Site Report - Wellington

PodGuard™ and shattering in Canola

Trail Code: GBHM01215-1

Year/Season: Winter 2015

Location: Spicers Creek, Wellington

Collaborators: The Mason family

Partners: Bayer

Background

Pod shattering is a well-known issue for canola producers, many of whom windrow rather than direct head to reduce potential yield losses that maybe incurred. However, windrowing has additional crop management, effort and production costs yet it does not completely eliminate the risk.

Shattering losses can generally take two forms-

1. Standing crop losses: Pod and seed losses from the crop whilst standing awaiting harvesting/windrowing are generally caused by adverse conditions such as hot and windy weather but can also be incurred from heavy rain events or hail storms.

2. Harvesting losses: These occur during the action of harvesting the crop. In the case of direct headed crops, the physical impact on the pods by the header, both dislodge whole pods or shatter pods, releasing the seed before it is captured by the header front. In the case of windrowed crops if the crop is too ripe at windrowing the same situation may occur. Windrowed crops during the 'picking up' process also presents an opportunity for the ripe canola pods to shatter, although modern belt pick up front systems seem to avoid major losses.

Recent trial work conducted by GOA has shown that the yields from direct heading can be comparable with windrowing if no significant shattering occurs prior to direct heading. Further trial work has also shown that standing crop losses are not a straight function of time, rather that it occurs in fits and spurts in response to extremes in conditions such as gusty, hot weather changes.

Bayer has identified and developed a shatter reducing genetic trait named "PodGuard™" for canola which is now commercially available in a seed line (IH51RR) with more varieties in the pipeline. If this new trait is effective in reducing pod shattering in canola, it will alleviate many harvesting concerns for growers. Growers could potentially:

- Delay windrowing to ensure maximum yield is captured by allowing green patches to mature further.
- Adopt direct heading more widely, as the risk and concern of pod shattering prior to and during harvest would be greatly reduced.

This GOA trial compared the PodGuard™ variety IH51RR to a commercially available canola variety 45Y25 in a direct heading situation. This is to provide growers with independent data evaluation of the effectiveness of the PodGuard™ trait and the yield performance of the IH51RR variety.

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Aims

1. Investigate the claims of reduced pod shattering in the Bayer canola line IH51RR with the "PodGuard™" trait as compared to a commercially available line, Pioneer 45Y25.
2. Assess IH51RR under simulated conditions of a delayed direct heading and an artificially created shattering event.

Methods

The trial used a small plot, randomised and replicated trial design.

The comparison variety, 45Y25 performed well in National Variety Trials (NVT) within the Orana growing region, it has a similar maturity to IH51RR and has been noted as having 'excellent' lodging resistance and to have 'excellent'[1] shattering resistance.

Table 1. Trial site details

Trial Establishment Date	Autumn 2015		
Crop and Variety	Canola – IH51RR and 45Y25	Target plant population	35 plants/ m^2
Sowing date	9/5/2015	Harvest Dates	H1- 18/11/15, H2- 2/12/15
Seedling equipment	Double Boot Tyne	Row Spacing	27.5 cm
Crop Nutrition (kg/ha)	100 MAP + 100 Urea	Soil type	Red Clay Loam
Previous Crop	Wheat	Pre Sowing Stubble Management	Cultivated

Table 2. Trial Treatments

Treatment	Variety	Harvest Timing	Simulated shattering
1	IH51RR	On Time (H1)	No
2	IH51RR	On Time (H1)	Yes
3	45Y25	On Time (H1)	No
4	45Y25	On Time (H1)	Yes
5	IH51RR	Delayed 14 days (H2)	No
6	IH51RR	Delayed 14 days (H2)	Yes
7	45Y25	Delayed 14 days (H2)	No
8	45Y25	Delayed 14 days (H2)	Yes

Shattering was simulated by dragging a 40 mm pipe twice lengthways through the plot at a height approximately three quarters of the way up from the branching point to the top of the canopy. Simulated shattering events were applied just prior to each harvest timing.

All plots were harvested by a small plot harvester for yield calculations at the two harvest timings mentioned above.

[1] http://www.pioneer.com/CMRoot/International/Australia_Intl/45Y25.pdf

Shattering losses were assessed both at each harvest timing as well as between the two timings by placing catch trays on the ground to capture any seeds or pod losses.

Results have been analysed by ANOVA with differences assessed using the LSD method with a 95% confidence level. Any reference to differences should be considered statistically significant unless otherwise stated.

Results

Simulated Shattering: The simulated shattering ahead of both harvest timings resulted in large measurable yield losses. However, as demonstrated in Figure 1 below there was only a varietal difference with no statistical significance in response to shattering timings. However, there was a clear trend for increased losses at the later timing. 45Y25 lost an average of 600 kg/ha at both shattering events and the IH51RR lost an average of 154 kg/ha at both events.

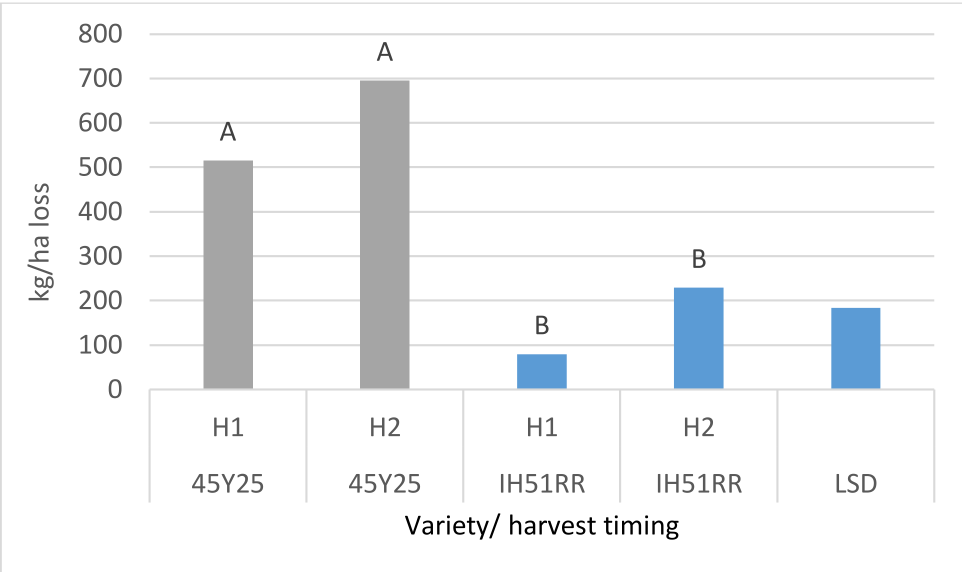

Figure 1. Simulated shattering losses (kg/ha) for both varieties at each of the harvest timings.

Shattering during direct heading: grain losses at the front of the machine were different between the two varieties but there was no difference between the two harvest timings for either variety. The average header losses over the two harvest timings of 97 kg/ha for IH51RR and 296 kg/ha for 45Y25.

Shattering losses between two harvest timings: measurable grain losses were observed between H1 and H2 – 160 kg/ha was recorded for 45Y25 and 20 kg/ha from IH51RR. This equated in 45Y25 to an average loss of over 10 kg/ha/day.

Harvested yields: harvested grain yields from various treatments are detailed in Figure 2 below. As shown, IH51RR at the first harvest timing (H1) without shattering averaged 2.67 t/ha, while the 45Y25 yielded 2.61 t/ha and were not statistically significantly different.

Following the simulated shattering event ahead of H1 only the yield of the 45Y25 was lower compared to the un-shattered 45Y25, there was no measured yield reduction in IH51RR.

At the second harvest timing (H2) all treatments showed a trend to lower yields than the first harvest timing although, many did not result in a statistically significant difference to the comparable H1 treatments. Both varieties at H2 timing in the un-shattered treatments again showed no significant difference to one another. However, the average yield difference between IH51RR and 45Y25 at the later harvest timing was greater than at H1.

IH51RR yielded statistically no less at the later harvest timing than the earlier timing when no shattering event was applied. However, the IH51RR yielded less at the later harvest timing when the shattering event was applied. The 45Y25 yielded significantly less following the simulated shattering at both harvest timings compared to the un-shattered 45Y25 treatments and second harvest timing with shattering was clearly the lowest yielding treatment.

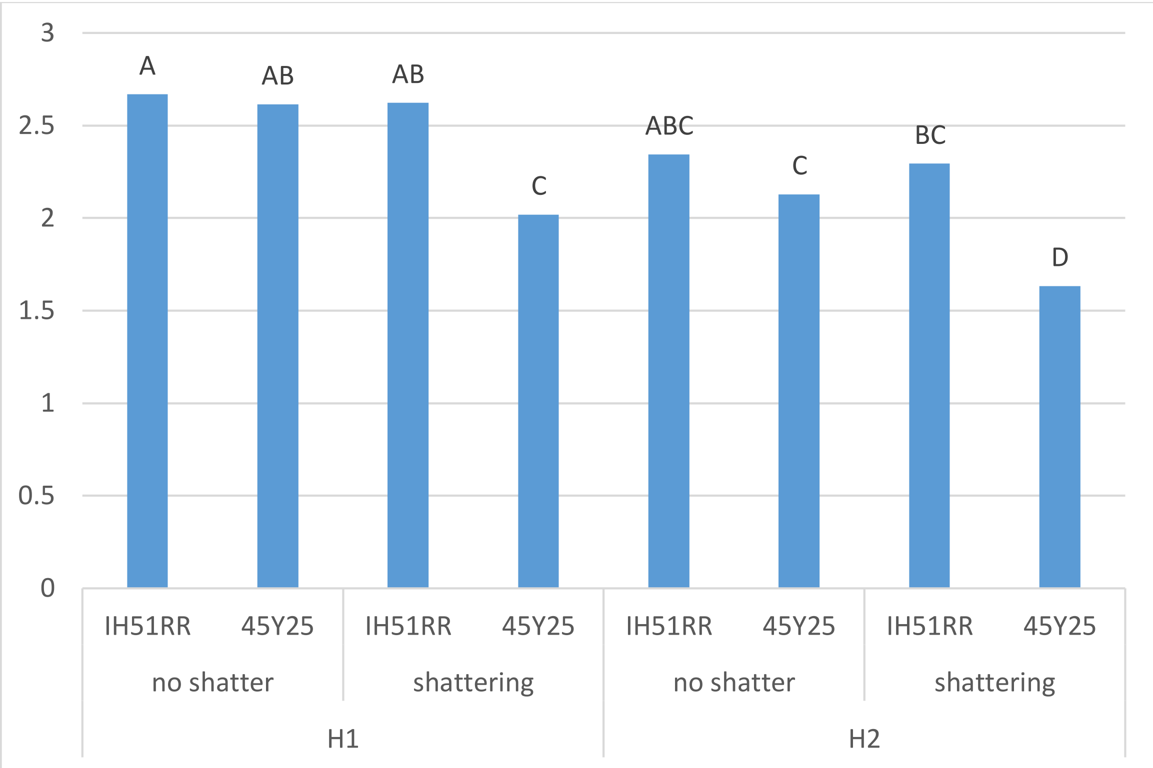

Figure 2. Average yields (t/ha) for both varieties with and without simulated shattering at each of the harvest timings.

Discussion

Both varieties at the first harvest timing compared similarly in terms of their harvested yields without any simulated shattering events applied. 45Y25 incurred significant yield loss even at the early harvest timing when the shattering event was applied, however, IH51RR appeared to have coped very well, with no measured yield reductions. This finding is supported by the yield loss measured with the catch trays during this event.

At the second harvest timing again both varieties showed comparable yields without shattering, albeit with a trend for lower yields in both. With the simulated shattering the 45Y25 performed poorly with a similar reduction in yield as seen at H1.

This trial therefore, suggests that where there is no major shattering event (such as storm, high winds, hail etc.) IH51RR performance may be only similar to that of non-PodGuard™ varieties, in this case represented as 45Y25. However, if shattering conditions occur it is clear that the IH51RR has a higher resilience to pod shattering and tends to maintain its yield.

It should be noted that there were some significant maturity differences between the two varieties. IH51RR matured much faster than the 45Y25 in this trial. On the 26th October the IH51RR was assessed as 95% colour change, on the same day the 45Y25 was less than 3%. On the 3rd November the 45Y25 was still not fully ripe at 86% colour change, yet the IH51RR was well past 100% colour change. The first harvest date was on the 18th November, at which time the IH51RR may have been ripe for up to 3 weeks yet there was little evidence of shattering visible from the IH51RR plots. However, there was some pod shattering already evident in the 45Y25 plots, which had been ripe for under 2 weeks. With this in mind the IH51RR was ripe for a much longer period and hence a larger window for shattering than the 45Y25. This only adds to the variety's impressive resilience to pod shattering.

Interesting to also note that the losses from the simulated shattering event in 45Y25 were similar at both the early and the late timings. The header losses measured at both harvest timings for 45Y25 were also similar. This evidence suggests that there was little change in the susceptibility to shattering when harvest is delayed and that any significant yield decline in canola through delayed direct harvesting is more likely attributable to a moderate-to-major shattering event and less a result of time. This is important as a yield reducing pod shattering event can come at any time, whether before, at or after the first opportunity to harvest.

The assessment of header losses showed that the 45Y25 was more susceptible to shattering than the IH51RR, however, this did not necessarily translate into yield differences. While not assessed in this trial the performance of the PodGuard™ trait would tend to suggest that there would be less of a penalty from harvesting at what would be normally considered sub optimal conditions for canola, i.e. in hot dry conditions.

Conclusion

This single local trial has shown that the PodGuard™ trait seems to be an effective option, offering protection for growers against the yield loss incurred during shattering events such as hail or excessive winds during crop maturation compared to that of more conventional varieties.

This genetic trait may give growers greater confidence in moving away from windrowing crops towards direct heading as pod shattering leading up to, and during direct heading, is a major concern of growers.

It may also give growers options to delay windrow timing of PodGuard™ varieties by removing the fear that delayed cutting could also result in shattering losses. This could also lead to improved yield performance as demonstrated in other trial work by GOA, which has shown significant yield gains by avoiding windrowing canola too early.

Acknowledgements

GOA would like acknowledge that Bayer, as the owner and distributor of the PodGuard™ trait, has contributed to the design and costs of undertaking this trial.

GOA would also like to thank Joe Mason and family for hosting this trial.