seed yield was less than the population mean seed yield. 'TLC 1' performed the best under low yielding environments, especially in year 1984-85, as reflected by low value of regression. 'TWC 3' and 'TGC 3' also performed better under low yielding environments but all these genotypes had low mean seed yield and large deviation values. However, genotypes like 'TK6' and 'TH 63' had high mean seed yield and performed better under low yielding environments.

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INDUCED POLYGENIC VARIABILITY IN RICE

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ABSTRACT

Two short duration rice varieties ADT 31 and Co 33 were subjected to induced mutagenesis with three doses each in gamma rays and EMS with a view to findout the economic potentiality of viable mutants and to study the nature of induced variability in M2 generation. Significant shift in the mean value was observed in different mutagen treatments for all characters except panicle length in ADT 31 and Co 33. The mean plant height decreased in Co 33. Grain yield significantly increased in all the three mutagen treatments with gamma rays in Co 33. The genotypic variance in M2 was of higher magnitude in most of the treatments as compared with the control. High heritability combined with higher genetic advance was observed in all the treated populations for plant height, productive tillers and plant yield except 120mM EMS treated population in Co 33 indicating that the induced genetic variation was due to additive effect. The magnitude and heritable portion of the induced variations differed with the genotype, character and mutagen.

KEY WORDS : Rice, Induced mutagenesis

Induced mugagenesis in self-fertilized annual species of crop plants has resulted in an enhanced genetic variability in quantitative characters associated with productivity. An important aspect of mutation breeding has been the quick mutational rectification of defects in varieties besides induction of polygenic mutations and development of ideotypes for varied agroclimatic conditions. As many as 68 mutants of rice have been evolved through induced mutagenesis and recommended for cultivation in different situations (Sharma, 1985). The present study was undertaken to find out the economic potentiality of viable mutants and to observe the nature of induced variability

in yield characters in two short duration rice varieties.

MATERIALS AND METHODS

Two early maturing rice cultivars ADT 31, a medium grain type and Co 33, a round grain type were treated with three doses each of gamma rays and ethyl methane sulphonate (EMS). Dry seeds with 10-12% moisture were exposed to 30, 40 and 50 kr doses of gamma rays produced from a 60 co gamma cell. Seeds presoaked in water were treated with freshly prepared aqueous solutions of 120 mM, 140mM and 160 mM EMS for 10.5 hours with intermittent shaking at 25 ± 2°C. Seeds treated with chemical mutagen were thoroughly washed in running water before sowing. Seeds of each treatment were sown in the field as M1 and untreated seeds as control. At harvest, seeds from the first formed three panicles in all normal looking M1 plants were bulked treatment- wise and grown as M2 along with the control, in two row plots of 5 m long adopting a randomised block design with two replications at a spacing of 20 x 10 cm. Single seedling was planted in a hill and normal cultivation practices followed. Measurements were taken on 15 plants per replication per treatment on flowering days, plant height, productive tillers, panicle length and plant yield. Standard statistical procedures were used for analysis of variance and for estimation of other genetic parameters (Panse and Sukatme, 1961).

RESULTS AND DISCUSSION

The character mean in different treatments either increased or decreased as compared to the control, the shift in the mean being highly significant only in some treatments (Table 1). The mean remained unchanged for panicle length in both ADT 31 and Co 33, for flowering days and productive tillers in Co 33 and for plant yield in ADT 31. The mean for flowering days was significantly increased at 40 kr, 50 kr, 120 mM EMS and 160 mM EMS in ADT 31. Plant yield significantly increased in all the three treatments with gamma rays in Co 33, whereas it had a reverse trend at 140 mM EMS.

The mean value for heading date, plant height, panicle length and grain yield were shifted in the negative direction in treatments with one or more doses of gamma rays (Shaini and Sharma, 1970 and Mallick *et al.*, 1979).

The variance for different characters in the mutagen treated populations was significant except in the treatments with 140 mM EMS in ADT 31 and 50 kr in Co 33 for productive tillers, all the gamma ray treatments in both ADT 31 and Co 33 and 140 mM EMS in ADT 31 for panicle length and 120 mM EMS in Co 33 for plant yield. The observed variance for various characters was far greater in magnitude than the respective control in most of the treatments. Increase in variance in quantitative characters was observed in M2 generation following mutagenic treatments in rice (Oka *et al.*, 1958 and Jana and Roy, 1973).

The genetic variance for any character in the individual mutagen treated population was of higher magnitude in most of the cases as compared with the control. In ADT 31, the extent of genetic variance was less than the control in 30 kr and 140 mM EMS for panicle length only. CO 33 also had reduced variance at all the mutagen treated populations for panicle length, the three chemical mutagen treated populations for flowering days, 120 mM EMS for productive tillers and 30 Kr and 120 mM EMS for plant yield. There was thus differential response of polygenic traits to different mutagens. The variability exhibited for different attributes would appear to be independent of varieties as also doses of mutagens. The increased variation might have been brought about by

imates and eatments	Flowering days		Plant height		Productive tillers		Panicle length		Plant yield	
	ADT 31	Co 33	ADT 31	Co 33	ADT 31	Co 33	ADT 31	Co 33	ADT 31	Co 33
ıtrol	71.5	71.0	86.3	84.2	15.7	12.3	20.1	18.9	23.1	20.2
ır Gamma	77.7	74.2	84.8	69.5	15.2	15.0	21.3	21.2	26.7	20.0
ır	78.8	74.2	85.5	69.2	13.6	15.3	21.3	20.3	26.4	28.8
Kr	82.2	75.0	82.7	69.7	13.5	15.0	20.7	20.5	22.1	30.4
mM EMS	79.3	75.2	92.4	73.8	13.3	15.0	22.0	20.4	19.0	21.4
mM	78.2	72.3	83.1	68.9	10.2	11.9	21.2	18.3	24.0	18.6
mM	85.8	76.0	90.5	76.8	11.7	12.5	22.1	19.7	24.6	22.2
	2.4	1.9	2.2	5.5	2.0	1.1	0.7	0.8	1.6	0.6
	6.9	5.4	6.2	15.5	5.6	3.0	2.0	2.3	4.5	1.6
Squares										
ıtrol	6.6	17.5	8.6	9.3	5.2	3.3	2.1	1.3	6.3	11.2
ır Gamma	34.8**	31.6**	52.8**	62.0**	25.1**	14.0**	6.1	4.8	66.0**	23.3**
ır	31.9**	35.1**	39.5**	55.7**	19.4**	12.3**	5.1	2.1	32.3**	54.9**
Kr	42.6**	25.0**	29.6**	108.0**	12.1**	6.8	3.4	3.3	34.2**	51.5**
mM EMS	43.7**	15.1**	124.5**	139.3**	12.4**	9.5**	9.9**	7.7**	41.6**	11.5
mM	66.9**	16.9**	285.0**	76.9**	6.0	9.8**	3.6	6.0**	81.5**	39.5**
mM	29.8**	33.6**	365.0**	174.7**	16.5**	31.2**	8.1**	5.9**	79.9**	59.1**
ic Variance										
ol	1.1	7.0	2.3	2.1	0.8	0.8	0.5	2.9	2.1	10.0
Kr Gamma	8.6	11.4	23.3	26.6	9.9	5.4	0.4	1.7	26.9	7.3
r	4.6	13.8	18.1	28.8	4.8	3.1	0.5	1.4	10.1	17.7
Kr	11.1	7.3	12.4	53.4	5.0	1.6	1.5	0.1	14.4	21.9
mM EMS	3.2	0.3	53.1	65.4	3.7	0.6	3.0	2.6	17.4	3.1
mM	23.9	6.6	140.3	35.3	1.4	3.6	0.4	2.3	36.7	16.2
mM	21.5	4.3	180.8	85.6	6.7	13.3	2.7	1.3	36.5	17.4
bility										
ol	15.1	66.1	35.5	29.3	19.2	31.6	28.3	18.7	51.6	29.7
Kr	32.7	56.8	78.8	75.1	65.5	62.9	7.7	55.2	68.9	45.9
Kr	17.0	64.8	84.5	74.8	32.8	33.6	10.3	19.5	43.5	47.7
Kr	35.1	41.0	72.1	97.8	69.0	29.7	82.4	28.5	72.7	53.0

the formation of new alleles or by the increased recombination by breaking linkages.

The estimations of heritability in broad sense and the genetic advance as percentage of mean for different characters were higher in most of the populations in M2 than in the untreated populations. High heritability combined with high genetic advance observed in all the treated populations in both the varieties for plant height, productive tillers and plant yield except at 120 mM EMS in Co 33 for productive tillers indicated that the variation was due to additive genetic effect. The magnitude and heritable portion of the induced variations were found to differ depending upon the genotype, character and mutagen (Rao and Siddiq, 1977; Das *et al.*, 1979). High heritability was reported in M2 and subsequent generations in rice (Anandakumar and Sree Rangasamy, 1986 and Chaudhury *et al.*, 1980). High heritability with high genetic advance was observed for productive tillers and plant yield in rice (Rao and Siddiq, 1977).

All the mutagen treated populations produced mutants with extreme values in respect of all characters and such an enlarged variability would offer ample scope of selection for improvement of yield and yield characters. Mutants with plus and minus values were also observed for plant height in one and the same treatment, particularly in ADT 31. All the mutagen treated population in Co 33 had more number of mutants with significantly reduced mean plant height.

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COMBINING ABILITY IN GRAIN SORGHUM

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ABSTRACT

A diallel set of 10 varieties of grain sorghum **Sorghum bicolor** (L.) Moench was studied to estimate the combining ability for yield and yield contributing traits. The **sca** variance was higher than **gca** variance for almost all the characters. Entry M - 209 was better general combiner for earliness, GJ-35 for dwarfness, DMYT 231 for panicle length, DR 23, for grain yield and M-209 for stover yield. Hybrids GJ - 36 x DR - 20 and GJ-35 x DMYT-231 had high sca effect for days to 50% flowering, GJ-36 x DR-23 and GJ-35 x DMYT-231 for earliness, M-209 x DR3-1 and GJ-36 x DR-10 for dwarfness, GJ-35 x M-209 and GJ-35 x DR-10 for panicle length, GJ-36 x M-229 and M-211 x DR-10 for grain yield.

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