Spotted Wing Drosophila management: what changes would you need to make?

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Project update for 'Improving the biosecurity preparedness of Australian horticulture for the exotic spotted wing drosophila (*Drosophila suzukii*)' MT17005

The spotted wing drosophila (SWD) is not found in Australia, although it now has a large distribution around the globe. In this article we discuss what practices growers overseas are using to manage this fly and highlight what Australian growers should consider if management of this fly is ever required.

During this project we have collected reports of yield loss resulting from SWD infestation in a range of crops. Reported losses vary from no loss to 100% loss, with the majority yield loss reports arising from raspberry farms. Losses of 20-40% are most commonly reported.

At least some of the reported yield loss variability can be explained if factoring in the amount of time passed since the initial incursion. When analysing data from US farms, we found that there is a negative trend between time passing and yield loss (Figure 1), likely due to improved management practices over time.

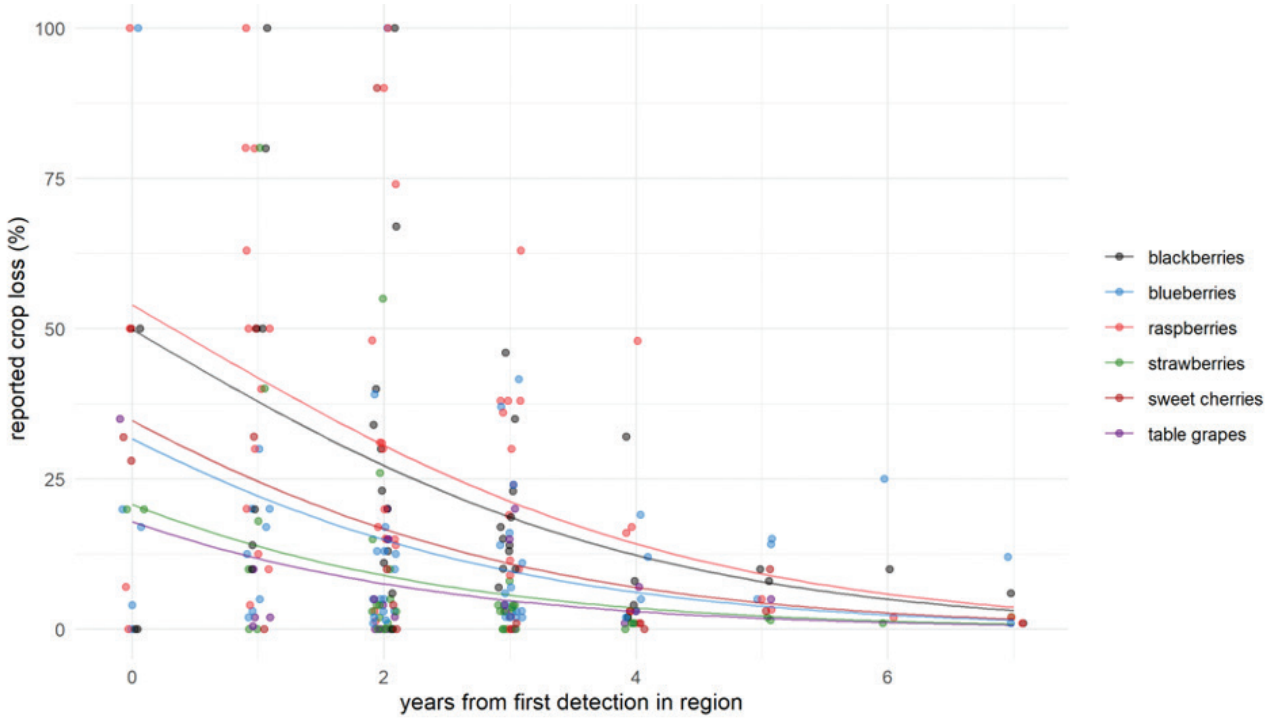

Figure 1.
Reported yield losses in host crops overseas over time. Source: Dr James Maino, *cesar*

Management overseas follows an integrated approach, with a heavy focus on cultural controls. In Australia, like overseas, management would involve introducing a range of practices to maintain crop quality and minimise losses. Table 1 highlights key considerations for management, based on current practices and findings overseas.

1. Generation time and fecundity

- A female fly lays 1-3 eggs per site and can lay up to 400 eggs throughout her lifetime.
- Population growth throughout a season is highly dependent on environmental conditions.
- SWD will rapidly increase its population size under mild conditions (approx. 22°C). See Table 2.

2. Host preferences

- Raspberries bear the brunt of egg laying compared to strawberries, blueberries, and blackberries.
- This may be due to the thin skin of the raspberry.
- Research into what drives preferences is ongoing.
- Use of the SWD Host Preference Index (Bellamy et al. 2013) indicates the following hierarchy: raspberry > strawberry > blackberry > cherry > peach > blueberry > grape

3. Microclimate manipulation

- A humid environment is important for SWD viability.
- Strategic pruning and plant spacing will allow for greater airflow, better chemical coverage and reduce shading.
- Research into optimised pruning methods is ongoing overseas.

4. Exclusion and mulches

- Exclusion netting must be at least 80 grams.
- Netting must be in place before SWD adults are detected in the area.
- Plastic weed barriers will stop larvae from burrowing into soil to pupate and will reduce presence of standing water, thus reducing humidity.

5. Chemical control

- If detected in Australia, the minor use and emergency permit system (and registrations) would support access to appropriate chemistry.
- Chemical control must be timed to target the adult.
- Overseas, regular use of a limited number of chemicals has increased risk of resistance.
- Flare-ups of secondary pests, such as scale, has also been an issue.

6. Natural enemies

- Hort Innovation funded research project reviewing Australian natural enemy options is underway (MT18010).
- Ground dwelling generalists, such as carabid beetles and earwigs are likely to have the greatest suppressive effect.

7. Reducing harvest intervals

- Reducing harvest intervals will:
  - reduce olfactory attractants from over ripe fruit
  - reduce number of preferred egg laying sites
  - reduce number of larvae that develop into adults, limiting population growth
- Past studies on raspberry indicate harvesting every two days gives good protection from egg lay and does not significantly impact yield.
- Harvesting every three days resulted in a noticeable difference, with more eggs and larvae detected.

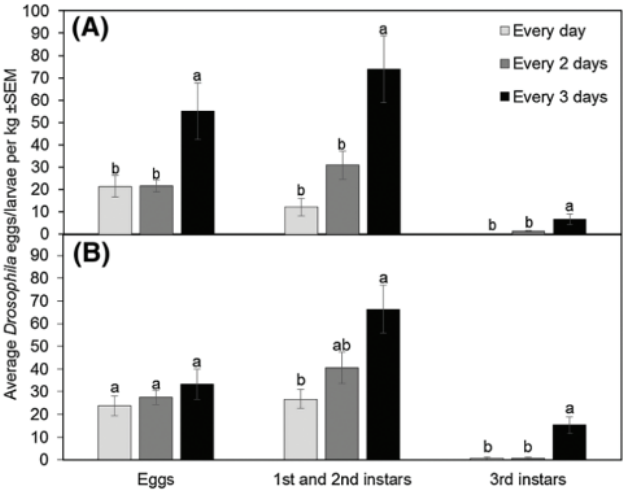

Figure 2. Effect of harvest frequencies on egg and larval presence. Source: Leach et al. (2017)

8. Quality control

- The floatation test is often used as a batch test for infected fruit.
- Training packing line workers to remove fruit with feeding symptoms (sunken blemishes on fruit are an indicator) adds another layer of quality control.

Table 1. An integrated approach to SWD management, drawing from learnings overseas

Chemical	Cultural	Biological
Several products registered overseas Applications must be timed to kill adults (aided by precision monitoring) Overusing of actives has led to resistance risks	Netting Shorter harvest intervals Careful canopy pruning Row mowing Laying plastic mulch Mass trapping / precision monitoring Waste disposal measures Quality control procedures (e.g. floatation tests)	No single parasitoid has been found to offer good suppression overseas Ground dwelling generalist natural enemies are known to help 'mop up' larvae and pupae Australian native parasitoid wasps of drosophila species may offer ecosystem services (research is ongoing)

Table 2. The fastest scenario for population increase, based on work by Tochen et al. (2014)

	Generation Time		Reproductive Rate	
Temperature (°C)	**Cherry**	**Blueberry**	**Cherry**	**Blueberry**
14	43 days	39 days	Low	Low
22	24 days	25 days	High	High
28	12 days	12 days	Very low	Very low

9. Waste disposal

- Fruit waste is removed during and after harvest. This includes fruit that has already dropped.
- Waste is sealed in pallet bins or drums. Fermenting of waste for 2-4 days at 18°C, creates an anaerobic environment that will kill larvae.
- In Australia, the wide climatic zones spanned by host fruit growing regions will necessitate unique regional management recommendations. If there is an incursion, it is possible that efficiencies could be made by aligning certain practices with those used to manage Queensland fruit fly or Mediterranean fruit fly depending on location. In the next article we discuss how monitoring may be used for best advantage for early detection and management of SWD.

References:

Bellamy, D et al. (2013) PLOS ONE, 8(4), 1–10.

Leach, H. et al. (2017) Journal of Pest Science, doi.org/10.1007/s10340-017-0873-9

Sial, A. et al. (2017) SWD in Organic Berry Crops. Management Guide.

Tochen, S. et al. (2014) Environmental Entomology, 43(2), 501–510

Attribution:

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