


# Field pea varieties and agronomy for low rainfall regions

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**Almost Ready**

**Location:** Minnipa Ag Centre

**Rainfall**  
Av. Annual: 325 mm  
Av. GSR: 241 mm  
2010 Total: 404 mm  
2010 GSR: 252 mm

**Yield**  
Potential: Pulses 2.4 t/ha  
Actual: 1.9 t/ha

**Paddock History**  
2010: Barley  
2009: Wheat  
2008: Wheat

**Soil Type**  
Brown loam

**Yield Limiting Factors**  
High temperatures during flowering/pod fill

## Why do the trial?

Pulse Breeding Australia (PBA), together with the GRDC funded Southern Region Pulse Agronomy Project, is committed to the expansion of field peas into lower rainfall areas of southern Australia. This is being achieved through the development of new cultivars and identification of agronomic methods to improve yield and yield reliability, to provide an economically viable break crop option in areas where pulses are not widely grown. These areas are generally characterized by variable soil types and low rainfall, of which Minnipa is a key part of the program.

The Southern Region Pulse Agronomy Project aims to identify best management practices to maximise the performance of new pulse varieties in farming systems. Research conducted on lentils in the mid-north of South Australia has shown the benefit of inter-row sowing into standing stubbles in relation to yield and increased standing plant height. Height and lodging improvements were generated by the stubble providing a trellis to support the stem of the plant, leading to improved harvestability. A field pea sowing date trial was set up at the Minnipa Agricultural Centre to compare and identify optimum sowing times of 6 pea varieties to maximise grain yield and minimise impacts of disease. It also aimed to investigate whether field peas could benefit from sowing into standing stubble compared to slashed stubble in low rainfall areas in terms of grain yield, disease infection or harvestability. 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 PBA field pea breeding trial containing 9 commercial entries and 97 advanced breeding lines was sown into good soil moisture levels on the 18 May at Minnipa.

An agronomic pea inter-row by time of sowing trial with 5 varieties (Kaspa, Parafield, PBA Gonyah, PBA Twilight and PBA Oura) and 1 advanced breeding line (OZP0819) was sown on 2 May (early) and 31 May (late) also at Minnipa. Stubble treatments were Standing (wheat stubble 30 cm high, ~3 t/ha) and Slashed stubble. All plots were sown inter-row, at 25 cm spacings.

All trials were sown with 63 kg/ha of DAP and a spray mix comprising 700 ml/ha paraquat, 800 ml/ha trifluralin and 1 L/ha chlorpyrifos. Post-sowing pre-emergent chemical applications included metribuzin @ 160 g/ha and 1.5 L/ha glyphosate with 20 ml/ha carfentrazone-ethyl (Hammer). 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, height, maturity, lodging, shattering and selection potential were recorded during the year and grain yields were measured at harvest.

## What happened?

Growing season rainfall was close to average at Minnipa in 2011, but yields were higher than average boosted by stored soil moisture from late 2010-2011 summer rainfall. Similar to 2010, low to moderate levels of blackspot and powdery mildew were observed, but had little effect on yield. Yields were above average, although not to the extent of 2009 or 2010. Later flowering and maturing lines were able to capitalise on the long and

## Key messages

- **Pea yields were high in 2011, but less than in the previous 2 years.**
- **Later maturing lines were favoured by the longer season, and apart from lower yields in Parafield there was generally little difference in grain yield between named varieties.**
- **A four week delay in sowing from early May resulted in a 32% yield loss across all varieties.**
- **Agronomy trials showed no significant effect of stubble management of grain yield in 2011, however standing stubble treatments showed increased standing height and reduced lodging compared to slashed stubble plots, which could aid harvest.**

favourable growing season, and generally performed equal or better than earlier maturing lines. Yields were generally not limited by moisture stress, however sporadic high temperature events during spring may have shortened flowering length and led to some level of flower and pod abortion, complicating interpretation of variety performance.

### 1. Stage 3 PBA breeding trial

The grain yield of the PBA Stage 3 trial averaged 1.88 t/ha in 2011 (Table 1). As in 2010 there was little variation in yield between the majority of lines, and yield of Kasper was similar to the site mean. Of the other 121 lines in this trial, only 14 lines yielded lower than Kasper (including Parafield), and 3 higher (including OZP0804 which yielded 2.44 t/ha – 30% above site mean). All commercial cultivars performed similarly to the site mean.

Grain yield of Kasper was 17% higher than Parafield (Table 1), similar to other recent wetter than average seasons (6% in 2010 and 17% in 2009). Early flowering and maturing recent releases

PBA Gunyah, PBA Twilight and PBA Oura were outyielded by several later maturing advanced breeding lines. The 2011 released very early flowering and maturing conventional leafed type dun pea, PBA Percy, showed reasonable yields in 2011, but will generally be better suited to the shorter seasons in this area.

The earlier flowering and maturing types, such as PBA Gunyah and PBA Twilight, have performed better than Kasper in the drier years of 2006-2007 (Table 2) and at the later sowing dates in sowing time experiments. However they have had similar yields in the more favourable seasons (2009-2011). These recent releases have consistently performed equal or better than Parafield and Kasper in these seasons, offering more reliable yield across variable seasons.

A mixture of Kasper, PBA Gunyah and PBA Twilight of equal proportions was trialled in 2011 to observe the effect of variable flowering window on yield. Start flower date (when 50% of plants have flowers) was similar to

PBA Gunyah, buffered by the Kasper (late) and Twilight (early) flowering patterns. Yield of this mixture (94% of Kasper) was not significantly different from any of the components, but was moderated to between Kasper yield and PBA Gunyah and PBA Twilight yield (85% of Kasper). This mixture would allow producers to grow varieties with similar seed and plant types concurrently, but different flowering patterns and performance across variable seasons.

The advanced breeding line 04H069P-05HO2014 was the highest yielding entry in the trial, yielding 25% higher than Kasper in this trial. This line is a semi-leafless dun pea with powdery mildew resistance and Kasper type grain and shattering resistance. Another advanced breeding line (04H343P-05HO2004) performed similarly, outyielding Kasper by 21%. This variety has dual powdery mildew and bacterial blight resistance, but does not have the Kasper type grain or non-shattering sugar pod trait. These lines will be further evaluated across more sites and seasons.

**Table 1 Grain yield (% Kasper), flowering date and number of flowering days of selected field pea lines in the 2011 Minnipa Stage 3A PBA trial, mean yield across 5 SA 2011 Stage 3 PBA sites and long term predicted yield at Minnipa**

Variety	Plant Type	Start Flower	Grain Yield (% Kasper)		
			Minnipa	Mean 5 SA sites 2011	Minnipa 2005-2011
Kasper	SL	25 Aug	2.02 t/ha	2.55 t/ha	1.73 t/ha
Parafield	C	18 Aug	83	90	97
PBA Gunyah	SL	17 Aug	85	93	101
PBA Oura	SL	20 Aug	86	92	104
PBA Percy	C	13 Aug	94	94	104
PBA Twilight	SL	13 Aug	85	94	102
Sturt	C	15 Aug	96	98	107
Yarrum	SL	27 Aug	102	95	104
Kasper/Gunyah/Twilight Mixture	SL	17 Aug	94	97	100
OZP0819	SL	18 Aug	95	105	109
OZP1003	SL	25 Aug	105	103	106
OZP1101	SL	25 Aug	101	102	106
04H069P-05HO2014	SL	24 Aug	125	112	112
04H0343P-05HO2004	SL	25 Aug	121	110	106
<b>Site Mean (t/ha)</b>			<b>1.88</b>	<b>2.48</b>	<b>1.74</b>
CV (%)			9.86	6.62	
LSD % (P=0.05)			15.8		

SL=Semi-leafless, C=Conventional

**Table 2 Grain yields (t/ha) of Parafield, Kasper, and recently released PBA field peas compared with rainfall and sowing date at Minnipa in advanced pea breeding trials, 2005-2011**

Line/Year	2005	2006	2007	2008	2009	2010	2011	2005-11
Parafield	0.92	0.61	0.99	<0.2	2.24	2.76	1.67	1.62
Kasper	0.86	0.54	1.04	<0.2	2.61	2.93	2.02	1.73
PBA Gunyah	-	0.68	1.12	<0.2	2.20	2.91	1.72	1.69
PBA Twilight	-	0.80	1.13	<0.2	2.19	2.94	1.72	1.70
PBA Oura	-	-	1.02	<0.2	2.51	2.97	1.73	1.74
PBA Percy	-	-	-	<0.2	2.39	2.92	1.90	1.74
GSR (mm)	264	111	141	139	333	345	252	226
AR (mm)	334	236	286	251	421	410	404	335
Date sown	24 May	15 May	8 May	20 May	4 May	31 May	18 May	

SL=Semi-leafless, C=Conventional

## 2. Sowing date x stubble management agronomy trial

Effects of stubble treatment were apparent early in the season through differences in standing plant height and growth habit, however these did not translate to differences in grain yield or disease infection in 2011.

A significant sowing date by variety interaction was observed for grain yield (Table 3). All varieties yielded higher sown early (average 2.72 t/ha) than sown late (average 1.85 t/ha), averaging 32% (30 kg/ha/day) higher when sown early. This is higher than in previous years, where the average yield loss from delayed sowing at Minnipa previous to 2010 (which showed no sowing date response) was 26 kg/ha/day.

The high yielding white pea line OZP0819 was the highest yielding variety sown early, yielding 31% higher than Kasper, while PBA Oura also outyielded Kasper by 10% when sown early. Parafield was outyielded by all other varieties at the early sowing date.

At the later sowing date all varieties generally performed similarly, except that OZP0819 and PBA Twilight outyielded Kasper (21 and 16%, respectively). OZP0819 showed the greatest penalty from delaying sowing (40%, or 46 kg/ha/day delay in sowing), while Parafield showed the least (21%, or 16 kg/ha/day sowing delay) (Table 3).

Early vegetative standing height measurements (taken late July) showed that standing height of

peas sown into standing stubbles was higher at both sowing dates (11-13 cm) than those in slashed stubbles (Table 4). Standing height of late sown peas was also higher than early sown peas, due to greater vegetative lodging in early sown peas. Visual observations showed the peas tendrils "netting" onto the standing stubble, which provided a trellis for the peas to grow up, leading to more erect plants (Figure 1).

Mature standing height showed a similar trend to vegetative standing height. Peas sown into standing stubbles averaged 12 cm higher than those sown into slashed stubbles (Table 4).

**Table 3 Effect of sowing date on yield (t/ha) and yield loss (kg/ha/day) of 6 field pea lines, Minnipa 2011**

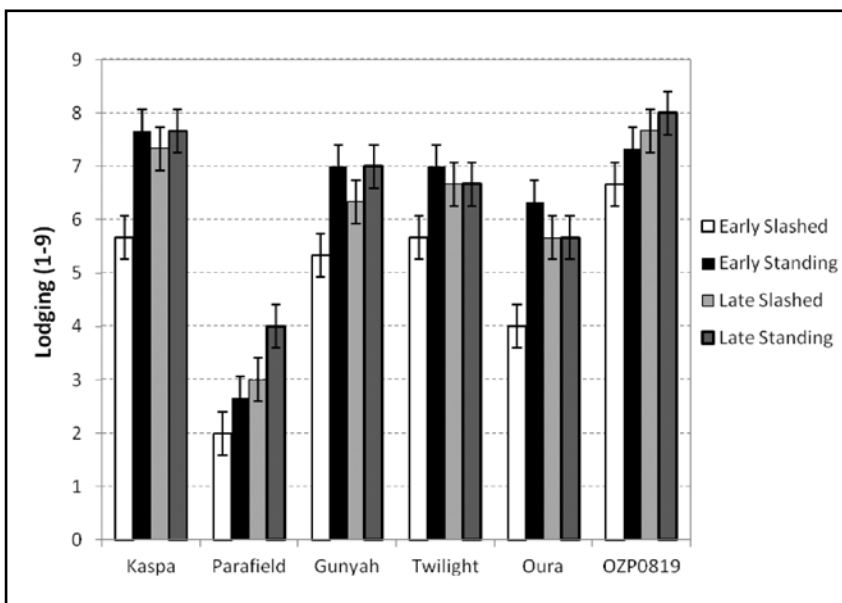
	Sowing Date	Kasper	Parafield	Gunyah	Twilight	Oura	OZP0819	LSD (P<0.05)
Yield (t/ha)	Early	2.55	2.33	2.68	2.64	2.79	3.33	0.276
	Late	1.65	1.85	1.84	1.92	1.83	2.00	(0.21 same TOS)
Yield loss (kg/ha/day)		31	17	29	25	33	46	4.2

**Table 4 Effect of sowing date and stubble treatment on vegetative standing height (cm), and stubble management on mature standing height (cm) of field peas, Minnipa 2011**

Measurement	TOS	Crop Stage	Slashed Stubble	Standing Stubble	LSD (P<0.05)
Vegetative Standing Height (cm)	Early	17-18 node	26	34	6.2
	Late	9-10 node	37	47	(1.4 same TOS)
Mature Standing Height (cm)		maturity	27.5	39.6	2.07



**Figure 1** Kaspa peas sown into slashed stubble (left) and standing stubble treatment (right)



**Figure 2** Lodging scores (1-9 score) of six field pea varieties sown at different sowing dates and stubble management methods, Minnipa 2011 (1 = flat, 9 = upright)

Lodging scores showed a significant three-way interaction between sowing date, variety and stubble treatment. Early sown peas were more erect at maturity when sown into standing stubble, except for Parafield which showed no difference between stubble management methods (Figure 2). However standing stubble did reduce lodging in Parafield at the late sowing date.

### What does this mean?

High yields were observed in 2011, with little variation between varieties, most likely due to the favourable conditions and minimal yield limiting factors. However the benefit of early sowing was again highlighted by a 32% yield loss from delayed sowing.

A number of new varieties exist for growers to select, based on their particular needs. Long term yield

analysis showed most commercial varieties and NVT lines performing similarly to Kaspa at Minnipa for the years 2005-2011. Kaspa has performed well long term at Minnipa, buoyed by recent favourable seasons, but earlier flowering and maturing varieties may maximise yield reliability across variable seasons in this environment. Parafield performed 6% below Kaspa at Minnipa and at a state level over the long term, indicating that upgrading to a variety with better yield reliability across seasons should be considered.

Recent releases PBA Gunyah, PBA Twilight, PBA Oura and PBA Percy all performed similarly to Kaspa in 2011, a season which again favoured later maturing types like Kaspa. These also show similar long term yields to Kaspa. However, their earlier maturities, together

with generally broad adaptation, make them an ideal choice for lower rainfall environments such as Minnipa, especially when early sowing cannot be practiced or where spring conditions are not favourable for later flowering varieties.

PBA Gunyah and PBA Twilight have the additional benefits of similar plant and seed type as Kaspa, which are favoured for their high milling quality due to round seed with an absence of dimpling compared to standard dun seed types and also due to improved harvestability over conventional plant types. PBA and the Southern Region Pulse Agronomy project will be further looking at the effect of growing seed mixtures of these varieties on yield and yield stability across variable seasons.

Whilst there is currently no market segregation for white peas in South Australia, the advanced breeding line OZP0819 is being considered for potential release due to its consistent high yield and superior agronomic and disease profile compared to many other commercial varieties. Its long term yield shows a 5% yield advantage over Kaspas at Minnipa, and 11% higher across the state. Growers

contemplating growing white pea types will be best advised to secure markets for this seed type prior to sowing.

Stubble treatments showed no yield difference in 2011, however differences in plant height and lodging were observed throughout the season which may aid harvestability, particularly in shorter seasons with less biomass.

Retaining anchored standing cereal stubble throughout the year field peas are grown is also seen as having benefits in reducing damage from wind erosion in regions characterised by light textured soils. With good quality cereal stubbles again in 2011, this agronomic trial will be continued with the new varieties to aim to validate these findings under variable seasonal conditions.

