



Controlling sweet corn pests in the Riverina

Tony Napier¹ & Sandra McDougall²

¹NSW DPI District Horticulturist, Yanco Agricultural Institute; ²NSW DPI Industry Leader for Field Vegetables, Yanco Agricultural Institute

IN A NUTSHELL

- A significant production challenge since the 1990s has been controlling *Helicoverpa* grubs since the pest developed resistance to the insecticides commonly used to control it
- Research that concludes this season presents growers with confidence to use some new insecticide options for control of *Helicoverpa*
- The research also showed that water rates and application technique are important for obtaining the best results from an insecticide

Growing sweet corn is similar to growing maize but the product produced has a much higher sugar content in the kernels. Maize is harvested when the kernels are fully matured and dry (below 12% moisture) while sweet corn is harvested when the moisture content of the kernels is still very high (above 68% moisture). Sweet corn can either be grown for the fresh market or for the processing market. The vast majority of the sweet corn grown in the Riverina is for the processing market.

Sweet corn in the Riverina

There has been a number of processing factories that source sweet corn from within the Riverina over the last few decades. The Mountain Maid factory was located at Batlow and processed sweet corn sourced predominantly from the Riverina districts of Gundagai, Wagga and Darlington Point until it closed in 1998. Parle Foods at Griffith also sourced large amounts of sweet corn from the Darlington Point, Whitton and Hillston districts from 2001 until 2003. The Simplot factory at Bathurst is still operating and sourcing part of their sweet corn requirements from the Riverina. Simplot have sourced from a number of growers in the Griffith and Whitton districts since 2003 but have recently cut back their Riverina requirements to a single grower in the Hillston district.

One of the most difficult problems to overcome when producing sweet corn is controlling pests that attack the cobs. *Helicoverpa armigera* is considered the most destructive of all the insect pests that attack sweet corn. This insect pest has devastated crops around Australia and when infestations are high, whole paddocks can be left unharvested. *Helicoverpa* grubs are very attracted to sweet corn when they first start to form cobs (silking). After hatching, these grubs quickly eat their way into the cob and render it unsuitable for processing. Before insecticide resistance occurred, the battle was a lot easier with most growers mainly using broad spectrum insecticides and getting very good results. Unfortunately, as insect resistance to

many of the broad spectrum insecticides started to develop in the early 1990s, this strategy became unsustainable and spray failures soon started to occur.

Researching better control strategies

There has been a series of major national research projects aimed at managing pests of sweet corn in Australia. The research has focused on *Helicoverpa* grub control and the increasing pressure of secondary pests. Much of the research has now been completed with the last of the trials winding up this season. The series of research projects has been led by Queensland Department of Primary Industries and involved agencies from most other states in Australia including researchers from Yanco Agricultural Institute. Some of the outcomes achieved from the research projects include a significant contribution towards the registration of new biological and narrow spectrum insecticides, developing Integrated Pest Management systems (which utilise pest monitoring and beneficial insect activity) and developing



Figure 1. Staff at Yanco Agricultural Institute harvesting the 2007–08 sweet corn efficacy trial



Table 1. Outline of the chemicals, order of application and water rates for each treatment

Treatment	Spray control program	Water rate
T1	Avatar applied when tassels first appear. Corrigan or Success used in rotation if pest thresholds reached.	High (276 L/ha)
T2	Corrigan applied when the crop first starts silking. Corrigan or Success used in rotation if pest thresholds reached.	High (276 L/ha)
T3	A tank mix of Dominex® and Lannate® applied when tassels first appear. A second tank mix of Dominex® and Lannate® applied one week later. Success rotated with Dominex and Lannate if pest thresholds reached.	High (276 L/ha)
T4	Similar program to T3 but using a lower water rate.	Low (138 L/ha)
T5	Control – no spray control program applied	NA

Note: A spray threshold of 3 grubs or 8 eggs per 20 plants was used

improved spray application methods. These outcomes are helping many sweet corn growers return to the yields that they enjoyed prior to the development of insecticide resistance.

Sweet corn trials in the Riverina

Two trials were established in the 2007–08 season to assess the efficacy of spray programs based on new generation, narrow spectrum chemicals and compared against older broad spectrum chemicals for controlling *Helicoverpa* grubs. The first two spray programs (treatments) evaluated the use of Corrigan® (a new experimental narrow spectrum insecticide) when first applied at silking. Both of these programs involved rotating with Success® and one also included an earlier application of Avatar® at tasselling. These three insecticides are narrow spectrum chemicals which have low levels of mammalian and environmental toxicity but high efficacy against Lepidoptera (grubs) pests. Success has been developed by Bayer and has been registered for use in sweet corn for a number of years. Avatar has been developed by Dupont and has registration in some crops for *Helicoverpa* grubs but not sweet corn. Corrigan is a new chemistry being developed by Dupont and was the focus of this season's trials.

The effectiveness of these two spraying programs was compared with typical spray programs using broad spectrum chemicals as the main control option. In addition, the broad spectrum chemical spray program was evaluated at both high and low water rates. The low water rate was applied with a standard "over the top" boom spray and the high water rate was applied with a boom fitted with droppers to help improve spray coverage to the target area. The spray treatments were also compared with a nil spray program where no spray treatments were applied.

Trial method

The trials had four replicates of five treatments in a randomised block design with the main assessments being conducted at harvest. There were numerous assessments from each treatment conducted on the trials including number of pest and beneficial insects present at crop maturity and the different levels of damage caused by *Helicoverpa* grubs. The damage assessment at harvest included sorting cobs into categories of either "suitable for processing", "Suitable for the fresh market" or "Unsuitable for any market".

Results

The data from both of the efficacy trials in the 2007–08 season were very similar with excellent results achieved when using the new generation, narrow spectrum insecticides. The spray programs of treatments T1 and T2, which applied Corrigan at silking and rotating with Success, gave significantly greater *Helicoverpa* control in sweet corn than using the broad spectrum insecticides and rotating with Success. Treatment T1 also had the extra application of Avatar at tasselling when there was an average of one *Helicoverpa* grub per two plants. The additional application of Avatar at tasselling, when using a Corrigan/Success rotation, gave no improvement in *Helicoverpa* control. Figure 1 below illustrates the greater *Helicoverpa* control for both the new generation insecticide treatments with a higher cob yield.

The spray programs of T3 and T4 which applied a rotation of Lannate® and Dominex® with Success gave significantly greater *Helicoverpa* control in sweet corn compared to a nil spray program. The spray program of Lannate and Dominex, in rotation with Success, was affected by water rate and application method. When applying this rotation, the *Helicoverpa* control is significantly improved at higher water rates and the use of droppers fitted to the boom.

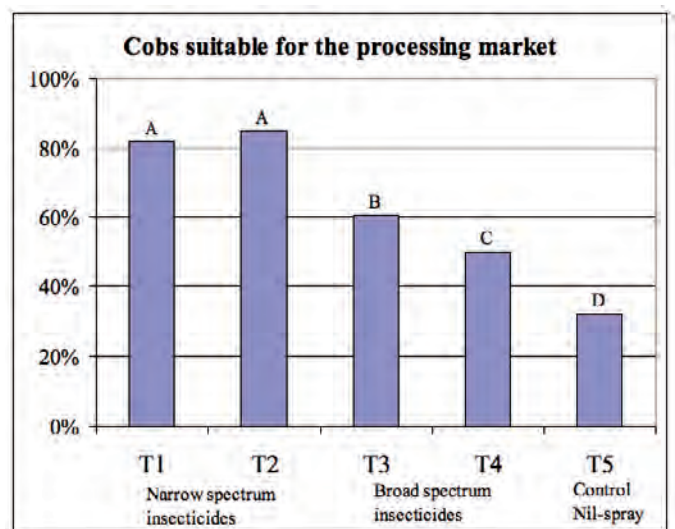



Figure 1. Percentage of cobs suitable for processing in trial two of the 2007–08 efficacy trials. Columns not sharing a similar letter are significantly different by LSD test at $P = 0.05$.



Leading to integrated pest management

Work from these and other trials around Australia has significantly contributed towards the registration process of a number of new narrow spectrum chemicals throughout the duration of the national sweet corn project. With more biological and narrow spectrum insecticides becoming available, Integrated Pest Management is fast becoming the preferred method of pest control for many sweet corn growers across Australia. The industry is now getting better pest control by changing from a high dependency on broad spectrum insecticides to a widespread use of biological methods. As a result of recent research such as this project growers now have a better understanding of pest-beneficial interactions, the use of biological and narrow spectrum insecticides, and pesticide application using improved equipment and techniques. 

Acknowledgements

The assistance of Valerie Draper, Alan Boulton, Scott Munro, Andrew Watson, Meryl Snudden, Lee Browne, Amanda Mills and the growers who co-operated with on-farm trials is gratefully acknowledged. Horticulture Australia provided funding for the project.

Further information

Tony Napier
District Horticulturist
NSW Department of Primary Industries, Yanco Agricultural Institute
T: 02 6951 2796
M: 0427 201 839



Figure 3. Sweet corn cobs that have no damage from insects



Figure 4. Sweet corn cobs with *Helicoverpa grub* damage