

CRDC reviews resistance research management

By Bruce Pyke, Research and Extension Manager, CRDC, Narrabri

Every year CRDC reviews one or more of its research programs or sub programs. The purpose of these reviews is to have independent experts provide a critical overview of how the industry manages certain challenges and how well the research effort is focussed in addressing those challenges.

In February 2002, CRDC commissioned a review entitled *A Review of Research, Development, Extension and Management of Pesticide Resistance in Insect and Mite Pests of Cotton in Australia*. Two independent experts on resistance research and management were appointed to conduct the review — Dr Ian Denholm from IACR Rothamstead UK and Associate Professor Tim Dennehy from the University of Arizona.

Both are experts in resistance monitoring, mechanisms and management. In addition, CRDC's Insect Program Consultant, Dr Vic Edge, accompanied the external reviewers as part of the review panel.

During the two-week duration of the review, the panel visited Narrabri, Tamworth, Camden and Canberra and met with researchers from NSW Agriculture, CSIRO, QDPI and the University of Queensland. In addition meetings were arranged with representa-



The review identified Australian resistance management research to be world class but it had "lost its focus".



tives of cotton growers, cotton consultants, the cotton extension team and the chemical industry. Written submissions were received from a number of individuals and groups including Cotton Growers Associations.

In early March the review panel provided CRDC with a confidential report containing a number of comments and recommendations aimed at improving the overall effort of managing the resistance challenge in cotton farming systems. At its annual budget meeting in March, the CRDC board considered the recommendations from the review and proposed a number of changes to projects and the management of aspects of the R&D program on resistance.

It has taken some months, but we are pleased to say that all of the key recommendations from the review have now been addressed. It will be up to the industry to judge over the coming years how successful we have been in meeting the challenges. The purpose of this article is to summarise the key recommendations from the review and CRDC's responses.

Overall, the review panel was very complimentary about the depth, breadth and quality of the research effort on resistance being funded by CRDC. They stated that the "resistance management research and its application in Australia is creative and competitive with the very best programs underway elsewhere in the world" and further that "the approaches pioneered in Australia have greatly influenced practices adopted elsewhere in the world."

Where they found areas to be critical of, they made recommendations to CRDC.

COMMUNICATION INTERFACE: RESEARCH/EXTENSION/INDUSTRY

One of the most significant recommendations from the review was the need to address recent 'loss of focus' in the resistance management program in Australia leading to what many in the industry see as fragmentation or an erosion of the strategy. This was seen to be a communication/extension issue and was due to the recent loss of key public sector personnel to industry without replacement of either personnel or expertise.

The review panel recommended that a 'resistance hub person' be located at Narrabri. The person should have sound research credentials and be an experienced communicator both with colleagues and with the industry. They should act as the point-person in the extension research interface and provide leadership and guidance for the TIMS committee.

CRDC responded to this recommendation by allocating funding to support the re-appointment of a NSW Agriculture funded entomologist based at ACRI who would fill the role of the resistance hub position and supervise the routine monitoring program for resistance in *H. armigera* to conventional chemistry. The reasons for the relocation of this program from Tamworth to ACRI are discussed under "Helicoverpa resistance monitoring to conventional chemistry and whitefly monitoring". At the time of writing, the new position at ACRI has been advertised and an appointment is expected before the end of October.

KEY ISSUE — WHAT IS THE PURPOSE OF THE STRATEGY?

The review panel commented on the level of dissatisfaction that they detected from some growers, consultants and extension team members on the limited feedback received during the season on results of resistance testing. Those commenting on this believed it was "too slow to be used in management decisions."

The review panel made the observation that this dissatisfaction was due more to the loss of focus discussed above than to any lack of quality or purpose from the testing laboratory.

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They believed the current resistance testing program was aimed at detecting changes in resistance over the season but would require significantly more resources to provide a service that gave rapid and meaningful reporting of resistance levels for individual collections. But they recommended that increased efforts be made to provide more regular summarised reports (for example, monthly) back to the industry on resistance levels and trends valley by valley.

CRDC's view on this issue is that the resistance testing program, as it is currently structured, is aimed at detecting broad changes in resistance levels over the season to provide the industry with information upon which to base changes to the strategy at its annual review. In responding to the key recommendations of this review, CRDC has increased the resistance program budget by nearly \$0.25 million and is not able to provide the significantly higher level of funding that would be required to have a resistance testing program capable of reporting rapidly on individual collections.

But the CRDC does agree that reporting can be improved and will be seeking ways to help this to happen.

EGG COLLECTING PROGRAM

The review found that the egg collecting effort was fragmented, inefficient and poorly coordinated. They recommended that CRDC should convene a meeting of researchers, cotton and chemical industry



representatives to evaluate how a more coordinated egg collecting program — employing common resources to better cater for the needs of each laboratory — can be developed.

CRDC has responded to this by establishing a base fund of \$60,000 per year for the egg collecting program. The Corporation has also invited AIRAC (the chemical industry's insecticide resistance action committee) to continue their long-running financial support for the egg collecting program.

Initial feedback from AIRAC has been positive and has allowed the Corporation to ensure there will be dedicated egg collecting conducted in the following areas for this season: Namoi, Gwydir, Macintyre, Burnett/Downs and Emerald. CRDC is also aiming to convene a meeting of researchers and industry representatives in October to address collection requirements, protocols and coordination, including reporting of results.

HELICOVERPA MONITORING FOR RESISTANCE TO CONVENTIONAL CHEMISTRY

For the past five years the routine monitoring of heliothis resistance to conventional chemistry has been conducted in Dr Robin Gunning's laboratory in Tamworth along with baseline resistance levels for new chemistry, resistance mechanism research and resistance and population monitoring of whiteflies.

When the review panel appraised the Tamworth research they commented that the quality and focus of the research was of

a high standard, but expressed concerns that the load placed on the human and laboratory resources in trying to service all these demands was too high.

This load was expected to increase with the escalation of the whitefly problems in Central Queensland. Consequently they recommended that CRDC consider providing funds to improve facilities at Tamworth and that the routine monitoring of heliothis resistance to conventional chemistry be transferred back to ACRI under the supervision of the 'resistance hub' entomologist. This would allow the Tamworth laboratory to concentrate on resistance mechanism work on heliothis, whitefly and aphids (Emma Cottage's post-doctoral project) and on resistance and population monitoring for whiteflies.

The panel also noted comments from some of the chemical industry representatives that were critical of the Tamworth research and lack of access to the data concerning key chemicals.

After visiting Tamworth, they concluded this was due primarily to the lack of past effort on the part of some companies to establish any on-going dialogue with the Tamworth researchers. The panel suggested companies should be encouraged to establish more regular communication with them.

CRDC's response to these recommendations was to provide some immediate support to the upgrading of a shed at Tamworth to enable insects to be reared and to support the relocation of CRDC's temporary insectary at ACRI to Tamworth. The Corporation placed funds into a commissioned budget to provide support for the ACRI laboratory to recommence routine monitoring of heliothis resistance to conventional chemistry provided NSW Agriculture agreed to re-appoint the vacant entomologist position. This re-appointment process is now underway.

The Corporation also notes that some companies have chosen to establish their own resistance testing programs for some of the new products on the market. While this is entirely a commercial decision for these companies, CRDC believes they would be better placed to seek, as individual companies, to support and strengthen the existing publicly funded research program. It should be noted that it is to this program that the cotton industry looks for information when deciding how best to manage resistance to a product.

BT RESISTANCE

Clearly, with the use of Ingard cotton over the past six seasons and the introduction of Bollgard II over the next two to three seasons, the management of this technology to avoid resistance development is a paramount issue for the industry. Over the two seasons leading up to the review, a number of problems had emerged with the Bt testing program at ACRI. In short these related to the departure of key staff affecting continuity and supervision and changes to techniques used.

The review panel looked very closely at the data presented and at the methodology used recently and in the past. They concluded that there was not enough evidence to be certain that some of the reported changes in the survival of field collected heliothis to Bt was due to resistance. They acknowledged that the task of monitoring for Bt resistance was extremely difficult, required considerable expertise and great care in interpretation of results.

The review panel also recognised that, despite their efforts, it was unfortunate that NSW Agriculture had not been able to replace Dr Jonathan Holloway with a similarly experienced researcher. Consequently, they recommended that the Bt monitoring project would be better placed under the control of CSIRO Entomology where researchers with experience of Bt resistance (Dr Ray Akhurst and Dr Rod Mahon) were currently working under CRDC funded projects and could supervise the monitoring program. They also recommended, that, if possible this project should remain centred at ACRI.

The panel also visited CSIRO Entomology, Canberra and met with the researchers there. They concluded that the work was of a high standard and important in order to better understand the potential for resistance to develop, the underlying mechanisms and the potential for cross-resistance.

CRDC subsequently funded CSIRO Entomology to take on the routine monitoring of heliothis for Bt resistance. The position of a professional officer to manage this project has been advertised and an appointment is expected some time in October. This project will complement CSIRO Entomology's other research projects on Bt resistance mechanisms.

APHIDS AND MITES

The routine monitoring of aphid and mite resistance to conventional chemistry takes place under the guidance of Dr Grant



The review panel concluded there was insufficient evidence for Bt resistance in field-collected heliothis.

Herron at the Elizabeth Macarthur Research Institute, Camden. The review panel visited Dr Herron's laboratory and discussed his work. They were highly supportive of this work and recommended CRDC continue funding this program.

CRDC has renewed Grant's project for a further three years and notes that his research for the horticultural industries on western flower thrips could be of great value to the cotton industry now that this pest was being found in cotton growing areas.

IPM AND RESISTANCE MANAGEMENT

When they met with grower and consultant groups, the review panel was asked how important they considered it was to have conformity between cotton growing regions — particularly with the increasing adoption of IPM practices which were leading to a reduction in overall pesticide use. Views were also expressed to the panel that the current IRMS was not flexible enough in valleys such as the Macintyre where the momentum for area-wide adoption of IPM practices was strong.

In responding to these comments the review panel recommended that "CRDC continue to maintain the momentum it has achieved with formulating resistance management strategies annually and strongly promoting grower compliance with them. Maintaining an informal adaptability of the strategy for special cases or needs such as have arisen in the Macintyre Valley should be possible with minimal complications."

In response to this, the Macintyre Valley growers and consultants approached the TIMS committee to introduce a trial IRMS for the four area-wide groups in the Macintyre Valley. After some negotiations,

TIMS approved a trial strategy for this area that allows increased flexibility with some of the key IPM friendly products and further restricts the use of broad-spectrum or disruptive products.

CRDC recognises this trial will require some additional monitoring and has encouraged several researchers to conduct some of their research there as well as providing support for an egg collector to be based at Goondiwindi. Local consultants were encouraged to assist by collecting chemical use and insect population data in a standardised format.

BROADENING THE STRATEGY TO INVOLVE OTHER INDUSTRIES

The review panel considered that the future will require greater collaboration between cotton, grains and horticulture industries on resistance management — particularly for *Helicoverpa* and whitefly. They recommended the TIMS committee seek to broaden its scope to include other crops.

The ACGRA has approved TIMS recommendations to invite GRDC and Pulse Australia on to the TIMS committee. Dr Dave Murray has been nominated by GRDC as their representative and John Slatter as the Pulse Australia representative.

CONCLUSIONS

Overall we received a good report card from the independent review of our research and management of resistance. The review considered much of the research — and the way in which the industry uses the information it provides — to be world leading. But the review panel made a range of key recommendations and CRDC is pleased to say it has addressed all of these.

Only time will tell how well we have addressed them, but CRDC's relationship with the industry is a healthy one and we can be sure they will quickly let us know if we haven't.

CRDC wishes to thank all those who contributed to this review — researchers, growers, consultants, extension staff, chemical industry and other cotton industry representatives. Also we wish to thank the review panel for their work and ongoing support — Dr Denholm has invited CRDC funded post-doctoral researcher Emma Cottage to visit his laboratories at Rothamstead to broaden her knowledge on aphid resistance mechanisms and Prof. Dennehy was a great host and coordinator of meetings in Arizona for the recent CRDC/CSD supported whitefly study tour to the US. Vic Edge continues to provide excellent support to the Corporation as a consultant.