

Field Pea Varieties and Agronomy for Low Rainfall Regions

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RESEARCH

Break Crops

Searching for answers



Location: Minnipa Ag Centre

Rainfall
Av. Annual: 325 mm
Av. GSR: 242 mm
2010 Total: 410 mm
2010 GSR: 346 mm

Yield
Potential: 3.2 t/ha
Actual: 2.9 t/ha

Paddock History
2009: Wheat
2008: Wheat
2007: Wheat
2006: Wheat

Soil Type
Red calcareous sandy clay loam

Diseases
Blackspot - low to moderate infection

Plot size
10 m x 1.5 m x 3 reps

Yield limiting factors
Blackspot (low)
Odd heat event during flower/
pod fill

to the wet and long growing season, which generally favoured later flowering pea varieties.

- Most advanced breeding lines showed no difference in yield to Kaspas (2.93t/ha) due to the favourable conditions.
- Though blackspot was present in 2010, it was not as extensive as in 2009 and had little impact on yield. This will have contributed to the 27% higher yield achieved in 2010 compared with 2009.
- Agronomy trials showed no significant effect of sowing date or stubble management treatments in 2010. This is likely due to the long growing season, and lack of disease. However early sowing is still recommended for low rainfall regions providing frost, weeds and blackspot risks are considered.

Why do the trial?

The aims of this work are to facilitate the expansion of field peas into lower rainfall areas of southern Australia through the development of new cultivars and identification of agronomic methods to improve yield and yield reliability, and to provide an economically viable break crop option in areas where pulses are not presently grown. These areas are generally characterized by variable soil types and low rainfall.

Pulse Breeding Australia (PBA) field peas is committed to increasing adaptation of pulse crops in the medium and low rainfall areas of Australia, of which Minnipa is a key part of the program. Selection

criteria for these environments include resistance to blackspot, shattering, lodging, tolerance to soil boron and soil salinity, and appropriate flowering/maturity time. PBA also has a germplasm enhancement (pre-breeding) program that focuses on identifying and incorporating genes with tolerance to frost, water use efficiency, transient drought and heat at flowering/podding into adapted varieties.

The agronomic management trials aim to identify best management practices in new pea varieties to maximise field pea yield, and is part of the GRDC funded southern region pulse agronomic project. A sowing date trial was set up to compare and identify optimum sowing times of 6 pea varieties to maximise grain yield and minimise impacts of disease. A secondary trial was also set up to determine whether field peas could benefit from sowing into standing stubble compared to slashed stubble in low rainfall areas. This project also provides information back to PBA on the appropriate flowering and podding times required in field peas for optimum performance in low rainfall environments.

How was it done?

A replicated Stage 3 pea breeding trial containing 6 commercial entries and 59 advanced breeding lines was sown into good soil moisture levels on the 31 May at Minnipa. An agronomic pea time of sowing trial with 4 varieties (Kaspas, Parafield, PBA Gonyah and PBA Twilight) and 2 advanced breeding lines (OZP0703 and OZP0903) was sown on the 27 May (early) and 11 June (mid) also at Minnipa.

Key messages

- New field pea varieties PBA Gonyah and PBA Twilight performed similarly to Kaspas and Parafield under extremely favourable conditions in 2010 at Minnipa, and given their yield advantages over these varieties in drier seasons, will be better adapted varieties for this region.
- Grain yield of PBA Stage 3 field peas averaged 2.9 t/ha at Minnipa in 2010 due

A stubble management trial was also sown on the 9 June at Minnipa, comprising sowing into standing stubble (wheat stubble 30 cm high) and slashed stubble. Varieties in this trial included 4 commercial varieties (Kaspa, Parafield, PBA Gunyah and PBA Twilight) and 2 advanced breeding lines (OZP0703 and OZP0819). All sowing dates were 3-4 weeks later than in previous years due to the later break to the season.

All trials were sown with 66 kg/ha of 18:20 and a spray mix comprising 700 mL/ha paraquat, 800 mL/ha trifluralin and 1 L/ha chlorpyrifos. Pre-emergent chemical applications included metribuzin @ 160 g/ha and 1 L/ha glyphosate with 80 mL/ha oxyfluorfen. Clethodim® @ 350 mL/ha with 1% Hasten® was applied post emergent for grass weed control. Insect sprays were applied as required. Scores for establishment, early vigour, disease, flowering, maturity, lodging, shattering and selection potential were recorded during the year and grain yields were measured at harvest.

What happened?

As in 2009, very high growing season rainfall was recorded at Minnipa in 2010. However this did not cause such a severe infection of blackspot disease as was observed in 2009, most likely due to the later sowing date in 2010. This low level of blackspot together with lower levels of powdery mildew in 2010 resulted in a 27% higher yield than in the previous year. Yields

were also not limited by moisture stress, and vegetative growth and yield potential was high. Later flowering and maturing lines were able to capitalise on the long and favourable growing season, and generally performed equal or better than earlier maturing lines. Several high temperature events during spring may have led to some flower and pod abortion.

Stage 3 PBA breeding trial

The grain yield of the PBA Stage 3 trial averaged 2.9 t/ha in 2010 (Table 1). There was very little variation in yield between the vast majority of lines and yield of Kaspa was the same as the site mean. Of the other 64 lines in this trial, only 12 lines yielded lower than Kaspa, and 7 higher. All commercial cultivars performed similarly to the site mean.

The highest yielding line from the 2009 trial, the late and short flowering OZP1001, was again one of the standouts, yielding 10% above Kaspa. The advanced breeding line 02H016P-03HO2004-06TGVP001, an early-mid flowering Kaspa/Yarrum cross, was the highest yielding entry in the trial, yielding 12% higher than Kaspa in this trial. This line, as well as 04H069P-05HO2014 and 04H049P-05HO2003 (improved boron tolerance) yielded well in both this trial and also at a state level, and will be further evaluated across more sites and seasons.

Sowing date agronomy trial

Yield of early sown peas was not affected by disease in 2010, and the soft finish to the season did not penalise yield of later sown peas.

Consequently, there was no yield difference between sowing dates in this trial. This is a very different result to that found from previous experiments at Minnipa where a yield penalty of 26 kg/day occurred as sowing was delayed. Significant variety differences were apparent (Table 2). OZP0903 yielded higher than all other varieties (3.3 t/ha), and 13% higher than Kaspa. OZP0903, Kaspa and OZP0703 all yielded higher than Parafield. 2010 releases PBA Gunyah and PBA Twilight performed similarly to Kaspa, along with the bacterial blight resistant OZP0703, an anticipated 2011 release.

Stubble management agronomy trial

As for the sowing date trial, there was no significant treatment interaction with stubble management. This is likely because the long and wet season favoured vegetative growth and biomass was high, and consequently any improvements in crop standability, ease of harvest or disease which might have been observed in a drier season were not apparent in 2010. However there were differences in yield between varieties (Table 2). OZP0819, a tall, white field pea, yielded highest (3.3 t/ha), averaging 17% higher yield than Kaspa, a result not found in the PBA breeding trial. As for the sowing date trial, PBA Gunyah, PBA Twilight and OZP0703 all performed similarly to Kaspa (2.8 t/ha). Parafield yielded lower than all lines except PBA Twilight.

Table 2 Grain yields of six varieties in sowing date and stubble management trials at Minnipa, 2010

Sowing date trial							
Line	Kaspa	Parafield	PBA Gunyah	PBA Twilight	OP0703	OZP0819	LSD (P>0.05)
Yield (t/ha)	2.90	2.61	2.78	2.75	2.88	3.29	0.25

Stubble management trials							
Line	Kaspa	Parafield	PBA Gunyah	PBA Twilight	OP0703	OZP0819	LSD (P>0.05)
Yield (t/ha)	2.78	2.46	2.84	2.69	2.78	3.27	0.25

Table 1 Grain Yield, flowering date and number of flowering days of selected field pea lines in the 2010 Minnipa Stage 3A PBA trial

Variety	Start Flower	Flower Days	Grain Yield % Kaspa	
			Minnipa	Mean 5 sites SA
Kaspa	13 Sept	25	2.93 t/ha	2.97 t/ha
Parafield	4 Sept	40	94	91
PBA Gonyah	9 Sept	30	99	95
PBA Twilight	3 Sept	35	100	94
Sturt	31 Aug	39	106	100
Yarrum	23 Sept	15	102	101
OZP0606	9 Sept	27	103	99
OZP0703	31 Aug	37	101	66
OZP0801	9 Sept	28	105	100
OZP0803	1 Sept	37	104	103
OZP0804	11 Sept	29	97	104
OZP0805	9 Sept	31	98	101
OZP0808	9 Sept	27	110	107
OZP0809	17 Sept	21	101	104
OZP0815	2 Sept	40	104	101
OZP0819	2 Sept	38	102	103
OZP0901	24 Aug	45	100	100
OZP0903	1 Sept	35	101	107
OZP0904	1 Sept	38	106	106
OZP0905	12 Sept	24	104	102
OZP01001	12 Sept	24	108	110
OZP01002	13 Sept	32	105	109
OZP01003	21 Sept	19	103	107
OZP01004	21 Sept	15	108	108
02H016P-03HO2004-06TGV001	14 Sept	21	112	112
04H069P-05HO2014	14 Sept	26	107	104
04H049P-05HO2003	14 Sept	25	108	101
Site Mean Yield (t/ha)			2.90	2.92
CV %			3.83	5.34
LSD ($P>0.05$)			6.8	

What does this mean?

Favourable conditions and minimal yield limiting factors such as disease resulted in little differences between lines included in the Stage 3 field pea breeding trial. Since soil moisture was not limiting, and a soft finish to the season was observed, agronomic management trials at Minnipa in 2010 showed no differences between sowing dates or stubble

management treatments under these conditions. However early sowing and stubble retention is still generally recommended in low rainfall regions provided that optimal management of blackspot, frost and weed risks are considered. These trials will be continued with the new varieties to validate practices under lower rainfall conditions.

While Kaspa still remains an option for low rainfall environments due to its combination of improved standability, shattering resistance, early vigour, grain yield potential, and round dun seed type, growers should consider the benefits of the 2010 pea releases PBA Gonyah and PBA Twilight. These lines yielded similarly to Kaspa in 2010, a season which favoured later maturing types like Kaspa, and have the same plant and seed type benefits of Kaspa which are favoured for their milling quality and harvestability over Parafield. These earlier maturing "Kaspa types" also maximise yield reliability across seasons in favourable years (e.g. 2009-10) or short seasons (e.g. 2006-08). This makes these varieties an optimum choice for lower rainfall environments such as Minnipa, especially in years where early sowing cannot be practiced or where spring conditions are not favourable for later flowering varieties. The bacterial blight resistant line OZP0703 is expected to become available for 2012 sowings, and displays a combination of broad adaptation, high yield potential and a favourable disease resistance profile. While Parafield did not yield significantly lower than most other varieties in the breeding trial, it did perform lower than Kaspa and some other lines in the agronomy trials. This is likely to be because Parafield is not as well suited to wetter seasons such as 2010 due to its high amount of vegetative growth and proneness to lodging, causing shading of neighbouring plants and issues at harvest.

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