Cotton Catchment Communities CRC

NSW DEPARTMENT OF PRIMARY INDUSTRIES

COTTON *TALES*

Gwydir Valley "What's happening in the north west"

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Helicoverpa larvae in Bollgard II® cotton

Helicoverpa larvae can reach the medium-large size in some fields of Bollgard II®. Sometimes larvae reach numbers which are greater than threshold levels. In these situations consultants and growers are mostly concerned about potential economic damage but this situation may also affect resistance management.

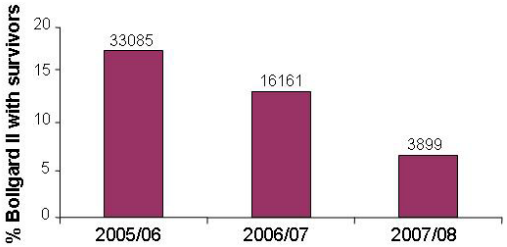
By the end of 2007/08 there was growing concern from the industry that Bollgard II® with survivors was largely restricted to St George, and more larvae were surviving in Bollgard II® fields than in previous seasons.

To find out if these perceptions were true, and to estimate the % Bollgard II® at threshold that is treated, we surveyed 46 CCA members on data from 2005/06, 2006/07 and 2007/08. In these seasons the total licensed Bollgard II® area was 230,000, 114,000, and 61,000 ha. In each season the survey covered >66% of the Bollgard II® area and all valleys were well represented.

We considered Bollgard II® to have survivors if it was at threshold: at least 2 larvae 3-8 mm/m in at least 2 consecutive checks or 1 larvae > 8mm/m.

The % Bollgard II® with survivors is not increasing

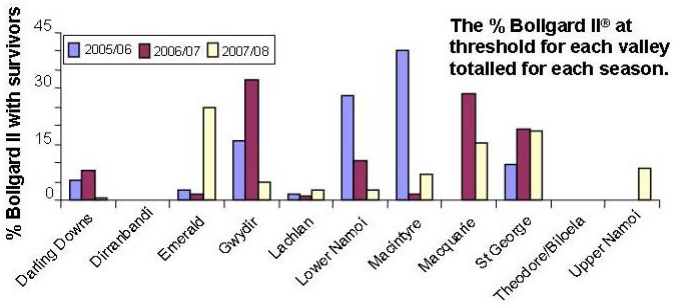
When the data were totalled for each season across valleys 15% of the Bollgard II® area reached threshold. In 2005/06 18% of the Bollgard II® area reached threshold, while only 7% reached threshold in 2007/08. The perceived increase in survivors may reflect greater awareness of the issue via extension efforts.



The % Bollgard II at threshold for each season totalled across valleys. The values at the top of each bar are total Bollgard II® (ha).

There is no trend among seasons for one valley to be more or less likely to have Bollgard II® with survivors

In 2005/06 the Gwydir, Lower Namoi and MacIntyre valleys had a percentage of Bollgard II® with larvae that was above the average. In 2006/07 the Lower Namoi, St George, Macquarie, and Gwydir valleys had a percentage of Bollgard II® with larvae that was above the average. In 2007/08 the Upper Namoi, Macquarie, St George, and Emerald valleys had a percentage of Bollgard II® with larvae that was above the average.

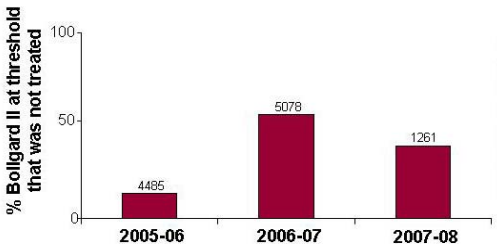


The % Bollgard II® at threshold for each valley totalled for each season.

Not all of the Bollgard II® with survivors was treated

To extend the life of Bollgard II® growers follow a strict Resistance Management Plan. Despite this strategy, there are concerns that Cry2Ab resistant alleles in both Helicoverpa species may be increasing.

In some years more than half of the area that reached threshold (of at least 1 medium-large larvae/m) was not treated. *This finding is a concern for managing resistance.* Because larvae surviving on Bollgard II® probably consume Bt toxin at a non-lethal dose, it is possible that there is greater selection for resistance. This makes it important to treat Bollgard II® at threshold to stop larvae from contributing to future generations. Follow-up pupae digs in fields that carried threshold numbers of larvae have confirmed that survivors are able to successfully pupate and emerge as moths.



The % Bollgard II® at threshold in each season that was not treated. The values at the top of each bar give the total Bollgard II® (ha) at threshold that was not treated.

Case studies from 2007/08

A follow-up questionnaire to consultants that reported survivors in 2007/08 did not indentify practices or conditions that led to some Bollgard II® fields carrying larvae while others did not. Plants in affected fields may have a different physiology or genetic makeup that affects the rate of toxin production, neither of which can be noticed by simply observing the plant.

The fact that not all fields are affected suggests that the behaviour of Helicoverpa is not likely to lead to survival, but it is possible that larvae behave differently on plants that have a lower initial level of Bt toxin.

Thresholds

Researching economic thresholds for Bollgard II® is difficult because situations where larvae develop cannot be predicted. By artificially damaging Bollgard II® plants and/or leaving some parts of affected Bollgard II® fields unsprayed, it may be possible to research whether yield penalties exist when medium-large larvae are not treated. Future research may also need to consider the role thresholds can play in reducing the selection pressure for Bt resistance.

The presence of medium-large larvae in Bollgard II® is:

- not due to Bt resistance
- not increasing (from 2005/06 until 2007/08)
- widespread among valleys and climatic regions
- not always controlled (but it should be)

The full report from this survey can be found at:
http://www.cotton.crc.org.au/ (Industry – Publications –Pests & Beneficials – Insect Resistance Management).

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