Field Pea Performance at Minnipa 2009

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RESEARCH

Location:
Minnipa Ag Centre

Rainfall
Av. Annual: 325 mm
Av. GSR: 242 mm
2009 Total: 421 mm
2009 GSR: 333 mm

Yield
Potential: 3.6 t/ha (peas)
Actual: 2.6 t/ha Kaspa peas (Stage 3A variety trial)

Paddock History
2008: Wheat
2007: Wheat
2006: Wheat

Soil Type
Red calcareous sandy loam

Diseases
Blackspot moderate to high infection, moderate powdery mildew infection

Plot size
10 m x 1.5 m x 3 reps

Yield Limiting Factors
Blackspot (moderate), powdery mildew (low), water logging (exacerbated blackspot infection)

Key messages

- **A high rainfall growing season favoured blackspot disease build up and generally later flowering pea varieties at Minnipa in 2009.**
- **Kaspa was 17% higher yielding than Parafield, its highest margin over this variety at Minnipa in eleven years of testing.**
- **Kaspa's grain yield was reduced by 19% when sowing date was delayed from 30 April to 20 May, however no grain yield reduction occurred in the advanced PBA field pea lines OZP0602 and OZP0601 with this delayed sowing date.**
- **OZP0601 and OPP0602, despite lower performance than Kaspa in the MAC variety trial in 2009, will provide better adapted "Kaspa type" options for low rainfall environments when they become available due to their earlier and longer flowering periods.**

Why do the trial?

Pulse Breeding Australia (PBA) field peas has a focus on increasing adaptation in the medium to low rainfall areas of Australia. This particular work is aimed at developing cultivars and agronomic methods that will increase and stabilise production in environments characterized by variable soil types and low rainfall, of which Minnipa is a key site of the program. Major 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, transient drought and heat at flowering/podding into adapted varieties.

The agronomic management trial aims to identify best sowing times in new pea varieties to maximise yield and minimise disease infection and is part of the GRDC funded southern region pulse agronomic project. 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 70 advanced breeding lines were sown into good moisture levels on 4 May at Minnipa. An agronomic pea time of sowing trial with 2 varieties (Kaspa and Parafield) and 2 advanced breeding lines (OZP0601 and OZP0602) was sown on 30 April (early) and 20 May (mid) also at Minnipa.

All trials were sown with 70 kg/ha of di-ammonium phosphate and 1 L/ha Triflur X. Post emergent weed management included metribuzin @130 g/ha and Select @ 250 ml/ha with 1% Hasten. 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?

In stark contrast to 2008, extremely high growing season rainfall was recorded at Minnipa in 2009. Surprisingly symptoms of waterlogging were observed during winter and a moderate to high infection of blackspot disease occurred during winter and early spring. Blackspot infection levels were particularly severe in the Stage 3A PBA trial potentially due to increased waterlogging in this part of the paddock.

Blackspot was less severe in the sowing time trial however higher levels existed in the early sowing compared with the late sowing. Powdery mildew also occurred during late spring but had little impact on grain yield. Field pea growth in all trials was not suppressed by moisture stress and vegetative growth and yield potential was high.

Generally later flowering lines performed better in 2009 as they were able to make use of the long and favourable growing season. However sporadic high temperature events during spring led to some level of flower and pod abortion in most varieties, complicating variety performance.

Stage 3 breeding trial

Grain yield of Kaspa was 17% higher than Parafield, a result not seen before at Minnipa (Table 2). Kaspa's previous highest yield increases over Parafield at Minnipa were approximately 5% in 2001 and 2007. Another indication of the unusual year was that Kaspa was 15% higher yielding than Bundi and 11% higher yielding than Sturt, with both varieties yielding slightly higher than Kaspa in long term analysis at this site. OZP0601 and OZP0602, the two early and longer flowering lines from PBA being multiplied for release in 2011, were also lower yielding than Kaspa but performed similarly to Parafield. Like other early flowering lines at Minnipa in 2009, OZP0601 & OZP0602 were not favoured by the early sowing date and the long wet growing season, since they are better suited to shorter growing season conditions such as 2006 and 2007 (Table 2).

The late flowering advanced breeding line 01H280P-02HO2012-04HO5001 was the highest yielding entry in the trial (14% higher than Kaspa). It was also high yielding across all SA PBA sites in 2009 (Table 1). This line and others such as 03H078P-04H2007 & 03H117P-04HO2008, which both had lower blackspot disease levels than commercial entries, require further evaluation across sites and seasons to validate their performances, particularly in shorter growing seasons.

Agronomic time of sowing trial

A significant interaction between variety and sowing date for grain yield occurred at Minnipa in 2009. Grain yields of Parafield, OZP0601 and OZP0602 were the same at each sowing time however grain yield of Kaspa was reduced at the mid sowing date compared with the early sowing date (Figure 1).

Table 1 Blackspot disease score, grain yield, flowering date & number of days flowered of selected field pea lines in the 2009 Minnipa Stage 3A PBA trial

Variety / Line	Blackspot mean score*	Minnipa Flower		Grain yield % Kaspa	
	Minnipa	Start date	Days	Minnipa	Mean SA
Bundi	6.3	27 July	42	85	85
Kaspa	6.0	10 August	25	100	100
Maki	7.7	7 August	31	45	66
Parafield	6.3	31 July	35	86	90
Sturt	6.7	27 July	42	89	97
Yarrum	4.3	21 August	17	104	96
OZP0601	7.0	27 July	35	84	90
OZP0602	6.7	28 July	38	84	97
OZP0606	6.0	7 August	28	113	104
OZP0703	6.0	31 July	38	96	102
OZP0705	6.3	28 July	41	88	92
OZP0803	6.7	28 July	34	101	108
OZP0804	7.3	10 August	32	75	92
OZP0805	6.0	3 August	32	74	91
OZP0819	6.3	31 July	31	96	105
OZP0901	6.3	20 July	46	91	96
OZP0903	6.7	27 July	39	92	103
OZP0905	5.7	7 August	31	105	106
01H280P-02H02012-04HO5001	6.0	10 August	25	114	111
03HO78P-04H2007	4.0	7 August	35	81	87
03H117P-04HO2008	5.3	28 July	41	106	100
03H211P-04HO2004	8.3	31 July	35	55	61
Kaspa (t/ha)				2.61	2.42
Site mean yield	6.2			2.29	
CV %				7.8	
LSD (P>0.05)				*0.36*	

**Blackspot disease score on the 16th September, 0=no disease, 9=high disease*

 # Mean of PBA Stage 3A 2009 field pea trials conducted at Balaklava, Snowtown, Turretfield & Willamulka

Table 2 Grain yields of Parafield, Kaspa, OZP0601 & OZP0602 field peas compared with rainfall and sowing date at Minnipa in advanced pea breeding trials, 1999 - 2009

Line/Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Parafield	0.90	2.20	2.46	1.51	1.40	0.87	0.92	0.61	0.99	<0.2	2.24
Kaspa	0.81	2.24	2.54	1.52	1.40	0.79	0.86	0.54	1.04	<0.2	2.61
OZP0601								0.80	1.13	<0.2	2.19
OZP0602								0.68	1.12	<0.2	2.20
GSR (mm)	212	299	267	219	204	223	264	111	141	139	333
AR(mm)	268	389	354	277	263	288	334	236	286	251	421
Date Sown	31/5	2/6	29/5	27/5	8/6	1/6	24/1	15/5	8/5	20/5	4/5

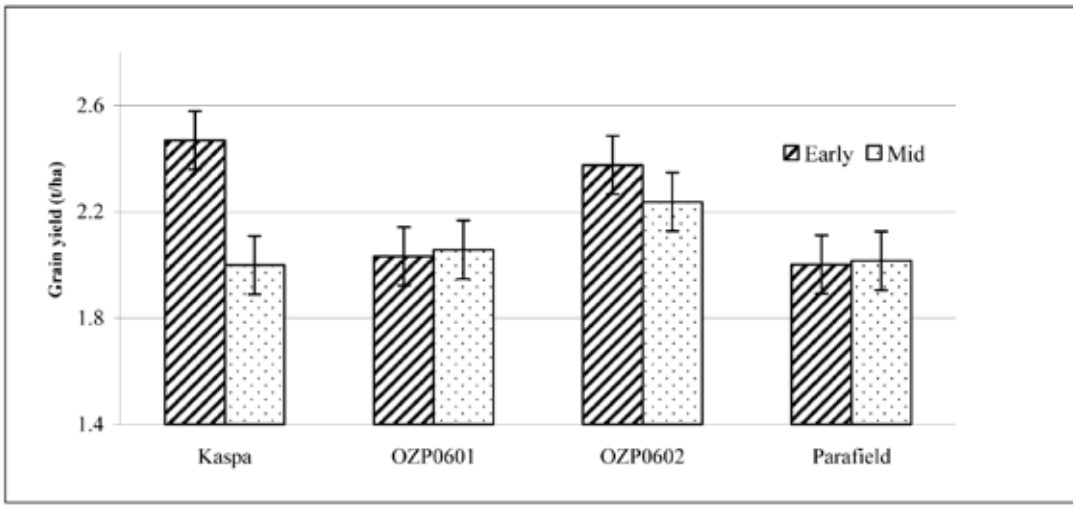

Figure 1 Effect of sowing date on the grain yield of four pea lines at Minnipa, 2009

Table 3 Flowering date and duration of four field peas from Minnipa sowing date trial, 2009

Date sown	Flowering date & duration *(in italics)*			
	Parafield	Kaspa	OZP0601	OZP0602
30 April	31 July *42*	10 August *32*	31 July *35*	28 July *38*
20 May	21 August *28*	28 August *18*	17 August *28*	14 August *31*

The flowering window of Kaspa was only 18 days at the mid sowing compared with 28-31 in the other three varieties (Table 3) most likely explaining this reduction in grain yield. OZP0602 was the highest yielding variety at the mid sowing time, 12% higher yielding than Kaspa.

What does this mean?

Very high yield potential existed during the year due to the favourable growing season however final grain yields were significantly lower than potential. The high level of blackspot disease infection caused by frequent rainfall events and water logged soils during winter and early spring resulted in grain yield losses and indicated major differences in disease tolerance between cultivars (e.g. Maki appears to be highly disease intolerant to blackspot compared to Kaspa). Interestingly, field pea breeding has regularly shown that tolerance to blackpsot is not always directly associated with the level of plant disease symptoms in the field, as was the case at Minnipa last year. For this reason screening for higher blackspot tolerance is an important component of the PBA program. This is currently undertaken at Wagga with disease loss studies using fungicides, however opportunistic screening in breeding nurseries (e.g. Minnipa last year) is highly valuable as ongoing drought has made breeding for disease tolerance difficult. Lines identified with potentially higher blackspot tolerance compared to Kaspa in SA (e.g. 01H280P-02HO2012-04HO5001) will be progressed for further evaluation and used in future breeding.

Kaspa currently remains an option for low rainfall environments since it has the best combination of round dun seed, pod shatter resistance, improved standing ability, good early vigour and grain yield. However its best yields, as seen in 2009 at Minnipa, occur in favourable years. OZP0601 and OPP0602, despite lower performance than Kaspa in the disease affected variety trial in 2009, will provide better adapted "Kaspa type" options for low rainfall environments when available due to their earlier and longer flowering periods. In particular they will provide greater yield stability than Kaspa in years where early sowing cannot be achieved (Figure 1) or where spring conditions are unfavourable for flowering and pod set in later flowering varieties.

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