

FIELD PERFORMANCE OF CANOLA QUALITY *BRASSICA JUNCEA*G. RAKOW, J.P. RANEY

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## ABSTRACT

*Brassica juncea* mustard is grown as a condiment crop in the three prairie provinces of western Canada. It is better adapted to the semi-arid growing conditions in these provinces than either *B. napus* and *B. rapa* and the development of a canola quality, edible oilseed form of *B. juncea* for production in western Canada is therefore highly desirable. High yielding, high oil content *B. juncea* canola was developed through cross breeding and selection, with best lines having seed oil contents of only 1 to 2% lower than *B. napus*, and further seed oil increases in *B. juncea* are being pursued through cross breeding with very high oil content, high glucosinolate *B. juncea* lines. *B. juncea* canola lines were highly resistant to blackleg. It is expected that the first canola quality *B. juncea* cultivar could become available within a few years.

## INTRODUCTION

*Brassica juncea* mustard is grown as a condiment crop on some 50,000 ha annually in the three prairie provinces of western Canada. It is better adapted to the semi-arid growing conditions in these provinces and higher yielding than either of the two canola species *B. napus* and *B. rapa* (Woods, *et al.* 1991). Love *et al.* (1990) developed low glucosinolate forms of *B. juncea* and combined this trait with the low erucic acid characteristic through cross breeding which resulted in canola quality *B. juncea* (Love *et al.* 1991). The low erucic acid, low glucosinolate canola quality *B. juncea* lines were field tested and it was found that they were higher yielding than *B. napus* but seed oil contents were 5% lower than those of *B. napus* which was unacceptable for an edible oilseed crop. A breeding program was initiated with the objective to increase seed oil contents of canola quality *B. juncea*. This report presents data on agronomic performance and seed quality of selected canola quality *B. juncea* lines in comparison to *B. napus* canola in multi-location yield tests in Saskatchewan in 1993.

## EXPERIMENTAL

Parental materials and selections

The F<sub>4</sub> generations of two canola quality (low erucic acid, low glucosinolate) *B. juncea* breeding populations, 246 lines of population P, and 480 lines of population R, derived from a three-way cross involving the low glucosinolate line 1058 (Love *et al.* 1990), the zero erucic acid-high oil content line LDZ (Love *et al.* 1991) and the Canadian Oriental mustard cultivar Cutlass as a source for white rust resistance, were grown in a breeding nursery at Saskatoon in 1990. Agronomically superior progenies that had high oil content were selected from both populations (Rakow 1991). Lines of population P had 41.3% oil and were free of allyl glucosinolate, the hot principle in mustard seed. Lines of population R had an oil content of 42.4%, but contained 11.6 µmoles of allyl glucosinolate per g of oilfree meal. Crosses were made in 1991 between lines of population P and lines of population R with the objective to combine the higher oil content of population R with the non-allyl glucosinolate characteristic of population P. In 1992, 975 F<sub>3</sub> lines were field tested in a 2-replicate breeding nursery and lines selected that were of superior agronomic type, had high oil content and were of the non-allyl glucosinolate type. Twenty lines were selected and evaluated in 4-replicate, 4-row plot yield tests at nine locations in western Canada. The canola quality *B. juncea* line J90-4316, a high oil content line of the Saskatoon Research Station J90-2741, and the three *B. napus* canola quality cultivars AC Elect, Cyclone and Legacy were included in the tests as check cultivars.

Performance of lines

All *B. juncea* lines yielded well in comparison to *B. napus* cultivars, but were several days later in maturity (Table 1). *B. juncea* lines were 30 to 40 cm taller than *B. napus* cultivars but had similar lodging scores indicating that the taller *B. juncea* plants were not more prone to lodging than *B. napus*. The blackleg scores from the disease nursery indicated that all *B. juncea* lines were highly resistant to the blackleg fungus *Leptosphaeria maculans*. The *B. napus* cultivar AC Elect had a blackleg score of 4.0 indicating its susceptibility to this disease.

TABLE 1. Average agronomic performance and seed quality of canola quality *B. juncea*, high oil *B. juncea* and *B. napus* canola grown at 9 locations in western Canada in 1993.

Entry	Yield		Mat (days)	Height (cm)	Ldg. <sup>1</sup> (1-5)	BL <sup>2</sup> (0-5)	Oil (%)	GSL <sup>3</sup> µmoles/g
	kg/ha	% Legacy						
<i>B. juncea</i>								
J92-78	2226	117	112	169	2.0	0.4	44.5	21.4
J92-223	2338	122	112	163	2.1	0.2	44.5	19.2
J92-650	2104	110	111	161	2.1	0.4	45.0	18.8
J90-4316	2131	112	112	166	2.5	0.4	43.0	22.0
J90-2741	2200	115	115	173	1.7	0.2	50.3	135.1
<i>B. napus</i>								
Cyclone	2061	108	109	130	2.2	1.8	46.1	4.4
AC Elect	1899	99	107	130	2.6	4.0	47.2	6.6
Legacy	1910	100	108	130	2.5	n.d.	46.6	6.3

<sup>1</sup> Lodging 1= no lodging, 5= completely lodged, <sup>2</sup> Blackleg: 0=no disease, 5=dead,

<sup>3</sup> Glucosinolate from Saskatoon location, n.d. = not determined.

Oil contents of the three high oil content, canola quality *B. juncea* lines J92-78, J92-223 and J92-650, were 2.5 to 3.0% higher than that of the P-population parent J90-4316 indicating significant advances in increasing seed oil contents in *B. juncea* canola. However, they were 1.0 to 2.0% lower than those in *B. napus* cultivars. The high oil content line J90-2741 (high glucosinolate) had an oil content of 50.3% and is being used as a germplasm source for further increasing oil contents in *B. juncea* seed.

Glucosinolate contents of *B. juncea* canola lines ranged from 18.8 to 22.0  $\mu$ moles per 1 g of oilfree meal of total alkenyl glucosinolates, and all lines were basically free of allyl glucosinolate. However, these levels were still approximately three times the levels of glucosinolates found in *B. napus* seed, and further reductions in glucosinolate contents would be desirable.

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