



Potassium strategies for wheat

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Purpose:	This trial examines potassium (K) rates as muriate of potash (MOP) products applied by a number of methods and the effects on growth and yield of Mace wheat.
Location:	WMG Trial Site: "Glen Ruff", Michael Brennan, Moora.
Soil Type:	Sandplain
Rotation:	2015 RR canola [GT50]; 2014 wheat; 2013 lupin.

Table 1. Soil Test Results

Depth	NO ₃ ⁻	NH ₄ ⁺	OC	P	PBI	K	S	Cu	Zn	pH _[Ca]	Al _[Ca]
0-10cm	16	4	0.69	18	18	24	7	0.39	0.78	4.7	1.5
10-20cm	8	3	0.42	22	26	18	5	0.40	0.31	4.5	4.9
20-30cm	4	2	0.20	7	29	15	7	0.26	0.20	4.4	7.1
30-50cm	3	2	0.00	2	0	16	12	0.00	0.00	4.5	5.3

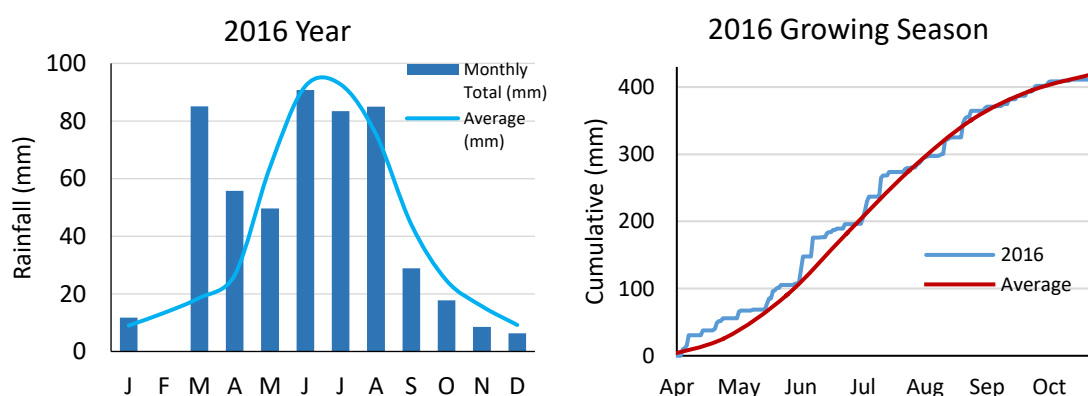


Figure 1. 2016 monthly rainfall data (mm) for Chelsea BOM Stn 9006, 10.5 km W of trial

BACKGROUND SUMMARY

As target yields increase, potassium supply is increasingly important for maintaining optimal productivity of cropping country. Sandplain soils, especially, show low extractable K levels. Potassium is often supplied as topdressed MOP before seeding. However, this may not be the most effective method of application since the K may be pushed into slower-wetting inter-rows by seeding bars. In this trial, we supplied K in different rates by topdressing MOP immediately after seeding PSPE, after emergence, or in a full NPK compound granule, Vigour, drilled at seeding with or without supplemental MOP to examine effects on germination and emergence and later grain production.

TRIAL DESIGN

Plot size: 10 x 1.8 m
Machinery use: Small plot seeder with knife points and press wheels
Repetitions: 3
Crop type and varieties used: Mace wheat
Seeding rates and dates: 14/05/2016 at 80 kg/ha

Table 2. Fertiliser application and treatments

Trt	Drilled with seed	K PSPE	K 4WAS	Totals:	K	N	P	S
1	85 MAPSZC				0	90	15	15
2	108 Vigour, 10 MAPSZC				13	91	15	15
3	140 Vigour				17	91	15	16
4	140 Vigour, 25 MOP				30	91	15	17
5	140 Vigour	25 MOP topdress			30	91	15	17
6	140 Vigour		25 MOP topdress		30	91	15	17
7	140 Vigour, 50 MOP				42	91	15	17
8	140 Vigour	50 MOP topdress			42	91	15	17
9	140 Vigour		50 MOP topdress		42	91	15	17
10	140 Vigour, 75 MOP				55	91	15	17
11	140 Vigour	75 MOP topdress			55	91	15	17
12	140 Vigour		75 MOP topdress		55	91	15	17

Note: All plots received MAXamFLO 70 L/ha in furrow at seeding, UreaPlus 100 kg/ha 4WAS and UAN 50 L/ha 8WAS for 90 kg/ha N total applied during the season.

RESULTS

Continual rainfall events through the growing season, following March and April falls that were well above average, set the region up for some very strong yields. Indeed, plots in the trial showed yields ranging from equivalent to 2.2 to 3.6 t/ha. On average, plots that received some K yielded greater than 2.8 t/ha, and differences between treatments were significant ($p=0.002$).

Broadly, yield increased relative to increased K input up to 30 kg/ha K, being around 0.5 t/ha greater than where nil K was applied. Thereafter, yield increase was minimal with increasing K rate up to 55 kg/ha, meaning the data had strong goodness-of-fit to a diminishing yield response curve ($R^2 = 0.99$, Figure 3).

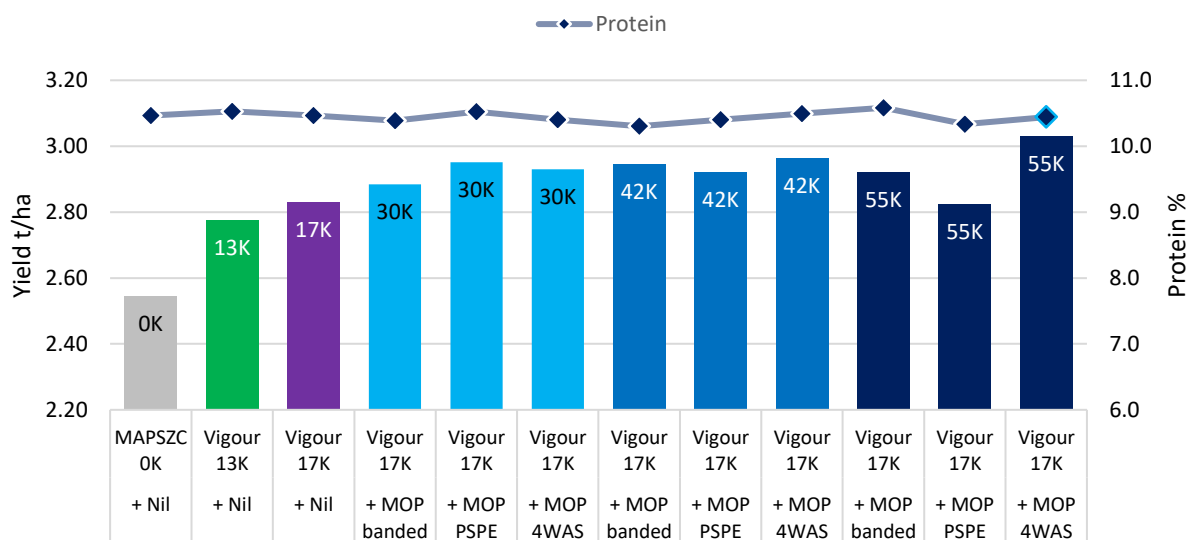


Figure 2. Wheat yield in response to different K fertiliser treatments. Numbers on columns show total K rate applied (kg/ha)

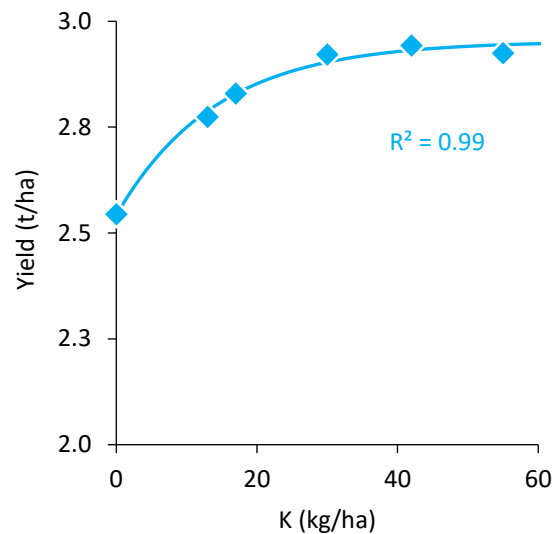


Figure 3. Average yield response to rate of K applied, Mitscherlich function fitted

Although yield differences were significant in response to the rate of K applied, neither the timing of application (seeding or 4WAS) nor placement (banded below the seed or topdressed) for found to have a significant effect on grain yield.

Grain quality analysis showed protein content to be very consistent at around 10.5% across all treatments, indicating that nitrogen, in split application, to a total of 90 kg/ha was efficiently utilised and maximised the yield potential of Mace wheat at the site. Combined with high hectolitre weights, above 80 kg/hL, and low screenings, grain produced from the trial indicatively met APW1 or APW2 delivery grades.

FINANCIAL ANALYSIS OF RESULTS

Gross margin analysis showed all but one treatment, 75 kg MOP topdressed PSPE, to improve returns compared with Nil K applied. This contrasts with the lowest PSPE application of MOP, 25 kg/ha, that resulted in the greatest increase in gross margin return of nearly \$60/ha. Application of MOP at 4 weeks after sowing was the most consistent method of increasing returns, regardless of rate. However, this may be a result of application timing coinciding with ideal rainfall events and the associated UreaPlus application at the same time as much as a response to broadcast K in itself.

It is worth noting the improvement in returns due to the application of the NPK compound without supplementary MOP. The Vigour granules alone improved yields to the point that many additional MOP applications did not produce enough additional grain to further improve the margin return.

However, considering at the overall gross margin in response to rate, optimal K rate is around 30 kg/ha. Applying this in the form of Vigour alone would require 250 kg/ha at seeding, providing also 30 kg/ha P. This amount would be in excess of budgetary and practical constraints for many yellow sandplain growers.

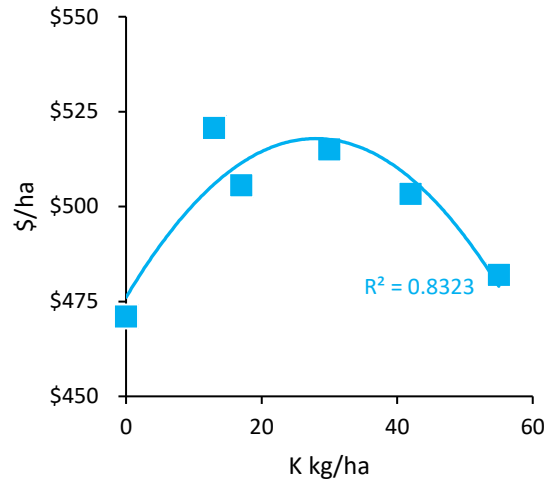


Figure 4. Average gross margin, net of all fertiliser cost, with increasing K application rate, Quadratic function fitted

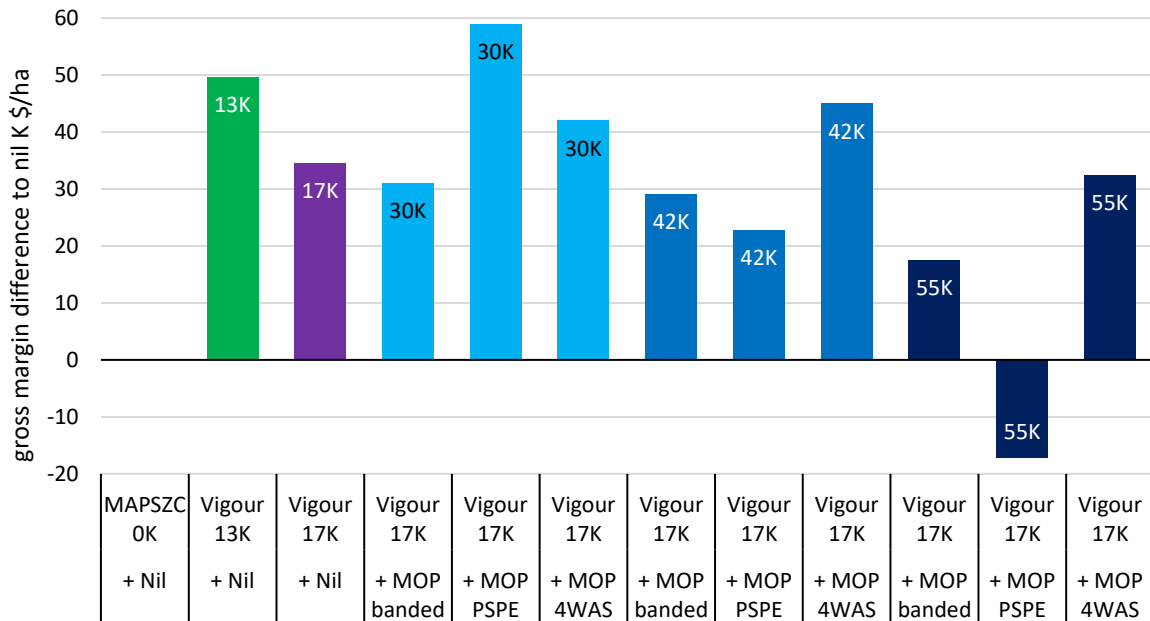


Figure 5. Increases in gross margin, net of all fertiliser costs, by the application of K treatments in the trial

CONCLUSIONS:

- Sandplain soil with Colwell K analysis lower than 30 mg/kg is highly likely to be responsive to K.
- Potassium applied at 13-17 kg/ha in the compound NPK+traces fertiliser, Vigour, banded below the seed improved yields compared to NP+traces compound alone, and yields were further enhanced by applying additional 12.5 kg/ha K as MOP.
- Optimised returns will depend fertiliser and grain prices at the time. In the present trial, the greatest increase in returns were seen with Vigour 140 kg/ha at seeding plus 25 kg/ha MOP applied PSPE.

ACKNOWLEDGEMENTS:

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Table 4. Fertiliser cost, wheat yield, grain quality and gross margin net of total fertiliser input

Trt	K	Source	Fert# \$/ha	Yield t/ha	LSD p<0.05	Protein %	Hecto litre	Scrngs %	Grade	Grain* \$/ha	Return s \$/ha
1	0K	-	\$142	2.54	a	10.5	80.4	1.2	APW2	\$613	\$471
2	13	Vigour	\$159	2.77	b	10.5	80.6	1.0	APW1	\$680	\$521
3	17	Vigour	\$176	2.83	bc	10.5	80.8	1.1	APW2	\$682	\$506
4	30	Vigour+MOP band	\$193	2.88	bcd	10.4	80.4	1.2	APW2	\$695	\$502
5	30	Vigour + MOP PSPE	\$193	2.95	cd	10.5	80.4	1.0	APW1	\$723	\$530
6	30	Vigour + MOP 4WAS	\$193	2.93	bcd	10.4	80.4	1.0	APW2	\$706	\$513
7	42	Vigour+MOP band	\$210	2.95	cd	10.3	80.5	1.2	APW2	\$710	\$500
8	42	Vigour + MOP PSPE	\$210	2.92	bcd	10.4	80.6	1.0	APW2	\$704	\$494
9	42	Vigour + MOP 4WAS	\$210	2.96	cd	10.5	80.2	1.1	APW1	\$726	\$516
10	55	Vigour+MOP band	\$227	2.92	bcd	10.6	80.9	1.2	APW1	\$715	\$489
11	55	Vigour + MOP PSPE	\$227	2.82	bc	10.3	80.2	1.2	APW2	\$681	\$454
12	55	Vigour + MOP 4WAS	\$227	3.03	d	10.4	80.4	1.3	APW2	\$730	\$503
LSD _{0.05}				0.18							
CV				0.04							

costs

Notes: All prices net delivered/received Kwinana and GST Exclusive

* Delivery grade \$/t Kwinana 14 December 2016: APW1 \$245; APW2 \$241

Total of all fertilizer products applied. March 2015 retail price (ex Kwinana)

CONTACTS DETAILS

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