

Preparedness for the exotic vegetable leafminer in vegetable and nursery crops in Australia



Actual size:

1-2 mm



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Key points

- **Vegetable leafminer (VLM) is a significant pest of horticulture globally, and a recent threat to Australian horticulture.**
- **Identification and in-field early detection for VLM is challenging, but support and resources are available.**
- **Early detection is vital to improve chances of containment and local eradication, and to avoid population increases as a result of inappropriate chemical use.**

Pest and Impact

The exotic leafminer, *Liriomyza sativae* (vegetable leafminer - VLM), was detected on mainland Australia at the coastal town of Seisia on Cape York Peninsula in 2015. It is now under quarantine but represents a major risk to Australian horticulture, particularly **the vegetable industry, melons industry, and the nursery and gardens industry**. Overseas, VLM is a well known pest and can cause considerable damage, particularly when heavy infestations affect young crops. Yield losses are variable, depending on plant age, environment, pest density and management practices.

VLM has four lifestages. Adults create holes to feed on leaves and to lay eggs inside leaves, creating 'stippling' damage. Upon hatching, larvae tunnel through leaves, feeding and creating thick white trails, called 'leaf mines'. Larvae then emerge from the leaves to pupate in the soil and finally emerge as a fly. At 25°C, the lifecycle takes about 3 weeks. Most damage occurs at the larval stage. Heavy leaf mining can reduce plant growth or even kill young plants. Oviposition and feeding holes created by adults exposes plants to secondary infection.

Monitoring

Why should I monitor?

VLM is most likely to cause problems early upon arrival, before chemical management plans have been adjusted to conserve parasitoids. Surveillance for VLM will ensure that correct chemical choices can be made as soon as VLM arrive, to avoid sudden outbreaks and crop losses, and to increase the chance of local containment or eradication.

Where and when do I look?

Most of coastal Australia, in particular the east coast is predicted to be suitable for VLM establishment and activity (Figure 1). See the 'More Information' section for a link to an interactive tool to explore risk across season at your location.

Surveillance should be conducted within high risk crops (Figure 2) and should include broadleaf weeds along crop edges, particularly weeds within the Fabaceae, Asteraceae and Brassicaceae families. Surveillance will be most important when a high risk season (Figure 3) overlaps with young crops, as young plants are most vulnerable to damage.

Seasonality in glasshouses

Active periods for VLM will be increased inside glasshouses, and if plants are growing, they should be considered at risk, regardless of season. For example, in northern Chinese provinces where winter temperatures fall below survivable temperatures for VLM, they are able to successfully overwinter as pupae within glasshouses, and repopulate the field in the spring.

What should I look for?

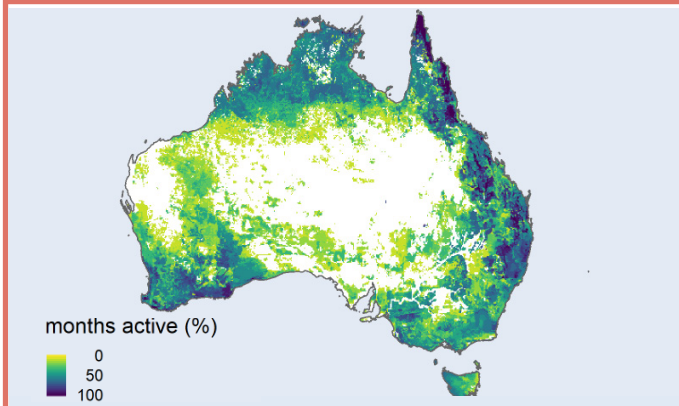
Adult VLM are very small, black and yellow flies that are difficult to see by eye. Surveillance should focus on the damage they create on plants, which includes white serpentine mines (Figure 4A and 4B) and stippled appearance (Figure 4C) on leaves. Fruits are unaffected, with the exception of bean pods which may show leaf mines (Figure 4D).

It is important to note that some native flies create very similar looking damage (see back page). Always photograph suspicious damage, collect a sample and contact **the Exotic Plant Pest Hotline**.

**IF YOU SEE ANYTHING UNUSUAL,
CALL THE EXOTIC PLANT PEST HOTLINE**

1800 084 881

Figure 1. Predicted activity

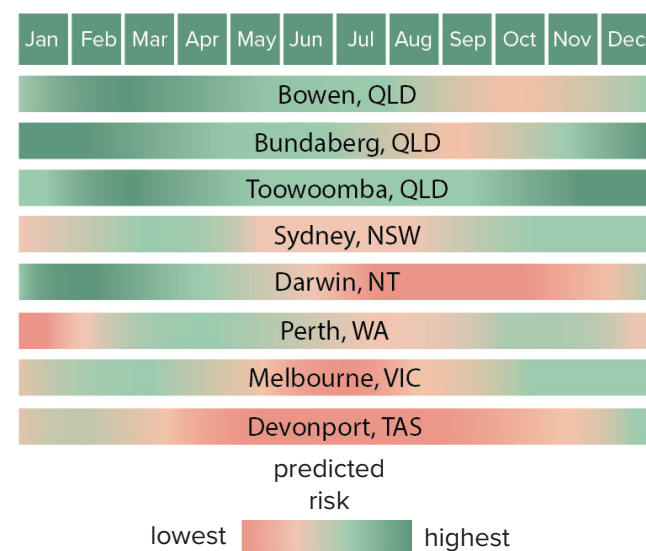


Potential VLM activity across Australia, shown as the percent of the year that climate is suitable*.

Figure 2. Major crops at risk of VLM

- Tomato, capsicum, chilli, eggplant (Solanaceae)
- Melon, pumpkin, squash, zucchini (Cucurbitaceae)
- Beans and peas (Fabaceae)
- Ornamentals (e.g. snap dragon and petunia)
- Cabbage, broccoli, bokchoy, kale, turnip, radish and other brassicas (Brassicaceae)
- Allium species, including onions and garlic
- Lettuce (Asteraceae)
- Celery (Apiaceae)

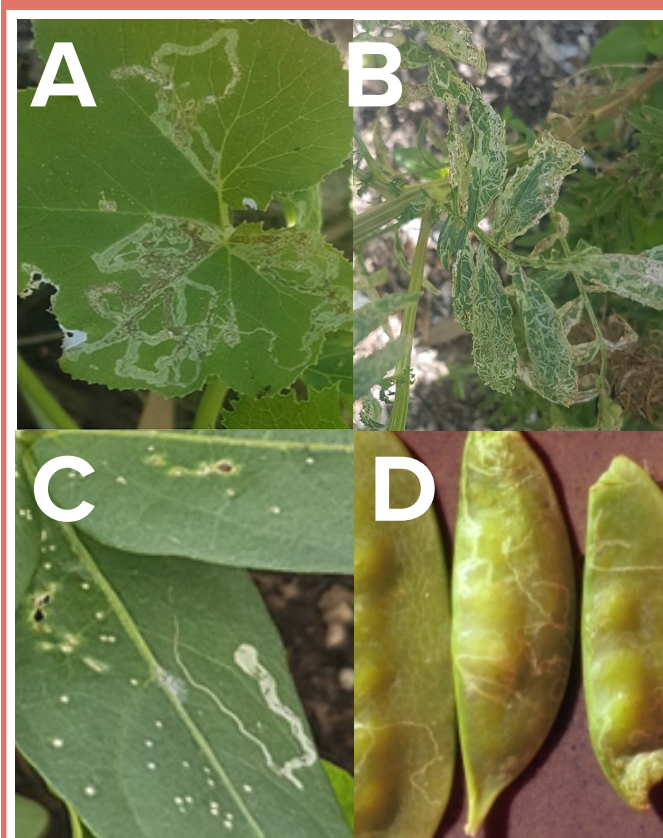
Figure 3. Predicted seasonality



Average predicted risk of VLM, based on climate suitability across season, at eight growing regions across Australia (aggregated across a 100km radius of the central point)*.

*These predictions assume absence of glasshouses and/or irrigation, which can increase local risk.

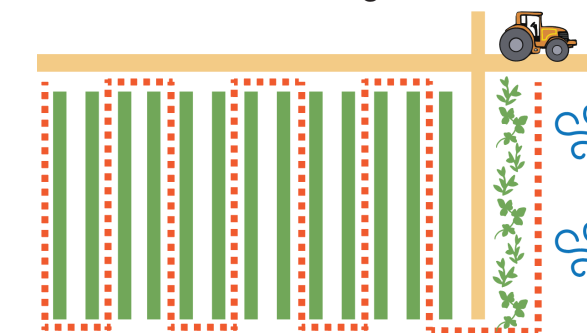
Figure 4. Symptoms in leaves



(A) Moderate damage on melons, (B) heavy damage on ornamental flowers and (C) stippling and mining damage on beans. Images: Elia Pirtle, cesar Pty Ltd. (D) Leaf mining in bean pods. Image: Whitney Cranshaw, Colorado State University, Bugwood.org

Figure 5. Surveillance guidelines

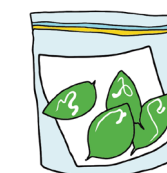
Walk a transect, travelling 10 sec / m*



1. Scan for damage



2. Snap a photo



3. Collect a sample

How do I survey my farm?

1. Choose a block of crops (at least 30 rows of plants) that may be at high risk, due to being:
 - An at risk crop (Figure 2).
 - Near to transport routes and unloading areas.
 - The 'incoming wind side' of paddock edges.
2. Within the block, survey by following a snaking transect line (red dotted line in Figure 5), which includes broadleaf weeds present along the edges of the block (grasses do not need to be inspected) and travels down every other row of plants (Figure 5).
 - Scan plants at a slow walking pace of 10 seconds per 1 metre*.
3. Record your survey results.

How do I assess each plant?

1. **Scan:** Scan upper surfaces of leaves as you walk, looking for signs of stippling or mining.
2. **Snap:** Take a photo of any suspicious damage and record a GPS point.
3. **Collect:** Take a sample of leaves bearing suspicious damage.
 - Place a sheet of paper towel into a large plastic freezer bag, followed by the affected leaves. Seal the bag, partially inflated, and place bag in a dark cool place (ideally a refrigerator).
 - Collect at least three mined leaves, but preferably as many as you can**.
 - Small orange pupae may collect at the bottom of the bag. These are very valuable for genetic identification, and greatly increase chances of identification.
4. **Call:** Immediately report the suspicious damage to **the Exotic Plant Pest Hotline on 1800 084 881**. This will put you in touch with the Department of Primary Industries or Agriculture in your state or territory.

*The recommendation of 10 sec/metre aims to maximise detection likelihood, based on experimental data that explored the trade-off between slower search pace and larger area coverage.

**At least three mined leaves must be collected and screened for a 90% chance that DNA will be detected.

FAQs

Can traps be used?

Commercially available yellow sticky traps attract adult VLM. If suspicious leafmining damage is observed and reported, traps should then be hung nearby, at plant canopy height, and remain hung for no more than 2 weeks. They should then be collected, gently folded sticky side inwards, placed in a sealed plastic bag, and then stored in a refrigerator (not freezer) until analysis can be arranged.

Can I confidently identify VLM under a hand lens or by the shape of the leaf mine?

Unfortunately, no. VLM are only identifiable in their adult stage, and even then only can be distinguished from native fly species by an expert. Moreover, leafminer fly species already found in Australia can create indistinguishable leaf mines on the same crops that could be affected by VLM, including brassicas, asters, beets and beans.

Molecular methods will be key for identifying incursions of VLM. This means sample collection is invaluable.

How can VLM spread?

Adults can disperse by wind, however, most spread overseas has been a result of human assisted movement. VLM can hitchhike on goods, aircraft, vehicles, or the movement of plant material. Eggs and larvae may be spread via live plant material or cut flowers. Plants showing no outward signs of infestation may already be harbouring eggs. Pupae may be spread with crop debris or soil coming from infested areas.

Where can I find a complete host list?

A complete host list for VLM will be included in a VLM Contingency Plan, available before the conclusion of the Hort Innovation Project MT16004. In the meantime, contact Dr. Elia Pirtle for a full list of VLM's possible host plants.

Contact Dr Elia Pirtle with any questions or feedback:

epirtle@cesaraustralia.com
03 9349 4723

Useful resources

- An interactive tool to explore VLM risk across region and season. <https://ausveg.com.au/biosecurity-agricultural/biosecurity/mt16004/>
- IPCC (2016). ISPM 27 Diagnostic protocols for regulated pests; DP 16: Genus Liriomyza. <https://www.ippc.int/en/publications/83446/>

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