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Treatment of Currants\textsuperscript{1} and Cherries\textsuperscript{2} to Prevent Spot Diseases.

L. H. PAMMEL. G. W. CARVER.

EXPERIMENTS WITH CURRANT SPOT DISEASES.

In former bulletins of the Experiment Station, this subject has been treated. The experiments reported show quite conclusively that these diseases can be prevented by treating with Bordeaux mixture. The experiments were however repeated because Mr. D. G. Fairchild\textsuperscript{*} put the currant disease in the doubtful column of those to be treated.

The author makes this statement: “The fact that the author treated at the same time the disease caused by Septoria and another malady produced by \textit{Cercospora angulata}, makes it difficult to ascertain the effects of the fungicide on either fungus. It must be concluded that if Bordeaux mixture proves effective for this disease, it will need to be used more frequently than in Pammel’s experiments.”

In Iowa at least \textit{Septoria Ribis} only occurs on \textit{Ribes nigrum} and so reported in several papers.\textsuperscript{†} The suggestion was also made that the \textit{Septoria Ribis} and \textit{Cercospora angulata} are connected with \textit{Sphaerella Grossulariae}.

In our experiments in 1891 three applications were made with Bordeaux mixture as follows: June 9 and 26 and July 3.

\textsuperscript{1} Black Currants (\textit{Ribes nigrum}) were treated to prevent \textit{Septoria Ribis}. Red and White Currants (\textit{Ribes rubrum}) to prevent \textit{Cercospora angulata}.

\textsuperscript{2} Cherries, (\textit{Prunus Cerasus}) to prevent \textit{Cylindrotrium Fadi}.


From that experiment the following conclusions were drawn.† "Observation shows that three applications of the mixture are not sufficient, since many of the leaves fell during the latter part of August; nor is June 9, early enough." There was however a remarkable difference and we here show cuts made from photographs, showing the difference in treated and not treated Red Currants. In 1892 Bordeaux mixture and ammoniacal carbonate of copper were used separately, six applications having been made as follows:* June 17, 24, 27, 30, July 2 and 12.

From these experiments one of us concluded that Bordeaux mixture is more effective than ammoniacal carbonate of copper. In the case of Bordeaux mixture, "Few of the leaves of the treated plants had fallen in September, and those remaining showed few spots. The checks in some cases lost their entire foliage."

The following formulae were used for Bordeaux mixture and ammoniacal carbonate of copper in 1895:

**Bordeaux Mixture**—Copper sulphate, 6 pounds; Lime, 4 pounds; Water 22 gallons.

**Ammoniacal Carbonate of Copper**—carbonate of copper, 3 ounces; Ammonia, 1 quart; Water, 30 gallons.

Black Currants treated for *Septoria Ribis* were sprayed on May 10, 25, June 8, 25, and July 22. Red and White Currants treated for *Cercospora angulata*, were also sprayed on the same dates. The season was unusually early, some leaves were effected as early as May 8. During the latter part of May and in June, rains were frequent. The disease spread rapidly. Early in July many of the leaves of the checks, consisting of more than two dozen plants, had fallen off, while six treated with Bordeaux mixture retained their leaves and were free from spots. By the first of August the untreated lost most of their leaves, while the treated

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*Bulletin, Vol. 3 [1894], No. 30, Art. 2

†Bull. No. 17 Iowa Agr'l Experiment Station 1892, p 420.

*Bull. No. 20 Iowa Agr'l Experiment Station p 717.
were in vigorous growing condition. The untreated were in most cases bare by the middle of August. Many of the canes were dead or nearly so from the effects of the fungus.

Black Naples currant treated with Bordeaux mixture had few spotted leaves. The treated specimens had an average of 4500 leaves. The untreated were all badly spotted. The growth was not so vigorous as in treated plants.

In neither case did the ammoniacal carbonate of copper prove as effective as Bordeaux mixture. In case of red and white currants more leaves dropped from the canes than those treated with Bordeaux mixture. Black Naples treated with ammonical showed more spotted leaves and more fell than those treated with Bordeaux mixture.

CONCLUSIONS.

From these experiments we must conclude that five applications of Bordeaux mixture applied in proper time and with ordinary rainfall is sufficient to prevent almost entirely the spot disease of red and white currants, (Cercospora angulata) and spot disease of Black Naples currant, (Septoria Ribis). The ammoniacal carbonate of copper is not so effective and is not recommended, although easier to apply.

Experiments to prevent Cherry Leaf-Blight.

In earlier bulletins* attention has been called to the serious nature of this disease in the nursery and orchard, and the success attained in treating with Bordeaux mixture. Scarcely anything needs to be added after the publication of


the excellent results obtained by Galloway,* Thaxter†
Fairchild‡ and Beach,‖ leaves no doubt as to the efficacy of
the use of Bordeaux mixture for this disease.

It would seem to the writers that Bordeaux mixture
should be widely used in the nursery to prevent this trouble-
some disease. It may also be used advantageously in the or-
chard. In Bulletin No. 13 of this experiment station attention
was called to the fact that all varieties in the nursery are
not always affected in the same degree. The fact is to be
noted that young seedlings are peculiarly liable to the at-
tacks of this fungus. The sweet cherry (Prunus avium)
seems to be more subject than sour cherries (Prunus Cerasus)
but this varies under different conditions. The Mahaleb,
(Prunus Mahaleb) is least subject to the disease. The
European plum (Prunus domestica) on the college grounds
is also much subject though less than cherries commonly
grown here. The disease has occasionally been found on the
American seedling plums (Prunus Americana), but never to
any serious extent till this season. So bad has it been on
a mixed lot of seedlings that in many the buds will not take
successfully. In general however they were in much bet-
er condition than P. domestica. In fact very little of the
disease was found on budded stock. Bordeaux mixture should
therefore be applied to all of the stone fruits grown success-
fully in this climate. As to the cost of spraying large nur-
series the following estimate has been made by Galloway§,
when automatic machines drawn and operated by horse power

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© Bull. No. 7 p 27.
are used. Three men can spray about 100,000 seedlings a day using such a machine and taking the facts brought out by the experiment proper as a basis, together with the average price for labor and chemicals, it is believed a fair estimate of the cost of treating pear, plum and cherry stock the first year, or before and after the buds are inserted, will be about 25 cents for 1,000 trees. The next year, or when the buds are making their first season’s growth, the cost of work will probably not exceed 25 cents, while the following season, or the second year from the bud, the cost will be increased 10 to 15 cents, or about 40 cents per 1,000. On this basis the entire cost of treating trees until they are 2 years old from the bud will range from 85 cents to $1.00 per 1,000 or about 1 mill per tree.

Galloway* has made an interesting table, showing per cent of treated and untreated stocks, which work with difficulty and refuse to work at budding time July 1891.

<table>
<thead>
<tr>
<th>Kinds of Stock.</th>
<th>Kinds of Treatment</th>
<th>Worked with ease</th>
<th>Worked with difficulty</th>
<th>Refused to work.</th>
<th>Dead</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cherry.</td>
<td>Untreated.</td>
<td>55</td>
<td>7</td>
<td>29</td>
<td>9</td>
</tr>
<tr>
<td>&quot;</td>
<td>Bordeaux mix. 5 times</td>
<td>58</td>
<td>4</td>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot; 7 &quot;</td>
<td>61</td>
<td>7</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>&quot;</td>
<td>Ammoniacal Sol 5 &quot;</td>
<td>56</td>
<td>16</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot; 7 &quot;</td>
<td>67</td>
<td>12</td>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>

As to profits Prof. Galloway gives the following striking illustration. "The gain in value of the treated plats over those not treated range $1.00 to $40.00 per 1,000 trees, the average being $13.00 per 1,000."

The treated cherries in our experiments consisted of two rows of young cherry trees, leaving partial row for check. One row was treated with Bordeaux and one with ammoniacal carbonate of copper. Applications were made on the same dates as in currants. Owing to the advanced season cherries began to show signs of disease the first week in May. When treatment began the trees were nearly uniform as to

Pammel and Carver: Treatment of currants and cherries to prevent spot diseases.

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height. On August 22 those sprayed with Bordeaux mixture were 6 feet 2 inches, check 3 feet and 9 inches. In sprayed new growth, 18 inches, in check new growth, 12 inches. The sprayed had on an average 400 leaves and but few spotted; check 71 leaves badly spotted. With ammoniacal carbonate of copper the results were less decided, the leaves were more spotted but the foliage remained attached to the stems. The ammoniacal carbonate of copper injured the foliage somewhat. The treated plants retained their foliage till frost and presented a striking illustration as to the efficiency of treatment.

CONCLUSIONS.

We are justified in concluding from these experiments that Bordeaux mixture is a specific against this troublesome nursery disease.
Pammel and Carver: Treatment of currants and cherries to prevent spot diseases.

Plate I—Red Currants treated with Bordeaux mixture 1895.
PLATE II—Red currants not treated in 1895.
Plate 111—Red currents treated with ammoniacal carbonate of copper. 1892.
Plate IV—Cherry treated with Bordeaux mixture 1895.
Drawn by Charlotte M. King.
Plate VI—Red Currants not treated 1892.
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Plate — Red currants treated with ammoniacal carbonate of copper 1892.

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