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TO ESTIMATE THE GENETIC COMPONENT OF VARIANCE AND GENE EFFECTS FOR YIELD AND QUALITY CHARACTERS IN INDIAN MUSTERED CROP (*Brassica Juncea* [L.])

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Abstract

The research was carried out during *Rabi* seasons in the two successive years, 1996-97, and 1997-98 in the research farm of BNPG College Rath, Hamirpur, Uttar Pradesh (India). The analysis of variance for all the 11 characters under study was computed for testing the significance of differences among the treatment such as parents, F_1s, F_2s, parent vs. F_1s and parent vs F_2s. In case of P + F_1s, the test revealed highly significant differences for all the traits in this study. The differences between the parents were highly significant for all the characters indicating sample diversity among them. The variation among the F_1s was highly significant for all the 11 characters. The comparison of parents v/s/ F_1s exhibited significant differences for all the characters except days to flowering indicating a substantial amount of heterosis for the characters studies.

Keyword: *Indian Mustered Crop, Analysis of variance, Quality characters,*

Introduction

Oil crops play in important role in agricultural economy of India. The major oilseed crops are Groundnut, Rapeseed-mustard, Sesame, Linseed Castor, Safflower and Niger and grown in an about 13 per cent of gross cropped area. The country has distinction of being the largest grower of oilseed crops and has reached to near self-sufficiency in edible oil production but still there is wide scope for increasing production to food for fast growing population of the country. Rapeseed-mustard holds the promise in this aspect as it has both horizontal and vertical growth during the last decade. Rapeseed-mustard are major Rabi oilseed crop of northern India. It occupies a prominent position, next to groundnut, among the various oilseed crops grown in India. The total production under oilseeds has gone up from 0.76 million tonnes (1950-51) to 4.09 million tonnes in (2000-01). In U.P., the total area was 1.18 million hectares under oilseeds with the production of 1.14 million tones during 1996-97 and rapeseed-mustard occupied an area of about 1.07 million hectares and production of about 1.09 million tones, respectively during 1999-2000. The state of Uttar Pradesh has the largest share of about 17.63 per cent in area and 18.29 per cent in production of the country. However, in our country the productivity is very low (982 kg/ha) in comparison to other rapeseed-mustard growing countries like Germany where it is 2600 kg/ha.

Few researchers' work on the different parameters of crops which are given below:

Chander *et al.* (1985) reported high values of gca for seed yield, number of secondary branches, plant height and 1000-seed weight in Indian mustard. Parents showed highest specific combinations for seed yield, number of secondary branches, number of siliquae on main receme. RC 1268 was a good general combiner for most of the characters.

Dhillon *et al.* (1990a)in Indian mustard worked out seven agronomic traits viz., seed yield, seed size, primary and secondary branches, plant height, main receme length and pods on main receme. gca and sca variances were important for almost all the characters evaluated though former was larger in magnitude than later except for seed yield. Variety RLM 198 was found as best general combiner for all the traits except seed size.

Chauhan and Singh (1979) observed significant negative heterosis in a large number of crosses than positive heterosis in most of yield contributing traits. They also reported inbreeding depression to be low for days to maturity, days to flower, seed per siliqua, high for plant height, secondary branches, 1000-seed weight and seed yield per plant.

Comstock and Robinson (1948 and 1952) pointed out that it was theoretically possible to obtain estimates of over-dominance due to repulsion phase linkage in the material such as they used although the individual gene has expressed no more than partial dominance whether or not linkage has caused upward bias in the estimates obtained can be investigated by studying advanced generations in the manner suggested by Gardner *et al.* (1953) and Gardner and Lonnquits (1959). According to them if average degree of dominance decreases in later generation them linkage is confirmed.

A set of 45 F1s were made during Rabi 1996-97 using 10 x 10 diallel excluding reciprocals. The F1s were advanced in off-season nursery during summer 1997.

The experiment consisting 10 parents, their 45 F1's along with 45 F2's was conducted during 1997-98 in a Randomized complete Block Design with three replications at BNV College, Rath (Hamirpur). Each treatment was sown in 3 meter long in two rows each at the spacing of 45 cm row to row and 15 cm plant to plant. All the recommended agronomical practices were provided for good crop production.

Methods and material

The data were recorded on 10 randomly selected plants in parents and F_1s and 20 in F_2s for following characters:

1. Days to flowering:

The number of days for 50 per cent of flowering was counted from the date of sowing in each parents/cross and in each replication.

2. Days to maturity:

The number of days for physiological maturity was counted from date of sowing in each parents/cross and in each replication.

3. Plant height:

It was measured in centimeters from the ground level to the terminal shoot of the plant at the time of maturity with the help of meter scale.

4. Number of primary braches per plant:

Total number of primary branches bearing siliquae were counted from the base of the plant when it was to be matured.

5. Number of secondary branches per plant:

Total number of productive branches arises from primary branches were counted before harvesting in the sampled plants at the time of maturity.

6. Number of siliquae per main fruiting branch:

Total number of siliquae on main shoot bearing seeds were counted in selected plant at the time of maturity and mean number were calculated.

7. Number of seeds per clique:

Seeds of five randomly selected siliquae were counted and average number was estimated.

8. Siliqua length:

Length of five randomly selected siliqua was measured separately in cm. and the average length was calculated as usual procedure.

9. Test weight:

Exact 1000-random seeds of each parents and crosses were counted from each replication and weighed in g upto two decimal points with the help of electronic balance.

10. Oil content:

It was measured in percent with the help of nuclear magnetic resonance (NMR) instrument.

11. Seed yield per plant:

The seeds of each selected plants were bulked and weighed with the help of electronic balance in g upto two decimal points then average weight were calculated.

Results

To study the eleven characters of Indian Mustered namely days to flowering, Plants height, Number of branches per plant (primary and secondary), number of siliquae, per main raceme, Number of seed per siliquae, Siliqua length, days to maturity, 1000 seed weight, oil content %, seed yield per plant, gm were observed and analysis of variance was calculated and shown Table 1 and Table 2. The results obtained were discussed accordingly as under:

Table 1 Analysis of Variance for parents and F_1s for 11 Characters in 10 x 10 diallel Cross in Indian Mustard. (Mean sum of squares).

Source of variation	d. f.	Days to flowering	Plant height (cm)	No. of Branches / plant.		No. of siliquae/ main receme	No. of seeds / siliqua	Siliqua length (cm)	Days to maturity	1000 – seed weight (g)	Oil content (%)	Seed yield/ plant (g)
				Primary	Secondary							
Replications	2	2.567	3.512	1.615	7.824	232.462	0.205	1.128	37.010	0.0034	0.031	0.075
Parents	9	44.900**	3562.476**	1.060**	8.250**	7519.936**	6.902**	0.887**	1105.818**	0.907**	1161.2**	14.752**
F_1s	44	20.293**	735.202**	0.613	9.109**	31005.942**	3.827**	0.418**	1671.151**	.712**	5.324**	34.564**
P v F_1s	1	2.966	2279.28**	21.150**	127.290**	317686.460**	11.898**	0.204**	1472.315**	0.925**	0.612**	377.736**
Error	108	1.949	1.949	0.178	1.108	414.185	0.207	0.097	36.062	0.0101	0.0233	0.424

Table 2 Analysis of Variance for parents and F_2s in 10 parents diallel cross in Indian Mustard. (Mean Sum of Squares).

Source of variation	d.f.	Days to flowering	Plant height (cms)	No. of Branches / plant.		No. of siliquae/ plant	No. of seeds / siliqua	Siliqua length (cm)	Days to maturity	Test weight (g)	Oil content (%)	Seed yield/ plant (g)
				Primary	Secondary							
Replications	2	1.223	12.825	0.537	0.148	10.032	0.188	0.469	4.302	0.023	0.025	0.106
Parents	9	44.899**	3562.476**	1.060**	8.250**	75.19936**	6.902**	0.869**	1105.818**	0.907**	11.612**	14.752**
F_1s	44	8.699**	543.773**	1.538**	17.014**	41407.814**	2.882**	0.336**	2435.575**	0.793*	5.058**	84.036**
P v F_2s	1	8.337**	106.462**	3.273**	127.298**	17949.168**	24.755**	0.048	2493.836**	0.782**	0.310**	99.195**
Error	108	2.183	5.656	0.165	0.221	141.199	0.176	0.122	27.474**	0.009	0.036	0.106

The analysis of variance for all the 11 characters under study was computed for testing the significance of differences among the treatment such as parents, F_1s, F_2s, parent vs. F_1s and parent vs F_2s. the mean sum of squares for all the characters are presented in Table 1 and 2.

In case of P + F_1s, the test revealed highly significant differences for all the traits in this study. The differences between the parents were highly significant for all the characters indicating sample diversity among them. The variation among the F_1s was highly significant for all the 11 characters. The comparison of parents v/s/ F_1s exhibited significant differences for all the characters except days to flowering indicating a substantial amount of heterosis for the characters studies.

In case of P + F_2s, the parents and F_2s showed highly significant differences for all the characters. The parents v/s F_2s showed significant differences for all the characters except days to flowering.

Analysis of variance for pooled data of P + F_1s and P + F_2s was furnished in Table 1 and 2. The differences among the genotypes were highly significant for all the traits in all the combinations such as treatment, parents, F_2s and parents vs. F_2s.

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