



BIRCH LEAF MINER CONTROL

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Circular 182

April, 1952

THE CONNECTICUT AGRICULTURAL EXPERIMENT
STATION, NEW HAVEN, CONNECTICUT

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During the past few years gray birch trees in Connecticut have appeared extremely unsightly. From mid-May until late June the foliage has in many instances been almost completely browned by the larvae of the birch leaf mining sawfly *Fenusa pusilla*.²

In years when the pest is numerous most of the new foliage is injured by the first brood of miners. The second and subsequent broods attack only the newly developing leaves in the crowns of the trees. Old and toughened foliage is unattractive to adult sawflies for egg laying.

Life History & Habits

Adult sawflies begin to emerge about May 12. Larvae developing from eggs deposited in the leaves cause the characteristic injury to the foliage. Mature larvae emerge from the damaged leaves and drop to the ground where transformation to the adult stage takes place in the soil. During the summer the life cycle may be completed in five to six weeks. Second generation adults appear in late June. The remaining one to two broods are active in late summer and early autumn.

Former Control Method

Until recently, nicotine sulfate³ was almost the only spray used for the control of the birch leaf mining sawfly. Several sprays were required to control the various broods.

Experimental Procedure

Because of the success achieved in recent years in the control of many insect pests with DDT, lindane and aldrin, these insecticides were selected for trials on badly infested gray birch foliage. All were used in emulsion form; DDT and lindane as 25 per cent and aldrin as 21.85 per cent formulations. Each emulsion was used in a dosage series of 1 to 200, 400 and 800. A Potts-Spencer portable mist blower was employed to apply the treatments. The apparatus provided thorough coverage of both the upper and lower surfaces of the foliage.

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² A complete discussion of the life history and habits of this insect has been prepared by R. B. Friend in Bul. 348, Conn. Agr. Expt. Sta., 1933. It is now out of print but may be reviewed in libraries.

³ Friend, R. B., Birch Leaf Mining Sawfly, Conn. Agr. Expt. Sta. Bul. 348.

All of the trees in each treated area were sprayed once with the insecticides in dosage series to control the first brood of miners. When the time came to spray for the second brood, each treated area was divided into two subdivisions. One subdivision was sprayed only once with each of the three insecticides in dosage series; the remaining one-half of each area was sprayed twice. This procedure was followed to determine whether or not more than one spray was necessary to control the second brood of leaf miners. The third and fourth broods of miners were disregarded because, by the time they appeared, the birch trees had hardened off or were in the process of doing so. Consequently, there was very little, if any, new foliage developing.

Methods of Evaluating Results

Infested birch leaves were taken at random from the tops and sides of trees in each treatment. Only the general appearance of the leaves during initial infestation by the first brood was recorded. In addition, the presence of larvae, dead or alive, was also tabulated. For the remainder of the season, which included the period covering the end of the first brood and most of the second brood, the length of each leaf was recorded, as well as the presence of living and dead larvae. The status of the inhabitants of each leaf was determined by opening the mine with a forcep and dissecting needle. A binocular microscope was used to determine the condition of dissected material.

Timing of Experimental Treatments

The first treatments were applied on May 15 which was a hot, humid day. Examinations of newly developing leaves on June 20 indicated the presence of eggs in five out of 73 leaves. This infestation was the beginning of the second brood.

Eight days later 16 eggs and 43 larvae were dissected from 15 leaves. Treatments were made again at this time. On July 12 the final spray treatments were applied to one-half of each section treated June 28. The remaining half of each block received no additional treatments during the balance of the summer.

Results

An examination on May 25 of foliage taken from birch trees sprayed with lindane and aldrin on May 15 showed that birch leaf miner feeding had been stopped. DDT treatments were not effective.

On May 28 careful examination of miners in dissected leaves provided information relative to actual larval mortality for the three insecticides (Table 1). A study of this table will show that at no dosage level did DDT kill birch leaf miners in the mines. Aldrin at the strongest dose of 1 to 200 of emulsion destroyed all miners in the treated foliage, whereas some of the miners escaped lethal action of the insecticide at the two lighter dosages. None of the miners escaped

destruction by lindane at any dosage level. A complete clean-up of the first brood of miners with this insecticide was thus achieved. In contrast to untreated and DDT-treated foliage, which was for the most part nearly all brown as a result of miner injury, the lindane-treated trees at all dosage levels and the aldrin-sprayed foliage at the strongest dose of 1 to 200 of emulsion were entirely green. The low population in the check (Table 1) is due to the completion of larval development in untreated trees.

TABLE 1. RESULTS OF FIRST BROOD BIRCH LEAF MINER TREATMENT, MAY 15. AVERAGE PER LEAF OF 5 LEAVES EXAMINED PER TREATMENT

Treatment	14 Days After Treatment	
	Larvae	
	Alive	Dead
DDT Emulsion		
1-200	3.8	0
1-400	4.4	0
1-800	3.4	0
Lindane Emulsion		
1-200	0	4.4
1-400	0	2.0
1-800	0	3.8
Aldrin Emulsion		
1-200	0	7
1-400	0.8	7.6
1-800	1.0	4.1
Check	0.6	0

Seven days after the June 28 treatments made to control the second brood of birch leaf miners in newly developed foliage, leaves were examined for miner mortality (Table 2). This table shows that control of the second brood larvae in mines by lindane at all levels and aldrin at the strongest dosage is comparable to first brood results. DDT again provided no control. Aldrin at the two lighter dosages gave some control which compared almost exactly with first brood results.

Furthermore, it may be seen in Table 2 that a second treatment (July 12) to control the second brood of miners in new foliage is necessary if best results are to be obtained. The record also shows that with the exception of a slight kill by DDT at 1 to 200, this insecticide continued to be ineffective for control of birch leaf miner larvae in foliage. Lindane continued to be the best insecticide for the purpose despite a slight survival of larvae at all three dosage levels. This may be explained by the lack of toxicity to the eggs. Consequently, eggs present in the leaves at the time of treatment or deposited after the insecticides had lost most or all of their residual toxicity (to egg-laying adults) would hatch normally and the larvae would reach

maturity unless destroyed later by additional sprays. Aldrin at the lighter dosage treatments showed a slight rise in survival of larvae in the mines, perhaps also explained by the above stated reasons.

Obviously, when an insecticide treatment is applied to birch foliage at the beginning of the second brood (June 28) and not repeated several weeks later, new leaves developing during July may be invaded successfully by leaf miners. New birch leaves taken from the plots sprayed only once (June 28) for the second brood, had only living larvae when examined 23 days later. Thus, two treatments are necessary to control the second brood of birch leaf miners.

TABLE 2. RESULTS OF SECOND BROOD BIRCH LEAF MINER TREATMENTS. AVERAGE NUMBER OF LARVAE PER LEAF OF FIVE LEAVES EXAMINED

Treatment	Days After First Treatment				Days After Second Treatment	
	7		23		9	
	Alive	Dead	Alive	Dead	Alive	Dead
DDT Emulsion						
1-200	4.2	0	1.7	0	1.9	0.2
1-400	3.8	0	1.7	0	1.9	0.0
1-800	3.4	0	1.6	0	1.8	0.0
Lindane Emulsion						
1-200	0	4.6	1.4	0	0.3	7.6
1-400	0	14.2	0.4	0	0.1	8.0
1-800	0	6.2	2.4	0	2.0	4.2
Aldrin Emulsion						
1-200	0	5.8	2.0	0	0	6.8
1-400	0.6	10.8	2.4	0	1.2	5.8
1-800	1.0	5.8	1.8	0	1.8	4.0
Check	8.7	0	1.5	0	5.2	0.0

Suggestions for Control

The first brood of birch leaf miners may be controlled by spraying infested foliage with a 25 per cent lindane emulsion at the rate of 1 pint in 100 gallons of water (a teaspoon per gallon). Wettable powder may be substituted for the emulsion at the rate of 1 to 1.5 pounds per 100 gallons of water (4.5 to 7 gm. per gallon). Treatment should be made about May 15 to 20 or when the birch leaves are fairly well developed. Leaves found to contain small, grayish, kidney-shaped areas when held up to the light are ready for spraying. Properly timed, one treatment in May should adequately control the first brood of miners.

The first of two treatments to control the second brood of birch leaf miners effectively should be made June 28 to July 1. The second treatment must follow the first in 12 to 14 days. Lindane used as outlined above for control of the first brood of miners in May and properly timed in late June and July, will prevent noticeable injury to early and midsummer birch foliage by the second brood.