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Supplement 52

Diseases of Fruit and Nut Crops

In the United States in 1926

July 30, 1927

BUREAU OF
PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

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

Prepared by

W. A. Archer, Assistant Pathologist,
Office of Mycology and Disease Survey.

SECTION ON CITRUS AND SUB-TROPICAL FRUITS

Prepared by

H. R. Fulton, Pathologist, Office of Fruit Disease Investigations,
Bureau of Plant Industry.

Plant Disease Reporter
Supplement 52

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CONTENTS

Introduction	3	Pear	45
Fruit diseases of 1926	3	Quince	50
Diseases of pome fruits	3	Diseases of stone fruits	50
Apple	3	Peach	50
Scab	3	Brown rot	50
Blotch	9	Leaf curl	53
Cedar rust	13	Scab	56
Black rot	16	Bacterial spot	57
Bitter rot	18	Blight	60
Fire blight	23	Yellows	60
Crown gall	28	Little peach	62
Blister canker	30	Rosette	62
Powdery mildew	31	Spray injury	62
Sooty blotch	32	Frost injury	63
Fruit spot	33	Winter injury	64
Bitter pit	34	Miscellaneous disorders .	64
Jonathan spot	34	parasitic	65
King David spot	35	non-parasitic	66
Root rots	36	Plum	67
Spray injury	37	Cherry	69
Winter injury	38	Apricot	71
Miscellaneous		Diseases of small fruits	72
parasitic	39	Grape	72
non-parasitic	42	Strawberry	79

Raspberry	81	Banana	102
Blackberry	88	Papaya	103
Dewberry	89	Guava	103
Loganberry	90	Date	103
Currant	90	Feijoa	103
Gooseberry	90	Fig	103
Cranberry	91	Pomegranate	104
Blueberry	92	Diseases of nuts	104
Mulberry	93	Pecan	104
Diseases of sub-tropical fruits	93	Walnut	107
Citrus	93	Almond	108
Avocado	101	Filbert	108
Mango	102	Coconut	108
Olive	102		

I N T R O D U C T I O N

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

F R U I T D I S E A S E S O F 1 9 2 6

D I S E A S E S O F P O M E F R U I T S

A P P L E

SCAB CAUSED BY *VENTURIA INAEQUALIS* (CKE.) ABERH.

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

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

Apple - Scab

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

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

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

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

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

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

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

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

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

Apple - Scab

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

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

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

Tennessee: Apparently increasing in seriousness. (McClintock)

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

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

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

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

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

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

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

Apple - Scab

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

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

Percentage:		Percentage:	
loss	: States reporting	loss	: States reporting
16	: Iowa	1	: Illinois, Ohio, Penn-
6	: North Carolina, New		: sylvania
	: Jersey	.5	: Delaware, Indiana,
5	: Michigan, Wisconsin,		: California
	: South Dakota, Mon-	Trace	: West Virginia, Minne-
	: tana		: sota, Missouri, North
3	: New York		: Dakota, Kansas,
2.5	: Maryland		: Nebraska, Idaho, Wash-
2	: Virginia, Alabama,		: ington, Mississippi,
	: Oregon		: Arkansas
	:		:

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

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

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

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

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

Apple - Scab

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

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

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Apple - Scab; Blotch

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BLOTCH CAUSED BY PHYLLOSTICTA SOLITARIA ELL. & EV.

Of the major apple diseases in the United States blotch ranks about third in importance according to reports of collaborators during the past nine years. As mentioned in previous reports the disease is rather sharply confined to the area south of the 42nd parallel and east of the 100th meridian. A comparison of Fig. 1 of this publication with Fig. 2 in Plant Disease Reporter Supplement 14 will show that an extension in the area of severe infestation and loss has occurred in all directions, particularly eastward and southward, since 1920. In Fig. 1 there are indicated the localities in Minnesota, Wisconsin, Michigan, and New York where infection has been reported outside the usual area. These are of interest in conjecturing on the possibility of blotch spreading into northern

Apple - Blotch

states. This year in Rock County, Wisconsin, Vaughan reports a new location, stating that blotch occurred with a late scab infection. This report coupled with that of last year from Waushara County, where 50 trees with a 75 per cent infection were found, would lead to the assumption that the disease is gradually gaining a foothold in the state. The situation in New York on the other hand may be somewhat different since Thomas reports that:

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

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

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

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

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

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

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

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

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

Apple - Blotch

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

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

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

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

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

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

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

Apple - Blotch

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

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

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

Apple - Blotch; Cedar Rust

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

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

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CEDAR RUST CAUSED BY GYMNOSPORANGIUM JUNIPERI-VIRGINIANAE SCHW.

According to reports of collaborators during the past nine years cedar rust ranks about fifth among the major diseases of apple and is confined to the eastern half of the United States. The average annual loss since 1918 is estimated at slightly more than 1 per cent, with Virginia, North Carolina, West Virginia, Iowa, Nebraska, South Carolina, and Missouri, in order of importance, reporting the heaviest losses. This year the majority of the states reported the prevalence of the disease to be the same or less when compared with last year and with the average year. Nebraska, Kansas, Connecticut, and Arkansas reported more in com-

Apple - Cedar Rust

parison with last year and with the average year. The percentage losses in 1926 are given in table 6. Goss reported that in Nebraska cedar rust caused more damage this year than any other apple disease and that there was severe injury on fruit, whereas usually only leaf infection occurs. The early season was very dry, retarding somewhat the development of fruit and leaves. In Kansas, White reported a heavy infection which caused defoliation of susceptible varieties. Fant in North Carolina reports that damage to foliage is probably greater than to fruit.

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

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

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

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

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

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

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

Apple - Cedar Rust

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

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

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

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

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

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

Apple - Cedar Rust; Black Rot

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

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

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

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

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

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

Apple - Black Rot

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

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

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

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

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

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

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

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

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

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

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

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

Apple - Black Rot; Bitter Rot

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

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

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

Coming now to the states in which bitter rot is of more importance, we find that in Virginia it is rated as one of the major apple diseases. In general it is secondary to cedar rust and scab, but in the Piedmont Section, especially in Albemarle, Nelson, and Amherst Counties it usually outranks other diseases of apples and is the one most feared by the growers. This section grows the

Apple - Bitter Rot

highly prized, but very susceptible Yellow Newtown, or Albemarle Pippin. In some years growers of this variety have had their crops practically wiped out by bitter rot. In the Carolinas, Georgia, Alabama, and Tennessee bitter rot is regarded as the most serious apple disease and requires more attention than all other apple diseases combined. In Kentucky and in the southern fruit-producing areas of Illinois, Indiana, and Ohio, bitter rot is not of great importance when considered over a period of several years. In seasons with warm and wet weather, however, epiphytotics are likely to occur and heavy losses sometimes result.

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

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

Maryland: Hot and moist conditions in August and September were favorable. (Temple & Jehle)

Tennessee: Heavy rains in August made bitter rot spread rapidly. (McClintock)

Ohio: Temperature and moisture both favorable. (H. C. Young)

In the Proctorville and Gallipolis sections bitter rot was markedly destructive this season. This outbreak was rather localized in that territory, but quite a number of orchards had the entire crop destroyed, particularly Rome Beauty and Grimes. (H. W. Dye, Niagara Sprayer Co.)

Indiana: Heavy and frequent rains in fall caused rapid spread. (Gardner)

Missouri: A cool and somewhat dry summer probably reduced infection. (Archer)

Virginia: The temperature was favorable but there was not enough rain in midseason to cause exudation from mummies. (Schneiderhan)

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

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

Apple. - Bitter Rot

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

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

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

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

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

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

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

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

Apple - Bitter Rot

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Kentucky: Considerable blossom and twig blight. (Valleau)

Tennessee: Spur blight on early varieties. (Baskin)

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

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

Apple - Fire Blight

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

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

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

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

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

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

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

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

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

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

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

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

Nixon (2) has attacked the study of fire blight from a new angle. He has studied (1) the migration of the bacteria through apple tissue; (2) the effect on the host cell; (3) longevity and life cycle of the pathogen; (4) varietal tests for root immunity, together with (5) a new method of pathologic histology

Apple - Fire Blight

whereby immunity studies can be made microscopically. As a result of these studies nearly 1,200 trees of the more promising selections have been planted to test out their adaptability in locations favorable to infection.

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

"Spur blight was quite severe and was remarkable that it did not develop until after petal fall. It is possible that the blight bacteria were introduced by pollinating insects but that weather conditions delayed the development of the disease. Again it must be admitted that blight can become serious during a dry spring. This is the second season that this fact has impressed us. Favorable weather for insect pollination may be a factor.

"One of the outstanding facts in regard to fire blight is the seriousness of cankers in Willow Twigs in the western part of the state. This condition has been noticed in past years. It should be a well known fact that the severity of blight infection on any variety is not an index of the number of hold-over cankers which may be found. Thus, Jonathan is one of our worst varieties for twig blight, and Transparent the worst for body blight, yet on neither of these can hold-over cankers be found. Certain other varieties, particularly Willow Twig, which do not show serious twig or blossom blight, on the other hand do have abundant hold-over cankers."

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

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

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

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

Apple - Fire Blight

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

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

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

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

Apple - Fire Blight

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

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

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CROWN GALL CAUSED BY BACTERIUM TUMEFACIENS EFS. & TOWNS.

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

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

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

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

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

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

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

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

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

Apple - Crown Gall

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

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

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Apple - Crown Gall; Blister Canker

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

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

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

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

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

Tennessee: No infection seen in 1926. (McClintock)

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

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

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

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

Apple - Blister Canker; Powdery Mildew

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

Susceptibility	Varieties and Authorities
Very susceptible	Ben Davis (1,2,3,4,5,6); Gano (4,5); Genet (3); Maiden Blush (3); White Pippin (3)
Susceptible	Clayton (3); Delicious (2); Jonathan (3); Mammoth Black Twig (3); Rome (3); Stark (3)
(1) Arkansas Department of Plant Pathology.	(2) H. W. Anderson and L. R. Tehon in Illinois.
(3) M. W. Gardner in Indiana.	(4) W. A. Archer in Missouri.
(5) H. C. Young in Ohio.	(6) F. J. Schneiderhan in Virginia.

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

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

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

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

Apple - Powdery Mildew; Sooty Blotch; Flyspeck

Recent literature

1. Anon. Powdery mildew. Results of experiments. Fruit World of Australasia 27: 221. 1926.
2. Foëx, E. Notes sur quelques Érysiphacées. Bul. Soc. Myc. de France 41: 417-438. 1926.
3. Oppenheimer, H. R. Die Therapie der Baumschulkrankheiten. Angew. Bot. 8: 137-146. 1926.
4. Schubert, K. and K. Richter. Studien zur Bekämpfung des Apfelmeltaues (*Podosphaera leucotricha*) und einiger anderer Obstbaumschädlinge pilzlicher und tierischer Art. Angew. Bot. 8: 146-167. 1926.

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

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

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

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

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

Apple - Sooty Blotch; Flyspeck; Fruit Spot

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

FRUIT SPOT CAUSED BY PHOMA POMI PASS.

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

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

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

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

Recent literature

1. Walton, R. C. Apple fruit spot. In Pennsylvania Agr. Exp. Sta. Bul. 204 (Ann. Rept. 39; 1925-26): 15. 1926.
2. _____ and C. R. Orton. The perfect stage of Cylindrosporium pomi. Science n.s. 63: 236. Feb. 26, 1926.

BITTER PIT, NON-PARASITIC

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

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

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

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

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

Recent literature

1. Duriez. Une maladie nouvelle du pommier. Pomol. Franc. 1926 (1): 17-18. Jan. 1926.
2. Smith, A. J. M. Bitter pit in apples, a review of the problem. Spec. Rep. Food Invest. Board. Great Britain 28: 1-24. 1926.

JONATHAN SPOT, CAUSE UNDETERMINED

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

Apple - Jonathan Spot; King David Spot

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

Recent literature

1. Harrison, J. E. The Jonathan apple in cool storage. Jour. Dept. Agr. Victoria 24 (1): 31-38. 1926.
2. Osterwalder, A. Die fleckenbildung beim Jonathan apfel. Zeitschr. Pflanzenkr. 36: 264-269. 1926.
3. Pentzer, W. T. Color pigment in relation to the development of Jonathan spot. Proc. Amer. Soc. Hort. Sci. 22 (1925): 66-69. 1926.
4. Plagge, H. H. Prevention of storage disorders in apples. Amer. Fruit Grow. Mag. 46 (10): 3, 18. Oct. 1926.

KING DAVID SPOT, NON-PARASITIC

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

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

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

Apple - King David Spot; Root Rots

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

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

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

Recent literature

1. Robbins, W. J. Botany. In Some new developments in agricultural science. Report of the Director. Missouri Agr. Exp. Sta. Bul. 236: 44-45. 1926.

ROOT ROTS

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

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

Other root rots

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

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

Xylaria spp., black root rot. Only five collaborators sent data relating to occurrence of this root rot. Virginia reported a loss of 1.5 per cent, and Illinois and Maryland, a trace each. In Tennessee it was considered to be of moderate importance, while in Michigan it was said to be extremely rare. Schneiderhan reported from Virginia as follows: "Xylaria causes our commonest

Apple - Root Rots; Spray Injury

root rot. A survey of 25 of the best orchards in Frederick County indicates an average mortality rate in trees of 15.2 per cent. Black root rot is considered to be responsible for at least half of this trouble. Sporulating *Xylaria* was found in July." A maximum infection of 10 per cent was found in an orchard of Yellow Transparents in the Ozark region of Illinois, according to Anderson and Tehon.

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

Recent literature

1. Carne, W. M. Root rot of fruit trees due to *Armillaria mellea*. Jour. Dept. Agr. West. Australia II, 3: 429-432. 1926.
2. Hawkins, Stacy. Some *Xylarias* of Indiana. Proc. Indiana Acad. Sci. 35 (1925): 225-229. 1926.
3. Thomas, H. E. Root and crown injury of apple trees. Cornell Agr. Exp. Sta. Bul. 448: 1-9. 1926.
4. Valteau, W. D. Root troubles a cause of early death of apple trees. Trans. Kentucky State Hort. Soc. 1925: 141-155. 1926.
5. Zeller, S. M. Observations on infections of apple and prune roots by *Armillaria mellea* Vahl. Phytopath. 16: 479-484. July 1926.

SPRAY INJURY

In Delaware, according to Adams, "Pyrox" (containing copper) caused severe leaf-yellowing on weakened trees. He says also that arsenical dust (90-10) caused typical spotting on the foliage of weakened Williams and Early Ripe. From New Jersey, Martin reports that a summer strength of concentrated lime-sulfur caused severe leaf burning and that even Bordeaux mixture caused damage in some orchards. The Division of Plant Pathology in Washington reports that more injury than usual occurred from oil sprays, Bordeaux, and lime-sulfur. Oil injury took several forms including reduced vitality of trees and reduced size, spotting and russetting, and premature dropping of the fruit. The necessity of limiting arsenic residues on the fruit stimulated extensive commercial use of summer oil sprays. In southeastern Ohio, Ballou and Lewis (1) find that low temperature and excessive cloudiness and moisture just previous to and during the blooming period favored russet injury to apples from sprays. They say that their work of the past four years shows that much of the russet injury caused by caustic sprays occurs in the use

Apple - Spray Injury; Winter Injury

of Bordeaux for the pink spray of fruit buds. On the other hand, dry lime-sulfur straight through the spraying period gave 94 per cent of clear, unrusseted fruit on the Ensee variety, which is particularly susceptible to spray injury. Hydrated lime used in the same manner gave 96 per cent unrusseted fruit. Grubb and Hatton (3) maintain that post-blossoming use of lime-sulfur entails a considerable risk of reducing the crop. Osterwalder (4) summarizes the results of ten years' experiments with sprays. Bordeaux and various commercial spray materials generally induced foliage injury while, on the whole, lime-sulfur preparations (1-30 proportions especially) were more efficacious than the copper mixtures.

Recent literature

1. Ballou, F. H., and I. P. Lewis. Spraying to control apple scab and apple blotch in southeastern Ohio. Proc. Ohio State Hort. Soc. 59: 165-181. 1926.
2. Farley, A. J. Spray injury. Rept. Maryland State Hort. Soc. 28: 165-167. 1926.
3. Grubb, N. H., and R. G. Hatton. Post-blossoming use of lime-sulfur spray and fruit dropping. Gard. Chron. 79: 324-325. 1926.
4. Mogendorff, N. Some chemical factors involved in arsenical injury of fruit trees. New Jersey Agr. Exp. Sta. Bul. 419: 1-47. 1925.
5. Osterwalder, A. Schorfbekämpfungsversuche aus den Jahren 1915-1925. Zeitschr. für Pflanzenkrankh. 36: 79-97. 1926.
6. Shutt, F. T. The examination of Canadian sprayed apples for arsenic. Analyst 51: 291-292. 1926.
7. Sutton, G. L. Tests to determine the presence of arsenic in apples after treatment with arsenical sprays. Jour. Dept. Agr. West Australia II, 3: 221-225. 1926.
8. Wilcox, E. V. Apples and arsenic. England's complaint brings some new suggestions for orchard spraying. Country Gentleman 91: 21, 85-86. 1926.

WINTER INJURY

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

Apple - Winter Injury; Parasitic Diseases

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

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

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

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

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

Recent literature

1. Bradford, F. C., and H. A. Cardinell. Eighty winters in Michigan orchards. Michigan Sta. Spec. Bul. 149: 3-103. 1926.
2. Sandster, E. P. Winter killing of apple trees in Colorado. Fruit Belt 24 (3): 18. Mar. 1926.
3. Thomas, H. E. Root and crown injury of apple trees. Cornell Agr. Exp. Sta. Bul. 448: 1-9. 1926.

MISCELLANEOUS PARASITIC DISEASES

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

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

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

Apple - Parasitic Diseases

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

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

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

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

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

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

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

Penicillium sp., blue mold rot, occurred commonly.

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

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

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

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

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

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

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

Apple - Parasitic Diseases

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

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

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

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

Recent literature

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4. Heald, F. D., and R. Sprague. A spot rot of apples in storage caused by *Botrytis*. Phytopath. 16: 485-488. July 1926.
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7. Rose, D. H., and L. F. Butler. Pleospora rot of lemons and apples. (Abstract). Phytopath. 17: 47. Jan. 1927.
8. Southee, E. A., and F. T. Brooks. Notes on a pycnidial fungus associated with a dying-back of apple branches. Trans. Brit. Mycol. Soc. 11: 213-219. Dec. 1926.
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Apple - Parasitic Diseases; Non-Parasitic Diseases

11. Zeller, S. M. Cankers of apple and pear in Oregon and their control. Oregon Agr. Exp. Sta. Circ. 73: 1-29. Apr. 1926.
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drocarpon and Ramularia occurring on the bark of Pyrus spp.
in Oregon. Phytopath. 16: 623-627. Sept. 1926.

MISCELLANEOUS NON-PARASITIC DISEASES

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

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

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

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

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

Apple - Non-Parasitic Diseases

more or less irregular browning of the cambial region can often be traced back into three-year old wood."

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

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

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

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

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

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

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

Mosaic is again reported by Mills from New York.

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

Spot necrosis. Slightly important in Washington.

Apple - Non-Parasitic Diseases

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

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

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

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1. Brooks, C., and D. F. Fisher. Water core of apples. Jour. Agr. Res. 32: 223-260. 1926.
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P E A R

BLIGHT CAUSED BY BACILLUS AMYLOVORUS (BURR.) TREV.

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

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

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

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

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

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

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

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

Pear - Blight

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

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

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

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

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

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

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

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

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

Pear - Blight; Scab

Recent literature

1. Nixon, E. L. Fire blight. Pennsylvania Agr. Exp. Sta. Bul. 203: 1-22. June 1926.
2. Reimer, F. C. Value of Bordeaux mixture in blight control. Seventeenth Ann. Rept. Oreg. State Hort. Soc. p. 1-7. Dec. 1925.
3. Rosen, H. R. The number and arrangement of flagella of the fire blight pathogen, *Bacillus amylovorus*. Mycologia 18: 23-26. Jan.-Feb. 1926.

SCAB CAUSED BY *VENTURIA PYRINA* ADERH.

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

Some of the reports of collaborators follow:

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

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

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

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

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

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

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

MISCELLANEOUS PARASITIC DISEASES

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

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

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

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

Gymnosporangium globosum Farl., rust. Connecticut and Florida.

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

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

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

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

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

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

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

MISCELLANEOUS NON-PARASITIC DISEASES

Bitter pit - Reported from Washington.

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

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

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

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

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

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

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

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3. Harrison, J. E. Cold storage of pears. Fruit World of Australasia 27: 30-32. 1926.
4. Heppner, Myer J. Bartlett pear black-end rot investigation. California Pear-Grower 6 (9): 5-6. 1926.
5. Zeller, S. M. A blossom and spur blight of pear caused by a strain of Botrytis cinerea Pers. Jour. Agr. Res. 33: 477-482. Sept. 1926.

Q U I N C E

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

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

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

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

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

Recent literature

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

D I S E A S E S O F S T O N E F R U I T SP E A C HBROWN ROT CAUSED BY *SCLEROTINIA FRUCTICOLA* (WINT.) REHM.

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

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

Peach - Brown Rot

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

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

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

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

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

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

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

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

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

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

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

Illinois: Brown rot was almost absent from fruit this year because of two factors. Curculio was extremely rare and weather conditions were unfavorable for the development of the disease up to the time of harvesting. The wet weather during harvest might have caused heavy losses but for the fact that growers had sprayed

Peach - Brown Rot

unusually carefully and had thinned their fruit more than usual. The cracking of the fruit as a result of heavy rains following extreme dry weather in southern Illinois would have been a serious factor so far as brown rot was concerned had the spores been abundant in the orchards. Some brown rot developed in transit and in the market, but it was much less than expected. (Anderson)

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

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

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

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

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

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

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

Recent literature

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

Peach - Brown Rot; Leaf Curl

2. Anon. Control of brown rot in stone fruits. Recent experiments at Henderson. New Zealand Jour. Agr. 33: 170-173. Sept. 1926.
3. Roberts, J. W., and J. C. Dunegan. Blossom blight of the peach. Phytopath. 16: 217-222. Mar. 1926.
4. Schneiderhan, F. J., and R. H. Hurt. The dry-mix spray for peaches. Virginia Agr. Exp. Sta. Bul. 239: 1-16. 1926.

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

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

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

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

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

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

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

Following are extracts from the reports of collaborators:

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

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

New York: Only slight amounts noted. (Mills)

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

Peach - Leaf Curl

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

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

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

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

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

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

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

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

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

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

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

Peach - Leaf Curl

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

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

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

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

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

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

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

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

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

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

Peach - Leaf Curl; Scab

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

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

Recent literature

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

SCAB CAUSED BY CLADOSPORIUM CARPOPHILUM THÜM.

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

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

Peach - Scab; Bacterial Spot

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

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

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

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

BACTERIAL SPOT CAUSED BY BACTERIUM PRUNI EFS.

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

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

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

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

Peach - Bacterial Spot

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

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

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

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

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

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

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

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

Peach - Bacterial Spot

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

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

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

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

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

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

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

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

Recent literature

1. Anon. *Bacterium pruni* and peach canker. 44th Ann. Rept. Ohio Agr. Exp. Sta. (Bul. 392): 11-99. Mar. 1926.
2. Anderson, H. W. Control of bacterial spot of peach with sodium silicofluoride. Trans. Illinois State Hort. Soc. 59: 266-271. 1926.

Peach - Bacterial Spot; Blight; Yellows

3. Anderson, H. W. A theory to account for the bactericidal action of sodium silicofluoride and lack of injury to host tissues. (Abstract). *Phytopath.* 17: 50. Jan. 1927.
4. _____ Experiments with fertilizers and cultivation for the control of bacterial spot of peach. *Trans. Illinois State Hort. Soc.* 59: 258-261. 1926.
5. Higgins, B. B. Bacterial spot of peach. *Georgia Agr. Exp. Sta. Circ.* 79: 1-8. Aug. 1926.

BLIGHT CAUSED BY *CORYNEUM BEIJERINCKII* OUD.

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

Recent literature

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

YELLOW (CAUSE UNDETERMINED)

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

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

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

Peach - Yellows

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

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

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

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

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

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

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

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

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

Peach - Yellows; Little Peach; Rosette; Spray Injury

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

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

LITTLE PEACH (CAUSE UNKNOWN)

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

ROSETTE (CAUSE UNKNOWN)

No reports regarding rosette were received in 1926.

SPRAY INJURY

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

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

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

Peach - Spray Injury; Frost Injury

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

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

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

Recent literature

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

FROST INJURY

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

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

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

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

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

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

Peach - Frost Injury; Winter Injury; Disorders

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

Recent literature

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

WINTER INJURY

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

Recent literature

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

MISCELLANEOUS DISORDERS DUE TO WEATHER CONDITIONS

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

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

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

Recent literature

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

MISCELLANEOUS PARASITIC DISEASES

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

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

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

Botryosphaeria ribis chromogena Gross & Dug. Florida.

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

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

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

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

Rhizopus nigricans Ehr., soft rot. General.

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

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

Recent literature

1. Goldsworthy, M. C. Peach rust epidemic of 1926. California Countryman 13 (2): 7, 28. Nov. 1926.
2. Hesler, L. R. Peach disease conditions in Ohio. Ohio Sta. Bimo. Bul. 11: 110-114. 1926.

Peach - Parasitic Diseases; Non-Parasitic Diseases

3. Walton, R. C. Cause and prevention of peach canker. Pennsylvania State Hort. Assoc. News 3: 40-45. Mar. 1926.
4. Weldon, George P. The crown gall meance. Pacific Rural Press 112 (25): 691. Dec. 1926.
5. Zeller, S. M. The brown pocket heart rot of stone-fruit trees caused by *Trametes subrosea* Weir. Jour. Agr. Res. 33: 687-693. Oct. 1926.

MISCELLANEOUS NON-PARASITIC DISEASES

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

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

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

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

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

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

Recent literature

1. Anon. Peach hybrids again resist defoliation disease. Jour. Hered. 17: 389. Oct. 1926.
2. Blake, M. A. The secret of the split-pit peach. New Jersey Agr. 8 (10): 2-3. Oct. 1926.
3. Guyot, L. Essais de lutte pratique contre la chlorose du Pêcher. Rev. Path. Vég. et Ent. Agr. 13 (1): 66-69. 1926.

Peach - Non-Parasitic Diseases

Plum - Brown Rot; Black Knot

4. McClintock, J. A. Further evidence of uncongeniality in disease-resistant stocks. Proc. Amer. Soc. Hort. Sci. 22: 231-232. 1926.
5. McCubbin, W. A. Three little known diseases of peach. I: Rootlet rot. II. Punky rot. III. Heart rot. Pennsylvania State Hort. Assoc. News 3: 46-50. Mar. 1926.

P L U MBROWN ROT CAUSED BY *SCLEROTINIA FRUCTICOLA* (WINT.) REHM

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

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

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

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

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

In 1926 black knot was reported from New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, Tennessee, South Carolina, Texas, Ohio, Illinois,

Plum - Brown Rot; Pockets; Bacterial Spot; Miscellaneous Diseases

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

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

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

BACTERIAL SPOT CAUSED BY BACTERIUM PRUNI EPS.

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

MISCELLANEOUS DISEASES AND DISORDERS

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

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

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

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

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

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

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

Chlorosis due to excess of lime. Texas.

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

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

Recent literature

1. Brooks, F. T., and W. C. Moore. Silver-leaf disease. V. Jour. Pomol. & Hort. Science 5: 61-97. 1926.
2. Carne, W. M. Crinkle of Japanese Plums. Jour. Dept. Agr. Western Australia 2nd Ser. 3 (2): 175. 1926.
3. Swarbrick, T. The healing of wounds in woody stems. Jour. Pomol. & Hort. Science 5: 98-114. 1926.

C H E R R Y

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

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

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

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

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

LEAF SPOT CAUSED BY COCCOMYCES HIEMALIS HIG.

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

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

BACTERIAL SPOT CAUSED BY BACTERIUM PRUNI EPS.

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

BACTERIAL GUMMOSIS CAUSED BY BACTERIUM CERASI GRIFFIN

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

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

Recent literature

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

Cherry

MISCELLANEOUS DISEASES

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

Botrytis cinerea Auct., gray mold. Caused 1 per cent loss in California.

Exoascus cerasi (Fckl.) Sadeb., witches' broom. Occasional in western Oregon.

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

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

Recent literature

1. Faes, H., and Staehelin. Les maladies des cerisiers au printemps 1926. Terre Vaud. 18: 411-415. July 1926.
2. Gray, W. P. Spraying and harvesting the cherry crop. Ann. Rept. State Hort. Soc. Michigan 55: 21-24. 1926.
3. Ross, W. A. Sour cherries injured by Bordeaux. Canada Hort. 49: 28. Feb. 1926.
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A P R I C O T

Armillaria mellea (Vahl) Quel., root rot. Occasional tree killed in California.

Bacillus amylovorus (Burr.) Trev., fire blight. Loss a trace in Texas.

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

Bacterium pruni EFS., bacterial spot. Reported from Texas and Missouri.

Bacterium tumefaciens EFS., crown gall. Loss 2 per cent in Arizona.

Cladosporium carpophilum Thuem., scab. Texas. Loss 0.5 per cent.

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

Apricot - Diseases
Grape - Black Rot

Coccomyces sp., leaf spot. Texas.

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

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

Chlorosis due to too much lime. Trace in Texas.

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

D I S E A S E S O F S M A L L F R U I T S

G R A P E

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

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

General remarks of collaborators are given below:

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

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

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

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

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

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

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

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

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

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

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

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

"Powdery mildew was less serious in 1925 and 1926 than in 1924 and much less so than in 1923. Early in both seasons it caused some russetting of Malaga, Muscat and a few other varieties, about October 1, because of increased rainfall and cooler weather, the "active" mildew (live mycelium and spores) was found to a slight extent on the stems of the bunches in numerous vineyards of Muscat, Malaga, Emperor, Chanez and a few other varieties. On all of these perithecia in various stages of development were found.

"Evidence was obtained from holding tests during both seasons that mildewed stems are very likely to be attacked in storage or in transit by decay fungi, especially gray mold."

Recent literature

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BLACK MOLD ROT CAUSED BY *ASPERGILLUS NIGER* VAN TIEGH.

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

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

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

"In California gray mold rot was found in 1925 in practically all of the vineyards visited in Sonoma and Napa Counties; it also occurred, though to a lesser extent, in the territory around Sacramento and Lodi, mainly on Zinfandel, Tokay, and Alicante Bouschet. It was still less important at Modesto and could scarcely be found at all around Fresno and Bakersfield until the rains began early in October. It is noteworthy that as here indicated gray mold rot was progressively worse from south to north and, as pointed out in the case of black mold rot that ^{this} disease was progressively worse from north to south. Both were found at Modesto, which is roughly half way between Bakersfield (Kern County) and Santa Rosa (Sonoma County). The distribution of the two probably depends on differences in temperature and humidity in the different sections. It is known at least that *Botrytis* is

Grape - Gray Mold Rot; Frost Injury

most prevalent in moist, cool temperatures like that of the Bay counties. A recent survey in Oregon by Schuster and Husman shows that in the grape growing regions of that state Botrytis is quite prevalent and often destructive. These regions, it is scarcely necessary to point out, have a cool, damp climate. Anderson in 1924 reported Botrytis as by far the most serious fungous parasite in southeast Alaska which, as he also points out, has a climate characterized by mild winters and cool summers accompanied by much cloudy and rainy weather.

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

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

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

FROST INJURY

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

OTHER DISEASES AND INJURIES

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

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

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

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

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

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

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

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

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

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

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

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11. Rhoads, A. S. Diseases of grapes in Florida. Florida Agr. Exp. Sta. Bul. 178: 75-156. Jan. 1926.
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13. _____ Lesions de l'esca. Rev. Vitic. 65: 105-111; 121-125; 205-212. 1926.
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STRAWBERRY

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

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

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

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

Recent literature

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

POWDERY MILDEW CAUSED BY SPHAEROTHECA HUMULI DC.

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

Recent literature

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

MISCELLANEOUS DISEASES AND INJURIES

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

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

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

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

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

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

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

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

Chlorosis (undet.) Texas.

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

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

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

Recent literature

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Strawberry - Diseases and Injuries
Raspberry - Anthracnose

2. Plakidas, A. G. Strawberry 'yellows' a degeneration disease of the strawberry. *Phytopath.* 16: 423-426. 1926.
3. Rose, Dean H. Diseases of strawberries on the market, U. S. Dept. Agr. Circ. 402: 1-8. Dec. 1926.
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5. Staniland, L. N. Some observations on strawberry colworm. *Ann. Rept. Agr. & Hort. Res. Sta. Univ. Bristol* 1925: 61-65. 1926.

R A S P B E R R Y

ANTHRACNOSE CAUSED BY *PLECTODISCELLA VENETA* (SPEG.) BURKH.

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

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

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

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

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

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

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

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

Raspberry - Anthracnose

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

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

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

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

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

- References and authorities for data on varietal susceptibility.
- (1) Reported in 1926 to the Plant Disease Survey by W. S. Krout from Pennsylvania.
 - (2) Reported in 1926 to the Plant Disease Survey by the Section of Plant Pathology of Minnesota.
 - (3) Reported in 1926 to the Plant Disease Survey by C. W. Bennett from Michigan.
 - (4) Reported in 1925 to the Plant Disease Survey by G. P. Clinton from Connecticut.

Raspberry - Anthracnose; Leaf Curl, Mosaic

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

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LEAF CURL, MOSAIC, AND STREAK (VIRUS)

Leaf curl

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

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

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

Mosaic

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

Raspberry - Mosaic

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

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

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

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

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

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

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

New York: Herbert and Latham resistant.

Michigan: All varieties susceptible. (Bennett)

Pennsylvania: All varieties susceptible. (Krout)

Indiana: Black varieties susceptible. (Gardner)

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

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

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

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

Raspberry - Streak; Blue Stem

Streak

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

Recent literature

1. Berkeley, G. H., and A. B. Jackson. Studies in raspberry diseases. Mosaic, leaf curl, rosette, and wilt. Pamph. Canada Dept. Agr. n.s. 72: 3-15. 1926.
2. Glenn, P. A. The mosaic situation in Illinois. Proc. Wisconsin State Hort. Soc. 56: 117-121. Aug. 1926.
3. Hanchett. Raspberry mosaic. Proc. Wisconsin State Hort. Soc. 56: 40-44. Aug. 1926.
4. Rankin, W. H. Raspberry mosaic control in Hudson River Valley. Proc. New York State Hort. Soc. 71: 173-178. 1926.
5. _____ Mosaic of red and black cultivated raspberries. (Abstract) Phytopath. 17: 46. Jan. 1927.
6. Ruggles, A. G., and J. D. Winter. Some aspects of mosaic of the red raspberry from the standpoint of the nursery inspector. Minnesota Hort. 54: 79-85. Mar. 1926.
7. Thatcher, R. W. Forty-fourth Ann. Rept. New York Agr. Exp. Sta. 1924: 29. 1926.
8. Winter, J. D. Raspberry mosaic in Minnesota. Proc. Wisconsin State Hort. Soc. 56: 121-130. Aug. 1926.

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

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

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

Raspberry - Blue Stem; Winter Injury; Other Diseases

Recent literature

1. Berkeley, G. H., and A. B. Jackson. Verticillium wilt of the red raspberry. Scient. Agr. 6: 261-270. Apr. 1926.
2. Harris, R. V. The blue stripe wilt of the raspberry. Ann. Rept. East Malling Res. Sta. 1924: 126-134. 1925.

WINTER INJURY

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

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

Michigan: Cuthbert and Cumberland were susceptible. (Bennett)

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

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

Missouri: Red varieties are especially susceptible. (Archer)

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

Recent literature

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

OTHER DISEASES

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

Raspberry - Other Diseases

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

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

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

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

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

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

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

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

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

Recent literature

1. Colby, A. S., and H. W. Anderson. Diseases of brambles in Illinois and their control. Illinois Sta. Circ. 305: 3-20. 1926.
2. Dodge, B. O., and R. B. Wilcox. Diseases of raspberries and blackberries. U. S. Dept. Agr. Farm. Bul. 1488: 1-32. June 1926.

Raspberry - Other Diseases
Blackberry - Orange Rust; Anthracnose

3. Harris, R. V. Three raspberry diseases. The blue stripe wilt, cane spot disease, mosaic. Fruit Grow. Fruit., Flor. & Mark. Gard. 62: 205-206, 208. Aug. 12, 1926.
4. Zeller, S. M. A correction. Mycologia 19: 150-151. May-June 1927. Coryneum ruborum Oud. = Hendersonia rubi (West.) Sacc. as suggested by Archer. Ascospore stage should be called Ascospora rubi (Westend.) Zeller instead of Ascospora ruborum (Oud.) Zeller.

B L A C K B E R R Y

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

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

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

Recent literature

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

ANTHRACNOSE CAUSED BY PLECTODISCELLA VENETA (SPEG.) BURKH.

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

OTHER DISEASES

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

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

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

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

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

Recent literature

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

D E W B E R R Y

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

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

Mycosphaerella rubi Roark, leaf spot. Texas.

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

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

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

Recent literature

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

LOGANBERRY

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

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

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

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

CURRENT

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

Pseudopeziza ribis Klob., anthracnose. Indiana.

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

Recent literature

1. Briton-Jones, H. R. A note on the leaf spot disease of black currants (Pseudopeziza ribis). Ann. Rep. Agr. & Hort. Res. Stat. Univ. Bristol 1925: 105-108. 1926.
2. Cobb, A. J. Reversion or nettle head in black currants. Garden 90: 328. June 5, 1926.
3. Stevens, N. E. Occurrence of the current cane blight fungus on numerous hosts in the Southern States. Mycologia 18: 278-282. 1926.

GOOSEBERRY

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

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

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

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

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

Recent literature

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

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

C R A N B E R R Y

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

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

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

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

"Most of the trouble was experienced with Searl's variety

Cranberry to Blueberry

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

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

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

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

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

Recent literature

1. Stevens, N. E., and W. H. Sawyer. The distribution of cranberry false blossom. *Phytopath.* 16: 223-227. 1926.
2. _____ The false blossom situation. *Proc. Amer. Cran. Grow. Assoc.* 57: 20-26. 1927.

B L U E B E R R Y

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

Citrus Fruits - Canker

M U L B E R R Y

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

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

Recent literature

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

D I S E A S E S O F S U B T R O P I C A L F R U I T S

Prepared by H. R. Fulton

C I T R U S F R U I T SI. DISEASES CAUSED BY OR ATTRIBUTED TO PARASITES

CANKER CAUSED BY BACTERIUM CITRI (HASSE) JEHLE

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

Recent literature

1. Neal, D. C. Scouting for citrus canker. Quart. Bul. Mississippi State Pl. Bd. 6 (2): 14-15. July 1926.
2. Peltier, G. L., and W. J. Frederick. Effects of weather on world distribution and prevalence of citrus canker and citrus scab. Jour. Agr. Res. 32: 147-164. 1926.
3. _____ Further studies on the overwintering of *Pseudomonas citri*. Jour. Agr. Res. 32: 335-345. 1926.

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

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

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

Recent literature

1. Carne, W. M. Citrus pit (*Pseudomonas citriputae*, C. O. Smith). Jour. Dept. Agr. West. Australia II, 3: 378-381. Sept. 1926.
2. Lewcock, H. K. A citrus bacteriosis occurring in South Australia. (Abstract) Phytopath. 16: 80. Jan. 1926.
3. Smith, C. O. Similarity of bacterial diseases of avocado, lilac, and citrus in California. Phytopath. 16: 235-236. Mar. 1926.

SCAB CAUSED BY SPHACELOMA FAWCETTI JENKINS (SPOROTRICHUM CITRI BUTLER)

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

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

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

Louisiana: Reported by Tims on Satsuma oranges.

Texas: Reported as unimportant by Taubenhaus.

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

Citrus Fruits - Scab; Melanose

Recent literature

1. Peltier, G. L., and W. J. Frederick. Effects of weather on the world distribution and prevalence of citrus canker and citrus scab. Jour. Agr. Res. 32: 147-164. 1926.
2. Winston, J. R., J. J. Bowman, and W. J. Bach. Relative susceptibility of some rutaceous plants to attack by citrus scab fungus. Citrus Industr. 7 (3): 28-29. Mar. 1926.

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

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

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

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

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

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

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

Recent literature

1. Fulton, H. R. Spraying for citrus melanose control. Citrus Industr. 7 (3): 6-7, 31. Mar. 1926.
2. _____ Spraying for control of citrus melanose. Florida Grow. 33 (11): 6, 29. Mar. 13, 1926.
3. Wolf, F. A. The perfect stage of the fungus which causes melanose of citrus. Jour. Agr. Res. 33: 621-625. Oct. 1, 1926.
4. _____ Something new about melanose. Proc. Florida State Hort. Soc. 39 (1926): 153-154. 1926.

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

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

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

Recent literature

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

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

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

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

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

Porto Rico: Of little importance. (Cook)

Recent literature

1. Benton, R. J. Borax treatment of lemons for store. Agr. Gaz. New South Wales 38: 94. 1926.
2. Hostetler, V. V. Prevention of decay in citrus fruits. Better Crops 7 (1): 14, 44, 50-51. Sept. 1926.

Citrus Fruits - Blue and Green Mold Rots; Fruit Rots

3. Powell, H. C. The control of blue and green molds of orange. Negative results from borax. South African Fruit Grow. 13: 232. Sept. 1926.
4. _____ The use of sodium borate for the control of blue and green molds of oranges. Pretoria, 1926.

FRUIT ROTS CAUSED BY VARIOUS ORGANISMS

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

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

Aspergillus niger Tiegh.

Botrytis cinerea Pers.

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

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

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

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

Sclerotinia sclerotiorum (Lib.) Mass.

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

Recent literature

1. Bartholomew, E. T. Alternaria rot of lemons. California Agr. Exp. Sta. Bul. 408: 1-32. Oct. 1926.
2. _____ Concerning Alternaria rot of lemons. California Citrogr. 12 (1): 14-15, 17. Nov. 1926.
3. Fawcett, H. S. Alternaria problem in relation to navel oranges. California Citrogr. 12 (1): 30-31. Nov. 1926.
4. Hawkins, L. A., and W. R. Barger. Cold storage of Florida grapefruit. U. S. Dept. Agr. Bul. 1368: 1-6. 1926.
5. Read, F. M. The storing of lemons. Jour. Dept. Agr. Victoria 24: 292-303. May 1926.
6. Rose, D. H., and L. F. Butler. Pleospora rot of lemons and apples. (Abstract) Phytopath. 17: 47. Jan. 1927.

FOOT ROT ATTRIBUTED TO PHYTOPHTHORA TERRESTRIS SHERB.

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

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

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

Recent literature

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

GUMMOSIS AND BARK DISEASES DUE TO VARIOUS ORGANISMS

Botrytis cinerea Pers., Botrytis gummosis, California - see Dothiorella.
Diplodia natalensis Ell. & Ev., die-back, Porto Rico.

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

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

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

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

Recent literature

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

OTHER PARASITIC DISEASES

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

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

Cephaleuros virescens Kunze, algal leaf spot. Porto Rico.

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

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

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

Tylenchus semipenetrans Cobb, citrus nematode, was reported for the first time from Arizona in two grapefruit orchards in Maricopa County, apparently not having seriously affected the trees. (Streets)

Recent literature

1. Fawcett, H. S., and H. A. Lee. Citrus diseases and their control. New York, McGraw-Hill Book Co., Inc. 1926.
2. Fulton, H. R. Relative susceptibility of citrus varieties to attack by Gloeosporium limetticolum Clausen. Citrus Ind. 7 (8): 13, 17, 24-25. Aug. 1926.
3. Harland, S. C. Withertip disease of limes. Suggestions for its control. Trop. Agriculture 3: 74-75. Apr. 1926.

NON-PARASITIC DISEASES AND INJURIES

Blight or wilt, caused by deficient or irregular water supply, Florida - Most prevalent in thirsty soils, very deficient in organic matter, especially in the older groves on rough lemon root stock. The addition of organic matter to the soil seems to be the most promising line of treatment (Winston). In certain of the heavier soil types with normally high water table injury from drought was very serious in May. Some young groves showed 50 per cent of the trees completely defoliated and there has been excessive drop of fruit from mature citrus trees (Kuntz). Wilt continues to be of considerable importance in the groves of certain localities, but causes slight loss for the state as a whole (Rhoads). Porto Rico - A few reports have been received. (Cook)

Spray injury, Florida - Bordeaux-oil burn caused moderate loss, grapefruit being most susceptible and oranges and tangerines somewhat less so. There was no definite correlation between weather conditions and this injury. A large excess of lime in the Bordeaux tends to reduce injury. The degree of injury does not vary with the several types of emulsifier. Calcium caseinate added to the Bordeaux-oil reduces the injury but does not eliminate it. Refined white oils are about as risky as red oils (Winston). Porto Rico - In varying degrees depending on workmanship, usually slight. (Cook)

Recent literature

1. Bartholomew, E. T. Internal decline of lemons. III. Water deficit in lemon fruits caused by excessive evaporation. Amer. Jour. Bot. 13: 102-117. 1926.
2. _____ and W. J. Robbins. Internal decline (endoxerosis) of lemons. IV. The carbohydrates in the peel of healthy and endoxerotic fruits. Amer. Jour. Bot. 13: 342-354. 1926.
3. Braunton, E. June drop of oranges. California Cult. 67: 56. July 17, 1926.
4. Rhoads, A. S. Investigations on citrus "blight", wilt or leaf curl in Florida. (Abstract) Phytopath. 17: 58-59. Jan. 1927.
5. _____ Progress report on citrus blight investigations. Proc. Florida State Hort. Soc. 39 (1926): 143-146. 1926.
6. Surr, G. J., and L. D. Batchelor. Citrus culture in central California. California Agr. Exp. Sta. Bul. 405: 1-23. Aug. 1926. June drop: p. 20-21.

DISEASES OF UNKNOWN CAUSATION

Die-back and ammoniation, cause unknown, is on the wane in Florida due to more judicious use of fertilizers, less cultivation, and the prompt use of blue-stone as a soil application whenever die-back symptoms appear. Old seedling orange trees are most likely to show symptoms on the fruit while grapefruit shows the symptoms most usually on the vegetative parts (Winston). There was slight damage in scattered localities in California. (Fawcett)

False melanose or greasy spot, cause unknown, Porto Rico.

Gummosis, cause unknown, Florida - Less prevalent now than several years ago. Lemons and seedling oranges are most susceptible. The usual treatments are of questionable value. Possibly gummosis may be induced or aggravated by cold injury. (Winston)

Citrus Fruits to Avocado

Mottle leaf or foliocollosis, cause unknown, is a disease of major importance in California but is probably gradually growing less because of better general management of orchards (Fawcett). Common and occasionally serious in Porto Rico. (Cook)

Nail head rust or scaly bark, cause unknown, Florida - Is on the decrease and seems to disappear in any particular grove as soon as it begins to receive ordinary spraying and care (Winston). Affects chiefly the sweet orange, and is of importance only in certain localities throughout the citrus belt (Rhoads). Arizona - A slight amount on a few trees in one locality. (Streets)

Psorosis, cause unknown, is less prevalent in Florida than some years ago. It is most prevalent in droughty locations. No treatment now in use gives satisfactory results (Winston). Tangerines are especially susceptible (Rhoads). In California it is very important and generally distributed on trees 8 to 10 years of age. Lemon is immune, grapefruit and tangerine are susceptible, and sweet orange varieties are very susceptible. (Fawcett)

Recent literature

1. Carne, W. M. Exanthema. (A die-back of orange trees.) Jour. Dept. Agr. Western Australia II, 3: 59-62. 1926.
2. Doidge, Ethel M. Scaly bark (psorosis) of citrus trees. Jour. Dept. Agr. South Africa 12: 61-67. 1926.

A V O C A D O

Cephaleuros virescens Kunze, algal leaf spot. Porto Rico.

Colletotrichum gloeosporioides Penz. caused rot of mature fruits, especially of the Fuerte variety, in Florida (Fulton). In Porto Rico it was severe on some seedling trees and of little importance on others. (Cook)

Diplodia sp., stem disease, was reported from Porto Rico as killing twigs and seedlings, being most severe on seedlings grown in heavily manured soils. (Cook)

Pestalozzia sp., blight, Texas.

Pestalozzia guepini Desm. was reported to kill twigs and seedlings in Porto Rico, being most severe on seedlings that had been grown in heavily manured soils. (Cook)

Phyllachora gratissima Rehmy, tar spot. Porto Rico.

Pythiacystis citrophthora E. H. & R. E. Sm., bark disease. California.

Rhizopus sp. Most active and serious rot of ripe avocado fruit in California. (Horne)

Sphaceloma sp., scab, was general in Florida causing serious leaf spotting and fruit blemish. (Fulton)

Recent literature

1. Horne, W. T. Avocado fruit decays. Ann. Rep. California Avocado Assoc. 1925-26: 96-99. 1926.

Avocado to Banana

2. Smith, C. O. Blast of avocados - a bacterial disease. Ann. Rep. California Avocado Assoc. 1925-26: 72-74. 1926.
3. _____ Blast of avocados - a bacterial disease. California Citrogr. 11: 163. Mar. 1926.
4. _____ Similarity of bacterial diseases of avocado, lilac, and citrus in California. Phytopath. 16: 235-236. 1926.

M A N G O

Colletotrichum gloeosporioides Penz., canker and fruit rot, was reported as common in Porto Rico and very severe in some cases (Cook). The same fungus was reported as causing blossom blight during moist weather throughout the island, and as producing serious withertip in one locality. (Nolla)

Diplodia sp., withertip. Porto Rico.

Meliola mangierae Earle, sooty mold. Porto Rico.

O L I V E

Bacterium savastanoi EFS., knot or tubercle disease. California. (C. O. Smith)

Monkey face, probably physiological, was less severe in California than during the preceding year, causing moderate loss. It is generally distributed on the Barouni variety. There is distortion of the blossom end with development of corky tissue in the flesh, correlated with degeneration of the embryo. (Rawlins)

Soft nose, probably physiological, was less severe in California than during preceding year, causing moderate loss. It is generally distributed, but confined to the Sevillano variety. It develops after fruit begins to color. Young trees, heavily pruned, and heavily irrigated trees appear to produce most affected fruit. The fruit is soft at the end, shrivels and spoils. (Rawlins)

B A N A N A

Fusarium cubense EFS., wilt, was very destructive throughout Porto Rico. (Cook)

Gloeosporium musarum Cke. & Massee, fruit rot, was very common but not important on over-ripe fruit in Porto Rico. (Cook)

P A P A Y A

Glomerella cingulata (Ston.) Spauld. & Schrenk, fruit rot, occasionally severe in Porto Rico. (Cook)

Pucciniopsis caricae Earle, leaf spot. Porto Rico. Florida.

G U A V A

Clitocybe monadelphæ (Morg.) Sacc., root rot, observed occasionally in Florida. (Rhoads)

Glomerella cingulata (Ston.) Spauld. & Schrenk, fruit rot, was common and severe in Porto Rico. (Cook)

D A T E

Graphiola phoenicis (Moug.) Poit., rust. Porto Rico. Texas.

F E I J O A

Botrytis cinerea, Botrytis rot, apparently the most serious rot of this fruit in California. (Horne)

Penicillium expansum Link, rot, was reported as abundant on ripening fruit in California. (Horne)

F I G

Caconema radicum (Greef) Cobb, root knot. Texas.

Cercospora spp., leaf spot. Prevalent but unimportant in Texas.

Colletotrichum sp., anthracnose. Texas.

Corticium salmonicolor Berk. & Br. Slightly important in Florida.

Macrophoma fici Alm. & Cam., canker. Loss a trace in Texas.

Ozonium omnivorum Shear, root rot. Arizona and Texas. Loss 2 per cent in black lands of Texas.

Rhizoctonia microsclerotia Matz., leaf blight. Mississippi. Florida.

Sclerotinia sp., foot rot. Texas.

Corotellium fici (Cast.) Arth., rust. In Texas unimportant in sprayed orchards but in unsprayed orchards the loss often 100 per cent.

Premature dropping (physiological). Prevalent, with loss of 0.5 per cent in Texas.

Fig to Pecan

Souring of fruit (cause unknown). Reported from Texas where Taubenhaus reports the loss to be 30 per cent. He states that the disease is associated with fruit punctures made by the cotton leaf moth. Caldis (1) and Smith (2) discuss the relation of certain insects, acting as carriers of a yeast, to infection of fig fruits.

Recent literature

1. Caldis, P. D. Souring and internal rot of the fig. Pacific Rural Press 111: 500. Apr. 17, 1926.
2. Smith, R. Fig diseases and their control. Pacific Rural Press 112: 573. Nov. 20, 1926.

P O M E G R A N A T E

Cercospora lythracearum Heald & Wolf, leaf spot. Reported for the first time in Alabama.

D I S E A S E S O F N U T SP E C A NSCAB CAUSED BY FUSICLADIUM EFFUSUM WINT.

The situation with regard to pecan scab is well summarized in a report of J. B. Domaree to the Plant Disease Survey.

"The prevalence of pecan diseases during the season of 1926 as observed in several places in southeastern United States was not greatly different from that of previous years. Scab caused by Fusicladium effusum Wint., however, is undoubtedly gradually increasing in importance. While at one time the disease in an epiphytotic form was confined to one or two varieties, the causative fungus is now capable of seriously attacking several varieties of the host. There is evidence that this process of adaptation is still going on. During the earlier days of the pecan industry (20 or 25 years ago) the Delmas and Georgia and some Texas varieties were the only ones that seemed to be susceptible. Later, other varieties, such as Van Daman, Alley, Schley, and Pabst were added to the susceptible list. The fungus now seems to be adapting itself to other varieties once thought

Pecan

to be quite resistant. Of the formerly considered resistant varieties Moneymaker was found to be susceptible at Jeanerette and Whileville, Louisiana, and Selma, Alabama. Scab infected nuts of the Stuart variety were collected this season by Wedgworth in Mississippi, and Boyd at Thomasville, Georgia. The fungus has been attacking the variety Frotscher slightly in south Georgia and north Florida for the past four or five years and some loss of the variety occurred in south Georgia and Louisiana this season. Pecan scab caused a total loss of the Schley, Pabst, Delmas, Georgia, and Alley varieties in several thickly planted areas of north Florida, and the south portions of Georgia, Alabama, Mississippi, and Louisiana this season. Control measures under the direction of the U. S. Department of Agriculture are keeping pace with the gradual extension of the disease. Two to four applications of Bordeaux mixture applied during May, June, and July, if supplemented with orchard sanitary measures, will effectively control pecan scab. Four to six applications of monohydrate copper-lime dust controlled the disease very satisfactorily on the Schley and Alley varieties in south Georgia this season. Fighting the disease with dust is meeting with considerable favor and as a result of experiments conducted this past year extensive commercial dusting will be practiced next season."

Recent literature

1. Anderson, H. W. Diseases of nut crops in the northern United States. Rep. North. Nut Grow. Assoc. 16 (1925): 38-45. 1926.
2. Blackmon, G. H. Preliminary report from the Florida Agricultural Experiment Station on pecan investigations. Proc. Georgia-Florida Pecan Grow. Assoc. 20: 40-44. 1926.
3. Boyd, O. C. Report on the experiment of 1925 for pecan scab control at Baconton, Georgia. (Abstract) Phytopath. 16: 644-645. Sept. 1926.
4. Demarce, J. B. Recent developments regarding pecan diseases. Proc. Georgia-Florida Pecan Grow. Assoc. 20: 62-65. 1926.
5. _____ The pecan scab fungus. (Abstract) Phytopath. 16: 642-643. Sept. 1926.
6. _____ and J. R. Cole. Commercial control of pecan scab. U. S. Dept. Agr. Dept. Circ. 386: 1-8. June 1926.
7. Nolen, R. E. Pecan scab. Florida Agr. Exp. Sta. Bul. 181: 251-276. May 1926.

OTHER DISEASES

Bacterium tumefaciens EPS. & Towns., crown gall. Texas.

Cercospora fusca (Heald & Wolf) Rand, brown leaf spot. Reported from North Carolina; southern Georgia - loss a trace; and Texas - loss 0.5 per cent. J. B. Demaree, of the Office of Fruit Disease Investigations, in a report to the Plant Disease Survey states, "The *Cercospora* leaf spot makes its appearance about midsummer. It becomes quite plentiful during the latter part of the season and is found in most orchards. It is not considered important in thrifty trees. In prevalence it was not noticeably different this season than in former years."

Microsphaera alni (Wallr.) Wint., powdery mildew. Very prevalent in Texas causing premature shedding of fruit. Loss 5 per cent (Taubenhaus). Loss a trace in southern Georgia. Usually common on isolated or city trees; also common on Mobile, Success, and Pabst varieties. (Boyd)

Ozonium omnivorum Shear, root rot. Texas.

Phyllosticta caryae Pk., nursery leaf blight, was less prevalent during 1926 than it has been for several years. Very few nurserymen considered it sufficiently serious this season to employ any control measures. During favorable seasons the disease is serious in nurseries (Demaree). Reported from Texas by Taubenhaus.

Kernel spot (insect puncture). Reported from Georgia and Arkansas. According to Boyd, the loss in southern Georgia was estimated at about 3 per cent, there being a 50 per cent loss in some plantings.

Black pit (undet.) Reported from South Carolina and Georgia. Boyd estimates the loss in southern Georgia at 3 per cent. He states that the Schley and Frottscher varieties suffered most in 1926, especially in the southern part of the state. Some trees lost 5 to 25 per cent of their crop.

Little leaf. In a report to the Plant Disease Survey, Demaree makes the following observation:

"The known distribution of little leaf of pecans is from Savannah, Georgia, south to Miami, Florida, and west to Biloxi, Mississippi. Recently the writer found the disease present on trees near an old plantation homestead eight miles from Charleston, South Carolina. Dr. S. G. Lehman showed the writer specimens of typical little leaf that he had collected in an orchard near Raleigh, North Carolina. Heretofore, little leaf had only been found on trees that had been planted in fertile garden soils within city limits. The Raleigh specimen is the only one known by the writer to have been collected from trees growing under orchard conditions." (See also Demaree (2))

Rosette (undet.) Reported from South Carolina, Georgia, Texas, and Arizona. A loss of 10 per cent was reported for southern Georgia by Boyd. Demaree in his report to the Plant Disease Survey states:

"A smaller percentage of pecan trees are affected with rosette now than ten years ago. McMurran reported in 1919 (U. S. Dept. Agr. Bul. 756) that 10 to 20 per cent of the pecan trees planted in orchards in southeastern United States were affected with this disease. The smaller percentage of rosetted trees now present may be attributed

to several factors, as follows -- better care of orchards, judicious use of fertilizers, the general practice of plowing under leguminous cover crops, and greater discrimination in the selection of new orchard sites. During the pioneer days of the pecan industry many orchards were planted on impoverished cotton lands, deep sandy lands or eroded hillsides. Such soils as a rule develop rosetted trees. The selections of such undesirable soils for orchard sites are now very generally avoided, consequently a smaller percentage of rosette affected trees develop in the younger orchards." (See also Skinner and Demaree (4))

Recent literature

1. Adair, H. S. Black pit of pecan. Amer. Nut Jour. 26: 6, 7. Jan. 1927.
2. Demaree, J. B. Little leaf disease of Pecans. Phytopath. 16: 277-283. 1926.
3. _____ Recent developments regarding pecan diseases. Proc. Georgia-Florida Pecan Grow. Assoc. 20: 62-65. 1926.
4. Skinner, J. J., and J. B. Demaree. Relation of soil conditions and orchard management to the rosette of pecan trees. U. S. Dept. Agr. Bul. 1378: 1-16. 1926.

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

Bacterium juglandis (Pierce) EFS., bacterial blight. Reported from Delaware, Washington, Oregon, and California. California - Epidemic, loss about 60 per cent. The reason for the epidemic is not clear, since both temperature and rainfall were normal. The Franquette and Eureka varieties were resistant, while Payne, Placentia, Chase, Concord, and others were susceptible. Although generally considered to be resistant the Eureka variety in 1926 showed a loss of 30 per cent and the Mayette a loss of 50 per cent (Rudolph). Oregon - Experience shows that even our most favored commercial variety, the Franquette, often suffers severe losses. It is estimated that in 1925 and in 1926 at least half the crop that set on the trees was attacked by blight. These two years are probably for Oregon about the worst years on record. (Barss (1))

Gnomonia leptostyla (Fr.) Ces. & DeNot., anthracnose. In Delaware, according to Adams, anthracnose was very severe on the black walnut and butternut, causing defoliation. English walnuts also showed infection but there was no defoliation. The disease was reported also from Connecticut and Missouri.

Walnut to Coconut

Recent literature

1. Barss, H. P. Bacterial blight of the walnuts. Oregon Agr. Coll. Exten. Serv. Circ. (mim.) 229: 1-4. Dec. 1926.
2. Gard, M. Le pourridie du noyer. Traitements et mesures preventifs. Rev. Vitic. 64: 188-191. 1926.

A L M O N D

Cladosporium carpophilum Thuem., scab. Reported for the first time in Connecticut by Clinton.

Coryneum beijerinckii Oud., blight. Loss 4 per cent in California, according to Milbrath.

Sclerotinia fructicola (Wint.) Rehm, brown rot. Loss estimated as 30 per cent in Stanislaus County, California. There was much rain during and following the blooming period and mild temperatures prevailed during the time of infection. The Jordan, Texas, and Languedoc varieties were considered to be resistant but the I.X.L., Non Pareil, and especially the Drake and No Plus Ultra were susceptible. (Rudolph)

F I L B E R T

Bacterium sp., blight. General in Oregon and causing large losses in some nurseries and in some young plantings.

Phyllactinia corylea (Pers.) Karst., powdery mildew. Present in Washington

Recent literature

1. Barss, H. P. Bacterial blight of filbert. Oregon Agr. Coll. Exten. Serv. Circ. (mim.) 230: 1-6. Dec. 1926.

C O C O N U T

Colletotrichum sp., anthracnose. Florida - Quite commonly found in nurseries on young plants and apparently of some importance. (Seal)

Diplodia sp., leaf spot. Florida - Not uncommon in the nurseries in the southeastern section of the state. Of little importance. (Seal)

Pestalozzia sp., leaf spot. Florida - General in the southeastern part of the state. Of little importance. (Seal)

Phytophthora palmivora Butler, bud rot. Porto Rico - The campaign for the extermination of this disease by the destruction of diseased trees has been very successful. (Cook)

Coconut

Phytophthora sp., bud rot. Florida - Generally distributed over the southeastern part of the state. Of major importance. (Seal).

Thielaviopsis paradoxa (DeSeyn.) Hoehn., fruit fall. Rare in Porto Rico. (Cook). Seal reports Thielaviopsis sp. on leaves to be general and of some importance in the southeastern section of Florida.

Recent literature

1. Mendiola, N. B., and G. O. Ocfemia. The work of breeding disease resistant crop plants at the College of Agriculture at Los Banos. Philippine Agr. 15: 117-128. Aug. 1926.
2. Sharples, A. Diseases of coconut palms. Malayan Agr. Jour. 14: 65-73; 91-95. Mar. 1926.
3. Teodoro, N. G. Coconut diseases and their control. Philippine Agr. Rev. 18: 585-592. 1925.
4. Tucker, C. M. Phytophthora bud rot of coconut palms in Porto Rico. Jour. Agr. Res. 32: 471-498. 1926.
5. Walters, E. A. Report of the Agricultural Department, St. Lucia 1924: 1-30. 1926.