Pest Advisory Leaflet 23
1989

SOUTH PACIFIC COMMISSION

SERPENTINE LEAFMINERS

Above: *Mines caused by larvae of* Liriomyza sativae *on tomato.*

SERPENTINE LEAFMINERS are major pests of vegetables and ornamental flowers worldwide. Those species of importance in the SPC region are: *Liriomyza brassicae* in Fiji, Guam, Kiribati and Niue; *L. sativae* in the Northern Mariana Islands, Cook Islands, French Polynesia, Guam, New Caledonia, Vanuatu, and probably American Samoa and Western Samoa; *L. trifolii* in American Samoa, the Northern Mariana Islands, the Federated States of Micronesia, Guam, Tonga and Western Samoa. All three species and *L. huidobrensis* are recorded from Hawaii. These leafminers have spread in recent years with the development of the trade in cut flowers and leafy vegetables.

HOSTS

L. brassicae mainly attacks cruciferous crops, such as cabbage and radish, but occasionally pea. The other species have a very wide host range, occuring on beans (*Phaseolus* and *Vigna* species), beetroot, *Brassica* spp., capsicum, onion, pea, tomato, watermelon and other cucurbits, celery, lettuce and white potato. They are also pests of numerous ornamentals, especially chrysanthemum and gerbera, as well as a wide variety of weeds. However, food preferences of these species vary somewhat so that each one favours certain crops. *L. trifolii* is most common on beans, tomato and watermelon; *L. sativae* on cucumber, and *L. huidobrensis* is only a pest at high elevations in Hawaii, and prefers cool-season crops such as beet, pea and onion, although it also attacks tomato and cucumber.

BIOLOGY

Adult *Liriomyza* leafminers are black, or yellow and black flies about 3 mm long. The four species look very similar and for accurate identification specimens of the adult and pupae are needed. These can be obtained by placing leaves with active mines in a sealed paper bag in a dry place for several weeks. Dead adults and pupae will be found among the debris. Both should be preserved in labelled tubes of 70% alcohol.

The life-cycle is usually complete in less than three weeks, depending on temperature and the type of host. Egg-laying begins a day or so after emergence, is most frequent during the first week, but continues for several weeks. During this time hundreds of eggs are laid. They are placed beneath the leaf surface with ovipositors which are adapted for piercing plants. The punctured sites become slightly sunken as the cells beneath are destroyed and the sap leaks out. The eggs hatch after several days and the larvae start to mine the leaves (front cover), leaving winding tracks which widen as the larvae grow. There is usually one larva within a mine. They are about 3 mm long when mature, cylindrical, tapered towards the head and blunt at the rear. The moving mouthparts can be seen, as well as greenish-black streaks of excreta, if the mined leaf is held to the light. When the larvae are fully grown, at about 7 days, they cut holes in the leaf, fall to the ground and pupate just below the soil surface. Occasionally, they pupate on the leaf.

DAMAGE

Numerous, small, white spots are made by the female flies as they pierce the leaves to lay eggs and feed. When infestations are severe, plants lose vigour and leaves wilt. However, the most common damage is caused by the larvae as they mine the leaves. Leaves become susceptible to wind, dry out and fall prematurely. Depending on the type of crop this damage reduces yield in several ways. Seedlings may wilt and die or remain stunted; beans, capsicums and cucurbits are especially susceptible at this stage. Tomato plants may be defoliated and fruits may become sun-scorched and more susceptible to bacterial rot. Damage to leafy vegetables, such as lettuce and celery, may require careful sorting to maintain standards of

quality and this increases costs. On ornamentals, the unsightly appearance of only a few mines is sufficient to reduce the value of the crop.

CONTROL

Biological control

Many different species of parasites are known to attack leafminers. At least 23 species have been recorded in Hawaii. Some of the parasites feed on the outside of the larvae, others internally and emerge from the leafminer pupae. The external parasites pupate within the mines and can be easily seen when the leaf is held to the light.

Normally, if several species of parasites are present they will maintain leafminer populations below damaging levels. However where the leafminer is a recent introduction, and becomes a pest, it may be worth importing additional parasites. One parasite which has been imported to Hawaii and Guam and proven to be effective is *Ganaspidium hunteri*. Parasites will only be effective in the absence of insecticides, or when those used are carefully chosen to cause minimal damage to parasite populations.

Chemical control

There may be occasions when parasites are unable to control leafminers sufficiently to prevent yield losses and chemical control is necessary. Naled (0.2 to 0.4 per cent active ingredient) or diazinon (0.06 to 0.1 per cent active ingredient) or dimethoate (0.06 per cent active ingredient) can be used against *L. sativae* and *L. brassicae*. Naled may be the preferred chemical, as tests on Guam, for instance, have shown it to be least toxic to the parasites that occur there.

L. trifolii has shown resistance to many insecticides. In Guam it can be controlled with oxamyl or the pyrethroids permethrin and fenvalerate. The latter, at 0.01 to 0.02 per cent active ingredient, is preferred as it is less harmful to parasites. In parts of Hawaii this leafminer is now resistant to all these chemicals; resistance to the pyrethroids took only three months to develop.

In order to prevent similar resistance from developing elsewhere, crops should be sprayed with pyrethroids only when leafminers are a problem. If other pests need to be controlled, chemicals should be chosen that do not harm leafminer parasites. When caterpillars are present, *Bacillus thuringiensis* is a suitable choice, and naled may be used against other insect pests.

Some countries in the region have regulations to control the chemicals which may be applied to crops. If this is so, the local agriculture staff should be consulted before insecticides are used. All pesticides are hazardous and some of those mentioned above are considered highly dangerous. Safety precautions for their safe handling should be carefully observed and produce should not be eaten or marketed before the prescribed waiting period has elapsed.

QUARANTINE PRECAUTIONS

In those countries without leafminers strict quarantine precautions should be taken to prevent their introduction. The importation of plants with green leaves from infested countries presents a risk because they may contain leafminer eggs. Therefore, consignments of ornamentals, especially those in the family Asteraceae, such as chrysanthemums and gerbera, and leafy vegetables from infested areas, should be prohibited or fumigated with methyl bromide before export, at normal atmospheric pressures, using 32 g/m^3 for 2 hours at 21°C or above.

LEAFLETS IN THIS SERIES

1. Black leaf streak of banana (rev. 1984)
2. Banana bunchy top virus (1977)
3. Taro leaf blight (1977)
4. Coconut palm rhinoceros beetle (1977)
5. Banana burrowing nematode (1977)
6. The giant African snail (1977)
7. Black pod and canker of cocoa (1978)
8. Alomae and bobone diseases of taro (1978)
9. Root-knot nematodes (1979)
10. Dasheen mosaic virus (1979)
11. Rat damage to agricultural crops (rev. 1984)
12. Yam dieback (1980)
13. Green vegetable bug (1981)
14. Fruit-piercing moth (1982)
15. Tomato leaf mould (1983)
16. Cottony cushion scale, Seychelles scale, and Egyptian fluted scale (1983)
17. Coconut hispine beetle (1983)
18. Queensland fruit fly (1983)
19. Sweet potato little leaf (1984)
20. Pythium rots of taro (1985)
21. Papuana beetles (1987)
22. Sweet potato weevil (1989)

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