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Induced Polygenic Mutations in Lablab*

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The nature of induced mutations in quantitative characters of lablab was studied in M_2 generations obtained by treating dry and presoaked seeds in gamma rays and presoaked seeds in EMS. The mean M_2 generation was not affected by lower doses of gamma irradiation and EMS treatments. Increase in variance was observed in the treated populations for all traits studied but the magnitude was more for height and less for seed yield per plant. The heritability and genetic advance were more for height, days to flower and number of pods per plant.

The practical utility of induced mutations for the improvement of quantitatively inherited characters is well recognised since most of the economic traits in crop species are quantitatively inherited. There are many reports on induction of polygenic variability in various crop plants. In the present study the effect of gamma rays and ethyl methane sulphonate (EMS) on induction of variability in four quantitative characters in M_2 generation was investigated by utilising dry and water soaked seeds of lablab and the results presented.

MATERIALS AND METHODS

The dry (10 per cent moisture content) and presoaked seeds of CO. 6 lablab, (CO. 5 X DI 3196) were treated with 4, 8, 12, 16, 20 and 24 krads of gamma rays through the gamma cell at the Tamil Nadu Agricultural University, Coimbatore by exposing the seeds to a Cobalt-60 gamma source. The dose rate being 0.3×10^6 rads per hour.

The presoaked seeds (10 hours) were treated with EMS at room temperature $26 \pm 20°C$ with intermettent shaking. The treatments were 10, 20, 30, 40, 50 and 60 mM of EMS for four hours. After EMS treatment, the seeds were thoroughly washed with running tap water for half an hour.

The treated and control seeds were sown as M_1. Twenty M_1 plants in each treatment and in control were advanced to M_2 generation and raised as individual progeny in randomised blocks design replicated twice. Each M_1 plant progeny per replication was studied and the mean was used for statistical analysis. Morphological deviant plants and diseased plants were avoided.

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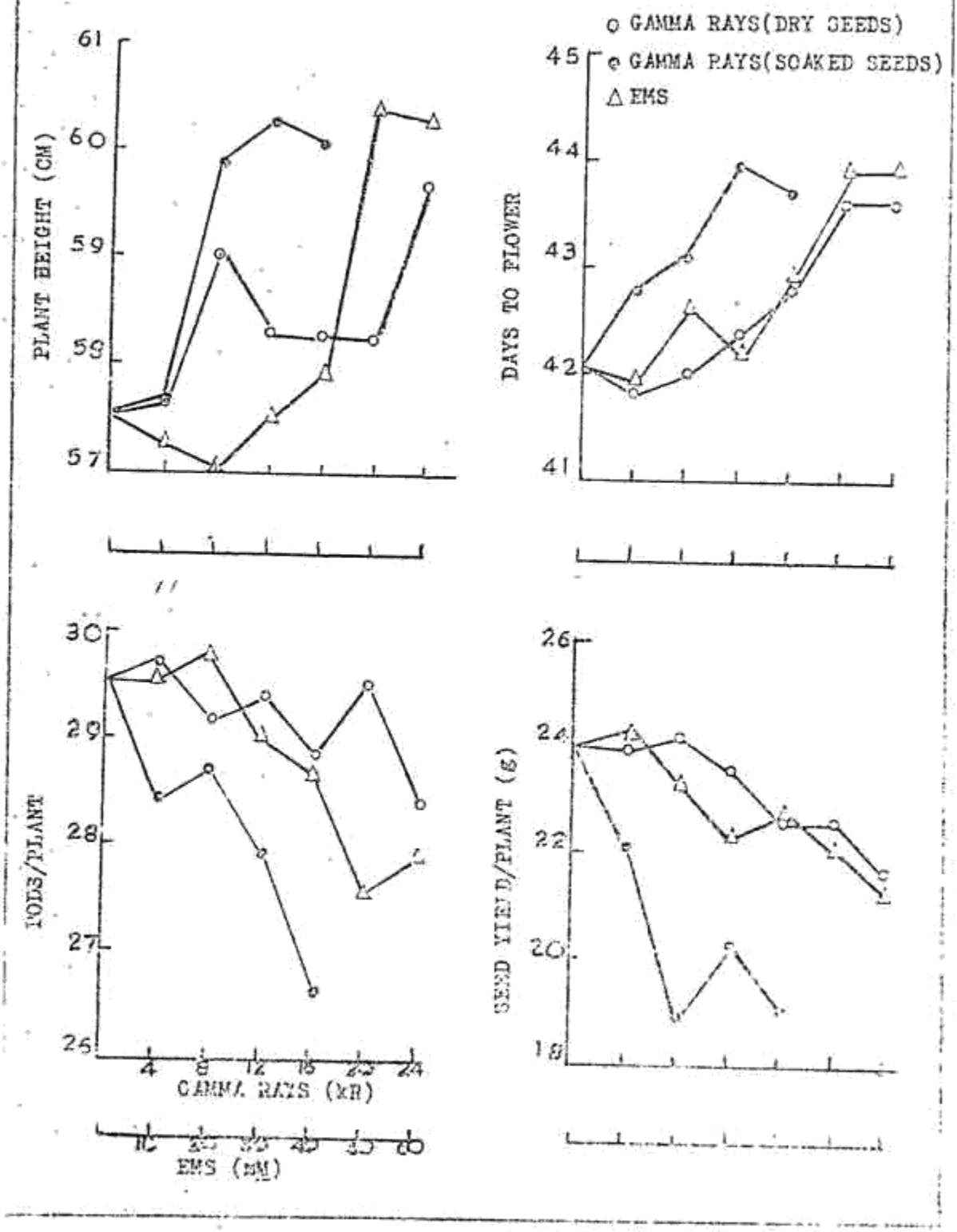
TABLE. Estimates of mean, Genetic variance (G.V), Heritability (H) and Genetic advance (G.A) in M_2 Generation

Mutagen (Dose/ conc.)	No. of M_1 plant progenies studied	Height at maturity				Days to flower				No. of pods per plant				Seed yield per plant			
		Mean (cm)	G.V.	H (%)	G.A	Mean (days)	G.V.	H (%)	G.A	Mean	G.V.	H (%)	G.A	Mean (g)	G.V.	H (%)	G.A
Control	20	57.5	1.97	27.84	1.53	42.0	0.45	38.14	0.85	29.5	2.05	11.84	0.72	24.0	—	—	—
Gamma rays (kR) (Dry seeds																	
4	20	57.6	0.37	5.02	0.28	41.8	0.43	38.05	0.78	29.7	2.25	14.00	1.16	23.9	—	—	—
8	20	57.9	3.79	36.88	2.43	42.0	0.42	33.87	0.78	29.2	2.85	16.71	1.42	24.1	—	—	—
12	20	58.3	7.92	74.93	5.01	42.4	1.06	38.85	1.06	29.4	3.00	15.90	1.42	23.5	—	—	—
16	20	58.3	5.36	74.03	4.10	42.8	0.74	40.66	1.13	28.8	4.70	30.86	2.48	22.5	1.56	11.34	0.87
20	20	58.3	0.01	79.17	5.50	43.6	0.19	40.37	1.06	29.5	3.15	31.16	2.04	22.5	1.42	11.64	0.84
24	20	59.7	14.42	87.18	7.30	43.6	1.00	61.34	1.26	28.4	1.55	11.56	0.87	21.6	2.50	18.66	1.41
Gamma rays (kR) (soaked seeds)																	
4	15	57.6	—	—	—	42.8	1.03	37.29	1.95	28.4	11.90	53.24	5.18	22.0	2.77	22.52	1.63
8	15	59.8	1.33	44.04	1.58	43.1	2.68	78.76	3.01	28.7	12.55	51.12	5.22	18.8	2.28	21.07	1.53
12	15	60.3	4.96	52.32	3.32	43.9	2.39	84.75	2.93	27.9	14.80	68.61	6.57	20.2	2.50	22.26	1.45
16	11	60.1	5.66	82.99	1.71	43.7	0.55	45.83	1.03	26.6	1.20	15.58	0.89	19.0	0.50	4.10	0.29
EMS (mM)																	
10	20	57.3	3.19	48.70	1.00	41.9	1.32	70.59	1.99	29.6	5.00	40.16	0.83	24.2	0.49	3.76	0.28
20	20	57.0	7.69	79.61	5.10	42.6	1.03	58.19	1.20	29.8	4.80	27.04	2.35	23.3	0.68	5.54	0.27
30	20	57.5	8.25	71.12	4.99	42.2	1.50	49.51	1.78	29.0	12.50	66.14	5.92	22.3	3.27	26.50	1.92
40	20	57.9	11.40	80.28	1.65	42.9	0.53	29.94	0.82	28.7	12.30	64.74	5.81	22.8	2.28	20.58	1.41
50	20	60.4	13.74	79.51	6.81	43.9	0.41	22.28	0.69	27.6	14.60	72.93	6.72	22.1	3.28	22.87	2.25
60	20	60.3	5.12	41.56	3.01	43.9	0.49	24.62	0.72	27.9	4.40	45.41	2.91	21.3	3.34	27.40	1.97

G.V. = Genotypic variance, H = Heritability in broad sense, G A. = Genetic advance.

FIG. 1. MEAN VALUES FOR DIFFERENT CHARACTERS IN M_2 GENERATION



Variability estimates were done as suggested by Rawlings *et al*. (1958).

RESULTS AND DISCUSSION

The results on estimation of mean, genotypic variance, heritability in broad-sense and genetic advance in M_2 generation for height at maturity, days to flower, number of pods per plant and seed yield per plant are presented in Table. The mean was not affected by the lower doses of gamma rays and EMS in all the four traits studied. But, at higher dose levels the mean of the treated populations was shifted from the mean of the control. The mean was shifted towards the positive direction for height of the plant and days to flower and towards the negative direction for number of pods per plant and seed yield per plant (Fig.1). The results indicated that induced polygenic mutations follow a trend opposite to that of the previous selection history of the variety supporting the views expressed by Brock (1965) and Goud (1968).

High variance was observed for all the characters in the treated populations than control, a finding that agrees with the reports from Jana *et al*. (1973) in rice, Goud *et al*. (1971) in ragi. Gaul (1964) stated that the radiation induced variability could be determined as early as in M_2 generation. Borojevic and Borojevic (1969) reported increased variability in wheat upto four times in M_2 which decreased gradually in M_4 and stabilised around M_5 generation. Increase in variability in the present study might be due to mutation of polygenes governing the quantitative characters and their segregation in M_2 generation.

All the four characters studied were found to respond differently to the mutagens. The magnitude was the highest for height of the plant followed by pods per plant and days to flower and the lowest for seed yield per plant. Similar observations were noticed by Oka *et al*. (1958) in rice. Also, the magnitude of variability differed with mutagen and dose in this study. Variability released was equal in extend by both mutagens for height of the plant. But' EMS was found to induce greater variability for number of pods per plant and seed yield. The gamma irradiation of soaked seeds generated more variability in the case of days to flower (Fig. 2).

The estimated heritability and genetic advance showed a definite increase in the treated populations over control in respect of height at meturity, days to flower and number of pods per plant. As such these characters may be considered as reliable for exercising selection in M_2 generation. But in the case of seed yield per plant, heritability and genetic advance were considerably less and therefore not likely to respond favourably to selection in M_2 generation.

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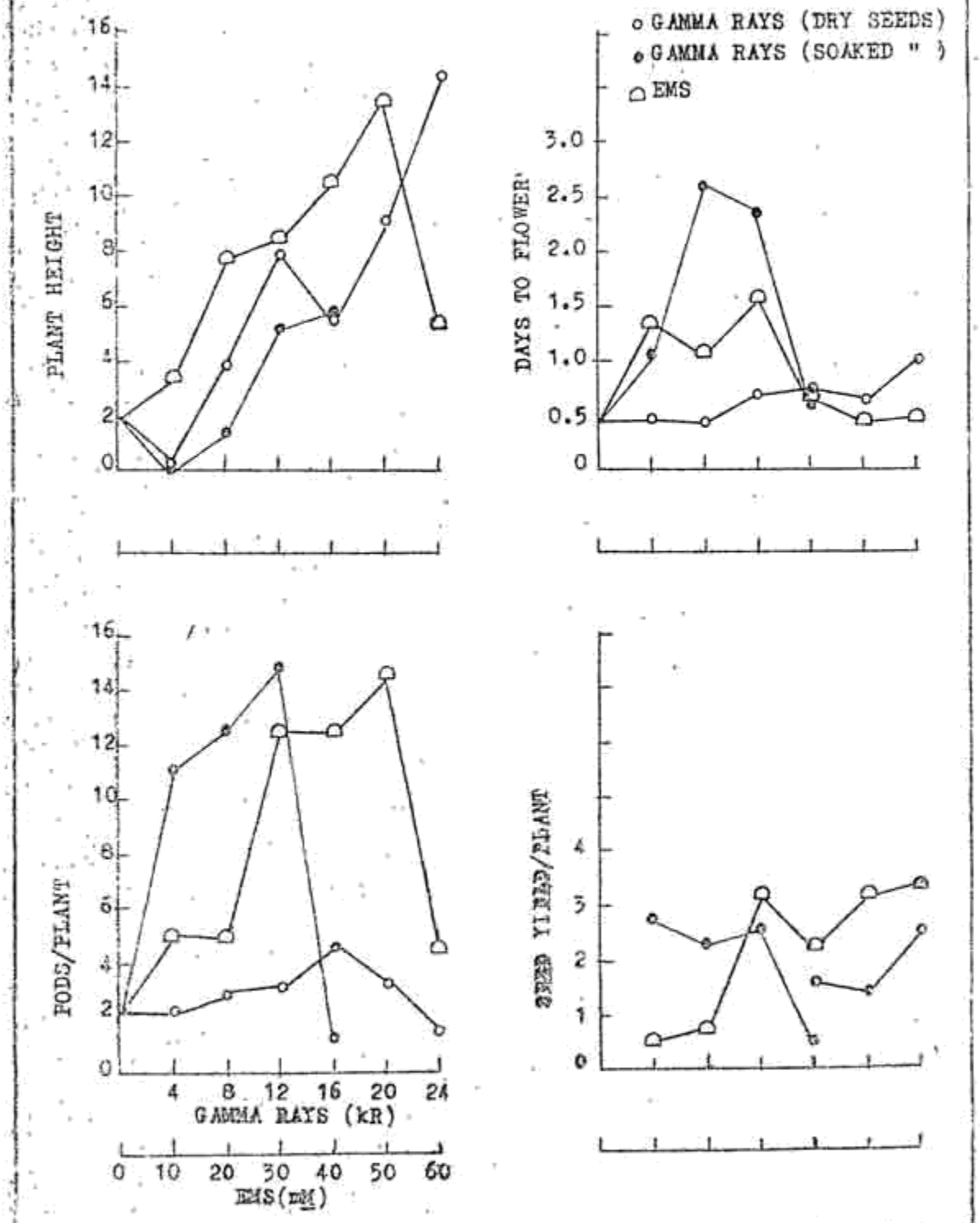
FIG.2. GENOTYPIC VARIANCE FOR DIFFERENT CHARACTERS IN M_2 GENERATION



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