IMPACT OF DELAYING HARVEST IN BARLEY

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TAKE HOME MESSAGES

1. In dry conditions there is no yield penalty when delaying harvest.

2. Harvest of Skipper, La Trobe and Compass should be prioritised as they are more susceptible to head loss.

3. To minimise risk associated with delaying harvest consider sowing only manageable areas of susceptible varieties.

BACKGROUND

Throughout the harvest period a number of logistical issues are presented, resulting in an inability for all crops to be harvested at the optimum time. Barley is particularly sensitive to a delayed harvest given the occurrence of lodging, brackling and head loss, potentially leading to a reduced yield. Different varieties have different levels of tolerance to a later harvest time, with taller varieties generally having an increased susceptibility to lodging and brackling (*Berry et al. 2004*).

A delayed harvest also affects grain quality, particularly in the presence of rainfall events. A major loss in grain quality from rainfall during harvest is caused by changes in grain protein, which often occurs as a result of pre-harvest sprouting. It has also been suggested that harvesting later than the optimum time can cause an increase in grain size, leading to a reduction in test weight and an increase in the quantity of grain retained (*Gardner et al. 2013*). Identifying the varieties more susceptible to the impacts of delaying harvest will allow growers to prioritise their harvest accordingly and assist with decision making pre-sowing.

AIM

To investigate the yield and quality effects of a delayed harvest on a range of barley varieties.

TRIAL DETAILS

Location:	Horsham
Soil type:	Clay, with sub-soil constraints
GSR (Apr-Oct):	172mm
Barley varieties:	Bass, Commander, Compass, Fairview, Fathom, Flinders, Gairdner, GrangeR, Hindmarsh, La Trobe, Navigator, Oxford, Schooner, Scope CL, Skipper, Sloop SA, Westminster and Wimmera
Sowing date:	13 May
Seeding equipment:	Knife points, press wheels, 30cm row spacing
Target plant density:	150 plants/m^2
Harvest dates:	12 November (optimum harvest) and 10 December (delayed harvest)

TRIAL INPUTS

Fertiliser: Granulock Supreme Z + Impact @ 55kg/ha at sowing; 180kg/ha of urea (83kg/ha N), applied as split application (GS14, GS30)

Pests, weeds and diseases were controlled to best management practice.

METHOD

A field trial was established with 18 barley varieties in a randomised complete block design (four replicates), consisting of an optimum harvest time and a delayed harvest time, separated by 28 days. Head loss counts were performed on all plots using a 50cm quadrat before the initial harvest to ascertain a basis of head loss prior to harvest. The same process was undertaken after the plots were harvested to determine the quantity of heads lost during the harvest process, as well as the period between harvest timings. Measures of plant heights were undertaken prior to the first harvest and lodging percentages were assessed visually prior to both harvest times to gauge growth habit at the time of harvest.

RESULTS AND INTERPRETATION

What was the yield penalty from delaying harvest?

The weather conditions over the period between the two harvest dates were relatively stable, with only 23mm of rain falling within the 28 day period. The largest rain event over the harvest period was 9mm and there were no extended periods of extreme heat or wind, thus conditions were not very conducive to head loss. As a result of this, head loss did not cause a significant change in yield from the first harvest to the second (Table 1).

Table 1. Mean (all varieties) yield, head loss and quality parameters for the two harvest timings.

Harvest time	Yield (t/ha)	Head loss (heads/m^2)	Protein (%)	Screenings (%)	Retention (%)	Test weight (kg/hL)
Optimum	3.4	1.8	11.6	8.7	54.7	69.4
Delayed	3.4	2.8	11.8	6.7	64.2	67.2
Sig. diff.	NS	P<0.005	NS	P<0.001	P<0.001	P<0.001
LSD (P=0.05)	-	0.7	-	1.2	3.3	0.4
CV%	5.7	92.2	6.1	18.7	16.6	1.8

While yield loss was not significantly affected by a delay in harvest, the quantity of heads lost was greater following the second harvest. This was a consequence of increased lodging and more heads being below the cutter bar, or snapping off when they came into contact with it.

The severity of head loss was not sufficiently significant to affect yield, partly due to the high yielding environment of the Wimmera (see *'Barley varieties of 2014' pp 71*). In a lower yielding environment the impact of head loss has been shown to be greater, however given the stable conditions over the 2014 harvest period, it would be unlikely to cause a significant shift in yield (*Walters and Craig, 2013*). In seasons where a wetter finish is experienced, with more significant rainfall events around the harvest period, greater head loss would be observed, potentially leading to a significantly reduced yield (*Gardner et al. 2013*).

Some varieties, given their different characteristics (growth habit and height), are more susceptible to head loss than others. The greatest head loss was generally observed in the taller varieties, namely Schooner, Skipper and Compass (Figure 1). Similarly, these taller varieties also appeared to lodge more than the shorter varieties, where head loss was not as great (Figure 2). A noteworthy exception to this trend was La Trobe, which although classified as a short and erect variety, displayed a relatively high degree of lodging which was also indicated by the number of heads lost. Most of the shorter, more erect varieties such as Bass, Navigator, Flinders and Oxford retained heads more efficiently than the taller varieties, thus limited head loss was observed. The varieties that displayed greater head loss are also generally higher yielding than those less prone to head loss. Nevertheless, in relatively stable conditions, the impacts of head loss in these high yielding varieties did not have a significant enough impact on yield to justify growing a low yielding variety, merely for better head retention.

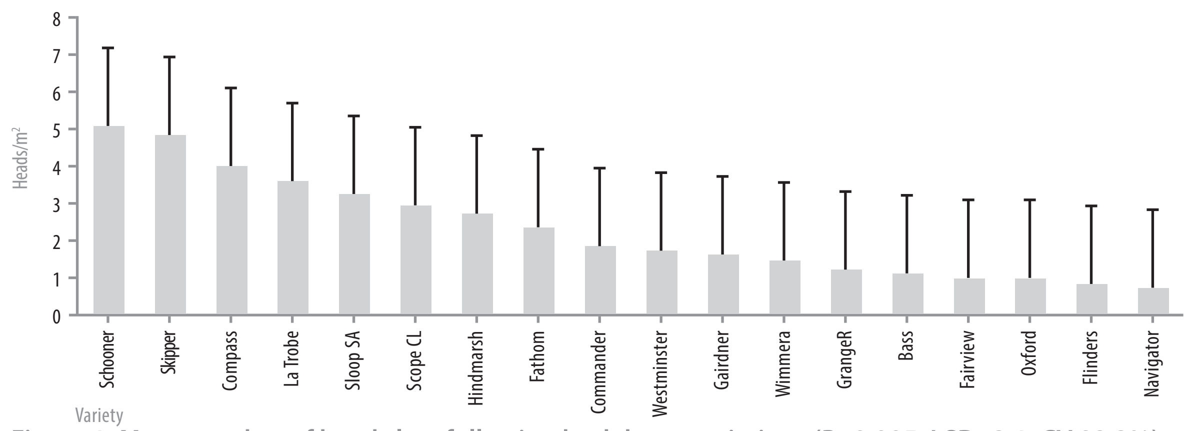

Figure 1. Mean number of heads lost following both harvest timings (P=0.005, LSD=2.1, CV 92.2%).

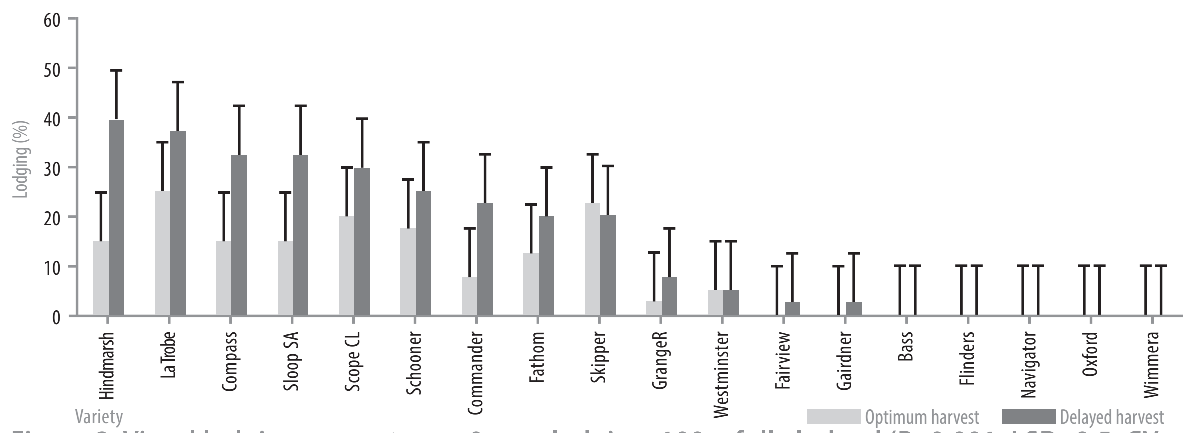

Figure 2. Visual lodging percentages, 0 = no lodging, 100 = fully lodged (P<0.001, LSD=9.5, CV 56.3%).

DELAYED HARVEST IMPACTS ON QUALITY

While yield was not significantly impacted by the later harvest time, the grain quality did alter. Protein content did not change significantly, as would be expected, given the relatively dry conditions over the harvest period. However, the screenings, retention and test weight were all significantly influenced by a delayed harvest.

When the mature grain becomes wet it swells and shrinks, but will generally not return to its original size (*Lindsey et al. 2013*). There is often a weight penalty associated with this process, however in this case this was not significant enough to affect yield. This notion is supported by a reduction in test weight in the second harvest time. Similarly, an increase in retention in the second harvest also suggests that this is the case.

The screenings were significantly lower in the delayed harvest samples than the initial harvest. This is due to easier threshing of grain in the delayed harvest, resulting in less chaff and cracked grain. In addition, the aforementioned swelling process would have also contributed to this, resulting in fewer small grains.

COMMERCIAL PRACTICE

Due to the stable weather conditions in the Wimmera over the 2014 harvest period, there was no yield impact from a delayed harvest. However, some varieties were more susceptible to head loss and lodging, therefore in years where conditions are conducive to head loss, these varieties should be prioritised at harvest in order to minimise the risk associated with a delay in harvest. In addition, growers may opt to grow manageable areas of varieties susceptible to head loss, sowing the remainder with varieties not as susceptible to head loss. The varieties found to be particularly susceptible to head loss and or lodging were Schooner, Skipper, Compass and Sloop SA.

If growing varieties which are not susceptible to head loss, such as Bass, Navigator, Oxford and Fairview, perhaps it would be better to prioritise the harvest of other crop types, (if ready); this is particularly true of canola, which is susceptible to risk of shattering from rainfall events.

ON-FARM PROFITABILITY

It is still best to grow the varieties that will achieve the greatest yield and quality, providing they fit into your farming system. Based on yield and quality data, the better suited varieties are Compass, Commander, Fathom, Scope CL and Skipper. However, Compass and Skipper have shown susceptibility to head loss and lodging, therefore in order to maximise profitability over time, consider growing fewer susceptible varieties to reduce the risk associated with a delayed harvest.

REFERENCES

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KEY WORDS

barley, delayed harvest, lodging, head loss, barley agronomy