

Yield and seed discolouration of windrowed broad beans in Victoria

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Abstract

A field trial was established at Rupanyup, Victoria, Australia in 2001 to determine the optimum time for windrowing broad beans cv Aquadulce and to compare this practise with direct heading. The fertiliser, weed control and disease management of the trial was the same as for the surrounding commercial crop of Aquadulce broad beans. There were four treatments comprising three times of windrowing: early (26 Nov) - seeds in mid-level pods with black line on hilum; mid (8 Dec) - seeds in top pods with black line on hilum; late (29 Dec) - seeds in top pods with completely black hilum; and direct-heading as a control. The direct headed and windrowed plots were harvested on 31 Dec. For each treatment, grain yield, seed size and the amount of seed discolouration was measured. The direct-headed treatment had higher grain yield and larger seed size than the early and mid windrowing treatments. There was no significant difference between the grain yield and seed sizes of the late windrowed and direct headed treatments. Grain samples from the early and mid windrowed beans had a greater percentage of seed coat discolouration than those from the late windrowed and direct- headed treatments.

Key Words

Vicia faba, broad beans, seed discolouration, windrowing

Introduction

Broad beans (*Vicia faba* L.) are better adapted to high rainfall (>450 mm) cropping regions than most pulse crops and have become an important grain crop in the Wimmera region of Victoria. In most seasons, growers are able to produce high yielding crops with excellent grain quality. However, in some seasons, discolouration of the seed coat has occurred which significantly reduces the market value of the grain.

The practice of windrowing bean crops in the Wimmera has grown in popularity over the last two seasons. Growers believe that windrowing results in better quality grain, however, there is little information available to compare the yield and grain quality of windrowed and direct-headed crops.

This trial was undertaken to determine the optimum time for windrowing broad beans cv Aquadulce and to compare this practise with direct heading. Grain yield, seed size and the amount of seed discolouration was compared for each treatment.

Methods

The field experiment was sown at Rupanyup on the property of Andrew and Rodney Weidemann. Sixteen plots (100 m x 6.1 m) of broad beans (cv Aquadulce) were sown on 14 June 2001 at 160 kg/ha in a randomised block design with four replicates. The fertiliser, weed control and disease management of the trial was the same as for the surrounding commercial crop of Aquadulce broad beans. There were four treatments comprising three times of windrowing: early (26 Nov) - seeds in mid-level pods with black line on hilum; mid (8 Dec) - seeds in top pods with black line on hilum; late (29 Dec) - seeds in top pods with completely black hilum; and direct heading as a control (Table 1).

Table 1. Windrowing treatments for broad bean crop

Timing	Description
Control	Direct-head crop at maturity
Early windrow	Seeds in middle pods have distinct black line on hilum (no black line visible on seed in top pods)
Mid windrow	Seed in top pods have distinct black line on hilum (seed in bottom and middle pods fully formed)
Late windrow	Seed in top pods have complete black hilum (bottom and middles pods are now very ripe and can shatter)

The direct headed and windrowed plots were harvested on 31 Dec. For each treatment, grain yield, 100-grain weight and the amount of seed coat discolouration was measured.

Results

The time of windrowing had a significant effect on grain yield in this trial (Figure 1). Direct headed (2.2 t/ha) yielded significantly higher than the early- (1.7 t/ha) and mid-windrowing (1.8 t/ha) treatments. The grain yield of the late windrowing treatment (2.0 t/ha) was not significantly different to that of the control (direct-headed).

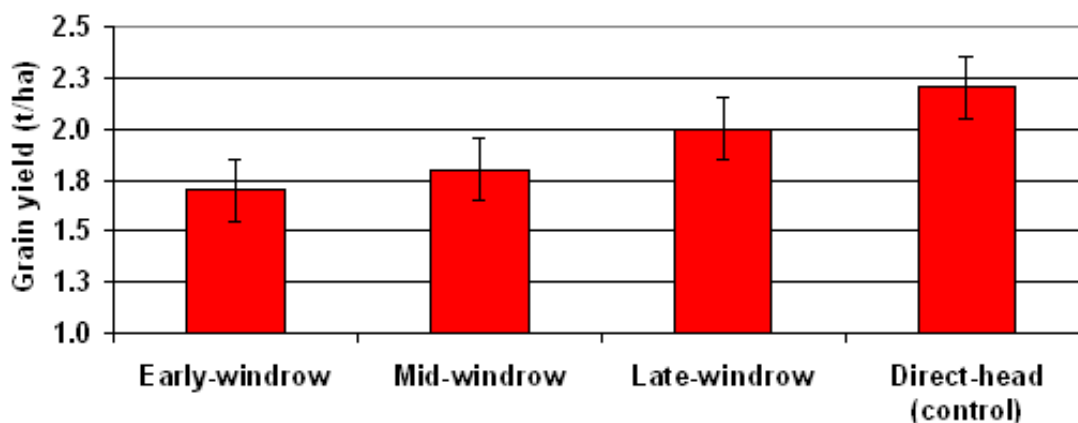


Figure 1: Comparison of the grain yields of broad beans cv Aquadulce grown at Rupanyup in 2001 and either windrowed at three different times or direct-headed

The time of windrowing also affected seed size and the amount of seed coat discolouration (Table 2). The 100-grain weights were lowest for the early windrowing treatment (68 g) and highest for the direct-heading (76 g) and late-windrowing (77 g) treatments. The amount of seed discolouration was greatest in samples from the early- and mid-windrowing plots (Table 2).

Table 2: Grain quality for windrowed versus direct headed Aquadulce broad beans grown at Rupanyup in 2001

Treatment	100-grain weight (g)	Percentage of grain with seed coat discolouration of:				
		0%	1-5%	6-25%	26-50%	>50%
Early windrow	68	41	49	9	1	0
Mid windrow	73	41	45	12	2	0
Late windrow	77	51	41	7	1	0
Direct head	76	52	37	10	1	0
LSD (5%)	2.8					

Conclusion

In the field trial conducted at Rupanyup in 2001, windrowing broad beans did not improve their yield or grain quality. The results showed that direct-headed beans were significantly higher yielding (2.2 t/ha) than the early- or mid-windrowing treatments (1.7 and 1.8 t/ha respectively). Previously growers thought that the optimum time for windrowing was at the mid-windrowing time, when seed in the top pods have a distinct black line on the hilum and seed in the bottom and middle pods were fully formed. However, this was not the case in this experiment. To prevent yield and quality losses, windrowing needed to take place when the seed in the top pods had a complete black hilum.

Windrowing before seeds in the top pods had completely black hilums and the bottom and middle pods were ripe was also detrimental to grain quality. The main effect of early windrowing was on grain size – average grain weight for early- and mid-windrowing was 71 g/100 seeds compared with the average for late windrowing and direct heading of 77 g/100 seeds.

These results are consistent with the results of other studies conducted near Horsham, Victoria, in 2001 (Trevor Bretag, Pers. Comm.). Dr. Bretag's work showed that grain discolouration was higher in windrowed crops than direct-headed crops. Within the windrow itself, seed coat discolouration was greatest in seed from the tops and the bottoms of the windrows.

The increase in seed coat discolouration associated with early windrowing in this trial may have been caused by weather damage following windrowing. The direct-headed and windrowed beans were all harvested on the same date. However, in this trial the early-windrowed plots may have been ready to harvest before the direct-headed plots. Ideally bean crops should be harvested as soon as possible once the grain moisture level drops below 14%.

These results support the recommendations of NSW Agriculture (1) that farmers should only windrow crops if there is likely to be a problem with direct heading. Windrowing may be an advantage if the crop is too tall to feed into a header easily, there is a weed problem or the crop is lodged and windrowing will aid harvest.

Acknowledgments

The authors thank Fiona McRae and Pippa Hallam for technical assistance. The Birchip Cropping Group, the Victorian Department of Natural Resources and Environment and the Grains Research and

Development Corporation provided financial and technical support. Andrew and Rodney Weidemann provided land, labour and field equipment for the trial.

References

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