

Management of Serpentine Leafminer

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Serpentine leafminer

Serpentine leafminer (*Liriomyza huidobrensis*) was detected on vegetable crops in the Sydney Basin in October 2020. It had not been detected previously in Australia and is considered an Emergency Plant Pest in Australia. It has also been detected in Southern Queensland.

Serpentine leafminer (SLM) is one of several pest leafminer species around the world significantly impacting horticultural industries.

It is a small black fly that feeds and lays eggs on plant leaves. When the larvae hatch they "mine" through the inside of the leaf leaving behind tell-tale serpentine tunnels which are easily visible to the naked eye.

High levels of larval infestations affect the plant's ability to photosynthesise, reducing plant growth and crop yields.

SLM pupates on the underside of the leaf (small brown cocoons 1-3mm long) but they can be easily knocked to the ground or fall into crevices of leafy vegetables.

The host range of SLM is extensive including vegetables, ornamentals and many weed species. Effective control of this pest is challenging.



Figure 1 Serpentine Leafminer (*Liriomyza huidobrensis*)

Integrated Pest Management

An effective integrated pest management (IPM) approach is the best long term approach to managing SLM.

IPM involves managing pests using a combination of techniques such as biological control, modifying cultural practices, monitoring pests and using IPM friendly insecticides.

In many countries overseas, over reliance on insecticide use has led to a rise in resistance within SLM leading to increased levels of plant damage by heavy pest pressure. Chemical use targeting other pest species, particularly broad-spectrum insecticides, can interfere with IPM programs and can lead to secondary outbreaks of SLM in the absence of beneficial predators. If chemicals are used as a control option, select ones that are IPM friendly.

There are a number of parasitoid wasp species that target leafminers already present in Australia and provide an effective non-chemical control option.

Parasitoid wasps can reach the SLM larvae within the leaf, laying their eggs on or in the larvae (figure 2). A well-managed IPM system can see mortality rates of SLM as high as 80 percent.

There are over 50 species of parasitoid wasp that target leafmining flies however four are particularly good at targeting SLM:

- *Opius* spp.
- *Diglyphus isaea*
- *Hemiptarsenus varicornis*
- *Zagrammosoma latilineatum*

Cultural Control

The best way to control SLM is to reduce the risk of the pest entering your property.

- Wherever possible, purchase planting stock from a Nursery Industry Accreditation Scheme Australia (NIASA) accredited supplier. If sourcing from a non-accredited supplier, ask for verification that the business has adequate pest, disease and weed management plans in place.
- Inspect all incoming stock for pests, diseases and weeds. Separate new stock from crops until it has been confirmed free from SLM symptoms.
- Control weeds surrounding crops and gardens especially those which are known hosts of SLM.
- Regularly monitor plant leaves for SLM mines.
- After harvest, immediately incorporate crop residues at depth.
- Floating row covers over susceptible crops can prevent flies from laying eggs.



Figure 2 Parasitic wasp *Zagrammosoma latilineatum*

- Floors and pathways in greenhouses should be designed to prevent flies from pupating in soil. Black plastic, aggregated gravel to a min 75mm deep or concrete helps prevent contamination and improves general hygiene
- Remove all green waste such as prunings and spent leaf material and bury.
- Purchase bagged media from a reputable supplier. Source loose media from a NIASA accredited supplier or pasteurise before use.
- If growing a single crop, once the crop is finished, cease irrigation and close up the house to increase interior temperature. High temperatures are lethal to SLM.
- Benches and hard surfaces should be cleaned between crops.

Produce Management

At risk properties (those who grow host plant species) must actively manage SLM along the entire supply chain to manage SLM in production regions.

Control options for SLM do not stop at the crop. Managing the biosecurity risk of SLM within plant produce is a vital part of our General Biosecurity Duty to ensure that SLM is not accidentally transported to new production regions.

Elements of the pest biology may hamper control efforts. SLM is frost tolerant and pupae can survive temperatures down to -

20°C with eggs being the most resistant life stage. Cold storage is not a good control option for vegetables, particularly as very low temperatures may risk damaging the produce.

Chemical Options

There are some chemical control options for SLM. However, only a few are compatible with IPM.

The larvae, living inside the leaf, are largely protected from many conventional insecticide sprays. Systemic and translaminar insecticides are better as they can reach the larvae.

Many insecticides will have a negative impact on beneficial predators of SLM such as parasitoid wasps. An incorrect spray program will adversely affect IPM programs and potentially lead to an increase in SLM numbers.

Chemical selection and rotating insecticides from different chemical groups is critical in reducing the risk of SLM developing insecticidal resistance. SLM has been known to develop resistance to many chemicals overseas and the resistance mode differs from country to country based on the dominant spray regime.

NSW DPI's Insecticide Resistance Unit is assessing the NSW population of SLM to identify if resistance to any chemicals is already present. If this is detected, chemical control recommendations will be adjusted accordingly.

An up to date list of registered chemical options and off-label permits for SLM can be found at NSW DPI [Chemical management of leafminer](#) webpage and Australian Pesticides and Veterinary Medicines Authority Registrations and [permits](#) webpage.

General Biosecurity Duty

Part 3 of the *Biosecurity Act* (2015) describes how people have a General Biosecurity Duty to prevent, eliminate or minimise the risk of SLM in NSW.

People dealing with SLM host plants which have visible signs of leafminer damage must act to ensure they are meeting this General Biosecurity Duty. Put simply, you must always act to prevent further spread of SLM in NSW, eliminate heavy infestations of the pest and minimise the impacts of SLM in plant production systems.

This duty may be met by any number of means that are considered Best Management Practice for SLM including

- not selling heavily infested SLM host plants,
- through the use of IPM to minimise the impact of SLM in the production system,
- adhering to industry standards such as Biosecure HACCP or market access arrangements like ICA29,
- treating host produce and plants with approved insecticides, fumigation or irradiation to prevent spread.

The General Biosecurity Duty for SLM is a legislative mechanism due to the risk of an adverse effect on the economy and the community that arises from the presence, spread or increase of serpentine leafminer within New South Wales.

Acknowledgements

Figure 1 courtesy of Merle Shepard, Gerald R. Carner, and P.A.C Ooi, *Insects and their Natural Enemies Associated with Vegetables and Soybean in Southeast Asia*, Bugwood.org

Figure 2 courtesy of Dr Elia Pirtle, Cesar PUB20/933

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