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Diseases of Fruit and Nut Crops in the United States in 1923

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DISEASES OF FRUIT AND NUT CROPS IN THE UNITED STATES IN 1923

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Introduction

The present summary on the diseases of fruits and nut crops in the United States for 1923 is based upon the records supplied by the numerous collaborators working in the several states and upon the recent publications on the diseases of these crops. It cannot be considered as being inclusive for reasons which appear later in this introduction. Nearly half of the information available for preparing this summary had to do with the diseases of the apple. This does not mean that the apple crop is of any such relative importance when compared with all other fruit and nut crops but rather that the apple is more widely grown than any other crop coming within the scope of this summary, and further that it is of sufficient importance in practically every part of the United States to engage the interest of observers as well as investigators. From the standpoint of the monetary value of these other crops it seems unfortunate that more information is not available regarding their diseases, which, in most cases, are of great importance in the production of quality fruit. Another reason why crops other than the apple are not given more consideration in this summary is because a considerable number of these crops are grown in regions where the Plant Disease Survey Collaborators are generally inactive in sending in reports on the conditions in their territory. Practically all of the reports in 1923 came from the eastern half of the United States while only a few scattering reports came from the remainder of the country. From the great fruit producing state of California a very meager amount of information was available. The Plant Disease Survey can never hope to carry out its purposes in a fully creditable way until full cooperation from the collaborators in each state is secured.

The Disease Situation in General

A few general remarks may be made regarding the fruit disease situation in 1923. Of the important apple diseases, scab, blotch, cedar rust, and frog-eye were of less importance than in 1922, chiefly for the reason that infection in the case of each of these diseases takes place early in the season and is dependent at that time upon rainfall to a great extent. With a few exceptional areas the rainfall was deficient at the critical period for infection. A study of the departure from the normal rainfall for April to June as shown in the following table indicates a general relationship between the areas where rainfall was deficient and where fungous diseases like scab, cedar rust, etc, were of lesser importance.

Bitter rot and fire blight were both more serious than in 1922. The former develops late in the season and was favored by the late rainfalls in the important bitter rot areas, and the latter is dependent upon quite a different set of conditions than those affecting the fungous diseases, even though primary infection takes place during the blossoming period. It is interesting to note that fire blight was probably near the crest of the high wave of this disease in 1923. It should be watched closely in 1924 to determine whether it will subside or not.

In the case of peach diseases the same general situation existed. Brown rot and scab were of less importance than in 1922 apparently because

of conditions similar to those affecting scab and similar diseases of the apple. On the other hand leaf curl was more severe in most sections owing to the prevalence of rain during the very early spring, and the consequent difficulty of getting spray rigs into the orchards.

Frost injury to fruit trees was severe in 1923 but probably of less general importance than in 1922.

New or Noteworthy diseases of 1923 (See general part of report for more specific data).

Apple - An infectious mosaic-like disease of apple was found in New York. Silver leaf caused by Stereum purpureum was reported in Washington.

Pear - Sooty blotch caused by Phyllachora pomigena was reported for the first time from Illinois.

Peach - Powdery mildew caused by Sphaerotheca pannosa was reported for the first time from Illinois.
Bud rot caused by Fusarium gemmiperda was reported from Georgia by Roberts.

Cherry - A canker on Montmorency cherry, following winter-injury to twigs, caused by Phomopsis padina (Sacc.) Died. was reported from Red Creek, New York.

Apricot - Black heart, caused by Verticillium sp. was reported from California.

Grape - Rust caused by Physopella vitis was reported as found in California for the first time.

Currant - Leaf spot caused by Cercospora angulata, Kansas.

Gooseberry - Powdery mildew caused Sphaerotheca mors-uvae, Colorado.
Leaf spot caused by Septoria ribis, Kansas.
Cane blight, caused by Leptosphaeria coniothyrium, Missouri.
Rosette, cause undetermined, Delaware.

Lemon - Brown rot caused by Pythiacystis citrophthora from a greenhouse in New Jersey.

Suggestions regarding special needs of the Survey

The greatest need is for more complete returns on plant diseases, especially from the western half of the United States. More complete data are also needed from all states regarding losses, with explanatory notes, especially when such losses are phenomenally high; more data on frost and drouth injury; more data from most states on the relative resistance of crop plants to disease. Attention is called to the information presented regarding the reaction of varietal groups of apple to cedar rust. Similar compilations should be made for several diseases.

1923

Table 1. Departure from the normal temperature and rainfall by states - April to September, (Figures taken from United States Department of Agriculture Monthly Weather Review 10: 1923.)

State	Departure from normal											
	Temperature (°F)						Precipitation (inches)					
	April	May	June	July	August	September	April	May	June	July	August	September
New Eng.	-0.2	-1.0	+1.4	-2.6	-1.5	+1.9	+1.97	-1.58	-0.41	-0.58	-1.64	-1.20
N. Y.	-1.0	-2.8	+1.7	-2.1	-1.7	+0.8	-0.40	-0.88	+0.03	-1.17	-1.69	+0.13
N. J.	+0.5	-1.3	+3.8	-1.9	-1.2	+1.3	-0.10	-2.08	-1.70	-0.68	-2.30	+0.18
Pa.	-0.4	-1.7	+3.3	-1.0	-0.8	+1.2	-0.57	-0.37	-1.76	-0.09	-1.41	+0.32
Del.-Md	-0.8	-1.7	+3.1	-1.3	-0.6	+1.2	+0.82	-1.70	-1.11	+0.27	-1.34	+0.31
Va.	-0.5	-2.1	+2.7	-1.1	-0.5	+0.8	+0.23	-2.00	-1.69	+0.58	+0.44	+0.80
N. C.	-0.5	-2.0	+1.6	-0.5	+0.7	+1.7	+0.61	+0.20	-2.72	-0.63	-1.12	+0.16
S. C.	-0.9	-3.1	-0.4	-0.8	+0.5	+1.2	+0.50	+2.78	-2.52	-1.44	+1.35	-1.15
Ga.	+0.3	-2.9	-1.6	-1.3	+0.4	+1.5	+0.36	+5.40	+0.60	-1.37	+0.11	-1.70
Fla.	+1.8	-1.6	-0.7	-0.7	0.0	+0.4	-0.37	+5.35	+2.36	-0.19	-0.56	-1.89
Ala	+0.2	-2.0	-1.1	-1.4	-0.6	+1.1	+1.45	+4.54	-0.18	-0.59	+1.56	-2.17
Miss.	+0.1	-1.6	-0.9	-1.4	-0.2	+0.4	+3.12	+4.63	+0.99	+0.55	+1.07	-1.19
La.	+1.0	-1.3	-0.6	-1.4	0.0	+0.1	+1.52	+3.67	+1.68	+0.56	+0.36	+1.24
Texas	+0.1	+1.0	+0.8	+0.6	+1.2	+0.8	+0.94	-1.71	-0.23	-1.06	-0.29	+1.79
Tenn.	-0.9	-2.1	-0.2	-0.3	+0.1	+0.4	+0.55	+2.34	-0.19	-0.68	+2.06	-0.36
Ky.	-1.1	-1.7	+0.1	+0.1	-0.3	-0.2	+0.94	+0.03	+0.41	-0.71	+2.47	+0.11
W. Va.	-1.2	-2.2	+1.3	-1.2	-0.7	+0.8	-0.10	-1.30	+0.27	+0.12	+0.52	+0.40
Ohio	-1.4	-2.4	+1.9	-0.8	-1.1	+0.3	-0.58	+0.04	-0.50	+0.35	+0.83	+0.62
Ind.	-2.7	-1.4	+1.0	-0.2	-0.5	+0.3	-1.00	+1.03	-0.39	+0.06	+1.55	+0.40
Ill.	-0.6	-1.8	+1.7	+1.2	-0.1	-0.4	-1.02	+0.10	-0.35	-1.37	+1.57	+0.47
Mich.	-2.2	-1.3	+3.5	+0.2	-1.9	+0.2	-0.45	-0.29	-0.50	+0.25	-0.18	+0.24
Wis.	-2.3	+0.1	+4.0	+2.0	-1.7	+0.2	-0.27	-1.91	+0.64	-0.53	-0.42	-0.28
Minn.	-2.2	+1.2	+3.9	+3.6	-1.9	+2.4	-0.29	-1.40	+0.58	-0.77	-0.84	-0.49
Iowa	-0.3	-0.9	+1.8	+2.4	-1.2	+0.8	-0.77	-1.73	+0.55	-2.21	+1.74	+2.43
Mo.	-0.6	-1.9	+0.2	+0.7	+1.3	+0.3	-0.74	-0.49	+1.02	-0.89	+0.31	+0.86

State	Departure from normal											
	Temperature (°F)						Precipitation (inches)					
	April	May	June	July	August	September	April	May	June	July	August	September
Ark.	+0.2	-2.0	-0.1	0.0	+2.5	-0.9	+1.52	+3.12	+1.12	-0.39	-1.40	+2.23
N. D.	-3.0	+1.5	+3.3	+3.7	-2.4	+3.7	+0.07	-0.78	+0.32	+0.53	+0.38	+0.75
S. D.	-0.9	+0.6	+1.7	+3.6	-1.8	+1.8	-0.17	-0.67	+1.20	+0.15	+0.82	+1.37
Nebr.	-0.7	-1.6	0.0	+1.9	-1.8	+0.4	+0.02	+1.37	+0.92	-0.59	+1.95	+1.56
Kans.	+0.7	-2.0	-0.1	+0.3	+0.8	+0.1	-0.15	+1.96	+2.15	-0.31	-0.65	+1.40
Okla.	+0.5	-0.7	+0.7	+2.3	+3.0	+0.2	+0.84	+1.58	+0.87	-1.82	-1.55	+4.21
Mont.	-0.6	+0.5	-0.2	+3.5	-0.7	+2.1	+0.01	-0.22	+1.29	+0.75	+0.50	+0.02
Wyo.	-1.9	+1.1	-0.6	+2.7	-0.9	+0.1	+0.09	-0.01	+0.51	+1.06	+0.55	+2.17
Colo.	-0.7	+0.2	-0.8	+1.1	-1.5	-2.1	-0.58	+0.36	+0.85	+0.85	+1.38	+0.27
N. Mex.	+0.1	+0.9	+0.2	+0.8	-0.9	-1.8	+0.13	-0.53	+0.02	-0.70	+1.73	+0.29
Ariz.	-1.0	+2.7	-3.2	-0.2	-1.7	-2.8	-0.10	-0.11	-0.31	+0.28	+0.59	+0.39
Utah	-1.9	+1.6	-3.4	+1.6	-1.3	-0.9	+0.80	-0.08	-0.08	+0.23	+0.20	-0.08
Nev.	-1.3	+1.4	-5.1	+1.1	-1.5	+0.6	+0.42	+0.21	+0.79	+0.09	+0.14	+0.48
Idaho	-1.0	+0.4	-2.1	+2.0	-0.2	+2.6	+0.56	+0.11	+1.40	+0.19	+0.21	-0.33
Wash.	+1.3	+0.4	-0.3	+1.4	+1.9	+2.6	-0.54	-0.19	+0.48	+0.46	+0.35	-0.69
Oreg.	+0.7	+0.8	-1.1	+0.9	+1.5	+2.7	-0.08	-0.07	+0.47	+0.59	-0.07	-0.54
Cal.	-2.4	+0.1	-5.4	-1.8	-1.4	+2.0	+2.38	-0.74	+0.29	-0.03	+0.03	+0.67

DISEASES OF POME FRUITS

APPLE

Scab caused by Venturia inaequalis (Cke.) Wint.

Geographical distribution

Apple scab was widely distributed as usual, being reported from all of the principal apple producing areas. The severe infection of 1921 and 1922 led plant pathologists to predict another epiphytotic for 1923, but the reports from a majority of the states do not indicate any increase in scab except in very restricted areas such as southern Delaware and possibly southern Ohio. Kansas and Idaho report scab as being about as prevalent as in 1922. Maine, New Hampshire, Connecticut, Pennsylvania, Kentucky, Indiana and Washington report the disease as being of average prevalence. All the remaining states sending reports indicate scab as being of less importance than usual. Summing up the situation it may be said that apple scab in 1923 was generally less severe than usual and that where timely applications of fungicides were made there was little difficulty in securing excellent control.

Economic importance of and losses from apple scab.

Revised estimates of damage in percentages and bushels will be given in a later supplement.

Table 2: Losses caused by apple scab in 1923 as estimated by state collaborators.

Percentage reduction in yield	State
8	North Carolina
7	Iowa
6	Ohio
5	Vermont, New York
4	Indiana, Alabama
3.5	Illinois
3	Connecticut, Delaware, Virginia Minnesota
2	Wisconsin
1.5	Kansas
1	New Hampshire, Massachusetts, West Virginia, South Carolina, Michigan, North Dakota
0.5	Arkansas, Idaho

APPLE - Scab (ascospore discharge)

Ascospore discharge

Studies on ascospore discharge were carried out in several states. The following (table 3) shows the dates of ascospore discharge as reported by various collaborators, together with the dates of bud development, so far as such data are given in the reports:

Table 3 Ascospore discharge in 1923

Place	Duration of period	Optimum periods for ascospore discharge
Seaford, Del.	Mar. 28-May 29	April 4, 14-17, May 8
Woodside, Del.	Apr. 15-May 21	Apr. 15,28, May 9,13,21
Littleton, Mass.	May 1 -June 14	May 12, 21.
Wayne Co., N. Y.	Apr. 30-June 26	May 18-19, June 3-8
Genesee Co., N. Y.	----------	May 18-19, June 3-4
Adams Co., Pa.	Apr. 14-June 21	Apr. 24
Winchester, Va.	Apr. 28-July 30	May 11, 15, 20, June 11
Columbus, Ohio	Apr. 4 -June 8	May 8-21

Table 4 Dates of apple bud development 1923

Place	Delayed Dormant	Prepink*	Pink*	Petal Fall*
Seaford, Del.	Mar. 30 (Stayman)	Apr. 5-11: (Two var)	Apr. 10, 16 (Two var.)	Apr.30,May 5,6 (Three var.)
Woodside, Del.	Apr. 5	----------	Apr. 16	Apr.30,May 5
Littleton, Mass.	Apr. 30	May 7-10	----------	May 21-24
Wayne Co. N. Y.	Apr.30- May 2	May 12	May 21	May 25
Genesee Co. N. Y.	Apr. 30	May 4	May 17	June 4
Adams Co., Pa.	Apr. 18 - 19	Apr 25-26:	Apr.30-May 2:	May 11-12
Winchester, Va.	Apr. 1 - 4	----------	Apr 23 - 25	May 5-8
Columbus, Ohio	Middle Apr.	----------	----------	----------

* Note: The prepink dates were for Early Ripe and Transparent; pink dates for Early Ripe and Stayman; petal-fall dates for Early Ripe, Transparent and Stayman.

J. F. Adams reports that ascospore discharge at Seaford began two days before the date of the delayed dormant application and that very little discharge took place after May 8, which was just following the petal-fall applications. At Woodside, Delaware, the first ascospore expulsion did not occur until April 15, which practically coincided with the time of the pink application.

APPLE - Scab (ascospore discharge)

In general, however, these data show a progressive ascospore expulsion coinciding with geographical seasonal development; the earliest "first discharge date" being at Seaford, Delaware, and the latest "first discharge date" at Littleton, Massachusetts.

"The ascospore discharge period as noted in this table covers a period of over 90 days which I believe is the longest on record anywhere. The lack of rain in May very likely prolonged this discharge period and I am quite positive that this absence of normal rainfall (1923, rainfall 1-1/10 inches--normal rainfall for the 8-year period, 4-1/10 inches), during the past sping was the most important single factor in determining a very light scab epidemic. The check trees in our experimental plats were infected only to the extent of 3% as compared with 100% last year. The initial infection very likely occurred in the period of April 28 to May 15, inclusive. The first scab appearance noted was on May 16 which would indicate that the first ascospore discharge which occurred April 28 was probably the cause of initial infection. Our data for the past few years demonstrates quite clearly that early spring infection is the important factor of scab epidemics. Infection after the 2-week's spray does not amount to very much with us and we feel that we can check most any scab epidemic by timely and proper application of the pink, the calyx, and the 2-week's spray." (Schneiderhan, Virginia)

Stover and Johnson (4) at Columbus, Ohio, and Anderson at Urbana, Illinois, report ascospore discharge two weeks before the period for the delayed dormant. It is evident in general that ascospore discharge in 1923 usually extended over a wider period than that of the dates of the first four or five applications, using the delayed dormant as the first date. From the results at Woodside, Delaware, it is also evident that exceptions may occur and that in some seasons the period of ascospore expulsion is likely to be very short. Probably there are wide differences in the amount of viable perithecial material present in different regions, as Clinton states that in Connecticut the ascospore stage was only moderately abundant and White in Kansas reports few perithecia in the overwintered leaves.

Comparing the data with that presented in Supplement 28 for 1922, (page 277) it is apparent that the correlation of first dates of ascospore discharge are fairly close but that the season for expulsion was in general longer in 1923 than in 1922.

Dates of earliest appearance of infection in 1923

Unfortunately the reports on earliest appearance of the apple scab are not generally accompanied with data concerning the stage of growth of the leaves or the stages of bud development, which would indicate the relative importance of the various sprays. Anderson in Illinois reports that scab appeared in that state on fruit as early as on foliage.

It is apparent that little correlation exists between the earliest dates of ascospore discharge and the appearance of first infection on foliage or fruit as shown by these reports. Collaborators are urged to increase the value of these data by furnishing the necessary supplemental information.

APPLE - Scab

Table 5. Dates of earliest recorded appearance of apple scab in 1923.

Date	Location	Date	Location
May 2	Franklin Co., Pa.	May 20	Central Iowa
" 7	Delaware	" 21	Ramsey Co., Minn.
" 10	Wisconsin	" 22	Columbus, Ohio
" 15	Michigan	" 23	Grafton, Ill.
" 16	Winchester, Va.	" 24	Olney, Ill.
" 16	Duchess Co. N. Y.	" 27	Urbana, Ill.
" 16	Hammonton, N. J.	" 29	Lafayette, Ind.
" 16	Littleton, Mass.	June 4	Greenland, N. H.
" 18	Highwood, Conn.		
" 18	Hollins, Va.		

Weather relations

In the New England states, eastern New York, Pennsylvania, Maryland, Virginia, West Virginia and the Southeast, the weather conditions were generally favorable only for the primary infection and were not such as to interefere in general with the timely application of sprays. In southern Delaware the conditions were very favorable for heavy and continued scab infection, resulting in one of the most severe epiphytotics experienced in that section.

Scab was also severe in portions of western New York, southern Ohio, Kentucky, and parts of Indiana and Illinois. It appears that these scab infections of 1923 were local in distribution and much scattered, corresponding in general with the localized precipitation and temperature recorded for the country from April to midsummer. In many states collaborators reported that the dry weather following the "petal fall," or "two weeks after petal fall" applications, effectively checked secondary infections.

Varietal susceptibility

McIntosh was again reported as being most susceptible in Massachusetts and Connecticut.

Adams reports severe infection on leaves, fruit, pedicels and sepals of Maiden Blush, Winesap, Nero and Paragon in Sussex County, Delaware. Fruit infection was prevalent also on Delicious, York Imperial, Lilly, Stayman, Red Astrachan, Grimes Golden, Gravenstein, Williams Early Red, Rome Beauty and Yellow Transparent. Early Ripe dropped leaves badly from scab in early June.

Hurt from Virginia reports the following comparative scab infection in 33 orchards (14 of Winesap, 12 of Albemarle Pippin, 3 of York Imperial, 3 of Ben Davis and 1 Stayman.)

Table 6. Percentage of scab infection in orchards at Crozet, Virginia. 1923.

Variety	Percentage orchards showing infection	Maximum percentage infection	Average percentage infection.
Winesap	86	2.6	0.7
Pippin	8	t	t
York	33	---?	---?
Ben Davis	100	1.0	0.3
Stayman	--	---	0.5
All varieties	45	2.6	0.9

Gardner in Indiana reports scab as being particularly severe on Delicious, Winter Banana, Ben Davis, Fameuse, Red June, Rome, and Moyer, while York Imperial, Grimes Golden, and Transparent show considerable resistance. Gardner also noted scab on fruit of Mann, Wealthy, Maiden Blush, Rambo, Northern Spy, Winesap, Northwestern Greening, Jonathan and Esopus.

In Wisconsin, Vaughan reports that Dudley showed 90 percent infection while Wealthy, McIntosh, Duchess, Snow, and Lubsk Queen showed only 50 percent under comparable conditions.

In Minnesota the crab varieties and Wealthy are said to be generally infected while the Greening showed some resistance. It should be noted that Wealthy is generally regarded as highly resistant in the East.

Messrs. Kirby and Honey of Cornell report the following cultivated and ornamental crabs as being moderately susceptible to apple scab: - Malus cashmeriana, M. coronaria, M. cordata, M. floribunda, M. platycarpa, M. prunifolia, M. ques, M. scheideckeri and M. soulardi. Those showing a trace of infection are M. flava, M. ioensis, M. transcendens. Bechtel's crab was reported by them as being so susceptible that necrotic areas were produced in the leaf.

The following table presents data on the comparative susceptibility of apple varieties arranged according to the group classification of Hedrick and Howe (New York (Geneva) Agr. Exp. Sta. Bul. 361: 79-135. 1913). A similar list is given for cedar rust and the discussion there (p.64) of the reasons for the varying reports regarding certain varieties (e.g., Ben Davis) or certain groups, will, for the most part, apply here equally well. However, in the case of scab, neither varietal susceptibility nor group susceptibility seems to be as well-marked as with cedar rust. It will be noted, nevertheless, that there is a striking unanimity of opinion regarding the susceptibility of varieties included in some groups, for instance the Fameuse group, number 8, and the Winesap group, number 34.

Table 7. Comparative susceptibility of groups of apple varieties to apple scab.

Group number	Variety	Relative susceptibility and reporter: Very resistant	Resistant	Susceptible	Very susceptible
1 Aport	Alexander		H & H,M		
	Bietigheimer	Sy			
	McMahon			(Vn)	
	Wolf River	Sy		M	

APPLE - Scab (varietal susceptibility)

Group number and name	Variety	Relative susceptibility and reporter: Very resistant	Resistant	Susceptible	Very susceptible
2 Baldwin	Babbit		Sy		
	Baldwin	Sy, (Cl), (Ch), (Bu)	M	(O)	
	Sutton		Sy, H&H		
3 Ben Davis	Beach			(V&M)	
	Ben Davis	Sy	H&H	M	(F), (P), (M), (O), (Gs), (An)
	Collins				(H)
Gano		Sy	M, H&H		(F), (C)
4 Black Gilliflower	Black Gilliflower		H&H		
5 Blue Pearmain	Baxter		H&H		
	Blue Pearmain				M
	White Pearmain				M
	Windsor	(Vn)			
6 Chenango	Chenango			H&H	
7 Early Harvest	Early Harvest				M, Sy
8 Fameuse	Fameuse				H&H, (Ga), (J.) (L), M, (Os), (P) (Vn)
	McIntosh				H&H, M, (B), (Ch), (Cl), (An), (Mo), (Os), Sy, (Th)
	St. Lawrence				H&H
	Shiawassee				M
10 Jonathan	Esopus			M, H&H	
	Jonathan		Sy, H&H (Vn)	M, (P), (O), (H)	
	King David		Sy		
	Mother			H&H	
	Red Canada			M, Sy, H&H	
12 Lady	Lady			H&H, D	
13 Lawver	Akin			M	
	Lawver			D	H&H, M, (F) (Gs)

APPLE - Scab (varietal susceptibility)

Group number and name	Variety	Relative susceptibility and reporter: Very resistant	Resistant	Susceptible	Very susceptible
14 Limbertwig	Limbertwig				D
16 Livland Raspberry	Livland Raspberry		M		
18 Northern Spy	Northern Spy			M, H&H	Sy
	Wagener	M	Sy, H&H		
19 Oldenburg	Oldenburg (Duchess)	M, (P), (Ch)	Sy, H&H	(T)	
	Pewaukee			M	
19a Gravenstein	Gravenstein		M, H&H	Sy, (Cl)	
20 Ralls	Ingram		Sy		
	Ralls				Sy
	Salome		Sy	(Ga)	
21 Rambo	Domine				D
	Rambo				Sy
22 Red Astrachan	Red Astrachan		H&H, (Cl)	M	Sy, D
23 - Reinette; 23a Fall Pippin	Banana			Sy, (O)	
	Boiken	Sy			
	Fall Pippin			H&H, (Cl)	
	Golden Pippin			H&H	
	Greenville		Sy		
	Hawley			H&H	
	Lowell		Sy		
	Maiden Blush		(E), (V&M)		
23b Rhode Island Greening	Greening	(St)			
	Monmouth			M	
	Northwestern Greening		M, H&H		Sy
	Patten Greening				(T)
	Rhode Island Greening		Sy	M, H&H	
23c Newtown	Belmont			H&H	Sy
	Green Newtown			H&H	
	Grimes Golden	M(O) (F) (Ga) (H)	Sy, H&H (P) (V&M)		
	Huntsman			H&H	
	(Newtown Pippin)				Sy
	Peck Pleasant				M
	White Pippin			Sy	

APPLE - Scab (varietal susceptibility)

Group number and name	Variety	Relative susceptibility and reporter: Very resistant	Resistant	Susceptible	Very susceptible
23d Swaar	Mann		Sy		
	Swaar		H&H		
24 Romanite	Minkler	Sy	M		
	Romanite			(Rd)	
	Stark			Sy, (O)	
	York Imperial	(N)(O)(F) (Ga)(H)	M	Sy, (V&M)	
25 Rome Beauty	Langford	Sy			
	Rome Beauty		H&H	M	(K)(G)(O) (Gs)(An) (Ga)(Th) Sy
26 Russet	Roxbury Russet	Sy	H&H		
	Russet	(L)(O)			
27 Summer Rambo	Summer Rambo			Sy	
28 Sweet Bough	Sweet Bough	Sy			
29 Tetofsky	Tetofsky		M		
30 Tompkins King	Ensee			Sy	
	Hubbardston	M	Sy, H&H		
	Tompkins King		M, Sy, H&H	(O)(Ch)	
31 Twenty Ounce	Twenty Ounce			H&H	
33 Wealthy	Wealthy	M, Sy	H&H	(P)(Vn)	(T)
34 Winesap	Arkansas				M, Sy
	Arkansas Black			M, D	Sy(N)(Rd)
	Kinnard				D(An)(H)
	Mammoth Black Twig				(H)
	Oliver (Senator)		Sy		(H)
	Paragon				(F)(H)
	Stayman			Sy	(O)(V&M)
	Winesap	(H)(Vn)		D	Sy(N)(R)(O) (Rd)(V&M) (Ga)(H)
35 Yellow Bell-flower	Moyer			(Ga)	
	Ortley			H&H	
	Yellow Bellflower		Sy	M, H&H	

APPLE - Scab (varietal susceptibility)

Group number and name	Variety	Relative susceptibility and reporter: Very resistant	Resistant	Susceptible	Very susceptible
36 Yellow Transparent	Yellow Transparent	(Ga)(H)	M,H&H,(O) (V&M)		Sy

D - G. M. Darrow, U. S. Dept. Agr. Bul. 1189. 1923
H&H - U. P. Hedrick and G. H. Howe, New York (Geneva) Agr. Exp. Sta. Bul. 361: 79-135. 1913.
M - H. E. Morris, Montana Agr. Exp. Sta. Bul. 840. 1914
Sy - A. D. Selby, Ohio Agr. Exp. Sta. Bul. 290. 1915

An - H. W. Anderson, Illinois
B - Charles Brooks, New Hampshire
Bu - O. Butler, New Hampshire
Ch - Charles Chupp, New York
Cl - G. P. Clinton, Connecticut
E - J. A. Elliott, Arkansas
F - H. R. Fulton, North Carolina
G - H. Garman, Kentucky
Ga - M. W. Gardner, Indiana
Gs - N. J. Giddings, West Virginia
H - L. R. Hesler, Tennessee
J - L. R. Jones, Wisconsin
K - F. D. Kern, Indiana
L - B. T. Lutman, Vermont
Mo - W. J. Morse, Maine
N - J. B. S. Norton, Maryland
O - C. R. Orton, Pennsylvania
Os - A. V. Osmun, Massachusetts
P - L. H. Pammel, Iowa
R - H. S. Reed, Virginia
Rd - G. M. Reed, Missouri
St - E. C. Stakman, Minnesota
T - A. G. Tolaas, Minnesota
Th - R. C. Thomas, Ohio
V&M - W. D. Valleau & W. W. Magill, Ky.
Vn - R. E. Vaughan, Wisconsin

() - data from report in Plant Disease Survey files

Control

The important features of the reports on the control of apple scab in 1923 were:

(1) The value of the delayed dormant and pre-pink applications in particular;
(2) The success of the spraying program in general;
(3) The general effectiveness of dusts where scab is not in epiphytotic form.

Massachusetts: Both spraying with lime-sulfur and dusting with sulfur have been successful in experimental orchards. (Osmun) Krout (2) reports that dusting sulfur and copper-lime-arsenate were compared in 1922 and that the results were in favor of the sulfur dust. The most successful results obtained in two years were when a 3-10-50 Bordeaux mixture was substituted for lime-sulfur at time of the delayed dormant.

Connecticut: Good spraying effective. (Clinton)

APPLE - Scab (control)

New York: Spray service was organized for twelve counties with special plant pathological assistants in charge. Special attention was given to bud development, insect development, and weather forecasts in making out the schedule for each spray. In western New York the growers who applied sprays May 18-19 (pink or pre-pink) and June 3-4 (petal fall) had good control. Dusts did not generally show up as well as the sprays. Scab in general appeared to be less severe in the Hudson Valley and spraying was very generally effective there.

Pennsylvania: Scab more severe in western part of state where thorough spraying is not so generally practiced. Pre-pink and pink applications generally most important ones. Excellent control in orchards where full schedule was followed. (Thurston & McCubbin)

Delaware: Apple scab was particularly destructive this season because of serious infection on the stems of the young fruit which caused them to drop. The primary infection of the fruit was the most serious stage of the disease as most growers held the disease in check during the later part of the growing season. (Adams)

Maryland: Infection most severe in lower counties. In three counties it appeared in the twigs. A pre-pink lime-sulfur spray was the determining factor in control of scab in one case at least. (Temple & Jehle.)

Virginia: Stearns and Hough (3) listed Kayso and Magnet Dry Paste added to spray mixtures in comparison with spray mixtures without such additions. Neither of these materials increased the effectiveness of the spray solution in protecting the foliage and fruit from insects and diseases.

Kentucky: In two counties a pre-pink was applied with poor results. (W. W. Magill.)

Alabama: Important only in unsprayed orchards. (Miles.)

Arkansas: Slight in sprayed orchards. (Dept. Plant Pathology.)

Ohio: Excellent control in northern Ohio. Unfavorable weather prevented pink application in southern Ohio, resulting in much loss. (Thomas.)

Liquid lime-sulfur and Bordeaux Mixture gave satisfactory control. Foliage injury occurred where Bordeaux was applied after the bloom. Fair control secured where trees were sprayed with lime-sulfur before bloom and dusted with sulfur after bloom. Lime-sulfur followed by copper-arsenic dust failed to give commercial control. Sulfur dust alone also failed to give satisfactory control. The pink spray was the most important single one for the year. The pre-pink was of practically no value because of weather conditions unfavorable for infection prior to the time of pink spray. (Stover & Johnson (4).

Indiana: Sprays gave good control. Pre-pink necessary. (Gardner.)

Illinois: Easily controlled in eastern and central Illinois, but not in western Illinois. (Anderson.)

Wisconsin: Organized 70 farm orchard spray rings of 8 - 12 growers each, in addition to spraying demonstrations in commercial orchards. Sprays and dusts gave satisfactory control. (Vaughan)

Keitt and Jones (1) report that sepal infection bears a

very important relation to seasonal development and control of apple scab. The sepals may be infected many days prior to the pink spray stage. The sepal infection is also established where the fungus is in a most favorable position for early secondary infection. A well timed pre-pink application has given most satisfactory control.

Kansas: Excellent control in sprayed orchards. (White)

Recent literature:

Cited:

1. Keitt, G. W. and L. K. Jones. Sepal infection in relation to the seasonal development and control of apple scab. (Abstract) Phytopath. 14: 36. Jan. 1924.
2. Krout, W. S. Combating apple scab. Massachusetts Agr. Exp. Sta. Bul. 214: 29-41. 1923.
3. Stearns, L. A. and W. S. Hough. Spreader tests on apples and peaches. Jour. Econ. Entomol. 16: 198-207. 1923.
4. Stover, W. G. and H. W. Johnson. First progress report on the study of apple scab under Ohio conditions. (Abstract) Phytopath. 14: 60. Jan. 1924.

Not cited:

Anon. Apple scab. New Hampshire Agr. Exp. Sta. Bul. 208: 24. 1923. (Results of Butler and Doran's experiments)

Anon. Spraying experiments. Ohio Agr. Exp. Sta. Bul. 362: 28-29. 1922. (Part of work of Ballou and Lewis)

Anon. Plant disease investigations at the Wisconsin Station. Wisconsin Agr. Exp. Sta. Bul. 352: 46, 53-65. 1923. (Results of Keitt and Jones' experiments)

Ballou, F. H. and I. P. Lewis. Spraying experiments in southeastern Ohio, 1922. Mo. Bul. Ohio Agr. Exp. Sta. 8: 42-50. 1923.

Bennett, C. W. Apple scab and its control. Quart. Bul. Michigan Agr. Exp. Sta. 5: 130-134. 1923.

Farley, A. J. Dry-mix sulfur lime, a substitute for self-boiled lime sulfur and summer-strength concentrated lime sulfur. New Jersey Agr. Exp. Sta. Bul. 379: 1-16. 1923.

_____ New Jersey dry mix sulfur lime. Convenient, safe, and effective as a summer fungicide. New Jersey Agr. 5[12]: 9, 15. Dec. 1923.

Howitt, J. E. Apple scab in Ontario. Canad. Hort. 46: 23-24. 1923.

Keitt, G. W. and L. K. Jones. Seasonal development and control of apple scab and cherry leaf spot in relation to environment (Abstract). Phytopath. 14: 36. Jan. 1924.

Young, H. C. Colloidal sulfur as a spray material. (Abstract). Phytopath. 14: 61-62. Jan. 1924.

Zappe, M. P. and E. M. Stoddard. Results of dusting versus spraying in Connecticut apple and peach orchards in 1922. Connecticut State Agr. Exp. Sta. Bul. 245: 229-243. 1923.

APPLE - Blotch

Blotch caused by Phyllosticta solitaria Ell. & Ev.

Geographical distribution:

The distribution of apple blotch in 1923 appears to coincide rather closely with the distribution as shown in Supplement 14 (Fig. 2, p. 13, 1920) although it was not reported from Nebraska and South Dakota as indicated in that map. In general the distribution of blotch may be indicated as a triangle on the map with Pennsylvania and New Jersey at the northeast, Texas at the southwest, and Nebraska and South Dakota at the northwest. The northern face of the triangle follows rather closely the forty-second parallel. The apparent restriction in 1923 was most probably due to the incompleteness of the reports, since during the history of the disease there has been no record of its disappearance from any locality once it has become fully established. The fungus is most persistent and there is every evidence in the records to show that it has been spreading slowly but surely in all directions since its first discovery on cultivated apples in 1897.

Economic importance and losses:

This disease appears to be the most serious disease year after year in the lower Ohio, Missouri, and lower Mississippi Valley apple sections, and districts lying to the southward of these areas. The chief reason for its persistence and annual severity appears to be its adaptation to overwintering in the bark cankers on living wood. These overwintering areas are always a source of infection and rarely fail to initiate the disease on leaf petioles and fruit. In 1923 the loss in Kentucky was said to be very heavy. Alabama and Kansas report a 10 percent loss. The disease was also reported by Maneval and Burrill as being especially severe in Missouri. In that state out of 34 orchards containing 1668 acres in 12 counties, blotch was said to be the most serious disease in 17. In 12 of these orchards an average of 35 percent of the fruit was blotched. From Mississippi come reports that half of the plantings in that state are infected. In the northeast, including New Jersey, Pennsylvania, Delaware, Maryland, and Virginia, the disease was not severe in 1923, probably causing less than 1 percent loss on the average over this area. Ohio and Illinois collaborators report 5 and 5.5 percent lossrespectively. In Virginia, Hurt reports 16 percent of all varieties at Crozet as being infected and on these the average infection was only one-tenth of one percent.

Relative prevalence:

Judging from the reports it is apparent that blotch was of the usual prevalence in 1923, however, it was certainly less severe in a majority of the states than it was in 1922. It would seem that the conditions which were unfavorable for scab affected blotch in a similar manner. The following table is presented to show the relative percentages of blotch in the important blotch areas.

APPLE - Blotch (relative prevalence)

Table 8. Percentage losses due to blotch, 1918 to 1923.

Percentage loss of marketable crop caused by blotch.

State	1918	1919	1920	1921	1922	1923 Pre-lim. Est.	State	1918	1919	1920	1921	1922	1923 Pre-lim. Est.
N.J.	.5	t	*	1.	1.	av.	Iowa	t.	*	t	t	3.	3.
Pa.	3.	1.	1.	1.	1.5	less	Mo.	1.	2.	4.	3.	t	more
Del.	t	t	.t	o.5	3.	t	Nebr.	t	2.	3.	4.	-	-
Md.	1.	t	.5	1.	1.5	-	Kans.	10.	3.	10.	5.	10.	10
Va.	t	1.	t	t	2	2	Ky.	1.	1.	10.	5.	35.	35.
W.Va.	t	1	1.	1.	t	1	Tenn.	5.	5.	10.	5.	8.	-
N.C.	-	5.	10.	10.	-	3.	Ala.	5.	8.	10.	-	-	10.
S.C.	5.	2.	8.	-	-	-	Miss.	10.	5.	5.	4.	6.	3.
Ga.	t	3.	2.	1.	-	-	La.	-	*	*	10.	t	-
Ohio	1.	1.	1.	2.	5.	5.	Texas	5.	8.	5.	3.	2.	2.
Ind.	1.	1.	1.	2.	2.	2.	Okla.	t	8.	8.	10.	-	-
Ill.	2.	3.	4.	7.	6.	5.5	Ark	t	2.	5.	3.	3.	3.

Dates of earliest appearance

May 14	Newton County, Miss.	June 10	Seaford, Del. (fruit)
May 24	Hardin, Ill.	" 11	Crozet, Va.
June 6	Seaford, Del. (leaf)	" 22	Monmouth County, N. J.
" 7	Orange County, Md.	" 29	Columbus, Ohio

Weather relations:

In the middle Atlantic states where blotch was generally less severe than in 1922 precipitation was generally deficient at the critical periods for severe infection in May and June. Gardner reports that heavy precipitation and high temperatures in May and June were responsible for the severe infection in southern Indiana. Anderson reports that heavy rains in early May resulted in a severe outbreak in southern Illinois. The heavy losses in Missouri are said by Burrill to be brought on by heavy precipitation and high temperatures which prevailed during the spring and summer.

Varietal susceptibility:

Gardner in Indiana reports fruit infection on Transparent, Fallawater, Siberian Crab, White Pippin, Dr. Matthews, Turley, Rhode Island Greening, Oliver, Red June, Fameuse and Clayton; cankers noted on Winter Maiden Blush and Fallawater; leaf infection found on Jonathan. In orchards containing blotch carriers, such as Ben Davis, widespread fruit infection of Grimes and Jonathan occurred.

APPLE - Blotch (varietal susceptibility)

Susceptible

Smith Cider - New Jersey
Pennsylvania, West Virginia, Kentucky
Northwestern Greening - Delaware, Virginia, West Virginia, Georgia
Pippin - Virginia, West Virginia
Ben Davis - Virginia, West Virginia, Kentucky, Alabama, Missouri, Illinois, Indiana
Stark - West Virginia
Gano - West Virginia, Kentucky, Missouri
Rome - Kentucky
Champion - Kentucky
Huntsman - Missouri
Jonathan - Missouri
Grimes - Missouri
Delicious - Missouri
Paines - Missouri
Ingram - Missouri
Winesap - Missouri

Resistant

Winesap - Kentucky
Stayman - Kentucky
Delicious - Kentucky
Transparent - Kentucky
Wealthy - Kentucky
Jonathan - Kentucky (?)

The following table gives data on the comparative susceptibility of apple varieties to blotch, arranged according to the group classification of Hedrick and Howe, (see cedar rust).

Table 9. Comparative susceptibility of groups of apple varieties to apple blotch.

Group number and name	Variety	Relative susceptibility and reporter: Very susceptible	Moderately affected	Resistant
3 Ben Davis	Ben Davis	R,Sy,L,D,G,(O) (Ln) (Sy)(F) (An)(G)(E)(H) (Sd) (St) (V&M) (Ms)	(B)(Rs)	
	Collins	D (V&M)	R, G	
	Gano	R,L,D,G,G',(E) (Ln)(Sd)		
	Shackleford	D		
5 Blue Pear-Main	Gideon		G	
	White Winter Pearmain	R,L		
7 Early Harvest	Early Harvest	(H)		
	Early Ripe			(H)
8 Fameuse	Fameuse	R		

APPLE - Blotch (comparative susceptibility)

Group number and name	Variety	Relative susceptibility and reporter: Very susceptible	Moderately affected	Resistant
10 Jonathan	Esopus		G	
	Jonathan			R,L,G,(An) (E)(H)
12 Lady	Lady		D	
13 Lawver	Akin	(B)G,G',		
	Lawver	R	D	
	McAfee	G'	R,L	
14 Limbertwig	Limbertwig	R,Sy,L,D,(Fu) (Re)(F)(E)(H)		
18 Northern Spy	Northern Spy		R,L	
	Wagener	R,L,(Sy)		
19 Oldenburg	Oldenburg	G,(G)(An)(H) (Sd)	R,D	
20 Ralls	Ingram		R,D	
	Milam		D	
	Ralls	D	R,L	
	Salome		G	
21 Rambo	Domine	R,L		
	Rambo		R,G	
22 Red Astrachan	Red Astrachan	D(Re)		
23 - Reinette				
23a Fall Pippin	Banana		D	
	Ewalt	(Fu')	D	
	Maiden Blush	R,L,G (O)(An) (G)(H)(E) (V&M)	(Rs)	
23b Rhode Island Greening	Northwestern Greening	R,L,Sy,D,G,G' (T)(Sd)(P)(F) (Sy)(Rd)(G) (Re)(O)(An)		
	Rhode Island Greening	D (G)		
23c Newtown	Grimes Golden	(Sy) (O)	R,G	L,D(An)(H) (Do)
	Huntsman	R,L		
	White Pippin		G	
	Yellow Newtown	(F)	R (F)	

APPLE - Blotch (comparative susceptibility)

Group number	Variety	Relative susceptibility and reporter: Very susceptible	Moderately affected	Resistant
23d Swaar	Mann	Sy,G,G',(Sy) (G)	D	
24 Romanite	Gilpin	R,L		
	Minkler		R,L	
	Stark	Sy,D,G,G',(Sy) (Fu')(G)(Do) (Sd)	(O)	
	York Imperial			R,L,G,(F)(H)
25 Rome	Rome Beauty	G'(An)(V&M)(B) (Fu)	R,L,D,(Sy)	
26 Russet	Golden Russet		R	
27 Summer Rambo	Summer Rambo	(Sy)		
33 Wealthy	Wealthy		R,L.G	(O)
34 Winesap	Arkansas	(Ln)	R	D,C
	Arkansas Black	R,L.G',(Ln)	D	
	Kinnard		D,G	
	Mammoth Black Twig	L (Ln)		(F)
	Oliver	D		
	Paragon	(H)		D
	Stayman		R,L	G(An)(F)(H)
	Winesap			R,L,D (H)(F)
35 Yellow Bellflower	Yellow Bellflower		R,L	
36 Yellow Transparent	Yellow Transparent	G',(E)		(H)

D - G. M. Darrow, U. S. Dept. Agr. Bul. 1189. 1923
G - M. W. Gardner, Laurenz Greene, and C. E. Baker, Indiana Agr. Exp. Sta. Bul. 267. 1923
G' - M. W. Gardner, Hoosier Hort. 6[1]: 3-11. Jan. 1924
L - D. E. Lewis, Kansas Agr. Exp. Sta. Bul. 196. 1913
R - J. W. Roberts, Bureau Plant Ind, Bul. 534. 1917
Sy - A. D. Selby, Ohio Agr. Exp. Sta. Bul. 333. 1919

() - Report in Plant Disease Survey files

An - H. W. Anderson, Illinois
B - J. T. Barrett, Illinois
Do - B. W. Douglas, Indiana
E - J. A. Elliott, Arkansas
N - J. B. S. Norton, Maryland
O - C. R. Orton, Pennsylvania
P - L. H. Pammel, Iowa
Rd - G. M. Reed, Missouri

APPLE - Blotch

F - F. D. Fromme, Virginia
Fu - H. R. Fulton, North Carolina
Fu' - H. R. Fulton, Pennsylvania
G - M. W. Gardner, Indiana
H - L. R. Hesler, Tennessee
K - F. D. Kern, Indiana
Ln - C. D. Learn, Oklahoma
Me - I. E. Melhus, Iowa
Ms - L. E. Miles, Alabama
Re - H. S. Reed, Virginia
Rs - F. M. Rolfs, Missouri
Sd - E. C. Sherwood, West Virginia
Sh - J. L. Sheldon, West Virginia
St - E. A. Stokdyk, Kansas
Sy - A. D. Selby, Ohio
T - C. E. Temple, Maryland
V&M - W. D. Valleau & W. W. Magill, Kentucky

Control:

Reports for 1923 indicate good control of blotch when the sprays were timely applied.

Kentucky: Ben Davis receiving Bordeaux Mixture at two week intervals after petal fall showed 50 percent blotch. (Valleau)
Alabama: Held in control by spraying. (Miles)
Arkansas: Very little in well-sprayed orchards. (Young)
Ohio: Excellent control by use of well timed sprays. (Thomas) "Spraying with Bordeaux (6-12-100) at petal fall and 2,4,6 and 10 weeks later, gave an average of 90 percent blotch-free fruit, while the checks showed 60 percent blotch. One tree was left unsprayed at each application, the results indicating that no one application was most important." (Stover & May (1))

In general the reports indicate that sprays applied about the petal fall period are very timely for preventing initial infection. Bordeaux mixture still seems to give the best results.

References:

Cited:

(1) Stover, W. G. and Curtis May. Studies in apple blotch in Ohio. (Abstract) Phytopath. 14: 60. Jan. 1924.

Not cited:

Anonymous: Apple blotch control. Indiana Agr. Exp. Sta. Rept. 1922: 37. 1923.
Ballou, F. H. & I. P. Lewis. Spraying experiments in southeastern Ohio. Ohio Agr. Exp. Sta. Mo. Bul. 8: 42-50. 1923.
Brock, W. S. The control of blotch and scale. Trans. Illinois State Hort. Soc. 56: 432-439. 1923.
Gardner, M. W. Origin and control of apple blotch cankers. Jour. Agr. Res. 25: 403-418. 1923.
_____ Apple blotch in Indiana. Hoosier Hort. 6[1]: 3-11.
Gardner, Max., Laurenz Greene, and C. E. Baker. Apple blotch. Indiana Agr. Exp. Sta. Bul. 267: 1-32. 1923.

APPLE - Bitter rot

Bitter rot caused by Glomerella cingulata (Stonem.) S. & von S.

Geographical distribution:

Bitter rot appears to have been more restricted in general distribution in 1923 than in 1922. No reports were received from the south Atlantic states and other outlying regions such as the extreme northeastern states and the extreme western areas as Kansas and Nebraska. As in the case of scab and blotch the distribution seems to have been quite irregular, the Ohio, Missouri, and southern Mississippi valley states appearing to suffer the heaviest losses. The accompanying map of the known distribution of bitter rot in the United States was adapted from one prepared by Dr. E. F. Guba.

Fig. 1. Distribution and severity of bitter rot of apple, as indicated by all records in the Plant Disease Survey. (Map prepared by E. F. Guba.)

APPLE - Bitter rot

Dates of first appearance

June	6	Kemper County, Miss.	Aug.	10	Seaford, Del.
"	12	Whitehall, Albemarle Co. Virginia.	"	--	Delaware County, Ohio
"	16	Mulberry Grove, Bond Co. Illinois	"	15	Clintondale, Ulster Co. New York
"	26	Warrick Co., Indiana			

Economic importance

While the losses from bitter rot were negligible in the New England States, New York, and Pennsylvania, they were more severe than usual in Delaware where the loss was estimated at 1.5 percent. Bitter rot was also severe in northern Georgia on Ben Davis and other susceptible varieties. The losses can be best shown by the following table.

Table 10. Percentage losses from bitter rot of apple as reported by collaborators, 1923.

Percentage loss	States reporting
15	Tennessee
8	Kentucky
4	Missouri
3.5	Mississippi
1.5	Delaware
1.0	Maryland, Ohio, Indiana, Illinois Alabama, Arkansas
0.5	Virginia, West Virginia
trace	Massachusetts, New York, Pennsylvania, Texas

Relative prevalence

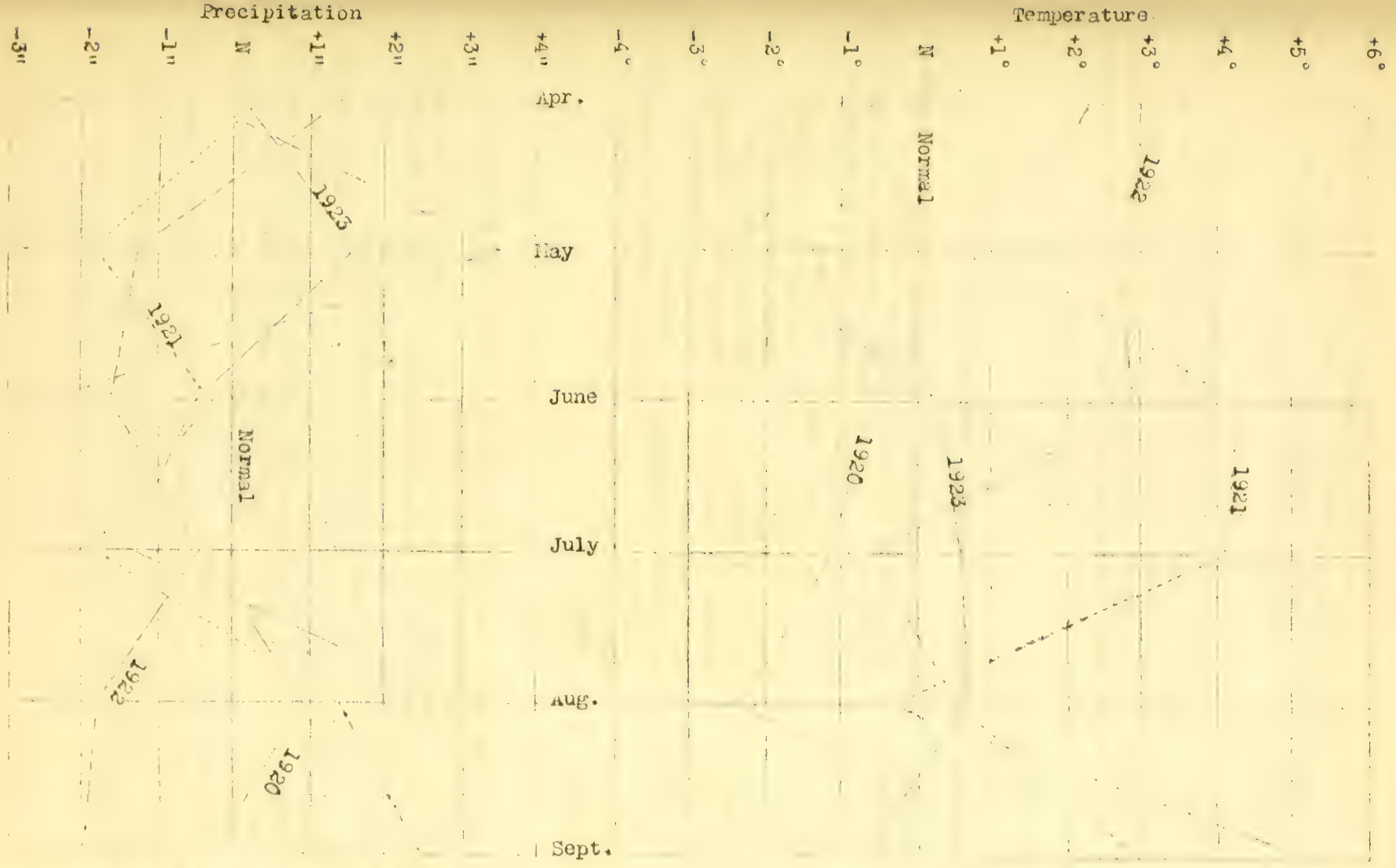
Average annual losses due to bitter rot in the United States 1918 - 1922.

1918	1919	1920	1921	1922	Average
.5	1.21	1.0	.2	.7	.72

The data for 1923 indicate the total losses for the United States to to be greater than usual, and possibly greater than for any year since these reports on losses have been kept for bitter rot.

Weather relations:

The regions where bitter rot was severe appear to coincide with the areas where the rainfall and temperature were above normal during August. This is well brought out in the accompanying chart prepared by Dr. E. F. Guba, covering the temperature and precipitation records in southern Illinois during the years 1920 to 1923.



Precipitation: departure from the normal (inches)

Temperature: departure from the normal (°F.)

N - Normal _ _ _ 1920 ..... 1921 - - 1922 ———1923

Fig. 2. Departures from the normal temperature and precipitation in southern Illinois, April - September, 1920 - 1923.

APPLE - Bitter rot

Regarding the situation in southern Illinois, Anderson make the following statement:

> "Bitter rot was worse this year than for at least ten years. It occurred rather generally over the southern end of the state. Growers have become careless due to the fact that bitter rot has been of so little importance during the last few years."

In Indiana Gardner reports that the outbreak of bitter rot in 1923 was correlated with high rainfall and temperature, and collaborators in Kentucky report similar conditions. In Tennessee where the losses were particularly severe the precipitation for August was 2.06 inches above normal for the state, while the temperature was slightly above normal indicating conditions favorable for bitter rot.

Varietal susceptibility:

The following varieties were reported susceptible in 1923.

Ben Davis - Kentucky, Tennessee, Illinois, Virginia
Bismarck - Maryland
Champion - Indiana, Illinois
Cole - Delaware
Commerce - Illinois
Delicious - Kentucky
Greenville - Indiana
Grimes - Virginia, Indiana
Huntsman - Illinois
Jeffries - Tennessee
Jonathan - Delaware, Tennessee, Indiana, Illinois
King David - Delaware, West Virginia, Tennessee, Illinois
Kinnard - Illinois
Lowell - Illinois
McIntosh - Delaware
Nero - Delaware
Northwestern Greening - Delaware
Ohio Nonpareil - Virginia
Piedmont Pippin - Virginia
Pippin - Virginia
Red Astrachan - Massachusetts
Rhode Island Greening - New York
Shackleford - Virginia
Smokehouse - Maryland
Stayman - Delaware
Transparent - Illinois
Winesap - Virginia, Indiana
York Imperial - Delaware, Tennessee, Virginia

Control:

Delaware: When copper sprays were applied in July and August very little infection was found (Adams).

Kentucky: Ben Davis and Delicious not receiving sprays in late summer have from 5 to 40 percent infection from bitter rot (Magill).

Arkansas: Not serious in well sprayed orchards (Young).

Ohio: Difficult to find in sprayed orchards (Thomas).

Indiana: In an orchard well sprayed with lime sulfur in Knox County, scattered infection occurred in August on Winesap, Jonathan and other varieties. The originally infected fruits were picked and removed from orchard and Bordeaux mixture applied. No more trouble. Believe bitter rot follows San Jose scale attacks about the next year (Gardner).

Illinois: Where Bordeaux was applied when the disease just appeared it was checked (Anderson).

Missouri: Spraying did not control in orchards of Missouri Fruit Experiment Station (Rhoads).

APPLE - Blister canker

Recent literature

Roberts, J. W. Apple bitter rot cankers in the eastern United States. Phytopath. 13: 461. Oct. 1923.

Blister canker caused by Nummularia discreta Tul.

Blister canker in 1923 appears to have been about as prevalent as usual. The disease is confined chiefly to the Ben Davis variety which is very susceptible, though of course other varieties are attacked. There appears to be considerable evidence from reports over a period of years that blister canker has been overrated in importance in commercial apple orchards. Practically all of the serious injury outside of Ben Davis plantings has occurred in neglected orchards. The most comprehensive survey in 1923 was made in Arkansas by P. H. Millar of the State Plant Board, and reported by V. H. Young. Of 107,611 trees inspected 6.25 percent were infected with Nummularia. In New York twenty orchards in the Hudson Valley showed considerable increase in number of cankers over what was found in 1922. Fully half of all these cankers were on Ben Davis, according to Guba. Adams reports a rather severe infection on Yellow Transparent in Sussex County, Delaware, which was associated with careless pruning and injury during cultivation. That blister canker follows injuries of all sorts is well known. Tehon and Anderson report that this disease may be found in 25 percent of the plantings in Illinois, but that the loss, which occurs chiefly in the central portion of the state, does not amount to more than 1 percent usually.

Recent literature:

Anderson, H. W. Blister canker in Illinois. Better Fruit. 17, No. 7: 11, 24. Jan. 1923.

"Frog Eye", Black Rot, and New York Apple Tree Canker.

Introductory note:

The disease reported as black rot in the past few annual summaries on fruit diseases, includes the frog eye leaf spot as well as the black rot of the apple and the so-called "New York apple tree canker." It is perhaps doubtful whether such a combination is justifiable, even though it is the usual treatment accorded these subjects in much of our literature. Sphaeropsis malorum Peck, the conidial stage of Physalospora cydoniae Arnaud, is a very common saprophyte on apple wood and many other woody hosts. There is no question regarding its being the cause of black rot of apple fruit, usually entering the fruit as a semi-parasitic organism, through the injuries caused primarily by insects, spray burns, etc. Such injured fruit can hardly be classed as being of sufficient commercial value to warrant the consideration of black rot as anything more than an incidental storage rot.

As for its relation to the "New York apple tree canker," it may be stated that a very high proportion of the cankers, upon which this fungus fruits abundantly, are produced primarily by Bacillus amylovorus (Burr.) Trev. Other cankers with which it is associated are those commonly found in the crotch, due to freezing injury, and those caused by insects such as are found on the Jonathan variety. The fungus also encroaches on the bark and wood of trees

weakened by scale. The comparatively few successful attempts to produce typical cankers by inoculation with Sphaeropsis malorum are more than offset by the large number of failures to produce cankers which have been recorded in the literature, and by data which have not been published. Sphaeropsis malorum is certainly a very weak parasite on woody parts, and in general can only attack and progress on trees much weakened from other causes.

The evidence that Sphaeropsis malorum is the cause of "frog eye" leaf spot of the apple rests chiefly upon the early work of Scott and Rorer in Arkansas. Other workers have not been as generally successful in producing the typical "frog eye" under controlled conditions. The writer (Orton) and his associates have for several years failed to secure infection in Pennsylvania with isolations of Sphaeropsis from various sources. Whether there is a difference between the "frog eye" diseases as they occur in different parts of the country remains to be shown.

The writer therefore desires to make it clear than in the following report an attempt has been made to separate the discussion into three parts as indicated above. Of these troubles "frog eye" is unquestionably the most important.

Frog eye

Throughout the country "frog eye" was less widely distributed and less abundant than usual. The only collaborators reporting more than the usual amount of infection were those from Ohio, Indiana, Minnesota and Iowa. From Massachusetts, Delaware, Maryland, Indiana, Michigan, Mississippi, Texas, and Oklahoma, the reports indicate the usual amount of infection. All the other reports indicate less.

The following annual losses have been reported for the United States in The Plant Disease Bulletin:

1918	1919	1920	1921	1922	Average	
1.4	1.36	1.3	.5	1.5	1.21	... percent

It should be noted that the above figures include fruit rot and loss through cankers reported as being caused by Physalospora cydoniae. It may be presumed, however, that these two factors have generally been of minor importance. The losses in 1923 indicate less than the average.

Date of first infection observed:

April 25	Clemson College, S. C.	May 30	Kings Co. N. Y.
" 26	Burkeville, Va.	June 1	Crawfordsville, Ind.
May 9	Bridgeville, Del.	" 4	Murphysboro, Jackson Co. Mich.
" 18	Highwood, Conn.		
" 23	Union Co. Pa.	" 6	Topeka, Kans.
" 23	Richland Co. Ohio	" 12	Ramsey Co. Minn.

"Frog eye" is a disease which is very dependent upon moisture during the period of infection, which in the East follows closely upon that of scab. The slight damage from "frog eye" was therefore correlated with the relatively dry season in many apple regions, particularly the northeastern sections. In those regions where the disease was more prevalent the precipitation and temperatures were more favorable during the early part of the season.

APPLE - Frog eye

In Delaware Stayman, Transparent, and Strawberry, were reported as being susceptible. Ben Davis and Delicious were susceptible in Kentucky, Maiden Blush in Illinois and Jonathan in Kansas. Malus ioensis was reported as susceptible in New York.

Black rot of apple fruits caused by Physalospora cydoniae Arn.

Black rot was reported in 1923 from Massachusetts, Connecticut, New York, Delaware, West Virginia, Arkansas, Ohio, Indiana, Minnesota, and Illinois. In all of these states it was apparently of slight importance except in Delaware, where Adams reports it as being severe on the early varieties, such as Fourth of July, Red Astrachan, Williams Early Red, and Transparent. It was apparently associated with the greater prevalence of curculio and codling moth in Delaware. Giddings also reports it as being associated with insect damage in West Virginia. In Indiana, black rot was found following blotch infection, according to Gardner. In Minnesota, Greenings are said to be the only variety noticeably susceptible to black rot.

New York apple tree canker

Canker was reported as being of common occurrence in New York, Ohio and Wisconsin. In Indiana, Gardner reports a case of Sphaeropsis following rust infection on the twigs of Rome Beauty in Orange County. Thomas reports canker following fire blight in Ohio, and in Minnesota it is said that it invariably follows fire blight on the twigs. Collaborators should watch carefully the relationship of Sphaeropsis infection to primary cankers caused by fire blight and other agents such as freezing or sun scald, and trees weakened by scale, root rots, etc.

Recent literature:

Cunningham, G. H. Black rot (Physalospora cydoniae Arn.). A fungous disease of apple, pear and quince. New Zealand Jour. Agr. 27: 95-102. 1923.

Cedar rust caused by Gymnosporangium juniperi-virginianae Schw.

According to the collaborators' reports for 1923, cedar rust was distributed about normally. Although there was a general decrease in its severity below that of 1922, apparently the disease was of nearly average severity in the red cedar areas, except in certain sections of some states such as Virginia and West Virginia, where eradication has aided materially in reducing the infection. The areas where cedar rust was most destructive were Virginia, West Virginia, and North Carolina, where 2 percent loss occurred, and in Iowa, where 3 percent loss was reported. All other collaborators reporting on cedar rust indicate losses amounting to not more than 1 percent of the crop, and usually only a trace.

Relative losses from cedar rust in the United States, 1919 - 1922

1919	1920	1921	1922	Average
1.7%	1.1%	.2%	1.6%	1.15%

APPLE - Cedar rust

Dates of earliest recorded appearance, 1923.

Foliage infection:

Pycnia,	April	26	: Burkeville, Virginia
"	May	24	: Millsboro, Delaware, (Duchess var.)
	June	1	: Crawfordsville, Indiana
	"	4	: Columbia Co., New York
	"	23	: McLeod Co., Minnesota

Fruit infection:

	June	9	: Shenandoah Valley, Virginia
	"	20	: Bridgeville, Delaware, (Rome var.)

Weather relations:

Cedar rust is exceedingly dependent upon moisture for the development of the telial horns on the cedars, and upon the proper combination of temperature and moisture for the infection of the apple (foliage or fruit) by the basidiospores. It is frequently difficult to compare outbreaks of cedar rust with the weather reports on precipitation and temperature, since, as is well known, cedar rust basidiospores may be disseminated and infection of the apple take place within a very short time, when favorable moisture and temperature conditions are correlated with the most susceptible condition of the apple foliage. In some cases a very slight precipitation at a critical time may result in heavy infection, and unless exact data were taken at the time it would be practically impossible to detect such periods through a study of the weather records.

The weather relations as reported by the collaborators indicate that the periods when the weather conditions were favorable for infection, were generally very short and few in number, with the result that the losses were slight except in the few cases noted. While Fromme and Schneiderhan state that cedar eradication in Virginia accounts in part for the great reduction in loss incurred by rust, the dry spring was probably of even greater importance in keeping the infection to a minimum. In Virginia, infection must have taken place during the pre-pink to pink stage, as it first appeared on the foliage at the time of petal fall.

Varietal susceptibility:

It has been recognized for many years that very clear cut differences in susceptibility to cedar rust exist between the different varieties of apples. As long ago as 1897 Chester (1) reported upon the rust resistance of a considerable number of varieties growing in Delaware. Later Stone (6) in Alabama, Reed and Crabill (4) in Virginia, Selby (5) in Ohio, and Giddings (2) in West Virginia published similar lists showing the relative susceptibility of apple varieties to rust. Valleau (7) furnished a very large list from Kentucky, which was included in the summary of 1922. Other collaborators have furnished supplementary and corroborative lists. Since the reaction to rust of such a large number of apple varieties is known it seemed highly desirable to collect and compare these data in tabular form and ascertain whether there is evidence of any such group relationship as occurs in the case of the reaction of potato varieties to the wart disease.

APPLE - Cedar rust (varietal susceptibility)

We have resorted to the classification published by Hedrick and Howe (3) for ascertaining the group to which any variety belongs. Unfortunately more than half of those varieties, upon which reports of rust resistance are available, are not included in the Hedrick and Howe list and there seems to be no immediate hope of ascertaining their group relationship. However, it has been possible to place a considerable number of varieties into what appear to be natural groups and when such groups are compared from the standpoint of the rust resistance of the individual varieties within the group, it appears that considerable significance should be attached to these tables. For instance, it should be noted that varieties constituting such groups as Aport, Ben Davis, Oldenburg and Gravenstein, Reinette, Winesap, and Yellow Transparent, show marked resistance or immunity quite uniformly, while the varieties belonging to such groups as Jonathan, Romanite, Rome and Wealthy are almost invariably very susceptible.

The apparent discrepancies occurring in the table, as shown for instance in the Grimes sub-group of Reinette, may be due to unavoidable errors such as:

(1) Misnomers.
(2) Misinterpretaion of terms used by reporters.
(3) Differences due to variation in the degree of infection in different localities or in different years. Varieties which are rather resistant during years of light infection may appear quite susceptible under conditions favorable for severe infection. Sometimes local conditions prevent foliage development at the time of teliospore discharge, with the result that susceptible varieties escape infection.
(4) The presence of different biological races of cedar rust which react differently to the same variety of host. That biological races of cedar rust probably exist is suggested by the conflicting reports upon such a well known variety as Ben Davis, which has been placed in each of the four classes by various observers, but even more suggestive are the observations of Waite (8) indicating a difference in the degree of severity of rust in the alternating years. Waite says, "The fungus in the odd years, which is, of course, a different set of individuals since this organism has a two year cycle, has increased in severity, but is always less abundant than in the even years." Waite also believes that the rust is adjusting itself continuously to new varieties. Our knowledge of other rusts leads us also to expect physiological races in cedar rust.

Key to abbrevations used in the table

An = H. W. Anderson, Illinois
B = J. T. Barrett, Illinois
C = F. D. Chester, Delaware
Ch = C. Chupp, New York
Cl = G. P. Clinton, Connecticut
Cr = C. H. Crabill, Virginia
F = F. D. Fromme, Virginia
Fr = E. N. Freeman, Minnesota
Fu = H. R. Fulton, Pennsylvania
G = N. J. Giddings, West Virginia
Ga = M. W. Gardner, Indiana
J = H. S. Jackson, Indiana
K = F. D. Kern, Indiana.
L = B. F. Lutman, Vermont
M = W. E. Maneval, Missouri
Me = I. E. Melhus, Iowa
O = C. R. Orton, Pennsylvania
P = L. H. Pammel, Iowa
R = J. W. Roberts, Washington, D.C.
R&C= Reed & Crabill, Virginia
Rd = G. M. Reed, Missouri
Sr = E. A. Siegler, Washington, D.C.
S = R. E. Stone, Alabama
Sh = J. L. Sheldon, West Virginia
Sy = A. D. Selby, Ohio
St = E. C. Stakman, Minnesota
T = C. E. Temple, Maryland
V = W. D. Valleau, Kentucky
Vn = R. E. Vaughan, Wisconsin
() = Report in Plant Disease Survey files

APPLE - Cedar rust

Table 11. Comparative susceptibility of apple varieties to cedar rust arranged according to Hedrick and Howe (3).

Group No. and Name	Variety	Immune	Resistant	Mod. susc.	Susceptible
1 Aport	Alexander	V, R			
	Bietigheimer	C	S, R		
	Wolf River	V			
2 Baldwin	Bledsoe (Bledsoe Pippin)		S		
	Babbitt	R	S		
	Baldwin	G,V,R			
	Bayard				V
	Sutton		V, R		
	Bostick Queen (Bostick)				C
3 Ben Davis	Ben Davis	V	C,R,G,R&C, Sy, (P)		
	Collins	V,S,R			
	Apple of Commerce (Beach)	S			
	Florence	V,R,			
	Gano	V,S,R			
	Shackleford	S		R	
	Arkansas Beauty			R	
5 Blue Pearmain	Pearmain		S		
	Gideon			R	
	Windsor	V			
6 Chenango	Chenango	V			
7 Early Harvest	Early Harvest	V,C,R	S		
	Early Ripe			R	
8 Fameuse	McIntosh	V,R			
	Shiawassee			R	
9 Hibernal	Hibernal	(St)			
10 Jonathan	Esopus	R			V
	Jonathan			R	G,S,R&C,V, (Rd) (An) (Sy) (K) (Cr) (Ga) (M) (Ch)
	King David	V			
	Mother	R			V
	Red Canada	V,R			

APPLE - Cedar rust

Group No. and Name	Variety	Immune	Resistant	Mod. susc.	Susceptible
13 Lawver	Akin	R	S,V,C		
	McAfee	C			
	Lawver	R			
14 Limbertwig	Limbertwig	V,C	S		
15 Longfield	Longfield	(P)			
16 Livland Raspberry	Livland Raspberry	V			
18 Northern Spy	Northern Spy	R	V		R&C, (R)
	Summer Hagloe	C			
	Wagener	V,C,R			
	Stannard			R	
19 Oldenburg (Duchess)	Hackworth	V			
	Black Buda	S			
	Charlamoff	V			
	Okabena	(St)			
	Oldenburg	V,(P),(St			
	Pewaukee	R	V, (K)		
	Gladstone			R	
19-A Graven-stein	Gravenstein	V,S,C			
20 Ralls	Giant Gentian	V			
	Doctor Walker				C
	Ingram	V			
	Milam	V			
	Ralls	C	S,V		
	Salome	V,R			
21 Rambo	Domine	V			
	Rambo			V,(O)	
				R	
	Red Rambo			R	
22 Red As-trachan	(Astrachan)	V			
	Oszi		S		
	Red Astrachan	S,C,R	G		
23 Reinette					

APPLE - Cedar rust

Group No: and Name	Variety	Immune	Resistant	Mod. susc.	Susceptible
23-A Fall Pippin	Banana			V,(Fr)	Sr
	Elgin Pippin		S		
	Fall Pippin	V,S,C,R			
	Maiden Blush			R	
23-B Rhode Island Greening	Northwestern Greening	V	R&C, (Cr),(St)	G	
	Rhode Island Greening	V			
	Starr	V			
23-C Newtown	Grimes		V,S,R&C,G,(Cr) (Ga),(K),(P),R		C
	Huntsman	V			
	Newtown Pippin (probably Yellow Newtown)	C,R			
	Shannon	R			C
	White Pippin	V		R	
	Yellow Newtown	V	R&C, (Cr)		C
23-D Swaar	Mann	V,C			
24 Romanite	Buckingham	V,R	(Fr)		S
	Gilpin				C
	Lansingburg	V			
	Minkler				C,V,(B)
	Nero			R	C,V
	Romanite			V	
	Stark			V	C
	York Imperial		S,V	R	G,R&C,C,(T),(R), (Cr),(O)
25 Rome	Langford (?)		C		
	Rome				(Rd),(Fr),(K),(T),(P),G,Sy,R&C,(J),(Cr)
26 Russett	Golden Russet	V,R			C
27 Summer Rambo	Summer Rambo				(O)
28 Sweet Bough	Sweet Bough	V,C	S		
29 Tetofski	Tetofski	(P),R			

APPLE – Cedar rust

Group No. and Name	Variety	Immune	Resistant	Mod. susc.	Susceptible
30 Tompkins King	Tompkins King	R			
	Hubbardston	R		V	
	Ozone		R		
31 Twenty Ounce	Twenty Ounce	R	Q		
32 Vandevere	Vandevere	R			
33 Wealthy	Wealthy				G,Sy,V,(Cl) (Sy),(an), (Mc),(Fr), (St),(F),(P) (Sh),(Ch), (Va),(K),(L)
	Peter			R	
34 Winesap	Arkansas	S,C,G,V, (R)	(C)		
	Arkansas Black	C,G,R	V		
	Kinnard	S,C,V			
	Oliver (Senator)		R&C		S,V,R
	Paragon	R,V			
	Stayman Winesap	C,V,G,F,R	(Fr),(Ga),(T), (Cr),R&C,(O)		
	Winesap	S,C,V,G,F; R	(Fr),(Cr),(O)		
	Vanhoy			R	
35 Yellow Bellflower	Ortley	V			
	Flory			Sr	R
	Yellow Bellflower	V,R			
	Barry				R
36 Yellow Transparent	Yellow Transparent	V,G,C,R			

Control:

A cedar eradication law was passed in New York. In Virginia the cedar eradication program has made a very distinct impression upon the cedar rust situation. In West Virginia the increased infection was attributed in part to the discontinuance of the cedar eradication program. In Arkansas the rust is reported as becoming less injurious in regions where cedar eradication is being continued.

Literature cited:

1. Chester, F. D. Apple rust. Ann. Rept. Delaware Agr. Exp. Sta. 8 (1896): 63-69. 1897.
2. Giddings, N. J. Infection and immunity in apple rust. West Virginia Agr. Exp. Sta. Bul. 170: 34-35. 1918.
3. Hedrick, U. P., and G. H. Howe. Apples: old and new. New York (Geneva) Agr. Exp. Sta. Bul. 361: 79-135. 1913.
4. Reed, H. S. & E. H. Crabill. The cedar rust disease of apples, etc. Virginia Agr. Exp. Sta. Tech. Bul. 9: 102-103. 1915.
5. Selby, A. D. Varieties of apples in Ohio: Disease susceptibility. Ohio Agr. Exp. Sta. Bul. 290: 35-41. 1915.
6. Stone, R. E. Cedar apples and apple leaf rust. Alabama Agr. Exp. Sta. Circ. 2: 1-11. 1908.
7. Valleau, W. D. Table 89. The Plant Dis. Bul. Suppl. 28: 297-298. 1923.
8. Waite, M. B. Cedar rust of the apple. Rept. Virginia State Hort. Soc. 18: 35-57. 1914

Fire blight caused by Bacillus amylovorus (Burr.) Trev.

Geographical distribution, economic importance and relative prevalence.

Fire blight was reported over a wider range than last year, particularly in the Rocky Mountain area. The map in figure 3 shows the reported distribution in 1923, together with the relative prevalence reported for 1923 as compared with 1922.

The areas where fire blight was especially severe were in New York and a band of territory extending westward through Ohio, Indiana, Illinois, Missouri, Arkansas, Kansas, Colorado, and into Texas and New Mexico. Blight was also severe in Wisconsin, Minnesota and North Dakota, as well as in Idaho, Nevada, and Washington. There is also evidence that blight was more severe in Massachusetts, Delaware, Maryland, Virginia, and North Carolina.

While blossom blight was the most prevalent phase of the disease in 1922, twig blight was the most prevalent in 1923, with numerous cases of fruit blight reported. Collar blight was again of some importance in Pennsylvania and West Virginia. The importance of these rather distinct phases of fire blight are largely associated with two factors - weather conditions and the prevalence of insect disseminators.

The relative prevalence may be obtained by studying the map in figure 3. A close scrutiny of the data compared with those presented during the past five years indicates that fire blight is on the increase and that the total losses in 1923 were probably greater than for the average year.

The estimated annual losses in the United States for the years 1918 to 1922 are shown herewith:

1918	1919	1920	1921	1922	Average
1.5%	.69%	1.2%	1.%	2.4%	1.36%

Fig. 3. Losses from fire blight in 1923 (figures) and relative prevalence compared with average year (above line) and with 1922 (below line).

APPLE – Fire blight

Dates of first appearance:

April	6	Leflore Co.... Miss.	May	28	Bridgeton.... N. J.
"	30	Orange Co..... N. Y.	June	1	Madison..... Wis.
May	4	Hancock Co.... Ohio.	"	1	Delta..... Colo.
"	9	Bridgeville... Del.	"	2	Oraville..... Ill.
"	18	Daleville..... Va.	"	14	Carver Co.... Minn.
"	23	Warrensburg... Mo.	"	16	Lisbon, Ransom Co.. N. D.
"	24	Laurence Co... Ind.			

The period of greatest injury to the host was during June and July, when the blight in numerous cases spread to the young fruits and caused much damage in Connecticut, New York, Delaware and Virginia.

Weather relations:

While fire blight is generally conceded to be favored by warm moist weather, the records for 1923 as well as those for 1922 indicate severe infections associated with continued cool weather accompanied by prolonged rainfall. The apparent incompatibility of these observations may possibly be explained by the differing weather conditions during the periods of infection, as compared with the weather during the periods of progression of the disease. It seems certain that primary infection is favored by warm weather during the blooming period and just following this period. The disease once established on the growing parts has often been observed to persist and spread over relatively long periods when the weather remains cool and wet. Such conditions favor continued vegetative growth, always an important factor in the progression of blight which ceases as soon as the growth period comes to an end.

Varietal susceptibility:

Most susceptible

Albemarle Pippin – Virginia
Alexander – New York
Benoni – Illinois
Golden Delicious – Kentucky
Greenings – New York, Michigan
Jonathan – Arkansas, Ohio, Indiana, Illinois, Michigan, New Mexico, Idaho
King – New York, Indiana
King David – Illinois
Maiden Blush – Indiana
Polly Eads – Kentucky
Rome Beauty – Virginia, Kentucky, Indiana
Spitzenburg – Indiana, Idaho
Starr – New Jersey
Summer Rambo – Indiana
Tolman Sweet – Michigan, Wisconsin
Vandevere – Indiana
Wagener – Ohio
Wealthy – New York, Ohio, Indiana, Michigan, Minnesota
Wolf River – New York
Yellow Transparent – Delaware, Kentucky, Indiana, Illinois
York – Virginia
Crabs and seedlings in general – Minnesota

APPLE - Fire blight

Moderately susceptible	Quite resistant
Ben Davis - New Mexico	Aiken - Indiana
Black Twig - Indiana	Ben Davis - Indiana
Early - Indiana	Delicious - Indiana
Greenings - Minnesota	Grimes - Indiana, Illinois
Indian - Indiana	Oldenburg - Indiana
Lowry - Virginia	Red Astrachan - Indiana
Northern Spy - Indiana	Russet - Indiana
Stark - Indiana	Wolf River - Indiana
Stayman - Virginia, Indiana	
Winesap - Virginia, Indiana, Illinois, New Mexico	Immune
York - Indiana	Arkansas Black Twig - New Mexico

If the number of reports are indicative, Jonathan, Wealthy, and Yellow Transparent are the most susceptible varieties.

In Virginia, Fromme reports that counts of twig blight on three varieties gave the following figures denoting relative susceptibility:

Albemarle Pippin	4.8
York Imperial	4.3
Winesap	0.3

A survey by Kirby and Honey in a park at Rochester, New York gave interesting data on the relative susceptibility of various species and horticultural forms of Malus.

Light infection on

Malus arnoldiana	M. rivularis
M. atrosanguinea	M. spectabilis
M. dawsoniana	M. scheidsckeri
M. floribunda	M. soulardi
M. ioensis	M. transcendens
M. orthocarpa	M. zumi
M. ringo	

Moderate infection on

M. cashmeriana

In New Jersey apple trees adjacent to severely infected Crataegus were said to be most severely blighted.

The following table (12) lists the comparative susceptibility of apple varieties arranged according to the classification of Hedrick and Howe (see cedar rust, p. 66). It will be noted that varieties in the Aport and Jonathan groups (1 and 10) are rather uniformly reported as very susceptible, while those included in the Winesap Group (34) are more often said to be rather resistant.

APPLE - Fire blight

Table 12, Comparative susceptibility of groups of apple varieties to fire blight.

Group number and name	Variety	Relative susceptibility and reporter: Very resistant	Resistant	Susceptible	Very susceptible
1 Aport	Alexander				Sw, H&H(Br) (Je) (Sl) (Ba) (Ch)
	Arabka				H&H
	Bietigheimer		Sy		
	Bismarck				H&H
	Constantine				H&H
	McMahon				Sw,H,(Vn)
	Wolf River	(Ga)	(O)		Sw,Sy
2 Baldwin	Babbitt	H&H, Sy			
	Baldwin	H&H	Sw,Sy (O) (Ch)	Sy	
	Sutton				H&H,Sy (Ch)
3 Ben Davis	Ben Davis	Sw,Rd(Ga) (Rd)	Sy(O) (V&M)	Sy	
	Gano	Sw,Rd(Rd)	Sy		(Sl)
4 Black Gilliflower	Black Gilliflower				H&H
7 Early Harvest	Early Harvest	Rd (O)	(Ga)		Sy
8 Fameuse	Fameuse			Sw	(P)
	McIntosh		Sw	Sy	(Sl)
	St. Lawrence			St	
10 Jonathan	Esopus			Sw,Sy	H&H,Sy(Fi) (Ga) (Ch) (Ow) (Hu) (Bs) (H&D)
	Jonathan		Sw	H,Sy	H&H,Rd,D(B) (Hu) (T&A) (Ga) (Ce) (Te) (F) (A) (Sk) (Np) (Ma) (V&M) (Br) (Sl) (E) (Rd) (An) (M) (Ow)
	Kaighn			D	
	King David	Sy	D		Sy (T&A)
	Mother				(H&H)
	Red Canada	Sy			

APPLE - Fire blight

Group number and name	Variety	Relative susceptibility and reporter: Very resistant	Resistant	Susceptible	Very susceptible
12 Lady	Lady	H&H			
13 Lawyer	Akin	(Ga)			
14 Limbertwig	Limbertwig				D(Fu)(Hr)
16 Livland Raspberry	Livland Raspberry			Sy	D
18 Northern Spy	Northern Spy	H&H	(Ga)	Sy (O)	(Sl)
	Ontario	Rd		St	
	Wagener	Sw,H&H			Sy
19 Oldenburg	Oldenburg	Sw,Sy,D (P)(Ga)	Sy		
	Pewaukee				H&H
19a Gravenstein	Gravenstein			Sy	
20 Ralls	Ingram	Sy			Rd,D,(Rd)
	Ralls				H&H,D
	Stone			Sy	
21 Rambo	Domine		D		
	Rambo	Sy	Sy		
22 Red Astrachan	Astrachan	(Ga)	Sy		
	Red Astrachan	(C)			
23-Reinette					
23a Fall Pippin	Banana			Sy	Sw(Ga)(Ma) (V&N)
	Boiken		Sy		
	Fall Pippin				H&H,St (N)
	Greenville			Sy	
	Lowell			Sy	
	Maiden Blush		D(O)	Sy	Sy*(N)(E) (Ga)
23b Rhode Island Greening	Northwestern Greening	(Minn.) (Vn)	Sw,Sy		
	Patten Greening	(Minn.)			
	Rhode Island Greening				H&H,Sy,D
23c Newtown	Belmont		Sy	Sy*	
	Grimes Golden	H&H	Sw,Sy', (Mi)(N&)	(O)(G)	Sy(R)(Ow)
	Newtown Pippin	Sy'*	Sy*	Sy (Fu')	
	White Pippin	Sy			

APPLE – Fire blight

Group number and name	Variety	Relative susceptibility and reporter: Very resistant	Resistant	Susceptible	Very susceptible
23d Swaar	Mann			St,Sy	
	Swaar	H&H			
24 Romanite	Buckingham				(Fu)
	Minkler	Sy			
	Stark	Sy*	(Ga) (O)		Sy,D
	York Imperial		Sy' (O) (V&M) (Ga)	Sy	Rd,D (M) (Fu') (R) (G) (O) (Mc) (Ch) (A)
25 Rome	Lankford	Sy	Sy*,Sy'		
	Rome Beauty	Sw	(O)	(Ga)	H&H,Sy,D,(V&M) (Sl) (Fu) (Ch) (O) (Ma)
26 Russet	Roxbury		Sy		
	Russet	(Ga)			
27 Summer Rambo	Summer Rambo		Sy	(Ga)	(M) (O)
28 Sweet Bough	Sweet Bough	H&H		Sy	(M)
30 Tompkins King	Esopus			Sy	
	Hubbardston		Sy		
	Tompkins King	Sw,H&H		(O) (Ga)	Sy(Ow) (Ch)
31 Twenty Ounce	Twenty Ounce	H&H			D(O) (Ba) (Ch)
32 Vandevere	Vandevere			(Ga)	
33 Wealthy	Wealthy	Sy*	Sy',Sw	Sy(Ga)	(Minn) (M) (Vn) (Ma) (P) (Sl) (S) (O) (Rd) (V&M)
34 Winesap	Arkansas		Sy,D		
	Arkansas Black	(Cr)	Sy		
	Black Twig		(Ga)		
	Kinnard		D		
	Oliver			Sy	
	Paragon		D		
	Stayman	Sw(N) (Fu) (O)	Sy,D(V&M) (Ga)	Sy'	
	Winesap	Sy(Fu)	Sy',D(Ga) (V&M)		(T&A)
35 Yellow Bell-flower	Yellow Bellflower	Sy*	Sy	Sy'	

APPLE- Fire blight

Group number and name	Variety	Relative susceptibility and reporter: Very resistant	Resistant	Susceptible	Very susceptible
36	Yellow Transparent		(O)	Sw,Sy*,Sy' (Ga)	H,Sy,Rd,D (F) (G) (P) (T&M) (A) (Mc) (Ma) (V&M) (C) (Ev) (N) (J) (B) (Rd) (Am) (Vn) (H) (O) (G) (E) (Te) (Hr)
Crabs	Hyslop			Sw	(O)
	Martha			Sw	
	Transcendent				Sw,St(T) (P) (Je) (Sl) (Fr) (J) (Minn) (Vn)
	Virginia				(Minn)
	Whitney			Sw	

D – G. M. Darrow, U. S. Dept. Agr. Bul. 1189. 1923.
H – J. L. Hewitt, Arkansas Agr. Exp. Sta. Bul. 113. 1913.
H&H – U. P. Hedrick and G. H. Howe, New York (Geneva) Agr. Exp. Sta. Bul. 361: 79-135. 1913.
Rd – G. M. Reed, Phytopath. 4: 27-30. 1914
St – V. B. Stewart, New York (Cornell) Agr. Exp. Sta. Bul. 329. 1913
Sw – D. B. Swingle, Montana Agr. Exp. Sta. Circ. 98. 1921
Sy – A. D. Selby, Ohio Agr. Exp. Sta. Bul. 290. 1915
Sy' – A. D. Selby, Ohio Agr. Exp. Sta. Bul. 133. 1913

* – collar rot
() – data from report in Plant Disease Survey files

A – J. F. Adams, Delaware
An – H. W. Anderson, Illinois
B – J. T. Barrett, Illinois
Ba – M. R. Barrus, New York
Br – J. T. Bregger, Michigan
Bs – H. P. Barss, Oregon
C – M. T. Cook, New Jersey
Ch – Charles Chupp, New York
Cr – R. F. Crawford, New Mexico
E – J. A. Elliott, Arkansas
Ev – Paul Evans, Missouri
F – F. D. Fromme, Virginia
Fi – F. D. Fisher, Washington
Fr – E. M. Freeman, Minnesota
Fu – H. R. Fulton, North Carolina
Fu' – H. R. Fulton, Pennsylvania
G – N. J. Giddings, West Virginia
Ga – M. W. Gardner, Indiana
H&D – F. D. Heald and B. F. Dana, Washington
Hr – L. R. Hesler, Tennessee
Hu – C. W. Hungerford, Idaho
J – L. R. Jones, Wisconsin
Je – H. M. Jennison, Montana
M – W. E. Maneval, Missouri
Ma – W. W. Magill, Kentucky
Mc – T. H. McHatton, Georgia
Minn. – Sect. Pl. Path., Minnesota
N – J. B. S. Norton, Maryland
Np – Robert S. Northrop, Utah
O – C. R. Orton, Pennsylvania
Ow – C. E. Owens, Oregon
P – L. H. Pammel, Iowa
R – H. S. Reed, Virginia
Rd – G. M. Reed, Missouri
S – E. C. Stakman, Minnesota

APPLE - Fire blight - fruit spot

Sk - E. A. Stokdyk, Kansas
Sl - W. L. Shovell, Montana
T - A. G. Tolaas, Minnesota
T&A - L. R. Tehon and W. W. Anderson, Illinois
Te - C. E. Temple, Maryland
V&M - W. D. Valleau and W. W. Magill, Kentucky
Vn-- R. E. Vaughan, Wisconsin

Recent literature:

Chambers, E. L. Apple fire blight reduced in Dunn County campaign. Wisconsin Dept. Agr. Bul. 52: 70-72 (1922) 1923.
Orton, C. R. Relation of the so-called winter injury at the collar of apple trees to fire blight. Proc. State Hort. Assoc. Pennsylvania 64: 36. 1923.

Fruit spot caused by Phoma pomi Pass.

In 1923 Brook's fruit spot was reported from Massachusetts, southeastern New York, New Jersey, Delaware, eastern West Virginia, Arkansas, southern Ohio, and Missouri. In West Virginia it was said to be more important than usual; otherwise it was reported as less prevalent, or at any rate not more so. According to E. F. Guba of New York fruit spot is usually the major disease of apples in the Hudson Valley, but there was almost none observed in that section in 1923. In Pennsylvania, where this disease often becomes important, it practically disappeared in 1923. The loss for New York was estimated as ranging from a trace to one percent, and in West Virginia at two percent.

W. E. Maneval reported that in Missouri, according to Mr. Neely Turner, "Senator is immune, Jonathan very susceptible, Ben Davis, York Imperial, and King David moderately susceptible." (See Orchard Survey in Missouri, p. 88). Baldwin, Tolman Sweet, and Yellow Bellflower were said to be especially susceptible in New York. Jonathan was reported affected in Delaware and in Arkansas, where V. H. Young stated that over fifty percent infection was noted in one block of this variety. Other varieties attacked were Grimes Golden and Winesap in West Virginia and Rome Beauty in Ohio.

Recent literature:

Brooks, Charles, Phoma fruit spot of apples. Am. Fruit Growers Mag. 44: Feb. 1924.
Thomas, R. C. A new fruit spot of apple, Brook's spot. Mo. Bul. Ohio Agr. Exp. Sta. 8: 91-96. 1923.

Powdery mildew caused by Podosphaera leucotricha (E. & E.) Salm.

Powdery mildew of apple was reported from New York, Pennsylvania, Delaware, Virginia, Ohio, Indiana, Minnesota, Iowa, Missouri, Colorado, Arizona, Idaho, and Washington. As a rule it was said to be of little importance, even less than usual in most of the eastern states where it is not ordinarily considered to be economically significant. Fromme reported that in Virginia it was severe locally, but caused slight loss for the state as a whole. In Colorado, according to Learn, powdery mildew did some damage in Delta and Mesa Counties in the early part of the year (see Pl. Dis. Reporter 7: 18, July 1, 1923), Hungerford stated that it was quite prevalent in unsprayed orchards in Idaho.

APPLE - Powdery mildew

Fromme reported that differences in varietal susceptibility were marked. "Mammoth Black Twig showed 50% of the blossoms affected; none on Winesap and Red June nearby. Also found on Pinnox Red and Rhode Island Greening." In Pennsylvania it is most commonly found on Jonathan.

Recent literature:

Cunningham, G. H. Powdery mildew, Podosphaera leucotricha (E. & E.) Salm. Its appearance, cause and control. New Zealand Jour. agr. 26: 344-351. 1923.

Hostermann, G., and K. Noack. Die Bekämpfung des Apfelmehltaues. Deut. Obstb. Zeit. 69: 162. May 25, 1923.

Crown gall caused by Bacterium tumefaciens E. F. S. and Towns.

Crown gall was reported as being on the increase in Minnesota and Iowa. In the latter state a loss of 35 percent of the nursery stock is reported by Melhus. In general the reports come from nurseries, where inspection indicates high percentages of infection, especially in those regions where dry conditions aggravate the physiological disturbances brought about by crown gall. The aerial swellings, which have been usually termed "aerial crown gall," were reported from New Jersey, Ohio and Missouri.

Miss Brown (1) has recently thrown some doubt upon the etiology of the aerial tumors found on apple stems. Failure to isolate the organism out of material from various parts of the United States and the apparent association of wooly aphis with these types of tumors has led her to hypothecate this insect as the causal organism, rather than B. tumefaciens.

The symposium on crown gall, held at Cincinnati, has attracted considerable attention and a report of the crown gall committee which was approved by the American Phytopathological Society and the Society of Economic Entomologists, will be published in Phytopathology and other journals. The recommendations materially alter the status of the disease from the standpoint of the nurserymen and inspectors and reopen a field for further researches upon the importance and control of this disease.

One severe case of infection was reported in Arizona by Brown, as following planting of apple on the site of a diseased mesquite forest with resulting loss of 1-1/2 acres. The condition as regards the presence of crown gall on the trees at time of planting was not stated.

Varietal susceptibility:

Early Harvest Early May Yates	) more susceptible in Mississippi than ..	(McBride (Delicious (Red June
Wealthy Duchess Transparent	) 50 percent infected in Illinois nurseries	
Ben Davis Gano Rome	) Quite susceptible in New Mexico	

APPLE - Sooty blotch and flyspeck

Recent literature:

Cited

1. Brown, Nellie A. An apple stem tumor not crown gall. (Abstract) Phytopath. 14: 29-30. Jan. 1924.

Not cited:

Anon. Galls on crowns of apple trees. Jour. Dept. Agr. South Africa 7: 198. 1923.

Sherbakoff, C. D. Crown gall control in the nursery. Proc. Tennessee State Hort. Soc. 17: 74-77. 1922.

Sooty blotch and flyspeck caused by Phyllachora pomigena (Schw.) Sacc. and Leptothyrium pomi (Mont. & Fr.) Sacc.

These diseases were reported from a number of states east of the Mississippi River and from Missouri and Kansas. In most cases they were said to be unimportant, but in a few states the damage caused by one or both was appreciable, as is indicated in the reports quoted below. They are invariably most prevalent in shaded, damp or low situations where the air drainage is bad.

M. W. Gardner reported that the flyspeck fungus was found on the bark of a young apple limb in Indiana, February 8.

Besides the varieties mentioned in the reports quoted; sooty blotch was reported on Ben Davis, Grimes Golden, and Missouri Pippin in Illinois, and Baldwin in Connecticut; and flyspeck on Ben Davis and Missouri Pippin in Illinois.

Delaware: Sooty blotch and flyspeck more generally prevalent than last year. The disease became conspicuous in Sussex County the first part of September. Most severe where the July and August sprays were omitted. Many growers with prospects of No. 1 fruit in July had cull apples to harvest in September because of their failure to apply a late spray. Many orchardists applied dust in August with very effective results where if spraying only was possible the fruit would have been neglected. A rainy period of three to four days duration the last of August appeared to favor the establishment of the disease. (Adams)

Virginia: Cloud (Gloeodes pomigena) always troublesome in poorly sprayed orchards. Loss for state 2%. Flyspeck much less prevalent than cloud; loss caused 0.5%. (Fromme)

Indiana: Sooty blotch very serious this year; worse than usual or than last year; caused a reduction in value of apples of 0.2%. Statewide; worse in southern half. Appeared first during last week in September; favored by rains of September 19-21. Greatest damage done to Grimes, produced excess of second grade where grading was close. Most serious on shaded lower branches and on north slopes. (M. W. Gardner)

APPLE – Root rots

Missouri: Sooty blotch; Lady and Huntsman very susceptible, according to reports; Jonathan variable; Grimes Golden, Winesap, Gano, Ben Davis, and Delicious affected to a less degree. (W. E. Maneval)

Recent literature:

Anon. An apple disease. – First record in South Africa. Jour. Dept. Agr. South Africa 6: 381. May 1923. (Leptothyrium pomi)

Root rots caused by various fungi

Black root rot caused by Xylaria sp.

New York: Xylaria sp. caused a loss of 0.2%. Often found in western New York in old orchards. R. G. Palmer, assistant county agent of Monroe County, reports infection of 35% and 50% of Twenty Ounce apples respectively in two orchards, some trees dead. (Guba)

Virginia: (X. digitata) The most important root disease in the state; caused a loss of 1%. Generally distributed; apparently does not vary in severity from year to year. Northern Spy roots are holding up nicely in experimental tests. (Fromme)

Illinois: (Xylaria sp.) Serious in young orchards in Johnson County; some in Union County. (Tehon & Anderson)

Root rot caused by Armillaria mellea (Fr.) Quelet

Alabama, Wisconsin, and Iowa reported Armillaria root rot as occurring locally. According to L. E. Miles, in Alabama, "In one orchard planted in new ground ten percent of the trees were affected."

Root rot caused by Ozonium omnivorum Shear

Texas: Texas root rot by far overshadows all the other apple diseases in the black waxy lands. In fact, this is one serious limiting factor which practically prevents apple growing in these lands. The small percentage of apples grown in the state are mostly found in eastern Texas where the land is more or less of a light loam and where root rot is practically absent. (Taubenhaus.)

Root rots (cause undetermined)

A root rot which may have been caused by a Basidiomycete was prevalent in the eastern part of Oklahoma, and caused considerable loss, according to Stratton. In Indiana M. W. Gardner reported a root rot of unknown cause as occurring on "young Winesaps on newly cleared land. Not present in orchards planted on old farm land." An undetermined root rot was reported from Ohio also.

APPLE - Silver leaf

Silver leaf caused by Stereum purpureum Pers.

While silver leaf has been reported to the Survey from a number of states during preceding years, there has always been some doubt expressed as to the cause of the disease, and winter injury has usually been indicated as the main factor in its occurrence. In 1923 silver leaf caused by Stereum purpureum was reported from Washington by Heald and Dana, who stated that 1923 was the first year that authentic specimens of the fungus had been received. Heald reported further (Dec. 18):

> "I think there is no doubt that this disease is increased in severity by winter injury, but we have found that the trouble was really prevalent in the Spokane Valley for quite a number of years previous to the freeze of last winter.
>
> "From the work which has been carried on up to the present time, it seems to be very widely distributed in the Spokane Valley and probably extends all the way northward to the Canadian boundary. We have no experimental data as yet showing whether perfectly normal apple trees will be attacked by the silver-leaf fungus, but it seems from the experience with the disease in other parts of the world, that the fungus can develop in perfectly normal trees."

D. F. Fisher made the following statement regarding the severity of the disease in an orchard at Cashmere, Washington.

> "Some of the trees produced a few apples this year but they did not mature. The injury appeared to be more on the larger branches and on the trunks than in the small wood of the tops. The bark on the heavy wood was discolored and rotted all the way around and on the trunks to the ground line.
>
> "The grower states that the foliage, such as there was, this year was all silvered in the badly injured section, and now nearly every tree and every injured area on living trees in the other sections is covered with the fructifications of a fungus that Heald has identified as Stereum purpureum. That is, he so identified similar material from some Spokane orchards." (From a letter to M. B. Waite, Dec. 4)

The disease was also found in Tompkins County, New York, and determined as due to Stereum purpureum by E. E. Honey.

Mosaic

The following interesting report of the occurrence of a mosaic disease of apple is from New York.

> "Collected at Ithaca May 16, by F. M. Blodgett; at LeRoy, Genesee County, on the Walbridge variety, by E. F. Guba, August 23. Dr. F. M. Blodgett was able to transmit this disease, which is evidently mosaic, by means of grafting, using material collected in Tompkins County." (Guba)

Bitter pit (non-parasitic)

Bitter pit was reported from most of the Atlantic Coast states from Massachusetts to Virginia, from West Virginia, Ohio, and Indiana; and from Idaho, Washington, and California. In Massachusetts, West Virginia, Ohio, and Indiana it was said to be more prevalent than usual, and to be serious at least in some localities or on certain varieties. In most other cases, it was apparently not important, although Virginia reported some loss.

In Indiana, according to Gardner, the disease was "most serious and widespread on Grimes; serious on Stark; present on Mayer, Baldwin, Esopus, Stayman, McIntosh." Other states reported the following varieties as affected; Massachusetts - "Serious on Baldwin." (Osmun); Delaware - York Imperial, Nero, Rome Beauty (Adams); Virginia - "Especially on Grimes and York" (Fromme); West Virginia - "Bad on York Imperial, Baldwin, King David, and the Winesaps." (Sherwood and Giddings).

The following quotations are of interest:

Ohio: Fruit on young trees with light crops show greatest injury. (R. C. Thomas).

Indiana: Cullinan suggests that the dry spring followed by a wet summer favored the disease. (Gardner).

Kidd and West (1), who have been working in England on the cause of the "brown heart" of apples and pears, prevalent in shipments from Australia, found that during some of their experiments "in which brown heart was artificially produced under the influence of carbon dioxide and reduced oxygen concentrations in the storage atmospheres," there was also developed an abnormal condition remarkably like bitter pit. They suggest, therefore, that bitter pit may be caused by a temporary excess of carbon dioxide "beyond the danger limit in the internal atmosphere of the apples affected," such as might be produced in apples on the tree by the lowering of the temperature when a cold night follows a hot day. It was found by the authors that this danger limit is lower when the temperature is low, and it had been shown previously that "the carbon dioxide and oxygen conditions in the internal atmosphere at higher temperatures are well within the range" which may cause brown heart at lower temperatures.

Literature cited:

1. Kidd, Franklin, and Cyril West. Brown heart - A functional disease of apples and pears. Great Britain Food Invest. Bd. Spec. Rep. 18: 1-54. 1923.

Miscellaneous diseases and injuries

Leafspot caused by Coniothyrium pyrinum (Sacc.) Shel. was collected at Central Bridge, Schoharie County, New York, August 30. Chupp and Guba state that this leafspot, following frogeye, was "severe on one McIntosh apple tree causing defoliation and yellowing of the leaves. According to the grower, this same disease has been present on the one isolated tree for several years. No other fungus present."

Brown rot caused by Sclerotinia cinerea (Bon.) Schrot. - Alabama, Oklahoma, Indiana, Iowa, California; not important in any case. Mel. T. Cook (1) made isolations from Stayman Winesap apples for the purpose of securing

cultures of Glomerella rufomaculans, but found that in nearly every case the rot was due either to Sclerotinia or Botrytis.

Rot caused by Botrytis sp. - Washington.

Rot caused probably by Phytophthora cactorum Schröt. - Indiana. According to Gardner, the disease appeared July 18 at Lafayette on the same trees as in 1921 (see Pl. Dis. Bul. Suppl. 20: 53. June 10, 1922). "It was worst on Grimes, on low hanging fruits and drops in low wet spots in orchards. A Bordeaux spray was applied and no further trouble resulted. It was noted in October on Grimes and Ben Davis drops in Miami County."

Die-back caused by Valsa leucostoma (Pers.) Fr. was reported as common, associated with or following fire blight or winter injury, in New York and Nevada. It was of some importance on nursery stock and young trees in the former state.

Brown bark spot, cause unknown, was reported from Washington, and from Indiana as follows:

> "Burkholder suggests it may be associated with poor soil drainage. In 1921 this disease was found on Champion in Brown County. Specimens were sent to Morris in Montana, who pronounced it the same as their disease described as brown bark spot. This year it was sent in from Spencer County." (Gardner).

Collar rot, cause unknown, mostly on Grimes, in Ohio and Indiana. In the latter state, according to Gardner, the trouble is now "avoided by using double worked nursery stock."

Scald (non-parasitic) was reported from a very few states, but probably occurred much more widely. According to a statement issued by the American Association of Ice and Refrigeration (5), "Approximately 12,000,000 boxes of apples that went into storage last fall (1923) were wrapped in oiled wrappers for the prevention of loss from apple scald."

Other parasitic diseases reported were Cercospora mali Ell. & Ev. causing leafspot in Texas; Phyllosticta sp. on leaves and fruit from New Jersey; blue mold rot caused by Penicillium expansum (Lk.) emend. Thom.; spongy dry rot caused by Volutella fructi Stevens & Hall, from New York, West Virginia, and Indiana; fruit rot caused by Fusarium sp. from Washington; Neofabraea malicorticis (Cord.) Jackson from Washington; Cytospora sp. from New Mexico, Washington, and Oregon (11); Myxosporium corticolum Edg. (2, 3) from New York and Pennsylvania; Nectria galligena Bres., New York and Oregon (8, 9, 12); Daldinia concentrica (Bolt.) Ces. & De Not., Washington; Daedalea confragosa (Bolt.) Pers., New York; Septobasidium sp., Alabama and Louisiana; Polystictus versicolor (L.) Fr., New York and California (important in some cases); Schizophyllum commune Fr., New York.

Various other non-parasitic troubles were reported, mostly as unimportant. H. W. Anderson reported that in Illinois an unusual type of soft scald caused considerable loss to apples, especially Jonathans, in storage. Jonathan spot was reported from New York, New Jersey, Ohio, Indiana, Iowa, Idaho, Washington, and California; water core from New York and Arkansas; crinkle from Minnesota; internal breakdown from Idaho; cork, tan disease, fasciation, niter burning, and alkali injury from Washington; rosette(5) from Delaware (associated with drouth) and Idaho; measles from New Mexico. References 4, 7, and 10 give the results of work on the causes and control of brown heart and internal browning of apple fruits.

APPLE - Miscellaneous diseases

Injury due to weather conditions was reported as follows: drought spot, Arkansas (York Imperial, Shannon Pippin, and Mammoth Pippin), Idaho, Washington; drought injury (defoliation of trees), Missouri; skin crack, Virginia (apparently from rapid expansion following rainfall in August after prolonged drought. Growers have often thought this spray burn), Michigan; sunscald, scorch, or burn of fruit, Connecticut, New York, New Jersey, Delaware, Missouri; early drop, Virginia (an unusually severe early drop which involved as high as 85 percent of the total set was recorded in the Upper (Shenandoah) Valley of Virginia. Thought to be due to the 8° above zero weather in late March - Schneiderhan); hail injury, Connecticut, Iowa; frost injury, Connecticut, Delaware, West Virginia, Ohio, Indiana, Illinois, Iowa, Washington; winter injury, Connecticut, Ohio (serious upon young trees of Hubbardston, Rome, Jonathan, and Baldwin; apparently traceable to freezes of early December, 1922 - Thomas), Wisconsin (more than the usual amount. Stunting of trees and yellowing of foliage were the common symptoms in the northern section. The trouble appeared to be confined largely to the Northwestern Greening and associated with bad drainage - Vaughan), Minnesota (of less than the usual importance; mostly of sunscald type on branches and trunk - Sect. Pl. Path.), Washington (widespread and important in eastern part - Dana).

Recent literature:

Cited:

1. Cook, M. T. Brown rot of apple. Phytopath. 13: 462. Oct. 1923.
2. Gilchrist, Grace G. Bark canker disease of apple trees caused by Myxosporium corticolum Edgert. Trans. Brit. Myc. Soc. 8: 230-243. 1923.
3. ------- Bark canker disease of apple trees, caused by Myxosporium corticolum, Edgerton. Jour. Bath & West & South Co. Soc. Agr. Ser. 5, 17: 155-159. 1923.
   In Rep. Nat. Fruit & Cider Inst. 1922.
   (The disease was first discovered in England in 1920, at Long Ashton, and subsequently in a nursery at Sandford. Although it has been considered to be only a weak parasite in the United States, the damage in England was severe; however trees that are attacked are usually in a weak condition.)
4. Kidd, Franklin, and Cyril West. Brown heart - A functional disease of apples and pears. Great Britain Food Invest. Bd. Spec. Rept. 12. 54 pp. 1923.
   "The evidence .. indicates clearly that apples .... develop brown heart when stored in atmospheres containing percentages of carbon dioxide above a certain danger limit, the presence of oxygen being essential ..... It is shown that brown heart may occur at any stage in the storage life of the fruit and that the conditions causing it can produce their effect in a short time. Low temperatures increase the susceptibility of the fruit, and varieties and even individual apples differ markedly in their susceptibility to the disease."

5. McPike, E. F. (Secretary) Use of oiled wrappers for preventing apple scald increasing in Northwest. Amer. Assoc. Ice & Refrigeration Perishable Freight Conservation Bureau. Inform. Bul. 256: (Mimeographed, 1 page). Feb. 5, 1924.
6. Morris, O. M. Apple rosette. Washington Agr. Exp. Sta. Bul. 177 (Techn. Paper). 38 pp. July 1923.
7. Waters, R. Apple flesh-collapse or brown-heart. Control measures for orchard and cool store. New Zealand Jour. Agr. 27: 32-41. July 1923.
8. Wiltshire, S. P. Canker control trials. Jour. Bath & West & South Co. Soc. Agr. Ser. 5, 17: 188. 1923.
In Rep. Nat. Fruit & Cider Inst. for 1922.
9. ------- Canker infection of apple trees through scab wounds. Jour. Bath. & West & South Co. Soc. Agr. Ser. 5, 17: 206-208. 1923.
In Rep. Nat. Fruit & Cider Inst. for 1922.
10. Winkler, A. J. A study of the internal browning of the Yellow Newtown apple. Jour. Agr. Res. 24: 165-184. 1923.
11. Zeller, S. M. Cytospora canker of apple and pear. Biennn. Rept. Bd. Hort. Oregon 17: 162-164. 1923.
(Found to be prevalent in nearly all apple and pear growing sections in western Oregon, especially where the 1919 freeze caused severe injury to trees).
12. ------ European canker of pear and apple - its control. Biennn. Rep. Bd. Hort. Oregon 17: 155-158. 1923.
(The disease has gained considerable foothold in western Oregon, but it is more prevalent in pear than apple orchards. The general vitality of the trees influences their susceptibility to the canker).

Not cited:

Anon. Winter injury to apple roots. New Hampshire Agr. Exp. Sta. Bul. 208: 6-7. 1923.
Alcock, N. L. A die-back in Sussex. Trans. Brit. Myc. Soc. 8: 190. Mar. 1923. Diplodia griffoni.
Brittain, W. H. Methods employed in recording results of spraying and dusting experiments in apple orchards. Scient. Agr. 4: 141-151. Jan. 1924.
Brooks, Charles, J. S. Cooley, and D. F. Fisher. Apple scald and its control. U. S. Dept. Agr. Farm. Bul. 1384: 16 p. Oct. 1923.
McCubbin, W. A. Apple fruit spots. Proc. State Hort. Assoc. Pennsylvania 64: 137-139. 1923.
Stearns, L. A. and W. S. Hough. Spreader tests on apples and peaches. Jour. Econ. Entom. 16: 198-207. 1923.

Orchard surveys

Virginia:

Apple disease survey, Crozet, Virginia, 1923. See table 13.

Table 13. Data by R. H. Hurt from 33 orchards; 14 of Winesap, 12 of Albemarle Pippin, 3 of York Imperial, 3 of Ben Davis and 1 of Stayman. Fruit infection only.

Disease	Winesap			Pippin			York		
	Percent infected orchards	Maximum percent infection	Average percent infection	Percent infected orchards	Maximum percent infection	Average percent infection	Percent infected orchards	Maximum percent infection	Average percent infection
Scab	86	2.6	0.7	8	t	t	33	0.3	0.1
Cedar rust	0	0	0	8	t	t	0	0	0
Bitter rot	36	t	t	92	8.0	1.1	100	2.5	1.8
Blotch	0	0	0	42	2.0	0.3	0	0	0
Black rot	0	0	0	0	0	0	0	0	0
Fly speck	29	5.0	0.8	0	0	0	0	0	0
Cloud	36	5.0	0.6	0	0	0	0	0	0
Stippen	100	3.0	1.6	100	8.0	3.5	100	5.0	4.3
Drought crack	7	5.6	0.4	100	60.0	52.7	33	0.5	0.2

	Ben Davis			Stayman			All varieties		
Scab	100	1.0	0.3	--	--	0.5	45	2.6	0.9
Cedar rust	33	t	t	--	--	0	6	t	t
Bitter rot	100	2.0	0.6	--	--	0	71	8.0	0.7
Blotch	0	0	0	--	--	0	16	2.0	0.1
Black rot	0	0	0	--	--	0	13	t	t
Fly speck	0	0	0	--	--	0	13	5.0	0.4
Cloud	0	0	0	--	--	0	13	5.0	0.3
Stippen	66	2	1	--	--	5.0	99	8.0	2.6
Drought crack	33	t	t	--	--	0	42	60.0	14.0

APPLE - Orchard disease survey

Apple Disease Survey, Frederick County Virginia, 1923

Table 14. Data by F. J. Schneiderhan and R. H. Hurt from 23 orchards; 8 of Ben Davis, 8 of Stayman, 2 of York Imperial, and one each of Jonathan, Northwestern Greening, King David, Winesap and Rome.

Disease	Percent infected orchards	Maximum percent infection	Average percent infection	Data from cull piles at vinegar plants. Average percent infection.
Scab	48	56.5	3.9	2.3
Cedar rust	39	1.5	0.3	0.2
Bitter rot	26	100.0#	0.4	0.6
Blotch	0	0	0	0.1
Black rot	20	2.5	0.4	0.5
Fly speck	0	0	0	0.4
Cloud	39	20.5	1.5	5.7
Stippen	48	7.3	1.5	13.0
Drought crack	39	30.0	1.7	8.3
Codlin moth	87	57.5	8.0	20.4
Curculio	87	11.0	1.8	7.1
Aphis	56	16.5	3.1	11.0
Scale	61	41.0	4.4	13.0
Leaf roller	52	2.5	0.5	2.4

This case is omitted from the averages as only a few trees were affected.

Missouri:

During October and November Mr. Neeley Turner, of the extension department of the University of Missouri, inspected apples in various parts of the state. According to his records the following were the worst cases of loss from infections of fungi on fruit. The data are for 34 orchards containing 1668 acres in 12 counties (Andrew, Barry, Buchanan, Carroll, Cooper, Greene, Jackson, Jasper, Lawrence, McDonald, Newton, Platte). At least 20 of these orchards were sprayed pretty thoroughly (4 to 7 times).

The worst diseases on the fruit in these orchards were scab in 2, blotch in 17, sooty blotch in 6, bitter rot in 1, Phoma spot in 6, and rust in 1. In the 12 orchards in which there was the most blotch the percentage of blotched apples varied from 10 to 90 percent and averaged about 35 percent. The highest percentage of scabby apples was from 2 to 5 percent. In 1 orchard (10 acres) in which Jonathan was the main variety 100 percent of the fruit was affected with sooty blotch and fly speck, and in general sooty blotch was common and infections heavy. The highest percentage of bitter rot reported was 4 percent. In 4 orchards from 15 to 50 percent of Phoma spot was found. This was in Lawrence and Green counties. Phoma spot, it seems, has been unusually abundant this year and has received considerable attention.

Blotch was severe on fruit of Huntsman, Ben Davis, Jonathan (25 percent highest), Grimes, Delicious, Ingram (50 percent highest), Winesap, Paine's (90 percent highest) and Gano.

Sooty blotch was reported worst on Jonathan (1 case or 100 percent), Ingram (10 percent) Huntsman, Lady and Ben Davis.

PEAR - Fire blight

Phoma spot was found on 25 to 50 percent of fruit in some cases on Jonathan and Ben Davis.

Most of these 34 orchards varied in age from 20 to 30 years. (W. E. Maneval. 1923)

PEAR

Fire blight caused by Bacillus amylovorus (Burr.) Trev.

Pear blight is coextensive with the pear industry and the reports for 1923 indicate that the disease was fully as prevalent as in 1922 when there was a very conspicous increase over the two previous years. In a few states such as Connecticut, Pennsylvania, West Virginia and Wisconsin the collaborators report the disease as being of less importance than in 1922, but all the other reporters indicate as severe an outbreak or else a heavier infection than in 1922. In California Milbrath states, "There are few orchards in the diseased areas which did not have some blight. In some orchards all trees were severely infected. The loss in the state was about $2,000,000 based on removed trees, severely pruned trees and crop reduction. In Sacramento County out of 1,000,000 trees 30,000 were removed." In a number of states such as Kentucky, North Carolina, Florida, the Gulf States, Arkansas, New Mexico, Arizona, Utah, Idaho, and California, blight is considered the limiting factor in the cultivation of the pear.

Only a few estimates of losses in percentages were reported, but these are given for the purpose of showing the general importance of this disease.

Table 15. Percentage losses from pear blight in 1923, as estimated by collaborators.

State	Percent	State	Percent
New York	15	Mississippi	40
Virginia	2	Texas	5
West Virginia	4	Arkansas	60 - 75
Kentucky	50	Indiana	6
North Carolina	20	New Mexico	15

Varietal susceptibility and control:

The Bartlett and Clapp's Favorite are as usual reported as very susceptible. Kieffer is also reported as being rather susceptible in New York and Illinois. In Alabama the sand pear is the only resistant one but even it shows some twig blight. In Georgia and Florida, Rimes' Pineapple pear has shown marked evidences of being immune (1,2,7,9). In these states considerable work is under way on this interesting variety, which was reported by H. P. Rimes (7) as having originated in his orchard near Ludowici, Georgia. The original parent tree is now 43 years old and is vigorous and produces heavy annual crops.

During these years it has been close to other varieties such as LeConte and Kieffer, which have blighted badly. Attempts to infect this pear have failed. It is called the Pineapple pear on account of the pineapple-like odor.

At the Southern Oregon Substation the principal work is in connection with the study of blight resistance in pears (3,5,6). A. C. McCormick reports as follows (5):

> "Seedlings of P. ussuriensis have in some cases been planted directly in the orchards and there top-worked to the standard pear varieties. This procedure is, however, not to be generally recommended because we know the logical place to graft two distinct species is at the crown. We know, too that to top-work seedlings requires a great amount of individual attention on account of the variation in habit of growth of seedling stock. Therefore, it has been found necessary to develop resistant varieties which form the trunk and main limbs of the disease resistant trees. In this way the tops of the trees are standardized. Through inoculation experiments there were found two varieties of P. communis which were practically immune to blight, Old Home and Estella, and two or three cultivated varieties of P. ussuriensis chief among which are Chief Li and Hsiang Sui Li. These varieties when grafted on Chinese roots and top-worked to our standard commercial pear varieties give the pear grower a tree with the roots, trunk and main limbs immune to the ravages of pear blight. Practical pear growers estimate that these trees when top-worked will be 75 to 90 per-cent proof against the disease. This means that the disease will be confined in the commercial variety, to the tops of the trees, where it may readily be discovered and eradicated."

According to Root (8): honey bees are not the chief carriers of fire-blight, and if they do carry blight to a limited extent their value in pollination offsets many times any possible damage they may do as disease carriers.

Recent literature:

1. Anon. Pineapple pear is blight proof. Quart. Bul. Florida Dept. Agr. 33[3]: 60-61. July 1923.
2. Anon. Plant Diseases. Georgia Agr. Exp. Sta. Rept. 1922: 14-16. 1923.
3. Anon. Studies of pear blight in Oregon. Oregon Agr. Exp. Sta. Bien. Rept. 1921-22: 95-97. 1923.
4. Day, L. H. Control of pear blight in California. Amer. Fruit Grower 43[6]:3, 12. 1923.
5. McCormick, A. C. Blight resistance in pear stocks. National Nurseryman. 31: 112-114. 1923.
6. Reimer, F. C. Blight and other pear problems. Better Fruit 18[6]: 5-6. December 1923.
7. Rimes, R. D. Rimes' blight proof pineapple pear. Florida Grower. 28[12]: 16, 45. Sept. 22, 1923.
8. Root, E. R. Are bees carriers of fire blight? Better Fruit. 18[1]: 8, 26. 1923. (Abstract. Bot. Absts. 13, entry 331. Jan. 1924.

PEAR - Scab

9. Stuckey, H. P. The investigational work with pears at the Georgia experimental station. Report Iowa State Hort. Soc. 57: 169-172. 1923.

Not cited

Rimes, R. D. What is claimed for Rimes' blight-proof Pineapple pear. Amer. Nurseryman 38[4]: 86, 94. 1923.

Scab caused by Venturia pyrina Aderh.

Pear scab was apparently distributed generally over the areas where pears are grown. It was of more than usual importance in Illinois, Wisconsin, Washington, and California. More generally it was reported to be of less or of average importance. In Genesee County, New York, pear scab appeared to be of unusual importance, Bartlett showing 50 to 60 percent of fruit infection. In other orchards Flemish Beauty was about the only one conspicuously attacked but in neglected orchards all varieties were more or less susceptible (Chapman). The disease was prevalent in Western Washington (Heald & Dana); also in California where 1 percent loss was estimated (Milbrath).

Dates of first observation:

June	14	Kenosha, Wisconsin
"	12	Wayne County, New York
"	13	Concord, New Hampshire
"	28	Mt. Gilead, Ohio

Other diseases

Leaf blight caused by Fabraea maculata (Lev.) Atk. was reported from Connecticut, New York, New Jersey, Delaware, Alabama, and Illinois. Adams estimated a loss of 5 percent as due to this disease in Delaware, which was apparently the only state where it was of any importance.

Leafspot caused by Mycosphaerella sentina (Fr.) Schrot. was reported from New York, New Jersey, Virginia, Georgia, Alabama, Oklahoma, and Illinois. Varieties affected were Sheldon, Seckel, and Bartlett in New York, Pineapple in Georgia, Kieffer and sand pear nursery stock in Alabama.

Sooty blotch caused by Phyllachora pomigena (Schw.) Sacc. was reported from New York, Delaware, and Indiana, and from Illinois for the first time.

Diseases caused by Septobasidium spp. were reported as follows: girdle caused by Septobasidium sp. from Louisiana; canker caused by S. retiforme (B. & C.) Pat. from Florida, Alabama, and Texas; canker caused by S. pedicellatum (Schw.) Pat. (felty fungus), from Florida and Mississippi.

Corticium stevensii (Noack) Burt was reported by Weber as destructive, causing 50 percent defoliation, on a few old trees at Gainesville, Florida. The disease attacked the leaves and twigs. "The leaves were killed rapidly and turned black, clinging to the tree as in fire blight."

Other parasitic diseases reported were sooty mold caused Torula sp. from Illinois; powdery mildew caused by Podosphaera sp. from Colorado;

*pedicellatum

twig blight caused by Phoma ambigua (Nitz.) Sacc. from Florida; root rot caused by Ozonium omnivorum Shear from Texas and Arizona; crown gall caused by Bacterium tumefaciens EFS. and Towns., New Mexico and Arizona. Fruit rots were reported as due to Sclerotinia cinerea (Bon) Schröt. in Mississippi and Illinois; Physalospora cydoniae Arnaud in Alabama (on fruit in transit) and Arkansas; Botrytis sp. and Rhizopus nigricans Ehr. in Washington.

Winter injury and drought injury were reported from Washington; frost injury and russeting of the fruit due to frost from Ohio.

Other non-parasitic troubles reported include red leaf in New York; (Plant Dis. Reporter 7: 97. Oct. 1, 1923) "Apparently for the most part associated with poor soil and cultural conditions." (Guba); black leaf and black end in California; stoniness, rough bark, and alkali injury in Washington.

QUINCE

Fire blight caused by Bacillus amylovorus (Burr.) Trev. was reported as the most destructive disease of quinces in New York, where it caused a loss estimated at 12 to 15 percent. Other states where it was important were Delaware, Illinois (loss 0.5%), and Massachusetts. It was reported also from Connecticut, New Jersey, Pennsylvania, Texas and Ohio.

Leaf blight caused by Fabraea maculata (Lév.) Atk. was reported from Connecticut, New York, Delaware, West Virginia, South Carolina, Alabama, Indiana, and Illinois. In most of these states it was of some importance locally. Losses due to it were estimated at 5 percent in West Virginia, 4 percent in New York, and 0.5 percent in Illinois.

Rust caused by Gymnosporangium germinale (Schw.) Kern - Reported from Massachusetts, Connecticut, Pennsylvania, Alabama. Osmun (Massachusetts) stated that "Dry weather during the normal period for the dissemination of basidiospores probably accounts for the relatively small amount of infection."

Other diseases and injuries reported were hairy root due to Bacterium tumefaciens EFS. & Towns., Washington; bitter rot caused by Glomerella cingulata (Stonem.) S. & von S., West Virginia; brown rot caused by Sclerotinia cinerea (Bon.) Schröt., West Virginia; frost injury from Washington.

DISEASES OF STONE FRUITS

PEACH

Brown rot caused by Sclerotinia cinerea (Bon.) Schröt.

Brown rot of peach was widely distributed as usual, being reported from Massachusetts south and west to Georgia, Texas and Kansas; also in California and New Mexico.

In the northeastern United States brown rot caused much loss loss except in Delaware and eastern Maryland where it was more severe than in 1922. The

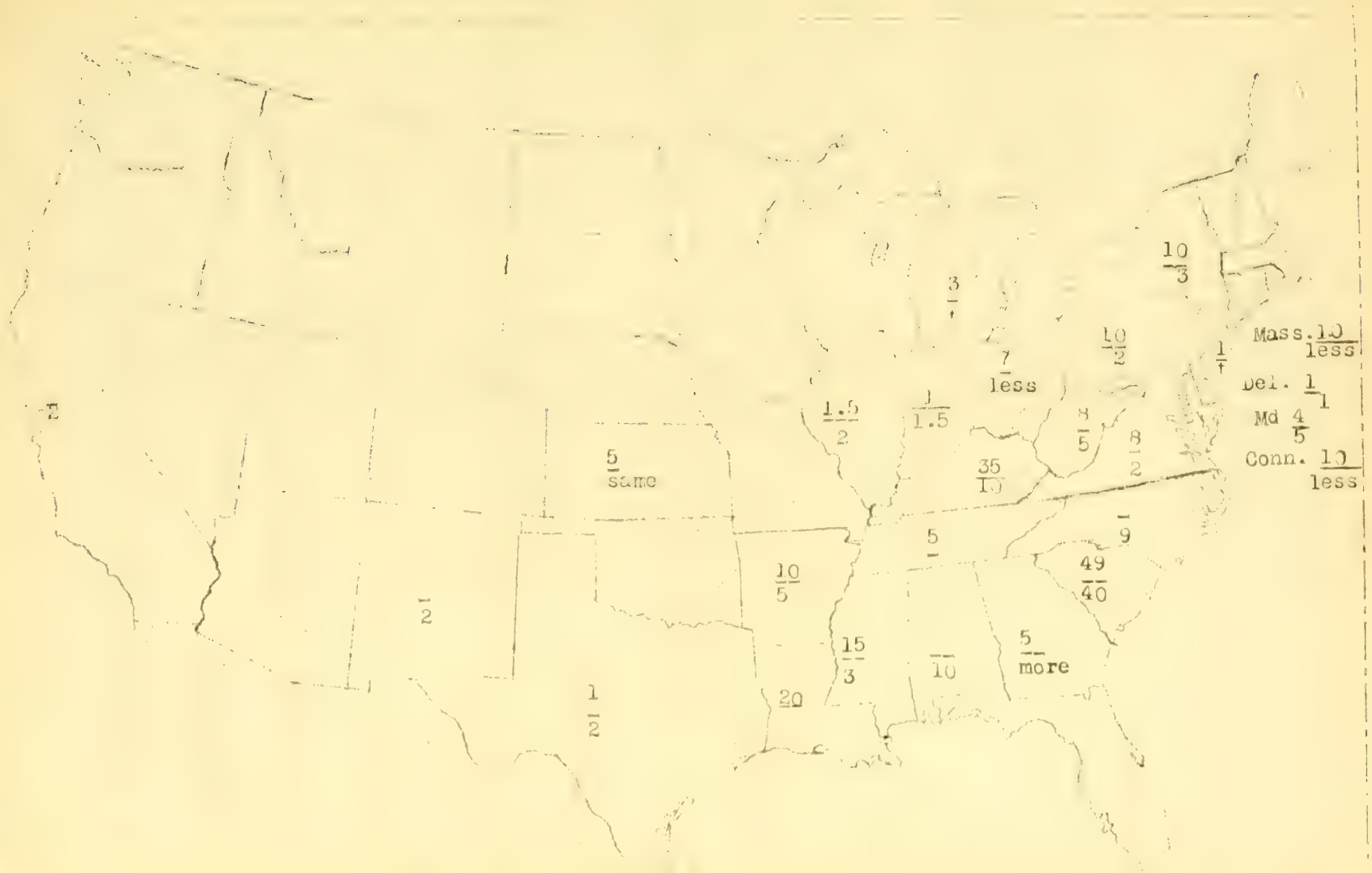


Fig. 4. Percentage losses from brown rot of peach in 1923 (lower figure) as compared with 1922 (upper figure).

disease was also less prevalent in the more northern peach areas of Ohio and Michigan, but from Kentucky to Illinois and southward the disease was generally of more importance than usual, with the possible exception of Arkansas where the loss was considerably less according to the reports from that state. In New Mexico and California the disease was important locally and it is estimated that a loss of 2 percent occurred in each of these states.

Dates of earliest appearance:

March 28	(blossoms)	Fort Valley, Ga	June 5	Hamilton Co., Ill.
May 4	(fruit)	" " "	" 16	Bridgeville, Del.
" 24	.....	Seneca Co., N. Y.	" 19	Cheshire, Conn.
" 29	.....	Pickens, S. C.	" 26	Clark Co., Miss.

Blossom blight was reported from New York, Maryland and North Carolina and twig blight from New York, South Carolina and Ohio.

Weather relations:

It is apparent that the incidence of brown rot in 1923 is closely related to the rainfall over the peach areas. Where the disease was of less importance, as in the north and northeast, the rainfall was slight throughout the growing period and until after the ripening dates for early peaches. Most of the rot in this area occurred on the late peaches after the arrival of periodic rains. In the more southern areas the precipitation was more normal and ,coupled with higher temperatures, much rot developed, especially upon the late crop.

Varietal susceptibility:

Hale, Early Elberta, and Elberta were reported susceptible in Delaware. (Adams). Uneeda was most susceptible in Georgia, but Yellow Riley, Carman, Belle of Georgia and Elberta were also susceptible. (Dunegan).

Control:

Maryland: Fair control secured by spraying with self-boiled lime sulfur when the buds were pink. (Jehle & Temple)

West Virginia: Reduction in brown rot apparently correlated with reduction in curculio damage. (Sherwood & Giddings)

Kentucky: Self-boiled lime sulfur and dry mix gave good control. (Magill)

The use of hydrated lime on the soil appears to give results in preventing the development of apothecia, according to Ezekiel (1):

PEACH - Brown rot

Table 16. Effect of hydrated lime on the growth of apothecia.

Pot number	$Ca(OH)_2$ in pounds per acre	pH after 1 day	pH after 14 days
1	125	6.81	6.55
2	625	6.65	6.65
3	5000	7.30	10.70
4	None (check)	5.99	6.40

Pot number	Development of apothecia after 1 day	6 days	10 days	14 days	20 days
1	-	-	trace	++	+++
2	-	-	-	-	-
3	-	-	-	-	-
4	++	+++	+++++	++	-

Recent literature:

Cited

1. Ezekiel, W. N. Brown rot of peaches and hydrated lime. Agr. Lime News Letter 4. Aug.--Dec. 1923

Not cited

Ezekiel, W. N. Strains of the brown rot fungus, Sclerotinia americana. Phytopath. 14: 32. Jan. 1924.

---------- Hydrogen ion concentration and the development of Sclerotinia apothecia. Science N. S. 58: 166. 1923.

Farley, A. J. Dry-mix sulfur lime. A substitute for self-boiled lime sulfur and summer-strength concentrated lime-sulfur. New Jersey Agr. Exp. Sta. Bul. 379: 1-16. 1923.

Hammond, A. A. Brown rot of stone fruits. Spraying experiments. Jour. Dept. Agr. Victoria 21: 489-495. 1923.

Harrison, T. H. Note on the occurrence in New South Wales of the perfect stage of a Sclerotinia causing brown rot of fruits. Jour. & Proc. Roy. Soc. New South Wales 55: 215-219. 1922.

Norton, J. B. S. & W. N. Ezekiel. The name of the American brown rot Sclerotinia. Phytopath. 14: 31-32. Jan. 1924.

Leaf curl caused by Exoascus deformans (Berk.) Fuckel

Leaf curl was widely distributed from New Hampshire to California. In general it was reported as being somewhat more severe than during the previous year and the losses during 1922 and 1923 were more than in 1921, but not so great as during the years of 1919 and 1920.

The total annual losses in the United States from leaf curl have been estimated, together with the average loss for five years, as follows:

PEACH – Leaf curl

1918	1919	1920	1921	1922	Average
.4	2.21	3.	.6	1.6	1.56

The following selected reports are typical for 1923:

Rhode Island: Leaf curl was abundant on all varieties, being severe even in some orchards which had received the dormant spray. (Browning)

New York: Particularly severe in counties bordering on Lake Ontario; prevalent all over state. Reported from 26 counties. (Guba)

Delaware: Greater prevalence than we have had for three years. (Adams)

Virginia: More prevalent than usual and general throughout the state. (Fromme)

Kentucky: Universal. Probably as severe as it can be. (Valleau)

South Carolina: Not important. (Ludwig)

Georgia: Peach leaf curl prevalent but not considered serious. Cool damp weather of spring favored the development of this disease which is not generally very common about Fort Valley. (Dunegan)

Mississippi: Damage slight except in unsprayed orchards. (Neal & Barker)

Oklahoma: More prevalent than usual. (Stratton)

Ohio: Rather less than last year. (Young)

Indiana: Much worse than last year. (Gardner)

Illinois: One of the worst outbreaks in years; 90 percent of the orchards infected. (Tehon & Anderson)

Iowa: More than usual. Spraying is not practical because trees are worthless. (Melhus)

Estimated losses from leaf curl in 1923:

State	Percent	State	Percent
New York	8	Mississippi	t
Delaware	1	Texas	t
Maryland	3	Arkansas	2
Virginia	0.5	Indiana	0.5
South Carolina	1	Illinois	3
Alabama	t	Iowa	4
		California	0.2

Dates of earliest appearance:

April 16	Webster Co., Miss	May 11	Bronx, N. Y.
" 24	Central, S. C.	" 23	Shipman, Va.
May 5	Orange Co., Ind.	" 25	Littleton, Mass.
" 6	Oklahoma	May	Haddam, Conn.
" 7	Germantown, Ohio	June 1	Rockingham Co., N. H.
" 9	Bridgeville, Del.	" 1	Wayne Co., Mich.

Varietal susceptibility:

Very few reports on varietal susceptibility and resistance were received. Fromme reports that "10 percent of shoots on Elberta and Carman at Blacksburg were infected while Early Crawford in the same orchard showed

practically no infection." In Illinois, Belle of Georgia is said to be most susceptible; Elberta less so and Champion most resistant, according to Tenon and Anderson.

Control:

Good control was obtained where the dormant lime-sulfur spray was applied early enough to prevent infection. Early spring rains in New York and other states interfered with the dormant applications so that the control was generally not up to the usual standard. In Kentucky where the infection was very severe lime-sulfur 1-8 gave control where applied before March 15. (Valleau) In Illinois, Bordeaux oil emulsion does not seem to be as effective as lime-sulfur in controlling leaf curl. (Anderson)

The important lesson from the situation in 1923 is, "Do not omit nor delay the dormant spray on peaches; leaf curl infection takes place during the first swelling and cracking of the buds and failure to get on the dormant spray prior to this time means partial failure at least."

Recent literature:

Massey, L. M., and M. W. Fitch. Some results of dusting experiments for apple scab and for peach leaf curl in 1921-1922. Proc. New York State Hort. Soc. 1922: 42-60. 1923.

Mix, A. J. Biological and cultural studies of Exoascaceae. I. Exoascus deformans (Berk) Fuckel. (Abstract) Phytopath. 14; 35. Jan. 1924.

Weldon, Geo. P. Spring spraying of peaches with lime-sulfur. Monthly Bul. California Dept. Agr. 12; 44. 1923.

Scab caused by Cladosporium carpophilum Thum.

Peach scab was of less importance than usual in the New England and Middle Atlantic States, except Delaware, where there was a denoted increase. In West Virginia, Kentucky and the South the disease was of usual importance and prevalence. In Ohio, Indiana, Illinois and Iowa scab was of more than usual importance because of the late infections.

New Jersey: Scab not as severe as in 1922 but usually present in most unsprayed orchards. In an orchard in Cumberland County, on Carman 62.2 percent of the fruit was infected, on Lola 38.5 percent and on Hiley 35.2 percent. In Atlantic County in one orchard, Greensboro, 75 percent was infected. (Wm. H. Martin)

Losses were reported as follows:

State	Percent	State	Percent
New York	1	Mississippi	1
Delaware	2	Texas	1
West Virginia	1	Arkansas	3
Kentucky	t	Illinois	0.5
North Carolina	3	Iowa	t
Alabama	2	Kansas	slight
		New Mexico	slight

PEACH - Bacterial spot

Dates of first appearance:

April	7 Wayne Co., Miss.	July	28 Upper Valley, Va.
July	9 Logan Co., Ill.	Aug.	State College, N. Mex.
"	18 Bridgeville, Del.	Sept.	Ohio

The dry summer weather prevailing in the east was generally unfavorable, but in sections of the Ohio Valley the abundant late rains were favorable for the late appearance and rapid spread of the disease after spraying had been generally discontinued.

Very few reports on varieties were received. In Delaware June budded stock from a Tennessee nursery (900 trees) showed severe twig infection. In Illinois, Indian Red, Heath Cling, Hale, Elberta and seedling peaches were most affected.

Spraying was generally successful in controlling scab in 1923 due probably to the generally light infection. Lime-sulfur dust was reported as giving good control in Delaware. More attention than usual was given to spraying peaches in Ohio, with good results.

Bacterial spot caused by Bacterium pruni EFS.

The most important general observation regarding the bacterial spot is its almost constant association with neglected and uncultivated orchards. Undoubtedly it is often confused with a physiological leaf spot which is also associated with unfavorable conditions for the normal growth of the trees. In 1923 the disease appears to be of about the same general distribution and importance as in 1922. The following reports are of especial interest:

Delaware: As reported last year this was the most serious disease of the crop for 1923. In comparison with last year the prevalence of the disease was in the form of fruit infection, while last year leaf infection and defoliation was the situation. Leaf infection was observed in slight prevalence May 22 while fruit infection was first found June 22. The largest amount of fruit infection developed during July. Severe twig infection occurred along with the leaf infection last year. It was observed this year that the heavier fruit infection occurred on shoots which showed the greatest amount of twig infection. The infection around the leaf petioles from last year in two instances showed the presence of a fungus fruiting (Phoma persicae). This fungus has been reported as causing a die-back condition. The fertilizer experiments this year failed to produce any favorable results on control of the disease. Some fall spraying with Bordeaux mixture is being undertaken this fall to determine its effects on disease control. (Adams)

New York: In New York the disease was rather general where cultivation and fertilization are neglected. Often confused with other injuries. (Guba)

Alabama: Leaf and twig injuries rather common. Severe defoliation in some cases. Fruit spot observed in few cases. Loss probably less than 1 percent, though hard to estimate, when one considers the resulting lowered vitality of the trees. (Miles)

PEACH - Bacterial spot

Mississippi: Date of first report May 26 - Lauderdale County. Damage serious resulting in partial defoliation of the trees. Also observed in Pearl River County on July 9. Damage very severe on the early varieties such as Greensboro, Carman, Mayflower and other early peaches. Many of these trees were about 75 percent defoliated early in July. (Sec. Pl. Path.)

Greatest injury on light, sandy soil with poor fertilization and care. (Neal & Barker)

Arkansas: Very common on leaves and less common on fruit in run down orchards. (Young)

Ohio: Most serious in neglected orchards. (Thomas)

Indiana: There is good evidence that disease is carried with nursery stock. The worst disease in commercial orchards. (Gardner)

Kansas: Common as usual. Very widespread wherever peaches are grown. Some twig cankers formed this season in addition to heavy leaf infections in some localities. (White)

Dates of first appearance:

Feb.		Clayton, La.	June	1	Orleans Co., N. Y.
April	9	Pearl River Co., Miss.	"	13	Marion Co., Ill.
May	20	Yavapai Co., Ariz.	"	18	Floyd Co., Ind.
"	22	Clemson College, So. Car.	July	30	New Brunswick, N. J.
"	22	Sussex Co., Del.			

Varietal susceptibility:

There appears to be considerable difference in the susceptibility of peach varieties to this disease. In New Jersey shot hole was severe on Elberta. In Mississippi such early varieties as Greensboro, Carman, and Mayflower were severely affected. In Indiana, Elberta was more susceptible than Hale. Very large fruit spots were produced on Red Bird Cling. Fruit infection was also severe on Elberta and Hale in Knox County, Indiana.

Indiana: In a plot containing 14 varieties in adjacent rows planted in 1920 in Lawrence County, Mr. H. E. Newland determined the rate of leaf fall on representative trees during the periods of August 3 to 4 inclusive, and August 15 to August 20 inclusive, and found the following average leaf fall per day per tree in the varieties:

Greensboro ..34	Heath Cling 15	Captain Ede 10
Rochester ...19	Belle of Georgia 11	Gold Drop ...19
Crosby 12	Hiley 5	Krummel 12
Carman 6	Salway 20	Hale 9
Champion 23	Big Red 16	

The Elbertas were much larger than these and not comparable. (Gardner)

Nature of injury:

A considerable variety of symptoms were reported as follows:

PEACH - Bacterial spot

Leafspot - New York, Delaware, Kentucky, South Carolina, Alabama, Texas, Arkansas, Ohio, Illinois, Kansas.
Shot hole - New Jersey, Virginia, South Carolina.
Defoliation - Massachusetts, Alabama, Mississippi, Ohio, Indiana.
Fruit spot - Delaware, Kentucky, Alabama, Arkansas, Indiana, Illinois.
Twig infection (cankers) - Delaware, Alabama, Texas, Kansas.

Control:

Indiana: In an experimental plot of young Elbertas in Lawrence County, a test of Na NO_3 applications has been made during 1922 and 1923 under the direction of F. P. Cullinan. Complicating factors prevent definite conclusion, but in general it appears that the deterrent effect of the Na NO_3 upon defoliation is not as great as was expected. At any rate, Na NO_3 alone cannot be considered insurance against the disease.

Mr. H. E. Newland ascertained the rate of defoliation on 18 representative trees in these plots during the nine-day period between July 26 and August 3, 1923, and found that single trees lost as many as 1226, 1340, 1538 and even 1848 leaves during the period mentioned. The lowest figure was 314. The average daily rate of leaf fall varied from 52 to 205 per tree, a condition which is really appalling and illustrates well the destructiveness of this disease. (Gardner)

Recent literature:

Roberts, J. W., and Leslie Pierce. The bacterial spot of peach. Trans. Illinois State Hort. Soc. 56: 78-87. 1923.

Crown gall caused by Bacterium tumefaciens EFS. & Towns.

Crown gall was reported from Connecticut, South Carolina, Alabama, Mississippi, Louisiana, Texas, Ohio, and Arizona. In Texas the loss is claimed by Taubenhaus to be 8 percent. In Arizona there were 800 trees killed in five counties; in Yuma County most of the trees dying have galls; in Greenlee County it is the most serious disease contended with; in Navajo and Apache counties it is found especially in the older orchards. (Brown)

Rust caused by Tranzschelia punctata (Pers.) Arth.

Rust was reported from Florida, Alabama, Mississippi, Texas and California.

Florida: Rust was collected during January, February, and March, and was found to be widespread and at that time serious, since it caused complete defoliation. It is probably of little economic importance. (Weber)

California: Reported as locally injurious to foliage in Butter County. This is the most important canning peach section of

California and several varieties of yellow clings are grown in great quantity. Small slightly sunken spots form on the fruit, and in the most developed of these, urediniospores occur. Considerable injury by causing fruit to be spotted as it emerged from peeling. Much fruit rejected as canneries are not willing to pare off small spots. Lye peeling is said to be interfered with. (W. T. Horne)

Rust very severe in certain orchards in Sutter County. Loss in affected orchards 15 to 75 percent. (Milbrath)

Blight caused by Coryneum beijerinckii Oudem.

Coryneum blight was reported from Colorado, as less prevalent than usual; Utah, where it was especially severe in the Brigham peach district; Idaho (see Pl. Dis. Reporter 7: 29. July 15, 1923); eastern Washington, where it was common and rather severe in some unsprayed orchards; and California, where, according to Milbrath, it was "general throughout the state causing a loss of about 3 percent."

Literature:

Weldon, G. P. Spring spraying of peaches with lime-sulfur. Mo. Bul. California State Dept. Agr. 12: 44-47. 1923.

Rhizopus rot caused by Rhizopus sp.

Rhizopus rot was reported from Connecticut, "Chiefly on fallen fruit; a little damage where late peaches were left too long before picking." (Clinton); Delaware, "Very common this season where splitting of oversized fruit had occurred. Market reports indicate common prevalence in shipments." (Adams); Indiana, "Noted on drops in field; found in shipments." (Gardner)

Yellows and little peach (cause undetermined)

Yellows was reported from Pennsylvania, Delaware, Maryland, Virginia, Ohio, and New Mexico and a suspected specimen was received from Kentucky. Losses of 2 percent were reported from Maryland and New Mexico, and a trace from Virginia.

Little peach was reported from Pennsylvania and Delaware (see reports below).

The reports from Pennsylvania and from Delaware are of especial interest:

Pennsylvania: In 1923 peach yellows inspection was carried out by the Pennsylvania Bureau of Plant Industry, Department of Agriculture, in 14 counties in the southeastern part of the state, covering 417 orchards containing 482,614 trees. Of these trees 10,698 or 2.21 percent were marked for yellows (and little peach). The corresponding figures for 1922 were 14 counties, 422 orchards, 442,507 trees, 11,052 marked, or 2.5 percent.

Comparative records of yellows in trees of various ages in all the orchards inspected is as follows: 1 year old, none; 2 years, .38 percent; 3 years, .67 percent; 4 years, 1.62 percent; 5 years, 3.6 percent; 6 years, 4.61 percent; 7 years, 3.74 percent; 8 years, 4.96 percent; 9 years and older, 2.67 percent.

Of the 417 orchards inspected 86 or over 20 percent had no yellows; 187 or almost half had less than 1 percent; 301 or about three-quarters had less than 5 percent; 367 or about 6 orchards out of 7 had less than 10 percent; 30 had over 20 percent; and 6 had over 50 percent. (Summary of results of peach yellows inspection in Pennsylvania in 1923. W. A. McCubbin).

Delaware: Diagram (1) of orchard showing inoculations made with yellows (Y) and little peach (LP). (See Delaware quotation)

Row:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Y	Y	Y	Y	Y		Y	Y	Y		Y	Y	Y		
2	Y	Y	Y	Y	Y		Y	Y	Y		Y	Y	Y		
3	LP	LP	LP	LP	LP		Y	Y	Y		Y	Y	Y		
4	LP	LP	LP	LP	LP		LP	LP	LP		LP	LP	LP		
5	Y	Y	Y	Y	Y		Y	Y	Y		Y	Y	Y		
6	Y	Y	Y	Y	Y		Y	Y	Y		Y	Y	Y		
7	LP	LP	LP	LP	LP		Y	Y	Y		Y	Y	Y		
8	LP	LP	LP	LP	LP		Y	Y	Y		Y	Y	Y		
9	LP	LP	LP	LP	LP		LP	LP	LP		LP	LP	LP		
10	Y	Y	Y	Y	Y		LP	LP	LP		LP	LP	LP		
11	Y	Y	Y	Y	Y		Y	Y	Y		Y	Y	Y		
12							LP	LP	LP		LP	LP	LP		
13							LP	LP	LP		LP	LP	LP		
14															
15															

The comments on experimental work on these two diseases are taken from results secured by Dr. T. F. Manns. The experimental orchard was

PEACH - Yellows and little peach

set out April 28, 1915, and contained 225 trees; 90 trees were Belle of Georgia and 105 Elberta. The remainder were miscellaneous varieties. Inoculations were started when the trees were three years old. The inoculum consisted of infusions of fruit, leaves, and limbs of trees affected by yellows or little peach, and inoculations were made through mechanical injuries such as borings, scratching or scarifying of limbs and trunks, and pruning wounds. A total of 76 trees of both varieties were inoculated with yellows material and 55 trees with little peach. (Diagram 1)

Field notes taken this season (1923) indicate no evidence whatever that the actual cases of yellows and little peach observed resulted

Diagram (2) showing actual cases of yellows (Y) and little peach (LP) found in experimental orchard in the summer of 1923. (X - missing trees) (see following quotation).

Row	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1				LP	LP			LP							X
2			LP	LP							X		LP		X
3		LP	LP			LP	X	LP	X	X					X
4		LP		LP				LP	X	LP	X	X	LP	LP	X
5	X	X	X	LP	LP			LP			X		Y	X	X
6				LP	LP							X	LP	LP	X
7								Y							LP
8			LP				LP			Y				X	LP
9								LP		LP	X		LP	LP	LP
10		Y		LP				LP	LP			X	LP	LP	X
11		LP	Y	Y	Y	LP	LP	LP	Y	Y		LP		LP	LP
12		LP	LP	Y	Y	X			Y			LP	LP	X	
13		LP	LP	LP		X	LP		LP		LP	LP	LP		
14					LP	Y	LP		X		X	LP	LP	X	X
15		LP	LP	X	X	LP	X		X			X	X	X	X

from these inoculations. The diagram (2) on present infection indicates a heavy outbreak of little peach this season which is difficult to explain because there had been practically no little peach in this orchard before. (J. F. Adams).

Rosette (cause undetermined)

Rosette was reported from Alabama. According to Miles, one very neglected orchard in Lowndes County showed 80 percent infection. Otherwise the damage appeared to be small.

McClintock (1) reports that he has been able to transmit the disease by means of infected buds from peach to peach, to two varieties of apricot, two of cultivated plum; one wild plum, one cherry, and two varieties of almond. On some of these hosts the disease produced a leaf mottling similar to mosaic.

Literature cited:

1. McClintock, J. A. Peach rosette, an infectious mosaic. Jour. Agr. Res. 24: 307-316. 1923.

Root knot caused by Heterodera radicicola (Greef) Müll.

Root knot was reported from South Carolina, Georgia, Alabama, Mississippi, Texas, and California. Neal and Barker stated that it was the most serious disease of peach trees in Mississippi, and the limiting factor in peach production in the southern part of the state. The loss was estimated at 5 percent. In Alabama, according to Miles, "No nursery in the state is free from this trouble. It is difficult to estimate the damage done in bearing orchards," A loss of 3 percent was reported from California, and 1 percent from Texas. (See also Pl. Dis. Reporter 7: 67. Sept. 1, 1923)

In California, according to Milbrath, peach trees affected were on peach roots, while apricot root stock has been resistant. McClintock (1, 2) has reported that resistance to the root knot nematode is apparently hereditary in the peach, and believes that by the use of resistant seedlings as root stocks, the root knot problem may eventually be solved for this host.

Neal and Barker reported that "Inoculated sulfur treatment followed by lime gave promising results but no definite conclusions can be drawn until further tests can be made."

Literature cited:

1. McClintock, J. A. The transmission of nematode resistance in the peach. Science n. s. 58: 466-467. Dec. 7, 1923.
2. ---------- Seed transmission of root-knot nematode resistance in the peach. (Abstract). Phytopath. 14: 62. Jan. 1924.

Other diseases and injuries

Powdery mildew caused by Sphaerotheca pannosa (Fr.) Lév. was reported from Pennsylvania, Kentucky, and Texas, and from Illinois for the first time. (Pl.

Dis. Reporter 7: 18. July 1, 1923.)

Bud rot of peach, caused by Fusarium gemmiperda Aderhold, has recently been reported from Georgia by Roberts (5).

Root rot caused by Ozonium omnivorum Shear was reported from Texas, and Arizona. It is one of the important peach diseases in the latter state, almost invariably killing trees attacked, according to Brown. It is said to be most conspicuous during the dry months preceding the summer rains.

Other parasitic diseases reported were shot hole caused by Cercospora circumscissa Sacc. from Mississippi, Florida, and Texas; leafspot caused by Phyllosticta circumscissa Cke., New Jersey; frosty mildew caused by Cercosporella persicae Sacc., Florida; black rot caused by Physalospora cydoniae Arnaud, Delaware (on Elberta peaches on the tree; first observation of this rot on peach in Delaware); stem blight caused by Phoma persicae Sacc., Ohio; die-back caused by Valsa leucostoma (Pers.) Fr., New York, Illinois; root rot caused by Armillaria mellea (Fr.) Quelet, Mississippi; fruit rots caused by Fusarium sp., and Alternaria sp. from California, and by Aspergillus niger Van Tieghem from Texas and California; silver leaf caused by Stereum purpureum Fr. from New York.

Troubles of non-parasitic or undetermined cause reported were gummosis from Florida, Ohio, and Washington; chlorosis due to excess of lime from Texas; sunscald of fruit, Indiana (probably due to defoliation by Bacterium pruni and subsequent exposure of fruit to the sun), Michigan; sunburn, Illinois; winter injury from Connecticut, South Carolina, Mississippi, Ohio, and Iowa; frost injury from Connecticut, and Delaware; little leaf from California.

Spray injury was reported from Connecticut, New Jersey, Delaware, Maryland, and Ohio.

Connecticut: Several reports of severe injury to peach foliage where lead arsenate was used in spray. (Clinton)

New Jersey: A number of orchards have been observed in which there is considerable spray injury. In one orchard in Cumberland County the trees were almost defoliated following the use of atomic sulfur. The injury was less severe in orchards sprayed with self-boiled lime sulfur and dry-mix but was present. At New Brunswick considerable injury was present on trees sprayed with dry-mix. The leaves were burned and large cankers were observed on both the new and old wood. (Dept. Pl. Path.)

Delaware: Considerable defoliation due to spray injury occurred during the middle of August. The injury was in the form of marginal burning as well as large shot-hole areas. In most instances, the growers confused the disturbance with the bacterial shot-hole. It was common in sprayed and dusted orchards. The older leaves rather than the later developed leaves were affected and the leaves injured formed a definite zone of about 6 to 8 leaves on the new seasons growth. The injury occurred during the first week of August when several showers followed by high temperatures occurred. (J. F. Adams)

General references:

1. Barss, H. P. Peach tree protection a duty. Biennn. Rept. Bd. Hort. Oregon 17: 159-161. 1923. (Control of Coryneum blight and leaf-curl.)

2. Cayley, D. M. Fungi associated with "Die back" in stone fruit trees. I. Ann. Appl. Biol. 10: 253-274. 1923.
3. Gourley, J. H. Peach growing in Ohio. Mo. Bul. Ohio Agr. Exp. Sta. 8: 35-42. 1923.
4. Headlee, Thomas J., William H. Martin, and Arthur J. Burley. Spray calendar for peaches. New Jersey Agr. Exp. Sta. Cir. 148. 4 pp. 1923.
5. Roberts, J. W. A budrot of peach caused by a species of Fusarium. Jour. Agr. Res. 26: 507-511. Dec. 8, 1923.
6. Stearns, L. A., and W. S. Hough. Spreader tests on apples and peaches. Jour. Econ. Entomol. 16: 198-207. 1923. (Abstract in Bot. Absts. 12: entry 6596. Nov. 1923)
7. Young, H. C. Colloidal sulfur as a spray material. (Abstract) Phytopath. 14: 61-62. Jan. 1924.
8. Zappe, M. P., and E. M. Stoddard. Results of dusting versus spraying in Connecticut apple and peach orchards in 1922. Connecticut Agr. Exp. Sta. Bul. 245: 229-243. Feb. 1923.

NECTARINE

Scab caused by Cladosporium carpophilum Thüm. was reported from New York and Illinois.

Brown rot caused by Sclerotinia cinerea (Bon.) Schröt. - New York.

Pink rot caused by Cephalothecium sp. - Illinois, "Two trees near Marion, Williamson County, had 40% of the fruit affected." (Tehon and Anderson)

PLUM AND PRUNE

Brown rot caused by Sclerotinia cinerea (Bon.) Schröt.

Brown rot was reported to be generally prevalent throughout the east from Massachusetts to South Carolina and as far west as North Dakota, Iowa, Missouri, and Arkansas. While it is always an important disease it was apparently less prevalent than usual throughout the northern United States except in Maryland. From Ohio and West Virginia westward it was of greater importance than usual, although in West Virginia the reduction in curculio injury was correlated with a reduction in the losses as compared with 1922.

In general the disease appeared as the usual fruit rot accompanying the late seasonal rains, but in New York and Minnesota blossom and twig blight were reported as being prevalent, and in Ohio and Illinois twig blight was severe locally.

The losses reported in 1923 are as follows:

PLUM AND PRUNE - Brown rot

State	Percent	State	Percent
New York	2	Illinois	5
Delaware	0.5	Wisconsin	21
Maryland	7	Minnesota	3.5
West Virginia	4	Iowa	22
South Carolina	1	North Dakota	1
Arkansas	10 to20		

Dates of first appearance:

May	16 (blossoms)	Ramsey Co., Minn.	July	9 (fruit)	Clemson Col.,S. C.
"	18 (blossoms)	Madison, Wis.	"	16 (fruit)	Greenville, Ill.
June	8 (fruit)	Tompkins, N. Y.	Aug.	27 (fruit)	Cass Co., N. D.
"	20 (fruit)	Newark, Del.	Sept.	29 (fruit)	Wethersfield, Conn.

Ascospore discharge was observed May 8 in Minnesota.

Black knot caused by Plowrightia morbosa (Schw.) Sacc.

Black knot was reported from the usual localities east of the Rocky Mountains. In only one state, Ohio, was it reported to be of greater prevalence than in 1922. In general it was of little importance except in neglected orchards or on a few trees about the garden. From Michigan there was one report on Burbank plum and in that state it is said to be of general occurrence on americana plums in the Upper Peninsula.

Plum pockets caused by Exoascus pruni (Berk.) Fuckel and E. communis Sad.

Plum pockets was reported from two counties in New York where it caused considerable loss in unsprayed home orchards. Two reports were received from Kentucky. In the vicinity of Gainesville, Florida, all wild plum trees inspected were 100 percent affected, no fruit maturing unattacked. A loss of 1 percent was estimated in Texas. The disease was reported as occurring in Ohio and Indiana. It was common on native and hybrid plums in Wisconsin where limb galls were observed. Fairly heavy local infections occurred in southern Minnesota. Prunus americana was especially susceptible in regions where rains occurred about two weeks after flowering time. A loss of 0.5 percent was estimated in Minnesota. The usual prevalence of the disease in Iowa and North Dakota was reported. A loss of 5 percent was reported in North Dakota. In Colorado the disease occurred as usual on wild species of Prunus, causing deformation and enlargement of leaves and shoots chiefly. The rainfall and temperature were above normal during the period of infection. One case of the disease on plums was reported from New Mexico.

Dates of earliest appearance:

June 3 Hennepin County, Minnesota
June 15 Onondaga County, New York
July 10 Barron, Wisconsin
July 12 Cass County, North Dakota

Leaf curl caused by Exoascus mirabilis Atk.

Leaf curl was reported as being the most important disease of red plums in Illinois; 30 percent of the plantings in that state are estimated to be infected, producing bud, leaf and twig injury. This disease has previously been reported as caused by Exoascus pruni. (Tehon & Anderson) The same disease was reported at Reesville, Louisiana, by Edgerton.

Leaf spot caused by Coccomyces prunophorae Higgins

Leaf spot was reported from New York, Pennsylvania, Florida, Ohio, Indiana, Illinois, Michigan, Wisconsin, and Minnesota (with Phyllosticta prunicola Sacc.). Indiana and Illinois were the only states reporting more of the disease than usual.

Florida: Very destructive to both wild and cultivated plums in the vicinity of Gainesville. The leaves were severely shot-holed and 40 percent were shed. (Weber)

Indiana: On Burbank plum in one case. In another noted only on native plum and none on adjacent Japanese plums. (Gardner)

Illinois: Second to brown rot in crop reduction. Loss 1 percent. Throughout state, but more severe southward. (Tehon & Anderson)

Wisconsin: Of very minor importance, as usual. Other similar leaf spotting seems to be due to spray injury (too strong lime-sulfur); apparently resembles bacterial spot but unable to prove organism. (Vaughn)

(See also Pl. Dis. Reporter 7: 97. Oct. 1, 1923)

Scab caused by Cladosporium carpophilum Thüm.

Scab on plum was reported from Ohio, Wisconsin, and Minnesota. Dr. J. W. Roberts, of the Office of Fruit Disease Investigations, makes the following statement concerning the occurrence of this disease on plum:

> "Scab on plum is not rare yet it is not very common. It appears to be found more often in the Middle West than further east. It is commonly believed that the same species of Cladosporium affects all the stone fruits, although I believe that final evidence is lacking as to the truth of this."

Other diseases and injuries

Bacterial leafspot caused by Bacterium pruni EFS. was reported from Massachusetts, New York, South Carolina, Florida, Texas, Oklahoma and Ohio.

Rust caused by Tranzschelia punctata (Pers.) Arth. (Puccinia prunispinosae Pers.) - Mississippi, "Heavy infection in Oktibbeha County; too late to cause much damage." (Neal and Barker);

PLUM - Other diseases

Texas; Oklahoma, Kansas, - "apparently worse than usual (Stokdyk); California, "In all prune districts; loss about .2 percent." (Milbrath)

Powdery mildew caused by Podosphaera oxyacanthae (DC.) DeBary - Florida, "Common and destructive although not widespread. The new growth was particularly attacked." (Weber)

Phyllosticta prunicola Sacc., reported from Minnesota; Septobasidium sp. from Louisiana; S. pseudopedicellatum from South Carolina; S. pedicellatum (Schw.) Pat. and S. retiforme (B. & C.) Pat. from Florida; Valsa leucostoma (Pers.) Fr. from Texas; twig blight caused by Diplodia pruni Fckl., Florida; wood decay caused by Armillaria mellea (Fr.) Quelet from California by Milbrath, who says, "About 1 percent of the trees in the state are severely affected."; Heterodera radicicola (Greef) Mull. and Bacterium tumefaciens EFS. & Town. from Arizona, "Both nemas and crown gall on same specimen." (Brown)

Rosette was transmitted by McClintock (see peach) from peach to two varieties of cultivated plums, Blue Damson and Red June, and to the wild Chickasaw plum, and also from the wild Chickasaw plum to Red June, by means of infected buds. The Marianna plum was found to be immune.

Yellows (cause not determined) - Delaware, observed in Sussex County on several trees of the Japanese varieties. (Adams)

Sour sap (cause unknown) - California, very general throughout the state; loss about 5 percent. (Milbrath)

Premature dropping of the fruit, due to dry weather, was reported from New York; drought spot from Delaware; drought injury from Washington.

Spray injury - Wisconsin (see report under Coccomyces prunophorae).

Literature:

Dorsey, M. J., and P. D. Strausbaugh. Plum investigations. I. Winter injury to plum during dormancy. Bot. Gaz. 76: 113-143. Oct. 1923.

Headlee, Thomas J., William H. Martin, and Arthur J. Farley. Spray calendar for plums and cherries. New Jersey Agr. Exp. Sta. Cir. 150. 4 pp. 1923.

Roberts, J. W. Plum blotch. Phytopath. 13: 461-462. Oct. 1923.

Roberts, R. H. Effect of defoliation upon blossom bud formation. Wisconsin Agr. Exp. Sta. Res. Bul. 56. 15 pp. Jan. 1923.

CHERRY

Leaf spot caused by Coccomyces hiemalis Higgins

Leaf spot was in general much less severe and less widely distributed than usual. Kentucky, Indiana, Illinois, and Arkansas were the only States where the disease was reported as being more severe than usual and where defoliation was prevalent, although in Iowa a 4 percent loss was reported. In Indiana, Gardner reports that leaf spot was the worst disease of cherries in 1923. The disease was not reported west of Iowa.

CHERRY - Leaf spot

Losses reported in 1923:

New York	.5	Illinois	1.5
Pennsylvania	.3	Iowa	4
Delaware	.2	Arkansas	4

Dates of earliest appearance:

May 14 Tompkins Co., N. Y.	June 16 East Lansing, Mich.
June 10 Sturgeon Bay, Wis.	June 18 Floyd Co., Ind.
June 13 Flora, Clay Co., Ill.	July 31 Seaford, Del.

Control:

Wisconsin: Spray and dust treatments satisfactory, though there was not enough disease to make a good comparison. (Vaughan)

The experiments of Keitt and Jones have shown that the addition of adhesives to fungicides failed to increase their efficiency for the control of cherry leaf spot. The best control was secured from 3 applications of a 3-3-50 Bordeaux mixture, the first spraying being made just after the petals had fallen, the second two weeks later, and the third after harvesting of the fruit.

Literature:

Keitt, G. W., and L. K. Jones. Seasonal development and control of apple scab and cherry leaf spot in relation to environment. (Abstract) Phytopath. 14: 36. Jan. 1924.

Brown rot caused by Sclerotinia cinerea (Bon.) Schrot.

Cherry brown rot was reported over a wider area than plum brown rot in 1923. In general it appears to have had about the same geographical distribution as in 1922, but was certainly less destructive in the northeastern United States. Throughout the cherry areas of the northern and central belt and in the south it was fully as severe as in 1922 and in some regions, notably Illinois and Iowa, it was more destructive.

The losses reported were as follows:

State	Percent	State	Percent
New York	2	Iowa	3
Delaware	0.5	Arkansas	3 - 4
Indiana	1	New Mexico	2
Illinois	2		

Blossom blight was reported from New York and Indiana; twig blight from New York, New Jersey, and Missouri. In Missouri the sand cherry (Prunus

bessegyi) showed severe twig blighting in the nursery followed by fruit rot at Mountain Grove. (Rhodes) Both sweet and sour cherries were reported susceptible in New York but in general the disease was more severe on the sweet cherries. Canker in sweet cherries was severe in one locality in New York. (Newhall)

Dates of first appearance:

June 1 Mountain Grove, Mo.	June 20 Whitley Co., Ind.
June 11 Wayne Co., N. Y.	June 21 New Haven, Conn.
June 14 Mt. Vernon, Ill.	July 13 Summit Co., Ohio

Literature:

Ludwigs, Karl. Bericht über das Auftreten der Spitzendürre (Monilia) bei Kirschen in der Provinz Brandenburg im Jahre 1922. (Report on the occurrence of withertip (Monilia) of cherries in the province of Brandenburg in 1922.) Deut. Obstb. Zeit. 69: 91-92. Mar. 1923.

Other diseases and injuries

Bacterial spot caused by Bacterium pruni EFS. - reported from New York as rather common on both sweet and sour cherry, severe locally and often confused with spray or dust injury; and from Mississippi. (See also Plant Dis. Reporter 7: 12. June 15, 1923.)

Powdery mildew caused by Podosphaera oxyacanthae (Fr.) DeBary - New York, Ohio, Indiana, Illinois, Iowa, Missouri, Colorado.

Black knot caused by Plowrightia morbosa (Schw.) Sacc. - Connecticut, "On choke cherry; scattered over state." (Clinton); New York, "Not important; general but more severe locally and on certain varieties. Observed on P. serotina in Nassau and Onondaga Counties. Very common on the native wild cherry in Suffolk County. Some reports on sweet and sour cherry." (Guba); Idaho, "Unimportant on cultivated forms; found on wild species in all parts of the state." (Hungerford)

Other parasitic diseases reported were fruit rot caused by Botrytis sp., New York (on Morello); scab caused by Cladosporium carpophilum Thüm., New York (on English Morello), Iowa; blight caused by Coryneum beijerinckii Oud., Washington; leafspot caused by Cercospora cerasella Sacc. (2) from Florida; rust caused by Tranzschelia punctata (Pers.) Arth., Mississippi; bacterial gummosis caused by Bacterium cerasi Griffin, Oregon (1), California (found in all cherry districts; loss about .5 percent - Wilbrath); crown gall caused by Bacterium tumefaciens EFS. & Towns., Washington; canker caused by Phomopsis padina (Sacc.) Died. First report to Survey in United States; found at Red Creek, New York, July 28; (common on trees with winter killed twigs - Guba); leaf blotch caused by Pestalozzia longiseta Speg., Florida.

Rosette was transmitted by McClintock (see peach) from peach to Mazzard cherries.

Frost injury was reported from Iowa, where Melnus estimated a 4 percent reduction in yield due to this cause, and from Washington, as follows:

"Considerable shot-holing of leaves with general mutilation of the foliage has occurred in eastern Washington sections,

due to late spring frosts or low temperatures during the winter." (Dana)

Winter injury - Connecticut, Ohio, Washington.

Miscellaneous references:

Cited

1. Barss, H. P. Bacterial gummosis of the cherry. Bienn. Rept. 17: 152-154. 1923.
2. Miyake, Chuichi. On a brown shot hole disease of cherry leaves caused by Mycosphaerella cerasella Aderh. Ann. Phytopath. Soc. Japan 1: 31-42. 1923.
In Japanese; English summary pp. 41-42.
Common on Prunus cerasus, also on P. yamasakura typica, P. yamasakura spontanea subvar. hortensis, P. rosakura, and P. itosakura subhirtella. Ascigerous stage of Cercospora cerasella Sacc. (Abstracted in Rev. Appl. Myc. 2: 416. Sept. 1923)

Not cited

Young, H. C. Colloidal sulfur as a spray material. (Abstract) Phytopath. 14: 61-62. Jan. 1924.

APRICOT

Blight caused by Coryneum beijerinckii Oud.

Coryneum blight was reported from Idaho, where it was said to be the most important disease of apricots, Washington, and California. Milbrath made the following statement regarding its occurrence in California:

"Shot-hole (Coryneum beijerinckii) was very severe throughout the state. There was hardly an orchard in which the fruit was not affected, ranging from 5 to 100 percent severely infected."

Root knot caused by Heterodera radicicola (Greef) Müll.

Arizona: Six trees killed on a farm six miles northwest of Tucson. Disease common perhaps, in other parts of southern Arizona. (J. G. Brown)

Practically all of the apricot trees in the Salt River Valley are budded on peach roots. Nurseries furnishing stock for our state have used peach roots almost exclusively.

I know of no case of nematodes attacking apricots on their own roots. Some of the more recent plantings in our section have been on apricot roots and I have failed to find any nematode injury. However, the majority of these plantings have been made where nematode infestation was very light.

This may partially account for the resistance. (D. C. George)
California: Apricot root stock (for peaches) has been found to be resistant. (Milbrath)

Other diseases

Black heart disease, caused apparently by a new species of Verticillium, was described by Czarnecki. (Czarnecki, Helen. Studies on the so-called black heart disease of the apricot. Phytopath. 13: 218-224. May 1923.) The disease was observed in several counties in California on apricot and almond in 1916.

Rosette was transmitted by McClintock (see Peach) from peach to apricot seedlings of the Royal and Moorpark varieties, and back to peach by means of infected buds. On apricot the leaves developed symptoms resembling those of mosaic.

Shot hole caused by Cylindrosporium padi Karst., Texas; shot hole caused by Bacterium pruni EFS., Illinois; scab caused by Cladosporium carpophilum Thum., Texas, New Mexico; brown rot caused by Sclerotinia cinerea (Bon.) Schrot., New York, Illinois (twig blight severe locally), California (loss 5 percent); black knot caused by Plowrightia morbosa (Schw.) Sacc., New York (one gall on a tree which intermingled with heavily infected plum trees); bacterial gummosis caused by Bacterium cerasi Griffin, California (general, loss 0.5 percent).

DISEASES OF SMALL FRUITS

GRAPE

Black rot caused by Guignardia bidwellii (Ellis) V. & R.

Black rot, which is generally the most serious disease of American varieties of grapes in the United States, was of very much less than the usual importance in the Northeast but of more than usual destructiveness in the grape areas of the Central and Southern states, except in Arkansas. As with most of our important plant diseases this variation in prevalence and destructiveness was correlated with weather conditions. In the Northeast the relatively dry summer was unfavorable for the disease but in the other areas where the rainfall was greater the disease was of much greater severity.

Estimated losses as compared with 1922:

GRAPE – Black rot

State	1922	1923	State	1922	1923
New Hampshire	trace	trace	Mississippi	5	5
Connecticut	20	much less	Texas	8	10
New York	2	trace	Arkansas	8	2 – 3
Pennsylvania	5	trace	Ohio	5	more
Delaware	5	4	Indiana	2	more
Maryland	10	10	Illinois	3	3.5
West Virginia	20	10	Wisconsin	5	much less
South Carolina	12.5	75	Iowa	5	4

Dates of earliest appearance in 1923:

May	22 (leaf)	Dover, Del.	June 26 (fruit)	Dover, Del.	
June	4 -----	Jackson, Co. Ill.	July 9 -------	Clemson College, S.C.	
June	9 -----	Oktibbeha Co, Miss.	July 15 -------	Lancaster, Wis.	
			Sept.13 -------	Jaffrey, N. H.	
June	18 -----	Floyd Co., Ind.			

Susceptibility of Vitis spp. to black rot from survey in park at Rochester, New York, 1923.

Light infection	Moderate infection	No infection noted
Vitis amurensis	Vitis rotundifolia	Vitis arizonica
V. cinerea	V. vulpina	V. betulifolia
V. coignetiae		V. bicolor
V. doaniana		V. candicans
V. piasezkii		V. champini
V. rupestris		V. labrusca
V. slavinii		V. longi
V. treleasei		V. monticola
		V. romanetti

Of the cultivated grapes observed Niagara and Catawba were most susceptible in Mississippi (Neal & Barker).

Control:

Delaware: The early application of copper fungicides have proved to be of the greatest importance in checking this disease. (Adams)

South Carolina: On vines sprayed with an 8-8-100 Bordeaux, using a casein spreader, a 90 percent control was obtained. On account of the rainy weather early in the season, it was difficult to get into the vineyards and there was severe loss from black rot even where efforts were made to control by spraying. (Moore)

Alabama: Controlled by sprays in most instances where tried. (Miles)

Florida: Bordeaux mixture superior to copper lime dusts. (Weber)

GRAPE - Downy mildew

Downy mildew caused by Plasmopara viticola (B. & C.) Berl. & DeToni

Downy mildew was of less importance in the northeast as indicated by reports from Connecticut, New York, and Pennsylvania. In Delaware the disease was of greater prevalence than usual but only of slight importance in September. There was much less mildew in South Carolina than usual where it was confined to the western and central sections, and apparently the disease was of slight importance in Florida, Alabama, Mississippi, Texas, Oklahoma, and Arkansas, although in Mississippi a severe epiphytotic occurred in Oktibbeha County, where several varieties were attacked. In Ohio and Wisconsin this disease was less prevalent than usual but in Indiana, Illinois, and Iowa it was of more than usual importance. The usual prevalence was reported from Minnesota. In Missouri the disease was not serious but was prevalent in the southwest part of the state.

Losses from downy mildew reported in 1923:

State	Percent	State	Percent
New York	trace	Alabama	trace
Pennsylvania	trace	Illinois	2
Maryland	4	Minnesota	trace
South Carolina	1	Iowa	2

Dates of earliest observance:

June 10 Cayuga Co., N. Y.
June 22 Columbia, S. C.
July 1 Hennepin Co., Minn.
July 6 Tazewell Co., Ill.
July 14 Westville, Conn.
July 28 Delaware, Ohio
Aug. 1 Pulaski Co., Ind.
Aug. 15 Oktibbeha Co., Miss.
Sept. 1 Madison, Wis.
Sept. 29 New Castle, Del.
Oct. 19 Oklahoma

New York: Only traces of the disease are present in commercial plantings. Prevalent on wild grapes upon which severe injury has been noted. Reported from thirty counties on wild grapes. (Guba)

Florida: Weber reports considerable difference in varieties as to their susceptibility to downy mildew in the Experiment Station vineyard.

Weber in Florida reports that Bordeaux is superior to copper-lime dusts in the control of downy mildew.

Powdery mildew caused by Uncinula necator (Schw.) Burr.

Powdery mildew of grape was reported from a number of states scattered through the country, but apparently was not important except in Utah, and California. The reports from these two states are quoted:

Utah: This disease was very severe throughout Davis County. In some vineyards total loss resulted. (Richards)

California: Mildew was extremely severe in 1923. There was not a vineyard which did not have an infection. The percentage loss ranged from 5 to 100 percent. There is a general opinion that the total loss was 45 percent, which would amount to about $25,000,000. One county reported an outlay of $70,000 for sulfur to combat this disease. (Milbrath. See also Pl. Dis. Reporter 7: 107-108. Nov. 1, 1923)

Recent literature:

Castella, F. de, and C. C. Brittlebank. Oidium of the vine. Jour. Dept. Agr. Victoria 21: 673-685, 738-745. Nov. & Dec. 1923.

Other diseases and injuries

Anthracnose caused by Sphaceloma ampelinum DeBy was reported from Massachusetts, Maryland, South Carolina, Florida, Alabama, Mississippi, and Illinois. Losses were estimated at 3 percent in South Carolina, 2 percent in Florida and Mississippi, and a trace in Maryland and Alabama.

Rust caused by Physopella vitis (Thum.) Arth. - Florida, California (according to Milbrath the disease was found in Santa Cruz County. This is the first time this rust has been reported from California). This rust was severe in Florida on several varieties of grapes developed by Munson.

Root knot caused by Heterodera radicicola (Greef) Mull. - California (2) (scattered throughout state; loss about 2 percent - Milbrath.)

Glomerella cingulata (Stonem.) S. & von S., New York, Illinois, Missouri; Melanconium fuligineum (Scrib. & Viala) Cav., Delaware, Missouri; Isariopsis clavispora (B. & C.) Sacc. (Cercospora viticola (Ces.) Sacc.), South Carolina, Florida; Cryptosporella viticola (Red.) Shear, New York, Ohio, Kansas; Bacterium tumefaciens EFS. & Towns., Ohio, New Mexico; Pestalozzia menezesiana Torrend and P. uvicola Speg. from Florida; Ozonium omnivorum Shear, Texas.

A mosaic-like trouble was reported by Weber as having been found on a single variety near Gainesville, Florida.

Black measles (cause unknown) - California (1)(severe throughout the state. The loss in certain vineyards ranged from 2 to 100 percent. The total loss in the state is about 3 percent. - Milbrath).

Chlorosis - Texas (due to excess of lime); Illinois (a type of chlorosis which seems to be almost epidemic in character is appearing in the region of Collinsville - Anderson, June 29).

Drought injury - leaf scorch, New York; tip burn, Idaho; leaf fall, Missouri; shrivelling of fruit, Missouri, Arizona.

Winter injury - Connecticut, Minnesota, Washington.

Recent literature:

Cited:

1. Bioletti, F. T. Black measles, water berries, and related vine troubles. California Agr. Exp. Sta. Bul. 358: 509-524. Apr. 1923.

GRAPE

2. Nougaret, R. L. Rootknot on grape. Monthly Bul. California Dept. Agr. 12: 139-146. Mar. - Aprl. 1923.

Not cited:

Faes, Henry, and M. Staehelin. Nouvelle contribution à l'étude du coitre de la vigne (Coniothyrium diplodiella) ou maladie de la grele. Ann. Agr. Suisse 24: 19-28. 1923.

Gard, Médéric, L'apoplexie de la vigne. Les Moyens de la combattre et d'y remédier. Rev. Vitic. 58: 399-401. May 31, 1923.

Headlee, Thomas J., William H. Martin, and Arthur J. Farley. Spray calendar for grapes. New Jersey Agr. Exp. Sta. Circ. 151. 1923.

Moreau, L. Contribution a l'étude de la maladie de l'esca (Apoplexie de la vigne) et de son traitement. Compt. Rend. Acad. Agr. France 9: 951-953. Dec. 26, 1923.

Moreau, L. and E. Vinet. Contribution a l'étude de l'apoplexie de la vigne et de son traitement. Compt. Rend. Acad. Agr. France 9: 32-36. Jan. 1923. Bul. Agr. Algérie, Tunisie, Maroc III, 29: 5-7. 1923.
Rev. Vitic. 58: 337-339. May 3, 1923.

Petri, L. L'arricciamento della vite è una malattia prodotta da protozoi? (Is the leaf curl of grapes a disease produced by protozoa?) Atti R. Accad. Lincei Roma Rendiconti Cl. Sci. Fis. Mat. e Nat. 32[1]: 395-397. 1923.
(Abstract, Bot. Absts. 13: entry 1064. Feb. 1924.

Putterill, V. A. Plant diseases in the Western Cape Province VIII. Court-Noué or short node disease of the vine. Jour. Dept. Agr. South Africa 6: 458-460. May 1923.

Rives, Louis. Le court-noué et les mycorhizes endotrophes de la vigne. Rev. Vitic. 59: 385 - 392. 405-409. Dec. 13, 20, 1923.

Ruban, G. Le permanganate de potasse: agent de traitement de maladies de la vigne. Rev. Vitic. 58: 269-272. 1923.

Young, H. C. Colloidal sulfur as a spray material. (Abstract) Phytopath. 14: 61-62. Jan. 1924.

STRAWBERRY

Leaf spot caused by Mycosphaerella fragariae (Schw.) Lindau

The common leaf spot was prevalent wherever strawberries are grown. Reports indicate that it was of more than average importance in Mississippi, Louisiana, Indiana and Illinois. In Illinois it was the most important disease of the year and was much more abundant than usual.

The following reductions in yield were reported:

STRAWBERRY - Leaf spot

State	Percent	State	Percent
New York	1	Mississippi	trace
Delaware	trace	Illinois	12
New Jersey	trace	Minnesota	1
Alabama	1	Iowa	5
Louisiana	1	North Dakota	trace

Earliest dates of observance in 1923:

Jan.	Hammond, La.	May 23	Chisago Co., Minn.
Mar. 25	Oktibbeha Co., Miss.	June 5	Franklin Co., Ill.
May 11	New York City	June 25	Fargo, N. D.
May 16	Lafayette, Ind.	July 10	Dayton, Ohio
May 17	Hartley, Del.	Aug.	Fort Collins, Colo.

New York: McAlpine growing beside Premier was badly affected. Premier variety almost free from infection in New York. (Guba)

Maryland: Our commercial growers are gradually eliminating the more susceptible varieties. (Temple)

Indiana: In one field "Charles the First" showed some resistance. Aroma and Progressive appeared resistant in Jefferson County. (Gardner)

Illinois: Aroma appears less susceptible than Lady Camille. Dunlap in Morgan County were thoroughly infected. (Tehon & Anderson)

Iowa: Rockhill, a new everbearing strawberry is said to be resistant.

Leaf scorch caused by Mollisia earliana (Ell. & Ev.) Sacc.

Leaf scorch was reported from North Carolina, Georgia, Louisiana, Indiana, Illinois and Wisconsin. Fant estimates a 10 percent loss as due to this disease in North Carolina. Regarding the control of leaf scorch, he says, "Good control of this disease has been secured within the state during 1922 and 1923 through the use of Bordeaux mixture. Five spray applications were made, the first at the first symptom of infection in the spring, and the last ten days before picking."

Wolf (1) states that leaf scorch is regarded as the most destructive disease of strawberry in North Carolina, and has been collected also in New York, Connecticut, New Jersey, Indiana, West Virginia, Wisconsin, Montana, Maryland, Louisiana, Tennessee, and Florida. The organism affects the leaves petioles, fruit pedicels, and calyx lobes. It does not attack species of Potentilla.

Literature cited:

1. Wolf, Frederick A. Strawberry leaf-scorch. (Abstract). Phytopath. 14: 30. Jan. 1924.

Root rot - (cause undetermined)

An undetermined root rot is reported as important in several states. Various factors are mentioned as contributing to the development of the disease, among them winter injury (Connecticut, New York) soil conditions, fungi such as Fusarium sp.(Ohio, Mississippi), and Rhizoctonia sp. (Michigan), but in no case has the trouble been proved to be due to any specific cause. The following quotations indicate the condition:

New York: Root rot is prevalent in many counties and many specimens are sent to the laboratory by growers. The cause of the trouble has not been determined. Apparently the root rot is brought about by low temperatures or other weakening factors followed by weakly parasitic soil organisms. (Chupp, July 1)
Very important locally; caused a loss of 0.5 percent. (Guba)

Illinois: Of great importance throughout central Illinois; caused a loss estimated at 1 percent. (Tehon & Anderson)

Michigan: Black root (Rhizoctonia sp.?). A number of strawberry plantings have suffered from rotting away of the root system. As high as 40 percent of the plants in some patches killed or stunted so severely that no marketable berries were produced. (C. W. Bennett)

Idaho: Yellowing of plant and rotting of crown; more important this year than usual. Evidently associated with alkaline soil. Common throughout the irrigated district. (Hungerford)

C. D. Sherbakoff (1) has reported a disease of a similar nature in Alabama and Tennessee.

Literature cited:

1. Sherbakoff, C. D. Three little known diseases of strawberries. (Abstract). Phytopath. 14: 60-61. Jan. 1924.

Other diseases and injuries

Leaf blight caused by Ascochyta fragariae Sacc. - Connecticut (not serious except on Glen Mary), New York; leafspot caused by Dendrophoma obscurans (Ell. & Ev.) Anderson, Illinois; leafspot caused by Phyllosticta fragaricola D. & Rab., Florida; powdery mildew caused by Sphaerotheca humuli (Fr.) Burr., New York, Washington; leaf spot caused by Pestalozzia guepini Desm., Florida.

Gray mold rot caused by Botrytis sp. - Connecticut (in one case about 75 percent of crop of Premier lost, Chesapeake little impaired); New York (Premier rotting badly while berries are still green, McAlpine growing in adjacent rows only slightly affected), New Jersey, Mississippi, Ohio, Wisconsin, Minnesota, Arkansas, Idaho, Washington.

Rhizopus rot caused by Rhizopus sp. - New York, Alabama, Iowa.

Rot caused by Phytophthora sp. was reported from Arkansas by D. H. Rose as causing severe damage in some localities.

Rot caused by Schizoparme straminea Shear, n. Gen. et sp., (1)

Rot caused by Pezizella lythri (Desm.) Shear & Dodge - Louisiana.

Lilac soft rot and brown hardrot of berries were reported by Sherbakoff (2) as common and destructive in Tennessee during 1923. Pythium sp. was isolated from berries affected by the softrot and Rhizoctonia sp. from the other decay.

STRAWBERRY - Other diseases

Slime molds assumed some importance in Minnesota (Fuligo sp.) and Kansas (Didymium sp., Diachaea leucopodia (Bull.) R., Physarum vernum)

Wilt caused by Fusarium sp., Florida; Rhizoctonia disease caused by Corticium vagum solani Burt, Washington; rootknot caused by Heterodera radicicola (Greef) Müll., Mississippi.

Yellows, cause unknown - Minnesota, "Common on some varieties such as Dunlap and Minnesota #3. The latter variety is not grown much on account of this trouble." (Sect. Pl. Path.)

Winter injury - Connecticut, Washington (important in all sections of the state, probably increased by contributing factors).

Frost injury - Florida, Louisiana, Texas, Iowa.

Recent literature:

Cited:

1. Shear, C. L. Life histories and undescribed genera and species of fungi. Mycologia 15: 120-131. 1923.
2. Sherbakoff, C. D. Three little known diseases of strawberries. (Abstract). Phytopath. 14: 60-61. Jan. 1924.

Not cited:

Ballard, E., and G. S. Peren. Red plant in strawberries and its correlation with"cauliflower disease." Jour. Pomol. & Hort. Sci. 3: 142-147. Sept. 1923.
Both diseases caused by the nematode Aphelenchus fragariae Ritz. Bos.

Dodge, B. O. Origin of the central and ostiolar cavities in pycnidia of certain fungus parasites of fruits. Jour. Agr. Res. 23: 743-760. Mar. 3, 1923.

Godfrey, G. H. The stem and bulb infesting nematode, Tylenchus dipsaci, in the Pacific Coast states (Washington, D. C.) Sept. 29, 1923.

Goodey, T. A. A review of the plant parasitic members of the genus Aphelenchus. Jour. Helminthol. 1: 143-156. Sept. 1923.
"Red plant" and "cauliflower" diseases of strawberry caused by Aphelenchus fragariae, attacking buds in the case of red plant, and stems in the other disease.

McKay, M. B. A serious nematode disease of strawberry and clover in Oregon. Bienn. Rep. Bd. Hort. Oregon 17: 177-182. 1923. (Also in Oregon Agr. Exp. Sta. Crop Pest and Hort. Rept. 3 (1915-1920); 139-144. Jan. 10, 1921)

RASPBERRY

Anthracnose caused by Plectodiscella veneta (Speg.) Burk.

(Gloeosporium venetum Speg.)

Anthracnose is probably the most serious fungous disease of raspberries especially black caps, in the eastern United States. It undoubtedly is causing greater damage than has been generally suspected.

In 1923 it was reported from Massachusetts to Florida and west to North Dakota and Arkansas. It was not considered to be of especial importance except in the following states: New York, Pennsylvania, New Jersey, West Virginia, Arkansas, Ohio, Indiana, Illinois, Wisconsin, and Iowa.

The following losses were reported in 1923:

State	Percent	State	Percent
New York	2	Michigan	1
Pennsylvania	15	Minnesota	1
Indiana	10	Iowa	8
Illinois	3	North Dakota	1

Dates of earliest observation in 1923:

May 19	Floyd Co., Ind.	June 19	Newark, Delaware
June 18	Ramsey Co., Minn	July 2	Woodland, Ill.
June 19	Oneida Co., N. Y.		

Varietal susceptibility:

New York: Black caps most susceptible; reds and purple varieties like Columbia somewhat less susceptible.

Pennsylvania: Black caps like Cumberland and Plum Farmer and the purple Columbia severely attacked.

Delaware: Cumberland and Gregg susceptible. Stark shows slight infection.

Indiana: Serious only in black caps. Cumberland especially so. In one patch Plum Farmer showed some resistance. (Gardner)

Michigan: All black varieties very subject to this disease. Red varieties not subject to severe injury. (Bennett)

Minnesota: Black caps very susceptible. (Sect. Pl. Path.)

Control:

New Jersey: On a spray plot conducted at Hammonton only 25 percent of the canes were free from anthracnose on the unsprayed plots as compared with 97 percent clean canes on the plots sprayed with lime-sulfur 1-40. (Martin)

RASPBERRY - Anthracnose

Indiana: Delayed dormant lime-sulfur 1-10 when leaf buds were bursting, and Bordeaux mixture 6-10-100 when the new canes were 8-12 inches high gave good control in four localities in 1923. (Gardner)

Wisconsin: Experiments by L. K. Jones for the control of anthracnose of black raspberries showed that two applications of lime-sulfur controlled the disease for commercial purposes. The addition of an adhesive to the mixture seemed to increase the efficiency of the fungicide. In general, Bordeaux mixture was less effective, though two applications gave a satisfactory commercial control. A third application of either Bordeaux mixture or lime-sulfur made a week after blooming of the plants was beneficial in reducing the amount of disease, but severe injury to the foliage followed.

Literature:

Anon. Plant diesease investigations at the Wisconsin Station. Wisconsin Agr. Exp. Sta. Bul. 352; 46, 53-65. 1923.

Orange rust caused by Gymnoconia interstitialis (Schl.) Lagerh.

Reported from Connecticut on wild plants; from New York on wild black raspberry and in Chemung County on cultivated varieties. Not reported on red or purple varieties. Orange rust was common in central and south Jersey. It was slightly prevalent in Pennsylvania, Ohio, Illinois, and Minnesota. In Michigan the disease was very important in certain localities in the southern peninsula on certain varieties but not on red raspberries. A 2 % loss was reported from Michigan. In Arkansas the rust is said to be general over the state and becoming more and more important; the loss in 1923 being estimated at 5-7 percent.

Dodge (1) has recently called attention to the wide distribution of the long-cycle orange rust as follows:

> "The long-cycled Gymnoconia is the only orange-rust known in Europe and Asia. When it was discovered that there were two of these rusts in North America it was said that the short-cycled form was southern in its distribution and the long-cycled strictly northern, the former being the rust so destructive to the blackberries and dewberries grown commercially. It is now known that it is no longer necessary to make pilgrimages to Bartlett, New Hampshire, for the Gymnoconia, because this rust thrives wherever the black raspberry, Rubus occidentalis, or its susceptible horticultural varieties may grow. The writer has reported that the rust is common on blackberries near Washington, D. C., and at Old Fort, North Carolina. He has since found it in abundance on blackberries at Salem, N. C., the type locality of Kunkelia nitens and at Cornelia, Ga. Germination tests reported in a letter to the author by Dr. Dosdall, mycologist at the Minnesota Agricultural Experimental Station, show that the Gymnoconia is probably very common in that state."

RASPBERRY - Orange rust

Regarding infection of raspberries Dodge says:

"Canes of a thoroughly infected black raspberry do not root at the tips very readily; therefore the long-cycled rust is not so often spread vegetatively to tip plants from an infected parent. The infection of very young tip plants by sporidia from teleutospores largely accounts for the appearance of the rust on new plants. The wild raspberry, Rubus occidentalis, and the horticultural varieties, Plum Farmer and Cumberland, were infected by laying black raspberry leaves bearing teleutospores over rooting tips of stolons and maintaining suitable moisture conditions. Infections of the black raspberry also occurred when the teleutospores were taken from blackberry leaves."

As for the relation of this rust between blackberries and raspberries he makes the following statement:

"The infection experiments prove: (a) that the short-cycled rust on wild blackberry can infect such cultivated varieties as the Kittatinny, Iceberg, Mercereau, Crandall, Taylor, Flowers, Ancient Briton, etc., (b) that the sporophytic stage of the Gymnoconia will go over from the mountain blackberry, Rubus canadensis, to such varieties as the Ward, Taylor, Mercereau, and Loganberry, and that teleutospores can be obtained on leaves of certain blackberries and dewberries by sowing aecidiospores from the black raspberry, which can in turn be likewise infected by sowing aecidiospores from the blackberry; (c) that the black raspberry can also be systemically infected with sporidia from teleutospores of the long-cycled rust on blackberry.

"We have no reason to suspect that the rust on the wild blackberries is in any way unlike that found on the cultivated blackberries, or that forms of the long-cycled rust on the blackberry and on the black raspberry are at all different biologically, except that certain strains may prove to be more vigorous in their parasitism. Later infection experiments tend to show that the Iceberg blackberry which is very susceptible to attack by the short-cycled rust from the blackberry, is very resistant to the rust from the wild dewberry. This short-cycled dewberry rust may be somewhat different biologically."

In another paper (2) Dodge has called attention to a most interesting phenomena attending the infection of Rubus spp. with Gymnoconia. He finds that the gametophytic mycelium affects its host in such a manner as to cause stomata to be formed on the upper leaf surface where otherwise stomata rarely appear. The sporophytic mycelium does not induce any such change.

Dodge makes the following statement regarding the control of orange rust on raspberry:

"It has been shown that it is of the greatest importance to begin a planting with rust-free nursery stock. If the black raspberry to be used has been propagated by rooting the tips of

canes one may be reasonably sure of getting some infected plants - that is, if the telial stage of the Gymnoconia is present in the nursery. Whether the tips of canes can be made to root early enough so that no buds or shoots that can be infected are formed before the frosts, are problems which will require further investigation. If nurserymen will destroy all infected canes before aecidiospores are shed, there will be no teleutospores in their propagating fields, and it follows that their tip-plants will not be infected when sent to the grower."

Literature:

1. Dodge, B. O. Systemic infections of Rubus with orange-rusts. Jour. Agr. Res. 25: 209-242. 1923.
2. ---------- Effect of the orange rusts of Rubus on the development and distribution of stomata. Jour. Agr. Res. 25: 495-500. 1923.

Mosaic, (Yellows) cause undetermined

Raspberry yellows was reported as follows in 1923:

About as usual		More than usual	
Massachusetts		Pennsylvania	15%
Connecticut		*Maryland	2%
New York	20%	Delaware	1%
Ohio		Idaho	
Wisconsin			
Michigan	10.%		
Minnesota	2.5%		
North Dakota	trace		

* Mosaic and leaf curl

It was also reported from New Jersey, Illinois, Indiana, Kentucky, Iowa and Washington. As regards its seriousness the following reports are of interest:

New York: Severe on reds and blacks all over state, but especially so in eastern New York and the Hudson Valley. Found in 80 percent of the plantings. (Guba)
New Jersey: Severe in South Jersey. (Martin)
Pennsylvania: The loss from this disease is greater than from all other "degeneration" diseases combined. Survey shows 80 percent of plantings of blacks and reds with an average of 20 percent infection. (Krout)
Ohio: Severe in northern counties. (Young)
Wisconsin: Found in 45 red and 15 black raspberry nurseries. (Vaughan)
Minnesota: Serious in some localities. (Sect. Pl. Path.)
Idaho: Found in practically every patch. (Hungerford)

RASPBERRY - Mosaic

Varietal susceptibility:

Connecticut: Most on Cuthbert; also on Early June and St. Regis. (Clinton)
New York: Early June and Yellow Queen susceptible. (Guba)
New Jersey: Severe in Cuthbert. (Martin)
Delaware: Observed on Cumberland. (Adams)
Indiana: Noted on Cuthbert and occasionally on the black cap variety Scarf. (Gardner)
Michigan: Perfection, Plum Farmer, Gregg, Cumberland, Columbia and many other varieties susceptible. Most damage on black caps. (Bennett)
Wisconsin: Marlboro susceptible. (Vaughan)

Control:

In Pennsylvania fifteen patches were rogued from which it is hoped disease free plants will be available in 1924. (Krout)

Literature:

Dickson, B. T. Raspberry mosaic and curl. Sci. Agr. 3: 308-310. May 1923.
Hockey, J. F. The control of raspberry mosaic. Phytopath. 13: 292. 1923.
Rankin, W. H. Running out of raspberries. New York (Geneva) Agr. Exp. Sta. Circ. 67: 12 pp. 1923.
Wilcox, R. B., and F. F. Smith. Transfer of mosaic disease from red to black raspberries. (Abstract) Phytopath. 14: Jan. 1924.

Leaf curl, cause undetermined

Raspberry leaf curl was reported from New York, Pennsylvania, Maryland, Indiana, Michigan, Wisconsin and Minnesota. In New York it occurred locally. In Tompkins County 10 percent of the wild raspberries were affected, but it was generally of slight economic importance.

In Pennsylvania it was found in 80% of the plantings examined by Krout and in 4 nurseries out of 32 by Trimble. About 4% loss was reported by Krout and 1% in nurseries by Trimble. Cuthbert was the most commonly infected variety.

In Indiana it was found on Cumberland and Scarf varieties by Wilcox at Crawfordsville; also on wild black raspberries near by. In Michigan, Cuthbert and Victory were very susceptible, and Gregg and Plum Farmer less so. Marlboro was especially susceptible in Wisconsin where leaf curl was noted in 46 nurseries inspected.

Literature:

Dickson, B. T. Raspberry mosaic and leaf curl. Sci. Agr. 3: 308-310. May 1923.
Rankin, W. H. Running out of raspberries. New York (Geneva) Agr. Exp. Sta. Circ. 67: 1-12. 1923.

RASPBERRY - Streak

Streak (eastern blue stem, rosette) cause undetermined

Streak was reported from New York, Pennsylvania, Maryland, Ohio, Indiana, Illinois, Michigan, and Wisconsin as follows:

New York: Reported from Monroe County on black caps. (Guba)

Pennsylvania: Found in 4 out of 32 nurseries growing raspberries. One of these had about 20 percent and the others less than 1 percent infected plants. (McCubbin)

Found on black caps, Cumberland and Plum Farmer; not on purples or reds. Twelve patches have been rogued. Loss estimated at 1 percent. (Krout)

Maryland: More, loss a trace. (Jehle and Temple)

Ohio: One report from West Toledo. (Young)

Indiana: Found in one patch of Cumberland near Crawfordsville by Wilcox. (Gardner)

Illinois: An important disease, possibly second in importance to anthracnose. Infection ranged from 5 to 90% in different fields in central Illinois. (Tehon & Anderson)

Michigan: Gregg, Plum Farmer and Cumberland chief varieties affected. Of considerable importance in some fields. Loss estimated at 0.5%. (Bennett)

Wisconsin: Of minor importance. (Vaughan)

Literature:

Rankin, W. H. Running out of raspberries. New York (Geneva) Agr. Exp. Sta. Cir. 67: 1-12. 1923.

Zeller, S. M. Mosaic and other systemic diseases of brambles in Oregon. Oregon Agr. Exp. Sta. Cir. 49: 1-15. July 1923.

Other diseases and injuries

Crown gall caused by Bacterium tumefaciens EFS. & Towns. - said to be rather important in a number of states. Losses reported were 6% in Iowa, 5% in Michigan, 3% in Pennsylvania, 1.5% in Minnesota, 1% in West Virginia, Illinois, and New Mexico. In Minnesota the disease was said to be the most serious disease of the raspberry. Practically every field of raspberries is infected and in some cases the fields have to be abandoned as far as raspberry growing is concerned.

Leafspot caused by Mycosphaerella rubi (West.) Roark (Septoria rubi West.) - New York, Pennsylvania, Delaware, Oklahoma, Indiana, Illinois, (rather more than usual, loss 1%), Minnesota, Iowa (2% loss), Missouri.

Spur blight caused by Mycosphaerella rubina (Pk.) Jacq. - New York (frequent and destructive locally, loss 1%), Wisconsin, Minnesota (of considerable importance, loss 1.5%. Plants attacked by gray bark seem to be weakened to such an extent that they are easily winter killed), North Dakota (important, 1% loss).

Cane blight caused by Leptosphaeria coniothyrium (Fckl.) Sacc. was reported from Massachusetts to West Virginia, and North Dakota to Illinois, and from Idaho; generally not important except locally. In West Virginia, however, it was said to be the most important disease of raspberries. Losses reported

were 2% in Pennsylvania and West Virginia, 1% in New York, .5% in Illinois, and a trace in North Dakota.

Powdery mildew caused by Sphaerotheca humuli (DC.) Burr., New York, Minnesota. Rust caused by Phragmidium imitans Arth. - Washington. Western blue stem caused by Acrostalagmus caulophagus Lawrence, New York, (very important locally). Wilt, cause unknown, but probably due to a fungus, Indiana (serious in one patch of Scarf variety, Crawfordsville. R. B. Wilcox saw this August 15 and stated that it resembled western blue stem except that canes died one at a time, instead of all together. (Gardner). Root rot, cause unknown, caused death of affected plants in Indiana and Illinois; winter injury, Iowa (loss 15%), Washington; alkali injury, Washington; fasciation, cause unknown, Maryland (on Cumberland black raspberry; a single plant out of about 40 appeared this year and died as a result).

References:

Bennett, C. W. Disease control in black raspberries. The problem of disease control and increased yields is mainly one of proper cultural methods, sanitation, and selection of disease free stocks. Michigan Agr. Exp. Sta. Quart. Bul. 6: 12-14. August 1923.

Hockey, J. F. Diseases of raspberries. Canad. Hort. 46: 29. Feb. 1923.

---------- Blue stem of black raspberry. Phytopath. 13: 293. 1923.

Leach, Julian G., and J. L. Seal. Powdery mildew of raspberries. (Abstract) Phytopath. 14: 61. Jan. 1924.

Weiss, C. O. Diseases and pests of raspberries. Better Fruit 17^{6}: 7-8; 17^{7}: 10, 20. 1923.

Wilcox, R. B. Progress in control of raspberry diseases. Proc. Amer. Pom. Soc. 38: 344-354. 1922.

DEWBERRY

Orange rust caused by Kunkelia nitens (Schw.) Arth. and Gymnoconia interstitialis (Schl.) Lagerh.

The orange rusts of wild dewberry were reported from Connecticut in 1923 as being caused chiefly by the short-cycled species but two reports of Gymnoconia were made as determined by germination tests. (Clinton & McCullock)

The orange rust is commonly found on wild dewberries throughout New York, Delaware, and Pennsylvania.

The Lucretia dewberry is thought by Dodge (1) to be highly resistant if not immune. The southern dewberry, Rubus enslenii, is readily infected by sowing aeciospores of Gymnoconia from black raspberry on its leaves.

Literature:

1. Dodge, B. O. Systemic infections of Rubus with the orange rusts. Jour. Agr. Res. 25: 209-242. 1923.

DEWBERRY - Other diseases

Other diseases and injuries

Leafspot caused by Mycosphaerella rubi Roark (Septoria rubi Westd.), Illinois; anthracnose caused by Gloeosporium sp., South Carolina; double blossom caused by Fusarium rubi Wint., Louisiana; rot of dewberries grown in North Carolina was reported by Shear (1) as caused by Phyllostictina carpogena Shear, n. sp.; mosaic, cause unknown, Connecticut (seen on at least one plant of the cultivated dewberries at the Station Experimental Farm. New host to us. - Clinton)

Reference:

1. Shear, C. L. Life histories and undescribed genera and species of fungi. Mycologia 15: 120-131. 1923.

LOGANBERRY

Crown gall caused by Bacterium tumefaciens EFS. & Towns., Washington; winter injury, Washington.

For orange rust see raspberry.

BLACKBERRY

Orange rust caused by Kunkelia nitens (Schw.) Arth. and Gymnoconia interstitialis (Schl.) Lagerh.

It is impossible to separate, except in a few cases, the diseases reported as being caused by the two rusts named above. Both the short and the long-cycled forms occur on blackberries over a rather wide area and only by germination of the spores can they be identified specifically by the plant pathologist. The color characters which were reported by Kunkel as being diagnostic are not entirely dependable according to the recent work of Dodge.

It was reported in 1923 from Massachusetts to Florida and westward to Colorado and Oklahoma. This was the second report from Colorado, it being reported from that state in 1904 by Paddock.

It was about as prevalent as usual except in New Jersey, Illinois, and Minnesota where it was reported as being of more than usual importance. In South Carolina it was reported as causing a loss of 20% of the crop. In Illinois a loss of 0.5% and in Iowa a loss of 5% were reported.

In general the disease was most common on wild blackberries throughout the country.

Dodge reports successful attempts to inoculate Iceberg, Crystal White, Kittatinny, Mercereau, Blowers, Ancient Briton, Oregon Evergreen and Crandall with ease. A variety received under the name of "Lawton" from a nursery remained uninfected after two seasons' attempts and is thought to be immune. McDonald also appears to be immune. Snyder and Eldorado appear to be very resistant. (See Dodge for reports on other varieties and species.)

BLACKBERRY – Orange rust

Control:

Dodge (2) makes the following statements:

"Methods by which the orange-rusts can be eradicated have been suggested in connection with the discussions of the infection experiments. It was pointed out that a blackberry can be freed from the orange-rust very easily if the task is undertaken soon after the primary infection becomes manifest. The mere snapping off of the infected cane at the point of attachment to the root will suffice in many cases. When a number of shoots in the form of a witch's broom are found, it usually indicates that the fungus has invaded the root or its crown; it will then be necessary to destroy this part of the root also. If the primary infection, however, is allowed to spread to the crown and root system the second year, so that new shoots are systemically and secondarily infected, the whole plant must be dug up, care being taken to include the roots for some distance.

"So far as controlling the short-cycled rust in the cultivated blackberry is concerned, the writer's experimental work is showing that it is perfectly practicable with a small amount of labor to prevent the spread of the rust. Primary infections by spores occur comparatively rarely in nature; thus, if one observes proper care for a period of two or three weeks in early spring as soon as the first leaves appear, he can readily detect and destroy rusted canes before the mycelium has spread far into the underground perennial structures and before the spores are shed.

"The eradication of all rust from a field of blackberries where the disease has been of long standing would be a more difficult undertaking. In New Jersey and in other states one can find fields where from 25% to 75% or more of the plants are infected. Such fields should be planted to some other crop unless the grower is willing to follow up and destroy all roots connected with the rusted plants.

"The work at Arlington, Va., affords a very good illustration of the efficacy of removing infected plants as soon as they show rust for the first time. The writer had about 130 cases of primary infection; wherever the rusted canes were pulled up so as to include all parts of the root runner which showed signs of infection, no rust appeared in 1923. In several cases where it was recorded that undoubtedly pieces of roots bearing mycelium were left in the soil, rusted plants showed in 1923."

Literature:

1. Dodge, B. O. A new type of orange rust on blackberry. Jour. Agr. Res. 25: 491-494, 1923.
2. ---------- Systemic infections of Rubus with the orange rusts. Jour. Agr. Res. 25: 209-242. 1923.

Other diseases and injuries

Anthracnose caused by Plectodiscella veneta (Speg.) Burk. – New York (only locally important), Pennsylvania (1% loss), Mississippi, Ohio, Indiana

(noted abundant on wild bushes but not in cultivated patches), Illinois (1% loss; probably throughout the state, though not often seen), Iowa (unimportant), Kansas (leafspot only, and then not on upper leaves), Idaho (few isolated reports).

Crown gall caused by Bacterium tumefaciens EFS. & Towns. – Massachusetts, Pennsylvania (bad in some fields, loss .5%), Texas (prevalent, loss 5%), Wisconsin (serious, all nurseries in Warrens and New London district were refused certificates in 1922, because of this disease, only 8 refused this year, twenty-four nurseries concerned), Washington.

Leaf spot caused by Mycosphaerella rubi (West.) Roark – New Jersey, Texas, Oklahoma, Indiana, Illinois, Iowa, Missouri.

Mosaic, cause unknown – New York (very common where blackberries are grown, loss 5%), Indiana (noted only on wild plants). A disease which appears to be mosaic is also reported by Wilbrath as occurring in California.

Blotch caused by Cercospora rubi Sacc., Florida; leafspot caused by Phyllosticta sp., Florida; rust caused by Kuehneola uredinis (Link) Arth. (K. albida Magn.), Indiana; cane blight caused by Leptosphaeria coniothyrium (Fckl.) Sacc., New York, Ohio; double blossom caused by Fusarium rubi Winter, New York (on wild blackberry); fruit mold caused by Botrytis sp., California (very severe in all districts); bluestem caused by Acrostalagmus caulophagus Lawrence, California (very severe in all berry regions of state, particularly in San Mateo County; loss 8%); sooty blotch and fly speck, cause undetermined, but may be due to the fungi which caused these diseases on the apple, New York, Indiana.

CURRANT

Root rot caused by Fomes ribis (Schum.) Gill., was reported as occurring on a white currant variety on the grounds of the New York Agricultural Station at Geneva where it has been established for several years.

Cane disease caused by Nectria sp. Ohio (causing death of canes in Lorain County), Minnesota (Ramsey County), Washington (Spokane County). It is possible that the fungus should be referred to N. cinnabarina which has been studied by Line (2) on currants in Great Britain.

Rust caused by Puccinia grossulariae (Schum.) Lagerh., was reported as being less prevalent than usual in New York and Minnesota. In Wisconsin more than the usual amount was present, Vaughan reporting 10% infection of blossoms, fruits and leaves in one planting. It was also generally distributed in North Dakota.

Leaf spot caused by Phyllosticta grossulariae Sacc. was reported August 29 at Mt. View, New Jersey.

Leaf spot caused by Septoria sp. was reported August 21 at Mt. Morris, Ogle County, Illinois.

Mosaic of Ribes floridum was observed May 6 in Tompkins County, New York, where 50% of the crop was injured according to Perry.

Chlorosis, characterized by a yellow, variegated color of the leaves with retarded growth and fruit development, was reported from Delaware.

Blister rust caused by Cronartium ribicola Fisch. von Wald. was reported from Connecticut and New York. See white pine.

CURRANT - Diseases

Leaf spot caused by Mycosphaerella grossulariae (Fr.) Lind. Reported only from New York, Pennsylvania and Iowa, although it undoubtedly occurs over a wide range. In Iowa a loss of 5 percent is reported.

Leaf spot caused by Pseudopeziza ribis Kleb. was reported from New York (less than usual; only one serious case observed in nursery), New Jersey, Wisconsin.

Cane blight caused by Botrysophaeria ribis Gross. & Duggar - New York (very plentiful in Hudson Valley), Delaware (severein local plantings),

Leaf spot caused by Cercospora angulata Wint. - Delaware, Iowa (loss 5%), Kansas (Wilder variety is very susceptible while North Star planted beside the former shows but a trace of this disease - White.)

Recent literature:

1. Barss, H. P. Diseases of currant and gooseberry. Oregon Agr. Exp. Sta. Circ. 42; 8-12. 1923.
2. Line, J. The parasitism of Nectria cinnabarina (coral spot), with special reference to its action on red currant. Brit. Mycol. Soc. Trans. 8; 22-28. 1922.
3. Lovett, A. L. and H. P. Barss. Insect pests and diseases of currants and gooseberries. Oregon Agr. Exp. Sta. Circ. 42; 12. June 1923.

GOOSEBERRY

Leaf spot caused by Septoria ribis Desm.

The Septoria leaf spot of gooseberry was reported as follows in 1923:

New York: Present in Ulster, Duchess, Monroe and Orleans counties. Probably more widespread than these reports indicate. (Guba)
Illinois: Every planting in the state infected but rarely causing marked defoliation. Loss estimated as a trace. First report June 5 at Urbana. (Tehon & Anderson)
Minnesota: Generally prevalent in southern two thirds of state. Relatively unimportant. Loss a trace. (Sect. Pl. Path.)
Kansas: Found causing defoliation in Wyandotte County. (White)
Colorado: Of average prevalence in Colorado. (Learn)

Powdery mildew caused by Sphaerotheca mors-uvae (Schw.) B & C.

Powdery mildew was of average prevalence in Minnesota where it occurs chiefly on the foliage. It was reported for the first time in Colorado where it caused defoliation about Ft. Collins. It was also quite generally prevalent in Idaho and was reported twice from northeastern Washington.

Rust caused by Puccinia grossulariae (Schum.) Lagerh.

This rust is a common one of wide distribution on native gooseberries and often found on cultivated varieties but not usually important. It was reported

from New Hampshire, Massachusetts, Connecticut, New York, Wisconsin (reported as destructive from Chippewa County, June 1), Minnesota, Iowa, North Dakota, Kansas (heavy infection observed about Manhattan; leaves, fruit, petioles and fruit pedicels attacked; considerable loss under these conditions - White.)

Other diseases and injuries

Anthracnose caused by Pseudopeziza ribis Kleb. Reported from Connecticut (one report), New Jersey, Delaware (one report), Illinois (severe locally especially in central part of state. Loss 1%), Washington (one report). Apparently the disease was of more than average severity in Illinois.

Blister rust caused by Cronartium ribicola Fisch. von Wald. - Connecticut (five localities; less than usual. See white pine).

Cane blight caused by Leptosphaeria coniothyrium (Fckl.) Sacc. - Pettis County, Missouri.

Leaf spot caused by Mycosphaerella grossulariae (Fr.) Lind. was reported from New York and Minnesota where it was apparently of average prevalence. It caused considerable defoliation in one nursery in New York.

A mosaic-like disease of gooseberry was reported from Rochester, New York by Kirby.

Rosette - Adams reports what appears to be a hitherto undescribed disease of gooseberries in New Castle County, Delaware. Many of the leaves in the dense growth were yellowed. No cause of the disturbance was found.

Sun scorch was reported at Long Hill, Connecticut, on June 22. The fruit was baked or burned on the bushes. (Clinton)

MULBERRY

The Cercospora leaf spot caused by Cercospora moricola Cooke was "found to be very destructive to a row of mulberry trees in Gainesville, Florida. The trees have apparently been killed by the disease which caused complete defoliation early in the season and frequently killed back some of the young tender twigs." (Weber)

Bacterial blight caused by Bacterium mori Boyer & Lambert emend. EFS. was reported as causing angular, intervenous leaf spots, August 1, in Tippecanoe County, Indiana by Gardner.

Texas root rot caused by Ozonium omnivorum Shear, was reported on a lot near the Experiment Station in Arizona. (Brown) In Texas it is reported as prevalent, having caused an 8 percent loss in 1923 according to Taubenhaus.

An interesting new disease of mulberry fruits was reported upon by Siegler and Jenkins (1) as occurring in South Carolina and other southern states. The disease is capable of causing considerable loss.

Literature cited:

1. Siegler, E. A., and A. E. Jenkins. Sclerotinia carunculoides, the cause of a serious disease of the mulberry (Morus alba). Jour. Agr. Res. 23: 833-836. 1923.

CRANBERRY

Practically all of the recorded fungus rots of the cranberry have been reported during the past year from one or another of the cranberry growing sections. In Massachusetts, all of the usual fungus rots were found. The amount of damage caused, however, was much less than in 1922. This was apparently due principally to the cool, rather dry weather which has been shown heretofore to be unfavorable to the development and spread of the most important cranberry diseases.

The false blossom (cause unknown) is apparently becoming somewhat more prevalent each year in the bogs of Massachusetts and New Jersey.

In the cranberry bogs on the Pacific coast in Oregon and Washington the diseases were more destructive than in 1922. The most serious cause of fruit rot in those states was Fusicoccum putrefaciens Shear. The Phomopsis rot and Sporonema rots were next in importance. Sclerotinia oxycocci Wor. was quite prevalent and affected many of the berries, especially the variety Bennett Jumbo.

BLUEBERRY, Vaccinium spp. and

HUCKLEBERRY, Gaylussacia spp.

Crown gall caused by Bacterium tumefaciens EFS. & Towns. was reported from Harrison County, Mississippi, on blueberry.

Exobasidium vaccinii (Fckl.) Wor. was reported July 4 from Tompkins County, New York on Vaccinium vitisidaea and on blueberry (Vaccinium sp.). It was also reported on huckleberry from Johnston County, North Carolina, by Fant.

Anthracnose of blueberry caused by Gloeosporium sp. Florida (caused no damage.)

Leaf spot and twig blight caused by Pestalozzia guepini Desm. occurred on blueberry, probably Vaccinium corymbosum, at Toms River, New Jersey.

A blueberry disease of unknown cause was reported from Maine. The two common species there are Vaccinium canadense and V. angustifolium. "It was first noted in the early part of the season as dead and dying patches, often roughly circular in outline. The disease did not progress nor the areas enlarge as the season advanced. The whole situation suggested some adverse climatic condition as the primary cause, but circumstantial evidence was far from conclusive that the condition was the result of dry weather, flooding, lightning, winter killing, or late frosts." (W. J. Morse)

DISEASES OF SUB-TROPICAL FRUITS

CITRUS FRUITS

Prepared by H. R. Fulton

Melanose caused by Phomopsis citri Fawcett

A recent bulletin (4), includes an abundance of information about the melanose diseases of citrus fruits. The occurrence, importance and distribution of the disease are discussed. It is also well described. The causal organism (Phomopsis citri Faw.) has been cultured and inoculation experiments conducted. The disease is effectively controlled by spraying with Bordeaux-oil-emulsion, at certain periods of development of the fruits. The control work is being continued in an experimental way during the present season from the commercial standpoint. (Weber (6)).

Florida: Melanose was reported as being severe this season on account of the early rains coming before the fruits had become immune. Where spraying with 3-3-50 Bordeaux-oil-emulsion had been done the disease was controlled. The spraying should be done 10 to 20 days after the petals have fallen. It is necessary to make the spraying before the rains begin. (Burger)

Melanose is the most important fruit blemish of oranges and grapefruit. It was less prevalent than the average and much less than in 1922. The fruit had reached an almost immune stage when the rainy infection period came in May. Grapefruits are more susceptible than oranges. Bordeaux-oil-emulsion applied just before May rains set in usually gives good commercial control; if applied at an earlier date results usually are not so good. (Winston)

Alabama: Melanose was extremely rare. (Fulton)

Mississippi: Prevalence the same as usual. It was not serious. (Neal and Barker)

Louisiana: Usual prevalence, of slight importance. (Edgerton) Observed in moderate amount on Louisiana oranges on the market. (Fulton)

Texas: Reported by DelCurto and others (5) from the lower Rio Grande Valley of Texas.

Literature:

1. Burger, O. F. Control of melanose of citrus fruits. Proc. Florida State Hort. Soc. for 1923. p. 171.
2. ---------- Melanose control. Florida Grower 28^{20}: 7, 17. Nov. 17, 1923.
3. Burger, O. F., E. F. DeBusk, and W. R. Briggs. Controlling melanose. Cituus Industry. 4^{10}: 6-8. Oct. 1923.
4. Burger, O. F., E. F. DeBusk, and W. R. Briggs. Preliminary report on controlling melanose and preparing Bordeaux-oil- Florida Agr. Exp. Sta. Bul. 167: 123-140. Jan. 1923.

5. DelCurto, J. M., E. W. Halstead, and H. F. Halstead. The Citrus Industry in the Lower Rio Grande Valley of Texas. Texas Dept. Agr. Bul.. 75. Mar. - Apr. 1923. p. 101.
6. Weber, G. F. Field work in Florida during the year on disease control. Quart. Bul. State Plant Bd. Florida 8: 1-8. Oct. 1923.
7. Winston, J. R. and J. J. Bowman. Commercial control of citrus melanose. U. S. Dept. Agr. Dept. Circ. 259: 1-8. March 1923.

Stem end rot caused by Phomopsis citri Fawcett and Diplodia natalensis Ev.

An important discovery recently made by scientists in the Department of Agriculture (3) is that proper removing of the small knobs or "buttons" which ordinarily are left on citrus fruits, satisfactorily controls both types of stem end rot. The gassing process commonly used for precoloring citrus fruits can be used to accomplish the disbuttoning. Bordeaux-oil-emulsion spraying soon after the fruit is set, at the proper time for melanose control, also prevents a large percentage of Phomopsis stem end rot in the mature fruit. Pruning out dead wood in the spring, through elimination of sources of infection, materially lowers the percentage of Diplodia stem end rot. Prompt shipment at low temperatures is another practical means of control.

Florida: Was reported from all sections in the State. In some groves the disease was rather severe. This disease appears only on ripe fruit or fruit almost ripe. (Burger)

About the same as preceding year. Occurs throughout the citrus belt. All commercial varieties are susceptible. Melanose control through spraying reduces this decay. (Winston)

Alabama and Mississippi: The two causal organisms are widely distributed on dead wood in Satsuma orange orchards, but fruit infection is rare, and not yet commercially important. (Fulton)

Louisiana: Considerable Diplodia and moderate Phomopsis stem end rot in Louisiana oranges on the market. (Fulton)

Literature:

1. Burger, O. F. Citrus stem end rot. Citrus Industry. 4[9] : p. 14. Sept. 1923.
2. Winston, J. R. and J. J. Bowman. A preliminary report on the control of stem end rot of citrus fruits by the removal of stems during the coloring process. Proc. Florida State Hort. Soc. for 1923. p. 177.
3. Winston, J. R., H. R. Fulton., J. J. Bowman. Commercial control of citrus stem end rot. U. S. Dept. Agr. Circ. 293: 1-10. Oct. 1923.

Scab (causal fungus erroneously named Cladosporium citri (pro tem) Massee)

Florida: The disease was rather severe this spring on the young fruit and tender twigs and leaves. Cool and rainy weather favored the development of scab. (Burger)

Grapefruit was affected somewhat less than the average year, and on the whole the disease was of minor importance, due to the fact that the cool and rainy weather came late in the spring after

fruit had reached a non-susceptible size. Bordeaux-oil-emulsion is more effective than lime-sulfur solution, and more than one application is usually required for commercial control. (Winston)

In nurseries the prevalence was about the average, and much damage was done throughout the citrus belt, infection occurring on expanding leaves in spring, summer and fall. Sour orange and rough lemon root-stocks are very susceptible, grapefruit is resistant, and round orange practically immune. Bordeaux-oil-emulsion applied at intervals of 3 or 4 weeks usually gives good commercial control. (Winston)

Alabama: General in southern counties, sometimes causing high percentage of injury and large loss on Satsuma oranges. Controlled where proper spray schedule was used. (Miles)

More prevalent than the average year. Summer flush of growth badly affected due to unusual summer rains. Spring infection of Satsuma fruit sometimes as high as 40% where no control was practiced. Protection of very young fruit with Bordeaux-oil-emulsion gives satisfactory control. (Fulton)

Mississippi: General in the citrus area, causing early shedding and unmarketable fruit of Satsuma oranges. Prevalence about the average. (Neal and Barker)

Scab quite prevalent on summer growth. Usually controlled on the fruit by spraying. (Fulton)

Louisiana: More prevalent than usual on fruits and leaves of Satsuma oranges in southern section of the state. (Edgerton)

Texas: Due to abnormal moisture conditions in the eastern Gulf Coast Section fruit of susceptible varieties, especially Satsuma oranges, showed more than usual damage. Leaves were deformed and twigs injured. The disease is not of importance in the lower Rio Grande Valley. (DelCurto)

Porto Rico: Severe in some places. (Cook and Toro)

Literature:

1. Peltier, G. L. and W. J. Frederick. Relative susceptibility of citrus fruits and hybrids to Cladosporium citri Massee. Jour. Agr. Res. 24: 955-959. June 16, 1923.
2. Tanaha, Tyôzaburô. A brief history of citrus scab in Japan. Phytopath. 13: 492-495. Nov. 1923.
3. Tower, W. V. Citrus scab. Porto Rico Agr. Exp. Sta. Agr. Ext. Note 53. (Reprinted in Trop. Agr. 60: 224-226. 1923)
4. Weber, G. F. Field work in Florida during the year on disease control. Quart. Bul. State Plant Board Florida. 8: 1-8. Oct. 1923.
5. Winston, J. R. Citrus scab; its cause and control. U. S. Dept. Agr. Bul. 1118: 1-39. Jan. 26, 1923.
6. Winston, J. R. Spraying for citrus scab. Florida Grower, 27[6]: 7. Feb. 10, 1923.

CITRUS - Canker

Canker caused by Bacterium citri (Hasse) Jehle

In Florida additional infected trees (eleven during 1923, and all but one of these during the first half of the year) have been found and destroyed in the Davie section. No new properties were reported. (Burger)

In Mobile county (Alabama) infection was discovered on a few trees only of Citrus trifoliata stock. These were immediately destroyed and no further infections were found. (Miles)

In Louisiana Edgerton reports about the same prevalence in the southern part of the state as during the preceding year.

Literature:

Anon. Report of citrus canker eradication (in Florida) for the quarter ending December 31, 1923. Quart. Bul. Florida Plant Board 8: 74. Jan. 1924.

Newell, W. Citrus canker eradication department. Quart. Bul. Florida State Plant Board 7: 87-95. 1923.

Stirling, Frank. The present status of citrus canker. Citrus Industry. 4^{10}: 22, 24. Oct. 1923.

Weber, G. F. Field work in Florida during the year on disease control. Quart. Bul. State Plant Board Florida. 8: 1-8. Oct. 1923.

Citrus blast and black pit caused by Bacterium citriputeale C. O. Smith

According to Fawcett, Horne, and Camp (1), black pit is most commonly met with on lemons in southern California, and blast occurs most frequently on leaves and twigs of oranges and grapefruit in the northern parts of the State. The organism is said to be widely distributed throughout the citrus regions of the State. In addition to citrus trees the organism can be transferred readily to leaves and twigs of some of the California live oaks. Injuries, low temperatures, and moisture were found important factors in the development of the disease.

Literature:

1. Fawcett, H. S., W. T. Horne, and S. F. Camp. Citrus blast and black pit. California Agr. Exp. Sta. Tech. Paper 5: 1-36. May 1923.

Lime withertip caused by Gloeosporium limetticolum Clausen

Florida: About the same as usual. This major lime disease causes twig blight, leaf spot and fruit scab wherever Key limes are grown in the state. Occasional applications of Bordeaux-oil-emulsion are an effective check. (Winston)

Anthracnose and withertip attributed to Colletotrichum gloeosporioides Penz.

Florida: Anthracnose was reported from one section as doing considerable damage to the fruit. In the northern section of the State leaves

that had been injured by the frost on February 19, 1923, showed considerable infection from this fungus. Withertip was reported from several sections of the State. There was in some places a rather severe epidemic of this disease. In young nurseries where the water had been high and injured the trees the disease was very severe. (Burger)

Anthracnose was of minor importance and seemed to follow too great fluctuations of soil moisture. Withertip seems to be the result of starvation and other devitalizing influences. Pruning out of dead wood, fertilization and insect control are almost always followed by prompt and complete recovery.

Alabama: Withertip not generally important. Severe in a few badly neglected groves. (Miles)

Mississippi: Withertip is general in the citrus area, but does little damage. (Neal and Barker)

Texas: Twig and fruit injury on grapefruit were more conspicuous than in 1922 in the lower Rio Grande Valley. (DelCurto)

Blossom-end rot associated with Alternaria citri Pierce and sometimes other fungi

Florida: Was rather prevalent through the State. Extreme rainy weather during summer probably favorable for its development. Reported on Ruby, Blood, Parson Brown, Pineapple, Jaffa, Valencia and Tangerine oranges. Later ripening varieties suffered least. Infection in some groves varied from 5% to 25%. (Burger)

Worse than usual, but of minor importance. Have not seen satisfactory results from usually prescribed treatments. (Winston)

California: One report of severe damage from fruit drop of Navel oranges.

Blue mold rot caused by Penicillium digitatum (Fr.) Sacc. and P. italicum Weh.

Florida: About the average amount. (Fulton)

Alabama and Mississippi: Practically none, due to care in handling fruit and to dry, bright, cool weather during shipping season. (Fulton)

Reported on oranges marketed in Connecticut. (Clinton)

Foot rot attributed to Phytophthora terrestris Sherb.

Florida: Was reported as doing damage to some nursery trees. It is rather prevalent in old seedling orange groves. It is worse on poorly drained land than on any other type of soil. (Burger)

About the same prevalence as usual. Is a major disease among old seedling orange trees. (Winston)

CITRUS - Miscellaneous diseases

Miscellaneous diseases, parasites known or suspected

Brown rot caused by Pythiacystis citrophthora Sm.& Sm. was reported to have been found on a lemon fruit grown in a greenhouse at New Brunswick, N. J. (Dept. of Plant Pathology). It occurred to some extent on lemons in the lower Rio Grande Valley of Texas. (DelCurto)

Gummosis caused by the above organism was reported to have killed a number of citrus trees in Arizona.

White mold rot caused by Oospora citri-aurantii (Ferr.) Sacc. & Sydow was of general occurrence in Satsuma orange groves of Alabama and Mississippi, following insect punctures in ripening fruit. No direct loss could be attributed to this fungus. (Fulton)

Felty fungus girdle caused by Septobasidium pedicillatum (Schw.) Pat. was reported by Burger as being very common in Florida during the year, and by Edgerton as having been noted on orange in St. Tammany Parish, Louisiana.

Algal disease caused by Cephaleuros virescens Kunze was reported by Burger from various localities in Florida, with some killing back of young branches; control was reported by spraying with lime-sulfur. Winston reports possibly more than usual, being most prevalent in certain moist hammock sections; spraying with Bordeaux-oil-emulsion is said to be especially effective if applied when the parasite takes on a reddish color.

Cassytha sp., (Lauraceae) a parasitic flowering plant of vine-like growth "is especially abundant on the lower East Coast of Florida. It is not considered a serious enemy of citrus fruits." (H. J. Wheeler)

Damping-off attributed to Rhizoctonia sp. caused considerable complaint because of the effect on citrus seedlings in Florida, according to Burger.

Scaly bark and nailhead rust attributed to Cladosporium herbarum var. citricolum Fawcett. Florida: "This disease seemed to spread slightly during the past year. The quarantined areas were increased by the addition of new property found infected." (Burger)

Sooty mold caused by Meliola sp. reported as common in Florida and Porto Rico.

Tearstain in Florida, according to Winston, is a manifestation of rust mite injury in at least 99% of the cases. "Grapefruits are more susceptible than oranges. Where rust mites do not occur in Florida, or where these insects are controlled, tearstain is absent; where mites are permitted to become abundant, tearstain is a very common blemish."

Citrus nematode, ~~Tylenchulus~~ +semipenetrans Cobb, was reported by E. E. Thomas (13) as being most prevalent in California in the older citrus sections. The amount of infestation varies greatly in different districts.

Miscellaneous diseases, cause unknown or non-parasitic.

Gummosis, cause unknown, was reported from Florida by Winston, Texas by DelCurto, and Porto Rico by Cook and Toro. Burger attributed a particular case of bark gummosis to Diplodia sp.

Psorosis, cause unknown, was reported by Winston as being about the same as in 1922 in Florida. DelCurto reports it as being quite serious, along with gummosis, in the lower Rio Grande Valley of Texas.

Blight cause unknown - Florida. Was serious in certain sections of the State, loss and removal of trees in certain groves along the East Coast amounted

+Tylenchus

to 33%. (Burger) According to Winston the prevalence was somewhat greater than usual, in spots throughout the state, but is still a minor disease; no satisfactory treatment is known, and the disease is always fatal.

Scaly twig rupture, cause unknown, reported by DelCurto from Hidalgo County, Texas. Grapefruit, oranges, and lemons are attacked, grapefruit more severely. The period of greatest injury was June.

Black melanose, cause unknown, a leaf disease of minor importance was reported by Winston as being more prevalent than usual in Florida.

Die-back, cause unknown, was reported by Burger and by Winston to be of major importance throughout the citrus belt in Florida, being especially serious on the light sandy ridges. Winston reports that bluestone applied to the soil like fertilizer, or to the foliage as Bordeaux spray usually gives excellent results.

Mottle leaf and chlorosis, seemingly an effect of excessive lime in the soil, was reported by Winston as being less prevalent in Florida, and by Miles as being important in Alabama.

Green spotting, caused by bruising the fruit so that the oil cells are ruptured, was described by Burger and DeBusk in Press Bulletin No. 342 of the Florida Experiment Station.

Spray injury, due to both oil spray and to lime-sulfur spray was reported by Burger from Florida. Winston thinks that the dark brown stellate excrescences on fruits and leaves, known as star melanose are probably a type of Bordeaux injury.

Lightning injury to citrus trees was reported by Burger as being rather common in Florida.

Recent literature on miscellaneous citrus diseases:

1. Blanchard, V. F. & Hodgson, R. W. Rebuilding frost injured citrus trees -- A progress report. Calif. Citrogr. 8: 263, 294-295. June 1923.
2. DelCurto, J. M., E. W. Halstead, and H. F. Halstead. The citrus industry in the Lower Rio Grande Valley of Texas. Texas State Dept. Agr. Bul. 75: Mar. - Apr. 1923.
3. Fawcett, H. S. Experiments in bridge grafting and inarching in connection with gummosis of citrus. Calif. Citrogr. 8: 68, 95. Jan. 1923.
4. ---------- Gum diseases of citrus trees in California. California Agr. Exp. Sta. Bul. 360: 370-423. Apr. 1923.
5. ---------- Gummosis of citrus. Jour. Agr. Res. 24: 191-236. Apr. 21, 1923.
6. ---------- Psorosis (scaly bark) of orange trees. Ann. Rep. California Citrus Inst. 3/4: 50-54. May 1923.
7. Ferris, E. B. and F. B. Richardson. The Satsuma orange in South Mississippi. Mississippi Agr. Exp. Sta. Bul. 217: 1923.
8. Lee, H. A. A disease of Satsuma and Mandarin orange fruits caused by Gloeosporium foliicolum Nishida. Philipp. Jour. Sci. 22: 603-615. June 1923.
9. Reed, H. S. and A. R. C. Haas. Effect of sodium chlorid and calcium chlorid upon growth and composition of young orange trees. California Agr. Exp. Sta. Tech. Paper 4: 1-21. Apr. 1921
10. Robinson, T. R. Safeguarding the introduction of citrus plants through improved quarantine methods. Florida Grow. 27[24]: 6-7. June 16, 1923.

11. Ryerson, Knowles. Efficiency in scaly bark and shell bark control. California Citrogr. 8: 371, 401. Sept. 1923.
12. Stevens, H. E. The present status of spraying and dusting for control of citrus diseases. Proc. Florida State Hort. Soc. 1923. p. 144.
13. Thomas, E. E. The citrus nematode, Tylenchulus semipenetrans. California Agr. Exp. Sta. Tech. Paper 2: 1-19. Feb. 1923.
14. Webber, H. J. The June drop of oranges. Ann. Rep. California Citrus Inst. 3/4: 91-100. May 1923.
15. ------- June drop caused by climatic conditions rather than a fungus growth. Three control methods suggested as tests for this year. Citrus Leaves 3^3: 1-5. Mar. 1923.
16. Weber, George F. Poria cocos developed on tuckahoe found attached to orange tree root. (Abstract). Phytopath. 14: 35. Jan. 1924.
17. Wheeler, H. J. Citrus culture in Florida. Jacksonville, Florida. 1923.

FIG

Leaf blight caused by Rhizoctonia microsclerotia Matz was reported from Florida, and Alabama, and from Louisiana for the first time. The disease was very prevalent on the Experiment Station grounds in Florida, according to Weber, and the "affected trees were usually entirely defoliated. Three trees were sprayed with 4-4-50 Bordeaux mixture on May 16 and on June 1 (1922). Not a single infection was found on these three sprayed trees while the three check trees (almost touching the sprayed trees) showed 20 percent infected twigs and the disease was rapidly spreading."

Rust caused by Physopella fici (Cast.) Arth. was reported from Florida as the most serious disease of fig trees, causing complete defoliation; from Alabama as not important, although sometimes causing defoliation; and from Louisiana and Texas.

Limb blight caused by Corticium laetum Karst. - Alabama (unimportant), Georgia (Last summer some dead wood was noticed in part of an orchard (near Savannah) and was pruned out. This spring a great deal of the disease showed up, affecting most of four trees and smaller portions of some dozen other trees), Mississippi (Harrison County, serious in grove observed), Florida (during the past year has been reported as very serious from several different parts of the state; pruning has proven a very efficient way of controlling the disease), Louisiana.

Root knot caused by Heterodera radiciola (Greef) Müll. - Mississippi (general, most serious along Gulf Coast; Celeste somewhat resistant), Texas.

Anthracnose caused by Glomerella cingulata (Stonem.) S. & von S., Florida, Alabama, Mississippi, Louisiana; leafspot caused by Cercospora fici Heald & Wolf, Mississippi; by Cercospora sp., Texas; canker caused by Macrophoma fici Alm. & S. and root rot caused by Ozonium omnivorum Shear, Texas. leafspot caused by Cercospora bolleana (Thüm.) Sacc., Alabama (very prevalent but little apparent injury).

Recent literature:

Phillips, Edith H. Checking fig smut. Associated Grower 5 : 20-22. 1923.

Aspergillus niger

AVOCADO

Scab caused by the same fungus as citrus scab, erroneously named Cladosporium citri (pro tem.) Massee. Florida: "Of major importance in nurseries; moderately important on bearing trees. Affects leaves and fruit. Usually controlled by applications of Bordeaux mixture." (Winston)

"Scab was the most common and probably caused more loss than all the other known avocado diseases in Florida. It has been reported from every section of the state where the avocado is grown and in certain instances has caused considerable damage. The disease on the foliage was most serious during March, and on the first fruit during May and June." (Weber)

Anthracnose caused by Colletotrichum gloeosporioides Penz. was not serious on the fruit, but caused considerable damage to younger twigs and to seedlings in Florida.

"A Fusarium sp. was apparently the cause of the excessive premature drop of fruit. It has been isolated from practically all specimens sent to this laboratory. The vascular systems of the stems and of the fruits were in each case badly discolored by this fungus." (Weber)

Other diseases reported from Florida were leafspot caused by Phyllosticta sp., blotch caused by Cercospora sp. (rare on leaves and twigs; occasionally found on fruit), leaf blotch caused by Pestalozzia guepini Desm. var. vaccinii Shear following other injuries, algae and lichens on the leaves, especially the lower shaded leaves.

Blight caused by Pestalozzia sp. - Texas.

MANGO

Anthracnose caused by Colletotrichum gloeosporioides Penz. - Florida, Porto Rico (canker, very severe; imported varieties very susceptible - Cook & Toro).

Other diseases reported from Florida were Pestalozzia guepini Desm. causing leafspot; Septobasidium pedicillatum (Schw.) Pat. (felty fungus) on the twigs but not believed to be parasitic; and Cephaleuros virescens Kuntze, an alga, causing leafspot and killing small twigs.

Fruit rot caused by Gloeosporium sp. (severe; attacks finer varieties of native mangoes), and wither tip caused by Diplodia sp. were reported from Porto Rico by Cook and Toro.

PERSIMMON

Fruit rot caused by Gloeosporium sp. was reported from Alabama as locally important on a single variety. Miles stated that "The organism and disease greatly resemble bitter rot of apple. It produces typical bitter rot lesions when inoculated into apple fruits."

The following diseases were reported from Florida: twig blight caused by Colletotrichum sp., common but not serious; twig blight caused by Phoma diospyri Sacc., leafspot caused by Pestalozzia guepini Desm., rosette, cause unknown.

BANANA

Leaf and fruit spot caused by Gloeosporium musarum C.& M. - Florida (caused extensive losses both by reducing leaf surface and because of fruit injury; very common on fruit on the market and often a limiting factor in its sale), Porto Rico (on all varieties throughout the Island).

Wilt caused by Fusarium cubense EFS. - Porto Rico (appears to be very destructive throughout the Island).

Pink mold caused by Cephalothecium roseum Cda. - found on leaves in Florida but is apparently only a weak parasite and caused little damage.

DATE

Smut caused by Graphiola phoenicis (Mong.) Poit. - Texas, Arizona, Porto Rico.

Leafspot caused by Exosporium palmivorum Sacc. - Texas.

PINEAPPLE

Red wilt, probably due to nematodes, Heterodera radicicola (Greef) Müll. Florida: Injury about the same as for last few years. A most important pineapple disease. (Winston)

OLIVE

Olive knot caused by Bacterium savastanoi EFS. - California (general throughout the state, but most severe in the Sacramento Valley. Loss about 1%. Infection very bad in some orchards. - Milbrath).

GUAVA

Dieback caused by Colletotrichum sp., and leafspot and twig blight caused by Cephaleuros virescens Kuntze - an alga, were reported from Florida. Fruit rot and spot caused by Glomerella psidii (Del.) Sheldon was reported from Florida and Porto Rico.

PAPAYA

Leafspot caused by Pucciniopsis caricae Earle was reported from Florida (serious, causing defoliation in severe infections; plant not extensively grown, so economic loss is small) and Porto Rico (unimportant).

LOQUAT

Leafspot caused by Sphaeropsis malorum Pk. ? - Florida (not important).

CHERIMOYER

Anthracnose caused by Gloeosporium sp. caused a black rot of the fruits in Florida, but the host is not extensively grown.

AGUACATE

Fruit rot caused by Gloeosporium sp. - Porto Rico (severe as a storage disease).

DISEASES OF NUTS

PECAN

Scab caused by Fusicladium effusum Wint.

Scab was generally reported as more prevalent than usual. Losses estimated were 20% in South Carolina, 15% in Alabama, and 10% in Mississippi. Other states from which reports were received are Georgia, Florida, Louisiana, and Arkansas.

Alabama: Very important on susceptible varieties. Total loss in some cases where susceptible varieties were not sprayed. Georgia Giant, Delmas, Pabst, Schley very susceptible; Success scabbing some; Stuart, Russell, Van Deman, Frotscher resistant. (Miles)

Mississippi: Scab has been very destructive the past season all over the state, especially so in the coastal, central, and delta sections. The abundant rainfall which occurred almost every week from May until August was very conducive to scab development and interfered materially with spraying operations for the control of the disease on the more susceptible varieties. Only partial control was obtained on Delmas and Pabst pecans, the two most susceptible varieties in this State. Varieties listed in the order of susceptibility to scab are Delmas, Pabst, Schley, Success, and Alley. Resistant varieties include Stuart, Russell, Van Deman, Money Maker, Hall, Frotscher, Moore, and Tesche. Success seems to be scabbing more seriously than heretofore, and some varieties like Schley are scabbing badly in some localities, while in others they are relatively free from the disease. It may be possible that there is biological specialization of the scab fungus, or enough

bud variation among certain varieties to cause pronounced difference in their susceptibility or immunity to scab. Dormant spraying with 1-8 lime sulfur followed with summer applications of 4-4-50 or 4-6-50 Bordeaux with oil emulsion added has given the best control of all spraying materials used in our experiments. (Neal & Barker)

Recent literature:

Demaree, J. B. Pecan scab experiments in 1922. Amer. Nut Jour. 18: 4-5. Jan. 1923.

Rosette (cause undetermined)

Rosette was reported from South Carolina, where fewer complaints were received than usual, and from Alabama. Miles reported that the disease was important, causing a loss of 4%. "The disease is general in the southern part of the state in light sandy soils. A four-year old orchard in land long used for cotton showed 93% of the trees badly rosetted. The disease is most prevalent in soils which have grown cotton for a long time, in satsuma orchards, and in soils lacking in humus generally."

Black pit (non-parasitic)

Black pit was reported as very severe in South Carolina by Moore, who stated that the disease "practically ruined pecans in every grove. The yield was cut in half." It caused considerable loss also in Mississippi, where it was more prevalent than usual. Neal and Barker report as follows:

> "Black pit has been reported from many counties over the state this season. It has been particularly serious in the coastal counties. Delmas, Schley, Pabst, Stuart, and Van Deman have been found to be affected in the order named. The disease seems to be very serious on Delmas, Schley, and Pabst pecans. The Russell, Atlanta, Hall, Money Maker, and Success seem to be less seriously affected, with the first four being practically immune. This trouble is evidently associated in some way with excessive and continuous rainfall. Dry weather the previous season does not appear to be accountable for it. On the other hand, it is possible that conditions which would bring about imperfect pollination may be responsible for this abnormal development of the nuts."

Severe losses due to this trouble were reported from Atlanta, Georgia, and Hope, Arkansas.

Other diseases and injuries

Anthracnose caused by Glomerella cingulata (Stonem.) S. & von S. was reported from Florida, Alabama, and Mississippi. In Mississippi, according to Neal and Barker, the disease is "rather serious. It appeared rather late on

practically mature nuts in most cases. Badly diseased nuts are apparently not well filled. It is common on most varieties, particularly Stuart, Delmas, and Van Deman."

Nursery blight caused by Phyllosticta caryae Peck was reported by Weber as very common and frequently, but not generally serious in nurseries in Florida; and from Alabama by Miles as general on nursery stock and sometimes found on weakened trees.

Brown leafspot caused by Cercospora fusca Rand was said to be common and locally important, causing premature defoliation in many cases, in Florida and Alabama, and was also reported from Carlsbad, New Mexico. According to Miles "Spraying for scab gives complete control of this trouble. There is evidence that weakened trees are more subject."

Powdery mildew caused by Microsphaera alni (Wallr.) Salm., South Carolina, Florida, Mississippi; crown gall caused by Bacterium tumefaciens EFS. & Towns., South Carolina, Mississippi; black spot of bark caused by Septobasidium pedicillatum (Schw.) Pat., and by Myriangium tuberculans Miles, Mississippi; kernel spot, Alabama; pink mold caused by Cephalothecium roseum Cda., twig blight due to Fusarium sp., dieback caused by Botryosphaeria berengeriana De Not., a bacterial twig blight, organism undetermined, and leafspot due to lichens, Florida.

Winter injury was severe in Mississippi. Neal and Barker stated that "Trees under four years old were seriously injured by the February and March freezes, particularly where fertilized and cultivated late in the fall of 1922." Winter injury was also reported from South Carolina.

Cold injury - frequently reported but not serious in Florida.

Recent literature:

Higgins, B. B. Winter injury to pecans. Amer. Fruit Grow. Mag. 44: 13. Jan. 1924.

ENGLISH WALNUT

Bacterial blight caused by Bacterium juglandis (Pierce) EFS. - Delaware (usually severe in seasons when fire blight of apple is prevalent; generally found in small home plantings - Adams), Washington, California (loss about 2 percent). Specimens of walnuts affected with a trouble resembling this disease were received by the Cornell Department of Plant Pathology from a field assistant in Ontario County, New York.

Leafspot caused by Marssonia juglandis (Lib.) P. Magn. - Illinois.

Twig blight and black spot of nuts due probably to drought - New Mexico. Crawford reported that "Many of the young fruit spurs and twigs are entirely dead and some of the nuts have black spottings on their surfaces." Specimens were examined by M. B. Waite who said that the trouble was probably due to drought.

Recent literature:

Anon. Walnut-blight. Introduction of immune variety by the Department. New Zealand Jour. Agr. 27: 25. July 1923.

ENGLISH WALNUT - Diseases

Juglans hindsii is the native California black walnut. It is suitable for use as a stock since it is immune to the bacterial blight, which had become so destructive in New Zealand that the Department did not encourage walnut planting.

ALMOND

Shot hole caused by Coryneum beijerinckii Oud. - California, said to be more injurious than in 1922.

Black heart caused by Verticillium sp. - see apricot.

Rosette of peach was transmitted by McCormick (see peach) from peach to apricot, from apricot to bitter and Texas seedling almonds, and from the almonds back to peach. It was also transmitted from wild plums to bitter almonds.

COCONUT

Wilt, apparently caused by Pythium sp., was reported by Weber (1) from Florida. "The leaves become yellow and wilt one after another until the bud falls from the top of the plant."

Bud rot, cause undetermined, was reported as doing considerable damage near Palm Beach, Florida. In Porto Rico, according to Cook and Toro "Bud rot occurs over the entire Island but is most severe in the western part. It is less severe than the Cuban bud rot and we believe it to be different."

Recent literature:

Cited

1. Weber, G. F. Field work in Florida during the year on disease control. Quart. Bul. St. Plant Bd. Florida 8: 1-8. Oct. 1923.

Not cited

Goodey, T. A. A review of the plant parasitic members of the genus Aphelenchus. Jour. Helminthol. 1: 143-156. Sept. 1923.
Aphelenchus cocophilus Cobb causes red-ring disease of coconut in the West Indies.

McRae, William. Inoculation experiments with Phytophthora palmivora Butl. on Borassus flabellifer Linn. and Cocos nucifera Linn. Mem. Dept. Agr. India Bot. Ser. 12: 57-70. July 1923.

Reinking, O. A. Comparative study of Phytophthora faberi on coconut and cacao in the Philippine Islands. Jour. Agr. Res. 25: 267-284. Aug. 11, 1923.
Causes coconut budrot, and blackrot and canker of cacao.

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