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DELINEATION OF EMS-INDUCED GENETIC VARIABILITY IN SOME AGRONOMIC TRAITS IN MUNGBEAN, *VIGNA RADIATA* (L.) WILCZEK

(SHORT COMMUNICATION)

ABSTRACT

The investigation involved treatment of pre-soaked seeds (11h) of a mungbean cutivar, PUSA 9072 with five doses of ethyl methane suphonate (EMS) at 0.1, 0.25, 0.5, 0.75 and 1% for 4hr under dark. Observation on field grown mutagenized population with regard to 14 agronomic characters evidenced for induction of the variability in the M_1 generation itself. The CV values of the traits for mutagenised population were stupendously higher for most of the test characters to the tune of 57% cases as compared to the untreated (control) plants.

Key words: EMS, genetic variability, Mungbean, *Vigna radiata*

INTRODUCTION

Mungbean, one of the leading grain legume crops of India, is a rich source of vegetable protein and some essential minerals and vitamins, protein content ranging between 17.2 to 29.9% (Naik *et al.* 2000). Mungbean is believed to be native of India and central Asia, where it is being grown since ancient times. Orissa leads the list of mungbean growing states in India in terms of area and produation. In productivity Punjab ranks first (834 kg/ha) followed by Uttar Pradesh (592 Kg/ha) (Prasad 2002). The average yield of mungbean (417 kg/ha) is much below its potential yield ceiling. The natural variability has almost been exhausted to such a limit that further improvement of this crop can only be possible by broadening its genetic base and for this purpose mutation breeding could play a significance role. Amongst the mutagens used in crop improvement, ethyl methane sulphonate (EMS) has been effectively used leading to isolation of a number of desirable mutant varieties (Sigurbjornsson and Micke 1969). We present here the use of EMS

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with a view to widen the genetic base of variation in the major yield attributing traits of mungbean from a study on the M_1 generation.

MATERIALS AND METHODS

The variety PUSA 9072 that has been recently introduced for cultivation in Uttar Pradesh was used as the parent genotype in the present study. Five doses of ethyl methane sulphonate (EMS) At 0.1, 0.25, 0.5, 0.75 and 1% concentration were used for treatment of presoaked (11hr) seeds, 60 seeds for each of the doses, for 4hr under dark. An aliquot of 60 seeds was presoaked for 11h and kept in double distillated H_2O for 4h to serve as control. Treated seeds including the control were sown in the field under complete randomized block design replicated thrice during the rabi season of 2002. Studies were made on 14 characters seven related to duration and seven attributing seed yield in the mutagenized population (Table 1). Observations on quantitative traits related to seed yield were recorded at maturity.

RESULTS AND DISCUSSION

Critical study of the M_1 population in the field is perhaps the best way to study the genetic variability induced in the base population. In the present experiment, coefficient of variation (CV) was enhanced due to treatment with ethyl methane sulphonate (EMS) for about 57% cases (Table 1). It was more evident in case of the yield related characters such as number of clusters/branch, number of clusters/plant, pod length and number of seeds/pod. Although induced variability becomes strikingly high in the M_2 and subsequent generations, it was surprisingly high in the M_1 generation itself in the present study. Reports on induced variability in the M_1 and M_2 in mungbean due to treatment with EMS have been reported also by Jebaraj and Merappan (1981), Chow and Loo (1988), Singh *et al.* (2000), Nandanwar *et al.* (2001). They studied efficiency and effectiveness of this mutagen on the basis of chlorophyll and other viable mutants.

In the present study, there was strikingly high change in the CV values as compared to the control for all the 14 characters studied. In case of days to germination, CV values for 0.75% (61.37%) and 1% treatment (55.72%) were much higher than the corresponding CV value of the control (45.53%). Days to emergence of trifoliate leaves did not show any CV enhancement except for marginal increase at 0.5%. All the treatment except 1% showed higher CV values ranging from 13.3 to 16.18% *vis-ŕ-vis* 10.98% of the control for days to first flowering.

Increased CV values were obtained for 0.1% (15.33%), 0.75% (16.20%) and 1% (12.34%) doses for days to 50% flowering. For days to first pod setting, increased CV was obtained for only 0.25% (16.49%) where as for days

Table 1

Estimation of induced variation in the M_1 population from seed treatment of the mungbean cultivar PUSA 9072 with EMS treatment at five doses

EMS Treatments (%)	Para-meters	Days to germi-nation	Days to emergence of trifoliate leaves	Days to first flowering	Days to 50% flowering	Days to first pod setting	Days to 50% pod setting	Days to first maturity	Plant height at maturity	No. of Primary branches	No. of cluster/ branch	No. of cluster/ plant	No. of pods/ plant	Pod length (cm)	No. of seeds/ pod
0 (Control)	m	1.85	9.41	37.69	43.91	38.94	46.63	57.41	36	3.52	3.44	8.81	25.72	6.42	10.31
	Range	1-5	8-14	36-46	39-48	37-55	44-61	55-60	17-50	2-4	1-5	7-18	14-42	6-7	9-11
	C.V.	45.53	21.94	10.98	10.17	15.53	8.44	3.60	21.75	29.29	37.16	37.16	54.00	1.55	5.42
0.1	m	2.28	10.3	44.73	51.64	49.39	53.20	67.05	26	2.09	2.72	5.23	5.08	5.73	8.09
	Range	1-5	9-13	37-48	41-56	38-60	45-63	54-72	14-38	0-3	1-4	2-13	3-9	5.5-6	7-9
	C.V.	34.69	12.29	13.30	15.33	13.48	10.31	8.93	26.88	61.19	45.93	64.58	37.43	2.87	8.72
0.25	m	3.90	10.44	43.99	51.77	47.79	54.60	66.6	24	1.71	2.10	4.13	5	5.42	7.83
	Range	2-7	9-13	38-50	45-55	39-63	43-66	61-77	7-41	0-3	1-3	1-10	2-8	5-6	7-9
	C.V.	38.05	16.61	17.05	8.24	16.49	13.75	9.18	37.79	50	38.13	60.26	50.8	7.70	6.01
0.50	m	4.94	11.88	46.66	55.66	50.66	66.33	77	21	2.38	1.66	33.33	4.49	5.27	7.38
	Range	4-8	10-14	45-53	49-62	43-65	50-70	66-81	18-26	1-3	1-4	1-4	2-6	5-5.5	7-8
	C.V.	33.78	22.70	15.42	9.77	14	6.94	10.39	18.65	35.02	38	43.84	25.90	3.03	3
0.75	m	5.33	13.33	49.33	61	56.33	70.33	79.33	23	2.5	1.33	2.33	2.33	4.83	7.56
	Range	3-8	11-15	45-56	47-60	44-65	50-75	70-83	17-31	1-4	1-3	1-6	2-4	4.5-5	7-8
	C.V.	61.37	12.55	16.18	16.20	13.72	18.24	18.59	15.29	29.44	42.53	72	26.12	3.07	4.36
1.0	m	5.76	14.5	51	66	59.33	*	NA	22	3.33	NA	NA	NA	NA	NA
	Range	5-8	11-16	47-58	58-69	45-66	*	NA	14-23	1-4	NA	NA	NA	NA	NA
	C.V.	55.72	18.41	10.08	12.34	14.97	*	NA	25.44	34.8	NA	NA	NA	NA	NA

Pods initiated but dropped later or were unproductive, NA indicates non-applicable

to 50% pod setting and days to first maturity CV was more for all the treatments except 0.5% for 50% pod setting. However, data were not available for 1%, as either pods had dropped or had been unproductive. With regard to plant height, enhanced CV was observed at 0.1% (26.88%), 0.25% (37.79%) and 1% (25.44%) treatments. In case of number of primary branches, CV was increased for all the treatments ranging between 29.44 to 61.19% as compared to 29.29% of the control. For number of cluster per branch, CV value increased for the first four treatments ranging from 38.13 to 45.93% as compared to the control (37.16%). For number of cluster per plant, it varied from 43.84 to 60.26% as compared to the control (37.16%).

In respect of pod length, increased CV was observed for the first four treatments that varied from 2.87 to 7.07% and the values were exceedingly high as compared to the control (1.55%) except, however, for 1% where no productive pod setting occurred. No increase in CV was observed for number of pods per plant. CV for seed number was enhanced only at the lower two doses that varies from 6.01 to 8.72% as compared to the control (5.42%). Khan (1989) and Singh *et al.* (2000) also reported such types of induced variation in mungbean by EMS in the M_2 generation. The physiological duration from germination to pod maturity are known to affect seed yield. A broadened base of genetic variation in such characters could be helpful in selection of mutants yielding high or suitable for desirable crop rotations. Characters including plant height, number of primary branches, number of cluster/branch, number of cluster/plant, number of pods/plant and number of seeds/pod are well known contributing traits. Induced variation in these vegetative and reproductive characters could pave the way for selection of mutants for further studies to select high yielding genotypes.

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