

A snapshot of the Cotton Australia TIMS Committee in 2009

By Greg Kauter, Cotton Australia, Sharon Downes, CSIRO and Bruce Pyke, CRDC

Prior to introducing the first commercial Bt transgenic cotton in 1995, The Australian Cotton Growers Research Association (ACGRA) formed a broadly represented, grower led group called the Transgenic and Insect Management Strategies committee (TIMS committee). This committee was established to oversee the development of the industry's resistance management strategies for insecticides and Bt cotton.

The TIMS committee, which is now facilitated by Cotton Australia, functions as an industry stewardship group, with broad representation from growers, researchers, crop consultants and members of the pulse and grains industries.

The agricultural chemical, biotechnology and planting seed companies that provide crop protection tools to Australian cotton growers also approach the TIMS committee for advice on issues associated with developing resistance management plans for new or existing technologies.

WHAT IS THE ROLE OF THE TIMS COMMITTEE?

The TIMS committee supports the sustainability of the cotton industry by:

- Providing a forum for resolving cotton industry resistant management issues.
- Assisting with the development and implementation of short and long term resistance management strategies.
- Regularly reviewing the operation and effectiveness of resistance management strategies, and supporting the evolution of resistance management strategies for Bt and conventional cotton that are compatible with the principles of Integrated Pest Management (IPM).
- Establishing panels to provide advice on technical and scientific aspects of resistance management to insecticides, and insect and herbicide tolerant transgenic plants.
- Providing advice on behalf of the cotton industry to the Australian Pesticides & Veterinary Medicines Authority (APVMA) on the resistance management plans for commercially released transgenic cotton.

Each year the TIMS committee delivers an Insecticide Resistance Manage-



Glenn Fresser, Monsanto's Jodie Pedrana and Andrew Parker at a recent REFCOM meeting.

ment Strategy (IRMS) and contributes to the development of the Bollgard II Resistance Management Plan (RMP), and Roundup Ready Flex Crop Management Plan (CMP). This process involves striking a balance in content between these three management strategies as well as considering the trade-off between the practicality and the science behind the most effective response to managing resistance.

Committee members, representing industry growers, researchers and consultants put considerable effort into the annual review, and into communicating these resistance management plans.

- The committee is considered to be an independent body capable of reviewing and researching market sensitive data, as committee representatives are independent from commercial providers.
- The committee represents the whole cotton industry. This occurs because committee representatives from all geographies are assigned specific areas of responsibility.
- The committee provides a forum for resistance issues to be discussed throughout relevant industries with a view to

considering joint management strategies, particularly with industries that may influence resistance issues within the cotton industry.

- The Crop Consultants Association is represented on the committee and is assigned specific areas of responsibility.
- Current and future technology providers should feel comfortable approaching the committee with 'market sensitive' issues. This allows the committee to maintain a holistic view of insect and weed resistance management.
- The committee develops and maintains a close relationship with regulatory authorities (such as the APVMA and OGTR).
- Clear communication channels exist for the exchange of information between industry and research.
- Time lines for reviews should provide ample opportunity for industry and researchers to consider proposed changes and meet deadlines.
- TIMS Technical Panels allow for review and discussion of proposed and existing resistance management plans with technology and trait providers.

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TIMS COMMITTEE REPRESENTATION

Role	Representative	Representing	Area of responsibility
Chairman	Andrew Parkes	Cotton Australia	Independent - from any region
Northern Area	Damien Erbacher	Cotton Australia	Biloela, Central Highlands, & Dawson Valley CGA's.
Darling Downs	Neville Walton	Cotton Australia	Darling Downs CGA
Western Area	Greg Morris	Cotton Australia	Bourke CGA, Dirranbandi CGA, Mungindi WU & CGA, St George CGA
Central North Area	Tony Taylor	Cotton Australia	Gwydir Valley CGA, Macintyre Valley CGA, Walgett CGA
Central South Area	Andrew Greste	Cotton Australia	Lower Namoi CGA, Upper Namoi CGA
Southern Area	Bill Tyrwhitt	Cotton Australia	Lachlan CGA, Macquarie CGA, Tandou
Herbicide Tech Panel Chairman	Cleave Rogan	Cotton Australia	Transfer of recommendations to and from Herbicide Tech Panel
Central CCA	Matt Holding	CCA	Central Highlands, Dawson & Callide Valleys plus Darling Downs
Northern CCA	Rachel Brimblecombe	CCA	Gwydir, Macintyre, Lower and Upper Namoi Valleys
Southern CCA	Campbell Muldoon	CCA	Macquarie, Lachlan, Murrumbidgee, Tandou
Western CCA	Jamie Street	CCA	St George, Dirranbandi, Mungindi, Walgett and Bourke regions
NSW DPI	Robert Mensah	NSW DPI	Communication to and from NSW DPI
QDPI&F	Geoff McIntyre	QDPI	Communication to and from QDPI&F
CSIRO	Lewis Wilson	CSIRO	Communication to and from CSIRO
CRDC	Tracey Farrell	CRDC	Communication to and from CRDC
CRC	Gary Fitt	CRC	Communication to and from CRC
GRDC	Dave Murray	GRDC	Communication to and from GRDC
Pulse Australia	Vacant	Pulse Australia	Communication to and from Pulse Australia

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REVIEW OF BT RESISTANCE RESEARCH AND EXTENSION ACTIVITIES

Led by TIMS Chair and Gwydir Valley grower Andrew Parkes, the Research and Extension in Resistance Forum (REFCOM) brought together researchers, growers, consultants, and representatives from Monsanto and the Cotton CRC's extension team, to discuss research progress and communication on Bt resistance.

Topics for review and discussion included refuges and *Helicoverpa* ecology updates, Bt resistance mechanism research, Bt resistance monitoring results and new research ideas. CSIRO researcher Sharon Downes presented the results of a recent survey of Crop Consultants Australia members on survivors in Bollgard II, and an analysis of scenarios using the Bt resistance model with the latest resistance frequencies was also a key topic at the meeting.

Bt resistance monitoring results

The levels of Bt (*Bacillus thuringiensis*) resistance in *Helicoverpa* species are monitored by CSIRO in their Narrabri and Canberra laboratories, and by Monsanto in their Toowoomba laboratory. As well as screening field populations for resistance genes, laboratory studies test whether resistant insects are disadvantaged (such as slower growth, lower reproduction) and how the resistance works.

Key points in the presentations to the REFCOM group were that:

- New evidence confirms that genes allowing *Helicoverpa* to survive Cry 1Ac are rare in Australian populations.
- A gene allowing *Helicoverpa* to survive Cry2Ab is present in populations of *Helicoverpa armigera* and *H. punctigera*, and is about four to six times more frequent than initially thought.
- In 2007–08 a higher percentage of the *H. armigera* population carried a copy of this Cry2Ab gene compared to previous years. Also, the percentage of the *H. punctigera* population that has a copy of this Cry2Ab gene has gradually increased since 2002.
- *Helicoverpa* that carry the Cry2Ab resistance gene occur throughout the industry and the increases in frequencies were seen in all valleys where good field collections were made.
- In response to the changes in Cry2Ab frequency, the industry and Monsanto increased support in the 2008–09 season to enable resistance monitoring to start earlier and finish later. With this increased effort it will be possible to look for shifts in frequencies throughout the season that may help determine when selection might occur.
- The resistance testing for 2008–09 is about 60 per cent complete and it is important to wait until the end of testing (May–June) before assessing the results. So far an increase in Cry2Ab frequencies has again been observed in *H.*

punctigera. The frequencies for *H. armigera* remain similar to those obtained in 2008–09.

- Larvae collected in 2008–09 from Bollgard II plants have yet to be tested for Bt resistance but egg collections from the same area suggest that neither *Helicoverpa* species is differentially surviving on Bollgard II cotton.
- The results since 2005–06 suggest that in both *Helicoverpa* species the survivors from Bollgard II plants are not more likely to carry Bt resistance genes than a random sample of the population.

Bollgard II resistance management plans

The TIMS Committee has the important role of endorsing any amendments to the resistance management plan (RMP) for Bollgard II and the CMP for Roundup Ready Flex. The Bollgard II RMP is the industry's key strategy to prolonging the life of this important Bt technology and should take into account any new research findings and consider them alongside information on resistance frequencies.

The Committee is currently reviewing amendments to the Bollgard II RMP for the 2009–10 season. The changes currently under consideration are aimed at strengthening the key tactics in the RMP.

The RMP is based on three main principles:

1. Minimising the exposure of *Helicoverpa* spp. to the Bt proteins Cry 1Ac and Cry 2Ab;

- 2, Providing a population of susceptible individuals that can mate with any resistant individuals, hence diluting any potential resistance; and,
3. Removing resistant individuals at the end of the cotton season.

The three resistance management tactics – planting windows; growing refuges; and, pupae destruction (or trap cropping in central Queensland, and northern Australia) – are aimed at underwriting the longevity of the Bt transgenic crop technology in Australia. The Bollgard II RMP is supported by industry but importantly it is also a regulatory requirement of the registration granted to Monsanto for Bollgard II in Australia.

A continued increase in Cry2Ab resistance frequencies in either *Helicoverpa* species is a concern to the industry. So as a precautionary measure, the industry and CSIRO are working with Monsanto to develop protocols to help decide what Cry2Ab resistance frequency would trigger a revision of the current RMP, when that proposed RMP change may occur, and what the change may be. This process is critical to ensure that Bollgard II and any future Bt cotton technology is adequately protected for the long-term.

WHAT WILL THE TIMS COMMITTEE BE FOCUSING ON IN 2009?

The TIMS committee has a full schedule of activities in 2009 including:

Resistance management of Bollgard II

- Review of Bollgard II RMP (northern and southern Australia);
- Review of Bollgard II planting window variation protocol; and,
- Auditing compliance with RMPs.

Resistance management of herbicide tolerant crops

- Review of Roundup Ready Flex CMP and Liberty Link CMP.

Resistance management of insecticides

- Review of regional IRMS.

Industry communication

- Develop communication plans for important resistance management messages for growers and consultants for the 2009– 10 season.

Further information:

TIMS Committee – Greg Kauter, Cotton Australia, (02) 9669 5222 or 0429 700711.

Bt Resistance Monitoring – Dr Sharon Downes, CSIRO, (02) 6799 1500 or 0427 480967.

ACRONYMS AND ABBREVIATIONS

ACGRA – Australian Cotton Growers Research Association

APVMA – Australian Pesticides and Veterinary medicines Authority

CCA – Crop Consultants Australian (previously Cotton Consultants Australia)

IRMS – Insecticide Resistance Management Strategy (for insecticides and miticides)

IPM – Integrated Pest Management

Bt – bacterium *Bacillus thuringiensis*

Bollgard II – Bt cotton containing Cry 1Ac and Cry 2Ab Bt proteins

INGARD – Bt cotton containing the Cry 1Ac Bt protein

Roundup Ready Flex – cotton containing two copies of the cp4 epsps gene conferring tolerance to glyphosate

RMP – Resistance Management Plan (for Bollgard II)

CMP – Crop Management Plan (for Roundup Ready Flex)

REFCOM – Research and Extension in Resistance Forum

CHEMICAL ACCREDITATION COURSES

Moura 1/7, Biloela 2/7, Theodore 3/7, Emerald 6/7, Mungindi 9/7, Goondiwindi 10/7, St George 13/7, Dirranbandi 14/7, Toowoomba 15/7, Dalby 16/7, Warren 28-29/4, Narromine 28-29/4, Trangie 28-29/4, Gilgandra 29-30/4, Moree 1-2/7, Narrabri 2-3/7, Wee Waa 2-3/7, Gunnedah 6-7/7

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