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ADVANCES IN BREEDING FOR BASAL BRANCHING AND PRODUCTIVE LINES OF *Brassica juncea*

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ABSTRACT

An attempt was made to study the variability of basal and non-basal branching genotypes in F_3 and F_4 generations derived from nine crosses in Indian mustard (*Brassica Juncea*) [Czern & Coss (L)]. Sixty four F_3 families were studied for yield and yield attributes. Among them thirty two were selected and F_4 families of them were evaluated for yielding ability. The results revealed that there is sufficient variability available for all the plant type and yield parameters in the F_3 generation. A selection towards basal branching types is suggested to enhance the seed yield in *B. Juncea*.

Key Words: *Brassica Juncea*, basal branching; selection; variability.

INTRODUCTION

A pre-requisite for any selection programme is the existence of genetic variability. In Indian mustard (*Brassica Juncea*), the genetic variability is limited (Rai, 1989). A major advance was made in this respect by Prakash (1973), when a large number of ampidiploids were synthesized. Based on several studies it has been suggested that (Jain, 1984; Labana, 1984) the ideal plant for improved agronomic situations should be 1m tall with basal and compact branching having appressed pods and higher number of bold seeds. However, the studies relating to basal branching and its utilization are very scarce. Basal branching genotype has been defined (Vijayakumar *et al.*, 1994) as one in which at least one productive primary branch initiates within a height of 30 cm (H_1) from the ground.

The aim of this paper is to examine the variability, particularly for basal branching and its association with yield in F_3 and F_4 generations of some inter-varietal crosses made using cultivars and synthetic strains of *B. Juncea*.

individual plants were selected for basal branching and other yield components during *rabi* 1989.

List of crosses and their pedigree

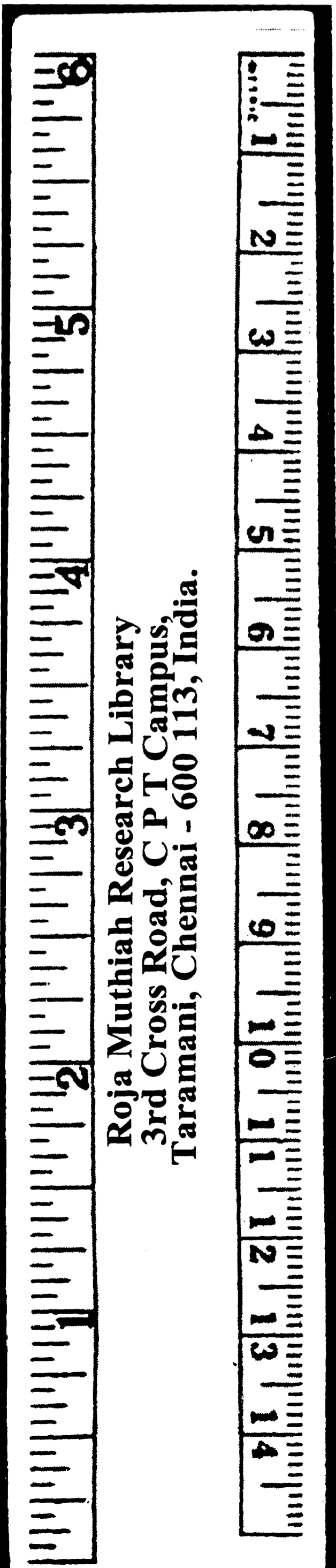
| Cross | No. of Plants | Expanded pedigree |
|-------|---------------|---|
| PBRN | 10 | PB = Pusa Bold |
| PBNN | 6 | RN = Synthetic <i>B. Juncea</i> |
| PBYS | 8 | (<i>B. campestris</i> ssp. <i>rapifera</i> x <i>B. nigra</i>) |
| JNRN | 6 | NN - Synthetic <i>B. Juncea</i> |
| JN NN | 4 | (<i>B. campestris</i> ssp. <i>narinosa</i> x <i>B. nigra</i>) |
| RN JN | 8 | YS = Yellow seeded <i>B. Juncea</i> |
| RNYS | 8 | (An accession from Poland) |
| NNRN | 8 | JN = Synthetic <i>B. Juncea</i> |
| RNNN | 6 | (<i>B. campestris</i> ssp. <i>japonica</i> x <i>B. nigra</i>) |

MATERIALS AND METHODS

In the F_3 of nine crosses detailed below, 64

F_3 families from the selected plants were raised during *rabi* 1990 on plant-to-progeny basis.

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* p = 0.05; ** p = 0.01

Each family was sown in four rows of 3m length with a spacing of 75cm between rows and 10 cm between plants. Single plant data were collected on seven traits which included those indicative of basal branching, namely, number of primary (PBI) and secondary (SBI) branches within the height (H), in addition to plant height (HT), seed yield (SY) and harvest index (HI) on per plant basis. An entry where two-thirds of the selected plants were basal branching were considered as basal branching entries, and the rest as non-basal branching.

Data collected on five randomly chosen plants was subjected to ANOVA. Using the method of Arunachalam and Bandyopadhyay (1994), the 64 families were grouped into four classes, H:High, M+:Medium above mean, M:Medium below mean and L:Low using a performance score computed across the seven traits. The top 50% entries in each class was selected to give 32 families. The F_4 progeny of the selected F_3 plants from all the nine crosses was raised during *rabi* 1991 in a RBD, where each family was sown in a single row of 5m length in two replications with spacings mentioned earlier. The seed yield (g) per plot of each family was recorded.

RESULTS AND DISCUSSION

The variation between the 64 families was significant for all the traits. The coefficient of variation (C.V.) was greater for basal branching traits (Table 1) than others. However variation was subdued for the economically important traits, seed yield and harvest index. But the C.V. for SYI and HII were 4 and 5 times that of SY and HI, indicating that utilised variability was abundant for basal branching productivity traits. Though high variation for number of branches was recorded earlier (Paul, 1978), such variation for basal branching as observed in this study has not yet been reported. This was followed by significant differences in F_4 families for seed yield.

Data on mean seed yield of 32 selected families in F_3 and F_4 brought to light that all the productive families with high (H) or M+ overall status were basal branching. Despite some having M+ status, most of the non-basal branching families were of M-status. No basal branching families attained overall status 'L'. The mean seed yield (g) of families with high status was 23.3, followed M+ (21.4g), M-(16.8g) and low (11.9g). Since index selection was reported to be efficient in preliminary selection for single plant yield (Chatterjee and Bhattacharya, 1986; Teresa, 1987), the results of this study would add a modification that stable and high yields could preferentially be selected for using basal branching traits, PBI, SBI, SYI and HII.

The progress of yield improvement from F_3 and F_4 indicated that the mean seed yield of basal branching families in F_4 (320g) was lower to non-basal branching families (353g). The regression of F_4 seed yield on F_3 was negative and significant with respect to basal branching families, while for non-basal branching types, it was positive and significant. Basal branching families, while for non-basal branching types, it was positive and significant. Basal branching families segregated into 68% of non-basal branching plants in F_4 , indicating high heterozygosity for basal branching. In contrast, non-basal branching families gave an average of 77% of non-basal branching plants in F_4 , confirming high genetic uniformity of non-basal branching types. This could be a main reason for the comparatively low yields of basal branching F_4 families. In view of the above results it is advisable that individual selection be practised for basal branching types beyond F_3 generation. Nevertheless, the results gave a conclusive trend that it is possible to breed for basal branching and high productivity disproving contrary opinion by some physiologists (Bhargava and Tomar, 1982; Bhargava *et al.*, 1983; Chauhan *et al.*, 1987). A variety evolved with basal branching and high production of about 29.4 q/ha compared

to the yield of about 25 c/ha of the check, Pusa Bargni is in All India Trials. This is an encouraging proof, and it is time breeders invest sufficient efforts to evolve basal branching mustards, in future.

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Table 1. Mean (M), range (R) and coefficient of variation (CV) for seven traits in 64 families

| Trait | M ± S.E.m | R | CV (%) |
|--|--------------|---------------|--------|
| HT: Plant height (cm) | 218.5 ± 6.10 | 172.4 - 264.0 | 8.1 |
| PB 1 : No. of primary branches at H1 | 0.8 ± 0.49 | 0 - 3.0 | 116.0 |
| SB 1 : No. of secondary branches at H1 | 2.3 ± 1.62 | 0 - 7.3 | 111.3 |
| SY1 : Seed yield (g) at H1 | 1.2 ± 1.03 | 0 - 7.3 | 134.4 |
| SY : Seed yield (g) / plant | 17.2 ± 3.57 | 6.2 - 34.0 | 13.7 |
| HI 1 : Harvest index (%) at H1 | 0.8 ± 0.57 | 0 - 3.7 | 130.3 |
| HI : Harvest index (%) / plant | 13.8 ± 1.50 | 7.5 - 24.1 | 24.0 |