USING

Trichogramma Wasps

FOR THE BIOLOGICAL CONTROL OF

Heliothis in Sweet Corn

BUGS FOR BUGS

TRICHOGRAMMA is the generic name for an important group of naturally occurring microscopic wasps found throughout the world. Female Trichogramma wasps lay their own eggs into, or parasitise, the eggs of moths.

If present in sufficient numbers, Trichogramma wasps can effectively control caterpillar pests such as lightbrown apple moth, codling moth and heliothis in horticultural crops. Although Trichogramma are found naturally in virtually any crop where there are moth eggs and where insecticide use has been low, their numbers are typically low and not sufficient to control horticultural pests. However, their numbers can be boosted through the introduction of commercially reared wasps. This increases wasps numbers to levels that are able to make a significant impact on the number of moth eggs producing larvae.

At less than half a millimetre long Trichogramma wasps are just visible to the naked eye.

Trichogramma 'capsules' yield approximately 1,000 wasps.

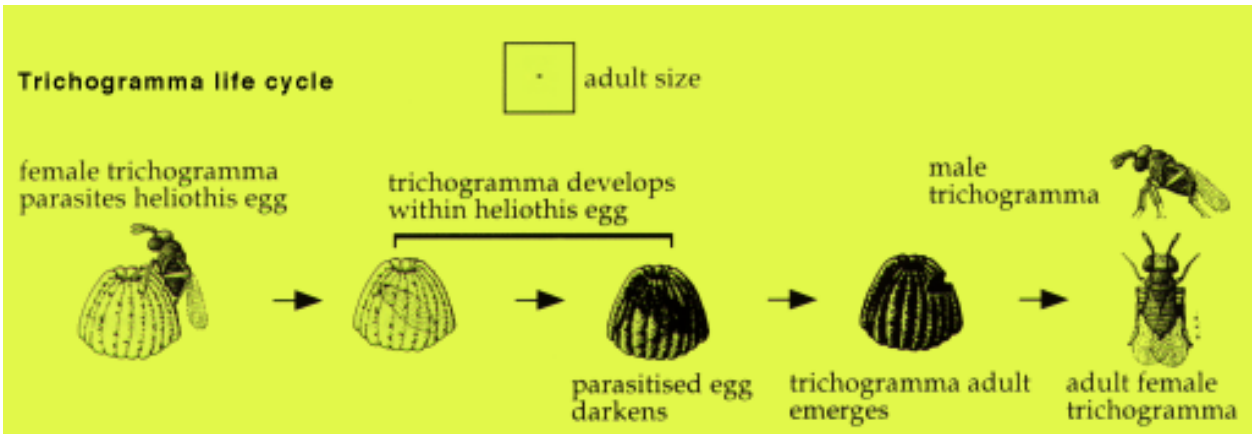
Trichogramma have been reared and released overseas for many years. Over one million hectares of crops are treated worldwide annually. In Australia, increased use of products which do not disrupt crop ecology (e.g. pheromone mating disruption, *Bacillus thuringiensis*, insect virus products and some insect growth regulators), instead of conventional chemical insecticides, provides a new opportunity to incorporate Trichogramma into integrated pest management programs.

Further, increased restrictions on the use of chemical insecticides and increased pest resistence to chemicals, makes it wise for growers to adopt biological means of pest control wherever possible.

Development of a capsule delivery and release timing system enables growers to liberate large numbers of Trichogramma wasps into the crop to coincide with heliothis egg laying.

Bug for Bugs provides a telephone technical support service so that growers can get fast, reliable advice on the best use of the product.

Bugs for Bugs Trichogramma wasps provide Australian growers with a new tool for IPM programmes and will reduce dependence on chemical control methods.



Female Trichogramma wasps lay their own eggs into, or parasitise, the eggs of moths. The wasp eggs hatch and the resultant larvae devour the developing caterpillar inside the moth egg.
When mature, the wasp chews a hole in the moth egg and emerge ready to parasitise other moth eggs. This process takes 7 to 20 days depending on temperature.
Two or three Trichogramma wasps emerge from one heliothis egg. A female wasp can parasitise over 50 eggs in its adult life of 5- 20 days.

Using Trichogramma for the Control of Heliothis in Sweet Corn

In the recent past, chemical insecticides have been the standard control measure but in the last few years the bacterial insecticide *Bacillus thuringiensis* (B.t.) and nuclearpolyhedrosis virus (NPV) products have come into use. These products are harmless to beneficial insects and so enable the mass release of parasitic Trichogramma wasps as part of integrated pest management programs.

The problem of Heliothis

Heliothis larvae may be controlled with conventional insecticides but the steady moth pressure encountered through the warmer months in most districts, demands repeated applications per crop - perhaps 10 applications per planting. This is not only costly but promotes resistance to insecticides- ultimately resulting in failure to control the pest.

NPV formulations are effective but are not the answer in themselves. Without a high level of natural enemy activity, control of heliothis is likely to be less than desirable.

Breaking the cycle of chemical dependence

Natural populations of Trichogramma are present in most disricts but are usually slow to increase in spring. Their activity will be further limited if applications of chemical insecticides are made. This locks the grower into a cycle of chemical use because Trichogramma and other beneficial insect species do not get an opportunity to increase to useful levels.

The introduction of mass reared Trichogramma can break this cycle of dependence on chemical insecticides by boosting Trichogramma numbers at critical times during the season.

Trichogramma for Sweet Corn

The species selected for use against heliothis is *Trichogramma pretiosum*. Field trials in sweet corn have clearly demonstrated that this species has the ability to find and parasitise heliothis eggs in dense foliage. This species seems more suited to sweet corn than other species observed. Very high levels of parasitism, close to 100% are commonly recorded, but anything over 50% is likely to make a significant contribution to heliothis control when used in conjunction with other compatible products.

IPM programs

In summary, the program consists of several elements:
- Trichogramma releases

- NPV virus sprays

and if larvae pressure is high at silking:

- Applications of spinosad

The aim of the program is to use chemical insecticides only at the silking stage, and then only if necessary.

During the vegetative stage, Trichogramma are released and applications of virus made. The typical result is that by silking, parasitism has reached high levels and applications of virus build on the virus coming through from infected larvae and few larvae are able to cause damage to cobs.

Virus sprays are safe to use with trichogramma - eggs that are not parasitised by the trichogramma and yield larvae are targeted with virus. The more eggs parasitised, the less larvae to kill with other products.

Spray action thresholds should therefore be based on the numbers of larvae hatching not the number of eggs laid.

Spinosad can be applied at silking if larvae pressure is high but this will kill adult wasps and wasps about to emerge. Those eggs parasitised up to several days before the spray application will yield healthy adults in about a week.

This program, which minimises the use of chemical insecticides will likewise minimise the development of heliothis tolerance to chemical insecticides.

Heliothis egg development. Left, fresh 'white' egg; centre, 'brown ring' stage egg; right, egg just before larva hatch showing dark head capsule.

'Black' parasitised egg on corn silk.

Trichogramma wasp escape hole

Methods of Release

Trichogramma wasps are delivered in the form of parasitised grain moth eggs enclosed in small cardboard capsules. These are simply dropped into the whorl.

The capsules provide the parasitised eggs with some protection from predators like ants and beetles and also give protection from rain and irrigation.

For larger areas, loose parasitised eggs can be distributed in a special liquid mixture via specialised dosing equipment.

The wasps move downwind so put a few more capsules out along the windward boundaries.

Trichogramma release strategies

Two basic strategies are recommended depending on the nature of likely heliothis egg pressure.

Steady heliothis pressure

Very high levels of parasitism (95%+) can be achieved in crops where egg pressure is steady and increasing towards silking - parasitism increases with each week and each generation, wasps become evenly spread through the crop and do not have to travel far to find an host egg.

Releases can start as soon as eggs are easily found in the crop during the vegetative stages - 1 egg per 10 plants is enough to start releases.

Two releases, a week apart, of 60 to 90 capsules per hectare is recommended and make three releases in the first planting in an area.

Heliothis pressure typically only at silking

Periods of nil or very low egg pressure prior to silking do not favour the build up of trichogramma. In this case, increase the release rate and concentrate releases around the tasselling-early silking period.

Make 2 releases of 120 capsules per hectare, a week apart, starting about 1 week before tasselling.

• Consider your district and the situation you typically experience and chose between the above strategies.

• Situations where successive plantings are made side by side are ideal for Trichogramma.

Nuclearpolyhedrosis virus

NPV sprays can begin soon after eggs are found in the crop. Sprayed virus is short lived in the field (24 hrs) and needs to target very small to small larvae or eggs about to hatch. If larvae are infected during the vegetative stage they can spread the virus through the crop, infecting more larvae.

Rain and overhead irrigation assists this process. Crops under drippers are not likely to get as good a result with virus.

Larvae infected with virus in the silks may burrow into silks but as the virus takes effect will exit the silks to die. It is therefore common to find a little damage to silks but no larvae present and no damage to cob tip.

Post Release Monitoring

Regardless of the program used, it is important to monitor egg pressure and subsequent larval infestation in the crop and if necessary intervene with a compatible larvicide while the larvae are small.

Trichogramma activity can be measured by collecting heliothis eggs, keeping them in a warm place, and watching to see how many eggs go black, i.e. that are parasitised.

Secondary pests

As broad spectrum insecticides have been removed from the program, secondary pests may emerge. The most common are aphids, thrips and green vegetable bug.

All these pests have natural enemies but may or may not be at a level that keeps them below economic damage. If these pests increase to damaging levels, use soft options wherever possible.

Green vegetable bug can cause serious damage during kernel formation. If present, broad spectrum sprays can be applied after silking - when very few heliothis eggs are laid and it is not so important to protect the Trichogramma.

For more information on monitoring and secondary pests see:

‘’Sweet corn insect pests and their natural enemies’ pocket book available from QDPI Bookshop..

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