

MacTriX - Trichogramma Wasps

- Easy to apply • Cost effective • Good for the environment

Background

These tiny Trichogramma wasps that we call "MacTriX" have proved to be a very effective parasitoid of macadamia nutborer (MNB) with parasitism rates over 90% commonly observed. The need to spray is therefore greatly reduced. Crop consultants and farm managers used to wake at night worrying about this pest and consultants spent a good deal of their time monitoring crops for nutborer. High damage levels (over 20%) were not uncommon in spite of spraying.

The wasps work into the tops of trees where good spray contact is difficult and continue to work during showery weather when spraying is problematic.

It has also been found that good wasp activity reduces the numbers of overwintering MNB pupae in the vicinity and reduces pressure the following season. MacTriX can be used in an IPM program in combination with selective products like methoxyfenoxide and the occasional use of some broad spectrum chemicals.

About MacTriX

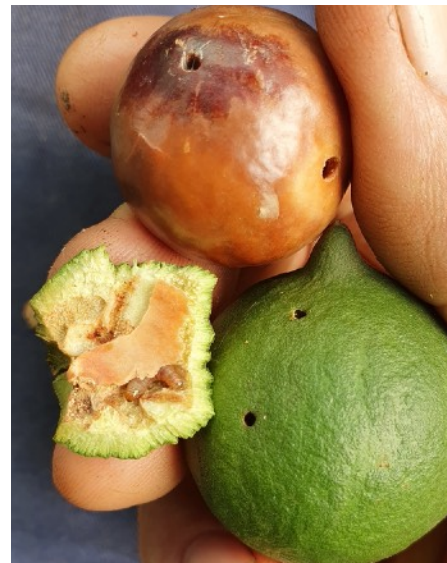
MacTriX (*Trichogrammatoidea cryptophlebiae*) are minute wasps that lay their eggs within the eggs of certain lepidopteran moths, including macadamia nutborer, *Cryptophlebia ombrodelta*.

MacTriX adults are honey coloured, with red eyes, fringed wings, and small clubbed antennae. They are less than 0.5 mm in length and males are even smaller than females.

Female MacTriX lay their eggs into the MNB eggs. These eggs hatch and wasp larvae then develop within the macadamia nutborer egg, killing the developing caterpillar in the process. After pupation the adult MacTriX chew through the egg and emerge - usually 2 or 3 adults from each nutborer egg - to mate and again search for macadamia nutborer eggs.

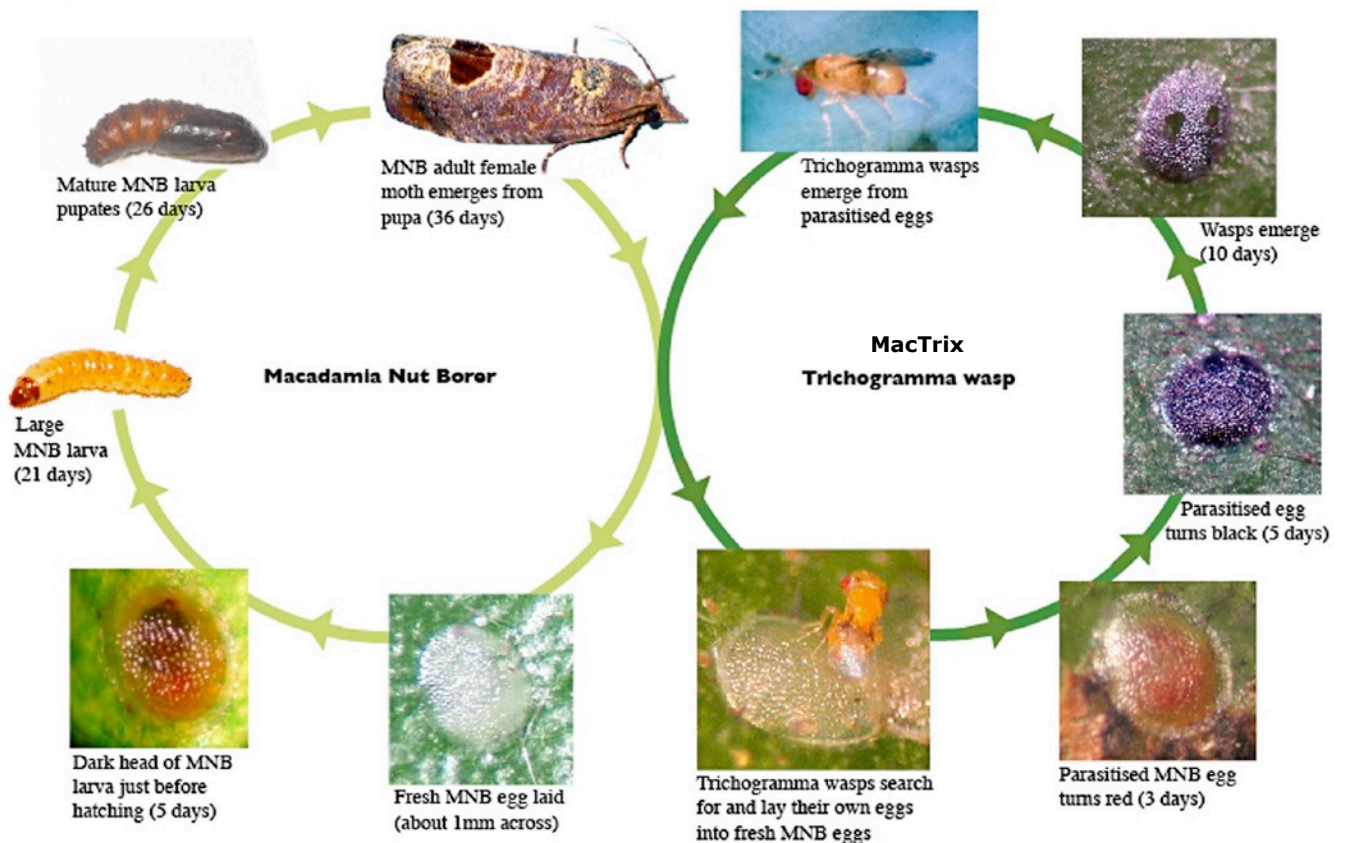


MacTriX on a match head



MNB damage (photo Eddy Dunne)

How Trichogramma Intercepts the Lifecycle of Macadamia Nut Borer



Method of release

The Trichogramma wasps are dispatched as parasitised nutborer eggs on sheets of finely corrugated cardboard which can be broken up into 24 individual cards. Staple the cards to the back of a leaf around head height in areas where nutborer have been observed or in areas where you expect moths to move into the orchard from other nearby hosts and areas where you've had a problem in the past.

The density of the parasitised eggs will vary on the sheets. We sort the sheets into low, medium, high and very high density – rating them respectively 500+, 1000+, 1500+ and 2000+ parasitised eggs per sheet (24 strips per sheet). This allows for a wide margin of error – there are many more eggs than this.

To make use of all the sheets we generally send the lower density sheets to the growers with smaller orders and give more sheets to place evenly throughout the orchard. High-density sheets usually go to the larger orders for placement into hot spots, windward boundaries and previous problem areas. Sometimes a small order will have a high-density sheet and sometimes a large order will include some lower density sheets.

We always supply in excess of your order (a quick look and count with a hand lens will make this obvious) and some weeks when we have excess sheets we distribute them amongst all orders at no extra cost. We cannot store them for more than 5 days.

Release strategy

The strategy used is initially a **pre-emptive** one, with a more targeted approach as the season progresses. Making numerous releases hedges against sudden rises in nutborer pressure, adverse weather events and the possibility of needing to spray. On high pressure farms, it is desirable to release at least some wasps earlier than the recommendations below to get them established as early as possible.

Release timing

Typical programs will start at these times:
Mid October for North Queensland
Early November for Bundaberg region
Mid November for SE Qld
Late November for Northern NSW
Early December for Nambucca Heads

This will depend on the number of weeks in your program. Start time is likely to be before many eggs are found in the standard monitoring sample but it is desirable to get some of these early laid eggs parasitised wasps. This will facilitate wasps establishment, dispersal and a rapid increase in parasitism as the moth pressure increases.

Release rates

Release rates will range from 100 per hectare per week for large crops and up to 1,000 per hectare for very small crops. Releases should go for at least 8 consecutive weeks. Order enough for the total area you want the wasps to be active in. The rate can be reduced for larger crops when hot spots of nutborer are known.

Initially, place all the strips in known hot spots or along pressure boundaries. Other high pressure areas can include packing sheds and proximity to nearby poinciana, wattles and mangroves. Later on spread the cards more evenly through the block but particularly the main windward side.

If releases start a bit late, higher rates per hectare should be made in the first 2 weeks. Discuss your release rate and strategy suitable for your farm with your consultant or call us.



Mac nutborer pupal case



MacTrix pupae on corrugated cards



MacTrix cards are stapled into the trees



MacTrix female just emerged from MNB egg.

Chemicals and Trichogramma

Methoxyfenozide targeting MNB, is not toxic to MacTrix but wasps are killed by many other insecticides. Ideally Trichogramma establishment and development will occur in low spray situations. However, over many years now we have seen that they are still able to work very effectively in crops that are sprayed occasionally. Repeated sprays of hazardous insecticides will reduce their numbers considerably. If it is deemed necessary to spray a hazardous product, for example for fruitspotting bugs, then do so, but consult your consultant or supplier for the least toxic solution.

Once MacTrix are established in the crop, the use of "hazardous" sprays, is not as disruptive. At this stage many wasps are still developing in the nutborer eggs and are to some extent shielded from impact of insecticides.

In this way, the wasps are able to recover from occasional sprays. Therefore, opportunistic releases in between sprays in the early part of the season can help to establish the wasps early, even if some of them get killed by subsequent sprays.

Wasp emergence

When your Trichogramma wasps leave our insectary they usually have 3-4 days to emerge when kept at 25°C. We generally dispatch on Mondays so that the package arrives on Tuesday or Wednesday. The cards are put out on Thursday or early Friday and the wasps should begin to emerge on Friday.

The package contains a note on estimated emergence time. However, temperatures in transit may vary from 25°C. If it's hotter they will come out earlier and if it's colder, later. Open the parcel when it arrives to check if any wasps have started to emerge.

If the Trichogramma are placed in the field on arrival, and it's cool in the field, it may be several days before the wasps emerge. Predators, such as ants, may eat some Trichogramma pupae before the wasps emerge. We therefore suggest you place the cards in the field in the 24 hours leading up to estimated wasp emergence. This will minimise predation.

Alternatively, place some strips in a glass jar on arrival. Release the cards in the field when a few wasps start coming out.

Stalling wasp emergence

If wasps start emerging earlier than you expect (or if the weather is unsuitable for placement in the field) the Trichogramma emergence can be slowed down by placing them in a cool place.

Wasp development is minimal below 12°C. Place the MacTrix cards in a fridge that runs between 5 and 14°C or in an Esky with several ice bricks. Refrigeration should not exceed 4 days, as wasp fitness will decline beyond this time.

Monitoring for nutborer parasitism

Twenty years ago monitoring for nutborer was a major activity of crop consultants. These days the pressure is generally not so high, thanks to MacTrix. MNB can still break out and it's important to be able to differentiate between unparasitised and parasitised eggs. A lot can be learned from the respective number and appearance of the various stages of eggs compared with previous monitoring samples.

As MacTrix build up in a crop there are various tell-tale signs that show a reduction in your nutborer population. Firstly, the appearance of black nutborer eggs and then black eggs with escape holes will correspond with a decline in unparasitised nutborer eggs. Note, many eggs found while monitoring may be parasitised but have not had time to go black (this takes about 5 days). These nuts with eggs can be collected and monitored to see if they turn black or not. Nuts can be placed in egg cartons to stop them rolling around and squashing the eggs.



Coal black eggs parasitised by MacTrix (Pic, J Coates)



Escapes holes made by adult wasps. The eggs remain black after the wasps have emerged and several wasps may emerge from one egg.



Nuts with eggs on them can be set aside to see if the eggs are parasitised.

More on monitoring

The images on the right show the development of a group of both parasitised and unparasitised MNB eggs. Normally you wouldn't see so many MNB eggs together.

The two eggs on the left have been parasitised. We've kept the wasps away from the rest to see the development of unparasitised eggs.

Parasitised eggs will go an even red colour before turning black. While unparasitised eggs darken more in the centre and then the dark head of the caterpillar becomes visible.

Typically, sampling for MNB and MacTrix is done by removing 100 to 320 nuts from trees (e.g. 10 nuts from 32 trees) and examining them for nutborer eggs. Any eggs found are recorded and scored as either: fresh, red, hatched, black or black with escape holes.

Nuts are also checked for damage, and any larvae and their size are recorded. This sampling is done fortnightly (or weekly during pressure periods) and gives a very good picture of what is going on when compared with results from previous weeks.

Monitoring for MNB and MacTrix takes practice, so if you don't have time we suggest you employ a crop consultant who is experienced in doing so.

Finding moderate to high levels of parasitism by MacTrix can save a lot of spraying and easily covers the cost of a consultant.

The development of parasitised and unparasitised MNB eggs. The two eggs on the left are parasitised by MacTrix



Day 1
Freshly laid up to 14 hours old MNB eggs.
MacTrix wasps are added at this time.



Day 2
Unparasitised eggs develop a pink hue and larvae can be seen developing.
Parasitised eggs (far left) are more evenly pink.



Day 3
Unparasitised eggs develop a darker redder centre.
Parasitised eggs are more evenly red



Day 4
Unparasitised eggs continue to darken in the centre.
Parasitised eggs darken and remain red all over.



Day 5
Unparasitised eggs showing dark head of caterpillar. Third from right has hatched.
Wasps will emerge from the two parasitised eggs on the left in another 4 days.

What we need from you:

Start Date, Quantity (1,000's) per delivery and # of weekly deliveries.

Name or Company and address where package will be left out of the sun (nearby post office preferred),

Mobile phone and Email address for delivery tracking notifications.

If you have a crop monitoring consultant you can order through them.

BioResources Pty Ltd, ABN: 12 078 989 081
Ph: 0492 247 176 Email: office@bioresources.com.au
Web: www.bioresources.com.au
YouTube channel: www.youtube.com/@bioresourcesau

Sales and Grower support

Main office ph: 0492 247 176
Email: office@bioresources.com.au

BioResources Grower Support Team:

Mark Duncan (all districts) ph: 0411 339 499
Jake Byrne (Nthn NSW) ph: 0419 199 123
Adam Billsborough (SE Qld) ph: 0467 094 114
or call us for our nearest consultant/distributor

