

# Managing Queensland fruit fly in citrus

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## Introduction

Queensland fruit fly (*Bactrocera tryoni*) 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 regions of NSW. It is most prevalent from October to May.

Most citrus varieties can be attacked by QFF but some varieties are more attractive than others, especially Meyer lemon, mandarins and grapefruit. Citrus is not the most favourable host for QFF because of its thick skin and rind oil, which can kill eggs and larvae.

Citrus fruit are normally stung when they are silver green, just changing colour to fully coloured. Fruit damage can be high in situations when there are



Figure 2. Adult Queensland fruit fly.

no other suitable hosts and there are high numbers of flies or fruit have thin skins or are already damaged (splitting, hail damage).

In addition to the direct damage QFF can cause to fruit, an infestation can have serious implications for movement of fruit beyond and within states, especially for export. Southern NSW is on the edge of the Queensland fruit fly's natural range.

A trade zone called the Fruit Fly Exclusion Zone (FFEZ) has been established to maximise access to export markets by maintaining freedom from fruit flies within that zone. The main horticultural production areas in this zone include Griffith, Narrandera, Leeton, Hillston and Broken Hill in NSW; Shepparton, Swan Hill and Mildura in Victoria and Waikerie and Renmark in SA (Refer to Figure 1).

## Description and lifecycle

The adult QFF body is about 6–8 mm long, and reddish brown with yellow markings (Figure 2). In early spring, over-wintering adult flies become active and the females lay eggs in suitably mature fruit. Larvae develop in these fruit and from then on the fruit fly population builds up as successions of suitable fruit become available for infestation. By late summer–autumn, the flies can be very numerous and readily infest any suitable unprotected fruit until the onset of cold weather in late autumn. QFF overwinter



Figure 1. The Fruit Fly Exclusion Zone (FFEZ).

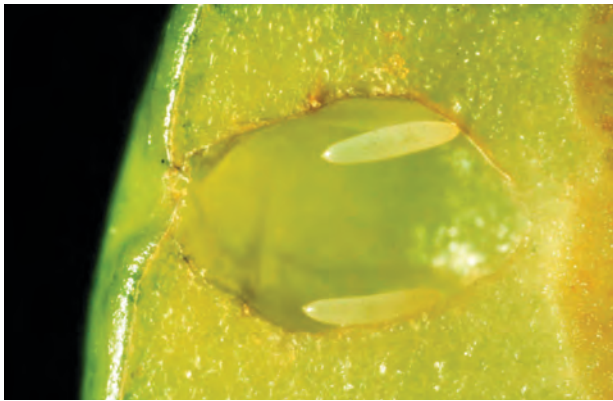


Figure 3. Queensland fruit fly eggs (about 1 mm).



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



Figure 5. Queensland fruit fly pupae (6–8 mm).

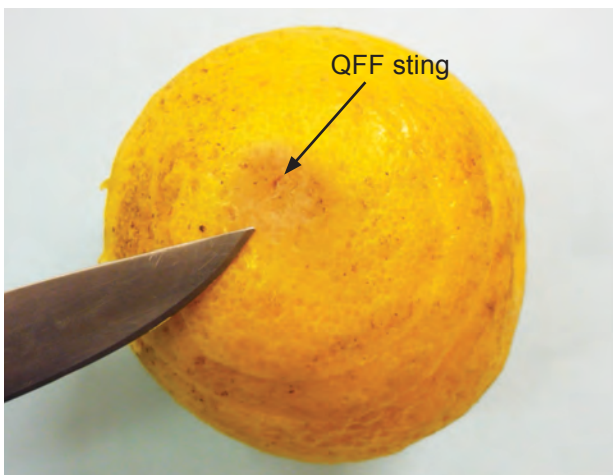


Figure 6. Fruit stung by Queensland fruit fly often get secondary fungal infections such as sour rot, brown rot or blue and green moulds.

mostly as adults which shelter in protected locations and are difficult to find. QFF can also enter a region via 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 3). 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 4). When fully fed the larva pupates, usually in the soil beneath the tree (Figure 5).

The larval and pupal stages each take from 9 days to several weeks, depending on temperature. At least a week elapses before the newly emerged adult female lays eggs. The adults can live for many weeks and the females continue to lay eggs. There may be five or more overlapping generations during spring, summer and autumn. Fruit flies are most active in the early morning and late afternoon and rest in shaded spots during the hottest part of the day.

## Fruit fly 'stings'

The egg-site punctures in the fruit are commonly referred to as 'stings' (Figure 6). 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 in colour and banana shaped. In citrus the sting mark may 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.

## Damage to fruit

Fruit infested with QFF larvae usually falls 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 7). Frequently citrus fruits, although stung, do not develop larvae, but the stung fruit sometimes fall (Figure 8). Larvae can successfully develop in most citrus varieties including the fruit of the rootstock *Citrus trifoliata*.

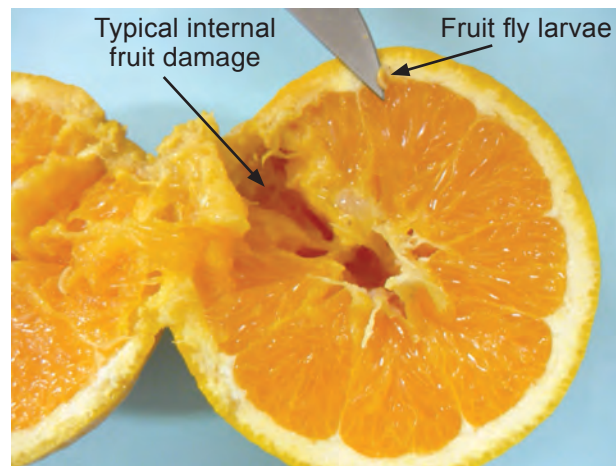


Figure 7. Orange attacked by Queensland fruit fly – showing damage around site of sting and developing larvae.



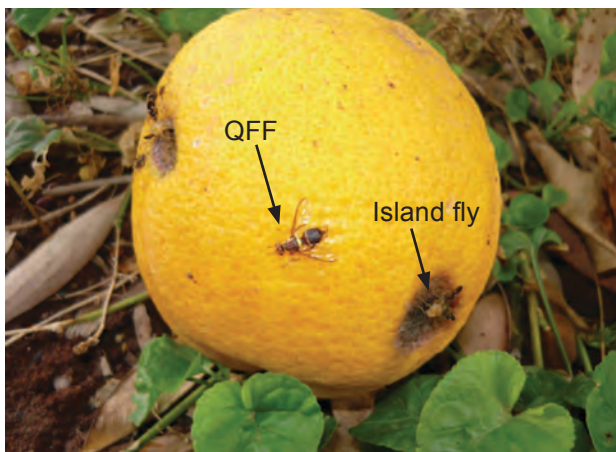


Figure 8. Queensland fruit fly laying eggs in fallen fruit.

## Control of Queensland fruit fly

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 and dispose of reject fruit properly.

There are a number of chemicals registered for the control of QFF in citrus. They can be described according to how they are used in controlling QFF. For information on registered chemicals or chemical permits visit the APVMA website ([www.apvma.gov.au](http://www.apvma.gov.au)) or contact your local chemical reseller or agricultural advisor.

## Traps and lures

Parapheromone traps are used to monitor male fruit fly populations in orchards. Traps consist of the trap and a lure which contains a mixture of the male attractant or parapheromone and an insecticide. The lures in the traps attract only the male fruit fly, which are then killed. Traps are hung in trees and best placed in the east or north east side of the tree out of direct sunlight. The lures are effective for about 3 months.



Figure 9. Parapheromone trap used to monitor male fruit flies.

The traps are effective and convenient for detection of fruit fly but they do not control it. They are an important tool for monitoring the efficacy of bait and spray programs. There are a number of other fruit flies that are often captured in these traps such as Island fly and Callantra. These are not pest fruit flies.

Some products are used as lure stations and not actually placed in traps. The lures are hung in trees and can attract and kill male fruit flies, but they do not catch the flies in a trap. Lure stations are not used to monitor fruit fly populations.

Traps and lures can be purchased from your local agricultural supplier.

## Baits

Bait mixture is prepared using an attractant (protein source) and an insecticide. Flies are attracted to the protein which they require for egg maturation. As they feed they are killed by the insecticide. The insecticides used in bait sprays include maldison, chlorpyrifos, spinosad and trichlorfon. The protein source is either yeast autolysate or hydrolysate.

### Application of baits

Bait mixtures should be used according to label directions. Bait sprays are usually applied as a band or spot spray to the lower foliage or skirts of trees. Recommended rates are about 50–100 mL (use the lower rate on smaller trees). The bait is usually applied to every tree in every second row. Alternate the bait spraying between the rows and the side of the tree it is applied to. Bait mixture that makes contact with fruit can cause fruit burn.

Baiting should commence at least 6 weeks prior to ripening. Apply weekly or after heavy rain when fruit fly are active. Baiting is more effective when carried out in the morning when the fruit flies are most active.

## Cover Sprays

In most areas, cover sprays are not normally cost effective or necessary in treating large commercial plantings of citrus trees. However, in areas of high fruit fly pressure cover sprays are sometimes used. Cover sprays should be applied according to label directions.

The two pesticides registered for use as cover sprays for QFF control in citrus are dimethoate and fenthion — both of which are currently being reviewed by the Australian Pesticides & Veterinary Medicines Authority (APVMA).

In October 2011 the APVMA suspended the use of dimethoate on many food crops. The suspension will last until 5 October 2012 after which new regulations on its use may be enacted. The current suspension prohibits the use of dimethoate on certain horticultural crops and on food producing plants in the home garden.

Dimethoate is still able to be used as a preharvest treatment on citrus crops and this use is covered in a permit (PER 13155, expires 5 October 2012). Dimethoate may damage some varieties of citrus e.g. Meyer lemons, seville oranges and kumquats.

Another permit (PER 13158, expires 5 October 2012) also allows the use of dimethoate as a postharvest treatment for fruit fly on citrus varieties (excluding kumquats). For mandarins the postharvest use does not apply if dimethoate has been used as a preharvest treatment. The permit states: *“DO NOT treat mandarins that have received a preharvest treatment with dimethoate. Only mandarins that have not been treated preharvest may receive a postharvest treatment under this permit”*.

Fenthion is also under review by the APVMA and possible outcomes of that review may affect fruit fly control methods in the near future. However at this time current product uses for citrus still apply.

## 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
- ✓ don't send damaged or fallen fruit to the packing shed
- ✓ maintain good orchard hygiene.

## Further information

Queensland fruit fly, NSW DPI Primefact 1186 @ [www.dpi.nsw.gov.au](http://www.dpi.nsw.gov.au)

NSW DPI Fruit Fly webpage @ [www.dpi.nsw.gov.au/agriculture/pests-weeds/insects](http://www.dpi.nsw.gov.au/agriculture/pests-weeds/insects)

## Acknowledgements

This is the second edition of Primefact 752 replacing 'Managing Queensland fruit fly in citrus' by S Hardy, G Campbell and A Jessup, November 2007.

Photos courtesy of NSW DPI.

**Always read the label: Users of agricultural (or veterinary) 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 compliance with the directions on the label or the conditions of the Permit by reason of any statement made or not made in this publication.**

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