



Department of
**Primary Industries and
Regional Development**

Bad Bugs

and your garden

Darryl Hardie



Gross value of agricultural production (GVAP) \$7.9

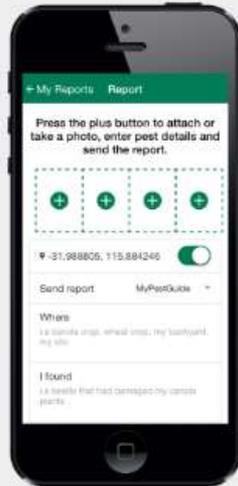
Commercial and recreational fisheries \$1.2

WA industry	GVAP (in billions)	WA Exports (in billions)
Livestock and value added products	\$2.1	\$1.6
Cereals and horticulture	\$5.3	
Cereals		\$4.0

Data from ABS and WAFFFI

Threats?: Look for the unusual!



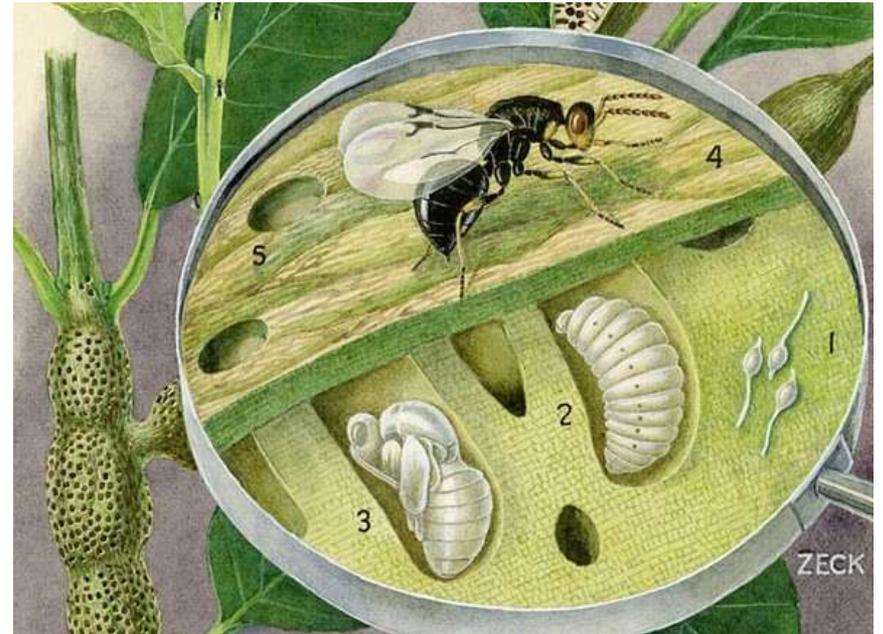




MyPestGuide Reporter App



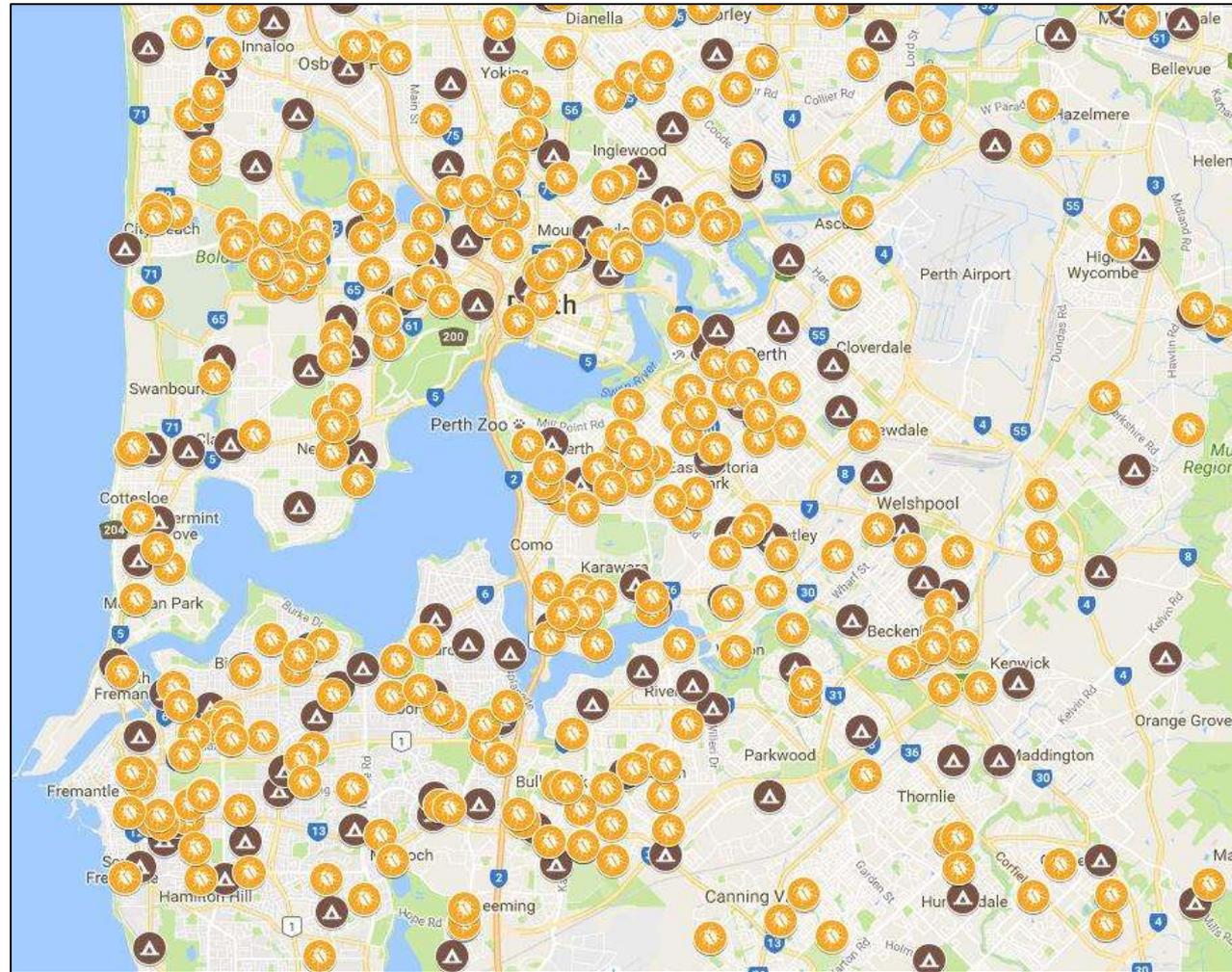
Supporting your success





The “Pantry Blitz”

- Citizen scientists downloaded our free photo reporting app for iPhone, Android – or or they could report via a website
- 3,000 members of the community signed up for a sticky trap with khapra beetle lure
- 2,552 reports have been received to date four weeks



- **World's worst fruit pest of economic importance**
- **Infests over 200 fruit and vegetable species worldwide**
- **African origin – Kenya**

Established in:

- **Africa (40 countries)**
- **Middle East (8)**
- **Central America and Caribbean (10)**
- **Europe (17)**
- **South America (8)**
- **Hawaii**



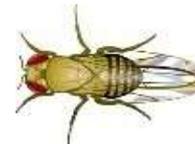
- **Endemic to Western Australia**
- **First detected in 1895 (Claremont)**
- **Largest populations located in south-west WA**
- **Highly polyphagous – attacks a wide range of hosts**
- **Problem to commercial and home growers**

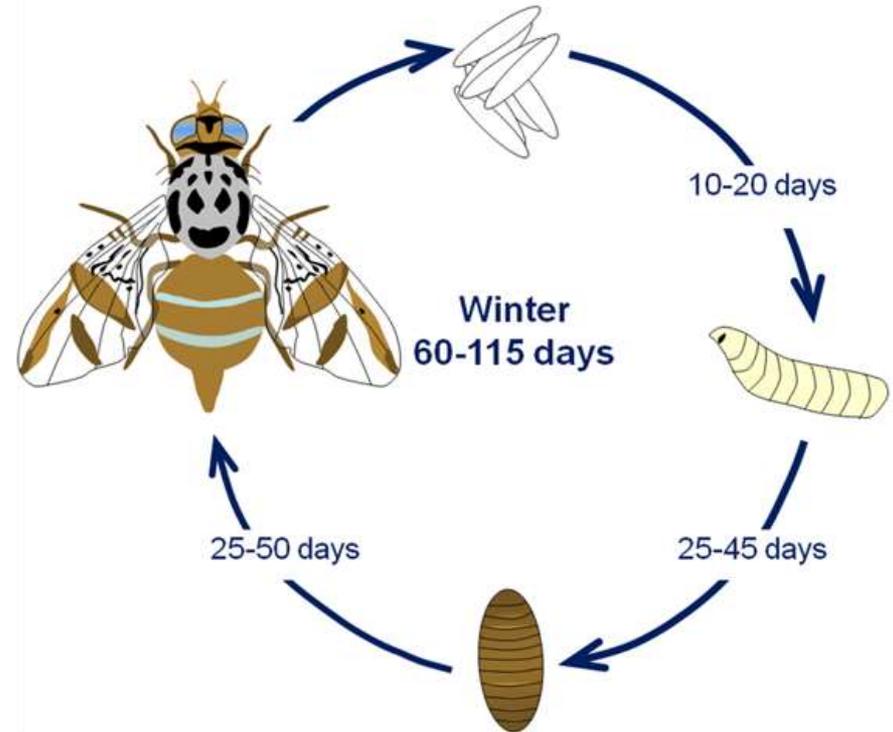
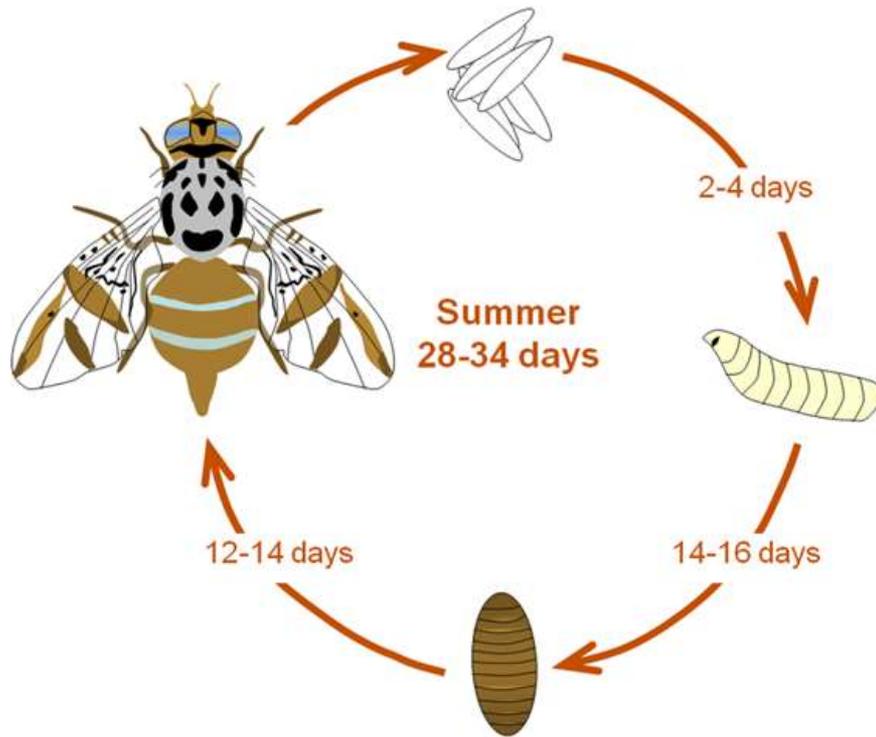


- **WA is now the only State in Australia with an established Medfly population**
- **Found from Derby to Esperance and many inland towns**
- **South Australia has occasional outbreaks of Medfly**
- **Medfly should not be confused with the small black 'vinegar fly' which is attracted to fermenting or damaged fruit.**



- Often referred to as a fruit fly or ferment fly
- Not a true fruit fly
- Does not attack fruit on tree (but there is a new quarantine pest that will – *D. suzukii*)
- Attacks fallen/damaged fruit
- Much smaller fly than Medfly, but larvae can be as large





- The life cycle is driven by temperature.
- Flies are active if temperature is $> 10^{\circ}\text{C}$.
- Halted above 35.6°C

DEPARTMENT OF AGRICULTURE OF
WESTERN AUSTRALIA

★

BULLETIN No. 2813

**FRUIT FLY
CONTROL**

WITH
Rogor 40
AND
Lebaycid

by
D. SHEDLEY, B.Sc. [Agric.]
Entomologist

Reprinted from "THE JOURNAL OF AGRICULTURE OF
WESTERN AUSTRALIA"
Volume 1 (Fourth Series) No. 11 - NOVEMBER, 1960

BAYER RESEARCH
produces new answer to
FRUIT FLY MENACE

NEW 'TRIPLE-ACTION' INSECTICIDE KILLS FRUIT FLY
— ADULTS AND MAGGOTS — AND OTHER PESTS

- BY CONTACT
- BY PENETRATION
- BY SEMI-SYSTEMIC EFFECT



HERE IS AN INSECTICIDE WHICH CONTROLS ADULT FRUIT FLY AND AT
THE SAME TIME PREVENTS MAGGOT DEVELOPMENT WITHIN THE FRUIT!

LEBAYCID

is a completely new organic phosphorous insecticide developed by Farbenfabriken Bayer A.G., of Leverkusen, W. Germany—the creators of Folidol E605, Dipterox, Metasystox 'I' and Gusathion. It is unique in its power to operate three ways: as a contact spray; by partial absorption into the plants—killing maggots as they feed; and by penetration of the fruit, killing fruit fly larvae as they hatch. **LEBAYCID** also controls other important pome and stone fruit pests (e.g. peach tip moth and codling moth). On tomatoes, Lebaycid also shows promise as an effective means of suppressing mites, aphids and bugs.

AVAILABLE IN
BOTTLES OF 1 OZ.
AND 4 OZ. AND TINS
OF 1 PINT



ORDER SUPPLIES
NOW FROM YOUR
LOCAL STOCKIST

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- 1. Exclusion**
- 2. Hygiene/Sanitation**
- 3. Bait spraying**
- 4. Lure and kill**

1. Exclusion

- Most effective for home gardener
- Thin fruit, then cover individual fruit or cluster of fruits with a cover
- Mesh bags, mesh sleeves
- Mosquito netting, shadecloth, nylon flyscreen
- May need to be supported by a frame such as made by polypipe, bamboo frame





Screening (really big bags)



- **Attracts and kill males and females**
- **Baits provide newly emerged adults with a source of protein (newly emerged adults take 2-3 days to mature)**
- **Baits provide mature adults with protein**



Male



Female

2. Bait spraying



- Start before fruits begin to form



- **Apply baits to the underside of leaves of fruiting hosts**
- **Can also apply bait to leafy ornamentals nearby**
- **Can be applied to trunk (but not as effective)**
- **DO NOT spray fruit (will mark it)**
- **2-3 spots per tree**
- **Mixture needs to be used on the same day – it does not keep**



- **Lasts for approx. 7 days**
- **Washed off by rain/overhead irrigation**
- **Reapply every 7 days and for up to 14 days post harvest**
- **May not be effective in urban area where there are high populations and constant reinvasion occurs**

Options:

- Organophosphates – maldison (malathion), trichlorfon (e.g. Dipterex/Lepidex)
- Mix with water and protein e.g. vegemite or sugar
- OR premix containing spinosad e.g. Eco-naturalure, Naturalure fruit fly control – dilute with water
- Apply as coarse droplets to underside of leaves
- Can use paint brush, plastic spray bottle, pump up sprayer etc





Success - spinetoram



3. Hygiene/Sanitation

- **Bag infested fruit – then solarise**
- **Can feed to animals**
- **Remove unwanted hosts**
- **Medfly can sustain populations year-round in fallen fruit**
- **Sanitation is essential to stop the life cycle**





4. Mass trapping/lure and kill

- Lures attract males and females
- Flies either drown (wet), or are killed by pesticide (dry)
- Place at least one commercial device every 5 trees
- Place in semi-shaded area on sunny side of tree at 1.5 m



Female



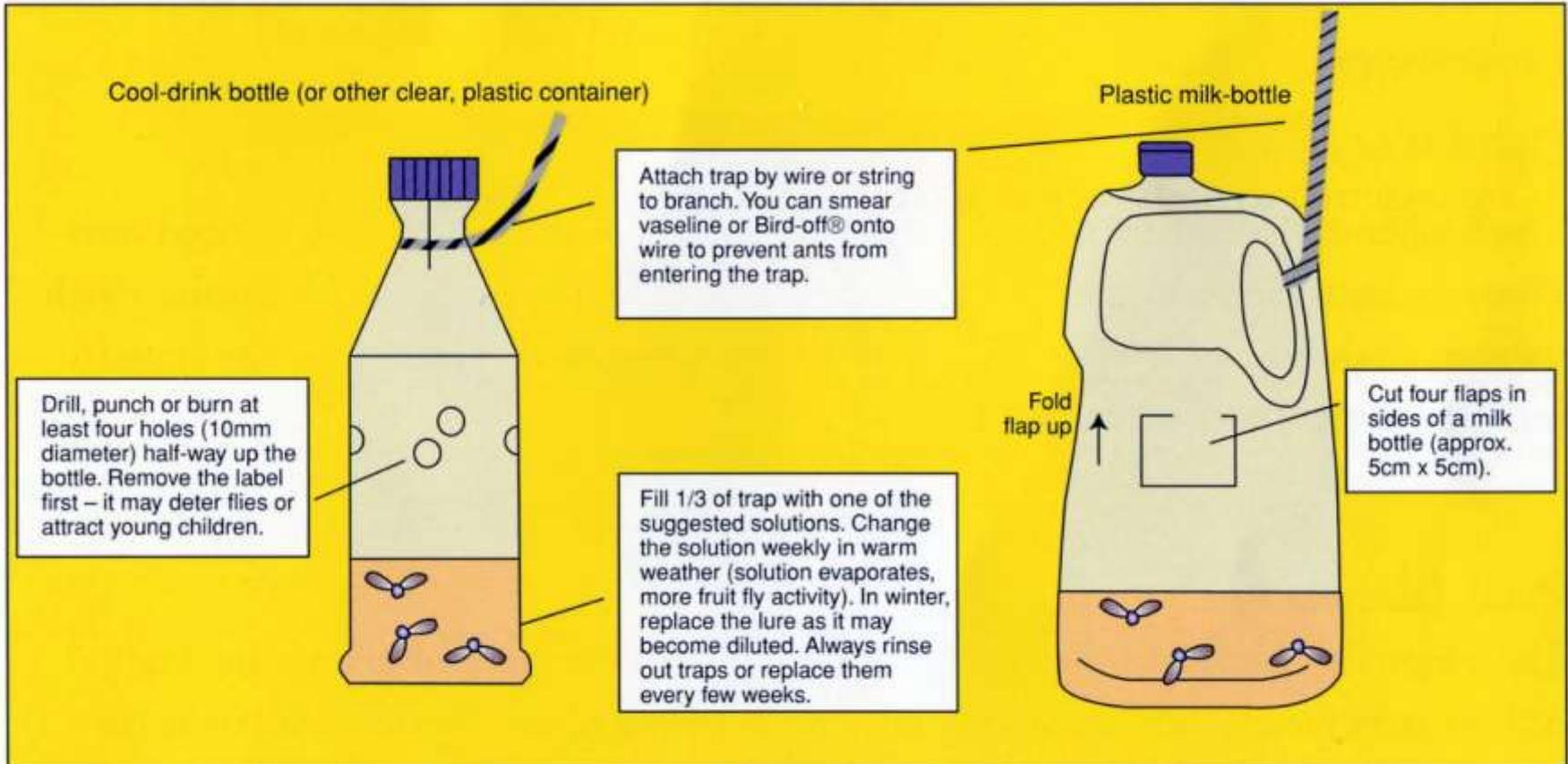
Male

4. Mass trapping/lure and kill



- Efficacy is affected by trap density and efficiency of traps and lures
- CeraTrap is the only device currently commercially available to householders
- Catches high percentage of females
- Will also catch other insects including ferment flies and bushflies
- DAFWA will be trialling a dry version





Solution 1

80 g white sugar
1.5 g dry brewer's yeast
920 mL water

Solution 2

5 mL imitation vanilla essence
20 mL household ammonia
1 L water

Solution 3

Peel from 6 mandarins (or 2 oranges)
50 mL household ammonia
1 L water

Solution 4

2 tsp honey
2 tbs ammonia
2 tbs imitation vanilla essence
1 L water

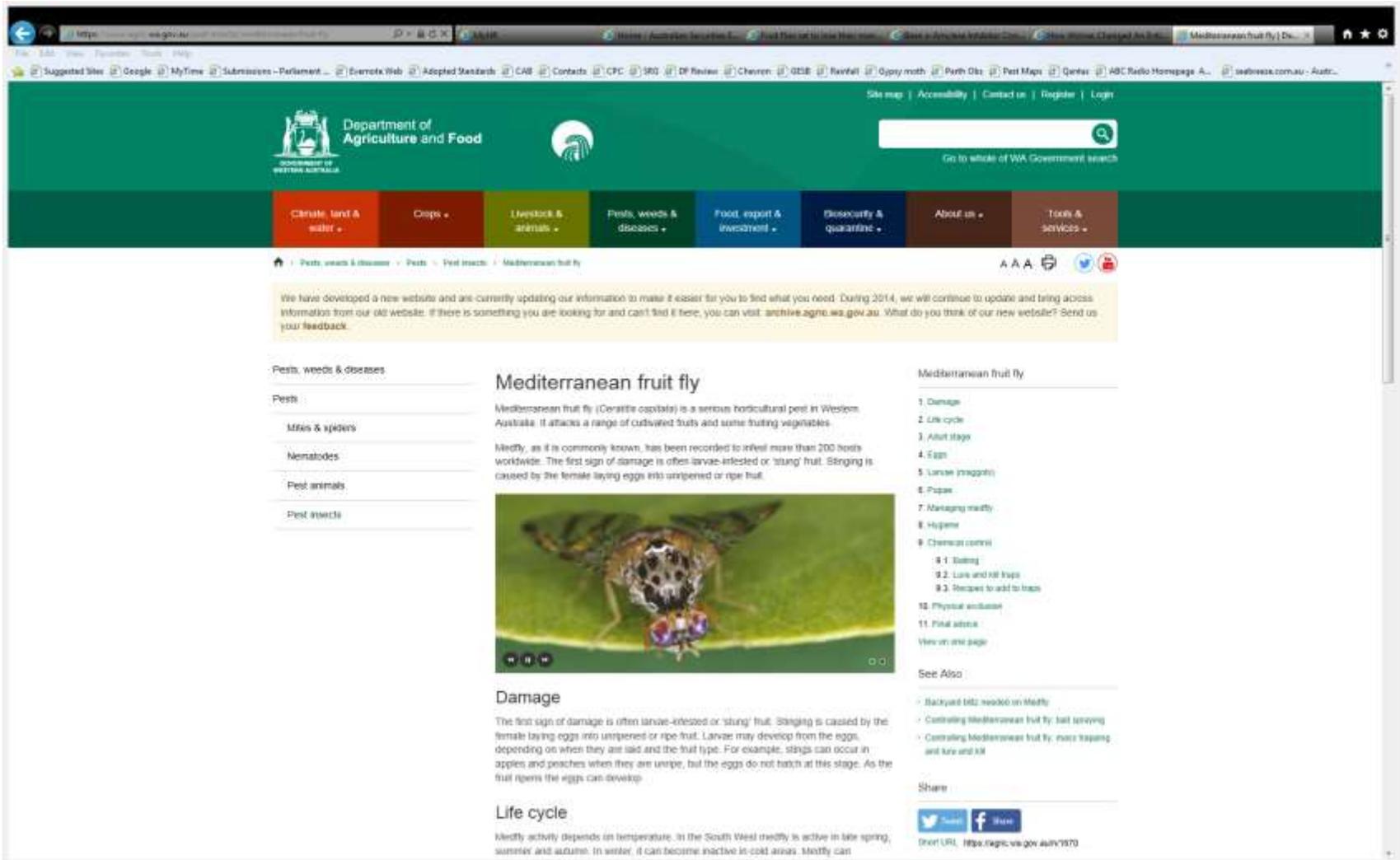
Solution 5

1 tsp borax
1 tsp sugar
2 tsp bran
1 L water



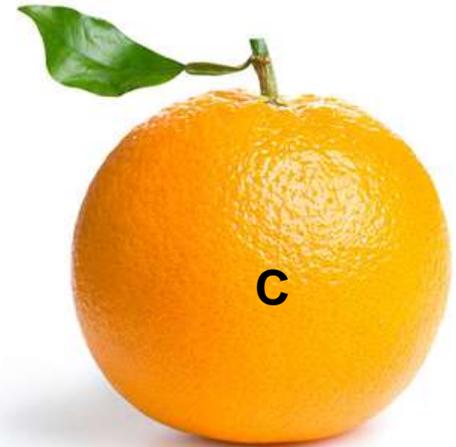
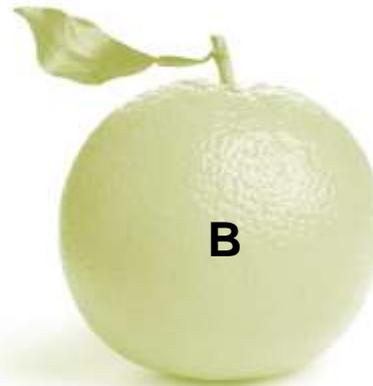
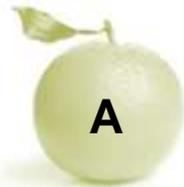
- www.agric.wa.gov.au (DAFWA)
- <http://www.bugsforbugs.com.au/> (Bugs for Bugs)
- <http://www.greenharvest.com.au/> (Green Harvest)
- <http://www.commercialnetmakers.com.au/> (Commercial Netmakers)
- www.organicfarming.com.au (Organic Farming Systems)
- Elders, Landmark, CRT, NRI, A Giumelli & Sons,
EE Muir & Sons, Bunnings, Master Hardware
- Bio-trap Australia (Colin Bain) colin@biotrap.com.au
- Probodelt (Pablo Liguori) pab.liguori@gmail.com
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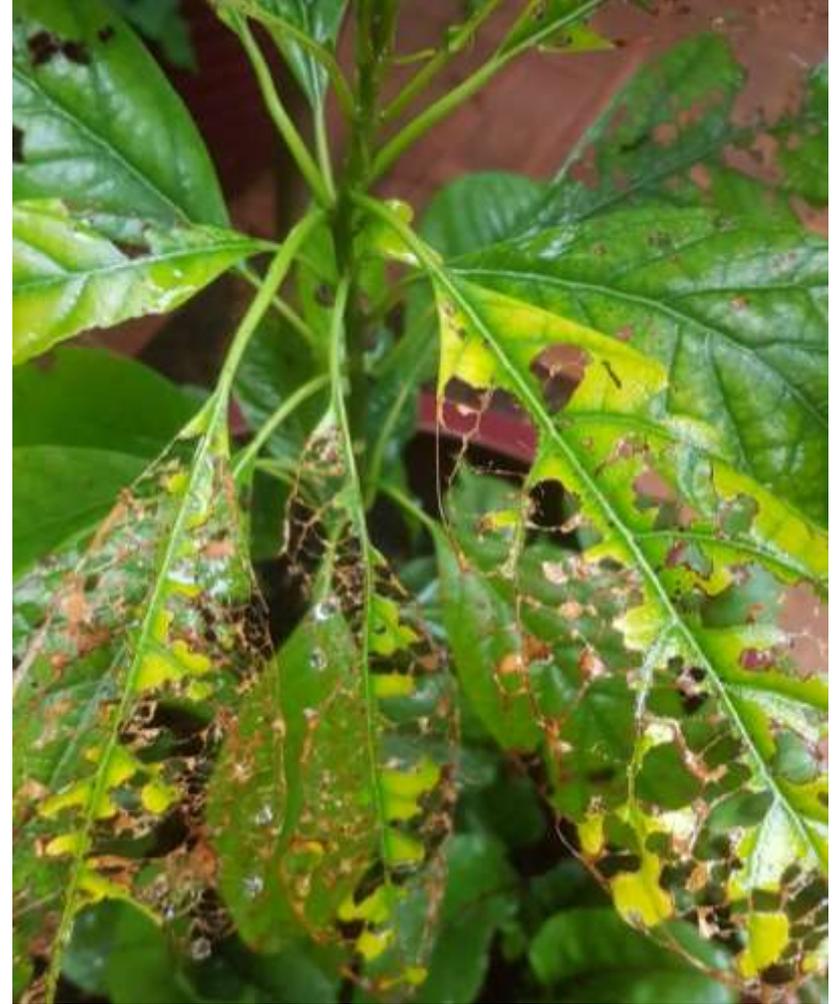




The screenshot shows a web browser displaying the DAFWA website. The page title is "Mediterranean fruit fly". The navigation menu includes: Climate, land & water; Crops; Livestock & animals; Pests, weeds & diseases; Food, export & investment; Biosecurity & quarantine; About us; Tools & services. The main content area features a breadcrumb trail: Home > Pests, weeds & diseases > Pests > Pest insects > Mediterranean fruit fly. A notice states: "We have developed a new website and are currently updating our information to make it easier for you to find what you need. During 2014, we will continue to update and bring access information from our old website. If there is something you are looking for and can't find it here, you can visit: archive.agric.wa.gov.au. What do you think of our new website? Send us your feedback." The left sidebar lists categories: Pests, weeds & diseases; Pests; Mites & spiders; Nematodes; Pest animals; Pest insects. The main content area has the heading "Mediterranean fruit fly" and a sub-heading "Mediterranean fruit fly (Ceratitis capitata) is a serious horticultural pest in Western Australia. It attacks a range of cultivated fruits and some fruiting vegetables." Below this is a paragraph: "Medfly, as it is commonly known, has been recorded to infest more than 200 hosts worldwide. The first sign of damage is often larvae-infested or 'stung' fruit. Stinging is caused by the female laying eggs into unripe or ripe fruit." This is followed by an image of a Mediterranean fruit fly on a green leaf. Below the image is the heading "Damage" and a paragraph: "The first sign of damage is often larvae-infested or 'stung' fruit. Stinging is caused by the female laying eggs into unripe or ripe fruit. Larvae may develop from the eggs, depending on when they are laid and the fruit type. For example, stings can occur in apples and peaches when they are unripe, but the eggs do not hatch at this stage. As the fruit ripens the eggs can develop." Below this is the heading "Life cycle" and a paragraph: "Medfly activity depends on temperature. In the South West medfly is active in late spring, summer and autumn. In winter, it can become inactive in cold areas. Medfly can" The right sidebar contains a table of contents for the page: 1. Damage; 2. Life cycle; 3. Adult stage; 4. Eggs; 5. Larvae (maggots); 6. Pupae; 7. Managing medfly; 8. Hygiene; 9. Chemical control; 10. Physical exclusion; 11. Final advice; View on one page. Below this is a "See Also" section with links: Backyard bit: medfly on Medfly; Controlling Mediterranean fruit fly, but not stinging; Controlling Mediterranean fruit fly: mass trapping and lure and kill. At the bottom, there is a "Share" section with social media icons for Twitter and Facebook, and a "Short URL" link: https://agric.wa.gov.au/nr7070.

Tinbergen and his students studied other variations of this effect. He experimented with dummy plaster eggs of various sizes and markings finding that most birds preferred ones with more exaggerated markings than their own, more saturated versions of their colour, and a larger size than their own. Small songbirds which laid light blue grey-dappled eggs preferred to sit on a bright blue black polka-dotted dummy so large they slid off repeatedly. Territorial male stickleback fish would attack wooden floats with red undersides—attacking them more vigorously than invading male sticklebacks if the underside were redder.





Tomato Potato Psyllid (TPP)





Chemicals available for the control of Tomato potato psyllid (domestic use)

'Domestic Use' chemicals can be used by non-commercial properties including:

- backyard (residential) gardeners
- school gardeners
- community and shire gardeners
- hobby farm gardeners



Tomato potato psyllid adults and nymphs on the back of a leaf.

Table 1. Products registered for domestic (home garden) use

Product name	Active ingredient	Rate of application	Comments
Bayer Advanced Lawn® and Garden Insecticide	25g/L beta cyfluthrin	2-4mL/5L water	Very toxic to fish and other aquatic life. Spray thoroughly on top and underside of leaves. Do not pick tomatoes for 1 day after spraying, all other vegetables 7 days after spraying.
Yates® Baythroid® Lawn Grub and Garden Insecticide	12.5g/L cyfluthrin	3mL/1L water	Dangerous to fish. Only for use in tomato, do not pick for 1 day after spraying. Spray plant thoroughly on top and underside of leaves.
David Grays Bug Gun	20g/L permethrin	ready to use, apply weekly	Spray all foliage thoroughly on top and underside of leaves.

Important disclaimer

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Table 2. Products available for use under Agricultural Pesticides and Veterinary Medicines Authority Permit PER84063

Product name	Active ingredient	Rate of application	Comments*
Yates Success Ultra Insect Control	Spinetoram	Mix 5mL/1L water	Apply every 7-14 days, ensure that all foliage is treated including the underside of leaves
Success Neo Insect Control		Mix 0.2-0.4mL/1L water	
Abrade Abrasive Barrier Insecticide	Amorphous Silica	Apply 0.25-0.5mL/10m ²	Apply 6-7 days apart.
Aphid Spray Natural Pyrethrum Insect Spray	Pyrethrins, Piperonyl Butoxide	Ready to use	Apply 7 days apart.
Yates Slay-Afe Pyrethrum Insecticide		Ready to use	Dangerous to fish. Do not use on seedlings, do not apply when plants are dry and suffering from moisture stress.
Hortico Insect Ready to Spray Tomatoes and Vegetables		Ready to use	Dangerous to fish. Apply weekly if required, do not pick for 1 day after spraying. Do not apply when soil is dry and plants are suffering from moisture stress.
Hortico Insect Killer Concentrated Natural Pyrethrum		Mix 20mL/1L water	Dangerous to fish. Apply weekly if required, do not pick for 1 day after spraying.
Richgro Beat-A-Bug® Insect Spray		Mix 25mL/1L water	Dangerous to bees, do not spray into ponds. Do not apply when plants are dry and suffering from moisture stress. Do not pick for 1 day after spraying.
Richgro Beat-A-Bug® naturally Based Insect Spray Concentrate		Mix 10-20mL/800mL water	Dangerous to fish and bees. Do not apply when plants are dry and suffering from moisture stress. Do not pick for 1 day after spraying.
Richgro Pyrethrum Naturally Based Insect Killer		Ready to use	Dangerous to fish. Do not apply to young seedlings; do not apply if plants are dry and suffering from moisture stress. Do not pick for 1 day after spraying.
Beat-A-Bug® Natural Pyrethrum Insect Spray Broad Spectrum Control		Ready to use	Ensure thorough coverage, do not pick for 1 day after spraying, and do not apply to young seedlings.
Kendon Pyrethrum Insect Killer		Mix 30mL/5L	Ensure thorough coverage, do not pick for 1 day after spraying.
Heiniger Pyrethrum Spray Insecticide		Mix 1mL/1L	Ensure thorough coverage, do not pick for 1 day after spraying.
Yates® Nature's Way® Vegie and Herb Spray Concentrate Natrasoap® Pest Spray	Potassium salts of fatty acids	Mix 15-30mL/1L	Apply to run-off, every 5-7 days or as required. Do not use on delicate plants.



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HITMAN⁺

SOAP INSECTICIDE

ACTIVE CONSTITUENTS:
285 g/L Potassium Salts of Fatty Acids

For the control of insect pests on
broadacre crops, fruit trees,
vegetables, nut crops and nurseries
as per the directions for use table.

VICCHEM
The Right Chemistry

 Australian
Organic Registered
Farm Input
ALLOWED INPUT 10033A

Eggplant caterpillar



Nature is all its' magnificent glory 😊😊😊
😊 3 beautiful bird eggs in one of our apricot
trees in the Perth Hills #perth #perthhills
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- As slaters feeding on mulch and decaying vegetation, keep garden beds and mulch away from the perimeter of the house
- If you do have a garden bed next to the house, use a non-plant based mulch (such as pebbles) and minimise watering (as slaters like moisture)
- Iron chelate based snail pellets are also effective against slaters and, as they break down, they release iron to feed the plants. They're safer than traditional snail pellets for use around pets, children and wildlife but they should be stored and used with caution and common sense.
- When it comes to seedlings, try plant collars (old pots with the bottom chopped out) for the first couple of weeks, or pot on seedlings to establish them before planting out. Once the stems become tougher, they're less attractive to slaters.
- Make sure all cracks and crevices around the edge of the house are sealed to prevent the entry of slaters and other unwanted pests.





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Naming and shaming Australia's most unwanted



The top 43



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Queensland fruit fly eradication program

THE QUARANTINE AREA WILL REMAIN IN PLACE UNTIL NOVEMBER 2018 (subject to no further flies detected).

Quarantine Area

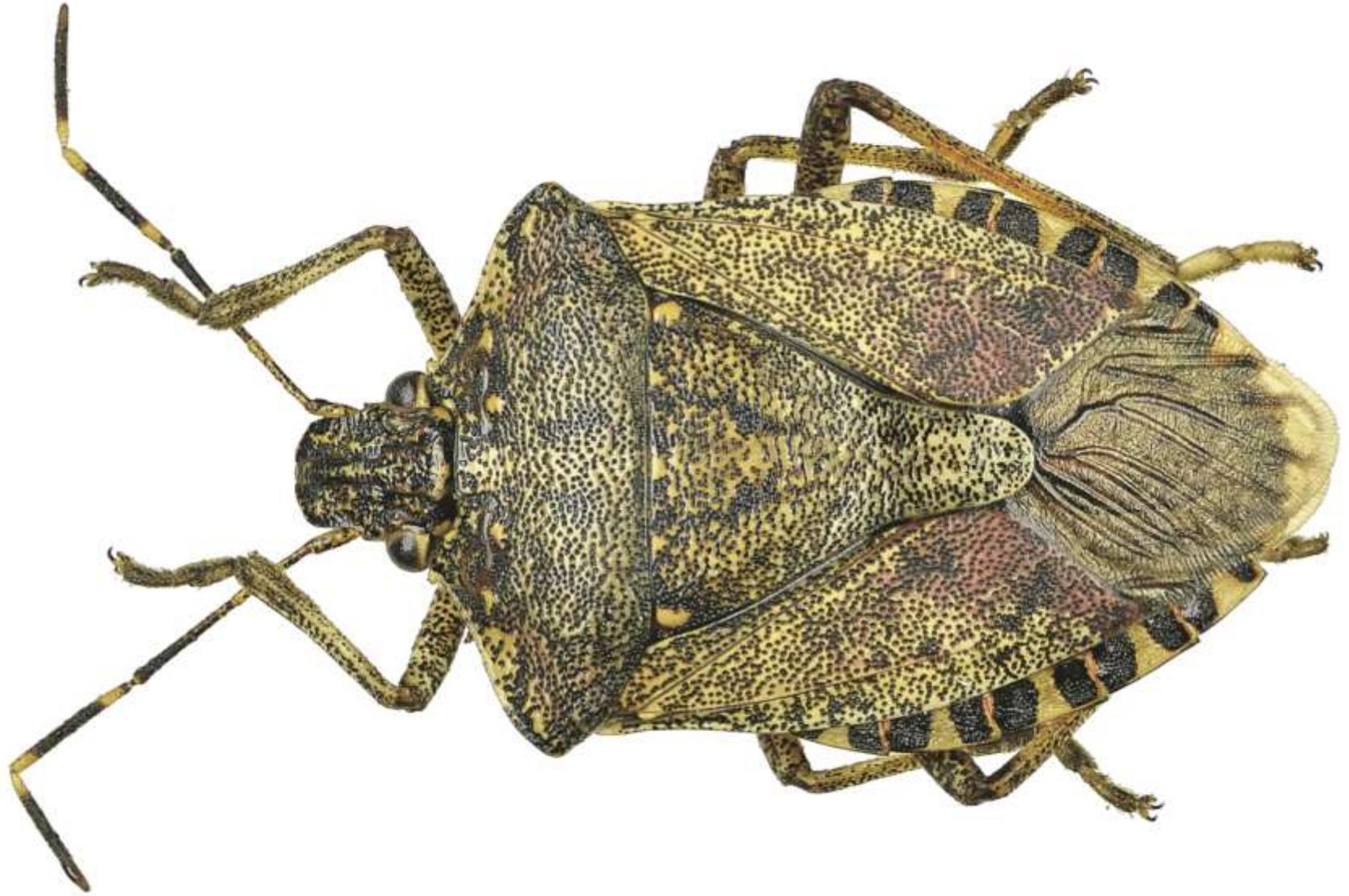
Map current from 18 May 2018



- Como, Kensington, Karawara, South Perth, Bentley.
- Came into effect 5 May 2018.
- Was extended on 18 May to include part of Bentley and Curtin University.
- **DO NOT** move home-grown fruit and vegetables from the Quarantine Area.
- Ripening and fallen fruit disposed of every 3 days according to guidelines.



Brown marmorated Stink Bug





Brown Marmorated Stink Bug



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World: Fruit and nut case

Control of a global pest which has already caused millions of dollars' worth of damage to hazelnut crops in Georgia and apple production in north eastern regions of the USA is now benefiting from the Centre for Agriculture and Bioscience International's (CABI) expertise in scientific research and development.

Dr Tim Haye, Head of Arthropod Biological Control at CABI, is leading a project in China to determine whether a natural solution can be found to control devastating impacts of the brown marmorated stink bug *Halyomorpha halys*.

Known not only for its pungent smell to deter predators and its ability to 'hitchhike' around the world, the brown marmorated stink bug in 2016 caused \$60m worth of damage to Georgia's hazelnuts (a third

of its crop) and in 2010, \$37m worth of apples were destroyed in parts of the USA.

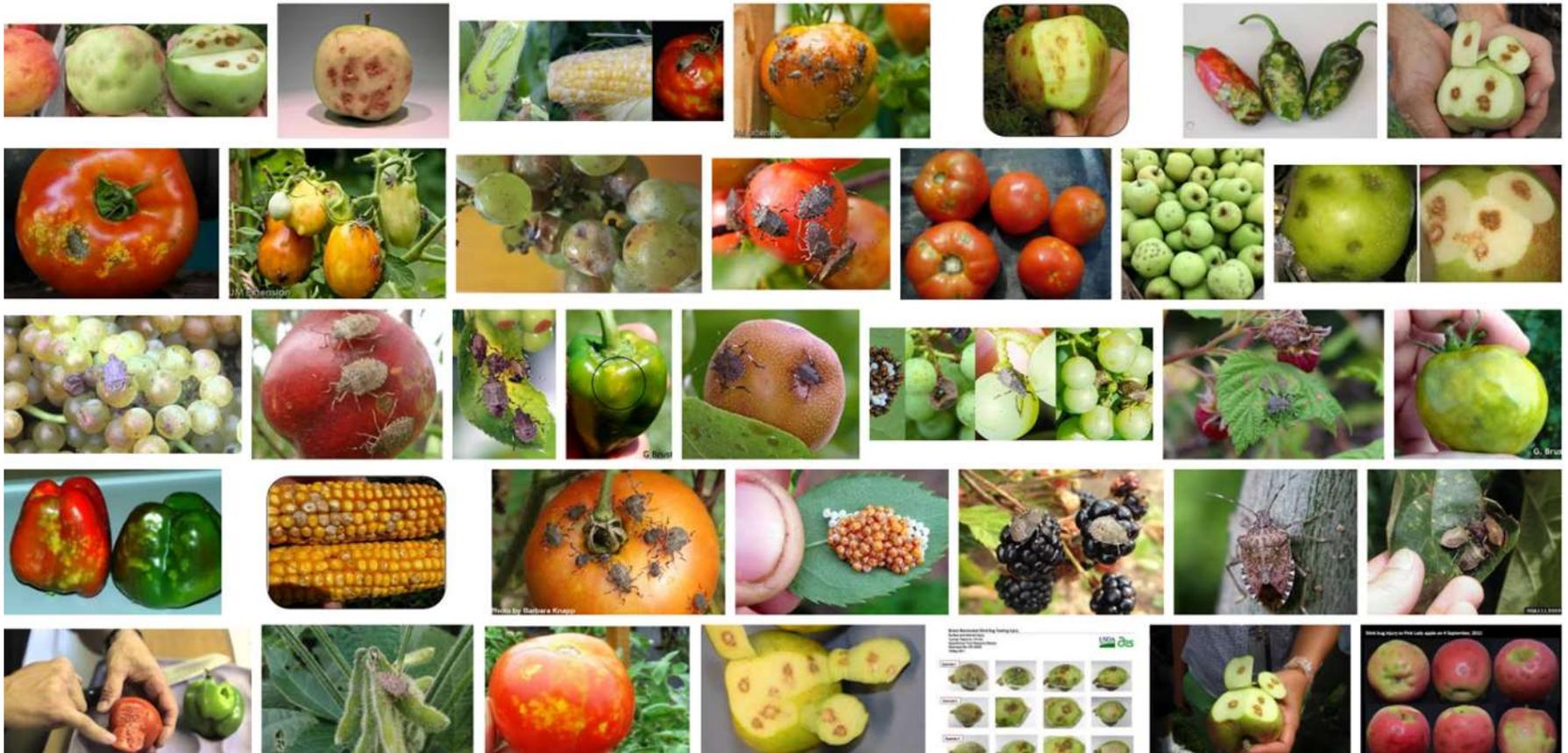
Dr Haye, as part of CABI's work to help farmers increase their incomes from their crops and therefore meet the UN's Sustainable Development Goal of 'No Poverty', is busy developing a bioclimatic model for the potential distribution of the bug with colleagues from the International Pest Risk Research Group.

As devastating losses in Georgia continued in 2017 and hazelnut production in Turkey and Italy is also threatened, Dr Haye is also working to see if the parasitic wasp *Trissolcus japonicus* (from the stink bug's native range in China) can prove an effective weapon in the fight against the stink bug and serve as a more environmentally-friendly alternative to pesticide control.



Brown marmorated stink bug *Halyomorpha halys*

CABI has already completed a risk assessment study, and it is hoped the research conducted in Switzerland will help determine the possible use of the Asian natural enemy against the stink bug in Georgia.



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European wasp



Yellow paperwasp



**Over-wintered nests can
give rise to very high
wasp population
densities**

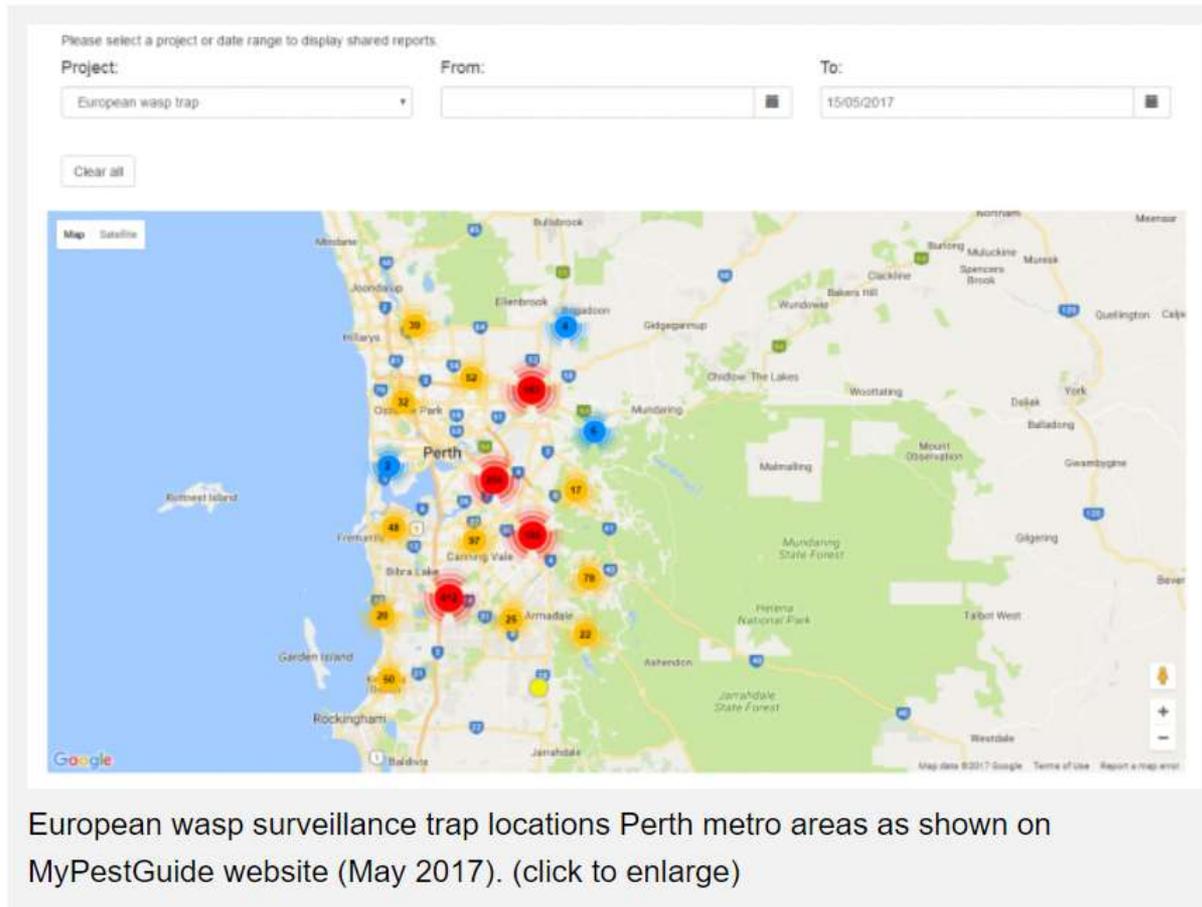


**European wasp
nests can be re-
queened and over-
winter in the
temperate climates
of New Zealand and
Australia**





The program is strengthened through public involvement in the **Adopt-a-Trap** initiative and Local Government participation through the **European Wasp Working Group**.





Adopt a Trap



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Mole crickets - more ugly than bad





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WHAT'S EATING MY GARDEN

Red Imported Fire Ant Stings





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WHAT'S EATING MY GARDEN





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EXOTIC PLANT PEST HOTLINE
1800 084 881



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WHAT'S EATING MY GARDEN

Lacewings - generalist predators





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WHAT'S EATING MY GARDEN

Mealybugs



UC Statewide IPM Project
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WHAT'S EATING MY GARDEN

Ladybird beetles - scale predators





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WHAT'S EATING MY GARDEN

Cryptolaemus - mealybug predator





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WHAT'S EATING MY GARDEN

Mealybug parasites





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WHAT'S EATING MY GARDEN

Aphytis - armoured scale parasites

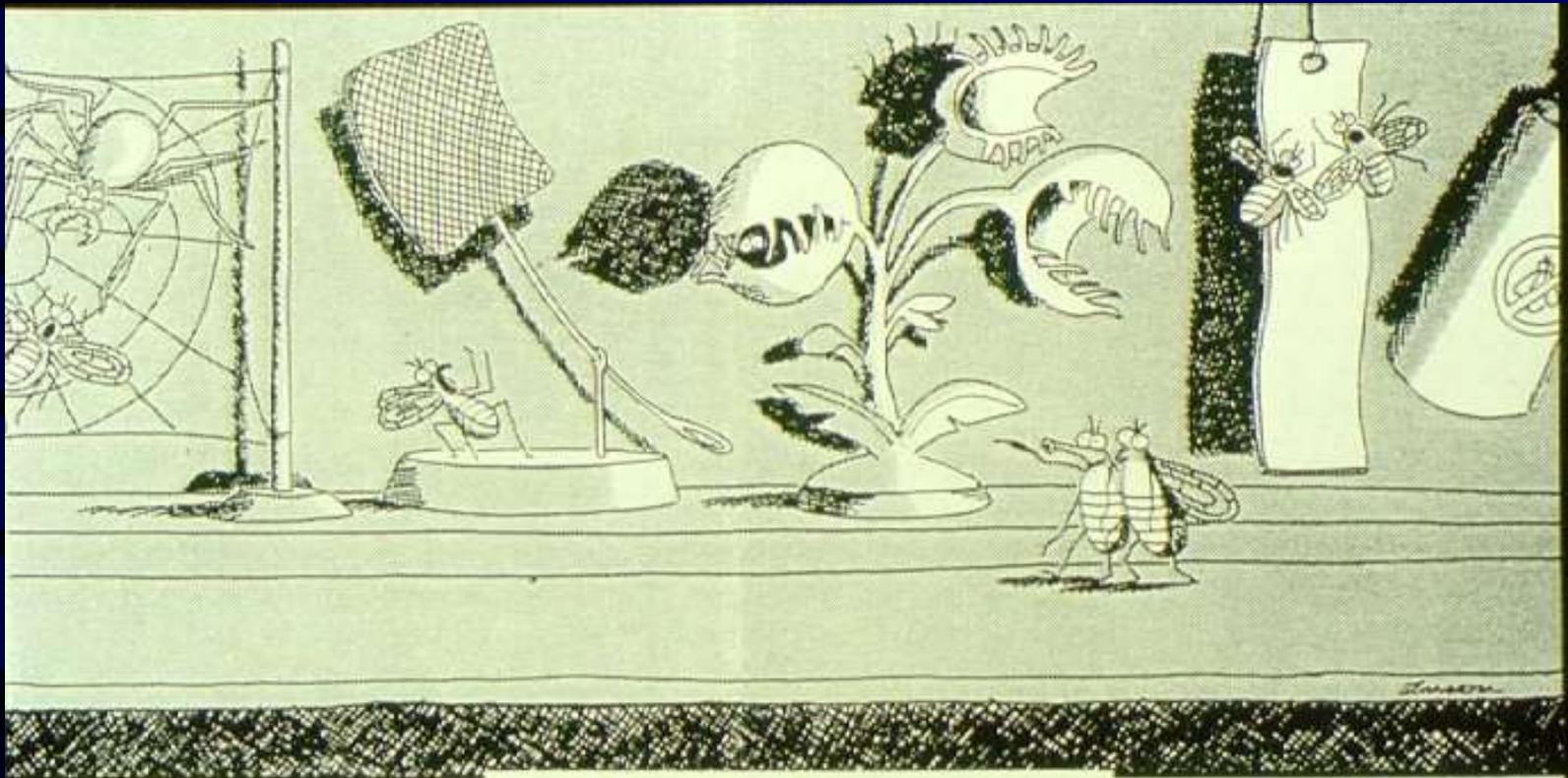


Orius - thrips predator



Cultural control

- reflective mulches
- intercropping
- indicator plants
- weed hygiene (reservoirs of thrips and viruses)
- crop residue removal (harbour pests)



The Museum of Integrated Pest Management



Department of
Agriculture and Food



Thank you

darryl.hardie@dpird.wa.gov.au