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# GAMMA-RAY INDUCED VARIABILITY FOR SOME QUANTITATIVE CHARACTERS IN GROUNDNUT

Advantages of mutagenesis to increase variability for characters of economic importance in groundnut (*Arachis hypogaea* L.) was demonstrated by Gregory (1955). The present study reports variability induced by gamma-rays for some quantitative characters in two groundnut cultivars.

Two-hundred seeds each of two groundnut cultivars, JL 24 and KRG 1 were treated with 30 kR and 40 kR doses of gamma-rays. Treated seeds alongwith untreated controls were planted in a single row plot in split-plot design with varieties as main plots and mutagen doses as sub-plots, using four replications. In the $M_1$ generation the number of plants that survived till maturity were 127 in JL 24 30 kR, 128 in JL 24 40 kR, 130 in KRG 1 30 kR, and 125 in KRG 1 40 kR. These $M_1$ plants harvested separately were advanced to $M_2$ generation in progeny rows. One-hundred $M_2$ progenies not segregating for qualitative characters were bulked, treatment wise and a random sample of about 2000 $M_3$ seeds was taken from each bulk constitute a trial. This trial with six treatments was planted in Randomized Block Design using four replications. Each treatment was planted in 10 rows which were 5 m long and 30 cm apart with 10 cm plant-to-plant distance. Necessary agronomic practices were followed to raise a good crop. Twenty-five random plants from middle eight rows of each plot were tagged to record observations on plant height, number of primary branches, pods per plant, pod yield per plant, shelling percentage and kernel yield per plant.

Analysis of variance for Randomized Block Design was conducted to test the significance of differences among treatments for different quantitative characters in the $M_3$ generations. To test whether treated populations had significantly more variability in comparison with that of untreated control for different quantitative characters, 'F' test was used (Snedecor and Cochran, 1967). It was assumed that the untreated control population could provide an estimate of environmental variability and the treated populations would include environmental as well as induced genetic variability.

The treatment with 30kR and 40kR in JL 24 and 40 kR in KRG 1 reduced the mean plant height at maturity by 2cm and significantly increased the intrapopulation variance compared to their respective untreated controls. The mean number of primary branches was not affected by gamma-rays in either of the varieties. However, the intrapopulation variance in KRG 1 treated with 30 and 40 kR was significantly higher than the control.

There was no significant alterations in number of pods per plant by irradiation with gamma-rays and an average of 20-25 pods per plant were recorded in all the treatments. Similarly the pod yield per plant was not affected in treated population except KRG 1 40 kR in which it was reduced by about 3 g from the control mean plant yield of 14.59 g. Three treatments, JL 24 30 kR, KRG 1 30 kR and KRG 1 40 kR showed significantly higher variability than their control populations indicating induction of genetic variability for number of pods and pod yield per plant (Table 1). Similar trends were noticed for kernel yield per plant, wherein KRG 1 40 kR (7.84 g) has less kernel yield than its control (9.26 g). Shelling outturn of KRG 1 30 kR treatment was 5% higher than its control (63.5%) and in JL 24 40 kR it was 4% less than its control (63.27%). While all the four treatments showed higher variability populations for shelling outturn, that for kernel yield was higher in all except KRG 1 30 kR.

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Table 1. Effect of gamma-rays treatment on JL 24 and KRG 1 groundnut varieties

| Character | Dose | JL 24 M3 generation | | KRG 1 M3 generation | |
|---|---|---|---|---|---|
| | | Mean | Variance | Mean | Variance |
| Plant height (cm) | 0 kR | 28.00 | 10.18 | 27.73 | 30.45 |
| | 30 kR | 26.43 | 16.61** | 27.04 | 41.01 |
| | 40 kR | 26.08 | 14.88* | 25.35 | 45.45* |
| Primary branches per plant | 0 kR | 4.56 | 1.56 | 3.78 | 0.64 |
| | 30 kR | 4.73 | 2.00 | 3.66 | 0.93* |
| | 40 kR | 4.84 | 1.89 | 3.72 | 0.99* |
| Pods per plant | 0 kR | 23.52 | 69.29 | 22.62 | 65.60 |
| | 30 kR | 24.68 | 104.98* | 21.22 | 98.52* |
| | 40 kR | 25.05 | 89.45 | 21.53 | 116.26** |
| Pod yield per plant (g) | 0 kR | 17.68 | 78.23 | 14.58 | 34.76 |
| | 30 kR | 18.79 | 108.60* | 14.00 | 50.91* |
| | 40 kR | 17.91 | 88.51 | 11.72 | 55.98** |
| Kernel yield per plant (g) | 0 kR | 10.68 | 34.09 | 9.26 | 23.07 |
| | 30 kR | 11.27 | 57.03** | 9.56 | 31.79 |
| | 40 kR | 11.05 | 57.95** | 7.84 | 35.85* |
| Shelling (%) | 0 kR | 63.27 | 104.25 | 63.50 | 93.53 |
| | 30 kR | 60.40 | 160.90* | 68.18 | 143.35* |
| | 40 kR | 59.25 | 160.52* | 66.83 | 158.73** |

*, ** Significant at 5% and 1% respectively

The yielding ability of crop plants is a complex quantitative character showing continuous variation and highly influenced by environmental factors. In spite of the difficulty of detecting micromutations influencing yield, there is no doubt about their possible occurrence. A significant increase in variance of treatments for different yield components over untreated control, as discussed above is the indication of the occurrence of micromutations. This offers a possibility for further selection and improving these characters. In most of the cases, the mean of treatment was either similar to or slightly better than that of untreated control. This suggested that the micromutations detected by this study were in positive as well as negative directions. These results are in confirmity with those of Gregory (1955) and Ramanathan (1983) who also observed increased variability for quantitative characters in treated populations of groundnut. Thirty-four superior single plants isolated from these four treatments are being evaluated for yield and other quantitative characters.

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