

The effect of some pesticides on the larvae of *Cirrospilus vittatus*, a parasite of the apple leaf miner *Stigmella malella*, in a laboratory experiment

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Eveleens and Evenhuis (1968) showed that *Cirrospilus vittatus* Wlk. (Hymenoptera, Eulophidae) is an important parasite of the apple leaf miner *Stigmella malella* (Stt.) (Lepidoptera, Stigmellidae) in The Netherlands. They observed, however, that the effect of the parasite may be reduced by one or more unknown factors. The above authors made their observations in 1967 in a part of the experimental orchard Thedingsweert near Tiel (province of Gelderland), which part was treated according to an "integrated control" scheme. Since 1964 a rather serious leaf miner infestation has occurred in this plot. The only chemicals sprayed in 1967 were fungicides, viz. captan against apple scab, and triamiphos against apple mildew; both were sprayed about every 10 days between 10 April and 17 August 1967.

Triamiphos is an organic phosphorus fungicide, which has also a certain contact and systemic effect against aphids and mites (Meltzer, 1961). It seemed possible that this pesticide might be harmful to the parasite of the above leaf miner, but not to its host. This might explain the fact that the parasite appeared in large numbers only in the period after spraying had ceased in August (as represented in fig. 1 of Eveleens and Evenhuis, 1968).

D'Aguilar (1959) observed that leaf miner infestation was less severe on less frequently sprayed apple trees. He suggested that the fortnightly treatments with pesticides might be responsible, as they might have killed the parasite. However, he did not mention the pesticides used.

The present paper describes an experiment with a few pesticides, to examine their effect on the leaf miner parasite. The pesticides used were 0.6% parathion, 1.5% triamiphos and 1% captan and they were compared with water as a check.

Leaves with mines containing a larva of the parasite (the ectoparasitic larvae are fairly easily detected by holding the leaves against the light) were collected from the apple varieties 'Belle de Boskoop', 'Jonathan' and 'Cox's Orange Pippin' in the integrated-treated part of the experimental orchard Thedingsweert. The chemicals were applied to the leaves by brushing with a small paint-brush, the treatments being performed on five dates between 9 September and 10 October.

The results are shown in Table 1. On each treatment date, leaves with a total of 16 living parasite larvae were used. After the pesticides had dried, the leaves of each

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Table 1. Numbers of dead parasite larvae 7 days after treatment with pesticides on five dates. Each treatment was started with 16 living larvae.

	9 Sept.	13 Sept.	25 Sept.	27 Sept.	10 Oct.	Total number killed	Total percentage killed
Parathion	12	15	12	9	9	57	71
Triamiphos	7	3	3	2	4	19	24
Captan	4	1	4	1	4	14	18
Water	2	0	3	1	3	9	11

treatment were kept in the laboratory in large, separate, closed, plastic containers. Seven days after treatment the numbers of dead and living parasite larvae were recorded, after dissecting them out of the mines under a binocular.

The figures in Table 1 indicate that a treatment with parathion killed many parasite larvae, whereas the treatments with triamiphos and captan caused only a slightly higher mortality than the check. Statistical analysis of the figures showed that only the effect of parathion differed significantly at the 0.01 level from the effect of the other treatments. An effect of the fungicides could not be demonstrated. The numbers from Table 1 have been investigated through an analysis of variance completed by a studentized-range test.

A correlation test showed that in the treatments with parathion there was a small significant decrease in mortality at the significance level of 0.10 on the successive dates during late season. This decrease in the effect of the parathion treatment may perhaps be connected with the effect of the lower temperatures prevailing during development of the insect as the autumn advanced (Sun, 1960). Alternatively it might be due to the fact that more parasite larvae had gone into diapause; such larvae may be less susceptible to insecticides. Evenhuis (1960) recorded this for *Aphelinus mali* (Hald.), the parasite of the woolly apple aphid.

Though adults of *Cirrospilus vittatus* have not yet been tested in the laboratory for their susceptibility to pesticides, it may be concluded that triamiphos does not have any very marked effect on the larval population of this parasite.

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Samenvatting

De werking van enkele bestrijdingsmiddelen op de larven van Cirrospilus vittatus, een parasiet van de appelbladmineerder Stigmella malella, in laboratoriumproeven

In laboratoriumproeven werd aangetoond dat een zeer groot gedeelte van de larven van de parasiet van de appelbladmineerder door een behandeling met parathion in

de bladmijnen gedood wordt (Tabel 1). Met triamifos en captan werd ten opzichte van de behandelingen met water een iets hogere sterfte waargenomen; dit verschil was evenwel wiskundig niet betrouwbaar. In het najaar bleek de dodende werking van parathion met het verloop van de tijd enigszins af te nemen. De oorzaak hiervan moet gezocht worden in een invloed van de lagere temperatuur of in het in diapauze gaan van de larven.

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