

October ROGI meeting: Colin Harris

Colin is the first full time researcher to work on two specific parasitoid wasps which are the nemesis of Queensland fruit fly. He spoke about and demonstrated practical easy measures for home gardeners using natural biological control methods based on current research.

Before we discuss Colin's research, let's be clear—this is the fruit fly we're looking at:



- A native occurring throughout eastern Australia.
- Adult is wasp-like, red-brown with yellow marks, about 8mm long.
- They hold their wings outstretched in a horizontal position when walking.
- They flick them in a characteristic manner.
- The female pierces (stings) the maturing fruit and lays a clutch of white, banana-shaped eggs just below the surface.
- Hatching takes place after 2 to 3 days and the resulting larvae are white carrot-shaped maggots (about 7mm long when mature) that tunnel in the flesh. They carry bacteria that aid in fruit breakdown. The mature larvae can 'jump' by curling into a 'U'-shape and then rapidly straightening.
- Larvae mature in 7-10 days in summer and emerge from the fruit to pupate in the soil. The pupal stage lasts about 10 days.

- Life cycle takes about 2.5 weeks during summer.
- Adult flies congregate on foliage and fruit to feed on bacterial colonies and later to mate.
- These bacterial colonies are more plentiful under humid conditions.
- Queensland fruit fly infests both indigenous and introduced fruits. Some varieties affected: apple, avocado, capsicum, carambola, citrus, custard apple, grape, guava, mango, papaya, passionfruit, persimmon, pomegranate, loquat, tomato.
- To **monitor fruit fly activity**, hang male lure traps under the shady canopy, where flies tend to rest. Check the number of flies trapped each week. The recommended trap contains a synthetic attractant combined with a fumigant insecticide.
- One per hectare should be hung according to manufacturer's instructions.
- Inspect traps at weekly intervals from the end of flowering and until the completion of harvesting. Take action as soon as 2 flies per day are caught.

Control Options

Cultural

- Fruit flies become active after periods of rain or high humidity. Do not allow fallen fruit to remain.

Biological

• This is what Colin is researching

Chemical

- A protein bait for the control of female fruit flies is approved for use on various crops—can be applied in spots or bands on foliage.
- Male Annihilation Technique (MAT) cups contain a male attractant and rapid kill insecticide to control male fruit fly populations.

Information edited from:

<https://www.daf.qld.gov.au/business-priorities/agriculture/plants/fruit-vegetable/insect-pests/queensland-fruit-fly>

Back to Colin's talk:

Of the many different types of fruit fly worldwide, Queensland fruit fly is the second most destructive.

Research into fruit fly behaviour and bio control waned after the development and wide use of chemicals since the 1950s. This led to the common usage of various types of pots/traps which lure fruit flies of one sex or the other into them where they are trapped/drowned/poisoned. These pots have a limited range, require active management of the contents and have been of dubious benefit.

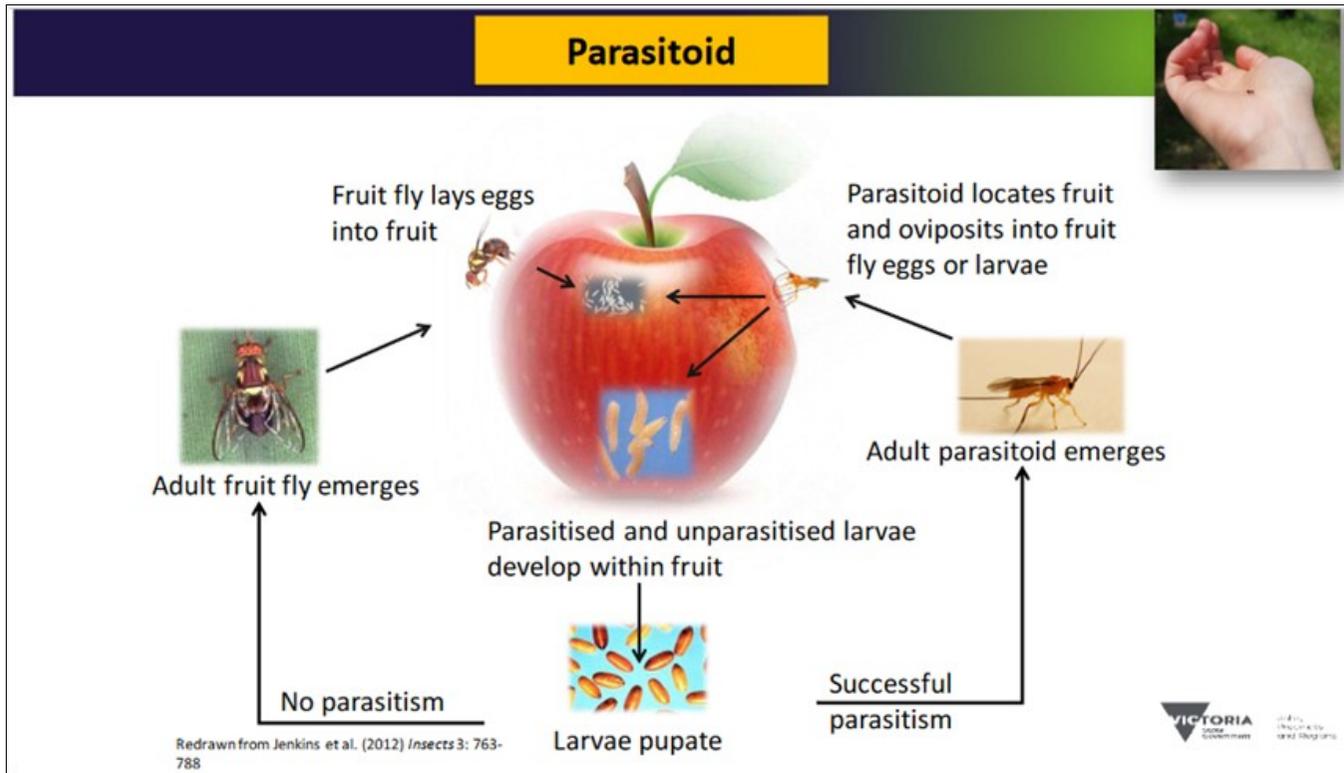
To minimise on-site breeding of fruit fly, current home garden management should include bagging and disposal of fallen fruit which may be stung (or letting the chooks out to seek and destroy).

Solarisation (eg by placing fruit into a black plastic bag in the sun to kill the larvae) is often suggested, but it will kill the parasitoid wasp as well, so he does not recommend it.

At the DPI campus in Cleveland, Colin has been researching a year-round method of reducing the overall population of Queensland fruit fly using two different parasitoid wasps.

This involves active breeding of these wasps which lay their eggs in the fruit fly larvae thereby making them hosts for their own eggs and larvae.

See over for an excellent diagram illustrating this life cycle of the QFF.



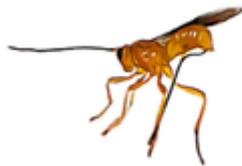
Using a system such as this will provide a means for home gardeners to play a role in increasing parasitoid populations in their local area.

The other factor is the need for habitats to provide refuges and feeding sites (nectar sources) that support parasitoid wasp populations in fruit-growing environments.

This is another reason to grow flowers as well when you're growing food. Colin mentioned alyssum, but he said that research with flowers and wasps is very preliminary and thus he cannot suggest/recommend any particular flowering plant as a food source for these wasps at this stage. Sounds like a good reason to grow a wide range until we know more!

The two wasps that parasitise Queensland Fruit Fly

Diachasmimorpha kraussi
Australian native parasitoid of Qld and northern NSW. Orange colour.



Fopius arisanus
native of Malaysia imported into Australia in the 1950s. Black.



The idea behind Colin's research was to find a way to break the cycle above and thus greatly reduce the reproduction of QFF by utilising:

1. the natural habit of the wasps to parasitise the QFF eggs or larvae and
2. the fact that the wasps are much smaller than the fruit flies.

His team have come up with containers called augmentoria** that infested fruit can be placed into, allowing larvae to emerge from the fruit and pupate. These larvae may or may not be parasitised. Only the adult parasitoids (and not the fruit flies) can escape from the container because of their smaller size.

So ... how to go about the process of making an augmentoria?

The researchers have been able to build a simple composting trap/breeding device (the augmentoria) which uses 2mm shade cloth (or similar) mesh that the parasitoids are able to get through but not the fruit flies.

** They are called 'augmentoria' because they augment (i.e. Increase) the numbers of wasps that are already in existence onsite. If there are no existing wasps, then the site needs to be inoculated with them. If you're not sure if you have wasps in your area, find some fruiting wild tobacco. See p 4.

Here is Colin's reasoning for mentioning the **use of chemicals** to an organic growers group:

'I included this as a general information piece so the information can be spread by members to their friends and the general public so they can see that there is an alternative to spraying that works as effectively, without destroying all the garden biota (e.g. the use of targeted fruit fly baits in a controlled fashion).

I consider it important as this reduction in chemical use is a step in the right direction for non-organic growers without them stepping out of their comfort zone entirely.'

At the ROGI meeting, Colin displayed his augmentoria and showed how it works.

Here's how you can make one at home:

1. Use a small dalek-style compost bin with no aeration holes and
2. some 2 mm shade cloth (see *photo right*), cut into a square (measuring a bit more than the diameter of the top of the compost bin). Join 2 sides to make a tube.
3. Set the bin about 100 mm into the ground so the QFF larvae don't make their way to the surface outside the bin, and go on to wreak havoc!
4. Cut a circle out of the lid.
5. Stretch one end of the shade cloth tube over the open top of the bin, so it hangs over the outside about 15cm.
6. Place the lid on the bin to secure the shade cloth and thread the tube through the hole in the lid.
7. At any time, you can place stung fruit into the bottom of the bin, by passing



it through the shade cloth tube.

8. Secure the open end of the tube by tying it with string so that fruit flies cannot escape. The wasps can escape (which we want) because they are smaller than the mesh size.

There is no need for human management of the device apart from dumping all fruit fly-affected or fallen fruit into it.

This device works to trap the fruit flies while at the same time building up the population of parasitoids who can then escape into the garden (they're attracted to light) to kill more future fruit flies.

After the fruit inside the device is dealt with by the parasitoids, it can then be added to the main compost bins— Colin suggests emptying the augmentoria in winter when there are few, if any, QFF.

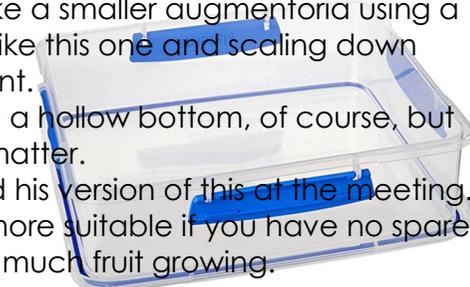
Here's a photo of Colin and the device so you can get a better idea of the finished product.



You can make a smaller augmentoria using a Sistema box like this one and sealing down the equipment.

It won't have a hollow bottom, of course, but this doesn't matter.

Colin showed his version of this at the meeting. It would be more suitable if you have no spare space or not much fruit growing.





Wild tobacco *Solanum mauritianum* is a favourite of the wasps. It will attract them into your growing area, so that it will be inoculated with them.

Colin found some fruiting wild tobacco growing near the lower car park area at Salvos, and also on the corner of Dawson Rd - further down MacArthur St from the church. Handy to know if you want to inoculate your garden with the wasps.

Here's how:

- collect yellow wild tobacco fruit
- place in an **unlidded** plastic container with no holes in the base containing 25mm of soil
- place container so that it does not get rained on/in (the larvae will drown).
- After 3 weeks the entire contents of the container should be bagged and placed in the rubbish bin; by this time any parasitoids will have emerged.
- You might also notice fruit flies emerging from the container; don't panic as these particular fruit fly *Bactrocera cacuminata* only infest wild tobacco (monophagous).
- **Do not** put wild tobacco into your augmentoria as it is a serious weed and near impossible to eradicate once you have it.

We've received follow-up emails from Colin:

"One of my colleagues, Chloe van der Burg requires fruit flies from the wild as part of the current research project.

The best way for us to collect flies is to collect fruit from the wild, parks and gardens or private gardens.

If any of your members would like to donate fruit that may be infested with fruit fly it would assist our research greatly.

Chloe will be able to organise collecting of fruit from the grower's residence or place of employment (contact Chloe c.vanderburg@qut.edu.au).

Alternatively if someone wants to visit the glasshouse (with the fruit) where I conduct my work we can organise a quick tour as a thankyou—contact me c36.harris@qut.edu.au

Only 3-4 people at a time for the glasshouse please as space is limited and COVID restrictions apply.

Also, please convey to the group that I am available, work time dependent, to

Miscellaneous information from Colin.:

Don't use the blue sticky traps – they lure all beneficial insects, not just pests.

Queensland fruit fly may have a range of up to 150 metres, so encourage the neighbourhood to be QFF aware!

Chooks free-ranging under fruit trees in your orchard will eat larvae in dropped stung fruit.

answer follow up questions. Please allocate someone to collect the questions and send them to me all at once."

This is exciting research and the results show that the process works. I'm sure you, as a ROGI member, are as keen as I am about it, and are as grateful as I am that his team is persisting with it.

Those of you who were present when Colin spoke about this will recall the apparent difficulty we had getting our heads around this concept. I hope this attempt at conveying it to you is adequate.

However, if you're still struggling to understand, or you have questions for Colin, please send them to info@rogi.com.au and we'll send them all together, as Colin has requested.

Reporting by Diana Yeo, Sue Goodrick and Jill Nixon (with editing assistance from Col).

Compiled by Jill Nixon.

Fun fact from Colin:

Monophagous – only eats one type of food
e.g. panda and bamboo,
koala and eucalyptus

Polyphagous – will eat pretty much anything!
e.g. parasitoid wasps, most Aus. fruit flies

Colin gave ROGI a book that lists 5½ pages of fruits that Queensland fruit flies eat. Fascinating! I'm sure the book will be in high demand from the library!