Competitive wheat seeding systems for weed management and profit at Binnu in 2013

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Summary

- Magenta yielded higher than Mace in both seeding systems
- Single row yielded higher than twin row at Binnu, also looked much healthier (better) throughout season. This has not been a consistent observation in other research trials. Likely cause is poor P nutrition due to fertiliser placement in twin row and low P site.
- Increasing seeding rates reduced the yield potential of Magenta. In contrast, plant densities of 150 plants/m^2 were the most productive for Mace.

Background

Reducing row spacing can improve competitiveness of a system against weeds and increase productivity through better utilisation of the resource, however there are implications eg stubble management, cost. Ribbon seeding or twin rows may increase the competitiveness of a crop and its productivity through effectively reducing row spacing. The system will be impacted by agronomy of wheat varieties eg seeding rates, fertiliser placement and variety. This study is one component of a series of experiments conducted in 2012 and 2013 at Binnu and Eradu.

Aim

Identify if twin row seeding systems and adjusting seeding rate will

1) Increase the competitive ability of wheat in weedy situations and reduce weed seed set
2) Increase the profitability of wheat production through increased yield and reduced costs of inputs

Methodology

- 2 varieties sown using 2 different seeding systems
- Sown at 3 different seeding rates

Trial Details

Location: Binnu (NAG Trial Site)
Soil Type: Yellow sand
Rain: January to April – 80mm; May to October – 162mm

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
33	5.8	41.4	0.2	41.8	6.6	26.4	52.6	22.4	11.8	0	0.4

Plot Size: 15m x 1.54m
Number of Plots: 48 (24 treatments x 2 reps)
Variety: Mace, Magenta
Seeding System: Twin row Stiletto boots, single row Super Seeder points
Target plant population: 75, 150, 300 plants/m^2 (30, 60, 120 kg/ha respectively)
Seeding Date: 9th May
Fertiliser (Rate/ha): 9th May – 100kg Agstar Extra, 50kg Urea
11th June – 60kg Urea
Chemical (Rate/ha): 9th May – 200ml Talstar, 100ml Dominex, 1.5L Treflan, 2L Sprayseed
29th May – 670ml Velocity + 1% Hasten
Harvest: 24th October

Results

Seeding efficiency declined with increasing plant density. At the target plant population of 75 plants/m^2, the efficiency of seeding was close to 100%. However at the highest targeted plant density of 300 plants/m^2, 190 plants/m^2 established. This is an efficiency of 60%.

Seeding efficiency did not improve with twin rows compared to single rows for the targeted plant densities used in the experiment. However, at the target plant density of 150 plants/m^2, Magenta established more plants than Mace (Table 1).

The tillering capacity of Magenta was greater than that of Mace. Magenta had significantly more heads than Mace (Table 1). Head numbers were significantly higher using a single row system compared to a twin row system with Magenta, but no difference between systems for Mace (Table 1). The increased tillering capacity of Magenta was evident by the increased number of head/plant of Magenta compared to Mace at the lowest target plant population (Table 1).

Table 1: Plant and head numbers (#/m^2) and heads/plant (#/plant) for Mace and Magenta sown using a single row or twin row at 75, 150 and 300 targeted plant density (TPP).

Variety	Seeding system	Targeted plant density *(Figures in brackets are seeding rates kg/ha)*								
		75 *(30)*	**150** *(60)*	**300** *(120)*	**75** *(30)*	**150** *(60)*	**300** *(120)*	**75** *(30)*	**150** *(60)*	**300** *(120)*
		Plant counts (#/m^2)			**Head numbers (#/m^2)**			**Heads/ plant**		
Mace	Single row	72	119	196	115	140	171	1.6	1.2	0.9
	Twin row	64	106	185	99	146	203	1.5	1.4	1.1
Magenta	Single row	76	130	183	170	194	208	2.3	1.5	1.1
	Twin row	75	126	196	135	171	219	1.8	1.4	1.1
		P-value	LSD		P-value	LSD				
Variety		0.029	6		<0.001	8				
TPP		<0.001	8		<0.001	10				
Variety.System		0.043	9		0.005	11				
System.TPP					<0.001	13				
CV		8%			8%					

The greenness (NDVI reading) of plants was measured using a Greenseeker on the 10th July. Magenta (0.3656) was significantly greener that Mace (0.2773) and the single row (0.3592) were significantly greener than the twin row (0.2836) (Figure 1). This corresponds to the visual observations at the trial throughout the year. The twin row seeding system was less vigorous than the single row seeding system. However this does not reflect the observations in 2012 at Binnu and 2013 at Eradu.

Soil test results indicate the site was low in phosphorus (P colwell 4, PBI 38). The twin row system placed fertiliser in between the rows. Reduced availability of the phosphorus may be an explanation for the poor vigour of the twin row seeding system at Binnu.

Magenta was significantly higher yielding than Mace at each seeding rate (Table 2). Overall, Magenta yielded 1.26 t/ha while Mace yielded 0.93 t/ha. Single row system yielded higher at 1.28 t/ha than the twin row system at 0.90 t/ha. Poor nutrition due to seed placement is the likely factor. Magenta was higher yielding at the lowest plant density (75 TPP), while the highest yield for Mace

was at the plant density of 150 plants/m^2 (Table 2). Screenings were significantly higher for Magenta than Mace but declined with increasing plant density of Mace (Table 2).

Magenta was more profitable due to higher yields although high screenings led to downgrading to AGP1. It was able to utilise the late rains due to its longer maturity. Mace had low screenings which enabled it to be in the Australian Hard grade, but its yields were simply lower than Magenta's. Average protein levels were 13.9% for Mace and 14.6% for Magenta.

There were limited weeds establishing at the trial site in 2013. The dry winter rainfall did not encourage late germinating radish plants. The competitiveness of the seeding systems for weed control was not assessed. Spray drift across one rep of the trial resulted in analysis only on two replicates.

Figure 1: Mace at 150 target plant population – twin row (Left) vs single row (Right)

Table 2: Grain yield and screenings for Mace and Magenta sown using a single row or twin row at 75, 150 and 300 targeted plant density.

Variety	Seeding system	Targeted plant density (*Figures in brackets are seeding rates kg/ha*)					
		75 *(30)*	**150** *(60)*	**300** *(120)*	**75** *(30)*	**150** *(60)*	**300** *(120)*
		Grain Yield (t/ha)			**Screenings (%)**		
Mace	Single row	0.968	1.311	1.093	6.4	3.9	3.0
	Twin row	0.687	0.855	0.624	4.7	4.8	2.6
Magenta	Single row	1.605	1.442	1.267	8.5	7.1	8.3
	Twin row	1.124	1.124	0.999	7.2	7.8	7.5
		P-value		LSD	P-value		LSD
Variety		<0.001		0.890	<0.001		0.9
System		<0.001		0.089			
TPP		0.006		0.109	0.049		1.1
Variety.TPP		0.009		0.155	0.036		1.5
CV		14%			25%		

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