

intelligent and perfect spraying gives perfect fruit. He cited a case where a grape grower sprayed four times with Bordeaux mixture and had with some varieties 99 per cent. perfect fruit, despite adverse conditions. Other varieties averaged 94 to 92 per cent perfect. Several owners of large vineyards in

the same section did not spray, and had not a single pound fit for market.

Direct results of this nature have been obtained by the leading growers in all sections. Scores of other cases could be mentioned by THE HORTICULTURIST. Those growers who have undertaken spraying most extensively,

provided intelligence was combined with the work, realize the benefits and the returns in dollars and cents. Insect pests and fungous diseases must be combatted. It is then the part of the grower to study the method of procedure which would best suit his conditions.

## Fruit Enemies and Their Treatment

**M**ANY fruit growers with good intentions are disgusted with spraying each year because they do not know what spraying mixture to use, nor when to apply it. Bordeaux mixture is recognized as the standard for general orchard use, but there are pests on which this mixture has no effect. Every grower has not the time nor the opportunity to study insect life, but very little investigation regarding these enemies is necessary to distinguish between the forms that are destroyed by certain classes of spraying mixtures.

A study of insect life has revealed the fact that as far as injury to plant growth from insects is concerned there are two main classes—those that eat the vegetable tissue and those which suck the juices without destroying the tissue proper. The former class, to which belong the Potato Beetle, the larvæ of the Codling Moth, and numerous other forms, can readily be destroyed by Paris green or some such poison. To the class of sucking insects belong the scale insects, aphids or plant lice, and various other forms. Since these do not eat the tissue they must be destroyed by some means other than poisoning. Some caustic preparation that injures the body must be applied. For years kerosene emulsion was the standard but many commercial mixtures, including Scalecide, Kiloscale and such preparations are recommended by prominent fruit growers as being effective and cheap. Powder preparations, too, such as hellebore, are effective because they get into the breathing pores and so destroy the pest. The Lime Sulphur wash has become popular in many sections and is by many claimed to be the standard treatment for scale insects.

Then there are the fungous and the bacterial diseases. The former include such well-known troubles as Apple Scab, Black Knot, Mildew, Black Rot, and kindred diseases. These are readily destroyed by such fungicidal mixtures as Bordeaux mixture or ammonia copper carbonate, if treated thoroughly and at the proper time. The bacterial diseases comprise Peach Yellows, Pear Blight, several rots commonly found in vegetables, and many other troubles. They are the most difficult enemies to combat. Prevention is better than cure.

Care should be taken to discard varieties that are most susceptible to the diseases and every trace should be removed and burned as soon as it is noticed. If the soil becomes infested with the germs that produce a certain trouble, it takes years to remove them.

A careful consideration of these classes of pests shows that the Paris green and Bordeaux mixture merits the place it holds as a standard material for spraying. The Paris green plays havoc with insects which eat the tissue, while the Bordeaux mixture destroys fungous forms. The mixture used, however, must be regulated by the pests that are present and the sooner growers disabuse their minds of the idea that Bordeaux-Paris green mixture is the cure all for the orchard the better for them. Any quantity of it would never eradicate San Jose Scale. Likewise, the most effective treatment for San Jose Scales and other would be useless on combatting insect forms which eat.

Labor is scarce and some spraying mixtures expensive. It is, then, important that the grower make a careful study of the troubles with which he has to contend, and that he apply the proper mixture in whatever way is best suited to his conditions. As a general rule those who have made a study of fighting insects and fungi recommend about five sprayings in a season. This rule, however, does not hold good in every case.

In an interview secured by a representative of THE CANADIAN HORTICULTURIST with Mr. J. C. Harris, of Ingersoll, Mr. Harris said: "Spraying must be done according to the season. If done thoroughly, four times is usually enough. Considerable difficulty is frequently experienced in giving the first application in the spring because the ground is so soft. On the average 80 or 90 per cent. of the fruit is free from blemish if the trees receive four or five applications of the Bordeaux-Paris green mixture.

After carefully studying orchard and garden pests, and the best methods of combatting them Prof. W. Lochhead, of the Ontario Agricultural College, prepared a spray calendar showing the preparation of the various spraying mixtures, the mixture most effective in destroying the common pests and the dates at which applications should be

given in each case. This information has been published in bulletin 122.

In fighting leaf-eating insects and fungous diseases that attack the apple and the pear, Prof. Lochhead recommends Paris green and water (Paris green 1 lb.; water, 150 gals.; freshly slacked lime, 2 lbs.), just as the leaf buds are expanding, to destroy bud-moths and case-bearers. About a week later Bordeaux mixture and Paris green (blue stone, 4 lbs.; lime, 4 lbs.; Paris green, 4 oz.; water, 40 gals.) is required for bud-moths, case-bearers, canker-worms and tent-caterpillars as well as scab, leaf spot and mildew. Three subsequent sprayings with Bordeaux and Paris green are recommended one just before the blossoms open for canker-worms, tent-caterpillars, etc., as well as for such fungi as scab and leaf spot; one just after the blossoms fall for Bodling Moth, canker-worms, tent-caterpillars, pear slugs, scab and leaf spot; and one 10 days or two weeks later for Codling Moth, Palmer worm apple Bucculatrix, scab, leaf spot, etc.

For sucking insects on the apple and pear kerosene emulsion, whale oil soap, or lime wash are recommended, for pear-leaf, blister-mite, pear psylla, aphids, oyster shell, bark louse, etc. Applications should be given before the buds open, as the leaves are unfolding, again 10 days later, and about June 1. Professor Lochhead also advises the application of lime wash during winter for these pests.

The following treatment is suggested for the peach orchard: against Peach-leaf Curl, Brown Rot, Curculio and Bud-moth, Bordeaux mixture and Paris green before the flower buds open, after the blossoms fall, and again two weeks later. Besides a spraying with ammonia-copper carbonate (copper carbonate, 1 oz.; strong ammonia,  $\frac{1}{2}$  pint or more; and water 10 gals.) is advised after the fruit is well formed. At this season the Bordeaux mixture cannot be used because it spoils the appearance of the fruit. Aphids and scale insects on the peach can be kept in check by the use of kerosene emulsion (soft soap 1 qt., boiling soft water 1 gal., coal oil 2 gals.) diluted one part in 10 of water or whale oil soap one pound in seven gallons of water. Aphids should be treated as soon as they