Maximising grain yield of field peas

Mick Lines, Jenny Davidson & Larn McMurray, SARDI

Key findings

- Grain yield of field peas sown at Hart in 2010 averaged 2.5t/ha across all varieties.
- No time of sowing response was observed in 2010.
- Early sown plots with uncontrolled blackspot showed a 35% yield loss compared to the optimum control (fortnightly chlorothalonil), which yielded 3.6t/ha.
- Prospective releases OZP0703 and OZP0903 show a lot of promise, with OZP0703 performing similarly to Kaspa and OZP0903 yielding 10% greater.
- Chlorothalonil (Bravo®), pyraclostrobin (Cabrio®) and azoxystrobin plus chlorothalonil (Amistar® Opti) increased yields compared to the nil treatment with disease pressure.

Why do the trials?

To identify optimum sowing times in new field pea varieties and to improve recommendations from the 'Blackspot Manager' disease risk prediction model in different regions.

How was it done?

TOS Trial

Plot size	1.5m x 10m	**Fertiliser rate**	MAP @ 75kg/ha with seed
Sowing date	TOS 1: 30th April 2010 TOS 2: 21st May 2010 TOS 3: 11th June 2010	**Inoculant** **Row Spacing**	- 22.5 cm (9")
Varieties (seed rate)	Alma(45 plants/sq m) Kaspa, PBA Gunyah, PBA Twilight, OZP0703 & OZP0903 (55 plants/sq m)		
Trial design	Split plot with 3 reps, blocked by rep then sowing date.		

Fungicide Trial

Sowing details	Kaspa, 55 plants/sq m, 30th April 2010
Fungicide Tmts	Nil, Mancozeb (2kg/ha), Chlorothalonil (2L/ha), Amistar® (700ml/ha), Amistar® Xtra (850ml/ha), Amistar® Opti (3L/ha), Amistar® + Tilt (700ml/ha + 500ml/ha), Filan® (200g/ha), Cabrio® (200ml/ha), Filan® + Carbio® (200g/ha + 200ml/ha), Syngenta Product (identity withheld)
Fungicide timing	9 node + early flower

Results

Foliar disease

Conditions were favourable for plant growth, foliar disease and grain yield in 2010. However, blackspot infection was less than the early predictions based on 2009 stubble spore counts. This was most likely due to a combination of high summer and early autumn rainfall, prompting spore releases prior to sowing, and a dry start to May, which generally delayed sowing and reduced blackspot risk. Blackspot was recorded at moderate levels throughout the season despite the favourable growing season, except in the very early sown plots (30th April). Scores comparing Kaspa and PBA Gunyah showed no difference between cultivars, but blackspot infection was lower when sowing was delayed, consistent with previous results.

A wetter than average spring in 2010 meant conditions were also conducive for powdery mildew. A low infection was observed at Hart and its onset was too late to cause any significant yield loss.

Grain yield – Time of sowing and variety trial

Yield of field peas averaged 2.5 t/ha at Hart in 2010, the same as in 2009. Grain yield showed no response to sowing time.

Varietal differences in grain yield were measured (Figure 1). Alma, a tall, trailing conventional type pea, yielded 17% lower than Kaspa (2.12 t/ha). Yield of Alma may have been compromised by the large biomass and severe lodging. Kaspa performed similarly to the site mean.

PBA Gunyah and PBA Twilight performed similarly averaging 2.39 t/ha, and slightly lower than the site mean (2.48 t/ha). PBA Twilight performed similarly to Kaspa, while PBA Gunyah yielded slightly (8%) lower than Kaspa, but still 11% higher than Alma.

Prospective releases OZP0703 (improved bacterial blight tolerance) and OZP0903 (high yielding) both yielded higher than the site mean. OZP0903 yielded 10% higher than Kaspa and 33% higher than Alma and OZP0703 yielded similar to Kaspa.

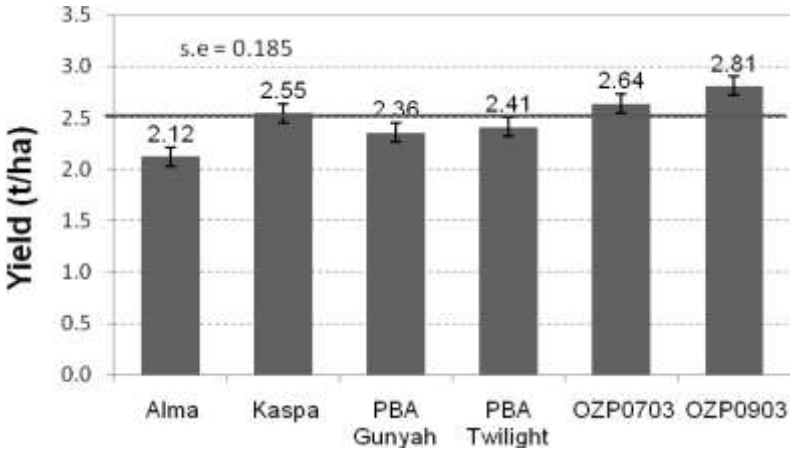

Figure 1: Grain yield of field pea cultivars at Hart, 2010.

Blackspot Manager Model validation

Blackspot infected pea stubble was collected from each time of sowing (early, mid and late) in the field pea disease management trial at Hart in November 2009. The disease level on the stubble varied for these sowing dates with 18, 12 and 8 nodes infected from early, mid and late sown plots in 2009. Nylon pouches containing the stubble were incubated on the soil surface at Hart through 2010. Each fortnight one pouch per sowing date was analysed for spore release. Spore release patterns (Figure 2) show that the peak release was late April and by the time most field pea crops in South Australia were emerging in late May, very few blackspot spores remained. This data validated the prediction of early spore release by 'Blackspot Manager' and blackspot disease was of lesser severity in South Australia in 2010 compared to previous years with late release of spores, except in crops that were sown very early on the break of the season.

The results in Figure 2 show that many more spores were released from the medium severity stubble (mid sown) than either the high or low severity (early or late sown). It was expected that the high severity stubble would produce most spores as had occurred in similar experiments in 2008 and 2009. Nevertheless the number of spores was much lower than in previous years, irrespective of severity of disease on the stubble.

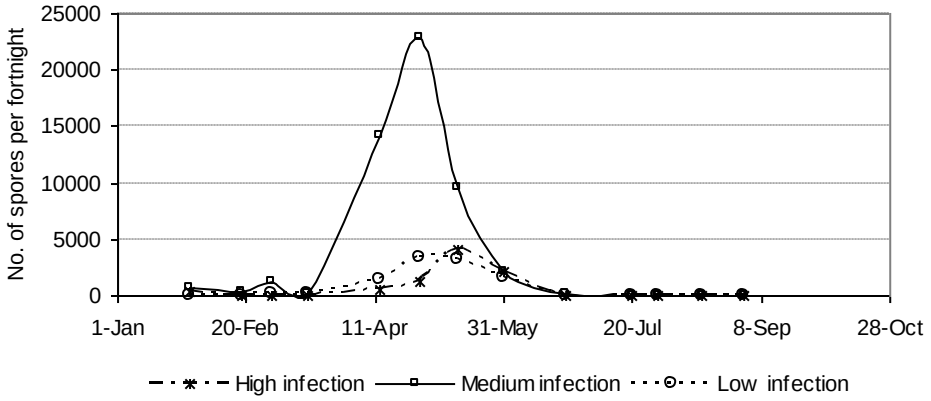

Figure 2. Blackspot spores trapped from pea stubble per fortnight from Hart incubation in 2010.

Alternative fungicides for blackspot on field peas – Fungicide trial

A range of fungicides (unregistered for this purpose) were tested for blackspot control on early sown (30th April) Kaspa peas at Hart in 2010, as the current options either provide inadequate or uneconomical control. Blackspot was assessed six times during the season and results are expressed as Area Under the Disease Progress Curve (AUDPC).

Treatments of chlorothalonil, pyraclostrobin and azoxystrobin plus chlorothalonil reduced disease and increased grain yield (Figures 3 and 4). However, these treatments have still not reached their yield potential as the response from fortnightly sprays of chlorothalonil was even greater (54% yield increase compared to unsprayed plots). This work will be validated in the coming season.

In the meantime the recommended strategy in field pea crops with a yield potential of at least 2.o t/ha is to apply P-Pickel T seed dressing followed by foliar applications of either mancozeb or chlorothalonil at 9 node growth stage and again at early flowering. This strategy should remain economic for grain prices above $200 tonne, but may not be economic in crops that yield less than 2.0 t/ha.

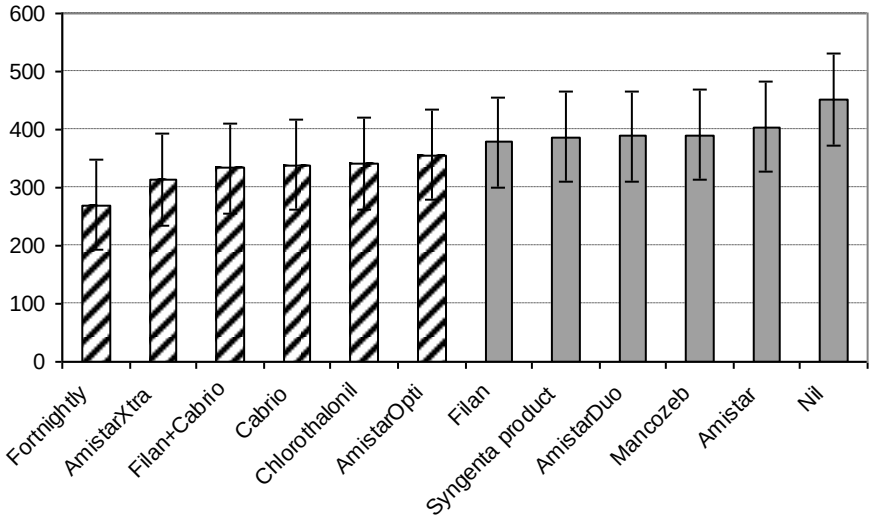

Figure 3: Blackspot assessed as Area Under Disease Progress Curve in fungicide treated plots of Kaspa at Hart 2010. Striped bars have significantly less disease than the untreated. L.S.D. = 78.2

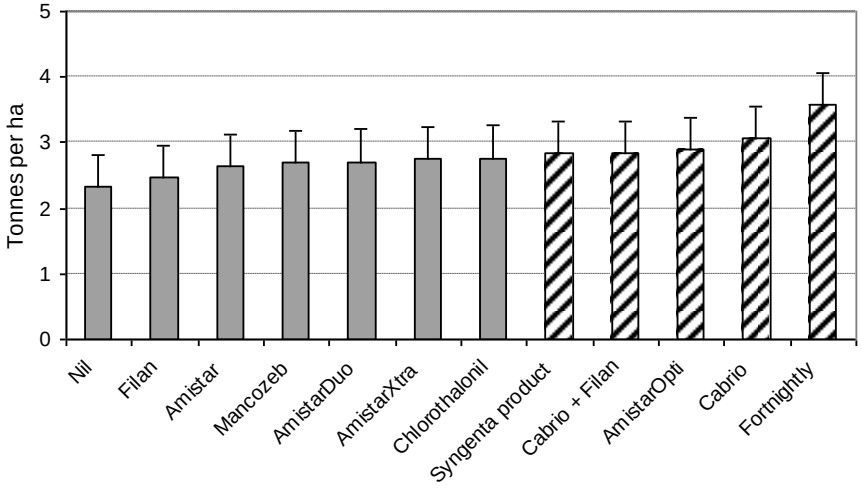

Figure 4: Yield in fungicide treated plots of Kaspa at Hart 2010. Striped bars have significantly more yield than the untreated. L.S.D. = 0.49

Summary

High growing season rainfall and moderate presence of disease meant conditions were favourable for pea production in 2010, with yields averaging 2.5t/ha at Hart. These yields are somewhat disappointing given the favourable growing conditions and relative yields of other crop type. Reasons for this are unclear but this is most likely due to a combination of blackspot (adjacent fungicide trial showed a 35% yield loss compared to fortnightly control), some level of transient moisture stress in September coinciding with flowering and perhaps high biomass leading to shading of some flowers and pods.
Grain yield showed no response to sowing time. This was likely due to the moderate blackspot, which penalised yield of early sown Kaspa by 35% (as evidenced by the fungicide trial), and the favourable season finish (which favoured later sown peas).

Over the last three seasons PBA Gunyah has performed between 7% below (2010) and 15% above (2008) Kaspa at Hart across all sowing dates, averaging 4% greater than Kaspa. PBA Twilight has been included in Hart trials only in the favourable seasons of 2009 and 2010, but has still averaged just 2% below Kaspa over those seasons. Long term NVT data (2004 – 2010) shows both varieties have similar yield to Kaspa, however PBA Gunyah and PBA Twilight have performed up to 17 and 22 percent higher than Kaspa in previous seasons with drier springs and lower yields.

Prospective releases OZP0703 and OZP0903 show a lot of promise. OZP0703 is a high yielding early flowering dun variety with greater tolerance to bacterial blight than current pea varieties. Long term NVT data shows a three percent yield advantage over Kaspa in all pea growing areas, with a range of 99 to 117 percent compared to Kaspa.

OZP0903 is presently being considered for commercial release. OZP0903 is a high yielding, early flowering and erect growing dun pea variety with good pod shatter resistance and high field resistance to bacterial blight and the new strain of downy mildew present in SA. OZP0903 has shown reliable and high yield potential in SA, averaging 6 percent higher than Kaspa in 2010 and 18% higher in 2009 across NVT and PBA field trials in South Australia.

The web-based model ‘Blackspot Manager’ reliably predicted the reduced risk of blackspot in 2010 for South Australian field peas. Model predictions for 2011 will begin late March on the website *www.agric.wa.gov.au/cropdiseases*.

Acknowledgements

GRDC for kindly funding this research.
SARDI Clare team for helping with trial management: Stuart Sherriff, John Nairn, Rowan Steele and Peter Maynard.