FRUIT FLY CONTROL
A challenge for Australian blueberry growers

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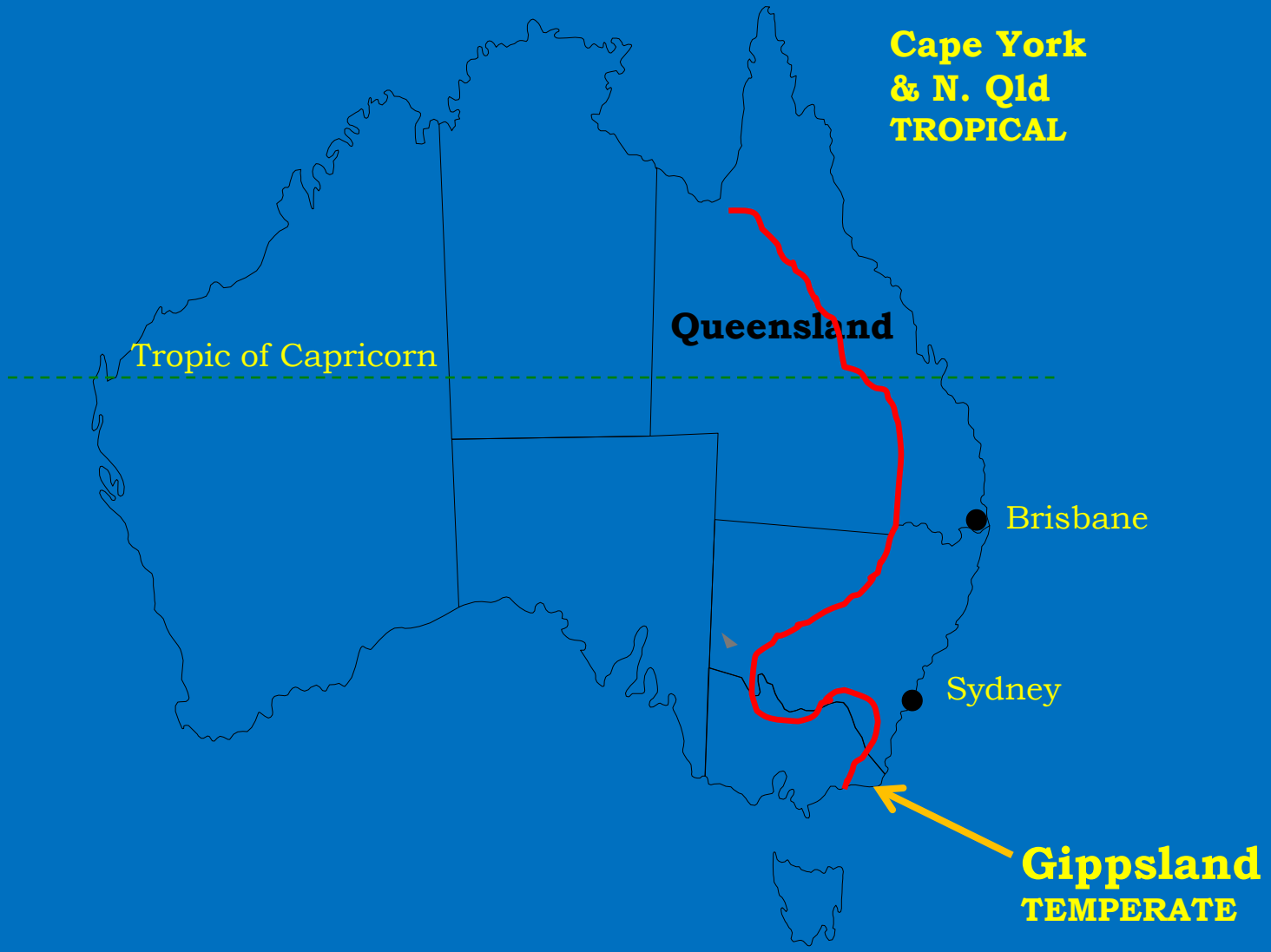
QUEENSLAND FRUIT FLY
'Scourge of our orchards'

Natural range of Qld fruit fly



Nature of the beast

- A native species
- Changed from nuisance to pest status
- Highly adaptive to new fruits
- Over-winters as the adult
- Capable of long flights - >100km
- Commences colonizing flights August
- 5-6 generations per year in sub-tropics
- Highly invasive – now through Pacific & has been detected in NZ twice in 3 years

Early control methods:

Bagging – covering individual fruits with paper bags

Netting – covering entire tree with fine mesh gauze

- Both still effective methods for small home garden orchards

How QFF has been controlled for the last 50 years

Lebaycid (fenthion) & Rogor (dimethoate) cover sprays - *the disadvantages*

- Required frequent applications
- Highly toxic to birds, mammals &invertebrates
- Environmentally hazardous (aquatic & terrestrial)
- Kills non-target & beneficial organisms
- Negated biological control programs
- Fruit residues frequently exceeded MRL
- Did not prevent ‘stings’on fruit
- Caused secondary pest flare-ups

Repeated cover spray applications can cause secondary pest flares

Mealybugs on custard apple

Mealybugs on blueberry

Mites on peaches

A viable alternative for control is area-wide management.

- based on a system Australian and USDA scientific groups developed for major fruit fly eradication programs on Pacific islands

'Area-wide Management'

"The exclusion of fruit flies from an area of land through management practices enabling fruit to be grown within it without suffering infestation"

Where did area wide management of fruit flies originate?

- In the 1990's native & exotic fruit flies were a major threat to fresh fruit production in many Pacific islands.
- A number of organizations collaborated to eradicate fruit flies from several islands.
- Scientists developed a standard model based on ***Male Annihilation Treatments*** **(MAT)** using pheromones to attract & kill males, and ***Protein bait*** (food) spot sprays to kill females.

Area wide management programs for QFF in orchard & home garden situations are based on the same principles as island eradication programs, but generally on a smaller scale

How is this achieved?

A management program comprises:

1. Population monitoring by trapping
2. Area saturation with MAT (male annihilation treatment) devices
3. Protein/insecticide bait spray applications to fruit trees and refuge vegetation
4. Strict orchard hygiene practices
5. Weekly fruit inspections - records

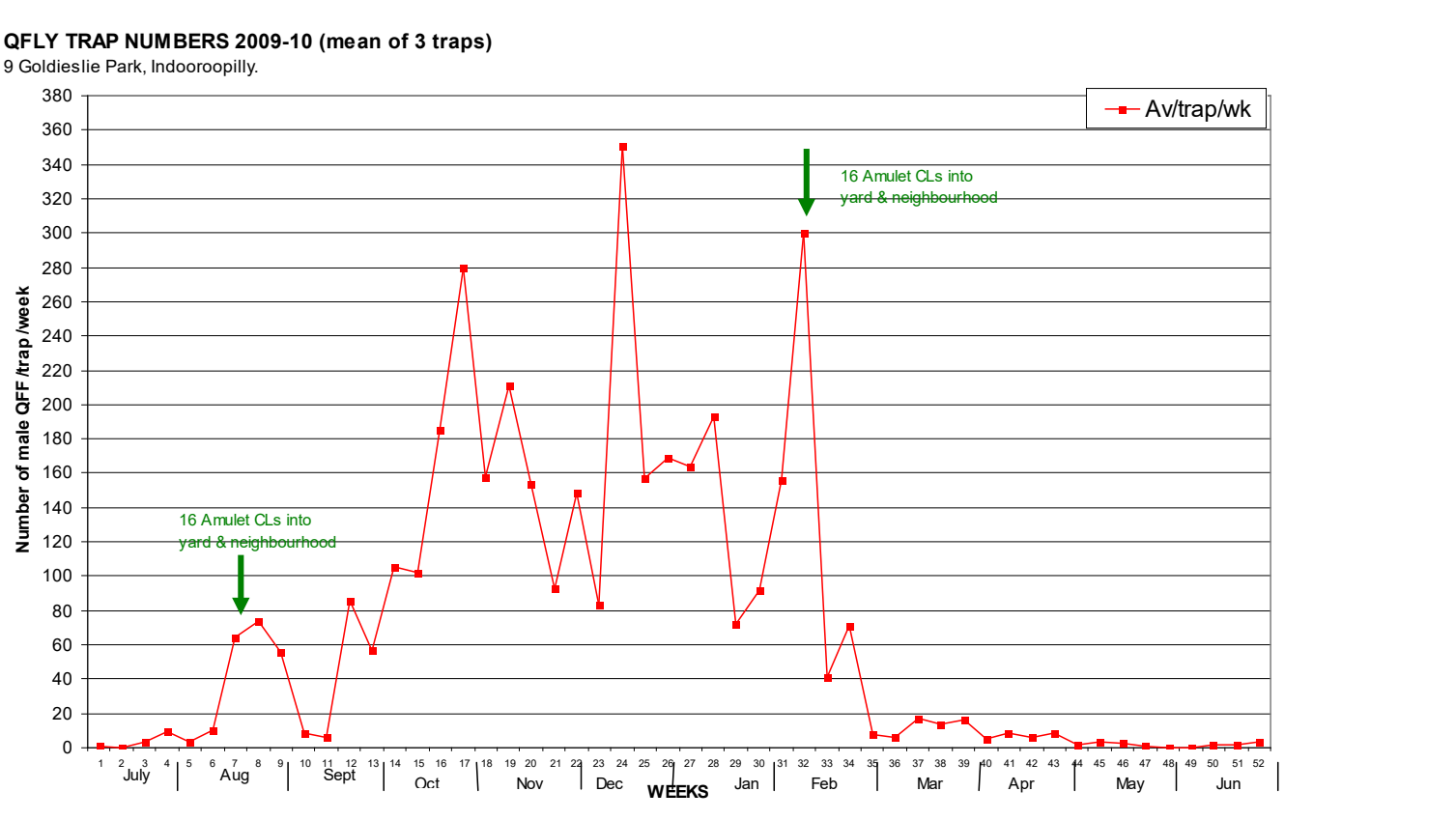
1. Male FF trapping data is a vital part of area wide FF management

- Traps of the 'Steiner' design – having inverted funnel entrances perform best.
- Clear traps weekly and record data.
- Trap data enables good management strategies to be made

Traps only males

Population dynamics through the year

Brisbane example



Trapping data – Commercial orchards

- One trap in each orchard block
- 4 or more traps outside orchard 100-400m from boundary
- Orchard vs 'external' trap data enables management decisions to be made if 'hot' spots appear.
- Recorded data is a valuable index of QFF occurrence each year – enables forward planning

2. MAT – male annihilation

Cue-lure pheromone attracts males of QFF and lesser QFF

Amulet CL contains Cue-lure & 20mg fipronil

QFF has yellow spot on shoulder
Lesser QFF – no yellow spot

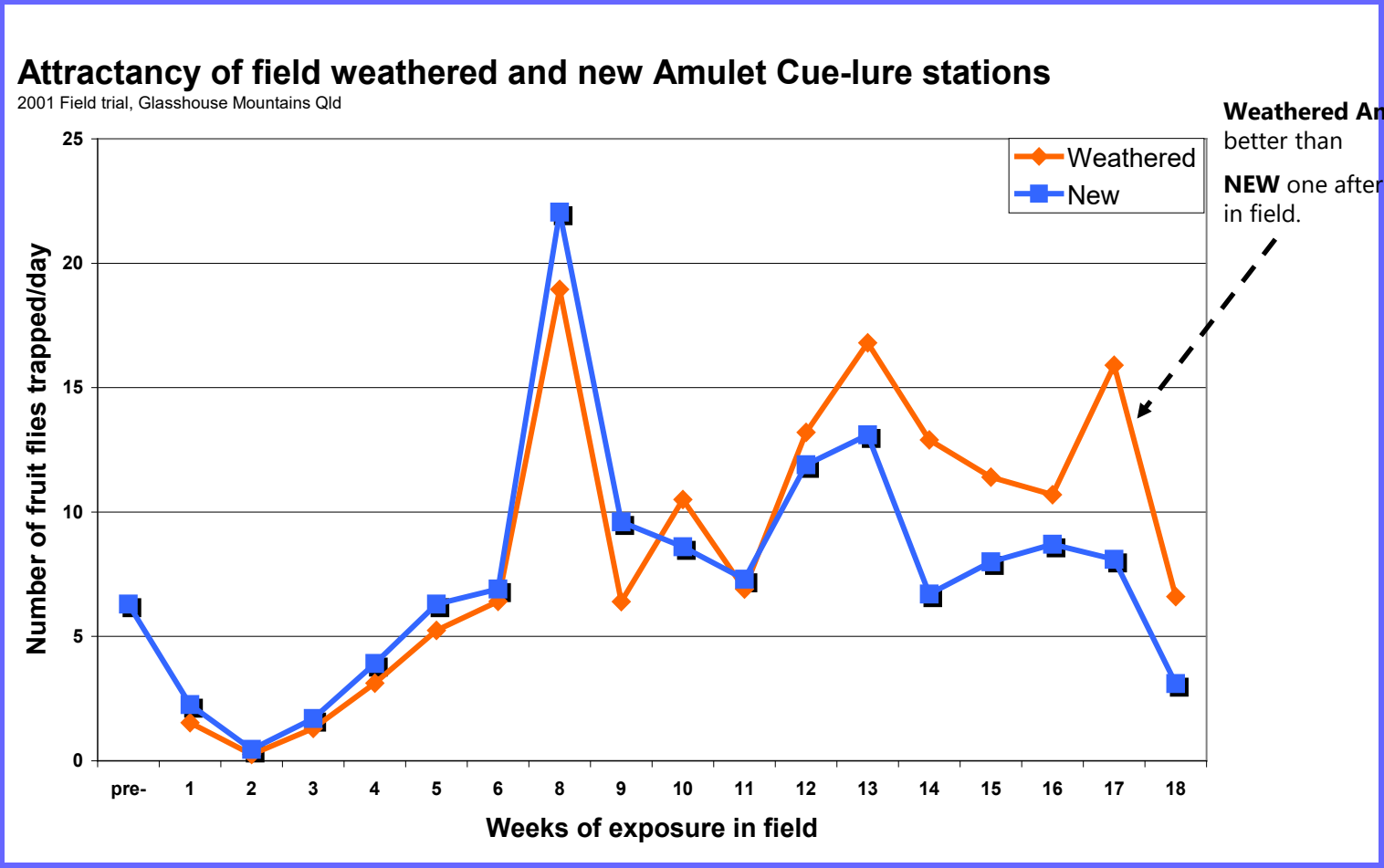
Fruit fly species most commonly attracted by Cue-lure

Properties of MAT stations (Amulet CL®) for QFF control

- Attract male QFF for 400m
- Contain 20mg fipronil, a slow acting insecticide
- ≈5 month field life
- Cue-lure stimulates mating activity & males attract females to mate.
- Lethal transfer of ***fipronil*** occurs – both males & females die
- ***Malathion*** based MATs kill male FF within minutes & do not allow male/female transfer of toxin

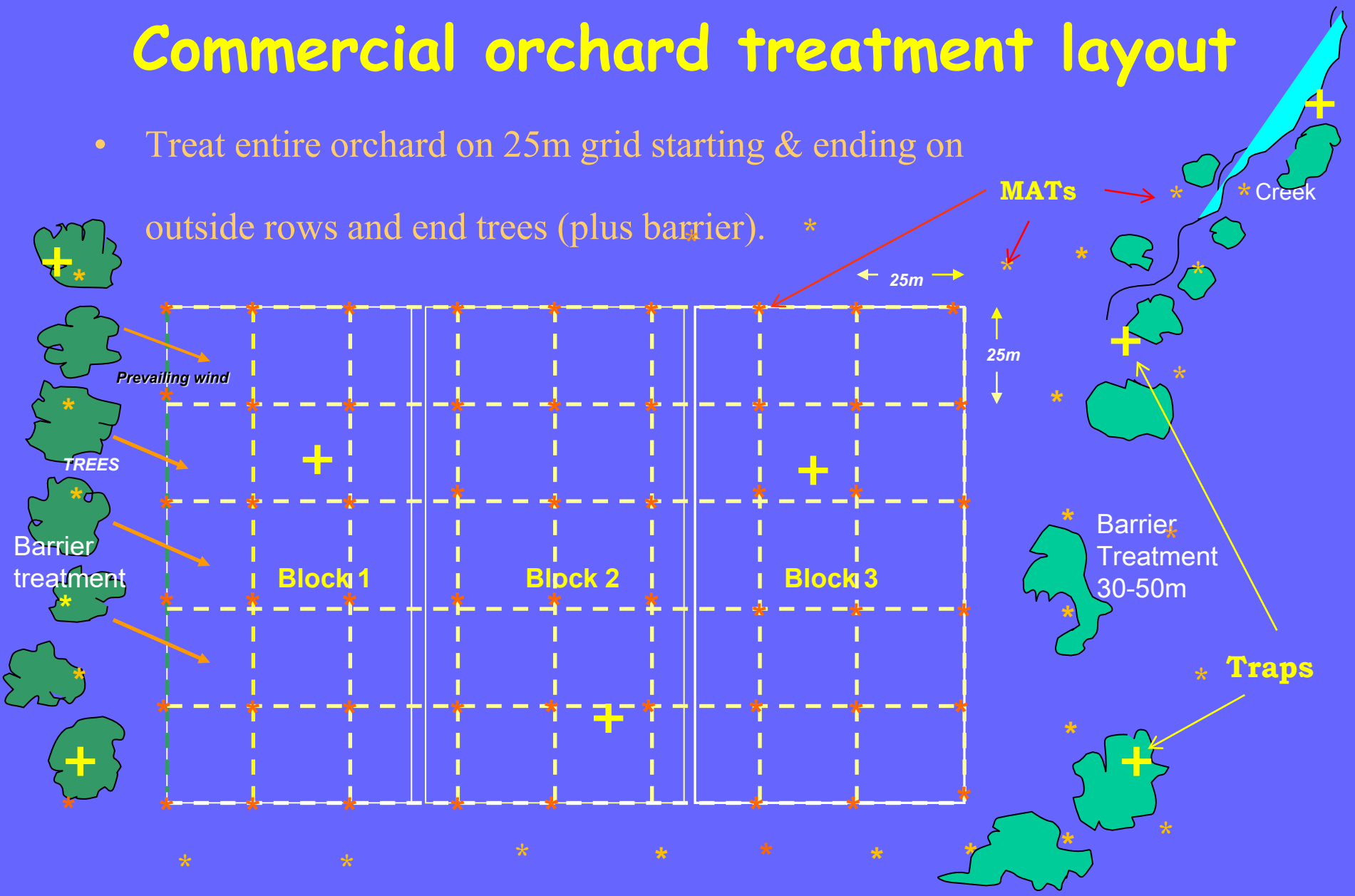
® Registered name of BASF

Amulet CL Field Life
(Field exposed compared with "NEW", direct from pack)
Field life shown to be >4½+months



Commercial orchard treatment layout

- Treat entire orchard on 25m grid starting & ending on outside rows and end trees (plus barrier).



What else is required?

- Understanding the habits and life cycle of Qld Fruit fly (QFF)
- If you understand how QFF behaves, you can devise methods to control it.

Life Cycle of QFF

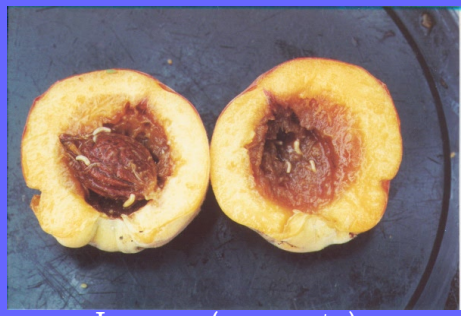

Mating pair

Female oviposits in fruit ("stings")


Female ovipositing in fruit

2-4 days

Larvae hatch & feed in fruit


Larvae (maggots) ready to leave fruit

7-10 days

PUPA
Mature larvae exit fruit and pupate in leaf litter under trees

5-10 days

Immature adult flies emerge and seek protein meals


Female drinking bait droplets

7-10 days for ovaries to develop after protein food

Protein fed flies mate at dusk. Females seek suitable fruit & start ovipositing

21-35 days total

Important Habits of QFF

- QFF like to shelter in dense shrubs & trees, not necessarily host (fruit) trees where humidity is high and temperatures stable.
- Immature flies obtain natural protein sources (bacteria & fungi – wild yeast etc) by licking leaf surfaces.
- Gravid females are attracted to ripening fruit odours, but are not interested in protein bait.

Gravid females are attracted by ripening fruit odours

Target refuge vegetation around orchard with bait sprays & MATs

Surrounding terrain will influence potential QFF risk levels

Mt Blue farms Tabulam

eucalypt savannah grazing land – relatively unfavourable habitat

Mt Blue farm Lindendale coastal NSW – highly favourable habitat

3. Bait sprays

- Target mainly female FF, but males equally attracted – WHY?
- Immature FF hatching from pupae have vestigial ovaries & testes.
- They must have a substantial protein meal for eggs & sperm to develop.
- QFF become sexually mature 7-10 days after a protein meal.
- **An insecticide bait spray program prevents immature QFF from reaching damaging status – – <u>the reason for 1 week spaced applications</u>.**

Infested fruit discarded in inter-row will cause a population explosion

Protein bait sprays on grass or insecticide soil treatment urgently needs research

QFF larva in blueberry

Discarded fruit a potential threat

Application Equipment

ATV drive-by strip - Large orchards

Rega 'Gen' for small orchards

Trigger hand sprayer for backyards

Apply to lower foliage of refuge & fruit trees avoiding fruit. DacGel protein bait is applied at 3.5-5L/ha or 5-10ml/tree.

Suitable protein bait formulations

- **DacGel fruit fly bait powder** (AgriPest P/L). Dissolves in water to form a rain-fast liquid gel. Contains a highly attractive yeast autolysate. Requires insecticide to be added.
- **Pinnacle brand yeast autolysate liquid**. (Bugs for Bugs) Dilute 20ml per L water. Requires insecticide to be added.
- **Natralure fruit fly bait spray** (Dow) Liquid concentrate of protein hydrolysate with spinosad toxicant. Dilute with water at label rate.

Bait Spray Application Methods

- 1-3 Spot sprays (10ml) per refuge tree
- 250ml/100m row or 3.5-10L/ha as a drive-by depending on product, crop & row spacing
- Apply weekly beginning 4-6 wks before fruit ripen.
- Avoid spraying fruit
- Blueberries present a problem for direct application
- Trap refuge shrubs in blueberry orchards as bait spray targets need investigation

Recording population data & pest management practices

- Trapping data recorded on xls spreadsheet
- Record crop inspection data on pest incidence
- Bait spray application records
- Deployment of MATs recorded
  - All this can be notated on a graph

An example of a commercial orchard program using Area-Wide Management

Sandy Creek Orchard, Nth Tamborine Q

Area: 14ha with 9 blocks of Gold Kiwifruit vines.

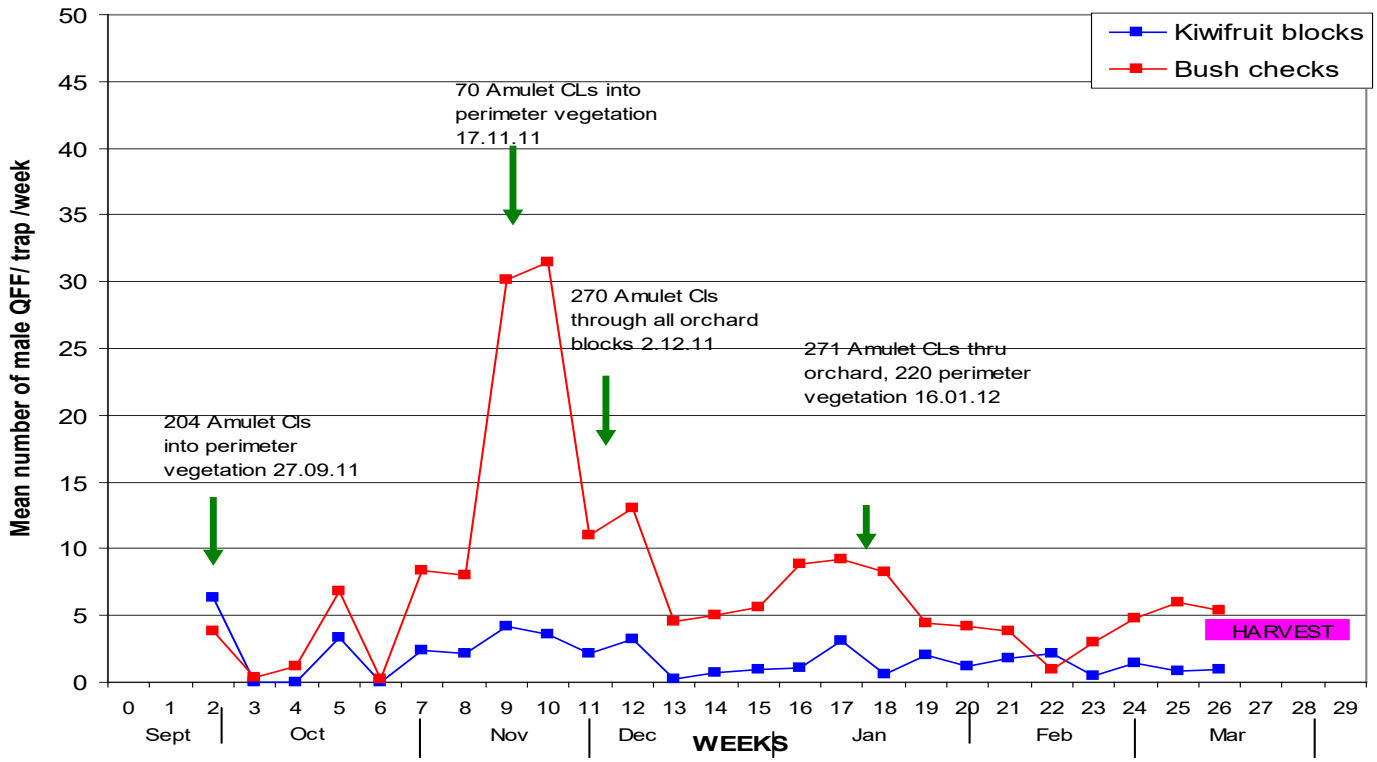
- **August**:Commence fruit fly trapping – 16 traps (11 orchard, 5 bush) Trap data continuous August – end March.
- Amulet CLs distributed in bush around orchard August
- Protein bait sprays on perimeter vegetation from Aug.
- Flowering and foliation September.
- Bait sprays commence in orchard mid-Oct @ 7-10 days
- Dipel spray for leaf roller caterpillars late Oct.
- Amulet CLs thru orchard end of Oct.
- Additional Amulets into bush areas up to 400m from orchard
- Bait sprays on weekly schedule from November.
- Fruit inspections weekly from December to harvest
- New Amulet CLs through orchard and bush areas mid-Jan.
- **Harvest mid-March**

Sandy Creek Orchard, Mt Tamborine data for 2011-12 season

A total of 1000 Amulet CLs (540 orchard, 460 bush) were used for the season, weekly bait sprays (malathion/protein autolysate) to male rows from October-March. *No QFF were recorded in 9 crop inspections and no stung fruit in 600t fruit*

FIGURE 1. Number of male QFF

Sandy Creek Orchard 2011-12. Means of 11 Orchard & 5 'Bush' traps.



THANK YOU

For more information contact

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