

Chasing high yield in faba beans at Frankland River



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Key Messages

- PBA Amberley faba bean produced yields over 5 t/ha
- Faba bean did not respond to Phosphorus or Nitrogen inputs.
- Additional fungicide and nutrition treatments increased yield by 400 kg/ha – however treatments tested were not economically viable.
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Background

Growers in high rainfall zones are testing the value of higher inputs in cereals and canola. With faba bean being more readily adopted by high rainfall farmers we are interested in seeing if beans respond to higher inputs

We aim to determine if faba beans in the high rainfall zone respond to high rates of phosphorus, in-crop nitrogen and/or a complete/intensive nutritional and disease management package

Trial details

Table 1 Trial Details

Trial Location	Frankland-Cranbrook Road, Frankland River
Soil type	Sandy loam gravel
Sowing date	29 April
Sowing rate	228kg/ha PBA Amberley inoculated using TagTeam and Alosca Group EF rhizobia packed with the seed
Fertiliser	All plots received muriate of potash 100 kg/ha on May 20. See treatment tables for other fertilisers.
Herbicides & Insecticides	Pre-seeding: 700g/ha terbuthylazine (875g/kg) + 700g/ha simazine (900g/kg) + 700g/ha diuron (900g/kg) At seeding: 1.1kg/ha carbetamide (900g/kg) + 180g/ha flumioxazin (500g/kg) + 80mL/ha bifenthrin (250g/L) + 2.5L/ha glyphosate (570g/L) 25 May: 80mL/ha Ecopar (pyraflufen-ethyl 20 g/L) + 0.2% BS1000 18 June: 330mL/ha clethodim (360g/L) + 100g/ha butroxydim (250g/kg) + 1% MSO + 100mL/ha haloxyfop (520g/L) 14 Sep: 100mL/ha sulfoxaflo (500g/kg) + 80mL/ha alpha cypermethrin (100g/L) 27 Nov: 2L/ha diquat (200g/L) + 0.2% BS1000
Harvest Date	20 Dec

Table 2 CSBP soil analysis of Frankland site 2021

Depth		0-10	10-20	20-30	30-40
Colour		DKBR	BRGR	BRGR	GRBR
Gravel	%	55-60	75-80	75-80	75-80
Texture		1.5	1	1	1
Ammonium Nitrogen	mg/kg	7	< 1	< 1	< 1
Nitrate Nitrogen	mg/kg	61	12	6	4
Total Nitrogen	%	0.68	0.23	0.12	0.08
PBI		208.1	135.4	84.4	76.3
Phosphorus Colwell	mg/kg	86	38	19	13
DGTP	ug/L	21.73	18.51	6.44	< 5.00
Potassium Colwell	mg/kg	198	146	102	104
Sulfur	mg/kg	11.8	9.2	6.4	6.4
Organic Carbon	%	5.63	3.14	1.53	1
Conductivity	dS/m	0.146	0.063	0.032	0.032
pH Level (CaCl ₂)		5.3	5.4	5.3	5.4
pH Level (H ₂ O)		6.1	6.3	6.4	6.5
DTPA Copper	mg/kg	2.04	1.41	0.71	0.52
DTPA Iron	mg/kg	47.4	42	28.9	18.8
DTPA Manganese	mg/kg	3.81	1.16	0.51	0.25
DTPA Zinc	mg/kg	2.89	0.76	0.24	0.11
Exc. Aluminium	meq/100g	0.11	0.08	0.06	0.05
Exc. Calcium	meq/100g	15.21	5.86	2.95	1.94
Exc. Magnesium	meq/100g	1.61	0.7	0.39	0.38
Exc. Potassium	meq/100g	0.44	0.32	0.23	0.25
Exc. Sodium	meq/100g	0.1	0.05	0.04	0.04
Boron Hot CaCl ₂	mg/kg	0.97	0.51	0.3	0.31

Table 3 2021 monthly rainfall (mm) from DPIRD Frankland site (FR), Average rainfall from BOM Frankland site (009635).

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Apr-Nov	Annual
2021	2	62	26	99	92	88	136	105	86	87	62	6	693	851
Average	15	14	23	42	72	87	94	80	64	80	28	20	547	619

Table 4 Trial treatments

Treatment	Phosphorus (kg/ha)	Nitrogen (kg/ha)
1	10P	0N
2	10P	75N [#]
3	20P	0N
4	20P	75N
5	40P	0N
6	40P	75N
7	40P+Extra*	0N
8	40P+Extra	75N

*Extra plots received four extra fungicide applications and extra nutrition amounting to 27 kg N/ha, 3 kg P/ha and 16 kg K/ha plus micronutrients and seaweed extract

[#] Nitrogen topdressed as urea in 3 separate applications of 25 kgN/ha.

Table 5 Treatment sprays

Date	Normal	Extra fertiliser	Extra fungicide
May 24		Urea	
June 21		Urea	
July 2		Foliar Fertiliser Mix – see Tables 5 to 7	Procymidone 500 mL/ha
July 8	4 kg MnSO ₄ /ha + 2 kg ZnSO ₄ /ha	4 kg MnSO ₄ /ha + 2 kg ZnSO ₄ /ha	
July 22			Aviator XPro 600mL/ha
August 8	Aviator XPro 600mL/ha		
August 12			Spin Flo 500mL/ha
Sept 3			Miravis Star 1000mL/ha
Sept 14	Veritas 1 L/ha		

Table 6 Fertiliser products used in 'Extra' Treatments at Frankland River in 2021

	Cost per kg or L	Rate	\$/ha
Manutec Trace elements	\$ 23.00	50 kg/ha	\$ 1,150
Eco seaweed	\$ 52.00	0.7 g/ha	\$ 36.40
Powerfeed	\$ 7.87	225 L/ha	\$ 1,771

Table 7 Analysis of fertiliser products used in 'Extra' Treatments at Frankland River in 2021

Product	Element	Element %	Rate (kg/ha)	kg Nutrient/ha
Manutec Trace elements	S	6.29	50	3
	Ca	10	50	5
	Mg	3.62	50	2
	Mn	2.88	50	1.4
	Fe	2.73	50	1.4
	Cu	1.25	50	0.6
	Zn	1	50	0.5
	B	0.09	50	0.05
	Mo	0.0038	50	0.002
Eco seaweed	N	1	0.7	0.01
	P	0.1	0.7	0.001
	K	12	0.7	0.08
	Aminoacids	6	0.7	0.04
	PGR's	600ppm	0.7	0.0004
Powerfeed	N	12	225	27
	P	1.4	225	3
	K	7	225	16

Results

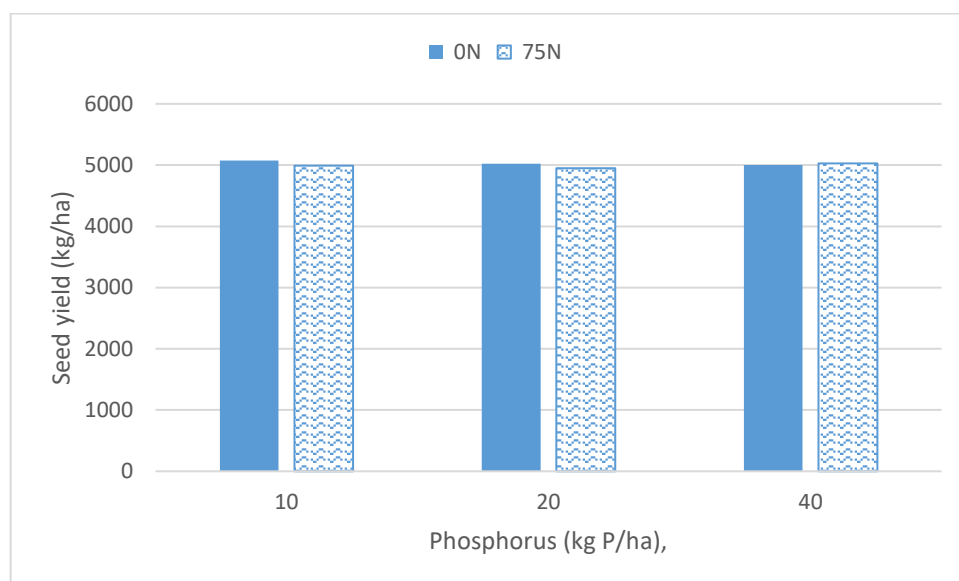


Figure 1 Seed yield response of PBA Amberley faba bean to phosphorus and nitrogen at Frankland River in 2021 (21ES04)

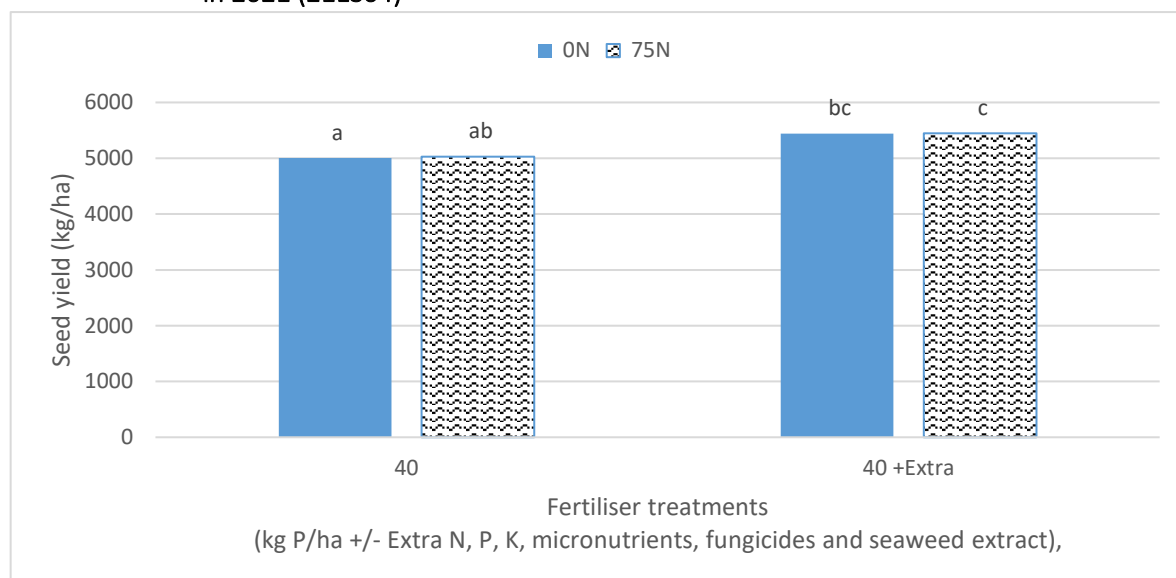


Figure 2 Seed yield response of PBA Amberley faba bean to nitrogen and Extra applications of N, P, K, micronutrients, fungicides and seaweed extract at Frankland River in 2021 (21ES04)

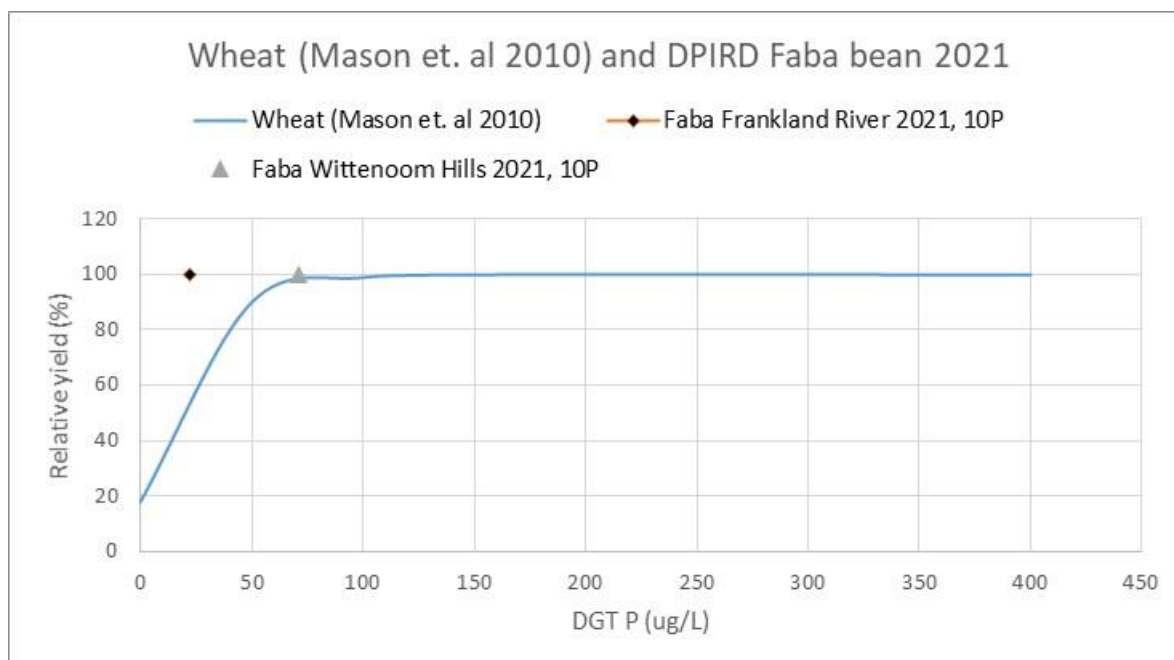


Figure 3 Relative yield of wheat (Mason et. al 2010) and faba bean in relation to soil P (DGT)

Comments

Rainfall in 2020 at Frankland was above average which caused waterlogging and flooding in the district. Fortunately, our trial site was well located and did not suffer from any waterlogging. The trial was sown on the 29th of April and emerged evenly. On May 25th the trial was sprayed with Ecopar which burned the top 2-4 leaves, but the crop recovered and grew out of the damage. By mid-June we could visually pick out 10P treatment plots with slighter less growth than plots with higher rates of applied P. By July 40P plots were visually better than plots with lower rates of applied P. However, from August onwards it was very difficult to discern treatment effects visually. Similarly, from June onwards we were not able to tell which plots had been treated with 75 kg N/ha.

Growth and pod set were excellent and by maturity it was difficult to discern between plots and almost impossible to walk down between the plots. Beans produced over 12 t/ha of biomass at maturity, producing over 300 kg/ha of nitrogen in the tops and we estimate around 150 kg N/ha in below ground biomass (Peoples *et. al* 2003, Peoples *et. al* 2017). We harvested in the seed around 200 kg N/ha, therefore we left around 100 kg N/ha in the tops and 150 kg N/ha in 'roots' for the following crops. If 50% of that is available in 2022 then total residual organic N (RON) in the paddock would be about 125 kg N/ha, equivalent to around 50 kg/ha of Bag N, with further mineralisation of RON in following years.

Seed yields were very high at 5 t/ha or more. Phosphorus and nitrogen treatments had no significant effect on total dry matter or seed yield. Recent research has suggested a new soil test for phosphorus (DGTP) may provide better predictions of likely response to P (Mason *et. al* 2010). We compared the response of beans to 10P (as we did not have a nil treatment) to that presented for wheat by Mason *et. al* 2010 (Figure 3), which indicated a P response was unlikely for wheat, and based on our observations in 2021 it appears unlikely for beans. It would be useful to gather more P response data of beans and soil tests to see if this observation holds true in other circumstances.

Our "extra" treatment which received four extra fungicide applications and extra nutrition amounting to 27 kg N/ha, 3 kg P/ha and 16 kg K/ha plus micronutrients and seaweed extract produced higher seed yields of around 5.4 t/ha compared to 5.0 t/ha for other treatments. As we used horticultural products from the local hardware store the 400 kg/ha of beans gained in our 'extra' treatments were nowhere near large enough to make the treatment economic but provides some insight into potential treatments to try in future experiments in high yielding situations.

References

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