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GENETIC PARAMETERS OF YIELD IN M3 AND M4 GENERATIONS OF RICE (Oryza sativa L.)

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ABSTRACT

Mutagenesis in Co 37 variety of rice was induced with gamma rays and Ethyl Methane Sulphonate. Polygenic variability was studied in M3 and M4 generations. The mean showed a declining trend with the increasing doses of mutagens in both viz., M3 and M4 generations. The phenotypic and genotypic variances and its co-efficient of variation for the yield were reduced in M4 compared to M3 If the selection pressure applied at the lower doses of 10 mm EMS and 25 or 30 KR of gamma rays found to throw economic mutants.

Artificial induction of mutation is a breeding approach to create new variability. But emphasis was largely made so far on macro mutation though the role played by micro or polygenic mutations is considerable in plant breeding programmes. The effects of micro mutations could be recognised only in later generations. To study the genetic parameters in the later generations of rice viz., M3 and M4 after exposing to physical and chemical mutagens, the present investigation was carried out.

MATERIALS AND METHODS

The rice strain Co 37 (Vaigai) was exposed to chemical mutagen, Ethyl Methane Sulphonate at 10, 20, 30, 40, 50, and 60 mm and gamma rays at 10, 20, 25, 30, 35 and 40 KR and the M1 and M2 generations were studied earlier (Nallathambi, 1979). In M3, 356 families were studied and based on the performance, 134 families were forwarded to M4 generation. Both the generations viz., M3 and M4 were raised in a randomised block design with three replications adopting a spacing of 20 x 10 cm. There was 60 plants in each replication. Twenty plants were selected at random in both the generations and the per plant yield was assessed. The data were statistically analysed for genetic parameters (Singh and Chaudhury, 1977).

RESULTS AND DISCUSSION

In general, the mean, CV, phenotypic and genotypic variances for yield showed reduction in M_4 compared to M_3 generation (Table 1). In both the generations, with the increase in dosages of the mutagens, the mean value showed a decreasing trend except 20 mm, 30 mm of EMS and 20 KR at M3 generation, indicating an inverse relationship between dose and effect. Bateman (1959) in rice and Gardener (1969) in maize also reported such negative shifts. The CV found to reduce from M3 to M4 for any doses probably due to its attainment towards homozygosity.

In general, the phenotypic and genotypic variance were of greater magnitude in M3 generation accompanied by greater phenotypic and genotypic coefficient of variation respectively. Among different doses, minimum PVC and GCV were noticed with 40mm of EMS and 10 KR of gamma rays indicating more stable in performance. Low variability and heritability exhibited by higher dose viz., 35 and 40 KR gamma rays

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Table 1: Mean, coefficient of variation and genetic parameters in M3and M4 generations for yield.

Treatment	Mean(g)		C.V.		P.V.		G.V.		P.C.V.		G.C.V.		Heritability(%)		Genetic advance		GA as % over mean	
	M_3	M_4	M_3	M_4	M_3	M_4	M_3	M_4	M_3	M_4	M_3	M_4	M_3	M_4	M_3	M_4	M_3	M_4
EMS (mm), +																		
10	14.5	11.8	16.8	10.7	9.5	7.2	3.5	5.6	21.3	22.6	12.9	14.9	36.2	77.1	2.4	4.3	16.2	36.2
20	15.1	10.4	13.8	13.4	9.1	3.0	4.7	1.1	19.9	16.7	14.4	9.9	51.2	35.6	3.2	1.3	21.4	12.1
30	15.3	10.3	25.0	8.1	15.4	1.8	0.6	1.2	25.6	13.2	5.2	10.4	4.9	62.5	0.3	1.7	2.2	16.9
40	12.9	10.1	26.3	10.8	13.5	1.9	1.7	0.7	28.2	13.5	10.0	8.1	12.3	35.4	0.9	1.0	7.3	10.0
50	11.7	10.8	31.3	14.1	13.3	3.6	-	1.3	30.8	17.5	-	10.4	-	35.2	-	1.4	-	12.6
60	13.9	10.9	20.3	9.2	11.3	3.6	3.2	2.6	24.1	17.5	12.8	14.8	28.2	72.3	1.9	2.8	14.1	25.9
Gamma rays (KR)																		
10	11.2	10.1	20.7	11.7	8.7	1.6	3.3	0.7	26.3	12.5	16.1	4.1	37.1	10.9	2.3	0.3	20.3	2.8
20	15.0	11.1	17.4	15.5	16.8	4.4	9.9	1.3	27.3	18.4	21.0	9.9	59.9	28.5	5.1	1.2	33.3	10.9
25	12.9	10.2	16.5	12.6	13.1	4.7	8.5	3.0	27.9	21.1	22.5	16.9	64.3	64.5	4.8	2.8	37.5	28.0
30	13.7	10.1	19.1	10.5	10.5	3.3	3.6	2.1	23.5	17.9	13.8	14.5	34.2	65.6	2.4	2.4	16.8	24.3
35	11.6	9.8	13.7	13.8	4.9	2.2	2.4	0.3	19.1	14.7	13.3	5.4	48.7	13.9	2.2	0.4	18.9	4.1
40	14.3	9.9	23.8	21.7	17.3	5.8	5.7	1.2	29.2	24.3	16.8	10.9	33.2	20.1	2.8	1.0	19.9	10.2
Control	14.6	12.4	17.8	11.4	6.9	4.1	-	0.8	17.7	16.3	-	7.1	-	19.8	-	0.8	-	6.4

indicated drastic mutational effect for chromosomal aberrations rather than gene mutation (Sucrossiroli, 1964). High heritability, genetic advance and genetic advance percentage over mean were shown by 10 mm dose in EMS while 25 and 30 KR in gamma rays exposure. Johnson *et al.* (1955) suggested that the high heritability coupled with genetic advance would be more useful in predicting the effectiveness of the character for improvement. High yielding polygenic mutant could be isolated from the treatment showing high heritability and genetic advance was reported by Ota *et al.* (1962) and Yamaguchi (1962). Hence exposing lower doses viz., 10 mm in EMS and 25 to 30 KR in gamma rays in rice with selection pressure in latter generations viz., M4 and M5 would throw economic polygenic mutants.

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EVALUATION OF SOME COTTON GENOTYPES ON THE BASIS OF COMBINING ABILITY IN A DIALLEL CROSS

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ABSTRACT

Combining ability analysis in a 13 x 13 diallel cross involving nine tall and four dwarf cotton genotypes revealed that additive genetic variance played an important role in controlling yield and quality. Four tall parents, PH-93, NH-210, suman and LRA-5166 were good general combiners for seed cotton yield, boll number, boll size and seed index. Among the dwarf genotypes, NH-262(a) and 081 were good general combiners for halo length and ginning out turn respectively. Six crosses involving tall x dwarf parents, four of tall x tall and one of dwarf x dwarf had high sca effects worthy of further exploitation.

Combining ability analysis was attempted in a 13 x 13 diallel cross involving some tall and dwarf genotypes with a view to identify better cross combinations for improving yield and quality characters and develop early maturing highly productive dwarf genotypes of **G. hirsutum.**

MATERIALS AND METHODS

Thirteen genotypes viz., PH-44, NH-352, suman, Purnima, NH-210, LRA-5166, PH-93, Athens-1 MCU-5 (Tall parents) and Cul-1412, 081, NH-262(a), NH-262(b) (dwarf, compact genotypes) were crossed in a diallel fashion excluding reciprocals. Thirteen parents and 78 F1 were sown in a randomised block design with two replications at Cotton Research Station farm during 1986-87 kharif season. Each genotype was represented by a single row consisting of 15 dibbles spaced at 60 cm in rows 60 cm apart. Recommended agronomic practices were adopted for maintaining good crop growth. Field observations were recorded on 5 plants in each plot. Boll weight was recorded on the basis of 20 bolls randomly picked from each plot. Post harvest observations viz., seed index, ginning outturn, halo length were estimated using procedures outlined by Santhanam, (1967). Combining ability analysis was made according to model-1, method-2 of Griffing (1956).

RESULTS AND DISCUSSION

Analysis of variance for combining ability (Table-1) revealed significance of both general and specific combining ability effects in expression of all the characters

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