Non-herbicide weed control: not as sexy as a new herbicide but really important

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Crop Competition

Weeds are a problem in crops because they compete for resources. The crop needs to compete back or the weeds will win.

Most grain growers are reluctant to reduce their row spacing for a number of good reasons. However, many growers are now using

Take Home Message

Herbicides are not the answer to herbicide resistance. We need to do something else. There is a very short list of effective non-herbicide weed control practises on offer to Australian grain growers.

Mingenew Trial – Annual Ryegrass

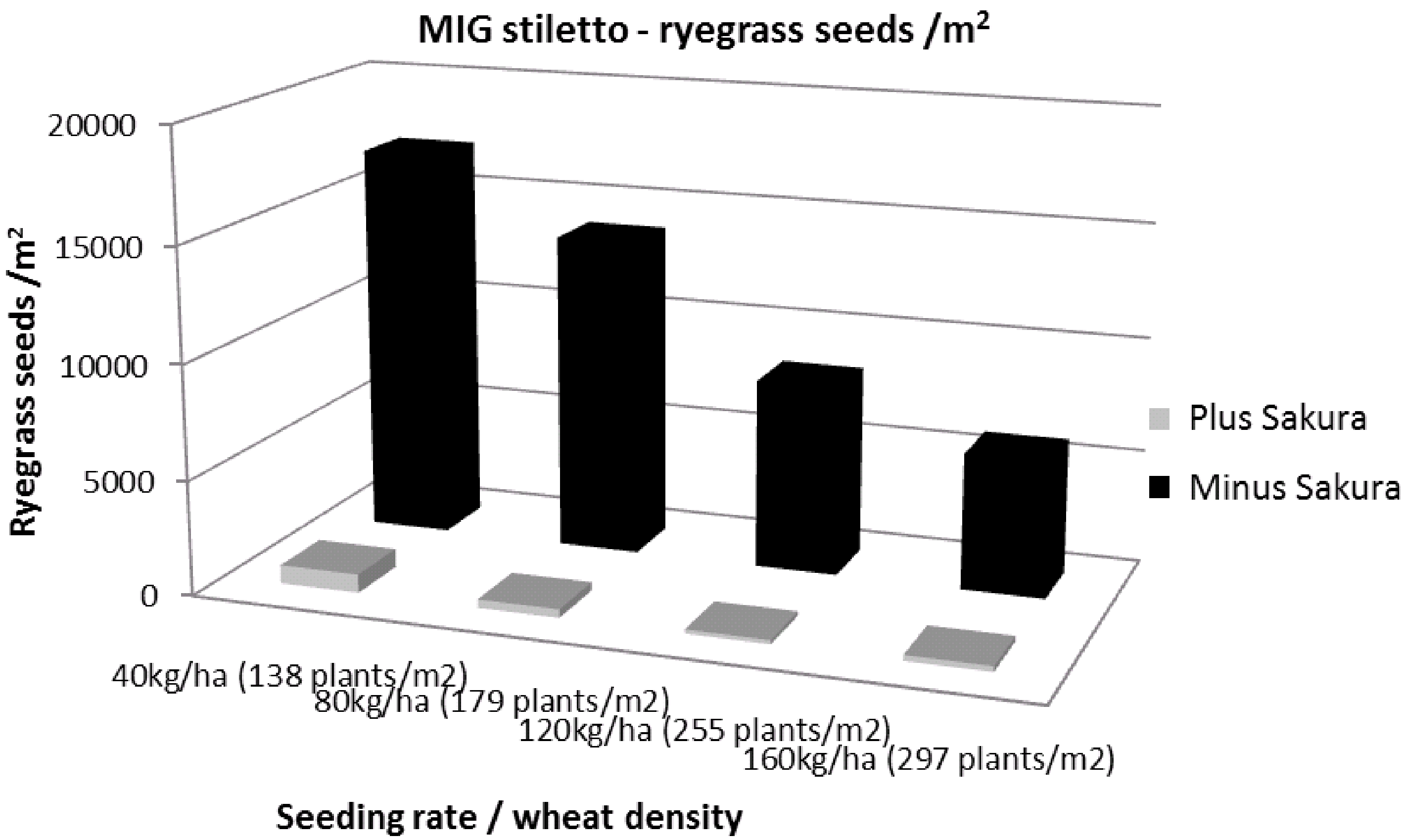

Figure 1: Ryegrass seed production per m^2 at Mingenew for four seeding rates, plus and minus Sakura herbicide 118 g/ha pre-sowing (average of single and paired row sowing). Wheat plant density is shown in brackets.

Ryegrass seed set was significantly reduced by increasing seeding rate ($p<0.05$; lsd 2768 seeds /m^2) (Figure 1).

Binnu Trial – Wild Radish

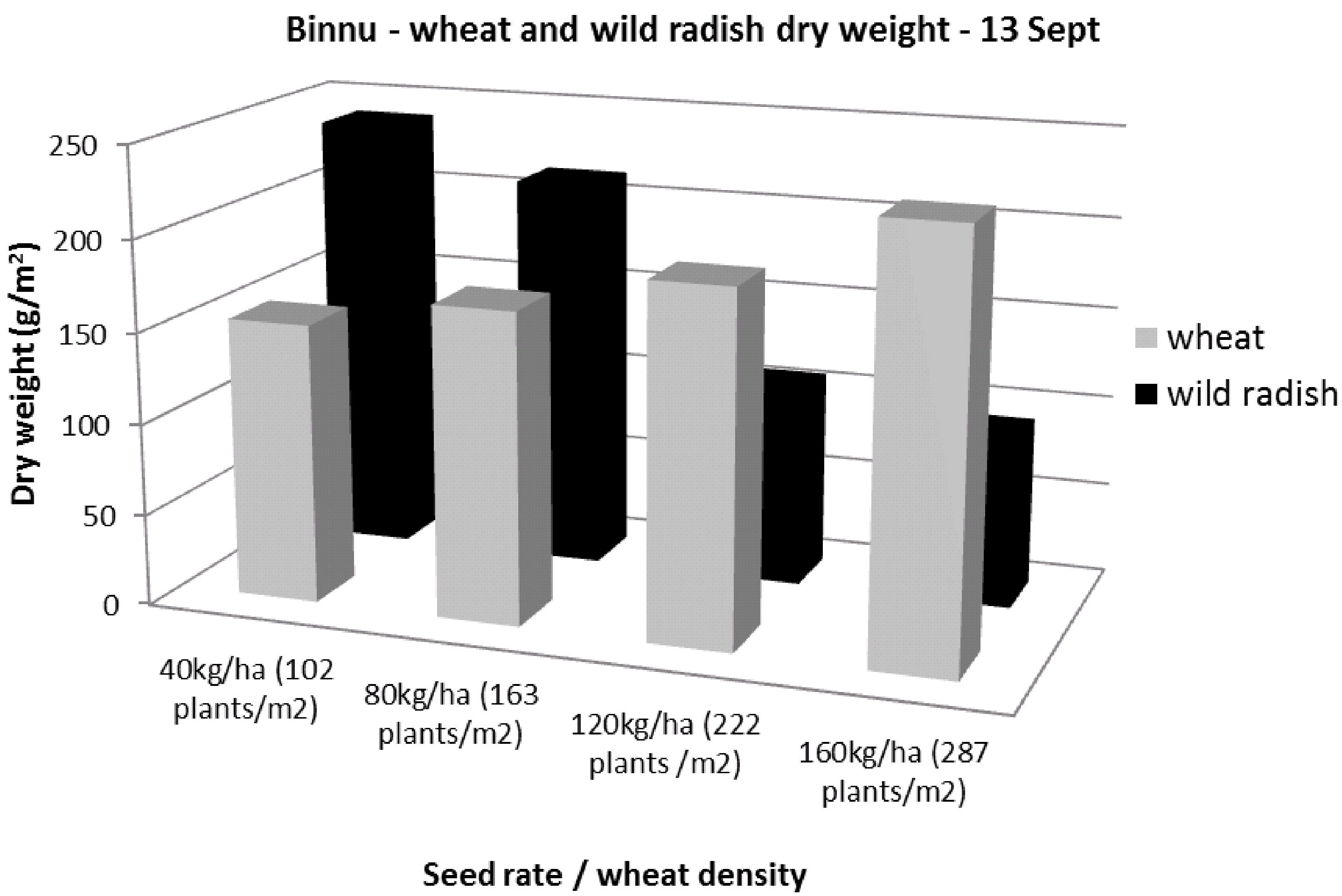

Figure 2: Wheat and wild radish (un-sprayed) dry weight (g/m^2) at Binnu as measured on 13 September from area of trial where no post-emergent herbicide was applied.

This research demonstrates what many other crop competition trials have demonstrated in the past. As crop density increases, crop biomass increases, and weed growth and seed set decreases (Figures 1 & 2). The concept is not new. The challenge is to do this in a practical and cost effective way.

Paired row sowing achieved using the Stiletto boot in this trial, has the potential to improve grain yield and competition with weeds.

The following data relates to a selection of 24 focus paddocks where the growers are cropping dominant with no livestock in the farming system. These focus paddocks have been monitored for twelve years as a part of a GRDC funded project to promote practical weed management.

Eight of the growers regularly practice harvest weed seed control (HWSC) either in the form of windrow burning or towing a chaff cart. On average, these growers practiced HWSC in 58% of years while achieving an average cropping intensity of 88.5% (Table 1). The frequency of HWSC is a little lower than expected, however the droughts of 02, 06 & 07 reduced the amount of harvest weed seed management due to a lot of paddocks either not harvest or not cropped. Also, some growers used HWSC for 5 years in a row by which time weed numbers were down so they cut back to burning lupin and canola windrows only.

Sixteen of the growers practiced HWSC in the form of narrow windrow burning in only 12% of years (i.e. Herbicides only group). This includes some whole paddock “cool burns”. If we remove these cool burns the amount of windrow burning drops to 8% of years. These growers maintained a cropping intensity of 88% (Table 1), almost identical to that of the plus HWSC group.

Table 1: Cropping intensity (%) and the percentage of years in which harvest weed seed control (HWSC) was practiced for 16 cropping dominant growers who rarely practice HWSC (Herbicides only) compared with eight cropping dominant growers who regularly practice HWSC.

	Herbicides Only	**Herbicides + Harvest Weed Seed Control**
% Crop	88	88.5
% of years using Harvest Weed Seed Control	12	58

The plus HWSC group have been on or very close to the “zero line” for ryegrass since 2008, demonstrating the benefits of removing weed seeds at harvest. This group started with 183 ryegrass /m^2 in 2001 compared to 125

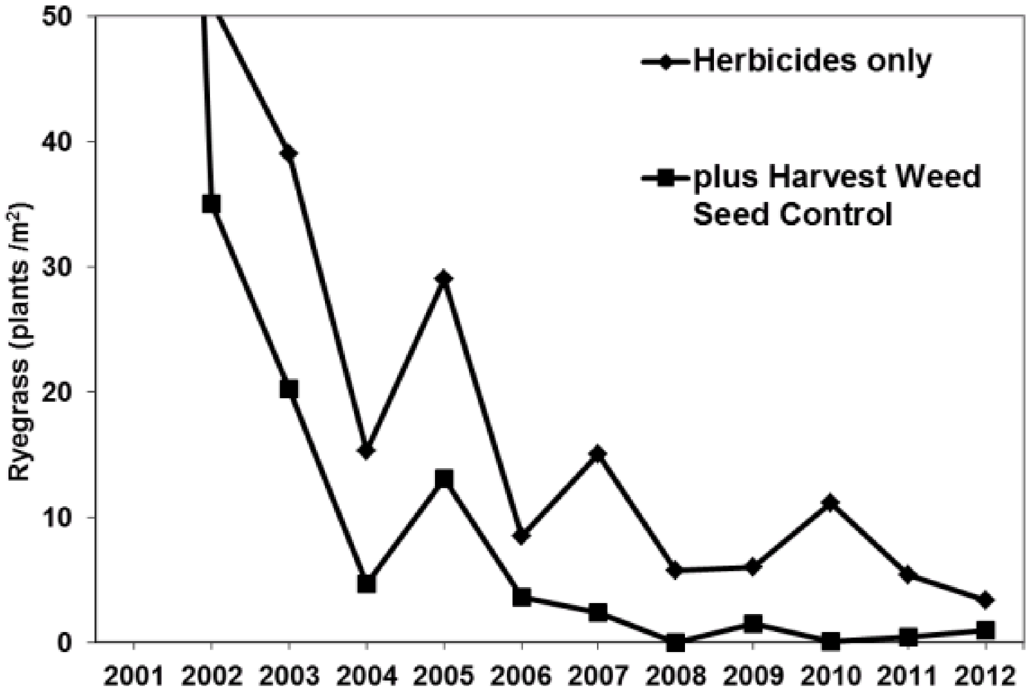

Figure 3: Average surviving ryegrass (in August) for 16 focus paddocks of cropping dominant growers who rarely practice harvest weed seed control (HWSC) (Herbicides only) compared with eight cropping dominant growers who regularly practice HWSC.

It is quite remarkable that growers have been so successful at eroding annual ryegrass seed banks of paddocks, while maintaining a cropping intensity of 88%. Many of the original messages about managing herbicide resistance in 1990's were built around the concept of phase farming, and rightfully so. However, these growers are now demonstrating that it is possible to crop at high intensity while eroding the weed seed bank despite some of the highest levels of herbicide resistance on the planet.

The growers who have had the most success at managing ryegrass populations are those who have practiced harvest weed seed control in the form of narrow windrow burning or by towing a chaff cart (figure 3). These growers started with a higher seed bank which was eroded to very low levels in just four years. In the eighth year of using this practice these growers had zero ryegrass in their focus paddocks and have averaged less than 1.5 ryegrass plants /m^2 ever since. Harvest weed seed control does not fix a system that is broken but can

Douglas. This research showed that we could correct four of our biggest constraints to sandplain farming in one fell swoop, namely

- Non-wetting soil – burying of non-wetting top soil
- Herbicide resistant weeds – burying of the seed bank regularly achieving 99% control
- Sub-soil acidity – deep burial of lime sand to correct acidity at depth.
- Compaction – deep ripping effect to a depth of 35cm (14”).

The ploughs that have been imported by growers are typically 8 to 14 furrow. Eight to ten furrow ploughs are typically pulled with a 300hp front wheel assist tractor with three point linkage. These machines can plough 2.5 to 3.5 ha / hour. The bigger ploughs are pulled with large wheeled or track tractors in the 400 to 500hp range. The 14 furrow plough is pretty much the biggest in the world, towed by the biggest tractors on the planet and can plough 5 to 5.5 ha / hour. The cost of ploughing for owner operator machines is approximately $70 to $100 /ha.

Research has shown average yield response to ploughing of 400 kg/ha across a range of crops. In many cases these yield responses are enduring for five years or more. Often the cost of ploughing is paid for in the first year and profit is made in the following years. Two large sandplain growers in the northern wheatbelt of WA are aiming to plough their entire farms. One has 12,500 ha and the other a 20,000 ha farm. These are successful growers who can see the income potential from adopting this technology.

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