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SPRAYING FOR PEACH FRUIT SPOT

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SPRAYING FOR PEACH FRUIT SPOT.

A. B. CORDLEY AND C. C. CATE.

The disease which is known by Oregon peach growers most commonly as "peach fruit spot" and also as "fungus," "shot-hole fungus," "peach spot" and "brown spot," has been in evidence for many years, during the past few of which it has occasionally caused no little loss. In some instances the crop has been so spotted that it could not be disposed of on the open market, and many tons of otherwise luscious fruit have been forced to the canneries or evaporators. Still more unfortunate is the fact that often a portion of the infested fruit is worthless and is left to decay on the trees and in the orchard, thereby harboring and spreading the disease so that year by year it may secure a firmer and surer hold upon each succeeding crop.

Under date of August 2, 1906, M. A. L. Kitchen, manager of the Ashland Fruit and Produce Association forwarded to us a box of badly infested Hale's Early peaches with the accompanying statement: "Many of our peaches this year are affected with a disease which causes spots on them much resembling scale." Later so many similar reports were received from most of the peach growing sections of the state that we decided to undertake a study of the disease and of the best methods of controlling it.

The results so far obtained indicate that one of the most important steps in controlling the disease is to spray in fall with some good fungicide. Therefore, this brief bulletin is issued, in advance of the more extended one which it is hoped to publish when the work has been completed, that growers may know what has already been accomplished and thus be prepared to spray this fall at the proper time.

The spraying experiments which were begun in the spring of 1907, were conducted the first season in cooperation with Mr. Benton Bowers who contributed the use of his orchard near Ashland. During the two succeeding seasons the work has been continued in cooperation with Mr. Albert Joy who purchased the orchard of Mr.



FIG. 1. Much of the fruit from the unsprayed trees was practically worthless.

Bowers. To both Mr. Bowers and Mr. Joy we desire to express our hearty appreciation for the many courtesies extended.

The orchard in which the work was done consists of about 12 acres of 15-year-old trees, mostly Muir, with some Albertas and Crawfords. It is well located, with a gentle slope to the northeast, and the soil which is deep and of the decomposed granitic type is considered excellent for peaches. Nevertheless the trees had generally been neglected, very little, if any, spraying had ever been done and we were told that the orchard had never produced a profitable crop—such fruit as had been produced having been “spotted” and of but little value.

The object of the experiments was to compare the efficiency of Bordeaux mixture and lime-sulphur in controlling the disease; and to determine the number of applications necessary and the best times at which they should be applied. During the first season's work the lime-sulphur was used only for the first application before the buds started in spring but during all the later experiments it has been tested as well for the summer applications.

WORK IN 1907.

The first application in 1907 was made between February 27th and March 4th, just as the first buds were swelling. A block of about two acres was sprayed with Bordeaux mixture and the remainder with Phoenix Lime-sulphur solution. Later the two acre block which comprised 13 rows across the north end of the orchard was subdivided into plots for the purpose of determining the relative efficiency of several different methods of treatment.

In the following table, which is intended to show the treatment given each plot and the results obtained, the various plots are numbered from one to thirteen while the columns which represent the various applications are lettered from A to D as follows:

“A”	represents	the 1st	application	made	February	27	to	March	4.
“B”	“	“	2nd	“	“	April	30.		
“C”	“	“	3rd	“	“	May	15.		
“D”	“	“	4th	“	“	June	1.		

“E” shows per cent of infested fruit at picking time.

The first application was made just as the buds were swelling; the second soon after the blossoms fell; the third when the fruit was about one-half inch in diameter; and the fourth when it was approximately one inch in diameter.



FIG. 2. The so-called "culls" from sprayed trees
could have been marketed as second grade fruit.

TABLE 1. SHOWING RESULTS OF SPRAYING FOR PEACH FRUIT SPOT IN 1907.

Plot	"A"	"B"	"C"	"D"	"E"
1					99
2					99
3	L-S				100
4	L-S				100
5	L-S	Bord.			95.4
6	L-S	Bord.			95.4
7	L-S	Bord.	Bord.		89.3
8	L-S	Bord.	Bord.	Bord.	56.4
9	Bord.	Bord.	Bord.	Bord.	28.3
10	Bord.	Bord.	Bord.		75.9
11	Bord.	Bord.			96
12	Bord.	Bord.			96
13	Bord.				99

A glance at this table leads to the conclusion that the results of the season's work were far from satisfactory. This is not true. Upon visiting the orchard shortly before the fruit was to be gathered and, making a critical examination of the various plots, we were much impressed with the very marked differences in the fruit on the sprayed and unsprayed trees. The fruit upon those trees which had received all four applications appeared to be almost absolutely free from spots while all of that upon the unsprayed trees was more or less infested and much of it was worthless. Moreover, the foliage of the sprayed trees was in much better condition and the trees were evidently more vigorous. The results were so marked that casual visitors to the orchard noted them and inquired the cause. The discrepancy between these observations and the final results as exhibited in the above table is explained by the fact that in estimating the percentage of infested fruit, only two grades were considered, viz: "clean" fruit and "infested" fruit. A single spot upon a peach, while it would scarcely impair its market value was sufficient to class it with the culls. Therefore, while much of the infested fruit from the unsprayed trees was practically worthless (Fig 1) nearly all of the so-called culls from the trees which had received the four applications could have been marketed as second, and much of it as first grade fruit. (Fig. 2.) Had the fruit been sorted into commercial grades instead of into "clean" and "infested" fruit, the results as tabulated would have been much more favorable for the sprayed trees.

Moreover, the facts gleaned from the above table became important when we came to plan the work for 1908.

The results obtained upon plots 3, 4 and 13 indicate very clearly, that so far as controlling peach fruit spot is concerned an applica-

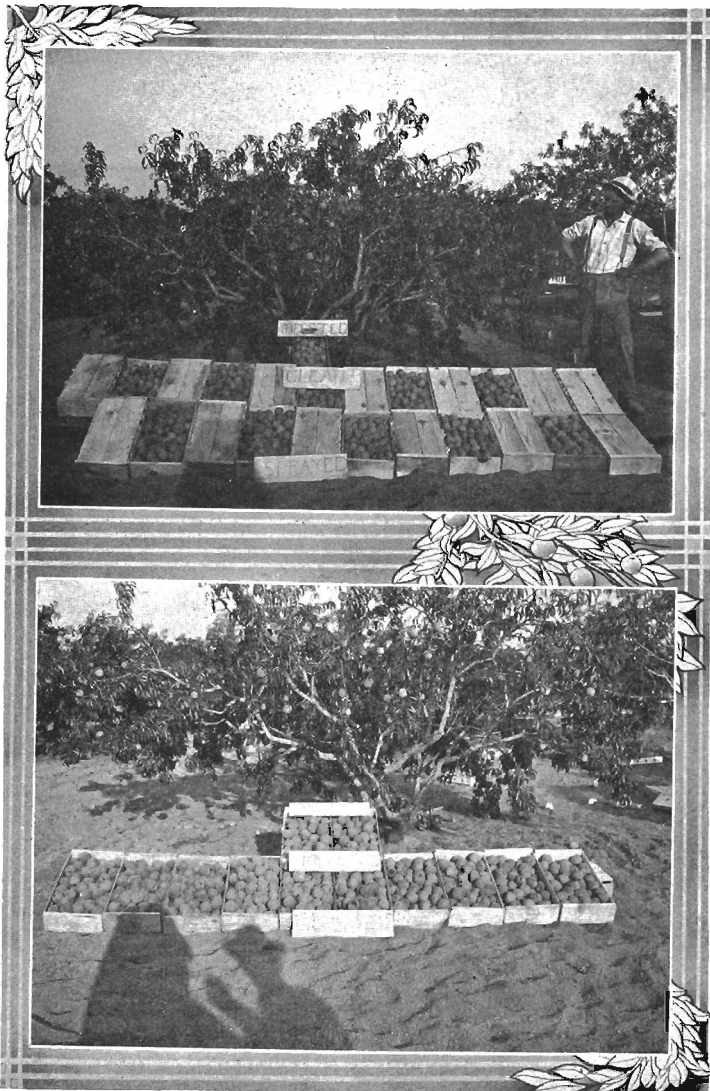


FIG. 3. Fruit from sprayed tree. Only one small basket infested.
FIG. 4. Fruit from unsprayed tree. But two baskets of clean fruit.

tion of lime-sulphur solution or of Bordeaux mixture before the buds open is worthless. Reference to plots 5, 6, 11 and 12, shows that the second application, likewise, was of very little value; and since we may assume that the spray applied at this time would remain efficient for at least ten days, we are led to the conclusion that infestation of the fruit probably did not begin much before May 10. We may also reasonably conclude, from the fact that practically all of the spots upon the fruit which had been sprayed four times were very small, that the protective influence of the last spray did not extend quite to the end of the period of infestation, and this conclusion is supported by the fact that light showers which would provide conditions favorable for infestation occurred as late as June 22.

From the single season's work, then, we may conclude, (1) that peach fruit spot can be controlled by spraying; (2) that so far as this disease is concerned the first and second applications were worthless; (3) that practically all of the infestation of the fruit occurred between May 10 and June 15; (4) that during that period the fruit should be protected by some fungicide; (5) Bordeaux mixture (3-6-50) was the only spray used upon the trees in foliage. There is some danger of injuring the foliage with Bordeaux but under the conditions which prevailed during our experiments, none whatever occurred.

WORK IN 1908.

November 1, 2, 1907, the entire orchard was sprayed, with the exception of one row through the centre which was left as a check. All of the trees south of this row were sprayed with "stock solution" lime-sulphur (sp. gr. 1.255, Beaumc 29.5) diluted 1 to 9; all north of the row were sprayed with 6-6-50 Bordeaux. About one-half the leaves had fallen before the applications were made.

Notwithstanding the fact that the results of 1907 demonstrate that the first and second applications were valueless, it was thought best to test this conclusion by another season's work, hence the plan of work for 1908 was essentially the same as for 1907, except that the entire orchard was sprayed and the various sprayings were so timed that the fourth occurred June 24 instead of June 1. Provision was also made for a larger number of plats for testing a somewhat greater range of combinations as shown in the following table. Stock solution lime-sulphur was also used upon some of the plots after the trees were in foliage.

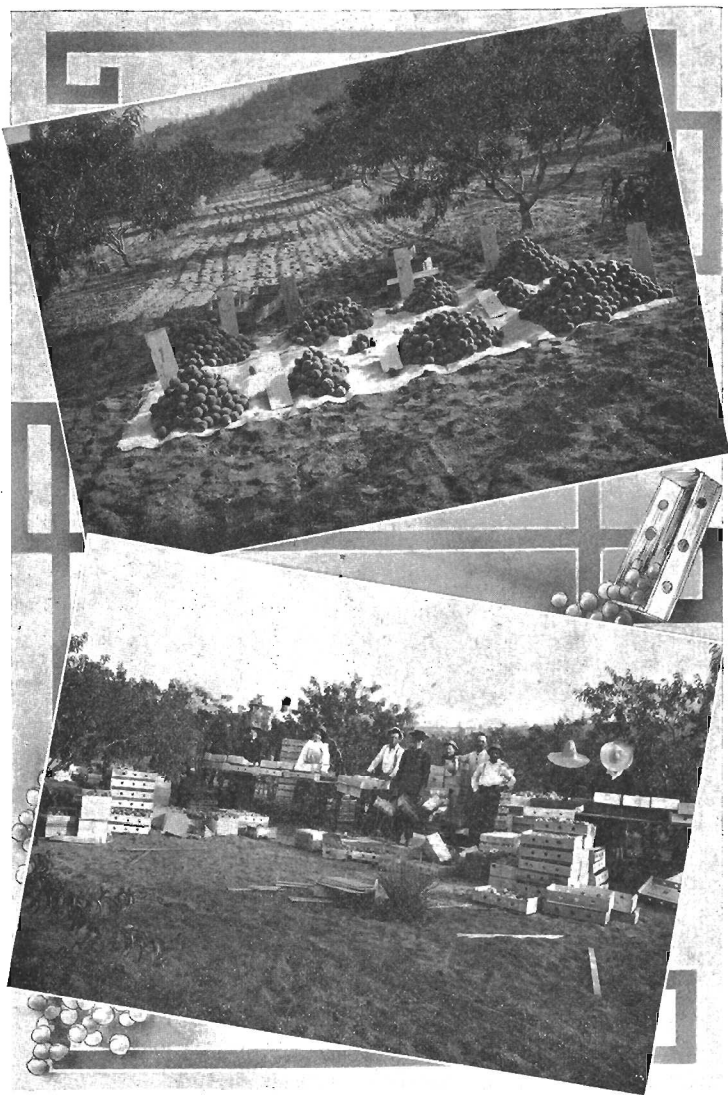


FIG. 4 and 5. The sprayed portion of the orchard produced a fair crop (1907).

In the table the various columns correspond to those of Table I except that the one marked "Fall" shows the spray which was applied Nov. 1, 2, 1907. The dates of the other applications were as follows:

"A" represents first spray applied March 4-5 just as the buds were beginning to swell.

"B" represents second spray applied May 13.

"C" " " third " " June 4.

"D" " " fourth " " June 24.

"E" " " per cent of infested fruit at picking time.

TABLE II. SHOWING RESULTS OF SPRAYING FOR PEACH FRUIT SPOT IN 1908.

Plot	Fall	"A"	"B"	"C"	"D"	"E"
1						83.8
2						65.8
3	Bord.					46.6
4	Bord.	Bord.	Bord.	Bord.		2.7
5	Bord.	Bord.	Bord.	Bord.	Bord.	3.6
6	Bord.			Bord.		39.2
7	Bord.			Bord.		30.3
8	Bord.				Bord.	41
9	Bord.	Bord.			Bord.	21.5
10	Bord.		Bord.			8.4
11	Bord.	Bord.		Bord.		25.6
12	Bord.	Bord.				41.2
13	Bord.		Bord.	Bord.		4.1
14	Bord.	Bord.			Bord.	21.5
15	Bord.				Bord.	41.4
16		Bord.			Bord.	78.1
17				Bord.	Bord.	76.3
18			Bord.	Bord.		36
19	Bord.			L. S.		33.2
20	Bord.	Bord.		L. S.		19.6
21	L. S.		L. S.	L. S.	L. S.	15.8
22	L. S.	L. S.	Bord.	Bord.		3.9
23	L. S.	L. S.	Bord.	Bord.		17.1
24	L. S.	L. S.	Bord.	Bord.	Bord.	2.5
25		L. S.		Bord.	Bord.	50.9
26	L. S.		L. S.	L. S.		9.7
27	L. S.	L. S.	L. S.	L. S.		8.8
28		L. S.	L. S.			21.7
29		L. S.		Bord.		50.8
30	L. S.		L. S.	L. S.		19.4
31			L. S.	L. S.		34
32				L. S.		64.8
33	Bord.	Bord.		L. S.	L. S.	10.7
34	Bord.	Bord.	L. S.	L. S.	L. S.	10.5
35	Bord.			L. S.		25

The stock solution lime-sulphur which was used in 1908, had a specific gravity of 1.25 (Breau 29). For the first application it was diluted 1 to 10; for the second 1 to 18 and for the third and fourth 1 to 20. Bordeaux 5-6-50 was used for the first spraying and 3-6-50 for the second, third and fourth.

Bordeaux again caused no injury whatever to the foliage. The lime-sulphur, 1 to 18, which was used for the second application caused an almost perceptible amount of injury; but when the effect

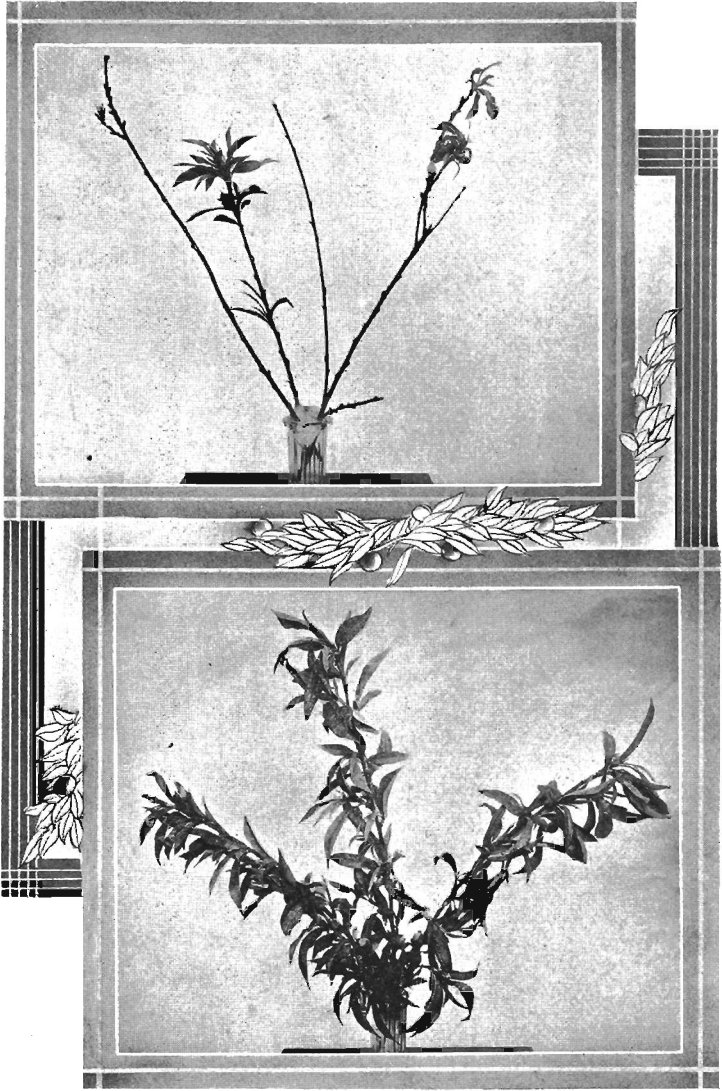


FIG. 7 and 8. Showing effect of fall spraying in controlling Peach Twig Blight.

of the third application, 1 to 20, was added to this the injury became quite noticeable. For this reason only a comparatively few of the trees were sprayed for the fourth time with lime-sulphur but on these no further injury could be detected.

In the main, the conclusions, which were drawn from the results obtained in 1907, are sustained by those of 1908. Again does it appear that the first application, just as the buds are swelling, is of practically no value in controlling peach fruit spot. Again are we led, by the good results obtained from the second and third applications, which correspond very closely, in dates, to the third and fourth applications of 1907, to the conclusion that the period of infestation by the fungus is confined to May 10 to June 15 and that this, therefore, is the critical period during which the growing fruit should be thoroughly protected by spraying. However, the inference that good results would follow an additional application in late June was not justified by the results. Moreover, at picking time, much of the fruit which received the last spraying still bore more or less of the spray deposits which were difficult to remove without injuring the delicate bloom.

Perhaps the most important result of the season's work was to demonstrate the value of fall spraying for this disease. Every plot which received this application gives evidence of its value and every one of the plots which gave the best results, viz: 4, 5, 10, 13, 22, 24, 26, 27, 33 and 34, were fall sprayed either with Bordeaux or lime-sulphur.

Little can be said as a result of the season's work as to the comparative value of Bordeaux mixture and lime-sulphur solution for spraying peaches. The Bordeaux seems to have given slightly better results, but the difference is so slight as to be easily within the range of error or normal variation.

It is usually considered a dangerous practice to use Bordeaux mixture upon peach trees in foliage, but under the conditions which have prevailed at Ashland during the past two seasons no injury whatever has resulted from the use of the 3-6-50 formula. This does not argue that injury might not occur under less favorable conditions and growers who plan to use Bordeaux upon their peach trees are urged to exercise care in the preparation of the mixture and also, if possible, to avoid spraying in cold, rainy weather. The more vigorously the trees are growing the less susceptible will they be to the Bordeaux injury.

We have conclusively demonstrated during the past three years that lime-sulphur gives better results than does Bordeaux in preventing apple scab and that by its use the danger of spray injury may be eliminated. It was hoped that similar results might follow its use upon the peach. Eventually such may be the case, but from the single season's work all that can safely be said is that in all probability stock solutions which test 30° Beaume if diluted 1 to 30 or 35 would not injure foliage and would probably be efficient in checking the disease.

In this connection the attention of growers is called to the following statement by Mr. W. M. Scott, of the U. S. Department of Agriculture, that "The self-boiled lime-sulphur mixture, however, when prepared as a mechanical mixture of lime and sulphur with only a small percentage of the sulphur in solution, is not injurious to peach foliage; and in our experiments for two years past has proved to be a good fungicide." *

* Circular 27, Bureau of Plant Industry p 5.

CONCLUSIONS.

1. Peach Fruit Spot probably causes a loss to the peach and apricot growers of Oregon greater than that caused by all other peach diseases.
2. The two seasons' work has demonstrated conclusively that the disease can be practically eliminated from an orchard by spraying.
3. Good results can be obtained by spraying either with Bordeaux mixture or with lime-sulphur solution. The results so far are slightly in favor of the Bordeaux.
4. Some danger to foliage accompanies summer spraying with either Bordeaux or lime-sulphur. Therefore, care should be exercised in preparing the spray and in not using it too strong.
5. The Fall application seems to be more efficient than any other single one. It should be made as soon as possible after the late fruit is gathered. If San Jose scale is present lime-sulphur (1 to 10 or 12) should be used; if not, Bordeaux may be used if preferred. This Fall application is beneficial also in controlling the peach twig blight. (See Fig. 7-8). It is possible that one annual Fall spraying may be all that is necessary to control the twig-blight and the fruit-spot.
6. Spraying just as the buds are swelling in Spring is useless as a preventive of peach fruit-spot. This is, however, the most important application for the control of peach leaf curl and should not be omitted if this disease has been prevalent.

7. Peach fruit-spot attacks the fruit between about May 10 and June 15.

8. The first Spring spraying, therefore, should be done about May 10; the second about June 1. If the disease has been unusually prevalent, or if rainy weather favorable to the growth of the fungus occurs, the second application may be made about May 20 to 25 and a third one about June 5 to 10.