CROWN ROT: A VALIDATION OF THE COMMERCIAL BENEFITS OF INTER-ROW SOWING

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Key words

Wheat, crown rot, diseases, inter-row, yield

GRDC code

NGA00001: validation and integration of new technology through grower groups in north-west NSW and south-west Queensland grain growing zones
DAN485: Management of Fusarium diseases and common root rot of cereals in the northern cropping zone

Take home messages

- 7 commercial wheat trials in 2006 showed inter-row sowing decreased both crown rot severity (average 53%) and incidence (average 48%) compared to sowing on the previous cereal rows
- Confirmed the level of disease impact seen previously by NSW DPI
- Inter-row sowing resulted in a significant yield increase at 4 of 7 sites (overall average yield increase of 5%)
- Average yield benefit of 101 kg/ha
- Inter-row sowing is a useful additional strategy but is **NOT** a primary management tool for crown rot

Background

Crown rot (CR) remains the number one winter cereal disease in the northern grain region. Yield losses in wheat of 50 per cent or more are not uncommon where high disease levels are combined with moisture stress late in the season. CR is caused by a stubble-borne pathogen *Fusarium pseudograminearum* (Fp). GRDC-funded research has shown that in a no-till cropping system, inoculum of Fp becomes concentrated in rows remaining from previous winter cereal crops.

Research conducted by the NSW DPI in 2004 and 2005 highlighted that sowing between the previous cereal rows was a strategy that reduced both the level of incidence of Fp as well as the severity of the disease. Level of incidence was reduced by an average of 52% and 45% in the two years, with CR severity reduced by 60% and 51% respectively.

The research also indicated that the effectiveness of inter-row sowing decreased in sites with high levels of CR. In sites where CR severity was >50%, inter-row sowing only reduced disease severity by an average of 29%. In sites with severity <50%, inter-row sowing reduced disease severity by 61%.

A primary role of NGA is to take promising R&D and validate the commercial benefits than can be delivered to growers whilst identifying any practical limitations. In this project the benefits of inter-row sowing on Fp incidence and disease severity were clear, the next step was to examine whether inter-row sowing delivered commercial benefits to growers in terms of actual grain yield and quality.

Methods

Seven commercial replicated trials were established in 2006 in the Walgett, Cryon, Burren Junction and Edgeroi districts to compare sowing 'on row' to 'between row' (inter-row). Individual plot sizes ranged from 12-48 m wide x full field length with row spacings from 33-40 cm. Trials were assessed for plant establishment and taken through to commercial harvest for grain yield and quality. Weigh bin yields were taken at 6 of the 7 sites with GPS yield mapping used at the Edgeroi site. Immediately prior to harvest, NSW DPI sampled plants from four locations in each plot to enable incidence and severity ratings to be conducted as per previous research.

Results

1. Plant establishment

No significant difference in establishment counts at any location or over the entire series of trials was evident with row placement (Figure 1). Adoption of inter-row sowing is unlikely to have any impact on optimal sowing rates.

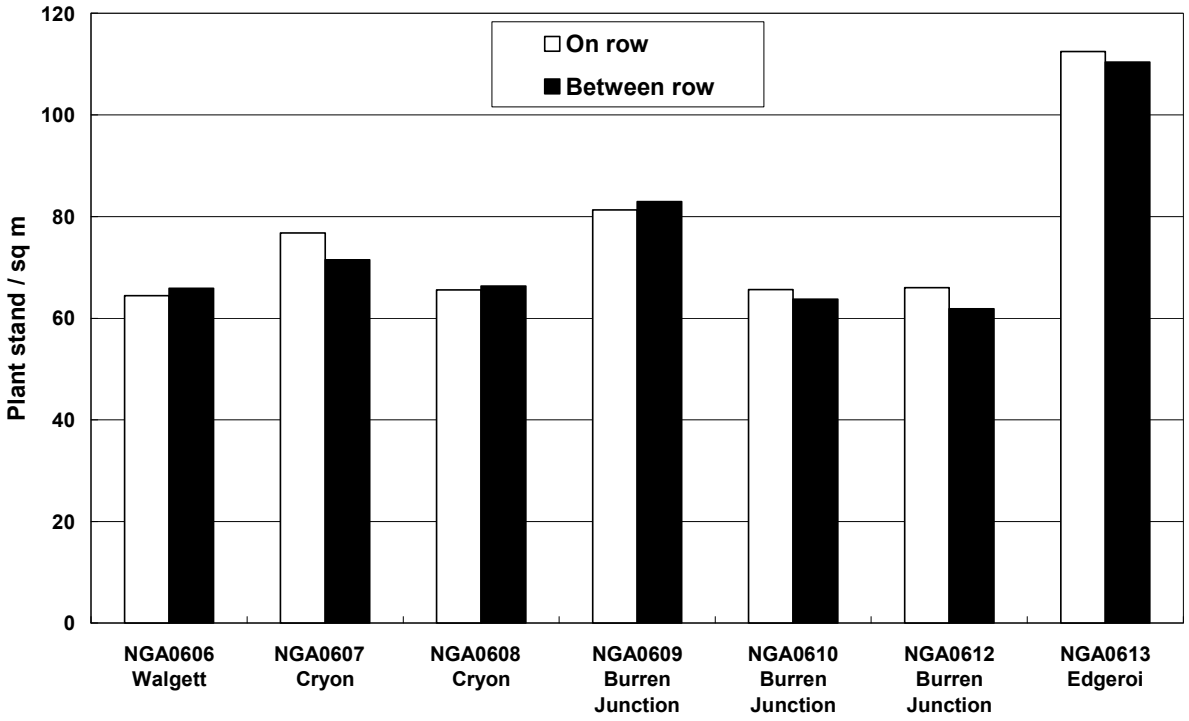

Figure 1: Effect of row placement on plant establishment in 7 bread wheat trials in 2006

2. Grain yield

Assessment for grain yield (Figure 2) showed inter-row sowing significantly increased wheat yield in 4 of the 7 trials. Higher average grain yields were recorded by inter-row sowing in all trials. Analysis over the entire trial series showed a significant increase in yield by use of inter-row sowing.

Across all trials the increase in yield by inter-row sowing was 5% with a range from 1%-9%. On average, inter-row sowing resulted in 101 kg/ha additional yield with a range from 4kg/ha to 187 kg/ha.

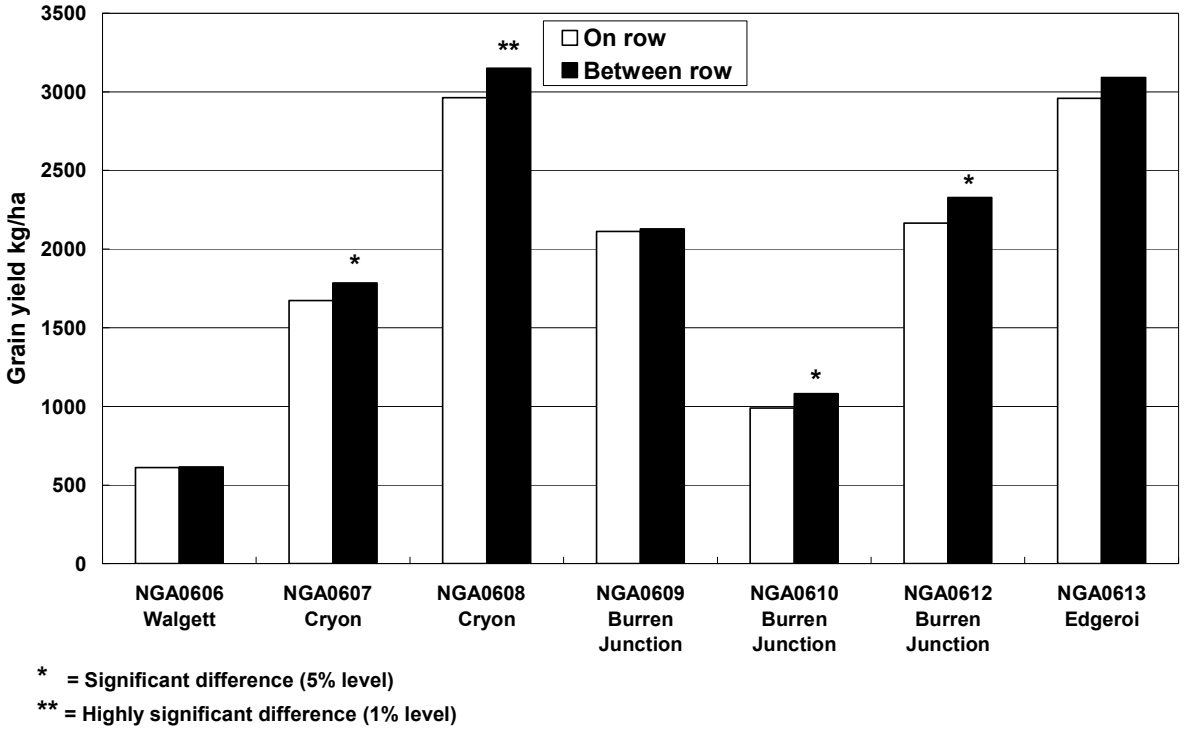

Figure 2: Effect of row placement on grain yield in 7 bread wheat trials in 2006

3. Grain quality

Grain quality was assessed at 6 of the sites. Inter-row sowing did not significantly affect test weight or protein. However an impact on screenings was recorded at 4 of the 6 sites tested (Figure 3). The level of reduction in screenings from inter-row sowing is however **unlikely** to result in any change in grain quality classification.

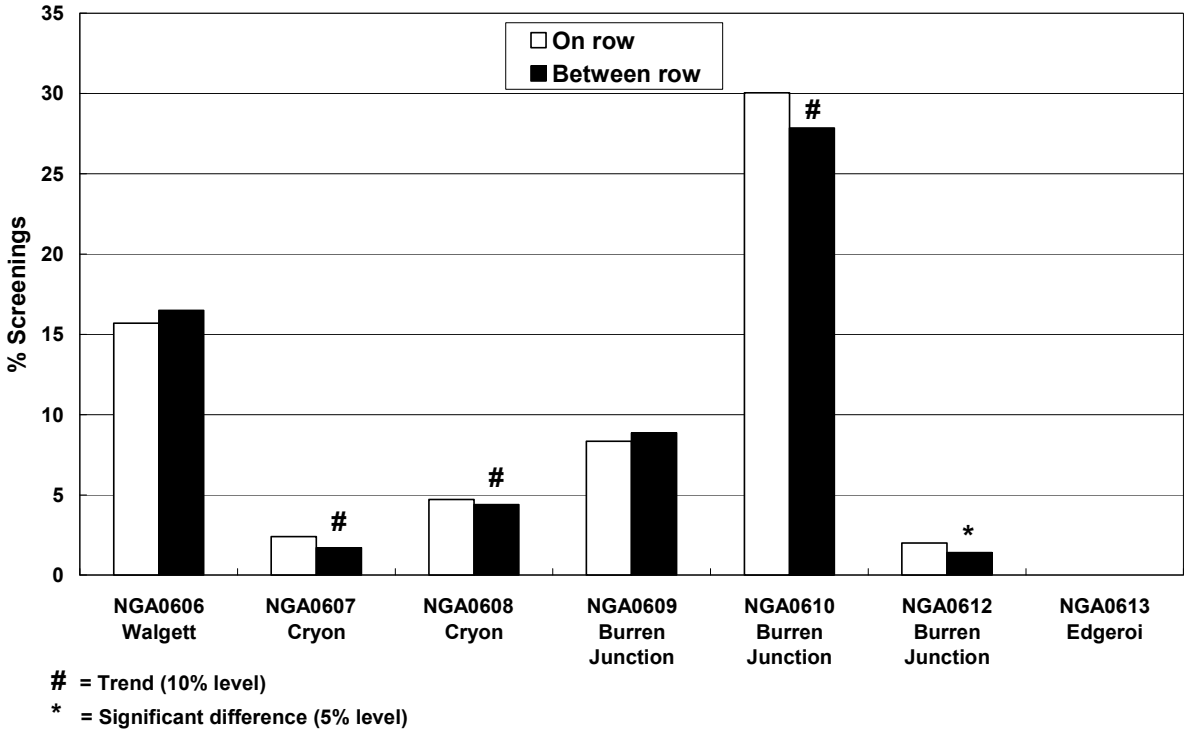

Figure 3: Effect of row placement on grain screenings in 7 bread wheat trials in 2006

4. Crown rot severity

Disease severity ratings (Figure 4) conducted by NSW DPI showed inter-row sowing reduced average CR severity by 53% (this result is very similar to the levels of 60% and 51% recorded in previous years).

Previous research had shown that the impact of inter-row sowing was greatest under **low** CR pressure. The data from these trials showed that where CR severity was lower (< 50%), there was a 79% reduction in disease severity but where CR severity was very high (>50%), the reduction was only 34%. These figures support previous work.

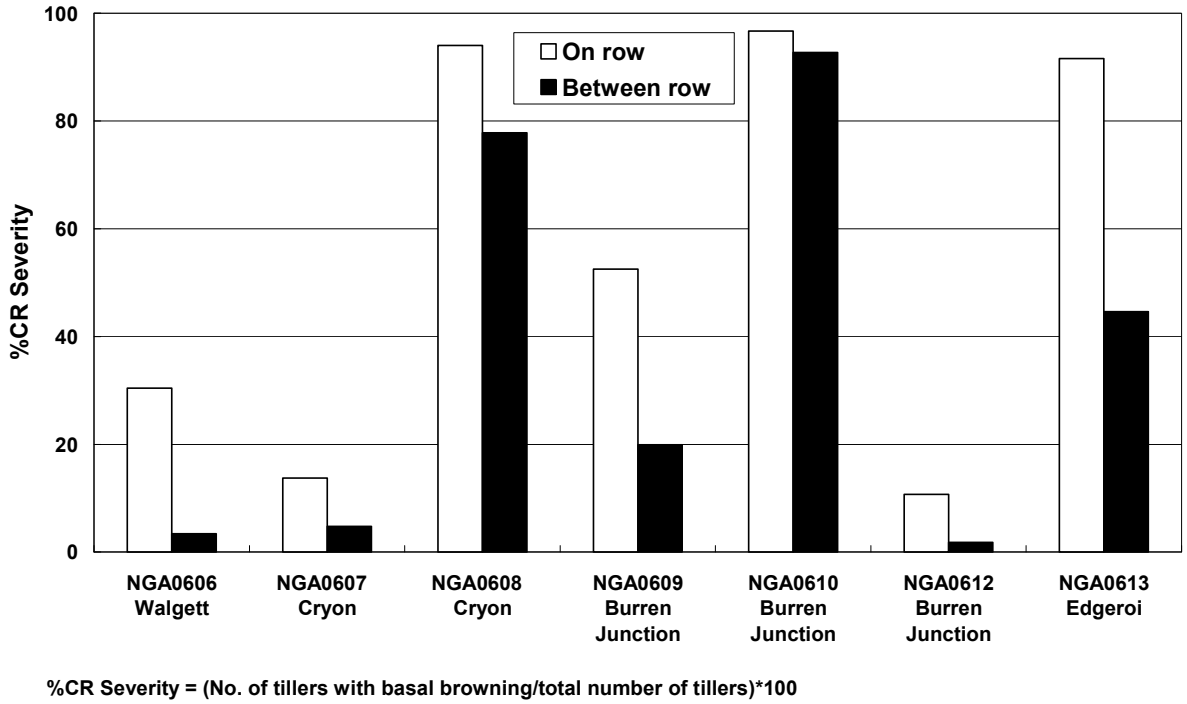

Figure 4: Effect of row placement on the severity of crown rot in 7 bread wheat trials in 2006

5. Commercial benefit

Figure 5 highlights the actual commercial returns that were obtained from inter-row sowing in these trials. Assuming a $200/t grain price, inter-row sowing would have delivered an additional $20/ha. With 2006 grain prices, the return on average was $27/ha. This benefit takes no account of the reduced level of CR inoculum carried forward.

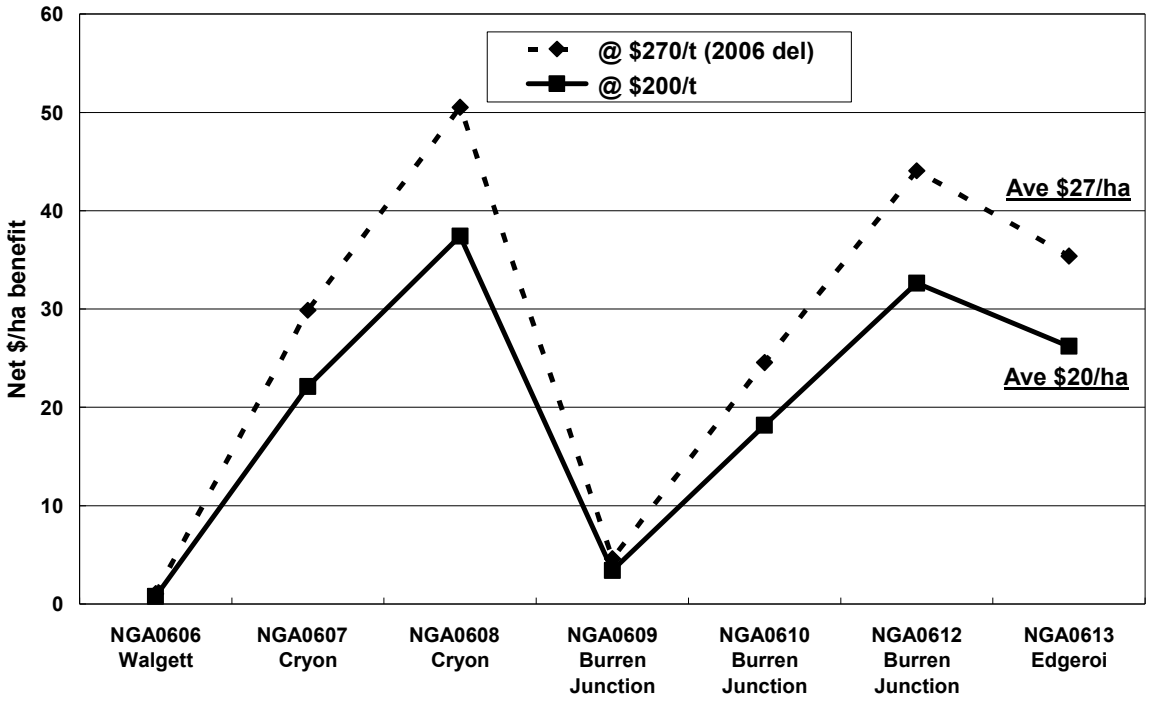

Figure 5: Net benefit from inter-row sowing in 7 bread wheat trials in 2006

Conclusions

These replicated but commercially conducted trials strongly support previous research showing benefits from inter-row sowing for CR management. This data gives the industry a good understanding of the level of real benefit that can be obtained from use of this practice. Although disease severity reductions of 50%-60% have been repeatedly demonstrated, the levels of yield benefit obtained are much more modest.

It has been highlighted previously that inter-row sowing is not a silver bullet for CR management. These on-farm trials clearly reinforce that position. Effective CR management will be based on crop rotation. Inter-row sowing is another useful tool but will be of most value in an integrated disease management program. **Under no circumstances** should inter-row sowing be used as a tool to enable 'back to back' wheat production where CR levels are already high.

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