POME FRUIT | ON-FARM FRUIT FLY MANAGEMENT

FRUIT FLY SPECIES

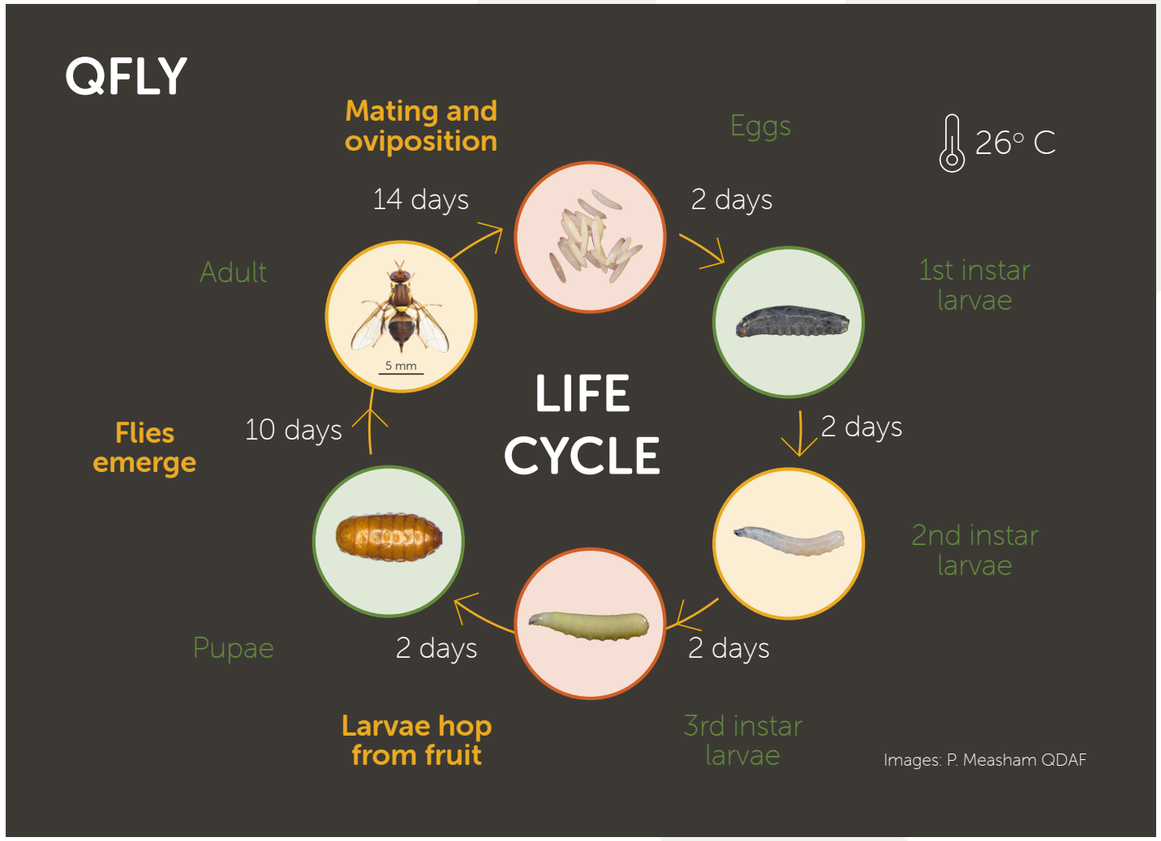
There are numerous species of fruit flies around the world, however, only some cause significant damage to commercial crops. The two economic species in Australia are Queensland fruit fly (Qfly, *Bactrocera tryoni*) and Mediterranean fruit fly (Medfly, *Ceratitis capitata*).

For more information on fruit fly species and their identification refer to fruitflyidentification.org.au, including flies present in Australia and those of biosecurity concern.

LIFE CYCLE

The life cycle of fruit flies is a complex process involving multiple developmental stages. Understanding each of the stages is important, as different control techniques are more effective at different stages. The developmental stages may also be extended by cooler weather. Fruit fly cause damage to fruit by laying their eggs within the host. The eggs hatch into larvae which then, aided by bacteria, consume the fruit and leave it unmarketable.

The time for the various life cycle stages is dependent upon the species and prevailing climatic conditions. Larval and pupal stages can be completed in as little as two weeks in ideal conditions. Below is an indicative life cycle of Qfly at 26°C.



MONITORING

Monitoring is an ongoing survey which can be used to indicate the presence or absence of pests and if their numbers are increasing or decreasing. Although monitoring will not indicate the exact numbers of a pest, it is useful in informing if control strategies are working and to highlight any specific areas needing further attention. Monitoring is also conducted by government agencies in certain regions to assist with claims of area freedom.

Lures - Monitoring employs the use of specific lures (para-pheromones) which are attractants to male fruit flies. Different lures attract different fruit fly species. Refer to fruitflyidentification.org.au for more information. Not all lure responses are the same, some lures are very attractive and can attract flies from long distances and some fly species may not be attracted to lures at all. As part of the process, the lure is combined with an insecticide in a trap. It is important that the insecticide used is fast acting to ensure that the fly is caught within the trap and killed.

Trap types - In combination with the various lures there are several different trap types available, including Lynfield, McPhail and Biotraps to name a few. Whilst each trap type has its own features, most follow a similar principle using a dispenser for an appropriate lure and a fast-acting contact insecticide.

Trap placement - Traps are generally placed in a 400m grid, however more traps may be employed in high-risk areas such as near water courses or unmanaged hosts. The placement of individual traps is important also and should be located within the tree canopy or in sheltered positions, in shade during warm periods and in light during cooler periods.

Trap Checking - Traps should be checked weekly during the active season and less frequently (fortnightly – monthly) at other times. Records should be kept of the number of flies caught and the location of the trap. Information gained from monitoring activity will help to inform the frequency of control actions. This, combined with knowledge of the property, may highlight areas of increased risk.

SOURCES OF INFESTATION

Understanding the likely sources of infestation is vital in effectively managing fruit fly and prioritising where to act. Isolating your crop as much as possible from the sources of infestation is very important.

Urban gardens and backyards - Urban gardens and backyards offer refuge to fruit flies by providing safe shelter and a microclimate which assists over wintering. Urban areas also provide a wide range of hosts which help bridge the seasonality of commercial hosts and can act as a constant breeding ground.

Alternate hosts - Many significant pest species of fruit fly are polyphagous, meaning that they have more than one host. Bearing this in mind, there may be alternate hosts in neighbouring properties. When checking your farm don't overlook your own non-commercial fruit and vegetable plantings and amenity plants in your backyard. For example, loquats used in amenity plantings are an early alternate host which may support rapid population growth following winter.

Feral trees - Feral trees are host fruit trees growing in unmanaged areas, often spread by birds. Whilst their potential impact is variable, they do represent a risk which should be managed.

Abandoned or neglected orchards - Abandoned orchards can still produce considerable amounts of fruit and are a potential source of flies as well as other pests and diseases. As such they need to be managed, particularly if they remain near active horticultural enterprises. It should be acknowledged that whilst addressing the issue of abandoned orchards is difficult, effort should still be made.

Other pathways - There are a range of other pathways requiring awareness and management. This includes employees and visitors on site, fruit bins, dump sites on farm and at packing sheds to name a few.

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This resource was developed by Plant Health Australia and the National Fruit Fly Council and funded through the Commonwealth Government. For more information, please visit preventfruitfly.com.au

CHEMICAL TOOLS

A concerning trend around agricultural chemical use, is its level of acceptance by consumers and regulators locally and internationally, and whilst a chemical tool may be available does not mean it is acceptable. The following table notes current registrations for Fruit Fly management in pome fruit crops and potential risks to future access based upon international reviews.

Fruit fly control options	Chemical Group	Use	WHP (days)	Regulatory risks
Abamectin	6	Bait spray - Fruit flies (PER91073–SA Biosecurity)	nr	EU: Use restricted to permanent greenhouses
Clothianidin	4A	Cover sprays–Fruit flies	7	APVMA: Under review Canada: Field uses cancelled or amended EU: Not authorised USA: Re-registration with new risk mitigation measures
Dichlorvos	1B	Fruit flies (PER6338– SA Biosecurity) (Trap toxicant)		Codex: No relevant MRLs EU: No authorisation in place
		Trap toxicant (PER13785–WA-DPIRD)		
Dimethoate	1B	After final harvest orchard clean-up (PER13859)	nr	Codex: No MRLs EU: Not authorised
Fipronil	2B	Bait stations–Qfly & LQfly		APVMA: Under review Codex: Re-evaluation completed, many MRLs withdrawn EU: No authorisation in place USA: Under review
Lambda-cyhalothrin	3A	Soil drench (PER12961–SA Biosecurity)	nr	EU: Candidate for substitution
MagMed	3A	Medfly Attract and kill–(PER92548)		
Malathion	1B	Bait/band spray–Qfly	3	APVMA: Review nearly complete, Fruit Fly bait spray use retained Codex: Re-evaluation scheduled for 2025/26. European Union: Use restricted to permanent greenhouses only.
		Male annihilation technique–Qfly (Qld only) (PER1205)		
		Trap toxicant (PER13785–WA-DPIRD)		
Pyrethrins	3A	Clean-up spray prior to harvest	1	Canada: Under review
Spinetoram	5	Cover sprays–Fruit flies (PER12590)	3	
Spinosad	5	Bait/band or spot spray		European Union: Under review for re-authorisation
Thiacloprid	4A	Cover spray–Medfly (PER14562)	21	
Trichlorfon	1B	Bait/band spray		
		Cover spray (PER12450)	7 cover spray	APVMA: Nominated for review. Codex: No MRLs. European Union and United States no authorisations or MRLs

Notes: Excludes Persimmons
PER91073 expires 31 May 2023
PER13785 expires 30 April 2024
PER12961 expires 31 March 2025
PER1205 expires 30 June 2028
PER12590 expires 31 May 2024
PER6338 expires 31 March 2025
PER13859 expires 31 July 2024
PER92548 expires 30 September 2025
PER14562 expires 30 September 2023
PER12450 expires 30 November 2025

Access risk rating:

R1	Short-term: Critical concern over retaining access
R2	Medium-term: Maintaining access of significant concern
R3	Long-term: Potential issues associated with use. Monitoring required

As with any agrichemical it is important to note the following: Treatments should not be employed in isolation but as part of a systematic approach to pest management. An over-reliance on one treatment can lead to a loss in efficacy due to resistance build-up and selection for resistant strains. Where possible, modes of actions should be rotated to avoid the development of resistance issues. Refer to the Australian Pesticides and Veterinary Medicines Authority (APVMA) for the most current registrations and permits. Note that pesticides must only be used for the purpose described on the product label, label instructions must be followed, and application should only be completed by a person competent to do so.

LURE AND KILL TECHNIQUES

Lure and kill techniques act by attracting the fly to a location and then killing it via an insecticide or other method. A trap in this instance is not essential as the objective is to kill the flies, not to trap them for monitoring purposes.

Protein bait spray - Protein is essential for the development of fruit flies and is required before sexual maturity is reached. Protein sources are a good attractant for both males and females, and when combined with an insecticide can be a very effective control option. Commercial protein products are available in varying formulations including gels, pastes and liquids and should be applied at least weekly and reapplied after rainfall events. Protein sprays may cause fruit burn, so caution should be exercised in application.

Male Annihilation Technique (MAT) - The Male Annihilation Technique or MAT uses a combination of an insecticide and parapheramone to kill male flies like monitoring, however this uses a block of absorbent material instead of a trap. MAT blocks need to be replaced every few months depending upon weather, to ensure that the insecticide remains effective.

As MAT often uses the same lures and insecticides as monitoring, any trap data you gather should be used carefully, as low male trap captures may suggest a decrease in population when female numbers in the crop may actually be increasing. MAT is more effective when used in combination with protein bait spraying.

Mass trapping - Mass trapping uses a high density of traps to reduce a pest population. Commonly mass trapping uses wet-based traps in which flies drown, combined with protein, ammonia or other food-based volatile attractants, although dry traps may also be used. Mass traps need to be cleared regularly to reduce the build-up of dead flies and to limit attractiveness to non-target insects. Although not employed as often, sticky traps may also be considered a mass trapping tool.

OTHER CONTROLS

Hygiene – Maintaining good on-farm hygiene is beneficial not only for managing fruit fly but for a wide range of other pests and diseases. Practicing good hygiene includes removing unwanted or neglected host trees, removing all remaining fruit after harvest, and destroying fallen fruit. Packing shed fruit dump sites are also a source of poor hygiene if not managed.

Physical protection - There are a range of physical protection methods including netting and bagging for managing flies, but the costs associated with these may be prohibitive. Among other advantages, protected cropping offers excellent benefits in controlling flies, particularly if control strategies are employed in surrounding areas to reduce pest pressure. Barrier sprays such as Kaolin clay and horticultural oils have been used, although with mixed results.

Area Wide Management (AWM) – AWM is an approach which recognises that pest insects, including fruit flies, move within the environment and that coordinated action across a region by multiple stakeholders is essential for control. For more information refer to https://area-wide-management.com.au/

It is important that multiple control tools are employed to ensure the best management results are achieved and that a single tool is not relied upon. Commonly MAT, protein bait sprays and hygiene are used together to achieve satisfactory control of fruit flies.

FUTURE FOCUS

Tools to combat fruit fly are in continual development and as we move towards a chemically limited future, these will gain increasing importance. Some examples include:

Sterile Insect Technique (SIT) - Although a mature technique, SIT remains widely in the domain of government as an incursion response tool. Future opportunities include the use of SIT as a pest suppression tool and options for commercial availability.

Biological controls - including parasitoids (as well as augmentoria) nematodes, viruses and other entomopathogens, and biopesticides offer significant opportunities for increasing our fruit fly management toolbox.

Synthetic biology and genetic tools - examples include rNAI, gene drives and derivatives, although social licence concerns need to be addressed before wide-scale employment of such tools.

Digital tools - Smart traps, farm-based modeling and decision support tools will help to improve monitoring and our management responses and will greatly assist our on-farm controls.

Novel chemistry - including the development of new pesticides and importantly lures to attract fruit flies.

Plant breeding - for crop varieties less susceptible or resistant to fruit fly damage.

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