FLORA AND FAUNA DOI:10.33451/florafauna.v23i1pp115-118
2017 Vol. 23 No. 1 PP 115-118 ISSN 0971 - 6920

STUDY OF EFFECT OF EMS, MMS AND GR ON YIELD CONTRIBUTING TRAITS IN URDBEAN, *VIGNA MUNGO*

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Received **:** 15.03.2017; ***Accepted*** : 02.05.2017

ABSTRACT

The study of the effect of three well known mutagens, ethyl methane sulphonate (EMS), methyl methane sulphonate (MMS) and gamma rays (GR) on the yield contributing traits of the urdbean variety TPU-4 were carried out in the M_3 generation. Effect of selected mutagenic treatments/doses of EMS (0.02, 0.03 and 0.04 M), MMS (0.0025, 0.05 and 0.01 M) and (GR) (30, 40 and 50 KR) on different yield contributing traits like plant height, plant spread, number of pods per plant, pod length, number of seeds per pod, seed yield per plant and 100 seed weight were analyzed in the M_3 populations of the variety TPU-4. Seeds of M_2 plants and control were harvested separately and sown to raise M_3 population.. Genetic variabilty in the mutagen administered M_3 progeny of the urdbean variety TPU-4 was analyzed by employing statistical methods. Data on mean values and shift in the mean of seven quantitative traits was evaluated on individual plant basis. The experimental findings revealed that concentrations / dose of the all these mutagens showed inhibitory effect on plant height, number of pods per plant, pod length and number of seeds per pod. Lower concentrations of mutagens exerted a promotory effect on plant spread, 100 seed weight and seed yield per plant while higher concentrations of these mutagens inhibited them to different extent.

Figure : 00 References : 11 Table : 01
KEY WORDS : EMS, GR, MMS, Mutations, Urdbean, Yield contributing traits

Introduction

Among the pulses crops, urdbean, *Vigna mungo* is an important pulse crop widely grown in Indian subcontinent. It is a valuable source of dietary protein. Nutritional composition of urdbean indicates[9] that it has protein content as high as 25%. In spite of its nutritional importance, the breeding methodology so for adopted in the improvement of blackgram are mostly conventional. Besides, the high autogamous nature also restricted the development of variability in this important legume crop[10]. Genetic variability is essential for any crop improvement programme. In pulses, genetic variability has been exhausted due to natural selection and hence conventional breeding methods are not very useful. The present investigation was undertaken with an objective of inducing genetic variability and viable mutations in urdbean employing ethyl methane sulphonate, methyl methane sulphonate and gamma rays in the locally adopted cultivar, TPU-4.

Materials and Methods

Germplasms of the urdbean cultivar, TPU-4 used in the present investigation was procured from Mahatma Phule Agricultural University, Rahuri (Maharashtra, India). Pilot experiments were conducted to determine suitable concentrations and duration of treatment of the mutagens, for the cultivar. From such experiments it was established that concentrations of 0.02, 0.03 and 0.04 M EMS, 0.0025, 0.005 and 0.01 M MMS for a duration of 6 hours and 30, 40 and 50 KR gamma rays are best suitable mutagenic treatments for this cultivar. Seeds, presoaked in distilled water for 6 hours, were treated with the above-mentioned concentrations of chemical mutagens for 6 hours at 25$\pm$ 2^{0}C with intermediate shaking. After treatment, the chemical was drained off and seeds were thoroughly washed in a running tap water for an hour. For gamma rays treatment, dry seeds with a moisture content of 10-12 % were irradiated with 30, 40 and 50 KR from a ^{60}Co source available in

TABLE -1 : Effect of mutagens on yield contributing traits in urdbean, *Vigna mungo*

Mutagen/ control	Treatments	Plant height		Plant spread		No.of pods/plant		Pod length		Seeds/ pod		Seed yield/ plant in gm		100-seed weight	
		Mean	Shift in mean	Mean	Shift in mean	Mean	Shift in mean	Mean	Shift in mean	Mean	Shift in mean	Mean	Shift in mean	Mean	Shift in mean
Control	—	41.20	—	39.92	—	40.12	—	4.98	—	5.95	—	8.40	—	5.42	—
EMS	0.02	37.50	-3.7	38.20	-1.72	38.95	-1.17	4.70	-0.28	5.86	-0.09	7.98	-0.42	5.12	-0.3
	0.03	35.20	-6.00	37.13	-2.79	38.87	-1.25	3.92	-1.06	5.59	-0.36	7.10	-1.3	4.86	-0.56
	0.04	34.63	-6.57	35.39	-4.53	36.65	-3.47	3.73	-1.25	5.55	-0.4	6.69	-1.71	4.28	-1.14
MMS	0.0025	42.9	1.70	42.61	2.69	42.78	2.66	5.00	0.02	5.89	-0.06	8.82	0.42	6.00	0.58
	0.005	39.44	-1.76	41.75	1.83	38.77	-1.35	4.69	-0.29	5.80	-015	8.45	0.05	5.40	-0.02
	0.01	38.75	-2.45	39.72	-0.2	37.35	-2.77	4.50	-0.48	5.57	-0.38	7.68	-0.72	5.00	-0.42
GR	30KR	39.82	-1.38	39.20	-0.72	37.97	-2.15	5.10	0.12	5.90	-0.05	8.67	0.27	5.84	0.42
	40KR	37.75	-3.45	38.78	-1.14	36.55	-3.57	4.80	-0.18	5.79	-0.16	7.98	-0.42	5.35	-0.07
	50KR	35.4	-5.8	38.47	-1.45	34.92	-5.2	4.74	-0.24	5.37	-0.58	7.12	-1.28	5.10	-0.32
	CV	2.78		3.97		3.64		3.15		3.2		4.56		6.42	
	SE_+	0.48		0.89		0.8		0.08		0.1		0.2		0.19	
	CD 5%	1.44		3.66		2.39		0.25		0.31		0.61		0.57	
	CD 1%	1.97		43.65		3.28		0.34		0.43		0.84		0.79	

the Department of Nuclear Chemistry, Savitribai Phule Pune University (Maharashtra State, India). 240 seeds were used in each treatment.

The mutagen treated and untreated (control) seeds were sown in the experimental fields following randomized block design (RBD) with three replications, at a spacing of 15 cm in rows and 45 cm between rows, to rise M_1 generation, during the kharif season. All the surviving M_1 plants were harvested individually to raise the M_2 generation population along with controls. The M_2 progeny was raised following randomized block design with 3 replications. M_3 generation was raised from bulked M_2 seeds for each treatment along with their respective control. The marked elite mutants searched throught the M_2 generation were sown separately to study their breeding behavior. The micro mutational studies were carried out on 15 randomly selected plants from each treatment per replication. The observations were recorded on different yield contributing traits like plant height, plant spread, number of pods per plant, pod length, number of seeds per pod, seed yield per plant and 100 seed weight.

Results and Discussion

Genetic variability in the mutagen administered M_3 progeny of urdben variety TPU-4 was analyzed quantitatively employing statistical methods. In the present invstigation total seven yield contributing traits were studied. It was found that the mean values showed shift in mean towerds positive as well as negative directions[5]. The result obtained (Table-1) from the findings are as below:

a. Plant height – Mean values of the plant height shifted in negative direction. Mean height of control plant was 41.20cm (Table-1). All the three concentrations of EMS, MMS and GR dose were more effective in decreasing the plant height in the var. TPU-4. Similar decrease in mean plant height was reported in green-gram[3]. Correlated the reduction in height with the chromosomal injury, genetic change or both.

b. Plant spread – All the mutagenic treatments except 0.0025M and 0.005M MMS exerted inhibitory effect on plant spread and also reported in Chickpea[1].

c. Number of pods per plant – Result showed that all the mutagens except 0.0025M MMS employed decreased the mean number of pods per plant. Similar decrease in pod number was observed[4] in green-gram and others in chickpea[1].

The decrease in number of pods in M_2 population has been attributed to the increased pollen sterility[7].

d. Pod length – All the mutagenic treatments except 0.0025M MMS showed inhibitory effect on pod length and in urdbean.similar results are reported[6].

e. Seed yield per plant - In the present investigation, all the treatments showed inhibitory effects on seed yield. Decrease in mean values for seed yield per plant was also reported in gram[8].

f. Number of seeds per pod – It was observed that number of seeds per pod decreased in all the treatments and similar result was recorded in mungbean[5].

g. 100-seed weight – Result indicates that only 0.0025 M MMS concentration increases the 100-seed weight. Similar increased 100-seed weight with mutagenic treatment has been observed in cowpea[2].

From the present investigation it was concluded that EMS, MMS and GR are very effective in inducing genetic variability in all the seven quantitative traits studied. From the result it was observed that lower doses of MMS and GR exerted promontory effects on plant spread, 100seed weight and seed yield per plant.

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