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Induced Variability in Groundnut in M_2 Generation

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ABSTRACT

Seeds of groundnut variety GAUG-1 were irradiated with 10, 20, 30, 40 and 50, KR of gamma rays and then post treated with 0.2 and 0.4% Ethyle Methane Sulphonate to induce variability. M_2 generation of treated seeds was studied for induced variability. Germination, number of leaflets and plant height were reduced while flowering was delayed in treated populations. Significant amount of polygenic variability was induced, genotypic coefficient of variation being higher for non effective pegs/plant, pods/plant, kernels/plant, pod weight/plant and kernel weight/plant. Moderate to high heritability values accompanied with high genetic advance were recorded for pod weight/plant, pod/plant and kernels/plant. The selection for these characters, therefore, could be effective in groundnut improvement programmes.

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INTRODUCTION

Hybridization in groundnut has not been taken up extensively because of inherent difficulty in obtaining successful crosses in legumes. This has resulted into development of only few cultivars indicating limited variability. The efficiency of induced mutations in increasing genetic variability has amply been demonstrated in several crops. The present investigation was, therefore, undertaken to study the variability induced in Spanish groundnut by physical as well as chemical mutagens.

MATERIALS AND METHODS

Fresh shelled seeds of groundnut variety GAUG-1 recommended for general cultivation in Gujarat were irradiated with 10, 20, 30, 40 and 50 KR of gamma rays inorder to induce variability for further improvement in yield and yield attributes. Irradiated as well as non irradiated seeds were subjected to 0.2 and 0.4 per cent Ethyl methane sulphonate treatment to make eighteen treatments including control. The M_1 generation was grown in 2.5 meter two row plot at 45 cm distance during summer in randomized block disign with four replications and observations on germination and growth characteristics were recorded. Ten plants harvested from each treatment were grown as progenies in M_2 during following kharif in completely randomized block disign with three replications. All the plants of all M_2 progenies were studied for induced variability for days to flowering, height at maturity, number of pods/plant, kernels/plant, non effective pegs/plant, pod yield/plant, kernel yield/plant and shelling percentage. The analysis of variance was carried out to study the variation among families (treatments) as well as among progenies. Genetic coefficient of variation (Burton, 1952), heritability and genetic advance (Allard, 1960) were calculated.

RESULTS AND DISCUSSION

Observations on growth characters revealed that germination, number of leaflets

at 4 week stage, days to flowering, plant height at flowering and maturity were affected by mutagenic treatments. While germination, number of leaflets and plant height were reduced, the flowering was deleyed in treated populations as compared to control. The effect was more pronounced in M_1 than the M_2. Treatment effect on growth characters was associated with treatment dose in M_1 generation whereas no definite trend was observed in M_2 generation. Similar effect of mutagen treatment has been reported for germination (Reddy *et al.* 1976, Avdhani and Ramana Rao, 1968), leaflets (Stucker *et al.* 1968), days to flowering (Mukewar, 1966) and plant height (Reddy *et al.* 1976).

Analysis of variance (Table 1) showed that significant amount of polygenic variability was induced through mutagenic treatments. All the treatments (families) as well as progenies within treatments had significant differences for all the evaluated characters viz., days to flowering, height at flowering, height at maturity, non effective pegs/plant, peds/plant, pod weight/plant, kernels/plant, kernels weight/plant, and shelling percentage. Different statastical constants such as range, mean with standard error, variances and genetic coefficient of variation were calculated (Table 2) to study the induced variation in M_2 generation. The value of phenotypic variance was much higher than the genotypic variance for variance for all the characters indicating that phenotypic

TABLE 1

Analysis of variance for nine characters in M_2 populations of groundnut.

	Between progenies	*Families (Treatment) within replication*	*Progenies within families replication*	*Within progenies*
d.f.	430	51	377	1950
			Mean squares*	
Days to flowering	16.67	40.03	13.30	7.92
Height at flowering	30.79	106.03	18.54	4.74
Height at maturity	83.62	275.74	52.76	15.91
Non effective pegs/plnat	22.32	41.33	16.90	11.20
Pods/plant	48.08	173.00	28.83	14.96
Pod weight/plant	12.32	47.55	6.73	4.84
Kernels/plant	141.44	529.56	89.33	61.30
Kernels weight/plant	7.07	27.50	3.84	2.46
Shelling percentage	63.10	149.63	46.25	36.37

*Significant at P = 0.01 level.

TABEL 2

Range, mean with standard error, genetic coefficient of variation, heritability and genetic advance for nine characters in M_2 generation of groundnut.

Characters	*Range*	*Mean* ± *SE*	*Comopnent of variance*			*Genetic coefficent of variation (%)*	*Heritability (%)*	*Genetic advance as per cent of mean*
			$\sigma^2 g$	$\sigma^2 ph$	$\sigma^2 e$			
Days to flowering	29.81-32.37	30.73 ± 1.31	1.89	9.81	7.92	4.47	19.27	4.04
Height at flowering (cm)	9.54-13.32	11.38 ± 1.01	5.63	10.39	4.75	20.49	54.19	31.00
Height at maturity (cm)	18.17-23.95	21.54 ± 1.86	14.66	30.87	15.91	17.78	47.96	25.35
Non effective pegs/plant	3.11-5.29	4.61 ± 1.60	2.53	13.73	11.70	34.49	18.43	30.59
Pods/plant	5.69-9.79	8.71 ± 1.81	7.78	22.24	14.96	30.99	32.73	36.51
Pod weight/plant (g)	2.43-4.95	4.08 ± 1.03	1.64	6.48	4.84	31.39	25.34	32.11
Kernels/plant	9.05-17.12	14.79 ± 3.67	17.61	78.91	61.30	28.38	22.31	56.00
Kernels weight/plant (g)	1.39-4.50	3.17 ± 0.74	1.01	3.47	2.46	31.79	29.16	35.33
Shelling percentage	69.00-74.66	71.74 ± 2.83	5.87	42.24	36.37	3.38	13.89	2.59

selection may not hold good for its genotypic bases. The values of genotypic coefficient of variation ranged from 34.39% for non effective pegs/plant to 3.38% for shelling percentage. High magnitude of genetic coefficient of variation was observed for non effective pegs/plant, pod weight/plant, kernel weight/plant, pods/plant and kernels/plant. Days to flowering and shelling percentage had low values. Stucker *et al.* (1968) reported high component of variance for kernels/plant and pod yield in treated population. High genetic coefficient of variation has been reported for kernel yield/plant (Kushwaha and Tanwar, 1974, Sanga and Sandhu, 1973) pod yield/plant (Ashokraj, 1969) kernels/plant (Badwal *et al*, 1967) in studies on natural variability. Dixit *et al.* (1970) reported low variation for shelling percentage. The results of present study were comparable with those of the reports on natural variability in groundnut.

Heritability in broad sense and genetic advance expressed as per cent of mean are presented in Table 2. The highest heritability value was obtained for height at flowering (54.19%) followed by height at maturity, pods/plant and pod weight/plant. Heritability values for shelling percentage and days to flowering were low. Genetic advance was high for kernels/plant, pods/plant, pod yield/plant and kernel yield/plant. High genetic advance accompanied by high heritability values is a situation where selection could be very much effective. In the present study, pod weight/plant, kernels/plant and pods/plant were found to have high genetic advance accompanied with moderate heritability value. Dorairaj *et al.* (1979) and Mohammid (1977) have reported high heritability and high genetic advance for pod yield/plant and kernel yield/plant. The selection for these direct yield contributing characters, therefore, would be very effective in improving the oil and kernel yield of groundnut.

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