Crop competition in chickpea and faba bean against sowthistle – Wagga Wagga 2017

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Key findings

- Decreasing row spacing and increasing plant density improved chickpea and faba bean competitive abilities.
- The improved competitive abilities improved yields and reduced sowthistle biomass and seed production, which will improve weed control in subsequent crops.

Introduction

Common sowthistle (*Sonchus oleraceus*) is a common weed in winter pulses. Sowthistle is difficult to manage as it produces a high number of wind-dispersed seed (up to 68,000/m^2) which can readily germinate on the soil surface throughout the year. Controlling sowthistle in pulse crops is difficult due to limited effective herbicide options and poor crop competitiveness. It has been demonstrated that enhancing crop competitiveness through increased crop density and reduced row spacing in cereals reduces weed biomass and seed production. In this experiment, we investigated whether competitiveness can be increased in chickpea and faba bean to reduce sowthistle biomass and seed production, and how this affects crop yield.

Site details

Location	Wagga Wagga Agricultural Institute
Soil type	Brown clay
Previous crop	Wheat
Fallow rainfall	140 mm (November 2016–March 2017)
In-crop rainfall and irrigation	222 mm (April 2017–October 2017)
Starter fertiliser	Grain legume starter 150 kg/ha (Nitrogen 0: Phosphorus 13.5: Potassium 0: Sulfur 6.5)
Soil analysis	see Table 1

Treatments

Varieties	Chickpea: PBA Slasher⊕ Faba bean: PBA Samira⊕
Row spacings	23 and 46 cm
Crop densities	Chickpea: 20, 40 and 80 plants/m^2 Faba bean: 15, 30 and 60 plants/m^2 Each treatment was applied to weedy (sowthistle) and weed free plots
Sowing date (SD)	SD chickpea: 22 May SD faba bean: 25 May

Crop protection

Table 1. Soil characteristics of the 2017 experiment site at Wagga Wagga.

Characteristic	Depth	
	0–10 cm depth	10–20 cm depth
pH_{Ca}	5.3*	5.7*
Aluminium (KCl) (cmol(+)/kg	0.4	0.4
Nitrate NO_3 (mg/kg)	43.0	13.0
Ammonium N (KCl) (mg/kg)	5.0	2.0
Sulfur (mg/kg)	6.0	7.0
Phosphorus (Colwell) (mg/kg)	83.0	23.0
Organic carbon (%)	1.3	0.6

* pH following amelioration with lime at 3 t/ha

Results

Chickpea

Narrow row spacing (23 cm) reduced sowthistle biomass/m² and seed production/m² by 55% and 12% respectively when compared with the wider row (46 cm) treatment (figures 1 and 2). However, sowthistle plant height and seed heads/plant did not significantly differ between narrow or wide rows. Increasing crop density reduced sowthistle plant height, biomass, seed heads/plant, seeds/plant and seeds/m² at both row spacing treatments.

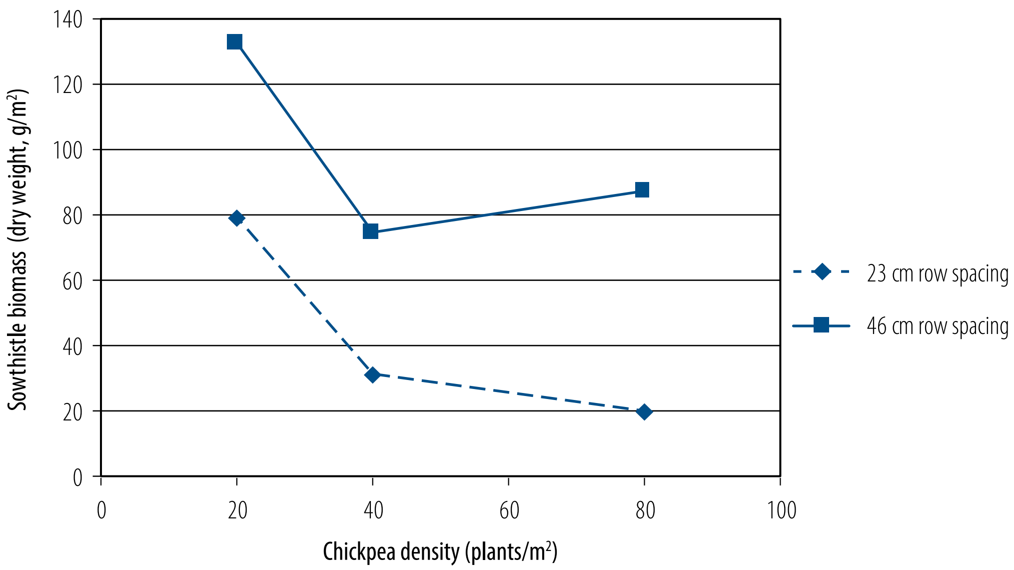

Figure 1. Reduced sowthistle biomass with increased chickpea density at 23 cm and 46 cm row spacing.

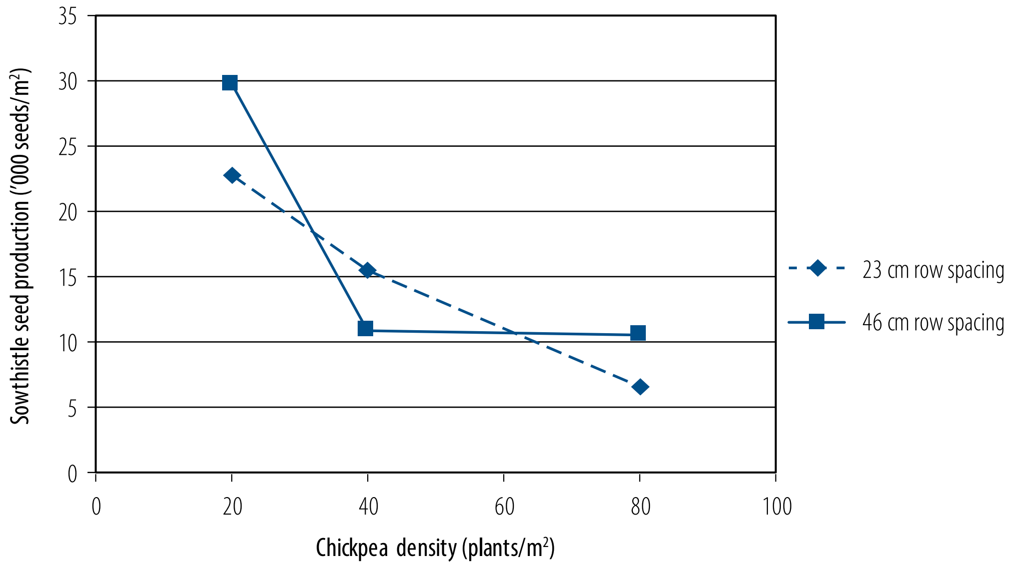

Figure 2. Reduced sowthistle seed production with increased chickpea density at 23 cm and 46 cm row spacing.

Greater harvest yields were attained with narrow row spacing. High chickpea densities resulted in a 44% higher harvest yield than wide row spacing. Plant density had a lesser effect on the yield at the wider row spacing (Figure 3).

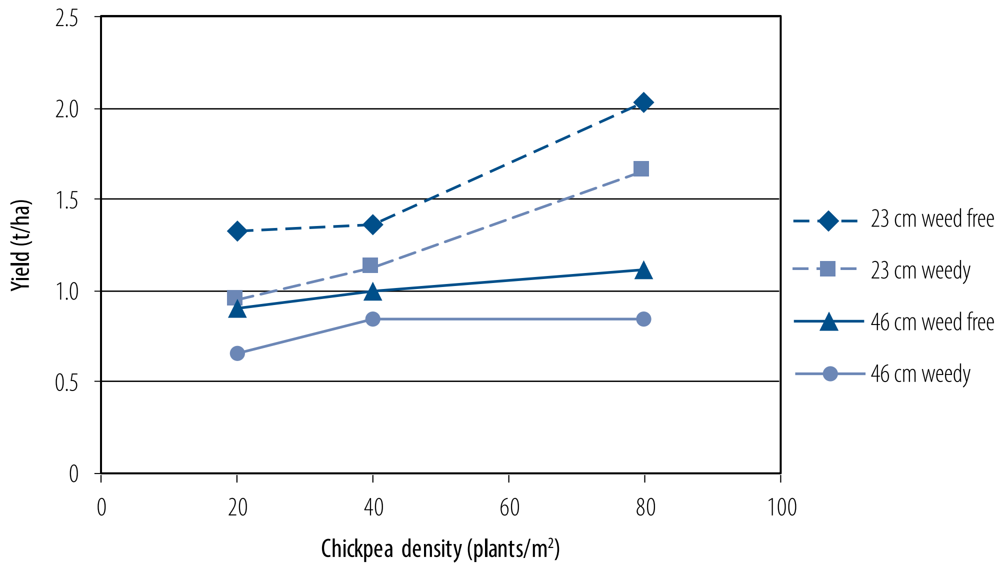

Figure 3. Yield response of chickpea with increasing density across wide and narrow row spacing in weedy (sowthistle) and weed free plots.

Faba bean

As with chickpea, increasing the plant density reduced sowthistle biomass and seed production. Sowthistle biomass/m^2 and seed produced/m^2 were reduced by 16% and 26% respectively using narrow row spacing when compared with wide row spacing (figures 4 and 5). Higher faba bean populations reduced weed plant height and biomass in both row spacing treatments. Additionally, the highest crop density tested (60 plants/m^2) significantly reduced sowthistle seed heads/plant, seeds/plant and seeds/m^2 compared with the lowest density (15 plants/m^2).

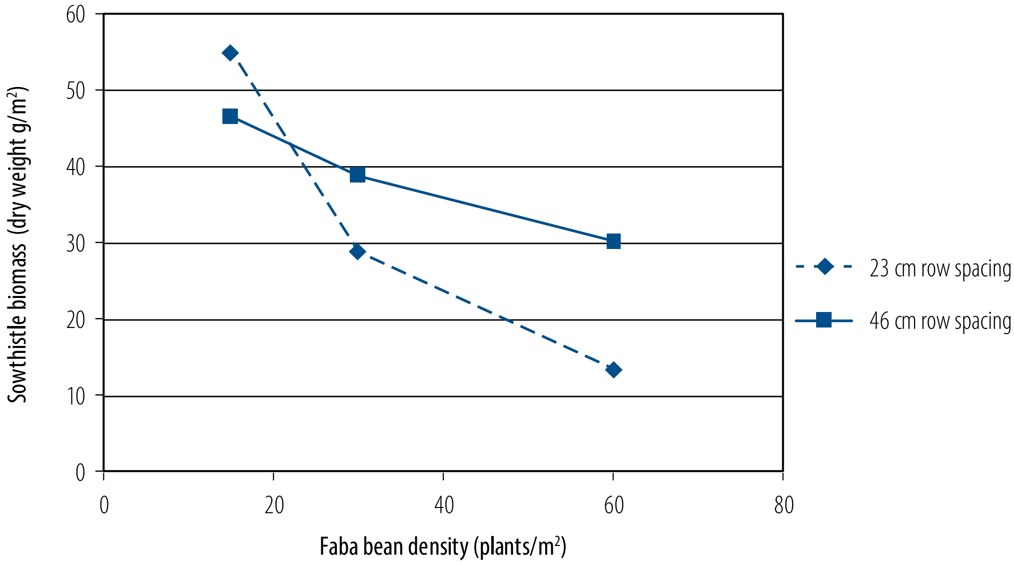

Figure 4. Reduced sowthistle biomass with increased faba bean density at 23 cm and 46 cm row spacing.

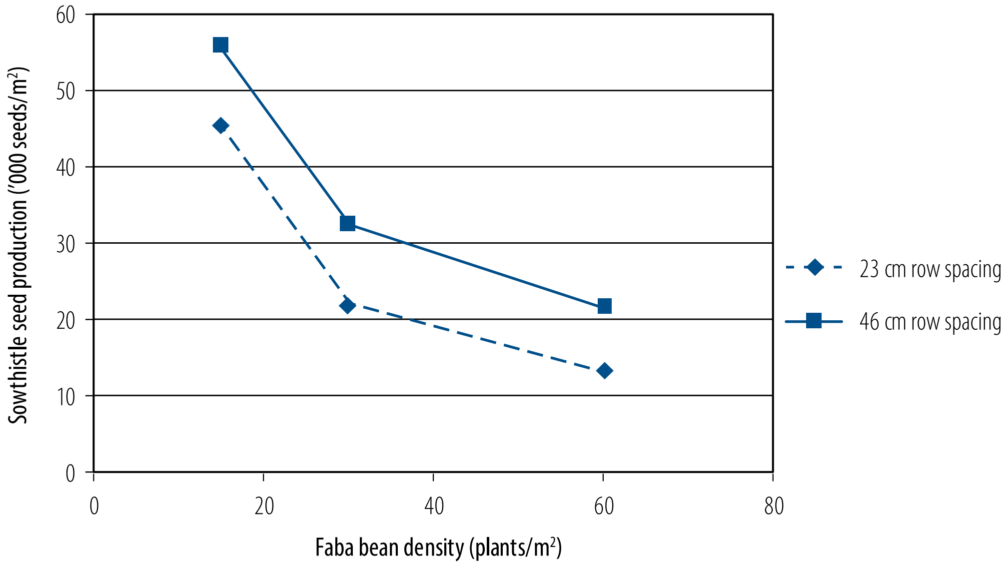

Figure 5. Reduced sowthistle seed production with increased faba bean density at 23 cm and 46 cm row spacing.

Higher faba bean yields were produced with narrow row spacing. The greatest differences were at higher plant densities (36% higher yield at 60 plants/m^2). Conversely, plant density did not significantly affect yield in the wider row spacing (Figure 6).

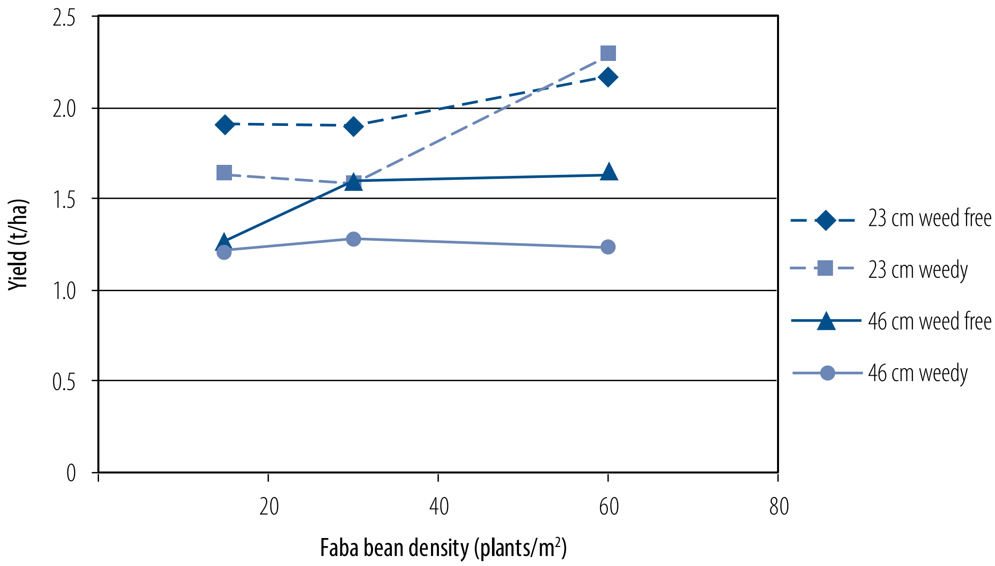

Figure 6. Yield response of faba bean with increasing density across wide and narrow row spacing in weedy (sowthistle) and weed free plots.

Conclusion

- Crop competition in chickpea and faba bean can be improved by increasing plant density and using narrow row spacing.
- In both faba bean and chickpea experiments, increasing crop populations resulted in fewer weed seeds/head. However, there were no differences in seed number/head between the wide- and narrow-row treatments in both experiments.
- Higher faba bean and chickpea populations resulted in lower sowthistle height, biomass, seed heads/plant, seeds/plant and seeds/m^2. Narrow-row spacing in both crops also significantly reduced sowthistle biomass and seeds/m^2.

Acknowledgements

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