New Varieties, New Agronomy - Pulse Agronomic Research, South-Eastern Australia

2007 Results Summary

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Dimboola field day 2007 – discussing lentil variety response to row spacing

Please Note:
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.
Data from this report is only to be used with authors' permission.

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SARDI South Australian Research and Development Institute

GRDC Grains Research & Development Corporation

Key Contributors

The authors wish to thank the contributions of the following people to this project:
Russel Argall and Mel Baker, DPI – Horsham
Jenny Davidson, Jim Egan and Jo Crouch, SARDI
Peter Matthews and Ian Menz, DPI NSW

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RESEARCH HIGHLIGHTS

In 2007, the pulse agronomic research project across south eastern Australia conducted several new proof of concept trials (Miletstone 11) to assess genotype and management interactions and to develop of protocols for trials in 2008 and 2009. In addition the variety specific agronomic management research continued on several exciting new varieties that a due for release from Pulse Breeding Australia. The Victorian component of the project has moved toward no-till cropping practices in line with the G x M research, with one site sown inter-row into standing cereal stubble. Many trials also provided opportunistic measurements (eg virus infection) which will provide valuable information to growers and advisors to maximise production in communing seasons.

Genotype x management (GxM)

- ROW SPACE/INTER-ROW SOWING, LENTILS**:** Grain yields averaged approximately 25% higher in plots sown on the 30 cm row spacing system (standing stubble) compared with the 19.5 cm row spacing system. Varieties responded differently to changes in row spacing with yield improvements ranging from 15% - 50%. Vigorous, taller new varieties such as Boomer appear to be well suited to wide rows and standing stubble, which provides a trellis to improve harvestability.
- WEED COMPETITION BY PLANT ARCHITECTURE, CHICKPEAS: There was variation in the current chickpea genotype for competition with ryegrass, particularly in reducing tiller numbers. Tall types (CICA512) and types with wide branching angles (Sonali) were generally more competitive than short and narrow branching angle types.
- CROPTOPPING, FABA BEANS: Generally earlier maturing varieties incurred lower levels of grain yield loss than later maturing varieties when crop topped at the appropriate stage for effective ryegrass control.
- BLACK SPOT, FIELD PEAS: The improved black spot resistance line, WA2211 had lower disease severity and slower build up of blackspot than Kaspa and Alma, however this was not reflected in final grain yield due to dry spring seasonal conditions. Further evaluation is required on WA2211 to assess wether its black spot resistance improvement is significant enough to allow early sowing.

2008 DIRECTIONS: A number of crops, lines and treatments for all trials has been expanded and refined in 2008 based on 2007 findings. A copy of the preliminary protocols is attached with this report.

Variety Specific Management

- LENTILS: Sowing date trials in Victoria showed clear variety specific responses, with Nipper showing its highest yields sown at earliest dates, while Boomer had similar yields a both the early and mid sowing dates. Opportunistic assessment of variety and sowing time responses to pod drop and shattering in lentils provided valuable information on several of the new varieties.
- CHICKPEAS: Early sowing generally produced the highest yield for chickpeas in 2007. Chickpea varieties in Victoria showed differences in response to plant density at each of the sowing dates. Generally Genesis 509 showed increased yield with higher plant densities, Almaz showed reduced yields and Genesis 090 was variable depending on sowing date. Opportunistic assessment of effects of plant density on virus infection levels in chickpeas occurred in some trials. Generally it appeared that lower plant densities resulted in higher infection from viruses, such as Beet Western Yellows (BWYV).
- FABA BEANS: Herbicide by sowing time trials in faba beans in SA concluded that Nura was more sensitive to applications of Spinnaker at early and mid sowing times but similar at late. Maximum grain yields of Nura were achieved at early sowing times.

Trials conducted in 2007 on new pulse varieties across south-eastern.

	Chickpeas								**Lentils**			
Experiment	**Genesis 090**	**Genesis 509**	**Almaz**	**Nafice**	**CICA 503**	**CICA 505**	**Genesis 114**	**Genesis 079**	**Nipper**	**Boomer**	**CIPAL 411**	**CIPAL 415**
Sowing date	W	W	W	W					W, sM,nYP,cYP	W, sM,nYP,cYP	nYP,cYP	W, sM
Plant density	W,mN	W,mN	W,mN	W	mN, Y	Y		mN	W, sM,nYP,cYP	W, sM,nYP,cYP	nYP,cYP	W, sM
Row spacing	Y	Y			Y	Y						
Herbicide tolerance	W	W	W	W								
Fungicide management	W, sM,mN	W, sM,mN	W, sM.mN	W, sM	mN		W, sM	W, sM, mN	W, sM,nYP,cYP	W, sM,nYP,cYP	nYP,cYP	
Harvest timing												
Wide scale release[2]	2005	2008	2008	2008	2009			2009	2007	2007	2009	

	Field peas			**Faba beans**	
Experiment	**OZP602**	**OZP703**	**Sturt**	**Farah**	**Nura**
Sowing date				lEP, mN,Wa	lEP, mN, Wa
Plant density		Wa, Y	Wa, Y	Wa	Wa
Row spacing		Wa, Y	Wa, Y	Wa	Wa
Herbicide tolerance				lEP	lEP
Fungicide management				mN	mN
Harvest timing					
Wide scale release[2]	2006			2005	2006

[1]W – Wimmera, Vic; sM – southern Mallee, Vic; mN – mid North, SA; nYP – northern Yorke Peninsula, SA; cYP – central Yorke Peninsula, SA; lEP – Lower Eyre Peninsula, SA; Wa – Wagga, NSW; Y, Yenda, NSW.
[2]Minimum of 400t of lentil seed and 750t of field pea and chickpea seed and 1000t of faba bean seed available to growers from commercialising company.

Notes:

jb66

GENOTYPE x MANAGEMENT EXPERIMENTS

1. Stubble + wider rows – Wimmera
2. Improved blackspot by sowing time-Peas, Mid North (preliminary validation only)
3. Weed competition by architecture-chickpeas, Mid North (preliminary validation only)
4. Crop topping by maturity-beans, midnorth (preliminary validation only)

Milestone 2 – 30/3/08

Trials sown to determine optimum sowing dates, plant densities and row space for new kabuli and desi chickpea varieties as per Table above. New varieties will be compared with Genesis 090 for at least 3 sowing dates, 4 plant densities and 2 row spacings. Establishment, flowering time, grain yield and seed quality attributes will be reported.

TRIAL 1: Chickpea Sowing Time x Plant Density, Wimmera (Dimboola), Victoria

Treatments

- Varieties (Genesis 090, Genesis 509, Almaz, Nafice)
- Sowing Dates (11 May, 8 June, 12 July),
- Plant Densities (15, 30, 45, 60, 90 plants/m^2)

Table 2.1 Seeding rate (kg/ha) required to achieve target plant densities in chickpeas. Seed weight (g/100 seed) indicated in brackets

Plant density (plants/m^2)	Genesis 090 (32)	Genesis 509 (17)	Nafice (49)	Almaz (44)
15	32	27	77	69
30	101	54	154	139
45	151	80	232	208
60	202	107	309	272
90	302	161	463	416

Results and Interpretation

- Key Message: Early sowing generally produced the highest yield for chickpeas in 2007. Chickpea varieties showed differences in response to plant density at each of the sowing dates. Generally Genesis 509 showed increased yield with higher plant densities, Almaz showed reduced yields and Genesis 090 was variable depending on sowing date.
- Climate - The season was characterised by an excellent early break in late April/early May (generally greater than 75 mm rainfall), followed by a relatively dry winter and spring. Maximum temperatures were generally slightly above average and minimum temperatures below average (Fig. 2.1). Several maximum temperatures were above 25^{o}C at Dimboola in September and October, with the hottest day being 36.1^{o}C on October 21. There were few significant frosts recorded during the flowering and podding periods of the lentils and chickpeas (September 25, October 2 and 8 at -0.2 ^{o}C). Rainfall was well below average for the growing season, but close to average annually, due to high summer rainfall (Table 2.2). Overall climatic conditions in 2007 were closer to a Queensland pattern, with crops grown on stored moisture.

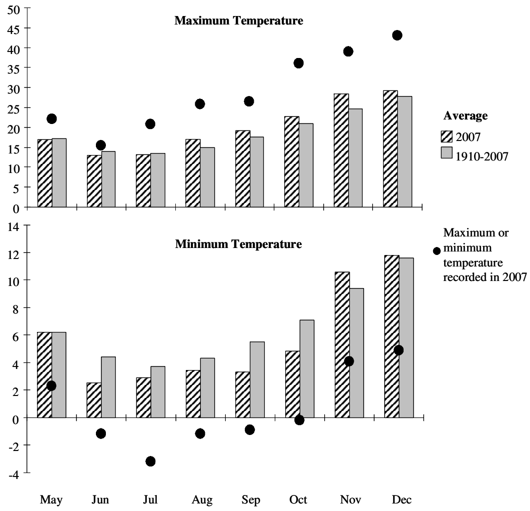


Figure 2.1. Average monthly maximum and minimum temperatures at Dimboola in 2007 in comparison with long term data (approximately 100 years @ Horsham) and highest and lowest recorded temperature for the month.

Table 2.2. Monthly rainfall, growing season rainfall (GSR) and total rainfall (mm) at Dimboola and Beulah in 2007 compared with long term averages.

	Dimboola		Beulah	
Month	**2007**	**Average (Horsham)**	**2007**	**Average (Beulah)**
Januray	64.4[1]	23.2	75.4	21.3
February	23.2	24.8	19.2	25.7
March	8.8	23.4	26.8	21.8
April	89.8	31.7	36.6	25.4
May	65.4	46.6	79.2	38.9
June	5.4	49.7	16	37.2
July	33.4	46.8	22.8	37.2
August	6.2	48.5	2.8	39.5
September	10.6	46.2	12.8	38.2
October	6.2	44.1	5.4	37
November	41.6	33.7	45	28.9
December	23	27.4	35.8	24.5
GSR (May-Oct)	127.2	281.9	139	228
Total	378	446.1	377.8	375.6

1. Underlined figures sourced from Bureau of Meterology (Horsham for Dimboola site and Warracknabeal for Beulah site)

- Plant establishment – Similar trends for plant establishment were observed across all varieties. Generally achieved plant densities were below target plant densities at higher sowing rates (Table 2.3). At later sowing dates emergence was generally slightly reduced (5-10%; data not shown).

Table 2.3. Relationship between target plant density and actual plant establishment in chickpeas at Dimboola in 2007

Plants/m^2	
Target	**Established**
15	14
30	27
45	38
60	46
90	63
lsd	2

- Grain yield – Highest yields of approximately 1 t/ha were achieved by Genesis 509 sown May 11 and Genesis 090 sown June 8 both at the higher plant densities (Fig 2.2). All varieties achieved highest yields sown May 11, however Genesis 090 also produced similar yields sown June 8, but at high plant densities. Varieties showed different responses to plant density at each of the sowing dates. Genesis 090 sown May 11 had highest yields at 30-45 plants/m^2, while at the later sowing dates highest yields were at the higher densities. For Genesis 509, highest yields were achieved at plant densities greater than 45 plants/m^2 for all sowing dates. An opposite trend was seen for Almaz sown May 11, where highest yields were achieved at the lowest densities. Sown June 8 there was no response to sowing date and yields were almost zero sown July 12. Nafice showed similar responses to Genesis 090, except at the July 12 sowing date, where Nafice had no yield. It is also notable in these trials that hare damage was apparent and more severe in Nafice and Almaz than Genesis 090 and Genesis 509. The differences observed between Genesis 090 and 509 in response to plant density are probably due to differences in plant type. Genesis 509 is an erect type plant and Genesis 090 has more of a spreading (bush) habit.
- Seed Size –For all varieties May and June sown treatments produced the largest seed and highest proportions of larger sized seed (8 and 9mm). Sown May 11 seed size was reduced with increasing plant densities, however no effect was observed at later sowing dates. Nafice produced the largest seed (approximately 40% 9 mm, 45% 8 mm, 15% <8mm), followed by Almaz (approximately 35% 9 mm, 50% 8 mm, 15% <8 mm) and Genesis 090 (approximately 40% 8 mm, 60% <8 mm)

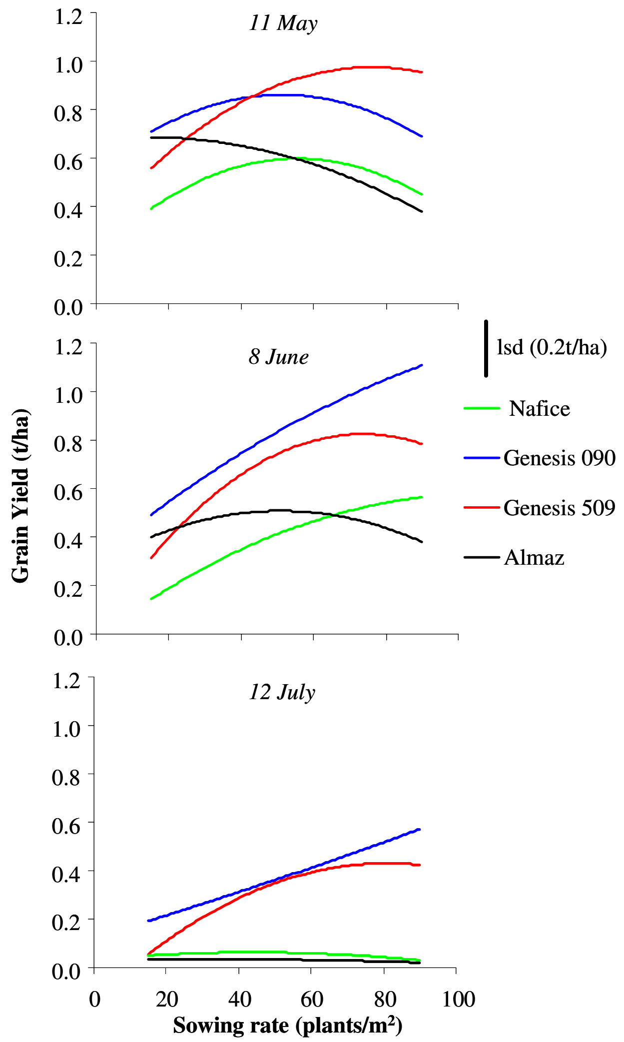


Figure 2.2. Effect of sowing time and plant density on the grain yield of chickpea varieties sown at Dimboola in 2007.

TRIAL 2: Chickpea Plant Density, mid North (Turretfield), South Australia

Aim: To maximise production advantages of new kabuli and desi chickpea varieties through the identification of optimum plant densities.

Varieties: Almaz, CICA503, Genesis 079, Genesis 090, Genesis 509
Sowing date: June 9th
Seed rate: 20, 35, 50 & 70 seeds per sq.m.
Fertiliser: DAP @ 80kg/ha pre, MAP @ 48kg/ha drilled with the seed.

Results and Discussion

Favourable early winter seasonal conditions were followed by dry conditions during late winter and spring. Late spring rainfall events were beneficial to grain formation and the average trial yield was a very respectable 1.7 t/ha given the below average growing season rainfall.

Plant density & grain yield

A significant interaction between seeding rate and variety occurred for plant density and grain yield. Plant density of all varieties increased with increasing seed rate, with the exception of Genesis 509, which had no increase from 35 pl.sqm to 50 pl.sqm (Figure 1). CICA503 showed a lower plant density at 35 and 70 pl.sqm than other varieties except Genesis 509 at 70 pl.sqm, while Genesis 509 showed a lower plant density at 50 pl.sqm than other varieties.

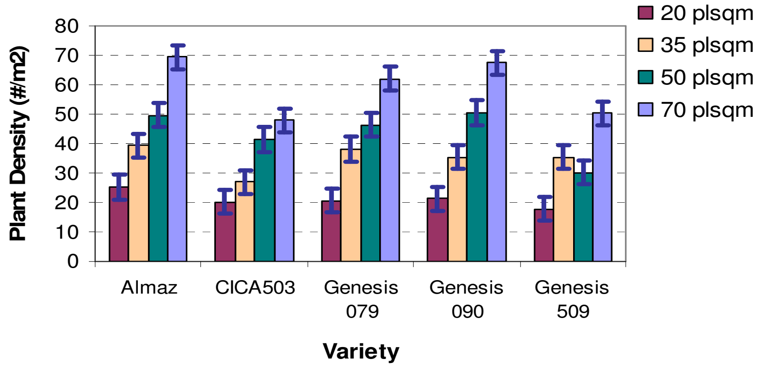


Figure 1: Effect of seed rate and variety on plant density (pl.sqm) of chickpeas at Turretfield, 2007

On average grain yield increased with increasing seed rates, though generally not significantly between 35, 50 and 70 pl.sqm (Figure 2). Grain yields were lower at 20 pl.sqm than at all other rates in all varieties. Almaz, CICA503 and Genesis 090 showed no difference in yields at 35, 50 and 70 pl.sqm. Genesis 509 showed considerably greater yield at 70 pl.sqm, than at 35 and 50 pl.sqm, although the actual establishment in this treatment was only 50 pl.sqm (Figure 1). Grain yield of Genesis 079 was maximised at seeding rates of 50 pl.sqm.

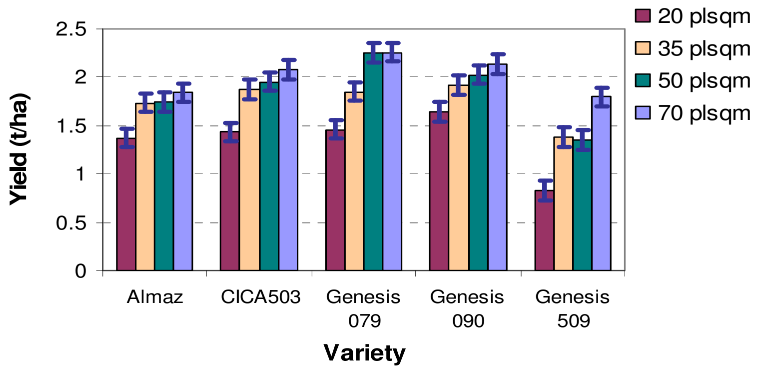


Figure 2: Effect of seed rate and variety on grain yield (t/ha) of chickpeas at Turretfield, 2007

Grain weight

In all varieties grain weight was maximised at 50 pl.sqm (Figure 3a). There was a large varietal impact on seed weight, with Almaz larger than Genesis 090, followed by Genesis 079 (Figure 3b). Genesis 509 showed the smallest seed size.

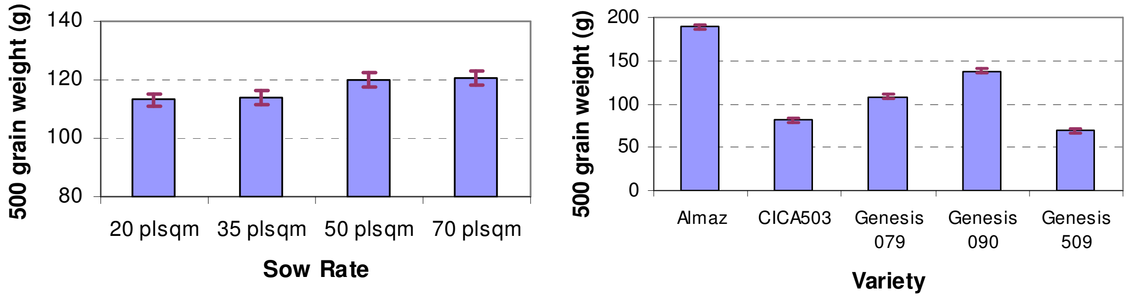


Figure 3a(L): Effect of seed rate on chickpea grain weight (g/500 seeds) at Turretfield, 2007
Figure 3b(R): Effect of variety on chickpea grain weight (g/500 seeds) at Turretfield, 2007

Virus infection score
Beet western yellows virus was prevalent throughout the trial and led to plant death in infected plants. Virus scoring showed that infection decreased as seed rate increased (Figure 4a). Varietal scoring also showed higher infection levels in Genesis 509 than other varieties. However this variety was also the only variety where achieved plant densities were consistently lower than targeted rates (Figure 1), further supporting the findings in Figure 4a. CICA503 had lower infection levels than Almaz and Genesis 079, but no different to Genesis 090 (Figure 4b). Further varietal assessment is required to confirm these findings.

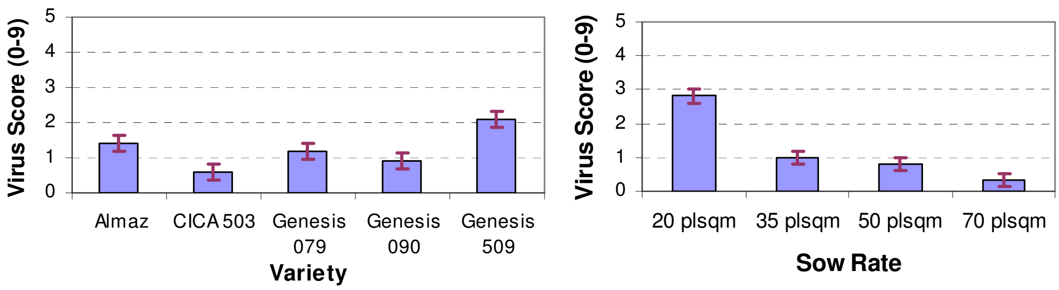


Figure 4a(L): Effect of seed rate on virus score (0-9) of chickpeas at Turretfield, 2007
Figure 4b(R): Effect of seed rate on virus score (0-9) of chickpeas at Turretfield, 2007
Virus scores: based on percentage plot affected, where 0=0% and 9=90% of plants in plot affected with virus symptoms

Comments
Previous plant density experiments in SA have shown that grain yield of kabuli lines (small & large) has been optimised at 35 plsqm and desi lines at 50 pl.sqm. In 2007 at Turretfield plant densities of 50 pl.sqm optimised yields of Genesis 509 (desi) and Genesis 079 (small kabuli) while plant densities of 35 pl.sqm optimised grain yield in all other varieties, including CICA503 (desi) and Genesis 090 (small kabuli). Genesis 079 has smaller seed than Genesis 090, and while further work is required, findings in 2007 suggest that it should be sown at the traditional desi rate of 50 pl.sqm to maximise grain yields and reduce virus infection. Further work across seasons, sowing dates and environments is required to confirm these findings.

Acknowledgments

The assistance and help of John Nairn, Peter Maynard, Mark Bennie and Rowan Steele, SARDI Clare, with trial management is gratefully acknowledged.

TRIAL 3: Chickpea Row Space, Yenda, New South Wales

Aim: To investigate effects of changing row spacing on chickpea yield.

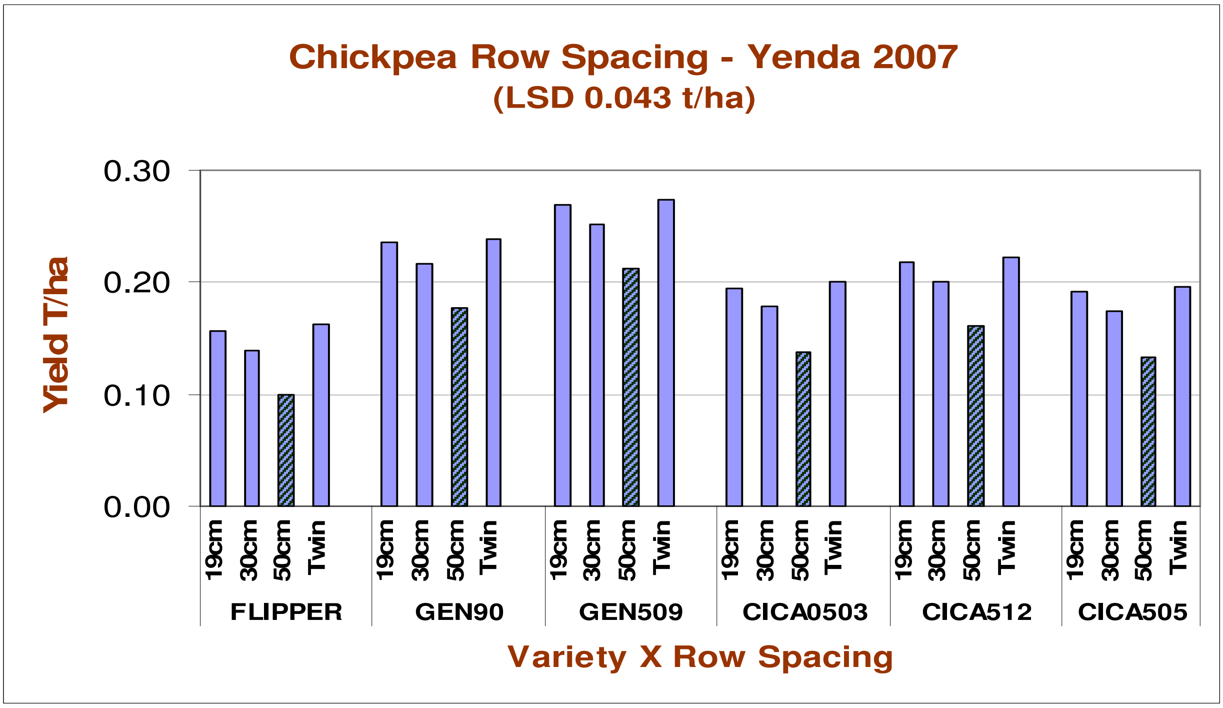
Trial Cp1: Yenda (DRA07YEND)

Co-operator:	Kym & Judy Eckerman and Nick & Trish Eckerman "Hillview" Yenda
Sowing date:	8th June 2007
Fertiliser:	115 kg/ha Grain Legume Super
Pesticides:	4th June 2007 Glyphosate & Sencor @ 300g/ha 15th August 2007 Verdict 75ml/ha
Method:	Six varieties – FLIPPER, CICA0503, CICA0505, CICA0512, GENESIS090 and GENESIS509. Four spacings: 19cm, 30cm, 50cm & twin 50cm (two rows 35/15cm apart). Plots consisted of two adjacent runs of the cone seeder to provide enough rows for the wider row spacing and to minimise edge effects.

Results and Discussion

The 50cm row treatments were significantly lower yielding in all varieties. There were no significant variety by row spacing interactions. Varieties were significantly different with Genesis509 the top yielding variety at 19 cm, 30cm or twin rows. The twin row arrangement (two rows 35/15cm apart) showed similar results to the 19cm or 30cm rows.

Analysis of Variance	F_value	Prob
VARIETY	28.23	**<.001**
SPACE	9.43	**0.011**
VARIETY.SPACE	1.04	0.453


Chickpea Row Spacing - Yenda 2007
(LSD 0.043 t/ha)
Yield T/ha
0.30
0.20
0.10
0.00
19cm
30cm
50cm
Twin
FLIPPER
GEN90
GEN509
CICA0503
CICA512
CICA505
Variety X Row Spacing

Milestone 3 – 30/3/2008

Trials sown to determine optimum disease management strategy, focussing on podding applications, in new resistant and moderately resistant desi and kabuli chickpea varieties as per Table above. New varieties will be compared with Genesis 090 for at least 3 disease management strategies. Flowering time, disease severity, grain yield and seed quality attributes will be reported.

TRIAL 1: Chickpea Disease Management, Wimmera (Dimboola), Victoria

Treatments

- Varieties (Genesis 090, Genesis 509, Almaz, Nafice, Genesis 114, Genesis 079)
- Treatments

Table 3.1. Fungicide treatments, rates and timings used at Dimboola and Beulah to control ascochtya blight

Regime	Chemical & Application Rate[1]	Timing
Fortnightly	chlorothalonil 500 @ 2 L/ha	Fortnightly starting 6 weeks after emergence.
Strategically	chlorothalonil 500 @ 2 L/ha	Strategically from vegetatively through to podding
Podding	chlorothalonil 500 @ 2 L/ha	Podding
Nil	Nil	Nil

1. Refers to application rate of the product

Results and Interpretation

- Key Message: No disease was present in the trial this year, therefore no effects of fungicide management regime were seen.
- Climate – see milestone 2
- Genesis 090 produced the highest yields and Nafice lowest (Table 3.2). However it should be noted that there was hare damage in the trial, particularly in Almaz and Nafice.

Table 3.2. Grain yields of chickpea varieties in disease management trials at Dimboola in 2007

Almaz	Flip 94-079c	Flip 97-114c	Genesis 090	Genesis 509	Nafice
0.52	0.52	0.51	0.76	0.60	0.19

lsd - 0.08

TRIAL 2: Chickpea Disease Management, southern Mallee (Beulah), Victoria

Treatments

- Varieties (Genesis 090, Genesis 509, Almaz, Nafice, Genesis 114, Genesis 079)
- Treatments (see Table 3.1)

Results and Interpretation

- Key Message: No disease was present in the trial this year, therefore no effects of fungicide management regime were seen.
- Climate – see milestone 2

- Genesis 509 produced the highest yields and Nafice lowest (Table 3.3). However it should be noted that there was hare damage in the trial, particularly in Almaz and Nafice.

Table 3.3. Grain yields of chickpea varieties in disease management trials at Beulah in 2007

Almaz	Flip 94-079c	Flip 97-114c	Genesis 090	Genesis 509	Nafice
0.09	0.34	0.19	0.32	0.37	0.08

lsd - 0.05

<u>TRIAL 3: Chickpea Disease Management, Turretfield, mid North, South Australia</u>

Aim: To maximise production advantages of new kabuli and desi chickpea varieties through the development of appropriate disease management strategies.

Varieties: Almaz, CICA503, Genesis 079, Genesis 090, Genesis 509 & Howzat
Sowing dates: June 9th
Seed rates: CICA503, Genesis 509, Howzat - 50plsqm; Almaz, Genesis 079, Genesis 090 - 35plsqm
Fertiliser: DAP @ 80kg/ha pre, MAP @ 48kg/ha drilled with the seed.
Fungicides (6): Control - no sprays
Fort - chlorothalonil 2L/ha fortnightly from 8 weeks after sowing (WAS)
Pod - chlorothalonil 2L/ha at early podding
Podplus - chlorothalonil 2L/ha at early and late podding
Strat - chlorothalonil 2L/ha 8 (WAS), early flowering and early podding
Systemic- Folicur @ 435ml/ha sprayed within 3 days after a 10mm rainfall event for Howzat, 20mm for Almaz, and a significant rainfall event during podding for other varieties
Disease inoculation: Susceptible plants were grown in glasshouse and infected with ascochyta blight prior to sowing 1 plant at each end of every plot on the 31st of July.

Results and Discussion

Foliar disease levels

Dry and hot conditions prevailed throughout late winter and spring limiting disease spread and plant growth. Low amounts of ascochyta blight infection occurred in susceptible (Howzat) and intermediate (Almaz) varieties, however infected plants had recovered by the end of the year. Disease levels in all plots were too low to score and had no impact on grain yield.

Yield

There was no fungicide treatment effect on grain yield in 2007. Grain yields showed that CICA503, Genesis079 and Howzat were the highest yielding varieites (Figure 1). Genesis090 yielded higher than Almaz and Genesis509, which were similar in yield.

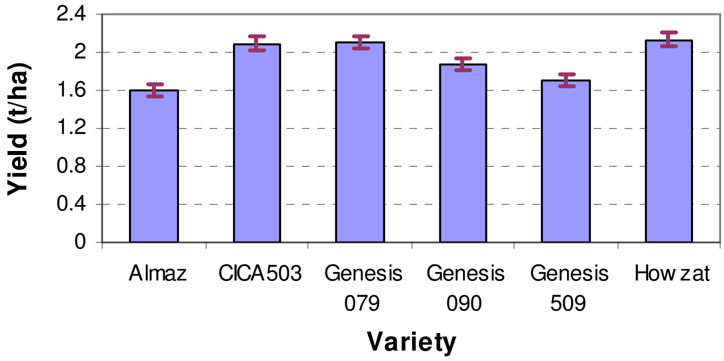
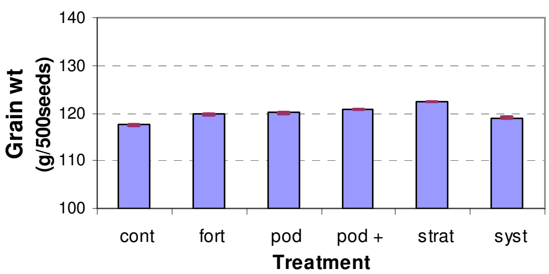


Figure 1: Effect of variety on grain yield (t/ha) of chickpeas at Turretfield, 2007

Grain weight

Fungicide treatments at early podding (pod), early and late podding (podplus) and strategic sprays (strat) had larger seeds than the control, but not significantly larger than fortnightly or systemic sprays (Figure 2a). The grain size of the control was not significantly smaller than those of fortnightly or systemic sprays.

Grain weight varied greatly with variety, with Almaz much larger than Genesis090, followed by Genesis079 (Figure 2b). Genesis509 showed smallest seed size.



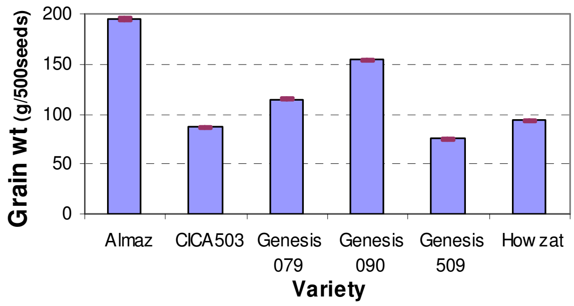


Figure 2a(L): Effect of fungicide treatment on grain weight (g/500 seeds) of chickpeas at Turretfield, 2007
Figure 2b(R): Effect of variety on grain weight (g/500 seeds) of chickpeas at Turretfield, 2007

Acknowledgments

The assistance and help of John Nairn, Peter Maynard, Mark Bennie and Rowan Steele, SARDI Clare, with trial management is gratefully acknowledged.

Milestone 4 – 30/3/2008

Trials sown to determine plant densities and row space for new field pea varieties as per Table above. New varieties will be compared with Kaspa for at least 4 plant densities and 2 row spacings. Establishment, flowering time and grain yield will be reported.

TRIAL 1: Field Pea Plant Density, Yenda, New South Wales

Aim: To investigate how yield responds to varying plant populations within field pea varieties in southern NSW.

Trial Fp3. Yenda (FZA07YEND)

Co-operator: Kym & Judy Eckerman and Nick & Trish Eckerman
"Hillview" Yenda
Sowing date: 5th June 2007
Fertiliser: 115 kg/ha Grain Legume Super
Pesticides: 4th June 2007 Glyphosate & Sencor @ 300g/ha
15th August 2007 Verdict 75ml/ha

Method: Targeted populations are listed below. They were sown in 30 cm rows through a coneseeder at predetermined weights accounting for seed size & germination.

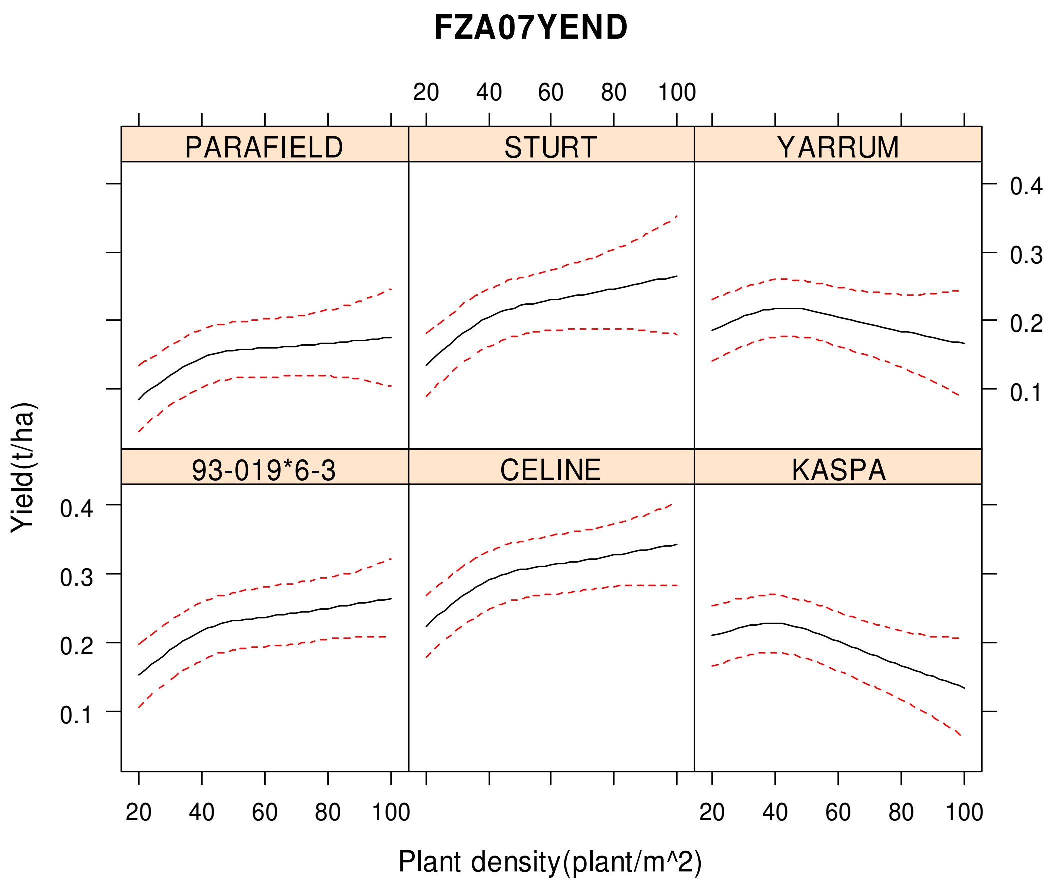
Variety	Target Plant Population (plants/m^2)				
	16	32	48	64	80
96-019*6-3					
CELINE					
KASPA					
PARAFIELD					
STURT					
YARRUM					

Results and Discussion

There were significant responses to both increasing plant density and variety across the entire trial (curvature & slope) but no interactions with variety. This is of little concern as we wish to compare populations within a variety not across a range of varieties.

This response to population can be seen below as both positive and negative on grain yield. Variety significance is generally related to plant maturity type with early maturing varieties Celine, 93-019*6-3 and Sturt had positive grain yield responses from increasing plant populations, where as slightly longer maturing Kaspa and Yarrum responded negatively to increasing populations. Mid maturing Parafield showed no yield significant responses to increasing populations above 40 plants/m^2.

There was significant overall curvature but no interaction of variety by curvature. However there were significant varietal slopes differences. In the graph below, the black lines represent the predicted means for each variety and the dotted lines are the 95% confidence limits.



For the early maturing lines optimum populations ranged from 40 plants/m^2 up to 80plants/m^2. For Parafield, the corresponding optimum was between 40-50plants/m^2. Yield in late maturity varieties peaked at approximately 30-40plants/m^2 then declined with further density increases.

Picture 6. dry matter cuts and sampling for pod mapping in plant density trials at Wagga in 2007.

TRIAL 2: Field Pea Plant Density, Wagga Wagga, New South Wales

Aim: To investigate how yield responds to varying plant populations within field pea varieties in southern NSW

Trial Fp4. Wagga Wagga (FZA07WARI)

Co-operator:	Agricultural Institute, Wagga Wagga	
Sowing date:	18th June	
Fertiliser:	115 kg/ha Grain Legume Super	
Herbicides:	18th June	2L Stomp + 2L Sprayseed pre-sowing
	PSPE	Spinnaker @ 70g/ha
Insecticide	Fastac Duo (200ml/ha) on 10 Sept & 28 Oct	

Method: Targeted populations are listed below. They were sown in 30 cm rows through a coneseeder at predetermined weights accounting for seed size & germination.

Variety	**Target Plant Population (plants/m^2)**				
	16	**32**	**48**	**64**	**80**
96-019*6-3					
CELINE					
KASPA					
PARAFIELD					
OZP0703					
YARRUM					

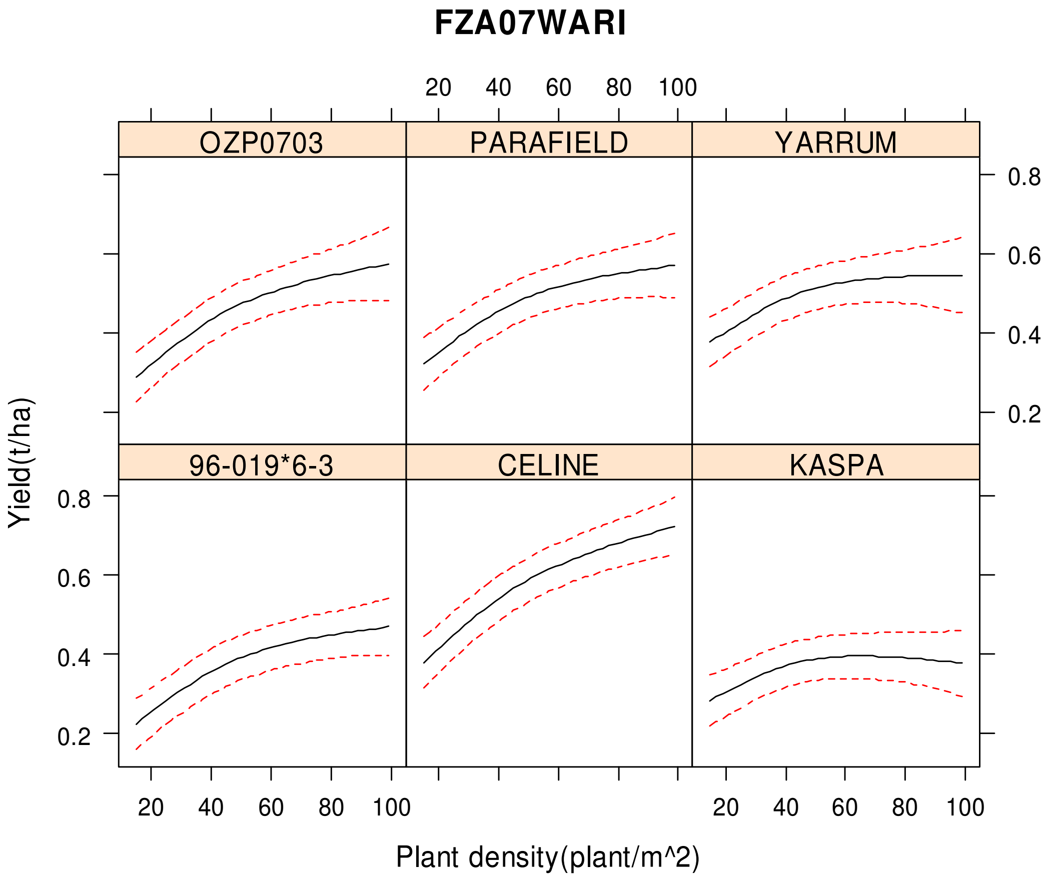
Results and Discussion

Similarly to other seeding population trials, there was a significant interaction with seeding rate and grain yield. There was also a significant varietal difference between the 6 varieties. Again there was no interaction of variety by population across the trial. Again also this is of little concern as we wish to compare populations within a variety not across a range of varieties.

Early to mid maturing varieties (OZP0703, 96-019*6-3, Celine & Parafeild) had steeper response curve slopes then late maturing varieties (Yarrum & Kaspa) and thus greater yield responses to increasing plant populations under these conditions. Yield plateaued at lower populations in the late maturing varieties.

Under these drought conditions it is difficult to recommend populations from this trial. This is still very valuable data for understanding treatment responses under extreme drought conditions.

There was significant overall curvature but no interaction of variety by curvature. However there were significant varietal slopes. The graphs above show the variety by density curves. The solid black line represents the predicted mean and the dotted line represents the 95% confidence limits.



TRIAL 3: Field Pea Row Spacing, Yenda, New South Wales
Aim: To investigate how yield responds to varying row spacings in field pea.

Trial Fp1. Yenda (FRA07YEND)

Co-operator: Kym & Judy Eckerman and Nick & Trish Eckerman
"Hillview" Yenda
Sowing date: 8th June 2007
Fertiliser: 115 kg/ha Grain Legume Super
Pesticides: 4th June 2007 Glyphosate & Sencor @ 300g/ha
15th August 2007 Verdict 75ml/ha

Method: Two varieties – Parafield and Kaspa. Four spacings: 19cm, 30cm, 50cm & twin 50cm (two rows 35/15cm apart). Plots consisted of two adjacent runs of the cone seeder to provide enough rows for the wider row spacing and to minimise edge effects. Two target densities were used – 30 and 50 plants/m2.

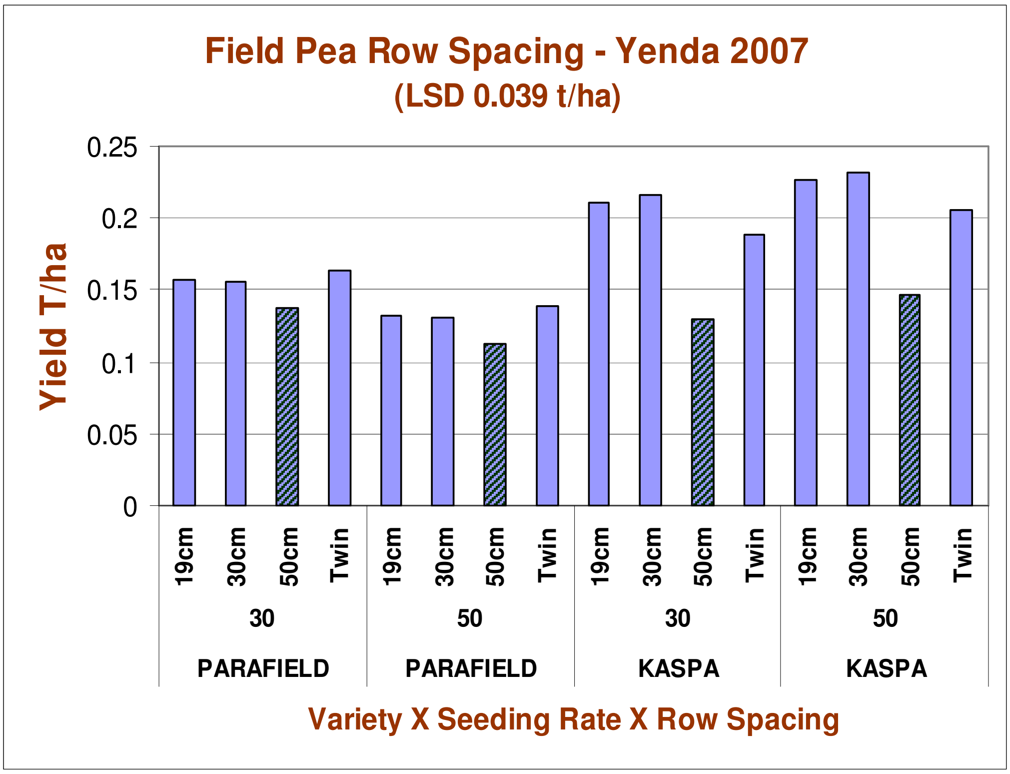
Results and Discussion

Yields were very low reflecting the very dry season. However, despite this, trials were clean and even and the results obtained were real and meaningful and should have general application under similar conditions. The wide rows (50cm) resulted in significantly lower yields, particularly in Kaspa. There were no significant yield differences between

19cm, 30cm and twin rows for both varieties at both 30 and 50 plants/sq m. Kaspa yielded significantly higher than Parafield. Increasing population from 30 to 50 plants/sq m did not affect yield.

Variety, row spacing, variety X row spacing and variety X seeding rate were significantly different. No significant variety by row spacing by seeding rate interaction, no significant row spacing by seeding rate interaction and finally no significant main effect of seeding rate.

Analysis of Variance	F_value	Prob
VARIETY	40.81	**<.001**
ROW SPACE	5.62	**0.023**
SEEDING RATE	0.35	0.563
VARIETY.RSPACE	3.29	**0.033**
VARIETY.SRATE	6.91	**0.018**
SPACE.SRATE	0.05	0.983
VARIETY.SPACE.SRATE	0.38	0.771



Picture 4. Procedures adopted to measure heights and map nodes and pods in agronomy trials at Wagga.

TRIAL 4: Field Pea Row Spacing, Wagga Wagga, New South Wales
Aim: To investigate how yield responds to varying row spacings in field pea.

Trial Fp2. Wagga (FRA07WARI

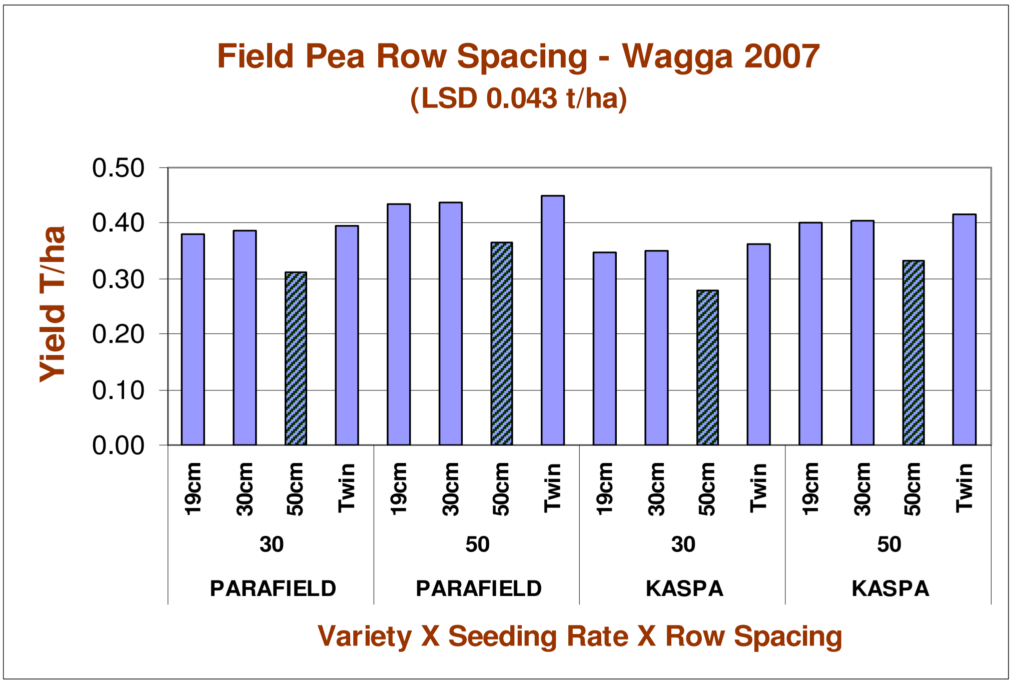
Co-operator:	Agricultural Institute, Wagga Wagga	
Sowing date:	25th June 2007	
Fertiliser:	115 kg/ha Grain Legume Super	
Herbicides:	18 June	2L Stomp + 2L Sprayseed pre-sowing
	25 June (PSPE)	Spinnaker @ 70g/ha + Supracide
	August	Verdict @ 100 ml/ha
Insecticide	Fastac Duo (200ml/ha) on	
	Supracide (200ml/ha) on 25 June	
Fungicides:	Bravo (2L/ha) + Spinflow (200ml/ha) regularly to control fungal diseases	

Method: Four spacings: 19cm, 30cm, 50cm & twin 50cm (two rows 35/15cm apart). Two adjacent runs of the cone seeder were used per plot to give sufficient width. Target density 45 plants/m2.

Results and Discussion

Yields were very low reflecting the very dry season. However, despite this, trials were clean and even and the results obtained were real and meaningful and should have general application under similar conditions. Yield in the wide (50cm) row spacings were significantly lower. There were no significant interactions, only significant main effects of variety, row spacing and seeding rate.

Analysis of Variance	F_value	Prob
VARIETY	5.8	**0.023**
SPACE	7.18	**<.001**
SRATE	14.92	**<.001**
VARIETY.SPACE	0.16	0.925
VARIETY.SRATE	1.56	0.221
SPACE.SRATE	0.48	0.696
VARIETY.SPACE.SRATE	0.7	0.562



Picture 5. Narrow rows (19cnm) versus wide rows (50cm) in agronomy trials at Wagga in 2007.

Milestone 5 – 30/3/2008

Trials sown to determine optimum sowing dates and plant densities of in the new green and red lentil varieties with improved ascochyta blight and botrytis resistance. New varieties will be compared with Nugget for at least 3 sowing dates and at least 4 plant densities. Establishment, flowering time, grain yield and seed quality attributes will be reported.

TRIAL 1: Lentil Plant Density x Sowing Date, Wimmera (Dimboola), Victoria

Treatments

- Varieties (Nipper, Boomer, Nugget, Northfield, CIPAL 415)
- Sowing Dates (11 May, 8 June, 12 July)
- Plant Densities (60, 90, 120, 150, 250 plants/m^2)

Table 5.1. Seeding rate (kg/ha) required to achieve target plant densities in lentils. Seed weight (g/100 seed) indicated in brackets

Plant density (plants/m^2)	**Nugget** (4)	**Northfield** (3)	**Boomer** (6.2)	**Nipper** (2.9)	**CIPAL415** (3.6)
60	25	19	39	18	23
90	38	28	59	27	34
120	50	38	78	37	45
150	63	47	98	46	57
250	105	79	163	76	95

Results and interpretation

- Key Message: Early sowing generally produced the highest yield for lentils in 2007. Lentils varieties generally all responded similarly to plant density, in that, at the May sowing date, lower densities produced higher yields, while at the July sowing date, higher densities produced highest yields.
- Climate – see milestone 2
- Plant establishment – Similar trends for plant establishment were observed across all varieties. Generally achieved plant densities were below target plant densities at higher sowing rates (10-30% less for Nugget, Nipper and Boomer; Table 5.2). Establishment was slightly reduced on average for the June 8 sowing date (data not shown).
- Flowering – Ranking of varieties for flowering dates changed at each of the sowing dates. Boomer flowered earliest at both the May and June sowing 10 days and 2 days earlier than Nugget, however at the July sowing date, it flowered 4 days later than Nugget (Table 5.3). Nipper, in comparison, flowered 9 days later than Nugget sown May 11 and 2 days later sown June 8 and July 12. This potentially highlights its suitability for earlier sowing, as its May sown flowering date is only 3 days earlier than the flowering date for Nugget sown June.
- Grain yield – May sown treatments produced the highest yields and July sown treatments lowest yields (Table 5.4a). Boomer, Nipper and Nugget were the highest yielding varieties and Northfield lowest. Response to plant density varied across sowing dates (Table 5.4b). At the May sowing date, lower densities produced higher yields, while at the July sowing date, higher densities produced highest yields.

Table 5.2. Relationship between target plant density and actual plant establishment for each lentil variety at Dimboola in 2007 (numbers are averages across the three sowing dates)

Plant Density	Boomer	CIPAL 415	Nipper	Northfield	Nugget	*Mean*
60	55	38	52	40	51	*47*
90	79	54	69	56	78	*67*
120	102	71	95	67	95	*86*
150	125	83	108	88	119	*105*
250	194	131	184	136	181	*165*
Mean	*111*	*75*	*102*	*77*	*105*	
lsd$_{(PDxVar)}$ - 7	**lsd$_{(Var)}$** - 4	**lsd$_{(PD)}$** - 4				

Table 5.3. Flowering date for varieties sown at three sowing dates at Dimboola in 2007

Sowing Time	Boomer	CIPAL 415	Nipper	Northfield	Nugget
May 11	3 Sep	15 Sep	22 Sep	24 Sep	13 Sep
June 8	23 Sep	27 Sep	27 Sep	1 Oct	25 Sep
July 12	9 Oct	13 Oct	7 Oct	15 Oct	5 Oct

Table 5.4a. Grain yield (t/ha) for varieties sown at three sowing dates at Dimboola in 2007 (numbers are averages across the five plant densities)

Sowing Time	Boomer	CIPAL 415	Nipper	Northfield	Nugget	*Mean*
May 11	0.41	0.39	0.43	0.25	0.41	*0.38*
June 8	0.41	0.25	0.31	0.19	0.38	*0.31*
July 12	0.30	0.19	0.25	0.13	0.25	*0.22*
Mean	*0.37*	*0.27*	*0.33*	*0.19*	*0.35*	
lsd$_{(STxVar)}$ - ns	**lsd$_{(Var)}$** – 0.04	**lsd$_{(ST)}$** – 0.07				

Table 5.4b. Grain yield (t/ha) for varieties sown at five plant densities at Dimboola in 2007 (numbers are averages across the three sowing dates)

Plant Density	May 11	June 8	July 12	*Mean*
60	0.43	0.24	0.13	*0.27*
90	0.45	0.31	0.19	*0.32*
120	0.39	0.32	0.22	*0.31*
150	0.36	0.35	0.25	*0.32*
250	0.26	0.33	0.33	*0.31*
lsd$_{(PDxVar)}$ – 0.09	**lsd$_{(PD)}$** – 0.07			

TRIAL 2: Lentil Plant Density x Sowing Date, southern Mallee (Beulah) Victoria

Treatments

- Varieties (Nipper, Boomer, Nugget, Northfield, CIPAL 415)
- Sowing Dates (9 May, 7 June, 12 July)
- Plant Densities (60, 90, 120, 150, 250 plants/m^2)

Results and interpretation

Low yields – no data

TRIAL 3: Lentil Plant Density and Sowing Date, Maitland and Willamulka, Yorke Peninsula, South Australia

Aim: To maximise production advantages of new lentil varieties through the identification of optimum sowing times and plant densities.

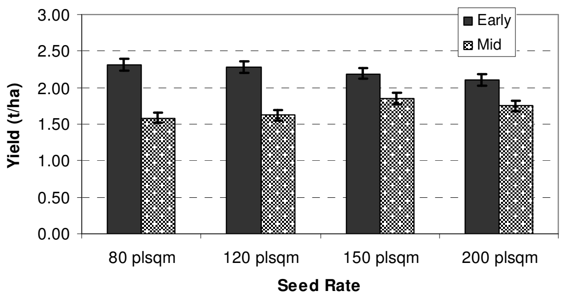
Varieties: Nugget, Northfield, Nipper, Boomer & CIPAL411
Sowing dates: Maitland: May 9, June 3, June 28
Willamulka: May 7, May 24, June 6
Seed rate: 80, 120, 150 & 200 seeds per sq.m.
Fertiliser: MAP+2% zinc @ 90kg/ha drilled with the seed.

Results and Discussion

An early break to the season combined with favourable early winter rainfall events provided ideal conditions for establishment and early growth. Dry and hot late winter and spring conditions suppressed lentil plant growth at both sites and restricted grain yields particularly in the late sowing time treatment. Grain yields from the late sowing date at Maitland were affected by livestock prior to harvest and have not been reported here.

Grain yield

There was no effect of seed rate on variety performance at either site, however there was an effect of sowing time and seed rate on grain yield. Grain yields varied across sowing times and seed rates. At Maitland (Figure 1a) yields were maximised by sowing at 80 pl.sqm when sowing early, and 150 pl.sqm for mid sowing times. At Willamulka (Figure 1b) yields were maximised by sowing at 120 pl.sqm for the early sowing, and 200 pl.sqm for the mid and late sowing times. At Willamulka the 80 pl.sqm treatment had lower grain yield than all other treatments at the same sowing time, but only significantly lower at the late sowing time.



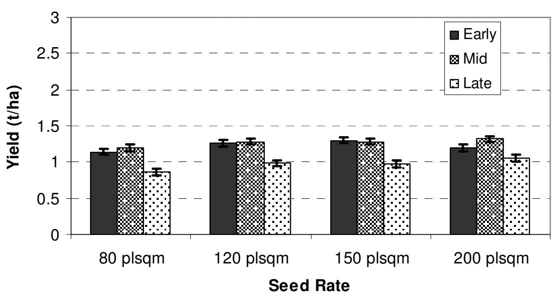


Figure 1a: Effect of sowing time and seed rate on grain yield (t/ha) at Maitland, 2007
Figure 1b: Effect of sowing time and seed rate on grain yield (t/ha) at Willamulka, 2007

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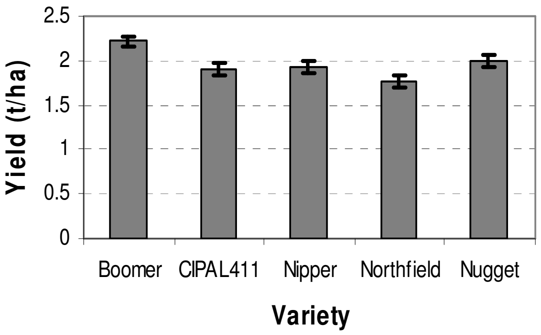


Figure 2a: Grain yield (t/ha) of lentil varieites at Maitland, 2007

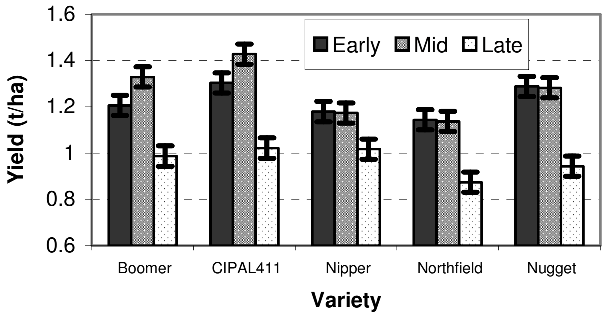
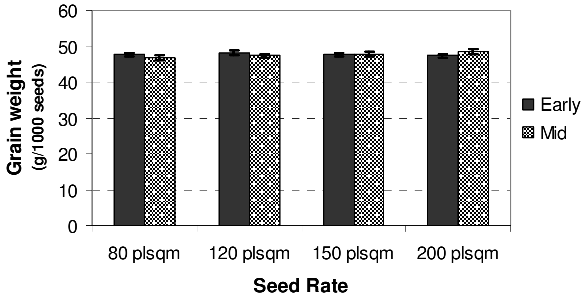


Figure 2b: Effect of sowing time and variety on grain yield (t/ha) at Willamulka, 2007

A more detailed analysis of variety performance and their interaction with sowing time is presented in Milestone 7, where varieties were compared at the standard 120 pl.sqm rather than across varying plant densities as they are in this section. However, at Maitland there was no interaction between variety and sowing time and Boomer had the highest grain yields (2.2 t/ha), followed by CIPAL411, Nipper and Nugget. Northfield was the lowest yielding (1.76 t/ha), (Figure 2a). Sowing time affected variety performance at Willamulka (Figure 2b). Grain loss through pod drop and or shattering reduced grain yields of Boomer and CIPAL411 by 0.18 t/ha and 0.14 t/ha respectively in the early sowing time complicating interpretation of results. Generally Boomer, CIPAL411 and Nugget were the highest yielding varieties and Nipper and Northfield lower yielding.

Grain weight

Grain weights showed a significant interaction between time of sowing and seed rate at both sites. At Maitland a delay in sowing time resulted in a higher grain weight at the highest seed rate (200 pl.sqm) (Figure 3a). Grain weights were similar across sowing times for all other seed rates. At Willamulka the lowest grain weights occurred at the highest seed rate (200 pl.sqm) in the early sowing time. However at the late sowing time the lowest grain weights occurred at the lowest seed rate (80 pl.sqm) (Figure 3b). Grain weights at the mid sowing time were similar across seed rates.



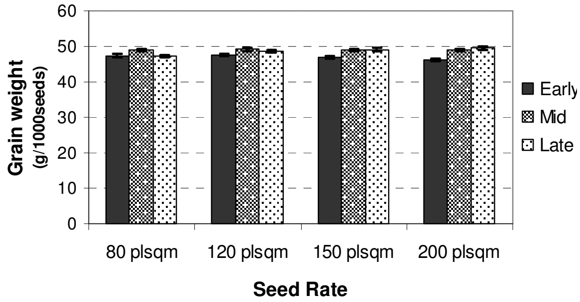


Figure 3a(L): Effect of sowing time and seed rate on grain weight (g/1000 seeds) at Maitland, 2007
Figure 3b(R): Effect of sowing time and seed rate on grain weight (g/1000 seeds) at Willamulka, 2007

Comments

All varieties behaved similarly for grain yield in response to changes in plant density. This result was also found in the 2005 and 2006 trials, and indicates that the current recommended rate of 120 plants per sq.m is adequate for optimising yields at standard sowing dates in the new varieties Boomer and Nipper. The effects of sowing time indicate that in some seasons to maximise yields when sowing late plant densities can be increased, however this may not always be economical and in some cases could increase risk of disease. Lower rates could also be used when sowing early but again this result could vary with seasonal conditions.

Acknowledgments

The assistance and help of John Nairn, Peter Maynard, Mark Bennie and Rowan Steele, SARDI Clare, with trial management is gratefully acknowledged.

Milestone 6 – 30/3/2008

Trials sown to determine herbicide tolerance of new lentil varieties inter-row sown into standing stubble as per table above. New varieties will be compared with Nugget for at least 3 disease management strategies. Flowering time, disease severity, grain yield and seed quality attributes will be reported.

TRIAL 1: Lentil Herbicide Tolerance, Wimmera (Dimboola), Victoria Treatments

- Varieties (Nipper, Boomer, Nugget)
- Treatments

Table 6.1 Herbicide treatments used for herbicide tolerance trials at Dimboola in 2007

Herbicide Treatment (active ingredient and formulation)	Application Rate	Application Timing[1]
Trifluralin 480	1000 ml/ha	PS
Trifluralin 480	2000 ml/ha	PS
Metolachlor 720	1000 ml/ha	PS
Metolachlor 720	2000 ml/ha	PS
Simazine 900[2]	1000 g/ha	PSPE
Simazine 900	2000 g/ha	PSPE
Metribuzin 750	280 g/ha	PSPE
Metribuzin 750	560 g/ha	PSPE
Metribuzin 750	560 g/ha	PS
Metribuzin 750	560 g/ha	PEb
Diuron 900	850 g/ha	PSPE
Diuron 900	1700 g/ha	PSPE
Simazine 900 + Metribuzin 750	800 g/ha + 280 g/ha	PSPE
Simazine 900 + Metribuzin 750	1600 g/ha + 560 g/ha	PSPE
Simazine 900 + Metribuzin 750	800 g/ha + 280 g/ha	75:25*
Simazine 900 + Prometryn 500	800 g/ha + 1500 ml/ha	PEb
Simazine 900 + Prometryn 500	1600 g/ha + 3000 ml/ha	PEb
Diflufenican 500	150 ml/ha	PEb
Diflufenican 500	150 ml/ha	PEb
Flumetsulam 800	25 g/ha	PEb
Flumetsulam 800	50 g/ha	PEb

1. PS, Pre Sowing; PSPE, Post Sowing Pre Emergent; PEb, Post Emergent (5 node stage of crop) *75:25, 75% of mix applied PS and 25% applied PSPE.
2. Simazine 900 at 1000 g/ha is used as the control treatment.

Results and interpretation

- ➢ Key Message: The tolerance of Nipper and Boomer to commonly used herbicides in terms of grain yield was similar to Nugget. Herbicide treatments containing metribuzin applied PSPE, generally caused the greatest yield loss to all varieties.
- Climate – See Milestone 2
- Plant establishment – There were no differences in establishment between varieties. The simazine + metribuzin and metribuzin treatments reduced establishment by greater than 50% when applied at label rates and by almost 100% when applied at the double rate (Table 6.3). No other treatments had a major effect on establishment.
- Herbicide damage – Generally varieties showed a similar level of damage in response to herbicides. Significant symptoms of herbicide damage were recorded for many treatments (Table 6.2). Metribuzin applied PSPE at both rates and PEb, and simazine + metribuzin applied PSPE at both rates showed high levels of crop damage. The double rates caused high levels of

plant death. It is notable that metribuzin applied PS caused only low to moderate levels of crop damage. The only treatment with significant differences between varieties was for flumetsulam at both rates where Boomer had lower damage scores than Nipper and Nugget (Table 6.2).

Table 6.2. Herbicide damage symptoms (1 – no symptoms, 9 – complete death) observed on of lentils for each of the herbicide treatments at Dimboola in 2007

Herbicide Treatment	Rate	Timing[1]	Boomer	Nipper	Nugget
Trifluralin 480	1000 ml/ha	PS	1.0	1.0	1.0
Trifluralin 480	2000 ml/ha	PS	1.0	1.0	1.0
Metolachlor 720	1000 ml/ha	PS	1.0	1.0	1.3
Metolachlor 720	2000 ml/ha	PS	1.0	1.0	1.0
Simazine 900	1000 g/ha	PSPE	2.3	2.6	2.1
Simazine 900	2000 g/ha	PSPE	2.3	2.8	2.3
Metribuzin 750	280 g/ha	PSPE	4.8	5.3	5.5
Metribuzin 750	560 g/ha	PSPE	8.5	9.0	9.0
Metribuzin 750	560 g/ha	PS	1.8	2.3	3.3
Metribuzin 750	560 g/ha	PEb	7.3	7.3	7.5
Diuron 900	850 g/ha	PSPE	1.0	1.0	1.0
Diuron 900	1700 g/ha	PSPE	2.0	2.3	2.3
Simazine 900 + Metribuzin 750	800 g/ha + 280 g/ha	PSPE	7.0	8.0	7.5
Simazine 900 + Metribuzin 750	1600 g/ha + 560 g/ha	PSPE	8.8	9.0	9.0
Simazine 900 + Metribuzin 750	800 g/ha + 280 g/ha	75:25*	2.3	3.3	3.3
Simazine 900 + Prometryn 500	800 g/ha + 1500 ml/ha	PEb	2.3	3.3	2.5
Simazine 900 + Prometryn 500	1600 g/ha + 3000 ml/ha	PEb	3.0	4.8	3.5
Diflufenican 500	150 ml/ha	PEb	3.8	3.0	3.8
Diflufenican 500	150 ml/ha	PEb	4.8	3.8	4.0
Flumetsulam 800	25 g/ha	PEb	2.3	3.8	3.0
Flumetsulam 800	50 g/ha	PEb	1.8	4.5	3.3
	lsd	1.2			

1. PS, Pre Sowing; PSPE, Post Sowing Pre Emergent; PEb, Post Emergent (5 node stage of crop) *75:25, 75% of mix applied PS and 25% applied PSPE.

- Weed populations - moderate weed populations were present throughout much of the trial (major weeds included musk, bedstraw and vetch). The treatments of metribuzin and simazine + metribuzin appeared to provide slightly better weed control (Table 6.3).
- Grain yield – there were no significant differences among varieties in response to herbicide treatments (Table 6.3). Overall Boomer and Nugget (0.6 t/ha) produced yields approximately 10% greater than Nipper. Both metribuzin and simazine + metribuzin at double rates applied PSPE caused complete yield loss for all varieties, while metribuzin applied PSPE at label rates caused about 60% yield loss compared with the simazine control at label rates. Metribuzin applied PS caused no yield loss. The main reason for the damage seen with metribuzin is because we are using it PSPE in a no-till system with relatively shallow sowing (<5cm) and furrows from the press wheels. The mobility of metribuzin means that any rainfall events will flush the chemical into the germinating seed layer resulting in the damage observed.

Table 6.3. Emergence, weed scores (1 – no weeds, 5 – high weed population) and grain yields of lentils for each of the herbicide treatments at Dimboola in 2007 (averaged across the 3 varieties). Simazine applied at 1000 g/ha has been used as the control treatment for comparison

Herbicide Treatment	Rate	Timing[1]	Emergence	Weed Score	Grain Yield (t/ha)
Trifluralin 480	1000 ml/ha	PS	90	2.5	0.70
Trifluralin 480	2000 ml/ha	PS	93	2.4	0.61
Metolachlor 720	1000 ml/ha	PS	91	2.2	0.60
Metolachlor 720	2000 ml/ha	PS	95	2.5	0.63
Simazine 900	*1000 g/ha*	*PSPE*	*79*	*1.8*	*0.54*
Simazine 900	2000 g/ha	PSPE	86	2.2	0.46
Metribuzin 750	280 g/ha	PSPE	43	1.5	0.54
Metribuzin 750	560 g/ha	PSPE	3	1.3	0.00
Metribuzin 750	560 g/ha	PS	81	1.5	0.59
Metribuzin 750	560 g/ha	PEb	89	2.1	0.41
Diuron 900	850 g/ha	PSPE	90	2.1	0.72
Diuron 900	1700 g/ha	PSPE	82	2.0	0.57
Simazine 900 + Metribuzin 750	800 g/ha + 280 g/ha	PSPE	24	1.5	0.18
Simazine 900 + Metribuzin 750	1600 g/ha + 560 g/ha	PSPE	4	1.0	0.03
Simazine 900 + Metribuzin 750	800 g/ha + 280 g/ha	75:25*	80	1.6	0.61
Simazine 900 + Prometryn 500	800 g/ha + 1500 ml/ha	PEb	78	2.1	0.56
Simazine 900 + Prometryn 500	1600 g/ha + 3000 ml/ha	PEb	68	1.8	0.52
Diflufenican 500	150 ml/ha	PEb	89	2.3	0.51
Diflufenican 500	150 ml/ha	PEb	89	2.4	0.52
Flumetsulam 800	25 g/ha	PEb	86	2.3	0.69
Flumetsulam 800	50 g/ha	PEb	92	2.5	0.64
		lsd	14	0.5	0.17

1. PS, Pre Sowing; PSPE, Post Sowing Pre Emergent; PEb, Post Emergent (5 node stage of crop) *75:25, 75% of mix applied PS and 25% applied PSPE.

Milestone 7 – 30/3/2008

Trials sown to determine optimum disease management strategy at different sowing times, in the new green and red lentil varieties with improved ascochyta blight and botrytis resistance as per table above. New varieties will be compared with Nugget for at least 3 disease management strategies and 2 sowing times. Flowering time, disease severity, grain yield and seed quality attributes will be reported.

TRIAL 1: Lentil Disease Management x Time of Sowing, Wimmera (Dimboola), Victoria

Treatments

- Varieties (Nipper, Boomer, Nugget, Northfield, CIPAL 415)
- Sowing dates - 11 May, 8 June.
- Fungicide Treatments

Table 7.1. Fungicide treatments, rates and timings used at Dimboola and Beulah to control ascochyta blight (chlorothalonil) and botrytis grey mould (carbendazim)

Regime	Application Time
Nil	
Carbendazim 500 @ 500 ml/ha	Canopy closure
Chlorothalonil 500@ 2 L/ha	Podding
Carbendazim 500 @ 500 ml/ha then Chlorothalonil 500 @ 2 L/ha	Canopy closure then Podding

1. canopy closure sprays not applied at Beulah and TOS 2 Dimboola as canopy closure was not reached.

Results and interpretation

- Key Message: No disease was present in the trial this year, therefore no effects of fungicide management regime were seen. Grain yields were less than 0.5 t/ha.

TRIAL 2: Lentil Disease Management x Time of Sowing, southern Mallee (Beulah), Victoria

Treatments

- Varieties (Nipper, Boomer, Nugget, Northfield, CIPAL 415)
- Beulah – 9 May, 7 June.
- Fungicide Treatments (Table 7.1)

Results and interpretation

- Key Message: No disease was present in the trial this year, therefore no effects of fungicide management regime were seen. Trial was not harvested.

TRIAL 3: Lentil Disease Management x Time of Sowing, Maitland and Willamulka, mid North, South Australia

Aim: To maximise production advantages of new lentil varieties through the development of appropriate disease management strategies.

Varieties: Nugget, Northfield, Nipper, Boomer & CIPAL411
Sowing dates: Maitland: May 9, June 3, June 28
Willamulka: May 7, May 24, June 6
Fertiliser: MAP+2% zinc @ 90kg/ha drilled with the seed.
Fungicides (3): Nil,
Carbendizum at canopy closure
Carbendizum at canopy closure + later as required + chlorothalonil at early podding

Results and Discussion

Dry and hot spring conditions suppressed lentil plant growth at both sites. No foliar diseases occurred at either site and hence there was no response to fungicide treatments. However, variety and sowing time treatments did have an effect on grain yield and quality at both sites.

Yield

At both sites grain yields decreased as sowing was delayed (Table 1). Grain yields from the late sowing date at Maitland were affected by livestock prior to harvest and have not been included.

Boomer and Nugget were the highest yielding varieties at Maitland while CIPAL411 and Nipper yielded similarly but slightly lower (Table 2). At Willamulka, CIPAL411 and Boomer were the highest yielding varieties, while Nugget and Nipper yielded similarly and slightly lower. At both sites Northfield had the lowest grain yields.

Table 1: Effect of sowing date on grain yield (t/ha) of lentil varieties at two sites in SA in 2007

Location	Sowing Date			LSD (0.05)
	Early	Mid	Late	
Maitland	2.25	1.73	-	0.20
Willamulka	1.21	1.16	0.76	0.09

Table 2: Effect of variety on grain yield (t/ha) and grain loss (t/ha) of lentil varieties at two sites in SA in 2007

Location		Lentil Variety					LSD (0.05)
		Boomer	CIPAL411	Nipper	Northfield	Nugget	
Maitland	Yield (t/ha)	2.12	1.99	1.96	1.79	2.1	0.12
	Grain loss (t/ha)	0.050	0.057	0.022	0.025	0.018	0.01
Willamulka	Yield (t/ha)	1.1	1.13	1.01	0.92	1.06	0.05
	Grain loss (t/ha)	0.042	0.018	0.009	0.007	0.013	0.003

Grain loss was calculated by counting the number of seeds (attached to, or removed from pod) on the ground (over 0.36 sq.m) at two places in each plot

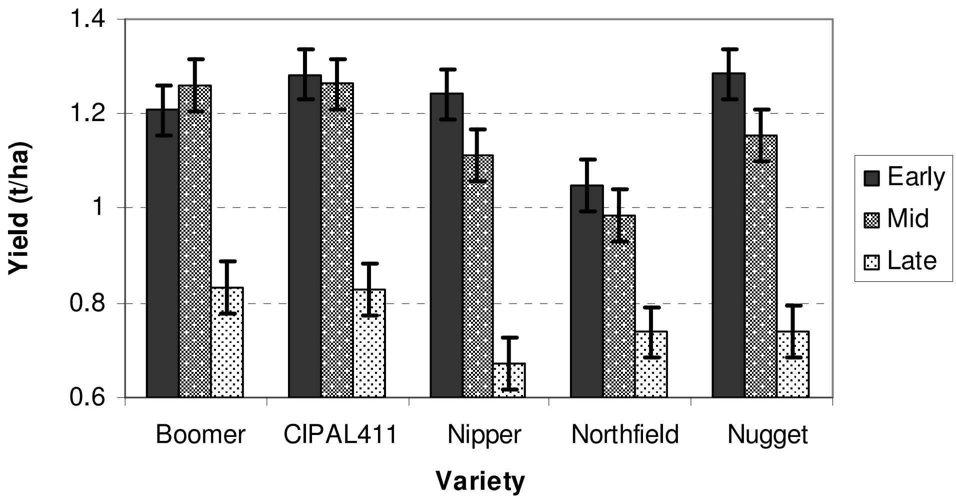
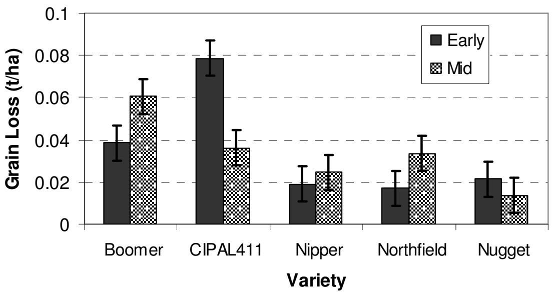


Figure 1: Effect of sowing time and variety on grain yield (t/ha) of lentils at Willamulka in 2007.

Sowing time affected variety performance at Willamulka but not at Maitland. At the early sowing time at Willamulka all varieties had similar grain yields (1.2 t/ha) apart from Northfield (1.0 t/ha), Figure 1. At the mid sowing time Boomer and CIPAL411 were higher yielding than Nipper and Nugget, which in turn were higher yielding than Northfield. However at the late sowing Nipper was the lowest yielding variety, similar to Nugget and Northfield with all three lower yielding than Boomer and CIPAL411.

Grain loss (Pod drop/shattering)

Grain loss through either or a combination of shattering and pod drop occurred to a low level at both sites (Figure 3a & 3b). Total grain loss only is reported regardless of the mechanism. Yield losses were very low compared with total grain yields achieved (Table 2) and had no effect on relative variety performance, however variety differences were observed. The early maturing varieties in 2007, Boomer and CIPAL411, were more susceptible, with losses generally greater at the early sowing times. Boomer incurred the greatest loss for each sowing time followed by CIPAL411, with the exception of the early sowing time at Maitland. In this treatment the more erect variety, CIPAL411, had a higher loss, most likely due to increased pod drop from a strong wind event at maturity. Grain loss generally decreased as sowing time was delayed, except at Maitland in Boomer where a significantly greater loss occurred at the later sowing time. This is most likely to be due to a longer delay between maturity and harvest at the mid sowing time compared with the early sowing increasing the exposure to shattering. The highest yield loss recorded was 6% of the harvested yield in the early sowing time of Boomer at Willamulka. However yield losses generally ranged from only 0.5 to 3% of harvested yield in all varieties.



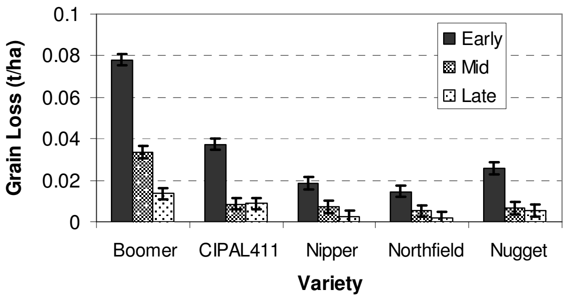


Figure 3a(L): Grain loss (t/ha) of each variety at Maitland, 2007
Figure 3b(R): Grain loss (t/ha) of each variety at Willamulka, 2007

Dry matter production
Biomass cuts were taken at Maitland at the start of flowering for each variety and do not reflect final dry matter production, particularly in early flowering varieties like Boomer. Hence, comparison between varieties is difficult, however comparisons within varieties across sowing dates are useful. Northfield and Nugget showed an incremental decrease in dry matter production as sowing time is delayed (Figure 4). Boomer and CIPAL411 showed an initial large drop in dry matter from the early to the mid sowing time but no further drop at the late sowing time. Nipper showed the reverse trend, with the early and mid sowing times producing the same level of dry matter but a sharp drop occurring at the late sowing time.

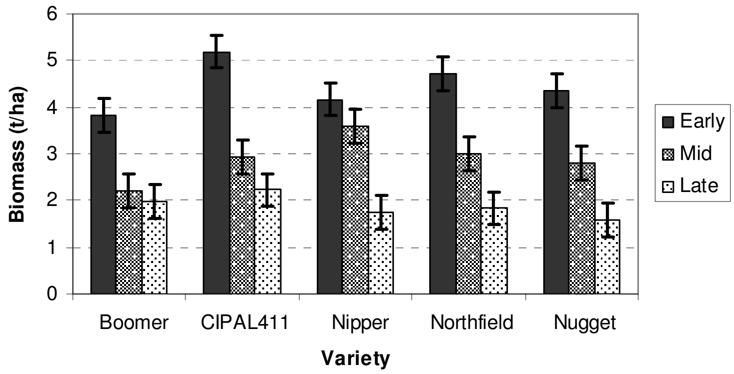


Figure 4: Effect of sowing time and variety on dry matter (t/ha) of lentils at Maitland in 2007 taken at the start of flowering for each variety.

Grain weight
There was an effect of variety on grain weight which was consistent for both sites, with Boomer showing the highest grain weight followed by CIPAL411 (see Table 3). There was an interaction between variety and sowing time for grain weight at Willamulka. At this site there was no effect of sowing time on grain weight in CIPAL411, however the highest grain weight for Boomer and Nugget was achieved at the mid sowing time. Nipper had a lower grain weight at the early sowing time and Northfield had a lower grain weight at the late sowing time.

Table 3: Effect of sowing date and variety on 1000 grain weight (g/1000 seeds) of lentil varieties at two sites in SA in 2007

Location	Sowing date	Lentil Variety				
		Boomer	CIPAL411	Nipper	Northfield	Nugget
Maitland	May-09	68.5	52.8	36.2	34.4	43.0
	Jun-03	70.0	51.6	36.8	35.0	43.5
	LSD (0.05)	1.64 (0.75 within a sowing date)				
Willamulka	May-07	67.6	52.7	38.4	35.1	45.1
	May-24	69.7	53.5	38.7	35.3	46.4
	Jun-06	67.0	53.2	39.3	34.2	44.4
	LSD (0.05)	0.84				

Comments

Earlier flowering varieties Boomer and CIPAL411 were favoured for grain yield in 2007 due to dry and hot seasonal conditions during spring. This was particularly evident at late sowing times as flowering occurred earlier and under lower heat stresses in these varieties than in the later flowering varieties of Nipper and Northfield. Boomer, CIPAL411 and Nugget also have greater levels of early vigour and are taller in plant height than the late flowering varieties. These traits were important for maximising grain production in 2007, again particularly at later sowing times, where low dry matter production by Nipper prior to flowering restricted its ability to set high grain yield.

As found in previous experiments Nipper's relative yield to Nugget dropped away when sowing time was delayed at Willamulka. Nipper will require early sowing in these medium to low rainfall environments to maximise its dry matter production and subsequent grain yield. In fact, Nipper is more suited to early sowing dates than any other current lentil variety due to its smaller plant type and superior levels of disease resistance.

At Willamulka grain yield of Boomer and CIPAL411 was not affected by a delay in sowing time from the early to mid timings unlike in Nugget and Nipper. This is an important finding as both these varieties only have moderate levels of resistance to botrytis grey mould and ascochyta blight and could be exposed to high disease pressure if sown too early in long and wet growing seasons. Furthermore they are tall vigorous varieties which can lodge prematurely if sown early under favourable growing conditions.

Boomer is a green lentil and large seed size is important in these types to meet market requirements. The highest grain weight for Boomer was also achieved at the mid sowing time in 2007. This finding adds further support to delaying the sowing time of Boomer in seasons with early breaks. Further work is required to validate the relationship between sowing time and seed size in Boomer.

Lentils are susceptible to some yield loss through either pod drop (mainly via wind on the mature crop) or in some varieties shattering, caused by a brittling of the pod wall as it dries. The early flowering and maturing varieties Boomer and CIPAL411 were most susceptible. Losses were generally greater in the early sowing dates where the maturity differences between early and late varieties were accentuated, making timely harvest of all varieties impractical. Boomer is more susceptible to shattering than the other varieties evaluated and will require timely harvest to minimise losses. However even in the early sowing time where losses were greatest, Boomer was still the highest yielding variety. CIPAL411 and Nugget are erect varieties at maturity and tend to expose their pods to wind events. Varieties which lodge (Aldinga) or bend over (Northfield) at maturity tend to protect their pods from wind events to a greater extent. Due to these plant type differences and the early maturity of CIPAL411 it incurred the highest level of yield loss in the early time of sowing at Maitland from a strong wind event at maturity. Again, yield loss was still only low and in most commercial cases this can be avoided by timely harvest.

Acknowledgments

The assistance and help of John Nairn, Peter Maynard, Mark Bennie and Rowan Steele, SARDI Clare, with trial management is gratefully acknowledged.

Milestone 8 – 30/3/2008

Trials sown to determine optimum sowing dates, plant densities and row space for new faba bean varieties as per Table 3. New varieties will be compared with Fiesta for at least 3 sowing dates, 4 plant densities and 2 row spacings. Establishment, flowering time, grain yield and seed quality attributes will be reported.

TRIAL 1: Faba Bean Row Space, Wagga Wagga, New South Wales

Aim: To investigate how yield responds to varying row spacings in faba bean.

Trial Fb1: Wagga, NSW (VRA07WARI)

Co-operator: NSW DPI, Wagga Agricultural Institute, Wagga Wagga
Sowing date: 28th May 2007

Method: Two varieties – Farah and Nura. Four spacings: 19cm, 30cm, 50cm & twin 50cm (two rows 35/15cm apart). Plots consisted of two adjacent runs of the cone seeder to provide enough rows for the wider row spacing and to minimise edge effects. Two target seeding rates were used – 140 and 180 kg/ha.

Results and Discussion

Plots were too short and not harvest because of the drought.

Picture 8: Ian Menz looking at the bright future of pulses in southern NSW

TRIAL 1: Faba Bean Plant Density, Wagga Wagga, New South Wales

Aim: To test the yield response of new varieties of faba beans to changes in plant populations across southern NSW. The information from this trial plus others is used to validate and improve grower recommendations.

Trial Fb2. Wagga, NSW (VZA07WARI)

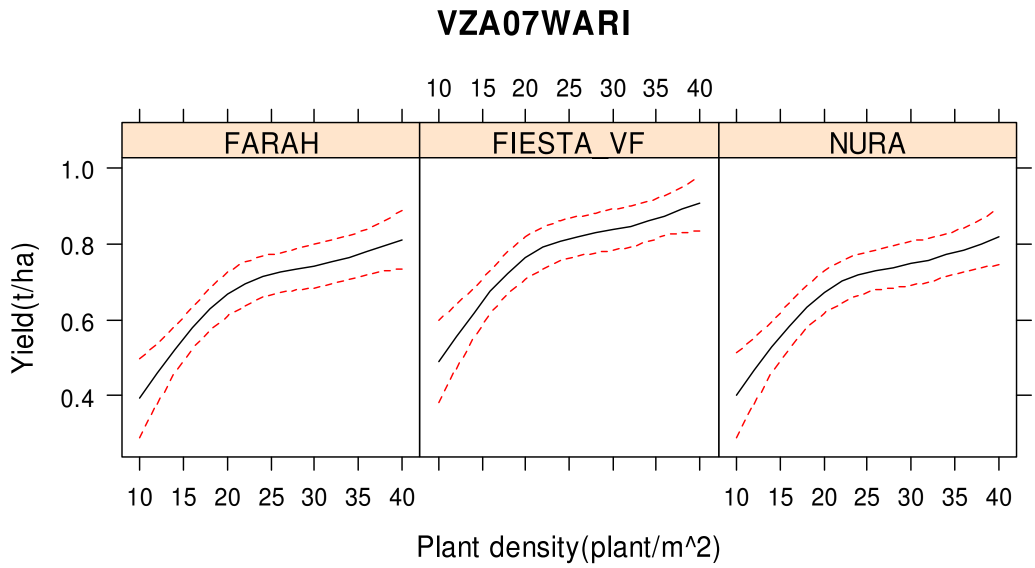
Treatments

Variety	Target Plant Population (plants/m^2)					
	10	15	20	25	30	35
Fiesta VF						
Farah						
Nura						

Co-operator: NSW DPI, Wagga Agricultural Institute, Wagga Wagga
Sowing date: 17th May 2007
Fertiliser: 115 kg/ha Grain Legume Super
Herbicides: 2L/ha Stomp + 2L/ha Sprayseed pre-sowing
1st June 500ml/ha Sencor + 200ml Supracide
Insecticides: Fastac Duo (200ml/ha) on 10 Sept & 28 Oct
Fungicide: Penncozeb 1.5l/ha on 8th August, 21st August, 12th September, 28th September

Results and Discussion

All three varieties responded similarly to plant density, with no significant variety by plant density for either curvature or slope between the different varieties.



Milestone 9 – 30/3/2008

Trials sown to determine tolerance to imazethapyr of Nura relative to Farah faba beans at differing sowing times as per Trials Table. Establishment, flowering time, grain yield and seed quality attributes will be reported.

TRIAL 1: Faba Bean Herbicide tolerance trial, Cockaleechie, Lower EP, South Australia

Prepared by Jim Egan and Joanne Crouch

Aims

- To compare the tolerance of faba bean varieties (Nura and Farah) to rates of Spinnaker® herbicide, either alone or with Simazine.
- To determine if Spinnaker® effects are influenced by time of sowing.

Experimental design and treatments

Factorial experiment, with

- 3 Times of Sowing - Early (May 10), Mid (June 5) and Late (June 22)
- x 2 Varieties – Nura and Farah
- x 6 Herbicide treatments
  - Unsprayed Control - no post-sowing / pre-emergence herbicide application
  - Simazine Control – Simazine 500 @ 2.0 L/ha pspe as a standard management practice
  - Spinnaker® normal – Spinnaker 700® @ 100 g/ha pspe (recommended maximum rate)
  - Spinnaker® high – Spinnaker 700® @ 200 g/ha pspe (double recommended max rate)
  - Simazine + Spinnaker® low – Simazine 500 @ 1.2 L/ha + Spinnaker 700® @ 70 g/ha pspe
  - Simazine + Spinnaker® normal – Simazine 500 @ 2.0 L/ha + Spinnaker 700® @ 100 g/ha pspe.

Split plot trial design, with Time of Sowing as main plots, and factorial Variety x Herbicide treatment plots as subplots. Three replicates, arranged in 3 bays. Plots 10 m long x 8 rows (1.5 m) wide.

Results

Due to the variable levels of weeds in unsprayed control plots and their confounding effects on results, data for these plots were removed prior to analysis.

Time of sowing and herbicide treatments significantly affected grain yields, but mean yields for the two varieties Farah and Nura were the same (1.76 t/ha) when averaged across time of sowing and herbicide treatments. Delayed sowing produced a similar yield decline in both varieties, although there was a trend (not significant) for Nura to be the higher yielding variety at early sowing and the lower yielding at late sowing (Table 1).

Spinnaker at the recommended (100 g/ha) and double recommended rates (200 g/ha) caused significant yield loss compared with the simazine controls. Shaded treatment means in Table 1 indicate those treatment combinations where yields were (significantly) below the simazine controls for each variety by time of sowing. Nura was sensitive to Spinnaker at all three sowing times, while Farah's yield was reduced by Spinnaker (at both recommended and double recommended rates) only at late sowing. Overall, Spinnaker damage and yield depression was strongest at late sowing.

Table 1. Effect of sowing time and herbicides on grain yield of faba bean varieties at Cockaleechie in 2007 (grain yields in t/ha).

TIME OF SOWING	Early sown (May 10)		Mid sown (June 5)		Late sown (June 22)	
VARIETY	**Farah**	**Nura**	**Farah**	**Nura**	**Farah**	**Nura**
HERBICIDE						
Simazine control	2.30	3.01	1.84	1.88	1.80	1.59
Spinnaker normal (rec. rate)	2.13	1.98	1.60	1.94	1.22	1.15
Spinnaker high (2x rec. rate)	1.98	2.27	1.67	1.21	0.62	0.55
Simazine + Spinnaker low	2.26	2.22	1.87	2.06	1.69	1.50
Simazine + Spinnaker normal	2.39	2.39	1.85	1.42	1.26	1.25
Mean of herbicide treatments	**2.21**	**2.37**	**1.77**	**1.70**	**1.32**	**1.21**

LSD (within Variety x Time of Sowing) = 0.46
LSD (within Herbicide x Time of Sowing) = 0.40

Spring dry matter production (total above ground biomass) results (Table 2) also show these detrimental effects of Spinnaker on bean growth. Again, shaded means are significantly below the simazine control treatments for the same sowing time. Since both varieties responded similarly to the herbicide treatments at each sowing time (interaction of variety x time of sowing x herbicide treatment not significant), means of the two varieties are given in Table 2.

Table 2. Effect of sowing time and herbicides on dry matter production of faba bean varieties at Cockaleechie in 2007 (total above ground biomass (t/ha) measured at early –mid flowering).

TIME OF SOWING	Early sown (May 10)	Mid sown (June 5)	Late sown (June 22)
VARIETY			
HERBICIDE			
Simazine control	2.66	2.05	2.35
Spinnaker normal (rec. rate)	2.03	1.78	1.65
Spinnaker high (2x rec. rate)	1.78	1.47	1.14
Simazine + Spinnaker low	2.37	1.88	2.14
Simazine + Spinnaker normal	2.44	1.91	2.04
Mean of all herbicide treatments	**2.26**	**1.82**	**1.86**

LSD (within Time of Sowing) = 0.22

Note that comparisons between sowing times for spring dry matter production cannot be made, due to different sampling dates for the different sowing time treatments, with small variations in crop growth stage at sampling.

Farah had higher dry matter production than Nura at all sowing times, with a mean of 2.11 t/ha compared with 1.84 t/ha for Nura. Dry matter yield was significantly reduced by both recommended and double rates of Spinnaker alone, and also by Spinnaker / simazine mixes.

Spinnaker effects on bean growth were also evident in plant height measurements – total plant height in early spring (Table 3) and height to bottom pods at harvest (Table 4). Nura was shorter than Farah, and both varieties became progressively shorter with delayed sowing.

Table 3. Effect of sowing time and herbicides on total height (cm) of faba bean varieties at Cockaleechie in 2007 (measured on August 29).

TIME OF SOWING	Early sown (May 10)		Mid sown (June 5)		Late sown (June 22)	
VARIETY	**Farah**	**Nura**	**Farah**	**Nura**	**Farah**	**Nura**
HERBICIDE						
Simazine control	79.9	66.1	42.8	36.0	25.4	21.2
Spinnaker normal (rec. rate)	75.0	56.8	43.5	31.6	16.2	15.9
Spinnaker high (2x rec. rate)	39.7	49.2	37.8	25.1	15.7	12.8
Simazine + Spinnaker low	76.3	60.6	42.1	32.8	22.0	21.2
Simazine + Spinnaker normal	73.2	71.8	41.0	29.2	19.2	17.9
Mean of herbicide treatments	**68.8**	**60.9**	**41.5**	**31.0**	**19.7**	**17.8**

LSD (within Variety x Time of Sowing) = 9.4

The high rate of Spinnaker significantly shortened plants at all sowing times, and both Farah and Nura were similarly affected. Spinnaker at the recommended rate also showed some height reduction at later sowing, but these effects were not significant.

Effects of Spinnaker on height to bottom pods showed up as more significant (statistically), with lower bottom pods in Nura at both recommended and double rates at all times of sowing. Farah was also shortened by double rates of Spinnaker at all sowing times, and by recommended rates at mid and late sowings only.

Table 4. Effect of sowing time and herbicides on height to bottom pods (cm) at harvest of faba bean varieties at Cockaleechie in 2007.

TIME OF SOWING	Early sown (May 10)		Mid sown (June 5)		Late sown (June 22)	
VARIETY	**Farah**	**Nura**	**Farah**	**Nura**	**Farah**	**Nura**
HERBICIDE						
Simazine control	32.3	29.7	25.6	21.8	19.0	14.3
Spinnaker normal (rec. rate)	31.8	20.5	20.6	17.4	14.7	9.4
Spinnaker high (2x rec. rate)	27.0	20.8	19.0	11.3	11.5	7.8
Simazine + Spinnaker low	27.9	28.2	20.6	19.4	18.9	13.3
Simazine + Spinnaker normal	32.3	32.1	20.5	16.6	15.5	12.9
Mean of herbicide treatments	**30.3**	**26.2**	**21.3**	**17.3**	**15.9**	**11.5**

LSD (within Variety x Time of Sowing) = 4.3

Interpretation and other information

Visual observations of Spinnaker causing reduced bean growth were quite spectacular, and confirmed by the data shown in tables. The recommended maximum rate of Spinnaker (100 g/ha) suppressed growth and final grain yield in both Farah and Nura, and this was further exacerbated at higher rates and later sowing. The results do not show Nura to be more sensitive to Spinnaker than Farah overall, although Nura yields were reduced by Spinnaker at all sowing times, while Farah yields were only reduced at later sowings.

More detailed statistical analysis of these results may assist in better definition of the interaction effects between variety, sowing time and herbicide treatments.

Milestone 10 – 30/3/2008

Trials sown to determine optimum disease management strategy at different sowing times, in the new faba bean varieties with improved ascochyta blight and chocolate spot resistance as per table 3. New varieties will be compared with Fiesta for at least 3 disease management strategies and 2 sowing times. Flowering time, disease severity, grain yield and seed quality attributes will be reported.

TRIAL 1: Faba Bean Disease Management x Time of Sowing, Tarlee, mid North, South Australia.

Aim: To maximise production advantages of new faba bean varieties through the development of appropriate disease management strategies.

Varieties: Farah (Fa) & Nura (Nu) @ 24 plants per sq. m
Sowing dates: Early - May 1, Mid - May 18, Late - June 6
Fertiliser: MAP+2.5% zinc @ 100kg/ha drilled with the seed
Fungicide treatments:

- Control – no sprays
- Tri + early carb – triadimefon (500ml/ha) 7 wks post sowing, carbendazim (500ml/ha) at first flower
  (First flower dates: Early sowing = 13/7 (Fa), 24/7 (Nu); Mid= 13/8 (Fa), 24/8 (Nu); Late= 31/8)
- Single carb – carbendazim (500ml/ha) mid-late August, (early sowing = 13/8; Mid = 24/8; Late = 31/8)
- Double carb – carbendazim (500 ml/ha) as for Single carb & at end of flowering
- Tri + double carb – triadimefon (500 ml/ha) at 7 wks post sowing & carbendazim (500 ml/ha) as for Double carb
- Complete spray – triadimefon (500 ml/ha) & chlorothalonil (2.3L/ha) 7 wks post sowing, chlorothalonil (2.3 L/ha) fortnightly from 7 wks with carbendazim (500 ml/ha) during flowering

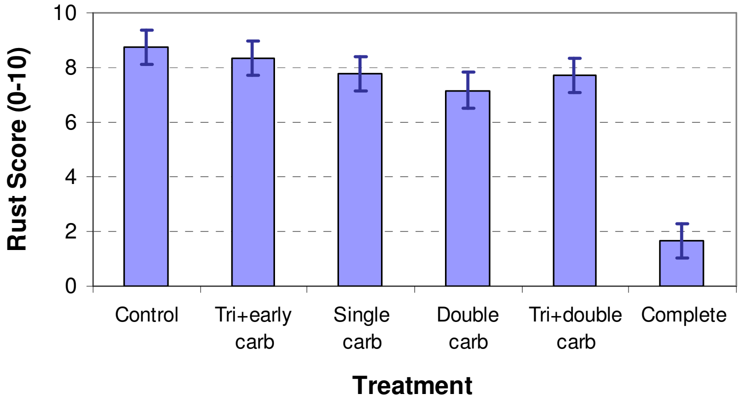
The trial was a split plot design with 3 reps, blocked by sowing date. Variety x fungicide treatments randomised within blocks

Results

Foliar disease

Despite very low levels of ascochyta blight being observed in the early sowing time, no significant level of this disease or chocolate spot and cercospora occurred in the trial. A low level of rust infection occurred in both varieties at all sowing times in early October, however this infection ceased quickly due to dry conditions and high temperatures. There was no difference in disease levels between varieties or sowing times, however there were differences between fungicide treatments. The complete treatment had very low rust levels (Figure 1). The Double carb treatment had lower rust levels than the control treatment, however the Tri+double carb treatment did not reduce rust levels, confounding interpretation of results, since the only difference was an early spray of triadimefon in the latter treatment. This difference between treatments is likely to be caused by variable data due to low infection levels.

Figure 1: Effect of fungicide treatment on incidence of rust infection on faba bean plants at Tarlee,



2007. 0 = no plants infected, 10 = 100% plants infected.

Grain yield & grain weight

Grain yield decreased by 14% from early to mid sowing times but no further yield reduction occurred at the late sowing time (Table 1). Late season rainfall events were of benefit to the late sowing times improving relative yields. Nura was higher yielding than Farah at the mid sowing time and equal to Farah at the early and late sowing time. This finding was different to previous trials where Nura has been lower yielding at later sowing dates, emphasising the benefit from the late season rainfall events.

Grain yields varied with fungicide treatment (Figure 2). The complete and Tri+early carb treatments were similar, and 7% higher yielding than other treatments. The complete treatment had lower rust levels than all other treatments, which is the likely explanation for the yield increase, however the single cercospora treatment had similar rust levels to other treatments and reasons for this yield result are unclear.

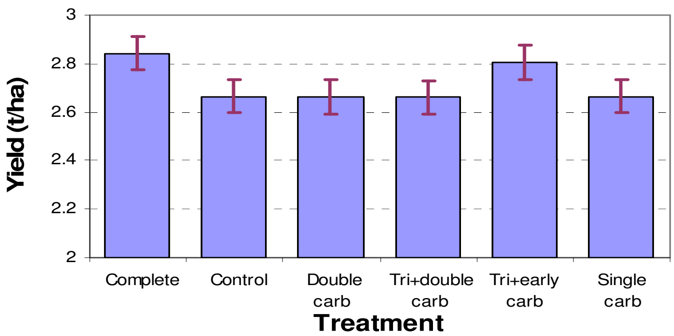


Figure 2: Effect of fungicide treatment on grain yield (t/ha) of Faba beans at Tarlee, 2007.

Farah had a higher grain weight than Nura (297 g per 500 seeds compared with 277g). Grain weight decreased with sowing time with the largest decrease (10%) occurring between the early and mid sowing time (Table 1).

Table 1: Effect of sowing time on grain yield (t/ha) and grain weight (g/500 seeds)

	Grain Yield (t/ha)		Grain Weight (g/500 seeds)	
TOS	**Farah**	**Nura**	**Farah**	**Nura**
Early	3.0	3.0	326	297
Mid	2.5	2.7	288	272
Late	2.6	2.5	278	262
LSD	0.26 (0.14 within TOS)		5.62 (4.54 within TOS)	

<u>Necking</u>

Necking, where the top part of the bean plant collapses and bends completely over, was observed in trials and commercial crops of Nura in 2007. Necking in beans is different to lodging (where the whole plant leans over) and reasons for its occurrence are unclear but may be linked to severe vegetative frost or hot wind events or a combination of both. Necking was observed in the Tarlee trial with levels higher at the early sowing time (Figure 3). At the early sowing time Nura had necking scores nearly double that of Farah however grain yields were the same (Table 1).

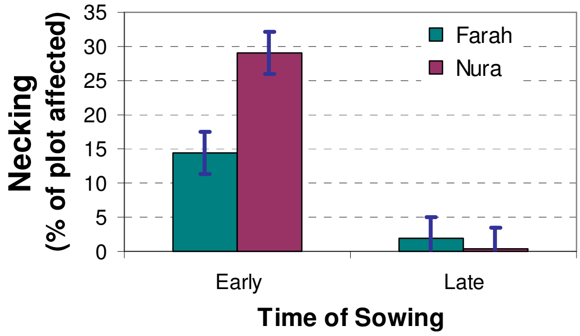
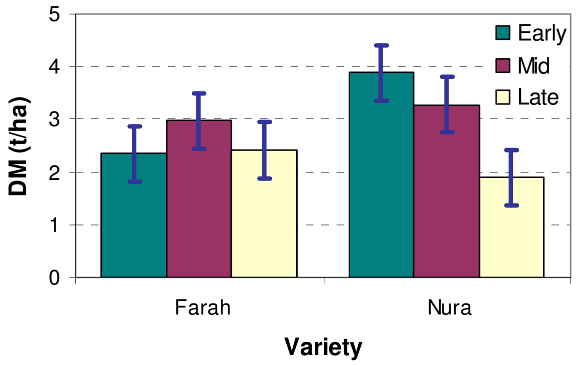


Figure 3: Effect of sowing time and variety on necking (% plot affected) of Faba beans, Tarlee 2007.

Dry matter production and Height to bottom pod

Biomass cuts were taken at the start of flowering for each variety. This timing means the results do not reflect final dry matter production, particularly in early and mid sowing times as significant production occurred after cuts were taken. Hence, comparison between varieties is not possible, however comparisons within varieties across sowing dates are useful. Farah had similar dry matter levels by the start of flowering in each sowing time, however Nura had a lower level of dry matter at the late sowing time compared with the early and mid (Figure 4a). This biomass reduction in Nura is likely to explain the relative drop in yield with late sowings of this variety in some environments and seasons.

Height to bottom pod decreased at each sowing time (Figure 4b). Nura had lower pod height than Farah at the late sowing time only. The high heights to bottom pod (60cm) achieved in the early sowing treatments were most likely due to high levels of flower abortion in early flowers from shading and or cold temperatures. This high abortion level increased harvestability but was likely to have reduced some of the yield advantages of early sowing last season.



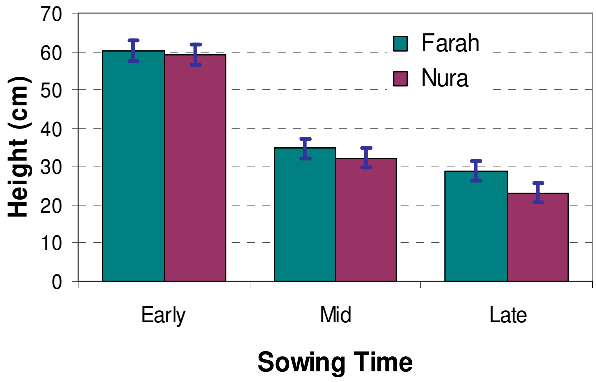


Figure 4a (L): Effect of sowing time and variety on biomass production (t DM/ha) of Faba beans at Tarlee, 2007.

Figure 4b (R): Effect of sowing time and variety on height to bottom pod of Faba beans at Tarlee, 2007.

Key findings:

- A low level of rust infection occurred during October and was the only foliar disease affecting bean performance.
- 7% higher grain yields occurred in the fortnightly sprayed (improved rust control) and single cercospora treatment (reasons unclear) compared with the nil treatment.
- Grain yields decreased by 14% when sowing date was delayed from May 1 to May 18. No further yield loss occurred when sowing date was delayed to June 6.
- Nura was higher yielding than Farah at the mid sowing time and equal at the others, unlike in previous trials where Nura has been lower yielding at later sowing dates. Late rainfall events in 2007 were of more benefit to Nura than Farah.
- Necking (collapsing of top part of bean plant) was greater at the early sowing time. Nura had a higher level of necking than Farah sown early, but yields were the same. Similar necking and yield occurred between the two varieties when sown late.

TRIAL 2: Faba Bean Plant Density, Wagga Wagga, New South Wales

Aim: To test the yield response of new varieties of faba beans to changes in plant populations across southern NSW. The information from this trial plus others is used to validate and improve grower recommendations.

Trial Fb2. Wagga, NSW (VZA07WARI)

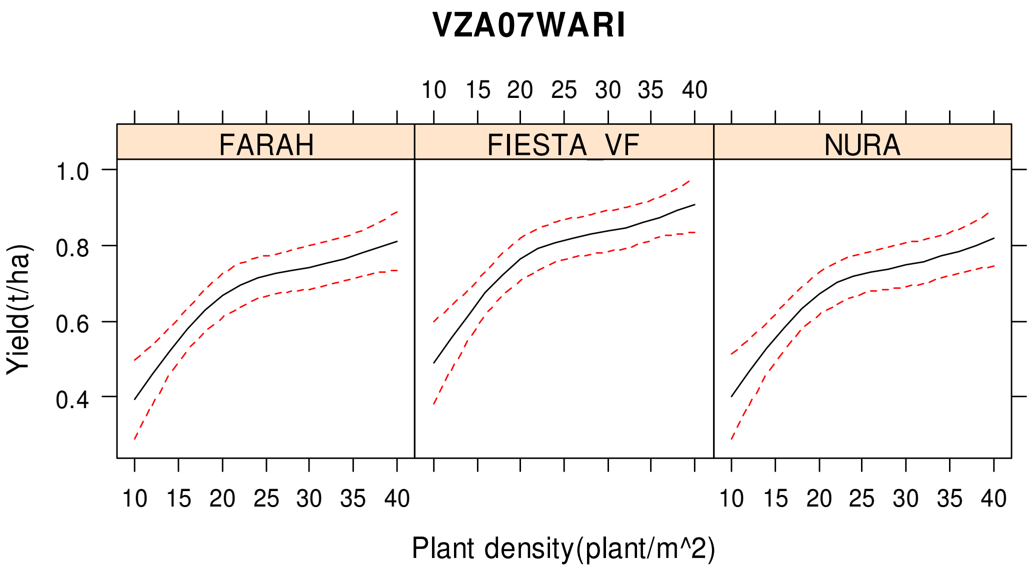
Treatments

Variety	Target Plant Population (plants/m^2)					
	10	15	20	25	30	35
Fiesta VF						
Farah						
Nura						

Co-operator: NSW DPI, Wagga Agricultural Institute, Wagga Wagga
Sowing date: 17th May 2007
Fertiliser: 115 kg/ha Grain Legume Super
Herbicides: 2L/ha Stomp + 2L/ha Sprayseed pre-sowing
1st June 500ml/ha Sencor + 200ml Supracide
Insecticides: Fastac Duo (200ml/ha) on 10 Sept & 28 Oct
Fungicide: Penncozeb 1.5l/ha on 8th August, 21st August, 12th September, 28th September

Results and Discussion

All three varieties responded similarly to plant density, with no significant variety by plant density for either curvature or slope between the different varieties.



Milestone 11 – 30/3/2008

Proof of concept trials sown to assess genotype and management interactions and aid development of protocols for trials in 2008 and 2009.

1. Stubble + wider rows - Wimmera, Vic (preliminary validation only)
2. Improved blackspot by sowing time-Peas, Mid North, SA (preliminary validation only)
3. Weed competition by architecture-chickpeas, Mid North, SA (preliminary validation only)
4. Crop topping by maturity-beans, Mid-north, SA (preliminary validation only)

Phenology, disease, architecture characteristics and grain yield will be recorded as required.

Please note: these trials were designed, primarily to provide background information for the development of more detailed studies in 2008.

TRIAL 1a: Lentil Row Spacing (InterRow Sown), Wimmera (Dimboola), Victoria.

Treatments

- Varieties (Nipper, Boomer, Nugget, Northfield, CIPAL 415, CIPAL 411, Aldinga, CIPAL 607)
- Treatments - 1. Inter-row, 30 cm row spacing, standing stubble; 2. Inter-row, 30 cm row spacing, slashed stubble; 3. 19 cm row spacing, slashed stubble

Results

- Key Message: Grain yields averaged approximately 25% higher in plots sown on 30 cm the row spacing system (standing stubble) compared with the 19.5 cm row spacing system. Varieties responded differently to changes in row spacing with yield improvements ranging from 15% - 50%.
  - Plant establishment – Most varieties established between 85 and 90 plants/m^2, Nipper was slightly higher at 100 plants/m^2 and CIPAL415 and Northfield significantly lower at 65 plants/m^2.
  - Flowering – Row space had no impact on flowering date. Flowering dates of varieties were as follows: CIPAL411 (22 Sep), Boomer (23 Sep), CIPAL607 (24 Sep), Nugget and Aldinga (26 Sep), Nipper and CIPAL415 (28 Sep), and Northfield (30 Sep).
  - Height – Generally crop height (top of canopy) and height of the lowest pod were greater in the 30 cm row spacing's compared with 19.5 cm spacing's (Table 11.1). In particular, height to lowest pod was increased by at least 20% in most varieties. The only variety to show no significant response to row spacing was CIPAL411. Boomer was the tallest variety followed by Nugget and CIPAL411. The increased height probably occurs because on wider rows there are a greater number of plants per metre of crop row, thus increasing interplant competition for light and increasing height.
  - Biomass – No major differences in biomass were noted between the row spacing treatments. CIPAL411 generally produced the most biomass, followed by Boomer and Nugget (data not shown). Northfield and Aldinga produced the least biomass.
  - Grain Yield – Grain yields averaged approximately 25% higher in the plots sown at 30 cm row spacing's (standing) compared with 19.5 cm row spacing's (Table 11.2). Across the varieties, improvements in yield ranged between 15% (Northfield) and 50% (Aldinga). Harvestability was also much easier in the 30 cm row spacing's, as plants tended to be more erect and did not lodge.
  - It was also notable that in terms of grain yield the variety most susceptible to lodging, Aldinga, showed the greatest response to wider row sowing. The vigorous, taller new varieties such as Boomer appear to be well suited to wide rows and standing stubble, which provides a trellis to improve harvestability. Further comparisons will occur over the coming

seasons to further particularly looking lentil with different growth habits, eg. Erect vs prostrate, branching vs non branching etc.

Table 11.1. Total crop height (to top of canopy) and height of lowest pod at harvest for lentil varieties grown in 19.5 cm and 30 cm row spacing's at Dimboola in 2007

Stubble	Aldinga	Boomer	CIPAL411	CIPAL415	CIPAL607	Nipper	Northfield	Nugget	*Mean*
				Crop height (cm)					
Slashed 19.5 cm	17.5	20.3	21.3	15.5	18.0	18.3	16.8	20.0	*18.4*
Slashed 30 cm	18.5	22.5	21.8	16.8	19.0	19.3	17.3	21.5	*19.6*
Standing 30 cm	19.0	22.5	21.0	17.5	18.5	19.0	17.0	21.3	*19.5*
Mean	*18.3*	*21.8*	*21.3*	*16.6*	*18.5*	*18.8*	*17.0*	*20.9*	
lsd$_{(RSxVar)}$ - ns	**lsd**$_{(RS)}$ – 0.8		**lsd**$_{(Var)}$ – 1.1						
				Height to lowest pod (cm)					
Slashed 19.5 cm	6.3	9.0	10.0	4.8	7.0	8.8	6.3	8.5	*7.6*
Slashed 30 cm	8.8	11.3	10.8	6.8	9.3	9.8	7.8	10.5	*9.3*
Standing 30 cm	9.5	11.8	9.8	6.5	8.0	9.5	8.3	10.8	*9.3*
Mean	*8.2*	*10.7*	*10.2*	*6.0*	*8.1*	*9.3*	*7.4*	*9.9*	
lsd$_{(RSxVar)}$ – 1.4	**lsd**$_{(RS)}$ – 0.8		**lsd**$_{(Var)}$ – 0.8						

Table 11.2. Grain yield (t/ha) of lentil varieties grown in 19.5 cm and 30 cm row spacing's at Dimboola in 2007

Stubble	Aldinga	Boomer	CIPAL411	CIPAL415	CIPAL607	Nipper	Northfield	Nugget	*Mean*
Slashed 19.5 cm	0.47	0.65	0.74	0.46	0.46	0.48	0.29	0.57	0.51
Slashed 30 cm	0.71	0.77	0.67	0.56	0.63	0.60	0.38	0.65	0.62
Standing 30 cm	0.71	0.78	0.92	0.61	0.56	0.67	0.32	0.70	0.66
Mean	0.63	0.73	0.78	0.54	0.55	0.59	0.33	0.64	
lsd$_{(RSxVar)}$ – ns	**lsd**$_{(RS)}$ – 0.1		**lsd**$_{(Var)}$ – 0.1						

TRIAL 1b: Lentil Row Spacing (InterRow Sown), southern Mallee (Beulah), Victoria.

Treatments

- Varieties (Nipper, Boomer, Nugget, Northfield, CIPAL 415, CIPAL 411, Aldinga, CIPAL 607)
- Treatments – 1. 30 cm row spacing; 19 cm row spacing. Both treatments sown perpendicular to stubble as no guidance used by grower at this site.

Results and interpretation

- Plant establishment – Most varieties had establishment between 80 and 90 plants/m^2. CIPAL415 and Northfield were significantly lower at 65 plants/m^2.
- Grain yield – Yields were generally extremely low, so it is difficult too draw many conclusions from the data (Table 11.3).

Table 11.3. Grain yield (t/ha) of lentil varieties grown in 19.5 cm and 30 cm row spacing's at Beulah in 2007

Stubble	Aldinga	Boomer	CIPAL411	CIPAL415	CIPAL607	Nipper	Northfield	Nugget	*Mean*
Slashed 19.5 cm	0.09	0.26	0.22	0.12	0.12	0.19	0.07	0.20	0.16
Slashed 30 cm	0.29	0.21	0.24	0.20	0.17	0.13	0.16	0.11	0.19
Mean	0.19	0.24	0.23	0.16	0.15	0.16	0.12	0.15	
lsd$_{(RSxVar)}$ – 0.08	**lsd**$_{(RS)}$ – ns	**lsd**$_{(Var)}$ – 0.0.5							

TRIAL 2: Black Spot management in Field Pea, South Australia.

Aim: To assess wether field pea breeding advancements in resistance to blackspot are significant enough to allow management changes to sowing time in this crop.

The ability to successfully sow field peas earlier in low and medium rainfall environments will maximise grain yield and crop reliability in these environments.

Varieties: Alma, Kaspa, WA2211 (improved blackspot tolerance)
Sowing dates: Turretfield: May 10, May 26, June 12
Hart: May 1, May 18, June 6
Fertiliser: MAP+2% zinc @ 76 kg/ha drilled with the seed.
Treatments (6): Nil
Fortnightly cholorothalonil
P-Pickel T
PPT plus Mancozeb
Single Mancozeb
Double Mancozeb

Note: trials on sowing time by Alma and Kaspa varieties were funded by SA Grains Industry Trust as part of a separate project in SA validating disease forecasting models. Funds from this GRDC project allowed the incorporation of WA2211 into these experiments to evaluate the potential benefits of improved blackspot resistance in field peas.

Results and Discussion

An early season break in 2007 allowed sowing of trials in early May. Last sowing dates reflect the conventional sowing date for peas in these regions of SA. Blackspot developed naturally at Turretfield and Hart in the first two sowing dates and continued to expand over plants until mid August. Dry and hot conditions from mid August onwards prevented further development of the epidemic. Final sowing date had minimal disease since the peak release of airborne black spot spores had finished by time of plant emergence.

Disease ratings

Delayed sowing reduced the amount of blackspot at all sites and this effect continued throughout the growing season. At Turretfield and Hart WA2211 and Kaspa generally had lower blackspot infection levels than Alma (Table 1). This was particularly evident earlier in the season. The PPT seed treatment had an early effect on suppressing blackspot levels however it became less as the season progressed. Effects of foliar fungicides were less conclusive due to the dry seasonal conditions. However analysis indicates the treatment reduced foliar infection by 2-4% compared to untreated controls. The effect this has on yield was confounded by the dry finish to the season.

Table 1: Effect of sowing date and cultivar on blackspot disease severity and grain yield at two sites in SA, 2007

		Foliar black spot % plot severity				Grain yield (t/ha)			
Site	Sow date	Alma	Kaspa	WA 2211	Mean	Alma	Kaspa	WA2211	Mean
T/	May 10	14.7	11.4	8.1	11.4	2.32	2.56	2.8	2.55
field	May 26	5.7	4.1	3.9	4.6	2.2	2.34	2.39	2.3
Rated	June 12	0.1	0	0	0.02	1.46	1.87	1.91	1.75
29/8	Mean	6.8	5.2	4		2	2.26	2.34	
		lsd (P<0.05) = 2.8 (2.5 same sow date)				lsd (P<0.05) = 0.41 (0.16 same sow date)			
Hart	May 1	38.9	31.7	30.8	33.8	1.28	1.55	1.61	1.48
	May 18	10.3	5.9	4.7	6.9	0.76	1.01	1.3	1.02
Rated	June 6	2.8	1.4	1.5	1.9	0.5	0.76	1.02	0.76
25/7	Mean	17.3	13	12.3		0.85	1.11	1.31	
		lsd (P<0.05) = 3.4 (2.4 same sow date)				lsd (P<0.05) = 0.11 (0.06 same sow date)			

NS = not significant

Grain Yield
Early sowing was of significant benefit in all three trials with highest grain yields achieved when all cultivars were sown around a week of the season break (April 30). Delaying sowing by 2-3 weeks after the season break resulted in a yield reduction of approximately 40% at Hart and 10% at Turretfield (Table 1). When sowing date was delayed at Hart and Turretfield by another 2-3 weeks to early June (recommended sowing time for peas at these sites) yields were reduced by a further 25% to 0.6 t/ha at Hart and 1.8 t/ha at Turretfield.

Sowing approximately 2 weeks before the conventional sowing date was beneficial for grain yield of all varieties at both sites in 2007. Sowing on the break was also beneficial at all sites despite the moderate disease levels at Turretfield and Hart. However at Turretfield this sowing date was only beneficial to the cultivar with improved black spot tolerance, WA2211. The cultivar WA2211, with improved blackspot tolerance, was higher yielding than Kaspa in the mid and late sowing dates at Hart but only equal in yield at the early sowing date where the blackspot level was the highest. At Turretfield WA2211 was higher yielding than Kaspa at the early sowing date but equal in yield at the mid and late dates. At both sites WA2211 was higher yielding than Alma at all sowing dates.

Key findings & comments

- WA2211 had lower disease severity and slower build up of blackspot than Kaspa and Alma, however this was not reflected in final grain yield due to dry spring seasonal conditions.
- P-Pickel T slows the blackspot epidemic during the early stages of the crop growth. The effect of P-Pickel T wears off and disease levels are no different to untreated controls beyond 12 weeks after sowing.
- The blackspot epidemic spreads further in the crop during flowering and podding, by spore splash (demonstrated by trap plants placed at Kingsford trial). Fungicide sprays at this stage, to stop the infection on upper foliage and stems, may be beneficial in higher rainfall regions. This needs to be tested in trials by timing spraying with spore release.
- Concept trial methodology was successfully developed to assess wether field pea lines with improved blackspot resistance levels can be sown at earlier sowing dates than currently recommended. However further evaluation is required on WA2211 to assess wether its black spot resistance improvement is significant enough due to the dry seasonal conditions which prevailed in 2007 . This will occur again in 2008.
- The importance of an additive effect of varietal improvement, seed dressing and foliar sprays in allowing earlier sowing is not fully understood and requires further evaluation in a year more favourable for disease infection and spread.

Acknowledgments
The assistance and help of John Nairn, Peter Maynard, Mark Bennie and Rowan Steele, SARDI Clare, with trial management is gratefully acknowledged.

TRIAL 3: Weed Competition by plant architecture - Chickpeas, South Australia.
Aim: To determine wether varietal differences in chickpea plant architecture effect their competitiveness with ryegrass.
Preventing increases in resistant rye grass numbers during the chickpea phase of rotations is essential for maximum crop yield and sustainable cropping systems in southern Australia.

Varieties: Almaz, CICA503, CICA510, CICA512 Genesis 079, Genesis 090, Genesis 509 & Sonali
Sowing date: June 9
Fertiliser: MAP+2% zinc @ 76 kg/ha drilled with the seed.

Treatments (3): Nil ryegrass (no rye grass sown)
Low ryegrass density (sown with rye grass (SLR4 Biotype 4) at 40 plants/m^2)
High ryegrass density (sown with rye grass (SLR4 Biotype 4) at 400 plants/m^2)

Results and Discussion

Weed competition levels and seasonal conditions

The presence of significant levels of background rye grass and broad leaf weeds (fumitory and wire weed), due to reduced herbicide control options available, increased targeted weed populations and the variability of weed numbers within treatments.

Dry seasonal conditions during late winter and early spring reduced chickpea plant growth and the degree of variation in plant type expression across genotypes.

Yield

There was no interaction between rye grass treatment and varieties for grain yield. The addition of rye grass at the low density decreased yields of all varieties by 42% compared with the nil treatment (1.43 t/ha). Grain yields of the high rye grass treatment were just 20% of the nil treatment. Yields of CICA503, CICA510, CICA512, Genesis079, Genesis090 and Sonali were similar (Figure 1). Almaz and Genesis509 were lower in yield than CICA510, CICA512 and Genesis079, but not significantly lower than other varieties.

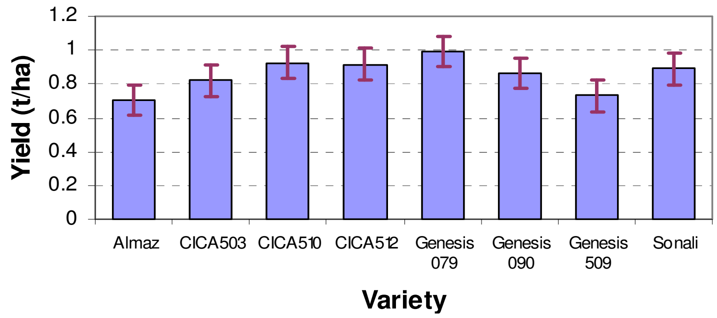


Figure 1: Effect of variety on yield of chickpeas at Turretfield, 2007.

Final plant competition score

Competition scores showed that there was no difference between the varieties for nil and high ryegrass densities (Figure 2). At the low ryegrass density Genesis 509 (medium height, narrow branching angle) and CICA510 (short) were assessed as being less competitive than all other varieties except Genesis 079 (short). Sonali (wide branching angle) showed a lower competition score than all other varieties except for CICA512 (tall). Genesis 079 also showed higher scores at low density than CICA512 and Genesis 090 (medium height, moderate branching angle).

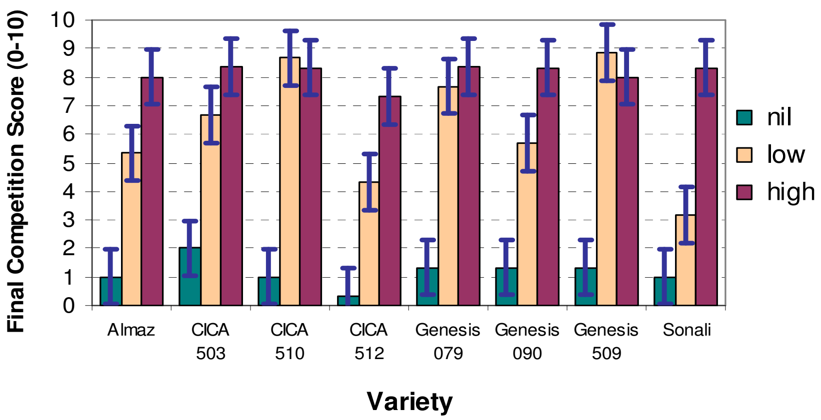


Figure 2: Effect of variety on competition score (0-10, 0= no rye grass in plots, 10 = 100% of plot contains ryegrass) of chickpeas at maturity at Turretfield, 2007.

Competition scores decreased with increasing ryegrass density, except for CICA503, CICA510, Genesis 079 and Genesis 509, where there was no difference between competition scores for low and high ryegrass densities.

Ryegrass plant numbers
There was no effect of variety on ryegrass plant numbers, with rye grass densities averaging 20, 115 and 650 pl.sqm for nil, low and high ryegrass densities, respectively. This compared with targeted populations of 0, 40 and 400 pl.sqm respectively.

Ryegrass head production
Sonali had the lowest ryegrass head counts for low and high ryegrass densities, but only significantly lower than CICA510 and Genesis 079 (low density), and CICA503 and Genesis 090 (high ryegrass density) (Figure 3). Genesis 090 had significantly higher rye grass head counts than all other varieties at the high density, except for CICA503. Head counts increased with increasing ryegrass density from low to high, but only significantly for CICA503, CICA512 and Genesis 090.

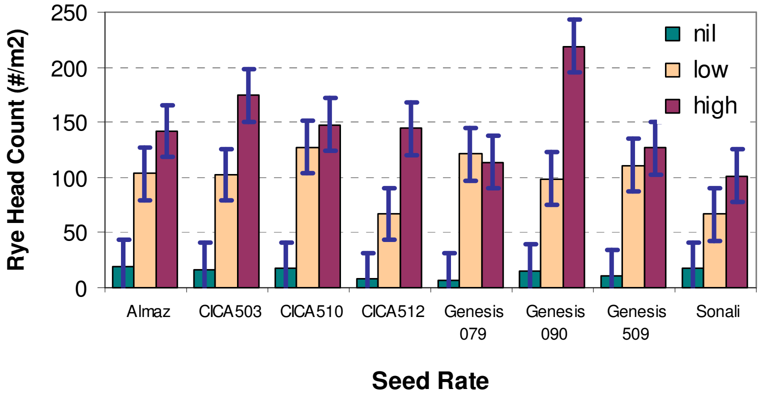


Figure 3: Effect of chickpea variety and ryegrass density on ryegrass head counts in chickpeas at Turretfield, 2007.

Grain weight
Grain weights decreased between nil and high ryegrass density treatments, though not significantly for Genesis 509 (Figure 4). There was no significant difference in seed weight between nil and low ryegrass densities for all varieties except Almaz and CICA510.
Almaz showed the biggest reduction in grain weight under competition, with a 27% reduction in grain weight at the high ryegrass density compared with the control (Figure 4). Almaz showed the highest seed weight at nil and low ryegrass densities, but only similar weights to Genesis 090 at the high rye density.

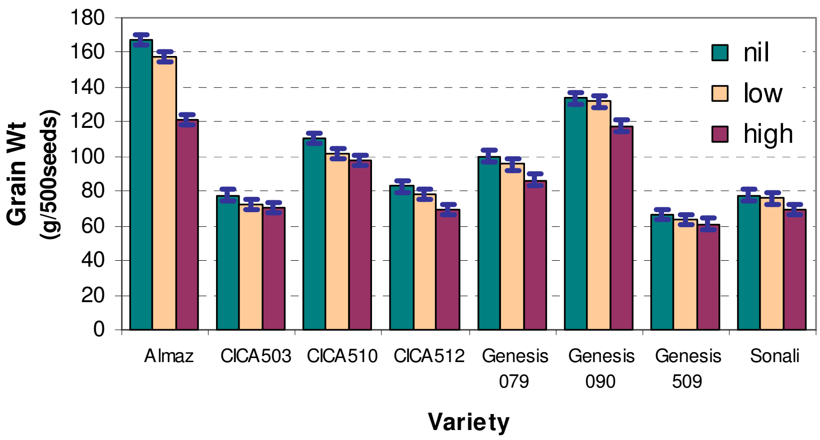


Figure 4: Effect of variety and ryegrass density on grain weight (g/500 seeds) of chickpeas at Turretfield, 2007.

Key findings & comments

- Site background weed levels increased total weed competition levels to very high numbers masking differences between genotypes for grain yield. However genotype differences still occurred for competition score and final ryegrass tiller numbers in the low ryegrass treatment.
- Limited findings suggests there is variation in the current chickpea genotype for competition with ryegrass, particularly in reducing tiller numbers. Tall types (CICA512) and types with wide branching angles (Sonali) were generally more competitive than short and narrow branching angle types.
- The concept trial had limited success in 2007 due to trial methodology and site selection issues. Further refinements to trial methodology are required for 2008. These are:
  - Lower rye grass numbers (40 and 100 plants per sq.m) are required than those used in 2007 (adapted from work undertaken in wheat).
  - A site with very low background weed numbers is essential due to limited herbicide options available.
  - The ability of the chickpea variety to reduce ryegrass tiller numbers is likely to be a greater assessment of the competitive rating of the variety than its grain yield.
- A number of lines with a greater variation in vigour, plant height and plant shape (degree of angle of branches) than those evaluated in 2007 have been selected from advanced breeding trials in 2007 for assessment in 2008.

Acknowledgments
The assistance and help of John Nairn, Peter Maynard, Mark Bennie and Rowan Steele, SARDI Clare, with trial management is gratefully acknowledged.

TRIAL 3: Croptopping, Faba Beans, South Australia.

Aim: To determine the correct maturity timing required in faba beans for successful crop topping practice.

The ability to crop top faba beans without incurring grain yield loss will improve management options for controlling resistant ryegrass in many cropping areas of southern Australian.

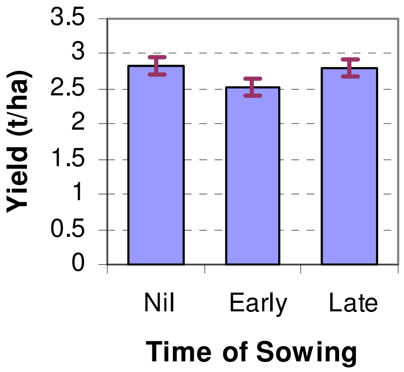
Varieties: Farah (mid-late maturity), Fiesta (mid), Fiord (early), Nura (mid), 1269*483/6 (late), 974*611*974/15 (mid-late), AFO2002 (late), AFO3001 (early)
Sowing dates: May 18
Fertiliser: DAP @ 80 kg/ha pre, MAP @ 48kg/ha drilled with the seed.
Treatments (3): Nil
Early Gramoxone @ 1.5 L/ha on the 12th of October (rye grass milky dough stage).
Late Gramoxone @ 1.5 L/ha on the 26th of October

Results and Discussion

The interaction between crop-topping treatment and variety was not significant for grain yield or grain weight.

Yield

Crop top timings showed that when performed at the early timing (latest opportunity for successful rye grass control) yield was reduced (Figure 1a), whereas yields from late topped beans were no different to the untreated control. AFO2002 was lower yielding than all other varieties (Figure 1b), while the variety 974*611*974/15 yielded lower than Farah, Fiesta and Fiord. All other varieties yielded similarly.



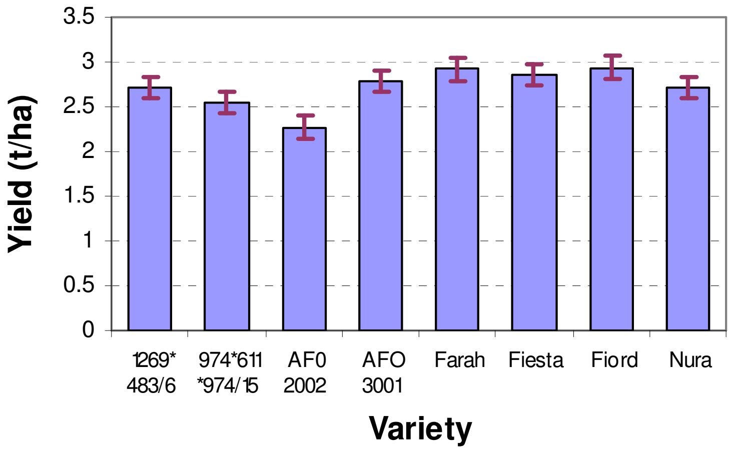
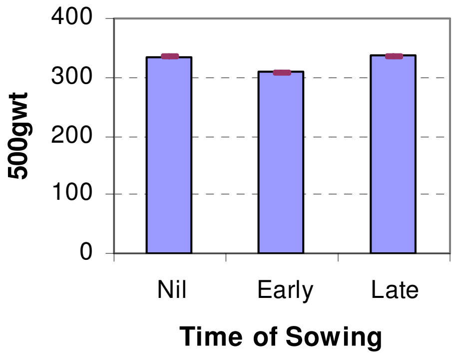


Figure 1a: Effect of timing of crop topping on grain yield (t/ha) of beans at Turretfield, 2007

Figure 1b: Effect of variety on grain yield (t/ha) of beans at Turretfield, 2007

Grain weight

As for grain yield, crop topping early reduced grain weights (Figure 2a), whereas late topping had no impact on grain weight. There was a large varietal effect on grain weight, with 974*611*974/15 significantly larger than other varieties (Figure 2b). Fiord produced the smallest seeds, just 58% of the variety with the largest seed size (974*611*974/15).



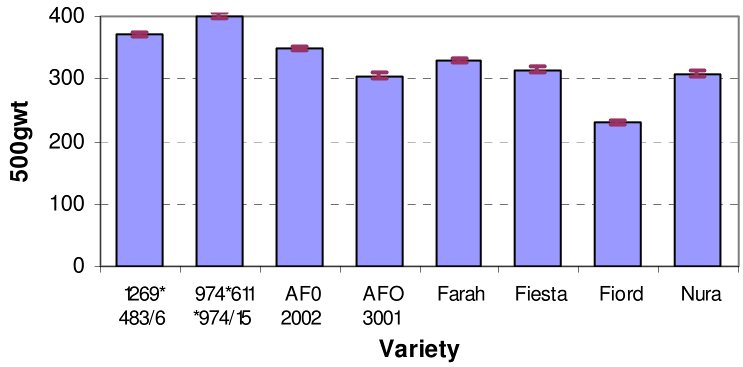


Figure 2a: Effect of timing of crop topping on grain weight (g/500 seeds) of beans at Turretfield, 2007

Figure 2b: Effect of variety on grain weight (g/500 seeds) of beans at Turretfield, 2007

Key findings & comments

- Dry and hot spring conditions led to poor pod set and early senescence of faba bean varieties in 2007. Grain yields of earlier maturing varieties were higher than those of later maturing types.
- There was no significant interaction between crop topping timing treatment and variety performance for grain yield as late varieties were lower yielding in all treatments, including the nil treatment due to the dry seasonal conditions.
- Generally earlier maturing varieties incurred lower levels of grain yield loss than later maturing varieties when crop topped at the appropriate stage for effective ryegrass control. However this difference was not significant in the 2007 trial.
- The concept trial methodology for evaluating relative yield loss due to various crop timings was found to be sound and will be repeated in 2008, although trial layout changes will be made to improve spraying logistics. A very early timing treatment will be added to assess the extremes of yield loss potential in all varieties and detailed flowering and maturity scores will be taken. Field pea, lentil and chickpea varieties will also be evaluated.

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ATTACHMENT 1

G x M Experimental Protocols - 2008

Row Spacing (Jason Brand)
Aim: To investigate the adaptability of a range of lentil and chickpea varieties to inter-row sowing in wider row spacing's than conventional cropping systems.
Results from this trial will be used to provide advice to breeders on the characteristics required for modern inter-row and wider row cropping systems. These trials are comparisons of systems, not just row space.

Treatments
Crops: Lentils and Chickpeas
Sites: Wimmera (Horsham), southern Mallee (Curyo) and potentially southern NSW.
Varieties: To be determined. Will include varieties with a range of growth habits and maturities.
Row space treatments: Lentils: 20cm and 30cm; Chickpeas: 20cm, 30cm and 60cm(?? if possible??). 20cm treatment conventionally sown similar to current practise in breeding programs. 30cm sown inter-row into standing stubble
Measurements: Establishment, crop height, biomass, lodging, grain yield, quality and weight

Sowing time by Blackspot in Peas: (Larn McMurray)
Aim: To assess wether recent field pea breeding advancements in resistance to blackspot are significant enough to allow management changes to sowing time in this crop.
The ability to successfully sow field peas earlier in low and medium rainfall environments will maximise grain yield and crop reliability in these environments. Information will also be provided to PBA Field peas on the disease resistance level required to bring forward field pea sowing dates in low and medium rainfall environments. This experiment will occur for 1- 2 more years depending upon germplasm availability from PBA Field peas.

Treatments
Crops: Field Peas
Sites: Turretfield (lower Mid North, SA) & Hart (Mid North, SA)
Varieties: WA2211 (improved blackspot resistance), Alma (old conventional type standard), Kaspa (current semi-leafless standard), other improved breeding lines will be sought from PBA Field peas but likely to be limited by seed availability.
Fungicide treatments including: Nil, Fortnightly cholorothalonil, P-Pickel T & foliar mancozeb
Sowing times: 2-3 depending on season break; first at season break; second 2-3 weeks after first and a Third 2-3 weeks after second if still in a reasonable sowing window.
Measurements: Disease levels, grain yield and grain weight.

Crop-topping or desiccation effects on weed control and seed quality (Larn McMurray, Eric Armstrong and Jason Brand)
Aim: To determine the correct maturity timing required in field peas, chickpeas, lentils and faba beans for successful crop topping practice.
The ability to crop top pulses without incurring grain yield loss will improve management options for controlling resistant ryegrass in many cropping areas of southern Australian. Early harvest will also allow farmers to spread their harvest operation and allow more efficient use of machinery. Furthermore, harvesting at the optimum time improves seed quality and reduces weather damage and soil contamination, thereby minimising or eliminating down grading of seed quality and

maximising the marketability of the crop. Information will be provided to PBA on the maturity timing of genotypes to optimise control of ryegrass and maximise yield and seed quality.
SA trials to be based around ryegrass control (timing of sprays), NSW trials to based around seed quality and timing of harvest (not including lentils), Vic trials – only lentils and focussed on seed quality and harvestability, particularly of Boomer.

Varieties: Various in each crop representing the range of maturity timing available in each crop. Commercial standards will also be included.

Treatments (at least 3): 1. Nil
2.Early Gramoxone @ 1.0 L/ha at the rye grass milky dough stage to allow effective rye grass control.
3. On time Gramoxone @ 1.0 L/ha at the rye grass milky dough stage to allow effective rye grass control.
4. Late Gramoxone @ 1.0 L/ha two weeks after the early treatment

Measurements: Flowering dates, maturity dates, grain yield, seed moinsture, grain quality (where required) and grain weight.

Weed Competition in chickpeas: (Larn McMurray)

Aim: To determine wether varietal differences in chickpea plant architecture effect their competitiveness with ryegrass.

Preventing increases in resistant rye grass numbers during the chickpea phase of rotations is essential for maximum crop yield and sustainable cropping systems in southern Australia. Information will also be provided to PBA Chickpeas on the chickpea plant type required to maximise this crops competitiveness with rye grass.

Varieties: To be determined. Will include varieties with a range of growth habits and maturities. A number of advanced breeding lines suitable for evaluation were identified in PBA Chickpea breeding trials in 2007. Controls to include Almaz, CICA503, CICA512 Genesis 079, Genesis 090, Genesis 509 & Sonali

Treatments (3): 1. Nil ryegrass (no rye grass sown)
2. Low ryegrass density (sown with rye grass (SLR4 Biotype 4) at 40 plants/m^2)
3. High ryegrass density (sown with rye grass (SLR4 Biotype 4) at 100 plants/m^2)

Measurements: Grain yield, grain weight, rye grass numbers and importantly rye grass tiller numbers