

MultiCrop Trials

M1. Field Pea, Lentil and Chickpea Variety x Stubble Management, Mid North (Pinery) and Yorke Peninsula (Minlaton), South Australia

Aim

To determine whether sowing inter-row in standing stubbles varying in stubble height will benefit yield of field pea, lentil and chickpea varieties.

Treatments

Crop and variety details:

Crop	Variety	Maturity	Plant type
Field Pea	PBA Gunyah	Early	erect, semi-dwarf
	PBA Pearl	Early-mid	erect, semi-dwarf
	Parafield	Late	prostrate, conventional
Lentil	PBA Flash	Early	Erect
	Nipper	Mid	Erect
	CIPAL0803	Mid-late	Prostrate
Chickpea	PBA Striker	Early	Desi
	CICA0857	Early	Desi
	PBA Slasher	Mid	Kabuli

Sowing date: 28th May (Pinery) and 8th June (Minlaton)

Treatments: Short – 5cm high

Medium – 20cm high

Tall – 40cm high

All slashed stubbles were retained in inter-row so that stubble loads were identical between treatments

Stubble Pinery = 1.8t/ha wheat stubble, Minlaton = 1.4t/ha wheat stubble

East-West direction at both sites

Fertiliser: MAP + Zn @ 75kg/ha

Background

Previous work conducted in South Australia by the Southern Pulse Agronomy project has shown that yield improvements of up to 30% are possible in lentils when inter-row sown into standing cereal stubble (depending on variety and sowing date) compared to where stubbles were removed.

Besides the benefit of stubble on soil moisture retention, it was hypothesised that lentils may have benefitted from protection from wind provided by the stubble. Firstly, by altering the “microclimate” at the plant level in standing stubble systems to increase soil moisture and subsequent yield. Secondly, by diverting additional carbohydrates into the photosynthetic development and flower production, rather than into stem development for wind resistance. And finally, by preventing the erosion and displacement of soil from around the plant stem caused by the moving plants, which may also minimise the breakage of upper lateral roots.

This trial aims to determine whether varying stubble height (but with the same amount of stubble) will benefit yield of field pea, lentil and chickpea varieties of varying plant type and maturity profiles.

Results and Interpretation

- Vegetative biomass – biomass cuts taken in late August showed that stubble height had a significant effect on biomass at Pinery (Table 1). Plots sown into Medium and Tall stubble treatments showed 16-29% (respectively) greater biomass than those sown into Short stubble. No biomass data was collected from the Minlaton trial.
- Final biomass – stubble height had no significant effect on final biomass at Pinery (Table 1).

- Maturity – end of season maturity scores showed that stubble height had a significant effect on maturity at Pinery (Table 1). Pulse crops sown into Short stubble showed earlier maturity than those sown into Medium and Tall stubbles. Maturity data was not collected from the Minlaton trial.
- Grain yield – Stubble height had a significant effect on grain yield (across all crop types and varieties) at Pinery (Table 1). Grain yield was 12% higher in Medium (20cm) and Tall (40cm) stubble treatments than Short (5cm) stubble. Stubble height had no effect on grain yield at Minlaton.

There was a significant difference in yield between the three crop types at both sites (Table 2). Field pea was the highest yielding crop at both sites, by 25-42% at Pinery and 42-48% at Minlaton. Chickpea yielded 14% higher than lentil at Pinery, while there was no significant difference in yield between lentil and chickpea at Minlaton.

A significant variety response was generated for each crop type at both sites (Table 3). Field pea and lentil varieties behaved similarly at both sites. PBA Pearl was the highest yielding field pea variety, while PBA Gunyah and Parafield performed similarly. PBA Ace was the highest yielding lentil variety, while PBA Flash and Nipper performed similarly. PBA Striker was the highest yielding chickpea variety at Minlaton, and equal highest with PBA Slasher at Pinery. The kabuli chickpea CICA0857 was the lowest or equal lowest yielding chickpea at both sites.

Table 1: Effect of stubble height on biomass (t/ha), maturity score (1-9) and grain yield (t/ha) of pulse crops, Pinery 2012.

Stubble treatment	Short	Medium	Tall	LSD (P<0.05)
Vegetative biomass (t/ha)*	0.25 ^a	0.29 ^b	0.32 ^b	0.032
Mature biomass (t/ha)*	1.86	2.04	2.00	Ns
Maturity (1-9 score)**	3.37 ^L	3.63 ^M	3.78 ^M	0.27
Yield (t/ha)	1.44 ^S	1.62 ^T	1.60 ^T	0.10

* Measurements taken 21st August and 31st October

** Maturity score: 1 = dead, 9 = healthy

Table 2: Grain yield (t/ha) of field pea, lentil and chickpea at Pinery and Minlaton, 2012.

Crop	Field Pea	Lentil	Chickpea	LSD (P<0.05)
Pinery	1.86 ^a	1.31 ^c	1.49 ^b	0.14
Minlaton	3.30 ^S	2.33 ^T	2.23 ^T	0.18

Table 3: Grain yield (t/ha) of field pea, lentil and chickpea varieties at Pinery and Minlaton, 2012. Varieties are listed in order of maturity for each crop type

Crop	Variety	Pinery		Minlaton	
		Yield (t/ha)	LSD (P<0.05)	Yield (t/ha)	LSD (P<0.05)
Field Pea	PBA Gunyah	1.77 ^b		3.14 ^b	
	PBA Pearl	2.04 ^a	0.09	3.50 ^a	0.17
	Parafield	1.78 ^b		3.22 ^b	
Lentil	PBA Flash	1.23 ^M		2.25 ^M	
	Nipper	1.16 ^M	0.15	2.21 ^M	0.15
	PBA Ace	1.54 ^L		2.52 ^L	
Chickpea	PBA Striker	1.63 ^S		2.33 ^S	
	CICA0857	1.31 ^T	0.12	2.16 ^T	0.11
	PBA Slasher	1.53 ^S		2.20 ^T	

Key Findings and Comments

- Yields were relatively high at these sites in 2012, particularly given the drier than average growing season. Chickpeas performed particularly well, yielding equal to lentils at Minlaton

and higher than lentils at Pinery. Yields may have been buoyed by the presence of stubble in all treatments, helping to conserved soil moisture, and the mild (although dry) finish to the season.

- Variety responses were similar across both sites, with PBA Pearl, PBA Ace and PBA Striker being the highest yielding varieties for each crop type. These lines have also consistently performed well across National Variety Testing trials in South Australia.
- Stubble height had a significant effect on early season biomass, end season maturity and grain yield of pulse crops at Pinery in 2012. For each measurement, the Short stubble treatment was significantly different to Medium and Tall stubbles, which performed similarly.
- The absence of a grain yield response from stubble height at Minlaton may be due to the lower and inconsistent stubble load at this site due to wheel traffic and stock damage over summer. It may also indicate that stubble retention, and the conservation of soil moisture, is more important at lower rainfall and lower yielding sites (eg Pinery).
- There was no interaction between stubble treatment and variety, meaning that all varieties (regardless of their varying plant type and maturity profiles) behaved similarly across the three stubble treatments in 2012.
- Despite there being no difference in total stubble load, differences in vegetative growth and grain yield were generated between the three stubble heights at Pinery. This supports previous work conducted by this project showing that the physical arrangement of stubble (ie standing versus slashed) can have a significant effect on the growth and performance of pulse crop types, as well as the amount of stubble present (ie retained versus removed).
- Precise reasons for the differences in vegetative growth and grain yield between the three stubble heights (but same total stubble load) are still unclear, however they are likely generated from the protection from wind (particularly early in the season) provided by the stubble, which may result in moisture conservation. Further work is required to discover the mechanisms for this response.