

frozen back in winter. If you take out the power-sprayer the cost is excessive, yet if you wait for the whole orchard to become infected and then take out power-sprayer the leaves become badly curled, making it hard to kill all the aphides, and the growth of the shoots is so bent and crooked that it gives the tree a bad appearance.

Personally, I have often practised cutting off the young shoots as they become infected, helping the expense by removing unnecessary water-sprouts and suckers at same time, but I believe spraying is the only way, under Vernon conditions, where we must do all we can to avoid excessive soft growth.

I now use a knapsack sprayer called the Standard Spray Pump, with which it is possible to spray trees even up to twelve years old, and can be used with bucket, knapsack, or barrel, and works very much like a bicycle-pump. It comes fitted with three nozzles, one of which gives a fine mist spray, with surprisingly strong pressure, so that it can be thrown 10 to 20 feet effectively. I have brought one with me and shall be pleased to demonstrate it to any one at close of meeting.

There are a great many other problems in "aphis-control" which are special to the grower under his particular exposure. In fact, like all operations in the orchard, the really efficient and economic control of pests must be met by the ingenuity and practical knowledge of the individual grower, because he alone knows all the other factors which influence successful fruit-culture.

## TWO INJURIOUS INSECTS OF ECONOMIC IMPORTANCE ATTACKING PEACH, APRICOT, AND PLUM TREES.

By W. H. LYNE.

Mr. Chairman, Ladies and Gentlemen,—In dealing with the subject assigned to me on the programme under the title of "Peach Insects," with your permission I will confine my remarks to discussing two insects of considerable economic importance. These two insects—namely, the peach-twig borer (*Anarsia lineatella*) and the peach-root borer (*Sanninoidea exitiosa*)—do not confine their work of destruction to the peach-tree alone, but also attack the apricot, plum, almond, and occasionally the cherry-tree.

### THE PEACH-TWIG BORER (*ANARSIA LINEATELLA*).

The adult of this insect is a small brown moth with wings expanding about  $\frac{3}{8}$  to  $\frac{1}{2}$  inch. It has a jaunty little head, reminding one of that of a quail in a miniature way. There are two distinct broods during spring and summer, and in some latitudes a later brood in the fall. As soon as the new growth appears the young larvæ commence to bore into the tender new twigs, the tips of which soon wilt, and upon examination the larvæ, about  $\frac{1}{4}$  inch long, may be found burrowed into the heart of the tree just below the wilted portions. In the course of a month the larvæ leave the young twigs and spin cocoons, which they secure in a crevice in the limbs of the tree with a few cross-webs. These pupate and in about two weeks the second brood of moths begin to fly. After mating, the females deposit their eggs on or near the fruit. When the new larvæ hatch out, they immediately commence to bore into the fruit just under the skin and gradually work farther in as they grow older; thus the second brood are fruit-borers. Some of these leave the fruit before it is picked and spin their cocoons in the crotches and crevices of the trees, as did the first brood; others of the later brood bore into the bark, spend their winter in the larval stage, and so are ready to operate on the young growth directly it appears in the spring. I think this irregularity of habit depends greatly upon latitude and atmospheric conditions. The loss resulting from the attack of this insect in some districts is enormous, hundreds of tons of peaches, apricots, and plums being condemned as culls. Many car-loads are condemned after being carefully packed and delivered at points of distribution. When the egg or the young larva just hatched out is the only evidence of infection at the time the fruit is being sorted and packed, one can easily realize how hard it would be to guarantee a car-load free from infection.

*Control.*—The remedy adopted so far consists of winter spraying with lime-sulphur 1-10 just as the buds are opening, and arsenate of lead 3 lb. to 50 gallons of water when the new growth starts. To protect the fruit from the attack of the second brood of larvæ, spray with arsenate of lead 3 lb. to 50 gallons of water just about the time the moths commence to fly, which will depend somewhat on the atmospheric conditions of the season. In this latitude the moths are on the wing by the middle of July.

THE PEACH-ROOT BORER (*SANNINOIDEA EXITIOSA*).

The peach-root borer (*Sanninoidea opalescens*) is known as the western species, the eastern species being *Sanninoidea exitiosa*.\* There is a slight difference in the abdominal markings of the adult insect. The moth is a clear wing, belonging to the family Sesiidae. It has a wasp-like appearance, the males being black with narrowly yellow-banded abdomen, and almost entirely transparent wings. The females are much larger, the fore-wings bluish black and entirely covered with scales. The under-wings are transparent, while the abdomen is bluish black with a broad orange band about the middle. Moths hatched out in this district answer this description. The moth lays its eggs on the bark near the surface of the ground the latter part of July or the beginning of August. These hatch out in a few days and immediately commence boring into the bark in a downward direction. By winter they are from  $\frac{1}{2}$  to  $\frac{3}{4}$  inch long, and have already eaten out considerable of the inner-bark tissue near or just beneath the surface of the ground. In spring they resume feeding, attaining a length of a little more than 1 inch long. Their presence underneath the bark may be easily detected by the gummy exudation mingled with brown granulated castings. By selecting one of the points of exudation and cutting in with a good sharp horse-shoeing knife, the channel in which the larvæ are working is easily found. Follow this down and the borer is soon found doing his best to girdle the tree. About the end of June, or a little later in this latitude, the larvæ crawl out to near the entrance of the excavation and spin a cocoon of silk covered with bits of chips and gum, and change to pupæ. In this stage they remain about two or three weeks; then emerge as moths ready to start a new brood. In cutting out the borers, one should avoid as much as possible cutting into the healthy bark, especially in a horizontal direction, as the borer may have left very little solid bark with which to maintain the life of the tree. Perhaps the best time to cut out borers would be June, when they are full grown and easier to find, before they pupate and the new moths fly. After cutting out all the borers and before replacing the earth around the tree, the following wash should be applied from the crown of the roots to 18 inches above the ground: One part lime-sulphur to 6 parts water, with enough fresh-slaked lime to thicken 5 gallons of the mixture to a good thick paint; into this stir thoroughly  $\frac{1}{2}$  lb. whale-oil soap and  $\frac{1}{4}$  pint of carbolic acid or 1 lb. of coal-tar. When the paint has had time to dry on the trees, replace the earth, banking up 4 or 5 inches. This wash will also protect the roots from fungous rot, etc., besides making it very difficult for the young larvæ to penetrate.

In some sections the practice of fumigating the roots with carbon-bisulphide in order to kill the borers has been resorted to, to save the cutting of the trees; but is not very popular on account of the danger of killing the trees, which has often happened if the carbon-bisulphide was allowed to come in contact with the bark, or if the soil is too wet at the time or soon after the application. The peach-root borer is one of the most injurious insects attacking the peach and other stone trees, on account of its deadly work in the most vital part of the tree, where it works unseen; and often its presence is not even suspected until too late, when the tree wilts and dies as the result of the crown of the roots having been completely girdled.

Mr. McCubbin gave an account of the depredations of the fruit-fly in West Australia.

Mr. Boncquet: In regard to the root-borers of the peach, in Minnesota a few years ago the trees were troubled by rabbits, mice, and borers. One of the professors

\* *S. exitiosa* was the variety bred in the Okanagan.

suggested the use of boiled linseed-oil, and burning it until it became sticky like tanglefoot. Aloes and carbolic acid were added to the mixture and the whole applied to the trees. It proved, I believe, an effective remedy.

Mr. Lyne: I might say that there are numerous washes in operation. Crude coal-tar has been proved effective.

Mr. Tom Wilson: I have tried coal-tar on sapling ash against rabbits; so far as I know, no harm resulted. We used to band holly-trees for half a foot.

Mr. Brittain: Asphaltum is being used largely now. It expands and contracts with the temperature and it is permanent.

Mr. Lyne: This has been experimented with, and I believe that, on occasion, injury resulted.

Mr. Kennedy: I never saw asphaltum used in the Santa Clara Valley, California.

Mr. Lyne: They used whale-oil also.

Mr. Brittain: They also use carbolic and limewash; with a system of "worming" the wash allows one to see the borings better.

Mr. Bonquet: When are the eggs laid?

Mr. Lyne: In July and early August.

Mr. Edwin Smith: Have you any notes on the eggs of *Anarsia lineatella* in fruit and the effect of cold-storage on them?

Mr. Lyne: Refrigerated peaches will come in and they will be pronounced fairly clean. If many crates come in at one time, the merchants unload at their own time. By holding the fruit thus many worms will hatch out.

The Chairman: We will now proceed to the next paper.

#### CUTWORMS AND THEIR CONTROL.

BY M. S. MIDDLETON, DISTRICT HORTICULTURIST, NELSON, B.C.

The cutworms in the Kootenay and other Interior points did practically no injury this year (1913) to crops. This is attributed to the larvæ having been parasitized last fall. It was almost impossible to find a cutworm this year, where last year they could be found in millions. It seems to be the history of all insect pests taken over a number of years that it is one of epidemics alternating with periods of comparative immunity, which is brought about almost wholly by parasitic attacks. These parasitic controls are of the greatest advantage in keeping down the ravages of all insect pests, and for this reason the study of the new entomology is not only interesting, but, I believe, quite practical at least in many cases. These periodical outbreaks are always liable to appear, however, and we should always be prepared to combat them to the best advantage. We find that the cutworms were extremely bad during the seasons of the years 1900, 1906, and in 1912. They gradually worked up to this epidemic stage and in the year following were extremely scarce.

Although we are able to control the outbreaks of cutworms quite satisfactorily, there still remains a great field for further investigation and experimentation work. It was my intention to have carried on a number of experiments this summer, with the object in view of finding out, if possible, more effective means of controlling these pests, but owing to the immunity this year was unable to do so. We must all feel pleased that the cutworms were scarce and the cause of very little loss this year. I shall have to confine my remarks to the results I obtained last year while dealing with possibly the greatest scourge of cutworms which the Kootenay District has had since the advent of agriculture. The worms were so thick that the ground could be actually seen moving with them, and they could be heard feeding on the clover. In parts the clover-crops were completely devoured by the cutworms. Various controls of poisoned baits were used with varying results.

I found them doing injury to nearly every cultivated plant, including green grain. The greatest losses were caused in the vegetable-gardens and in young orchards, where the worms of the climbing species would crawl up the small trees and eat out the upper buds. This did not result in the killing of the trees, but the