Effect of sowing date, nitrogen rate and timing on grain yield and quality of six wheat varieties - Merriwagga 2014

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Introduction

Varieties can differ in their ability to yield at various sowing dates. The same goes for their response to various rates of nitrogen and how they turn that nitrogen into yield and protein. This trial was designed to measure the influence of sowing date and nitrogen rate across various types of wheat varieties.

Site details

Soil type:	Red sandy loam
Sowing date:	TOS 1: 1st May, 2014 and TOS 2: 29th May, 2014
Available N at sowing:	36 kg/ha (0-60 cm)
Previous crop:	Bolac wheat
Rainfall:	160 mm April–October + 125 mm December–March

Treatments

6 wheat varieties	EGA-Gregory, Dart, Lancer, Spitfire, Sunguard, Suntop
2 nitrogen (N) timings	N1: At sowing N2: late tillering to first node stage
5 nitrogen rates	N1 Rates: 0, 20, 40, 80, 160 kg/ha N2 Rate: 40 kg/ha

Results

Sowing early at TOS 1 resulted in an average yield across all varieties and N rates of 2509 kg/ha. TOS 2 yielded 1926 kg/ha (LSD = 94 kg/ha). Spitfire, EGA Gregory, Suntop and Lancer were the highest yielding varieties in this trial as shown in figure 1.

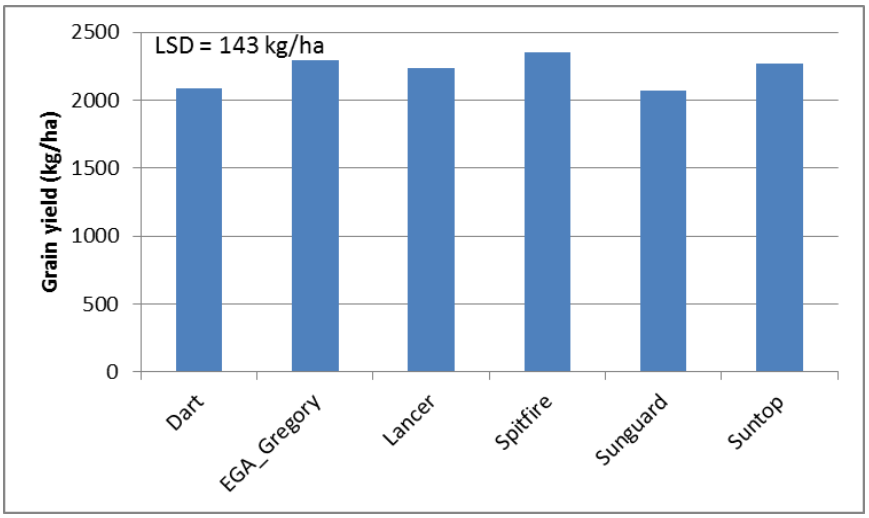

Figure 1: Grain yield of six wheat varieties averaged across sowing dates and nitrogen treatments at Merriwagga in 2014 (l.s.d. = 143 kg/ha).

Yield increased as nitrogen rate increased until the rate reached 160 kg N/ha, where yield then declined as shown in figure 2.

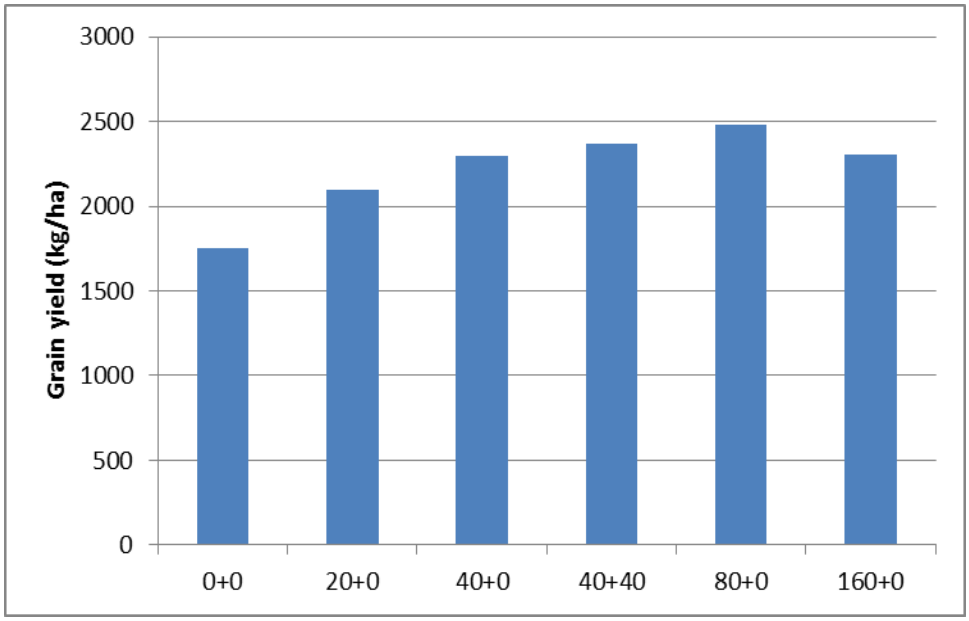

Figure 2: Grain yield of each nitrogen rate averaged across sowing dates and variety treatments at Merriwagga in 2014.

Yield responses measured as a result of nitrogen were larger at TOS 1 than TOS 2, as shown in figure 3.

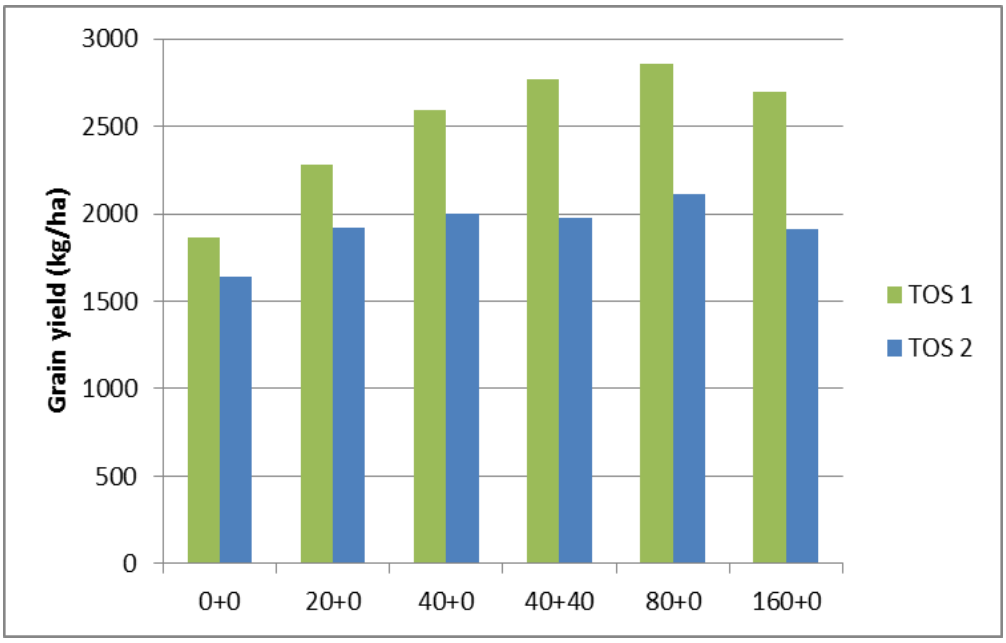

Figure 3: Grain yield of each nitrogen rate and sowing date averaged across variety treatments at Merriwagga in 2014.

As shown in table 1, the TOS 1 allowed a higher return on investment and profit than TOS 2. Given associated risks, applying 40 kg N/ha at TOS 1 gave the best combination of profit ($116.79) and return on investment (212%).

Table 1: Economic analysis of return on investment of nitrogen loss across TOS 1 and TOS 2 at Merriwagga in 2014.

Nitrogen treatment	Grain yield kg/ha		Cost of nitrogen (urea @ $550/t	Cost of application ($/ha)	Grain yield benefit kg/ha		Profit $/ha		Return on investment	
	TOS 1	TOS 2			TOS 1	TOS 2	TOS 1	TOS 2	TOS 1	TOS 2
0+0	1861	1640	0	0	0	0	0	0	0	0
20+0	2278	1917	24	7	417	277	$67.00	$34.10	216%	110%
40+0	2592	1999	48	7	731	359	$116.79	$29.37	212%	53%
40+40	2770	1973	96	14	909	333	$103.62	-$31.75	94%	-29%
80+0	2854	2112	96	7	993	472	$130.36	$7.92	127%	8%
160+0	2698	1912	192	7	837	272	-$2.31	-$135.08	-1%	-68%
				Average	**777**	**343**	**$ 83**	**-$ 19**	**130%**	**15%**

Summary

In summary this trial mirrors many other VSAP trials highlighting the importance of sowing early enough to maximise yield, and late enough to minimise the impact of frost. This trial achieved both of these targets.

The response to nitrogen was significant and showed that nitrogen was well warranted in this trial, and that the ideal target rate given profitability and return on investment was 40 kg N/ha. Applying all of the nitrogen at sowing was more efficient than splitting it between at sowing and in the crop. This may have been due to the drier end to the season not allowing the topdressed nitrogen to be available to the crop.

The difference in response to nitrogen between the two sowing times is interesting and important. This trial highlighted a much higher response when applying nitrogen to the earlier sowing time than the later sowing time. This is likely as a result of the later sowing time having a lower average yield potential, coupled with the fact that there was less in crop rain for the later sowing date to utilise the nitrogen for grain yield.

In terms of variety, whilst there was a difference in yield between varieties, the difference was not huge, and nitrogen responses were larger than varietal responses.

Acknowledgements

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