COMMERCIAL EXPERIENCES WITH THE LEPTON TEST KIT IN AUSTRALIA

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Abstract

The need to be able to distinguish between the two principle pests of the Australian cotton industry *Helicoverpa armigera* (H*a*, Cotton Bollworm) and *Helicoverpa punctigera* (H*p*, Native Budworm) became important in 1983 when H*a* developed a level of resistance to synthetic pyrethroid. The Lepton Test Kit enables the determination of species based on eggs and/or larvae.

The Lepton Test Kit is currently in its fourth season of commercial use and it has enabled cotton growers and their consultant to:

(i) use cheaper sprays when H*p* is dominant
(ii) make well timed applications of expensive chemicals when needed
(iii) avoid the need to clean up resistant survivors with expensive chemicals and
(iv) assess spray failures and determine if resistance was the cause of the failure.

The use of the Lepton Test Kit features as one of the key guidelines in the Australian cotton industries highly successful Insecticide Resistance Management Strategy.

Introduction

H*a* and H*p* are the most important pests of cotton in Australia. H*a* currently has high levels of resistance to synthetic pyrethroids and endosulfan. Resistance levels to other important chemicals such as profenofos and thiodicarb are increasing. Resistance is not a concern at present in H*p* as this species originates from a large unsprayed refugia in central Australia. . To relate this Australian situation to that in the USA from a pyrethroid resistance standpoint, H*a* is the equivalent of *Heliothis virecens* (Tobacco Budworm) whilst H*p* and *Helicoverpa zea* (Cotton Bollworm) are similar in that they are not resistance to pyrethroids (Table 1).

The development of the Lepton Test Kit was a joint venture between four parties. The Cotton Research and Development Corporation (CRDC) (i) who saw the need for a test to differentiate between H*a* and H*p*. The CRDC used a combination of grower and Government money to fund the Commonwealth Scientific and Industrial Research Organisation (CSIRO) (ii) who won the development contract. Abbott Laboratories (iii) became a partner to commercialise the product and NSW Agriculture (iv) (a State Department of Agriculture) played a key role in the in-field validation of the test kit.

Discussion

Commercial Experiences in Australia

Australian cotton growers and their consultants are currently in their fourth season of commercial use of the Lepton Test Kit.

In Australia, H*a* and H*p* can occur all season although H*p* tends to be an early season pest and H*a* numbers build up mid to late season. The occurrence of each species is unpredictable and varies from year to year. Growers and their consultants can not rely on regional data because populations are dynamic and variation between farms in the same region can be high. Figure 2 shows typical variation in the % of H*a* found on four farms in one region on one day.

Australian growers can spend up to US$160 (A$200) per acre on insecticides predominantly to control *Helicoverpa sp*. The Lepton Test Kit has enabled growers to target this money to the best chemicals to give control at different times of the season. The cost of the chemicals for H*a* control is around US$16 (A$20) per acre whilst H*p* can be controlled for US$6 (A$8). The kit provides the ability to select appropriate chemistry to control the species present. It is this use that pays the biggest financial dividends to growers who use Lepton.

Collection of samples is simple with 1 to 2 eggs collected per terminal, making sure not to collect clusters of eggs, as these have usually been layed by one moth. They are collected randomly, usually on the go when scouting. Because of the big differences that can occur in the species composition even in the same region, each management unit needs to be sampled. At least 100 eggs need to be taken. Work conducted by NSW Agriculture in validating the kit showed that this was the optimum sample size and that smaller samples can lead to inaccurate results.

The Lepton Test Kit provides the grower and consultant with the percentage of H*a*. Once the test has been conducted "Stop/Go Charts" are consulted. The "Stop/Go Chart" predicts numbers of surviving resistant larvae based on the time of season, hatch rate and percentage resistance. The grower and consultant can then make a decision on the type of chemical needed to gain control. Identification of the species at the egg stage is important as chemical applications especially for H*a* must be timed for egg hatch to achieve the maximum effectiveness.

The Lepton Test Kit has also proved to be a useful tool for assessing chemical application failures (that have not

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controlled *Helicoverpa sp.*). Using Lepton after a spray failure can help a grower or consultant decide if resistance was the cause of the failure or if it was another problem, for example, poor application conditions. Failures due to resistance have predominantly H*a* surviving with very low numbers of H*p*.

The use of the Lepton Test Kit is recommended as one of the key guidelines in the Insecticide Resistance Management Strategy for 1996-97. This strategy has been instrumental in slowing the rate of resistance increase in the Australian industry. It recognises that knowing the species of *Helicoverpa* enables targeted and timed sprays that will reduce the rate of insecticide resistance development.

The big dilemma initially facing busy growers and consultants in using the Lepton Test Kit was "How do I find the time to make the collections, do the test and where will I carry it out?"

The value of the information gained overcame many of these obstacles. As resistance levels and the associated problems have increased, so has the useage of the kit. This has seen the problem of time overcome by necessity as well as by ingenuity. People have set up specialised consultancy services carrying out the Lepton Test and other monitoring services, some consultants have added an extra person to their team to carry out the Lepton Test (passing on the associated cost to the clients) and in some cases associated people such as growers partners have learnt to take samples and do the test.

Summary

The Lepton Test Kit has become an important tool for Australian cotton growers. It has allowed them to:

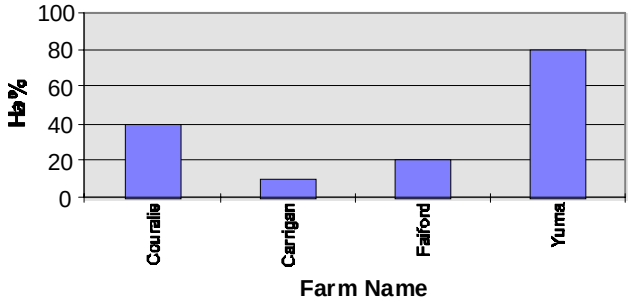
(i) use cheap sprays when H*p* (non resistant) are dominant,
(ii) make well timed applications of expensive sprays when needed,
(iii) avoid clean up sprays on fields where failures have occurred and
(iv) assess spray failures and determine if resistance was the cause.

The Lepton Test Kit also has an important role in insecticide resistance management. The initial dilemma of finding the time to carry out the Lepton Test has been overcome by necessity as well as ingenuity.

Table 1. Pyrethroid resistance comparison between Australian and the USA

Australian Pest	US Pest	Pyrethroid Resistance
Helicoverpa armigera (Cotton Bollworm)	*Heliothis virecens* (Tobacco Budworm)	Yes
Helicoverpa punctigera (Native Budworm)	*Helicoverpa zea* (Cotton Bollworm)	No

Figure 1. Between farm variation of *Helicoverpa armigera* % (HA) in the Gwydir Valley. (20th January 1993)



Source: NSW Agriculture