

The Canadian Entomologist.

VOL. XLIX.

LONDON, JUNE, 1917

No. 6

POPULAR AND PRACTICAL ENTOMOLOGY.

TWO APPLE LEAF MITES OF ECONOMIC IMPORTANCE.

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THE "SILVER-LEAF" OR "RUSTY-LEAF" MITE.

(*Phyllocoptes schlectendali* NALEPA.)

During the summers of 1912 and 1913, which the writer spent in British Columbia, he had an excellent opportunity for observing the work of the mite *Phyllocoptes schlectendali* Nalepa, this species being extraordinarily abundant in the Okanagan Valley and other parts of the Dry Belt.

It is most commonly found attacking the leaves of the apple, and though it cannot often be considered a serious enemy of the foliage, the result of its work is conspicuous and peculiar. The presence of the mite makes itself apparent by a decided silvery appearance of the leaves, which, in severe cases, is very pronounced and can be detected from a considerable distance. This appearance is due to the formation of an air space between the epiderm and the palisade cells due to the punctures of the mites. A tree so affected bears a striking resemblance to one attacked by the disease Silver-Leaf, said to be caused by a fungus (*Stereum purpureum* Pers.)

This is not the only case in which a silvery appearance is brought about by the work of mites. On plums, bad infestations of Red Spider (*Tetranychus bimaculatus*) produce a somewhat similar appearance, though not so characteristic, and mites feeding upon elm leaves have been observed to produce similar symptoms. It was first thought that all such trees were suffering from Silver-Leaf, which is not surprising, since both these troubles are very abundant in British Columbia and are often present on the same tree. It was only, however, when trees that had been sprayed with nicotine sulphate did not develop the disease that this diag-

nosis was thrown in doubt and the true cause discovered. Though this type of injury is very common in British Columbia and appears to have been noticed quite widely in the United States and Canada, the amount of actual harm which the mites accomplish in this way is questionable, and is probably of little importance in most cases. Parrott (1 and 2) who appears to have been the first to have recorded this species in America, says that this species is very common on apple foliage in the United States, that it is more common in the United States than on the continent, and that it seems to have possibilities of developing to greater economic importance. P. J. O'Gara (3) who records this mite from Southern Oregon, noticed its work on the apple foliage, which, however, he did not regard as serious. He states that the mite is chiefly important as a pest of pears, the foliage, terminals of twigs and even the fruit being injuriously affected. He describes the injured foliage as presenting a peculiar russet appearance on the underside, and as being somewhat curled, as though with drought. The terminal shoots and the fruit is also attacked, being russeted and cracked as a result of the punctures of the mite. With serious attacks, the whole tree is said to have a brownish appearance, giving the trouble the name "Rusty Leaf," by which it is known in the Rogue River Valley, Oregon. We have never noticed such severe attacks to the pear in British Columbia, but it would not be surprising to find that such existed, so prevalent is the mite throughout the fruit-growing sections. It would appear from the foregoing that, though this pest is known to be prevalent throughout the United States and Canada, it has never been regarded as a serious enemy of apple foliage, and only locally as a serious pest of pears.

Through the summer of 1912 numerous specimens of apple twigs were sent to the office of the Provincial Entomologist at Vernon, disfigured in a curious way by brownish incrustations on the bark of one and two-year-old wood. These injured areas were generally more or less circular in form, though sometimes of an irregular shape. A crack usually separated the healthy from the diseased wood, and the epidermis was frequently ruptured. This injury appeared to be most pronounced on wood of the Northern Spy, though other varieties suffered to some extent. A careful

examination of the incrustations revealed nothing of a parasitic nature.

The next year similar injured twigs were submitted for examination in even greater quantity. In particular, a number of nursery firms complained of heavy loss to their Northern Spy stock from being rendered so unsightly as to be quite unmarketable. One firm, situated in the Okanagan, was compelled to destroy a large quantity of Northern Spy stock, as a result of this trouble. It appeared, on further examination of affected twigs, that the year following the appearance of the trouble, the injured areas frequently dropped out, thus rendering the injured tree more unsightly than before. Further examination of the incrustations still revealed nothing, but so serious had the situation become, that it was decided to follow the matter up carefully, in order to determine definitely the cause of the trouble.

The writer left British Columbia in the fall of that year and was unable to prosecute this matter further. However, Mr. J. S. Dash (5), then working under the direction of the Inspector of Fruit Pests, examined a number of injured twigs during the month of October. He found them to contain hundreds of hibernating mites, whose identity could not be ascertained with certainty at the time, since they were immature. At the request of the writer, a number of affected nursery trees were sent to Truro, kept over winter and planted out the following spring. In July the silvery appearance, characteristic of the work of *Phyllocoptes schlectendali*, became apparent on the leaves, which, on examination, were found to be covered with mites belonging to this species.

It would appear from our observations that the mites, which feed on the foliage during the summer months, make their way to the twigs in the autumn where they enter an old egg blister of the Rose Leaf-hopper (*Empoa rosæ*), a common apple pest throughout the province, or of the Apple Leaf-hopper (*Empoasca mali*) or through a lenticel, and there they develop their hibernating incrustations, which render the affected trees so unsightly. As an enemy of nursery trees and particularly of Northern Spys, this mite is, therefore, of considerable importance, since stock so disfigured is unmarketable. The actual harm done to such

stock is slight and, as a pest of older trees, it cannot be considered as being of a very serious nature.

THE APPLE LEAF MITE (*Eriophyes malifoliae*).

Regarding this mite Parrott (2) says: "This is a vagabond species and is found in association with *Eriophyes pyri* and *Phyllocoptes schlectendali*, upon the under surface of apple leaves." From this it is apparent that he regards this mite as of secondary and minor importance and not able, by itself, to inflict much injury. While we have never seen any particularly destructive outbreaks, it is possible that this mite may prove to be of greater economic importance than is commonly supposed, at least under conditions that exist in the Okanagan.

In view of the resemblance between the injuries produced by the former species discussed and a fungous disease, it is an interesting fact, that this mite causes symptoms strikingly like another fungous trouble, viz., Apple Scab (*Venturia pomi*). The mites work on the underside of the leaves, concealed by the pubescence, and the first indication of their work is in the form of more or less olive-green, circular spots on the upper surface, which gradually darken until they become dark brown in colour. These spots become slightly raised above the surface of the leaf, forming a saucer-shaped hollow on the underside. These symptoms are so suggestive of apple scab, that it is not surprising that they have been mistaken for this trouble even by those familiar with the disease. Not only were the leaves affected but the tender shoots were also attacked, causing them to wither and become brown and dead. This appearance is suggestive of the damage done to pears by *Phyllocoptes schlectendali*, as described by O'Gara, but was noticed where only *Eriophyes malifoliae* was present. This type of injury was very prevalent during the summer of 1913.

Unfortunately we were prevented from making observations regarding the hibernating habits of this species, but we feel certain that a careful study of its life history and habits would reward research. It is altogether possible that these two species discussed in this article are responsible for much more damage than is com-

monly attributed to them. In particular it seems well within the range of possibility that they may be responsible for many of the blotched apples and the disfiguration of other species of orchard fruits that is so common throughout the fruit districts, since both species have been found feeding in large numbers on fruit so affected. Which of the species discussed here, if either, is responsible for such injury, can only be determined by experiment.

The problem of control should be a comparatively simple one, since both species are readily destroyed by the summer sprays of lime-sulphur, or by weak solutions of nicotine sulphate.

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EXPLANATION OF PLATE X.

- Fig. 1. Injury to apple twig by hibernating incrustations of *Phyllocoptes schlectendali*.
- Fig. II. Appearance of injury the next season.
- Fig. III. A, Leaf infested with *Phyllocoptes*; B, Uninjured leaf.
- Fig. IV. Leaves injured by *Eriophyes malifoliae* (Parrott).