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THE BEST REMEDY FOR GOOSEBERRY MILDEW.

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*Connected with Second Judicial Department Branch Station.
†Connected with Fertilizer Control.
THE BEST REMEDY FOR GOOSEBERRY MILDEW.

F. H. HALL.

The gooseberry mildew is a parasitic plant, or fungus. When it first appears upon the young shoots and the fruit, it covers them with a network of white threads which makes the affected spots glisten as though decked with frost. Soon the threads become more numerous and more matted, lose their glistening color and coat the berries and parts of the stems with a brownish, felt-like layer. This is the mature stage of the fungus; and scattered through the brown layer are minute black specks containing the ripened winter spores which are to start the disease anew the next spring. These spores correspond to the seeds of the higher plants and result from the fertilization of a large cell upon one of the interlacing threads by protoplasm from a cell upon a neighboring thread. Eight of these spores are enclosed within a tiny sack or spore case (ascus) and this in turn is protected by the dark-colored case (peritheciun) which is seen in the brown layer of matted threads. But all through its later existence the plant is producing new starting points of growth by separating from the ends of vertical branches of the threads cell after cell in the

*This is a brief review of Bulletin No. 133 of this Station on Spraying in 1897 to Prevent Gooseberry Mildew, by C. P. Close. Any one specially interested in the detailed account of the investigations will be furnished, on application, with a copy of the complete Bulletin.
form of a summer spore (conidium). These spores are borne away by the winds and finding suitable lodgement upon fruit or leaf or stem start into growth as independent plants. These two methods of reproduction correspond to propagation of higher plants by seeds and by cuttings; though in the case of mildew the cuttings are self-made and are far more numerous than could be obtained by the gardener from the gooseberry bush upon which the parasite grows.

A severe attack of mildew upon the young leaves and shoots will so exhaust their nourishment that they are checked in growth and seriously injured, sometimes killed. The berries are also stunted and deformed and often crack open, letting in the germs of decay; but the greatest damage arises from the unsightly patches upon the fruit which destroy its beauty and prevent its sale. The English varieties and their seedlings are most subject to the disease but American varieties are not exempt. Bulletin No. 114 of this Station gives a comparison of the different varieties with regard to their susceptibility to the disease.

As with other fungi, the spores of mildew may be prevented from germination by the presence of many substances known as fungicides. One of these, potassium sulphide, has been used with good success at the Station for ten years, but other authorities have recommended Bordeaux mixture for this purpose and have strongly urged its use. So far as known, however, successful comparative tests of the efficiency of these fungicides had not been made, so it was decided to use them side by side in 1897 and to decide upon their merits. Two other compounds, lysol, a substance derived from coal tar and not before used as a preventive of the mildew, and formalin, a chemical based upon the characteristic secretion of ants, were included in the test.

It was decided to use these materials in solutions of different strength and also to begin treatments with them early, medium early and late. The plantation of Industry gooseberries be-
longing to King & Robinson, of Trumansburg, was selected and was divided for the purposes of the experiment into three series, each series to consist of two plats in different parts of the plantation. The spraying upon Series I was begun early, April 12, just as the buds were opening; upon Series II, medium early, when the second treatment was given Series I; and upon Series III late, when the third application was made upon Series I and the second upon Series II. From this time all plats were sprayed upon the same dates, about ten days apart, until 7 treatments had been given the bushes in Series I, 6 in Series II and 5 in Series III. Check rows, untreated, were left for each series.

Materials and strengths used.

Upon one set of bushes in each of the six plats Bordeaux mixture, 1 to 11 formula, was used until May 26, when the fruit was so large that spots made by this mixture would show upon the berries at marketing and injure their sale. Accordingly, potassium sulphide, 1 oz. to 2 gals. of water, was substituted in the last three treatments of each series.

Lysol, used only in Series I, and formalin, each at the rates of 1 ounce in 1, in 2 or in 4 gallons of water, and potassium sulphide, 1 ounce in 2 or 3 gallons of water, were applied in each strength of solution to two separated plats.

Mildew did not appear until May 26, but at this time a little was noticed on the fruit, especially on the untreated rows. The treatments with the potassium sulphide seemed to be doing the best service, but there was so little mildew upon any of the treated rows that the difference was very slight. At the next treatment, June 7, the fruit on the check rows was badly affected; that upon the bushes treated with lysol and formalin, slightly less diseased; with Bordeaux mixture, still less injured; but the early and medium early treatments with potassium sulphide showed best results. One more spraying was given, June 21, and the fruit was picked on July 6 and 7 to be marketed green. The foliage had not been injured by any of the treatments and all of the bushes had made good,
healthy growth and yielded well. The mildewed fruit and perfect fruit were weighed separately and the average yields per bushel under the different treatments compared.

Except in the case of Bordeaux mixture, the very early treatments gave best results. Such treatment with the weaker solution (1 oz. to 3 gals.) of potassium sulphide prevented mildew on all but 5 per cent of the fruit, while the later treatments gave two and one-half and three times as much. With the stronger solution (1 oz. to 2 gals.) the very early treatment reduced the mildewed fruit to 6.6 per cent, while with the applications begun later the amount of mildew injury was nearly twice as great.

The plats treated very early with potassium sulphide yielded more fruit than did any others, and the percentage of mildewed fruit was so much smaller that the amount of marketable fruit was far greater. The average yield of perfect fruit per bush on the two plats treated 7 times with the weaker potassium sulphide treatment was 77 ounces, on those treated 6 times, 45 ounces and on those treated 5 times, 70 ounces, an average yield per bush of 64 ounces; while the greatest yield of mildew-free fruit from treatment with any other fungicide was from the bushes given 7 applications of the weakest solution of lysol (1 oz. to 4 gals.) which yielded 44 ounces. The stronger solution of potassium sulphide, averaging the yields from all the plats, gave 46 ounces of perfect fruit per bush.

Lysol ranks next in effectiveness to potassium sulphide, the amount of mildew being reduced by it to from 24.5 to 56.8 per cent, while check remedies. rows gave 78.7 per cent. With Bordeaux mixture the medium early treatment was most effectual, reducing the injury to 29.1 per cent, while the very early treatment gave 37.4 per cent, and the late treatment 58 per cent. Formalin was of little avail in checking mildew, as the best treatment with it gave 48.8 per cent and the poorest 78.3 per cent:
The expense of treatment is but small; for the potassium sulphide necessary to spray one bush seven times with the weak solution which gave the best results would cost only one-fifth of a cent. The solution can be easily applied with a bucket pump, one manufactured by the Deming Company, Salem, Ohio, giving good satisfaction in this experiment; and one gallon of solution will cover 12 medium-sized bushes. The comparative cost of the different fungicides is shown in the table below:

**Average Cost of Fungicides.**

<table>
<thead>
<tr>
<th>Fungicide</th>
<th>Per pound</th>
<th>For 1 gallon of solution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 oz. to 1 gallon water</td>
</tr>
<tr>
<td></td>
<td>65</td>
<td>4.06</td>
</tr>
<tr>
<td><em>Formalin</em></td>
<td>50</td>
<td>1.125</td>
</tr>
<tr>
<td>Potassium sulphide</td>
<td>18</td>
<td>—</td>
</tr>
<tr>
<td>Bordeaux mixture</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

*Forty per cent solution of formaldehyde gas should be requested when purchasing.

**Recommendation.** Potassium sulphide is the most effective remedy for controlling gooseberry mildew. It should be applied very early in the season, just as the buds are swelling; at the rate of 1 ounce in 2 or 3 gallons of water and the treatment repeated every ten days or two weeks.