Evaluating alternative pulse options for low rainfall regions

RESEARCH

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Location:
Minnipa Ag Centre
Paddock S5
SARDI Pulse Breeding Australia
Rainfall
Av. Annual: 325 mm
Av. GSR: 241 mm
2015 Total: 333 mm
2015 GSR: 258 mm
Yield
Potential: Pulses 1.96 t/ha
Actual: Peas 1.6 - 1.95 t/ha
Paddock History
2014: Canola
2013: Wheat and barley
2012: Wheat
Soil Type
Clay loam
Plot Size
1.5 m x 10 m x 3 reps
Yield Limiting Factors
Limited soil moisture prior to sowing, late season moisture stress

Key messages

- **Field peas have proven to be the most reliable pulse option on the upper Eyre Peninsula with yields remaining the most stable across seasons.**
- **Under favourable conditions there is potential for alternative pulse crops to be successful.**
- **Paddock selection, soil type, time of sowing, pulse agronomy, marketing and storage options all need careful consideration when looking at growing alternative pulse crops.**
- **New varietal options offer earlier maturity as well as improvements in harvestability, disease resistance and herbicide tolerance over older commercial standards, aiding production and profitability.**
- **Higher value alternatives, such as lentils, may be a high risk option and pulse crops better suited to the region could still prove to be the most profitable option in the long term.**

Why do the trial?

There has been increasing interest from growers and agronomists in low rainfall farming regions to evaluate alternative break crop options to field peas. Field peas are generally well suited to low rainfall farming systems and have historically been the main pulse option for the upper Eyre Peninsula region. However, record high prices and new varieties with improved agronomic characteristics has renewed interest in alternative pulse options. This is the second consecutive year for this trial and alternative pulse crops to field peas performed poorer in the 2015 season compared to the 2014 season. 2014 saw yields well above the long term averages due to favourable conditions and above average rainfall. Crop means for 2014 have been included for reference.

How was it done?

A field pulse demonstration trial was set up at Minnipa in 2015 to compare newly released faba bean, chickpea, field pea and lentil varieties. Five varieties of faba beans, chickpeas and lentils and six varieties of field peas were selected for comparison. Included in the variety selection were Nura faba bean, Genesis™ 090 chickpea, Kaspa field pea and Nugget lentil as commercial standards. Chickpea, field pea and lentil seed was treated with P-Pickle-T seed treatment prior to sowing. All crops were sown on 13 May with 60 kg/ha of MAP. The different crop types were sown as individual trials for ease of crop management and harvest. Faba beans were sown with Group F inoculum at 24 plants/m^2, field peas with Group E at 55 plants/m^2 and lentils with Group F at 120 plants/m^2. Chickpeas were sown with Group N inoculum. Desi chickpeas were sown at 50 plants/m^2 and kabuli chickpea varieties were sown at 35 plants/m^2.

Throughout the growing season pests and weeds were controlled as required in line with standard pulse crop management. Emergence, flowering, lodging, and pod drop scores were recorded during the growing season and grain yields were taken at harvest. Field peas were harvested on 29 October, faba beans and lentils on 30 October, and chickpeas on 30 November.

What happened?

Annual rainfall (332 mm) and growing season rainfall (258 mm) in 2015 was close to average at Minnipa. However, a dry start to 2015 meant there was marginal soil moisture at time of sowing. Following good winter rainfall, October recorded well below average rainfall as well as above average day time temperatures, causing moisture stress during pod fill and maturity. October also saw three consecutive days with temperatures above 35 degrees and very strong winds, which is likely to have reduced yields and grain size.

Field peas performed on par with the long term average grain yield and were also the only pulse crop to yield higher than the 2014 season, which saw above average grain yields under favourable conditions. Field peas achieved the highest crop mean of 1.8 t/ha, followed by faba beans (1.5 t/ha), lentils (1.4 t/ha), and chickpeas (0.7 t/ha) in 2015 (Table 1).

Table 1 Faba bean, chickpea, field pea and lentil variety performance, Minnipa 2015 (listed in descending order of grain yield).

Faba bean variety	Yield (t/ha)	Flower day (Julian)	Maturity rating	Chickpea variety	Yield (t/ha)	Flower day (Julian)	Maturity rating
Farah	1.51	216	Early-mid	PBA Striker	0.88	253	Early
PBA Samira	1.49	227	Early-mid	PBA Slasher	0.73	254	Mid
AF09167	1.47	219	Early	Genesis™ 079	0.66	255	Early
Fiord	1.40	217	Early	PBA Monarch	0.62	255	Early
Nura	1.38	225	Early-mid	Genesis™ 090	0.45	255	Mid
Crop mean (t/ha)	**1.45**			**Crop mean**	**0.67**		
LSD (P=0.05)	*0.04*			*LSD (P=0.05)*	*0.10*		
2014 Crop Mean	**1.89**			**2014 Crop Mean**	**1.30**		
Field pea variety	**Yield (t/ha)**	**Flower day (Julian)**	**Maturity rating**	**Lentil variety**	**Yield (t/ha)**	**Flower day (Julian)**	**Maturity rating**
PBA Pearl	1.95	231	Early	PBA Blitz	1.60	243	Early
Kaspa	1.94	242	Mid	PBA Bolt	1.52	255	Early-mid
PBA Twilight	1.90	225	Early	PBA Jumbo2	1.37	252	Early-mid
PBA Oura	1.89	227	Early	PBA Hurricane XT	1.21	254	Mid
OZP1101	1.69	240	Mid-late	Nugget	1.12	256	Mid-late
PBA Wharton	1.64	239	Early				
Crop mean	**1.83**			**Crop mean**	**1.36**		
LSD (P=0.05)	*0.24*			*LSD (P=0.05)*	*0.09*		
2014 Crop Mean	**1.79**			**2014 Crop Mean**	**1.43**		

Field peas were the highest yielding pulse crop in this trial for 2015, yielding 20% higher than faba beans. PBA Pearl, Kaspa, PBA Twilight and PBA Oura were equal highest yielding, and yielded higher than the potential new release OZP1101 and PBA Wharton. PBA Wharton was the lowest yielding variety, 15% lower than Kaspa. Although it was the highest yielding variety in 2014 under more favourable conditions, long term yield performance at Minnipa suggests that PBA Wharton is in fact lower yielding than Kaspa and its performance has been variable across seasons in these environments. It is important to note that PBA Pearl is a white pea and therefore cannot be delivered to bulk export markets with dun peas. Growers are advised to secure markets before deciding to grow white peas.

Farah, PBA Samira and AF09167 were the equal highest yielding faba bean varieties, followed by Fiord which was the highest yielding variety in 2014. The newly released disease resistant variety PBA Samira yielded 8% higher than the commercial standard Nura.

The early maturing variety PBA Blitz, and PBA Bolt, a line with improved salt and boron tolerance, were the highest yielding lentil varieties. The newly released herbicide tolerant variety PBA Hurricane XT was the lowest yielding along with Nugget. Lentil grain yields were similar to 2014 yields but lower than field pea yields, most likely due to their slightly later flowering and maturity timing. With no significant rain falling from mid-September until early November, as well as high temperature events in October, lentil and faba bean appeared to be more affected than field pea during this critical grain filling period, particularly the later maturing varieties, PBA Hurricane XT and Nugget.

Overall chickpeas were the lowest yielding of the pulses evaluated, due to the combined effects of their later maturity with the late season moisture and temperature stresses. PBA Striker was the highest yielding chickpea variety, yielding 20% higher than PBA Slasher and almost doubling the yield of commercial standard Genesis™ 090. PBA Striker has performed well in low rainfall areas due to its early flowering and maturity, as well as very good early vigour. The early maturing kabuli types Genesis™ 079 and PBA Monarch had similar yields, both yielding higher than Genesis™ 090.

What does this mean?

In 2014 under favourable conditions all pulse types performed well at Minnipa and there was little separation in grain yields between them. However, hotter spring conditions in 2015 affected the performance of chickpeas, faba beans and to a lesser extent lentils more adversely than field peas, leading to lower yields than in 2014. The hot and dry finish to the growing season limited soil moisture availability through maturity, particularly impacting on chickpeas, with a 50% reduction in yields from 2014. The late season moisture stress is also expressed in the lentil results, where early maturing variety PBA Blitz was on top, while the latest maturing variety Nugget was the lowest yielding.

Field peas performed relatively well at Minnipa in 2015 and were not only the highest yielding pulse crop for the year, but also performed on par with long term yields and their 2014 performance. Field peas remain agronomically the best suited pulse crop to low rainfall farming regions, proving to be the most reliable and stable across seasons. They are better suited to low rainfall seasons over alternative pulse crops due to their relatively early maturity, high levels of winter biomass production and broader adaptation to different soil types.

Although alternative pulse crops did not perform as well as field peas in an average season, the 2014 figures in Table 1 show that under favourable conditions with a good season break, other pulse crops can be grown successfully. If opportunity arises with a good season outlook and break there are a number of things that growers need to consider for growing an alternative pulse crop. This includes paddock selection and soil type (particularly flat, free draining paddocks free of sticks and stones to improve harvestability), time of sowing, pulse agronomy, marketing and storage. Growers need to be aware of specific market requirements and in some cases on farm storage is required. Time of sowing is critical to maximise success. Previous studies have emphasised the importance of early sowing in the upper Eyre Peninsula region, as field pea yields have shown to be reduced by up to 0.2 t/ha for every week that sowing is delayed. Correct variety choice is also an important factor to consider, with newly released varieties offering earlier maturity and improvements in harvestability, disease resistance, and tolerance to herbicides. Selections should be based upon all available information.

High commodity prices in alternative pulse crops, such as lentils, continues to drive interest and area sown to these crops in South Australia. Lentils are well suited to production on the Yorke Peninsula and to the lesser extent the lower Mid North region, however further expansion is possible provided that all essential criteria for successful production is met. Be mindful that the current very high prices for lentils are unlikely to be sustainable. Despite lower prices in field peas, often their increased ease of production combined with higher yields may still make them a lower risk and more profitable pulse break crop option than lentils in low rainfall areas.

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