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Short Communication

INDUCED CHLOROPHYLL AND MORPHOLOGICAL MUTATIONS IN MUNGBEAN

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The present investigation was undertaken to study the effect of three mutagens viz., gamma rays, ethylmethane sulphonate (EMS) and epichlorhydrin (ECH) on growth and development of seedlings and their standardization for maximizing and widening the frequency and spectrum of mutations in mungbean. The uniform healthy and dry seeds (moisture, 9.0%) of green gram cv. PS 16 were exposed to 20, 30 and 40 kR doses of gamma rays (Source ^{60}Co). In case of chemical treatments the seeds were soaked in solution of ethylmethane sulphonate (0.05, 0.1, 0.2 and 0.3%) and epichlorhydrin (0.1, 0.2, 0.3 and 0.4%) freshly prepared in 0.1 M phosphate buffer pH 7.4 for 6 h at 25 ± 1°C. The treated seeds were dipped in 5% aqueous solution of sodium thiosulphate for 10 minutes to stop the action of mutagen and then washed thoroughly with running water. The seeds were sown in field immediately after treatment. Seeds soaked in phosphate buffer pH 7.4 for 6 h were used as control. All the M_1 plants from each treatment were harvested and seeds were bulked treatment wise to grow a representative bulk M_2 generation. M_2 population of each treatment was subjected to screen for chlorophyll and other viable mutations. Chlorophyll mutations were scored and classified as per Blixt [1].

A detailed analysis of spectrum and frequency of chlorophyll and morphological mutations as induced by the three mutagens is presented in Table 1. Four types of chlorophyll mutations identified in the present investigation were in the order xantha>albina>viridis>chlorina. Similar results have also been observed in an earlier study [2]. The results also indicate that all the three mutagens induced high frequency of chlorophyll mutations and the untreated (control) population did not show any chlorophyll mutation. EMS was found to be the most effective mutagen, inducing 2.08% chlorophyll mutations followed by ECH (1.82%) and gamma rays (1.66%). This is in agreement with the earlier report [3]. The spectrum of morphological mutations include mutants with respect to growth habit, foliage, maturity, pod size and sterility.

Table 1. Spectrum and frequency of chlorophyll and morphological mutations in M_2 generation induced by different mutagens in green gram CV. PS-16

Type of mutations	Control	Gamma rays	EMS	ECH
Chlorophyll mutations (%)				
Albina	0.00	0.38	0.61	0.68
Chlorina	0.00	0.34	0.24	0.14
Xantha	0.00	0.68	0.92	0.82
Viridis	0.00	0.26	0.31	0.18
Total	0.00	1.66	2.08	1.82
Morphological mutations (%)				
Plant growth				
Compact	0.00	0.04	0.20	0.11
Bushy	0.00	0.13	0.20	0.14
Erect	0.00	0.04	0.14	0.07
Spreading	0.00	0.17	0.14	0.00
Tall	0.00	0.09	0.07	0.11
Dwarf	0.00	0.09	0.07	0.07
Foliage				
Pentafoliate	0.00	0.30	0.24	0.25
Tetrafoliate	0.00	0.09	0.14	0.11
Largepuckered	0.00	0.04	0.10	0.07
Maturity				
Early	0.00	0.09	0.03	0.00
Late	0.00	0.00	0.14	0.11
Sterile/semisterile	0.00	0.21	0.20	0.14
Pod size				
Large pod	0.00	0.04	0.07	0.04
Small pod	0.00	0.09	0.03	0.04
Total	0.00	1.42	1.77	1.26

A mild relative mutagenic specificity was observed in relation to morphological mutations. Some of the morphological mutations, viz., foliage and growth habit appeared more frequently than other types. Similar results have also been observed by earlier workers [3, 4].

In general, relative differences in mutability for different traits have been observed in present study. For example mutations affecting foliage appeared more frequently with ECH, whereas EMS induced more mutations for growth habit. Gamma rays on the other hand induced more mutations affecting flowering and maturity. The more frequent induction of certain mutation types by a particular mutagen may be attributed to the fact that the genes controlling these characters may be more responsive to either alkylating agents or ionizing radiations. This could be due to differential mode of action of the mutagens on different base sequences in various genes. The morphological mutants induced in the present study included agronomically desirable features which may possibly be utilized in future breeding programme.

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