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John C. Schread

Pests of ORNAMENTALS
Reports on control experiments

Thrips on Privet

and other insects on ornamentals

California privet at left shows normal leaves; those at right have been severely damaged by thrips.

Scale on Magnolia and Tuliptree
Leaf Miner and Psyllid on Boxwood
Whitefly on Mountain-laurel

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION • NEW HAVEN

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All photographs by B. W. McFarland

Thrips on Privet and Other Insects on Ornamentals

John C. Schread

Privet Thrips

The California privet (*Ligustrum californicum*) and related varieties are sometimes seriously affected by a species of thrips known as *Dendrothrips ornatus* Jabl. It occurs also on *Tilia, Syringa,* and *Alnus.*

When treatment is neglected the leaves of heavily infested privet are puckered and small in size. They lose their rich, green color, becoming yellowish, grayish or silvery in appearance. As a rule the damaged foliage does not drop prematurely. Consequently the off-color appearance of the plants persists from early summer when first noticeable until the end of the season.

The adults are golden-yellow to almost blackish with gray markings. They are very active and appear most often on the upper surface of the leaves. The nymphs are light green to yellowish-white in color and remain more or less quiescent while feeding. They suck plant juices from the underside of leaves but may also be present on the upper surface, especially on clear, warm days. Adults hibernate in litter at the base of the plants and under bark scales. Eggs are deposited mostly on the petiole and lower surface of the leaves. They are, however, sometimes found on the upper surface. The number of annual generations was not determined.

Earlier control measures

It was reported in 1937 that one treatment of nicotine-Penetrol (1) or nicotine soap (2) spray controlled the pest when the insecticide was applied as soon as thrips appeared on privet. Sweetened sprays, similar to those used to control gladiolus thrips were tried but were injurious to the plants.

In the following pages a discussion of privet thrips and its control with organic insecticides is given.

Experimental materials and methods

Control experiments were carried on from 1953 to 1955 inclusive. The insecticides used in the tests were DDT, BHC, malathion, Isolan and the experimental compounds 12008, American Cyanamid O,O-diethyl-S-isopropylmercapto methyl dithiophosphate and G-22870, 3 methyl-pyrazolyl-(5)-dimethyl carbamate.

Experimental control treatments were made on a 125-foot California privet hedge 4½ feet high, with an average width of 3½ feet. The hedge was divided into nine lengths of approximately 14 feet in 1953. Eight 11-foot lengths in 1954 and five 20-foot lengths in 1955 were used in these experimental treatments. Each of the 1955 treated areas was divided in half 5 weeks after the first series of treatments was made. Additional treatments were then applied to the 10-foot areas. DDT and malathion were used in all three years, whereas the remaining four materials were tried for one or two seasons only. All treatments were applied with a 12-quart wheelbarrow mist blower.

Control experiments in 1953

The first experiment was started on July 22, 1953. DDT 25 per cent, malathion 57 per cent, Isolan 25 per cent and BHC 13.75 per cent emulsions were used at dilutions of 1:800 and 1:1600. Triton B-1956 was added to the sprays at the rate of 1:800. About two quarts of spray were used for each treatment. Counts before treatments indicated 586 thrips on 40 leaves, 550 of which were nymphs.

Results of the treatments were determined mostly by counting the live thrips on 40 leaves taken at random from 10 8- to 12-inch twigs (4 leaves on each twig) cut from the top and sides of the treated and the untreated areas of the hedge. Dead thrips were counted once, that is, during the initial examination after treatment (Table 1).

An examination of Table 1 indicates that good control had been obtained within 24 hours after treatment. One newly-hatched thrips was found in the DDT- and malathion-treated areas at the lowest dilutions.

The status of the thrips population was determined again 3 weeks after the first examinations were made. (Table 1 shows that re-infestation was taking place.) Since all of the live thrips were immature forms, the data indicate that the insecticides had little or no toxic effect on thrips eggs embedded in privet leaves. Two weeks from this time, August 26, the thrips had disappeared almost completely both in the treated and untreated areas of the hedge. Perhaps this was due to insecticide residue in the sprayed areas of the hedge. The steady decline in thrips in the untreated section of the hedge was attributed, to some extent, to the complete discoloration of the foliage (see cover photo); hence it was unattractive for feeding. Thrips could not be found on the hedge in early September.

Table 1. Control of privet thrips following treatment on July 22, 1953

Material and dilution	Number of live thrips on 40 leaves July 23	Aug. 13	Aug. 26
DDT 1:800	0	40	0
DDT 1:1600	1	14	1
Malathion 1:800	0	18	4
Malathion 1:1600	1	20	4
Isolan 1:800	0	10	3
Isolan 1:1600	0	8	1
BHC 1:800	0	18	3
BHC 1:1600	0	8	4
Untreated	579	125	6

Table 2. Control of privet thrips following treatment on July 30, 1954

Material and dilution	Number of live thrips on 40 leaves Aug. 6	Aug. 16
DDT 1:800	24	16
DDT 1:1600	48	84
Malathion 1:800	36	80
Malathion 1:1600	121	128
Isolan 1:800	164	76
Isolan 1:1600	144	72
G-22870 1:800	148	88
G-22870 1:1600	104	36
12008 1:800	32	16
12008 1:1600	36	52
Untreated	216	48

Thrips control in 1954

On July 28, 1954, 50 leaves were taken at random from the hedge used in the experiments in the previous year. Both adult and young thrips were counted. There was a total of 1118 thrips, an average of 22.3 per leaf. Ten 8-foot areas of the hedge were sprayed on July 30 with experimental compounds 12008 50 per cent and G-22870 25 per cent in addition to DDT 25 per cent, malathion 50 per cent and Isolan 25 per cent emulsions. Each insecticide was used at dilutions of 1:800 and 1:1600. Triton B-1956 was added to the prepared sprays at the rate of 1:800. About 2 quarts of spray were used for each treatment.

Control data were taken by counting the live adults and young thrips on 40 leaves taken at random from each treatment (Table 2). Rain had removed most of the dead thrips from the foliage, hence they were not included in the counts.

Data in Table 2 show that the number of immature thrips present in the treated areas of the hedge was greater during the first few weeks after treatment in 1954 than in 1953. This may be explained partly by the fact that the initial population was one-third higher in 1954 than in 1953. Since this was true, a heavier egg deposition and subsequent greater number of surviving young might be expected.

Table 3. Thrips found on privet, May and June, 1955

Date	No. of twigs examined	No. of thrips present Adult	Young
May 2	12	0	0
May 13	24	1	1
May 27	12	0	0
June 10	16	6	0

Rainfall in the New Haven area during August 1954 was 3.53 inches more than in August 1953. This may have favored survival of young thrips because the treatments might be expected to lose some of their residual action.

Although for 2 years satisfactory control of privet thrips was obtained during mid-summer it was quite evident that the hedge was extensively damaged by the insects before treatments were made. The experiments for 1955, therefore, were planned to prevent injury and maintain healthy foliage throughout the growing season.

Consequently, a continuous check was kept on the hedge for the appearance of the overwintering adults during the spring months, so that insecticides would be applied in time to inhibit development of the summer broods of thrips.

All of the leaves on a number of twigs of the current season's growth were examined for thrips during May and early June. The shoots were not cut from the hedge for this would have dislodged many of the very active and fast-moving adults. Instead, they were carefully examined individually with as little disturbance as conditions would permit. Twigs examined were 6 to 8 inches long, with 10 to 14 leaves on a twig. Results of the examination appear in Table 3.

The upper surfaces of many other leaves were examined on June 10, in addition to the 16 noted in Table 3, and 27 adult thrips were found.

The first series of treatments was made on June 10. DDT 25 per cent and malathion 55.4 per cent emulsions were used at dilutions of 1:800 and 1:1600. Triton B-1956 was used at 1:800. About 2 quarts of spray were used per treatment. Control data were taken from 40 leaves examined at random in the treated and untreated areas of the hedge (Table 4).

In order to compare two treatments with one, additional sprays were applied on July 14 to one-half of each of the areas sprayed on June 10. A random sample of 40 leaves was examined from each treated and untreated area (Table 5).

For the first 3 weeks following the June 10 treatments (Table 4) there were almost no thrips in the treated areas of the hedge. Perhaps this was due not alone to the residual action of the insecticides but also to a low thrips population. Within a week following the July 14 treatments (Table 5) a number of young thrips were present in the

Table 4. Control of privet thrips following treatment on June 10, 1955

Material and dilution	Number of live thrips on 40 leaves June 17	July 1	July 13 Adults	Young
DDT 1:800	0	1	2	4
DDT 1:1600	0	0	4	72
Malathion 1:800	0	0	0	33
Malathion 1:1600	0	0	0	89
Untreated	1	9	0	397

Table 5. Comparison of privet thrips control with one treatment and two treatments, 1955

Material and dilution	Number of live thrips on 40 leaves: Treated June 10			Treated June 10 & July 14		
	July 18	July 26	Aug. 10	July 18	July 26	Aug. 10
DDT 1:800	14	2	7†	0	0	1†
DDT 1:1600	60*	4	8†	46	3*	10†
Malathion 1:800	17	2	4	3	0	7†
Malathion 1:1600	81	4	6	27	3	5
Untreated	286	5	4	286	5	4

* One adult. † All adults.

treated sections of the hedge. They were more noticeable at the lowest dilutions of the insecticides. By comparison to the untreated area, however, the control of newly-hatched thrips was good.

In the one-treatment areas the population of young thrips increased rather sharply during the middle of July, with a noticeable decline during the latter part of the month and in early August (Tables 4 & 5). The adults were never very abundant but they did occur more often as the season advanced and the young thinned out. Ultimately they became the overwintering brood.

In the two-treatment areas young thrips were quite numerous a week after treatment at the lowest dilution of both insecticides. After that time there appeared to be no significant difference in the population in the one- and two-treatment areas.

Since the rainfall from July 19 through August 10 did not exceed 0.8 of an inch, this did not account for the drop in thrips population of the hedge in 1955. In common with the results obtained in the previous years, the treatments appeared to have no noticeable toxic effect on thrips eggs.

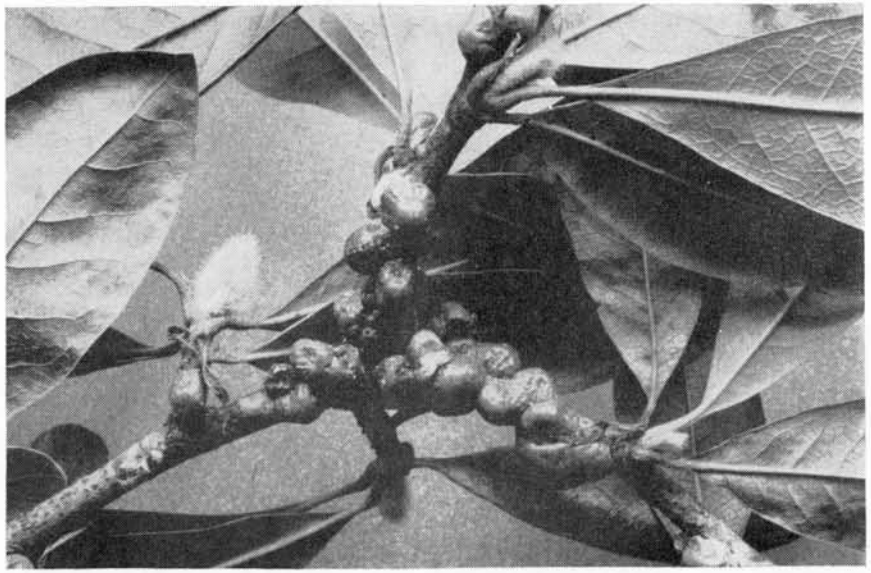

Figure 1. This scale on magnolia is one of the largest species in the United States. Badly infested trees produce stunted twigs and undersize leaves.

Magnolia Scale

The *Neolecanium cornuparvum* (Thro.) scale attacks a variety of magnolias. Badly infested trees are weakened and produce stunted twigs and undersize leaves. When infestation is allowed to continue for several years twigs and branches deteriorate and small trees may die.

The scale is among the largest occurring in the United States. At maturity the conspicuous females are soft and about ½ inch long. They are dark shining brown, convex, smooth, and covered with a white waxy bloom. Badly infested twigs and branches appear to be coated with cotton. The scale leaves an elliptical scar when removed from the bark. The nymphs are blackish with a waxy bloom (3). They occur mainly on the underside of the twigs and branches. Occasionally a few are found on the upper side but they make up a relatively small proportion of the population.

Scales reach maturity during August and early September. A new generation arises as live young (eggs are not produced) and overwinters as first instar nymphs on the newer twigs. Growth is resumed during the next April. There is but one generation a year.

Control experiment

The following experiment in control of the magnolia scale was undertaken on a 10- to 12-foot *Magnolia stelatta* tree. Several of the principal branches were conveniently situated so that they could be sprayed without interference from one another. Sucker growth at the base of the tree provided another area for treatment. Counts of young scales were made before treatments were applied. There was a total of 650 first instar nymphs on five twigs (average 7 inches in length) taken at random from the tree in early April.

On April 11, 30 per cent Thimet and 50 per cent malathion emulsions were applied to the tree at dilutions of 1:400 and 1:800. Repetition of treatments could not be made. An average of 1 gallon of each diluted spray was applied with a 12-quart wheelbarrow mist blower.

Results of the tests taken on May 10 showed that all the scales were dead. A total of 2154 scales on 20 twigs (averaging 6 inches in length) were examined. The treatments did not injure the tree. Re-examination of the tree in June confirmed the examinations made a month earlier.

Tuliptree Scale

Tuliptrees may be killed by heavy infestations of *Toumeyella liriodendri* Gmel. scale. The large, dark brown, wrinkled, hemispherical scale (1/3 inch in diameter when mature) is only a little smaller than the magnolia scale.

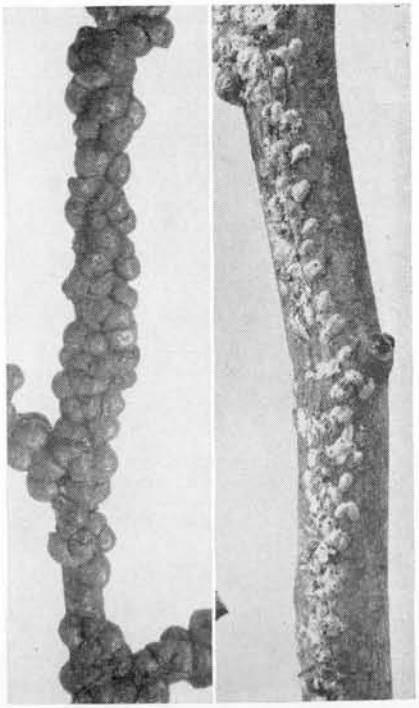

Figure 2. Mature female scales on tuliptree are shown at left, male scales at right.

The lower branches of tuliptrees are usually the first to become infested and may be completely covered with crowded masses of female scales. Unless the insect is controlled, twigs and branches and ultimately the entire tree may die.

The scale hibernates as first instar nymphs, mostly on the underside of the branches. They are small, blackish, flat, and oval in outline. Scales begin to grow in April and reach maturity during July. Young are produced viviparously during August. There is one generation annually. The leaves of infested trees may turn yellow. Honeydew secreted by the pest serves as a medium for the growth of a sooty mold. Hence all parts of an infested tree, including the foliage, may be coated with a disagreeable, sticky blackness.

Control experiment

Two 7- to 9-foot trees were used in the following experiment. No others were available. Scale counts made in early April before treatments were applied indicated 558 nymphs on five twigs (averaging 4 inches in length). Malathion 50 per cent emulsion was sprayed on the trees on April 11 at dilutions of 1:400 and 1:800. One to two quarts of spray material for each treatment was applied with a 12-quart wheelbarrow mist blower. Triton B-1956 was added to the sprays to enhance spreading and sticking. Results of the treatments taken on May 19 showed that all of the scales were dead. More than 3138 scales on 10 twigs (average 6½ inches in length) were examined. Malathion caused no apparent injury to the tree.

Boxwood Insects

Boxwood is planted more often in Connecticut now than in the past. It does well in most areas without winter protection. A 300-foot boxwood hedge has been growing in the central part of the state for more than 60 years. It was brought from Massachusetts, where it was originally planted in the early part

Figure 3. At left, injury from the boxwood leaf miner; at right, curled leaves show work of the boxwood psyllid.

of the 19th century. Its present thriftiness suggests that the variety is quite well adapted to southern New England.

Several species of insects and mites are perennial pests of boxwood. They have been discussed and the results of the use of DDT, aldrin, dieldrin, chlordane, lindane, nicotine sulfate, and ovotran for their control are given in Bulletin 565 of this Station.

Control of boxwood leaf miner

The boxwood leaf miner (*Monarthropolpus buxi* Lab.) feeds inside the leaves and causes water-soaked blister-like areas to appear, mostly noticeable on the lower surface. Leaves are stunted, turn yellowish-brown and sometimes drop from the plant prematurely.

There is only one brood annually. Adults begin to emerge in May. In 1953 all but 16 out of 175 midges had issued by June 1. Eggs are laid in the new leaves during May and June. Examination of 25 new leaves taken at random from an infested plant in mid-July indicated the presence of 321 live miners and no dead ones.

Plants were sprayed on July 15 with 57 per cent malathion at dilutions of 1:400, 1:800 and 1:1600. Triton B-1956 was added to the sprays at the rate of 1:800 to improve their spreading and sticking properties. Treatments were applied with a 12-quart wheelbarrow mist blower. Results of the tests taken from 10 leaves per treatment are given in Table 6.

Good control of boxwood leaf miner was obtained with malathion at the two lowest dilutions and complete control with the highest (Table 6). The treatments did not produce any noticeable injury to boxwood foliage.

Table 6. Control of boxwood miner following treatment with malathion on July 15, 1953

Dilution	Number of leaf miners on July 24		Per cent kill
	Alive	Dead	
1:400	0	130	100
1:800	14	86	86
1:1600	23	122	84.1
Untreated	103	0	

Control of boxwood psyllid

The boxwood psyllid (*Psylla buxi* L.) hibernates as a first instar nymph at the base of boxwood buds. Adults begin to appear in May and may be seen throughout most of the summer. They lay their eggs at the base of the buds where they hatch during late summer. There is only one generation annually.

As the buds develop in the spring the nymphs infest the terminal leaves. The feeding punctures cause the leaves to curl and form a cup in which the nymphs are concealed.

Table 7. Control of boxwood psyllid with malathion

Dilution	Treatment on May 5		Per cent kill
	Alive	Dead	
1:200	4	68	94.4
1:400	20	9	31
1:800	41	14	25.4

Counts of the number of live nymphs before treatment indicated 136 in five terminal leaf clusters averaging 10.3 leaves each. On May 2, three 4- to 5-foot boxwoods having circumferences of about 15 feet were sprayed with 50 per cent malathion at dilutions of 1:200, 1:400, and 1:800. Triton B-1956 was added to the sprays. Results of the treatments taken from five terminal leaf clusters (average 10 leaves each) per treatment are given in Table 7. All of the plants were treated. None was available as a check. Good control of psyllid nymphs was obtained with malathion at the strongest dilution only.

Counts of adult psyllids taken on July 14 indicated 4 on the plant treated with malathion at 1:200, 22 on the one treated at 1:400 and 40 on the plant treated at 1:800. These plants were sprayed again on July 15 with malathion at the same dilutions used May 2 and examination on July 21 showed that all adult psyllids were dead.

Whitefly on Mountain-laurel

The mountain-laurel or Calico-bush *Kalmia latifolia* is an evergreen shrub. It is now commonly used in foundation plantings with small evergreen trees and shrubs and for mass display in shaded areas and in hedge rows. Flowers are pink or white and appear in late May and June.

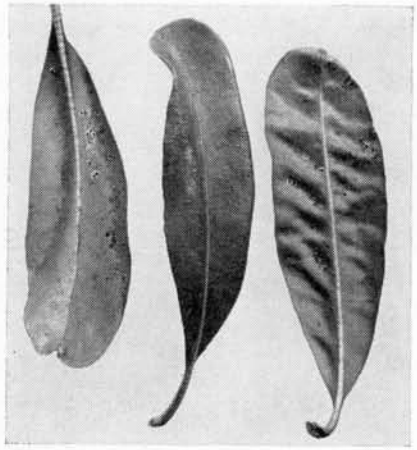

Figure 4. Young of the mulberry whitefly are shown at left and right on leaves of mountain-laurel. Photo at center shows typical discoloration and folding in area of feeding.

Mountain-laurel may be infested occasionally with the mulberry whitefly, *Tetraleurodes mori* (Quaint). This whitefly is also reported as injurious to maple, dogwood, mulberry, and ash. The adults are tiny white flies that appear both on the upper and lower surface of the foliage, but more abundantly on the underside of the leaves. They fly away when disturbed. The young are small, black, oval, scale-like insects with a white waxy margin and about 1/35 of an inch in length. They are found most often on the underside of the leaves. A ridge or partial fold arises in the areas where they feed. A light greenish-yellow discoloration may later appear in the injured areas.

Control experiment

Experiments intended to determine effective controls for the mulberry whitefly were carried on during the spring of 1954. The insect was causing considerable malformation of the foliage on a 150-foot mountain-laurel hedge. Plants comprising the hedge varied in height from 5 to 8 feet with 8- to 15-foot circumferences.

It was determined on May 6 that many of the new brood of whiteflies had molted once. Pretreatment counts indicated the presence of 56 live nymphs and no dead ones on ten leaves taken at random from the hedge.

Four of the largest plants widely separated in the hedge were sprayed on May 7 with 57 per cent malathion and 30.6 per cent Potasan at dilutions of 1:400 and 1:800. Triton B-1956 was added to the sprays at the rate of 1:800 for better coverage. A 12-quart wheelbarrow mist blower was used to make the treatments.

Control counts made on May 25 showed that all whiteflies had been killed by the treatments. There were 181 dead whiteflies and none alive on 40 leaves taken at random from the treated plants and 27 alive and none dead on 10 leaves taken from untreated plants.

Summary

Spraying privet during late June or early July with DDT or malathion emulsions at the rate of 1 pint per 100 gallons of water, or 1 teaspoon per gallon gave good control of thrips. Wettable powders used at the rate of 1 to 2 pounds per 100 gallons of water (2 to 4 teaspoons per gallon) could be substituted for the emulsions. Heavy rainfall occurring soon after treatment might necessitate a second application of insecticide before mid-July.

Rainfall affected thrips survival by washing them from the foliage and by reducing the effectiveness of the treatments. Thrips population declined towards late summer and ultimately disappeared from unsprayed hedges. Notwithstanding, sprays applied in early and mid-summer prevented thrips injury that would otherwise have developed. Two insecticide treatments were not significantly better than one.

Magnolia and tuliptree scales were controlled with one treatment of malathion, 50 per cent emulsion, 2 pints in 100 gallons (2 teaspoons per gallon) applied in April. Thimet was as effective as malathion when used on the magnolia scale.

Malathion diluted as for scales gave good control of the boxwood leaf miner when treatment was made in July. Control of the boxwood psyllid in May was successful when used at the rate of 4 pints in 100 gallons. Adult psyllids were easily killed with malathion when plants were sprayed in July.

The control of whitefly on mountain-laurel was complete when malathion was applied early in May at the rate of 1 pint in 100 gallons.

Literature Cited

1. Anonymous. American Nurseryman 65:4, 1937.
2. Anonymous. Horticulture 15:141, 1937.
3. HERRICK, G. W. The Magnolia scale (*Neolicanium cornuparvum* Thro.) Ann. Ent. Soc. Amer. 24:302-305.

This publication is one in a continuing series on research conducted at this Station to control insect pests on ornamentals. Titles of other publications in this series to date are given below.

B 578	Scale Insects and Their Control
B 588	Aphids and Scale Insects on Ornamentals
B 591	Mite Pests of Ornamentals and Their Control
C 199	Dogwood Borer
C 200	Systemic Insecticides to Control Pests of Ornamentals