AN AGRONOMIC COMPARISON OF BRASSICA JUNCEA, B. NAPUS AND B. CAMPESTRIS IN SOUTH-WESTERN AUSTRALIA.

By A.G. McKay, N.N. Roy and M.L. Poole, Department of Agriculture-Western Australia, Jarrah Rd., South Perth, 6151, Australia.

INTRODUCTION

The isolation of zero erucic acid lines of Indian or oriental mustard (*Brassica juncea*) (Kirk and Oram, 1981), (Roy, 1981) together with the selection of glucosinolate-free lines of this species (Cohen, Knowles, Thies and Roebbelen, 1983) makes the development of double zero *B. juncea* varieties possible.

In south-western Australia blackleg disease (*Leptosphaeria maculans*) destroyed the rapeseed industry in the early 1970s, and blackleg tolerance is now an essential character of the rapeseed varieties (mainly *B. napus*) cultivated in this region.

B. juncea is highly resistant to blackleg disease (Roy, 1978) (Helms and Cruickshank, 1979), and in view of the possibility of breeding low erucic acid, low glucosinolate varieties, information was required on the field performance of *B. juncea* relative to the rapeseed species already cultivated in Australia, viz. *B. napus* and *B. campestris*.

METHODS

Four field trials were sown in the south-west of Western Australia in the winter of 1982. All trial sites were located between the latitudes of 32°S and 35°S. The growing season (May - October) rainfall received was: Avondale 286mm, Badgingarra 514mm, Mount Barker 372mm, Wongan Hills 349mm.

The *B. napus* lines tested included the currently commercially grown blackleg tolerant varieties Wesroona and Wesbell plus two advanced generation breeding lines 76N219-M17S and 75N107-118.

The *B. campestris* representatives included the blackleg tolerant variety Jumbuck, the Canadian variety Span and two breeding lines Chinoli A2 and DRC1.

The *B. juncea* lines were some of the higher yielding lines from a collection held by the CSIRO in Canberra (Oram, pers. comm.) and included three Indian lines (CPI 81794, CPI 81799, CPI 61680), the Canadian variety Lethbridge 22A and the Russian variety Skorospelka.

The trials were all sown between the 17th and 24th June, and fertilizers were applied, containing rates ranging from 8 to 32 kg /ha of phosphorus and from 28 to 50 kg/ha of nitrogen. Seeding rates ranged from 4 kg/ha for smaller seeded lines to 5 kg/ha for larger seeded lines. Weeds and insects were controlled at all sites.

A randomized block design with four replicates was employed. Plots were 1.25m (5 rows) x 30m.

RESULTS

In table 1 the results from the trial at Mount Barker are summarized, while the yield data from all four trial sites are summarized in table 2.

The Indian *B. juncea* line CPI 81799 was the second highest yielding line overall (table 2), bettered only by the *B. napus* breeding line 76N219-M17S.

At the Avondale and Badgingarra sites the yields of the *B. napus* lines were markedly reduced by pod shattering which had occurred before harvest (table 3).

Table 3: Estimated pre-harvest pod shattering losses (%)

	Avondale	Badgingarra	Wongan Hills
B. napus	22	18	6
B. campestris	2	1	1
B. juncea	2	0.2	0

A bacterial blight (not yet positively identified) caused loss of leaf area on the Indian *B. juncea* lines (CPI lines) at the Badgingarra and Wongan Hills sites. All other lines including the *B. juncea* varieties Lethbridge 22A and Skorospelka appeared resistant to the disease.

Mount Barker was the only site where blackleg disease was observed, however, it was not severe, and stem cankering and subsequent plant lodging were only observed on a few isolated plants of susceptible lines. A low incidence of leaf infection (lesions) was observed on all *B. napus* and *B. campestris* lines while *B. juncea* leaves remained lesion free.

DISCUSSION

The Indian *B. juncea* line CPI 81799 outyielded the locally bred *B. napus* variety Wesroona by an average of 18% over four sites and was only marginally bettered by an improved *B. napus* breeding line. The ability of this imported *B. juncea* line to perform so well re-

Table 1. The performance of oilseed Brassica lines at Mount Barker Research Station, Western Australia

Line	Species	Days from sowing to anthesis	Yield (kg/ha)	Oil content (% dm)	Estimated preharvest pod shatter (%)
76N219-M17S	B. napus	95	1,794	44.2	0
CPI 81799	B. juncea	80	1,762	44.0	0
75N107-118	B. napus	90	1,441	42.2	0
Span	B. campestris	77	1,486	44.3	0
PI 194900	B. carinata	112	1,600	40.1	2*
Wesroona	B. napus	97	1,564	42.5	0
CPI 61680	B. juncea	83	1,716	43.9	0
Chinoli A2	B. campestris	83	1,423	46.0	0
Jumbuck	B. campestris	81	1,583	45.6	0
Brown sarson	B. campestris	61	1,183	45.3	0
CPI 81794	B. juncea	77	1,379	42.8	0
DRC 1	B. campestris	83	1,258	42.0	0
Skorospelka	B. juncea	105	1,089	42.9	4*
Lethbridge 22A	B. juncea	105	874	40.8	2*
Wesbell	B. napus	105	744	40.6	40*
Significance			$p < 0.01$	$p < 0.01$	
$LSD_{(0.05)}$			376	1.3	

* harvested 10 days later than other lines

Table 2. Yield comparison of Brassica lines at four sites in Western Australia.

		Yield as % of Wesroona yield				
		Avondale	Badgingarra	Mt Barker	Wongan Hills	Mean
76N219-M17S	(Bn)	129.7	135.3	112.6	120.8	124.4
CPI81799	(Bj)	146.5	120.2	110.5	97.7	118.7
75N107-118	(Bn)	115.2	101.5	90.4	110.3	104.3
Span	(Bc)	101.9	96.3	93.2	115.6	101.8
PI 194900	(Bcar)	92.9	156.7	100.3	55.2	101.3
Wesroona	(Bn)	100.0	100.0	100.0	100.0	100.0
CPI 61680	(Bj)	107.3	109.0	107.6	74.5	99.6
Chinoli A2	(Bc)	104.6	109.4	89.2	86.5	97.4
Jumbuck	(Bc)	112.4	73.9	99.3	98.0	95.9
DRC 1	(Bc)	102.2	-	78.9	-	90.6
Brown sarson	(Bc)	91.4	97.8	74.2	84.5	87.0
CPI 81794	(Bj)	112.8	80.8	86.5	67.2	86.8
Skorospelka	(Bj)	68.3	88.6	68.3	-	75.1
Lethbridge 22A	(Bj)	77.7	99.0	54.8	48.2	69.9
Wesbell	(Bn)	71.5	40.6	46.7	59.9	54.7
Wesroona yield (kg/ha)		871	908	1,594	1,306	

(Bn) = *Brassica napus*, (Bj) = *B. juncea*,
(Bc) = *B. campestris*, (Bcar) = *B. carinata*

lative to locally bred and selected rapeseed varieties is most encouraging.

Under Canadian conditions *B. juncea* also outyields *B. napus* (by about 12%) and *B. campestris* (by more than 16%) (Downey, 1971). Other advantages of *B. juncea* over other oilseed *Brassica* species include blackleg disease resistance (Roy, 1978), less susceptibility to pod shattering and higher linoleic acid content in the oil (Kirk and Oram, 1978).

Transferring the zero erucic acid (Kirk and Oram, 1981) and low glucosinolate (Cohen *et al*, 1983) characters, along with bacterial blight resistance, into early maturing *B. juncea* varieties would appear to be a very worthwhile undertaking.

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