If you are growing a spring wheat variety it is probably not worth tailoring sowing date to the individual variety in Western Australia

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Key Messages

- Early time of sowing can increase a crop's exposure to frost, while late time of sowing increases a crop's exposure to terminal drought.
- In theory these effects can be managed by changing the variety to suit the time of sowing so that the flowering occurs in an optimum window.
- 4 trials at Corrigin and Eradu in 2011 and 2012 with varieties of varying phenology show that modern commercial varieties are broadly adapted to the time of sowing.
- If sowing any time after 1 May, time of sowing by variety interactions with adapted commercially released spring wheats are not worth pursuing and farmers may as well choose the best yielding variety, regardless of time sowing.

Aims

Spring wheat varieties dominate in Western Australia. They have little or no vernalisation requirement and are adapted to planting dates around May and flower in September or October. The commercially released varieties available to farmers vary in their phenology, with some varieties like Axe and Zippy being noticeably faster maturing than longer varieties like Endure or Bolac that are grown in the Eastern states. In Western Australia varieties like Wyalkatchem are considered mid season length and Magenta is considered to be a slightly longer maturing variety, although the difference in time to flowering may only vary by a few days.

The objective with any variety is to time flowering so it occurs during a period that balances risk of drought stress and frost. In between, the crop must spend a sufficient quantity of time in the vegetative stage to produce enough spikelets that will turn into grains to generate yield. Historically, shorter season varieties are sown later if there is a late start to the season. These varieties are able to quickly adapt to the shorter season and progress through their lifecycle quickly, and in theory produce an adequate number of grains with reasonable grain size. Longer season varieties are sown earlier and spend longer in the vegetative stages. Again in theory, they will produce more grains, and providing the season finishes well these varieties will still fill their grains. The theory is well established and is often used when recommending one variety over another for a particular region.

Whilst the theory is well established, the basis behind the designation of a particular region and what constitutes management is perhaps less well defined. Early sowing in one season may mean that crops were exposed to late frosts. Similarly later sowing may predispose a crop to heat stress during grain fill or terminal drought. Either condition can occur on the same soil in the same location. It just depends on the outcome of the season.

Here we explore how 10 varieties performed at 3 times of sowing at Corrigin and Eradu in 2011 and 2012. The varieties varied in phenology from moderately fast to slow.

Method

Trials were established at Eradu on a deep yellowish-brown loamy sand (Plant Available Water Holding Capacity, PAWC = 96mm) and Corrigin on a loamy duplex soil (PAWC = 79mm) in 2011 and 2012. Varieties were sown at three times of sowing (TOS), early (late April to early May; (Time of sowing 1, TOS 1), conventional time of sowing (mid May to early June, TOS 2) and late (late June to early July TOS 3). Specific times of sowing at each location are presented in table 1. Sites were managed so that nutrients were non-limiting. Fertiliser was applied at sowing using formulations of S, K, and trace elements appropriate to the region and the soil type. 2011 was a favourable season with 340 and 326mm of growing season rainfall (GSR) at Corrigin and Eradu respectively. 2012 was dry, with just 170mm and 245mm of GSR at Corrigin and Eradu.

Table 1. Time of sowing in 2011 and 2012 for Corrigin and Eradu.

Location	Time of Sowing 1	Time of Sowing 2	Time of Sowing 3
Corrgin (2011)	30/04/2011	24/05/2011	21/06/2011
Corrigin (2012)	02/05/2012	21/05/2012	21/06/2012
Eradu (2011)	29/04/2011	24/05/2011	23/06/2011
Eradu (2012)	02/5/2012	21/05/2012	21/06/2012

Table 2. Varieties and their relative maturity.

Maturity	Variety
Fast	Westonia (Wes)
	Wyalkatchem (Wya)
Mid-fast	Carnamah (Car)
	Gladius (Gla)
	Yitpi (2011 only) (Yit)
	Scout (2012 only) (Sco)
	Janz (Jan)
Mid	Magenta (Mag)
	Gregory (Gre)
Slow	Endure (End)

Results

In Corrigin in 2011, at time of sowing 1, there were no differences in yield between Westonia, Wyalkatchem, Carnamah, Gladius, Yitpi, Janz or Magenta, which all yielded more than 4 t/ha (Figure 1). Gregory and Endure yielded slightly less than 4.0 t/ha. At time of sowing 2, Yitpi and Carnamah were the only varieties to yield significantly less at the later time of sowing. For Westonia, Wyalkatchem, Gladius, Janz, Gregory, Magenta, and Endure, the differences were less than 200 kg/ha and not significantly different.

At time of sowing 3, yields declined for Westonia, Carnamah, Gladius, Yitpi, Magenta and Endure. Wyalkatchem, Janz and Gregory coped well with the later time of sowing and did not yield significantly less than when they were sown early.

In 2012, with a much tougher season, time of sowing had a markedly greater impact on yield (Figure 1). Once again, few differences were detected between the varieties for the first time of sowing. Only the longer season varieties of Gregory and Endure appeared to be poorly adapted to this environment, and yielded less than 2 t/ha. All other varieties yielded around 2.5 t/ha, despite the relatively tough growing conditions. There was generally a 0.5 t/ha yield penalty from time of sowing 1 to time of sowing 2. However variety per se could not mitigate this yield loss. Scout and Janz suffered 1 t/ha yield penalties, while Magenta suffered a 1.5 t/ha yield penalty. For the third time of sowing, yield declined further to approximately 1 t/ha. However at this time of sowing, there were no differences in yield between varieties. Therefore at Corrigin in 2012, variety was most important at time of sowing 2 and genotype by management interactions were detected. However from a management perspective, there was no reason to switch from growing Wyalkatchem at any time of sowing.

At Eradu in 2011, Wyalkatchem yielded more than every other variety at time of sowing 1 and time of sowing 2 (Figure 2). There was a yield penalty for sowing later (~400 kg/ha), and considerable G * M, where some varieties appeared to maintain yield from time of sowing 1 to 2 (Westonia, Carnamah, Gladius, Yitpi, Janz, Gregory) while others (Magenta, Wyalkatchem, and Endure) experienced a considerable (> 500 kg/ha) decline in yield with the later time of sowing. By time of sowing 3 however yields declined by approximately 2 t/ha and statistical differences between varieties almost vanished. Again, from a management perspective there was no reason to switch from Wyalkatchem, regardless of the time of sowing.

Eradu in 2012 was very poor where the trial yielded just 1 t/ha and for many varieties time of sowing was not important (Figure 2). Wyalkatchem, Scout, Carnamah and Endure all yielded more than 1 t/ha at time of sowing 1. At time of sowing 2, Scout yielded 1.3 t/ha. Wyalkatchem did not incur a yield penalty between times of sowing one and two. Varietal differences at time of sowing 3 were small. Gregory and Endure suffered substantial yield penalties. However, the differences between other varieties were negligible.

In general Wyalkatchem was either the highest yielding variety or equal highest yielding variety at every location in every year and at every time of sowing with one exception. The only exception occurred when Scout out yielded Wyalkatchem at the second time of sowing at Eradu in 2012. The underlying implication is that modern elite germplasm is widely adapted to the environment, and that modern varieties are remarkably unresponsive to the time of sowing. That is, varieties generally yield better when sown early and there is no need to over complicate variety specific management packages with elite spring wheat varieties. In essence, choose the best variety for your location and manage it accordingly.

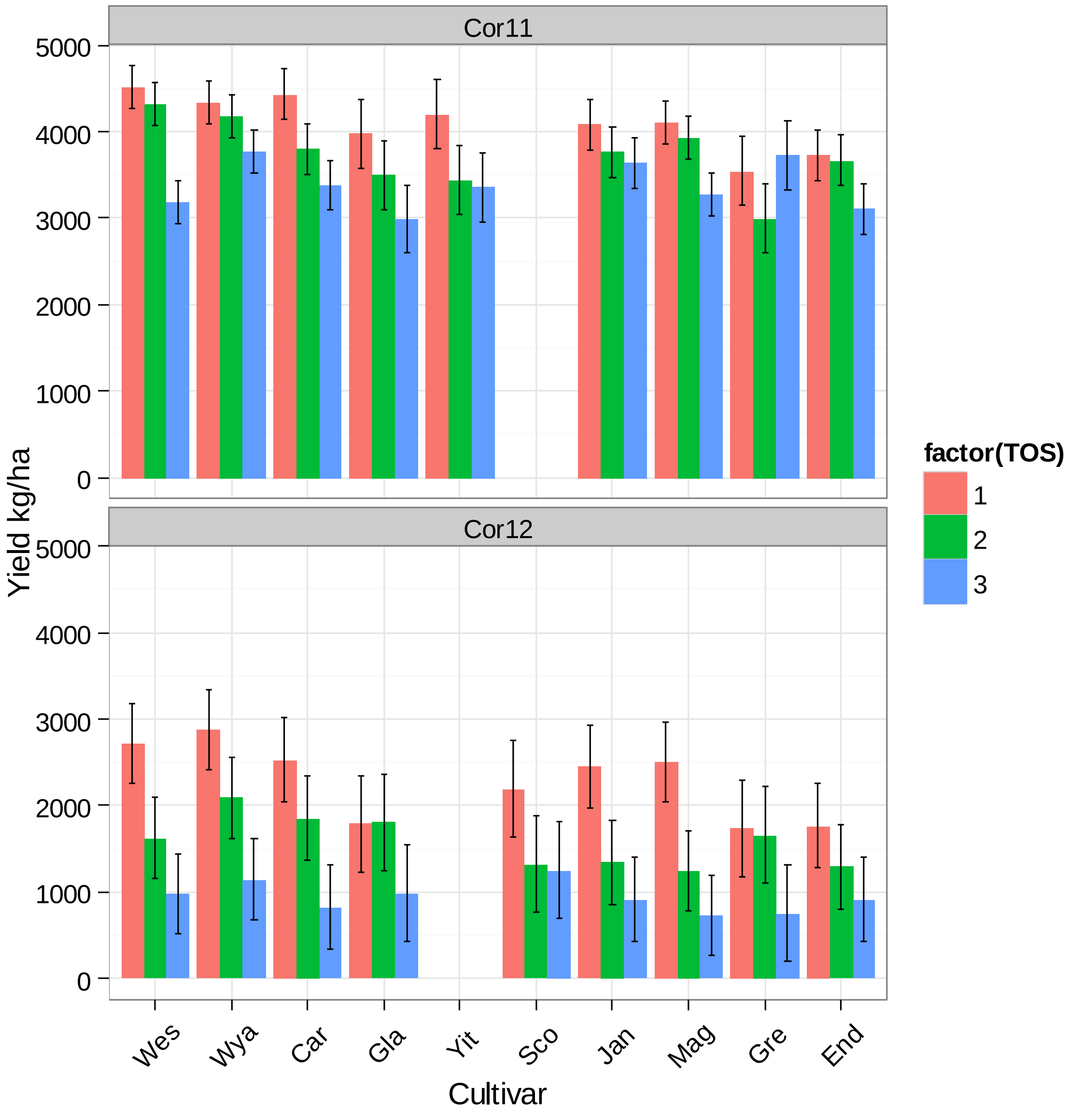

Figure 1 – Yields for 10 cultivars at Corrigin in 2011 and 2012 at each time of sowing. Error bars denote the standard error of the mean.

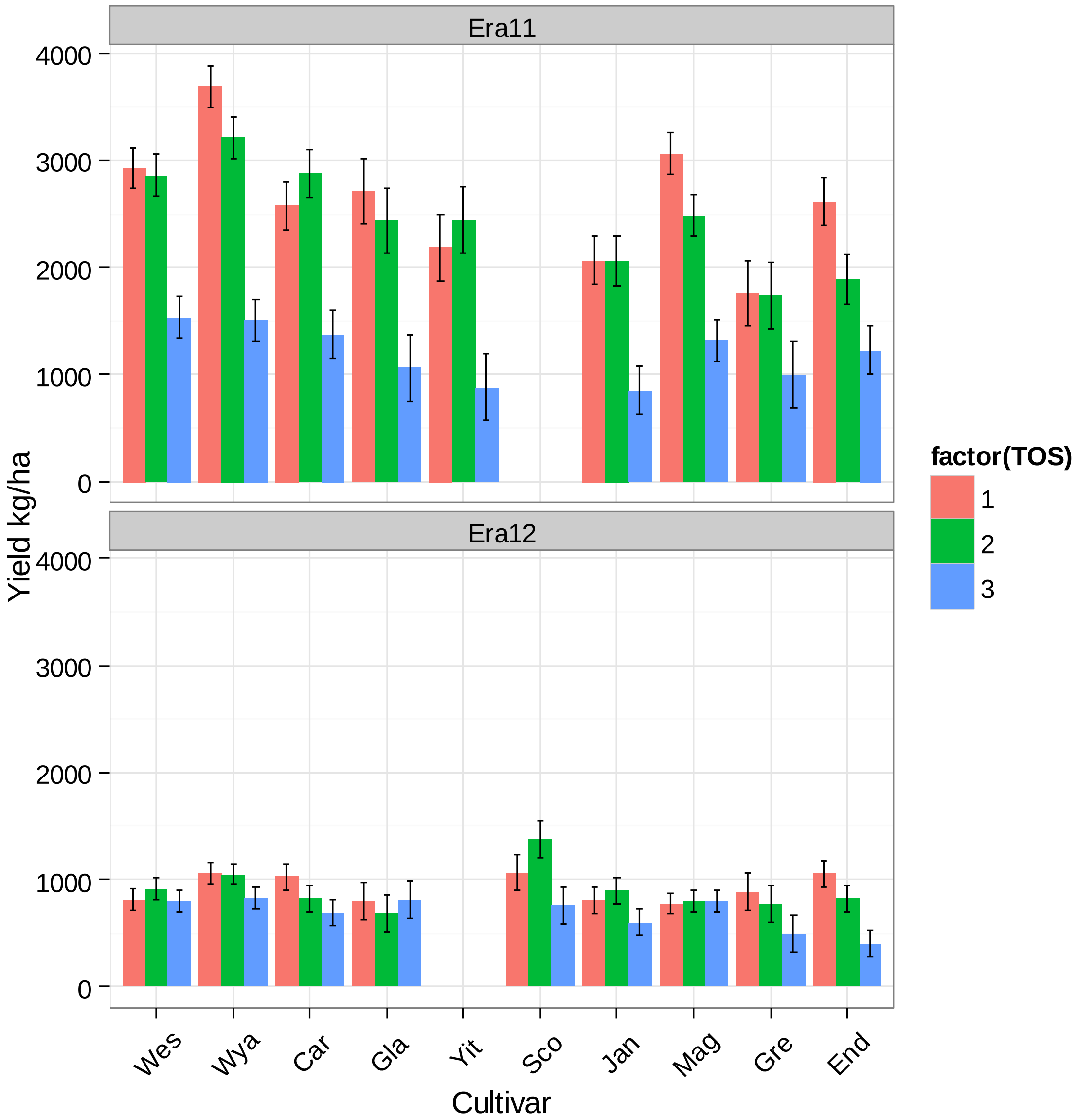

Figure 2 – Yields for 10 cultivars at Eradu in 2011 and 2012 at each time of sowing. Error bars denote the standard error of the mean.

CONCLUSION

The time of sowing by variety interactions demonstrated that the best performing cultivar was almost always the best, or equal best, regardless of the time of sowing.

Key words

Cultivar, Wheat, Time of sowing.

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