Time of sowing of *Brassicas* in central west NSW

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ABSTRACT

Trials were conducted at Trangie Agricultural Research Centre in central-west New South Wales in 2009 and 2010 to investigate time of sowing of representative lines of *Brassica juncea* (Indian mustard) and *Brassica napus* (canola). In the warm season of 2009, sowing on 21 April (TOS1) was significantly higher yielding than sowing on 18 May (TOS2). Within sowing times yield was negatively correlated with time taken from sowing to 50% flowering, and was positively correlated with harvest index of individual treatments. In the wet season of 2010, there was no significant effect of time of sowing on yield, with dry matter production being significantly greater from sowing on 30 April (TOS1) than from sowing on 18 May (TOS2) and 20 June (TOS3). Conversely, harvest index was significantly less from TOS1 than from TOS2 and TOS3. There was no clear species advantage of either *B. juncea* or canola in either year for yield or for harvest index.

Key words: Brassica, *B. juncea*, canola, time of sowing, harvest index

INTRODUCTION

Brassica juncea (Indian mustard) has been trialled in several low rainfall regions across Australia as an alternative for *Brassica napus* (canola). Lewis and Thurling (1994) found in trials in Western Australia that mustard had a higher yield than canola due to more effective partitioning of water use to critical reproductive stages, but found no relationship between flowering time and seed yield. Other trials in Western Australia (Gunasekera *et al.* 2009) showed mustard had superior water use efficiency for dry matter production compared with canola, but low harvest index of resulted in seed yields not being significantly greater than seed yields of canola. The suitability of *B. juncea* as a break crop was investigated in central west NSW, comparing yield, oil content, dry matter and harvest index of three *B. juncea* varieties and three canola varieties across two sowing times in 2009 and three sowing times in 2010.

MATERIALS and METHODS

Site details

Trials were sown at Trangie Agricultural Research Centre on a grey vertosol soil. Plant available water at time of first sowing was approximately 150 mm in both seasons (based on gravimetric moisture readings and CSIRO characterisation).

Varieties sown

Tarcoola	(early maturity open-pollinated canola)
Hyola 50	(mid-season maturity hybrid canola)
44C79	(early to mid-season maturity open-pollinated canola)
Oasis CL	(early maturity open-pollinated canola quality *B. juncea*)
Dune	(mid maturity open-pollinated canola quality *B. juncea*) – *2009 only*
Sahara CL	(early maturity open-pollinated canola quality *B. juncea*) – *2010 only*
SARDI515M	(early maturity open-pollinated industrial quality *B. juncea*)

Sowing dates

2009 21 April, 18 May
2010 30 April, 18 May, 20 June

Climatic conditions

Seasonal rainfall and temperature was contrasting in 2009 and 2010, although frost occurrence was relatively low in both seasons. Total rainfall from 1 April to 30 October was 205 mm and 363 mm in 2009 and 2010 respectively, compared to the long term median rainfall for the same

period of 202 mm. In 2009, 136 mm of growing season rainfall fell prior to 10 June, whilst in 2010 all months received growing season rainfall above the long term median. Mean temperature for the growing season of April to June was 14.8ºC and 13.6ºC in 2009 and 2010 respectively, compared to the long term median temperature for the same period of 13.2ºC. The mean daily temperature for the months of July and August in 2009 was 2.55ºC above the long term median.

RESULTS

2009

Yield and oil

Table 1. Yield (t/ha) and oil content (6% grain moisture) of three canola lines and three *B. juncea* lines at two times of sowing in 2009 (machine harvest).

	Yield (t/ha)		Oil (%)	
Variety	21 April	18 May	21 April	18 May
B. juncea				
SARDI515M	1.34	0.88	45.00	37.90
Oasis_CL	1.19	0.50	40.07	32.93
Dune	0.71	0.43	40.10	33.77
Canola				
Tarcoola	1.21	0.65	41.87	37.97
Hyola 50	0.69	0.36	36.47	33.17
44C79	0.66	0.42	41.40	37.63
	5% l.s.d.		5% l.s.d.	
sow time	0.18		3.49	
variety	0.17		2.01	
sow time x variety	n.s.		n.s.	

Yield was significantly higher in TOS1 than TOS2 for all varieties. The lines SARDI515M, Tarcoola and Oasis_CL were the highest yielding lines from TOS1, while SARDI515M was significantly higher yielding than all other varieties from TOS2. There was no clear advantage of either *B. juncea* or canola for yield. Oil was significantly higher in TOS1 than TOS2. SARDI515M had significantly higher oil than all other varieties from TOS1. There was no clear advantage of either *B. juncea* or canola for oil.

Dry matter and harvest index

Table 2. Dry matter production (t/ha) and harvest index at maturity of three canola lines and three *B. juncea* lines at two times of sowing in 2009 (hand harvest).

	Dry matter (t/ha)		Harvest Index	
Variety	21 April	18 May	21 April	18 May
SARDI515M	12.58	9.09	0.166	0.208
Dune	10.86	4.80	0.108	0.095
Oasis_CL	9.21	6.51	0.137	0.124
Hyola 50	8.12	6.07	0.108	0.075
Tarcoola	7.20	6.06	0.189	0.166
44C79	6.87	6.26	0.082	0.124
	5% l.s.d.		5% l.s.d.	
sow time	1.06		n.s.	
variety	2.00		0.028	
sow time x variety	n.s.		0.064	

Dry matter production was significantly greater at TOS1 than TOS2. SARDI515M had greater dry matter production than all lines across both times of sowing with the exception of Dune in TOS1. There appeared a general trend for the *B. juncea* varieties to have greater dry matter production than the canola varieties at TOS1, however this was not the case at TOS2. There was no significant effect of sowing time on harvest index. SARDI515M and Tarcoola had significantly higher harvest index than all other varieties at TOS1, while SARDI515M had significantly higher harvest index than all other varieties at TOS2. There was no clear advantage of either *B. juncea* or canola for harvest index.

2010
Yield and oil

Table 3. Yield (t/ha) of three canola and three *B. juncea* lines at three times of sowing in 2010.

Variety	30-Apr	18-May	20-Jun
SARDI515M	0.98	0.79	0.53
Oasis_CL	1.083	0.84	1.11
Sahara_CL	0.66	0.76	0.77
Hyola 50	1.35	1.11	1.45
Tarcoola	1.30	0.97	0.56
44C79	1.02	0.79	0.57
	5% l.s.d.		
sow time	n.s.		
variety (within ST)	0.36		
sow time x variety	0.37		

There was no significant effect of time of sowing on yield in 2010. There was no clear yield advantage of any variety within TOS1 or TOS2. Hyola 50 was significantly higher yielding than all other varieties from TOS3 with the exception of Oasis_CL. There was no clear advantage of canola or *B. juncea* for yield.

Dry matter and harvest index
There was a significant effect of time of sowing on dry matter production, with TOS1 giving higher dry matter than TOS2 and TOS3. There was no significant effect of variety on dry matter production. There was no clear advantage of either canola or *B. juncea* for dry matter production in 2010 (data not shown). Both TOS! And TOS2 gave a significantly higher harvest index than TOS1. Tarcoola had a higher harvest index than all varieties at TOS1, with the exception of Hyola 50. There was no clear advantage of either canola or *B. juncea* for harvest index in 2010 (data not shown).

DISCUSSION

The 2010 trial was severely waterlogged, significantly affecting the outcomes of the trial. Discussion will therefore mainly focus on the outcomes of the 2009 trial.

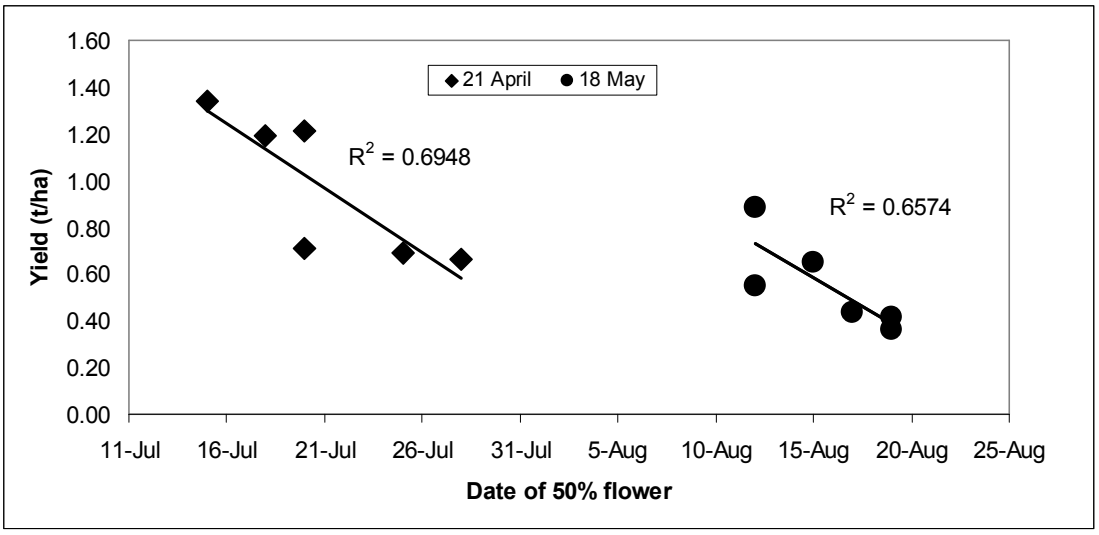

Fig 1. Effect of flowering date on yield of three canola and three *B. juncea* varieties at two times of sowing in 2009.

Figure 1 shows that the flowering dates of TOS1 and TOS2 in 2009 were negatively correlated with yield. This was largely due to temperatures over the July and August period of 2009, being 2.55ºC above the long term median. This finding is in contrast to the findings of Lewis and Thurling (1994), who found no correlation between yield and flowering date. The time taken from sowing to 50% flowering for TOS1 was in the order SARDI515M < Oasis_CL < Tarcoola = Dune < Hyola 50 < 44C79. Where flowering occurred on the same day as occurred with Tarcoola and Dune at TOS1 and with SARDI515M and Oasis_CL at TOS2, the yield advantage of Tarcoola and SARDI515M respectively was due to higher harvest index.

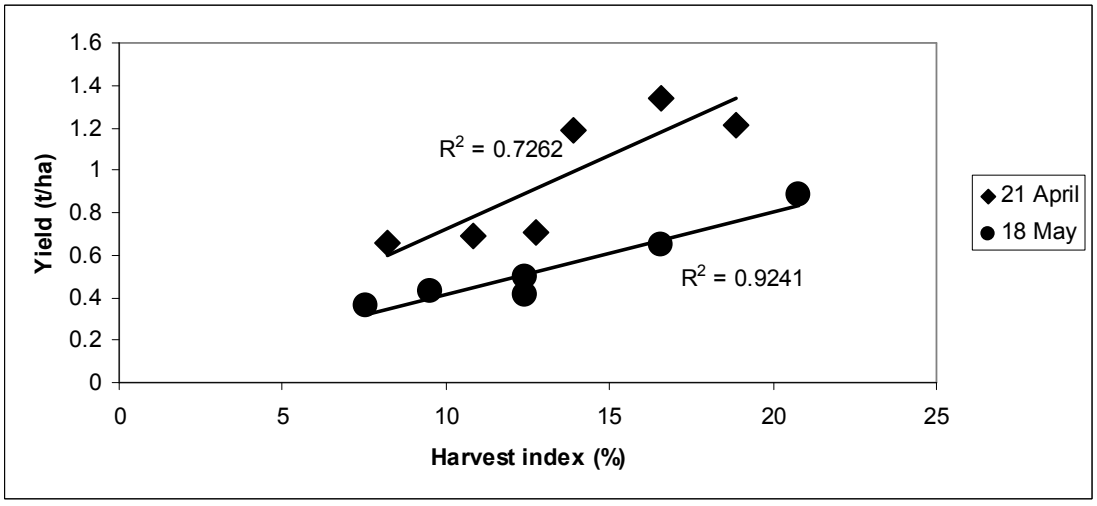

Fig 2. Relationship between harvest index and yield of three canola varieties and three *B. juncea* varieties at two times of sowing in 2009.

The 2009 trial showed that yield was strongly correlated with the harvest index of the individual treatments for both times of sowing. This is in contrast to Gunasekera *et al.* (2009), who found no relationship between harvest index and yield in a trial involving canola and *B. juncea*. Several studies have reported greater levels of osmotic adjustment in *B. juncea* than in canola (Gunasekera *et al.* 2009, however one study by Niknam (2003) observed high and low

levels of osmotic adjustment in canola and *B. juncea*. The yield of Tarcoola canola compared to the *B. juncea* varieties Dune and Oasis_CL in this trial suggests that high levels of osmotic adjustment may not be confined to *B. juncea*.

CONCLUSION

In the warm, dry season of 2009, yield advantage of *Brassica* species was primarily due to the ability to avoid heat by shortening the time between sowing and flowering. Varieties that were relatively quick to reach 50% flowering were not exclusively *B. juncea* with the canola variety Tarcoola as quick as the *B. juncea* variety Dune.

The ability of a particular variety to convert dry matter production into grain (harvest index) was also important. This trial showed significant differences between harvest index results for particular varieties, however there were no clear differences between canola and *B. juncea* general.

The 2009 trial suggests that growers in low rainfall regions that are aiming to capitalise on the agronomic benefits of *Brassica* crops should consider growing varieties that are quick to flower and that produce inherently higher harvest index. Further to this, the canola variety Tarcoola was similar in time taken from sowing to 50% flowering as the *B. juncea* variety Dune, suggesting that these two *Brassica* types should be sown around the same time.

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