



ANALYSIS OF GENETIC VARIABILITY IN M₂ GENERATION OF COWPEA [*VIGNA UNGUICULATA* (L.) WALP.]

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ABSTRACT:

Cowpea [*Vigna unguiculata* (L.) Walp.] known as 'Labia' and in Marathi known as Chavali It belongs to family Fabaceae. Cowpea is one of the most important pulse crops in India. It contains carbohydrates, proteins, fats, vitamins and minerals. The seeds are major source of dietary protein in most developing countries. The seeds of Cowpea var. Phule Pandhari (9708) were treated with 0.050%, 0.075%, 0.10% and 0.125% and Ethyl methane sulphonate and another lot of seeds were exposed to different doses 20 kR , 30 kR , 40 kR and 50 kR of gamma rays and combination of both EMS and Gamma rays. Statistical analysis of phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV), heritability (h²) and genetic advance (GA) for Plant height, Number of pods per plant, Length of pod, Number of seeds per pod, 100 seeds weight was carried out. Induced variability was calculated in following treatments of EMS and gamma rays in seven different yield-contributing traits of Cowpea in the M₂ generation. Plant height showed maximum phenotypic coefficient of variation (31.9670) followed by number of pods per plant (17.2426), 100 seed weight (14.4367), length of pod (6.3240), number of seeds per pods (5.3409).

INTRODUCTION:

In Cowpea [*Vigna unguiculata* (L.) Walp.] statistical analysis of phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV), heritability (h²) and genetic advance (GA) has been computed for the quantitative traits like Plant height, Number of pods per plant, Length of pod, Number of seeds per pod and 100 seeds weight. Calculation of heritability and genetic advance for different traits in Cowpea populations were carried out to allow selection of desired genotypes. Induced variability was calculated in following two mutagenic treatments of Gamma rays and EMS in five different yield-contributing traits of Cowpea in the M₂ generation.

MATERIAL AND METHOD:

Experimental seed material of Cowpea (*Vigna unguiculata* [L.] Walp.) Variety – **Phule Pandhari (PCP- 9708)** was collected from Pulse and oil seed research station Pandharpur, Dist: Solapur. released by Mahatma Phule Krishi Vidhyapeeth, Rahuri, Dist: Ahmednagar.

Mutagens used:

Physical mutagen Gamma rays, Chemical mutagen Ethyl methane sulphonate (EMS) were used for treatment.

EMS treatment: -

Dry and healthy seeds were treated with EMS at the concentration of 0.050 %, 0.075 %, 0.10% and 0.125 % for 6 hours. The seeds of each treatment along with control were

sown in research field by complete randomized block design (RBD) with three replication and result was recorded in M₂ generation.

Gamma ray's treatment:

The experimental seed material was irradiated at Nuclear Chemistry Division, Department of Chemistry, University of Pune Ganesh khind , Pune -411007. For Gamma rays treatment the dry and healthy seed were packed and irradiated with 20 kR, 30 kR, 40 kR and 50 kR obtained from source Co⁶⁰.

Combination of Gamma Rays and Ethyl methanesulphonate (EMS)

RESULT AND DISCUSSION:

The phenotypic and genotypic coefficient of variation was expressed in the terms of percentage, which was comparatively high at EMS treatments than that of other two treatments. In traits, plant height in EMS treatment showed maximum phenotypic coefficient of variation (31.9670) followed by plant height (29.7799) in Gamma rays treatment, plant height (10.2250) was in Combination of both treatments. Among the three mutagenic treatments, the EMS mutagen was found to be better for variability in plant height of Cowpea. The number of pods per plant (16.2366) in Combination of Gamma rays and EMS was estimated highest value in M₂ generation followed by Gamma rays (13.4415) treatments and least value (10.9324) was estimated in EMS treatments for variability of number of pods per plant. Among the three mutagenic treatments, the Combination of Gamma rays and EMS mutagen was found to be better for variability in number of pods per plant of Cowpea. For character of variability like length of pod was shows highest estimated value (4.5237) in M₂ generation of Combination

of Gamma rays and EMS treatment followed by EMS (4.5081) estimated value and least value (1.9876) was found in Gamma rays' treatment. Among the three mutagenic treatments, the maximum phenotypic coefficient of variation was found in Combination of both mutagenic treatments for development of genetic variability for length of pod trait in M₂ generation. The number of seeds per pod was found in highest estimated value (4.8212) in Combination of both mutagenic treatments followed by Gamma rays estimated value (3.0697) and least value (2.3186) was recorded in the EMS treatment. Among the three mutagenic treatments, Combination of Gamma rays and EMS was found better mutagen for producing variability in number of seeds per pod in M₂ generation. The maximum estimated value (6.5985) of weight of 100 seeds was found EMS treatment followed by Combination of Gamma rays and EMS (3.7137) and least value (1.9400) was found in Gamma rays. Among the three mutagenic treatments, EMS treatment was found good for the variability of weight of 100 seeds.

In EMS treatment maximum GCV (31.8960) was observed for Plant height, followed by plant height (27.9749) GCV in Gamma rays treatment, number of pods per plants (13.9456) in combination treatment.

CONCLUSION:

For all the quantitative characters, the phenotypic coefficients of variation were equal to the genotypic coefficients of variation. Difference between phenotypic and genotypic coefficients of variation for all the characters was influenced by environment. A phenotypic coefficient of variation (PCV) was higher than its genotypic coefficients of variation (GCV) for the studied characters. This resemblance between

PCV and GCV in almost all the characters observed that the environment had effect on these characters expression. Mohd Rafiq Wani and Samiullah Khan (2006) observed high phenotypic and genotypic variance in the quantitative traits in all the mutagenic treatments indicated better chances for selection to be successful. However, with the genotypic coefficient of variation individual was not possible to determine the amount of variation. Arulbala chandran *et al.* (2010) in Blackgram studied with gamma radiation recorded the same results. Anbu Selvam *et al.* (2010) in Blackgram also observed the same result. Wani (2011) reported in Chickpea and Vasu and Hasan (2011) studied in Methithe characters like PCV, GCV and Azad (2012) in Mungbean and Shinde (2013) in Cluster bean.

Among the three mutagenic treatments, the EMS mutagen was found to be better for variability in plant height of Cowpea.

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Photo plate -Variety PCP 9708 (Phule Pandhari

OBSERVATION TABLE:

TABLE: Effect of EMS treatment on variability parameters in M2 generation of *Vigna unguiculata* (L.) Walp.

Variability parameters	Plant height	No. of pods per plant	Length of pod	No. of seeds per pod	Weight of 100 seeds
PCV%	31.9670796	10.93243345	4.508138414	2.318616699	6.598552777
GCV%	31.89605771	10.2403104	3.899686965	0.843286772	6.556354068
h²	99.55614971	87.73897527	74.82815032	13.22795341	98.72506058
GA%	65.17134719	2.066846886	1.015497276	0.08624253	1.129430135

TABLE: Effect of Gamma ray treatment on variability parameters of *Vigna unguiculata* (L.) Walp. in M₂ generation.

Variability parameters	Plant height	No. of pods per plant	Length of pod	No. of seeds per pod	Weight of 100 seeds
PCV%	29.77995933	13.44151383	1.987650266	3.069794432	1.940037999
GCV%	27.97494173	11.7234912	1.612348037	2.855229092	1.938032203
h ²	88.24501486	76.0707253	65.80178037	86.50940637	99.79332787
GA%	60.69518801	2.233445581	0.386397552	0.736898109	0.328841923

TABLE: Effect of Combination (EMS+Gamma rays) treatment on variability parameters in M₂ generation of *Vigna unguiculata* (L.) Walp.

Variability parameters	Plant height	No. of pods per plant	Length of pod	No. of seeds per pod	Weight of 100 seeds
PCV%	10.22507977	16.2366949	4.523748489	4.821261572	3.713709558
GCV%	10.07828519	13.94560192	4.277382509	4.59680126	3.597199556
h²	97.14934512	73.76991247	89.40447892	90.90548054	93.82383733
GA%	17.2136539	2.660707591	1.164304042	1.213136096	0.565113853