

Early sowing options for cereals – wheat, barley or oats

Raj Malik¹, Mark Seymour², Blakely Paynter³, Georgia Troup³, Brenda Shackley¹ and Jeremy Curry²

Department of Primary Industries and Regional Development ¹Katanning, ²Esperance, ³Northam

Key messages

In 2017:

- Barley was higher yielding and more profitable cereal crop to grow than wheat and oats at all sowing times at all locations – Lake Grace, Gibson and Northam.
- Overall, there was no significant difference among barley varieties for grain yield and net returns. However, it must be noted that Compass, Rosalind and Urambie are feed varieties.
- Bannister and Williams performed better than other oats varieties at all time of sowings at all locations. Durack was the lowest yielding oat variety and was not suited to early sowing.
- At Lake Grace Trojan produced higher yields than Mace from mid-April sowings. Long season wheat variety Wylah produced low grain yields and low returns form all sowing times at all locations

Aims

Long-term climatic trends are changing the way growers are approaching many of their agronomy and farming operations, and sowing is no exception with early sowing in April becoming the norm in Western Australia.

Growers are seeking information to assist in selecting the cereal type to grow for taking advantage of early sowing opportunities.

In this research, we compared April sowing opportunities of wheat, barley and oats with early and late-May sowing times to determine

- Which cereal option is best for April sowing
- Which is the best variety for each cereal type for April sowing

Method

In 2017, we conducted three field experiments at Lake Grace, Northam (Muresk) and Gibson (EDRS) looking at the response of wheat, barley and oats varieties (with maturity type) to changes in sowing times. Six barley varieties – Compass (mid), Flinders (long), Granger (long), La Trobe (mid), Rosalind (mid), Urambie (very long); six oats varieties – Bannister (mid), Carrolup (mid), Durack (early), Kojonup (mid), Williams (early), Yallara (early-mid); and six wheat varieties – Cutlass (mid-long), Mace (short – mid), Magenta (mid – long), Trojan (mid), Wylah (long), Yitpi (mid – long) were sown in mid-April (14 April 2017), early May (5 May 2017) and late-May (25 May).

Each site was sown in a randomised split block design with three dates of sowing (targeting three weeks apart) as the main plot and three species and six varieties of each species randomised within species as the sub-plots. Each trial was sown in six banks of 10m long x 1.54m wide plots with three replications. Each site was sprayed with a knockdown herbicide before seeding and direct-drilled into canola stubble with a small plot air-seeder using knife points and press wheels. Fungicide treated seed (target establishment of 150 plants/m² for wheat and barley and 240 plants/m² for oats) was placed at 2–3 cm depth.

Plant establishment counts were conducted at 2-3 weeks after sowing. Awn peep emergence (Z49) for barley and oats) and flowering (Z65) dates for wheat were recorded three times a week. Biomass cuts were taken at maturity from each variety and analysed for yield components. Grain yields were recorded from plots using a small plot harvester and samples were taken and cleaned for physical grain quality, protein and moisture according to CBH specifications.

We calculated net returns by taking into account grain prices, operating costs and input costs proved by ConsultAg Narrogin (Garren Knell and Trent Butcher). The assumptions used in calculating gross margins were: Costs - seeds, fertilisers, herbicides, fungicides and application costs for barley - \$313/ha, oats - \$309/ha and wheat - \$311/ha. Grade dependent grain prices for barley of \$240-270/t (5 year decile price), wheat \$253-294/t and oats \$215-235/t.

Data was analysed (ANOVA, Table 1) within Genstat (VSN International 18th edition) with treatment structure of - TOS*(Species/Variety) a block structure of - Rep/TOS/Species. In this paper, we are presenting plant establishment, grain yield and net returns data only.

Table 1. Results of analysis of variance (ANOVA) for grain yield and net return from TOS x species x variety trials at Lake Grace, Gibson and Northam in 2017

ANOVA	Grain yield			Net returns		
	17KA17	17ES21	17NO12	17KA17	17ES21	17NO12
	Lake Grace	Gibson	Northam	Lake Grace	Gibson	Northam
Time of sowing (TOS)	0.03	n.s.	0.01	n.s.	n.s.	0.012
Species	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TOS x Species	0.002	n.s.	0.002	0.007	0.032	0.009
Species x Variety	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TOS x Species x Variety	<0.001	<0.001	n.s.	n.s.	<0.001	n.s.

Results

Plant Establishment

From April through to May all three trial sites had a very dry top soil and we applied 5-8mm irrigation in April sowing treatments to ensure plant germination. At Lake Grace establishment averaged 120 plants/m² in mid-April sowing compared to 152 and 201 plants/m² in early and late-May sowings. Gibson had an average establishment of 104 plants/m² from April sowing compared to 184 and 204 plants/m² in early May and late-May sowing. Establishment at Northam ranged from 139 to 172 plants/m² over the three sowing times.

Grain Yield

Grain yield varied significantly ($p < 0.05$) among the species with barley producing significantly higher grain yields than wheat and oats at all locations.

Lake Grace

Time of sowing had significant effect on grain yield with early-May sowing producing significantly higher grain yields than mid-April and late-May sowing times.

At this site, barley yielded on average nearly 1.0 t/ha more than wheat and 1.2 t/ha more than oats. Also at each time of sowing barley produced significantly higher yields than oats and wheat. In mid-April and late-May sowing times, barley yields were nearly 1.0 t/ha higher than oats and wheat whilst in early-May sowing barley grain yields were 1.5 t/ha and 1.1 t/ha higher than oats and wheat.

There was a significant interaction between TOS x species x variety ($p < 0.05$) suggesting a significant change in the relative performance of varieties between three sowing times (Figure 1). There was no significant difference among barley varieties for mid-April and early-May sowing (except Granger) whilst in late-May sowing, Compass and La Trobe were higher yielding than other barley varieties. For mid-April sowing, Trojan was the only wheat variety which produced statistically similar yields to barley varieties whilst for early-May sowing all barley varieties (except Granger), produced significantly higher yields than all of wheat varieties. For mid-April sowing, Bannister, Kojonup and Williams oats produced similar yield to Compass, Flinders, Rosalind and Urambie barley, but significantly less yield than Granger and La Trobe.

Gibson

Grain yield of barley was on average nearly 1.6 t/ha higher than wheat and nearly 0.5 t/ha than oats at Gibson. A significant interaction between TOs x species x variety suggested that there was significant difference among barley varieties across three sowing times (Figure 2). In mid-April sowing, Flinders and Rosalind barley produced significant higher yields than La Trobe whilst in early-May sowing Rosalind produced significantly higher yields than any other barley variety. None of the wheat varieties produced similar yields to any of the barley varieties in any of the sowing times. However, oats were very competitive to barley varieties and oats varieties such as Bannister, Kojonup and Williams produced better or similar yields to most of barley varieties in all of the sowing times.

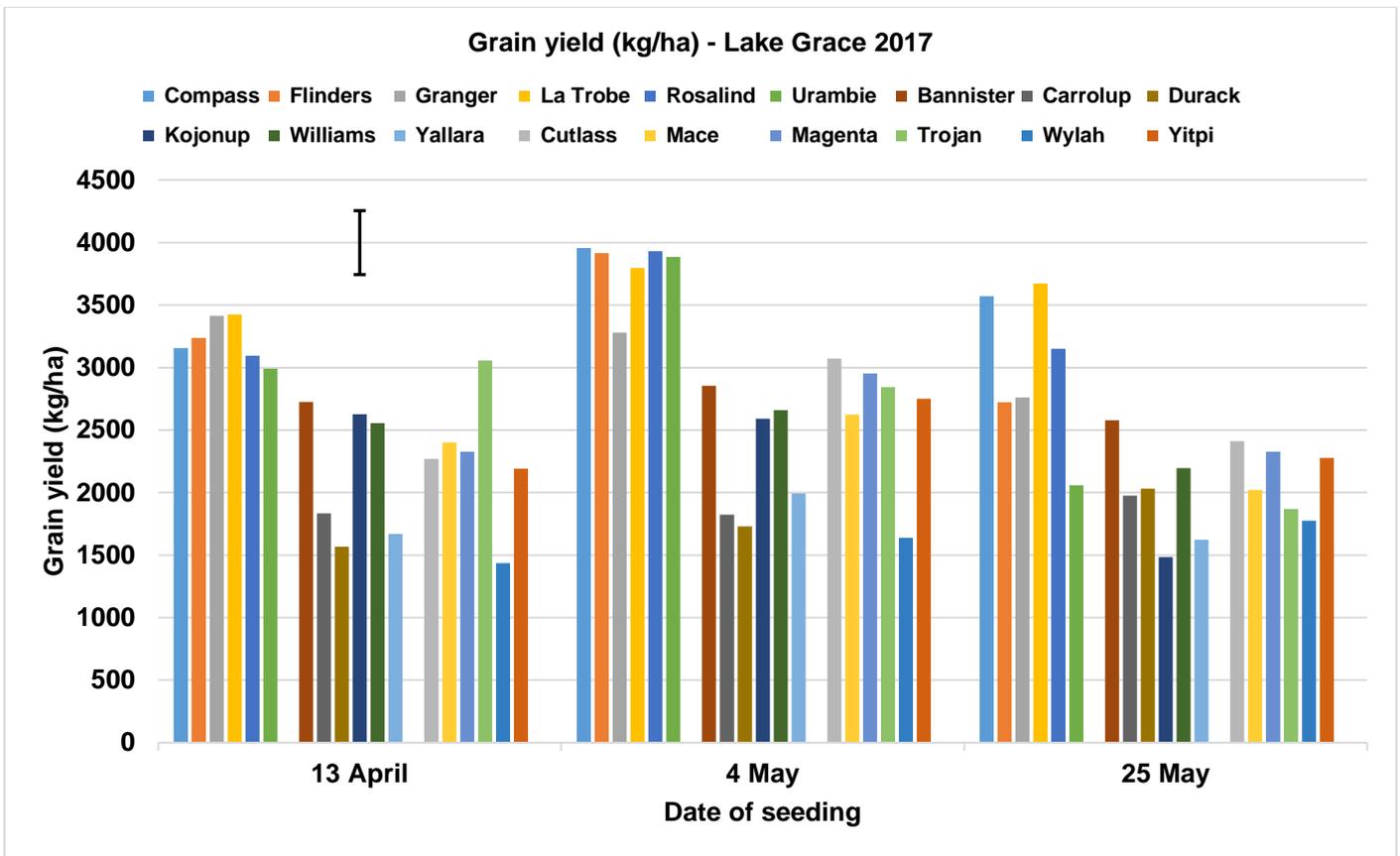


Figure 1. Grain yield of barley, oats and wheat varieties in mid-April, early-May and late-May sowing times at Lake Grace in 2017. Vertical bar represents Lsd ($p < 0.05$) = 512 kg/ha, except when comparing TOS = 446 kg/ha and TOS x species = 464 kg/ha)

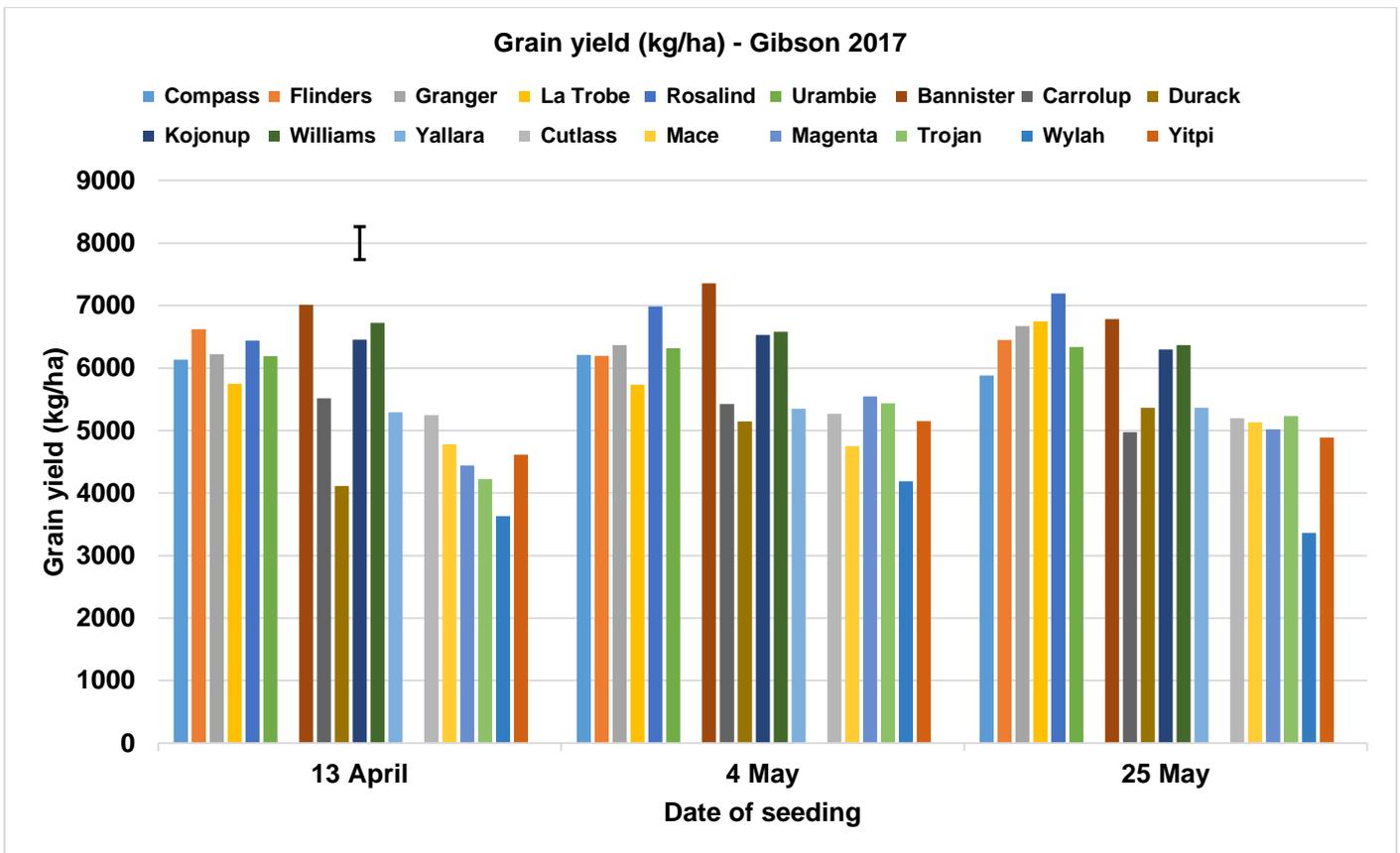


Figure 2. Grain yield of barley, oats and wheat varieties in mid-April, early-May and late-May sowing times at Gibson in 2017. Vertical bar represents Lsd ($p < 0.05$) = 528 kg/ha, except when comparing TOS = 516 kg/ha and TOS x species = 479 kg/ha).

Northam

Mid-April sowing at Northam produced significantly higher grain yields than early and late-May sowing times. However, there was no significant interaction between sowing times x species x varieties meaning that relative ranking of varieties for grain yield was similar regardless of time of sowing.

At Northam, average grain yield of barley was nearly 1.3 t/ha higher than wheat and nearly 1.6 t/h than oats. In addition, barley yields were significantly higher than oats and wheat in each time of sowing treatments. Barley yields were 1.1, 1.6 and 1.3 t/ha higher than wheat and ~1.0, 2.1 and 1.6 t/ha higher than oats in mid-April, early-May and late-May sowings.

A summary of which is best cereal option is suitable for mid-April and which one is best variety for that cereal type is given in Table 2.

Table 2. Which cereal type and variety is best option for grain yields for each time of sowing (based on statistical comparisons) at Lake Grace, Gibson and Northam in 2017?

Location	Options	mid-April	early-May	late-May
Lake Grace	Option 1	Barley (all)	Barley (all but granger)	Barley (La Trobe or compass)
	Option 2	Oats (Bannister, Kojonup or Williams) or Wheat (Trojan)	Wheat (all but Wylah)	Oats (Bannister or Williams) Or Wheat (all but Wylah)
	Option 3		Oats (Bannister, Kojonup or Williams)	
Gibson	Option 1	Barley (all but La Trobe and Compass)	Barley (Rosalind) or Oats (Bannister)	Barley (La Trobe or Rosalind)
	Option 2	Oats (Bannister or Williams)	Wheat (all but Mace and Wylah)	Oats (Bannister or Williams)
	Option 3	Wheat (Cutlass or Mace)		Wheat (all but Wylah)
Northam	Option 1	Barley (all)	Barley (all)	Barley (all)
	Option 2	Oats (all) or Wheat (all)	Wheat (all)	Oats (all) Or Wheat (all)
	Option 3		Oats (all)	

Net returns

There were significant difference among species for net returns with barley producing significantly higher returns than wheat and oats at all the three locations. The net returns were mainly correlated to grain yield ($r' = 0.67$ at Lake Grace, 0.83 at Gibson and 0.94 at Northam) however quality also impacted the net returns – particularly at Gibson.

At Lake Grace the net return from barley were \$192 and \$342/ha more than wheat and oats. Since there was no interaction of time of sowing with species or varieties, this suggested there was no difference between varieties for net returns across the time of sowings.

At Gibson the net return from barley was \$186 and \$133/ha more than wheat and oats – lower than other sites as the majority of barley varieties at this site failed to meet malt grade and were dropped into Feed grade based on grain brightness. This led to Cutlass and Mace wheat and Bannister, Kojonup and Williams oats sown in mid-April producing more or less similar net returns to barley.

At Northam, net returns from barley were \$285 and \$465 higher than wheat and oats. There was no time of sowing by species or variety interaction, resulting in no difference among varieties for net returns across time of sowings.

A summary of which cereal option and the variety is most profitable for mid-April is presented in Table 3. Barley was more profitable than wheat or oats at all locations in all sowing times without much difference between the barley varieties.

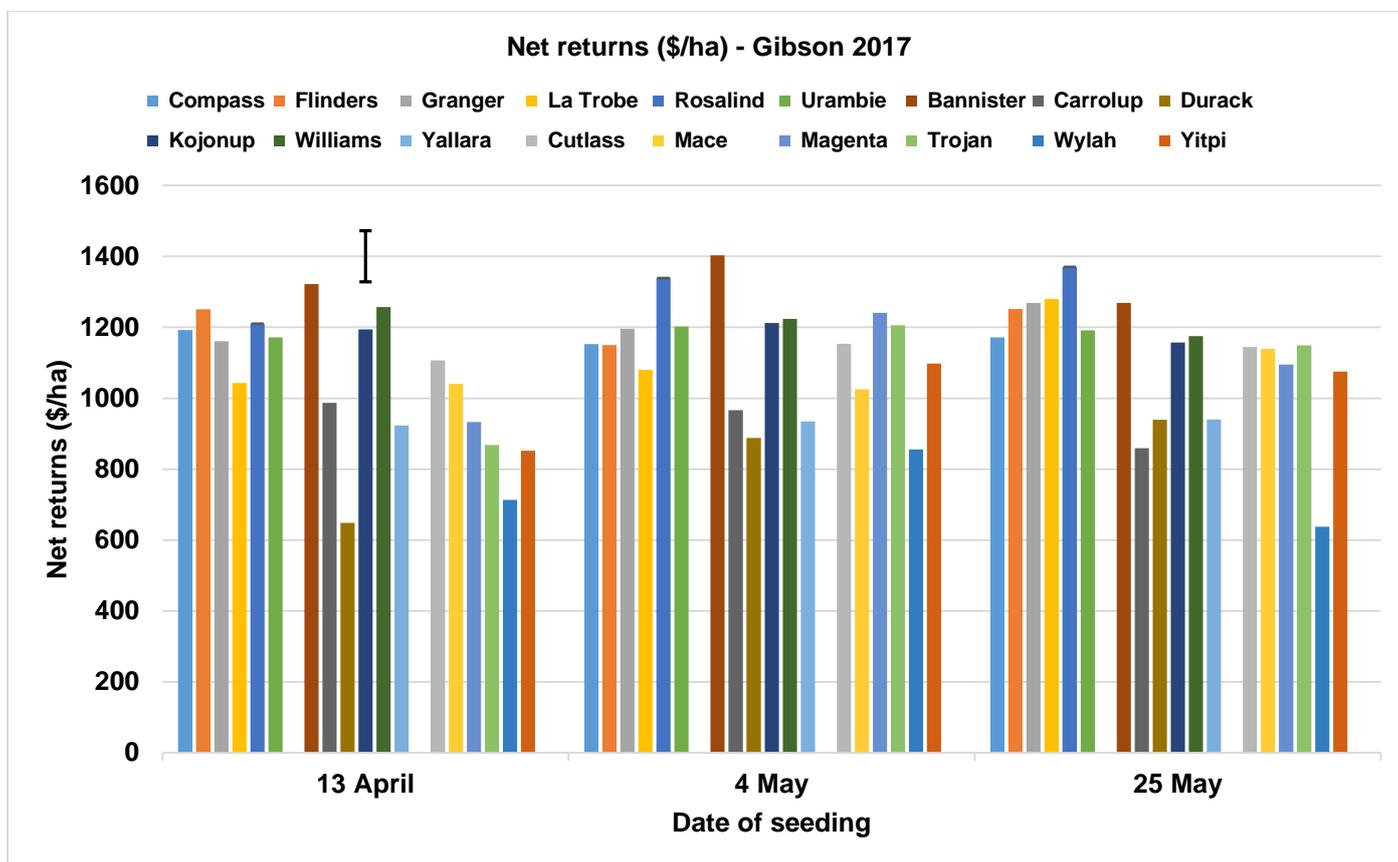


Figure 3. Net returns yield of barley, oats and wheat varieties in mid-April, early-May and late-May sowing times at Gibson in 2017. Vertical bar represents Lsd ($p < 0.05$) = \$144/ha, except when comparing TOS = \$139/ha and TOS x species = \$129/ha).

Table 3. Which cereal type and variety is more profitable for each time of sowing (based on statistical comparisons) at Lake Grace, Gibson and Northam in 2017?

Location	Options	mid-April	early-May	late-May
Lake Grace	Option 1	Barley (all)	Barley (all) or Wheat (all)	Barley (all)
	Option 2	Wheat (all)	Oats (all)	Oats (all) or Wheat (all)
	Option 3	Oats (all)		
Gibson	Option 1	Barley (all)	Barley (Rosalind)	Barley (all but Compass and Urambie)
	Option 2	Oats (Bannister, Kojonup or Williams)	Oats (Bannister) or Wheat (all but Mace or Wylah)	Oats (Bannister, Kojonup or Williams) or Wheat (all but Wylah)
	Option 3	Wheat (Cutlass, Mace or Magenta)		
Northam	Option 1	Barley (all)	Barley (all)	Barley (all)
	Option 2	Oats (all) or Wheat (all)	Wheat (all)	Wheat (all)
	Option 3		Oats (all)	Oats (all)

Conclusion

In 2017 we found that in most instances barley was higher yielding and more profitable cereal option to grow than wheat or oats at all sowing dates provided barley met malt specifications. For mid-April sowing, depending on the location, on average barley yielded 1.0 to 1.7 t/ha more than wheat and 0.5 to 1.1 t/ha more than oats and produced net returns of \$215 to 250/ha higher than wheat and \$115 to 375/ha higher than oats.

Key words

Early sowing, Mid-April sowing, cereal options, variety

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