

## Mutagenic Effectiveness and Efficiency of Gamma Rays and Ethyl Methane Sulphonate in Green Gram (*Vigna radiata* (L.) Wilczek.)\*

S. JEBARAJ and P. V. MARAPPAN

The relative effectiveness and efficiency of the two mutagens in causing chlorophyll and viable mutants were studied in both the varieties. The study revealed that gamma rays found to be more effective in inducing chlorophyll as well as viable mutants. Varietal preference to mutagens was also noticed in the present study. Both mutagenic effectiveness and efficiency were higher at lower doses of both the mutagens.

Konzak *et. al.* (1965) who coined the terms "effective" and "efficiency" presented a detailed account of the concepts of mutagenic effectiveness and efficiency. Mutagenic effectiveness denotes the frequency of mutations induced by a unit dose of a mutagen (factor mutation/dose), while mutagenic efficiency is a measure of the proportion of mutations in relation to undesirable changes (factor mutation/sterility) like sterility, injury, survival etc., The usefulness of any mutagen would therefore depend on its effectiveness and efficiency. The effectiveness of a mutagen is of theoretical importance but does not have any immediate practical significance (Gaul *et. al.*, 1972). For practical purpose one should aim to obtain high efficiency with an optimum dose of mutagen. Therefore the present study was undertaken to assess the relative effectiveness and efficiency of gamma rays and ethyl methane sulphonate (EMS) in the grain legume, green gram *Vigna radiata* (L.) wilczek.) and the results presented.

### MATERIAL AND METHODS

Two varieties of green gram, viz.,

K. 851 and P. S. II were treated with gamma rays and EMS.

#### Method of Treatment:

**Gamma rays:** Dry seeds with 12 per cent moisture were treated with 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100 Krads of gamma rays in a 2000 curie <sup>60</sup>Co gamma cell (Trombay make) installed in the Sugar Cane Breeding Institute, Coimbatore at a dose rate of 2500 rads per minute.

**EMS :** Twelve hours presoaked seeds were treated with freshly prepared aqueous solution of EMS (Eastman Kodak Chemicals, USA) with 20, 40, 60, 80, 100 and 200 mM for 6 hrs. The treatment was carried out at room temperature 23<sup>o</sup>±1<sup>o</sup>C with intermittent shaking of the container.

The gamma irradiated seeds were sown the next day after the treatment. The EMS treated seeds were thoroughly

\* Part of M. Sc. (Ag) thesis submitted by the first author to Tamil Nadu Agricultural University, Coimbatore.



Table 2. Simple correlation co-efficients, partial regression co-efficients, SE, t - values Standardised partial regression co-efficients, their SE and Multiple correlation coefficients

Variables	Simple Correlation co-efficient	Partial regression co-efficient	SE	t Value	Standardised partial regression co-efficients	SE	Multiple Correlation co-efficients
$X_1$ : Powdery Mildew (Disease Index)							
Monsoon 1978	-0.266	-10.3764	10.2670	1.0087	-0.3227	0.3198	0.7619**
Summer 1979	-0.0247	-0.2478	0.8823	0.2809	-0.0886	0.3185	0.6708**
$X_2$ : Phyllody (Percent)							
Monsoon 1978	-0.0764	-2.3552	6.7738	0.4078	-0.1809	0.3208	0.7619**
Summer 1979	-0.2208*	-8.3917	2.2184	3.7807**	-1.1859	0.3138	0.6708**
$X_3$ : Charcoal Rot (Percent)							
Monsoon 1978	-0.3899**	-5.9499	1.8550	3.0433**	-0.9886	0.3248	0.7619**
Summer 1979	-0.4481**	-10.8755	2.4649	4.4123**	-1.4097	0.3185	0.6708**
$X_4$ : Alternaria blight (Disease Index)							
Monsoon 1978	-0.5922**	-10.7293	2.2376	4.7947**	-1.5134	0.3156	0.7619**
Summer 1979	-0.2007	-1.3889	1.6259	0.9083	-0.2898	0.3185	0.6708**

\* Significant at  $P=0.05$ \*\* Significant at  $P=0.01$