SELECTION FOR BETTER AGRONOMICAL AND NUTRITIONAL CHARACTERISTICS IN INDIAN RAPESEED-MUSTARD

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ABSTRACT

B. juncea and *B. napus* seeds from selected lines adapted to Indian conditions were evaluated for their erucic acid and glucosinolate content. Plants producing zero erucic acid in their seed oil were selected using the half seed technique. The zero erucic progeny were further selected on the basis of glucosinolate content of their leaf tissue, buds and finally the seeds. *B. juncea* plants were identified with yellow seed coats, zero erucic and high oleic (40-60%) acid contents with glucosinolates that gave rise to either only allyl or allyl plus butenyl isothiocyanate in the oil free meal. *B. napus* plants having zero erucic and high oleic (59-70%) acid contents with total aliphatic glucosinolate of 52 to 91 μm/g oil free meal were identified from early maturing (125-135 days) lines. Further work is in progress to incorporate low glucosinolate characteristic in both species.

INTRODUCTION

More than 70% of the edible oil in India is produced from groundnut and rapeseed-mustard. The presence of nutritionally toxic compounds e.g. erucic acid in the oil and glucosinolates in the de-oiled cake are the two undesirable factors in rapeseed and mustard (Kumar and Tsunoda 1980, Ahuja and Banga 1992). None of the Indian cultivars are low in any of these two compounds and attempts to introduce exotic '00' varieties have failed repeatedly. Hence, the emphasis is on breeding for lines containing low erucic acid and low glucosinolates suitable for Indian growing conditions.

EXPERIMENTAL

B. juncea lines derived from amphidiploid (*E. sativa x B. campestris*) x *B. juncea*, selected for better plant type and *B. napus* lines derived from (*B. napus x Raphanobrassica*) x *B. napus*, selected for early maturity, were used to evaluate their fatty acid and glucosinolate content. Fatty acid (FA) and Glucosinolate (GS) content were determined using the method of Thies (1971 and 1980 respectively) as modified by Raney (personal communication). Indian *B. napus* var. ISN-706 and *B. juncea* var. Pusa Bold were used as checks along with low erucic acid var. Westar and ZEM.

Single plants of Indian field grown *B. juncea* and *B. napus* where characterized

TABLE 1: Fatty acids and glucosinolate profile of some *B. napus* selections

MATERIALS	Fatty Acids (%)				
	OLEIC ACID 18:1	LINOLEIC ACID 18:2	LINOLENIC ACID 18:3	ERUCIC ACID 22:1	TOTAL ALIPHATIC GLUCOSINOLATE (μm/g oil free meal)
TBN-1	59.5	20.9	12.5	0.0	61.6
TBN-2	59.2	19.6	14.4	0.0	54.8
TBN-3	66.4	15.1	10.1	0.0	90.5
TBN-4	70.1	13.3	7.3	0.0	93.5
TBN-5	66.9	15.5	10.0	0.0	56.6
TBN-6	66.5	15.0	11.5	0.0	81.7
ISN-706	25.1	14.4	7.7	30.8	99.3
Westar	58.9	20.0	11.1	0.3	15.6

as to their FA profiles by analyzing the oil from a bulk sample of seeds. Half seed FA analysis was then conducted on 12 selfed seeds from each plant exhibiting low levels of erucic acid in the bulk analyses. The remaining half seeds, which combined very low erucic and the lowest polyunsaturated fatty acid content were grown in the greenhouse from which selfed (S) and open pollinated (OP) seeds were harvested.

The glucosinolate content of the leaves and buds of these plants, grown from the selected half seeds, were analyzed and selections made for low total aliphatic glucosinolates. In addition *B. juncea* plants were characterized as to whether the glucosinolate breakdown products present were butenyl only, a mix of butenyl and allyl or only allyl isothiocyanate.

The harvested OP seeds from each plant was analyzed to determine the total GS content of the seed and to confirm the GS profile. In the selected *B. napus* plants the glucosinolate content ranged from 55 to 91 μm/g oil free meal, all lower than the unselected population of ISN-706, as well as being free of erucic acid (Table 1). All selected plants had a lower polyunsaturated FA levels than Westar. Selfed progeny of these plants were grown in the green house, selfed and crossed to the Canola quality cultivars AC Excel, Cyclone and Shiralee to incorporate the low glucosinolate characteristic.

The *B. juncea* plants varied in their glucosinolate composition with aliphatic content ranging between 95-124 μm/g oil free meal. Some plants contained only glucosinolate that gave rise to allyl isothiocyanate while other plants produced seeds with both allyl and butenyl isothiocyanates. No plants were identified within the population examined that contained glucosinolate that yielded only butenyl isothiocyanate although the ratios of allyl to butenyl isothiocyanate varied from plant to plant (Table 2). The FA profile of the selected plants were free of erucic acid and all selections had a lower polyunsaturated fatty acid content than the low erucic line ZEM. Plants grown from selfed seeds of the selected plants have been crossed with the low glucosinolate *B. juncea* line BJ-1058 (developed at Saskatoon) to incorporate this characteristic into *B. juncea* adapted to Indian growing conditions.

TABLE 2: Fatty acids and glucosinolate profile of some *B. juncea* selections

	Fatty Acids (%)				Glucosinolate (μm/g oil free meal)		
MATERIALS	OLEIC ACID 18:1	LINOLEIC ACID 18:2	LINOLENIC ACID 18:3	ERUCIC ACID 22:1	ALLYL GLUCO-SINOLATE	BUTENYL GLUCO-SINOLATE	TOTAL ALIPHATIC GLUCOSINOLATE
TBJ-1	48.1	32.9	11.1	0.0	105.0	0.2	105.3
TBJ-2	40.6	36.3	15.2	0.0	51.6	63.8	116.3
TBJ-3	42.7	34.2	15.4	0.0	91.3	32.6	124.3
TBJ-4	52.8	29.2	9.0	0.0	94.6	0.3	95.1
TBJ-5	61.9	18.9	12.1	0.0	103.4	0.7	104.3
TBJ-6	50.0	30.7	10.4	0.0	122.5	0.8	123.6
Pusa Bold	11.5	14.5	12.3	46.7	32.2	89.0	123.8
ZEM	46.1	36.5	8.3	0.0	168.4	0.0	168.4

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