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Short Communication

TRANSGRESSIVE SEGREGATION AND SELECTION OF ZERO ERUCIC ACID STRAINS FROM INTERGENERIC CROSSES OF *BRASSICA*

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Rapeseed mustard is the second most important edible oilseed crop in India. The Indian cultivated varieties have high erucic acid in the seed oil which is nutritionally undesirable (Gopalan et al. 1974, Sauer and Kramer 1983), and have low oleic acid while high is required for extended shelf life. 'Canola' is a trade name designating rapeseed having ideal fatty acids profile for human consumption (Downey 1990). In India, efforts were initiated during mid seventies resulting in identification/development of some 'O' erucic acid rapeseed mustard genotypes that need to be improved for their agronomic attributes (Malode et al. 1995). The available exotic 'Canola' cultivars could not be popularized in India due to late maturity and poor seed set (Anonymous 1995). The present work reports selection and development of nutritionally improved zero erucic acid rapeseed mustard strains, from the transgressive segregants of intergeneric crosses of *Brassica*, suitable for Indian agroclimatic conditions.

The advanced generation backcross derivatives of *B. juncea* derived from (*E. sativa* × *B. campestris*) × *B. juncea* (Agnihotri *et al.* 1990a) were selected for yellow seed coat and early maturity. The advanced generation backcross derivatives of *B. napus* derived from (*B. napus* × *Raphanobrassica*) × *B. napus* (Agnihotri *et al.* 1990b) were selected for shattering tolerance and early maturity. Single plant selections were made for four consecutive generations for phenotypically superior early maturing plants following the pedigree method. The plants were analysed for their fatty acids through bulk seed analysis, followed by half seed technique (Agnihotri *et al.* 1995). The single plant progenies, derived from the remaining half cotyledon of the identified zero erucic acid *B. juncea* and *B. napus*, selected for desired proportions of oleic, linoleic and linolenic acids, were utilized for development of zero erucic acid strains following the pedigree method. Agronomical selections were made during four subsequent generations. The fatty acids composition of these advanced generation lines/strains were analysed by an improved GLC method (Kaushik and Agnihotri 1997) that confirmed the stability of zero erucic acid in these lines.

As evident from Table 1, these newly developed zero erucic acid strains are significantly superior in quality as compared to the Indian cultivars. They have zero erucic acid and high oleic acid, 40-50% in *B. juncea* and 45-70% in *B. napus*, as compared to the high erucic acid (40-50%) and low oleic acid (10- 25%) in the cultivated varieties. The essential fatty acid, linoleic acid, is much higher, 30-38% in *B. juncea* and upto 22% in *B. napus*, as compared to 10-15% in the national check varieties, Varuna and GSL-1. The oil content of some of these lines viz. TERI(OE)R05, R09, M08 and M10, is marginally higher than the national check varieties.

Table 1. Quality and agronomical characteristics of zero erucic acid strains of *Brassica* species

		B. junca Strains				
S. No.	Characters	TERI(OE) M 07	TERI(OE) M08	TERI(OE) M 10	TERI(OE) M21	Varuna (NC)*
1	Days to maturity	139	136	139	117	143
2	Plant height (cm)	177	179	177	167	170
3	No. of pods/plant	490	296	471	258	530
4	1000 seed weight(g)	2.89	3.66	2.88	3.63	4.29
5	Seed colour/size	Yellow/ medium	Yellow/ medium	Yellow/ medium	Yellow/ medium	Brown/ medium
6	No. of seeds per pod	12	18	15	17	13
7	Yield (Q/ha)	17.61	18.76	18.30	18.32	20.38
8	Oil content (%)	42.8	45.6	46.1	43.7	44.4
9	Oleic acid (%)	34.47	45.0	50.0	40.6	11.42
10	Linoleic acid (%)	36.52	36.63	30.7	36.3	19.07
11	Linolenic acid (%)	16.49	13.84	10.4	15.2	10.52
12	Erucic acid (%)	0.0	0.0	0.0	0.0	48.43

		B. napus Strains				
S. No.	Characters	TERI(OE) R03	TERI(OE) R05	TERI(OE) R09	TERI(OE) R15	GSL-1 (NC)*
1	Days to maturity	136	141	149	118	153
2	Plant height (cm)	140	88	122	101	165
3	No. of pods/plant	291	212	255	210	308
4	1000 seed weight(g)	3.05	3.01	2.50	3.87	3.47
5	Seed colour/size	Brown/ medium	Brown/ medium	Brown/ medium	Brown/ medium	Brown/ medium
6	No. of seeds per pod	22	20	24	24	17
7	Yield (Q/ha)	19.01	17.58	13.31	14.23	15.90
8	Oil content (%)	43.3	47.5	50.2	46.3	46.4
9	Oleic acid (%)	59.5	47.68	70.1	45.60	24.42
10	Linoleic acid (%)	20.9	22.73	13.3	22.50	14.67
11	Linolenic acid (%)	12.5	10.19	7.3	8.13	8.87
12	Erucic acid (%)	0.0	0.0	0.0	0.0	36.93

*NC-National check variety

These zero erucic acid strains have been evolved from the transgressive segregants of the backcross progenies of the intergeneric hybrids derived through *in vitro* embryo rescue, followed by callusing and secondary embryogenesis (Agnihotri *et al.* 1990a, b). Chromosome alterations in callus cultures is well documented in literature (Hayliss 1980, Shepard *et al.* 1980) and tissue culture conditions are known to cause increased genetic variations termed somaclonal variations (Lee and Philips 1987, Larkin and Scowcroft 1981, Zehr *et al* 1987). There is a possibility that these embryos have undergone chromosomal changes/mutations during *in vitro* culture leading to the altered fatty acid biosynthesis.

A significant reduction in the days to maturity was observed in a large number of segregants. Some of the selected zero erucic acid *B. napus* [TERI(OE)R03 and R15] and *B. juncea* [TERI(OE)M08 and M 21] strains matured 17 to 35 days earlier than the national check varieties. Thurling and Kaveeta (1991) have reported introgression of early flowering and early maturity in *B. napus* from the primary and secondary gene pools of *B. campestris*. The parents involved in the intergeneric hybridization i.e. *B. campestris, E. sativa* and *Raphanus sativus* are early in maturity (90 to 120 days) as compared to the rapeseed mustard cultivars (130 to 160 days) and seem to be responsible for the introgression of earliness in the transgressive hybrid progenies that were utilized for developing the early maturing zero erucic acid strains of *B. juncea* and *B. napus*. Further work is in progress to make selections for the improvement in economically important agronomic attributes to overcome the marginal yield penalty. These nutritionally superior quality strains provide useful gene pool that can be profitably utilized in further breeding programmes.

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