Preparedness for the exotic vegetable leafminer in vegetable and nursery crops in Darwin, NT

Resource prepared for Hort Innovation project
MT16004 workshop February 2020

Actual size:

1-2 mm

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 monitoring for VLM is challenging, but support and resources are available.**
- **Early detection is vital, as inappropriate chemical use causes populations to flourish.**

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. The impact of VLM (left unmanaged) is predicted to be moderate-high across Darwin, NT (Figure 1).

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.

Hort Innovation

EXOTIC PEST - CALL THE HOTLINE IF SUSPICIOUS ON 1800 084 881

Seasonality

In Darwin, VLM risk is expected to be highest between late summer and late autumn, when the climate is most suitable for their growth (Figure 2). Early detection surveillance should focus on this period. Risk is expected to be lowest between late winter and early summer. See the 'Useful resources' section (pg 3) for a link to an online, interactive map to explore regional risk across season and crop at your location.

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 greenhouses, and repopulate the field in spring.

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. Early detection monitoring for VLM will ensure that correct chemical choices can be made as soon as VLM arrives, to avoid sudden outbreaks and crop losses, and to increase the chance of local containment or eradication.

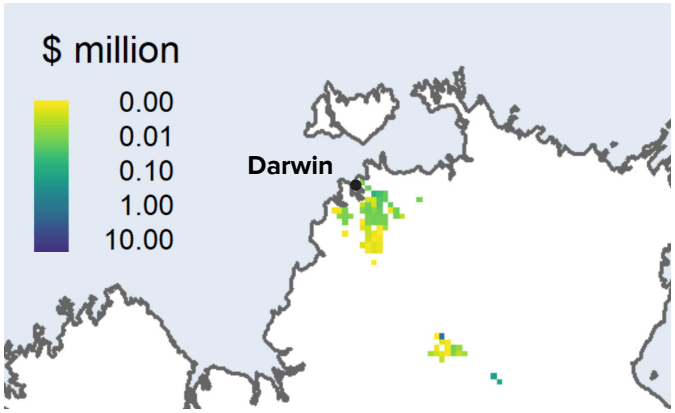
Where and when do I look?

Crops at risk (Figure 3) include tomato, capsicum, chilli, eggplant (Solanaceae), melon, pumpkin, squash, zucchini (Cucurbitaceae), and beans (Fabaceae). VLM also attacks weeds in other plant families such as Asteraceae and Brassicaceae. Ornamentals (e.g. snap dragon and petunia), and most Allium species, including onions and garlic are also at risk. Surveillance will be most important when a high risk season (Figure 2) overlaps with young crops.

What should I look for?

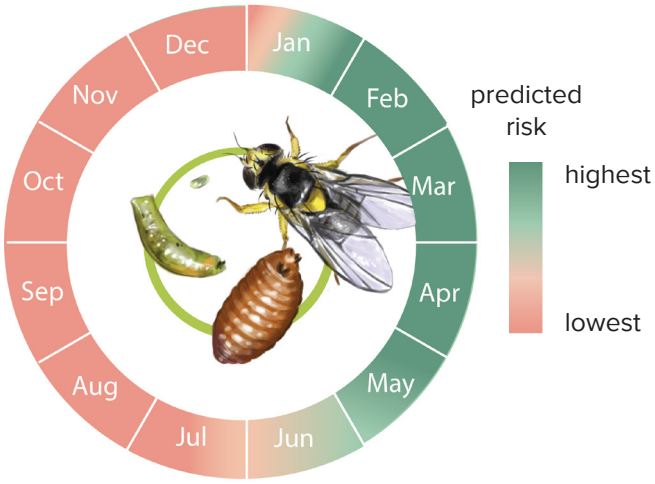
Adult VLM are very small, black and yellow flies that are difficult to see by eye. Surveillance should focus on the damage they create on plants (Figure 4), which includes white serpentine mines (A, B)

Fig 1. Predicted impact in Darwin



Predicted impact (in Australian dollars) of VLM in the greater Darwin, NT region, based on climate and crop value.

Fig 2. Predicted seasonality in Darwin



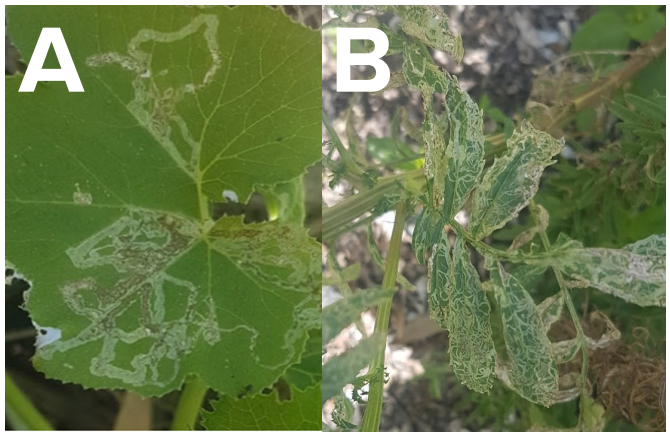
Average predicted seasonality of VLM within 100km of Darwin, NT.

Fig 3. Major crops at risk of VLM in Darwin

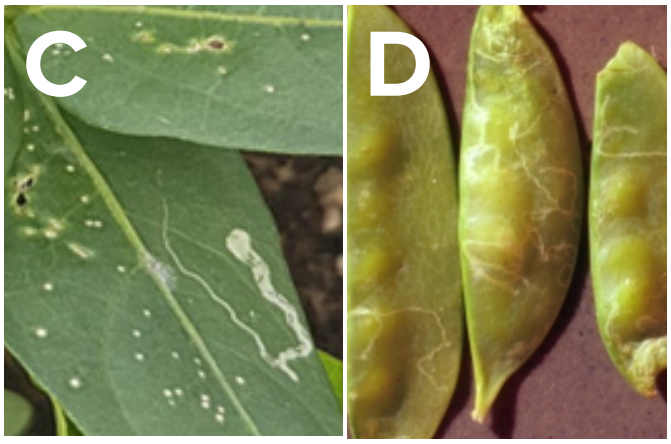
- Snake bean
- Okra
- Asian melons
- Melons
- Cucumber
- Capsicum
- Chilli

Major commodities grown in the Darwin, NT region that are at risk of VLM.

Fig 4. Symptoms on plants

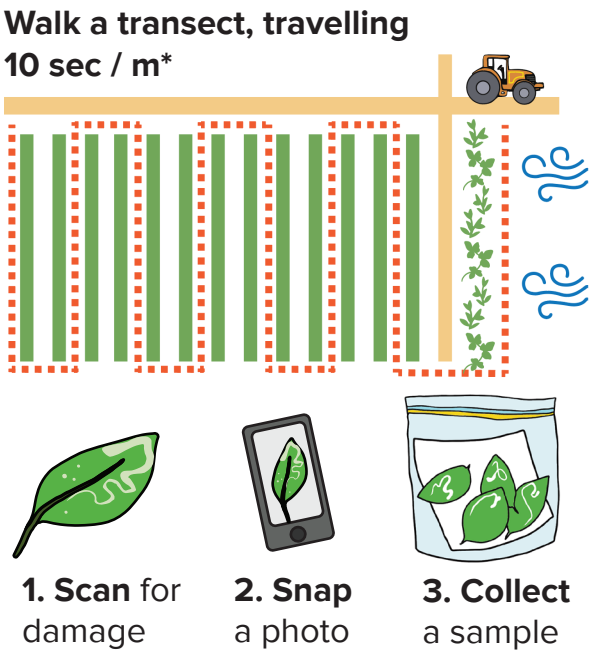


Moderate damage on melons (left) and heavy damage on marigolds flowers (right).



Stippling and mining damage on beans (left) and mining in bean pods (right).

Fig 5. Surveillance guidelines



and stippled appearance (C) on leaves. Fruits are unaffected, with the exception of bean pods which may show leaf mines (D).

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

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 3)
   - 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 (orange dotted line in Figure 5), which begins with any broadleaf weeds present along the highest risk edge of the block (grasses do not need to be inspected) and travel 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 the 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.
   - Label the bag using a permanent marking pen with the following information:
     - Your name; contact number; date; address, town, postcode; crop type.
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.

EXOTIC PEST - CALL THE HOTLINE IF SUSPICIOUS ON 1800 084 881

Frequently asked questions

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

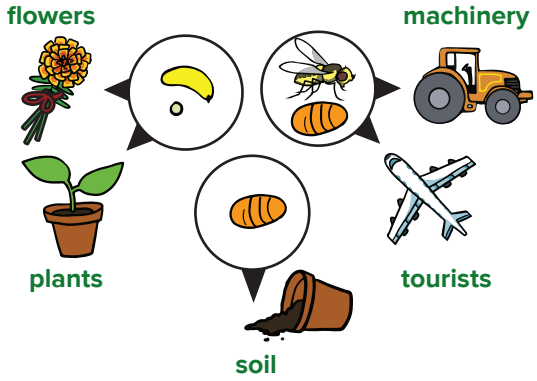
Unfortunately, no. VLM are only identifiable in their adult stage, and even then only can be distinguished from native fly species by an expert. Moreover, leafminer fly species already found in Australia can create indistinguishable leaf mines on the same crops that could be affected by VLM, including brassicas, Asteraceae, 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 (Figure 6). 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 associated with infested areas.

Fig 6. Human assisted spread



*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 any DNA present will be detected.

Useful resources

- An interactive tool to explore VLM risk across region and season. https://ausveg.com.au/biosecurity-agrichemical/biosecurity/mt16004/
- IPCC (2016). ISPM 27 Diagnostic protocols for regulated pests; DP 16: Genus Liriomyza. https://www.ippc.int/static/media/files/publication/en/2017/01/DP_16_2016_En_2017-01-30.pdf

Authors: Dr Elia Pirtle (**cesar**), A/Prof Paul Umina (**cesar**) and Dr Peter Ridland (University of Melbourne).

Illustration, graphic design and photos by Dr Elia Pirtle (**cesar**) unless otherwise specified.

Editing by Madeleine Quirk, AUSVEG.

Contact Dr Elia Pirtle with any questions or feedback:

epirtle@cesaraustralia.com
03 9349 4723

This project was made possible with support from the Torres Strait Regional Authority, the Kuarareg Native Title Aboriginal Corporation, the Torres Shire Council, myPathways, the Apudthama Land Trust, Seisia Enterprises and the NPA Regional Council.

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

1800 084 881

Hort Innovation

This project has been funded by Hort Innovation, using the vegetable and nursery research and development levies and contributions from the Australian Government. Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture.

cesar
Australian Government Department of Agriculture
The University of Melbourne
AUSVEG
Plant Health Australia