GOA Trial Site Report

Wheat - improving confidence in high plant populations as a weed control tool in lower rainfall environments.

Trial Code:	**GOWE06320-1**
Season/Year:	Winter 2020
Location:	'The Wilgas', Nyngan
Collaborators:	Greg Moody

Keywords

GOWE063, Wheat, plant populations, competition, varieties

Take home messages

Increasing sowing rates increased resultant crop populations and assumedly weed competition, varieties that reached peak biomass earlier may be better choices in paddocks where weeds are a problem.

Increasing sowing rates and crop populations did not negatively impact yields

Increasing sowing rates and crop populations did not result in higher screenings.

Background

The improvement in weed management through enhancing crop competitiveness through decreasing row spacing and increasing plant populations is well documented. However, a key barrier to adoption, particularly in marginal yield/ rainfall environments, is perceived yield instability and risks for lowering of grain quality (e.g. screenings and retention). Furthermore, decreasing row spacing can also impede trash flow which goes against production systems increasingly focussed on maximising stubble retention to maximise water use efficiency. Additionally, there are increases in costs for machinery with narrower rows and/or increased seed rates.

Recent research such as US00084, UWA0071/2, has also demonstrated changes in crop competitiveness through variety and crop choice that requires some further regional validation against standard district practices or commonly grown varieties. However, it can be argued seeding rates will be the most easily changed and more readily adopted by growers as opposed to reduced row spacing.

The proposed approach will focus on the impact on yield and grain quality of increasing crop competitiveness through seed rate and crop choice focusing on variety.

Aims

Investigate if increasing sowing rate impacts on yield and grain quality of a range of varieties common to the GOA region.

GOA Trial Site Report

Investigate any interactions between population and variety on crop biomass as a measure of crop competition

Methods

Trial Details							
Trial Establishment Date	Autumn 2020						
Sowing configuration	275 mm row spacing, DBS, 150 kg/ha Urea, 100 kg/ha MAP						
Paddock history	2019 wheat		**Soil test**	Nitrogen (kg/ha)	Colwell P (ppm)	Sulfur (ppm)	
			0-10cm	34	58	5	
			10-90cm	125			
Sowing timings	Time of sowing		Harvest	Target the later sowing to be more than 3 weeks outside the latest timing as recommended by the NSW DPI Winter crop variety sowing guide			
	Ideal	28/4/2020	30/10/2020				
	Late	29/5/2020	9/11/2020				
Varieties and Target plant pop (plant/m²): a selection of quicker varieties to suit later sowing common to the region				Target plant population and sowing rate (kg/ha)			
	Variety	**Habit**		**30**	**70**	**110**	**150**
	Beckom	Short plant type		11	27	47	72
	Condo	Tall plant type		14	35	61	93
	Coolah	Tall plant type		10	25	43	66
	Mustang	Medium plant height		10	25	44	68
	Scepter	Medium plant height		13	34	59	91
	Spitfire	Medium plant height		14	37	64	99
	Suntop	Tall plant height		14	37	65	99
	Flanker	Tall plant height		15	38	66	100
Trial design	Type: small plot (~12m x 2m) Design: split randomized block Replication: 4		Analysis ASREML – randomized complete block. Tested to a 95% confidence interval				
Treatment related observations and measurements	• Plant establishment • Vegetation index (2) NDVI • Grain yield and quality						

Results

Plant establishment: for most varieties, establishment achieved close to the targeted population (Figure 1). In all cases each population established within each variety was significantly higher or lower than the other populations established.

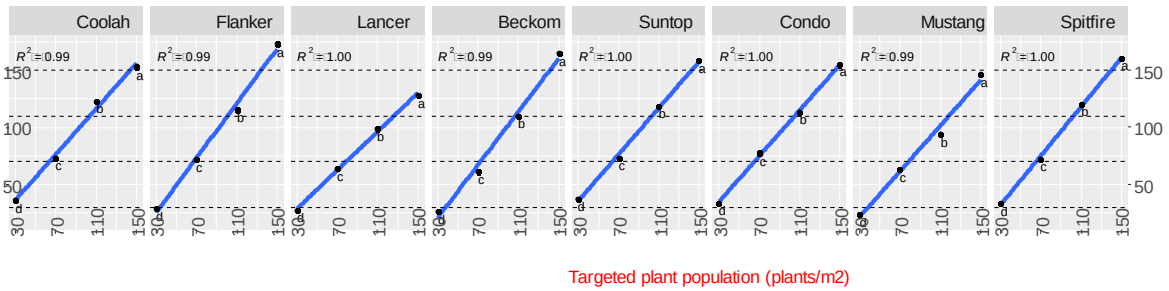

Figure 1. Plant establishment, actual against targeted, horizontal dashed lines are target of 30, 70, 110 and 150 plants/m2. Treatments with the same letter within a variety AND timing are not significantly different.

Vegetation Index: For all varieties vegetation index increased with plant population (**Figure 2**). Beckom and Mustang had lower early vigour than other varieties. Condo and Spitfire had the highest vigour at the lowest population. Suntop and Spitfire did not show increased VI at populations above 70 plants/m2.

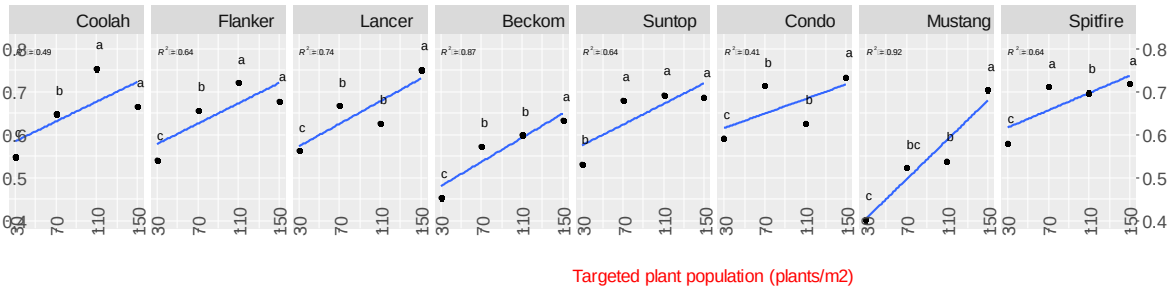

Figure 2. Vegetation index (NDVI) by variety and population (plants/m2). Treatments with the same letter within a variety are not significantly different. Assessed 49 days after sowing.

Yield: For 5 of the 8 varieties, increasing population had little or no effect on final yields, sowing at the higher rates did not cause any decrease in yields (**Figure 3**). Low populations of Coolah, Beckom and Suntop tended to have lower yields.

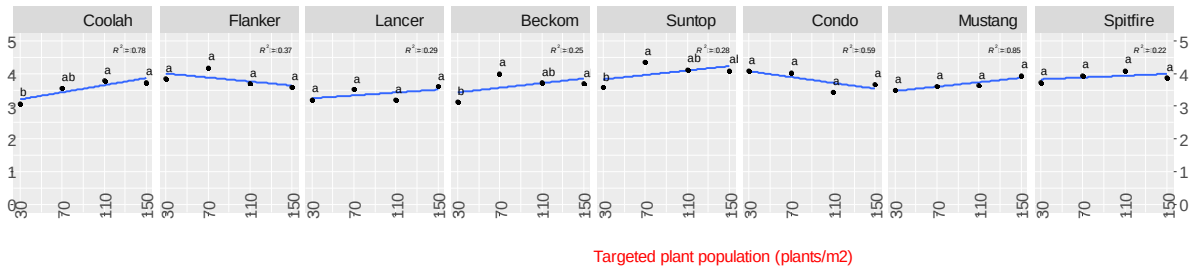

Figure 3. Yield (t/ha) by variety and population (plants/m2). Treatments with the same letter within a variety are not significantly different.

Screenings: For all varieties except for Suntop, screenings either did not change or decreased with increasing populations (Figure 4). Suntop was close to the threshold of 5% screenings regardless of population. Screenings in Coolah, Condo, Beckom, Condo and Mustang all tended to decrease with increasing populations.

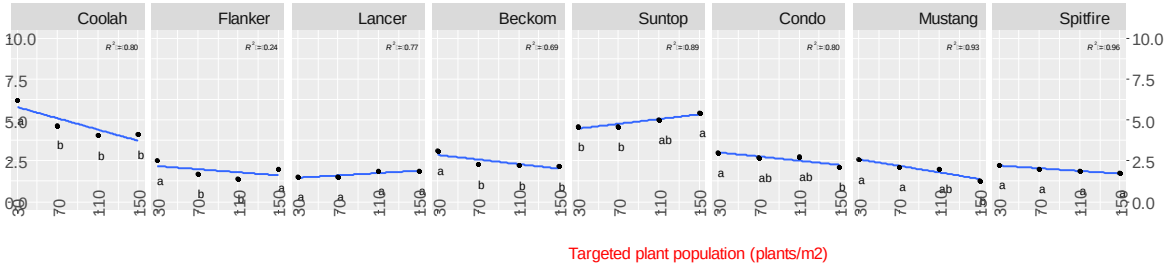

Figure 4. Screenings (%) by variety and population (plants/m2). Treatments with the same letter within a variety are not significantly different.

Discussion

Increasing populations increased the vegetation index (which may be considered a proxy for crop competition) regardless of variety. For the varieties and the populations tested this tended to be a linear relationship. This suggests that growers may consider increasing sowing rates of their existing varieties to increase populations and increase weed competition.

These was a considerable difference between varieties in early season vigour. And growers with problem weed paddocks may consider switching to a variety that displays higher levels of early vigour.

Increasing populations had little bearing on screenings, and this appeared to be more variety driven.

Conclusions

Increasing sowing rates in all varieties tested this would likely increase crop competition.

Some varieties display higher levels of crop competition at the same population and growth stage.

Increasing sowing rates did not negatively impact yields or grain quality in terms of screenings. In fact, evidence in this trial suggests quite the opposite, yields improved, and screening decreased with higher sowing rates.

Acknowledgements

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GOA Trial Site Report

Appendix

Variety	Target population	Plant establishment (plants/m2)			Vegetation index (June)			Yield (t/ha)			Screenings (%)		
		p.v.[1]	s1[2]	s2[3]	p.v.[1]	s1[2]	s2[3]	p.v.[1]	s1[2]	s2[3]	p.v.[1]	s1[2]	s2[3]
Beckom													
	30	26.0	j	d	0.24	o	c	3.1	gh	b	3.1	e	a
	70	61.1	i	c	0.31	mn	b	4.0	abcd	a	2.3	fghi	b
	110	110.0	efg	b	0.36	jklm	b	3.7	abcdefgh	ab	2.2	fghi	b
	150	164.5	ab	a	0.42	fghi	a	3.7	abcdefgh	ab	2.2	fghij	b
Condo													
	30	34.0	j	d	0.34	klmn	c	4.1	abcd	a	3.0	e	a
	70	77.5	h	c	0.48	cdef	b	4.0	abcd	a	2.7	efg	ab
	110	113.6	def	b	0.48	cde	b	3.4	defgh	a	2.8	ef	ab
	150	155.0	bc	a	0.62	a	a	3.7	abcdefgh	a	2.1	fghij	b
Coolah													
	30	36.4	j	d	0.30	n	c	3.1	h	b	6.2	a	a
	70	73.4	hi	c	0.41	ghij	b	3.6	bcdefgh	ab	4.7	cd	b
	110	123.0	de	b	0.54	b	a	3.8	abcdefg	a	4.1	d	b
	150	152.7	bc	a	0.50	bc	a	3.7	abcdefgh	ab	4.1	d	b
Flanker													
	30	28.6	j	d	0.30	n	c	3.8	abcdef	a	2.5	efgh	a
	70	71.8	hi	c	0.41	ghij	b	4.2	ab	a	1.7	ijk	b
	110	115.5	de	b	0.50	bcd	a	3.7	abcdefgh	a	1.4	k	b
	150	173.0	a	a	0.49	bcde	a	3.6	bcdefgh	a	2.0	ghijk	ab
Lancer													
	30	27.5	j	d	0.29	no	c	3.2	efgh	a	1.5	jk	a
	70	63.4	hi	c	0.37	ijkl	b	3.5	bcdefgh	a	1.5	jk	a
	110	98.6	fg	b	0.38	hijk	b	3.2	fgh	a	1.9	hijk	a
	150	128.2	d	a	0.49	bcde	a	3.6	bcdefgh	a	1.9	hijk	a
Mustang													
	30	23.6	j	d	0.24	o	c	3.5	cdefgh	a	2.6	efg	a
	70	63.0	hi	c	0.29	no	bc	3.6	bcdefgh	a	2.1	fghij	a
	110	93.9	g	b	0.32	lmn	b	3.6	bcdefgh	a	2.0	ghijk	ab
	150	146.1	c	a	0.41	ghij	a	3.9	abcde	a	1.3	k	b
Spitfire													
	30	33.4	j	d	0.33	lmn	c	3.7	abcdefgh	a	2.2	fghi	a
	70	72.5	hi	c	0.41	ghij	b	3.9	abcd	a	2.0	ghijk	a
	110	120.2	de	b	0.54	b	a	4.1	abcd	a	1.9	hijk	a
	150	160.5	abc	a	0.53	bc	a	3.9	abcde	a	1.7	ijk	a
Suntop													
	30	37.5	j	d	0.30	no	b	3.6	bcdefgh	b	4.6	cd	b
	70	73.4	hi	c	0.39	ghijk	a	4.3	a	a	4.6	cd	b
	110	118.2	de	b	0.44	efgh	a	4.1	abc	ab	5.0	bc	ab
	150	158.2	abc	a	0.44	defg	a	4.1	abcd	ab	5.4	b	a
	lsd	16.4	na	na	0.06	na	na	0.7	na	na	0.7	na	na

[1] predicted value
[2] values with the same letter for each variable are not significantly different
[3] values with the same letter for each variable within each VARIETY only are not significantly different