SA Grain Legume Development and Extension Project



Summary of 2021 Field Trial Results



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Project management

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Project Investment

Grains Research and Development Corporation: project UOA2105-013RTX "Development and extension to close the economic yield gap and maximise faming systems benefits from grain legume production in South Australia"

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Cover image: Melrose salt tolerant lentil variety trial, 10 September 2021

INTRODUCTION

The project aims to deliver local development and extension to close the economic yield gap and maximise faming systems benefits from grain legume production in South Australia.

Over the lifeline of the project (2021-2025), the proposed investment will:

Average annual rainfall

- Address the current yield gap in grain legumes and drive its closure through supporting increased technical efficiency of growers with extension of best practice grain legume agronomy;
- Support grain growers and their advisers (100 per hub, 20 per spoke) in the target regions (Figure 1) to maximise system profitability by incorporating grain legumes in rotation;
- Drive and support sustainable expansion of the area grown to grain legumes; and
- A targeted 45% of growers adopt or intend to adopt new and novel practices emerging from linked proof-of concept and innovation research

30-year climatology (1981 to 2010)



Figure 1. Trial locations for SA Grain Legume hub and spoke sites in 2021, selected by collaborators to represent the range of environments and soil types across the state's legume cropping regions.

MELROSE

SITE SUMMARY

Melrose experienced below average rainfall throughout majority of the growing season in 2021. (Figure 2). Rainfall events during June were adequate for trial germination following sowing in late May. Good rainfall in July aided vegetative growth but was too early to aid reproductive development of flowers and pods. Cold conditions and frequent events below zero degrees Celsius during winter and early spring, couple with low rainfall, reduced flower and pod set potential. November rainfall was too late to benefit pod fill, as trials were harvest at crop maturity in late November. Average grain yield was 0.96 t/ha for lentil.







Figure 3. Minimum, maximum and average temperature recorded at the Melrose trials site in 2021.

Depth	NH₃-N	NO ₃ -N	Р	К	S	OC	EC	рН	рН	
(cm)			(mg/kg)			(%)	(dS/m)	(CaCl ₂)	(H ₂ 0)	
0-10	5	14	74	692	12.2	1.08	0.174	7.1	7.5	
10-30	2	5	24	424	5.5	0.72	0.173	7.3	8.0	
30-60	1	3	20	294	10.9	0.43	0.403	7.0	7.5	
60-90	2	2	20	204	29.5	0.19	0.776	7.4	8.0	
90-120	2	3	23	215	48.4	0.27	0.954	6.7	7.3	
Depth	Cu	Fe	Mn	Zn	В	Exc Ca	Exc Mg	Exc K	Exc Na	Exc Al
(cm)		-	(mg/kg)		-			meq/100g)		
0-10	1.86	27.6	41.02	1.51	0.80	9.06	2.26	1.22	0.25	0.02
10-30	1.57	15.4	10.90	0.46	1.07	12.18	3.84	0.84	0.43	0.06
30-60	1.33	15.0	7.45	0.34	1.05	11.78	4.58	0.56	1.11	0.03
60-90	1.02	13.8	5.99	0.37	1.00	10.18	4.75	0.38	1.94	0.03
90-120	0.93	13.7	8.06	0.69	1.62	10.40	4.69	0.41	2.60	0.03

Table 1. Soil characteristics (grey-brown clay loam to brown clay) for the trial site at Melrose, 2021.

LENTIL SALT TOLERANCE

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Aim: This trial aims to assess the yield potential of salt tolerant lentil varieties.

Methodology: Trial details are provided in Table 2.

Plots were harvested at crop maturity and grain yield was converted from kg/plot to t/ha.

Grain quality parameters, such as grain weight, screenings, and protein content, were assessed using harvested grain samples. Grain weight was determined by weighing 300 seeds and converting the weight to g/100seeds. Grain protein was assessed using a NIR grain analyser and a lentil protein calibration curve developed by SARDI. Screenings were assessed by shaking a 100 g grain samples over a 2 mm slotted sieve, with the portion below the sieved weighed and converted to percentage of sample less than 2 mm.

Data was analysed using a one-way ANOVA in Genstat 21st Edition.

Treatments/Varieties: PBA Bolt, PBA Hurricane XT, PBA Hallmark XT, GIA2002L-I, GIA2101L, 08H200L-11HHI3019-13SA-15BO01, 12H1305L-15HS3002, 14H152L-15HSHI2001.

Table 2. Trial details, including sowing and harvest date, at Melrose 2021.

Trial design	RCRD split plat demo
That design	
Replicates	3
Sowing date	26/5/21
Plant density	120 plants/m2
Row spacing	23 cm
Fertiliser	80 kg/ha MAP + Zn
Harvest date	22/11/21

Key messages

- Average lentil grain yield was 1.13 t/ha at Melrose, 2021.
- Varieties with improved salt tolerance had equivalent yield to PBA Hurricane XT.

Results and Discussion:

Lentil plots did not reach canopy closure due to dry autumn and spring conditions experienced in the growing season. All varieties, except for GIA2101L-I and 08H200L-11HHI3019-13SA-15BO01, reached 100% flowering by early September, while the latter varieties had only reached 50% flowering (data not shown).

Variety selection did not influence grain yield, with average grain yield of 1.13 t/ha at Melrose, 2021 (Table 3).

Grain quality parameters assessed were influenced by variety selection (Table 3). Grain weight reflects seed size from harvested grain. PBA Bolt (4.9 g) and 12H1305L-15HS3002 (5.0 g) had the largest seed size. GIA2101L (3.8 g) had the smallest seed size, with PBA Hurricane XT (4.0 g) second smallest. Percentage of screenings less than 2 mm differed between varieties. However, all varieties had screenings less than 4% and therefore all samples fall under then maximum limit for the highest visual grade lentil market category. Protein content within lentil varieties differed, with a range of 21-23%. Current whole or split grain lentil markets do not assess protein content of grain, as markets are based on visual quality standards. However, increasing demand for plant-based protein and development of local pulse protein fractionation manufacturing, may see the expansion of market opportunities for growers to sell lentil grain based on protein content, particularly where visual quality classifications cannot be met.

Variaty	Grain yield	Grain weight	Protein	Screenings
Variety	(t/ha)	(g/100 seeds)	(%)	(% grain <2 mm)
PBA Bolt	1.021	4.914	22.1	1.950
PBA Hurricane XT	1.185	3.989	22.7	0.850
PBA Hallmark XT	1.021	4.637	21.8	1.370
GIA2002L-I	1.322	4.344	21.2	0.787
GIA2101L	1.032	3.820	23.3	1.303
08H200L-11HHI3019-13SA-	1.234	4.612	23.0	1.367
15BO01				
12H1305L-15HS3002	1.177	5.009	22.4	1.507
14H152L-15HSHI2001	1.063	4.562	20.9	1.097
Average	1.13	4.49	22.2	1.279
LSD (P<0.05)	ns	0.1577	1.06	0.582

Table 3. Grain yield (t/ha) and grain quality parameters in response to lentil variety selection at Melrose, 2021. ns = not significant (P>0.05).