

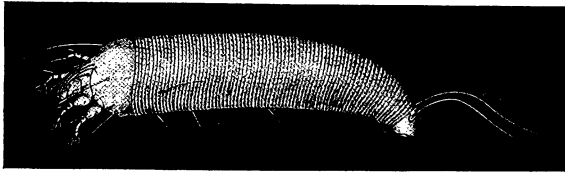
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THE BLISTER-MITE AND ITS ALLIES.

SUMMARIZED BY

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FROM BULLETIN BY

P. J. PARROTT, H. E. HODGKISS AND W. J. SCHOENE.

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POPULAR EDITION*

OF

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THE BLISTER-MITE AND ITS ALLIES.

F. H. HALL.

**A new
apple pest.**

A new enemy has entered the field to disturb the apple growers of New York State. The newcomer is not liable ever to become such a pest as the San José scale, about which the orchardists are, with good reason, much worried; but it has caused considerable injury of a peculiarly striking kind in many orchards; and is in itself quite different from the ordinary apple-tree enemies. It demanded attention and study.

The mites.

We speak of the new pest in the singular, but several allied forms really cause the trouble. These belong to a group of mites, the Eriophyidæ, of which one species, the blister mite, *Eriophyes pyri*, far exceeds the others in abundance. These mites are not insects, in the scientific sense, though they resemble insects quite closely in many points. They are more nearly related, however, to the spiders, harvest men, ticks and chicken mites; but they live upon or in plant tissue, not on animal juices.

True insects have bodies in three sections, the second section bearing three pairs of legs; but in the mites and related forms the first two parts of the body are united into one, which bears either two or four pairs of legs. The forms we are considering are four-legged creatures, with long slender abdomens made up of from fifty to eighty successive rings (striæ) of firmer tissue frequently marked with rows of tubercles and ornamented with a few pairs of stiff hairs or bristles. They feed like plant lice by thrusting into the tender tissue of the leaf or bud the slender

*This is a brief review of Bulletin No. 283 of this Station, on The Apple and Pear Mites, by P. J. Parrott, H. E. Hodgkiss and W. J. Schoene. Anyone specially interested in the detailed account of the investigations, will be furnished, on application, with a copy of the complete Bulletin.

little stylets contained within the down-curved beak or snout which makes up the principal part of the head.

These mites are very minute creatures, so small that they are hardly visible to the unaided eye; and to make out the details of their structure, by which they are classified into species, requires the assistance of a compound microscope. Through such study by the Station Entomologists it was found that five distinct species were at work on the foliage of the apple trees in infested orchards. Of these, one was a form never before studied or described and one a species quite well known.

**Long known
as pear
pest.**

This leading species in the present outbreak has hitherto confined its efforts mainly to pear foliage. On leaves of pear trees, particularly on nursery stock and young trees this blister mite produces the peculiar bright or dark red or brownish spots that have given it its name. Its history can be traced back to 1857 in Europe, though writers a century and a quarter before that time spoke of the galls produced by similar mites. They had no idea, however, what produced the peculiar growths that they classified, by form, into groups, each with a formidable Latin name. The discoverer of the mite itself was also much confused by the living forms which he found within these pear leaf blisters. He made out what we now know to be three distinct creatures, calling the mite itself the larva and the other two creatures the intermediate and adult stages. This mite was brought to America sometime before 1872, probably on pear or apple trees or buds; for in that year its work on pear foliage was called to the attention of the Entomologist of the U. S. Department of Agriculture and the mite revealed by microscopic examination. In subsequent years the blister mite was found in many states on pear foliage; and has commanded much attention; but it has never been regarded as a very dangerous enemy.

**Work on
pear.** The mites burrow into the leaves from below and the irritation they cause induces the growth of the galls. These at first are greenish pimples, with a more or less reddish tinge. The color strengthens as the galls increase in size, soon producing the bril-

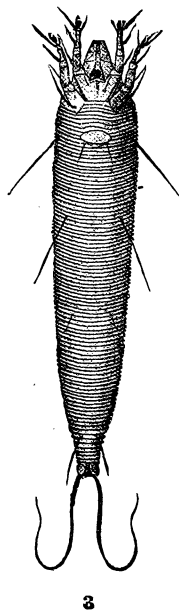
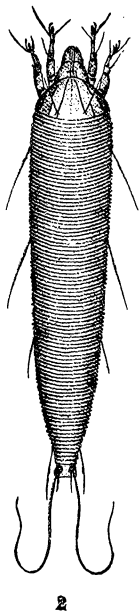
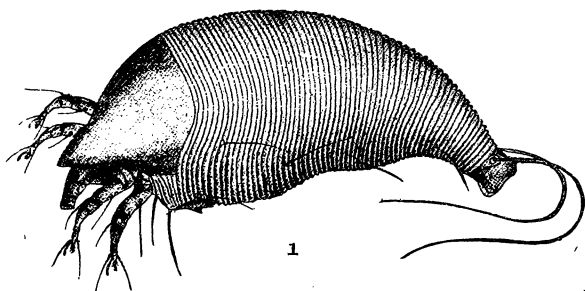


PLATE I.—PEAR AND APPLE MITES.

liant red blisters. These later become more or less brown or black, and the tissue corky. On some varieties of pear, especially the Keiffer, if the mites are numerous, the unfolding leaves are completely reddened, swollen and blistered and the opened leaves are much wrinkled and distorted. The galls are usually arranged in a row on each side of the main rib. When numerous, the spots may coalesce, forming dark brown or blackish patches which may cover much of the leaf and cause it to rupture in one or more parts, especially along the margins. Severe infestation of the mites may cause defoliation, even to such an extent that it results in the premature falling of the fruit from the injured leaf clusters. The mites produce light colored pimples on the blossom end of the fruit and on the fruit stems, but these injuries are not frequent and do not appear to impair the health or value of the fruit.

**Work on
apple.**

These blisters or galls also characterize the work of the mites on apple foliage, where they resemble, in general effect, the spots produced by bordeaux when sprayed under unfavorable weather conditions; but the bordeaux spots are depressions or, at least, are not raised above the surface of the leaf, while the mite galls are noticeably elevated. The galls also usually show one or more tiny openings—the tunnels or burrows made by the mites on entering and leaving the leaf. These, of course, are missing on the bordeaux injury spots. The color of the blisters on apple foliage is usually less brilliant than on pear leaves. About July 1, the most striking effects of the mite work appear, especially if there is much yellowing of the foliage, as frequently occurs. Upon the upper surfaces of such leaves the mite-infested spots are of a light brown or dark green color and are uniformly brown beneath. These spots are thickly massed, forming a dark, broad band of irregular width along each side of the leaf which contrasts conspicuously with the intervening light yellow area about the midrib.

This striping of the leaves as viewed from below is very suggestive of the so called "foliagè plants."

The mites also injure the fruit and the fruit stems, the evidences of their work showing at first as light green pimples, which



PLATE II.—1. YOUNG LEAF CLUSTER SHOWING FIRST APPEARANCE OF MITE INJURIES. 2. OLD LEAF CLUSTER WITH GALLS ON FRUITS AND LEAVES.

may later change to blister-like spots or pock marks. These are usually about the blossom end of the apples. They do not seem to affect the fruit to any noticeable extent. Injured stems show similar pimples of smaller size; and a severe attack may cause marked thickening and irregularity of the stems.

Extent of outbreak.

The mite has long been known to infest apple trees in Europe, and it is quite likely that it has been present in New York orchards for many years but it was not brought to the attention of the Station until 1902. At that time it was found to be very abundant in a large orchard near Williamson and the infestation has continued and increased in this orchard through 1906. In 1903 Prof. Slingerland of Cornell University noticed the work of the mite on numerous trees in many localities in the central portion of the State; in 1905 many orchards in Wayne, Ontario, Monroe and Niagara counties were found to be badly infested and in 1906 the pest was found to be equally abundant in orchards in Livingston, Wyoming, Seneca and Yates counties. It is probably present in other parts of the State, and has been reported from apple growing sections of other states.

Beside pear and apple this mite and its allies also feed on the serviceberry, cotoneaster, white beam tree, European mountain ash, and wild service tree.

Life history and habits.

The mites spend the winter in the buds, usually under the second and third layers of bud scales; and frequently collect in colonies of fifty or more. These colonies cluster in little depressions or grooves in the scales and are more or less concealed and protected by the pubescence, "fuzziness," of the buds. As warm weather approaches, the mites become active, move toward the base of the growing bud scales and feed there. As the buds burst, the mites move toward the unfolded leaves. In these the eggs are deposited. This migration takes place with the maturing of the bud scales, during the latter part of April or early part of May, soon after which the discoloration of the leaves by the pale or reddish spots appears. The mites burrow through the skin of the leaf and feed upon the

succulent tissue within, thus setting up an irritation which results in the formation of blisters. The eggs are deposited within these galls, as many as 14 having been found in a single blister. The young hatch in about a week and channel about in the gall tissue in all directions, feeding upon the plant juices. When fully developed they pass through tiny openings in the under surface of the galls and seek other spots to produce fresh galls and start new colonies. The production of young and the migration of adults is continuous throughout the summer and in favorable seasons the numbers of the mites are sufficient to infest completely the unfolding leaves of the new growth as they appear. In the latter part of May and early part of June the mites are also found in large numbers in the pubescence of the new wood, upon the leaf stems and on the unfolding leaves of the new growth. During October the mites abandon the leaves and swell the numbers already in hiding in the buds and on the fuzzy bark of the new growth; but when winter really arrives all will be found hibernating beneath the bud scales.

In testing methods for the repression of this pest, work was carried on in two pear orchards in control. and one large apple orchard.

In the first pear orchard, which was of three-year trees, fall and spring treatments with sulphur washes were compared, both the boiled and self-boiled washes being used for the fall treatment; and the self-boiled wash for the spring treatment. Slight injury to fruit spurs resulted from use of the self-boiled wash, but there was no apparent ill effect from use of the boiled wash. The fall treatments were very effective in destroying the mites, as the trees treated at that time with either formula showed no signs of mite work, while the check trees showed many discolored leaves and some badly distorted.

In the other orchard of two-year-old trees, some preliminary tests were made to control the mite by picking off and destroying the infested leaves as soon as any mite work showed, a practice commonly recommended. It was not a success in this case, though it reduced the numbers of the pests materially. However, all the mites are not in the leaves at any time, some being

upon the buds and in the pubescence of the bark. These escape and reinfest the leaves.

In the spraying test, only spring treatment with the self-boiled wash was given, and it was markedly successful. A careful examination on August 1 showed that 8 of 20 sprayed trees were slightly affected with the mites; while all the check trees were well infested. None of the trees were injured by the treatment.

The most extensive series of tests was that in the Maiden Blush and Baldwin apple orchard near Williamson. These trees were 40 years old; and since 1902 part of them have been badly infested with the mites. The infestation spread in succeeding years, so that in 1904 and 1905 nearly every tree in the orchard that was not treated showed plain evidences of injury. In 1905 the treatments made were not successful. The sprays used were whale oil soap (1 lb. to 5 gals. water) and kerosene emulsion (1 part to 8 parts water). These were applied on May 2 when the buds were opening and the mites beginning to migrate, apparently a favorable time for the work; but the pubescence on the buds evidently protected many of the mites from the spray mixture, since this resists wetting to a noticeable degree. It is probable also that the spraying was too late so that many of the mites had already gone into the unfolding leaves, where of course they could be reached by no spray. The spraying was not profitable, though it gave some small protection to the trees.

In 1906 the treatments were made earlier, the first on April 4, when the buds were still dormant. Special attention was given to the oil sprays. In this early spraying four trees were treated with miscible oil (1 part to 20 of water), four with whale oil soap (1 lb. to 7 gals. of water), four with kerosene emulsion (1 part to 8 parts water) and four with pure kerosene. On April 20 larger numbers of trees were treated with the same sprays, omitting the pure kerosene.

These treatments gave most satisfactory results.

By the early treatment with miscible oil the trees were kept almost completely free from mites, the only infestation being on widely separated branches; and the later treatments worked nearly, though not quite, as well. They were noticeably better

than those sprayed at the same time with whale oil soap or kerosene emulsion. This treatment cost 4 cents a tree for the mixture.

The kerosene gave even better results, so far as mite destruction was concerned; but it retarded the leaf buds nearly a month and prevented fruit setting. The trees made a vigorous, healthy growth later and showed less mite infestation than any trees in the orchard since 1902. But, as noted, the fruit crop was lost and the kerosene cost five times as much per tree as the miscible oil.

The kerosene emulsion was not quite so successful in destroying the mites; but it caused no injury to fruit or leaf buds and the fruit yields were fully as large as on the checks. It is believed that the use of a stronger emulsion, one part to five of water, would have made this treatment very effective; and its cheapness and safety as compared with kerosene and the miscible oils recommend it for general orchard work.

The whale-oil soap solution, though applied as thoroughly as the other sprays, appeared to have but little effect on the mites.

The results obtained in these experiments suggest the following directions for the treatment of mite-infested apple and pear orchards respectively. On apple trees, spray with kerosene emulsion diluted with five parts of water, the applications being made during the months of October, November, March or April. If possible, two sprayings should be made, one in the fall and one in the spring, as many mites are liable to escape with only one treatment. If it is not practicable to make more than one application, apply the mixture in the fall as soon as possible after the majority of the leaves have fallen, as many of the mites are still in the pubescence of the young wood, where they are more easily destroyed than under the bud scales. Special pains should be taken in the treatment of apple trees to wet the buds and the new growth thoroughly with the emulsion. Nothing less than a thorough drenching of the buds will give satisfactory results. The rough bark of the limbs and trunks may be neglected as this affords no protection to the mites. Mis-

cible oil diluted with ten to fifteen parts of water may be used in place of the kerosene emulsion. Pure kerosene oil and crude petroleum are advised only when other sprays have failed. In using them they should be applied with the wind as a fine mist, spraying ceasing as soon as the oil commences to run on the bark.

How seriously an orchard should be infested before it is advisable to apply spray mixtures is a question which the individual must determine for himself, as he is in a better position to watch the progress and to note the effects of the mite upon the foliage and to decide what are the probable results of the infestation upon fruit yields. From the observations that have been made upon the behavior of the mite in this State as an apple pest, it has been apparent that it varies in destructiveness in different orchards and in different years. This conduct of the mite appears to be due to the attacks of Gamasides, a group of closely related mites, which are its most formidable enemies. This is one of the hopeful features of the present invasion of the mites and should be given due weight in considering the advisability of spraying. Many orchards that are slightly infested may safely be allowed to run their chances for the present, recourse to treatment being taken upon the increase of the mite in sufficient numbers to affect the growth of the leaves and to cause their premature falling. But orchards that are overrun with mites should be sprayed. The leaves play an important rôle in determining the fruit yields, and trees that are subject to serious infestation of the leaves by the mite, accompanied by undue and unseasonable defoliation by the pest, such as has occurred during the past two years, would certainly produce smaller crops.

The progress of the blister-mite upon pear trees may often be checked by simply pruning out and destroying by fire the infested twigs at the first appearance of injury. If the infestation is general the trees should be sprayed according to the directions given for the treatment of apples. Trees that are infested with the San José scale as well should be sprayed with the boiled lime sulphur wash which will control both the scale and the blister-mite.