

SOME PROBLEMS IN APHIS-CONTROL.

BY L. L. PALMER, HORTICULTURIST, COLDSTREAM ESTATE CO.

No one should appreciate the value of the present meetings more than the fruit-growers and farmers of British Columbia. The men actually engaged in the cultural operations of their farms, day after day, need to get away from local conditions. Such a change broadens the scope, and they go back to their work with renewed energy and zeal.

Individually and collectively, the growers of British Columbia are facing a great economic problem. Not a phase of the fruit and gardening industry of our Province, from the different cultural operations to the wide questions of marketing and distribution, that is not being systematically and thoroughly studied, in the endeavour to place our industry on a par with the industrial enterprises of our cities.

This work must not be left to the Government alone. Without the co-operation of the growers themselves the greatest good cannot be accomplished. The final product will measure up to the standards, which as a united body we are aiming to attain, directly in proportion to the manner in which each farmer and producer turns over his finished product to the public.

There is not one single operation in the proper care of orchards that may not influence the quality, the size, and the appearance of the fruit produced. These operations the individual owner or director must control, and upon his knowledge and ability to apply that knowledge depends the success of the industry. He must know his own local conditions, so that he may prune wisely; that he cultivate advantageously; that he may spray timely. The Government cannot study each separate ranch so minutely and practically as the owner; but what the Government can do, and is doing, is to furnish scientific principles and definite knowledge which must be applied to peculiarities of each varying location.

Of all the orchard operations, none tax the ability of the grower more than the prevention and control of the insect pests and diseases to which his special district is subject. This is a question upon which the grower must continually renew his store of knowledge, because great progress is constantly being made as to improved methods of control and as to actual information regarding life-habits of economic insects. Mr. Winslow has given us a grasp of the amount of damage done annually to our fruit-trees by insect pests. As fruit-growers, it is our duty to be sure that we are not, by neglect on our part, adding to and influencing the cost of decreasing such a loss.

Chief among the economic pests of British Columbia are several species of aphides. These sucking-insects are very generally scattered throughout fruit-growing regions, and cause the grower a large amount of trouble. It is not my purpose to give you a detailed description of the life-history and habits of all different species of aphides which may be found in different parts of British Columbia, nor will time allow me to give a discussion of the relative merits of different sprays used in controlling these. Many experimental stations have printed good descriptions and effective methods of spraying, which are gladly furnished upon written application. I want to call your attention to some of the problems the grower faces in combating aphides in the Okanagan, and the relation of other orchard operations to this important factor in the production of "quality fruit."

When a grower's fruit falls below standard, some operation, or series of operations, is at fault, unless the grower is so unfortunate as to be trying to produce under adverse soil or climatic conditions. Did he plough the past spring so as to get the greatest good from soil conditions? Was his orchard subject to seepage? Did his pruning result in forced growth? Did he skip his usual spraying? Many questions will arise, any one of which answered negatively may have been the cause, directly or indirectly, of his poor results.

The point I want to underline here—to exaggerate if necessary—is the fact that every operation performed in the orchard has its influence on the final product; also upon the efficiency of all operations depends the success of spraying, of pruning, of cultivating, and of all other phases of orchard-work. If you neglect one, you lose most of the value of the work expended on all the others for the current year. On an orchard of my own, I thoroughly cultivated, I carefully pruned, I properly thinned, I effectually sprayed for codling-moth; but the result of these operations produced a large per cent. of small gnarly fruit. Each operation cost money—money advisedly spent if the final product had been up to standard. Gentlemen, I neglected to spray for rosy apple-aphis because I thought I could save about \$5 an acre by so doing. In the end my product was worth from \$50 to \$100 an acre less. But that was not my only loss; I had expended from \$10 to \$15 an acre to thin. Where and when was I to get that back? A conclusion to me was self-evident: A fruit-grower cannot afford to allow any insect pest which directly or indirectly injures the quality of the product turned out to go uncontrolled, or he will not only lose the value of the crop, but also the cost of producing it.

If the cost of production is too high, the grower must reduce it, not by neglect of any single operation, but by making one operation aid another, by more thorough work in fewer operations; in fact, by better balancing of all the factors which make for the production of No. 1 fruit.

In controlling orchard pests, economy is just as essential as in other lines of business. If the orchard is infested with several different insects, endeavour at one operation to destroy as many as possible by using that combination of sprays which scientific research and practical application have proven most effective.

Many orchards in the Okanagan are infested with woolly and green apple-aphis and scale-insects. Thanks to the work of entomologists, we know something of the life-history and habits of these insects, and what class of sprays is effective against them.

The best time for the application of spray material, were we treating these insects separately, would vary, but it is possible by thorough work to kill the one which is doing the most damage, or the two which are of greatest economic importance, and also very effectually check the third. Thus, had I an old orchard infested with these three pests—woolly apple-aphis, green apple-aphis, and oyster-shell scale—under Vernon District conditions I would spray as follows: Previous to the opening of the leaf-buds in early spring, apply with power-sprayer and pressure of at least 175 lb., winter-strength lime-sulphur, dilution 1 part concentrated lime-sulphur to 9 parts water, to which is added 1 part of Black Leaf 40 to every 800 parts of the lime-sulphur solution. This combination should kill all over-winter woolly aphis above ground, as well as oyster-shell scale, when thoroughly brought in contact with insects. Be sure every crevice and crack in the trunk and limbs is drenched with the spray. This will not, however, kill all the green apple-aphis eggs. The addition of Black Leaf 40 seems to be much more effective in killing both the woolly aphis and the scale than the lime-sulphur alone. In the Vernon District the past season, which was a late one, this spray was applicable April 5th to 15th, inclusive.

Should the orchard in question be principally infected with green apple-aphis, as are many of our younger-bearing orchards, an application of spring-strength lime-sulphur, 1 part to 30, to which is added Black Leaf 40, 1 part to 900 parts of diluted lime-sulphur, applied after the leaf-buds have just opened, will kill effectually the greater part of green apple-aphis, which have mostly emerged from eggs but have not yet had time to curl the leaves.

I consider the spring spraying the most important and essential, as the killing of all aphides present in the orchard at that time gives the trees an opportunity to make good, strong growth before reinfestation. The woolly apple-aphis requires special attention in this section. I do not believe growers appreciate the damage caused by it. I cannot but attribute a large amount of the diseased cankers on

the trunks and limbs of trees to these piercing plant-lice. At least, I am sure of the orchards on Coldstream Estate; those which have been infested with woolly aphid have been clearly the most subject to many forms of canker which found foothold through punctures in bark caused by these aphides. It is likely that where continued infestation has taken place the stimulated growth and gall formations caused by woolly apple-aphid will so weaken a tree as to make it more subject to the ills of adverse physiological conditions.

Many growers are attributing their losses of crops, and their troubles with silver-leaf and fruit-pit, to physiological troubles, and yet are neglecting to study ways and means of keeping their orchard conditions balanced, so as to meet any excessive moisture during summer or fall season; to better withstand the inroads of frost in winter; in fact, to hold the trees as nearly to the normal as possible. A tree loaded with woolly aphid is not only injured in the trunk and limbs so that they are not able to perfectly perform their functions, but the roots are often killed to such an extent as to prevent the proper flow of sap. Yet growers wonder why such trees are not producing good crops of high-class fruit every year.

In addition to the early spring spraying for woolly apple-aphid, an application of a 15-per-cent. solution of kerosene emulsion, or Black Leaf 40, 1 part to 900, about the 10th to 15th of September, in Vernon District, will free the tree-tops of these insects previous to the appearance of the winged viviparous females, which probably migrate to another host-plant, beyond control.

There are many spray combinations equally effective in other locations as are the ones I have briefly suggested for this district, and opinions differ widely as to when and how they should be applied. But the orchardist's problem in controlling pests does not stop with the knowledge of the life-history of insects; with the best sprays to use or the right time to apply them; nor is spraying alone the most economically effective means of controlling them.

It is necessary to make every phase of orchard operation tend to help every other, and the grower who successfully does this reduces to a minimum the expense of orchard care. For example, trees infested with woolly apple-aphid are most dangerously infested in the roots and generally in the first foot of soil, within a radius of 3 to 4 feet of the tree. It is very expensive to shovel the dirt away from the crown of the tree for spraying, but sometimes even this would pay. However, I believe you can do better. In the spring or early fall, if moisture conditions are favourable, start single ploughing by throwing a furrow away from tree on each side—a necessary operation every other year. Have a man follow up the plough and with a large digger-hoe, or shovel, expose as much of crown and roots as possible within a 4-foot radius of the tree. This can be done very quickly if you catch moisture conditions just right. Follow this up with a thorough spraying of kerosene emulsion, forcing the spray well into the soil about the crown and base of the tree. You are in this case taking advantage of another orchard operation which makes the spraying more effective.

Another example: The eggs of the green apple-aphid are found extensively towards the end of the previous season's growth. Very frequently those eggs will be deposited on one or two growths only to a tree. If you can arrange your labours so as to prune the trees from one to four years old in late winter or early spring, you can easily see the shining black eggs and clip them off in the regular pruning operation, putting the cuttings in neat piles at one side of the tree, to be easily hauled off and burned. By pruning young trees in the late winter here, you avoid exposing immature wood to our cold winter weather.

In connection with pruning to control aphides, some growers practise cutting off shoots in summer as fast as aphides appear on them. The infection is so scattered that it seldom pays to take out the power-sprayer, and with the exception of very small trees the ordinary hand knapsack sprayer is not effective. It is certainly a complicated problem. If you prune off the infested shoots in early July you cause a forced, soft, bunched growth which never matures and is easily

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.