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THE CONTROL OF THE PEAR THRIPS

C. R. PHIPPS



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CONTROL OF THE PEAR THRIPS

C. R. PHIPPS *

SUMMARY

The pear thrips (*Taeniothrips pyri* Daniel), one of the most destructive pear pests in New York, is distributed thruout the fruit sections of the State, but has been injurious mainly in the Hudson Valley.

The thrips is a very difficult insect to combat due to its peculiar structure and feeding habits. The majority of orchardists are taken unawares and fail to secure the degree of control proportionate to their expenditures for labor and materials.

Experiments have shown that the pear thrips can be effectively controlled by spraying. The critical period for successful spraying begins with the emergence of the adults and continues until the buds open.

Three or even four sprayings may be advantageously employed, viz.: One or two when the adults first appear, a third when the blossoms are in the cluster-bud stage, and a fourth against the larvæ when the petals are falling.

Miscible oil or whale oil soap in combination with nicotine sulfate have given the best results in recent years when applied with a spray outfit capable of maintaining a pressure of from 200 to 300 pounds.

INTRODUCTION

The sudden appearance of the adults, usually just before the buds begin to open, and the rapid manner in which they work have combined to make the pear thrips an exceedingly dangerous pest. The purpose of this bulletin is to record experimental evidence showing that the thrips can be controlled, and to inform the grower as to what materials and methods to employ.

* The author wishes to take this opportunity to thank the orchardists and the Columbia County Farm Bureau for their cooperation in this work.

In New York, Columbia County in the Hudson Valley has suffered most severely, especially orchards in the vicinity of Hudson and Germantown. During 1920 the species was also reported in destructive numbers in a few orchards in Oswego County. Figures showing the annual loss from this pest in the State are not available. However, it is certain that the majority of growers combating the insect have been waging a losing battle, while many have given up the fight entirely. Not only is there a tremendous loss of fruit each year, but the injury of the adults and larvæ to the leaves weakens the trees perceptibly.

IMPORTANCE AND DISTRIBUTION

The pear thrips has been recorded in the southern part of England,¹ in Crimea,² and in the United States. It was first recorded on this continent in California³ in 1904. Parrott⁴ discovered the insect in New York in 1911. Since then it has been recorded in Pennsylvania, Maryland, and in 1915 at Royal Oak, British Columbia.⁵ Vancouver Island and nearby islands in the Gulf of Georgia have experienced most severe infestations.

Pears, prunes, and cherries are most subject to injury in California. In British Columbia prunes and pears are most seriously damaged, while apples and cherries also suffer somewhat. In New York the pear is the only host seriously attacked, altho the thrips have been recorded on apples, cherries, peaches, plums, and quinces.

LIFE HISTORY

In the spring, the adults emerge from their winter quarters in the ground generally during the first warm spell in April when pale areas are beginning to show around the bud scales. Owing to their wiry structure they are able to penetrate the unopened buds and feed on the soft tissues. Egg laying begins in a few days and continues for a period of from two to three weeks. The eggs are laid on the fruit

¹ Bagnall, R. S. A contribution to our knowledge of the British Thysanoptera with notes on injurious species. *Jour. Econ. Biol.* 4: No. 2. 1909.

² Mokrzecki, S. A. Report on injurious insects and diseases of plants in the Government of Taurida during the year 1912. *Rev. App. Ent.* 1: Ser. A, 363. 1913.

³ Daniel, S. M. New California Thysanoptera. *Ent. News*, 15: No. 9. 1904.

⁴ Bulletin No. 343 of this Station.

⁵ Cameron, A. E. and Treherne, R. C. The pear thrips and its control in British Columbia. *Dominion of Canada Dept. of Agr. Bull.* 15, Ottawa. 1918.

stems, mid-ribs, and petioles. The larvæ hatch in about two weeks and soon after may be seen in large numbers in the calyx cups. When full grown, the larvæ fall to the ground and enter the soil to an average depth of 5 to 6 inches and there spend the winter, emerging the following spring as adults.

In 1920 the first adults appeared on April 18, a warm, bright day. The two succeeding days were also warm and the adults were out in large numbers. Larvæ were noted on May 6. By the end of May the majority of the adults had disappeared from the trees. In 1919 the thrips appeared about April 1. The wide difference between the dates of emergence from year to year, coupled with the celerity with which these insects work, make it imperative that the grower keep a close watch on his orchard in the early spring.

DESCRIPTION

The adult is a dark-brown, four-winged insect about one-twentieth of an inch in length. By means of its peculiar rasping mouthparts it is able to lacerate the leaves and buds and then suck up the juices.

The egg is whitish in color, small and bean-shaped. The female has a saw-like ovipositor which enables her to make tiny slits in the plant stem for the insertion of the eggs.

The larva is small, white in color, and has a single pair of eyes. The mouthparts are like those of the adult and feeding is done in the same manner.

NATURE OF INJURY

The most serious damage is done soon after the emergence of the adults. Possessing slender, wiry bodies, they are able to work their way into the delicate flower parts, either destroying them completely or rendering them incapable of producing fruit. (See Plates I, II, and III.) In a short time the buds begin to dry up and the orchard takes on the appearance of having been swept by fire. The leaves are also injured somewhat, often being dwarfed and crinkled in appearance. (See Plate IV.)

In a great many cases the injury is not uniform thruout an orchard, one section being heavily infested while another portion containing the same variety, may escape injury. Two factors are probably responsible for this peculiar phenomenon: First, the exposure of the orchard, the earliest opening buds generally being

subject to the most serious infestation; and second, the slight migration of the pest from year to year has doubtless been an important factor in maintaining local infestation areas. It appears that the adults frequently confine their efforts to the tree or trees under which they spent the winter, and the larvæ, in turn, winter over in the same spot.

Larvæ working in the calyx cups often do considerable damage and may even scab up the small pears. In the Hudson Valley, Kieffers and Seckels are most subject to injury, while Bartletts and Clapp Favorites usually escape serious harm.

SPRAYING MATERIALS AND METHODS

Experiments conducted by this Station in cooperation with various growers in the Hudson Valley have demonstrated that the thrips is a difficult pest to combat. The insects appear suddenly, enter the buds quickly, and require prompt and very thoro spraying to insure their control.

TYPE OF SPRAY MACHINERY

Past experience has shown that the first requisite is a spray rig capable of maintaining a pressure of from 200 to 300 pounds in order to force the spray material into the unopened buds where the thrips are feeding. To be effective, the spray must be applied before the buds open (Plate V), otherwise the damage will be done before the insects are exposed to the spray. The spray gun has given very satisfactory results and is used almost universally. A fairly coarse, driving spray is necessary for effective work, special care being taken to drive the material into the ends of the buds. In spraying it is very important to cover the trunk and branches, and especially the fruit spurs as a great many adults may be found on the tree for a day or so before they enter the buds.

TIME OF APPLICATION

Too much cannot be said concerning the time of application of the various sprays. Just as soon as the adults appear on the trees in numbers spraying should begin as a delay of even one day may result in the loss of a large percentage of the crop. Once firmly fortified within the buds it is extremely difficult to kill all of the



PLATE I.—KIEFFER BRANCH SHOWING "BLIGHTING" OF BLOSSOM CLUSTERS DUE TO
WORK OF THE THRIPS.



PLATE II.—KIEFFER BLOSSOM-CLUSTERS SHOWING INJURY CAUSED BY ADULT THRIPS.



PLATE III.— UNINJURED KIEFFER BLOSSOM-CLUSTERS.



PLATE IV.—INFLUENCE OF ADULT THRIPS ON PEAR FOLIAGE.



PLATE V.—VARIOUS STAGES IN BUD DEVELOPMENT SHOWING (A) CORRECT TIME TO APPLY FIRST SPRAY.

insects. The weather frequently becomes cold and windy after the first warm spell and not only is spraying impossible, but the buds will not open for a week or ten days. By that time the damage is done, and the only purpose in subsequent spraying is to reduce the number of insects for the following season. A thoro and timely application is absolutely necessary if efficient control is to be achieved.

MATERIALS

During the past two years the best results have been obtained with miscible oil or whale oil soap in combination with nicotine sulfate. The proportions used were as follows: Miscible oil, 5 gallons; nicotine sulfate, 1 pint; and water, 100 gallons.

Where soap is used instead of miscible oil the proportions are: Soap, 5 pounds; nicotine sulfate, 1 pint; and water, 100 gallons.

EXPERIMENTAL

In 1918 several cooperative experiments were carried out at Germantown, New York. The best results were obtained with lime applied at the rate of 80 pounds to 100 gallons of water.

In 1919 several more orchards in the Hudson Valley were laid out in plats. The combinations used in a Kieffer orchard owned by Mr. Webster Coons of Germantown were as follows: (1) Soap, 5 pounds; nicotine sulfate, 1 pint; and water, 100 gallons. (2) Lime, 80 pounds; nicotine sulfate, $\frac{3}{4}$ pint; water, 100 gallons. (3) Miscible oil, 5 gallons; nicotine sulfate, 1 pint; and water, 100 gallons.

The same combinations were employed in the orchard of Mr. A. W. Hover and counts made to determine the relative efficiency of each. In both orchards the miscible oil and nicotine sulfate treatment proved most beneficial. Mr. Coons reported the best Kieffer crop he has had since the thrips became destructive in that region. The number of thrips was reduced from about 8 to 0.68 per bud by means of the oil treatment, while the other spray mixtures were unsatisfactory.

In 1920 the writer laid out several experiments in cooperation with Germantown growers. Many different combinations were tried and counts made to determine their relative efficiency. Table 1 is a summary of the results obtained from counts made a few days after the sprays were applied.

TABLE 1.—RESULTS OF SPRAYING EXPERIMENTS AGAINST THE PEAR THRIPS, 1920.

TREATMENT	AMOUNT OF MATERIAL PER 100 GAL. WATER	AVERAGE NUMBER THRIPS PER BUD
Miscible oil, nicotine sulfate, and clay	5 gal. oil, 1 pint nicotine sulfate, 30 lbs. clay	0.96
Soap, nicotine sulfate, and clay	5 lbs. soap, 1 pint nicotine sulfate, 30 lbs. clay	1.00
Miscible oil and nicotine sulfate	5 gal. oil, 1 pint nicotine sulfate	1.35
Soap and nicotine sulfate	5 lbs. soap, 1 pint nicotine sulfate	1.95
Clay	60 lbs.	2.00
Lime	60 lbs.	2.95
Miscible oil	5 gal.	3.70
Check	5.90

Because of the peculiar properties which enable a miscible oil to penetrate or to become absorbed by the unopened buds, miscible oil or distillate oil has become an important factor in the control of the pear thrips. The killing power of a high grade miscible oil is very great for death immediately follows contact with the spray.

Soap has also given fairly good results, but its killing power is slightly less than that of the oil and, moreover, the penetrative power of soap is only moderate.

For those growers who can obtain clay at a reasonable price and who desire to make an experiment, clay may be added to the spray combination at the rate of from 50 to 60 pounds to 100 gallons of the mixture.

THE COONS EXPERIMENT

The Coons orchard is made up of two large blocks of Kieffers, one block consisting of about 240 trees and the other of a much larger number. These trees are about 20 years old and, owing to their location, they have always been subject to attack. The smaller block (Plat 1) is situated in a slight depression and has a southern exposure. The buds on these trees have always opened early in the spring and have suffered accordingly. Previous to 1920, the

upper block (Plat 2), which has a northeastern exposure, has escaped serious infestation. During that year, however, the thrips were also quite numerous in this block, appearing at the same time as in the lower block. Figures 1 and 2 show the arrangement of the plats, the spray materials used, and the dates of application.

Row No.

1 and 2	April 19, miscible oil May 5, lime-sulfur and nicotine sulfate May 18, codling moth spray
3 and 4	April 19, miscible oil and nicotine sulfate May 5, lime-sulfur and nicotine sulfate May 18, codling moth spray
5	April 19, lime May 5, lime-sulfur and nicotine sulfate May 18, codling moth spray
6 and 7	April 19, scap and nicotine sulfate May 5, lime-sulfur and nicotine sulfate May 18, codling moth spray
8	Check

FIG. 1.—ARRANGEMENT, SPRAY MATERIALS USED, AND DATES OF APPLICATION ON PLAT 1.

Row No.

1 and 2	April 20, lime and nicotine sulfate May 5, miscible oil and nicotine sulfate May 18, codling moth spray
3 and 4	April 20, miscible oil and nicotine sulfate May 5, lime-sulfur and nicotine sulfate May 18, codling moth spray
5 to 30	Same as Rows 3 and 4

FIG. 2.—ARRANGEMENT, SPRAY MATERIALS USED, AND DATES OF APPLICATION ON PLAT 2.

The results obtained in this experiment were highly gratifying, the owner stating that it was the best Kieffer crop he had ever had. The check trees gave remarkably light yields, some having scarcely half a bushel of fruit. On the other hand, many of the trees in the rows treated with miscible oil and nicotine sulfate were loaded down and yielded from 5 to 6 bushels of pears. As control measures have improved during the past years the tendency has been to reduce the

depredations of this pest, so that the accumulative effects of past treatments have doubtless exerted an influence on the results secured during 1920.

THE HOVER EXPERIMENT

The Hover orchard consists of approximately 350 Kieffer trees which are about 20 years old. As in the case of Plat 1 in the Coons orchard, the planting is situated on a warm, protected slope with a southern and eastern exposure. Injuries were first noted in this orchard in 1909 when there was a very small crop.

During the 1920 season many spraying mixtures were tested, and each treatment was applied as thoroly as possible. The materials used in this experiment were the same as in the Coons orchard except that clay was added to the miscible oil and nicotine sulfate and soap and nicotine sulfate combinations. The thrips were noted for the first time on April 18. By the following day they were out in numbers and spraying operations were started immediately. The majority of adults on the outside of the buds were killed easily, and the oil appeared to penetrate the buds and kill a great many more of the thrips than did any other treatment.

The cluster-bud and blossom sprays were applied at approximately the same time as in the case of the Coons orchard. This experiment was also quite satisfactory, altho the yield of fruit was not so large as in the Coons orchard. After the fruit was picked, Mr. Hover stated that "The smoothest and cleanest fruit came from the miscible oil, nicotine sulfate, clay block." This orchard has been kept in a high state of cultivation as has that of Mr. Coons.

THE LICHTENHAN EXPERIMENT

A third experiment was conducted in the orchard of Mr. V. F. Lichtenhan, a large fruit grower near Germantown. Two grades of miscible oil were used in combination with nicotine sulfate, and also a mixture of soap and nicotine sulfate. However, the results obtained in this orchard were negligible as the infestation was too light to furnish any conclusive data.

SUMMARY OF CONTROL MEASURES

Based on the results secured in cooperative experiments conducted in the Hudson Valley during the seasons of 1918, 1919, and 1920,

the following measures are recommended as a means of controlling the pear thrips.

1. In spraying to combat adult thrips special pains should be taken to wet the ends of the buds thoroly. Spray with miscible oil and nicotine sulfate as soon as the adults appear in numbers. This is usually about the time that pale areas begin to show around the bud scales, generally the middle or latter part of April in the Hudson Valley.

2. In case of severe infestations spray again with the same combination from three to four days later.

3. As the cluster buds are separating, spray in the usual proportions with lime-sulfur or bordeaux mixture to which has been added $\frac{3}{4}$ pint of nicotine sulfate to each 100 gallons of spray.

4. To destroy the larvæ on the fruit and foliage add nicotine sulfate to the bordeaux or lime-sulfur spray as commonly applied at this time, or else make a special application of nicotine sulfate and soap.

5. Use a high grade miscible oil that will form a stable emulsion when diluted with water.

6. For effective control it is necessary to use a spray rig capable of maintaining a pressure of from 200 to 300 pounds.