



Managing *Helicoverpa* in Bollgard II cotton

There have been recent reports of *Helicoverpa* survivors (larvae larger than 3mm) in Bollgard II cotton fields across a number of cotton regions.

Since the widespread uptake of Bollgard II in 2005–06 there have been occasional reports of larvae surviving for several weeks at threshold levels in Bollgard II fields. Most affected fields are at mid to late flowering and the survivors include *H. armigera* and *H. punctigera*.

What are ‘survivors’? Are they resistant to Bollgard II?

Work conducted by CSIRO and Monsanto showed that larvae did not survive on Bollgard II due to Bt resistance or because of the absence of Bt genes in the cotton. Recent work suggests that larvae exhibit strong behavioural responses to the Bt proteins in Bollgard II plants. Detection and avoidance of the Bt toxins results in frequent movement of larvae, potentially within and between plants, resulting in an apparent feeding preference for flowers. These behaviours, coupled with the sometimes temporal and spatial variability of Bt toxin expression in Bollgard II cotton, can result in a proportion of larvae becoming established on some plants in a field.

Control of *Helicoverpa* larvae in Bollgard II

For resistance management reasons, it is recommended that if larvae reach thresholds in Bollgard II fields they should be controlled by spraying. However work conducted by both Monsanto and CSIRO suggests that it is unlikely that there will be a yield penalty associated with larvae survival in Bollgard II fields.

This is supported by a recent study that used the distribution of larval damage in fields that carried larvae at the current thresholds as the basis for an artificial damage experiment. The work showed that Bollgard II plants could tolerate up to 100 percent square loss at early flowering, up to 100 percent square removal alone or in combination with 30 percent boll damage at peak flowering, and 30 percent boll damage at late flowering, without impacting yield or quality.

Therefore Bollgard II cotton seems to compensate well for damage caused by larvae and the current threshold can be used in most situations without causing significant yield reduction.

Helicoverpa thresholds

Do not include any larvae less than 3mm long in spray threshold counts. For economic management of *Helicoverpa*, larval populations should be controlled with an insecticide if a threshold of:

- 2 larvae/m > 3 mm long are found over 2 consecutive checks; or,
- 1 larvae/m > 8 mm long is found in any check.

When using the above thresholds to make a spray decision, it is critical that consecutive checks are used across a number of different areas in a field. It is common for *Helicoverpa* survivors to have a patchy distribution within a field and for larvae to be above threshold in one check, and then numbers reduce to below threshold numbers in subsequent checks. More information on how to effectively sample crops can be found on pages 51-52 of the Cotton Pest Management Guide 2013-14 (available from the CottonInfo and CRDC websites: www.mybmp.com.au, www.crdc.com.au).

Insecticide selection for Bollgard II crops

When controlling *Helicoverpa* within Bollgard II crops, insecticide selection should comply with the cotton industry's Insecticide Resistance Management Strategy (IRMS). The predator/pest ratio (described in the Cotton Pest Management Guide) should also be given careful consideration when the application of an insecticide is being considered. If an insecticide is required, try to choose the most effective product that is the least disruptive to the beneficial complex. Refer to the *Impact of insecticides and miticides on predators, parasitoids and bees in cotton* table contained in the Cotton Pest Management Guide 2013-14 (see

pages 8-9) for more information.

It is also important to consider the risk of flaring other pests, such as Silverleaf Whitefly or Mealybug when making a spray decision as the benefits of spraying the *Helicoverpa* larvae could be outweighed by the risk of having to control other pests later in the season. While foliar Bt can be used on Bollgard II crops, it is a requirement of the Bollgard II Resistance Management Plan that foliar Bt not be used on any refuge crops.

With the increased risk of resistance to Cry2Ab in *Helicoverpa* it is critical that we monitor the distribution and proportions of fields that are affected by surviving larvae, and the number of fields that are sprayed to control *Helicoverpa*. Part of the end of season general survey of CCA members includes questions about control of *Helicoverpa* in Bollgard II fields.

For more information:

- Whitburn G, Downes SJ, 2009, Sprays for surviving *Helicoverpa* larvae in Bollgard II® survey results. *The Australian Cottongrower* 30:12-16
- Lu B, Downes SJ, Wilson L, Gregg P, Knight K, Kauter G, McCorkell B, 2011, Is the economic threshold for *Helicoverpa* spp. larvae in Bollgard II® adequate? *The Australian Cottongrower* Dec-Jan: 40-45
- Lu B, Downes SJ, Wilson L, Gregg P, Knight K, Kauter G, McCorkell B, 2011, How do susceptible *Helicoverpa* spp. larvae behave on Bollgard II®? *The Australian Cottongrower* Oct-Nov: 12-15
- The Cotton Pest Management Guide 2013-14.