Forage peas – a potential new break crop option

Larn McMurray and Michael Lines, SARDI

Key findings

- Forage pea varieties produced similar levels of biomass to other peas and less than vetch at Hart in 2014. They were also more susceptible to blackspot than other pea varieties.
- The value of PBA Hayman as an alternative to vetch will depend largely on being able to sow it early and control blackspot disease infection. This will often be difficult to achieve and sowing dates will need to be as early as possible around safe "black spot manager" predictions.
- Where sowing of field peas was delayed, biomass was maximised by increasing sowing densities above 50 plants/m^2 with little negative effect on grain yield.

Why do the trial?

These trials form part of a SAGIT funded project which aims to assess the potential of the newly released forage (PBA Hayman) and dual purpose (PBA Coogee) field pea varieties as alternatives to vetch and grain field peas. Outcomes from these trials and similar trials at Lameroo, Minnipa and Tarlee will be used to develop agronomic management guidelines to allow the successful production of these varieties in SA.

How was it done?

Plot size	1.75 m x 10 m	**Fertiliser**	MAP (10:22) + 2% Zn @ 90 kg/ha
Seeding dates	7th May and 28th June		

Two forage experiments were undertaken at Hart in 2014 following on from similar trials held in 2013. The first experiment aimed to compare field pea and vetch varieties for biomass and grain yield potential, and the second to determine optimum sowing dates and sowing densities for maximising biomass production of field pea varieties. In the first trial, four field pea varieties (Kaspa, Morgan, PBA Coogee and PBA Hayman) and four vetch varieties (Morava, Rasina, Capello and RM4) were sown at two sowing dates. The second trial included four field pea varieties sown at four plant densities (25, 50, 75 and 100 plants/m2) sown on the same dates. Trials were set up as split plot design with three replicates. In both trials biomass measurements were taken during flowering and at maturity. Cuts during flowering were timed to correlate with early pod development (1-2 flat pods per plant, approximately 10-14 days after commencement of flowering). Final grain yield, nitrogen fixation and hay quality assessments were all measured.

Results and discussion

Above average rainfall and warm temperatures favoured rapid early plant growth but also high levels of blackspot disease pressure. The blackspot manager disease prediction for Blyth up until the 18th of May was for a medium risk level indicating that a yield loss in field peas of 20-35% could occur. Late autumn and early winter rainfall was well above average and frequent rainfall events occurred favouring disease spread. Moderate to high levels of black spot disease infection did occur and restricted early vegetative growth particularly in the early time of sowing. Higher levels of disease infection were observed in PBA Hayman compared with all other varieties at both sowing dates (Table 1). Disease infection was particularly severe in PBA Hayman at the early sowing date indicating this variety is more susceptible to this disease than other varieties. Rainfall ceased in spring and the finish to the season was characterised by a dry but relatively cool finish to the season. Grain yields of Kaspa field peas were 1.6 t/ha across both sowing dates with no effect of sowing timing due to the higher blackspot disease intensity at the May 7th sowing date cancelling out any benefit from earlier sowing last year.

Table 1. Blackspot disease severity (% plant infection) of field pea varieties, Hart 2014

Sow Date	Variety			
	Coogee	**Hayman**	**Kaspa**	**Morgan**
7-May	40	60	20	26.7
28-May	13.3	30	13.3	13.3
LSD (0.05)		11.25		

Trial 1: Comparison of field pea and vetch cultivar performance

An interaction between sowing date and variety for Early Pod Development Stage (EPDS) biomass production occurred in 2014. Delaying sowing by 3 weeks from early May to late May resulted in an increase in biomass production in Kaspa and PBA Coogee field peas but no response in Morgan and PBA Hayman (Figure 1). This result was in contrast to the 2013 result where a similar delay in sowing resulted in a reduction in biomass production in PBA Hayman and Kaspa. The 2014 response was most likely due to the impact of the high black spot disease infection at the first time of sowing. Apart from the early maturing variety Rasina all vetch varieties were reduced in biomass as sowing was delayed (Figure 1).

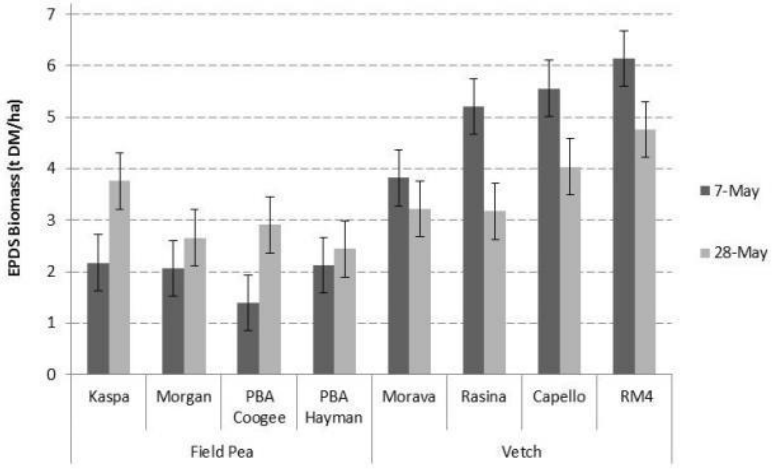

Figure 1 Effect of sowing date on early pod development stage (EPDS) biomass yield (t/ha) of field pea and vetch varieties, Hart 2014.

All vetch varieties also had higher biomass production than the field pea lines when sown early, a result again reflecting the impact of black spot on field peas. At the later sowing date biomass production was generally similar in all varieties except for the woolly pod variety RM4. This variety had higher biomass levels compared to all lines except for Kaspa and its fellow woolly pod type Capello. Biomass levels at maturity (data not presented) were similar to the EPDS levels with all field pea lines having similar levels regardless of sowing date. At the early sowing time all vetch varieties yielded similar and around double that of the peas however at the late sowing date they were similar to all pea lines.

Grain yields (Figure 2) were not affected by sowing date in 2014. A similar result occurred in 2013 with only Kaspa and Morgan showing grain yield reductions with a delay in sowing. Last year Kaspa and Morgan had higher grain yields than the dual purpose PBA Coogee, the forage type PBA Hayman and Morava vetch but similar yields to the other vetch lines including, somewhat surprisingly, the woolly pod types.

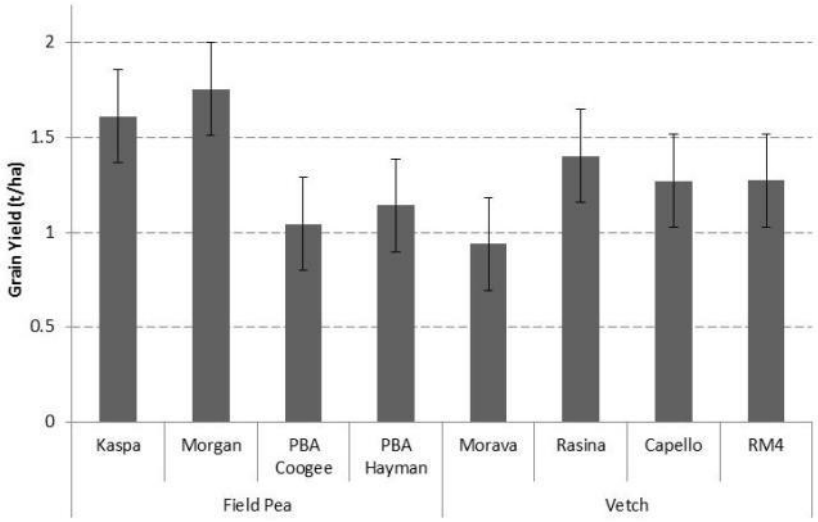

Figure 2. Grain yield (t/ha) of field pea and vetch varieties across two sowing dates, Hart 2014

Trial 2: Maximising biomass potential of forage and dual purpose field pea varieties through sowing date and plant density

As found in 2013, all field pea varieties responded the same to changes in seeding density. Maximum biomass production occurred at 75 plants/m^2 (Figure 3) and grain yield was maximised at 50 plants/m^2 (Figure 4). However, there was no yield penalty associated with increasing rates to 75 plants/m^2. In 2013 EPDS biomass was maximised at 50 plants/m^2 but no production penalty occurred when increasing to 75 plants/m^2. Again this difference found in 2014 compared with 2013 is likely to be a reflection of the increased disease levels last year.

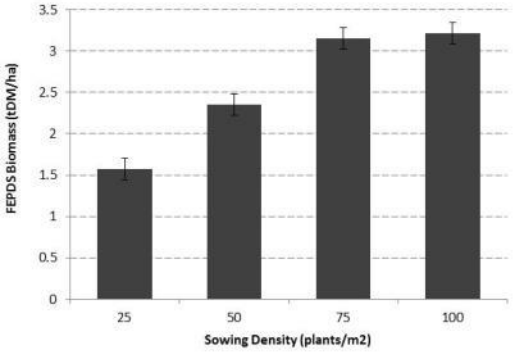

Figure 3. Effect of sowing density on early pod development stage (EPDS) biomass yield (t/ha) of field pea varieties, Minnipa 2014

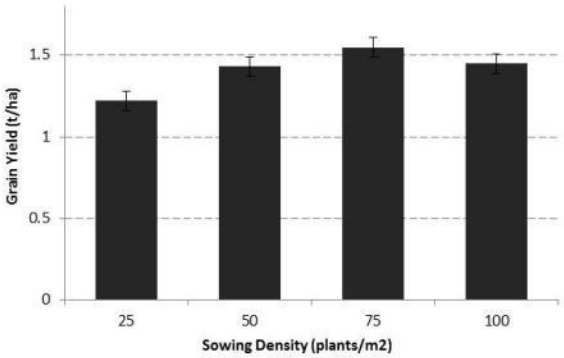

Figure 4. Effect of sowing density on grain yield (t/ha) of field pea varieties, Minnipa 2014

Summary / implications

Dual purpose and/or forage field pea varieties were developed with the aim of providing growers with a competitive alternative to vetch and other current break crop options. Dual purpose field pea varieties may also provide growers with the flexibility to react to seasonal conditions eg. frost, drought, or high grain/hay prices.

These pea types were compared with grain field peas and vetch at Hart and three other sites in 2013 and 2014 providing an understanding of their performance and potential as a break crop option in SA farming systems. The forage field pea variety PBA Hayman agronomically performed very differently to the grain variety Kaspa and dual purpose varieties Morgan and PBA Coogee. PBA Hayman was found to have a higher biomass production potential than all other field pea varieties evaluated producing grain yields 50-70% greater than Kaspa and Morgan at Hart and Tarlee in 2013. In some situations it produced greater biomass levels than both the common and woolly pod vetch varieties evaluated. However, it performed poorly at Minnipa in 2014 and only similar to Kaspa at Hart in 2014 due to increased susceptibility to blackspot and poor adaptation to shorter and drier seasons.

The increased susceptibility of PBA Hayman to blackspot is of significant concern as delayed sowing (the management strategy for reducing blackspot infections) also reduced its biomass production advantage over other field peas in some situations. This was most likely due to its later maturity and relatively slower early growth rate. While these plant characteristics are likely to reduce the potential biomass yield of PBA Hayman in low rainfall environments, they tend to suit varieties sown for hay. PBA Hayman has significantly lower grain yield potential than other field pea varieties (20-80% lower) however due to its small seed size (14g/100 seeds) a lower seeding rate can be used. The value of PBA Hayman as an alternative to vetch in SA will depend largely on being able to sow it early and control blackspot disease infection.

Across all forage experiments in SA, biomass production of the dual forage/grain field pea variety PBA Coogee was generally only similar to Kaspa and Morgan. Its grain yield was always lower than Kaspa (14-54%) and equal or lower than Morgan. This suggests Kaspa or Morgan remain the variety of choice for grain yield or “dual purpose” situations apart from in disease prone areas as PBA Coogee has improved resistance to bacterial blight over Kaspa and is the only option with resistance to powdery mildew.

Biomass comparisons between field peas (Kaspa, Morgan and PBA Coogee) and vetch were complex, varying with site, year, variety and sowing date. Generally vetch varieties produced equal or greater biomass levels when blackspot was present or in favourable growing environments.

Current recommendations for maximising grain yield in field pea will also maximise biomass production, ie earliest sowing around 'Blackspot Manager' recommendations and sowing densities of 50 plants/m^2. Where the sowing date is delayed past optimum to manage blackspot or due to late season breaks, biomass yield can be maximised by increasing sowing density of all varieties to 75 plants/m^2, with little negative effect on grain yield.

These trials contained 46 rows or 138 plots and almost 400 biomass cuts were completed by the Clare SARDI team.
Photo courtesy of Trevor & Kathy Fischer, Hilltown.