IPM in the northern region

By Kate Charleston, Queensland Primary Industries and Fisheries, DEEDI, Toowoomba

The total grain cropping area of north eastern Australia (from Dubbo to North Queensland) is estimated at five million hectares. Wheat and coarse grains are grown on 92 per cent of this area with the remainder taken up by oilseeds and pulses.

Integrated pest management (IPM) in grain cropping farming systems has been promoted for over 30 years. The term IPM is used here to refer to the integration of tactics to manage pests, rather than a sole reliance on insecticides.

IPM is now well established in grain growing regions of north eastern Australia and many key IPM tactics have been widely adopted.

DRIVING FORCES FOR IPM

The late 1970s is used as a reference point for the start of IPM in north eastern Australia. This period marked a new era in pest management with the introduction of synthetic pyrethroids. These insecticides were cheap and effective against a broad range of pests.

Synthetic pyrethroids were widely adopted by industry yet within six years insecticide resistance developed and dramatically reduced efficacy against the primary field crop target *Helicoverpa armigera*.

Within a decade this pest developed high levels of resistance to many insecticide groups. These broad spectrum insecticides also decimated natural enemies which are often important in suppressing pest populations.

This crisis highlighted the vulnerability of the northern grains region to the dangers of relying solely on insecticides for the control of pests. It provided the impetus for the development of IPM recommendations, area wide management strategies, multi-pest strategies and the search for more selective insecticides and biopesticides.

A more recent driving force for IPM has been the arrival in Australia of silverleaf whitefly (SLW) in 1994. This pest poses significant threats to soybeans, sunflowers and navy beans. With no effective insecticides for the control of SLW, the only management option is to maximise the effectiveness of natural enemies.

IPM OBJECTIVES

The major objective of pest management has been to replace older, less selective insecticides with more selective products that allow natural enemies to contribute to pest control and suppress outbreaks.

The IPM strategy also includes the development of a range of techniques and options that reduce risk of pest attack.

Complementing IPM is the insecticide resistance management strategy. This strategy aims to limit the number of generations exposed to pesticides, rotate insecticide groups and restrict the number of sprays per season.

...viii ▷

Sucking pests like these green vegetable bugs cannot be controlled with selective insecticides. (Photo by D. Ironside)

ONGOING R&D

IPM remains high on the agenda of grain producers in the northern region and to meet this need the GRDC plans to continue funding IPM research.

Over the past decade, considerable progress has been made in the development, implementation and adoption of IPM tactics for some major insect pests. But the only available management options for other major pests, particularly pod-sucking bugs and pod-borers, have the potential to derail IPM because they are highly disruptive to beneficial insects.

Additional major IPM issues include the resistance threat to the new generation pesticides targeting *Helicoverpa armigera*, the likely deregistration of dimethoate (the only effective mirid and aphicide in grain crops), and the need for multi-pest IPM to reduce the risk of flaring SLW by eliminating prophylactic spraying.

Ongoing RD&E is clearly needed to address these issues.

◁vii…IPM IN THE NORTH

IPM TOOLS AND STRATEGIES

Insecticides

Insecticides are important tools in controlling pest outbreaks quickly. The development of more selective insecticides that are less disruptive to natural enemies is driven by resistance issues and de-registration of older products with residue, health and environmental concerns.

But for some pests (for example, sucking pests), there are currently limited or no selective options.

Economic thresholds

Economic thresholds are one of the cornerstones of IPM. They help rationalise and target reduced insecticide use. This reduces the impact on natural enemies, selection for resistance and the risk of environmental and health problems.

Economic thresholds for many pests have progressed from subjective recommendations (spray when pests reach damaging levels) to nominal fixed thresholds (such as, two larvae per metre) to more recent dynamic thresholds. These dynamic thresholds identify pest-crop scenarios where economic damage is not inflicted.

Sampling

Sampling reliability is critical to determine the type and number of pests present in the crop and whether these warrant control. Standardised beat sheet sampling has now been widely adopted in the grains industry and replaced a range of methods such as sweep nets and visual sampling.

Conservation of natural enemies

There is now considerable evidence that pests can flare rapidly when insecticides kill natural enemies.

Conservation of natural enemies is assisted by research into economic thresholds for a range of pests. This research has shown that the control of many primary pests, like sucking pests, can be delayed until the crop is at lesser risk from secondary pests like SLW.

Classical biological control

Australian grain economics (low crop value, large area and high labour cost) generally preclude the rearing and release of exotic and native natural enemies. The relatively small areas of many of the pest susceptible pulse crops such as soybeans also make commercial investment unlikely.

Nevertheless a range of introduced parasitoids have made a significant impact on insect numbers. Parasitoids like *Trichogramma spp.* that target helicoverpa eggs have been very effective yet parasitoids for other species are less successful. The release, in 2004, of *Eretmocerus hayati* for the control of SLW shows good establishment in SLW regions although its impact is yet to be determined.

Natural enemies such as *Trichogramma pretiosum* are very effective parasitoids of Helicoverpa eggs. (Photo by Brad Scholz)

Biopesticides

The pest crisis of the 1990s led to a renewed interest in bio-control options such as viruses, bacteria and fungi. Nucleopolyhedrovirus (NPV), a highly specific virus that only controls helicoverpa and *Bacillus thuriengiensis* (Bt) a bacteria that controls many caterpillar pests are two that have been commercialised and widely used.

Cultural control

Cultural controls, as pest management tools, have been widely adopted in grain farming systems. Common practices include; cultivation to destroy overwintering pupae, crop rotations and weed management to reduce alternative hosts. Some practices less widely used include; adjusting sowing rates to compensate for pest damage, using press wheels to reduce soil insect access to seed and irrigation management to keep surface soil moisture.

Area wide management (AWM)

On many grain farms insect pests are still managed on a field by field basis with little regard for neighbouring properties. AWM has been implemented on the Darling Downs where groups of growers managed the local population of helicoverpa by acting together on a broad geographic scale. Some of the approaches used in AWM include the planting of sacrificial crops to reduce early season populations and promote natural enemies by using selective insecticides.

This regional approach may provide benefits in managing other pests which are locally generated, for example SLW.

PROMOTING IPM

Pivotal to the adoption of IPM are the strong links between researchers, extension, consultants, growers and industry bodies. These links allow rapid dissemination of information, provide researchers with feedback about practical aspects of IPM and highlight IPM issues of greatest concern.

One very effective means of promoting IPM has been to offer IPM courses to growers and consultants.

WHERE TO FROM HERE...

The lack of effective insecticides and/or biopesticides for sucking pests in grains remains a major constraint to IPM implementation, particularly in pulse crops.

Other IPM alternatives such as trap cropping, host plant resistance and cultural control techniques also need further investigation. A reliable SLW rating scheme and sampling research into problematic pests will also provide much needed data to manage such pests.

The future of IPM in the grains industry is dependent on an ongoing partnership between researchers and practitioners of IPM – and good communication.

This overview is a summary of a paper by Hugh Brier, David Murray, Lewis Wilson, Adrian Nicholas, Melina Miles, Paul Grundy and Austin McLennan published in the Australian Journal of Experimental Agriculture 48 (12): 1574-1593. **This research was funded by the GRDC.** ■

NEW COLLABORATIVE PROJECT

The GRDC is funding a new collaborative project between CSIRO Entomology, Queensland DPI&F, DAFWA and the University of Queensland.

In agricultural landscapes in north, south and west Australia, they are investigating how grain pests are affected by the composition of the landscape by:

- Identifying source habitats of pests and natural enemies;
- Assessing their movement between habitats such as native vegetation and crops; and,
- Working out how long it takes pests and their natural enemies to colonise crops and how this is influenced by the landscape in which the crops are grown.

The research will identify the features of landscapes that suppress pests and will align IPM guidelines for pest management at several scales – field, farm and landscape. It is hoped the results will help reduce farmers' reliance on broad-spectrum insecticides, and, at the same time consider the broader public benefits of biodiversity and conservation.