

DISEASE MANAGEMENT IN NEW FABIA BEAN VARIETIES, 2004/2005

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These trials were initiated in 2004, as a component of the collaborative GRDC project DAV00057 "Pulse agronomic research for the development of variety specific management packages in south eastern Australia". The project involves field research in Victoria, NSW and SA, and works with Pulse Australia to develop variety specific management packages for new pulse crop varieties as they are released to growers.

Field experiments were conducted at Saddleworth (Mid North of SA) and Cockaleechee (Lower Eyre Peninsula) to develop cost effective disease management guidelines for new fabia bean varieties, to take advantage of their improved disease resistances. Three varieties were compared, namely Fiesta, the recently released Farah (improved ascochyta resistance) and the potential release line Icarus*Ascot/7/3, which has improved ascochyta and chocolate spot resistance. All three varieties were sown at 24 viable seeds/m², on the basis of seed size and germination percentage.

The Saddleworth trial was sown dry on May 21, with MAP fertiliser at 100 kg/ha, but due to no sub-soil moisture and severely cracked soil, germination was delayed until around June 10 (estimate). The Cockaleechee trial was sown into a moist seed bed on June 11, with 10:21:0 Zn2.5% fertiliser at 100 kg/ha. Trial design was split plot, with varieties as the main blocks, and spray treatments as sub-plots within these. Treatments were replicated four times. Plot size was 10m long x 8 rows (1.5m) wide.

Provision was made for eight fungicide spray treatment regimes in each trial. These included fixed treatments of unsprayed (Control), Standard, Standard without early sprays, Complete (every 2 weeks) and Minimal (end of flowering spray only). There were also three flexible or tactical spraying regime treatments to control diseases in each of Fiesta, Farah and Ic*As/7/3, determined by monitoring of disease levels and recent and forecast weather conditions at the time. Hence actual spray applications differed slightly between the two sites, as shown in Tables 17.7.1 and 17.7.2 below.

At both sites disease levels on Ic*As/7/3 were never sufficiently high to warrant a fungicide spray, essentially making this treatment a second control, so results from these plots were pooled with treatment 1 (Control) plots for analysis.

Table 1 Fungicide spray treatments in Saddleworth trial – sown dry on May 21, estimated germination date June 10.

Spray Treatment	Spray date							
	29 Jul	11 Aug	18 Aug	24 Aug	6 Sep	22 Sep	5 Oct	19 Oct
1. Control								
2. Standard	M		M		C			M+C
3. Standard w/out early spray					C			M+C
4. Fiesta tactical	M				C			
5. Farah tactical					M+C			
6. Ic*As/7/3 tactical								
7. Complete	M	M		M	M+C	M+C	M+C	M+C
8. Minimal					C			
Days post-sowing	69	82	89	95	108	124	137	151
Days post-germination	49	62	69	75	88	104	117	131

Fungicides: M = Mancozeb (Dithane® Rainshield (750g/kg mancozeb) @ 2.0-2.2 kg/ha)
 C = Carbendazim (Bavistin® FL (500g/L carbendazim) @ 500ml/ha)

Table 2 Fungicide spray treatments in Cockaleeche trial – sown on June 11.

Spray Treatment	Spray date					
	9 Aug	25 Aug	3 Sep	17 Sep	8 Oct	3 Nov
1. Control						
2. Standard	M		C		M+C	
3. Standard w/out early spray			C		M+C	
4. Fiesta tactical		M	M+C			C+Ch
5. Farah tactical		M	C			
6. Ic*As/7/3 tactical						
7. Complete	M	M	M+C	M+C	M+C	C+Ch
8. Minimal			C			
Days post-sowing	59	75	84	98	119	145

Fungicides: M = Mancozeb (Dithane® Rainshield (750g/kg mancozeb) @ 2.0-2.2 kg/ha)
 C = Carbendazim (Bavistin® FL (500g/L carbendazim) @ 500ml/ha)
 Ch = Chlorothalonil (Bravo® (720g/L chlorothalonil) @ 600 ml/ha).

Poor emergence, largely as a result of sowing into dry, severely cracked soil and mice damage, resulted in low and variable plant densities in the Saddleworth trial. Replicate 3 was most severely affected, so this was removed from the data analysis for grain yield and seed weight, while a “mice damage” score was used as a covariate in some analyses for this site.

Preliminary analysis of results indicates the following major points from each location:

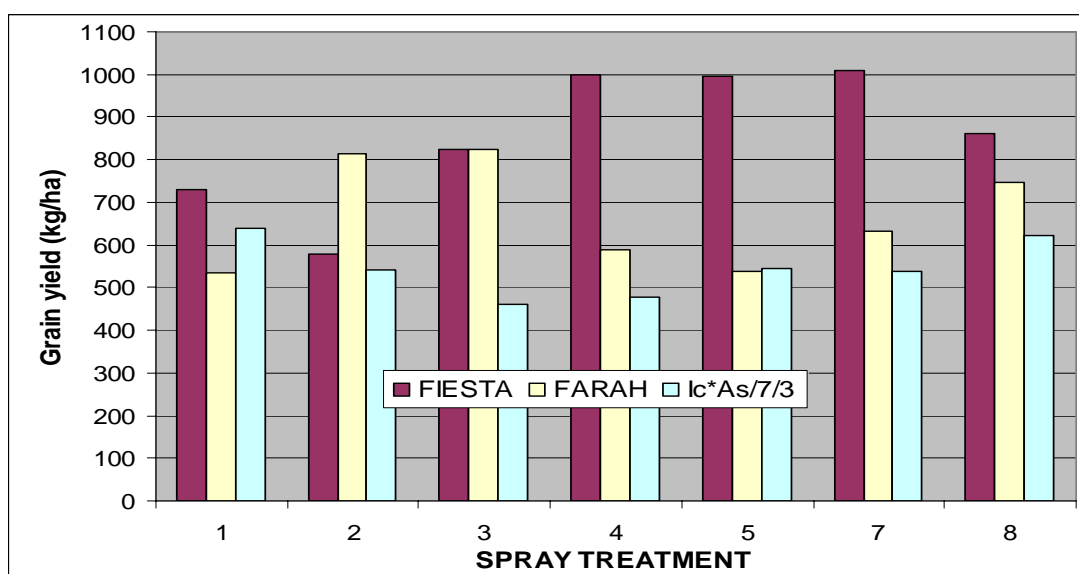
Saddleworth (see Table 17.7.3):

- Low to moderate levels of ascochyta. Fiesta showed significantly higher foliar symptom score (3.3) than Farah (1.5) and Ic*As/7/3 (1.4). No effect of spray treatments on any of the varieties, i.e. fungicide sprays, even the Complete treatment, did not reduce visual symptoms on Fiesta or the other two varieties.
- Low levels of cercospora were also observed on the lower leaves (“early” cercospora) and further up the plant (“advanced” cercospora – misdiagnosed as chocolate spot in the field). No variety differences in the early or advanced cercospora levels, but a significant spray effect on advanced cercospora symptoms – all spray treatments significantly reduced levels in all varieties.
- Grain yield differed significantly between varieties: Fiesta (0.84 t/ha) was higher yielding than Farah (0.65 t/ha) and Ic*As/7/3 (0.56 t/ha). Spray treatments had no overall effect on yields, but the variety by spray interaction was significant, indicating that the varieties responded differently to spray treatments, as we would expect. Fiesta was the most responsive variety (see Figure 17.7.1), with spray treatments 4, 5 and 7 all higher yielding than Control (unsprayed). Farah was less responsive, spray treatments 2 and 3 being higher yielding than Control. Ic*As/7/3 was unresponsive, all spray treatments producing the same yields as Control.
- Overall yields were well below the potential for this site and year, probably due to a combination of factors including poor establishment, herbicide damage, hot, dry spring conditions and insect (heliethis) damage. Note that Fiesta with the best spray treatments yielded 1.0 t/ha, well ahead of the best Farah treatments (0.8 t/ha) and the best Ic*As/7/3 (0.64 t/ha, with no spray).
- Seed size (100 seed weight) differed significantly between varieties – Farah (69.5 g/100 seeds) was larger than Ic*As/7/3 (58.4). Fiesta seed size was intermediate (62.1), and not significantly different from either of the other varieties. Spray treatments had no effect on seed weights.
- Seed staining was worst in Fiesta (stain index of 7.4), and lowest in Ic*As/7/3 (2.1). Farah was intermediate for staining (5.0), and not significantly different from either Fiesta or Ic*As/7/3. Spray treatments had no significant effect on seed staining, although it was reduced to low levels (2.4) in Fiesta with the Complete spray.

Table 3 Variety and spray treatment means for disease, grain yield and quality measures at Saddleworth.

VARIETY	Ascochyta score (1-9)	Cercospora (Early) score (1-9)	Cercospora (Advanced) score (1-9)	Grain yield (kg/ha)	100 seed weight (g/100 grain)	Seed stain index
Fiesta	3.3	2.7	2.0	841	62.1	7.4
Farah	1.5	2.7	2.3	652	69.5	5.0
Ic*As/7/3	1.4	2.8	1.7	558	58.4	2.1
Mean	2.0	2.7	2.0	684	63.3	4.8
Significance	p<0.01	NS	NS	p<0.05	p<0.05	p<0.01
LSD	0.9			171	9.1	2.3
SPRAY TREATMENT						
1&6. Control	2.0	2.9	2.7	635	63.0	6.3
2. Standard	2.0	2.7	1.8	644	63.3	4.9
3. No early spray	1.8	2.5	2.1	703	64.6	3.4
4. Fiesta tactical	2.0	2.8	1.8	689	62.1	5.6
5. Farah tactical	2.7	2.7	2.0	693	62.2	5.1
7. Complete	2.0	2.5	1.3	727	65.1	2.6
8. Minimal	2.0	2.7	1.5	743	63.4	4.6
Mean	2.0	2.7	2.0	684	63.3	4.8
Significance	NS	NS	p<0.001	NS	NS	NS
LSD			0.5			
INTERACTION - VARIETY x SPRAY TREATMENT						
Significance	NS	NS	NS	p<0.05	NS	NS

Figure 1 Grain yield of faba bean varieties with fungicide spray treatments, Saddleworth.



Cockaleeche (see Table 4 below):

- Low levels of ascochyta. Fiesta had a significantly higher foliar symptom score (2.1) than Farah and Ic*As/7/3 (both 1.1). The Standard and Complete spray treatments reduced ascochyta on Fiesta to negligible levels (score of 1.0).
- Chocolate spot foliar scores were slightly higher in all varieties (2.0-2.5), and not affected by spray treatments.
- Grain yields were similar in all varieties (Fiesta 1.96 t/ha, Farah 1.93 t/ha and Ic*As/7/3 1.84 t/ha – differences not significant) and spray treatments. Hot, dry spring conditions, especially several very hot windy days in late September – mid October, most likely limited yield potential and masked any disease effects on grain yield.
- Pre-harvest measurements of height (to bottom pod), lodging score and necking score all showed significant variety effects, but were not influenced by spray treatments. Fiesta was taller than Farah which in turn was taller than Ic*As/7/3. Fiesta and Farah both lodged slightly more than Ic*As/7/3, which also had lower levels of necking.

- 100 seed weight was higher in Farah (66.9 g/100 seeds) than in Fiesta (60.9) and Ic*As/7/3 (60.2), but was not affected by spray treatments.
- Seed staining was minimal across all treatments, and so not recorded. Insect damage (heliiothis) was severe however.

Table 4 Variety and spray treatment means for disease, grain yield and quality measures at Cockaleecheie.

VARIETY	Ascochyta score (1-9)	Chocolate spot score (1-9)	Grain yield (kg/ha)	100 seed weight (g/100 grain)	Height to bottom pod (cm)	Lodging score (1-9)
Fiesta	2.1	2.6	1960	60.9	44.1	8.0
Farah	1.1	2.4	1934	66.9	38.2	8.1
Ic*As/7/3	1.1	1.4	1841	60.2	33.8	8.8
Mean	1.5	2.1	1912	62.7	38.7	8.3
Significance	p<0.05	NS	NS	p<0.001	p<0.01	p=0.001
LSD	0.6			1.8	5.2	0.3
SPRAY TREATMENT						
1&6. Control	1.5	2.2	1933	62.2	39.7	8.3
2. Standard	1.3	1.7	1865	63.2	40.5	8.3
3. No early spray	1.7	2.0	1963	63.3	36.6	8.3
4. Fiesta tactical	1.3	2.3	1896	62.6	37.8	8.3
5. Farah tactical	1.3	2.3	1884	63.1	38.1	8.3
7. Complete	1.0	2.0	1872	63.2	36.5	8.3
8. Minimal	2.0	2.3	1947	61.8	40.8	8.2
Mean	1.5	2.1	1912	62.7	38.7	8.3
Significance	p<0.05	NS	NS	NS	NS	NS
LSD	0.4			62.7	38.7	8.3
INTERACTION - VARIETY x SPRAY TREATMENT						
Significance	p=0.001	NS	NS	p<0.05	NS	NS

Implications of 2004 results for disease management in faba bean varieties

2004 was a low disease year at both sites, and the effects of early disease on final yield and grain quality were most likely masked by the seasonal factors of the hot, dry spring conditions and insect (heliiothis) damage. Despite these limitations, the following disease management points were observed:

Fiesta:

Foliar ascochyta symptoms were reduced at Cockaleecheie with an early (8-9 weeks post-sowing) mancozeb spray, but not at Saddleworth.

Chocolate spot was not reduced by any of the fungicide sprays at Cockaleecheie.

Early cercospora infection was not reduced by any of the fungicide sprays at Saddleworth, but all of the spray treatments reduced the cercospora infection levels on older leaves.

Fiesta grain yield was significantly boosted by spray treatments 4 (Fiesta tactical – mancozeb at 7 weeks post-germination and carbendazim at early flowering), 5 (Farah tactical – mancozeb plus carbendazim at early flowering), and 7 (Complete), at Saddleworth. But no effect of fungicide sprays on yield at Cockaleecheie, or on seed size at either site.

Seed staining was reduced in Fiesta with all of the fungicide regimes at Saddleworth, but most pronounced with the Complete spray program. Staining was not a problem at Cockaleecheie.

Farah:

Foliar ascochyta was at minimum levels in Farah at both sites, even without fungicide applications.

Chocolate spot was also low in Farah at Cockaleecheie, and did not respond to fungicides.

Early stages of cercospora in Farah at Saddleworth did not respond to fungicides, although its spread up the plant appeared to have been retarded by an early mancozeb spray (about 7 weeks post-germination).

Farah grain yield was increased with spray treatments 2 (Standard –mancozeb at 7 and 10 weeks post-germination, carbendazim at early flowering, and mancozeb plus carbendazim at end of flowering) and 3 (Standard without pre-flowering mancozeb sprays). But no effect of fungicide sprays on yield at Cockaleecheie, or on seed size at either site.

Fungicides gave no reduction in seed staining in Farah at Saddleworth, although stain levels were about half those in Fiesta. Staining was not a problem at Cockaleeche.

*Ic*As/7/3:*

Foliar ascochyta was at negligible levels in *Ic*As/7/3* at both sites in the absence of a fungicide spray.

Chocolate spot was also low at Cockaleeche, and did not respond to fungicides.

Early stages of cercospora in *Ic*As/7/3* at Saddleworth did not respond to fungicides. But its spread up the plant appeared to have been retarded by all of the fungicide regimes.

*Ic*As/7/3* grain yield and seed weights showed no significant responses to fungicide sprays at either site.

Seed staining was negligible in *Ic*As/7/3* (and the other varieties) at Cockaleeche, and minimal (less than 50% of Farah and 25% of Fiesta) at Saddleworth. Fungicides gave no further reduction.

These experiments will continue in 2005, with possible modification following review of the 2004 results.