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FACT SHEET | APRIL 2024

Mega Pests

Managing Major Chewing and Biting Insects

What is the problem with these pests?

Corn earworm (*Helicoverpa armigera*), native budworm (*Helicoverpa punctigera*) and diamondback moth (DBM, *Plutella xylostella*) are destructive pests. The caterpillars (larvae) of these pests are difficult to control for a number of reasons including development of resistance to insecticides, rapid population increases, and the practical difficulties of achieving complete spray coverage in some at-risk crops (e.g. sweet corn, Brassica crops, lettuce).

ICP TIPS FOR MANAGING CHEWING AND BITING PESTS

- Read the fact sheet: Mega Pests - The Basics of Protecting Your Crops
- Consider a break in production, especially in brassica production regions
- Identify and monitor populations of both pests and beneficials. Record observations of eggs, small larvae, and adults
- Don't rely on synthetic insecticides for control – understand all the available management options. Rotate between pesticide groups to avoid resistance
- Know your acceptable limits of crop damage and identify when you may need to spray
- If insecticide sprays are necessary, choose soft options to avoid disrupting natural enemies
- Understand environmental conditions conducive to the survival and spread of pests and beneficials, and to biopesticide performance
- Biopesticides are pesticides derived from natural materials such as animals, plants, bacteria and certain minerals
- Disrupt pest life cycles by targeting overwintering and survival sites.

Hort Innovation

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RMCG

ahr applied horticultural research

Figure 1: Heliothis larvae feeding on sweet corn

A desperate need for more affordable and effective control of DBM and corn earworm has led many growers to seek help and then trial and implement integrated management approaches. Integrated Crop Protection (ICP) considers the whole production system – all pest threats, the crop, soil health and environmental influences. In ICP, the aim is not zero pests, but rather sustainable pest management to reduce damage to acceptable economic levels.

The management of the Helicoverpa species (together referred to as 'heliothis') and DBM, is complex. Knowledge of the beneficial organisms in and around your crops, and their relationship with the pests, is necessary in order to make effective treatment decisions. The pest pressure, the number of beneficials and their population trend (increasing or decreasing) can be determined through close monitoring, and are the basis of pest management decisions at each crop stage.

Monitoring and scouting are particularly important steps in managing chewing and biting pests in your crops. This fact sheet provides information and know-how to get you started.

What attracts these pests?

Warm, humid weather and host plants like sweet corn, Brassicas and lettuce, provide the perfect environment for DBM and heliothis. The climate in south-east Queensland is particularly attractive but in all states, these crops are susceptible at certain times of the year.

The continuous presence of susceptible hosts in combination with overuse of broad spectrum synthetic chemicals (and resultant chemical resistance) has allowed pest population increases, and given rise to reports of poor pest control and variable produce quality. These directly affect grower income.

How can I protect my farm from these caterpillars?

Start early! Start looking! Record your observations

Look at incoming transplants and make sure they are clean and free of eggs and larvae, before planting. Wireworms, slugs, cutworms and armyworms attack newly transplanted and emerging crops. Scout young crops regularly: turnover leaves and check for eggs, larvae, and recent damage, and also for the presence of beneficial organisms. Scouting is particularly important in lettuce and brassicas because every part of these plants, in all stages of their development, are subject to attack.

Weather monitoring is also critical because temperatures affect the generation times of pests and beneficials that have been introduced.

Scout crops regularly and know what to look for

Pheromone traps can be used to give early warning of the presence of some pests. Finding heliothis eggs should trigger crop protection activity. The appearance of the eggs provides predictive information useful in decision making about the timing of the crop protection activity. Newly laid eggs are white in colour, brown eggs are nearing hatching, and shiny black eggs are parasitised and unlikely to hatch. Treatments

are needed before larvae burrow into the parts of developing crops, where they are impossible to treat.

Of specific relevance to lettuce and Brassica crops is scouting at the heart stage. This requires cutting open the heads to check for the larvae (caterpillars) themselves.

Sampling may be at random but it is more informative when the relative feeding damage on wrapper leaves is recorded for each inspected head. Sampling charts are useful as they provide growers with a guide to the minimum number of plants to be checked, to give confidence the results from them are valid and representative of the whole block.

Implementing ICP - understanding the options

Predicting the potential effectiveness of ICP requires understanding of the damage thresholds and the targets of each ICP practice. The ICP approaches that consider both the pest life cycles and the stages at which crops are most at risk, are likely to be more effective.

The first step is to limit use of broad spectrum insecticides and instead use biopesticides and soft option insecticides. The nature of commercially available beneficials and biopesticides and their sensitivities need to be understood to ensure these options are used effectively. Important information on biopesticide application timing, rates and coverage appears on the product label along with additional guidelines, e.g. for Bacillus thuringiensis (Bt) applications, avoid overhead irrigation on the treated area for 24 to 48 hours to prevent wash-off; stickers that promote adherence to leaf surfaces and UV light inhibitors may enhance efficacy.

Information on commercially available beneficial insects can be found on the following websites:

Bugs for Bugs – bugsforbugs.com.au

Biological Services – biologicalservices.com.au/index.html

Natural Solutions – naturalsolutions.com.au

Beneficial organisms, like parasitoid wasps (e.g. Diadegma, Trichogramma and Telenomus), predatory bugs (e.g. shield bugs, damsel bugs and assassin bugs), tachnid flies and earwigs readily control eggs and caterpillars. Spiders, lacewings and ladybirds are more generalist predators which can also offer relief against some aphids and thrips. If beneficials are present they can often control low numbers of pests. However, if conditions favour the pests, their populations may build rapidly and additional control methods (e.g. narrow-spectrum insecticides, biopesticides or introduced beneficials) may be needed to restore the balance.

Figure 2: Trichogramma – An important egg parisitoid of moth eggs

Biopesticides include *Bacillus thuringiensis* (Bt), a bacterium that is applied as a spray (e.g. sold as Dipel®). Bt is effective against all caterpillar species that eat it including heliothis and DBM larvae. Bt spray coverage needs to be complete and it should be applied at egg hatching and young larval stages.

The **nuclear polyhedrosis virus (NPV)** is

another biopesticide. It is a viral pathogen that is species specific, i.e. Gemstar® and Vivus® are formulations of the Helicoverpa NPV and are only effective when eaten by heliothis caterpillars. They are most effective against young caterpillars, and therefore crop stages where egg laying is most prevalent, should be targeted, e.g. sweet corn silks.

Soft option insecticides like spinetoram and related fermentation products of biological organisms (e.g. Success Neo®) affect the nervous system of heliothis, some thrips and beetle pests. Chlorantraniliprole (Coragen®) and Flubendiamide (Belt®) are specific to caterpillar pests. These technologies are safer to use and better for the environment. However, overuse of any one product may lead to the development of resistance.

Case study: Successful management of corn earworm in Queensland using ICP approaches

The sweet corn and brassica industries have led the way on implementing effective and sustainable ICP measures against chewing insects. Sweet corn growers in SE Queensland have been successfully managing corn earworm in situations where scouting and monitoring has supported decision-making, and environmental conditions have suited the application of biological pesticides and the establishment and protection of beneficials (parasitoids and predators).

Loss of pest control, the economics of conventional control and variable product quality were the major reasons that the Lockyer Valley sweet corn growers took a regional approach and gravitated to ICP for corn earworm management. In particular, the growers have made monitoring a routine practice and have developed skills in making timely and successful introductions of beneficials.

Important steps taken by successful growers

Experienced ICP researchers helped introduce ICP practices to Lockyer Valley growers. The growers realised early on they needed training as they were not familiar with the pest life cycle or that of the native beneficials. They were trained in how to recognise pests and beneficials in their various life cycle stages, when and where to monitor for them, and how to effectively protect beneficials by limiting the use of synthetic insecticides.

Soil monitoring

Because spring-summer sweet corn crops are at greatest risk, soil monitoring starts in the winter with over-wintering heliothis pupae the target of inspections. In one metre row lengths, growers dig carefully to expose emergence tunnels and look for pupae in the chambers. The pupae are usually found in the upper 10 cm. If more than one pupa is found in 10 m2 the growers will cultivate to disrupt the pest's life cycle.

Use of beneficials

The egg parasitoid wasp (Trichogramma pretiosum) is hard to monitor directly because of its tiny size, but sweet corn growers have become confident about finding and identifying newly laid (white), close to hatching (brown) and parasitised (shiny black) heliothis eggs. Their numbers provide information on the expected pest pressure and required timing of action.

The more black eggs found, the lower the necessity for pest-specific action.

Figure 3: Heliothis eggs Courtesy Brad Scholz Queensland Department of Primary Industries

Regular monitoring

Up to the tasselling stage, the sweet corn growers check the whole plant during weekly scouting. Thereafter, the monitoring is twice weekly and the tassels and silks are the main inspection points. The growers apply Bt and NPV sprays at this time. For many growers these are the only spray applications until just prior to harvest. Sensitivity to ultra-violet light makes late afternoon spraying of these biopesticides necessary and modifications to boom sprayers have enabled the sprays to be directed at the cobs. The effectiveness of these treatments is constantly reviewed by growers who make adjustments specific for their crop and equipment.

Consumers are ICP drivers too

Use of ICP to control chewing insects can reduce reliance on synthetic pesticides, and reduce labour requirements (as a result of an overall reduction in spraying). Synthetic pesticide use is a rarely used "fall back" practice today. However, some ICP growers believe consumers are not ready to accept ladybird beetles or wasps in their produce, even though they are harmless and often dead. Reluctantly, but to ensure these contaminating organisms are not present, some growers use synthetic sprays approximately three days before harvest. It is expected that consumer education will result in changes in market requirements and acceptance, which in turn will drive future expansion of the already successful ICP approach.

A SELECTION OF HELPFUL RESOURCES

In addition to the other Mega Pest fact sheets in this series, there are many useful resources that can be accessed on the Soil Wealth ICP website.

1. Pests, Diseases and Disorders of Sweet Corn: A field identification guide – REVISSED 2023
2. Stay in control of diamondback moth this season
3. Lettuce information kit. Agrilink, your growing guide to better farming
4. Brassica Information Kit. Agrilink, your growing guide to better farming
5. Sweet Corn Information Kit. Agrilink, your growing guide to better farming