

Managing Queensland fruit fly in citrus

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Introduction

Queensland fruit fly (*Bactrocera tryroni*) is a serious pest of most fruit in Queensland and parts of NSW. Queensland fruit fly (QFF) prefers humid conditions but can also survive in the drier urban and irrigated areas in the south and south-western of NSW. It is most prevalent from October to May.

Although citrus is not the most favourable host for QFF because of its thick skin and rind oil, most citrus varieties can be attacked. Some varieties are more attractive than others, especially Meyer lemon, mandarins and grapefruit. Valencia oranges and grapefruit that are held on the tree over summer have the highest risk, as that is when QFF is most active. Although Navels are harvested in winter when QFF activity is low, daytime temperatures can be sufficient to facilitate short periods of QFF activity. There have been instances of Navel fruit infested with QFF during winter.

The highest threat period for citrus is when fruit starts to become mature (i.e. from colour break). Immature green fruit are not a preferable host, however, they can be stung and become a breeding site. This fruit might fall off the tree before harvest. Fruit damage can be high when there are no other suitable hosts and high numbers of flies or fruit with thin skins or previous damage (e.g. splitting, hail damage).

Queensland fruit fly severity is highly variable, with some orchards requiring continuous action (i.e. close to infested towns or neighbours with unmanaged fruit trees) and others requiring occasional action when incursions occur (i.e. isolated blocks/districts).

In most cases, QFF enters commercial orchards by people bringing in infested fruit. This emphasises the importance of good orchard quarantine practices that prohibit fruit from being moved into the orchard. Once established in an orchard, QFF slowly move out to surrounding areas.

Queensland fruit fly is generally a localised orchard problem. Research indicates that fruit flies only move several hundred metres in their lifetime. Where QFF is not managed, it will continue to be a problem in the following year.

When orchards are actively managed for QFF, numbers can be reduced to low levels. It is important for citrus growers to manage QFF appropriately for their site conditions. The key to managing QFF is to monitor and, if threshold levels are exceeded, immediately start control measures.

In addition to the direct damage QFF can cause to fruit, an infestation can have serious implications for the movement of fruit beyond and within states, especially for export. A QFF detected at a quarantine-sensitive market can quickly shut down trade and affect fruit prices.

Description and lifecycle

The adult QFF body is about 6–8 mm long, and reddish-brown with yellow markings (Figure 1).

In early spring, over-wintering adult flies become active and the females lay eggs in suitably mature fruit. Larvae develop in the fruit and the fruit fly population continues to build up as more fruit becomes available for infestation. By late summer-autumn, fruit fly populations can be sufficient to readily infest

any suitable unprotected fruit until cold weather comes in late autumn. QFF overwinter mostly as adults who shelter in protected locations and are difficult to find. QFF can also enter a region via the transport of infested fruit from endemic areas.

The female lays several hundred eggs during her lifetime. She lays about six eggs at a time about 3 mm deep in the fruit (Figure 2). In 2 or 3 days, tiny larvae (maggots) hatch from the eggs and burrow towards the centre of the fruit. The larvae develop through three stages and are about 6–8 mm long and yellowish when fully grown (Figure 3). When fully fed the larva pupates, usually in the soil beneath the tree (Figure 4).

The larval and pupal stages each take from 9 days to several weeks, depending on temperature. At least 7 days elapse before the newly emerged adult female lays eggs.

The adults can live for many weeks and the females continue to lay eggs. There can be five or more overlapping generations during spring, summer and autumn. Fruit flies are most active in the early morning and late afternoon, resting in shaded spots during the hottest part of the day.



Figure 1. Adult Queensland fruit fly.



Figure 2. Queensland fruit fly eggs (about 1 mm).



Figure 3. Queensland fruit fly larvae (6–8 mm).



Figure 4. Queensland fruit fly pupae (6–8 mm).

Fruit fly stings

The egg-site punctures in the fruit are commonly referred to as 'stings' (Figure 5). To identify them, make a shallow cut through the skin and look with a hand lens for the egg cavity containing eggs or the remains of hatched eggs. Eggs are small (about 1 mm), white and banana-shaped. In citrus the sting mark might be a brown depressed spot, or have only a vague, bruised appearance; on green citrus fruit the skin can colour prematurely around the sting site.

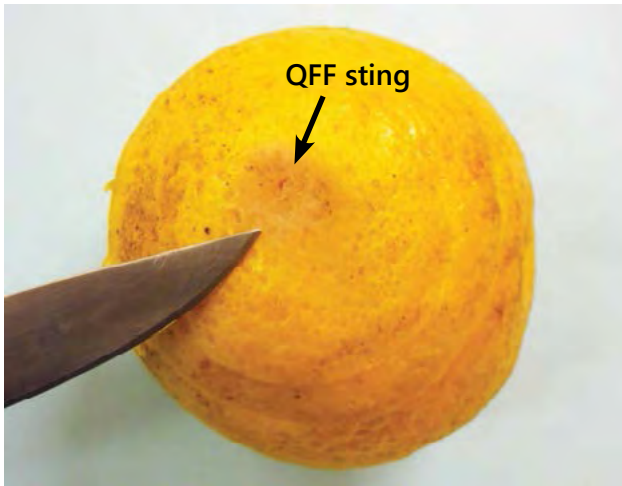


Figure 5. Fruit stung by Queensland fruit fly often get secondary fungal infections such as sour rot, brown rot or blue and green moulds.

Damage to fruit

Fruit infested with QFF larvae usually fall from the tree. Damage by larvae tunnelling in the fruit varies with the type and maturity of the fruit, the number of larvae in it, and the weather (Figure 6). Often citrus fruits, although stung, do not develop larvae, but the stung fruit sometimes fall (Figure 7). Larvae can successfully develop in most citrus varieties including fruit on *Citrus trifoliata* rootstock.

Queensland fruit fly control

In districts where QFF occurs, harvest fruit as early as possible. Fruit fly populations increase as the season advances and temperatures become warmer. As the fruit ripens it becomes more attractive to the egg-laying females. Do not send damaged or fallen fruit to the packing shed; dispose of reject fruit properly.

There are several chemicals registered for the control of QFF in citrus. For information on registered chemicals or chemical permits, visit the [APVMA website](http://www.apvma.gov.au) (www.apvma.gov.au) or contact your local chemical services provider or agricultural advisor.

Monitoring

The current recommendation is for one trap to be placed every 10–20 hectares (about 300–450 m apart). A higher density will improve detection and identify problem areas, but will also increase the time taken to monitor traps. One strategy is to install as many traps as possible that can feasibly be monitored weekly. For example, on a 40-hectare orchard, installing

four traps is a reasonable starting point. If you find one male fly in a trap, it might be a wind-blown traveller, but it is a good prompt to be ready to respond.

If you find more than one male fly, it could indicate a local problem. Try to identify the source by installing additional traps (i.e. at the four corners of the orchard).

Orchard management

If QFF are continually trapped in one part of the orchard, investigate the possible cause (i.e. neighbouring trees) and, if possible, remove the cause, which could be an alternative host tree (e.g. stone fruit/loquat tree).

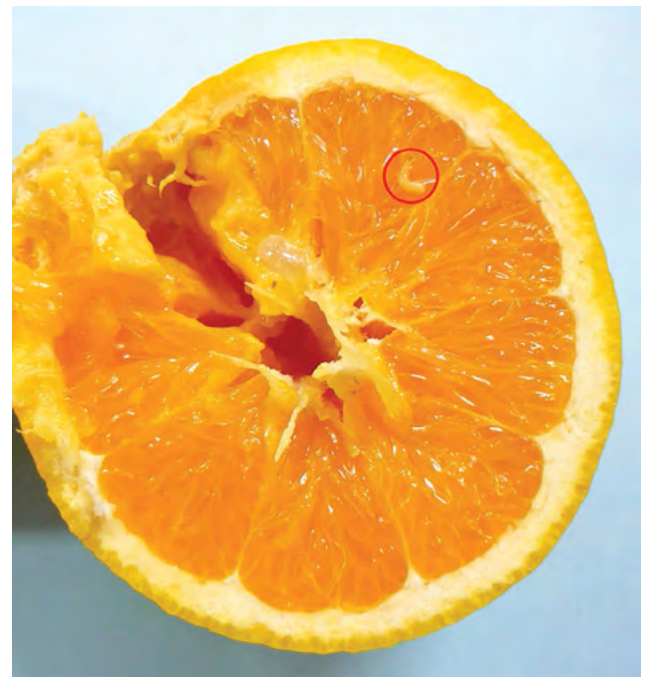


Figure 6. An orange with signs of Queensland fruit fly attack and larva (in red circle). Photo: Andrew Creek.

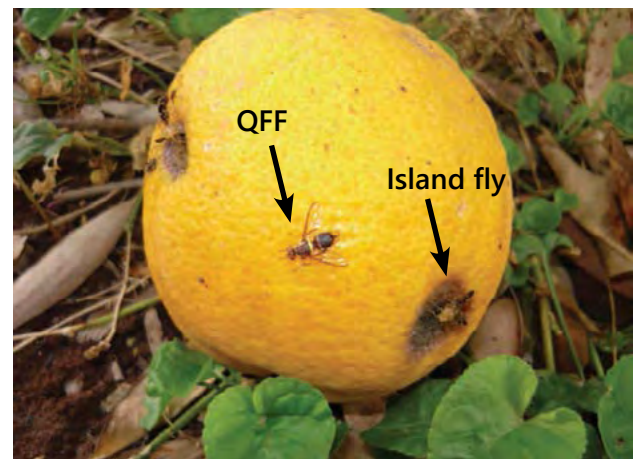


Figure 7. Fruit flies laying eggs in fallen fruit.

The best long-term results are achieved when neighbours work together to implement an area-wide coordinated control program. Explain the situation and perhaps offer to remove trees and provide and plant alternative trees.

If orchard blocks are close to a source of high QFF pressure, they might require continual control action. If traps or killer pads are placed at high densities they can also help to reduce QFF populations. A combination of male attracting pheromone traps and female biased protein traps could be appropriate. This could be an option for high risk areas of the orchard (e.g. near a neighbouring unmanaged backyard tree).

If the block becomes heavily infested, refer to the [APVMA website](http://www.apvma.gov.au) (www.apvma.gov.au) for treatment options, but discuss treatment plans with your packing house before application; a cover spray on mandarins might disqualify a postharvest treatment. Always follow label directions. After harvest, remove infested fruit (rake and mulch) and possibly apply a registered orchard postharvest insecticide ground treatment. Heavy infestations should not occur if a bait spraying program is properly implemented.

Orchard hygiene

Orchard hygiene is an important part of QFF management. Make sure you:

- remove unwanted fruit trees from around sheds, houses and along boundary fences
- control QFF in all other host plants
- remove all late hanging fruit missed during harvest
- pick up and properly dispose of fallen fruit
- do not send damaged or fallen fruit to the packing shed
- maintain good orchard hygiene.

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Disclaimer

The information contained in this publication is based on knowledge and understanding at the time of writing (March 2021). However, because of advances in knowledge, users are reminded of the need to ensure that the information upon which they rely is up to date and to check the currency of the information with the appropriate officer of the Regional NSW or the user's independent advisor.

Always read the label

Users of agricultural chemical products must always read the label and any permit before using the product and strictly comply with the directions on the label and the conditions of any permit. Users are not absolved from any compliance with the directions on the label or the conditions of the permit by reason of any statement made or omitted to be made in this publication.

Pesticides

Pesticide use is administered by the Australian Pesticides and Veterinary Medicines Authority (APVMA). The Environment Protection Authority administers the Pesticides Act 1999 and Pesticides Regulation 2017, which controls pesticide use in NSW. The primary principle of the Pesticides Act is that pesticides must only be used for the purpose described on the product label and label instructions must be followed.