
BARLEY VARIETIES AND TIME OF SOWING

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Take home messages

- Fathom, Spartacus CL and Rosalind have performed consistently well at most sites in 2016.
- Compass performed poorly when sown early, with substantial lodging and head loss. When sown later, it was one of the top performers with little to no lodging observed.
- Fathom, Hindmarsh, La Trobe, Spartacus CL, Rosalind and Compass are consistently the top yielding varieties over a range of different seasonal finishes in the Mallee and Wimmera.

Background

On a yearly basis, new barley varieties are released promising bigger and better yields and improved agronomic traits. This leads to the tough decision about whether to keep your existing variety or make the switch to a new variety.

One thing growers often fail to do is trial a new variety on their farm for a number of years. Another risk comes from purely chasing yield. While this may be good in the short-term, it is important to also think about a varieties long-term impacts on your farm. For example, will the selected variety help to suppress weeds? Will it have a high disease carry over?

Time of sowing (TOS) is another factor that can influence yield. In 2016 there were a lot of earlier sown crops that, due to excellent growing conditions, produced substantial biomass resulting in severe lodging during the grain filling period and at maturity. In previous TOS trials, earlier sown crops have out-yielded later sown crops, but the canopy was a lot less dense in those years.

Identifying the optimum sowing time for particular varieties can help growers plan management strategies that will allow their barley to reach its full potential.

This paper will review variety performance alone, however using this information in conjunction with a variety's whole agronomic package will ensure optimum outcomes for barley growers. See *2014 BCG Season Research Results*, pp. 71 and *2015 BCG Season Research Results*, pp. 69 for more BCG barley variety research.

Aim

To compare the performance of new and existing barley varieties and the influence of sowing time on crop performance.

Trial details and inputs

Location	Kalkee	Nhill	Warmur	Manangatang (NVT)	Ultima (NVT)
Annual rainfall	467mm	455mm	444mm	387mm	421mm
GSR (Apr-Oct)	374mm	339mm	371mm	294mm	348mm
Soil type	Clay	Clay	Clay loam	Sandy loam	Sandy clay loam
Paddock history	Lentils	Wheat	Fallow	Peas	Peas
Varieties	Compass, La Trobe, Hindmarsh, Spartacus CL, Rosalind, Scope CL, Commander, Fathom	Commander, Compass, Fathom, Hindmarsh, Spartacus CL, La Trobe, Maritime, Oxford, Scope CL, Urambie, Westminster, Rosalind	Spartacus CL, La Trobe, Scope CL, Compass, Hindmarsh, Fathom, Rosalind, Moby	La Trobe, Flagship, Buloke, Oxford, Hindmarsh, Scope CL, Bass, Fleet, Commander, Flinders, Rosalind, SY Rattler, Compass, Fathom, Granger, Gairdner, Schooner, Spartacus CL	Bass, Spartacus CL, Gairdner, Flagship, Hindmarsh, La Trobe, Flinders, Compass, Rosalind, Scope CL, Buloke, Fleet, Fathom, Commander, Oxford, Granger, Schooner, SY Rattler
Target plant density	140 plants/m ²	140 plants/m ²	130 plants/m ²	130 plants/m ²	130 plants/m ²
Seeding equipment	Knife points, press wheels, 30cm row spacing				
Sowing date	TOS1: 18 May TOS2: 20 June	16 May	4 May	24 April	17 May
Replicates	Four	Three	Four	Three	Three
Harvest date	7 December	24 December	25 November	18 November	25 November
Trial average yield	TOS1: 7.8t/ha TOS2: 7.7t/ha	4.8t/ha	6.5t/ha	4.8t/ha	4.3t/ha
Fertiliser	TOS1 & 2: Granulock Supreme Z + Impact @ 50kg/ha at sowing; urea @ 50kg/ha at early tillering; 50kg/ha at late tillering	Granulock Supreme Z + Impact @ 50kg/ha at sowing; urea @ 100kg/ha at early tillering; urea @ 100kg/ha at mid tillering	Granulock Supreme Z + Impact @ 50kg/ha at sowing; urea @ 80kg/ha at early tillering; urea @ 60kg/ha at late tillering	Granulock Supreme Z + Impact @ 50kg/ha at sowing; SOA @ 50kg/ha at early tillering	Granulock Supreme Z + Impact @ 50kg/ha at sowing; urea @ 100kg/ha at early tillering

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

Method

Replicated trials were established at Nhill, Warmur, Manangatang (NVT), Ultima (NVT) and Kalkee. A randomised complete block design was used for all trials apart from at Kalkee where a split plot design was used. Assessments included, establishment counts/scores, NDVI (measure of canopy greenness) and grain yield and quality parameters.

Results and interpretation

The excellent growing season in 2016 delivered some excellent yield results but also created some challenges. Issues encountered with all barley trials this year, were similar to grower experiences. Lodging, due to heavy, bulky crops and significant rainfall during the grain filling period was an issue particularly in Compass, Commander and Scope CL. This also carried through to maturity. The development of secondary tillers also created issues, preventing barley from being harvested at optimum maturity.

These issues, and the above average rainfall in spring, led to the deterioration of crops (lodging and brackling) and discolouration of the grain which pushed barley outside of malt specifications. Common problems were dark tipping and 'bin burn' which was discolouration that occurred in the paddock due to weather conditions.

For the purpose of this article, malt and feed grades have been determined based purely on grain quality parameters (test weight, protein, retention and screenings). In this instance, grain discolouration has been disregarded.

Mallee

Manangatang

The trial at Manangatang was dry sown into a pea stubble and emerged well. Spot form of net blotch was quite evident at the site and was managed accordingly so as not to affect overall yield. Secondary tillers were prevalent late in the season, so the trial was desiccated before harvest to bring it in evenly. Prior to harvest, minor head loss was also an issue but was fairly consistent across all varieties and there was no lodging among varieties.

Fathom was the highest yielding variety at this site (Table 1). Oxford, which is a late maturing variety more suited to higher rainfall areas, also yielded well. Agronomically similar varieties Spartacus CL, Hindmarsh, Rosalind and La Trobe all yielded similar.

In terms of grain quality, test weight was very low for all varieties. To avoid penalising early varieties, the trial was not desiccated until all varieties had reached maturity and consequently, small grains from the secondary tillers (not fully formed) were evident in the sample causing the test weight to be lower and the screenings slightly higher (most varieties still below seven per cent). This pushed all malt varieties out of specification.

Retention and protein were within malt specifications for all varieties.

Warmur

The Warmur barley variety trial was sown just after rain and received a follow up rain after sowing. However, the soil was very hard and cloddy at sowing, possibly restricting seed to soil contact, and plant establishment numbers were slightly lower than expected.

Lodging was prevalent at this site with Compass and Scope CL most affected. Head loss counts were undertaken to gauge the level of head loss amongst varieties, in particular Compass and Scope CL (Figure 1). Further information on head loss and lodging susceptibility, and harvest risks in varieties, can be found in the 'Delayed harvest of barley' article page 49.

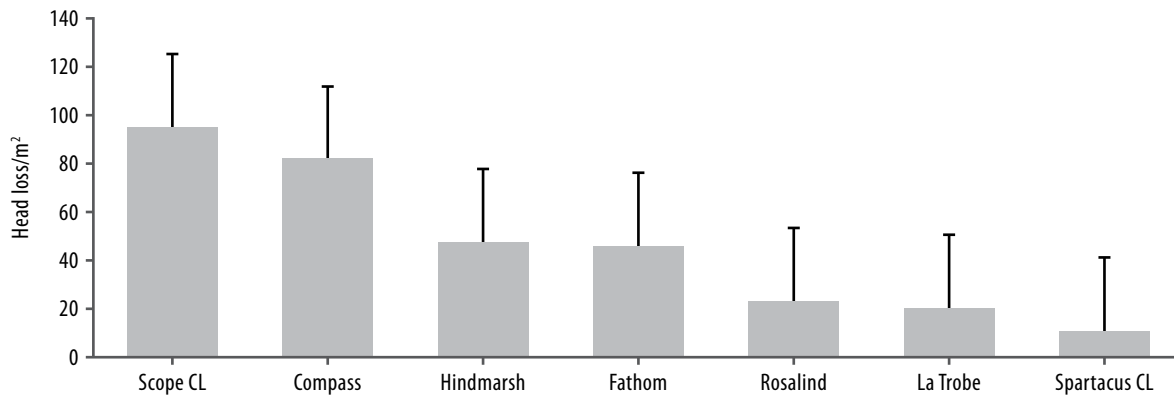


Figure 1. Head loss counts (heads/m²) measured after harvest to determine the impact on yield (P=<0.001, LSD=30.3, CV=43.6%).

The highest yielding varieties were Fathom, Spartacus CL and Rosalind and the lowest were Scope CL and Compass (Table 1).

In terms of grain quality there were no differences in protein, screenings or retention; all varieties were within malt specifications. Spartacus CL, La Trobe and Hindmarsh had high test weights (within malt specifications). All other varieties were below 65kg/hl.

Ultima

At Ultima the barley variety trial was sown into a moist soil bed on pea stubble and emerged eight days later. Emergence was even across the trial and throughout the season, and lodging was not an issue.

The highest yielding variety was Rosalind which yielded significantly higher than Hindmarsh, Compass and La Trobe which were also above the site mean average (Table 1). Spartacus CL and Fathom were slightly lower yielding than expected (below the site mean).

Oxford, GrangeR and SY Rattler, which are all longer season varieties suited to higher rainfall areas, capitalised on the exceptional finish to the season.

Test weight was slightly lower in most varieties, with the only malt varieties within specification (>65kg/hl) being La Trobe, Scope CL, GrangeR, Oxford and Flinders. Retention and screenings were within malt thresholds for all varieties. Protein dropped away in some varieties, but for commonly grown malt/food varieties in the region – Scope CL, Hindmarsh, La Trobe – were above nine per cent.

Long-term NVT averages

The exceptional year saw a range of varieties with different maturities topping the yields across the multiple Mallee NVT sites. Keeping in mind that this is one year of data in an above average season for most regions, it is extremely important to look at the long-term variety performance. Figure 2 compares the 2016 average of all Mallee sites (as a percentage of the site mean) with a long-term (five years) average of each variety.

Rosalind, Compass, Hindmarsh, La Trobe, Spartacus CL and Fathom are still the most consistent performing varieties over a five year average (Note: there is only three years of data available for Spartacus CL and Rosalind).

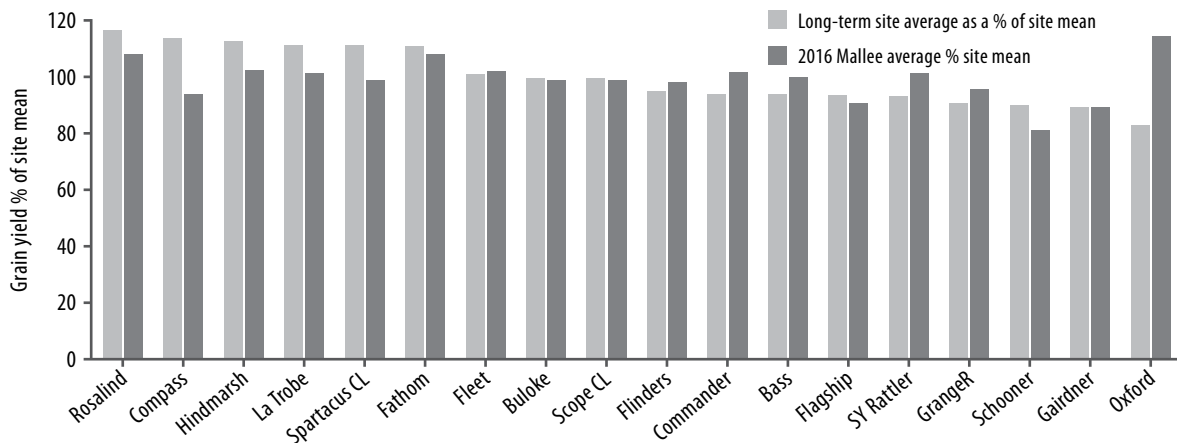


Figure 2. Mallee NVT barley grain yield (% of site mean) comparing 2016 to long-term averages (2012-2016) of 18 varieties at Manangatang, Rainbow, Murrayville, Birchip, Hopetoun, Ultima and Walpeup. Note: Rosalind and Spartacus have only been in NVT trials for three years.

Wimmera

Nhill

The trial at Nhill was sown into moist soil and emerged well achieving just under the target plant density of 140 plants/m². The site received lower rainfall than other parts of the region but was still above average.

Throughout the season, Compass suffered severe lodging. There was also lodging in Commander and Maritime.

The highest yielding varieties were Oxford and Urambie which are long season varieties that thrived in the soft finish to the season. The two Clearfield varieties, Scope CL and Spartacus CL, yielded similar and the lowest yielding varieties were Compass and Commander.

In terms of grain quality, the only malt/food varieties to make malt grade were Westminster and Hindmarsh (food). Spartacus CL also achieved malt specification but as it is currently undergoing malt accreditation, was classified as feed. Test weight was low in Commander and Compass, while protein was low (below malt grade) for malt varieties La Trobe, Scope CL and Commander.

Table 1. Variety yield data (t/ha) and percentage (%) of site mean for Manangatang, Warmur, Ultima and Nhill.

Variety	Manangatang (NVT)		Warmur		Ultima (NVT)		Nhill	
	Yield (t/ha)	% of site mean	Yield (t/ha)	% of site mean	Yield (t/ha)	% of site mean	Yield (t/ha)	% of site mean
Bass	4.9	103	-	-	3.5	81	-	-
Buloke	4.2	88	-	-	4.0	94	-	-
Commander	4.9	103	-	-	4.2	98	4.1	86
Compass	4.6	97	5.5	84	4.4	102	3.8	80
Fathom	6.0	125	7.1	108	4.1	96	4.5	95
Flagship	4.5	94	-	-	4.5	104	-	-
Fleet	5.5	114	-	-	4.2	97	-	-
Flinders	4.3	90	-	-	4.2	99	-	-
Gairdner	4.3	90	-	-	3.9	90	-	-
GrangeR	4.3	90	-	-	4.6	107	-	-
Hindmarsh	5.2	109	6.5	100	4.4	103	5	105
La Trobe	5.0	106	6.6	101	4.3	100	4.9	103
Oxford	5.3	112	-	-	4.7	109	5.6	118
Rosalind	5.1	107	7	106	4.7	111	4.9	103
Schooner	3.9	81	-	-	3.8	88	-	-
Scope CL	4.3	91	6.1	94	4.2	97	5	105
Spartacus CL	5.3	111	7	107	4.0	93	5	105
SY Rattler	4.8	100	-	-	4.7	109	-	-
Urambie	-	-	-	-	-	-	5.6	118
Westminster	-	-	-	-	-	-	4.3	90
Site mean (t/ha)	4.8		6.5		4.3		4.8	
Sig. diff.	P<0.001		P<0.001		P<0.001		P<0.001	
LSD (P=0.05)	0.4		0.4		0.3		0.4	
CV%	4.9		4.5		3.5		4.7	

Kalkee

The barley variety trial at Kalkee also looked at the interaction between variety and sowing time. The two times of sowing treatments (18 May and 20 June) were sown into a moist seed bed with the later time of sowing receiving adequate follow up rain. Both the early and later sown plots emerged well and were even across varieties.

The earlier sown crops were taller and produced substantial biomass. When heavy rains and wind occurred in spring, significant lodging occurred in susceptible varieties during flowering and at maturity. Compass, Commander and Scope CL were the most affected. Later sowing of these varieties, reduced the extent of lodging.

In terms of yield, there was no measurable difference between sowing time with the mean of both sowing times being the same. However, different varieties performed better when sown at specific sowing times. Fathom, Scope CL and Spartacus CL all yielded significantly higher when sown earlier, whereas Compass favoured a later time of sowing with a 0.8t/ha yield benefit (Table 2).

All other varieties did not differ in their performance as a result of sowing time. The highest yielding varieties at both sowing times were Rosalind and Fathom.

The trial may have been limited in nitrogen, when yields were compared to other barley trials at the same site. Unlimited nitrogen would have been beneficial, allowing the crop to reach its full yield potential.

Table 2. Barley yields (t/ha) at Kalkee when sown early (TOS1) and late (TOS2).

Variety	Kalkee TOS1		Kalkee TOS2	
	Yield (t/ha)	% of site mean	Yield (t/ha)	% of site mean
Rosalind	8.6	111	8.3	108
Fathom	8.4	108	7.9	103
Scope CL	7.9	102	7.4	96
La Trobe	7.8	100	7.7	100
Spartacus CL	7.7	99	7.3	95
Hindmarsh	7.4	95	7.4	96
Commander	7.2	93	7.6	99
Compass	7	90	7.8	102
Site mean	7.8		7.7	
Sig. diff.				
Variety			P<0.001	
TOS			NS (P=0.052)	
Variety x TOS			P<0.001	
LSD (P=.05)				
Variety			0.3	
TOS			0.3	
Variety x TOS			0.4	
CV%			3.8	

There were differences between individual varieties in terms of protein, test weight, retention and screenings, but they didn't behave differently between the two sowing times. There were also no differences when just comparing barley (mean of all varieties) at TOS1 and TOS2. Both sowing times however, were within malt thresholds.

Long-term NVT averages

The Wimmera NVT long-term data is in line with the Mallee data, showing Spartacus CL and Compass yielding exceptionally well over a five year period (note: only three years of data for Spartacus CL). Fathom, Rosalind, La Trobe and Hindmarsh are also among the top six yielding varieties (Figure 3).

Longer season varieties yielded higher than their long-term average in 2016 (eg. Westminster, Oxford, GrangeR). When looking at their five year average, yield performance is much lower for these varieties.

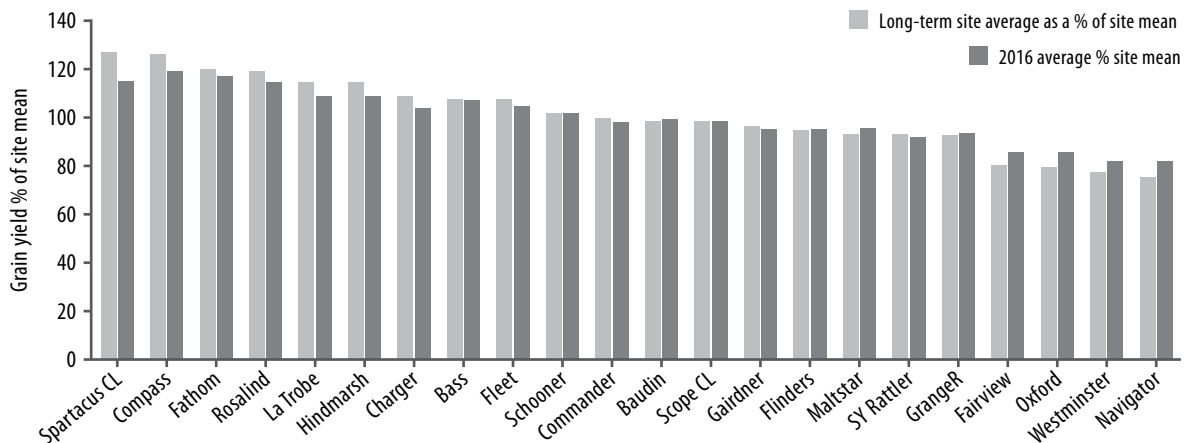


Figure 3. Wimmera NVT barley grain yield (% of site mean) comparing to 2016 long-term averages (2012-2016) of 22 varieties at Horsham, Brim, Minyip and Kaniva. Note: Rosalind and Spartacus have only been in NVT trials for three years.

Commercial practice

The 2016 growing season was exceptional, described by a number of farmers as “the best they have ever experienced”. This has resulted in the variety results being a bit inconsistent in terms of rankings (compared to recent years). It has shown though, how well some longer season varieties can yield in a higher rainfall year with a soft finish.

Generally, Fathom, Rosalind, Spartacus CL and Oxford performed well across most of the sites. Oxford, which is a longer season variety, was well suited to the season but, generally, does not perform well in ‘typical’ Wimmera and Mallee seasons.

One of the poorer performers this year was Compass (particularly in the Mallee). A question most growers would be asking is why did Compass perform so poorly? The variety didn’t appear to favour or capitalise on the above average rainfall and soft finish to the season like other varieties did.

A combination of factors could have influenced the performance of Compass at most sites:

- Being better suited to lower to medium rainfall, it could have reached its yield potential in some instances.
- An earlier sowing time didn’t benefit Compass this year. It yielded 0.8t/ha better when sown later (also the experience of farmers).

Early sown crops generally grow bigger and taller which, in 2016, contributed to lodging at the grain filling stage and at maturity, resulting in head loss. This was also a result of the plant reaching maturity very quickly and secondary tillers forming, meaning crops were more exposed to weather (delayed harvest).

Again, it is important to consider the long-term performance of a variety over a number of years and seasonal finishes, and not to throw a variety out on the back of an exceptionally rare year.

Rosalind, Compass, Hindmarsh, La Trobe, Spartacus CL and Fathom are still the most consistent performing varieties long-term in the Wimmera and the Mallee. From these six varieties, it’s then about choosing a variety or varieties based on attributes that will fit your farming system.

In order to spread risk, consider growing varieties with different susceptibilities to certain characteristics (Table 3).

Table 3. An overview of the six top yielding varieties and ratings for yield, delayed harvest, weed competition and disease (general disease rating). More detailed information can be found in Appendix 4 on page 220.

Variety	Yield rating	Delayed harvest rating	Weed competition rating	Disease rating
Spartacus CL	High	Very good head retention and standability	Poor	Moderate to poor
Hindmarsh	High and food accredited	Good head retention and standability	Poor	Moderate to poor
Rosalind	High	Good head retention and standability	Moderate	Moderate
Fathom	High	In an average year generally good head retention and standability – poor in above average season	Good	Good
Compass	High	Poorer head retention and standability	Good	Moderate
La Trobe	High and malt accredited	Good head retention and standability	Moderate to poor	Moderate to poor

In terms of when to sow a variety, previous research has shown that sowing earlier usually results in a yield benefit. In this year's barley time of sowing trial Fathom and Spartacus CL, which are both early maturing varieties, obtained a significant yield benefit when sown earlier. Conversely, Compass suffered significant yield loss when sown early.

On-farm profitability

Mallee growers, in particular, might be considering the value of replacing Scope CL with the new Spartacus CL.

A comparison of the gross income from the two Clearfield varieties is presented in Table 4. Assuming Scope CL achieved malt, there really is no difference between gross income of the two varieties. However, if Scope CL only made feed grade, an increase of \$67t/ha could be achieved when growing Spartacus CL at Birchip and \$58t/ha at Manangatang. If Spartacus CL achieves malt accreditation (possible date 2018) these differences would increase.

Table 4. Gross income for Spartacus CL and Scope CL using NVT long-term average yield (t/ha) and Birchip and Manangatang grain prices from 1 December 2016.

Variety	Long-term NVT yield average (t/ha)	Birchip grain price/t	Manangatang grain price/t	Birchip gross income	Manangatang gross income	Other things to consider that could impact yield/profitability
Scope CL (Malt)	2.6	\$157 Scope CL (SO1)	\$141 (SO1)	\$414 (Malt) \$348 (Feed)	\$367 (Malt) \$302 (Feed)	Prone to high head loss and lodging/brackling Susceptible to CCN
Spartacus CL (Feed)	3.1	\$134 (F1)	\$116 (F1)	\$415 (Feed)	\$360 (Feed)	Non-competitive (potential for greater costs long-term) Cost of purchasing seed

When looking at sowing time in the Wimmera, an increase in gross income could be achieved when altering the sowing date for some varieties.

When sown late, Compass achieved an 0.8t/ha yield advantage, equating to an additional \$112t/ha (using Feed 1 price at Dooen of \$139.50 from 1 December 2016). Conversely, Spartacus CL made an additional \$62 when sown early. This highlights the importance of sowing in the optimum window for each variety in a given year.

References

Walters L., 2015, *2015 BCG Season Research Results*, 'Barley variety performance 2015' pp. 69.

Victorian Winter Crop Summary 2016, Agriculture Victoria.

GRDC National Variety Trials.

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