

Sowing early for crop competition

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RESEARCH

Searching for answers

Location

Roseworthy -
University of Adelaide

Rainfall

Av. Annual: 394 mm
Av. GSR: 288 mm
2016 Total: 602 mm
2016 GSR: 448 mm

Yield

Actual: 8.8 t/ha (W)

Paddock History

2015: Lentils
2014: Wheat
2013: Canola

Soil Type

Sandy loam over medium calcareous clay - Red brown earth

Plot Size

10 m x 2 m x 4 reps

cover before the pre-emergent herbicide has dissipated will reduce the competitiveness and seed production of later emerging weeds. This can be achieved by increasing the competitiveness of crops, particularly cereals.

There are several ways to increase the competitive nature of cereal crops, such as increasing the seeding rate or reducing row spacings. However, we have been investigating an alternative approach to increasing the competitiveness of wheat crops. Sowing wheat later results in it growing more slowly as the soil temperature decreases going into winter. This means it takes longer for canopy closure to occur and this gives weeds a greater opportunity to use resources. Earlier sowing, when soil temperatures are warmer, results in more rapid growth and faster canopy closure. This provides an opportunity to increase the amount of competition against weeds without having to significantly change other aspects of the farming system.

Over the past three years, a series of trials have been undertaken at Hart, Roseworthy and Lake Bolac in collaboration with the Hart Fieldsite Group and Southern Farming Systems to look at the role of competition from early sowing to aid pre-emergent weed control. In the trials, wheat was sown about one month apart with several different pre-emergent herbicide options used. The results reported are from a field trial undertaken at Roseworthy in 2016 to investigate the effect of time of sowing (TOS) on the performance of pre-emergent herbicides and their mixtures on annual ryegrass control in wheat.

How was it done?

A field trial was established at Roseworthy in 2016 to compare the effect of early and delayed sowing on annual ryegrass control with different pre-emergent herbicides. The trial was established in a split-plot design with wheat cultivar Mace sown at 90 kg/ha, two times of sowing (6 May 6 and 1 June) and six pre-emergent herbicide treatments (Table 1).

The replicated trial was sown into a faba bean stubble using a standard knife-point press wheel system on 22.5 cm (9") row spacing. Fertiliser rates were applied as 100 kg/ha DAP (18:20:0:0) banded below the seed. Pre-sowing weed control was glyphosate (2.5 L/ha) + oxyfluorfen (90 mL/ha). Fungicide tebuconazole was applied on 23 September @ 290 mL/ha. Pre-emergent herbicides were applied with a 2 m pressurised hand boom and incorporated within a few hours of application. Boxer Gold was applied post-emergent on 1 June (TOS1) and 25 June (TOS2), when the crop had reached the 2-leaf growth stage. Assessments included ryegrass control (reduction in plant and seed set), crop establishment, grain yield and quality.

What happened?

TOS had no effect on annual ryegrass plant numbers, whereas herbicides reduced numbers significantly ($P < 0.001$, Table 2). While all herbicides reduced plant numbers, Boxer Gold was the least effective herbicide at TOS1 and Sakura + Avadex Xtra was the most effective.

Key messages

- **Sowing wheat early can improve crop competition against weeds.**
- **Crop competition can reduce grass weed seed set by up to 50%.**
- **It is important to get the pre-emergent herbicide strategy right and grow the right cultivar for the season length.**

Why do the trial?

As grass weeds become increasingly resistant to post-emergent herbicides, more reliance is being placed on pre-emergent herbicides for weed control. One issue that arises with the use of pre-emergent herbicides is the emergence of weeds after the herbicides have dissipated. Obtaining early ground

Table 1. Pre-emergent herbicide treatments evaluated in TOS trial at Roseworthy in 2016.

Herbicide treatment	Herbicides applied
1	Nil
2	Sakura (118 g/ha) pre
3	Sakura (118 g/ha) + Avadex Xtra (2 L/ha) pre
4	Sakura (118 g/ha) pre followed by *Boxer Gold (2.5 L/ha) post
5	Boxer Gold (2.5 L/ha) pre
6	Boxer Gold (2.5 L/ha) + Avadex Xtra (2 L/ha) pre

*POST Boxer Gold applied to crop at 2-leaf growth stage.

Table 2. Annual ryegrass plant counts in August 2016, head counts in October 2016 and grain yield in Mace wheat sown on 6 May 2016 (TOS1) or 1 June 2016 (TOS2) at Roseworthy, SA.

Pre-emergent herbicide	Plant counts (August) (m ²)		Head counts (October) (m ²)		Mace wheat yield (t/ha)	
	TOS1	TOS2	TOS1	TOS2	TOS1	TOS2
Nil	341	374	347	685	5.7	4.8
Sakura	77	40	60	71	7.3	8.8
Sakura + Avadex XTRA	18	13	4	21	7.5	8.8
Sakura fb Boxer Gold*	49	12	32	23	7.1	8.7
Boxer Gold	116	60	116	112	7.0	8.5
Boxer Gold + Avadex XTRA	94	89	67	167	7.5	7.8
TOS*	ns*		P=0.05		P<0.001	
Herbicide	P<0.001		P<0.001		P<0.001	
Interaction	ns		P<0.001		P<0.001	

*TOS = time of sowing; fb = followed by; ns = not significant.

For annual ryegrass head counts in October there was an effect ($P<0.05$) of both herbicide, TOS, and their interaction (Table 2). In contrast to annual ryegrass plant numbers, annual ryegrass seed heads in October were different between TOS (Table 2), with on average twice the number of annual ryegrass seed heads in the second TOS compared with the first TOS. Sakura + Avadex Xtra coupled with the early TOS was particularly effective at reducing annual ryegrass seed set, reducing seed heads by 99%. However, Boxer Gold tended to struggle with the high rainfall and long growing season in 2016.

There were differences between herbicide treatments, TOS and their interaction in wheat grain yield (Table 2), which was related to weed density and spring rainfall.

Where herbicides had controlled annual ryegrass well, yield was higher for TOS2 compared with TOS1. However, in the absence of herbicide yield was higher for TOS1 compared to TOS2.

For both TOS herbicide treatment increased yield by 23 to 32% for TOS1 and by 63 to 83% for TOS2. Sakura and Sakura + Avadex Xtra tended to have the highest yields. Boxer Gold + Avadex Xtra produced a high yield from TOS1, but not TOS2.

In previous experiments in 2014 and 2015, average wheat yields were higher with the early TOS; by 42% in 2014 and by 45% in 2015. Both seasons were characterised by lower than average spring rainfall and higher than average spring temperatures. In 2016, there was higher than average rainfall in spring and cooler temperatures.

In 2016, average wheat yield from the second TOS was higher at Roseworthy (12%) and Hart (36%), but not different at Lake Bolac. Choosing an appropriate wheat cultivar for the season length is essential in maximizing yield from early sown wheat.

What does this mean?

Our experiments at three sites across three years have shown there is no advantage in annual ryegrass control in delaying sowing of wheat. Earlier sowing provides more competition for annual ryegrass and complements pre-emergent herbicides used. In particular, it can reduce the amount of annual ryegrass seed set, reducing populations in future years.

Where seasons are longer, it is necessary to choose a more

persistent herbicide option. Sakura + Avadex Xtra is better than Boxer Gold under these conditions. Whether earlier sowing increases grain yield depends on seasonal conditions. In longer seasons, later sown wheat crops may benefit more from spring sowing. However, where spring rainfall is low, earlier sown wheat benefits. Matching wheat variety to season length and appropriate choice of pre-emergent herbicides is essential to get the best from early sowing.

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Sakura is a registered trademark of Kumiai Chemical Industry Co. Ltd.

Avadex Xtra is a registered trademark of Nufarm.

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