SELECTION FOR DOUBLE LOW INDIAN BRASSICA CAMPESTRIS LINES FROM BRASSICA NAPUS x BRASSICA CAMPESTRIS

S.S. Badwal, K.L. Ahuja, R.K. Raheja

Department of Plant Breeding
Punjab Agricultural University, Ludhiana-141 004, India

With the objective of developing toria lines low in erucic acid and glucosinolates, a toria cultivar TL 15 (erucic acid - 50.5% and glucosinolates - 3%) was crossed to a double low variety, Tower (Brassica napus L.). F_1 seeds exhibited 49.6% erucic acid. In the F_2, visual selections towards toria types were made. Ten single plants were selected and their F_2 progenies raised. Two of them showed 35% erucic acid. From the progeny of these two plants, 29 plants were found to contain 0.5% to 3% glucosinolates (seed basis). Two plants having erucic acid 21% and 24% and glucosinolates (1.0%) were selected and their progenies raised (F_5). Sixty two plants were selected having 11.5% to 37.8% of erucic acid and 0.5%-1.0% of glucosinolates. Eight plants with erucic acid between 11.5% to 23.8% and glucosinolates 0.5% were grown (F_6). Two plants P_2-25-P_{34}-2-P_2 and P_2-25-P_{34}-2-P_6 had erucic acid 11.2% and 13.4% respectively. One of 25 plants (bud pollinated) had 5.4% erucic acid, 0.5% glucosinolates, 49.21% oleic acid and 25.9% linoleic acid. The oil content was 39%.

INTRODUCTION

Brassica campestris var. toria is one of the major oilseed crops grown in India. Presently, more emphasis is given to the improvement in seed yield rather than on the nutritional aspect of oil and meal. Oil quality depends upon its fatty acid composition. Oil of toria differs markedly from those of other edible vegetable oils by the presence of erucic acid and eicosenoic acid, where the latter is in very large amounts (50-59%) (Ahuja et al. 1989). The oil, in addition, contains comparatively large amount of linolenic acid and small amount of linoleic and palmitic acids. Feeding experiments with animals have shown that erucic acid causes myocardial lesions (Gopalan et al. 1974). Toria meal is a rich source of protein but contains high level of glucosinolates which causes reduced appetite and productivity (Bell et al. 1972). To avoid the risk of such deleterious effects in human beings, plant breeders have developed double zero cultivars in Oleiferous Brassicas in western european countries (Johnsson and Uppstrom, 1986 and Rakow et al. 1987). However, no such attempt has been made in India to breed such cultivars. To achieve this objective a released toria cultivar TL 15 (erucic acid-50.5%) was crossed to double low summer rape canadian

Table 1. Variation in major fatty acids in different generations of an interspecific cross - Tower x TL 15

Generation/Line		Fatty acids (%)				
		Oleic	Linoleic	Linolenic	Eicosenoic	Erucic
Parent	Tower	59.5	20.5	10.5	1.3	1.2
Parent	TL 15	13.4	13.8	13.5	10.2	50.5
F_1(Seed)	Tower x TL 15	10.6	14.6	12.6	13.4	49.7
F_1(Seed)	Tower x TL 15	9.7	14.9	13.5	12.9	49.6
F_3	P_1	15.4	17.5	11.0	11.2	44.8
F_3	P_3^2	20.4	18.6	12.0	10.1	35.1*
F_3	P_3	16.1	18.2	13.5	10.5	35.7*
F_4	P_2-30	20.8	18.4	13.6	11.5	33.5
F_4	P_3^2-36	18.2	19.5	12.2	12.5	33.2
F_4	P_3-32	20.1	19.5	12.1	13.2	31.9
F_4	P_3-42	18.6	18.5	10.9	15.6	31.5
F_4	P_2^2-18	23.2	18.7	13.4	12.3	31.1
F_4	P_3^2-33	24.2	16.4	12.4	11.6	30.4
F_4	P_3-39	20.2	21.9	10.0	14.7	27.3
F_4	P_2-25	27.0	19.4	11.0	12.5	24.5*
F_4	P_2^2-24	28.0	22.9	10.4	13.8	21.1*
F_5	P_2-25-P_{13}-P_7	27.1	20.7	10.3	16.5	21.3
F_5	P_2^2-24-P_{34}-P^6	22.9	21.9	12.7	18.7	20.9
F_5	P_2^2-25-P_{13}-P^5	30.9	20.3	10.7	14.6	19.4
F_5	P_2^2-25-P_{22}-P^2	25.5	24.4	13.0	17.6	15.1
F_5	P_2^2-25-P_{34}-P^6	33.4	29.6	11.0	12.7	13.8*
F_5	P_2^2-25-P_{34}-P_2^6	32.5	27.0	11.5	13.1	11.5*
F_6	P_2-25-P_{34}-6-P_7	39.6	18.0	10.4	9.8	17.8
F_6	P_2^2-25-P_{34}-2-P^7	36.1	20.0	11.4	10.0	17.6
F_6	P_2^2-25-P_{34}-2-P^7	38.9	19.1	9.6	11.1	16.8
F_6	P_2^2-25-P_{34}-6-P^5	43.0	17.8	8.8	9.6	16.6
F_6	P_2^2-25-P_{34}-2-P^3	38.6	19.9	11.0	9.6	16.4
F_6	P_2^2-25-P_{34}-6-P^3	46.9	20.0	10.4	6.4	11.8
F_6	P_2^2-25-P_{34}-2-P^4	46.0	21.6	11.1	7.2	10.0
F_6	P_2^2-25-P_{34}-2-P^9	46.2	21.9	11.1	6.5	9.2*
F_6	P_2^2-25-P_{34}-2-P_2^{12}	49.2	25.9	11.7	2.9	5.4*

*These lines were subjected to single plant selection in the next generation.

variety - Tower (Brassica napus) in the year 1983. The results of this investigation are presented in this paper.

MATERIALS AND METHODS

An interspecific cross was made between Tower and TL 15 in the year 1983. F_1 was raised in winter of 1984. Seeds from F_1 and later generations were analysed for fatty acid composition using gas liquid chromatography. A few desirable toria type plants showing high fertility and low content of erucic acid were advanced to next generationsfor further lowering the content of erucic acid and glucosinolates. Twenty nine plants selected in F_4 were evaluated for glucosinolates using tes tape.

RESULTS AND DISCUSSION

The results of fatty acid composition of the parental lines, F_1 seeds and the selected plants in latter generations showing variation for fatty acid pattern are given in Table 1. F_1 seeds exhibited erucic acid-49.6%. In the F_2, visual selections towards toria type plants and fertility were made. Ten single plants were selected from F_2 and their F_3 progenies raised. In F_3, only two plants showed erucic acid-35%. From the progeny of these two plants, 29 desirable plants were selected and their erucic acid content was determined which ranged between 21.28% to 51.5% (F_4). These plants were also evaluated for glucosinolates which showed variation from 0.5% to 3% (seed basis) by Tes tape. Two plants having erucic acid (21% and 24%) and glucosinolates (1.0%) were selected and their progeny raised forming the F_5 generation. From F_5, sixty two plants were selected showing a range of 11.5% to 37.8% for erucic acid and 0.5-1.0% for glucosinolates. Eight plants with erucic acid between 11.5% to 23.8% and glucosinolates-0.5% were grown in winter of 1989-90 to raise F_6 generation. Two plants, P_2-25-P_{34}-P_2 and P_2-25-P_{34}-P_6 had erucic acid 11.5% and 13.8% respectively. In F_6, 25 plants were selfed by bud pollination and their seeds were analysed for fatty acid composition. One plant, P_2-25-P_{34}-2-P_2 possessed erucic acid as low as 5.4% and had 49.2% oleic acid, 25.9% linoleic acid, 11.7% linolenic acid and 2.9% eiosenoic acid. Another plant P_2-25-P_{34}-2-P_{12} had 9.2% erucic acid, 46.2% oleic acid, 21.9% linoleic acid, 11.1% linolenic acid and 6.5% eicosenoic acid. The progenies of these two plants in F_7 generation were raised in winter of 1990-91. Each plant in the progeny was selfed and their seeds will be further subjected to fatty acid analysis. The glucosinolates content of each plant will also be determined. Efforts would be made to identify plants having erucic acid below 2%, eiosenoic acid near 1.5% and linolenic acid as low as possible. From these breeding lines, in addition

to Canola type, selection for efficient plant type with high seed yield, oil content and short duration suitable to the prevalent cropping systems would be continued as in the earlier generations.

CONCLUSIONS

1. Two toria lines possessing 5.4% and 9.2% erucic acid and 0.5% glucosinolates (seed basis) have been developed.

2. The line, P_2-25-P_{34}-2-P_2 exhibited erucic acid (5.4%), oleic acid (49.2%), Linoleic (25.9%), Linolenic (11.7%) and eicosenoic (2.9%).

3. Although, low erucic acid and glucosinolates lines have been developed, yet selection for high seed yield, oil content and short duration will be the future strategy to develop Canola type cultivars which suite to the prevalent cropping systems.

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