

# Variety specific management for pulses - herbicide tolerance

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The aim of this trial was to assess the relative tolerance of new field pea and chickpea cultivars to a range of commonly used herbicides

## Summary

Trials were sown at Birchip to assess the relative tolerance of new field pea and chickpea cultivars to a range of commonly used herbicide treatments. Results indicate that the new varieties of field pea and chickpea perform similarly to commonly grown cultivars.

## Background

New pulse cultivars have significant agronomic and yield improvements compared with older cultivars. They have better disease resistance, plant architecture (standability), seed quality and yield. There are also changes in flowering and maturity that have implications for agronomic management. Previous research and field observations indicate that pulse cultivars can vary widely in their response to herbicide application.

Field trials conducted in 2004 compared the effect of commonly used herbicides on the performance of current and potential new cultivars of peas and chickpeas. The trials did not aim to assess the relative efficacy of these chemicals to control weeds.

This research is part of a GRDC funded project on the development of optimum management practices for new pulse cultivars across SE Australia (plant density, sowing time, disease management and herbicide tolerance). Data is supplied to Pulse Australia for the development of management packages.

## Methods

The experiment was designed as a split plot with 4 replicates (i.e. cultivars were randomized within each replicate of herbicide). Plots were sown on June 9 at the BCG Birchip site to compare cultivars of field pea and chickpea. 0.8L/ha Trifluralin was applied to the entire trial area prior to sowing.

### Treatments and design

#### Herbicides

All herbicides treatments were applied at single and double label rates with a water rate of 80 L/ha. Wetters and oils were used as recommended. There were no untreated control plots because subsequent weed competition was expected to be too great to permit valid comparisons.

**Table 1.** Herbicide treatments, application timing and rate (per ha).

Herbicide Treatment	Application Timing <sup>1</sup>	Field Peas	Chickpeas
Trifluralin x1	PS	1.2L*	1.2L*
Trifluralin x2	PS	2.4L*	2.4L*
Simazine x1	PSPE		1.0L
Simazine x2	PSPE		2.0L
Spinnaker x1	PSPE	100g	
Spinnaker x2	PSPE	200g	
Sencor x1	PSPE	280g	280g
Sencor x2	PSPE	560g	560g
Diuron x1	PSPE	850g	
Diuron x2	PSPE	1700g	
Simazine + Spinnaker x1	PSPE		1L + 45g
Simazine + Spinnaker x2	PSPE		2L + 90g
Simazine + Diuron x1	PSPE		1L + 450g
Simazine + Diuron x2	PSPE		2L + 900g
Simazine + Balance x1	PSPE		1L + 100g
Simazine + Balance x2	PSPE		2L + 200g
Raptor x1	4 node	45g	
Raptor x2	4 node	90g	
Brodal + MCPAx1	4 node	150ml+150ml	
Brodal + MCPAx2	4 node	300ml+300ml	
Broadstrike x1	4 node	25g	25g
Broadstrike x2	4 node	50g	50g
Verdict x1	Z14 weeds	100ml	100ml
Verdict x2	Z14 weeds	200ml	200ml
Select x1	Z14 weeds	400ml	400ml
Select x2	Z14 weeds	800ml	800ml

<sup>1</sup>. PS - applied immediately after sowing and harrowed in; PSPE – applied post sowing pre-emergence; 4 node – applied at the 4 node stage of crop growth; Z14 weeds – applied at the Z14 stage of grass weed growth.

\* Total application – includes 0.8L/ha applied before sowing to all plots

Note: Exact details of chemicals used (e.g. active ingredients, manufacturer etc.) can be supplied upon request.

## Cultivars

### FIELD PEAS

Moonlight and Kaspera were sown to a targeted plant density of 50 plants/m<sup>2</sup> and Sturt at 40 plants/m<sup>2</sup>.

**Table 2a.** Field pea cultivar descriptions.

Cultivar	Leaf type	Plant hgt	Grain type	Flower time	Pod shatter resist'n	Lodge Resist'n	Black Spot	Downey milde	Powdery mildew
Kaspera	SL	Tall dwarf	Dun	Late	R	MS/M R	MS/S	R	S
Sturt	Conv	Tall trailin	White	Mid	MS	S	S	MS	S
Moonlight	SL	Med dwarf	White	Mid	R	MR	S	MR	S

SL = semi-leafless, Conv = conventional; T = tall, M = medium; S = susceptible, MS = moderately susceptible, MR = moderately resistant, R = resistant

## CHICKPEAS

Desi types were sown to a targeted plant density of 40 plants/m<sup>2</sup> and Kabuli's at 30 plants/m<sup>2</sup>

**Table 2b.** Chickpea cultivar descriptions.

Cultivar	Grain type	Seed Size	Ascochyta blight		Height	Flower Time	Maturity
			Foliage	Seed			
Howzat	Desi	Med/Large	MS	MS	Med	Mid/Early	Mid
Flip 94-508c	Desi	Small	R	MS	Med	Mid/Late	Mid/Late
Flip 94-509c	Desi	Small	R	MS	Med	Mid/Early	Mid
Flip 94-090c	Kabuli	Med	R	MS	Med	Mid	Mid

S = susceptible, MS = moderately susceptible, MR = moderately resistant, R = resistant, med = medium,

## Paddock management

Seed was sown with 70kg/ha Grain legume mix Super (zinc 2%). Prior to sowing, weeds were controlled using a pre-sowing knockdown herbicide. No in-crop herbicides were applied other than the herbicide treatments as indicated. No fungicides were applied due to dry conditions and lack of disease. Insect pests were controlled using insecticides as required. The predominant weed at the site was medic.

## Measurements and analysis

Emergence was recorded 6 weeks after sowing. Herbicide damage symptoms were scored when symptoms were apparent 12 weeks after sowing using a system similar to that of the European Weed Research Council (Table 3). Field peas were not scored as there were no significant herbicide damage symptoms. Flowering date and height were also recorded.

**Table 3.** Scoring system used to assess herbicide damage

Score	Symptoms
1	<b>None evident</b>
2	<b>Very slight symptoms</b> – some discolouration and/or distortion and/or stunting just visible
3	<b>Slight symptoms</b> – discolouration and/or distortion and/or stunting clearly visible, effects reversible
4	<b>Moderate symptoms</b> – moderate discolouration and/or distortion and/or stunting, some effects probably reversible
5	<b>Severe symptoms</b> – severe discolouration and/or distortion and/or stunting, majority of plants showing symptoms
6	<b>Moderate damage</b> – some plants killed, nearly all plants damaged
7	<b>Heavy damage</b> – substantial number of plants killed, surviving plants damaged
8	<b>Very heavy damage</b> – majority of plants killed, surviving plants severely damaged
9	<b>Complete loss of plants and/or crop yield</b>

Weed pressure scores (1 – no weeds, 5 – high weed population) were recorded during the season. Due to the low seasonal rainfall, few seed pods formed on the chickpeas and plots were not harvested. The field peas performed better and grain yields and grain weight (g/100 seed) were recorded.

All trials were analysed using ANOVA.

## Results

### Chickpeas

Emergence counts were around 30 plants/m<sup>2</sup> for all varieties and treatments. This was the target for Flip 94-090c and 10 plants/m<sup>2</sup> less than the target for Howzat and Flip 94-509c.

Simazine + Spinnaker and Simazine + Balance were the only herbicide treatments to cause significant symptoms (Table 4). For these combinations, the double rate caused significantly worse symptoms. All varieties showed similar symptoms in response to the herbicides. Weed scores indicated that Simazine + Spinnaker and Simazine + Balance provided the best control of weeds (Table 5). Simazine + Balance at double rate reduced plant height at flowering by 25%. The herbicide treatments had no effect on flowering date.

**Table 4.** Herbicide damage score and weeds score for chickpeas in each herbicide treatment.

Herbicide Treatment	Timing	Herbicide damage score		Weed score	
		Rate x1	Rate x2	Rate x1	Rate x2
Trifluralin	PS	1.0	1.1	5.0	5.0
Simazine	PSPE	1.1	1.3	3.0	1.8
Sencor	PSPE	1.0	1.0	3.3	2.8
Simazine + Spinnaker	PSPE	1.4	2.8	1.9	1.0
Simazine + Diuron	PSPE	1.0	1.1	2.5	1.8
Simazine + Balance	PSPE	3.2	5.2	1.2	1.1
Broadstrike	4 node	1.2	1.6	3.9	4.1
Verdict	Z14 weeds	1.0	1.0	5.0	4.8
Select	Z14 weeds	1.0	1.0	4.8	4.7
<b>L.S.D.</b>		<b>0.5</b>		<b>0.5<sup>1</sup></b>	

<sup>1</sup>. For comparison within a rate only

### Field Peas

Emergence was similar across all herbicide treatments and achieved targeted densities for Sturt (40 plants/m<sup>2</sup>), slightly higher for Kaspas (55 plants/m<sup>2</sup>) and slightly lower for Moonlight (45 plants/m<sup>2</sup>).

No visual damage was seen or effects on flowering date and height at flowering noted for any of the herbicide treatments.

Weed score showed that Spinnaker provided best weed control (Table 5). Spinnaker at the single rate also produced the highest grain yields. Primarily in this research we were interested in whether the herbicides reduce grain yields compared with a weed free situation. Adjusted grain yields, taking into account weed score gives the best indication of this, as in these trials it was almost impossible to achieve a weed free situation without application of herbicides. The results show that the only treatment to significantly reduce in yield was

Spinnaker x2 (Table 5). When comparing varieties, Sturt generally yielded 30% greater than other varieties.

Grain weights showed a similar trend to yield, i.e. the highest yielding treatments also had the highest grain weights. In terms of varieties, Moonlight was generally 20% greater than Sturt or Kaspera.

**Table 5.** Weed score and grain yield for chickpeas in each herbicide treatment. The number in brackets is the adjusted yield using weed score as a covariate.

Herbicide Treatment	Timing	Weed Score		Grain Yield t/ha (adjusted grain yield)	
		Rate x1	Rate x2	Rate x1	Rate x2
Trifluralin x1	PS	4.9	4.7	0.13 (0.29)	0.18 (0.33)
Spinnaker x1	PSPE	1.2	1.1	0.43 (0.36)	0.29 (0.21)
Sencor x1	PSPE	2.8	1.8	0.26 (0.28)	0.36 (0.33)
Diuron x1	PSPE	2.1	1.6	0.19 (0.33)	0.24 (0.33)
Raptor x1	4 node	3.2	2.8	0.23 (0.27)	0.24 (0.26)
Brodal + MCPAx1	4 node	2.5	1.9	0.27 (0.27)	0.29 (0.26)
Broadstrike x1	4 node	3.4	2.8	0.19 (0.24)	0.24 (0.27)
Verdict x1	Z14	4.9	4.6	0.14 (0.29)	0.14 (0.27)
	weeds				
Select x1	Z14	4.8	4.8	0.14 (0.28)	0.10 (0.25)
	weeds				
L.S.D.		0.4 <sup>1</sup>		0.06 (0.1)	

1. For comparison within a rate only

## Interpretation

### General

Despite low seasonal rainfall, we were still able to see significant effects associated with the application of herbicides.

The application of correct chemicals to control the weed spectrum is essential if you are to achieve any significant yield in a season like 2004. Field pea yields were 40-70% greater when weeds were controlled adequately. Of the chickpeas, the plots to produce seed pods were those treated with Simazine + Spinnaker and Simazine + Balance.

### Field Peas

All cultivars appear to have adequate tolerance to the range of herbicides used in this experiment. Sturt was the highest yielding cultivar.

Spinnaker appears to have a narrow safety margin for use, with yields greatly reduced at double label rates.

### Chickpeas

Flip 94-509c and Flip 94-090c exhibited a tolerance to herbicides similar to that of Howzat. Both new varieties appear to have potential in the southern Mallee.