NEW FACTS CONCERNING AMERICAN GOOSEBERRY MILDEW AND ITS CURE.

THE purposes of this article are to describe the results obtained by the author in a series of spraying experiments carried out in 1913, and to draw attention to some fresh facts which have been discovered in the life-history of this mildew.* Both matters are likely to prove of importance to the gardener and fruit-grower. It is satisfactory to note that while, unfortunately, the official legislative measures which were adopted on the importation of this new pest have not prevented its spread far and wide over the country, the attention which has been directed to this mildew has resulted in the acquisition of a better knowledge both of the details of its life-history and of the means of checking its ravages. As will be seen from the facts mentioned below, there is now reason to believe that gardeners, and fruit-growers with a small acreage of Gooseberries, will be able, if attention is paid to certain all-important points, to prevent epidemic outbreaks of the mildew, and save the crop and bushes from serious injury.

In the spraying experiments carried on with the assistance of Mr. R. G. Hatton, plots comprising several hundred bushes of a number of different varieties, situated on commercial fruit-farms at three centres in Kent (Roadmarsh, Mereworth and under-Blean) were sprayed with either the lime-sulphur wash or with a solution of liver of sulphur. The results obtained show clearly the superiority of lime-sulphur over liver of sulphur for preventing the spread of the mildew in its white powdery "summer stage." In one experiment bushes previously quite free from mildew were observed to show a slight trace of it on June 6. The bushes were immediately drenched with the liver of sulphur solution at the strength of two ounces to three gallons of water—clearly the strongest solution available, since, at this strength the tips of the youngest shoots are turned brown and killed, and the edges of the young leaves are scorched and shrivelled. Another drenching with the same wash was given on June 12—less than half the amount of the first treatment—June 23 showed that the disease had not been appreciably checked, many of the shoots and berries being smothered with mildew. Similar results were obtained in other sprayings, while in most cases the use of the lime-sulphur wash greatly checked the development of the disease, and should be possible to grow a clean crop of berries. After the crop has been gathered a good final spraying with lime-sulphur should be given.

The advantages of the lime-sulphur wash are its cheapness, ease of application, and unknown specific toxicity. A slight disadvantage consists of its sediment marking the berries. The wash is best purchased from firms of reputed, who place on the market lime-sulphur in a concentrated form, with a guaranteed specific gravity of 1.3. Lime-sulphur washes, and unknown specific gravity, should always be avoided. One gallon of the concentrated wash of 1.3 sp. gr. requires making up with water to 30 gallons in order to obtain the full strength wash of 1.01 sp. gr. suitable for spraying most varieties of Gooseberries; for the half-strength wash of 1.005 sp. gr. one gallon must be made up with water to 60 gallons. The wash is best applied by a knapsack pump, which must be fitted with a nozzle which gives a fine misty spray, such as is supplied with the Vermorel "pistole." The spray, when dry, is so remarkably adherent that even heavy rains do not wash it off; consequently, if there are berries on the bush they become much marked by the whitish sediment. The handling of the berries in the operation of the spray, removes a good deal of the sediment, and should any appreciable amount still remain, and this be objected to, the berries can be cleaned by a vigorous rinsing in water. It is pointed out—and this is a matter which will need emphasising now that the use of lime-sulphur is becoming so common—that there can be no danger to health in the use of berries with lime-sulphur sediment on them; sulphur is not a poison, and the very small quantities present on berries could not be harmful to the district.

As a matter of experiment, I took some berries, which had been specially heavily sprayed with lime-sulphur, with the result that when dry, they were well covered with the whitish sediment, and boiled them with sugar as in ordinary experiment. There was no objectionable smell was given off during the cooking, and that the berries when eaten had no objectionable taste or unpleasant after-effects.

While, however, spraying with lime-sulphur is very often successful in keeping the mildew below the level of injury, there are cases where the soil under or round the bushes has become infested with the "winter spores," the berries become badly mildewed in spite of frequent and thorough sprayings. In order to understand how this happens a brief review of the main facts in the life-history of the mildew is necessary. As shown in the coloured illustrations published in *Gard. Chron.,* Dec. 7, 1912, the American Gooseberry mildew passes through two distinct stages in its life-cycle every year; in its "summer stage it is white and adheres closely when dry; in the "powder" consisting of myriads of minute "summer spores" (conidium), very light and easily carried by the wind. These spores...
convey the disease to the leaves, shoots, and berries, and in this stage the disease can be checked by spraying. In the second stage—called the "niveum," the mycelium, although forming during the summer, it carries on the life of the mildew through the winter—the fungus becomes dense and scar-lke, and produces hundreds of minute black balls (perithecia), inside each of which is found a little sac (ascus) containing eight "winter spores" (asospores). No spraying is of any use against this stage. Before the wall of the fruit-body being of a corky nature, no chemical is able to penetrate them and reach the "winter spore" inside; consequently, the only way of dealing with this stage is to remove and burn it. From personal observations I am able to describe the mode of opening of the perithecia. When moistened with water, a perfectly ripe fruit-body soon cracks open by a slit at the top, and the contained sac begins to swell and protrude through the opening. In about five minutes the sac has swollen enormously, and has become about eight times as large as it was when inside the fruit-body. The wall of the sac becomes thinner and thinner in consequence of the increase in size—just as in the case of a bladder or soap-bubble when blown up—until after a short time it splits and the eight "winter spores" are forcibly ejected into the air to a distance of about 1 inch. Carried about by currents of air, these asospores reach the leaves or berry and give rise in a few days to fresh patches of mildew in its white, powdery, infectious "summer stage."

Now, these fruit-bodies are at first firmly attached to the brown patches of "spawn" on the leaves; but as these patches begin to be affected by weather conditions in winter they become loose and drop to the ground. There they remain during the winter, burst open in the spring, and discharge their "winter spores", which give rise to the fresh spring and early summer outbreaks. This fact has been known for some time, and on this account the removal and burning of all diseased tips of shoots in the early autumn—about October—has been enforced (so far as possible) by the authorities. I have discovered, however, that this soil infection may take place much earlier. Thus, in August, the fruit-bodies formed in the "winter stage" infected berries have become free; when such a mildewed berry is gently tapped over a piece of white paper hundreds of just visible black "spores" may be observed; these are ripe fruit-bodies containing mature "winter spores."

In the light of this fresh fact, it is a matter of great practical importance in fighting the mildew not to allow berries with any brown "winter stage" on them to remain on the bush, as there will always be the serious danger of the soil under the bushes becoming heavily infected, in which case spraying in the next season would probably be of little avail in keeping off the mildew from the berries. It was observed that last season this infection of the soil occurred in no case in many plantations in Kent, where late dessert berries are grown.

Another fact of equal practical importance is the frequent occurrence of the "winter stage" of the mildew on the leaf of the Gooseberry. In cases where the shoot is severely attacked the young leaves become arrested in growth, and finally covered with the brown "winter stage." In other cases the leaves are only slightly affected or shrunken, and the mildew is confined to the lower part of the leaf-stalk, where a small brown patch of the winter stage is formed. In either case, if such diseased leaves are allowed to remain on the ground they inevitably infect the soil, with the result that next spring the "winter spores" cause fresh outbreaks of mildew. To prevent such soil infection, "tipping" in August before the leaves fall must be resorted to.

Taking everything into consideration, "tipping" in August or early in September before the leaves have fallen is to be strongly recommended. In some seasons and with bushes of a certain age no further growth of the shoots will take place after this tipping is done; and if all the mildew has been cut off the bush is freed from the parasites, since the disease is always confined to the young wood. If, as will probably occur in some seasons, a little fresh growth is made and this becomes infected with mildew, the growthing will be still in a better position, since there will certainly be much less disease to be removed before the "fruit-bodies" fall to the ground.

The following conditions of culture help bushes to withstand attacks of mildew:—(1) An open situation. (2) Not too close planting. (3) A natural unforced growth; such is obtained naturally in a good soil or by well-balanced manuring. Excessive nitrogenous manuring,—e.g., heavy dressing of guano manure,—causes the bushes to produce floppy shoots, which are liable to become virulently attacked by mildew.

In conclusion, it may be pointed out that it is clear that, with the new facts now brought forward, the combat against the American Gooseberry mildew has entered on a fresh stage. If we may conclude, as there seems ground for doing, that the lime-sulphur spray will keep the "summer stage" from doing serious injury, and that "tipping" in August or September will prevent soil infection, then all growers of Gooseberries on a small scale should not find it too laborious a task to grow a healthy crop of Gooseberries in spite of the introduction into this country (and doubtless the permanent establishment) of this most serious pest of the Gooseberry. E. S. Salmon.

NEW OR NOTEWORTHY PLANTS.

CYTRIPEDIUM PEREIRAE.

This subject of this note is a remarkable Cytripedium, of which a specimen in formalin and a coloured drawing were sent to me by Mr. J. D. Pereira, Singapore. The plant which he has for sale was obtained on one of the islands near the Lakuwai group north of Penang, the home of Cytripedium niveum. He suggests that it may be a natural hybrid between C. niveum and C. exul, although, so far as we know, the latter species has not yet been met with in this region. It certainly has the appearance of being a hybrid of C. niveum, with some other species at least allied to it. In this exul, the leaves are linear, rounded, and unequaly lobed at the tip, 15 cm. long, green, faintly mottled; the peduncle is 12 cm. or more long, the bract lanceolate and much longer than the ovary. The flower is white, with pink spots on the bases of the upper sepal and the petals. The growing season will still be in a better position, since there will certainly be much less disease to be removed before the "fruit-bodies" fall to the ground.

ORCHID NOTES AND CLEANSINGS.

ONCIDIODA MAURICI (R.H.S. Award of Merit, May 5, 1924)

Our illustration (fig. 143) represents this interesting cross between Oncidium tigrinum and Cocciloria vulgaris, for which Monsieur H. Grrais, Amiens, received an Award of Merit at the Royal Horticultural Society’s meeting on May 5. The sepals and petals are dull purple and the lip primrose yellow. The hybrid is a very interesting one, in that the colouring of the outer segments is like the Cocciloria, while the lip resembles the Oncidium.

CLASSIFICATION OF HYBRID ORCHIDS.

Mr. J. Gersey Fowler, chairman of the Orchid Committee of the Royal Horticultural Society, submitted at the last meeting of the Orchid Committee, for the consideration of the