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

2004 Results Summary

Jason Brand, Larn McMurray and Eric Armstrong

Please Note:
1. Several of the chickpea lines have now been named. Flip 94-090c – Genesis 090^{TM}; Flip 94-508c – Genesis 508^{TM}; Flip 94-509c – Genesis 509^{TM}; WACPE 2075 – Sonali.
2. Only tables of significant effects have been shown.
3. In all milestones, as a minimum we have provided a results table, plus interpretation (In some instances, were data has been prepared for other industry reports, more detailed Results and Discussion has been provided). Detailed methods and further information can be provided upon request.

Data from this report is only to be used with authors permission. This is not a public document.

Milestone 1 – 30/3/05

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.

Results

Grain yield of chickpeas grown in the sowing date x plant density trial in the Wimmera, Victoria (t/ha)

Sowing Time	Sowing Rate	Flip 94-090c	Flip 94-508c	Flip 94-509c	Howzat
May 25	**15**	0.16	0.15	0.35	0.09
	30	0.19	0.06	0.18	0.15
	45	0.15	0.02	0.09	0.19
	60	0.07	0.03	0.10	0.14
	90	0.07	0.02	0.03	0.14
June 22	**15**	0.30	0.25	0.17	0.23
	30	0.17	0.08	0.20	0.17
	45	0.12	0.10	0.23	0.14
	60	0.08	0.11	0.13	0.11
	90	0.09	0.03	0.05	0.08
July 20	**15**	0.29	0.34	0.27	0.25
	30	0.40	0.20	0.31	0.19
	45	0.17	0.24	0.25	0.09
	60	0.15	0.11	0.11	0.17
	90	0.13	0.05	0.14	0.11

CV%	49.4	(rep.block.plot stratum)
Statistics	LSD	
ST x SR x Var	0.13	ST = Sowing Time
SR x Var**	0.07	SR = Sowing Rate
ST x Var	NS	Var = Variety
ST x SR	NS	
Var	0.03	
SR	0.04	*P=0.061
ST*	0.07	**P=0.052

Average Tables

SR x Var	**Sowing Rate**	**Flip 94-090c**	**Flip 94-508c**	**Flip 94-509c**	**Howzat**
	15	0.25	0.25	0.26	0.19
	30	0.26	0.11	0.23	0.17
	45	0.14	0.12	0.19	0.14
	60	0.10	0.08	0.11	0.14
	90	0.10	0.03	0.07	0.11
Variety		**Flip 94-090c**	**Flip 94-508c**	**Flip 94-509c**	**Howzat**
		0.17	0.12	0.17	0.15
Sowing rate	**Sowing Rate**				
	15	0.24			
	30	0.19			
	45	0.15			
	60	0.11			
	90	0.08			
Sowing time	**Sowing Time**				
	May 25	0.12			
	June 22	0.13			
	July 20	0.13			

Additional Data Collected: Emergence, Flowering Date, Height at Flowering and Maturity, Pod Score, Grain Weight, Seed Size Distribution (Flip 94-090c only)

Interpretation and Other Information

- Results of this trial need to be treated with caution due to the low yields and adverse environmental conditions experienced throughout the season.
- Growing season rainfall was extremely low (190mm c.f. 265mm long term average) and there was no subsoil moisture due to low summer rainfall. Only 9mm rainfall was recorded in October (a critical period for crop growth and yield determination). There was an extremely hot day October 13 (37^{O}C) followed by a frost (Oct 16, -3.4) which resulted in almost complete flower and pod abortion. Approximately 80mm rain fell in November and December, ensuring that we achieved grain yields up to 400kg/ha.
- Emergence was similar to target plant densities.
- Results highlight the yield potential of the new lines Flip 94-090c and Flip 94-509c.
- Low plant densities and later sowing tended to be higher yielding due to the late rainfall. This is the opposite trend of 2003 and needs further investigation.
- There was a greater proportion of large seed (>8mm) of Flip 94-090c at low plant densities compared with high plant densities (25% c.f. 5%).

Milestone 2 – 30/3/2005

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.

Results

Wimmera

Grain yield of chickpeas grown in the herbicide tolerance trial in the Wimmera, Victoria (t/ha)

Herbicide	Rate	Flip 94-090c	Flip 94-508c	Flip 94-509c	Howzat
Trifluralin	**1.2L/ha**	1.0	1.0	1.0	1.0
	2.4L/ha	1.5	1.5	1.5	2.0
Simazine	**1L/ha**	1.0	1.0	1.0	1.0
	2L/ha	1.0	1.8	1.0	1.0
Metribuzin	**435g/ha**	1.0	1.0	1.0	1.0
	870g/ha	1.0	2.5	2.3	1.8
Simazine+Imazethapyr	**1L+45g/ha**	2.0	2.0	1.3	2.8
	2L+90g/ha	4.0	4.0	3.5	3.5
Simazine+Diuron	**1L+450g/ha**	1.0	1.0	1.0	1.0
	2L+900g/ha	1.0	1.3	1.0	1.3
Simazine+Isoxaflutole	**1L+100g/ha**	1.8	2.3	2.0	2.3
	2L+200g/ha	3.3	3.5	3.5	3.8
Flumetsulam	**25g/ha**	3.3	3.0	2.5	3.0
	50g/ha	3.0	2.3	3.0	2.3
Haloxyfop+oil	**100ml/ha**	1.0	1.0	1.0	1.0
	200ml/ha	1.0	1.0	1.0	1.0
Clethodim+oil	**400ml/ha**	1.3	1.0	1.0	1.5
	800ml/ha	1.0	1.5	1.0	1.3

CV%	22.7	(rep.block.plot stratum)
Statistics	LSD	
H x R X Var	0.6	H = Herbicide
R x Var	0.2	R = Application Rate
H x Var	0.4	Var = Variety
H x R	0.4	
Var	0.1	
R	0.1	
H	0.3	

Average Tables

R xVar	Rate	Flip 94-090c	Flip 94-508c	Flip 94-509c	Howzat
	x1	1.5	1.5	1.3	1.6
	x2	1.9	2.1	2.0	2.0

H x Var	Herbicide	Flip 94-090c	Flip 94-508c	Flip 94-509c	Howzat
	Trifluralin	1.3	1.3	1.3	1.5
	Simazine	1.0	1.4	1.0	1.0
	Metribuzin	1.0	1.8	1.6	1.4
	Simazine+Imazethapyr	3.0	3.0	2.4	3.1
	Simazine+Diuron	1.0	1.1	1.0	1.1
	Simazine+Isoxaflutole	2.5	2.9	2.8	3.0
	Flumetsulam	3.1	2.6	2.8	2.6
	Haloxyfop+oil	1.0	1.0	1.0	1.0
	Clethodim+oil	1.1	1.3	1.0	1.4

H x R	**Herbicide**	**x1**	**x2**
	Trifluralin	1.0	1.6
	Simazine	1.0	1.2
	Metribuzin	1.0	1.9
	Simazine+Imazethapyr	2.0	3.8
	Simazine+Diuron	1.0	1.1
	Simazine+Isoxaflutole	2.1	3.5
	Flumetsulam	2.9	2.6
	Haloxyfop+oil	1.0	1.0
	Clethodim+oil	1.2	1.2

Variety	**Flip 94-090c**	**Flip 94-508c**	**Flip 94-509c**	**Howzat**
	1.7	1.8	1.6	1.8

Rate	**Rate**
x1	1.5
x2	2.0

Herbicide	**Herbicide**
Trifluralin	1.3
Simazine	1.1
Metribuzin	1.4
Simazine+Imazethapyr	2.9
Simazine+Diuron	1.1
Simazine+Isoxaflutole	2.8
Flumetsulam	2.8
Haloxyfop+oil	1.0
Clethodim+oil	1.2

Grain yield of chickpeas grown in the herbicide tolerance trial in the Wimmera, Victoria (t/ha)

CV%	44.1	(rep.block.plot stratum)
Statistics	LSD	
H x R X Var	NS	H = Herbicide
R x Var	NS	R = Application Rate
H x Var	NS	Var = Variety
H x R	NS	
Var	0.02	
R	NS	
H	0.05	

Average Tables

Variety	**Flip 94-090c**	**Flip 94-508c**	**Flip 94-509c**	**Howzat**
	0.18	0.09	0.15	0.15

Herbicide	**Herbicide**
Trifluralin	0.08
Simazine	0.14
Metribuzin	0.15
Simazine+Imazethapyr	0.26
Simazine+Diuron	0.17
Simazine+Isoxaflutole	0.24
Flumetsulam	0.07
Haloxyfop+oil	0.10
Clethodim+oil	0.10

Southern Mallee

Grain yield of chickpeas grown in the herbicide tolerance trial in the southern Mallee, Victoria (t/ha)

Herbicide	Rate	Flip 94-090c	Flip 94-509c	Howzat
Trifluralin	**1.2L/ha**	1.0	1.0	1.0
	2.4L/ha	1.0	1.0	1.3
Simazine	**1L/ha**	1.0	1.3	1.0
	2L/ha	1.5	1.3	1.3
Metribuzin	**435g/ha**	1.0	1.0	1.0
	870g/ha	1.0	1.0	1.0
Simazine+Imazethapyr	**1L+45g/ha**	1.8	1.3	1.3
	2L+90g/ha	2.8	2.3	3.5
Simazine+Diuron	**1L+450g/ha**	1.0	1.0	1.0
	2L+900g/ha	1.0	1.3	1.0
Simazine+Isoxaflutole	**1L+100g/ha**	3.0	3.5	3.0
	2L+200g/ha	5.0	5.3	5.3
Flumetsulam	**25g/ha**	1.0	1.0	1.5
	50g/ha	2.0	1.3	1.5
Haloxyfop+oil	**100ml/ha**	1.0	1.0	1.0
	200ml/ha	1.0	1.0	1.0
Clethodim+oil	**400ml/ha**	1.0	1.0	1.0
	800ml/ha	1.0	1.0	1.0

CV%	19.1	(rep.block.plot stratum)
Statistics	LSD	
H x R X Var	0.4	H = Herbicide
R x Var	NS	R = Application Rate
H x Var	0.3	Var = Variety
H x R	0.3	
Var	NS	
R	0.1	
H	0.2	

Average Tables

H x Var	Herbicide	Flip 94-090c	Flip 94-509c	Howzat
	Trifluralin	1.0	1.0	1.1
	Simazine	1.3	1.3	1.1
	Metribuzin	1.0	1.0	1.0
	Simazine+Imazethapyr	2.3	1.8	2.4
	Simazine+Diuron	1.0	1.1	1.0
	Simazine+Isoxaflutole	4.0	4.4	4.1
	Flumetsulam	1.5	1.1	1.5
	Haloxyfop+oil	1.0	1.0	1.0
	Clethodim+oil	1.0	1.0	1.0

H x R	Herbicide	x1	x2
	Trifluralin	1.0	1.1
	Simazine	1.1	1.3
	Metribuzin	1.0	1.0
	Simazine+Imazethapyr	1.4	2.8
	Simazine+Diuron	1.0	1.1
	Simazine+Isoxaflutole	3.2	5.2
	Flumetsulam	1.2	1.6

	Haloxyfop+oil	1.0	1.0
	Clethodim+oil	1.0	1.0

Rate	**Rate**
	x1 1.3
	x2 1.8

Herbicide	**Herbicide**
	Trifluralin 1.0
	Simazine 1.2
	Metribuzin 1.0
	Simazine+Imazethapyr 2.1
	Simazine+Diuron 1.0
	Simazine+Isoxaflutole 4.2
	Flumetsulam 1.4
	Haloxyfop+oil 1.0
	Clethodim+oil 1.0

Additional Data Collected: Both sites – Emergence; Birchip - Height at Flowering and Weed Score; Kalkee - Pod Score, Grain Weight and Seed Size Distribution (Flip 94-090c only)

Interpretation and Other Information

Grain Yield results of these trials need to be treated with caution due to the adverse environmental conditions experienced throughout the season.

Wimmera

- See Milestone 1 for weather interpretation.
- Emergence was similar across all treatments and varieties.
- All varieties responded similarly to the herbicide treatments.
- The most significant damage was in simazine + imazethapyr, simazine + isoxaflutole and flumetsulam treatments.
- Grain yields were improved in treatments with greatest weed control, hence no yield reductions were observed in the simazine + imazethapyr and simazine + isoxaflutole treatments, where most crop damage was observed.

Birchip

- Growing season rainfall was extremely low (157mm c.f. 230mm long term average) and there was no subsoil moisture due to low summer rainfall. Only 8mm rainfall was recorded in October (a critical period for crop growth and yield determination). There was an extremely hot period during October which resulted in significant flower and pod abortion. Many plots had died without setting pods prior to harvest. The late rainfall of 50mm in November was too late to be of any benefit.
- Emergence was similar across all treatments and varieties.
- All varieties responded similarly to the herbicide treatments.
- The most significant damage was in simazine + imazethapyr and simazine + isoxaflutole treatments. Simazine + isoxaflutole applied at double rates caused a significant reduction in crop height.
- The trial was not harvested and grain yields not recorded as there was almost no pods set (see above).

Milestone 3 – 30/3/2005

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.

Results

Wimmera

Disease Score of chickpeas grown in the disease management trial in the Wimmera, Victoria (t/ha)

	Regime	Flip 94-090c	Flip 94-092c	Flip 94-508c	Flip 94-509c	Flip 97-530	Howzat	Kaniva	WACPE 2075
	Nil	3.3	3.3	2.0	1.8	3.5	6.0	8.0	5.5
	Pod	2.5	4.0	2.0	1.3	3.5	5.0	8.3	6.3
	Fortnight	1.0	1.5	1.0	1.0	1.0	1.0	1.3	1.0

CV%	19.1	(block.plot stratum)
Statistics	LSD	
Reg x Var	0.8	
Var	0.5	Reg = Spray Regime
Reg	0.3	Var = Variety

Average Tables

Variety		Flip 94-090c	Flip 94-092c	Flip 94-508c	Flip 94-509c	Flip 97-530	Howzat	Kaniva	WACPE 2075
		2.3	2.9	1.7	1.3	2.7	4.0	5.8	4.3
Regime	**Regime**								
	Nil	4.2							
	Pod	4.1							
	Fortnight	1.1							

Grain yield of chickpeas grown in the disease management trial in the Wimmera, Victoria (t/ha)

	Regime	Flip 94-090c	Flip 94-092c	Flip 94-508c	Flip 94-509c	Flip 97-530	Howzat	Kaniva	WACPE 2075
	Nil	0.21	0.11	0.11	0.17	0.07	0.10	0.02	0.11
	Pod	0.19	0.09	0.06	0.19	0.12	0.13	0.02	0.07
	Fortnight	0.16	0.06	0.04	0.11	0.04	0.17	0.03	0.13

CV%	43.9	(block.plot stratum)
Statistics	LSD	
Reg x Var	0.06	
Var	0.04	Reg = Spray Regime
Reg	NS	Var = Variety

Average Tables

Variety	Flip 94-090c	Flip 94-092c	Flip 94-508c	Flip 94-509c	Flip 97-530	Howzat	Kaniva	WACPE 2075
	0.19	0.09	0.07	0.16	0.08	0.13	0.02	0.10

Hart (Mid North)

A very high level of disease pressure occurred after inoculation at Hart due to average to above average winter rainfall events. The moderately susceptible line, Howzat, suffered high levels of stem breakage and moderate levels of plant death. Resistant lines only had leaf lesions. Disease pressure reduced during October due to a lack of significant rainfall after the middle of September. Very dry and hot conditions occurred in October and plants

were under high levels of moisture stress. The lack of timely finishing rains severely reduced pod set and grain yield in all plots. Heavily diseased plots recovered to some extent due to the decreased disease pressure and the availability of relatively more soil moisture due to lower plant numbers and reduced early season growth.

A significant interaction occurred between variety, fungicide timing and fungicide treatment for foliar disease infection. All treatments of Howzat had much higher levels of infection than all treatments in the resistant varieties. There were large differences in disease levels on Howzat between control treatments and fortnightly spray treatments. Although there was some significant difference in disease levels between control plots and fortnightly spray treatments in the resistant varieties these differences were only very small and had no impact on plant growth. Chlorothalonil treated plots of Howzat had lower levels of infection than Howzat treated with mancozeb for all fungicide timings except for podding sprays. In the resistant varieties there was very little difference in disease levels between chlorothalonil and mancozeb treatments.

Chickpea foliar disease severity score for variety, fungicide timing & treatment

Variety	Treatment	Control	Fortnightly	Strategic	Podding
Howzat	Chlorothalonil	7	3	4.5	7
Howzat	Mancozeb	7	4.5	6.5	7
Genesis 508	Chlorothalonil	2	1	1.5	1.5
Genesis 508	Mancozeb	2	1	1.5	2
FLIP94-509C	Chlorothalonil	2	1	1	1.5
FLIP94-509C	Mancozeb	1.5	1	1	2
Genesis 090	Chlorothalonil	1.5	1.5	1	1.5
Genesis 090	Mancozeb	2	1.5	1	1.5
LSD (0.05)			0.67		

Scored on 1/10/04 based on a 1-9 scale, where 1= no infection & 9= plot completely killed, no green tissue

Very low grain yields occurred in all varieties due to the extreme dry spring seasonal conditions. The interaction between variety and fungicide timing and treatment were not significant. Howzat was significantly lower yielding than all other varieties across all treatments. Genesis 090 and FLIP94-509C were the highest yielding lines.

Chickpea grain yield (t/ha) and weight (g/100 seeds) for variety across all treatments

Variety	t/ha	g/100
Howzat	0.2	23.4
Genesis 508	0.28	16.5
FLIP94-509C	0.36	17.1
Genesis 090	0.33	30.2
LSD (0.05)	0.04	0.8

The variety by fungicide treatment interaction for pod infection scores were not significant, however there was a significant interaction between variety and fungicide timing. In the control treatments Howzat had a far greater level of pod infection than the resistant lines, which all had a very low level, particularly Genesis 508 which had no infection. Howzat had significantly higher levels of pod infection in the control treatments compared some fungicide applications. This difference did not occur in the resistant varieties. Howzat treated with fortnightly sprays still had higher levels of infection than control treatments in resistant lines. Grain weight differences due to fungicide timing and treatment were not significant at Hart.

Chickpea pod disease severity score for variety by fungicide timing

Variety	Control	Fortnightly	Strategic	Podding
Howzat	4.7	2	2.5	2.3
Genesis 508	1	1	1	1
FLIP94-509C	1.5	1	1	1
Genesis 090	1.7	1.2	1.7	1.3
LSD (0.05)		0.82		

Scores on 1/12/04 and based on a 1-9 scale, where 1= no infection & 9= 100% of pods with lesions

Turretfield (mid North)

As at the Hart site a very high level of disease pressure occurred after inoculation at Turretfield due to favourable winter conditions. Moderately susceptible lines suffered high levels of stem breakage and moderate levels of plant death. Infection levels in resistant lines were limited to leaf lesions only. Disease pressure slowed greatly during October due to a lack of rainfall and grain yield potential was reduced. Late rain in November was beneficial for grain yield and likely to have contributed to the higher levels of pod infection found at this site when compared with Hart where late rains did not occur until after plant senescence.

A significant interaction between variety, fungicide timing and fungicide treatment occurred for grain yield and disease foliage score at Turretfield. Vastly higher foliage disease levels occurred in control treatments of Howzat than in control treatments of resistant varieties. Generally there was only very small differences in disease levels in resistant lines between control plots and the different fungicide timings and fungicide treatments, and these small differences had little effect of plant growth and final grain yield. Large differences in disease levels occurred between fungicide timing and fungicide treatments on Howzat. Chlorothalonil treatments had significantly lower foliage disease levels on Howzat than Mancozeb treatments at all timings except for podding where the two fungicides had similar results. Fortnightly and strategic sprays on Howzat with chlorothalonil were sufficient to bring foliar disease levels down to those found in the control treatments of resistant lines, however this did not occur with the mancozeb treatment.

Generally there was no significant difference in grain yield between treatments in the resistant varieties. Howzat had the highest and lowest yielding treatments in the trial. In Howzat, the fortnightly treatment of chlorothalonil was 254% higher yielding than the control treatment, while no significant yield differences occurred between these same treatments in the resistant varieties. Control and podding treatments regardless of fungicide used were lower yielding than all other treatments across all varieties. Fortnightly sprays of chlorothalonil was the highest yielding treatment in the trial however the fortnightly mancozeb treatment and strategic chlorothalonil treatment were only equivalent to the control yields of resistant varieties. The strategic spray of mancozeb in Howzat was lower yielding than the control treatments in the resistant varieties.

Chickpea foliar disease severity scores and grain yield (t/ha) for variety, fungicide timing & treatment

Variety	Treatment	Control		Fortnightly		Strategic		Podding	
		foliage score	yield (t/ha)	foliage score	yield (t/ha)	foliage score	yield (t/ha)	foliage score	yield (t/ha)
Howzat	Chlorothalonil	6.5	0.87	1.5	2.21	2.25	1.96	6.25	1.23
Howzat	Mancozeb	7	0.47	4	1.63	6.25	1.11	6.75	0.8
Howzat	Expt.1	6.75	0.78	2.5	2.05	4.25	1.57	5.75	1.28
Genesis 508	Chlorothalonil	2	1.64	1.25	1.65	1.5	1.69	1.5	1.65
Genesis 508	Mancozeb	1.75	1.71	1.75	1.77	2	1.76	2	1.69
Genesis 508	Expt.1	1.5	1.43	1	1.6	1.5	1.47	1.75	1.37
FLIP94-509C	Chlorothalonil	2.5	1.88	1	1.87	1.25	1.93	2	1.72
FLIP94-509C	Mancozeb	1.5	2.07	1.25	1.97	2	1.97	1.75	1.97
FLIP94-509C	Expt.1	1.5	1.77	1	1.85	1.25	1.77	1.75	1.87
Genesis 090	Chlorothalonil	2.5	1.72	1	1.88	1.25	1.82	2.75	1.87
Genesis 090	Mancozeb	2	1.89	1.5	2.03	2.5	1.94	2	1.95
Genesis 090	Expt.1	2	1.72	1	1.79	1.25	1.76	2.25	1.78
LSD (0.05)		0.85	0.26	0.85	0.26	0.85	0.26	0.85	0.26

Scored on 28/9/04 based on a 1-9 scale, where 1= no infection & 9= plot completely killed, no green tissue

The three way interaction was not significant for pod disease infection and grain weight, however the interaction between variety and fungicide timing was. Howzat had significantly higher pod infection levels than all other varieties at all spray timings, with the greatest disease level in the control treatment. Resistant varieties had higher levels of pod infection in control treatments when compared with sprayed treatments, although there was no difference between the timings (fortnightly, strategic and podding). However in Howzat the podding treatments had higher levels of infection than the strategic or fortnightly sprays. Howzat had lower grain weights in the control and podding sprays than at other spray times. Genesis 508 had lower grain weights in the control treatment when compared with the other timings while Genesis 090 and FLIP94-509C had no difference in grain weights across spray timings.

Chickpea pod disease severity score and grain weight (g/100 seeds) for variety by fungicide timing

Variety	Control		Fortnightly		Strategic		Podding	
	pod score	g/100 seeds	pod score	g/100 seeds	pod score	g/100 seeds	pod score	g/100 seeds
Howzat	6.1	19.38	2.2	22.32	2.5	21.14	3.7	19.03
Genesis 508	2.9	16.6	1.3	17.72	1.3	17.73	1.5	17.08
FLIP94-509C	2.2	17.18	1.1	17.13	1.3	17.37	1.3	17.45
Genesis 090	3.2	32.17	1.5	32.74	1.6	32.8	1.9	32.44
LSD (0.05)	0.50	0.79	0.50	0.79	0.50	0.79	0.50	0.79

Scored on 1/12/04 based on a 1-9 scale, where 1= no infection & 9= 100% of pods with lesions

Chlorothalonil had significantly lower pod disease scores than the mancozeb treatments across all varieties, in the strategic and podding sprays. Grain weights were also significantly higher in the chlorothalonil treatments at all timings except for the podding timing.

Chickpea pod disease severity score and grain weight (g/100 seeds) for treatment by fungicide timing

Treatment	Control		Fortnightly		Strategic		Podding	
	pod score	g/100 seeds	pod score	g/100 seeds	pod score	g/100 seeds	pod score	g/100 seeds
Chlorothalonil	3.4	21.72	1.3	22.9	1.1	22.97	1.5	21.5
Mancozeb	4.1	20.62	1.9	21.94	2.5	21.94	2.8	21.43
Expt.1	3.3	21.66	1.3	22.59	1.4	21.88	2	21.57
LSD (0.05)	0.64	0.76	0.64	0.76	0.64	0.76	0.64	0.76

Scored on 1/12/04 based on a 1-9 scale, where 1= no infection & 9= 100% of pods with lesions

Interpretation and Other Information
Grain Yield results of these trials need to be treated with caution due to the adverse environmental conditions experienced throughout the season.

Wimmera

- See Milestone 1 for weather interpretation.
- Infected stubble was spread throughout this trial to ensure adequate infection by ascochyta blight.
- The trial highlighted the excellent foliage resistance of Flip 94-090c, Flip 94-508c, Flip 94-509c and Flip 97-530. However because of late rainfall it also showed the importance of the recommended fungicide application at early podding to prevent seed discolouration. Where the plots remained untreated, there were significant levels of infection on the seed.
- Varieties that are susceptible (Kaniva) or moderately susceptible to ascochyta blight (Howzat and WACPE 2075) had significant yield reductions without the application of fungicides.

Southern Mallee

- The trial had no disease pressure and was not harvested for grain yield due to the dry conditions which have been outlined previously.

Mid North

At both sites Howzat had vastly higher levels of foliar disease than all three resistant varieties in the control treatments. Fungicide treatments reduced foliar disease levels in resistant varieties slightly but due to the low starting level of disease in these varieties it had no impact on plant growth. Significant reductions in disease levels in Howzat occurred at both sites when fungicide treatments were applied. Chlorothalonil reduced disease levels in Howzat to a greater extent than mancozeb at both sites; however even with fortnightly applications of chlorothalonil, the foliar disease levels in Howzat at Hart were still higher than in control treatments (no fungicides) of the resistant types. Disease levels were higher at Hart than at Turretfield possibly due to the difference in the inoculum application technique and due to different frequencies of winter rainfall events. At Hart the fortnightly spray treatment of chlorothalonil was not sufficient to prevent plant death in Howzat but was sufficient at Turretfield. The podding sprays (1 spray) and the mancozeb strategic fungicide spray (3 sprays) were in-sufficient to prevent plant death in Howzat at Hart and Turretfield The strategic spray of chlorothalonil at Turretfield did prevent plant death, again due to the lower intensity level of disease at this site.

Despite the very high level of disease infection at Hart the effect of fungicide timing, treatment and variety on grain yield was unclear due to the dry seasonal conditions dramatically reducing grain yields. Across all treatments Howzat was significantly lower yielding than all other varieties due to the higher level of disease infection in these plots. Genesis 508 was lower yielding than the other two resistant varieties due to its poor adaptation to dry seasonal conditions. High grain yield differences occurred between fungicide timing and fungicide treatments at Turretfield in Howzat. Fortnightly sprays of chlorothalonil were required to maximise yields of Howzat. Mancozeb, regardless of application strategy, was not sufficient to maximise yields in Howzat. All three resistant varieties suffered no significant level of yield loss when they were not sprayed under this high level of disease pressure.

Very low levels of pod infection occurred in resistant types at Hart and there was no effect of fungicide in these varieties at this site. At Turretfield late rains occurred prior to senescence and provided more favourable conditions for pod infection. Low levels of pod infection occurred in resistant types at this site and spraying fungicides further reduced this level, although there was no significant difference between fungicide timings or treatments. Although this increase in pod infection level in the resistant types had no effect on grain yield a spray is warranted at podding to

reduce seed infection and seed staining in these varieties under these conditions. At both sites Howzat had significant levels of pod infection, which was reduced by fungicide application. The fortnightly spray treatment at both sites reduced infection levels the greatest, however they were still at higher levels than in the podding treatments of the resistant types. At Turretfield chlorothalonil was far superior to Mancozeb in reducing pod infection levels in Howzat and this chemical should be used if growing these moderately susceptible varieties. The fortnightly fungicide treatments in Howzat had significantly larger grain size than other treatments. Interestingly of the resistant lines, only Genesis 508 suffered a significant decrease in grain size in the control treatments when compared with the fortnightly and strategic treatments. The podding spray treatment resulted in a non-significant reduction in r seed size compared to the other two fungicide timing treatments . Seed size in this treatment was also not significantly larger than the control treatment. Despite this seed size reduction no yield loss occurred in these treatments. Further work is required to see if this finding is an ongoing issue in this variety and whether more than one spray at podding is required.

Mid North Conclusions

- Howzat had significantly greater levels of foliar disease and pod infection levels than all resistant varieties when no fungicides were applied.
- Under high disease pressure in Howzat fortnightly sprays of chlorothalonil did not always prevent plant death from occurring.
- Maximum grain yields in Howzat treatments at Turretfield occurred in fortnightly sprays of chlorothalonil, however disease levels in these treatments were still higher than in untreated plots of the resistant varieties
- Resistant varieties with no fungicides applied suffered no yield loss when compared to the same varieties treated with fortnightly sprays under high disease pressure at Turretfield
- One spray at podding to reduce pod infection levels from low levels to very low levels in resistant varieties was all that was required to successfully grow the new resistant chickpeas under high levels of disease pressure last year.
  There was no significant difference between the fungicides used to reduce pod infection levels in the resistant types, however chlorothalonil reduced levels to a far greater extent than Mancozeb in Howzat.

Milestone 4 – 30/3/2005

Disease severity and grain yield data from trials sown in each of two years to determine the optimum disease management strategy for Farrah 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 SouthWales (only 2005 and 2006).

Results (prepared by Jim Egan SARDI, Port Lincoln)

Variety and fungicide spray treatment effects on disease, grain yield and quality measures in faba beans at Saddleworth (Mid North of SA) in 2004.

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

Variety and fungicide spray treatment effects on disease, grain yield and quality measures in faba beans at Cockaleechie (Lower Eyre Peninsula of SA) in 2004.

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

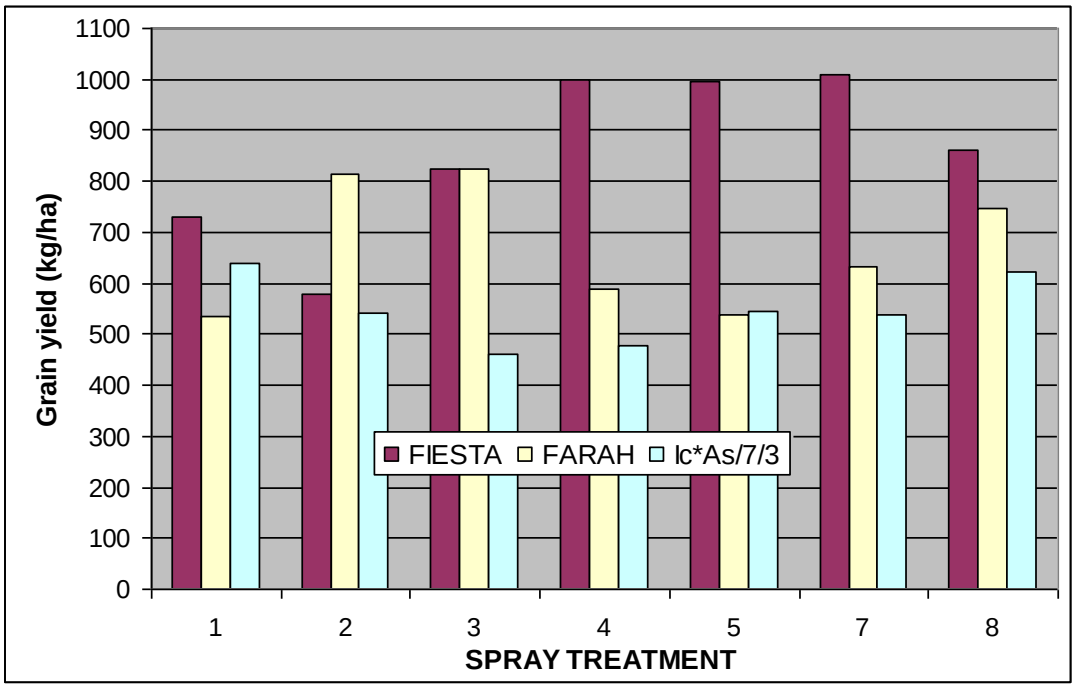
Interpretation and Other Information

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

Saddleworth

- 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), 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 (heliothis) 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.

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



Cockaleechie

- 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 (heliothis) was severe however.

Milestone 5 – 30/3/2005
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 and central Yorke Peninsula (Melton and Sandilands)
At both trial sites due to very dry spring conditions and high levels of moisture stress no disease occurred last year. Hence there were no significant interactions between treatments at either site apart from an overall time of sowing difference which was reported on in the time of sowing by seeding rate experiment (Milestone 6).

Milestone 6 – 30/3/2005

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.

Results

Melton (northern Yorke Peninsula)

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. Nugget was significantly higher yielding than Northfield and CIPAL203 at the early time of sowing. At the mid time of sowing Northfield and Nugget were similar yielding, however CIPAL203 was significantly lower yielding than Northfield. At the late time of sowing all varieties were not significantly different in grain yield. Grain yield decreased significantly as sowing date was delayed across all varieties, this trend also occurred in Nugget. However in Northfield grain yield only decreased at the late sowing date and in CIPAL203 the mid timing decreased in yield but there was no further decrease in yield at the late sowing date.

Lentil grain yield (t/ha) and weight (g/1000 seeds) for variety by sowing time

Sowing date	Northfield		Nugget		CIPAL203		Mean	
	t/ha	g/1000	t/ha	g/1000	t/ha	g/1000	t/ha	g/1000
Sown 21/5	1.97	29.51	2.26	36.42	1.85	30.39	2.02	32.11
Sown 11/6	1.9	32.12	1.82	41.49	1.58	33.38	1.77	35.66
Sown 6/7	1.48	34.06	1.42	44.9	1.59	35.5	1.5	38.15
LSD (0.05)	0.25	1.85	0.25	1.85	0.25	1.85	0.14	1.33

Across all treatments plant density was significant for plant count, grain yield and seed size. Plant counts increased with plant density although apart from at 80 plants per sq.m were well below targeted rates. Counts for 120 and 150 were not significantly different from each other. At 80 plants per sq.m the lowest grain yield and highest grain size was achieved. All other treatments had grain weights and size similar to each other.

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/1000
80 pl/m^2	79	1.66	36.03
120 pl/m^2	96	1.79	35.17
150 pl/m^2	105	1.78	35.19
200 pl/m^2	135	1.83	34.85
LSD (0.05)	10.9	0.11	0.61

Sandilands (southern Yorke Peninsula)

Like at Melton the 3 way interaction and the 2 way interaction involving plant density was not significant for grain yield or weight. The interaction for sowing date and variety was significant. The early time of sowing yielded lower than the mid and late sowing times which yielded similarly. All varieties yielded similarly at the early time of sowing. At the mid and late times of sowing Nugget was higher yielding than Northfield and CIPAL203 which yielded similarly, but the difference was only significant at the late sowing date. Yields of Northfield were not significantly different as sowing date varied. However in Nugget and CIPAL203 the early time of sowing was

lower than the mid and late sowing dates. The grain weight showed increasing trend as sowing date was delayed, however this difference was not always significant.

Lentil grain yield (t/ha) and weight (g/1000 seeds) for variety by sowing time

Variety	Northfield		Nugget		CIPAL203		Mean	
	t/ha	g/1000	t/ha	g/1000	t/ha	g/1000	t/ha	g/1000
Sown 26/5	1.54	34.68	1.46	48.66	1.42	36.14	1.48	39.83
Sown 17/6	1.71	35.03	1.89	50.22	1.77	36.58	1.79	40.61
Sown 7/7	1.58	37.11	1.97	49.86	1.72	38.02	1.76	41.66
LSD (0.05)	0.24	1.54	0.24	1.54	0.24	1.54	0.21	1.46

Across all treatments plant density was significant for plant count, grain yield and seed size. Plant counts increased with plant density although apart from at 80 plants per sq.m were below targeted rates however not to the same extent as found at Melton. Plant counts for all plant density treatments were significantly different from each other. Grain yield was significantly higher in the 150 and 200 plant density treatments than the 80 plant density treatment. Grain size in the 200 plant density treatment was smaller than all other treatments where size was similar.

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/1000
80 pl/m^2	73	1.61	40.87
120 pl/m^2	104	1.67	40.95
150 pl/m^2	125	1.7	40.82
200 pl/m^2	157	1.72	40.16
LSD (0.05)	7.7	0.06	0.63

Interpretation and Other Information

Early season growing conditions were favourable at both sites and by the end of September all sowing time treatments at both sites had above average yield potential. A lack of rain after mid September until early November at both sites significantly reduced grain yields in all treatments. At Melton the season finished quickly and under very high levels of moisture stress, which reduced grain yields particularly in the late time of sowing treatments. At Sandilands late rains in November were useful for grain filling and the seasonal finishing conditions were generally kinder than at Melton, however plants still suffered from moderate levels of post flowering moisture stress. Disease was not evident at either site and weeds and insect pests also had no effect on grain yield. Post sowing pre-emergent metribuzin damage occurred in the first two times of sowing at Melton and was responsible for the lower than targeted plant densities in these sowing times. CIPAL203 suffered higher levels of damage symptoms than the other varieties.

Lentil yield trends to sowing dates were different across the two sites. At Melton, yield decreased as sowing date was delayed and this was reflected in vegetative growth levels with the later sowing date treatments being relatively poorly grown when the moisture stress occurred. At Sandilands the early time of sowing was significantly lower yielding than the later sowing dates, which yielded similarly. The most likely reason for the lower yield at the early sowing date was due to the very high levels of biomass produced in this treatment. Plants sown early lodged prematurely and most likely suffered from higher levels of moisture stress during late October than the later sown treatments. They also matured relatively quickly and failed to make use of the late rains, which fell in November to the same extent as the later sown treatments. The late sowing date at this site was

still flowering when rains in November occurred allowing plants to recover from the earlier moisture stress to some extent.

Variety performance was also different at each site. Nugget's highest relative yields at Melton occurred when sown early. As sowing date was delayed at this site Nugget's yield advantage over the other varieties was reduced. Nugget tends to flower for longer periods than these other varieties and would not have been favoured by sowing dates, which exposed it to high levels of moisture stress and the rapid dry finish last year. Northfield and CIPAL203 both mature quickly enabling seed of these varieties to fill better than in Nugget in quick finishes, hence their relative better yields occurred at the later sowing dates at Melton. At Sandilands, Nugget's best relative yields occurred when sown late. At this site plants in the late time of sowing were able to respond to late rains and Nugget being more indeterminate in its flowering pattern was likely to have been favoured to a greater extent than the other lines. CIPAL203 yielded similarly to Northfield at both sites at all sowing dates apart from the mid sowing date at Melton where Northfield was significantly higher yielding. CIPAL203 has a small plant type and can produce relatively lower biomass levels if seasonal conditions are adverse. This reduced biomass production may have been responsible for its lower relative yields at the mid time of sowing at Melton, however it was not relatively lower yielding at the late time of sowing where biomass production would have been at its lowest level. CIPAL203 was more sensitive to metribuzin damage which was observed in the early and mid times of sowing. This increased varietal sensitivity also may have been responsible for its lower relative yields, particularly in the mid sowing time as seasonal conditions would not have favoured recovery to the same extent as in the earlier sown herbicide damaged treatment.

Seeding rate interactions with variety or sowing time were not significant in either site last year. Over all treatments the low target plant densities (80plants per sq.m) were lower yielding at both sites while all other plant densities performed similarly. The rapid dry finish to the season was the overriding limitation to yield and meant all treatments matured quickly and at a similar time.

Conclusions

Results from 2004 were strongly influenced by the rapid dry finish to the season. Generally CIPAL203 performed similarly to Northfield for its response to sowing time last year, while no response to seeding rate occurred last year. Due to its superior disease resistance and relatively lower biomass production CIPAL203 is likely to benefit to a greater extent from earlier sowing dates than Northfield, providing the risk of metribuzin damage is avoided. Further evaluation is required in seasons with more average finishing conditions.

Milestone 8 – 30/3/2005

Herbicide damage symptoms and grain yield data from trials sown to determine the relative herbicide tolerance of Sturt and Moonlight supplied to Pulse Australia and GRDC in collated and tabulated form by Dr Brand.

The new varieties will be compared with Kaspa for at least 6 commonly used herbicides or herbicide mixes at 1 site in the southern Mallee, Victoria

Results

Grain yield of field peas grown in the herbicide tolerance trial in the southern Mallee, Victoria (t/ha)

CV%	22.2	(rep.block.plot stratum)
Statistics	LSD	
H x R X Var	NS	H = Herbicide
R x Var	NS	R = Application Rate
H x Var	NS	Var = Variety
H x R	0.06	
Var	0.02	
R	NS	
H	0.04	

Average Tables

H x Var	**Herbicide**	**Kaspa**	**Moonlight**	**Sturt**
	Trifluralin	0.13	0.10	0.24
	Imazethapyr	0.36	0.32	0.41
	Metribuzin	0.27	0.28	0.38
	Diuron	0.33	0.34	0.42
	Imazamox+wetter	0.19	0.21	0.31
	Diflufenican+MCPA	0.26	0.26	0.32
	Flumetsulam	0.17	0.18	0.30
	Haloxyfop+oil	0.10	0.11	0.21
	Clethodim+oil	0.09	0.09	0.20

H x R	**Herbicide**	**x1**	**x2**
	Trifluralin	0.13	0.18
	Imazethapyr	0.43	0.30
	Metribuzin	0.26	0.36
	Diuron	0.35	0.38
	Imazamox+wetter	0.23	0.24
	Diflufenican+MCPA	0.27	0.29
	Flumetsulam	0.19	0.24
	Haloxyfop+oil	0.14	0.14
	Clethodim+oil	0.14	0.11

Variety	**Kaspa**	**Moonlight**	**Sturt**
	0.21	0.21	0.31

Herbicide	**Herbicide**
	Trifluralin 0.16
	Imazethapyr 0.36
	Metribuzin 0.31
	Diuron 0.36
	Imazamox+wetter 0.24
	Diflufenican+MCPA 0.28

Flumetsulam	0.22
Haloxyfop+oil	0.14
Clethodim+oil	0.13

Adjusted grain yield of field peas grown in the herbicide tolerance trial in the southern Mallee, Victoria (t/ha)- Only H x R table shown as this is the highest level of significance.

H x R	Herbicide	x1	x2
	Trifluralin	0.29	0.33
	Imazethapyr	0.36	0.21
	Metribuzin	0.28	0.33
	Diuron	0.33	0.33
	Imazamox+wetter	0.27	0.26
	Diflufenican+MCPA	0.27	0.26
	Flumetsulam	0.24	0.27
	Haloxyfop+oil	0.29	0.27
	Clethodim+oil	0.28	0.25

$Lsd_{(P<0.05)} - 0.08$

Additional Data Collected: Emergence, Height at Flowering, Weed Score, Grain Weight and Grain Moisture.

Interpretation and Other Information

- See Milestone 2 for weather interpretation.
- Emergence was 55 plants/m^2 for Kaspa, 45 plants/m^2 for Moonlight and 42 plants per/m^2 for Sturt. Targeted densities were 50 plants/m^2 for Kaspa and Moonlight and 40 plants/m^2 for Sturt.
- All varieties responded similarly to the herbicide treatments. No visual damage was observed for any of the herbicide treatments. This was probably due to the dry conditions experienced.
- Grain yields were strongly correlated with weed populations, i.e. herbicides that gave good weed control resulted in highest grain yields. To overcome this affect, we used weed score as a covariate. This showed that Imazethapyr applied at double rates caused a significant reduction in yield (approximately 40%). This implies that the safety margin for this chemical is relatively low, therefor growers need to use caution and avoid overlapping within their crops.
- Sturt appears to have the best adaptation to dry environments with yields 50% greater than Kaspa and Moonlight. This is the same trend as has been observed in the breeding program.

Milestone 9 – 30/3/2005

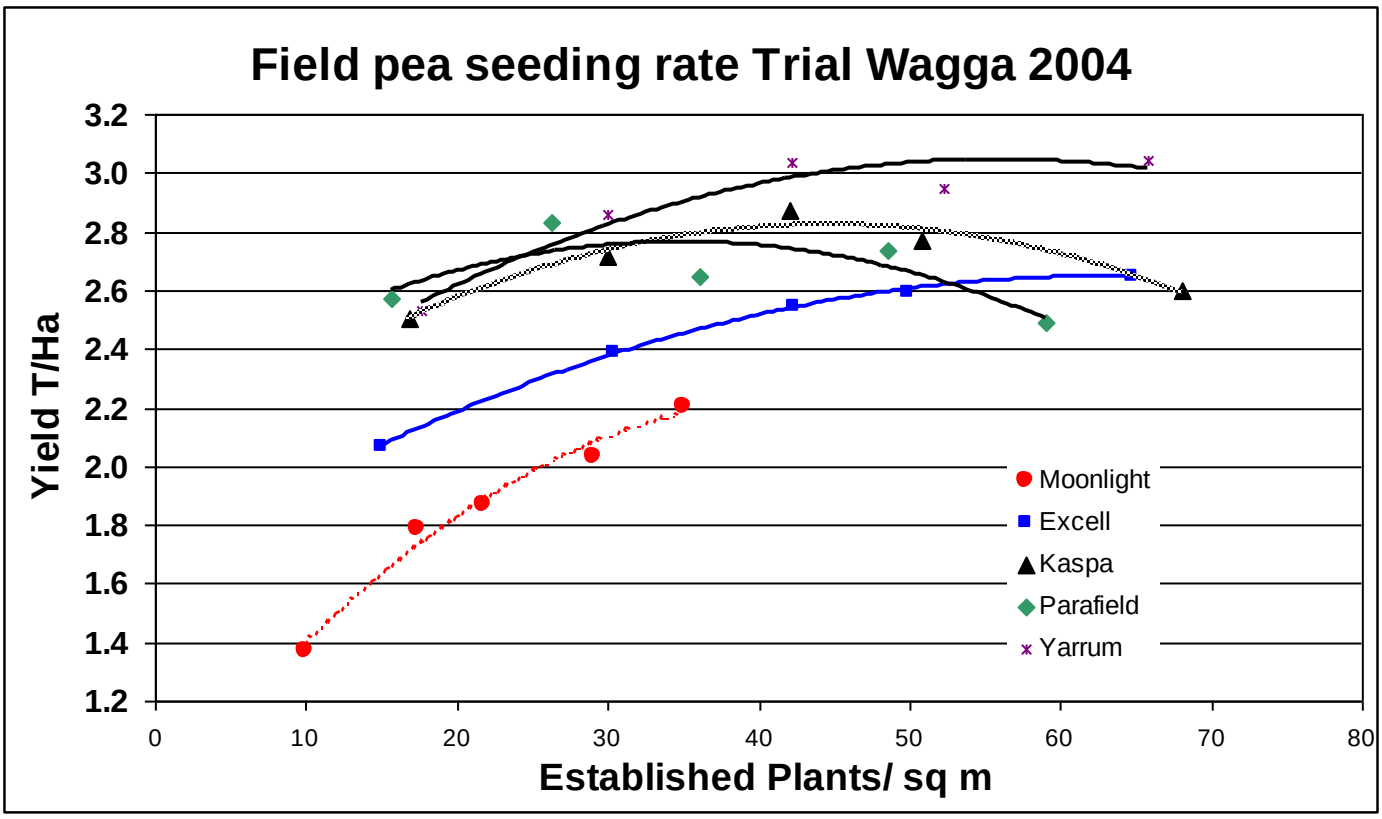
Grain yield data from trials sown to determine optimum sowing dates and plant densities Moonlight, Sturt (Yenda only) and 96-262*1 supplied to Pulse Australia and GRDC in a collated and tabulated form by Dr Armstrong.

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.

Results

Wagga

	Field pea seeding rate trial WAGGA (FZA04WARI) Sown: 8 June 2004										
		Target	Measured	YIELD	100			14 Oct	4 Nov	25 Nov	25 Nov
Trt	Variety	Plant/m^2	Plant/m^2	T/HA	sd wt	Fl_start	Fl_Fin	VIG	MAT	Erect	Rating
1	Excell	16	15	2.07	19.5	22 Sep	22 Oct	7.7	7.7	6.0	8.0
2	Excell	32	30	2.39	20.5	21 Sep	20 Oct	8.0	6.3	5.7	8.7
3	Excell	48	42	2.55	21.4	22 Sep	19 Oct	8.0	6.3	6.0	9.0
4	Excell	64	50	2.59	21.1	21 Sep	19 Oct	8.0	6.0	6.0	9.0
5	Excell	80	65	2.65	21.5	21 Sep	18 Oct	8.0	6.0	5.7	9.0
6	Kaspa	16	17	2.51	20.5	5 Oct	24 Oct	7.0	6.0	4.0	7.0
7	Kaspa	32	30	2.72	19.8	6 Oct	22 Oct	7.7	5.0	3.7	7.7
8	Kaspa	48	42	2.87	20.3	5 Oct	20 Oct	7.7	5.0	3.7	7.3
9	Kaspa	64	51	2.77	20.0	6 Oct	20 Oct	7.7	4.3	3.0	7.3
10	Kaspa	80	68	2.60	19.2	6 Oct	19 Oct	7.7	3.7	3.3	7.3
11	Moonlight	16	10	1.37	21.2	27 Sep		7.0	8.0	6.7	4.3
12	Moonlight	32	17	1.79	21.7	27 Sep	27 Oct	7.0	7.3	7.0	6.0
13	Moonlight	48	22	1.87	20.7	27 Sep	26 Oct	8.0	6.7	6.3	7.7
14	Moonlight	64	29	2.03	21.8	27 Sep	22 Oct	8.0	5.7	5.7	8.0
15	Moonlight	80	35	2.20	21.6	27 Sep	22 Oct	8.0	5.3	5.7	8.0
16	Parafield	16	16	2.57	23.1	27 Sep	22 Oct	9.0	6.7	2.7	5.3
17	Parafield	32	26	2.83	23.5	27 Sep	19 Oct	9.0	6.3	2.0	5.7
18	Parafield	48	36	2.65	23.7	28 Sep	19 Oct	9.0	5.0	2.0	6.0
19	Parafield	64	49	2.74	23.8	28 Sep	20 Oct	9.0	5.0	2.0	6.0
20	Parafield	80	59	2.49	23.0	27 Sep	19 Oct	9.0	5.0	2.0	6.0
21	Yarrum	16	18	2.53	21.2	6 Oct	20 Oct	6.0	5.0	3.0	6.0
22	Yarrum	32	30	2.86	20.8	6 Oct	19 Oct	6.0	4.0	2.3	6.7
23	Yarrum	48	42	3.03	20.9	6 Oct	18 Oct	7.0	4.0	2.0	6.7
24	Yarrum	64	52	2.95	20.9	6 Oct	19 Oct	7.0	3.7	2.7	6.7
25	Yarrum	80	66	3.05	20.9	6 Oct	18 Oct	7.0	3.7	2.7	7.0
	SED t/ha			0.160							



Interpretation and Other Information

Wagga

- Establishment of Moonlight was very poor any yield was still very responsive at the highest seeding rate
- Excell and Yarrum had similar response curves with an optimum density of 40-50 plants/m2
- Parafield and Kaspa had similar response curves with a noticable decline in yield at the higher seeding rates. Optimum plant densities were around 30 plants/m2 for Parafield and 40 plants /m2 for Kaspa
- Increasing seeding rate in most varieties resulted in a quicker finish to flowering, increasing lodging and earlier maturity
- Seed size was unaffected by seeding rate

Yenda

- Extremely low yielding and showed no effect of treatment.

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.

Results
Trials are with the biometrician & results will not be available for some time.