Commercial performance of Bollgard II

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Bollgard II is due to completely replace Ingard in the Australian cotton industry in 2004–05.

As a part of this transition, the commercial performance of Bollgard II was measured in 2002–03 to see how it stacks up against current cotton types.

Commercial evaluations trials were conducted over 65 locations spanning the entire cotton belt. Individual trial sites comprised commercial sized areas (greater than 20 hectares) of each cotton type (Bollgard II, Ingard and conventional cotton).

Trial sites were planted and managed commercially by individual trial co-operators. Fifty nine of these 65 sites were analysed, with six being discounted due to hail, drought or row configuration.

Comparison fields were either adjacent to the Bollgard II, or in the same management unit. Pesticide drift between the evaluation fields was minimised.

Each comparison field was plant mapped at the end of the season (between defoliation and harvest), with commercial yields collated from relevant ginning organisations and/or growers.

Insecticidal performance

Early trials run by Stewart Addison in 2001–02 had light Helicoverpa pressure — with an average of only 8.3 sprays required on conventional cotton. In 2002–03, the pressure was even lighter, with only 6.59 sprays recorded on conventional cotton.

Despite the trials being conducted under these light insect pressure conditions, Bollgard II was found to reduce Helicoverpa pesticide applications by 97 per cent (2002–03) and 98 per cent (2001–02) when compared to conventional cotton (Figure 1).

Bollgard II required similar treatments for secondary pests in 2001–02 compared to Ingard and conventional cotton.

But in season 2002–03, Bollgard II required an average of one additional secondary pest spray over conventional cotton. Secondary pest pressure between the seasons was not significantly different — but the widespread use of Steward in 2002–03 targeting Helicoverpa in conventional cotton may have offered some incidental control of secondary pests.

FIGURE 1: Total Helicoverpa sp. applications

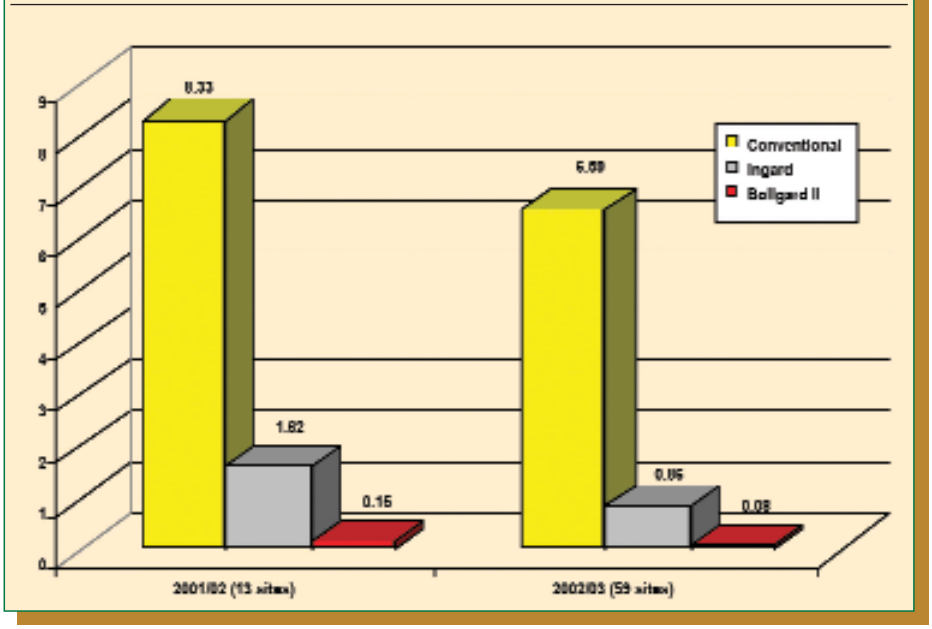
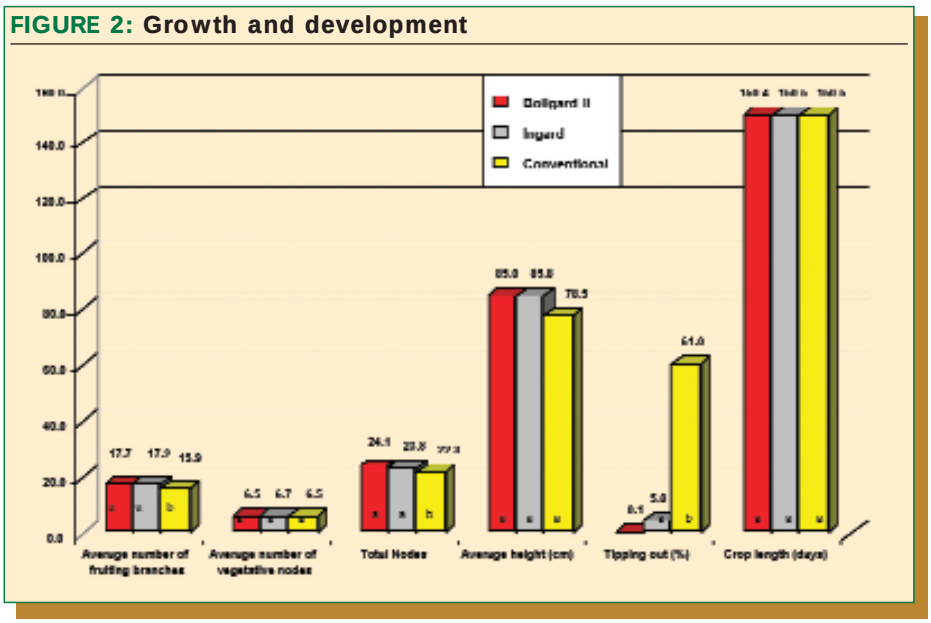


FIGURE 2: Growth and development



Earliness

All treatments had similar vegetative characteristics, but the Bollgard II sites had significantly more fruiting nodes than conventional cotton, with similar crop height. Importantly, the Bollgard II sites achieved these additional fruiting nodes while maintaining the same maturity (planting to defoliation days) as conventional cotton (Figure 2). This may translate to approximately seven to 10 days crop earliness depending upon late season temperatures.

Tipping out

The Bollgard II sites had significantly less terminal damage (tipping out) than conventional cotton primarily due to superior Helicoverpa control.

It should however be noted that the tipping out level in conventional cotton was very low — probably a reflection of the light insect pressure.

Fruit retention

Differences in fruit retention between Ingard and Bollgard II are particularly sig-

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FIGURE 3: Fruit retention

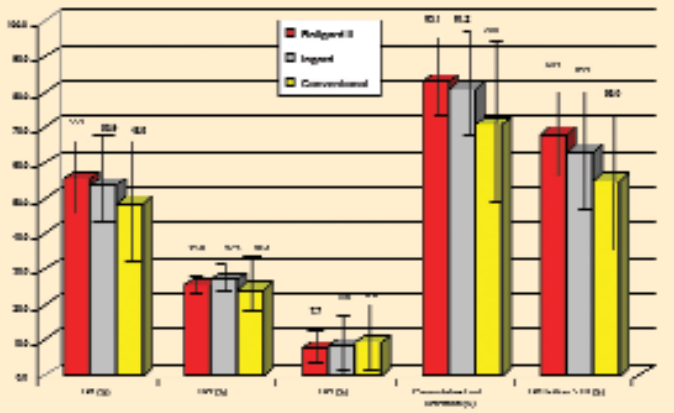
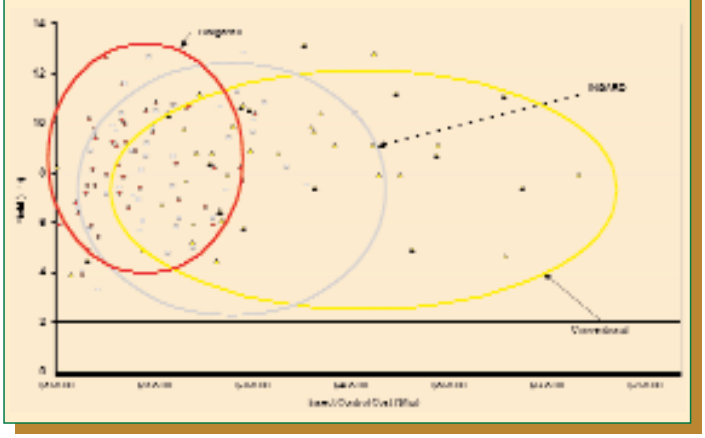


FIGURE 4: Insect control costs and yield



nificant considering that trials were conducted under very low insect pressure. Larger differences would be expected under higher insect pressure scenarios.

The robustness of Helicoverpa control by Bollgard II has resulted in less variance across all fruit retention parameters than either Ingard or conventional cottons. The higher cumulative and bottom five first position fruit retention of Bollgard II has contributed to crop earliness observed in Figure 2.

The high fruit retention (Figure 3) did not translate into a crop that set and retained a disproportionate amount of early fruit at the expense of later fruit. This has implications for crop management. It suggests that Bollgard II is not necessarily predisposed to early cut-out, and so management of the crop should not be significantly different from either Ingard or conventional cotton.

The fruit retention pattern of the Bollgard II follows the same basic pattern as conventional cotton, differing only in the percentage of fruit retained at each fruiting node.

Yield

The increased number of fruiting branches along with a higher level of fruit retention in Bollgard II resulted in an average 8.9 per cent yield increase over conventional cotton.

But these results need to be treated with caution. Bollgard II varieties should not be expected to have a yield advantage in all circumstances, but under high pressure situations, or when insect control on conventional cotton is poor, yield differences will be more likely to be observed.

Economic analysis

The increased robustness and consistency of Helicoverpa control found in Bollgard II has resulted in a greatly reduced yield/cost range compared to conventional cotton (Figure 4).

RECOMMENDATIONS

It is clear that Bollgard II offers significant reductions in pesticide requirements over either Ingard or conventional cotton, despite these trials being conducted under very light Helicoverpa pressure.

This increased efficacy against Helicoverpa translated into a crop that has the ability to retain significantly higher amounts of fruit. It has also resulted in a fruiting pattern which is much more stable than conventional cotton. Furthermore, this higher fruit retention did not result, on average, with a crop which exhibited premature cut-out.

Bollgard II in these trials offered less deviation in insecticide costs than both Ingard and conventional cotton, while providing, on average, a yield increase.

The single stem (low tipping out), high fruit retention habit of Bollgard II may require specific management considerations. For yield potential to be maximised, crop managers should aim to produce an average plant, which has between 10 and 14 effective fruiting branches. This can usually be achieved by the manipulation of irrigations (along with adequate nutrition) so that at first flower, the crop has at least seven fruiting nodes present above the node where the flower appears (7 NAWF).

The improvements in Helicoverpa control offered by Bollgard II may also alter the control parameters of some secondary pests. The thresholds for these pests may need to be revisited in light of the fruit retention exhibited by Bollgard II.

Bollgard II may also alter the nutrient demand placed on the soil. High fruit retention may serve to place increased demand for nutrients over a shorter period of time, as the plant attempts to resource the fruit set. So under certain environmental conditions (low soil K and waterlogging), the crop may be more inclined to exhibit premature senescence. Crop managers should consider soil sampling for K, and fertilise if required.

Other macronutrients (especially N) may need to be applied using split rate applications in order to better resource the high amount of fruit present. But it is unclear whether Bollgard II will require increased amounts of fertiliser. Further work is required to quantify the affects of high fruit retention on nutrient demand and requirements.

The trial results clearly demonstrate the benefits of Bollgard II when examined under commercial growing conditions. A similar series of commercial evaluations are being run this season to increase our database and evaluate the technology under different pest pressure.