Pulse Agronomic Research for the Development of Variety Specific Management Packages in South Eastern Australia

2005 Results Summary

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Please Note:
1. Several of the chickpea lines have now been named. Flip 94-090c – Genesis™ 090; Flip 94-508c – Genesis™ 508; Flip 94-509c – Genesis™ 509; WACPE 2075 – Sonali.
2. In all milestones, as a minimum we have provided a results table or summary, plus interpretation In some instances, were data have been prepared for other industry reports, a more detailed report has been provided). Further information (including detailed methods) can be provided upon request.
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Milestone 1 – 30/3/05 – repeated in 2005

Grain yield data from trials sown to determine optimum sowing dates and plant densities of Flip 94-090c, Flip 94-509c and Flip 94-508c supplied to Pulse Australia and GRDC in a collated and tabulated form by Dr Brand.
The new varieties will be compared with Howzat for at least 3 sowing dates and at least 4 plant densities at 1 site in the Wimmera, Victoria.

<u>WIMMERA (KALKEE), VICTORIA</u>

Results

Relationship between target plant density and actual plant establishment in chickpeas at Kalkee in 2005.

Plants/m²	
Target	Established
15	14
30	26
45	36
60	48
90	67

Effect of sowing date on grain yield (t/ha) of Chickpeas at Kalkee in 2005.

Sowing Date	Genesis 090	Genesis 508	Genesis 509
May 19	2.26	1.83	1.92
June 16	2.07	1.59	1.87
July 11	2.02	1.56	1.85
lsd		0.13	

Howzat excluded from analysis due to low yields (0.3 t/ha) caused by ascochyta blight infection

Effect of plant density on grain yield (t/ha) of Chickpeas at Kalkee in 2005.

Plant density (plants/m²)	Genesis 090	Genesis 508	Genesis 509
15(14)	1.77	1.32	1.39
30(26)	2.11	1.60	1.78
45(36)	2.18	1.78	1.95
60(48)	2.27	1.73	2.01
90(67)	2.26	1.86	2.27
lsd		0.12	

Howzat excluded from analysis due to low yields (0.3 t/ha) caused by ascochyta blight infection

Interpretation and Other Information

- Key Message: Sowing earlier (e.g mid/late May) and with plant densities greater than 30 plants/m^2 (~100 kg/ha) for Genesis 090 and 45 plants/m^2 (~80 kg/ha) for Genesis 508 and 509 resulted in highest yields. Early sowing also ensured optimum seed size for Genesis 090.
- Climate - The season was characterised by a relatively mild, wet spring following a dry autumn and early winter. Sowing was only delayed by 1-2 weeks compared with a normal year, primarily due to multiple rainfall events which occurred June 9th – June 21st. Both sites showed similar trends for maximum and minimum temperatures. Maximum temperatures were generally slightly above average, apart from the critical months for pulse production of September and October. No maximum temperatures above 26.5^{o}C were recorded at Kalkee from June through October. Minimum temperatures were slightly below average, but there were no significant frosts recorded during the flowering and podding periods of the lentils and chickpeas. Rainfall was close to average for the growing season, but significantly higher than average for October. Critically throughout spring there were a large number of rainfall events. For example, 16 days with rainfall were recorded in September and 10 days in October. Overall climatic conditions in 2005 were ideal for production of high yielding pulse crops.
- Plant establishment – achieved plant densities were generally below target plant densities. The trend for each sowing rate was consistent across all varieties and sowing dates.
- Disease and Maturity – all plots of Howzat were significantly affected by ascochyta blight in this trial. No significant symptoms were seen on Genesis 090, 509 and 508. The infection from ascochyta blight in this trial was natural infection (i.e. no stubble was spread around the site).
- Grain yield – highest yields were achieved for Genesis 090 and 508 when sown early (May 19), despite the fact that no rain occurred prior to June 9, which meant that emergence for the May 19 sowing date was only 1-2 weeks ahead of the June 16 sowing date. Genesis 509 showed no response to sowing date. Howzat only yielded 0.3t/ha at all sowing dates and plant densities due to the ascochyta blight, hence it was excluded from the analysis. All Genesis varieties were responsive to sowing rate, with increased yields at higher plant densities. Genesis 509 was particularly responsive with a yield increase of over 40% when comparing a plant density of 90 plants/m^2 with 15 plants/m^2.
- Seed Size – the highest proportion of 8mm seed of Genesis 090 was produced when sown May 19 or June 16 (62% c.f. 52% when sown July 11).

Milestone 2 – 30/3/2006

Herbicide damage symptoms and grain yield data from trials sown in each of two years to determine the relative herbicide tolerance of Flip 94-090c, Flip 94-509c and Flip 94-508c supplied to Pulse Australia and GRDC in collated and tabulated form by Dr Brand.
The new varieties will be compared with and Howzat for at least 6 commonly used herbicides or herbicide mixes at 1 site each in the Wimmera and southern Mallee (not including Flip 94-508c), Victoria.

WIMMERA (KALKEE), VICTORIA

Results

Weed scores (1 – no weeds, 5 – high weed population) and grain yields of chickpeas for each of the herbicide treatments at recommended (N) and double recommended rates (2N) at Kalkee in 2005. Comparative control treatment underlined.

Herbicide	Weed Score		Grain Yield (t/ha)	
	N	2N	N	2N
trifluralin 480	3.0	3.0	1.13	0.91
metalachlor 720	2.3	2.8	1.20	1.26
metribuzin 750	1.5	1.3	1.62	1.63
simazine 900	<u>2.0</u>	1.0	<u>1.51</u>	1.68
simazine 900+isoxaflutole 750	1.0	1.0	1.80	1.72
simazine 900+diuron 900	1.8	1.3	1.63	1.68
simazine 900+prometryn 500	1.0	1.0	1.85	1.80
simazine 900+imazethapyr 700	1.0	1.0	1.84	1.59
flumetsulam 750	1.8	1.5	1.20	1.13
lsd	0.6		0.20	

Interpretation and Other Information

- Key Message: Genesis 090, Genesis 508 and Genesis 509 showed similar tolerance responses in terms of grain yield and herbicide damage symptoms to a range of herbicides as the current commercial variety Howzat.
- Climate – see milestone 1.
- Plant establishment - plant establishment was not significantly affected by herbicide treatment, however, there appeared to be a slight trend toward lower plant populations in trifluralin @ 2 L/ha (19 plants/m^2 c.f. site mean of 25 plants/m^2).
- Herbicide damage - no obvious symptoms of crop damage were observed for any of the herbicide treatments.
- Weed populations - weed populations (primarily mustard) were significant in several herbicide treatments applied at recommended rates and trifluralin and metalachlor at double recommended rates. However, within a treatment across the trial, weed populations were consistent.
- Grain yield – all varieties showed the same trend in response to herbicide application indicating that the new varieties have similar tolerances to commonly used herbicides as current commercial varieties (Howzat). Grain yields were generally lowest in treatments with poor weed control ($R^2 = 0.71$) indicating significant effects of weeds on yields. The key treatments that appeared to result in yield loss as a direct result of the herbicide were, flumetsulam applied a recommended and double recommended rates and simazine + imazethapyr at double recommended rate (removing these 3 treatments from the correlation between grain yield and weed score increased the R^2 to 0.91). These results are not surprising as these chemicals have been previously shown to cause yield loss in chickpeas. Comparing variety yields, Genesis 090 generally yielded 12% and 17% more than Genesis 509 and Genesis 508, respectively. Because of ascochyta blight Howzat yielded 48% less than Genesis 090.

SOUTHERN MALLEE (BEULAH), VICTORIA

Results

Average herbicide damage symptoms (1 – no symptoms, 9 – complete death) and grain yield of chickpeas for each of the herbicide treatments at recommended[1] (N) and double recommended rates (2N) at Beulah in 2005.

Herbicide	Herbicide damage		Grain yield (t/ha)	
	N	2N	N	2N
trifluralin 480	2.4	4.3	2.44	2.19
metalachlor 720	1.3	1.3	2.51	2.70
metribuzin 750	1.3	1.3	2.57	2.43
simazine 900	1.0	1.1	2.57	2.42
simazine 900+isoxaflutole 750	1.1	3.0	2.48	2.22
simazine 900+diuron 900	1.1	1.8	2.45	2.41
simazine 900+prometryn 500	1.2	1.9	2.50	2.30
simazine 900+imazethapyr 700	3.7	5.9	2.05	1.75
flumetsulam 750	2.1	2.8	2.42	2.35
lsd	0.6		0.20	

1. Exact rates can be supplied upon request.

- Key Message: Genesis 090, Genesis 508 and Genesis 509 showed similar tolerance responses in terms of grain yield and herbicide damage symptoms to a range of herbicides as the current commercial variety Howzat. Simazine + imazethapyr applied at recommended rates caused 20% yield loss to all varieties in 2005. Several other herbicides caused yield loss when applied at double recommended rates indicating potentially small safety margins.
- Climate – See Kalkee description (Milestone 1). At Beulah sowing was delayed 4-5 weeks compared with a normal year.
- Plant Establishment – plant establishment was 30-35 plants/m^2 for all herbicide treatments except for the trifluralin treatment. For Genesis 509, plant establishment was reduced by approximately 40-50% where trifluralin was applied at recommended and double recommended rates. For Genesis 090 and Howzat there was no effect at the recommended rate, but at the double rate, establishment was reduced by approximately 30%.
- Herbicide damage and weeds – visual damage symptoms were noted for several herbicide treatments, but no significant interactions were seen between varieties and herbicide treatments. Simazine + spinnaker applied at recommended and double recommended rates caused the most significant crop damage to all varieties. Moderate symptoms were seen with double recommended rates of trifluralin, simazine + isoxaflutole and flumetsulam. No weeds were present in this trial, thus any yield loss can be fully attributable to herbicide damage.
- Grain yield - there were no significant interactions for grain yield among varieties and herbicide treatments indicating that the new varieties have tolerances to commonly used herbicides similar to the current commercial variety (Howzat). Higher levels of herbicide damage translated significantly into yield losses with an R^2 of 0.83 between damage scores and grain yield. Using simazine at the recommended rate as the control comparison, it can be seen that grain yields were significantly reduced in the simazine + imazethapyr treatment applied at recommended and double the recommended rates and trifluralin, simazine + isoxaflutole, simazine + prometryn and flumetsulam treatments at double recommended rates. Comparing variety yields, Genesis 090 generally yielded 11% and 6% more than Genesis 509 and Howzat.

Milestone 3 – 30/3/2006

Disease severity and grain yield data from trials sown in each of two years to determine the optimum disease management strategy for Flip 94-090c, Flip 94-509c and Flip 94-508c supplied to Pulse Australia and GRDC in collated and tabulated form by Dr Brand and Mr McMurray.
The new varieties will be compared with and Howzat for at least 3 disease management strategies at 1 site each in the Wimmera and southern Mallee (not including Flip 94-508c), Victoria and Mid North, South Australia.

WIMMERA (KALKEE), VICTORIA

Fungicide treatment descriptions

Fungicide treatments, rates and timings used at Kalkee and Beulah to control ascochyta blight.

Regime	Chemical & Application Rate[1]	Timing	Total sprays Kalkee	Total sprays Beulah
Fortnightly	chlorothalonil 500 @ 1.5l/ha	Fortnightly	8	7
Strategically	chlorothalonil 500 @ 1.5l/ha	Strategically from vegetatively through to podding	4	4
Podding(C)	chlorothalonil 500 @ 1.5l/ha	Podding	1	1
Podding(M)	mancozeb 750 @ 1kg/ha	Podding	1	1
Nil	Nil	Nil	0	0

1. Refers to application rate of the product

Results

Ascochyta blight scores (1 – no symptoms, 9 – complete death) recorded 14 October 2005 on the ***foliage*** *of chickpeas grown at Kalkee with various fungicide management regimes under high disease pressure.*

Regime	Genesis 090	Genesis 509	Genesis 508	Nafice	Almaz	Sonali	Howzat	Kaniva
Fortnightly	1.0	1.0	1.0	1.5	1.3	1.8	2.3	3.5
Strategically	1.3	1.5	1.0	3.5	4.3	7.0	8.3	8.8
Podding(C)	1.8	1.5	1.5	4.5	5.8	7.8	8.5	9.0
Podding(M)	1.5	1.3	1.5	4.3	5.0	7.8	8.3	9.0
Nil	1.8	1.3	1.3	4.5	5.3	7.5	8.3	9.0
lsd				1.0				

Ascochyta blight scores (1 – no symptoms, 9 – pods completely covered) recorded 21 November 2005 on the ***pods*** *of chickpeas grown at Kalkee with various fungicide management regimes under high disease pressure.*

Regime	Genesis 090	Genesis 509	Genesis 508	Nafice	Almaz	Sonali	Howzat	Kaniva
Fortnightly	1.0	1.0	1.0	1.0	1.0	1.3	1.3	4.0
Strategically	2.3	1.0	1.0	2.3	3.3	6.0	8.3	9.0
Podding(C)	4.5	2.0	2.5	4.3	6.0	5.3	9.0	9.0
Podding(M)	4.5	2.5	2.3	5.0	6.5	7.3	9.0	9.0
Nil	5.3	2.8	2.0	5.3	6.5	9.0	9.0	9.0
lsd				1.3				

Grain yield (t/ha) of chickpeas grown at Kalkee with several fungicide management regimes under high disease pressure.

Regime	Genesis 090	Genesis 509	Genesis 508	Nafice	Almaz	Sonali	Howzat	Kaniva
Fortnightly	2.19	2.01	1.74	1.56	1.71	1.68	1.82	1.18
Strategically	2.16	2.05	1.72	1.30	1.37	0.44	0.18	0.00
Podding(C)	1.90	1.95	1.65	0.85	0.71	0.20	0.04	0.00

Podding(M)	1.80	1.87	1.60	0.79	0.58	0.18	0.03	0.00
Nil	1.85	1.91	1.67	0.85	0.53	0.11	0.01	0.00
lsd				0.21				

Gross margin ($/ha) of chickpeas grown at Kalkee with several fungicide management regimes under high disease pressure.

Regime	Genesis 090	Genesis 509	Genesis 508	Nafice	Almaz	Sonali	Howzat	Kaniva
Fortnightly	1191	383	291	945	1026	270	320	550
Strategically	1218	457	346	776	790	-90	-180	-240
Podding(C)	1019	469	364	450	327	-129	-183	-195
Podding(M)	988	443	351	398	222	-130	-183	-192
Nil	999	469	388	449	190	-144	-176	-180

GM($/ha): Production = $180/ha, Fungicide = $15/ha/application chlorothalonil & $12/ha/application dithane. Income = (Desi = $350, Kabuli9mm = $850, Kabuli8mm = $750, Kabuli7mm = $550, Kabuli6mm = $330, Screen = $200)

Ascochyta blight infection on seed (% of seed infected) of chickpeas grown at Kalkee with several fungicide management regimes under high disease pressure.

Regime	Genesis 090	Genesis 509	Genesis 508	Nafice	Almaz
Fortnightly	0.0	0.0	0.3	0.5	1.1
Strategically	0.0	0.0	0.3	1.1	1.8
Podding(C)	1.3	0.5	0.3	1.4	2.6
Podding(M)	1.4	0.8	2.8	3.9	7.4
Nil	3.7	1.5	2.0	4.5	5.9
lsd			1.9		

Interpretation and Other Information

- Key Message: results indicated that to prevent yield loss and pod and seed infection caused by ascochyta blight, the resistant varieties, Genesis 090, 509 and 508, are likely to only require 1 fungicide application of chlorothalonil at podding. Nafice and Almaz (moderately resistant) are likely to require 3-4 fungicide applications (6-8 weeks after sowing, during flowering and 2 sprays during podding) to achieve a similar result. Howzat and Kaniva require fortnightly applications beginning 6-8 weeks after sowing.
- The disease pressure observed in this trial was very high due to environmental conditions conducive for ascochyta blight (Milestone 1), and the fact that we had spread ascochyta blight infected stubble throughout the plots.
- Ascochyta blight symptoms (foliage) – the Genesis series varieties showed few symptoms of ascochyta blight, even when no fungicide was applied. In the fortnightly application regime no symptoms were observed. Other varieties did not perform as well with Nafice, Almaz, Sonali and Howzat all displaying minor symptoms of ascochyta blight in the fortnightly application regime, while Kaniva had moderate symptoms. In the strategic application regime, Nafice and Almaz showed significantly worse symptoms than in the fortnightly application, but less symptoms than the podding or nil regimes. Almaz generally showed slightly worse symptoms than Nafice, but both were significantly better than Sonali, Howzat and Kaniva. Sonali, Howzat and Kaniva, all showed severe symptoms or were dead in fungicide treatments other than the fortnightly application regime.
- Ascochyta blight symptoms (pods) – Ascochyta blight scores on the pods were generally similar to foliage ascochyta blight scores for all varieties except Genesis 090. Genesis 090 displayed symptoms significantly worse than other Genesis varieties in all spray treatments except the fortnightly application. The strategic spray regime was sufficient to prevent all pod infection in Genesis 508 and 509, while in Genesis 090, Nafice and Almaz only the fortnightly regime prevent pod infection. No treatment completely prevented ascochyta blight symptoms in Sonali,

Howzat and Kaniva. Please note that under field conditions with resistant varieties (Genesis 090, 509 and 508) the disease pressure is unlikely to ever reach the level observed in this trial, thus pod infection should be preventable with a single fungicide application during podding. In this trial, pod infection was a result of spores that were generated from the susceptible to moderately resistant varieties.

- Grain yield and gross margin – In the fortnightly spray regime, where disease was controlled, Genesis 090, produced highest yields and Kaniva lowest. Genesis 508 and 509 had no significant yield loss in any of the disease management regimes compared with the fortnightly regime. For Genesis 090 the strategic regime prevent any yield loss, however, in the pod or nil regime a 13-18% yield loss was recorded. For Almaz and Nafice the strategic spray regime resulted in losses of 20% and 18% respectively. For the podding and nil regimes, yield loss was between 45 and 70%. Sonali, Howzat and Kaniva all showed yield losses greater than 75% in regimes with reduced fungicide application compared with fortnightly. Gross margins highlight the potential profitability of Genesis 090 even without fungicide applied.
- Other information – Where ascochyta blight was not adequately controlled seed size (and the proportion of larger seed) was reduced. This is particularly critical for the larger seeded Kabuli's where size is needed for the premium prices. Tests for ascochyta blight infection on seed revealed that significant levels of ascochyta blight were present on the seed of all varieties except Genesis 509 from the nil and podding (M) fungicide regime. Across all treatments Nafice and Almaz generally had the highest level. These results highlight that it is critical that growers apply a fungicide seed dressing prior to sowing in 2006, particularly on varieties with a rating of moderately resistant or less. It also potentially indicates that chlorothalonil applied at podding is a better option than mancozeb.

SOUTHERN MALLEE (BEULAH), VICTORIA

Results

Ascochyta blight scores (1 – no symptoms, 9 – complete death) recorded 9 November 2005 on the foliage of chickpeas grown at Beulah with several fungicide management regimes under high disease pressure.

Regime	Genesis 090	Genesis 509	Howzat	Sonali
Fortnightly	1.0	1.0	1.8	1.8
Strategically	1.0	1.0	3.8	3.3
Podding(C)	2.0	1.8	6.5	6.5
Podding(M)	2.3	1.8	7.5	7.0
Nil	2.3	1.3	8.0	6.8
lsd	1.0			

Grain yield (t/ha) of chickpeas grown at Kalkee with several fungicide management regimes under high disease pressure.

Regime	Genesis 090	Genesis 509	Howzat	Sonali
Fortnightly	2.77	2.30	2.75	2.35
Strategically	2.76	2.32	1.94	1.96
Podding(C)	2.31	2.00	0.53	0.51
Podding(M)	2.50	2.02	0.16	0.46
Nil	2.38	2.10	0.29	0.54
lsd	0.30			

Interpretation and Other Information

- Key Message: results indicated that to prevent yield loss and pod and seed infection caused by ascochyta blight, the resistant varieties, Genesis 090, 509 and 508, are likely to only require 1 fungicide application of chlorothalonil at podding. Nafice and Almaz (moderately resistant) are likely to require 3-4 fungicide applications (6-8 weeks after sowing, during flowering, 2 sprays during podding) to achieve a similar result. Howzat and Kaniva require fortnightly applications beginning 6-8 weeks after sowing.

- The disease pressure observed in this trial was high, but less than that observed at Kalkee.
- Ascochyta blight symptoms (foliage) – Genesis 090 and 509 showed few symptoms of ascochyta blight, even when no fungicide was applied. Genesis 090 was slightly worse than Genesis 509. Both Howzat and Sonali showed severe symptoms of disease in the podding and nil fungicide regime.
- Grain yield – In the fortnightly spray regime, where disease was controlled, Genesis 090 and Howzat, produced highest yields and Sonali and Genesis 509 lowest. Genesis 090 had no yield loss in the strategic fungicide regime and only minimal yield loss in podding and nil fungicide regimes compared with the fortnightly regime. Howzat and Sonali showed yield losses of 30% and 20%, respectively in the strategic fungicide regime and greater than 75% in the podding and nil fungicide regimes compared with fortnightly.
- Other information – Similar to observations at Kalkee, Genesis 090 displayed a greater proportion of diseased pods than Genesis 509 in the podding and nil treatments. No diseased pods were recorded in the fortnightly and strategic regimes. Results in this trial clearly indicated that chlorothalonil was a better fungicide to use at podding than mancozeb, as there was generally less disease on pods of all varieties in that treatment. Where ascochyta blight was not adequately controlled, seed size (and the proportion of larger seed) was reduced.

MID NORTH (HART AND TURRETFIELD), SA

Larn McMurray, SARDI, Clare & Jenny Davidson, SARDI, Waite

Aims

To compare disease management strategies for minimum fungicide input and maximum grain yield and quality of new chickpea varieties.

To demonstrate the much improved levels of ascochyta blight disease resistance in new varieties of chickpeas to SA growers.

Treatments

Random complete block design experiments were conducted at two sites in South Australia in 2005 following on from similar experiments held at these sites in 2004. Trials were conducted at Hart in the mid north on the Hart Field day site (clay loam over heavy clay, pH 8.5 in water) and at Turretfield (Kingsford property) in the lower mid north (clay loam over a light medium clay, pH 7.3 in water).

Treatments consisted of:

6 varieties - Howzat (desi, moderately susceptible to ascochyta), Sonali (desi, moderately susceptible/moderately resistant), Almaz (large kabuli moderately resistant), Genesis 508 (desi, resistant), Genesis 090 (small kabuli, resistant) and FLIP94-509C (desi, resistant).

6 fungicide strategies - control (no sprays), fortnightly (sprays every 14 days starting at 6 weeks after sowing), standard (6 week after sowing, early flowering and early podding), chlorothalonil podding (chlorothalonil at early podding), mancozeb podding (mancozeb at early podding), predictive (sprayed when a single rainfall event of >10mm of rain was forecasted for Howzat and Sonali (MS to ascochyta), when >20mm of rain forecasted for Almaz (MR) & when > 50mm of rain forecasted for others (R)).

Treatment spray dates and frequency detailed in table 1.

Table 1: Sowing date, disease inoculation and spray treatment timing at Hart and Turretfield

Operation	Hart		Turretfield	
	Date	Treatments	Date	Treatments
Sown **Disease inoculated**	17/6 3/8 (Spore mix), 18/8 (stubble)	all spreader rows	29/6 13/8 (Spore mix), 2/9 (stubble)	all spreader rows
Spray 1 **Spray 2** **Spray 3**	29/7 12/8 16/8	St, Fn Fn P10,P20	12/8 16/8 26/8	St, Fn P10,P20 Fn
Spray 4 **Spray 5** **Spray 6**	26/8 8/9 20/9	Fn Fn,P10 Fn	7/9 22/9 6/10	Fn, P10 Fn St,Fn,P10,P20
Spray 7 **Spray 8** **Spray 9**	24/9 4/10 18/10	P10 St,Fn St,Fn,cP,mP,P10,P20	20/10 27/10 1/11	Fn St,cP,mP,P10 Fn
Spray 10 **Spray 11**	31/10 -	Fn -	16/11 30/11	Fn,cP,mP Fn

St=strategic sprays, Fn=fortnightly sprays, cP=chlorothalonil podding, mP=mancozeb podding, P10=predictive sprayed on 10mm of rain, P20=predictive sprayed on 20mm of rain, P50=predictive sprayed on 50mm of rain

All sprays were chlorothalonil (720 g/L) @ 2.0L/ha except for mancozeb podding where mancozeb (800g/kg) @ 2.2kg/ha was applied.

Each trial was sown with group N inoculum with desi types at a density of 50 seeds per sq.m and the kabuli at 35 seeds per sq.m. Fertilizer used was MAP+2% Zn @ 90kg/ha at Hart and MAP +2% zinc @ 40kg/ha drilled with the seed (DAP @ 100kg/ha was pre-drilled) at Turretfield.

Both trials had rows of Kaniva sown between each plot and were inoculated with disease as shown in Table 1. All plots of the Turretfield trial were sprayed with procymidone (500g/L) @ 0.5 L/ha at mid and late podding to control botrytis infection. Trials were rated for foliar disease at various stages during the growing season and for pod disease infection at maturity. Trials were harvested for grain yield in December and 100 grain seed weights were recorded.

Results

Hart

Ascochyta blight disease severity in the trial was generally only at moderate levels until the podding stage. Due to late season rains and favourable conditions during October and early November disease pressure became high and resulted in plant death, severe pod infection and yield loss in moderately susceptible varieties, with some low level loss occurring in control plots of resistant varieties.

Table 2: The effect of various fungicide strategies on ascochyta blight infection (% plot severity infection at late podding & % pods infected at maturity) on selected chickpea varieties at Hart 2005

Treatment	Howzat		Genesis090		Genesis508		Sonali		Almaz		FLIP94-509C	
	%plot	*%pod*	%plot	*%pod*	%plot	*%pod*	%plot	*%pod*	%plot	*%pod*	%plot	*%pod*
Control	93	*100*	15	*78*	9	*49*	84	*100*	30	*85*	13	*71*
Fortnightly	25	*8*	9	*1*	8	*1*	21	*1*	11	*2*	8	*1*
Standard	61	*23*	11	*5*	13	*2*	44	*9*	20	*4*	8	*4*
Podding chlorothalonil	71	*75*	14	*9*	10	*4*	56	*59*	28	*11*	8	*14*
Podding mancozeb	76	*96*	21	*75*	10	*40*	61	*98*	29	*80*	14	*39*
Predictive	29	*17*	16	*83*	10	*60*	30	*6*	24	*78*	19	*80*
LSD (0.05)	9.3	*23.3*										

Table 3: The effect of various fungicide strategies on grain yield (t/ha) and seed size (g/100 seeds) on selected chickpea varieties at Hart

Treatment	Howzat		Genesis090		Genesis508		Sonali		Almaz		FLIP94-509C	
	t/ha	*g/100*	t/ha	*g/100*	t/ha	*g/100*	t/ha	*g/100*	t/ha	*g/100*	t/ha	*g/100*
Control	0.15	*10.7*	1.39	*30.5*	1.3	*14.4*	0.3	*12.9*	0.93	*35.7*	1.5	*14.4*
Fortnightly	1.9	*21.4*	1.78	*34.5*	1.57	*16.8*	1.76	*19*	1.79	*48.2*	1.78	*16.6*
Standard	0.96	*21.5*	1.74	*33.5*	1.56	*15.6*	1.64	*19.2*	1.56	*45.2*	1.71	*16.5*
Podding chlorothalonil	0.52	*19.9*	1.83	*33.7*	1.42	*16*	0.99	*17.5*	1.43	*44.6*	1.68	*15.8*
Podding mancozeb	0.24	*15.8*	1.51	*29.6*	1.38	*14.7*	0.65	*16.6*	1.16	*37.8*	1.6	*15.2*
Predictive	1.71	*21.12*	1.36	*29.7*	1.34	*14*	1.64	*19.2*	1.13	*38.1*	1.42	*13.8*
Site mean	1.33	*23.3*										
CV%	9.7	*4.7*										
LSD (0.05)	0.18	*1.5*										

Turretfield

Ascochyta blight disease severity in the trial was at high levels from late winter until the podding stage. Due to above average late season rainfall and very favourable conditions for disease spread during October and early November disease pressure became very severe and resulted in plant death of whole plots of unsprayed and some sprayed treatments of moderately susceptible and moderately resistant varieties. Moderate levels of pod infection and generally low levels of pod loss occurred in untreated plots of resistant varieties. Due to very high biomass production in varieties and treatments with low foliar loss from ascochyta blight and warm wet conditions in spring an outbreak of botrytis occurred leading to some level of pod infection and abortion, complicating interpretation of results.

Table 4: The effect of various fungicide strategies on ascochyta blight infection (% plot severity infection at late podding & % pods infected at maturity) on selected chickpea varieties at Turretfield

Treatment	Howzat		Genesis090		Genesis508		Sonali		Almaz		FLIP94-509C	
	%plot	*%pod*	%plot	*%pod*	%plot	*%pod*	%plot	*%pod*	%plot	*%pod*	%plot	*%pod*
Control	98	-	13	*11*	11	*24*	95	*94*	41	*78*	13	48
Fortnightly	29	*25*	10	*0*	8	*3*	28	*11*	13	*2.5*	9	3
Standard	90	*100*	13	*4*	14	*11*	64	*60*	46	*33*	9	19
Podding chlorothalonil	100	-	16	*10*	14	*3*	84	*98*	39	*18*	11	43
Podding mancozeb	99	-	14	*16*	11	*7*	90	*98*	41	*58*	13	15
Predictive	83	*93*	14	*14*	14	*20*	58	*80*	44	*84*	14	16
LSD (0.05)	8.3	*34.3*										

- = no pods present due to high disease infection

Table 5: Level of botrytis infection on pods at maturity on selected chickpea varieties at Turretfield

Variety/line	Pod infection (0-3, 3=high)	Homogeneous group
Almaz	1.69	A
Genesis090	1.17	AB
FLIP94-509C	1	AB
Genesis508	0.92	B
Sonali	0.75	B
Howzat	-	*No pods present*

Table 6: The effect of various fungicide strategies on grain yield (t/ha) and seed size (g/100 seeds) on selected chickpea varieties at Turretfield

Treatment	Howzat		Genesis090		Genesis508		Sonali		Almaz		FLIP94-509C	
	t/ha	*g/100*	t/ha	*g/100*	t/ha	*g/100*	t/ha	*g/100*	t/ha	*g/100*	t/ha	*g/100*
Control	0.04	*15.6*	1.79	*31.6*	1.91	*17.5*	0.13	*13.6*	0.1	*28.7*	2.08	*17.1*
Fortnightly	2.32	*22.9*	2.78	*34.1*	3.37	*17.7*	3.15	*18.1*	1.96	*43.8*	3.31	*17.6*
Standard	0.09	*16.7*	2.4	*32.6*	2.62	*18.4*	0.98	*17.2*	0.47	*36.8*	3.03	*16.4*
Podding chlorothalonil	0.03	*16.3*	2.29	*32.2*	2.24	*17.6*	0.44	*16.5*	0.71	*40.3*	2.57	*17.4*
Podding mancozeb	0.03	*16.8*	1.9	*31.2*	1.99	*17.7*	0.15	*16.2*	0.22	*25.8*	2.32	*16.8*
Predictive	0.05	*15.2*	1.72	*30.6*	1.92	*18.1*	1.21	*18.1*	0.16	*33.3*	2.1	*17.4*
Site mean	1.52	*22.6*										
CV%	12.9	*6.9*										
LSD (0.05)	0.27	*2.2*										

* Ascochyta blight (very severe) and botrytis (moderate) infection present.

Discussion

At both sites, as found in the 2004 experiments, varieties moderately susceptible to ascochyta blight like Howzat and Sonali had vastly higher levels of foliar disease than all three resistant varieties in the unsprayed control treatments. The moderately resistant variety Almaz also had higher levels of foliar disease than these resistant varieties particularly at Turretfield where a higher level of disease incidence occurred. All three resistant varieties had similar low levels of foliar infection at both sites in the unsprayed treatments and there was no advantage of applying fungicides to these varieties as found in varieties with only partial levels of resistance. At Turretfield only the fortnightly fungicide treatment reduced foliar disease levels in Howzat, Sonali and Almaz, all other fungicide strategies failed to control the disease effectively. At Hart the predictive spray strategy along with the fortnightly treatment effectively reduced disease levels in Howzat and Sonali. The standard spray strategy also reduced foliage disease levels to a lesser extent in both varieties at Hart with Sonali having lower levels than Howzat, but still significantly higher than the fortnightly and predictive treatments.

Very high yield loss occurred in the moderately susceptible and moderately resistant varieties when they were not treated with fungicide at both sites, in fact total yield loss occurred in Howzat at Turretfield in all treatments except the fortnightly sprayed strategy. Sonali (62% to 95% yield loss) and Almaz (64% to 92% yield loss) also suffered very high yield loss at this site in all sprayed treatments when compared with the fortnightly sprayed strategy in each variety. At Hart, where the disease pressure was lower, the foliar fungicide strategies had a greater level of success in preventing yield loss in varieties with partial levels of resistance. Yield losses compared to the fortnightly sprayed treatment in Howzat ranged from 87% in the mancozeb podding treatment to only 10% in the predictive (4 sprays) treatment. In Sonali the yield loss range was from 63% in the mancozeb podding spray to only 7% in both the standard and predictive strategies while in Almaz it ranged from 37% in the predictive to 13% in the standard. These results indicate that to grow varieties with partial resistance under moderate to high disease pressure conditions that at least three to four strategically applied foliar fungicides would be required to avoid yield loss.

Grain yield loss in the unsprayed treatments of the three resistant varieties was substantially less compared with grain yield loss in varieties with partial resistance. At Hart the unsprayed treatment of Genesis090 was 22% lower yielding than when it was sprayed fortnightly while in Genesis508 and FLIP94-509C there were yield reductions of 17% and 16% respectively. This compared with yield losses of 92%, 83% and 48% in the same treatments of Howzat, Sonali and Almaz respectively. In all three resistant varieties only one spray of chlorothalonil at the early podding stage was required to reduce grain yield loss to zero unlike in the other varieties where up to four sprays still failed to reduce all of the yield loss completely.

At Turretfield two sprays of chlorothalonil at the podding stage in all lines was insufficient to control disease and prevent yield loss due to the extremely high levels of inoculum present and the highly favourable conditions for disease spread which occurred during flowering and podding. In this podding treatment Genesis090 only incurred an 18% yield reduction when compared to the fortnightly sprayed treatment, this compared with reductions of 64% in Almaz, 86% in Sonali and 100% in Howzat for the same treatments. Due to the very high level of disease loading in this trial it is likely that even the fortnightly sprayed treatments of the varieties with partial resistance suffered some degree of yield loss. Botrytis was also present in this trial and pod infection and abortion in all varieties was observed despite two sprays of procymidone being applied. Pod infection ratings indicated that Almaz was more prone to infection than other varieties. The predictive spray strategies were unsuccessful in preventing yield loss in all varieties at Turretfield most likely due to the very high disease pressure level and the long extended wet period which existed during spring. This strategy requires further refining before it can be used successfully in a broad acre situation.

Due to favourable seasonal conditions for disease spread and pod infection during podding at both sites high levels of pod infection and grain size reductions occurred in Howzat and Sonali where they were not treated with fungicide. Almaz and the resistant varieties all suffered lower levels of pod infection and seed size reductions in the untreated plots. At Hart one spray of chlorothalonil at early podding in the resistant varieties reduced pod infection levels and seed size reductions to the same level as that achieved in the fortnightly sprayed treatments of these varieties. This was not achieved in Almaz, Sonali and Howzat where three to four sprays were required during the season to achieve a similar result. At Turretfield two sprays of chlorothalonil were required during podding to prevent a seed size reduction occurring in Genesis090 while none of the fungicide strategies were successful in preventing a seed size reduction in Almaz, Sonali and Howzat. No seed size reduction occurred in Genesis508 and FLIP94-509C in the unsprayed plots compared to the fortnightly sprayed plots despite having higher levels of pod infection than Genesis090.

Chlorothalonil was clearly superior to mancozeb as a podding spray treatment with lower levels of pod infection, yield losses and grain size reductions in all varieties at both sites. At Hart where one spray of chlorothalonil during podding was sufficient to prevent yield loss and seed size reduction in all three resistant varieties the application of one spray of mancozeb was only able to achieve this result in Gensis508 and FLIP94-509C but not in Genesis090. This result not only indicates that mancozeb had a lower level of efficacy than chlorothalonil but also that Genesis090 is likely to be more susceptible to pod loss than Genesis508 and FLIP94-509C.

Conclusions

- Howzat, Sonali and Almaz had significantly greater levels of foliar disease, pod infection levels, yield loss and seed size reductions than all three resistant varieties when no fungicides were applied at both sites.
- Under very severe disease pressure levels fortnightly sprays of chlorothalonil did not always prevent plant death from occurring in Howzat, Sonali and Almaz.
- One spray of chlorothalonil at the podding stage in the resistant varieties was sufficient to control high levels of ascochyta blight disease pressure and prevent yield loss and seed size reduction, up to eight sprays were required in moderately susceptible lines and four sprays in moderately resistant varieties.
- Genesis090 and Genesis508 can be successfully grown in SA with only the need for one fungicide spray during podding except for in cases where very severe levels of disease pressure exist early in the season and then more frequent spraying in flowering and podding may be required.

- Varieties with partial resistance to ascochyta blight like Almaz can be successfully grown in SA however they will require a proactive regular fungicide spray strategy including early season fungicide sprays when disease is present.
- The treatment based on spraying according to forecasted rainfall amounts and variety disease susceptibility (predictive) was successful for moderately susceptible varieties under high levels of disease pressure, however needs further refining for severe disease level conditions and varieties with moderate or greater levels of resistance to ascochyta blight.
- Chlorothalonil was superior to mancozeb as a podding spray treatment.

Acknowledgments
The assistance and help of John Nairn, Brad Bennett and Andrew Bird SARDI, Clare with trial management and spraying fungicide treatments and Shaid Khan SARDI, Waite Precinct with inoculating and rating trials are gratefully acknowledged.

Milestone 4 – 30/3/2006

Disease severity and grain yield data from trials sown in each of two years to determine the optimum disease management strategy for Farah and Ic*As/7/3 supplied to Pulse Australia and GRDC in collated and tabulated form by Mr McMurray and Dr Armstrong.
The new varieties will be compared with and Fiesta for at least 3 disease management strategies at 1 site each in the Mid North and lower Eyre Peninsula, South Australia (2004 and 2005) and Wagga, New South Wales (only 2005 and 2006).

LOWER EYRE PENINSULA (COCKALEECHIE) AND MID NORTH (SADDLEWORTH) SA

Jim Egan and Jo Crouch, SARDI, Port Lincoln

Disease score data provided by Jenny Davidson and Rohan Kimber, SARDI Field Crop Pathology Unit, Waite.

Note: Ic*As/7/3 was released as Nura in September 2005, and is referred to by this name in the following section.

Trials were sown at Saddleworth (Mid North district of SA) on June 7 (dry), and Cockaleechie (Lower Eyre Peninsula) on June 28, about a fortnight after the season break.

Proposed fungicide spray treatments: (similar to treatments 1 to 8 used in NSW trial at Wagga)

1. **Control** - no fungicide sprays.
2. **Standard** – 3-4 sprays total, depending on time to flowering: i.e. mancozeb @ 6-8 weeks post-emergence (and ca 10 weeks if not commenced flowering), carbendazim @ early flower and mancozeb+carbendazim @ end flower.
3. **Standard without early spray/s** – i.e. carbendazim @ early flower and mancozeb+carbendazim @ end flower.
4. **Fiesta VF tactical** program - mancozeb spray when ascochyta present (on Fiesta VF) and conditions favourable. Carbendazim sprays @ early and end flower.
5. **Farah tactical** program - mancozeb spray when ascochyta present (on Farah) and conditions favourable. Carbendazim sprays @ early and end flower.
6. **Nura tactical** program - spray with mancozeb+carbendazim if and when ascochyta and/or chocolate spot present (on Nura) and conditions favourable.
7. **Complete** - first chlorothalonil spray @ 6-8 weeks, and every 2 weeks thereafter. include carbendazim from early flower on.
8. **Minimal** - carbendazim @ early flower only.
9. **Chlorothalonil Standard without early spray/s** – i.e. carbendazim @ early flower and chlorothalonil+carbendazim @ end flower/early podding.

Saddleworth trial

At Saddleworth, the proposed 9 fungicide spray treatments was reduced to 8, with the omission of the Nura Tactical spray treatment due to insufficient disease present on Nura to warrant spraying. Thus treatment 6 effectively became another control (Nil spray) treatment.

Variety and fungicide spray treatment effects on disease, grain yield and quality measures in faba beans at Saddleworth in 2005.

VARIETY	Ascochyta score (1-9)	Chocolate spot score (1-3)	Grain yield (t/ha)	100 seed weight (g/100 grain)	Seed stain index (0-100)
Fiesta VF	3.9	2.3	5.58	76.9	7.1
Farah	2.2	2.1	5.94	77.4	2.3
Nura	1.1	1.8	4.43	68.5	1.4
Mean	2.4	2.1	5.32	74.3	3.6
Significance	P<0.001	P<0.001	P<0.001	P<0.001	P<0.001
LSD	0.3	0.2	0.49	1.0	1.2
SPRAY TREATMENT					
1&6. Control (Nil)	2.8	2.7	5.16	73.8	4.3
2. Standard	2.3	1.8	5.25	75.1	3.9
3. No early spray	2.9	2.2	5.50	73.8	2.7
4. Fiesta VF tactical	2.3	1.8	5.60	74.3	3.4
5. Farah tactical	2.4	1.9	4.87	74.4	4.8
7. Complete	1.2	1.3	5.41	75.0	1.5
8. Minimal	2.6	2.2	5.22	73.9	3.7
9. Chlorothalonil	2.2	1.8	5.67	74.2	3.9
Mean	2.4	2.1	5.32	74.3	3.6
Significance	P<0.001	P<0.001	NS	NS	P<0.05
LSD	0.6	0.3			2.0
INTERACTION - VARIETY x SPRAY TREATMENT					
Significance	P<0.01	P<0.001	NS	NS	NS

- **Ascochyta and chocolate spot disease scores** (in-crop) were both significantly affected by Variety and Spray treatment, and the interaction of Variety x Spray treatment was also significant.
  - **Ascochyta**: Nura < Farah < Fiesta VF.
    Complete < Standard < Nil.
    Minimal and Standard without early spray were both similar to Nil.
    Fiesta VF was the most responsive variety to fungicide sprays, and Nura the least responsive (minimal ascochyta in all treatments).
  - **Chocolate spot:** Nura < Farah < Fiesta VF.
    Complete < Standard < Nil.
    Other spray treatments were similar to Standard.
- **Cercospora** was present in all plots at a low level, with a slight indication of lower incidence in Nura plots.
- **Seed stain:** Significant Variety and Spray treatment effects.
  Nura and Farah < Fiesta VF. Nura lowest, but not significantly below Farah.
  Fiesta VF was most responsive to fungicide sprays, Nura least responsive – e.g. lowest seed stain in Fiesta VF with Complete spray, but still on a par with unsprayed Nura.
- **Yield:** Only Variety effects significant – Spray treatments NS.
  Nura < Farah and Fiesta VF.
- **Seed size:** Only Variety effects significant – Spray treatments NS.
  Nura < Farah and Fiesta VF.

Cockaleechie trial

At Cockaleechie, disease levels were low up to early October, so no tactical sprays were applied for any variety. Wind damage and tall, rank growth made spraying of individual plots impractical after early October. As a result, the trial was reduced to 4 spray treatments only, with no late sprays.

Variety and fungicide spray treatment effects on disease, grain yield and quality measures in faba beans at Cockaleechie in 2005.

VARIETY	Ascochyta index (0-100)	Defoliation score * (0-100)	Chocolate spot index (1-10)	Grain yield (t/ha)	100 seed weight (g/100 grain)	Seed stain index (0-100)
Fiesta VF	0.42	44.5	2.6	5.63	69.4	6.0
Farah	0.14	36.2	2.7	5.62	71.6	1.2
Nura	0.00	42.4	2.0	5.72	63.4	0.4
Mean	0.19	41.0	2.4	5.66	68.1	2.5
Significance	NS	P<0.05	P<0.05	NS	P<0.001	P<0.001
LSD		5.8	0.5		1.0	0.8
SPRAY TREATMENT						
1. Control (Nil)	0.02	53.5	2.7	5.57	68.0	2.6
2. Standard	0.56	31.3	1.8	5.77	67.8	3.0
3. No early spray	0.35	34.5	2.5	5.65	68.1	2.6
4. Complete	0.01	20.4	1.6	5.89	68.8	1.6
Mean	0.19	41.0	2.4	5.66	68.1	2.5
Significance	NS	P<0.001	P<0.001	P<0.01	NS	NS
LSD		10.0	0.8	0.25		
INTERACTION - VARIETY x SPRAY TREATMENT						
Significance	NS	NS	P<0.05	NS	NS	NS

*** Defoliation was largely attributed to cercospora infection.**

- **The defoliation score and chocolate spot disease index** (in-crop) were both significantly affected by Variety and Spray treatment, but the **Ascochyta disease index** was very low and not significantly affected (although tended to be lower on Nura and higher on Fiesta VF).
  - **Defoliation: Attributed to Cercospora infection, so interpreted as a measure of cercospora levels.**
    Farah < Fiesta VF and Nura.
    Complete spray treatment < Standard and Standard without early spray < Nil.
  - **Chocolate spot:** Nura < Farah and Fiesta VF.
    Complete spray treatment < Standard without early spray and Nil.
    Standard < Nil.
- **Seed stain:** Significant Variety effect only – Spray treatments NS.
  Nura and Farah < Fiesta VF.
- **Yield:** Significant Spray treatment effect only – Variety effect and interaction NS.
  Nil < Complete. Standard and Standard without early spray were intermediate in yield.
- **Seed size:** Significant Variety effect only – Spray treatments NS.
  Nura < Fiesta VF < Farah.

Interpretation and Other Information

The following general comments on responses need to be considered in the light of the very low disease levels at both sites in 2005.

- Ascochyta disease symptoms in-crop were generally lowest in Nura and highest in Fiesta VF.
- Chocolate spot was also lowest in Nura, and at similar (higher) levels in Fiesta VF and Farah.
- Cercospora levels were variable between varieties – this may reflect in part the difficulty of distinguishing cercospora from other disease symptoms in the field.
- Ascochyta seed staining was minimal in Nura, slightly more in Farah, and highest in Fiesta VF.
- Complete spray treatments reduced ascochyta in Farah and Fiesta VF at Saddleworth, but had no effect in Nura where the disease level was extremely low anyway. No response was seen at Cockaleechie, where disease levels were also low.
- Maximum yields in Fiesta VF and Farah at Cockaleechie were achieved with complete spray treatments, slightly better than the Standard spray regime. Nura yielded equally well with the Standard and Complete spray treatments.
- Yield results were not so well-defined at Saddleworth, however, with highest yields in Fiesta VF from the Standard without early spray treatment, in Farah from the Fiesta VF tactical treatment, and in Nura from the chlorothalonil Standard treatment.
- Variety yields were similar at Cockaleechie (5.6-5.7 t/ha), but at Saddleworth Nura was well down on Fiesta VF and Farah (4.4 t/ha compared with 5.6-5.9 t/ha). Spinnaker herbicide was applied at Saddleworth, and herbicide tolerance testing in SA has shown that Nura may be less tolerant to Spinnaker than either Fiesta VF or Farah, especially in low biomass situations. The later than ideal emergence of beans in 2005 (mid-June) may have rendered Nura more sensitive to the spinnaker application, therefore. It is proposed to test this in the 2006 pulse agronomy trial program.

<u>WAGGA, NSW</u>

Aim: To determine the optimum fungicide strategy for disease control in Farah, Fiesta VF and Nura faba bean.

Results

Sowing date: 24th June
Fertiliser: 110 kg/ha Grain Legume Super
Herbicides: 24 June 2L Stomp + 2L Sprayseed pre-sowing
25th July Sencor @ 500mls/ha pre-emergent
16 August Select @ 200 ml/ha

Variety	Fungicide Treatments	Yield (t/ha)	Plant Density (plants/m^2)	100 sdwt (grams)	Plot Disease Rating 10-Oct	Plant Disease Rating 10-Oct
Farah	Control	3.77	27	58.2	3	2
	Standard	3.58	23	59.2	3	2
	Stand_Without_Early	3.42	26	59.8	3	2
	Fiesta VF_Tactical	3.7	28	59.3	2	2
	Farah_Tactical	3.77	24	59.9	2	2
	Nura_Tactical	3.3	22	60.4	4	3
	Complete	2.38	21	60.1	2	1

	Minimal	3.54	25	60.4	2	2
Fiesta VF	Control	2.17	10	59.2	3	2
	Standard	2.24	12	58.0	3	2
	Stand_Without_Early	2.17	12	56.8	2	2
	Fiesta VF_Tactical	2.14	12	58.6	2	2
	Farah_Tactical	2.33	14	60.1	2	2
	Nura_Tactical	2.24	14	55.7	3	3
	Complete	2.48	16	58.3	2	1
	Minimal	2.69	14	58.6	2	2
Nura	Control	2.87	18	54.8	2	1
	Standard	2.83	21	56.0	2	1
	Stand_Without_Early	2.61	21	56.1	2	1
	Fiesta VF_Tactical	2.83	19	55.0	2	1
	Farah_Tactical	2.79	20	54.7	2	1
	Nura_Tactical	2.39	16	54.9	2	1
	Complete	3.11	21	56.0	1	1
	Minimal	2.74	21	55.4	2	1

LSD 5%	0.748		2.39
CV %	17.4		2.9

Key:
Plot Disease Rating : Incidence of disease in plot, 1 nil; 9 totally infected
Plant Disease Rating : Severity of disease on plants, 1 low level; 9 fully infected

Fungicide Treatments
Control - no fungicide sprays
Standard - 3-4 sprays: mancozeb @ 6-8 and at 10 weeks (if necessary), carbendazim @ early flower and mancozeb+carbendazim @ end flowering.
Standard without early spray - ie carbendazim @ early flowering and mancozeb+carbendazim @ end flowering.
Fiesta VF tactical program - mancozeb spray when ascochyta present (on fiesta) and conditions favourable for disease buildup. carbendazim sprays@ early and end flowering.
Farah tactical program - mancozeb spray when ascochyta present (on Farah) and conditions favourable for disease buildup. carbendazim sprays@ early and end flowering.
Nura tactical program - spray with mancozeb+carbendazim if and when ascochyta and/or chocolate spot present and conditions favourable for disease buildup.
Complete - first mancozeb spray @ 6-8 weeks, and every 2 weeks thereafter. include carbendazim from early flowering on
Minimal – carbendazim @ early flowering only.

Interpretation and Other Information

- The late break (12 June) and prevailing seasonal conditions were unfavourable for the spread of disease, although chocolate spot and rust did infect the trial plots early in the season. Disease was not a yield limiting factor in this trial this year.
- No significant difference was recorded between any of the different fungicide spray programs within varieties or between varieties.
- Fiesta VF plots had a reduced plant population compared to the other varieties due to poor seed quality of the commercial seed sourced.

Milestone 5 – 30/3/2006

Disease severity and grain yield data from trials sown to determine the optimum disease management strategy for CIPAL 203 and CIPAL 402 (not in 2004) supplied to Pulse Australia and GRDC in collated and tabulated form by Mr McMurray and Dr Brand (2005/06 only).
The new varieties will be compared with Nugget and Northfield for at least 3 disease management strategies at 1 site each in the northern and central Yorke Peninsula, South Australia and Wimmera, Victoria (2005/06).

NORTHERN YORKE PENINSULA (MELTON) & CENTRAL YORKE PENINSULA (SANDILANDS), SA

Larn McMurray and Brad Bennett, SARDI, Clare

Aims

To recommend agronomic and fungicide management strategies to minimise botrytis grey mould infections and maximum grain yield and quality in the new lentil varieties.

Treatments

Split plot experiments were devised to investigate the interactions between variety, sowing date and fungicide application at two sites in South Australia in 2005. Experiments were held at Melton on the upper Yorke Peninsula and at Sandilands on the central Yorke Peninsula.

Treatments consisted of:
4 varieties – Nugget, Northfield, Nipper (CIPAL203) and Boomer (CIPAL402)
3 sowing dates – Melton (June 2(dry), June 25, July 19), Sandilands (June 2(dry), June 26, July 19).
3 fungicide strategies – control (no fungicide), canopy (1 spray of carbendazim at canopy closure), canopy plus (1 spray of carbendazim at canopy closure and further sprays as required)

Table 1: Spray timings at Melton and Sandilands for canopy and canopy plus foliar spray strategies

Melton						Sandilands					
TofS 1		TofS 2		TofS 3		TofS 1		TofS 2		TofS 3	
Can-opy	Can-opy+	Can-opy	Can-opy+	Can-opy	Can-opy+	Can-opy	Can-opy+	Can-opy	Can-opy+	Can-opy	Can-opy+
26/8 Carb	26/8 Carb	20/9 Carb	20/9 Carb	6/10 Carb +chlo	6/10 Carb +chlo	20/9 Carb	20/9 Carb	6/10 Carb	6/10 Carb	1/11 Carb +chlo	1/11 Carb +chlo
1/11 chlo	20/9 Carb	1/11 chlo	19/10 Carb	1/11 chlo	1/11 Carb +chlo	1/11 chlo	6/10 Carb	1/11 chlo	19/10 Carb		
	19/10 Carb		1/11 Carb +chlo				19/10 Carb		1/11 Carb +chlo		
	1/11 Carb +chlo						1/11 Carb +chlo				

Carb = 0.5L/ha of carbendazim (500g/L), chlo=2.0L/ha of chlorothalonil (720g/L)

Each trial was sown at a plant density of 150 plants per sq.m with MAP +2% zinc @ 90kg/ha drilled with the seed. Canopy closure sprays were applied to canopy and canopy plus treatments in each sowing date prior to the individual rows merging together, additional sprays in canopy plus treatments were sprayed on the forecast of each substantial rain event after this first spray regardless of wether disease was identified or not. Chlorothalonil was sprayed on all plots on November 1 after ascochyta was identified at Melton to control this disease. Trials were harvested for grain yield in December and 100 grain seed weights were recorded.

Results

At both trial sites due to the late break to the season, relatively dry winter conditions and only moderate levels of vegetative growth there were no significant levels of botrytis grey mould at either site. Trace levels of botrytis were found in control plots of Northfield at both sites on a number of occasions but due to seasonal conditions did not progress to an epidemic. A late infection of ascochyta was at moderate to high levels at Melton until treated with chlorothalonil. There were no significant fungicide treatment effects at Melton and only an overall significant fungicide treatment effect at Sandilands. This effect showed that a slight yield increase (3%) across all varieties and sowing times occurred with fungicide application in both canopy and canopy plus treatments.

Melton

Table 2 Lentil grain yield (t/ha) for time of sowing by variety by fungicide strategy interaction

Sowing date	Variety	Fungicide Strategy		
		Control (t/ha)	Canopy (t/ha)	Canopy plus (t/ha)
2-June (dry)	Nipper	3.25	3.22	3.24
	Boomer	3.19	3.35	3.42
	Northfield	3.2	3.31	3.34
	Nugget	2.91	3.02	3.3
25-June	Nipper	3.19	3.26	3.24
	Boomer	3.61	3.37	3.62
	Northfield	3.4	3.29	3.43
	Nugget	3.08	3.27	3.05
19-July	Nipper	2.8	2.89	2.8
	Boomer	2.91	3.02	2.94
	Northfield	2.88	2.72	3.03
	Nugget	2.57	2.65	2.57
	LSD(0.05)	Not significant		
	CV%	5.5		

Sandilands

Table 3 Lentil grain yield (t/ha) and weight (g/100 seeds) for fungicide strategy

Fungicide strategy	t/ha	100 Grain weight
Control	2.69	4.4
Canopy	2.76	4.42
Canopy plus	2.75	4.44
Mean	2.73	4.42
LSD (0.05)	0.06	Not significant
CV%	4.4	5.1

Table 4 Lentil grain yield (t/ha) for time of sowing by variety by fungicide strategy interaction

Sowing date	Variety	Fungicide Strategy		
		Control (t/ha)	Canopy (t/ha)	Canopy plus (t/ha)
2-June (dry)	Nipper	2.75	2.81	2.64
	Boomer	3.15	3.28	3.12
	Northfield	2.91	3	3
	Nugget	2.92	2.89	2.79
26-June	Nipper	2.49	2.55	2.67
	Boomer	3.03	3.16	3.06
	Northfield	2.6	2.71	2.73
	Nugget	2.68	2.83	2.76
19-July	Nipper	2.39	2.35	2.22
	Boomer	2.59	2.59	2.79
	Northfield	2.31	2.4	2.53
	Nugget	2.48	2.57	2.47
	LSD(0.05)	Not significant		
	CV%	4.4		

Discussion

The late break (11 June) and prevailing seasonal conditions were unfavourable for the spread of botrytis grey mould at both sites in 2005. Traces of botrytis grey mould were found at both sites but had no impact on yield. A late season ascochyta blight outbreak did occur at Melton however control sprays may have been applied too late to induce a fungicide response. No significant difference was recorded between any of the different fungicide spray strategies between varieties or at different sowing times. Further work in years more favourable for disease spread is required to develop fungicide management strategies for the newly released lentil varieties Nipper and Boomer.

Acknowledgments

The assistance and help of John Nairn and Andrew Bird SARDI, Clare with trial management is gratefully acknowledged.

WIMMERA (KALKEE), VICTORIA

Results

Fungicide treatments, rates and timings used at Kalkee to control ascochyta blight (chlorothalonil) and botrytis grey mould (carbendazim).

Treatment	Chemical & Application Rate[1]	Timing	Total sprays
Strategically	chlorothalonil 500 @ 1.5l/ha	Strategically from vegetatively through to late podding	3
Podding	chlorothalonil 500 @ 1.5l/ha	Podding	1
Canopy Close	carbendazim 500 @ 500ml/ha	Canopy Closure	1
Nil	Nil	Nil	0

1. Refers to application rate of the product

Results

- Key Message: No disease was present in the trial this year, therefor no effects of fungicide management regime were seen. Boomer and Nugget yielded 2.4 t/ha compared with 2 t/ha for Nipper.

Milestone 6 – 30/3/2006

Grain yield data from trials sown to determine optimum sowing dates and plant densities for CIPAL 203 and CIPAL 402 (not in 2004) supplied to Pulse Australia and GRDC in a collated and tabulated form by Mr McMurray.
The new varieties will be compared with Nugget and/or Northfield for at least 3 sowing dates and at least 4 plant densities at 1 site each in the northern and central Yorke Peninsula, South Australia.

Lentil seeding date by plant density experiments Melton & Sandilands SA, 2005
Larn McMurray & Brad Bennett SARDI, Clare

Aims
To test the yield response of current and newly released lentil varieties to changes in plant populations and sowing dates across the main lentil growing regions of SA. The information from this trial plus others is used to validate and improve current grower recommendations.

Treatments
Split plot experiments were devised to investigate the interactions between variety, sowing date and seeding rate at two sites in South Australia in 2005. Experiments were held at Melton on the upper Yorke Peninsula and at Sandilands on the central Yorke Peninsula.

Treatments consisted of:
4 varieties – Nugget, Northfield Nipper (CIPAL203) and Boomer (CIPAL402)
3 sowing dates – Melton (June 2 dry, June 25 & July 19), Sandilands (June 2, June 26 & July 19).
4 plant densities – 80, 120, 150 & 200 seeds per sq. m.

Each trial was sown with MAP +2% zinc @ 90kg/ha drilled with the seed.

Plant establishment counts were taken on every plot six weeks after sowing and trials were harvested for grain yield in December and 100 grain seed weights were recorded.

Results
Melton
The interaction between plant density, variety and sowing date was not significant for grain yield or seed weight. The variety by time of sowing interaction was significant for grain yield and weight. There was no difference in grain yields of Nipper and Northfield at the early and mid sowing dates, however Nugget and to a lesser extent Boomer showed a yield decline with the earlier sowing date compared with the mid sowing time. All varieties showed a decline in yield with the late time of sowing. There was no change in grain size in the small seeded varieties Northfield and Nipper as sowing time was delayed, however there was an increase in grain size with the large seeded variety Boomer as plant date was delayed. This seed size increase also happened in the medium seed sized variety Nugget at the late sowing date only.

Table 1 Lentil grain yield (t/ha) and weight (g/100 seeds) for variety by sowing time

Sowing date	Northfield		Nugget		Nipper		Boomer		Mean	
	t/ha	g/100	t/ha	g/100	t/ha	g/100	t/ha	g/100	t/ha	g/100
Sown 2/6 (dry)	3.54	3.41	3.15	3.87	3.35	3.44	3.57	6.61	3.4	4.33
Sown 25/6	3.51	3.38	3.32	3.96	3.31	3.46	3.67	6.74	3.45	4.38
Sown 19/7	3.08	3.47	2.9	4.4	3.03	3.47	3.27	6.97	3.07	4.58
LSD (0.05)	0.13	0.09							0.11	0.05
CV%	4.3	2.6							1.4	0.5

Across all treatments plant density was significant for plant count and grain yield, however the interaction between variety and plant density was not significant for any measurement. Plant counts increased with plant density and apart from at 80 plants per sq.m were well below targeted rates. At 80 plants per sq.m the lowest grain yield was achieved. All other treatments had similar grain weights.

Table 2 Lentil plant establishment (plants per sq.m), grain yield (t/ha) and weight (g/1000 seeds) for seeding rate across all treatments

Targeted plant density	Plants per sq. m	t/ha	g/100
80 pl/m^2	73	3.19	4.43
120 pl/m^2	100	3.33	4.47
150 pl/m^2	120	3.35	4.43
200 pl/m^2	160	3.36	4.4
LSD (0.05)	8.4	0.07	ns
CV%	15.8	4.3	2.6

Sandilands

Like at Melton the 3 way interaction and the 2 way interaction involving plant density was not significant for grain yield or weight at Sandilands. Maximum grain yield of all of all varieties was achieved at the earliest sowing date. As sowing date was delayed grain yield of Northfield and Nipper decreased. However there was no yield response to a delay in sowing date in Nugget and only the late time of sowing in Boomer showed a yield decline. Grain weight increased across all varieties as sowing date was delayed.

Table 3 Lentil grain yield (t/ha) and weight (g/100 seeds) for variety by sowing time

Sowing date	Northfield		Nugget		Nipper		Boomer		Mean	
	t/ha	g/100	t/ha	g/100	t/ha	g/100	t/ha	g/100	t/ha	g/100
Sown 2/6 (dry)	2.97	3.29	2.88	3.77	2.88	3.24	3.26	6.29	3	4.15
Sown 26/6	2.62	3.51	2.78	3.98	2.64	3.41	3.14	6.51	2.79	4.35
Sown 19/7	2.55	3.86	2.72	4.58	2.31	3.82	2.97	6.84	2.64	4.77
LSD (0.05)	0.17	ns							0.14	0.09
CV%	6.2	4.7							2.2	0.9

Across all treatments plant density was significant for plant count and grain yield the interaction between variety and plant density was not significant for any measurement. Plant counts increased with plant density and as found at Melton apart from at 80 plants per sq.m were below targeted rates. Grain yield increased with increasing plant density and was significantly lower in the 80 plant density treatment.

Table 4 Lentil plant establishment (plants per sq.m), grain yield (t/ha) and weight (g/1000 seeds) for seeding rate across all treatments

Targeted plant density	Plants per sq. m	t/ha	g/100
80 pl/m^2	70	2.69	4.43
120 pl/m^2	95	2.81	4.46
150 pl/m^2	113	2.84	4.4
200 pl/m^2	146	2.9	4.41
LSD (0.05)	8.5	0.08	ns
CV%	17.2	6.2	4.7

Discussion

A dry and late start to the season led to the first time of sowing at both sites being dry sown in early June. The opening rains at both sites arrived on the 11th June, which was the effective sowing date for the first time of sowing. This sowing date was more in line with a mid sowing time for the Sandilands area and a mid too late sowing date for the Melton area. The second and third sowing dates fell in line with a late and very late sowing for both districts hence limiting the value of the data somewhat. Growing season conditions were generally favourable at both sites and a relatively dry winter combined with low levels of vegetative growth meant that there were only very low disease levels. Spring finishing conditions were favourable at both sites allowing high yields to be achieved which was particularly pleasing given the late start to the season. Ascochyta at moderate to high levels infected the Melton site during late October, particularly in the early time of sowing, and was controlled with foliar sprays however a high infection level had occurred by this time.

At both sites all varieties behaved similarly for grain yield to changes in plant density indicating that the current recommended rate of 120 plants per sq. m is adequate for optimum yields in the new varieties Boomer and Nipper. There was also no interaction between plant density and sowing time hence 120 plants per sq. m is recommended for normal and late sowing dates. As no information could be derived from an early sowing date in this year, further work is required before we can confirm optimum sowing rates at an early sowing time.

At both sites maximum grain yields of Nipper and Northfield were achieved at the earlier sowing dates and yield declined as sowing date was delayed. This was not the case with Nugget and Boomer where there was no advantage in sowing these varieties before the second sowing date in late June. In fact at Melton there was a yield penalty for sowing Nugget and Boomer to early last season. This result is explained by the presence of ascochyta blight at this site, which was at higher levels in the early sowing time than in the later sowing dates. Nugget and Boomer are both moderately susceptible to pod infection of ascochyta blight while Northfield and Nipper are resistant. Boomer also showed a relatively lower yield loss to delayed sowing times than Nipper and Northfield and also an increase in seed size at the later sowing dates. As seed quality (large size and freedom from disease blemish) is of paramount importance in large seeded green lentil varieties like Boomer, avoiding early sowing times in this variety is going to be important to maximise seed quality in most seasons. Ascochyta blight seed staining tests are currently being run on seed from 2005 to determine the different levels of infection with delayed sowing.

At Sandilands there was no ascochyta blight detected and the grain yield of Nugget and Boomer was not reduced at the early sowing date. However, unlike in Nipper and Northfield again there was no yield advantage by sowing these varieties early. Both Nugget and Boomer have large plant types and are later maturing than Northfield and Nipper which also have small plant types. Varieties with large plant types tend to produce canopies with high biomass levels, which can be prone to vegetative lodging and yield loss in favourable growing seasons if sown too early. Nipper is unlikely to incur yield loss from producing too much vegetative growth. Given its superior disease resistance to ascochyta blight and botrytis grey mould resistance over Nugget and Northfield respectively it is well suited to early and dry sowing dates providing weeds can be controlled as shown by the results in 2005.

Due to improved disease resistance levels and a shorter plant type Nipper is less prone to yield loss through being sown too early than all current varieties. However further work in seasons where an early sowing date can be achieved is required to confirm what fungicide strategy, if any, is required in Nipper to successfully grow it at substantially earlier sowing dates than the current early June to mid June timing recommended for all current varieties.

Acknowledgments

The assistance and help of John Nairn and Andrew Bird SARDI, Clare with trial management is gratefully acknowledged.

Milestone 7 – 30/3/2006

Herbicide damage symptoms and grain yield data from trials sown to determine the relative herbicide tolerance of CIPAL 203 and CIPAL 402 supplied to Pulse Australia and GRDC in collated and tabulated form by Dr Brand.
The new varieties will be compared with Northfield and/or Nugget for at least 6 commonly used herbicides or herbicide mixes at 1 site each in the Wimmera and southern Mallee, Victoria

Results

Herbicide damage symptoms (1 – no symptoms, 9 – complete death) of lentils for each of the herbicide treatments at recommended (N) and double recommended rates (2N) at Kalkee in 2005.

Herbicide	Rate	Nipper	Boomer	Nugget
trifluralin 480	1.0L/ha	1.0	1.3	1.8
	2.0L/ha	1.3	4.0	3.5
metalachlor 720	1L/ha	1.0	1.0	1.0
	2L/ha	1.3	1.3	1.3
metribuzin 750	280g/ha	1.0	1.0	1.0
	560g/ha	1.8	1.3	1.3
diuron 900	850g/ha	1.0	1.0	1.0
	1700g/ha	1.5	1.3	1.0
simazine 900	1000ml/ha	1.0	1.0	1.0
	2000ml/ha	1.0	1.0	1.0
simazine 900+prometryn 500	800ml+1500ml/ha	1.3	1.0	1.0
	1600ml+3000ml/ha	3.3	1.0	1.3
simazine 900+metribuzin 750	800ml+280g/ha	1.0	1.0	1.3
	1600ml+560g/ha	2.0	1.3	1.0
flumetsulam 750	25g/ha	2.0	1.0	1.3
	50g/ha	2.8	1.3	1.8
diflufenican 500	150ml/ha	3.3	3.5	3.0
	300ml/ha	4.0	4.5	4.3
lsd			0.6	

Weed scores (1 – no weeds, 5 – high weed population) and grain yields of lentils for each of the herbicide treatments at recommended (N) and double recommended rates (2N) at Kalkee in 2005.

Herbicide	Weed Score		Grain Yield (t/ha)	
	N	2N	N	2N
trifluralin 480	3.5	3.8	1.36	1.35
metalachlor 720	3.3	3.8	1.45	1.59
metribuzin 750	2.3	2.0	1.61	1.71
diuron 900	3.0	1.8	1.57	1.70
simazine 900	2.3	1.5	1.87	1.75
simazine 900+prometryn 500	2.0	1.0	1.72	1.93
simazine 900+metribuzin 750	1.8	1.0	1.78	1.73
flumetsulam 750	3.0	3.3	1.47	1.65
diflufenican 500	2.3	2.0	1.74	1.66
lsd	0.6		0.23	

Interpretation and Other Information

- Key Message – The tolerance of Nipper and Boomer to commonly used herbicides in terms of grain yield was similar to Nugget. However, based on herbicide damage symptoms, Nipper was worse than Boomer and Northfield for metribuzin, simazine + prometryn and simazine +

metribuzin at double recommended rates and for flumetsulam at both rates indicating a potentially smaller safety margin for these herbicides.

- Plant establishment - establishment was generally greatest for Nugget and Nipper (95 plants/m^2) and lowest for Boomer (80 plants/m^2). There were no major interaction between variety and herbicide treatments except trifluralin at double recommended rates which resulted in a 15% reduction in plants established for Nipper, compared with a 30% reduction for Boomer and 50% reduction for Nugget.
- Herbicide damage - Significant symptoms of herbicide damage were recorded for many treatments. Nugget and Boomer had higher damage scores than Nipper for trifluralin at double recommended rates. Nipper had higher damage scores than Nugget and Boomer for metribuzin, simazine + prometryn and simazine + metribuzin at double recommended rates and for flumetsulam at both rates. All varieties showed significant symptoms of damage from diflufenican at both rates.
- Weed populations - Moderate weed populations were present throughout much of the trial. The only herbicide treatments to provide complete weed control were simazine + metribuzin and simazine + prometryn at double recommended rates.
- Grain yield – There were no significant differences among varieties in response to herbicide treatments, despite differences observed in the herbicide damage symptoms. However, there appeared to be a trend indicating that the grain yield of Nipper was reduced in the simazine + prometryn treatment applied at double recommended rates. Overall, the herbicide effect on grain yield was primarily related to weed populations with lowest yields being observed in treatments with highest weed burden ($R^2 = 0.64$). Nugget and Boomer produced 1.7 t/ha compared with 1.5 t/ha for Nipper. This was expected as Nipper’s yield benefits occur when disease pressure is high (particularly from botrytis grey mould), due to Nipper’s improved resistance.

Milestone 9 – 30/3/2005

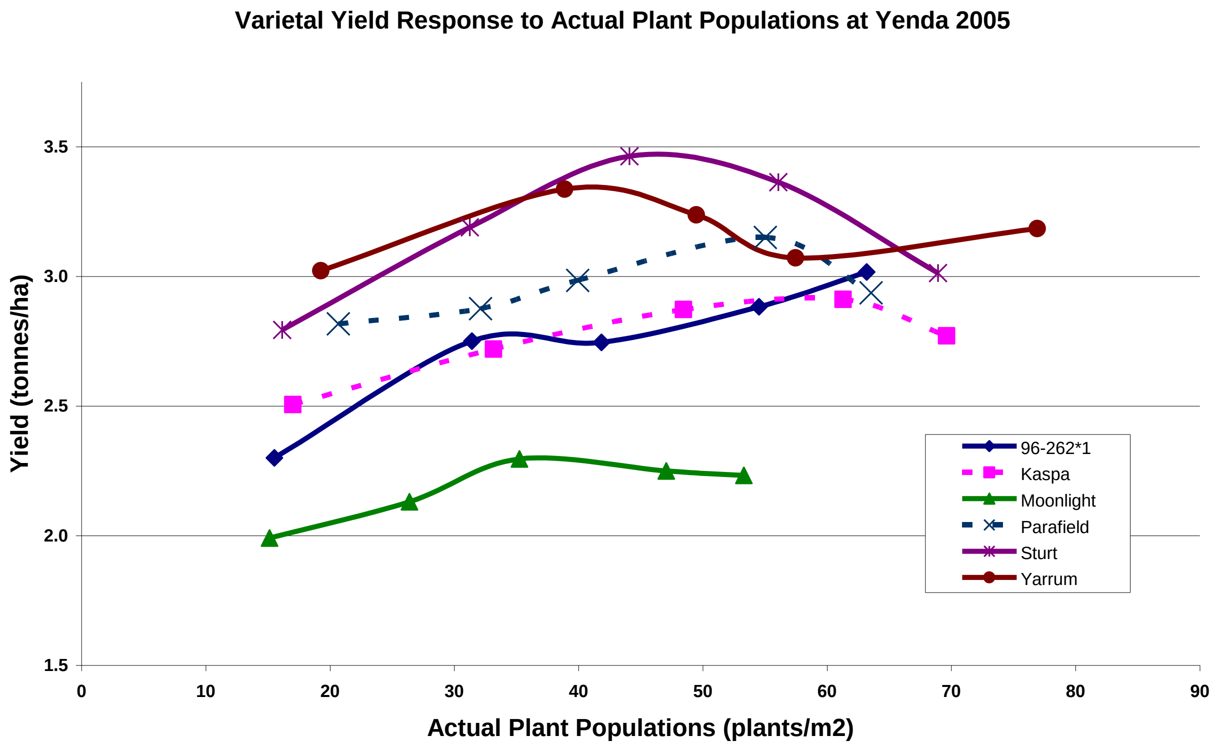
Grain yield data from trials sown to determine optimum sowing dates and plant densities Moonlight, Sturt (Yenda only) and 96-262*1 supplied to Pulse Australia and GRDC in a collated and tabulated form by Dr Armstrong.
The new varieties will be compared with Kaspa for at least 2 sowing dates and at least 4 plant densities at 1 site each in Yenda and Wagga, New South Wales.

Field Pea Plant Population Trials 2005

Aim: To test the yield response of current and nearly released field pea varieties to changes in plant populations across the different field pea growing regions of NSW. The information from this trial plus others is used to validate and improve current grower recommendations.

YENDA, NSW
Results

Cooperator:	Kym & Judy Eckerman and Nick & Trish Eckerman “Hillview” Yenda	
Sowing date:	6th July	
Fertiliser:	110 kg/ha Grain Legume Super	
Herbicides:	15th July	Sencor @ 280g/ha
	Early September	Correct @ 200 ml/ha
	10th October	Sumi Alpha @ 200 ml/ha



Additional Data Collected:

Variety	Target Density (plant/m2)	Measured Counts (plant/m2)	YIELD (t/ha)	100 sd wt (grams)	12 Oct Erect	3 Nov Mat	3 Nov Erect
96-262*1	16	16	2.30	18.6	8	4	3
	32	31	2.75	18.8	8	4	3
	48	42	2.75	18.6	7	4	2
	64	55	2.88	18.4	6	3	2
	80	63	3.02	19.1	6	3	2
Kaspa	16	17	2.51	18.7	9	6	5
	32	33	2.72	18.5	9	5	5
	48	48	2.87	19.7	8	6	4
	64	61	2.91	20.0	8	6	4
	80	70	2.77	21.2	8	6	4
Moonlight	16	15	1.99	21.1	9	6	5
	32	26	2.13	22.2	8	6	3
	48	35	2.30	23.3	6	5	4
	64	47	2.25	23.0	7	5	3
	80	53	2.23	22.7	7	5	3
Parafield	16	21	2.82	22.6	4	5	2
	32	32	2.88	23.0	4	6	2
	48	40	2.99	23.1	4	5	2
	64	55	3.15	23.3	4	5	3
	80	64	2.94	23.3	4	5	2
Sturt	16	16	2.79	18.8	4	5	3
	32	31	3.19	19.9	3	4	3
	48	44	3.46	19.0	4	5	4
	64	56	3.36	18.8	4	5	3
	80	69	3.01	18.7	3	5	3
Yarrum	16	19	3.02	22.0	9	5	3
	32	39	3.34	22.5	8	5	2
	48	49	3.24	22.1	7	5	2
	64	57	3.07	21.9	6	4	2
	80	77	3.19	22.2	7	5	2

Mean	2.83
LSD 5%	0.28
CV %	5.04

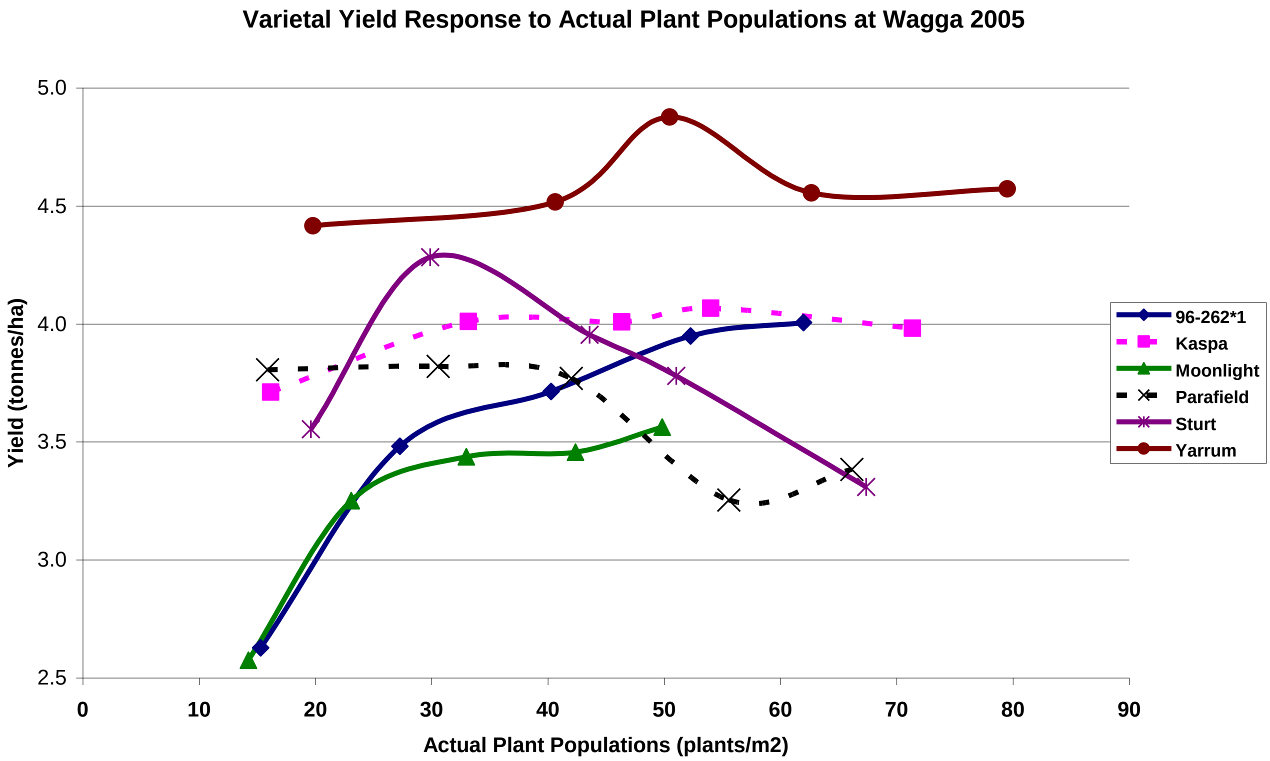
Notes:
Maturity score - 1, early - plants mostly yellow and at or past crop desiccation; 9, late - plants green and not yet turning. Taken as maturity approaches when the quickest lines are just fully turning.
Erect score, 1 flat, 9 erect and standing

Interpretation and Other Information

- Despite a late break to the season (12 June), very favourable conditions followed resulting in exceptionally well grown plants and above average yields with very little disease.
- Yield declined in all varieties when densities were below 35-40 plants/ sq m.
- There were no significant yield responses above 35-40 plants/ sq m in all varieties except 96-262*1.
- Seed size increased with density for Kaspa, Moonlight & Parafield but unaffected in others
- Increasing density increased lodging in the semi-dwarf types (Kaspa, Moonlight, Yarrum and 96*262*1)

WAGGA, NSW
Results

Site:	Agricultural Institute, Wagga Wagga	
Sowing date:	26th June	
Fertiliser:	110 kg/ha Grain Legume Super	
Herbicides:	25 June	2L Stomp + 2L Sprayseed pre-sowing
	4 July	Spinnaker @ 100g/ha pre-emergent
	16 August	Select @ 200 ml/ha
Insecticide	4, 17 Oct	Fastac Duo @200ml/ha
Fungicides:	Regular sprays of Bravo + Bavistan to control fungal diseases	



Additional Data Collected:

Variety	pl/m2 Target	pl/m2 Count	YIELD T/HA	100 sd wt	Fl_start	Fl_Fin	Vigour 4 Nov	Erect 4 Nov	Erect 16 Nov	Rating 16 Nov
96-262*1	16	15	2.63	17.1	30 Sep	1 Nov	6	7	7	3
	32	27	3.48	17.2	30 Sep	31 Oct	7	8	5	2
	48	40	3.71	17.9	30 Sep	29 Oct	7	7	4	2
	64	52	3.95	18.2	30 Sep	28 Oct	7	6	3	1
	80	62	4.01	17.7	30 Sep	28 Oct	7	6	3	1
Kaspa	16	16	3.71	18.3	8 Oct	2 Nov	9	9	5	4
	32	33	4.01	19.9	8 Oct	31 Oct	9	8	4	3
	48	46	4.01	19.3	8 Oct	30 Oct	9	8	4	2
	64	54	4.07	19.5	8 Oct	29 Oct	9	8	4	2

	80	71	3.98	19.0	8 Oct	28 Oct	8	7	4	2
Moonlight	16	14	2.58	20.1	2 Oct	2 Nov	9	8	6	6
	32	23	3.25	21.0	1 Oct	1 Nov	9	8	6	6
	48	33	3.44	21.7	1 Oct	31 Oct	9	8	6	5
	64	42	3.46	20.6	1 Oct	30 Oct	9	8	5	4
	80	50	3.56	21.1	30 Sep	29 Oct	9	7	6	4
Parafield	16	16	3.81	21.8	2 Oct	1 Nov	8	5	3	6
	32	31	3.82	21.6	2 Oct	31 Oct	8	5	2	4
	48	42	3.77	21.4	2 Oct	30 Oct	8	4	2	4
	64	56	3.25	21.5	2 Oct	29 Oct	8	4	2	4
	80	66	3.38	21.8	2 Oct	29 Oct	8	5	2	4
Sturt	16	20	3.55	17.1	30 Sep	3 Nov	7	6	2	7
	32	30	4.28	18.0	30 Sep	3 Nov	8	5	2	6
	48	44	3.95	18.4	30 Sep	2 Nov	7	4	2	5
	64	51	3.78	18.6	30 Sep	2 Nov	7	4	2	5
	80	67	3.31	17.4	30 Sep	2 Nov	7	4	2	4
Yarrum	16	20	4.42	20.7	8-Oct	29-Oct	8	9	3	2
	32	41	4.52	20.3	8-Oct	28-Oct	7	8	2	1
	48	50	4.88	20.0	8-Oct	27-Oct	8	7	2	1
	64	63	4.56	19.6	8-Oct	27-Oct	7	5	2	1
	80	80	4.57	19.4	8-Oct	26-Oct	7	6	2	1

MEAN	3.79
LSD	0.371
CV %	4.9

Interpretation and Other Information

- Despite a late break to the season (12 June), very favourable conditions followed resulting in exceptionally well grown plants and above average yields with very little disease.
- Yield at this site was around 30% higher than for Yenda but optimum plant densities for most varieties here were significantly lower at around 30 plants/m^2.
- Yarrum, Kaspa & Parafield had very flat response curves across all densities, suggesting these were better able to compensate at low densities. Yarrum in particular performed very well at the lowest density (20 p/m^2)
- Moonlight & 96-262*1 were the more responsive varieties
- Flowering finished 3-4 days earlier at higher densities
- Yarrum's yield was outstanding but at maturity lodged badly across all densities
- Increasing density increased lodging in the semi-dwarf types (Kaspa, Moonlight, Yarrum and 96*262*1)

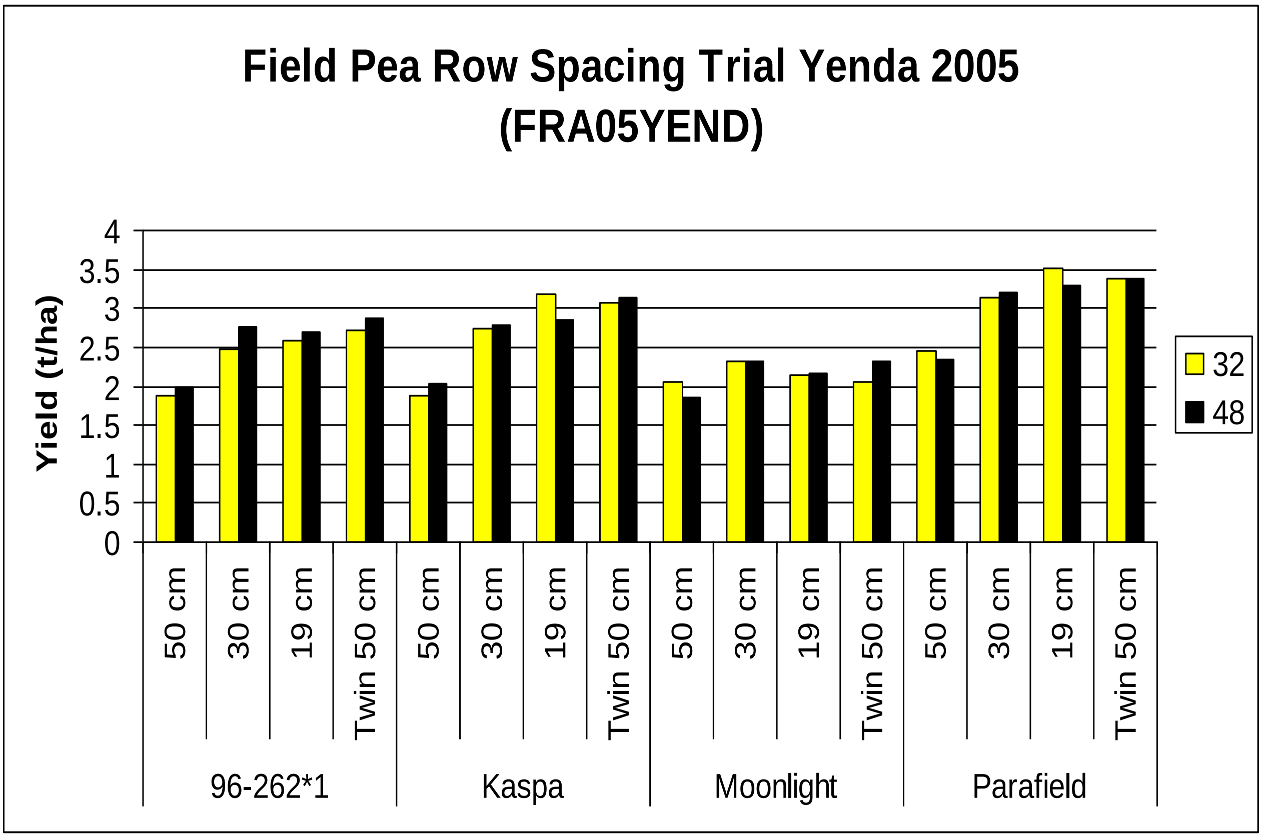
Milestone 10 – 30/3/2005

Harvestability and grain yield data from trials sown to compare the effects of wider row spacings on Moonlight and 96-262*1 supplied to Pulse Australia and GRDC in a collated and tabulated form by Dr Armstrong.
The new varieties will be compared with Kaspa and Parafield for at least 3 row spacings at 1 site each in Yenda and Wagga, New South Wales.

Field Pea Row Spacing Trials 2005
Aim: To look at the yield responses of different field pea plant types to varying row spacing.

<u>YENDA, NSW</u>
Results

Cooperator:	Kym & Judy Eckerman and Nick & Trish Eckerman	
	"Hillview" Yenda	
Sowing date:	7 July	
Fertiliser:	110 kg/ha Grain Legume Super	
Herbicides:	15th July	Sencor @ 280g/ha
	Early September	Correct @ 200 ml/ha
	10th October	Sumi Alpha @ 200 ml/ha
Method:	Four spacings evaluated: 19cm, 30cm, 50cm & twin 50cm (two rows 35/15cm apart)	
	Two adjacent runs of the cone seeder per plot were used to give sufficient width	
	Two target sowing densities of 32 & 48 plants/m2 were used	



Additional Data Collected:

Variety	Row Spacing Treatment	Target Plant Population (plants/m²)	Average Plant Counts (plants/m2)	Yield (t/ha)	100 sd wt (grams)	18-Nov Erect
96-262*1	50 cm	32	35	1.87	19.1	3
	30 cm		29	2.48	20.1	3
	19 cm		25	2.58	20.4	5
	Twin 50 cm		33	2.72	18.9	3
	50 cm	48	39	2.00	18.8	2
	30 cm		40	2.76	19.3	2
	19 cm		35	2.70	19.3	3
	Twin 50 cm		53	2.87	18.7	2
Kaspa	50 cm	32	42	1.88	20.0	3
	30 cm		34	2.75	18.8	4
	19 cm		28	3.18	19.0	4
	Twin 50 cm		41	3.07	18.5	4
	50 cm	48	56	2.04	21.0	3
	30 cm		50	2.79	19.5	3
	19 cm		39	2.86	18.6	4
	Twin 50 cm		55	3.13	19.4	3
Moonlight	50 cm	32	33	2.05	22.3	5
	30 cm		34	2.33	21.9	5
	19 cm		27	2.14	20.7	6
	Twin 50 cm		35	2.06	21.2	4
	50 cm	48	41	1.85	22.0	4
	30 cm		34	2.31	22.6	4
	19 cm		34	2.18	22.5	6
	Twin 50 cm		43	2.33	21.1	4
Parafield	50 cm	32	49	2.46	23.7	1
	30 cm		38	3.13	22.9	1
	19 cm		33	3.51	23.8	2
	Twin 50 cm		54	3.39	20.6	2
	50 cm	48	63	2.33	23.2	1
	30 cm		52	3.19	23.1	1
	19 cm		37	3.30	23.9	2
	Twin 50 cm		61	3.38	21.6	2

Mean Yield	2.61
LSD 5%	0.376
CV %	7.21

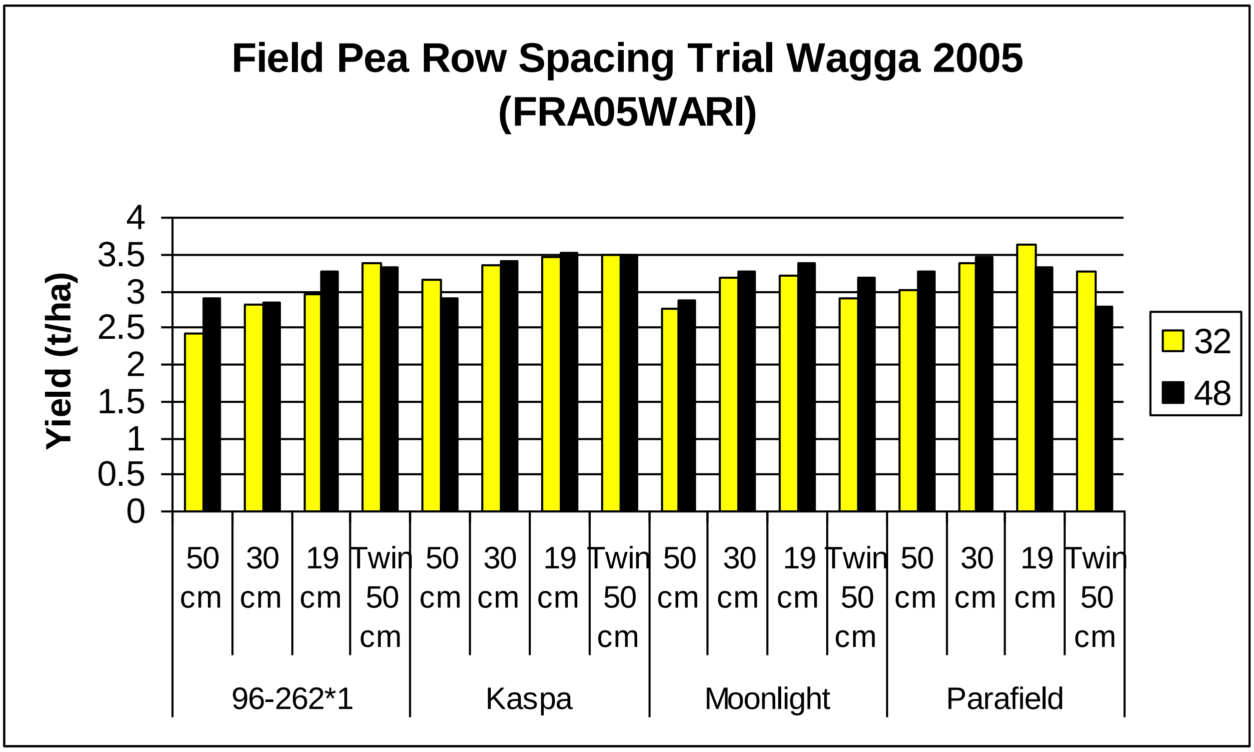
Notes: Erect - Erect score, 1 flat, 9 erect and standing

Interpretation and Other Information

- Despite a late break to the season (12 June) and very late sowing, very favourable conditions followed resulting in exceptionally well grown plants and above average yields with very little disease.
- Yields at Yenda were not significantly different for the 19, 30 & twin 50 cm spacing.
- Stretching row spacing to 50 cm reduced yields

Wagga, NSW
Results

Site: Agricultural Institute, Wagga Wagga
Sowing date: 11 July
Fertiliser: 110 kg/ha Grain Legume Super
Herbicides: 11 July 2L Stomp + 2L Sprayseed pre-sowing
25 July Spinnaker @ 100g/ha pre-emergent
2 September Select @ 200 ml/ha
Insecticide 4, 17 Oct Fastac Duo @200ml/ha
Fungicides: Regular sprays of Bravo + Bavistan to control fungal diseases
Method: Four spacings evaluated: 19cm, 30cm, 50cm & twin 50cm (two rows 35/15cm apart)
Two adjacent runs of the cone seeder per plot were used to give sufficient width
Two target sowing densities of 32 & 48 plants/m^2 were used



Additional Data Collected:

ID	Row space (cm)	plants/ m² Target	plants/ m² Count	Yield T/Ha	100 sd wt	Flow Start	9 Nov Vig	9 Nov Erect	13 Dec Erect	13 Dec Rating	Shatter score
96-262*1	19 cm	32	38	2.96	16	15 Oct	7	8	3	7	1
	19 cm	48	47	3.27	17	15 Oct	7	6	3	7	1
	30 cm	32	32	2.80	17	7 Oct	6	8	4	7	2
	30 cm	48	43	2.85	17	7 Oct	7	7	3	7	1
	50 cm	32	29	2.42	16	5 Oct	6	5	5	7	1
	50 cm	48	36	2.90	18	5 Oct	6	6	3	7	1
	Twin 50cm	32	41	3.38	16	15 Oct	7	7	2	6	1
	Twin 50cm	48	54	3.33	17	15 Oct	6	6	3	7	1

Kaspa	19 cm	32	48	3.46	18	4 Oct	8	7	3	7	
	19 cm	48	63	3.53	19	3 Oct	8	7	4	8	
	30 cm	32	35	3.34	18	15 Oct	8	8	4	8	
	30 cm	48	48	3.41	18	15 Oct	8	8	3	8	
	50 cm	32	28	3.16	18	15 Oct	8	7	5	8	
	50 cm	48	39	2.90	18	15 Oct	8	7	4	7	
	Twin 50cm	32	49	3.50	18	3 Oct	8	7	3	7	
	Twin 50cm	48	60	3.48	18	3 Oct	8	8	4	8	
Moonlight	19 cm	32	36	3.22	19	7 Oct	9	8	5	8	
	19 cm	48	46	3.38	20	7 Oct	9	8	6	9	
	30 cm	32	32	3.17	19	6 Oct	9	9	6	9	
	30 cm	48	38	3.27	19	6 Oct	9	9	6	9	
	50 cm	32	24	2.75	19	5 Oct	8	7	6	7	
	50 cm	48	33	2.86	19	7 Oct	9	7	5	7	
	Twin 50cm	32	36	2.91	19	6 Oct	9	8	5	8	
	Twin 50cm	48	48	3.18	19	6 Oct	9	8	6	8	
Parafield	19 cm	32	62	3.63	20	7 Oct	8	3	2	6	
	19 cm	48	68	3.32	21	7 Oct	8	4	2	6	
	30 cm	32	40	3.38	21	7 Oct	8	4	2	6	
	30 cm	48	55	3.46	21	7 Oct	8	4	2	6	
	50 cm	32	35	3.03	22	7 Oct	8	3	2	6	
	50 cm	48	46	3.27	22	7 Oct	8	4	2	6	1
	Twin 50cm	32	53	3.27	21	4 Oct	8	4	1	4	
	Twin 50cm	48	66	2.79	21	4 Oct	8	4	1	5	

Mean Yield	3.174
LSD 5%	0.283
CV %	4.5

Interpretation and Other Information

- Despite a late break to the season (12 June) and very late sowing, very favourable conditions followed resulting in exceptionally well grown plants and above average yields with very little disease.
- 50 cm single row spacings again tendered to be too wide for field pea at Wagga
- No real advantage of twin rows

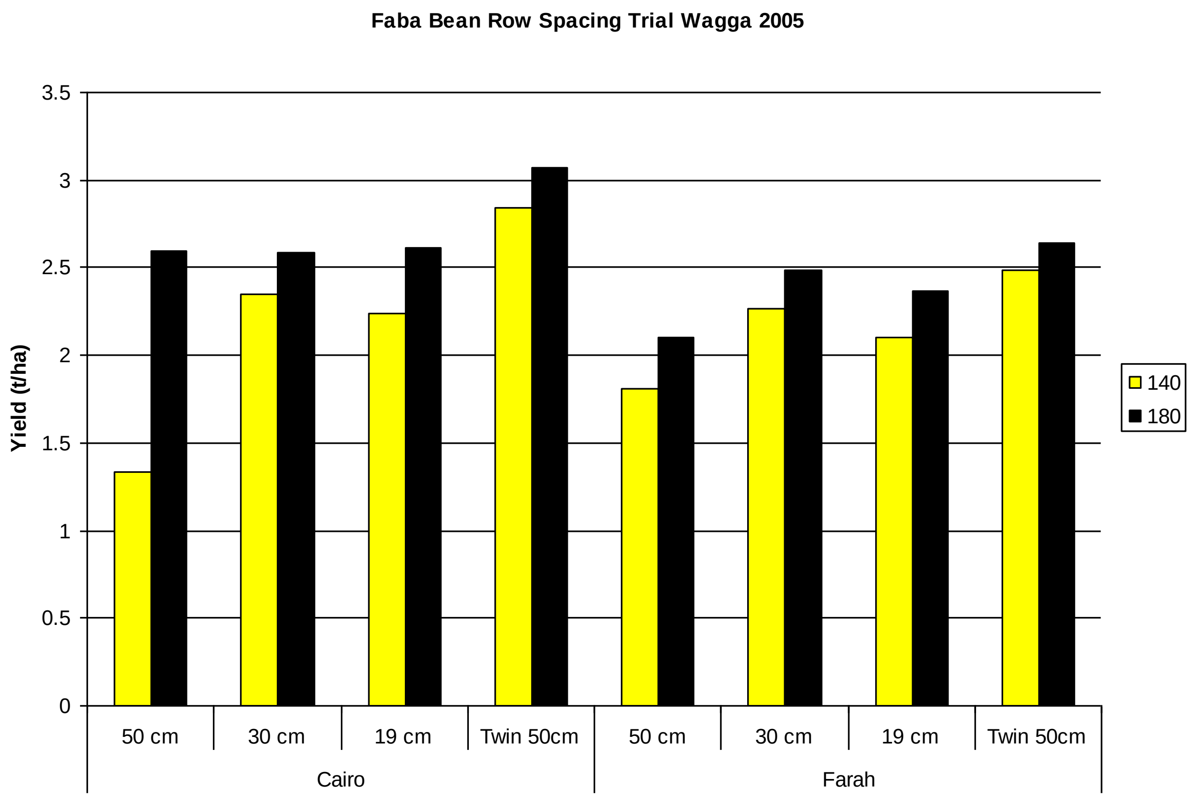
Milestone 13 – 30/3/2006

Grain yield data from trials sown to determine optimum plant densities and row spacing for Farah and Ic*As/7/3 supplied to Pulse Australia and GRDC in a collated and tabulated form by Dr Armstrong.

The new varieties will be compared with Fiesta for at least 4 plant densities and 3 row spacing at Wagga, New South Wales.

WAGGA, 2005

Site:	Agricultural Institute, Wagga Wagga	
Sowing date:	12 July	
Fertiliser:	110 kg/ha Grain Legume Super	
Herbicides:	12 July	2L Stomp + 2L Sprayseed pre-sowing
	25 July	Sencor @ 100g/ha pre-emergent
	16 August	Select @ 200 ml/ha
Fungicides:	Regular sprays of Pencozeb (1.5L/Ha) to control fungal diseases	
Method:	Four spacings evaluated: 19cm, 30cm, 50cm & twin 50cm (two rows 35/15cm apart)	
	Two adjacent runs of the cone seeder per plot were used to give sufficient width	
	Two target sowing rates of 140 & 180 kg/ha were used	



Variety	Target Seeding Rate	Row Spacing Treatment	Yield	100 sd wt	Average Plant Counts	13-Dec	13-Dec
	(kg/ha)		(t/ha)	(grams)	(plants/m2)	Erect	Rating
Cairo	140	50 cm	1.33	57.1	20	9	7
		30 cm	2.35	56.6	24	9	7
		19 cm	2.24	54.8	22	9	8
		Twin 50 cm	2.85	59.4	27	9	8
	180	50 cm	2.59	60.2	29	9	7
		30 cm	2.59	56.7	36	9	8
		19 cm	2.61	56.4	27	9	8
		Twin 50 cm	3.07	57.3	34	9	8
Farah	140	50 cm	1.81	59.8	16	9	5
		30 cm	2.27	58.6	17	9	6
		19 cm	2.11	58.0	20	9	7
		Twin 50 cm	2.49	58.7	24	9	8
	180	50 cm	2.10	61.9	22	9	6
		30 cm	2.49	56.6	30	9	7
		19 cm	2.37	58.3	26	9	6
		Twin 50 cm	2.64	58.9	28	9	8

Mean Yield (t/ha)	2.37
LSD 5%	0.45
CV %	9.7

Abbreviation

Erect Erect Scores : 1, flat; 9, erect

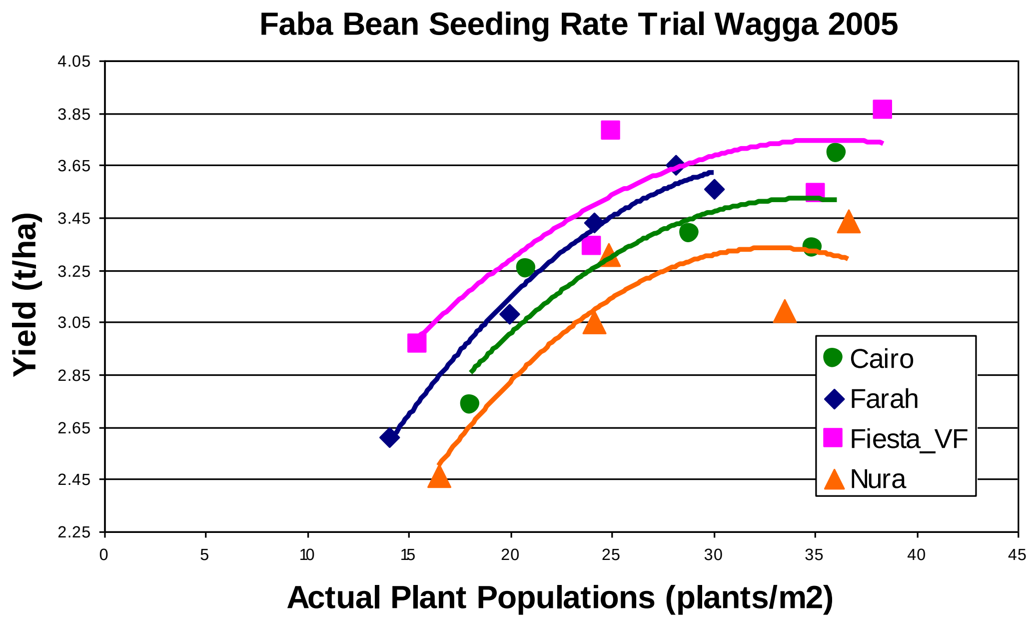
Rating Rating at Maturity, incorporates erectness, canopy density, pod set, freedom from disease. Scale 0 - 9, 9 the best.

Interpretation and Other Information:

- Despite a late break to the season (12 June) and very late sowing, very favourable conditions followed resulting in exceptionally well grown plants and above average yields with very little disease.
- No observable difference between the 30 cm row spacing and the conventional 19 cm row spacing in the trial across both seeding rates and varieties
- The stand out treatment was the twin rows spaced at 50 cm centres, spaced at 15 cm apart.
- The 50 cm rows performance was generally not significantly different to the conventional treatments, except for Cairo and Farah sown at 140 kg/ha.
- Increasing density from 140 to 180kg/ha increased yield

WAGGA

Site: Agricultural Institute, Wagga Wagga
Sowing date: 26th June
Fertiliser: 110 kg/ha Grain Legume Super
Herbicides: 25 June 2L Stomp + 2L Sprayseed pre-sowing
4 July Sencor @ 100g/ha pre-emergent
16 August Select @ 200 ml/ha
Fungicides: Regular sprays of Pencozeb (1.5L/Ha) to control fungal diseases
Method: Five target sowing rates 100, 140, 180, 220 & 260 kg/ha were used



Variety	Seeding Rate (kg/ha)	Measured Plant Counts (plant/m²)	YIELD (t/ha)	100 sd wt (grams)	13 Dec Erect	13 Dec Rating	13 Dec Height
Cairo	100	18	2.73	60.3	9	7	8
	140	21	3.25	58.8	8	7	8
	180	29	3.39	61.2	8	7	8
	220	35	3.33	60.2	8	8	8
	260	36	3.69	60.1	8	8	9
Farah	100	14	2.61	60.9	8	7	7
	140	20	3.08	62.4	8	7	8
	180	24	3.43	62.2	8	7	8
	220	28	3.65	61.4	8	8	9
	260	30	3.56	63.6	8	8	9
Fiesta_VF	100	15	2.97	58.0	8	6	7

	140	24	3.34	60.3	8	7	8
	180	25	3.78	59.5	8	8	9
	220	35	3.54	60.2	8	8	8
	260	38	3.86	62.9	8	9	9
Nura	100	16	2.47	57.6	9	6	5
	140	24	3.05	57.7	9	7	6
	180	25	3.31	57.2	9	8	7
	220	34	3.09	58.0	9	7	7
	260	37	3.44	59.5	9	8	7

LSD(5%)	0.23	2.6
LSD(1%)	0.33	3.7

Abbreviation

Erect Erect Scores : 1, flat; 9, erect

Rating Rating at Maturity, incorporates erectness, canopy density, pod set, freedom from disease. Scale 0 - 9, 9 the best.

Height 1, Short; 9, Tall

Interpretation and Other Information:

- All varieties were very responsive to seeding rate from a 26 June sowing (considered 4-5 weeks late for Wagga
- At this late sowing date, target plant populations need to be in excess of 30 plants /m^2
- Despite a late break to the season (12 June) and very late sowing, very favourable conditions followed resulting in exceptionally well grown plants and above average yields with very little disease.