

QUEENSLAND FRUIT FLY OUTBREAK ACTION PLAN

COMMERCIAL ORCHARDS IN RURAL AND PERI-URBAN LOCATIONS

The following is a list of steps, with options to implement them, in response to a declared outbreak of Queensland fruit fly (QFF) in rural area producing commercial fruit fly host fruit. These steps and options will be given to affected owners/ managers by an appointed representative of the Qff Governance Group both verbally and in written (e.g. information leaflet) format.

Steps

- 1. Visit outbreak site/s**
- 2. Talk to affected people**
- 3. Distribute information sheets**
- 4. Discuss Qff management options**
- 5. Discuss legal requirements regarding pesticide usage, obligations under the Act/s re control of Qff in an orchard**

Information sheets

- 1. Orchard hygiene**
- 2. Host removal**
- 3. Approved pesticides**
- 4. Traps, MAT and baits**
- 5. Pest exclusion**

Explanation

1. Orchard hygiene

Pick up fallen fruit. Ideally this should commence as soon as the first fruit falls to the ground and continue several times a week during the season. At the end of harvest late-hanging fruit that was not harvested should be picked and disposed of, too. This is because Qff pupae may leave the fallen or late-hanging fruit and pupate in the soil beneath before its host fruit has been picked up.

Ideally, fruit should be raked from under trees into the middle of the row and thoroughly slashed or mulched at least once a week. This is not always a viable option as irrigation lines may make effective raking impossible. A permit, approved by the Australian Pesticides and Veterinary Medicines Authority (APVMA), for the use of dimethoate on the soil, fallen fruit and unharvested fruit, exists for orchard needing to clean up after harvest. See information in the 'Approved pesticides' section below.

Flood irrigation will not kill Qff larvae and pupae.

It is not recommended to put picked up fruit into a compost heap as it is uncertain that all parts of the infested fruit will be exposed to the heat of decomposition.

It is also not recommended to dump fallen fruit or fruit culled at picking or packing into a hole dug in the paddock as Qff larvae can pupate there and adults emerge even through covering soil or mulch. If the fruit is dumped in a hole then it should be covered, daily, with at least 30cm of soil and then compressed.

Running poultry (e.g. chickens, geese, guinea fowl), sheep and cattle through the orchard after harvest is a very effective way of cleaning up fallen fruit as well as Qff eggs, larvae and pupae.

2. Host removal

If you can pick fruit off the tree/ vine/ shrub before it is ripe you will reduce Qff impact. Dispose of the harvested fruit as described above. If the fruit is of the correct type (e.g. tomato) it will ripen normally inside the house.

Ripe fruit can also be removed from its parent plant and disposed of as described above.

Complete removal of the host plant is a strategic and beneficial option that works very well in keeping Qff numbers down. The host plant can be removed prior to fruiting and placed in landfill or similar. The plant can be removed when in fruit but all fruit must also be removed and disposed of as described above.

3. Approved pesticides

There is a range of pesticides that are approved for urban use by the Australian Pesticides and Veterinary Medicines Authority (APVMA). Caution must be taken to ensure that use of these products is allowed on the crop being targeted and against Qff. The product label will give these details. The label must be followed accurately.

Pesticides may be approved for use only in some States and/or on some crops, only. Again, the label gives full instructions which need to be followed carefully. Also observe withholding period requirements (also on the label). These give you the minimum length of time between spray application and consumption of the treated fruit.

See Table 1 for a list of pesticides approved for use in commercial orchard situations (as at 18 December 2017). Please confirm by visiting <http://www.apvma.gov.au> (PUBCRIS database).

See Table 2 for a list of APVMA permits (as at 18 December 2017). Please confirm by visiting <http://www.apvma.gov.au> (Permits database).

NOTE #1 POST-HARVEST TREATMENTS: Some pesticides can be used, although not for all fruit or in all States, as a post-harvest dip or flood spray on the packing line (e.g. dimethoate) or as a fumigant (e.g. methyl bromide). Non-pesticide post-harvest

treatments, such as cold storage, hot water dip, hot air treatment and irradiation, are also available options for some fruit.

NOTE #2: All pesticides must be used strictly in accordance with APVMA approved label instructions and cautions.

NOTE #3: Not all fruits are covered by pesticide labels. Using pesticides on fruit types not mentioned on the label is illegal.

NOTE #4: Not all pesticides are approved in all States of Australia. Using pesticides in States not mentioned on the label is illegal.

NOTE #5: Residues of pesticides in treated fruit must be regulated so as not to exceed published or implied Maximum Residue Limits (MRLs). States of Australia and overseas export markets vary in their permitted MRLs.

4. Baits

Baits are based on Qff food. This is usually a proteinaceous material plus a toxicant. The toxicant can be a synthetic pesticide such as malathion or an organic one such as spinosad. These products are commercially available at produce stores. Baits are usually mixed in a home garden spray pump and applied in 100mL splashes, or mixed in a bucket and painted on with a paint brush, to fruiting plants every week during the fruiting season.

Baiting is seen as the number one option for Qff management.

Timing is essential – Start baiting at least 6 weeks before harvesting the earliest crop and continue baiting for three weeks after harvest of the latest maturing crop.

Bait once a week and, as soon as possible, repeat if it rains.

Where orchards abut other orchards (including abandoned orchards) enhanced trapping and baiting on the borders with neighbours should be applied.

A combination bait program with trapping for monitoring for Qff presence, location and size is recommended.

Currently available female-biased traps and baits include:

- BioTrap® Fruit Fly Attractant Gel from BioTrap Australia Pty Ltd. This trap uses a gel formulation of protein attractant with a small block of the pesticide DDVP. This trap remains effective for 3 months without the need for topping up.
- Cera Trap® Fruit Fly Attractant, originally from Spain and now available in Australia. This is a liquid formulation of protein attractant which has no added pesticide. The fly drowns in the liquid. The trap needs topping up with more liquid as the original attractant evaporates.

There have been recent advances in protein baits with the newly-approved organically acceptable Naturalure®. This bait uses a very low concentration per hectare of an insecticide derived from a common fungus to kill fruit flies attracted to a protein solution. There are other baits in common use such as protein mixed with malathion. All can be used at this time of year and during the season to attract and kill fruit flies. Don't forget to follow label directions and cautions.

Other protein baits on the market include:

- Pinnacle®, Mauri Yeast Products Pty Ltd – Autolysed protein paste which needs added water and pesticide (e.g. maldison)
- DacGEL™, AgriPest Pty Ltd – Autolysed protein powder formulated with rain fast gel which needs added water and pesticide
- Fruit Fly Lure™, Bugs for Bugs Pty Ptd – Autolysed protein paste which needs added water and pesticide
- Natflav 500™, Food Industry Products Pty Ltd – Autolysed protein paste which needs added water and pesticide
- Cera Bait™, distributed in Australia by Barmac Pty Ltd – Hydrolysed protein liquid which needs added pesticide
- Flavex® Liquid Type FL622), Halcyon Proteins Australia Pty Ltd – Hydrolysed protein paste which needs added water and pesticide
- Flavex® (Powder Type SPA400), Halcyon Proteins Australia Pty Ltd – Hydrolysed protein paste which needs added water and pesticide
- HYM-LURE™, distributed in Australia by BioTrap Pty Ltd – Hydrolysed protein paste which needs added water and pesticide
- Amulet Gel™ Insecticide, BASF Australia Pty Ltd – Autolysed protein powder formulated with pesticide (fipronil) and rain fast gel which needs added water and should only be applied to fruit fly refuge plants (not grape vines)
- Others e.g. Mazoferm E820, NU-Lure Insect Bait and Provesta 621 Autolysed yeast extract

WARNING – CROP SENSITIVITY: Many fruit fly baits which are based on protein may cause phytotoxic damage to fruits and/ or leaves. Most labels recommend to avoid spray contact with fruit and also to spray early in the morning.

5. Traps and MAT

Some APVMA approved pesticides can be used in rural situations as components of traps.

It is recommended to maintain a trapping program all year so as to monitor for the presence, location and size of Qff populations. These may change throughout the year.

Generally, traps are used only for monitoring purposes – just to see if fruit flies are present and if their numbers are building up for some reason. There are many traps available from various produce stores and from the internet or you can make your own from PET bottles.

Home-made traps using proteinaceous products such as Vegemite® and beer need replacement every 5 to 7 days as they deteriorate rapidly in the warmth of the day resulting in a stinking mess which then repels Qff rather than attracting them.

Commercial female-targeting traps are available and are much longer-lasting than most home-made styles.

Some orchards in Victoria, NSW and Queensland are currently trialling using large numbers of these traps, both male- and female-targeting traps, in mass-trapping control tests done on an orchard-wide scale.

Traps can contain Qff male-targeting chemicals or Qff female-targeting substances. Male traps have a synthetic sex-related pheromone while the female traps usually use a food-based attractant. Both traps also include a toxicant (or water which causes the fly to drown) plus other preservatives.

Traps, depending on the type, brand and purpose for use, should be placed, from one or two per hectare for monitoring purposes to upwards of 100 per hectare for mass-trapping, so that they get the sun only in the early morning (i.e. on an eastern facing aspect), at least 1.2m above the ground in evergreen foliage. Keep leaves and twigs away from the trap surface to help stop ants getting in.

MAT – Male Annihilation Technique – uses products that are similar to those used in male-targeted traps but the products are generally open to the environment, not in traps. Male Qff are attracted to a fibreboard pad which is impregnated with the sex-related pheromone and a toxicant, feed or walk on it, pick up the toxicant and die nearby.

According to label instructions, three or four MATs per hectare up to more than 100 per hectare are used, depending on the size of the Qff population.

Remember that MATs target male Qff only. Because male and female Qff adults exist in a 50:50 sex ratio, for every one male trapped there is one female still flying around. MATs take some time to impact on a Qff population and for this reason MATs are most effective when used in conjunction with baits (see section on 'Baits' above).

There are several commercially available MAT products.

Currently available male-biased traps and MAT include:

- BioTrap Globe Trap – BioTrap Australia Pty Ltd distributes Farmatech FT Cuelure Wafers which attract Queensland fruit fly
- Crop Care Amulet Cue-Lure Fruit Fly Stations, Crop Care Australasia Pty Ltd – readymade with lure and toxicant (fipronil) which can be placed in Steiner-style fruit fly trap or without a trap as a lure-and-kill station (MAT).
- Amulet Cue Lure Fruit Fly Stations, BASF Australia Pty Ltd – readymade with lure and toxicant (fipronil) which can be placed in Steiner-style fruit fly trap or without a trap as a lure-and-kill station (MAT).

- Eco-Lure Male Qld Fruit Fly Wick, Organic Crop Protectants Pty Ltd – Cuelure and pesticide (maldison) impregnated dental wick in a plastic cup which can be placed inside a fruit fly trap or hung out in the field on its own as a lure-and-kill station (MAT).
- Searles Fruit Fly Wick Attractant and Insecticide, J C & A T Searle Pty Ltd - Cuelure and pesticide (maldison) impregnated dental wick placed inside a Searle's fruit fly trap
- Q Fly Wick, Bugs for Bugs Pty Ltd – Cuelure and pesticide (maldison) impregnated dental wick in a plastic cup which can be placed inside a fruit fly trap or hung out in the field on its own as a lure-and-kill station (MAT).
- Dak Pot Lure & Insecticide Trap C165, Cedric Leathbridge T/A Bilpin Springs Orchard - Cuelure and pesticide (maldison) impregnated sponge placed inside a Dak Pot fruit fly trap
- Gepro Organics Va-Va-Voom Queensland Fruit Fly Trap, Gepro Pty Ltd – Liquid formulation of cuelure and raspberry ketone poured into fruit fly trap (an alternative lure for male Queensland fruit fly) needing no added pesticide as attracted flies drown in the liquid. Needs topping up with more product as it evaporates.
- Fly Bye Fruit Fly Lure, Nutri-Tech Solutions Pty Ltd - Liquid formulation of cuelure and raspberry ketone poured into fruit fly trap (an alternative lure for male Queensland fruit fly) needing no added pesticide as attracted flies drown in the liquid. Needs topping up with more product as it evaporates.
- Wild May Fruit Fly Attractant, Wild May Essential Oils Pty Ltd - Liquid formulation of cuelure and raspberry ketone poured into fruit fly trap (an alternative lure for male Queensland fruit fly) needing no added pesticide as attracted flies drown in the liquid. Needs topping up with more product as it evaporates.

6. Joining neighbouring orchards for Qff management

Consider banding together with neighbours with trapping and baiting. This style of management is called area-wide management and has been shown to be highly effective in fruit fly control around the world.

7. Orchards bordering urban areas

Special care must be taken in managing Qff in orchards which are close to urban areas, households, gardens, playgrounds, schools, etc.

8. Pest exclusion

Fruit can be covered with commercially available fine-mesh netting specifically for keeping fruit flies out of a crop. Exclusion netting can cover each fruit, or a bunch or branch of fruit or the whole tree or even the whole orchard. The netting mesh is fine enough so that Qff will not crawl through it. Take care that the netting does not improve conditions for other pests and diseases such as scales and mildews due to the reduced air movement under the netting. If the covers are applied too early fruit may not colour well due to the reduced amount of light under the cover.

Netting should be applied so that the netting is not in contact with fruit because Qff can land on the netting and lay its eggs onto the fruit through the netting.

Table 1. Pesticides approved for use in commercial orchards

CAUTION: Use only in accordance with up-to-date APVMA-approved label

Use	Name	Actives	Notes
BAIT - FEMALE	PYRIGRAN INSECTICIDE	CHLORPYRIFOS	Not approved for all crops
BAIT - FEMALE	STRIKE-OUT 500 WP INSECTICIDE	CHLORPYRIFOS	Not approved for all crops
BAIT - FEMALE	CONQUEST CHLORPYRIFOS 500 INSECTICIDE	CHLORPYRIFOS	Not approved for all crops
BAIT - FEMALE	MACRO PROTECT CHLORPYRIFOS 500 INSECTICIDE AND TERMITICIDE	CHLORPYRIFOS	Not approved for all crops
BAIT - FEMALE	FARMOZ CYREN 500 WP INSECTICIDE	CHLORPYRIFOS	Not approved for all crops
BAIT - FEMALE	CYREN 500 WP INSECTICIDE	CHLORPYRIFOS	Not approved for all crops
BAIT - FEMALE	LORSBAN 750 WG INSECTICIDE	CHLORPYRIFOS	Not approved for all crops
BAIT - FEMALE	DAVID GRAYS CHLORPYRIFOS 500	CHLORPYRIFOS	Not approved for all crops
BAIT - FEMALE	AMULET GEL INSECTICIDE	FIPRONIL	Not approved for all crops
BAIT - FEMALE	DAVID GRAYS FRUIT FLY GARDEN SPRAY	MALDISON	
BAIT - FEMALE	FYFANON 1000 EC INSECTICIDE	MALDISON	
BAIT - FEMALE	FYFANON 440 EW INSECTICIDE	MALDISON	
BAIT - FEMALE	FYFANON 500 EC INSECTICIDE	MALDISON	
BAIT - FEMALE	HY-MAL INSECTICIDE	MALDISON	
BAIT - FEMALE	DAVID GRAYS MALATHION GARDEN SPRAY	MALDISON	
BAIT - FEMALE	AMGROW CHEMSPRAY MALATHION INSECTICIDE	MALDISON	
BAIT - FEMALE	YATES FRUIT FLY KILLER	SPINOSAD	
BAIT - FEMALE	AMGROW ORGANIX FRUIT FLY CONTROL	SPINOSAD	
BAIT - FEMALE	NATURALURE HOME GARDEN FRUIT FLY BAIT CONCENTRATE	SPINOSAD	
BAIT - FEMALE	YATES NATURE'S WAY FRUIT FLY CONTROL	SPINOSAD	
BAIT - FEMALE	ECO-NATURALURE FRUIT FLY BAIT CONCENTRATE	SPINOSAD	
BAIT - FEMALE	NATURALURE FRUIT FLY BAIT CONCENTRATE	SPINOSAD	
BAIT - FEMALE	IMTRADE TYRANEX 500 SL INSECTICIDE & NEMATICIDE	TRICHLORFON	
BAIT - FEMALE	LEPIDEX 500 INSECTICIDE	TRICHLORFON	
BAIT - FEMALE	DIPTEREX 500 SL INSECTICIDE	TRICHLORFON	
COVER SPRAY	SUMITOMO SAMURAI SYSTEMIC INSECTICIDE	CLOTHIANIDIN	
COVER SPRAY	Relyon Dimex 400EC Insecticide	DIMETHOATE	Not approved for all crops
COVER SPRAY	Dimethon Insecticide	DIMETHOATE	Not approved for all crops
COVER SPRAY	GENFARM DIMETHOATE 400 INSECTICIDE	DIMETHOATE	Not approved for all crops
COVER SPRAY	APPARENT DECIMATOR 400 INSECTICIDE	DIMETHOATE	Not approved for all crops
COVER SPRAY	IMTRADE DIMETHOATE 400 EC INSECTICIDE	DIMETHOATE	Not approved for all crops
COVER SPRAY	ROGOR UPGRADE INSECTICIDE	DIMETHOATE	Not approved for all crops
COVER SPRAY	ROVER SYSTEMIC INSECTICIDE	DIMETHOATE	Not approved for all crops
COVER SPRAY	FARMALINX DIMETHOLINX INSECTICIDE	DIMETHOATE	Not approved for all crops
COVER SPRAY	TITAN DIMETHOATE 400 SYSTEMIC INSECTICIDE	DIMETHOATE	Not approved for all crops

COVER SPRAY	AW DIMETHOATE 400 SYSTEMIC INSECTICIDE	DIMETHOATE	Not approved for all crops
COVER SPRAY	CROPRO STALK INSECTICIDE	DIMETHOATE	Not approved for all crops
COVER SPRAY	HALLEY DIMETHOATE 400 SYSTEMIC INSECTICIDE	DIMETHOATE	Not approved for all crops
COVER SPRAY	DANADIM INSECTICIDE	DIMETHOATE	Not approved for all crops
COVER SPRAY	CONQUEST DIMETHOATE 400 SYSTEMIC INSECTICIDE	DIMETHOATE	Not approved for all crops
COVER SPRAY	SUPERWAY DIMETHOATE 400 SYSTEMIC INSECTICIDE	DIMETHOATE	Not approved for all crops
COVER SPRAY	4FARMERS DIMETHOATE 400 SYSTEMIC INSECTICIDE	DIMETHOATE	Not approved for all crops
COVER SPRAY	CHEMAG DIMETHOATE INSECTICIDE	DIMETHOATE	Not approved for all crops
COVER SPRAY	ADAMA DIMETHOATE 400 INSECTICIDE	DIMETHOATE	Not approved for all crops
COVER SPRAY	SABOTEUR SYSTEMIC INSECTICIDE	DIMETHOATE	Not approved for all crops
COVER SPRAY	FYFANON 440 EW INSECTICIDE	MALDISON	
MAT - MALE	NUFARM AMULET CUE-LURE FRUIT FLY STATIONS	CUE LURE, FIPRONIL	
MAT - MALE	AMULET CUE LURE FRUIT FLY STATIONS	CUE LURE, FIPRONIL	
MAT - MALE	ECO-LURE MALE QLD FRUIT FLY WICK	CUE LURE, MALDISON	Not approved in all States
MAT - MALE	Q FLY WICK	CUE LURE, MALDISON	Not approved in all States
TRAP - FEMALE	BIOTRAP DDVP CUBES	DICHLORVOS	
TRAP - FEMALE	APVMA EXEMPT		
TRAP - FEMALE	APVMA EXEMPT		
TRAP - MALE	AMULET CUE LURE FRUIT FLY STATIONS	CUE LURE, FIPRONIL	
TRAP - MALE	ECO-LURE MALE QLD FRUIT FLY WICK	CUE LURE, MALDISON	Not approved in all States
TRAP - MALE	SEARLES FRUIT FLY WICK ATTRACTANT AND INSECTICIDE	CUE LURE, MALDISON	Not approved in all States
TRAP - MALE	Q FLY WICK	CUE LURE, MALDISON	Not approved in all States
TRAP - MALE	DAK POT LURE & INSECTICIDE TRAP C165	CUE LURE, MALDISON	
TRAP - MALE	GEPRO ORGANICS VA-VA-VOOM QUEENSLAND FRUIT FLY TRAP	CUE LURE/ RASPBERRY KETONE	
TRAP - MALE	FLY BYE FRUIT FLY LURE	CUE LURE/ RASPBERRY KETONE	
TRAP - MALE	WILD MAY FRUIT FLY ATTRACTANT	CUE LURE/ RASPBERRY KETONE	
TRAP - MALE	BIOTRAP DDVP CUBES	DICHLORVOS	

Table 2. Pesticide Permits for use in some commercial orchards under certain conditions

CAUTION: Check APVMA website for up-to-date information on use and currency of these and other Permits

Use	Description	Permit No.
AFTER HARVEST CLEAN UP	Chlorpyrifos & maldison / Fruit fly outbreak & quarantine treatments	PER81637
AFTER HARVEST CLEAN UP	Dimethoate / Orchard cleanup fruit fly host crops / fruit fly	PER13859
BAIT - FEMALE	Abamectin (Vertimec Miticide) / Blackberries, Blueberries and Raspberries / Fruit Fly	PER14423
BAIT - FEMALE	Abamectin / Citrus / Queensland Fruit Fly	PER14932
BAIT - FEMALE	Hy Mal Insecticide / Rubus, Ribes and Blueberry / Fruit fly bait spray	PER13677
BAIT - FEMALE	Maldison / Strawberries (perimeter bait spray only) / Fruit Fly	PER13749
BAIT - FEMALE	Naturalure Fruit Fly Bait Concentrate / Ornamentals, amenity trees, fruit & nut trees, vines and vegetables / Medfly and Qff	PER80719
BAIT - FEMALE	Naturalure Fruit Fly Bait Concentrate / Ornamentals, amenity trees, fruit & nut trees, vines and vegetables / Medfly and Qff	PER14680
COVER SPRAY	Alpha-Cypermethrin / Fruiting vegetables, except cucurbits / Mediterrean fruit fly and Queensland fruit fly	PER80099
COVER SPRAY	Alpha-cypermethrin / Persimmons / QLD & Mediterranean Fruit Fly	PER14901
COVER SPRAY	Alpha-Cypermethrin / Stone Fruit / Fruit Fly	PER14875
COVER SPRAY	Bifenthrin / Tomatoes & Capsicums / Fruit Fly	PER13567
COVER SPRAY	Calypso Insecticide / Pome Fruit and Stone Fruit / Mediterranean Fruit Fly	PER14562
COVER SPRAY	Cherries / Fruit Flies / Trichlorfon	PER80542
COVER SPRAY	CLOTHIANIDIN/MANGO/FRUIT FLY	PER83944
COVER SPRAY	Dimethoate / Eggplant / Queensland fruit fly & Mediterranean fruit fly	PER12506
COVER SPRAY	Dipterex (trichlorfon) / Cherries / Fruit Flies	PER9941
COVER SPRAY	Dow AgroSciences Delegate / Pomefruit & Stonefruit / Fruit fly (Suppression only)	PER12590
COVER SPRAY	Dow AgroSciences Success Neo (spinetoram) / Strawberries, Rubus & Rubus hybrids and Blueberries / Fruit Fly	PER12927
COVER SPRAY	Maldison / Capsicums and Cucumbers / Fruit Fly	PER13031
COVER SPRAY	MALDISON / MANGO / FRUIT FLY	PER83998
COVER SPRAY	Maldison / Stonefruit / Fruit Fly	PER12907
COVER SPRAY	Maldison / Strawberries, Blueberries and Rubus spp. / Fruit Fly	PER12940
COVER SPRAY	Methomyl / Tomatoes & Capsicums / Fruit Fly	PER13566
COVER SPRAY	Sumitomo Samurai Systematic Insecticide / Fruiting vegetables, excluding Cucurbits / Medfly & Qff	PER80100
COVER SPRAY	Trichlorfon / Eggplant, Thai eggplant, Pepino & Cape gooseberry / Fruit fly	PER80717
COVER SPRAY	Trichlorfon / Specified berry fruit / Fruit Fly	PER12486
COVER SPRAY	Trichlorfon / Specified Fruit crops / Fruit fly	PER12450
COVER SPRAY	Trichlorfon / Stone fruit & guava / Mediterranean fruit fly	PER14683
COVER SPRAY	Trichlorfon / Table grapes / Fruit Fly	PER12439
TRAP - FEMALE	Lures, attractants, pheromones & toxicants for use in traps for the purpose of monitoring & mass trapping fruit flies	PER13785
TRAP - MALE	Lures, attractants, pheromones & toxicants for use in traps for the purpose of monitoring & mass trapping fruit flies	PER13785