

Question: How long do these plants have to be protected before the maggots cease to act?

Mr. Treherne: The fly will be laying eggs until September, but probably the plant will be so well established by the middle of July that further control against it would not be of practical value.

The President: I will now call on Mr. F. H. Getchell, Vancouver, B.C., for his paper on "Insects of the Lower Fraser Valley."

NOTES ON SOME INSECTS OF THE LOWER FRASER VALLEY.

BY F. H. GETCHELL, FIELD INSPECTOR, PROVINCIAL DEPARTMENT OF FRUIT PESTS.

During the past three seasons I have had the opportunity of collecting a few notes on the habits of insects frequenting the orchards of the Lower Fraser Valley. Through the courtesy of my Department I am permitted to give the Society a record of some of the notes obtained under their authorization. Many of the insects I have recorded in my notes have already been well reported in an article by Mr. Treherne in Bulletin 4 of the British Columbia Entomological series, and consequently it will not be necessary to deal at any length with any one individual insect. I have, however, several notes of local importance which may well supplement the facts already recorded.

THE WOOLLY APHIS (*Eriosoma lanigera*).

This insect is found in nearly every orchard in the valley. During the past season I have spent considerable time both in spraying and investigating this insect in the orchard owned by J. H. Lawrence, Hatzic, which numbered 2,500 trees from four to seven years old. Upon my first inspection I found one corner of the orchard, consisting of about 300 trees, seven-year-olds, badly infested with woolly aphids; the old stem mothers and the young brown aphides having, for the most part, wintered over on the trees. As a result of their work the small limbs and spurs were split and covered with the usual galls. A spray of Black Leaf 40, 1-800, and ordinary soap, 2-50, was applied, combined with lime-sulphur. In another set of experiments the lime-sulphur was replaced by soluble sulphur, a new spraying compound freshly come on to the market in these parts. The Government Bean power-sprayer, with Friend nozzles, was used at a pressure of 200 lb., and at a moderate estimate 75 per cent. of the aphides were killed at the first spraying. Although it is perhaps a trifle premature to make any definite statements about the relative virtues of the two sprays, lime-sulphur and soluble sulphur, yet I may say that, from this past summer's experiments, I have so far seen no difference in the effective values.

Twice during the summer they were treated by hand with coal-oil, once immediately after spraying. They were again sprayed with the machine the second week in August, with Black Leaf 40 from 1-800 to 1-1,000, and whale-oil soap 2-50. During this spraying I found it necessary to leave the district temporarily, but in a week's time I took the work up again. I soon discovered the aphides were migrating to a greater extent than I have ever observed before, and some of the older forms were dying. The date was the first week in September.

Later I observed a few of the migrants settled on the main bodies of the pear-trees in the neighbouring orchards. This is in itself an interesting observation, but I noted, further, that pear-trees as late as October still contained specimens of woolly aphides on them. These aphides were observed to be quite active when not even disturbed. I judged that, as the species does not habitually frequent the pear, they were ill at ease. Besides the movement to the pear, I noticed that a migration also took place to apple-trees where apparently the aphides localized and would remain there until the following year. I have no doubt, further, that many of the migrants, in searching for suitable trees on which to settle, failed to locate, and

thus many were lost; furthermore, I have no doubt also that a percentage of the brood did not move at all, but remained on the same trees as they were on during the summer. However, the migration as a whole was most marked, as I observed before.

Two apple-trees were so covered with aphides in September that in appearance they resembled snow. These trees were sprayed with Black Leaf 40 and whale-oil soap. This spray was very effective, as no aphides were found to survive.

THE PEAR-LEAF BLISTER-MITE (*Eriopyes pyri*).

This insect, which I have found in some orchards at Mission, had destroyed all the fruit. It is not necessary to mention the damage to the foliage, as this injury is well known. The former observation is, of course, the most important. A little infection occurs in every orchard visited in the valley, which indicates that it is spread throughout the whole valley.

THE BUD-MOTH (*Tmetocera ocellana*).

This insect is steadily increasing in the valley. Some orchardists believe it thins out the fruit on the tree; consequently they believe it a benefit rather than a detriment. The fallacy of this view I need not expose. While spraying the past season I found it working on the opening buds and blossoms the first week in April. I applied arsenate of lead, 2 lb. to 50 gallons water, with good results, though further demonstration spraying with this insect would prove beneficial. Its distribution is general, and it is probably the most serious of our pests.

THE OYSTER-SHELL SCALE (*Lepidosaphes ulmi*).

This insect requires little comment pertaining to its life-history, only as regards spraying during hatching season. At different points from Haney to Mission I found this scale hatching, and in some cases set by May 15th; while in 1912 it was about the first of June before similar conditions were noticed. This indicates a wide range, due to local climatic conditions.

THE TENT-CATERPILLAR (*Malacosoma crosa*).

These insects were hatched and well developed and doing considerable damage at Haney on May 20th, having almost entirely disappeared at Mission by June 12th.

THE OBLIQUE BANDED LEAF-ROLLER (*Archips rosaceana*).

This insect was very numerous in this city as well as on the Lower Fraser Valley this past summer. I am convinced that this insect can be easily controlled by the use of arsenate of lead applied about May 15th, judging from this season's observations.

THE ROSY APHIS (*Aphis sorbi*).

This aphid is proving to be a pest of marked importance and is spread over a large territory. It works on the opening foliage and is more difficult to control than other aphides, as it curls the leaf quicker than other species. In an orchard near Mission there was considerable damage caused by this insect during the two previous seasons. The aphid as a rule disappears to a large extent by the middle of June, and reoccurs on apple-trees in September. I believe this is about the time of their migration, but the secondary host as yet has not been learned. I have used Black Leaf 40, 1-800, on this aphid quite successfully, the essential point being earliness.

THE LESSER APPLE-WORM (*Enarmonia prunivora*).

It is indeed reasonable that this insect should demand its share of investigation. It existed in orchards where it had not been found before this summer. There are three or more distinct broods closely interwoven with one another, and quite frequently two larvæ of different broods were noticeable in an apple, one at each end. The first larvæ appeared about the middle of July, and the last about the middle of September. They were more numerous in orchards bordered by woods,

where the insect must hibernate. In the season of 1912, while spraying an old orchard near Abbotsford the first week in July, arsenate of lead was added to the spray. As the result of this experiment not half a dozen worms were found, while in the previous season this orchard was badly infested.

SPRAYING.

The value of spraying is often doubted by the average fruit-grower. But this misapprehension is largely due to an ignorance of results. It has been proven, however, that more consideration should be given spraying, both as to method and time of application, also the amount of material used. I have been requested to add a few practical facts on this subject.

The following is an estimate of some figures I have obtained concerning the cost of spraying. Lime and sulphur is sold at the rate of 27½ cents per 40-gallon barrel, and arsenate of lead at 14 cents per 100 lb. A five-year-old tree will require the use of ½ gallon of diluted spray, and a twenty-year-old tree 5 gallons of such spray. This may seem to be a close estimate, but using a power-sprayer with an equal pressure, and careful work, I have figured this to be 5 cents per five-year-old tree and 20 cents per twenty-year-old tree, or, as one good authority has stated, 1 cent per tree per year.

I am now desirous of making a few conclusive remarks relative to the best sprays to use, their number, also some results. I would unquestionably not omit the regular dormant spray of lime and sulphur applied at the time the buds are breaking, and the 1-3 scab sprays, the number of the latter depending on the season, with the first coinciding with the first lime-sulphur spray. Soluble sulphur has proven to be very effective, but its use as yet cannot be recommended for summer work. A fall spray of Bordeaux mixture should be applied to apple-trees for anthracnose, and one additional, if infection is very serious, according to the season.

From my experience of Fraser Valley conditions I realize that at the present status of our knowledge it is extremely difficult to lay down any definite rule which will cover any definite number of years and give equal results. As I have attempted to point out, especially as regards the spring development of buds and the consequent hatching of insects, in special reference, as this paper shows, to the oyster-shell scale, the season is extremely variable. I have no doubt that some years a single spray applied judiciously in the spring will accomplish as much as three sprayings could in an unfavourable year. During this past summer in particular, which was the driest we have experienced in the valley in twenty years, we did obtain good results with one spraying applied as the buds had well broken. In another year with a moist, wet spring the same results could not have been obtained with three sprayings. Consequently, we are down to this fact: that the individual fruit-grower in close co-operation with the Department of Horticulture will have to decide on the programme, one year with another.

As a general rule, however, allowing for the above-named limitations, I may say these three sprayings are required: (1) Winter spray, lime-sulphur, 1-9, with arsenate of lead, 2½-40 gallons, as the buds are breaking; (2) summer spray, lime-sulphur, 1-25 to 30, with arsenate of lead, 2½-40 gallons, after blossoming; (3) Bordeaux, 6-6-40, in the fall after the first rains (usually late in September or till October 15th).

Mr. Day: I am sure Mr. Getchell will be glad to answer any questions regarding his paper. There is one question I would like to ask; that is regarding the woolly aphid, which very often hibernates in the roots of the apple-trees. How would you control it?

Mr. Getchell: I think some have successfully combated it by applying tobacco-leaves to the roots, but for an orchard, personally I do not think it would be a very practical thing to do.

(Then followed a general discussion regarding the woolly aphid.)

Question: Have you any remedy to keep strawberry-plants from being destroyed? Sometimes when the plant is in full bearing it dies down, and the heart of the plant turns quite black.

Mr. Treherne: In our experience with strawberry-plants we find three distinct causes. The first is caused by the dampness of the soil that produces a rot of the root; secondly, of the leaf; this is due to the dampness of the soil, as well as the lack of lime in the soil. The soil around here would stand 2 tons of lime to the acre without doing any damage to it. Then the second cause is overproduction. The spring opens up so moderately that, unless a spring frost comes, we often get an overproduction of fruit, resulting in some dried-up strawberries. If the spring frost comes along and nips off a quarter or half of the blossoms, then you will have a good crop. Thirdly, you will find a white grub in the roots. These are the various causes, and I do not know to which one you refer.

Mr. Day: I will now call on Mr. W. H. Lyne, Assistant Inspector of Fruit Pests, Vancouver, to read his paper on "Remarks on the Life-history of Codling-moth on the Pacific Coast of British Columbia."

COMMENTS ON SOME PECULIARITIES IN CONNECTION WITH THE LIFE-HISTORY OF THE CODLING-MOTH ON THE PACIFIC COAST.

BY W. H. LYNE, ASSISTANT INSPECTOR OF FRUIT PESTS.

The history of the codling-moth on the Pacific Coast appears to have been a repetition of misunderstandings as to the insect's ability to acclimatize itself to the peculiar atmospheric conditions near the sea-coast. Perhaps the first locality to experience its mistake was Santa Cruz County, California, where it was prophesied that on account of the salt air and damp, foggy weather that prevailed so much during certain seasons, the codling-moth would not thrive, and if it managed to exist at all would never be of any economic importance.

However, the facts are these: that within ten years from the time of inception this industrious insect had become the scourge of the apple-growers in that locality; and so it has repeated its history at one point after another in California, Oregon, and Washington, until about five years ago we suddenly awakened to the fact that, although a few stray specimens were known to have been in existence for a few years previous in the Victoria and Saanich District on Vancouver Island, the codling-moth had finally demonstrated its ability to become just as great a pest and nuisance to the apple and pear growers of Vancouver Island as in many other places. The situation as discovered demanded immediate action on the part of those who were responsible for keeping the pest out of the Province, and it was during the campaign of exterminating this invader that special attention was paid to many details peculiar to its habits and life-history in general.

Just about this time there was considerable discussion by experts and others in the Western States as to whether the moth could be controlled with one application of arsenate of lead at the time blossoms were falling, or what is often termed "calyx-spraying," the aim being to fill the calyx-cup of the fruit, just forming, before it closed, after which the inside cavity is fortified against the attack of the young larva attempting to enter. Those in favour of one spraying appear to have been under the impression that nearly all the larvæ of the first brood entered the fruit by way of the calyx or blossom end, and by so doing consumed the poison in the calyx-cup, thus ending their career.

During the process of searching every tree for wormy fruit, in order to ascertain the amount of infection and destroy all that could be found, a close check was kept