https://doi.org/10.29321/MAJ.10.A02604

Madras agric. J. 70. (4): 219—222 April 1983

INDUCED VARIATION IN QUANTITATIVE CHARACTERS IN REDGRAM*

N. NADARAJAN[1], R. SETHUPATHI RAMALINGAM[2], and N. SIVASAMY[3].

The nature of induced mutations in quantitative characters of *Cajanus cajan* was studied in M_2 obtained by treating with gamma rays and DES. The mean values of all the characters were lower than in control except for days to maturity in which an increase in the mean values was observed. The range is enlarged in both positive and negative directions compared with control. An increase in the variance and coefficient of variabtlity were noticed in all the treated populations. The maximum variance was recorded in number of pods per plant followed by height of plant.

Eventhough the existing level of variability in Redgram, (*Cajanus cajan* L. Mill. Sp.) a popular grain legume in India, is rather wide the desired level of improvement could not be achieved by merely following the conventional techniques. In recent years increaing importance is given to mutation breeding programmes; and many useful mutants were obtained by this method. The practical utility of induced mutations for the imporvement of quantitatively inherited characters is well recognised since most of the economic traits in crop species are quantitatively inherited. In the present study the effect of gamma rays and DES (Diethyl sulphate) on induction of variabiiity in six quantitative characters in M_2 generation was investigated by utilizing two varieties of redgram and the results presented.

MATERIAL AND METHODS

Two redgram varieties differing in plant type and duration viz., SA.1, a long duration variety (170-180 days) with open plant body and axillary clusters and CO.2, a medium duration variety (115-120 days) with compact plant body and terminal clusters formed the materials. Dry and well filled seeds of uniform size were treated with 10, 15, 20, 25 and 30 Krads of gamma rays through the gamma cell at the Tamil Nadu Agricultvral University, Coimbatore by exposing the seeds to a Cobalt-60 gamma source. The pre-soaked seeds (16 hours) were treated with DES at room temperature with intermittent shaking. The treatments were 3, 6, 9, 12 and 15 mM of DES for 6 hours.

The treated and control seeds were sown as M_1. The M_2 generation was raised as individual M_1 plant and M_1 branch progeny bases. Two hundred and fifty plants were randomly selected for each does and observations on six characters were recorded. While selecting, progenies segregating for eithe

*Part of M.Sc. (Ag.) Thesis submitted by the Senior Author to the Tamil Nadu Agricultural University, Coimbatore.

1. Assistant Professor, School of Genetics.
2. Principal, KVK, Pondicherry.
3. Asst. Prof, AC & RI, Madurai.

chlorophyll or viable mutants and exhibiting sterility were not included. Plants bordering on gap and at margins were not selected The means, range, variance and coefficients of variation were calculated.

RESULTS AND DISCUSSION

Gaul (1965) stated that the induction of micro-mutations in polygenes controlling quantitative characters could be determined as early as in the M_2 generation. The results on estimation of mean, and coefficient of variation in M_2 generation for height at maturity, spread of plant, number of primary branches, number of days to maturity, number of pods per plant and weight of seeds per plant are presented in Table-1. In general, treatments with gamma rays and DES shifted the mean values towards negative direction when compared to the control for all the characters except days to maturity. The mean number of days to maturity was shifted towards positive direction (lateness). Similar lateness in flowering was observed by Rathinasamy and Kamalanathan (1978) in lablab and Vindhiyavarman *et al.* (1980) in *Vigna marina*. The decrease in the mean values observed in the present study suggest that mutations with detrimental effects occur more frequently as reported by Bhatia and Swaminathan (1962). The variety CO.2 selected for earliness and higher yield previously showed lateness in maturity, reduced number of pods per plant and reduced weight of seeds per plant in M_2 which is a clear indication of the fact that the induced polygenic mutations follow a trend opposite to that of the previous selection history of the variety (Brock, 1965).

In all the characters studied, the range is enlarged, in both the directions in the M_2 population compared with control. However, the range was mostly towards positive side in the case of days to maturity and negative direction in number of pods and weight of seeds per plant.

Considerable increase in variance and coefficient of variation was observed for all characters following treatments with gamma rays and DES than control. Such increase in variability due to mutagenic treatments was observed in quantitative characters by several investigators (Krishnasamy *et al*, 1977 in greengram, Rajput 1974 in *Phaseolus aureus*, Rathiansamy and Kamalanathan 1978 in lablab and Vindhiyavarman *et al*., 1980 in *Vigna marina*). 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. However, the increase in variance and coefficient of variation observed in the present study was generally progressive, but not linear with increase in doses of both the mutagens for all the characters studied. Vindhiyavarman *et al.* (1980) in *Vigna marina* reported such non-linear relationship between increase in dose and variance.

Different characters studied in the present study were found to respond differently to the mutagens. The magnitude of variability was hig-

er for number of pods per plant. The other characters which could be arranged in the order of decreasing variance were the height of plant, weight of seeds, spread of plants, days to maturity and number of primary branches. These observations were similar to those reported by Rathinasamy and Kamalanathan (1978) in lablab.

REFERENCES

BHATIA, C. R. and SWAMINATHAN, M. S. (1962). Induced polygenic variability in bread wheat and its bearing on selection procedure. *Z. Pfleanzenouct.* 48 : 317-26.

BROCK, R. D. (1965). Induced mutations affecting quantitative chereter. *The use of Induced Mutations in Plant Breeding (Rep. FAO IAEA Tech. Meeting.* Rome, 1964), Pergmon Press. 451-64

GAUL, H. (1964). Mutations in plent breeding. *Radiat. Bot.* 4 : 155-232.

KRISHNASAMY, S., R. RATHINASAMY and R. VEERASAMY. (1977). Studies on induction of mutations in greedgram (*Phaseolus aureus* Roxb) though physical mutagens. *Madras agric. J.* 64 ; 74-9.

RAJPUT, M.A. (1974). Increesed variability in the M_2 of gamma irradiated Mung beans (*Phaseolus aureus* Roxb.). *Radiat. Bot.* 14 : 85-9.

RATHINASAMY, R. and S. KAMALANATHAN (1978). Induced polygenic mutations in lablab. *Madras agric. J.* 65 491-96.

VINDHIYAVARMAN, P., P. CHANDRASEKARAN and V. SIVASUBRAMANIAN (1980). Induced Polygenic Mutations in *Vigna marian* Burn Merr. *Madras agric. J.* 67 : 780-84.

Table — Estimates of mean, and coefficient of variation (CV.) in M_2

Mutagen and dose	Height at maturity		Spread of plant		No. of primary branches		Days to maturity		No. of pods per plant		Weight of seeds per plant	
	Mean	C. V.%	Mean	C. V.%	Mean	C. V.%	Mean	C. V.%	Mean	C. V.%	Mean	C. V.%
A SA.1												
I. Control	167	6.4	68.7	12.5	12.0	17.3	138	4.5	356	3.9	74.8	11.5
II. Gamma rays (krad)												
10	169	7.7	63.9	18.0	10.5	24.6	139	5.9	298	4.9	62.6	14.1
15	155	7.5	64.7	13.8	12.2	20.5	143	4.6	326	5.1	65.4	14.7
20	164	6.4	65.8	13.9	13.3	17.5	139	4.7	314	5.1	67.5	15.1
25	160	7.6	61.1	16.6	9.3	19.3	140	4.9	330	5.2	63.8	17.5
30	158	7.4	68.1	14.0	11.4	20.8	142	5.0	308	5.3	62.7	15.7
III. DES (mM)												
3	161	8.0	68.9	13.0	12.1	20.8	141	5.4	342	4.5	63.9	13.5
6	160	7.3	71.1	13.8	10.8	23.6	140	4.9	318	4.8	62.7	13.8
9	159	7.7	74.4	12.9	12.0	19.0	143	5.0	336	5.1	64.3	16.2
12	166	7.1	64.2	13.9	11.3	20 0	144	4.9	300	5.9	62.1	15.3
15	168	6.9	65.8	13.6	12.2	21.8	142	5.4	294	5.9	66.3	15.0
B CO. 2												
I Control	105	6.6	51.6	13.7	9.3	21.0	93	6.7	176	4.7	42.5	15.6
II Gamma rays (Krad)												
10	102	8.9	50.6	19.6	7.9	29.0	92	7.8	147	9.0	37.3	27.3
15	106	8.9	52 8	16.6	7.7	31.1	94	7.0	170	8.4	41.4	22.2
20	95	9.3	48.3	19 2	9.5	23.1	96	7.6	118	7.5	36.8	20.1
25	100	9.5	45.0	19.2	8.0	28.9	97	7.5	123	9.0	42.1	20.1
30	91	9.6	43.5	19.4	8.4	26.1	95	7.0	139	7.6	35.1	23.5
III. DES (mM)												
3	103	9.4	49.8	16.5	8.6	23.5	92	8.2	155	8.7	37.1	28 4
6	98	10.1	47.3	21.4	7.4	33.2	94	7.2	143	10.0	36 5	26.5
9	95	8 1	41.4	19 0	9.9	23.6	96	6.9	169	7.9	34.8	26.5
12	93	9 4	47.3	18.8	7.3	30.4	95	7.7	138	7.2	37.4	20.6
15	102	9.9	46 2	20 8	7.8	30.8	94	7 0	121	10.7	36.3	27.4