

Grain yield of eighteen barley varieties sown at three different dates – Condobolin 2015

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Key findings

- » Late sowings could have a negative effect on barley yield due to heat and water stress during grain fill. In 2015 this was the key determining factor for grain yield.
- » While mid-season varieties yielded well in the first sowing time, mid and late sowings favoured early-flowering varieties.
- » Early sown, early flowering crops are at risk of flowering during frost events, and sowing decisions should be based on the phenology of the particular variety and understanding the region's climate.

Introduction

This experiment assessed the performance of 18 commercial barley varieties sown at three dates during 2015 at the Condobolin Agricultural Research and Advisory Station (CARAS). The impact of sowing time on flowering time, phenology and yield for each variety and sowing time is reported.

Site details

| | |
|-----------------------|--|
| Location | Condobolin Agricultural Research and Advisory Station |
| Experiment period | April–November 2015 |
| Soil type | Red-brown chromosol |
| Previous crop/s | Lucerne |
| Soil pH _{Ca} | 4.4 (0–10 cm), 6.3 (10–60 cm) |
| Nitrogen | 173 kg/ha |
| Fertiliser | 70 kg/ha mono-ammonium phosphate (MAP) applied at sowing |

Treatments

| | | |
|--------------|---|--|
| Sowing dates | TOS 1: 30 April TOS 2: 22 May TOS 3: 11 June | |
| Varieties | IGB1334T Bass [Ⓢ] Buloke [Ⓢ] Commander [Ⓢ] Compass [Ⓢ] Fathom [Ⓢ] Flinders [Ⓢ] Gairdner [Ⓢ] GrangeR [Ⓢ] | Hindmarsh [Ⓢ] La Trobe [Ⓢ] Navigator [Ⓢ] Oxford [Ⓢ] Schooner Scope [Ⓢ] Urambie [Ⓢ] Westminster [Ⓢ] Wimmera [Ⓢ] |

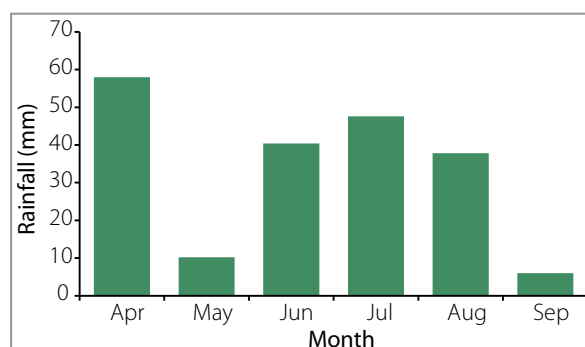


Figure 1. Growing season rainfall for Condobolin 2015. Growing seasons rainfall (GSR), 198 mm, total annual rainfall 421.8 mm. Mean annual rainfall 442.9 mm, mean GSR, 234 mm.

Results

There was very little rainfall throughout spring at Condobolin (Figure 1), which, when combined with unseasonably high temperatures in spring, resulted in a premature end to the growing season. There was a significant difference between yields from the three sowing dates ($P < 0.001$), showing a negative correlation with sowing time (Figure 2).

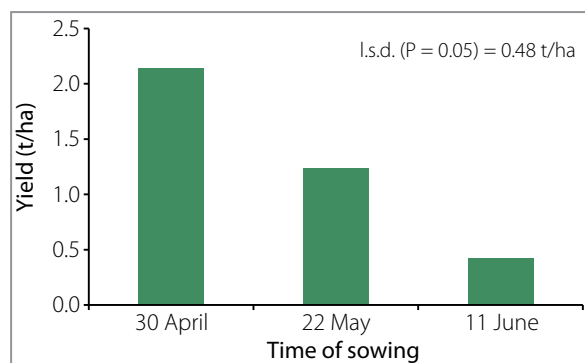


Figure 2. Yield (t/ha) of 18 barley varieties sown at three dates grouped by sowing time at Condobolin 2015.

Table 1. Yield (t/ha) of 18 barley varieties sown at three sowing dates at Condobolin.

| Variety | Yield (t/ha) | | |
|---|--------------|--------|--------|
| | 30 Apr | 22 May | 11 Jun |
| Spartacus CL | 2.93 | 1.91 | 0.90 |
| Flinders | 2.93 | 1.64 | 0.42 |
| Wimmera | 2.92 | 1.09 | 0.20 |
| Fathom | 2.89 | 1.77 | 1.19 |
| Compass | 2.68 | 1.61 | 0.49 |
| La Trobe | 2.67 | 1.74 | 0.69 |
| Bass | 2.40 | 1.71 | 0.56 |
| Buloke | 2.30 | 1.36 | 0.47 |
| Gairdner | 2.21 | 0.92 | 0.19 |
| Hindmarsh | 2.21 | 1.85 | 0.95 |
| Scope | 2.18 | 1.47 | 0.53 |
| Schooner | 1.99 | 1.33 | 0.69 |
| GrangeR | 1.88 | 0.71 | 0.42 |
| Westminster | 1.85 | 0.67 | 0.06 |
| Commander | 1.71 | 1.22 | 0.17 |
| Navigator | 1.70 | 0.75 | 0.17 |
| Oxford | 1.47 | 0.84 | 0.03 |
| Urambie | 1.29 | 0.64 | 0.12 |
| Mean | 2.23 | 1.29 | 0.46 |
| l.s.d. (P=0.05) variety 0.26 t/ha, date 0.15 t/ha | | | |

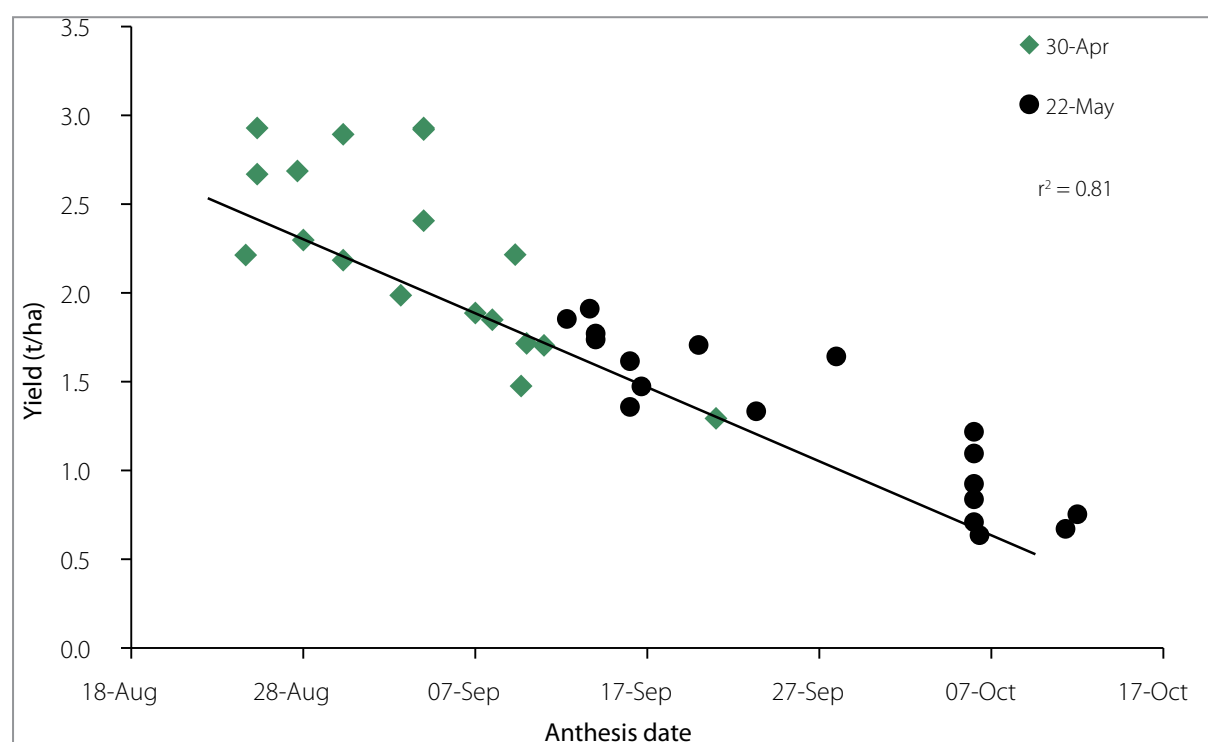


Figure 3. Anthesis dates vs yield for 18 barley varieties. June 11 sowing data not presented due to early senescence disrupting flowering.

A strong ($r^2 = 0.81$) correlation was observed between anthesis dates and yield, with varieties that yielded over 2.5 t/ha flowering before the first week of September (Figure 3). Yields declined sharply with delayed flowering. In years with cooler, wetter spring conditions, late sown varieties might not receive such a severe yield penalty.

The highest yielding varieties from the first time of sowing were Spartacus CL, Flinders and Wimmera (Table 1). Spartacus CL flowered on 25 August, while mid to late maturing varieties Flinders and Wimmera flowered 10 days later, indicating that

at earlier sowings, mid-flowering varieties can be competitive. However, this competitiveness decreases rapidly when sowing is delayed.

The May and June sowings heavily favoured early-flowering varieties, while long season types such as Westminster, Oxford and Urambie failed to yield commercial quantities. From the late sowing time, the highest yielding variety was feed variety Fathom, with yields of 1.19 t/ha that was significantly higher than the site average for that sowing time.

Summary

Barley varieties have widely different flowering phenology, with early flowering types suited to low rainfall short seasons where grain fill is achieved before moisture and heat stress sets in. Growers sowing early flowering varieties should be aware of when frost risk is greatest, and target their sowing times to avoid flowering during this period. During 2015 there were a number of frost events recorded during the flowering period of the early sowing treatments, however, any impact on yield was overshadowed by the hot, dry grain filling conditions.

If sowing a mid-season variety under similar hot, dry conditions, earlier sowings of these types have the potential to maximise yield, ensuring the crop flowers at the optimum interval, allowing sufficient time for grain filling.

Late-flowering varieties will produce superior yield and quality in medium to high rainfall and long, mild growing seasons. They incur severe penalties in short, dry season conditions such as those experienced at Condobolin in 2015.

The six highest yielding varieties from the early sowings were all released within the past three years. Switching varieties from older types can result in yield advantages, and potentially improved disease packages. For example, early sown Hindmarsh was significantly out-yielded (0.72 t/ha) by its recently released successor Spartacus CL, which has the additional benefit of imidazolinone tolerance.

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