REGIONAL MANAGEMENT OF HELIOTHIS ON THE DARLING DOWNS

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Introduction

While many Australian cotton growing valleys had the fortune of relatively low *Helicoverpa* spp. activity during the 1997/98 season, this was not the universal experience. Extremely high pest activity on the Darling Downs has reinforced the concerns that our current over-reliance on insecticides for the management of *Helicoverpa* on cotton and grain crops is unsustainable. Just as important is the realisation that within the agroecosystem, action must be taken to attempt to maintain *Helicoverpa* spp. populations at more manageable levels. While densities of up to 10 eggs per metre can be managed satisfactorily, densities of 50 or more eggs per metre pose serious difficulties, especially if activity persists at this level for several days or even weeks.

Helicoverpa spp. populations fluctuate in response to various factors. Where a succession of wild or cultivated hosts are available, successive generations can develop through the spring, summer and autumn months. If progressive population increases take place for whatever reasons, the end result can be serious management difficulties. Such was the case on the Darling Downs during the 1997/98 season, where the earlier than normal appearance of substantial numbers of *H. armigera* and their persistence at high levels throughout the season resulted in high insecticide use and some control difficulties across cotton and grain crops.

Regional or area wide management has been proposed as a strategy to maintain pest populations at more manageable levels. Knipling and Stadelbacher (1983) discussed the rationale of attacking the *Helicoverpa* populations during the first spring generation. This approach has been researched for several years in the Mississippi Delta (Hardee and Bell 1996, Street *et al.* 1997). Sequeira (1998) responded to problems with *Helicoverpa* in Central Queensland by implementing a regional management program for the 1996/97 season. A key component of this program was the use of early-season and late-season trap crops. It is this research that has been the catalyst for similar plans to deal with the *Helicoverpa* crisis on the Darling Downs.

This paper outlines the content of a regional management strategy that is being implemented on the Darling Downs for the 1998/99 season. The strategy is the result of a collaborative effort by research and extension staff, cottongrowers, graingrowers and consultants. The regional management strategy suggests tactics that aim to reduce

- the survival of over-wintering insecticide-resistant *armigera* pupae
- the early-season buildup of *Helicoverpa* on a regional/district scale
- the mid-season population pressure on *Helicoverpa*-susceptible crops

These tactics are summarised in a yearly activity chart (Figure 1).

Discussion

Late-season

Crop checking

All late-season crops (e.g. cotton, summer grain legumes, late sorghum, late sunflower) should be closely monitored for *Helicoverpa* activity. Where *Helicoverpa* infestations are present and above threshold, they should be controlled within the limits of insecticide resistance and available registrations. The catch phrase must be 'spray small or spray fail'.

Pupae busting

Identification of 'at risk' fields is a central issue for the pupae busting campaign. For the Darling Downs, the first over-wintering pupae are produced about mid-March. The precise commencement of production of over-wintering pupae will vary from year to year and be dependent on seasonal conditions. The *Diapause Watch* program will provide up-to-date information on the incidence of over-wintering. Fields harvested before mid-March are unlikely to harbour over-wintering pupae, provided regrowth has not subsequently supported larvae. Any fields that are attractive to *Helicoverpa* after mid-March are potential over-wintering sites. Pupae sampling should be used to detect over-wintering pupae, and is particularly important for planned no-till late season crops and double cropping opportunities. The recommended threshold for pupae busting action is one pupa per 10 m^2.

Pupae busting should be conducted as soon after harvest as possible, and preferably no later than 30 June. This time frame provides some flexibility to pupae bust before the desired cutoff date of late August should seasonal conditions hamper earlier pupae busting operations. Full surface disturbance and tillage to a depth of 10 cm is recommended.

Early-season

Improve management of commercial chickpea crops

It is important that winter crops such as chickpea do not act as nurseries for the first spring generation of *Helicoverpa*. For this reason, improved pest management guidelines should be followed. These guidelines include

- a planting window for the main commercial crop to avoid flowering during the normal spring emergence flights of *armigera* during October.
- avoid sowing commercial chickpea crops after mid-June.
- consider row crop configuration to support groundrig spray operations.
- on commercial crops where *Helicoverpa* infestations are present and above threshold, control them within the limits of insecticide resistance and available registrations.
- use LepTon™ test kits to determine species composition to aid pesticide choice decisions.
- destroy failed or abandoned crops by cultivation or herbicides immediately the decision to abandon has been made.
- control regrowth of harvested crops.

Use information from pheromone traps

Pheromone traps should be used to signal the arrival and/or emergence of the spring populations of *Helicoverpa*. Traps will operate during August, September and October. As trap catches do not reflect species composition in egglays on crops, the information they provide should be used as an alert for the commencement of more detailed sampling of crops for eggs and small larvae.

Sow a chickpea trap crop

It is recommended that each property sow an area (minimum 2 ha or 1% of cultivated area) of late-sown chickpea as trap crop to draw in locally-produced *armigera* moths during the main spring emergence period (October). Longer flowering and more attractive Kabuli varieties are recommended over conventional Desi types. These trap crops must be carefully monitored to time action against *Helicoverpa* infestations. Trap crops should be destroyed by cultivation before pupation occurs, but spraying may be considered early in the life of the trap crop to prolong its useful contribution as a trap crop. In raingrown areas where planting opportunities are limited, trap crop flowering may be manipulated (delayed) by slashing.

Promote the contribution of beneficial insects

Selective pesticides such as GemStar™ (*Helicoverpa* nuclear polyhedrosis virus) should be used early season where appropriate. As natural enemies are not normally abundant on chickpea, beneficials should not be relied on to contribute greatly to *Helicoverpa* egg and larval mortality. The use of disruptive insecticides (especially pyrethroids and organophosphates) should be delayed in all crops for as long as possible. Where *Helicoverpa* infestations are present and above threshold, they should be controlled within the limits of insecticide resistance and available registrations.

Mid-season

Insecticide management

Every effort should be made to conserve beneficials by using the most selective pesticide available. The use of disruptive insecticides (especially pyrethroids and organophosphates) should be delayed in all crops for as long as possible. LepTon™ test kits should be used to determine species composition and aid insecticide choice decisions. Where multiple sprays are used, coordinate rotations and alternate chemical groups. Adhere to the Insecticide Resistance Management Strategy.

Crop checking

Helicoverpa activity should be carefully monitored on all susceptible crops. Where *Helicoverpa* infestations are present and above threshold, control them within the limits of insecticide resistance and available registrations. Once again, spray timing is critical – 'spray small or spray fail'. General advice should be to manage crops so that they are not merely nurseries for *armigera*.

Conclusion

The studies on regional management of *Helicoverpa* in Australia are in an early research phase. Although there is enthusiastic support for the approach, there is no guarantee of success and more widespread adoption should initially be viewed cautiously.

The strategy is based on our current knowledge of the farming system and the pest's ecology. Different regions will require different components and/or timings to accommodate variations in local cropping patterns and pest ecology. From this perspective, the regional management strategy will evolve as our knowledge of the complex interactions increases. The ultimate objective is to provide an ecologically-based pest management program that is less dependent on insecticides. Only time and commitment will determine whether a regional management approach will be successful under our local conditions.

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Figure 1. Yearly activity chart for the regional management strategy implemented on the Darling Downs study areas for the 1998/99 season.