot was very severe. Early infection followed oriental peach moth and curculio injury. This made later control difficult. (Jehle)

Peach - Brown rot

Table 40. Percentage losses from rot on peach as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
20	Missouri	4	Indiana
15	Maryland, Mississippi	3	Massachusetts, Connecticut, Delaware, South Carolina, Arkansas
12	Kentucky		
10	Oklahoma, Tennessee	2	Virginia
8	New Jersey	1	West Virginia, Michigan, Oregon.
7	Kansas	Trace-3	New York
6	North Carolina		

West Virginia: Dry midseason weather was unfavorable for development of disease. (Sherwood)

Kentucky: There was a drought in late summer and many of the late peaches cracked and rotted. (Valleau)

Tennessee: Severe only on a few early varieties. The small crop of late fruit was, in the better orchards, protected by spray. (McClintock)

North Carolina: This disease caused severe loss this year. Blossom infection was severe followed by favorable weather for heavy loss of fruit. Twig and limb blight from infected fruits was severe everywhere especially on unsprayed trees. (Poole)

Arkansas: Very little seen in commercial plantings. (Young).

Michigan: This disease was exceptionally rare this season. Even the early maturing varieties were not severely affected. (Bennett)

Missouri: All unsprayed plantings showed considerable brown rot this year. There was very little fruit in home orchards which did not have some brown rot. (Scott)

Peach - Brown rot

Apothecia developed in abundance in some parts of Pennsylvania according to Thurston and Nixon. Kirby also observed mature apothecia April 12th in Montgomery County, Pennsylvania. Pierce found mature apothecia in the Vincennes section of Indiana, March 22, which was twenty-three days earlier than the date of their first appearance in the same orchard in 1926.

In the majority of the larger peach producing states, brown rot was apparently satisfactorily controlled by the application of the standard sprays and dusts. Omission of certain sprays, especially the pink, permitted rot development in some cases.

Wormald (6) has published some interesting data concerning the distribution of the brown-rot fungi. His summary is as follows:

> "The present distribution of the common brown-rot fungi, so far as has been ascertained from the literature on the subject and a study of strains collected by the writer, is as follows:
>
> "Sclerotinia fructigena: Europe, Japan, Manchuria.
>
> "Sclerotinia cinerea f. pruni: Europe, the Pacific coast of North America, Manchuria, and (according to Takahashi) a form of S. cinerea occurs on various species of Prunus in Japan.
>
> "Sclerotinia cinerea f. mali: Great Britain and Ireland (and probably the Continent).
>
> "Sclerotinia americana: the United States, British North America, Australia, and New Zealand."

Recent literature:

1. Fish, S. Brown rot of peaches. Journ. Dept. Agr. Victoria. 25: 409-411. July 1927.

2. Roberts, J. W. and J. C. Dunegan. Peach brown rot and scab. U. S. Dept. Agr. Farm. Bull. 1527. 14 P. Apr. 1927.

3. Roberts, J. W., and J. C. Dunegan. Critical remarks on certain species of Sclerotinia and Monilia associated with diseases of fruits. Mycologia 19: 195-206. July - Aug. 1927

4. Snapp, O. I., C. H. Alden, J. W. Roberts, J. C. Dunegan, and J. H. Pressley. Experiments on the control of the plum curculio, brown rot, and scab, attacking the peach in Georgia. U. S. Dept. Agr. Bull. 1482. 32 P. April, 1927.

5. Tesche, W. C. Bordeaux-oil for brown rot. Pacific Rur. Press. 114: 294. Sept. 17, 1927.

6. Wormald, H. Further studies of the brown-rot fungi. II. A contribution to our knowledge of the distribution of the species of Sclerotinia causing brown-rot. Ann. Bot. 41: 287-299. Apr. 1927.

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

Leaf curl was unusually prevalent in 1927 over a wide range of states and was especially common throughout the states of the middle west and neighboring regions. Estimated percentage losses to the peach crop of the United States as compiled by the Plant Disease Survey since and including 1918 are:

1918	1919	1920	1921	1922	1923	1924	1925	1926	Aver.
0.4	2.21	3.0	0.6	1.6	1.2	1.47	0.5	0.6	1.2+

The estimated percentage loss in 1927 will probably approach that of the epiphytotic year of 1920. In 1927 reports of the occurrence of leaf curl were received from 32 states. Twelve of these reported more than usual and four much more than in the average year. Included in this group are the following peach producing states: California, Arkansas, New York, New Jersey, Michigan, and Ohio. Only four states, Connecticut, Delaware, Maryland, and Washington reported less than in the average year. Loss estimates for 1927 are given in table 41.

Table 41. Percentage losses from leaf curl on peach as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
7	Kentucky	1.5	Illinois
5	Michigan, New York Tennessee	1	New Jersey, Maryland, Indiana, Missouri, Mississippi.
3	Arkansas, California	.5	Oregon
2.5	North Carolina	Trace	Iowa, Colorado, Idaho.
2	Massachusetts, Virginia, Oklahoma, South Carolina,		

Instances of severe infection were recorded in Pennsylvania and Michigan where certain unsprayed orchards were completely defoliated.

Collaborators who mention control measures state without exception that leaf curl was satisfactorily controlled by the standard application of lime-sulphur, and Bordeaux mixture. A more general use of dormant oil sprays without the addition of a fungicide was responsible for considerable curl in Arkansas according to Young. Magill in Kentucky states that Bordeaux mixture and oil emulsion were satisfactory in control. In Illinois, according to Anderson, sprays of oil emulsion-copper sulphate (4 pounds copper sulphate to 50 gallons of oil emulsion) have in practically all cases controlled the disease, while oil emulsion-Bordeaux has given only moderate control. He also states that lime-sulphur applied in the fall gave control in all cases observed. Gardner states that in Indiana "Scalecide" did not control.

SCAB CAUSED BY CLADOSPORIUM CARPOPHILUM THUEM.

An abundant development of scab is reported to have occurred in 1927 in Missouri, North Carolina, and Illinois. Over the remaining part of the United States it caused about the usual amount of loss. Poole in North Carolina states: "This has been a very favorable season for peach scab throughout the state. The late fruit was completely blackened on some trees. The new wood was severely infested on seedling varieties." An infection of 52 per cent of the fruit occurred in one orchard in Illinois according to Anderson. Loss estimates are given in table 42.

Table 42. Percentage losses from scab of peach as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
10	Missouri	.4	Virginia
3	North Carolina	Trace	Massachusetts, New York
2	Delaware, Maryland, Kentucky, Oklahoma.		West Virginia, Michigan, California
1	South Carolina, Tennessee, Mississippi, Arkansas		

It is well known that, as a general rule, late maturing varieties of peaches are injured more by scab than are those varieties which mature earlier in the season. Thurston notes that white varieties grown in Pennsylvania are especially susceptible. Poole in North Carolina states that the Elberta, Carmen, and Belle of Georgia varieties were injured only in a few instances.

Reports indicate that scab was readily controlled by the standard spray applications.

Recent literature:

1. Roberts, J. W. and J. C. Dunegan. Peach brown rot and scab. U. S. Dept. Agr. Farm. Bull. 1527. 14 P. Apr. 1927.

BACTERIAL SPOT CAUSED BY BACTERIUM PRUNI EFS.

In past seasons symptoms of different phases of the bacterial spot disease have probably not, in all cases, been clearly recognized and differentiated from other types of troubles such as nonparasitic leaf spot and different kinds of spray injury. Spray injury especially is quite likely to be confused with bacterial spot since symptoms are somewhat similar and in the case of each trouble severe symptoms occur more commonly on weak and poorly nourished trees.

Peach - Bacterial spot

In 1927, bacterial spot was reported from the majority of the peach producing states. Losses in yield as estimated by collaborators are: Kentucky, Kansas, and North Carolina, 4 per cent; Indiana, 2 per cent; Texas, 1 per cent; Mississippi, 1 to 2 per cent; Maryland 0.5 per cent; and Michigan, New York, and Iowa, a trace. In addition a 5 per cent loss in grade in Illinois and a 2 per cent loss in North Carolina are reported.

The following remarks indicate the degree of severity of attacks in some of the states having the heaviest reported infestations:

> New Jersey: In one orchard in Hunterdon County, approximately 25 per cent of the leaves dropped as a result of black spot attacks. (Martin)
>
> North Carolina: Severe again this year on the fruit of the Hale and Elberta varieties. More cull fruit results from this trouble in commercial districts than from any other disease. Heavy losses result from year to year. (Fant)
>
> Arkansas: Caused severe defoliation and poor coloring and weakening of trees in all parts of the state. Losses are difficult to estimate. This was the worst attack ever experienced in the state. (Young)
>
> Indiana: Early in the season, black spot caused severe defoliation. (Gardner)

Anderson states that in Illinois there was the worst outbreak ever experienced. He reports fruit infection general and records 100 per cent on the fruit in one orchard. The disease was apparently of little importance in New York, Virginia, Missouri and Michigan.

Anderson (2) reports the isolation of a bacteriophage for B. pruni from soil beneath infected peach trees.

During the past few years, sodium silico-fluoride has been tried in the control of bacterial spot in Illinois. Anderson (4) states that this material controlled the disease in 1925 and 1926 in experimental orchards. In 1926 a certain amount of leaf injury was produced and the fruit on sprayed trees was smaller than normal, had a high color, and ripened prematurely. In Ohio (1) sodium silico-fluoride with and without sulphur failed to control bacterial spot during the season 1926.

Recent literature:

1. Anon. Ohio Agr. Exp. Stat. Bul. 402:37. 1927.

2. Anderson, H. W. Bacteriophage of Bacterium pruni. (Abstract) Phytopath 18:144. 1928.

3. Anderson, H. W. Spraying for control of bacterial spot of peach. Trans. Ill. State Hort. Soc. 60: 147-154. 1927.

4. Anderson, H. W. The effect of sodium silico-fluoride sprays on the peach and on the control of bacterial spot. Sci.n.s. 65: 16-18. 1927.

YELLOWS (CAUSE UNDETERMINED)

The distribution of yellows in the United States, up to and including 1926 as indicated in Fig. 6 which was prepared by W. A. Archer, is based on data which Archer assembled from reports of collaborators and from data on file in the Office of Fruit Diseases. To this map has been added the two new locations of Habersham County, Georgia, and Mason County, Michigan, reported in 1927.

In connection with Fig. 6 some of the following explanatory notes regarding reports of occurrence of yellows in some of the more doubtful states bordering on the main yellows belt, are of interest:

Arkansas: Reported from Boone and Fulton Counties by J. L. Hewitt in 1910. In 1920 the Office of Fruit Diseases received specimens from Howard County. In 1918 and in succeeding years, however, J. A. Elliot, H. R. Rosen, and others of the Arkansas Experiment Stations indicate that the disease did not exist. H. R. Rosen in 1924 made the following statement:

"A recent trip was made to the most important peach section of the state, including the counties of Sevier, Howard, Pike, Little River, and Hempstead with the particular object of determining whether rosette was present. The main reason for the survey at this time was the receipt of some diseased peach twigs from Mr. R. A. McKnight of DeQueen, which showed symptoms suggesting peach yellows or rosette. ... A careful inspection of many orchards in the counties listed failed to show a single case of yellows. ...This is not the first time that peach yellows or rosette has been suspected as being present in Arkansas, and like all of the other cases which have come under my observations, when they were carefully investigated they were invariably found to be erroneous. ...So far as the writer knows, there is no record of yellows being present in this state, which is based on any investigation of Arkansas orchards."

Kansas: Melchers in 1919 reported occurrence but gave no data on locality. In 1921 Melchers states that no diseased trees were seen but that the disease had been reported several years before by Kellerman.

Missouri: Yellows was reported by F. M. Rolfs in 1908, 1909, and 1910. In 1913, however, Haseman states that the inspection of the State Board of Agriculture did not reveal yellows. G. M. Reed in 1917 indicated an "occasional occurrence."

Illinois: In a letter to the Plant Disease Survey in 1925, Anderson stated that he has given the matter of occurrence of yellows in Illinois considerable attention since 1917 and has not observed a single affected tree during that period.

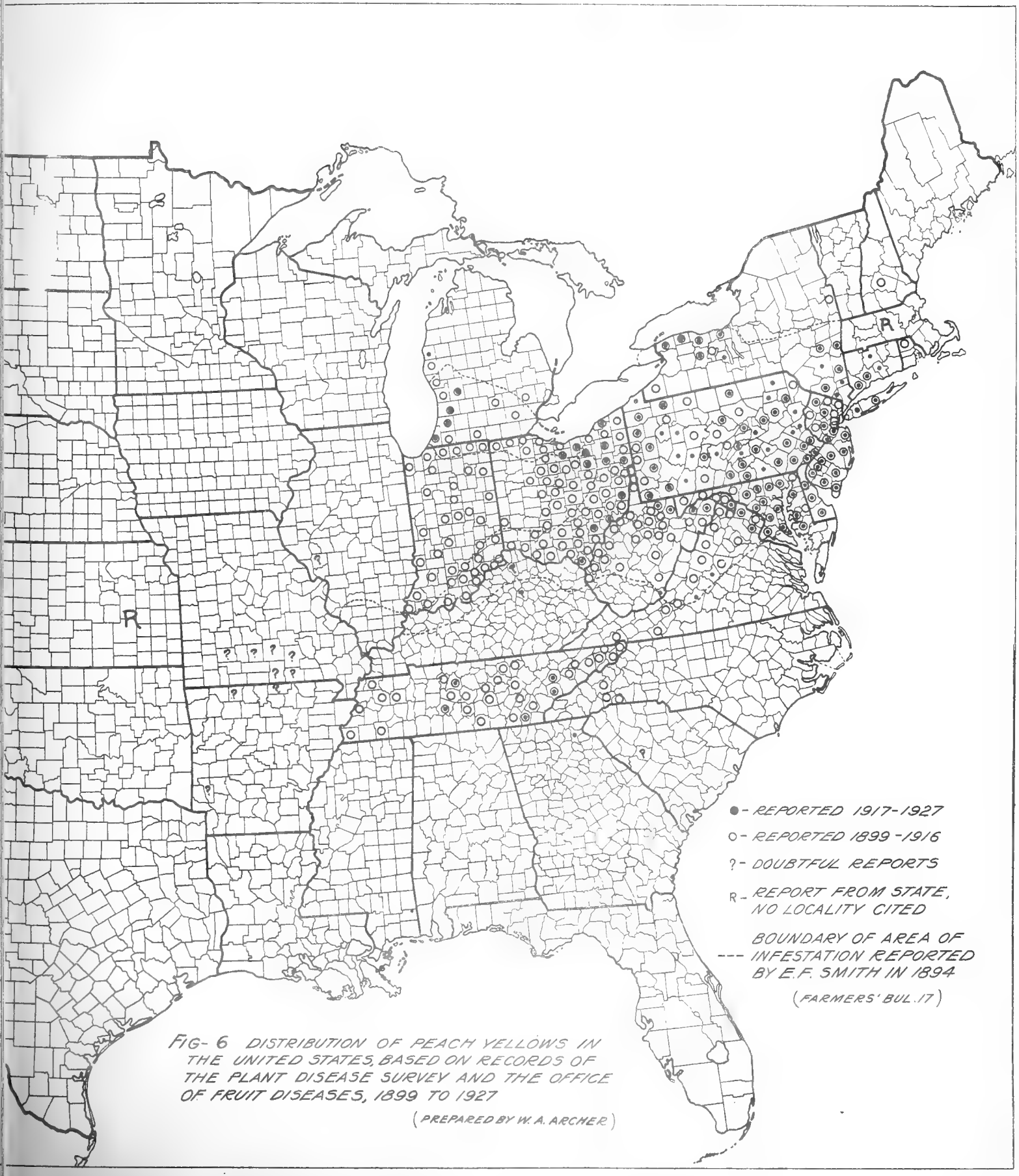

FIG- 6 DISTRIBUTION OF PEACH YELLOWS IN THE UNITED STATES, BASED ON RECORDS OF THE PLANT DISEASE SURVEY AND THE OFFICE OF FRUIT DISEASES, 1899 TO 1927

(PREPARED BY W. A. ARCHER)

Indiana: Yellows was reported in Indiana as present in considerable amounts between 1904 and 1908 and it was reported as common in 1915. In a letter to the Plant Disease Survey in 1925 Gardner stated that he felt confident that the disease was not to be found in the state at that time.

South Carolina: Evidence of occurrence of yellows in South Carolina consists of a doubtful report received by the Plant Disease Survey in 1913.

In 1927 yellows was reported from New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, Georgia, and Michigan. McClintock in Tennessee states that trees having certain symptoms of yellows occurred on the University Farm at Knoxville. Loss estimates in the states reporting yellows are Maryland, 2 per cent; New Jersey, 1.5 per cent; Massachusetts and Michigan 1 per cent; New York, trace to .5 per cent; and Virginia, a trace.

In New York the disease was present in seven counties according to Chupp. He states that some growers in the western part of the state believe it is becoming more common. In New Jersey, Martin found yellows generally distributed but not severe. In Delaware it is generally observed but not increasing in prevalence according to Adams. Schneiderhan states that no diseased trees were observed in Virginia, but that the disease is known to be present. Regarding yellows in Michigan, Bennett states that typical yellows trees were found in Berrien, Allegan, Kent, and Mason Counties, but that a large share of the injury involved in the loss estimate from that state is caused by a trouble having certain symptoms of both yellows and little peach but not exactly typical of either of these diseases. The first authentic report of the occurrence of yellows in Georgia was received during 1927. (See Plant Disease Reporter 9: 90. 1927).

Yellows was found still to be widely distributed in Pennsylvania, although the number of diseased trees is being decreased. Table 43 showing the prevalence of yellows in 1927 and the number of diseased trees removed in peach producing counties in Pennsylvania during the year, was submitted by W. A. McCubbin.

Progress in control was reported from three states. According to Blauvelt there is very little yellows in commercial orchards in Orange County, New York, presumably because growers remove infected trees at once. Bennett (2) attributes the scarcity of typical yellows trees in Michigan to the general practice of removal of infected trees as soon as symptoms appear. Martin in New Jersey, states that an eradication campaign conducted in the vicinity of Hammonton the past several years is apparently meeting with some success. The control campaign in Pennsylvania has been watched with interest. The percentage of yellows in the state has been gradually reduced over a period of seven years by a systematic inspection and eradication program. The results of this campaign as tabulated by McCubbin follow.

Table 43. Data on yellows distribution in 1927 in Pennsylvania, arranged by counties.

County	Orchards Inspected	Trees Inspected	Trees Marked	Per cent Yellows
Adams	61	78,472	140	.178
Berks	54	147,397	329	.223
Bucks	44	41,253	120	.290
Cumberland	33	51,343	167	.325
Chester	33	25,052	57	.227
Dauphin	26	26,790	74	.276
Delaware	14	10,067	31	.307
Franklin	69	238,310	467	.195
Lancaster	27	37,845	100	.264
Lebanon	14	25,965	145	.558
Lehigh	9	31,950	41	.128
Montgomery	23	35,169	61	.173
York	40	52,420	114	.217
13 Counties	447	802,033	1,846	.230

Table 44. Summary of records of peach yellows inspection and eradication records in Pennsylvania covering the years 1921 - 1927.

Year	No. of Trees	Trees Marked	Per Cent Yellows
1921	287,466	17,376	4.45
1922	442,507	11,052	2.50
1923	482,614	10,698	2.21
1924	674,012	6,064	.89
1925	655,493	2,326	.35
1926	624,743	2,524	.40
1927	802,033	1,846	.23
Total,7 Yrs.	3,968,868	51,886	1.30

Recent literature:

1. Anon. The Valley peach "yellows" problem. Pacific Rural Press 114: 595. Nov. 26, 1927.

2. Bennett, C. W. Peach yellows and little peach situation in Michigan. Ann. Rep. State Hort. Soc. Mich. 56: 187-196. 1926.

3. McCubbin, W. A. Peach yellows and little peach. Bull. Pennsylvania Dept. Agr. 10 (3): 16. Feb. 1927.

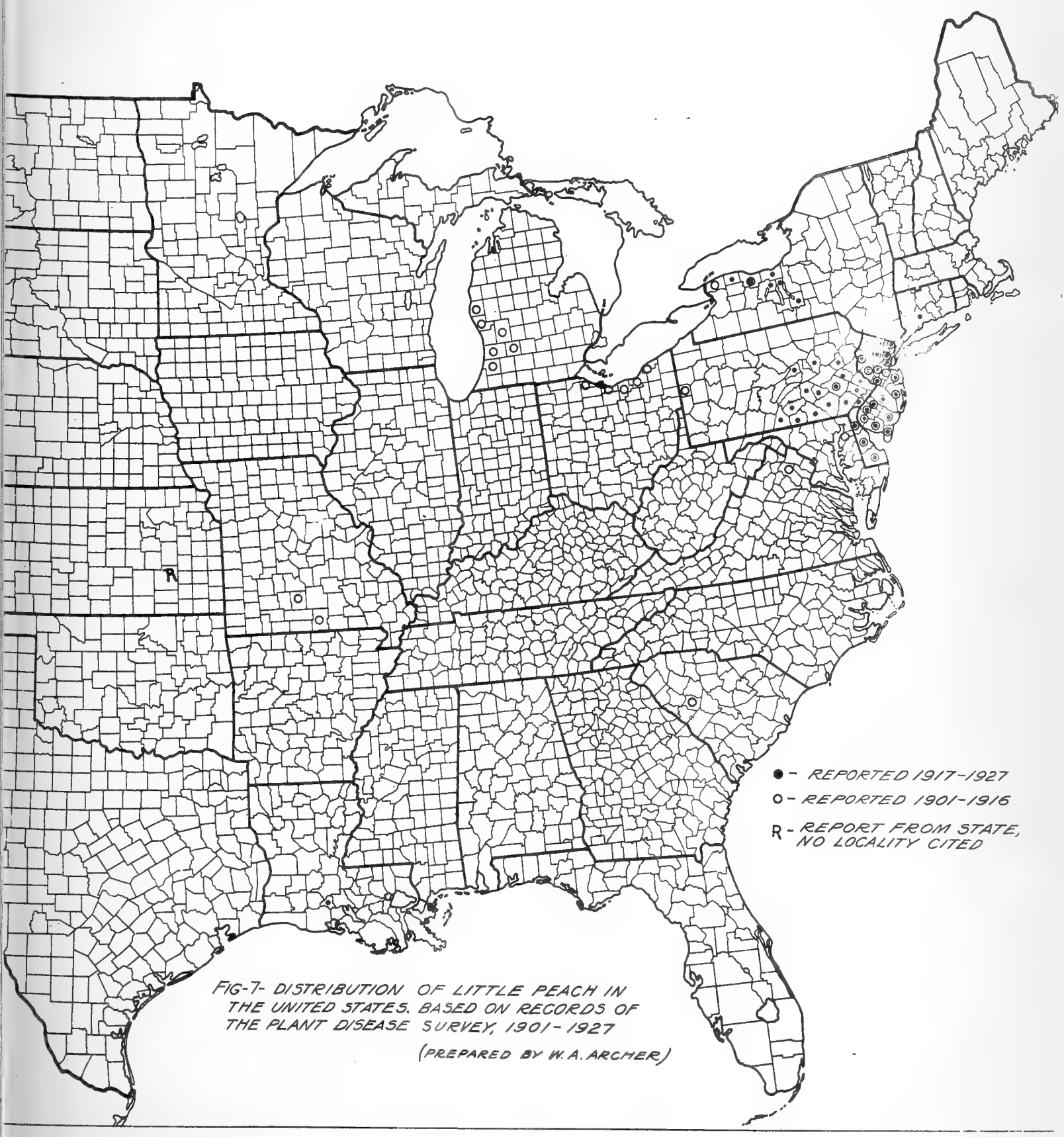

FIG-7- DISTRIBUTION OF LITTLE PEACH IN THE UNITED STATES. BASED ON RECORDS OF THE PLANT DISEASE SURVEY, 1901-1927

(PREPARED BY W. A. ARCHER)

LITTLE PEACH (CAUSE UNDETERMINED)

The distribution* of little peach in the United States as indicated in Fig. 7 is based on collaborators' reports to the Plant Disease Survey. Some of the data received are too general in nature to permit marking definite areas on the map. These data together with various explanatory remarks follow:

Connecticut: One report from New Haven County in 1921 and 1926 by Clinton.

Kansas: Reported to be present in 1919 by Melchers but no data or locality given.

Maryland: The report from Kent County in 1909 may be dubious because J. B. S. Norton states that no specimens were seen. There is no further record of the disease until 1925 when Temple and Jehle report its presence. However, they do not cite localities.

Michigan: In 1903 and 1905, M. B. Waite indicated that little peach was spreading rapidly. In 1911, E. A. Bessey considered the disease to be common in Allegan and Barry Counties; in 1913 and 1914 he reported it to be destructive in Allegan and Oceana Counties respectively. Bennett in 1926 reports it chiefly in the west central part of the state.

Missouri: Reported in 1910 by F. M. Rolfs from Wright and Howell counties.

Ohio: Reported from five northern counties in 1911 by A. D. Selby. In 1912 and 1918, however, he gives a negative report; as does R. C. Thomas in 1921 and H. C. Young in 1924, 1925 and 1926.

South Carolina: Recorded in Saluda County in 1913 by F. M. Rolfs. Reported not present by C. A. Ludwig in 1921, 1924 and 1926.

Virginia: Reported present in Fauquier County in 1910 by H. S. Reed. Reported absent in 1926 by F. J. Schnaiderhan.

In 1927 little peach was reported from New York, New Jersey, and Maryland. Losses were indicated as a trace in New York and Maryland. The disease is considered of slight importance in Maryland and New Jersey. It was not observed in Connecticut, Virginia, Kentucky, and Tennessee.

Recent literature:

(See peach yellows)

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*The distribution map shown in Fig. 7 and the statements regarding the geographical distribution of little peach were prepared by W. A. Archer in 1926.

ROSETTE (CAUSE UNDETERMINED)

The distribution of rosette in the United States from 1902 to 1927, as indicated in Fig. 8 is based on reports of collaborators to the Plant Disease Survey and on data in the Office of Fruit Diseases.

Each symbol used in the map indicates at least one specific report of rosette in the county marked by the symbol. In a few cases the reports have not been specific enough to be represented on the map. These, together with other explanatory notes, follow:

Arkansas: Reported from Baxter County in 1907 by H. P. Gould to Office of Fruit Diseases. Rosen, in 1924, in a letter to the Plant Disease Survey considers existing reports of the disease in the state to be erroneous. (See statement under peach yellows, p. 166)

Florida: The recent record in Walton county was taken from the annual report, 1923-24, on a plant disease survey by G. F. Weber. The infection was said to be scarce. The other occurrence in Alachua County was based on specimens received by the Office of Fruit Diseases during 1910 and 1911.

Kansas: The single record in Kansas in 1923 is based merely on a county agent's report.

Missouri: The earlier records were reported 1903 to 1910 by Paul Evans, W. M. Scott, and F. M. Rolfs. The more recent record (1913) in Newton County is based on a report by H. P. Gould and W. F. Fletcher, to the Office of Fruit Diseases. The disease was not abundant in commercial orchards. In 1926 when W. A. Archer made a survey no infection was found in the state.

Mississippi: The report in Forest County in 1924 by D. C. Neal, was the first record of the disease in the state.

Oklahoma: The two doubtful records are based on a unsigned collaborator's report received in 1906.

Tennessee: M. B. Waite records the disease in 1907 from Franklin County and S. H. Essary records it in 1913 from Shelby, Monroe, and Knox Counties and in 1917 from Henderson County. In addition there is a report from Hesler in 1920 stating that several cases were found in the center of the State.

West Virginia: The area marked is based on a report by Sheldon in 1920 who found two typical cases in a small home planting in Morgantown.

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*The distribution map shown in Fig. 8 and the statements regarding geographical distribution of rosette were prepared by W. A. Archer, in 192[illegible] The 1927 records of occurrence of rosette in McCracken County, Kentucky, and Madison County, Tennessee, have been added to the map prepared by Arche[illegible]

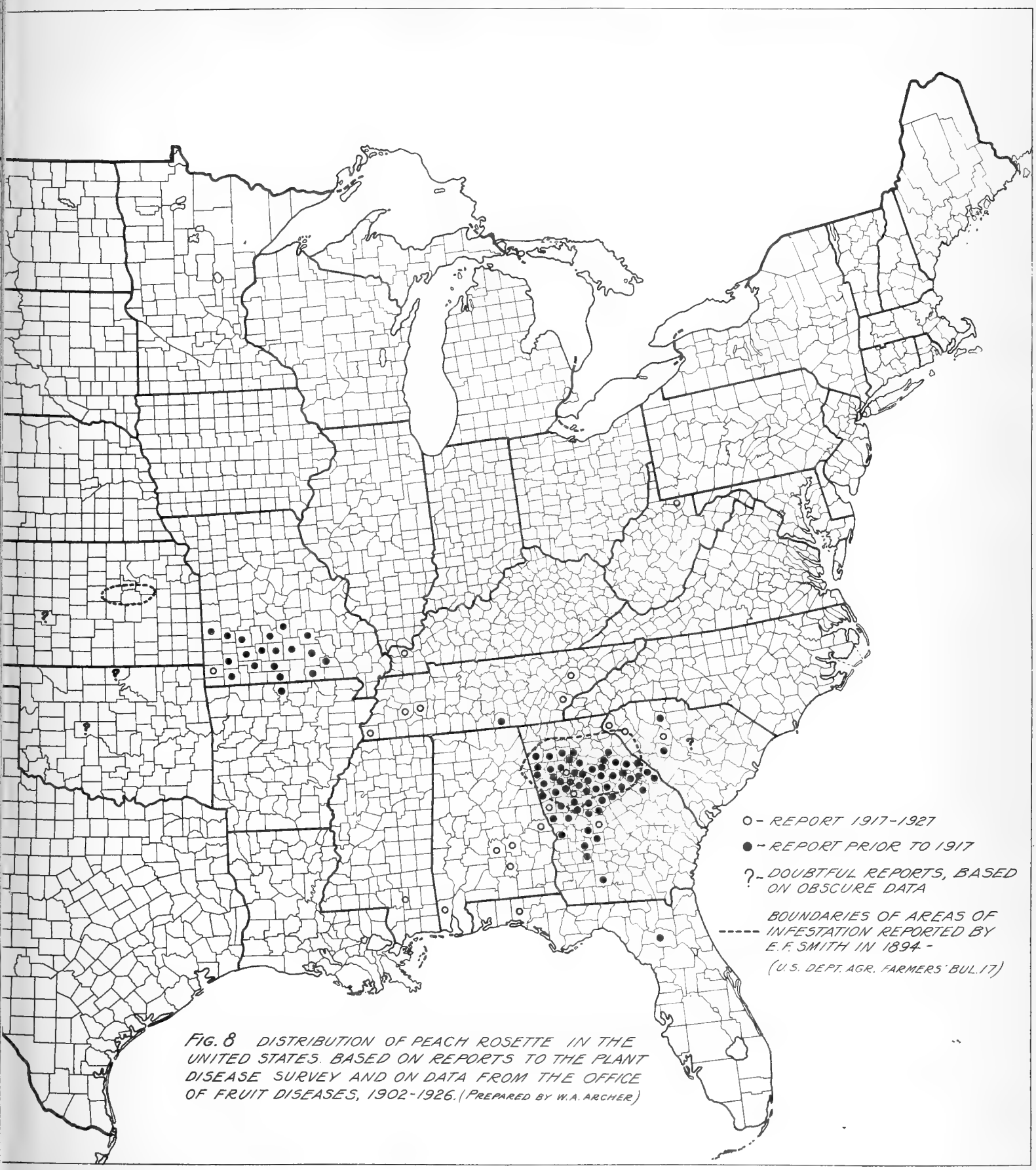

FIG. 8 DISTRIBUTION OF PEACH ROSETTE IN THE UNITED STATES. BASED ON REPORTS TO THE PLANT DISEASE SURVEY AND ON DATA FROM THE OFFICE OF FRUIT DISEASES, 1902-1926. (PREPARED BY W.A. ARCHER)

Peach - Rosette

In 1927 rosette was reported from the three states of Mississippi, Tennessee, and Kentucky. The Kentucky report constitutes the first record of the occurrence of rosette in that state. In no case was the disease found to be serious. Wedgworth in Mississippi states that it is, as a rule, a minor disease. In Tennessee, according to McClintock, rosette apparently spread to one commercial orchard from wild host plants, which were not determined. In Kentucky, only one orchard involving six diseased trees was found by Valleau, although he states that the disease may have occurred on another orchard near Paducah.

The disease was not reported to the Survey from Georgia or South Carolina in 1927.

Recent literature:

(See peach yellows)

INJURIES DUE TO LOW TEMPERATURES.

In 1927, as usual in the case of peach, spring frosts took a heavy toll of the peach crop. Comprehensive records as to losses are not available but reports indicate injury in the majority of peach producing states. Buds were killed by low winter temperatures in South Carolina, northern Illinois, New Mexico and Oregon, a 40 per cent loss occurring in the last named state.

In a number of states more than the usual amount of winter injury to trees was reported. A considerable number of trees was killed in New York. Young in Arkansas associates a considerable amount of winter injury in that state with poor drainage. Hesler found that winter-injured trees were generally distributed over the peach districts of Ohio. In the southern and central parts of Illinois large numbers of trees died according to Anderson. In California Horne states that: "Many thousands of trees, especially young trees, died. Many of these were in the less favorable locations with regard to soil quality and drainage."

Recent literature:

1. Abell, T. H. Some observations on winter injury in Utah peach orchards, December 1924. Utah. Agr. Exp. Sta. Bull. 202. 28 p. June, 1927.

MISCELLANEOUS DISEASES AND INJURIES

Armillaria mellea (Vahl) Quel., root-rot. Traces of injury reported from Texas. According to Milbrath, this rot is general in California.

Bacterium cerasi Griffin, gummosis. Reported from California.

Bacterium tumefaciens EFS. and Town., crown gall. Minor losses due to crown gall were reported from Utah and Arizona. Considerable injury in some instances is said to have occurred in Mississippi and Texas.

Peach - Miscellaneous Diseases

Caconema radicicola (Greef) Cobb., root-knot. Reported from Mississippi, Texas, and California. In California the loss is estimated at 0.5 per cent and in some orchards the loss amounted to the entire crop. The loss in Mississippi was said to be 5 per cent.

Coniothyrium Sp., blight. Texas.

Coryneum beijerinckii Oud., blight. In California an estimated loss of 5 per cent was produced. Reports of occurrence were received from Maryland, Ohio, Michigan, California, Utah, Idaho, and Washington. Linford states that the disease was almost totally absent in Utah, in 1927.

Cytospora leucostoma (Pers.) Sacc., canker. Specimens received from New Jersey.

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

Rhizopus nigricans Ehr., black mold rot. Adams in Delaware states that this rot followed oriental peach moth injury.

Sphaerotheca pannosa (Wallr.) Lév., powdery mildew. Reported from New York, Connecticut, Texas, and California. In California, the gray spots which were first produced on the fruit in some cases turned dark and the surface of the infected fruits cracked. A powdery mildew, name not given, was reported by Heald as prevalent in the Yakima district of Washington.

Tranzschelia punctata (Pers.) Arth., rust. Injury due to rust occurred in the widely scattered states of North Carolina, South Carolina, Mississippi, Texas, and California. In South Carolina, it was quite general and severe. Poole in North Carolina states that it appeared late in the season throughout the sand hill regions, on Elberta, Hale, and Belle of Georgia. In California, the disease caused an estimated loss of 0.5 per cent loss chiefly through fruit blemishes.

Chlorosis (undet.) Linford states that chlorosis of two distinct types seriously affects peaches in Utah. Chlorosis, due to excess lime, occurred in Texas, according to Taubenhaus.

Fruit gumming (undet.) Gumming of fruits, often involving the cracking of pits, caused an estimated loss of 2 per cent in California. Horne suggests frost injury as a possible cause.

Root rot (undet.) Reported from Mississippi and thought to be induced by poor drainage.

Spray injury. Martin observed injury in New Jersey. He states that with the reduction of the amount of lead arsenate used to 1 pound to 50 gallons of dry mix, there has resulted a considerable reduction in the amount of spray injury. There are orchards each year, however, where the injury is serious due to the use of excessive amounts of arsenate of lead. In one case a 70-10-20 dust is reported to have caused burning of the twigs.

Peach - Miscellaneous Diseases.

White spot (marcel) (non-par.) California: opaque, white, somewhat depressed areas show in fruit, these become dirty white in canning. Very local but may be severe. Associated with large size of fruit (Horne& Goldsworthy).

Recent literature:

1. Ezekiel, W. N. Two fungi on Sclerotinia apothecia. Phytopath. 17: 791-792. Nov. 1927.

2. Homma, Yasu. A canker disease of Prunus mume and P. persica caused by a species of Camarosporium. Bot. Mag. Tokyo 41: 541-546. Sept. 1927.

3. Johnstone, H. W. The canning peach basket and rust. Calif. Cult. 9: 30. July 9, 1927.

4. Samuel, Geoffrey. On the shot-hole disease caused by Clasterosporium carpophilum and on the "shot hole" effect. Ann. Bot. 41: 375-404. Apr. 1927.

P L U M

BROWN ROT CAUSED BY SCLEROTINIA FRUCTICOLA (WINT.) REHM

In 1927 brown rot was very destructive in Illinois, Minnesota, and Missouri. In each of these states, practically the entire crop was lost in some of the most severely affected orchards. In Illinois, in addition to the loss shown in Table 45, Anderson and Stout estimate a 25 per cent loss due to rot in transit and on the market. Over other parts of the United States, from which reports were received, brown rot produced about the usual amount of loss, except in West Virginia and Michigan where damage was estimated at less than the usual amount.

Table 45. Percentage losses from brown rot on plum as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
25	Illinois, Minnesota	4	Connecticut, Virginia
20	Missouri	1	Delaware, Michigan
10	Tennessee, Oklahoma, Oregon	Trace-.5	New York
5	Massachusetts, North Carolina, Wisconsin, Iowa.	Trace	North Dakota
7	Maryland		

Plum - Brown rot

In Missouri, Scott lists the Burbank and Green Gage varieties as very susceptible. Archer in Iowa states that, "In one orchard observations over a number of years indicate that Hansen varieties are very susceptible while Japanese hybrids developed by the Gardner nursery are very resistant." Stoddard in Connecticut found brown rot on Prunus cerasifera var. Pissartii for the first time in that state.

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

On some varieties of plums, black knot is recognized as a destructive disease on trees where no attempts at control are made. The general use of control measures in commercial districts has almost eliminated this trouble as a factor in commercial plum and cherry production although it is still an important disease in neglected plantings. In 1927 black knot was reported from Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, West Virginia, Tennessee, North Carolina, Mississippi, Illinois, and Michigan. Loss estimates of 1 per cent in Maryland and 0.5 per cent in Tennessee were reported. The disease is more or less common on wild plums and cherries in a number of eastern and middle western states.

In Iowa, Archer found the Wahnita variety of plum susceptible, a number of trees being practically killed by the disease.

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

Plum pocket was common in 1927 in Fremont County, Iowa, according to Archer. An unusually abundant development of this disease occurred in North Dakota where Brentzel estimated the loss at 10 per cent of the crop. In Texas a 5 per cent loss is estimated by Taubenhaus. The disease was common on wild plums in Nebraska, North Dakota, and Iowa.

MISCELLANEOUS DISEASES

Bacterium cerasi Griffin, bacterial gummosis. Severe locally in California causing an estimated loss of 2 per cent.

Bacterium pruni EFS., bacterial spot. Leaf infection was found by Adams to have occurred in Delaware by May 13. Traces of injury were produced in Maryland, according to Jehle, and Poole states that this disease was widespread in North Carolina on both wild and cultivated plums. In Mississippi, Neal found the disease more common on trees growing in sandy soils having little organic matter. Reports of occurrence were also received from Texas, Michigan, Iowa, and Kansas.

Bacterium tumefaciens E F S. and Town., crown gall. Observed on plums in Maryland, Michigan and Oregon.

Coccomyces prunophorae Hig., leaf spot. Traces of injury were caused in New York and an estimated loss of 2 per cent occurred in Minnesota. The disease was also observed in Iowa.

Exoascus mirabilis Atk., hypertrophy. Archer in Iowa states that this trouble occurred commonly near Randolph, Fremont County in wild plum thickets.

Fomes fulvus Fr., brown heart rot. Archer found this disease in Iowa on Japanese hybrids in a nursery and on the wild goose plum in a home orchard. This is the first report of the occurrence of brown heart rot in this state.

Phyllosticta spp., shot hole, blotch, leaf spot. Taubenhaus in Texas reported a species of Phyllosticta which caused a blotch of plum leaves. Two species of Phyllosticta were collected by Archer in Iowa. He identified one as P. virginiana (Ell. and Hals.) Seaver and states that the other conforms closely to the descriptions of P. prunicola Sacc.

Podosphaera oxyacanthae (DC.) D By., powdery mildew. Archer in Iowa states that this disease was common on water sprouts in shady locations but caused little or no loss.

Tranzschelia punctata (Pers.) Arth., rust. Louisiana, Texas, Kansas, and Iowa.

Valsa leucostoma (Pers.) Fr., die-back. Traces of injury occurred in three counties in Texas according to Taubenhaus.

Recent literature:

1. Amos, J., R. G. Hatton and A. D. Mackenzie. The incidence of "die back" disease in plum trees. Ann. Rept. East Malling Res. Sta. 13 (II Suppl.): 33-37. Mar. 1927.

2. Kieffer, D. L. Prune die-back and potash. Pacific Rural Press. 113: 621. May 7, 1927.

C H E R R Y

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

Collaborators' reports for 1927 indicate that brown rot on cherries was probably no more serious than usual. Except for sweet cherries, most varieties of which are known to be more susceptible to rot than sour kinds, few instances of severe loss were recorded. In the important cherry states of New York, Michigan, Wisconsin, and California, losses were small as shown in table 46.

Cherry - Brown rot

Table 46. Percentage losses from brown rot on cherry as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
10	Oklahoma	1	Maryland, Michigan
5	Massachusetts, Oregon	.5	Delaware
3	Virginia	Trace-.5	New York
2	North Carolina, Tennessee	Trace	Wisconsin, Kentucky, Arkansas, California
1.5	Connecticut		

In Wayne and Wyoming Counties, New York, blossom blight was serious in some cases on the English Morello. In Orange County, New York, some invasion of the fruit followed curculio punctures according to Blauvelt. In Virginia, Poole states that where cherries were allowed to remain on the trees too long before picking, rot was severe.

Recent literature:

See peach brown rot.

LEAF SPOT CAUSED BY COCCOMYCES HIEMALIS HIG.

Conditions were apparently very favorable for leaf spot development in a large part of the upper Mississippi River Valley. Considerable leaf spot occurred also in Maryland, New York, and northern Michigan. The most severe outbreak apparently occurred in Missouri where, according to Scott, sprays were not very effective in control due to excessive rainfall. He states that leaf spot resulted in almost complete failure of the cherry crop. The following are comments from collaborators in some of the states in which leaf spot was relatively common.

New York: Most of the injury due to this year's defoliation will show in the next few years. (Chupp.)

Kentucky: Cherry trees all over the state were almost completely defoliated relatively early in the season. (Valleau)

Arkansas: Severe shot-hole and defoliation common on unsprayed trees. Spraying not so effective as usual. (Young)

Illinois: Very extensive defoliation of trees throughout the state. (Anderson and Stout)

Cherry - Leaf spot

Indiana: Numerous cases of complete defoliation before fruit was picked. (Gardner, Dietz, and Pierce)

Iowa: Severe infection and defoliation occurred in many places over the state. (Archer)

Kansas: Cherry trees practically defoliated. (Elmer)

Gardner in Indiana found pedicel infection which resulted in drying of fruits. In Michigan, according to Bennett, fruit infection was severe in some orchards near Hart. He states that in some orchards, 5 per cent of the fruit was malformed by attacks of this disease.

Loss estimates are given in Table 47.

Table 47. Percentage losses from leaf spot on cherry as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
50	Missouri	1	Delaware, Virginia, Wisconsin
20	Oklahoma	.5	Montana
10	Maryland	4	Michigan
5	Iowa, Arkansas	.2	Oregon
2-5	New York	Trace	Massachusetts, Mississippi.

MISCELLANEOUS DISEASES AND INJURIES

Armillaria mellea (Vahl) Quel., root rot. Wedgworth reported that this disease occurred in Chickasaw County, Mississippi.

Bacterium cerasi Griffin, bacterial gummosis. Traces of injury in California. Reported also in Washington.

Bacterium pruni EFS., bacterial spot. The Rocky Mountain dwarf cherry as well as cultivated cherries in Iowa were affected according to Archer.

Coryneum beijerinckii Oud., blight. Reported from Washington.

Exoascus cerasi (Fckl.) Sadeb., witches'-broom. Occurred on wild cherry, Prunus serotina, at Blacksburg, Virginia.

Cherry - Miscellaneous diseases

Plowrightia morbosa (Schw.) Sacc., black knot. Reported from New York, Pennsylvania, West Virginia, and North Carolina. Poole in North Carolina states that it is prevalent in many parts of the state on wild cherries and was reported as causing severe damage to new plantings of cultivated sour cherries.

Podosphaera oxyacanthae (DC.) D By., powdery mildew. Reported from New York, Delaware, Michigan, Wisconsin, Iowa, Kansas, Colorado. It was an important disease in Iowa on nursery stock.

Body canker (undet.) A trouble causing death of both old and young trees produced considerable injury in Utah according to Linford. Winter injury is suspected as one of the contributing causes.

Winter injury. Severe in parts of Ohio and Iowa. In the latter state, according to Archer, many trees died during the seasons of 1926 and 1927 as a result of an early fall freeze in 1925.

Recent literature:

1. Anon. A new cherry disease. Calif. Cult. 68:475. Apr. 16, 1927.

2. Faes, H., and M. Staehelin. Les champignons et les insectes ennemis du cerisier. Ann. Agr. Suisse 28: 1-27. 1927.

A P R I C O T

Bacillus amylovorus (Burr.) Trev., fire blight. According to Taubenhaus this disease occurred on apricots in Texas.

Bacterium pruni EFS., bacterial spot. Specimens collected at Shenandoah, Iowa, by Archer.

Cladosporium carpophilum Thuem.,scab. Quite prevalent in Texas.

Coryneum beijerinckii, Oud., blight. In California, according to Milbrath, Coryneum blight was worse in 1927 than in 1926 and caused an estimated loss of 5 per cent. In Idaho it was not important in orchards which received the lime-sulphur dormant spray for scale.

Sclerotinia spp., brown rot. An estimated loss of 8 per cent occurred in California according to Milbrath. The disease was also severe in Kansas causing losses estimated at 10 per cent of the crop.

Sclerotinia sclerotiorum (Lib.) Mass., green rot. This disease was important in California causing a 3 per cent loss.

Tranzschelia punctata (Pers.) Arth., rust. Localized attacks occurred in California. The loss for the state was estimated as 0.5 per cent.

Recent literature:

1. Fish, S., and A. A. Hammond. "Shot-hole" of apricots. Progress report on control experiments carried out during 1926 in the Goulburn Valley. Jour. Dept. Agr. Victoria 25: 403-408. July 1927.

2. Rudolph, B. A. Monilia blossom blight (brown rot). Pacific Rural Press 113: 241. Feb. 19, 1927.

3. Smith, R. E. Green rot of the apricot. Pacific Rural Press 113: 622. May 7, 1927.

DISEASES OF SMALL FRUITS

GRAPE

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

In general in 1927, black rot was less destructive in the large commercial grape areas than in sections having smaller and more widely separated plantings. It was reported as severe in Virginia, Tennessee, Illinois, and locally in South Carolina, with losses of 50 per cent of the crop in some vineyards in South Carolina and Illinois. The average amount of black rot was reported from Tennessee, Virginia, North Carolina, and Louisiana; more from Massachusetts, Connecticut, New York, Kentucky, Illinois, Kansas, and Mississippi; less from Delaware, Maryland, West Virginia, South Carolina, Florida, Arkansas, and Wisconsin; and much less from Michigan and Iowa.

Table 48. Percentage losses from black rot of grape as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
10	Tennessee, Illinois Oklahoma.	2	Massachusetts, South Carolina
9	Virginia	1.5	Delaware
8	Maryland	1	Arkansas, Wisconsin, Kansas.
5	North Carolina, Mississippi.	Trace	West Virginia, New York, Iowa, Missouri, Michigan.
6	Kentucky	3	Texas

Grape - Block rot

Some of the following statements by collaborators indicate that conditions in a number of states were favorable for abundant black rot development in unsprayed vineyards. The available information seems to indicate that definite annual spray programs have been responsible, in the larger grape sections, for the reduction of this disease to a mere trace in many instances.

Pennsylvania: Generally prevalent but not of much importance except in small garden plantings. (Thurston).

Delaware: Improved spraying program reducing general prevalence. (Adams)

Tennessee: Generally present on unsprayed vines. Held in check with 3-4-50 Bordeaux. (McClintock).

North Carolina: Heavy loss on unsprayed grapes. (Poole).

South Carolina: Generally over the state. From 1 to 5 per cent loss in commercial vineyards. Home vineyards from 10 to 50 per cent loss. (Moore)

Ohio: Not serious in most commercial vineyards, which are mainly located within a few miles of Lake Erie. Often causes considerable damage in backyard plantings, especially in the central and northern parts of the state. Loss in 1927 probably did not exceed 1 per cent. (Wilcox)

Michigan: Very rare in commercial vineyards but more or less common on unsprayed vines. In the commercial grape sections, regular spray programs are believed to be responsible for the reduction of this disease, during the last few years, to a position of minor importance. (Bennett)

Missouri: Present in many small home vineyards but fairly well under control in commercial vineyards. (Scott)

DOWNY MILDEW CAUSED BY PLASMORARA VITICOLA (BERK. & CURT.) BERL. & DE TONI

Weather conditions were favorable for a rather unusual development of downy mildew in some of the New England states. It was also common in some vineyards in Arkansas, Missouri, and Illinois. Much more than the usual amount was reported from Massachusetts, Delaware, and Arkansas. Connecticut and Missouri reported more; Indiana, New Jersey, Tennessee, Florida, Illinois, and Indiana the same, and Michigan, Wisconsin, Minnesota, and Iowa less than the average year. In Massachusetts, Davis estimates the loss in some sprayed vineyards at 5 per cent and reports an 80 per cent infection in some of the unsprayed plantings. Other loss estimates are, Illinois, 3 per cent; Louisiana, Texas, and Missouri, 2 per cent; and Maryland and Tennessee 1 per cent.

Grape - Downy mildew.

In New Jersey the Niagara, Champagne, Agawam and Worden varieties are considered to be susceptible.

New York: Ontario Co. Especially abundant on leaves of Delaware and Catawba in the vicinity of Naples. (Bullock).

Orange Co. Quite prevalent near picking time. Delaware and Concords most commonly affected. Mostly on the leaves. (Blauvelt).

Tennessee: Present each season more or less. (McClintock).

North Carolina: Widespread but not severe. Common in vineyards in the mountain section. (Fant).

Texas: For the first time this year serious on cultivated grapes. Two per cent loss. (Taubenhaus).

Arkansas: Very common on some of the noncommercial varieties scattered over state. Of no importance on Concord. (Young)

Ohio: Negligible even on wild grapes and Catawba vineyards on the shore of Lake Erie. (Wilcox).

Illinois: Not as much as expected considering the weather conditions. (Anderson).

Missouri: More severe than usual on unsprayed vineyards. Season was quite favorable with a moderately cool summer and much moisture. (Scott).

Quinn (1) has reported regarding the introduction and prevalence of downy mildew in Australia.

Recent literature:

1. Quinn, D. G. Downy mildew. (Plasmopara viticola). Jour. Dept. Agr. South Australia 30: 726-735. Feb. 15, 1927.

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

Only a few reports of the occurrence of powdery mildew in 1927 were received. In New York, Mills reported damage in damp locations and Bullock also in New York considers Niagara and Concord the most susceptible varieties of those observed. Archer found powdery mildew in only one location in Iowa. In Arizona the disease was severe on Thompson Seedless where dusting had been neglected. (Arizona News Letter). In Utah it was a serious factor in home gardens and small vineyards but was less severe than usual according to Linford.

Grape - Powdery Mildew

The disease was generally distributed in California, according to Milbrath, and caused a loss estimated as 0.5 per cent of the crop.

Recent literature:

1. Bonnet, L. O. Mildew and sulphuring. Calif. Grape Grow. 8 (4): 12-13. April 1, 1927.

2. Johnstone, H. W. Sulphur control for grape mildew. Calif. Cult. 68: 618-619. May 21, 1927.

ANTHRACNOSE CAUSED BY SPHACELOMA AMPELINUM D BY.

An unusual outbreak of anthracnose occurred in Arkansas where wet weather favored early development. V. H. Young states that the varieties Catawba, Ellen Scott, and H. W. Munson are susceptible while Concord is resistant. Anthracnose was also reported from Maryland, North Carolina, Florida, Mississippi, and Iowa. It was not observed in Massachusetts, South Carolina, Louisiana, Illinois, Michigan, Wisconsin, and Minnesota.

MISCELLANEOUS DISEASES AND INJURIES.

Bacterium tumefaciens EFS. & Town., crown gall. Reported from Maryland, Michigan, Wisconsin, Kansas, Utah, Oregon, and Washington. A 25 per cent infection occurred in one vineyard in Utah.

Botrytis sp., rot. Reported from Delaware.

Cryptosporella viticola (Reddick) Shear, dead arm. Coleman (2) states that some grape growers of the Niagara Penninsula of Ontario consider this the most serious disease with which they have to contend. One vineyard in New York was seriously affected. In Michigan one twenty-acre vineyard had 15 per cent of the plants affected, and diseased vines in small numbers were found in many vineyards in Van Buren and Berrien Counties.

Melanconium fuligineum (Scrib. & Viala)Cav., bitter rot. Reported from Delaware, New Jersey, and Florida. No injury recorded.

Phymatotrichum omnivorum (Shear) Dug. Texas root rot. Fairly prevalent in Texas.

Chlorosis due to excess of lime. Taubenhaus reports this as common in Texas. He states that it is controlled by iron sulphate. Linford reported a severe form of chlorosis (cause undetermined) as occurring in a number of vineyards in Utah. He states:

Grape - Miscellaneous Diseases

"A serious limiting factor, restricting grape culture to soils and localities where it occurs least destructively and reducing the vigor and yield of many home garden and some commercial plantings. Much less frequent in the southern counties than in the northern."

Frost Injury. Reported from Arkansas and Illinois; no estimates of loss available.

Little Leaf, undet. Present in certain localities in California and caused an estimated loss of 0.5 per cent of the crop in that state.

Shelling, undet. Two vineyards in Van Buren County, Michigan, lost 10 per cent of the fruit before picking time according to Bennett. A small amount of shelling occurred in other vineyards in the same county.

Spanish Measles, undet. Reported as generally distributed in California and caused an estimated loss of 1 per cent of the crop.

Winter Injury. In New York, Chupp reported the formation of galls, similar to crown gall, on winter injured plants. In Ohio Wilcox reported that "Winter killing was serious where vineyards were not well drained. The fall of 1926 was extremely wet and the excess water injured the roots. The damage was 5 per cent or more."

Recent literature:

1. Bonnet, L. O. Treatment of black measles. Calif. Grape Grow. 8 (2): 4-5. Feb. 1, 1927.

2. Coleman, L. C. The dead arm disease of grapes in Ontario. A preliminary study. Scient. Agr. 8: 281-315. Jan. 1928.

3. Coleman, L. C. Dead arm of grapes. Rept. Canada Exp. Farms (Rept. Dom. Bot.) 1926: 72-75. 1927.

4. Eyer, J. R. and W. A. McCubbin, Grape insects and diseases. Bull. Pa. Dept. Agr. 9 (16). 27 p. 1927.

5. Lieske, R. Untersuchungen über die als Mauke oder Grind bezeichnete Erkrankung der Weinreben. Arb. Biol. Reichsanst. Land- u. Forstwirtsch., 15: 261-270. 1927.

6. Moreau, L., and E. Vinet. Innovations dans la lutte contre les parasites de la vigne. Rev. Vitic. 67: 261-269. Oct. 27, 1927.

7. Palmer, E. F., and J. R. van Haarlem, The grape in Ontario. Bull. Ontario Dept. Agr. 328. 52 p. June 1927.
   Grape diseases by L. C. Coleman, pp. 49-52.

8. Rose, D. H. Decay of California grapes in the vineyards, in transit and on the market. Blue Anchor 4 (10): 1, 19-21. Oct. 1927.

9. Viala, P. Recherches sur quelques formes de dépérissements de la vigne. Compt. Rend. Acad. Agr. France. 13: 88-90. Jan. 19, 1927.

10. Viala, P., and P. Marsais. La sclériase des raisins, due au Sordaria uvicola. Compt. Rend. Acad. Sci. Paris 184: 1504-1506. June 20, 1927.

S T R A W B E R R Y

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

Leaf spot was reported in 1927 from twenty-nine states. It was most abundant in Massachusetts, Connecticut, Illinois, and Louisiana, but in general caused little loss to the strawberry crop. Illinois reported the heaviest infestation involving an estimated loss of 1 per cent. In three states the disease is considered very important in the average year, in nine of moderate importance, and in ten of slight importance. In the four states reporting more leaf spot than in the average year, the loss was estimated at less than 1 per cent.

In Ontario, Berkeley (1) states that in most seasons the following varieties should show considerable resistance: Parson, Portio, Pocomoke, Lavinia, Splendid, and William Belt. In Delaware William Belt is very susceptible; in Tennessee Klondike is very susceptible and Gandy susceptible. In Florida Missionary is resistant: in Illinois, Premier and Aroma are resistant and Klondike, Gandy, Judith, and Dunlap susceptible. In Utah leaf spot is very common on wild strawberry, but appears to be of no importance on cultivated varieties.

Recent literature:

1. Berkeley, G. H. Strawberry diseases. Bull. Dept. Agr. Canada (Ottawa) n. s. 80: 50-53. 1927.

2. Neal, D. C. Strawberry leaf-spot and its control. Quart. Bull. State Plant Bd. Mississippi 6 (4): 23-24. Jan. 1927.

BLACK ROOT, CAUSE UNDETERMINED

In 1927 strawberry root rots were reported from several states. Black root seemed to be the predominating type. The geographical distribution of this trouble is indicated by reports of its occurrence in the widely separated states of Tennessee, Florida, Michigan, Wisconsin, and Washington. It is also reported from Ontario. Root rot (cause undet.) was reported from New Jersey and root rot, "caused by various parasites on weakened plants," was reported by Chupp in New York. In Texas and Michigan losses due to black root were estimated at 1 per cent. Strong in Michigan writes:

> "Black root causes considerable damage to strawberries. In some areas in Michigan the culture of the strawberry is about to be given up because of the disease. The short life of plantations is due in large part to black root and, with the present system of the cultivation of the strawberry in which patches are maintained for two to four years, it is safe to say that black root is causing a loss from 10 to 25 per cent of the crop, year in and year out because of the poor stands which are to be found in the older fields."

Soil fungi are suggested by collaborators as causes, with winter injury and stunting due to a variety of factors as predisposing influences. Berkeley (1) in Ontario, states that black root is more severe where strawberries follow strawberries year after year. He attributes some of this type of damage to winter injury but suggests that in some cases soil fungi are probably important causal agents. Strong reports (letter) as follows on the cause of black root in Michigan:

> "Black root has been reported from many sections for several years, and the disease has been attributed to a number of factors. It seems probable that any one or more of a number of organisms can produce the various symptoms which have been included in the descriptions of this disease. Study of Michigan material involving hundreds of isolations has placed chief responsibility upon two organisms, one possessing a Gloeosporium type and the other a Coniothyrium type of fruiting body. Inoculations with these organisms have produced the symptoms of this disease. Work looking to the definite determination of these organisms is now in progress. Each of these organisms has been found widely distributed in Michigan on both wild and cultivated strawberries, indicating wide natural occurrence of the pathogens. Isolations have also been made from North Carolina and Utah material."

Strawberry - Black root

Recent literature:

1. Berkeley, G. H. Strawberry diseases. Bull. Dept. Agr. Canada (Ottawa) n. s. 80: 50-53. 1927.

2. Wardlaw, C. W. Note on the occurrence of Pythium proliferum, de Bary, on the roots of the strawberry. - Ann. Bot. 41: 817-818. Oct. 1927.

3. --------- The strawberry disease in Lanarkshire. Ann. Appl. Biol. 14: 197-201. 1927.

VIRUS AND VIRUS-LIKE DISEASES

Diseases suspected of being of a virus type were reported from several states and from Ontario. In general these diseases have caused little loss but they continue to be of increasing interest to plant pathologists. Symptoms as described vary considerably but fall roughly into three classes.

Mosaic. Gardner reported a mosaic (or yellows) disease on strawberries in Indiana and Taylor found a similar trouble on some unknown strawberry varieties in Erie County, New York. Berkeley (1) in Ontario reported a disease which affects the Eaton variety and causes the production of characteristic mosaic-like, yellowish mottling. In no case has it been determined whether the troubles mentioned above are true mosaics.

Yellows. Guba reported that a disease of a yellows type caused a 10 per cent loss in some fields in Massachusetts. A yellows disease occurred in Illinois according to Anderson but symptoms seemed to be somewhat different from other yellows diseases which have been reported.

Witches' Broom. In 1927 a disease called "witches' broom" was reported from Oregon and Washington. It is considered of slight economic importance. The maximum infection in any one field was 3 per cent in Oregon. Zeller (2) in Oregon states regarding this disease:

> "Witches' broom of strawberry is characterized by a dwarfing of the whole plant, spindleness of the petioles and an arching downward of the margins of the leaflets which are lighter in color than the normal plants. Witches' broom has been found in Western Oregon only, but may have a wider distribution. Varieties have not been tested for resistance or susceptibility, but Marshall, Nick Ohmer, Oregon, and Ettersburg varieties have been found affected. Viriliferous leaf lice (Myzus fragaefolii) transmit the disease."

Strawberry - Virus and virus-like Diseases

Recent literature:

1. Berkeley, G. H. Strawberry diseases. Canada (Ottawa) Dept. Agr. Bull. n. s. 80: 50-53. 1927.

2. Zeller, S. M. Preliminary studies on witches broom of strawberry. Phytopath. 17: 329-335. 1927.

MISCELLANEOUS DISEASES AND INJURIES

Armillaria mellea (Vahl) Quel, root rot. Reported from Oregon and Washington.

Botrytis sp. In Minnesota, Botrytis rot was more common in 1927 than in 1926 according to the Department of Plant Pathology. Late in the season it was severe in some parts of Washington on ever-bearing varieties. Brooks in Florida reported it as more abundant than tan rot.

Caconema radicicola (Greef) cobb, root-knot. In Florida dry weather induced an earlier development of knots than usual.

Cercospora vexans C. Massal., leaf spot. Chupp reported this fungus, with a specimen, from New York on wild strawberry (Fragaria virginiana). Apparently it has not been collected in the state previously. It has been reported from Wisconsin by Davis (2,) p.421 on F. virginiana and F. vesca.

Colletotrichum sp., anthracnose. This newly reported disease was mentioned again by Brooks from Florida as causing injury on the Missionary variety. Runners and young plants are susceptible but the disease is less often found on the older parts.

Dendrophoma obscurans (Ell. & Ev.) H. W. Anderson, angular spot. Occurred in Illinois, Michigan, and Florida. Brooks in Florida reported control with Bordeaux mixture. The disease was not observed in Maryland, South Carolina, and Minnesota.

Diplocarpon earliana (Ell. & Ev.) Wolf. This disease was rather common in Arkansas on the Klondike variety and caused considerable damage locally. In Florida it was observed by Brooks in the spring on old fruiting plants but was more destructive during the summer in young plantings. It was also reported from Delaware, North Carolina, Indiana, Michigan, and Louisiana.

Fuligo vagans Pers., and other slime molds. Elmer states that many reports of the occurrence of slime mold on strawberries were received from the eastern part of Kansas. Slime molds were also reported as occurring on strawberries in Mississippi and New Jersey.

Strawberry - Miscellaneous Diseases.

Fusarium sp., root rot. Brooks states that in Florida a root rot, believed to be caused by a species of Fusarium, was more common than usual probably due to a very dry season.

Pezizella lythri (Desm.) Shear & Dodge, tan brown-rot. Brooks states that this was the leading rot in Florida strawberry fields during November and December 1926 and the first half of January 1927.

Phytophthora cactorum (Leb. & Cohn) Schroet., leather rot. Scott reported a 5 per cent loss in Missouri. He states that leather rot was a great menace to strawberry growers and shippers in south and northwest Missouri this year. Over 200 carlots shipped to out of state destinations were damaged by this and other rots. Some of the losses were as high as 75 per cent. Minor losses were reported from Maryland and Virginia.

Rhizoctonia sp., hard brown-rot. This rot caused minor losses in Florida and Louisiana.

Rhizopus nigricans Ehr., leak. Mississippi and Florida.

Sclerotinia sclerotiorum (Lib.) Mass., crown rot. Appeared in Louisiana during cool, damp weather.

Sphaerotheca humuli (DC.) Burr., powdery mildew. Occurred as a very minor disease in New York, Delaware, Tennessee, Florida, Michigan, Missouri, and Colorado. It was not observed in 15 other states which reported.

Tylenchus dipsaci (Kuehn) Bast., stem nematode. McKay in Oregon reports that this disease caused nearly total destruction of some patches along the Pacific coast.

Bacterial leaf spot (undet. bacterium). A new bacterial disease of strawberry was reported by Linford in Utah. (See Fl. Dis. Rep. 11: 109. 1927).

Wilt (undet.) According to Zeller this disease in Washington has caused an almost total loss of plants in some large fields.

Recent literature:

1. Brooks, A. M. Treatment of strawberry diseases, seasonable suggestions on crop troubles. Florida Grow. 35 (17): 27-28. Oct. 1927.

2. Davis, J. J. Notes on parasitic fungi in Wisconsin, VIII. Trans. Wis. Acad. Sci. 20: 413-431. Feb. 1922.

RASPBERRY

ANTHRACNOSE CAUSED BY PLECTODISCELLA VENETA (SPEG.) BURKH.

During the season of 1927 considerable loss was caused by this disease in Arkansas, Illinois, Indiana, and Maryland. Missouri and Kansas reported more than usual, North Dakota the same, and Iowa and Michigan, less.

Ohio: Another serious and very general infection of black raspberries occurred in the summer, at a height on the canes of about 2 feet. This infection probably did not greatly affect the 1927 crop, but stunted the laterals on young shoots, and killed or badly injured many buds, so it will undoubtedly reduce the fruit crop of 1928. Propagation of black caps was cut down in many fields by stunting of the laterals. During the past nine years this late infection has occurred commonly and has apparently done much more damage than the early spring infection. In fields which received a late dormant fungicidal spray the anthracnose was much reduced. The damage is difficult to estimate but is probably 5 per cent or more. (Wilcox).

Indiana: Infection apparently occurred over a larger period than usual. Much of the loss from this season's epidemic will occur next year. (Gardner).

Michigan: Infection during May was unusually heavy but due to dry weather, little infection occurred during June, July and August. Fall rains caused much spotting of cane tips of black raspberries. The young plants when dug in 1928 will have considerable anthracnose on the old canes which gave rise to the new "tip." (Bennett)

Iowa: Considerable loss was observed in Harrison County. Many inquiries and specimens were received from other localities. (Archer)

Missouri: Quite severe this season. Many canes were killed. (Scott)

Kansas: General but not severe. (Elmer.)

In general both moisture and temperature were favorable for early development of anthracnose in the states which lead in raspberry production, namely, New York, Michigan, Illinois, Indiana, Ohio, Wisconsin, and Minnesota. However, conditions in Michigan, Wisconsin, and Minnesota were not favorable for spread during the summer. Secondary infection was abundant in Ohio, according to Cooley, and Wilcox in the same state reports that late summer and fall infection was very abundant. Conditions of moisture and temperature were favorable for anthracnose development in Indiana and Illinois during a considerable portion of the season. Drought checked development of disease in Iowa and losses were less than usual.

Varietal Susceptibility

As a general rule, red varieties of raspberries are considered to be so resistant to anthracnose that control measures are not necessary. Purple or hybrid varieties are somewhat more susceptibile and black varieties as a general thing are quite susceptible and commonly severely injured.

Some of the information on varietal resistance available from 1927 reports is tabulated in Table 49. It will be noted that there is reasonable agreement among those reporting as to the susceptibility of the more common varieties. Some apparent variations to the ordinary way of reacting toward anthracnose were reported for some varieties. Gardner in Indiana states that red varieties were more severely affected than usual. He also states that Plum Farmer showed considerable resistance. Wilcox in Ohio noted a severe attack of anthracnose on Erskine Park, a red variety which is generally credited with considerable resistance.

Table 49. Data on varietal susceptibility of raspberries to anthracnose as compiled from reports of collaborators, 1927.

Very Susceptible	Susceptible	Resistant	Very Resistant
Cumberland (B)(2) (3)(4)	Columbian (P)(1)	Ranere (R)(1)	Cuthbert (R) (1)
Gregg (B) (2)	Cumberland (B) (1)	Cuthbert (R)(2)	Latham (R) (1)
Kansas (B) (2)	Plum Farmer(B) (1) (2) (4)	Latham (R)(2)	King (R) (1)
Honeysweet (B)(4)	Hoosier (B)(1)	King (R) (2)	June (R) (4)
	Kansas (B) (1)	Cardinal (P)(2)	Royal Purple (P) (4)
	Honeysweet (B) (1) (2)	Plum Farmer(B) (3)	Quillan (B) (4)
	Erskine Park (R) (1)		
	Haymaker (P) (2)		
	Gregg (B) (4)		

R - Red variety. P - Purple or hybrid variety. B - Black variety. Numerals indicate the collaborator and state from which the data were received as follows:

1. R. B. Wilcox - Ohio
2. C. W. Bennett - Michigan
3. M. W. Gardner - Indiana
4. A. S. Colby - Illinois

The Quillan, grown more extensively in Illinois than in other states, seems to be more resistant to anthracnose than any other black variety of common occurrence.

Control:

The recommendations of pathologists and horticulturists for anthracnose control have been modified considerably in the last decade. This change has been brought about chiefly by two factors, (1) the more general

recognition of the resistance of red and purple varieties, and (2) the extreme susceptibility of raspberry foliage to injury from spray. Spray injury of various types due to commercial lime-sulphur, self-scaled lime-sulphur, and Bordeaux mixture have been reported from time to time. The fruiting canes, in two fields of black raspberries in Michigan, were almost completely defoliated by after-blossom sprays of lime-sulphur in 1927. According to Bennett (2) certain types of sprays, under some conditions produce a mottling of leaves without killing any of the leaf area. As a general rule older leaves are more subject to injury from sprays than are young leaves. It has been noted that leaves of fruiting canes may be severely burned while leaves of turions of the same plant are not so badly injured.

For the most part, pathologists are recommending two sprays, a delayed dormant and one two or three weeks later, for the control of anthracnose. The second spray in some cases is recommended with certain reservations. Michigan and Illinois and probably other states recommend the removal from black raspberry tips of all parts of the old cane before planting. In tests made in Michigan on plants set in 1926 less than 5 per cent as much anthracnose occurred on plants from tips completely buried as was found on plants from tips to which the old cane parts were left attached, according to Bennett.

Anthracnose control on black raspberries will probably not be entirely satisfactory until some spray less injurious than those now commonly employed, is found for summer use. In some cases reports indicate that the early spring sprays in 1927 were very beneficial. Haenseler in New Jersey reports on a spray experiment conducted on black raspberries in Camden County as follows:

Unsprayed - 60 per cent canes had 1 to 5 lesions.
Collodial lime-sulphur
1-20, two applications - 14 per cent canes had 1 to 5 lesions.
1-10 dormant, and 1-20 summer - 3.3 per cent canes had 1 to 5 lesions.

He states that Bordeaux mixture is as effective as colloidal lime-sulphur as a summer spray. Bennett in Michigan reports that a delayed dormant was very effective in controlling the early infection and in keeping the lower portions of the new canes relatively free from disease. In Indiana, where conditions for disease development were probably more favorable, Gardner states that a dormant spray failed to control.

Recent literature:

1. Bennett, C. W. Some symptoms of raspberry diseases. Fruit and Gard. 25 (7): 5, 10-11. July, 1927.

2. Boyer, C. A. Diseases of raspberries and their control. Amer. Fruit Grow. Mag. 47 (2): 7, 28. Feb. 1927.

MOSAIC (VIRUS)

There seems to be general agreement among those investigating virus diseases of raspberries that there is a wide range of mosaic or mosaic-like symptoms to be found on raspberry plants. However, there is considerable variation in the interpretation of the significance of different types of symptoms. Three types of mosaic are described by Dodge and Wilcox (6). Bennett (1) has also described three mosaics under the names, "red raspberry mosaic," "mild mosaic," and "yellow mosaic," with the suggestion that in the case of red raspberry mosaic there is probably more than one virus involved. Symptoms of these three types are evidently the same as or very similar to those described by Dodge and Wilcox. Rankin (8) is inclined to attribute mosaic to a single virus. He suggests that some of the milder forms of mottling which occur in New York may be due to other factors such as red spider.

Very little data are available on the relative importance of mosaic in 1927 as compared with the average year. Massachusetts reported much more and Connecticut more than usual. In Minnesota there was less and in Wisconsin and Michigan the same as the average year. In states reporting losses from both anthracnose and mosaic the loss from mosaic was larger than from anthracnose. However, in some states, notably Illinois, Indiana, and Arkansas, reporting heavy losses from anthracnose, no mosaic loss estimates are available.

Table 50. Percentage losses from mosaic of raspberries as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
23	Massachusetts	5	Ohio, Wisconsin
10	Michigan, Minnesota	Trace	Delaware, Maryland
			Iowa, Missouri

Regarding the importance of mosaic in 1927 collaborators report as follows:

> Massachusetts: Very severe on reds. Several gardens total failures. On reds this is a most severe disease. (Davis)
>
> Connecticut: Twenty-four reports were received, all but one being on red varieties. (Bender and Clinton)
>
> New York: Orange County - Most of the old plantings were killed by mosaic. New plantings of such varieties as Latham, Ranere, and Herbert are being set out. Latham seems most desirable. (Chupp)

Raspberry - Mosaic

Ohio: All varieties susceptible with the possible exception of La France. Conspicuous red raspberry mosaic rare on Latham and St. Regis, fairly common on Cuthbert. On blackcaps, red raspberry mosaic is not common except where these are grown close to reds. Yellow mosaic is extremely rare. Mild mosaic is uncommon except in the southern part of the state. The damage to raspberries was probably 5 per cent although the total infection with mild mosaic will exceed this.

Michigan: It is estimated that 10 per cent of the King plants in the state have red raspberry mosaic. Yellow mosaic has recently been found on dewberry and King red raspberry but is believed to be more or less rare. Mild mosaic is very common on blacks and purples and in some cases, on red varieties. In some fields of the red varieties, King and Latham, all of the plants are infected with mild mosaic. The disease, however, causes no appreciable damage to reds and symptoms are difficult to see except on leaves produced when the temperature is very low. (Bennett)

Kansas: Common on red raspberries both in the field and in nurseries. (Elmer)

Iowa: The losses are evident only in an indirect manner. Mosaic infected plants may live for an indefinite number of years, but such plants are more subject to winter killing and other unfavorable conditions. (Archer)

Rankin (8) states "The true infectious mosaic of raspberries is the most important and, commercially speaking, the only important disease of red and purple raspberries in New York." Mosaic is not important in Oregon according to Zeller. Loss estimates for 1927 are given in Table 50.

Varietal susceptibility:

It seems to be the general opinion among collaborators who have reported on the subject of varietal susceptibility during 1927, that nearly all raspberry varieties are susceptible to mosaic to a greater or lesser degree. The everbearing varieties are credited with the greatest amount of resistance and the black varieties with the least. Red varieties seem to vary considerably in their resistance.

Rankin (8) has emphasized the importance of a distinction in the case of raspberry, between disease resistant and disease-escaping varieties and has introduced the term "klendusity" to mean disease-escaping. Of the more important red varieties he considers Golden Queen, Marlboro, and Cayuga not "klendusic"; Cuthbert, June, Loudon, Newman, and Ontario slightly "klendusic;" Eaton, Herbert, King, Latham, and Ranere, highly "klendusic;" and La France, Ohta, Sunbeam, Turner, and Van Fleet either immune or "klendusity" absolute. Regarding rate of spread, klendusity and resistance, he further states:

Raspberry - Mosaic

"The rate of spread of mosaic in the varieties Cuthbert and Marlboro is found to be slightly more rapid in western New York than it is in Ontario, Canada. In the lower Hudson River Valley mosaic usually spreads very rapidly in these varieties. The rate of spread of mosaic was measured in 28 named varieties of red raspberries at Geneva. It was found possible to divide the varieties into four classes as to relative klendusity (disease-escaping) and into five classes as to relative susceptibility. Klendusity and susceptibility are not correlated factors. Cuthbert, June and Ontario are only slightly klendusic and moderately susceptible. Herbert and Latham are the important varieties which exhibit a high degree of klendusity to mosaic. The former is very susceptible and the latter is more resistant than other standard varieties, except Ranere. Several less desirable varieties were found to be either immune or very klendusic. Black raspberry varieties are more susceptible to mosaic than red varieties. The injury is more serious to black raspberries and the plants soon die. The incidence of mosaic in black raspberries is high when they are grown near red raspberries containing mosaic. Varieties of black raspberries exhibit marked differences in klendusity."

Reports on varietal resistance are in some cases conflicting, probably partially due to failure to distinguish between susceptibility to infection and susceptibility to injury after infection. In New Jersey the variety Ranere (St. Regis) was reported as apparently immune, while Welch was severely attacked. In Ohio, Wilcox considers all varieties susceptible with the possible exception of La France. In Connecticut, Bender and Clinton report Cuthbert as very susceptible. In Indiana, according to Gardner, all red varieties and the black variety Honeysweet are susceptible. In Michigan, Bennett states that black varieties are very susceptible to injury after infection but often escape infection because aphids prefer other varieties on which to feed. King and Latham are considered more susceptible to infection than Cuthbert but more resistant to disease after infection.

Other data on varietal susceptibility are recorded in Table 51.

Raspberry - Mosaic

Table 51. Data on varietal susceptibility to mosaic as compiled from collaborators' reports.

Very Susceptible	Susceptible	Resistant	Very Resistant
Golden Queen (R) (1)	Cuthbert (R) (1) (2) (3)	Latham (R)(1)(3)	Erskine Pk. (R) (1) (3)
Herbert (R) (1)	King (R) (1) (2)	St. Regis (Ranere) (R)(1)(2)	Sunbeam(R)(1)(3)
Cumberland (B)(1)(3)	Marlboro (R) (1)	Erskine Park (R)(2)	Ohta (R)(1)(3)
Honeysweet (B)(1) (3)	Plum Farmer (B) (1) (2)	King (R) (3)	St. Regis (Ranere) (R) (3)
Gregg (B) (3)	Hoosier (B) (1) (2)		
Kansas (B) (3)	Kansas (B) (1) (2)		
Plum Farmer (B) (3)	Columbian (P)(1)(2)		
	Latham (R) (2)		
	Golden Queen (R) (2) (3)		
	Marlboro (R) (2)		
	Haymaker (P) (2)		
	Cardinal (P) (2)		
	Cumberland (B) (2)		
	June (R) (4)		

R - Red variety. P- Purple variety. B - Black variety. Numerals indicate the collaborator and state from which the data were received as follows:

1. W. H. Rankin, New York
2. R. B. Wilcox, Ohio
3. C. W. Bennett, Michigan
4. A. S. Colby, Illinois

Control: In several states, notably New York, Illinois, Indiana, Michigan, Wisconsin, and Minnesota, a state inspection service is in operation involving the inspection and roguing of raspberry patches from which stock for new plantings is to be taken. Progress in control has been reported as a result of the use of this measure and, also from roguing, which has been primarily experimental. Rankin (8) in New York states:

"Control of mosaic by roguing in Cuthbert, Herbert, June, and Ontario was successful at Geneva, the annual amount of mosaic being less than 2 per cent. Cuthbert, June, and Ontario stock from the same sources showed an average of 10 to 30 per cent mosaic after growing for one season in rogued plats in the lower Hudson River Valley. In a planting of over 35 varieties of red and purple raspberries at Geneva rogued for five seasons, the average annual amount of mosaic was reduced from 30 to about 4 per cent. Twenty-four of the varieties were free from mosaic in the fifth season.(1926).

Raspberry - Mosaic

"Mosaic-free stock and roguing of standard varieties are recommended as practicable methods of avoiding loss from mosaic in western, central, and northern New York. The more klendusic and resistant varieties, such as Herbert, Latham, and Ranere, may be successful in the lower Hudson River Valley. Precautions against dispersing aphids in roguing and cultivating are emphasized. The success of these methods of avoiding loss from mosaic depends upon the experience of growers. More desirable dessert and canning varieties which are not subject to mosaic are needed as an ideal solution of the mosaic problem."

In Michigan, according to Bennett, the 1927 plantings which were observed and which were set from inspected plants had less than 2 per cent mosaic. In Minnesota, according to the Section of Plant Pathology, "The percentage of this disease has been appreciably reduced in propagative planting. Some of these plantings have been apparently free from mosaic for the past two years. Ruggles and Winter (10) have published on the results of three years' experience on the control of mosaic in Minnesota. The following table 52 showing the reduction in mosaic in 1924 to 1926, due to roguing, is taken from their report.

Table 52. Total Latham plantings rogued 1924 to 1926.

	Number of plantings	Approximate number of acres	Total hills rogued	Av. per cent of mosaic
Rogued in 1924				
Not previously rogued	48	34	-	-
Rogued in 1925				
Previously rogued	99	87	8,272	4.0
Not previously rogued	23	12	4,865	15.4
Rogued in 1926				
Previously rogued	126	120	3,639	1.4
Not previously rogued	10	7	1,145	8.5

In Michigan, Bennett states:

"Rogying by means of a burner was tried on an experimental basis during the past season. The type of burner used consumes kerosene and throws a flame about twenty inches long. Approximately 50 acres of black raspberries were rogued. It was found that about 50 plants could be burned per hour. Evidence seems to indicate that in Michigan the great majority of mosaic infection takes place after the middle of June. If this is true, burning diseased plants early in the season should prove to be a very effective control measure."

Recent literature

1. Bennett, C. W. Virus diseases of raspberries. Michigan Agr. Exp. Stat. Techn. Bull. 80. 38p. May, 1927.

2. Bennett, C. W. Some symptoms of raspberry diseases. Fruit & Gard. 25 (7): 5, 10-11. July, 1927.

3. Berkeley, G. H. Raspberry mosaic. Canad. Hort. 50: 173-174. July, 1927.

4. Boyer, C. A. Diseases of raspberries and their control. Amer. Fruit Grow. Mag. 47 (2): 7, 28. Feb. 1927.

5. Chambers, E. L. The red raspberry mosaic situation in Wisconsin. Wisconsin Hort. 17: 84-85, 89-90. Feb. 1927.

6. Dodge, B. O. and R. B. Wilcox. Diseases of raspberries and blackberries. U. S. Dept. Agric. Farmers' Bull. 1488. 32 pp. 1926.

7. Elmer, O. H. Virus diseases of raspberries. Rep. Iowa State. Hort. Soc. 61: (1926) 211-213. 1927.

8. Rankin, W. H. Mosaic of raspberries. New York (Geneva) State Agr. Exp. Sta. Bull. 543. 60 p. Mar. 1927

9. Rankin, W. H. Symptoms of mosaic in raspberries. Canad. Hort. 50: (9) 217. Sept. 1927.

10. Ruggles, A. G. and J. D. Winter. Results of three years' experience in the control of mosaic in red raspberries in nurseries. Jour. Econ. Entom. 20: 478-483. June, 1927.

CURL (VIRUS)

In the states from which reports were received in 1927, there was on the average less curl present than in any one of the three preceeding years. In some of the states growing the highest raspberry acreages, namely, New York, Michigan, Illinois, Ohio, Oregon, Minnesota, Indiana, and Washington, this disease is not indicated as very important in the average year. Loss estimates for 1927 are: Ohio, 1 to 2 per cent, Michigan 1 per cent, and Minnesota a trace. The disease was reported from New York, Indiana, and Wisconsin but no loss estimates were given. In Washington it is said to be very important in the Spokane valley and also present in the Puyallup section. Rankin (2) states that, "Leaf-curl, although an important virus disease of red raspberries in many sections, is rarely found in New York." No curl was observed in Oregon.

Raspberry - Curl

Collaborator's reports indicate that curl is much less important than mosaic.

The factors which have been suggested as important in accounting for this small amount of injury are the following:

1. Curl symptoms are readily recognized by the average grower and diseased plants are removed.

2. Only a limited number of varieties is susceptible to severe curl infection.

3. Aphis rubiphila, believed to be the chief agent of dissemination of curl, is a small, slow-moving insect and is not so readily dispersed as some of the other species of aphids which feed on raspberries.

Although total losses are low, curl is not in all cases a minor disease, but in some plantings is very severe. Wilcox states that, "Leaf curl is not common in Ohio but when it does occur it frequently ruins an entire field in three or four years." In Michigan, infestations ranging from 10 to 80 per cent of the plants in individual fields are reported.

There is considerable lack of agreement among collaborators regarding varietal susceptibility although Cuthbert and Cumberland are usually considered to be susceptible. In Wisconsin, Vaughan states that curl is not severe on Latham, but that Marlboro, King, and Cuthbert are quite susceptible. Wilcox in Ohio states that, "Leaf curl occurs on both reds and blacks. Of the black-caps, Plum Farmer and Kansas appear immune, Cumberland and Hoosier very susceptible." He states that the disease is common on the red varieties Cuthbert and Marlboro. In Michigan Latham is considered susceptible and King very resistant or practically immune.

The variations in apparent resistance which exist may be due in part to the occurrence of different types of curl virus. Smith (3) was unable to infect black varieties from red varieties which had curl. Similar results were obtained by Bennett (1) who states:

> "Curl is readily transmitted from one susceptible black variety to another and has been transmitted from the black variety Cumberland to the red variety Cuthbert. The percentage of infection in the case of inoculations from blacks to reds, however, was not so high as when the transfers were from reds to reds or from blacks to blacks. Transfers of curl from red to blacks has never been obtained, though large number of aphids have been used and repeated inoculations have been made.

"Field observations would also indicate that curl does not readily pass from red to black raspberries. In several instances, rows of Cuthbert plants having a high percentage of curl are known to have grown alongside of rows of Cumberland plants for a number of years with the appearance of no evidence of curl in the black variety."

Other data on varietal susceptibility are recorded in Table 53.

Table 53. Data on varietal susceptibility of raspberries to curl as compiled from collaborators' reports, 1927.

Very Susceptible	Susceptible	Resistant	Very Resistant	Believed to be immune
Cuthbert (R) (1) (2) (3)	Latham (R) (1)	Brighton (R) (1)	Columbian(P) (1)	Erskine Park(R) (1)
Golden Queen (R) (1) (2)	Marlboro (R) (1)	Latham(R)(2)	Kansas(B)(1)	Sunbeam(R)(1)
Haymaker (P) (1)	Viking(R)(1)	King (R) (2)	Erskine Park (R) (2)	La France(R)(1)
Cumberland (B) (1)	Gregg (B) (1)		St. Regis	Ohta (R) (1)
Marlboro (R) (2)			Ranere(R)(2)	St.Regis(R)(1)
				June (R) (1)
				Cardinal(P)(1)
				Plum Farmer (B) (1) (2)
				Kansas (B) (2)

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

Numerals indicate the collaborator and state from which the data were received as follows:

1. C. W. Bennett, Michigan 2. R. B. Wilcox, Ohio
3. W. H. Rankin, New York

Literature cited:

1. Bennett, C. W. Virus diseases of raspberries. Mich. Agric. Exp. Sta. Tech. Bull. 80. 38 p. 1927.

2. Rankin, W. H. Mosaic of raspberries. New York Agric. Exp. Sta. Bull. 543. 60 p. 1927.

3 Smith, F. T. The relation of insects to the transmission of raspberry leaf curl. Jour. Econ. Entom. 18: 509-513. 1925

STREAK, CAUSE UNDETERMINED

During the year very little additional information regarding the distribution, prevalence, economic importance, and method of spread of this disease has become available. As yet no definite experimental evidence of transmission of streak by insects or other agencies has been produced though it is generally assumed on the basis of type of increase under field conditions that it is spread by sucking insects, probably aphids.

In 1927 streak was reported from New York, Ohio, Illinois, Michigan, and Oregon. Losses of 3 per cent in Ohio and 2 per cent in Illinois are reported. The other states mentioned merely indicated the occurrence of streak with no estimates of loss. The following remarks by collaborators indicate that streak is probably of less importance than curl, and caused less damage in 1927 than in the average year; and in some cases is being successfully controlled:

> New York: It is difficult to find definite streak. Indications of streak occasionally accompany "red raspberry mosaic" and "mild mosaic." - Double infection? (Rankin)
>
> Ohio: The raspberry acreage has been much reduced in recent years in the worst infected districts, due partially to disease but more to growth of cities. Of plantings made in new territory, many have been set with clean stock. (Wilcox)
>
> Illinois: Nursery inspectors report that the disease is not so prevalent as when first found in the state. (Anderson)
>
> Oregon: Known to be present in one planting of Cumberland. (Zeller)

Wilcox considers that red varieties are probably immune to streak. He says that streak has been found on unnamed hybrids but is very rare in the more common purple varieties such as Haymaker and Columbian. Hoosier and Honey Sweet he classifies as very susceptible and Plum Farmer and Kansas as somewhat more resistant.

TIP-BLIGHT CAUSED BY GLOMERELLA CINGULATA (STON.) SPAULDING AND SCHRENK

During the year Dodge (1) has published on a hitherto undescribed "Gloeosporium disease of raspberry" which has been found in Maryland, Ohio, Kentucky, Michigan, and other states. This trouble is known to have been of considerable importance in some plantings of black raspberries but its general economic importance has not been determined. This disease is described by Dodge as follows:

> "On the Columbian variety it first causes a blackening or necrosis of the leaf stalks and tips of young shoots. Later the leaves collapse and the tip ends of the shoots turn purple or blue, the discoloration proceeding from the tip downward. The lower part of the young cane may remain green for some time. The whole turion may finally die or the disease

may be confined to a single lateral. On account of the fact that the young canes, when badly infected, turn blue or purple, the disease is likely to be confused during the summer season with raspberry wilts which are known as blue-stem. In the case of the raspberry wilts, the blue discoloration appears just at the base and works upward while in the Gloeosporium blight the blueing of the shoot begins at the tips and works downward."

Regarding the cause, Dodge states:

"According to Shear, the strains of Gloeosporium isolated from raspberries, cannot be distinguished morphologically from those commonly found on apples and referred to Glomerella cingulata or Gloeosporium cingulatum.

"Cross inoculation with the chromogenic strain from raspberry and with a nonchromogenic strain from apple demonstrated the pathogenicity of the three strains on both hosts."

Other interesting relations of this trouble remain to be determined. One important consideration is the relation which this disease may have to apple bitter rot. Will the causal organism overwinter on raspberry and cross to apple the following spring? What is the significance of the finding of abundant development of this fungus on raspberries in the vicinity of apple orchards in Michigan and other northern states where bitter rot on apple is very rarely observed?

Literature cited:

1. Dodge, B. O. Gloeosporium blight of raspberry. Phytopath. 17: 769-774. 1927.

CANE BLIGHT CAUSED BY LEPTOSPHAERIA CONIOTHYRIUM (FCKL.) SACC.

Cane blight is not generally considered one of the more important diseases of raspberry although occasionally considerable losses are attributed to it. In some cases there is a question as to how much loss has been due to cane blight and how much to other causes. Since the effects of winter injury have been better recognized there has been a tendency to attribute more loss to this cause and less to cane blight. The cane blight fungus is reported as commonly occurring on winter injured canes and frequently the primary cause of injury is obscure.

Reports from fourteen states in 1927 indicate that collaborators consider this disease of very little importance.

New Jersey: Severe in one spot 50 by 15 feet on red raspberries under irrigation. (Haenseler)

Michigan: Little injury observed, fungus often present on winter injured canes. (Bennett)

Wisconsin: Widely distributed, not especially serious. (Vaughan)

Iowa: Occurs quite abundantly following winter injury. This year it appeared later in the fall than common. (Archer)

Oregon: Has been found only on winter injured black caps; seldom seen in the Northwest. (Zeller)

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

Orange rust on raspberries has a wide distribution as indicated by reports of occurrence in Massachusetts, New York, Delaware, Virginia, West Virginia, Michigan, Wisconsin, Minnesota, and Iowa. However, records indicate even a wider and more general occurrence on blackberry. Although this disease is unquestionably one of the minor problems of raspberry it is capable of doing serious injury under conditions favorable for its spread. The area of most abundant occurrence is probably southwestern Michigan. In Berrien and Van Buren Counties of that state, approximately 4,000 acres of raspberries are grown besides a considerable acreage of blackberries and dewberries. Wild brambles are common over this area and these are commonly infected with rust. Under such conditions orange rust sometimes becomes a serious factor in local plantings although in general the disease is not considered to be a menace. In 1927 in Michigan, Bennett reported a 63 per cent infestation in one three acre field of Cumberland raspberries and fields in which 5 per cent or more of the plants are affected are said to be common in certain sections. Some conception of the relative importance of orange rust can be obtained from the following reports by collaborators:

New York: Nearly altogether limited to wild plants, for in the cultivated plots the diseased plants are rogued. (Chupp)

West Virginia: Very important in the state but no data available on losses (Sherwood)

Arkansas: Not seen on raspberry but very important on blackberry. (Young)

Wisconsin: Abundant on wild and cultivated blackberry and wild black raspberry. Not found on red raspberry nor on cultivated black raspberry. (Vaughan)

Minnesota: A single case was reported on wild black raspberry. (Section of Plant Pathology)

Iowa: Four reports were received of infection on cultivated plants; wild raspberries are affected generally. (Archer)

All red varieties of raspberries are considered to be immune to orange rust, and purple varieties, if not immune, are extremely resistant. According to Bennett the black varieties which are most seriously affected in Michigan are Cumberland and Gregg. Plum Farmer and Kansas seem to be slightly more resistant.

CROWN GALL CAUSED BY BACTERIUM TUMEFACIENS EFS. AND TOWN.

In 1927, twenty-one states reported on crown gall on raspberries. In two states, Illinois and Michigan, it is considered a very important disease. In Minnesota, Connecticut, and New Jersey, it is said to be of moderate importance, and in Massachusetts, Maryland, New York, Florida, Indiana, Wisconsin, Iowa, Kansas, and Oregon of slight importance. Estimated losses are, Michigan 3 per cent, Minnesota 2 per cent, New York 0.2 per cent, Iowa and Maryland a trace. Chupp in New York reports that in one lot of nursery stock of the Columbian variety, 30 per cent of the plants had galls.

Massachusetts: Of slight importance; rarely observed. (Davis)

New York: Very severe in one patch of Columbians where a heavy coating of manure had been put on the fall before. (Taylor)

Michigan: Very common on plnatings growing on the light sandy soil of the southwestern part of the state. More often found on the roots of reds and on the fruiting canes of blacks. On black and purple varieties galls are sometimes so numerous around the crown of the plants, that no new canes are produced and the affected plants die after fruiting. (Bennett)

Utah: Reported occasionally in nursery stock. In one home garden in Logan it has proved very destructive. Its prevalence in commercial plantings in the state is unknown. (Linford)

Recent literature:

1. Banfield, W. M. Studies on the life history of the crown gall organism. (Abstract) Phytopath. 18; 128-129, 1928.

POWDERY MILDEW CAUSED BY SPHAEROTHECA HUMULI (DC.) WINT.

With the increased popularity of the Latham variety of red raspberry, powdery mildew is rapidly assuming a place of major importance as a raspberry disease. The Latham is the only variety reported as

seriously injured in 1927, though the purple variety Cardinal and the black variety Munger are said to be very susceptible. In Michigan, King is attacked but the disease is chiefly important on this variety because of confusion of symptoms of mildew with mosaic. In Minnesota, where the Latham variety is grown almost exclusively the loss for 1927 was estimated at 5 per cent.

Massachusetts: Moderately severe on the variety Latham. Not present on the other varieties. (Doran)

Connecticut: One report on this host; new to the State. (Bender)

New Jersey: 90 to 100 per cent infection on cane tips in one plantation near Hammond. (Haenseler)

Michigan: Caused a 20 per cent reduction in size of new canes of the Latham variety. The Cardinal is also very susceptible. Mildew occurred also on Cumberland, Plum Farmer, King, and wild red raspberries, but has caused no direct injury on these varieties. (Bennett)

Minnesota: Causes a general stunting in Latham especially in low areas and where rows are permitted to widen out. (Section of Plant Pathology)

Oregon: Limited to Munger of our three commercial varieties. Usually over 90 per cent of the plants of this variety are affected in the Willamette Valley. (Zeller)

Utah: Reported only from Castle Dole, Emery County, where in one planting it has been injurious for several years. (Linford)

OTHER DISEASES AND INJURIES

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

Ascospora rubi (Westend.) Zeller, canespot. Again reported from Oregon by Zeller. A 25 per cent infection was observed in one field. The Cuthbert variety is susceptible.

Botrytis sp., gray mold. Reported from New Jersey and Connecticut, in the latter state causing moderate injury on berries which were over-ripe when picked.

Cercospora rubi Sacc., leaf-spot. New York, on the variety Herbert.

Kuehneola uredinis (Lk.) Arth., yellow rust. Reported from Danville, Virginia, and Knoxville, Tennessee.

Mycosphaerella rubi Roark, leaf spot. In Ohio, Cooley reports that leaf-spot appeared early, being first noted June 15. The infection was abundant and widespread but caused only a slight loss. In Kansas it was general and severe on both red and black raspberries. In Michigan, the King variety is rather susceptible to this trouble but very little loss is caused. Other reports were received from Connecticut, New Jersey, South Carolina, and Iowa.

Mycosphaerella rubina (Pk) Jacz, Spur-blight seems to cause more injury in the western states than in the eastern. In Wisconsin, according to Vaughan, the disease may be associated with winter injury since it was most abundant in the vicinity of Bayfield where winter injury was severe. In Colorado it was very common and destroyed many fruiting canes. Fruit was small and ripened prematurely. The most severe loss was reported by Zeller in Oregon where a 40 per cent reduction in yield was reported in some fields. Two applications of 3-3-50 Bordeaux mixture gave control.

Phragmidium imitans Arth., leaf rust. Reported from Washington and Oregon. Zeller (4) states that it developed to serious proportions though it is difficult to estimate the damage. He states that the infection of second-year or fruiting canes near the ground is the most serious phase of the disease, since the resulting lesions produce brittleness and diminish sap conducting tissues.

Pucciniastrum americanum (Farl.) Arth., rust. Specimen received from Dunn County, Wisconsin, and identified by B. O. Dodge

Verticillum albo-atrum Reinke and Berth., wilt. In New Jersey, Verticillium was isolated from black raspberry plants set in the spring of 1927 in soil where egg-plants had had a 100 per cent Verticillium wilt infestation the previous year. Giddings states that wilt was unusually severe in West Virginia. This is attributed in part to the wet fall of 1926. In Michigan a ten acre field of Cumberlands set in 1926 had 40 per cent of the plants killed before the end of the 1927 season.

Chlorosis (cause undetermined). A type of chlorosis of unknown cause was said by Linford to be the most widespread and destructive disease of raspberry throughout Utah. Loss is estimated at 2 per cent.

Frost injury. No severe injury was reported. Frost markings consisting of white dots and lines parallel to the main veins of the leaves were common in Michigan.

Fruit mold. Rankin reported a 50 per cent loss of fruit in Ontario County, New York, due to molding of berries following "plant bug" injury.

Wind whipping. Death of young canes of black raspberries due to swaying in the wind, resulting in the breaking of the bark at the point of union with the crown, caused damage in Michigan and Iowa. A 1 per cent loss is estimated for Iowa.

Winter Injury. A loss estimated at 12 per cent occurred in Iowa according to Archer. He states:

> "Practically every raspberry grower experienced considerable loss this season from winter injury. The injury was manifested in marginal burning of leaves, blasting of blossoms, or quite frequently the sudden death of an entire cane while in full fruit. In addition the situation was often complicated by over-loading. That is to say, the injured plants which bore a heavy crop of fruit could not stand the added load under conditions of drought which occurred throughout the season in 1927. This is the second consecutive year of severe winter injury. Winter injury in the past two years has been the largest factor contributing to losses. In truth, losses from this source are often high."

Recent literature:

1. Bennett, C. W. Some symptoms of raspberry diseases. Fruit and Gard. 25 (7): 5, 10-11. July, 1927.

2. Boyer, C. A. Diseases of raspberries and their control. Amer. Fruit Grow. Mag. 47 (2): 7, 28. 1927.

3. Melhus, I. E. and O. H. Elmer. Raspberry diseases in Iowa. Iowa Agr. Exp. Sta. Circ. 105. 15 pp. June, 1927.

4. Zeller, S. M. The yellow rust of raspberry caused by Phragmidium imitans. Jour. Agr. Res. 34: 857-863. 1927.

5. - - - - - - - Contributions to our knowledge of Oregon fungi. II. Mycological notes for 1925. Mycologia 19: 130-143. 1927.

B L A C K B E R R Y

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

Reports of collaborators do not indicate that orange rust was especially destructive in 1927. Estimated losses are Michigan 1 per cent, New York, Texas, Iowa and Mississippi, a trace. In New York Chupp states that most of the rust is on wild plants. Cultivated plantings are watched and diseased plants removed before the rust spreads. According to the Department of Plant Pathology, much the same thing is true in New Jersey. The Russell variety is said to be resistant. In Michigan,

wild blackberries, dewberries and raspberries are affected and in some commercial plantings as many as 10 per cent of the plants are rusted. In Arkansas, V. H. Young states that orange rust is very common and destructive. Indiana and Wisconsin report the presence of rust. Wilcox in Ohio states that, "Eldorado, the main commercial variety is very resistant, but where Blower, Erie, or Early Harvest were grown, rust was common." He estimates the loss at less than 1 per cent.

ANTHRACNOSE CAUSED BY PLECTODISCELLA VENETA (SPEG.) BURKH.

Anthracnose is not usually considered to be a very destructive disease on blackberries. In 1927, although not especially serious, it caused more damage in some states than usual. Archer in Iowa states that in an average year this disease is relatively unimportant, but that in 1927 it occurred generally in scattered plantings. Gardner in Indiana and Bennett in Michigan report a heavy infection on the young canes and on the fruiting spurs, leaf petioles and leaves. This disease is also reported from New Jersey but no loss estimates are given.

MOSAIC, DWARF, AND CURL (VIRUS)

Mosaic: Reports of mosaic on blackberries were received from New York, New Jersey, Indiana and Michigan. In New York the loss is estimated by Chupp as a trace to 1 per cent. Taylor, also in New York, states that mosaic was very severe on the new variety Giant and affected plants had little vitality. Haenseler states that mosaic was "General in all parts of South Jersey on Russell." In Michigan according to Bennett, "With the exception of streak, the known virus diseases which attack raspberries also attack certain varieties of blackberry. One planting of the new variety Alfred, growing close to mosaic Latham raspberries, had 5 per cent mosaic. Symptoms were less severe than on raspberry. In general, however, mosaic is not common on blackberry. This is believed to be due to the fact that the common blackberry varieties do not seem to serve as very acceptable food plants for the species of aphid which is known to transmit mosaic."

Dwarf: Zeller (1) in Oregon described under the name of dwarf a disease of the virus type which has been under observation since 1918. He states:

> "Some growers of Phenomenal berries have reported as many as 100 per cent of the plants affected by the third year in plantings which have not been rogued. One planting of loganberries with 19 per cent of diseased plants in the third year has been found. As a rule, however, the loss through dwarf to the loganberry industry in the Pacific Coast States is very slight, but many individual growers have experienced high enough percentages to make total eradications necessary."

Dwarf has been transmitted by means of the aphid Capitophorus tetrarhodus.

Curl: In Michigan according to Bennett, curl was found on wild blackberry, indentified as Rubus allegheniensis, and on the Lucretia blackberry. By means of Aphis rubiphila, curl was transmitted from Cuthbert raspberry to Lucretia blackberry and back to raspberry.

Recent literature:

1. Dwarf of blackberries. Phytopath. 17: 629-648. Sept. 1927.

MISCELLANEOUS DISEASES AND INJURIES

Bacterium tumefaciens EFS and Town., crown gall. Massachusetts, New York, Michigan, and Texas reported crown gall on blackberry in 1927. Loss estimates are Michigan 2 per cent, Texas 1 per cent, New York, a trace. In one four-acre field in Michigan, 50 per cent of the plants were seriously affected.

Cercospora rubi Sacc., blotch. Specimens received from Hidalgo County, Texas, determined by B. O. Dodge.

Fusisporium rubi Wint., double blossom. Reported from New Jersey on the variety Black Diamond.

Kuehneola uredinis (Lk) Arth., yellow rust. New Jersey, Tennessee, Arkansas. In New Jersey "Varieties which are most susceptible to anthracnose are also very susceptible to yellow rust." (Dept. Plant Path.)

Leptosphaeria coniothyrium (Fckl.) Sacc., cane blight. A planting of one-fourth acre in Monmouth County, New Jersey was severely damaged

Mycosphaerella rubi Roark, leaf-spot. Estimated losses are, Kansas 2 per cent, Texas 1 per cent, Iowa a trace. Zeller in Oregon states that the Oregon Evergreen variety is immune, Himalaya resistant, Mammoth susceptible, and Kittatinny very susceptible. Leaf spot was severe in one planting in New Jersey and was found in Missouri in several wild patches.

Sphaerotheca humuli (DC) Burr, mildew. Bender reported this disease from Connecticut. This is said to be the first record of its occurrence on blackberry in the state.

Winter injury Archer reports a 5 per cent loss to blackberries in Iowa. He states:

> "Evidences of winter injury on blackberry occurred throughout the state in the form of leaf burn followed often by death of the plant before or during full fruit. During the past two winters, weather conditions have been severe, that is no snow with fairly low temperatures. These low temperatures injured the wood of plants which had failed to mature due to excessive moisture late in the fall."

DEWBERRY

Collybia dryophila Fr., root rot. This new disease is reported by Poole (1) from North Carolina.

Fusisporium rubi Wint., double blossom. Reported from New Jersey and Alabama.

Gymnoconia interstitialis (Schl.) Lagh. and Kunkelia nitens (Schw.) Arth., orange rust. Common in New York and Michigan on wild dewberries but of little importance on cultivated varieties. In Michigan the short cycle form is by far the more common.

Mycosphaerella rubi Roark, leaf spot. Reported from New York, South Carolina, Indiana, Michigan, Texas, and Washington. In New Jersey, an unnamed wild variety proved to be much more resistant than the variety Lucretia.

Mosaic undetermined. In Michigan, Bennett states, "The Lucretia dewberry is susceptible to both yellow mosaic and red raspberry mosaic. These diseases however, are only occasionally found in commercial fields and no appreciable loss has been produced. Mosaic is very common on wild dewberries in the southern part of the state."

Recent literature:

1. Poole, R. F. A root rot of Lucretia dewberry caused by a variety of Collybia dryophila Fr. Jour. Agr. Res. 35: 453-464. Sept.1, 1927.
2. Poole, R. F. A variety of Collybia dryophila parasitic on dewberry. Jour. Elisha Mitchell Sci. Soc. 43: 101-104. Dec. 1927.

LOGANBERRY

Bacterium tumefaciens EFS. and Town., crown gall. Reported from Washington.

Dwarf, undetermined. An infection amounting to 16 per cent of the plants in one field in Oregon was reported by Zeller.

CURRANT

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

Botrytis cinerea Auct., die back. In New Jersey, a fungus of the B. cinerea type was reported as causing a leaf-spot. Haenseler states: "About 10 per cent of the leaves of plants on an experimental plot at New Brunswick were infected. Generally there was only one spot, 1 to 2 centimeters in diameter, on each leaf." The Botrytis was isolated and the disease reproduced from inoculation.

Cercospora angulata Wint., leaf-spot. Archer found this disease to be common in Iowa. He says, "This leaf spot has a general distribution over the state and caused severe defoliation. All currants were totally defoliated by the latter part of September. The cause is not always Cercospora angulata since two other fungi, Mycosphaerella grossulariae and Pseudopeziza ribis, also cause defoliation."

Mycosphaerella grossulariae (Fr.) Lindau, leaf spot. Reported from New York, Indiana, Michigan, Iowa, and Washington. In Indiana this leaf-spot is said to have caused less damage than anthracnose.

Pseudopeziza ribis Kleb., anthracnose. In Connecticut, Bender states that anthracnose was more common and injurious than in the average year. In Indiana, Gardner observed severe defoliation during June, and says that the variety London Market has considerable resistance. Other reports of occurrence were received from New Jersey, New York, Michigan, Iowa and Washington.

Recent literature:

1. Amos, J. and Hatton R. G. Reversion of black currants. I. Jour. Pomol. & Hort. Sci. 6: 167-183. Sept. 1927.

2. Vasil'evsky, N. I. . . . Über die Beziehung der Septoriaarten auf Ribes nigrum and R. grossularia. Bolezni Rast. (Morbi Plant.) 16: 61-70. 1927.

3. Hoggan, Isme A. The parasitism of Plowrightia ribesia on the currant. Trans. Brit. Mycol. Soc. 12: 27-44. Mar. 1927.

G O O S E B E R R Y

Botrytis sp., die back. Van Hook (4) has recently published on a Botrytis disease found on gooseberry first near Bloomington, Indiana, more than eight years ago. It is said to cause a die-back of young growing shoots and to produce a "witches' broom" effect. The disease has occurred each season since its first discovery.

Mycosphaerella grossulariae (Fr.) Lindau, leaf spot. Gardner in Indiana states that this disease was more severe on gooseberry than on currant. Archer in Iowa says regarding this disease:

> "In 1927 the disease was first observed, June 15, in nursery rows at Shenandoah, where it occurred only on lower leaves. During July, in the nursery, infection spread to all the leaves. Defoliation started in August and was quite severe during September. Defoliation occurred on one and two-year old plants as follows: Red Jacket 90 per cent, Downing 80 per cent, Houghton 60 per cent. A spray schedule reduced the infection on Downing and Pearl to 5 per cent with no defoliation."

Gooseberry

Pseudopeziza ribis Kleb., anthracnose. In New Jersey severe on a few bushes. In Indiana, there was more anthracnose than usual resulting in defoliation. In Iowa, Archer reports the disease as common throughout the state on wild gooseberries.

Sphaerotheca mors-uvae (Schw.) Berk. & Curt., mildew. Reported from Indiana, Colorado, and Utah. It is said to have been severe locally in all three states. The loss in Iowa was estimated as a trace.

Recent literature:

1. Ericson, A. L. Wieder ein Mittel gegen Stachelbeermehltau. (Another remedy for gooseberry mildew.) Obst.-und Gemüsebau, 73:94. 1927.

2. Muskett, A. E. and E. Turner. The control of American gooseberry mildew in northern Ireland. Jour. Min. Agr. North Ireland. 1927.

3. Mattrass, R. M. Further experiments on the control of American gooseberry mildew. Jour. Min. Agric. 33: 1017-1022. 1927.

4. Van Hook, J. M. A Botrytis disease of Ribes odorata Wendl. Proc. Ind. Acad. Sci. 36: 253-255. 1927.

C R A N B E R R Y

False-blossom, undetermined. W. E. Stevens reports that in Plymouth County, Massachusetts, false blossom has increased at least ten times within the last three years. Spaeth and Kraybill (3) have conducted biochemical tests on plants affected by this trouble. They find that plants having false-blossom are higher in free reducing sugars, sucrose, starch, acid-hydrolizable substances and dry matter and lower in moisture, than healthy plants. They suggest that the trouble is caused by a virus.

Recent literature:

1. Brown, W. S. The cranberry in Oregon. Oregon Agr. Exp. Sta., Bull. 225: 31 p. 1927.

2. Driggers, B. F. A comparison of dusts and spray to control fungous diseases of the cranberry. New Jersey Agr. Exp. Sta. Bull. 450: 16p. April 1927.

3. Spaeth, C. P. and H. R. Kraybill. A biochemical study of the false-blossom disease of the cranberry. Jour. Agr. Res. 34: 35-47. Jan. 1927.

4. Stevens, N. E. Four years experience in forecasting the keeping quality of the cranberry crop in Wareham and Carver. Ann. Rep. New England. Cranberry Sales Co., 1927: 27-37. 1927.

5. Stevens, N. E. and H. F. Bain. Storage rots of cranberries in the 1926 crop. Phytopath. 17: 649-655. Sept. 1927.

MULBERRY

Bacterium mori (Boyer & Lambert) emend. EFS., blight. Specimens were received from H. H. Wedgworth in Mississippi. Scott in Missouri reports that it was found to be quite severe in one nursery, young trees showing 25 per cent or more infection. He also observed the disease on older trees in scattered locations over the state.

Pleospora maculans (Bereng.) Allesch., leaf-spot. North and South Carolina.

Sclerotinia carunculoides Siegler & Jenkins, popcorn disease. Mississippi.

Sclerotinia sp., canker, Texas.

DISEASES OF SUBTROPICAL FRUITS

Prepared by H. R. Fulton

CITRUS FRUITS

I. DISEASES CAUSED BY OR ATTRIBUTED TO PARASITES

CANKER CAUSED BY BACTERIUM CITRI (HASSE) JEHLE

In Florida 85 infected trees found in November on two properties near Fort Lauderdale were destroyed. This is the first serious infection found in Florida since 1923, although five infected trees were discovered in 1925 and two in 1926. In Alabama one infected grove tree was found in June. In Mississippi no canker has been found since 1922. In Louisiana there still remain a considerable number of scattered infections in dooryard plantings. In Texas there remains but one known infested property. (Kellerman)

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

Fawcett reports for California, moderate damage from this disease, and greater prevalence then usual. It occurs locally and affects navel oranges most, although all types of citrus are susceptible.

Citrus Fruits - Diseases

SCAB CAUSED BY SPHACELOMA FAWCETTI JENKINS (SPOROTRICHUM CITRI BUTLER)

Florida: On account of extreme drought very little scab developed on grapefruit from bloom at normal time. Fruit from bloom developing during the rainy season was attacked in many instances. Generally speaking, outbreaks were scattered, and there was much less damage than usual (Wolf). Spring bloom fruit practically free of scab; summer bloom fruit moderately affected (Winston).

Alabama: About the average amount on Satsuma oranges. Generally well controlled by spraying with Bordeaux (Fulton).

Mississippi: The usual amount on grapefruit and Satsuma orange, causing very slight losses. (Neal and Wedgworth).

Louisiana: Of usual moderate importance on Satsuma orange (Tims).

Texas: Unimportant traces reported from the Gulf Coast region by Taubenhaus and Bach.

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

Florida: A prolonged spring drought hindered infection, in spite of an abnormally large amount of sporulation on twigs killed by cold. Little serious damage to new shoots with advent of rains (Wolf). Spring bloom fruit passes the susceptible period without being seriously attacked by melanose. The summer bloom fruit and the late flush of growth seriously affected (Winston)

Alabama: Slight traces on Satsuma oranges. The commercial crop is well protected by Bordeaux spraying (Fulton)

Mississippi: Reported by Neal and Wedgworth as of minor importance; favored by ample moisture and warm temperatures; grapefruit and Satsuma oranges affected.

Texas: Reported by Bach on grapefruit in Hidalgo County.

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

Florida: Both Phomopsis and Diplodia types of stem end rot prevalent in usual degree in spite of drought conditions during the early part of the growing season (Fulton)

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

Florida: Less than usual in commercial shipments from the state. Relatively dry conditions in groves during shipping season probably had an influence. Green mold the most prevalent (Fulton).

California: Fawcett reports both types to have been more than normally prevalent and very important, long periods of rain in spring having been favorable for their development.

FRUIT ROTS CAUSED BY VARIOUS ORGANISMS

Alternaria citri Pierce, black rot, caused slight losses in Florida on oranges and in Alabama on Satsuma oranges (Fulton). In California it caused moderate loss, less than usual, on oranges and on lemons (Fawcett).

Botrytis cinerea Pers. Botrytis rot was of moderate importance, less than usual, in California (Fawcett).

Oospora citri-aurantii C. O. Sm., sour rot, in California, occurred on lemons more frequently than on oranges, less prevalent than usual, of moderate importance (Fawcett).

Phytophthora citrophthora (Sm. & Sm.) Leonian (Pythiacystis citrophthora (Sm. & Sm.), brown rot, was of usual prevalence in California. Lemons are more susceptible than oranges or grapefruit (Fawcett).

Sclerotinia sclerotiorum (Lib.) Massee, cottony rot, was less prevalent than usual in California. Lemons are especially susceptible (Fawcett).

Foot rot, presumably Phytophthora sp., Florida: Injury from the freeze in January did not favor foot rot, and it was less evident on old seedling sweet orange trees than in previous three seasons. Rainfall was far below normal with no downpours or prolonged periods of considerable rain. These conditions favored slow tree growth and were correlated with unfavorable conditions for foot rot development (Wolf).

GUMMOSIS AND BARK DISEASES DUE TO VARIOUS ORGANISMS.

Diplodia sp., Diplodia gummosis, was of moderate importance and of usual prevalence on lemons in California (Fawcett).

Phomopsis californica Fawc., decorticosis, was of usual moderate importance in California. Eureka variety of lemon is most susceptible, other lemon varieties less so; orange and grapefruit varieties immune (Fawcett). Sour orange stated by L. J. Klotz to be resistant.

Phytophthora (Pythiacystis) citrophthora, Pythiacystis gummosis was of usual prevalence in California; lemons are very susceptible, oranges and grapefruit less so, and sour orange is very resistant (Fawcett). Reported as occurring in Arizona. (State Comm. Hort. News Letter).

OTHER PARASITIC DISEASES

Armillaria mellea (Vahl) Quel., Armillaria root rot, was reported as occurring in usual degree in scattered localities in California (Fawcett).

Capnodium citricolum McAlp., sooty mold, was less prevalent than usual in Florida (Fulton). A trace was reported from Texas by Taubenhaus.

Cephaleuros mycoidea Karst., algal spot, is widespread in Florida but not seriously destructive. It is absent from groves that receive Bordeaux spray. It has been collected on leaves of grapefruit, of tangerine orange, of Temple orange, of Cuban shaddock and of sweet lemon (Wolf).

Colletotrichum gloeosporioides Penz., dieback, attributed to this fungus was reported by Neal from Mississippi as being of slight importance, and by Taubenhaus and Bach from Texas as occurring as a trace. For California, Fawcett reports a slight, but less than usual, anthracnose and withertip effects. Noted by L. Ogilvie as being most severe in Bermuda on lime and lemon, also to be found on orange and grapefruit.

Corticium koleroga (Cooke) Höhn., thread blight or shoestring disease, was reported in considerable quantity from a new locality in Florida, southeast of Lake Okeechobee, by Wolf.

Cuscuta sp., parasitic dodder, was reported as attacking citrus seedlings in the seed beds in Arizona.

Gloeosporium limetticolum, Clausen, lime withertip, practically absent from June bloom fruit in Florida (Winston).

False canker, a leaf spot of slight importance was reported from Mississippi (Neal)

Phymatotrichum omnivorum (Shear) Duggar, Texas root rot, was reported on orange and grapefruit in the lower Rio Grande Valley by Taubenhaus and Bach.

II NON-PARASITIC DISEASES AND INJURIES

Blight or wilt caused by deficient or irregular water supply. Florida. In some localities more prevalent than usual, due to abnormally dry season. (Fulton)

Citrus Fruits

Freezing injury. Florida - Temperatures in the low twenties prevailed over much of the citrus district on the night of January 15. Considerable damage was done by freezing fruit on the trees, and much bearing wood was injured in localities where lowest temperatures prevailed (Fulton)

Spray injury. Florida - slight to moderate damage in some cases, following the use of Bordeaux oil spray. Less than the usual acreage was sprayed with this combination on account of peculiar seasonal conditions (Fulton)

III DISEASES OF UNKNOWN CAUSATION

Concave gum disease, no cause assigned, was reported by Fawcett as occurring on orange in three restricted localities in California.

Chlorosis, probably caused by too much lime, was reported from Texas by Taubenhaus.

Dieback, possibly due to poor water conditions or cultural practices, was reported by Bach from the lower Rio Grande Valley in Texas.

Dry root rot , possibly due to unfavorable water and soil conditions and associated with Fusarium invasion, reported by Fawcett in scattered localities in California.

Exanthema or ammoniation, supposedly a malnutrition disease, less prevalent than usual in Florida (Fulton). Apparently less severe than usual in Florida (Winston). In California it showed its usual slight prevalence (Fawcett).

Gummosis, cause unknown, far more prevalent than is usually the case in Florida; this may be attributed to the freezes of the last winter; gummosis usually increases after severely cold winter (Winston).

Peteca, cause unknown, a blemish of California lemons in storage, was of usual moderate importance (Fawcett)

Psorosis, cause unknown, less than usual prevalence in Florida causing slight loss this season (Fulton). A very important disease in California; sweet orange, grapefruit and tangerine are susceptible, lemon and sour orange are immune (Fawcett).

Red blotch, cause unknown, affects lemons in storage producing a blemish that is of moderate importance (Fawcett).

Cephaleuros mycoidea Karst.; algal leaf spot, reported from Florida as abundant on leaves but not serious (Wolf).

Gloeosporium sp., anthracnose, reported from Texas (Taubenhaus).

Pestalozzia sp., blight, reported from Texas as a trace (Taubenhaus).

Sphaceloma sp., scab, less important than usual in Florida, on account of drought (Wolf).

DATE

Colletotrichum sp., anthracnose, traces in Texas (Taubenhaus).

Exosporium palmivorum Sacc., leaf spot, prevalent in Texas, but unimportant (Taubenhaus).

Graphiola phoenicis (Moug.) Poit., false smut, quite prevalent in Texas, but unimportant (Taubenhaus).

Pestalozzia sp., blight. Unimportant traces in Texas (Taubenhaus).

FEIJOA

Botrytis cinerea Pers., Botrytis rot. Fruit drops before ripening. Fruit left on wet ground and covered with paper ripened with little rot (Horne).

FIG

Aspergillus niger Tiegh. smut, seldom found on the Kadota variety of fig in California (Condit)

Botrytis sp. Follows softening or frosting of green fruit left on tree in fall, frequently extends through stem of fig and kills bud or girdles branch. Of little consequence on Kadota variety in California (Condit).

Caconema radicicola (Greef) Cobb, root knot, moderately important in Mississippi (Wedgworth), also prevalent in Texas (Taubenhaus).

Cercospora spp., leaf spot, prevalent but unimportant in Texas (Taubenhaus).

Cerotelium fici (Cast.) Arth., rust. Of slight importance in Mississippi (Neal and Wedgworth); of moderate importance in Louisiana (Tims), in Texas very serious in unsprayed orchards, but unimportant in sprayed ones (Taubenhaus and Bach).

Fig

Corticium koleroga (Cooke) Höhn., thread blight, reported from Florida (Wolf); and as prevailing to usual extent in Louisiana (Tims).

Diplodia sp., Diplodia rot, caused a serious limb canker with 1 per cent loss in Texas (Taubenhaus).

Fusarium moniliforme var. fici, endosepsis or internal rot. Very important in the central valley of California, the commercial fig producing area, increasing in prevalence in recent years. All fig varieties are susceptible when caprified with infected Blastophaga; non-caprified varieties escape because not visited by the insect carriers of infection. Controlled by treating the spring caprifigs with a disinfectant which permits the Blastophaga to emerge without contamination with spores of Fusarium moniliforme (Horne).

Glomerella cingulata (Ston.) Spauld. and Schrenk, anthracnose. Slight loss reported from South Carolina (Ludwig), and from Mississippi. (Neal and Wedgworth). Anthracnose attributed to Colletotrichum sp. was reported as a trace from Texas (Taubenhaus).

Macrophoma fici Alm. and Cam., canker, was of very slight importance in Texas (Taubenhaus).

Phymatotrichum omnivorum (Shear) Duggar, root rot, prevalent in the black lands of Texas (Taubenhaus).

Sclerotinia sclerotiorum (Lib.) Mass., Sclerotinia canker, serious in Texas, causing 1 per cent loss (Taubenhaus)

Tubercularia fici Edg., canker, reported as occurring generally in Louisiana, with moderate loss (Tims).

Premature dropping, very prevalent in Texas with 3 per cent loss (Taubenhaus).

Soured fruit, quite prevalent in Texas (Taubenhaus). Rare in California on the Kadota fig (Condit).

G U A V A

Cephaleurcs mycoidea Karst, algal leaf spot. Florida (Wolf).

L O Q U A T

Cephaleuros mycoidea Karst., algal leaf spot. Florida (Wolf).

O L I V E

Phymatotrichum omnivorum (Shear) Duggar, root rot, reported as very susceptible in Texas (Bach).

P E R S I M M O N

Corticium koleroga (Cooke) Höhn., thread blight, reported from Florida (Wolf).

Chlorosis, attributed to too much lime, reported from Texas (Taubenhaus).

Blossom shed, attributed to unbalanced fertilizer, reported from Texas (Taubenhaus).

P O M E G R A N A T E

Mycosphaerella lythracearum (Heald and Wolf) Wolf, blotch reported on fruit and leaves from Texas (Bach).

D I S E A S E S OF N U T S

P E C A N

SCAB CAUSED BY FUSICLADIUM EFFUSUM WINT.

In 1927 scab was held in check over the greater part of the pecan producing area of the United States by dry weather. The importance of this disease in different sections is well summarized by J. B. Demaree as follows:

> "During the season of 1927, pecan scab was of minor importance in North Carolina, South Carolina, the northern half of Georgia, Alabama, Mississippi, Louisiana, and the whole of Texas.
>
> The disease, while being present throughout the south Atlantic and Gulf Coast regions, generally caused less damage to the pecan crop than for the past ten or twelve years. In a pecan scab dusting experiment conducted at Monticello, Florida, during the season of 1927, the checks did not have a sufficient amount of scab to reduce the size of the nuts or lower their marketing qualities. Some nuts became spotted during the latter part of the season, but no actual damage resulted. Some localities, however, where conditions were

more favorable for infection did not fare so well. This was especially true in the flooded regions of south Mississippi, and south Louisiana, where scab caused a heavy loss."

Loss estimates are: South Carolina, 5 per cent; Georgia and North Carolina, 2 per cent; and Texas a trace. An additional estimated loss in grade of 2 per cent occurred in Georgia.

In North Carolina, according to Poole, "Seedling varieties were severely diseased and infected pecans dropped prematurely. The Stuart, Schley and better varieties of nuts seemed to be very resistant to scab." Other data on varietal susceptibility are presented in table 54.

Table 54. Data on varietal susceptibility to scab as compiled from collaborators reports, 1927.

Very susceptible	Susceptible	Resistant	Very resistant
Delmas (2)	Schley (1)	Curtis (2)	Frotscher (1)
Georgia (2)	Pabst (1) (2)	Nelson (2)	Stuart (1)
	Success (1)	Success (2)	Russell (1)
	Moneymaker (2)	Frotscher (2)	Moneymaker (1)
	Van Deman (2)	Stuart (2)	
		Moone (2)	
	Alley (2)	Tesch (2)	

Numerals indicate state and collaborator from which data were received as follows:

(1) D. C. Neal and H. H. Wedgworth, Mississippi. (2) O. C. Boyd - Georgia.

Control practices were not subjected to severe tests in the majority of Southern States in which pecans are grown, due to the unfavorable season for scab development. Hence, in many cases the effectiveness of different materials and methods could not be accurately estimated. Boyd in Georgia reported a high percentage of control with four to five applications of 3-4-50 Bordeaux mixture and with four to five applications of 20-80 dust. He states that dusting was satisfactory in several large commecial orchards. In Mississippi, Neal and Wedgworth found that four applications of monohydrated copper-lime dust gave evidence of some control but was not so effective as three applications of Bordeaux mixture.

Recent literature

1. Dye, H. W. The dusting of pecan trees with copper-lime dust is merely a new application of an established method and practice. Nat. Pecan Exch. News 4 (5): 12-13. May, 1927.

In 1927 rosette was apparently a factor of considerable importance in pecan production in North Carolina and Georgia. Losses are estimated as 10 per cent in Georgia, 2 per cent in North Carolina, and a trace in Texas. In North Carolina, according to Poole and Fant, rosette was observed in several localities in the eastern part of the state and is of common occurrence from year to year. In South Carolina the disease was found by Fenner in both budded and unbudded Stuart pecans. Boyd in Georgia states that all budded varieties are susceptible and that the disease is most severe in poorly cared for orchards where the soil is deficient in organic matter. According to Neal and Wedgworth in Mississippi, the disease is no longer confined to the Coastal Plains area but now occurs in many other parts of the state where trees are being planted. In Arkansas a number of diseased specimens were received by Young who states that rosette is probably quite important but that definite data on losses are not available.

MISCELLANEOUS DISEASES AND INJURIES

Botryosphaeria berengeriana DeNot., dieback. Reported as a disease of moderate importance in South Carolina.

Cercospora fusca (Heald & Wolf) emend. F. V. Rand, brown leaf spot. Traces were reported from North Carolina, South Carolina, Georgia, and Texas. Boyd states that in Georgia it is "noticeable only on rosetted, or otherwise impoverished trees, during the latter part of the season." Poole states that it caused some defoliation locally in North Carolina. According to Demaree this leaf spot "over a large area of the southern pecan belt was more prevalent in 1927 than in previous years."

Downy spot attributed to Cylindrosporium caryigenum Ell. & Ev. A leaf spot new to pecan was found in Georgia in 1926 and described by Demaree and Cole (3) and by Boyd (1). The causal organism has only been provisionally identified as the above named fungus. Boyd (2) says it resembles both a Cylindrosporium and a Cercosporella.

Glomerella cingulata (Ston.) Spauld. & Schrenk, anthracnose. Reported as of slight importance in Mississippi.

Mycosphaerella convexula (Schw.) F. V. Rand, leaf blotch. Demaree & Cole (3) report the observation of a "leaf blotch" in north Florida, south Georgia, and South Alabama on both orchard and nursery trees. In some nurseries complete defoliation by the middle of October occurred on account of it. They believe the fungus to be associated with Mycospharella convexula. Boyd in Georgia states that it "causes slight to severe premature defoliation especially in nurseries. It can be easily controlled in orchards with the scab spray schedule of either dust or spray."

PECAN - Miscellaneous Diseases

Phyllostica caryae Pk., leaf spot. Reported from Mississippi and Texas.

Kernel spot due to southern stink bug (Nezara viridula L.) and other factors. Estimated losses of 5 per cent occurred in Georgia and Texas. Boyd in Georgia states "The 'stink bugs' were unusually abundant and harmful on a number of crops this year including pecans. This was probably due to the warm dry spring and summer."

Recent literature

1. Boyd, O. C. An undetermined leaf spot of pecan. U. S. Dept. Agr. Plant Dis. Rep. 11: 134. Oct. 1, 1927.

2. _____ Preliminary report on a new leaf spot of Pecan. (Abstract) Phytopath. 18: 133-134. 1928.

3. Demaree, J. B., and J. R. Cole. Two unreported leaf spots of pecan. U. S. Dept. Agr. Plant Dis. Reporter 11: 135-136. Oct. 1, 1927.

4. _____ Sand burn of pecan seedlings. Phytopath. 17: 657-661. Sept. 1927.

W A L N U T

Bacterium juglandis (N. B. Pierce) EFS., bacterial blight. This disease was reported from Delaware, Washington and Oregon. Zeller in Oregon reported much more than usual and estimated the loss in quality as 20 per cent.