Industry Perceptions on Management Issues Associated with Bollgard® II

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1.0 Introduction:

The 2003 - 04 season heralded the first full commercialisation of cotton varieties in Australia with the Bollgard® II gene from Monsanto. Bollgard® II contains the insecticidal proteins Cry1Ac and Cry2A which provide control of *Helicoverpa* spp. under field conditions.

Based on limited experience, a range of perceptions have been aired which suggest that there is a need to change the management of Bollgard® II in comparison to conventional cotton to ensure full benefits are obtained from this technology. To verify or clarify the existence of these perceptions and to identify key Bollgard® II management issues, the Australian Cotton CRC Extension Networks' Insect Focus Team undertook an industry wide investigation.

The aims of this investigation were to:

- obtain a pre-season benchmark of grower and consultant perceptions and concerns on management of Bollgard® II.
- better direct national and local extension efforts in the area of Bollgard® II management,
- identify opportunities for additional research and /or demonstration trials,
- assess change in perceptions to Bollgard management over time (following post-season assessment).

The procedure for doing this was to conduct two sets of interviews:

1. Short interviews before the start of 2003 - 04 season (August – November 2003)
2. Short interviews at the end of 2003 - 04 season (May 2004)

The first round of interviews took place between August and November 2003. Respondents for the interviews were selected semi-randomly, which comprised of cotton consultants and growers from most Australian cotton producing regions. Seventy two people were interviewed either individually or as participants in the Australian Cotton CRC IPM Short course.

This report documents the findings from the first round of interviews.

The specific aim of the first round of interviews was to gather and benchmark initial feelings, concerns, issues and/or perceptions regarding Bollgard® II management.

2.0 Key differences in Management between Bollgard® II and Conventional cotton.

This investigation highlighted that both growers and consultants expect to have a greater emphasis on 'whole crop management' in Bollgard® II, including refining water and nutrition management in relation to a crop. This was in response to the Bollgard® II crop being more likely to have high fruit retention, higher yield potential and a shorter maturity period.

Eight major perceived differences between managing Bollgard® II and conventional cotton emerged from this investigation (Figure 1).

1. **Sucking/Secondary pests**
2. **Water**
3. **Nutrition**
4. **Early cut-out**
5. **Plant development**
6. **Yield and quality**
7. **Plant date and population**
8. **Other** (includes plant growth regulators and premature senescence)

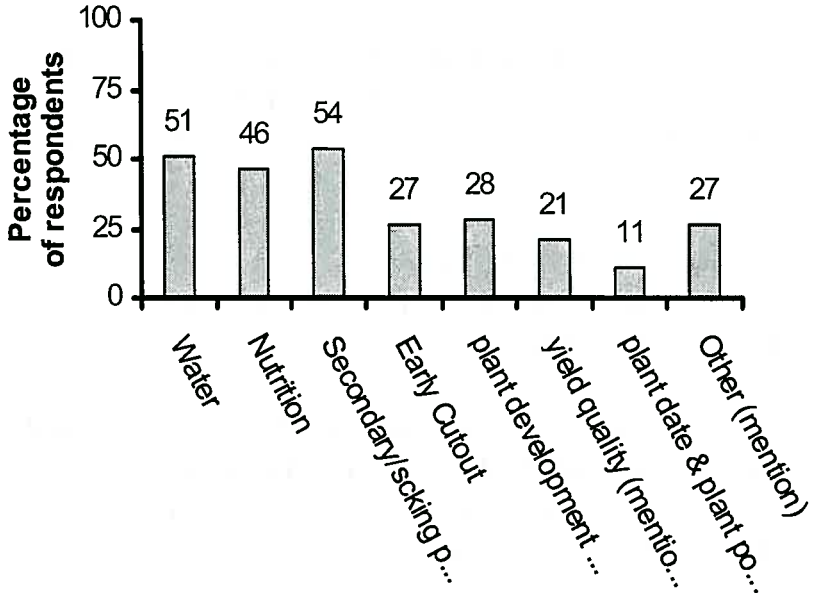

Figure 1. Most frequently mentioned challenges anticipated with Bollgard® II (growers and consultants combined), calculated by the total number of mentions made about each issue (some people may have mentioned more than one issue).

Water

- The main issue concerning water was the scheduling to meet the demand in Bollgard® II. Respondents highlighted the importance of ensuring that these crops do not become moisture stressed because if this was coupled with a high fruit load, it could result in premature cut-out.

"I don't think it will use more water (although it may)- this season we have allowed one more irrigation on the Bollgard® II. During peak season though I think waters will need to be close together. We're getting an EnviroSCAN® for that field so we can get a better handle on it". Cotton Grower, August 2003.

Nutrition:

- People were expecting to have an increased demand for nutrition to ensure the yield and fruit load is maximised. The need for fine-tuning nutrition in Bollgard® II crops through monitoring was also highlighted.

"We'll put a bit more nitrogen on it although we don't want it to go rank. It worked well last season. We'll probably run some urea through the water in the first 4 irrigations (50 units in total), but this will depend on the weather- we'll see how It's growing at the time". Cotton Grower, August 2003.

Secondary Pests:

- There is widespread acceptance that there will be reduced emphasis on specific *Helicoverpa* management. There was a desire for more information on 'secondary pests', the potential damage they cause and subsequent management. The potential secondary pests mentioned included mirids, jassids, aphids, thrips and whitefly.

"Secondary pest becoming the primary pest and the difficult nature of recording these populations". Cotton Grower, August 2003.

3.0 Information on Management of Bollgard® II.

Prior to the start of the 2003 - 04 season there was a variety of ways growers and consultants could have accessed information on Bollgard® II. Some examples of this were:

- Commercial trial areas of Bollgard® II were planted in most districts. These were coordinated by Monsanto and included varieties from both seed companies (Cotton Seed Distributors and Deltapine Australia). Monsanto organised field days (involving both seed companies) during the season at most districts.
- Information was presented on Bollgard® II management at industry meetings including Cotton Consultants Australia Production Seminar and the annual 'pre-season information tours' held by both seed companies.

- Both seed companies have provided written material on their varieties and technical updates highlighting management issues of Bollgard® II.
- Both seed companies have useful websites.
- The Australian Cotton CRC National Cotton Extension Team has conducted trials and promoted investigations into the damage recovery of Bollgard® II cotton.
- The extension group has also provided information regionally via newsletters (*Cotton Tales*) and other mediums.

The majority of respondents (60-80%) felt that there was sufficient information available to successfully manage Bollgard® II. There was a strong recognition that a seasons experience of growing/ managing it would be a very important learning exercise.

During this evaluation we sought to find out where growers and consultants had accessed their information about managing Bollgard® II prior to the season. The responses on sources of information were divided into 6 categories (Figure 2).

1. **Seed companies**
2. **Monsanto**
3. **Research and Extension**
4. **Networking** – informal, *eg speaking to neighbours*
5. **Experience** – the respondents' own experience in growing or managing Bollgard II®.
6. **Media** – this category represents 'other' but only one response was identified

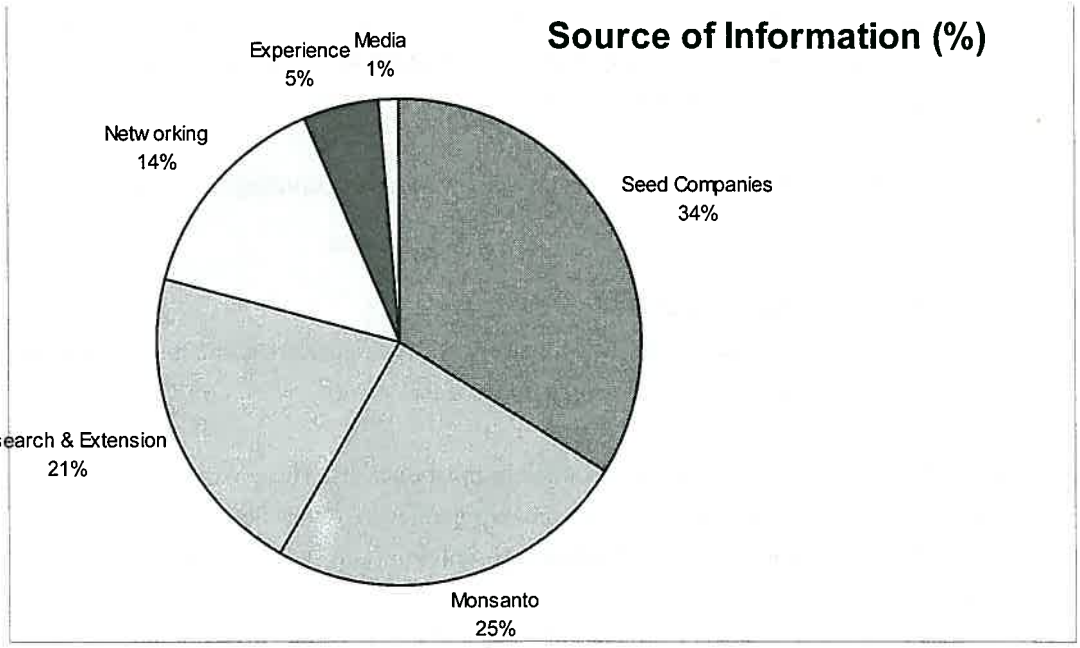

Figure 2. A breakdown of major sources of the most frequently mentioned information sources on Bollgard® II cotton. The number of times each source was mentioned was calculated as a percentage of the total number of mentions. Respondents could contribute zero, one or more than one mention.

Seed Companies

Whilst reference to seed companies was often generic, when a specific company was mentioned it was more often Cotton Seed Distributors specifically and information disseminated either via mail-outs or the web.

Monsanto

Monsanto was commonly referred to as a source of information, both generically and with reference to the accreditation course and field days.

Research & Extension

There were many generic responses to 'industry' research and development (CRDC, ACRI) and also some specific reference was made to the extension team and individuals in the team.

Networking.

Networking broadly referred to information gained informally such as through discussions with neighbours. Responses suggested that interviewees gained information from other growers and consultants. Many specifically mentioned networking activities such as field days and area wide management groups.

Experience.

Experience in growing and managing Bollgard® II was highlighted by those people who had conducted trials or had demonstration fields in season 2002-03.

4.0 Information Gaps on Bollgard® II management.

It was generally acknowledged that the introduction of Bollgard® II was a steep learning curve for everyone. Many people suggested that regardless of the amount of information they had, there was a lot they were going to learn by simply growing a crop themselves. Some people highlighted that many of the issues identified required research and this research should be done regionally to be fully utilised. Information gaps have been categorised in to the following five headings:

1. Plant Growth

Most comments relating to plant growth centred on the fact that Bollgard® II crops would potentially have higher retention. There was recognition that crops with higher boll loads would act differently in terms of determinacy than their "equivalent" varieties. Under high retention there may be a greater tendency to cut-out prematurely. There were questions about the implications of stress or 'minor set backs' during the season on high retention crops. These include climatic and management related factors.

"We have to get out into the field and grow the new technology. We need to learn ourselves, as we did with INGARD®"

2. Nutrition

Better information was desired on in-crop nutritional monitoring such as petiole and leaf testing and if yield potential is going to be increased with Bollgard® II, should current fertiliser recommendations be revisited? Questions frequently referred to quantity, timing and application.

"Nutrition is probably the biggest issue. That is the timing of requirements, uptake in a high boll load situation." Cotton Consultant, August 2003.

3. Irrigation

Generic comments on irrigation were often mentioned in combination with nutrition. In addition, irrigation timing and deficits were specifically mentioned.

We need information on fertilizers and irrigation and it needs to be done locally. Cotton Grower, August 2003.

4. Efficacy Performance

Issues regarding efficacy performance of Bollgard® II varied a lot and included:

- Is efficacy compromised under adverse conditions, either through management or climatic factors?
- How would it perform under high pressure? Bollgard® II had only been grown on a paddock scale during 'low *Helicoverpa* pressure' years.
- Would there be a significant reduction in efficacy later in the season?
- Could efficacy levels be tested during the season as a decision support tool?

"It's a worry when we hear that Bollgard® II may not be completely robust under very high Heliothis pressure, so we'll have to keep monitoring retention." Cotton Grower, August 2003.

5. Insect Management

A number of the respondents, both consultants and growers raised the issue of the role of consultants in a Bollgard® II system. Will more plant monitoring be required, how much time needs to be devoted to 'secondary pests' and can they justify similar fees? More information will be required on some of the sucking pests that have not traditionally been as prevalent. Specific mention in this category was made of stink bugs, jassids and aphids.

.... talking about the secondary pests and early season fruit retention, how to deal with those components of the technology. Cotton Grower, August 2003.

6. Varieties

As a result of the large scale introduction of Bollgard® II, with a large number of new and unknown varieties, uncertainty about yield and quality potential has concerned many growers. It was suggested that information was needed on variety performance on a broader scale than variety trials such as district wide variety surveys.

"Bollgard® II has been an extremely fast transition. Have the seed companies really had enough time to get it right?" Cotton Grower, August 2003.

4.0 Conclusion:

The initial part of this investigation into industry perceptions on management issues associated with Bollgard® II was to gather and benchmark initial feelings, concerns, issues and/or perceptions prior to the first fully commercial plantings. We also intended to gauge how information on Bollgard® II management was accessed, and whether this was adequate.

This investigation highlighted that there will be reduced emphasis on specific *helicoverpa* management; but a greater emphasis on 'total crop management' including refining water and nutrition management in a crop that has higher fruit retention, a shorter maturity period and the removal of *helicoverpa* damage as a yield constraint. There was also recognition that 'secondary pests' would become more important and information was required on the potential damage they cause and subsequent management.

Most of those interviewed (60-80%) felt that there was sufficient information available to successfully manage Bollgard® II for 2003– 04. However, there was a strong recognition that experiencing a season of growing it would be a very important learning exercise.

Despite general satisfaction that there was sufficient information to successfully grow Bollgard® II, a range of issues for which research could be applied to improve information were highlighted. There was a strong preference for research to be applied locally.

The second component of this evaluation (Part B – post-season interviews of the same set of 72 respondents) will aim to capture the input and impact of information delivery and extension during the 2003/04 season. This will include identifying ways in which people managed Bollgard® II 'differently' to other cotton crops they had previously grown or consulted on. This will help eliminate information gaps and assist with ongoing management challenges that growers and consultants face in a Bollgard® II system. The information from this evaluation will also help to effectively guide our future extension activities by differentiating the Bollgard® II management concerns that are based on perception from those that have a more solid basis.

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