Field peas: maximising grain yield through sowing times

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Key Findings:

- Early sowing of field pea is essential for economic yields in dry years in low rainfall environments, providing frost, weed and blackspot risks are considered.
- Kaspa & OZP0602 had lower disease severity and slower build up of blackspot than the old Alma cultivar.
- Strategic applications of foliar fungicides led to a small but significant reduction in blackspot.
- Sowing field peas on the season break will increase blackspot risk however exposure to risk can be reduced through the use of the blackspot predictive tools (Blackspot Manager and DIRI) and careful paddock selection.

Why do the trials?

To identify best sowing time and fungicide strategies for maximum grain yields in field peas.
To improve the reliability of the SARDI blackspot disease prediction model and validate the blackspot predictive model 'Blackspot Manager' in SA by incorporating data from replicated trials.

How was it done?

Plot size	1.5m x 10m	**Fertiliser rate**	MAP 2.5% Zn @ 76kg/ha with seed
Sowing date	TOS 1: 1st May 2008	**Inoculant**	-
	TOS 2: 21st May 2008	**Row Spacing**	22.5 cm
	TOS 3: 8th June 2008		
Varieties (seed rate)	Alma(45 plants/m^2), Kaspa, OZP0602 & WAPEA2211 (55 plants/m^2)		
Trial design	Split plot with 3 reps, blocked by sowing date. Variety by fungicide treatments randomised within blocks		

Fungicide Tmts.	**Seed**	**Foliar**
Nil	Apron	None
P-Pickle T (PPT)	Apron + PPT	None
PPT + Mancozeb	Apron + PPT	Mancozeb @ 2 kg/ha – mid veg. July 11 (TOS1); July 30 (TOS2) & August 22 (TOS3)
Single Mancozeb	Apron	Mancozeb @ 2 kg/ha – mid veg. July 11 (TOS1); July 30 (TOS2) & August 22 (TOS3)
Single Mancozeb + Single Chlorothalonil	Apron	Mancozeb @ 2 kg/ha – July 11 (TOS1) July 30 (TOS2) & Aug 22. Chlorothalonil @ 2L/ha –August 22 (TOS1); Sept 4 (TOS2) and October 2 (TOS3)
Fortnightly Bravo	Apron + PPT	Chlorothalonil @ 2L/ha – June 6 & 26, July 11 & 23, August 8 & 22, September 4 & 17, and October 2

Similar trials were also conducted at Turretfield (high rainfall) and Minnipa (low rainfall) and form part of this SAGIT funded research. Results from these trials are also reported in this article.

Results

Disease ratings

Disease levels (blackspot) reached moderate levels in the Hart and Turretfield experiments during winter but failed to progress further during spring due to a lack of rainfall and dry conditions. As in 2007 delayed sowing reduced the amount of blackspot infection and this effect continued throughout the growing season.

The seed treatment P-Pickel T (PPT) had an early effect in reducing disease levels but this suppression generally wore off around 6-8 weeks after sowing. Foliar fungicides also had a small but significant effect on suppressing disease but this effect did not translate into grain yield due to the overriding effects of the dry spring. Anecdotal evidence from application in commercial crops has shown that these small differences have resulted in economical yield gain in more average seasons. Fortnightly fungicide sprays suppressed disease to low levels but this is not an economical practice (Table 1).

Table 1. Effect of seed dressings and fungicides on blackspot severity at 2 sites in SA, 2008.

Treatment	**Turretfield 2008**			**Hart 2008**	
	Disease score in TOS1 13th Aug 08	*Mean disease score of 3 times of sowing* 25th Sept 08		*Mean disease score of 3 times of sowing* 17th Sept 08	
	No. nodes infected	No. nodes infected	No. leaves infected, ( ) =sqrt	No. nodes infected	No. leaves infected
Control	4.2	8.5	10.4 (3.1)	7.7	9.9
P-Picklel T	3.3	7.3	9.2 (2.9)	6.9	9.1
P-Pickel T plus	2.6	7.8	9.4 (2.9)	6.8	8.6
Mancozeb	3.4	7.4	9.3 (2.9)	7.2	9.4
Mancozeb /	3.6	7.4	10.1 (3.0)	6.7	8.4
Fortnightly	0.3	3.7	5.7 (2.2)	1.9	2.7
LSD (P<0.05)	0.5	1.9	- (0.4)	0.9	0.8

Disease spread and intensity was found to start earlier in the old conventional leaf type variety Alma. This variety continued to have greater levels of disease than the other varieties at both infected sites during the season. Of the other three lines evaluated Kaspa generally had higher levels than WA2211 which in turn had higher levels than OZP0602 (Table 2). These results indicated that improved genotypes for blackspot resistance do exist and are being progressed through Pulse Breeding Australia.

Grain Yield

There was no significant benefit of early sowing across all varieties in 2008, unlike in 2007. This was most likely due to frequent but erratic high temperature and frost events in early spring. However, there was no yield penalty from earlier sowing in the new varieties (Kaspa and OZP0602), Table 2.

Also reducing the benefit of early sowing in 2008 was the early favourable season growing conditions (not at Minnipa). The early sowing treatments incurred higher disease levels, increased vegetative production and plant lodging. The latter was particularly evident at the higher rainfall site of Turretfield and in the older conventional type variety Alma.

Table 2: Effect of sowing date and cultivar on blackspot severity and grain yield in SA, 2008.

		Foliar black spot % plot severity, ( )=sqrt %plot sev.					**Grain yield (t/ha)**				
Site	Sow date	Alma	Kaspa	WA 2211	OZP 0602	Mean	Alma	Kaspa	WA 2211	OZP 0602	Mean
T/field	May 9	8.7 (2.9)	4.9 (2.2)	5.4 (2.2)	3.8 (1.9)	5.7 (2.3)	1.57	2.25	1.8	2.25	1.96
	May 30	3.3 (1.7)	2.1 (1.3)	1.1 (1)	1 (0.8)	1.9 (1.2)	1.74	2.2	1.76	2.43	2.03
Rated 31/7	June 20	0.1 (0.1)	0 (0.1)	0 (0)	0 (0)	0 (0.1)	1.59	2.12	2.06	2.09	1.96
	Mean	4 (1.6)	2.3 (1.2)	2.1 (1)	1.62 (1)		1.63	2.19	1.87	2.25	
		lsd (P<0.05) = - , (0.35)					lsd (P<0.05) = 0.28 (0.15 same sow date)				
Hart	May 1	6.8	5.8	5	3.2	5.2	1.21	1.38	1.11	1.51	1.3
	May 21	2.3	1.1	0.8	0.6	1.2	1.2	1.25	1.18	1.47	1.28
Rated	June 8	0.7	0.1	0.2	0.1	0.3	1.09	1.11	1.13	1.26	1.15
23/7	Mean	3.3	2.4	2	1.3		1.17	1.24	1.14	1.42	
		lsd (P<0.05) = 1.2					lsd (P<0.05) = 0.17 (0.1 same sow date)				
							Parafield				
Minnipa	May 20	ND	ND	ND	ND	ND	NS	NS	NS	NS	0.22
	June 13	ND	ND	ND	ND	ND	NS	NS	NS	NS	0.05
Rated 6/8	Mean						0.12	0.13	0.14	0.16	
							lsd (P<0.05) = 0.07 (sow date) (0.03 var.)				

NS = not significant, ND = No disease present, - = not evaluated at this site

Grain yields of the late flowering variety Kaspa decreased as sowing date was delayed (Table 2). This result also occurred in the 2007 experiments and has prompted the wide spread earlier commercial sowings of this variety in recent years. Alma was the lowest yielding variety at both sites and showed a variable response to changes in sowing date making it difficult to optimise Alma's grain yield through manipulation of sowing date. The early flowering Kaspa type line, OZP0602, was the highest yielding variety at both sites (15% higher yielding than Kaspa at Hart and 3% at Turretfield). At both sites OZP0602 was higher yielding than Kaspa when sown at the mid sowing time but similar yielding to Kaspa at the early sowing time.

Model validation

Disease infection data were used to update the blackspot prediction model (DIRI). Results were highly correlated in the medium and high rainfall regions but poorly correlated in the low rainfall regions. A new model for DIRI was generated for the low rainfall regions using historical data and produced more favourable results.

These trials were also used to validate 'Blackspot Manager' (a WA department of Agriculture model that predicts the timing of release of airborne spores of blackspot from pea stubble) in SA. This tool was widely used by the SA field pea industry in 2008 to determine early sowing dates with low risk of infection from blackspot. The trials showed that the relationship between the model's spore release predictions and observed disease severity differed at each site (Figure 1). Currently the WA advice with 'Blackspot Manager' is to sow after 50% of spores have been released regardless of area. Findings from these trials indicate that this sowing advice may need to be altered to 75-90% of spore release in higher rainfall regions. Further data are required to validate this result in more favourable seasons.

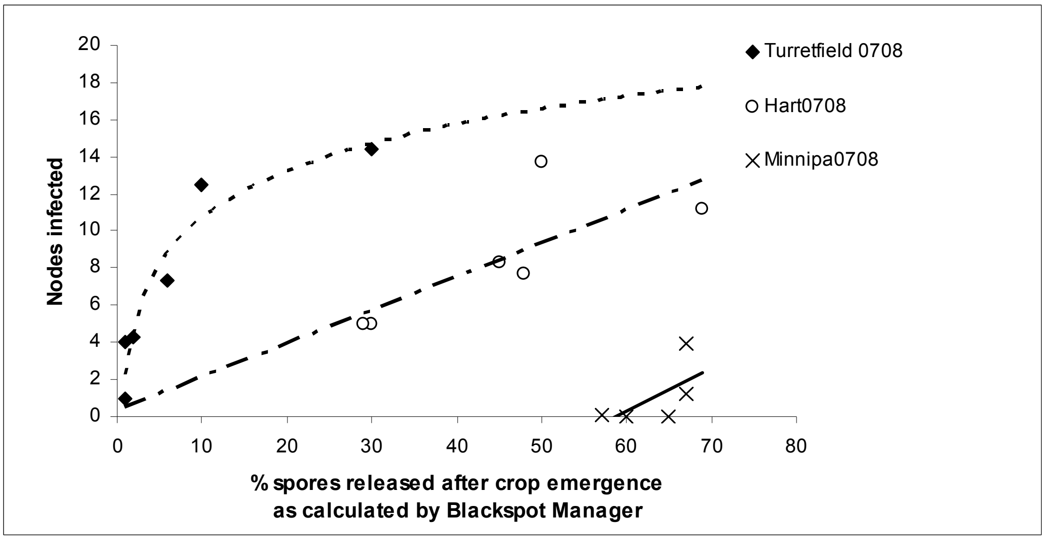

Figure 1. Relationship between final blackspot severity and Blackspot Manager spore release predictions at 3 sites over 2 years in SA

Summary

Early sowing has maximised yields of field peas over the last three years at field sites in SA representing low, medium and high rainfall pea growing areas (Figure 2). Early sowing has been paramount for economical field pea production in low and medium rainfall areas over this period and continues to be the best management strategy providing consideration for black spot, weeds and frost risk occurs. Providing management strategies like using rotational gaps of at least four years and not sowing pea crops next to neighbouring pea stubbles are implemented it is likely greater yield loss will occur from delayed sowing than from blackspot infection across seasons in low and medium rainfall environments.

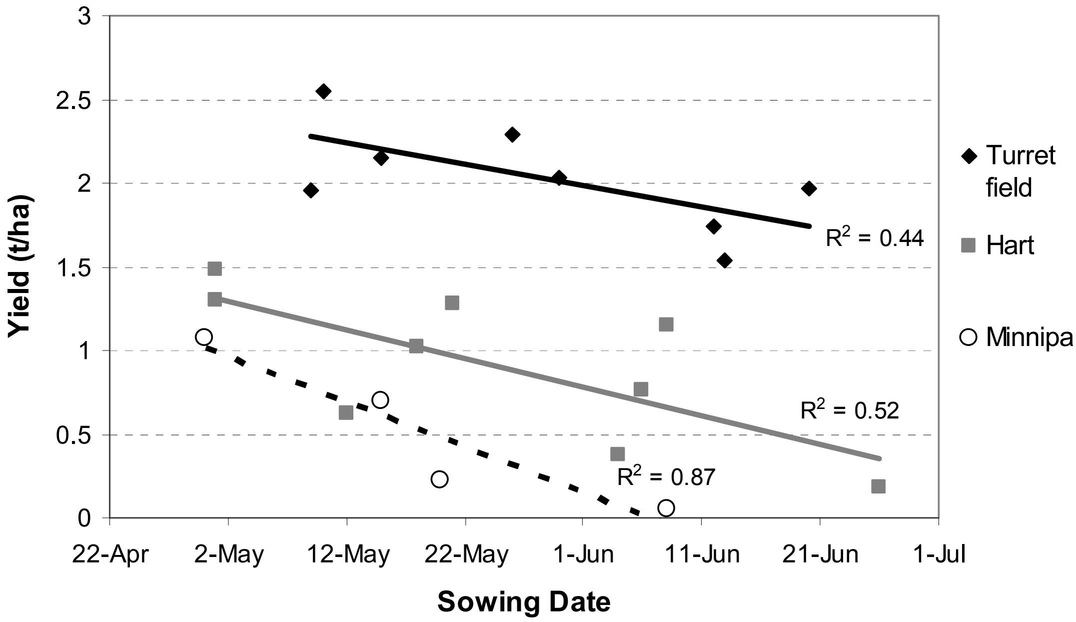

Figure 2: Effect of sowing date on grain yield of field peas at three sites in SA, 2006-2008.

OZP0602 shows high yields, wide adaptation and suitability to SA conditions, particularly to low and medium rainfall areas where it may not need to be sown as early as Kaspa to maximise yields, providing a safer option where sowing needs to be delayed due to disease, frost, weed or excessive growth issues.

'Blackspot Manager' and DIRI are important tools that can assist consultants and growers to make correct management decisions to reduce blackspot risk and have become highly relevant with the current trend of early sowing.

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SAGIT

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