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VARIETAL RESPONSE TO INDUCED CHLOROPHYLL AND VIABLE MUTATIONS IN GREEN GRAM (*Vigna radiata* L. WILCZEK)

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The frequency and spectrum of chlorophyll and viable mutations were studied in the M_2 progenies of four green gram cultivars *viz*, Kopergaon, Pusa Baisakhi, L. 24/2 and Sel, 122 after subjecting them to various doses of EMS and gamma irradiattion singly and in combination. While L. 24/2 recorded the least number of chlorophyll variations, Sel. 122 did so in viable mutations. The performance of the first three clusters in their chronological order of emergence varied with the genotype.

The ever increasing global paucity of protein has accentuated the need for augmenting pulses production. Green gram is an important pulse crop in India grown over an area of 1.2 million hectares. The fineness of texture of its flowers to artificial emasculation stands in the way of increasing the variability of this crop through hybridization. Hence induced mutagenesis was resorted to by exposing the seeds of four green gram cultivars to gamma rays, EMS and their combinations.

MATERIAL AND METHODS

The experiment was carried out at the Tamil Nadu Agricultural University, Coimbatore. One hundred and eighty healthy and well filled seeds at a moisture content of 7±1 per cent of four green gram cultivars which exhibited extremes of sensitivity to mutagen treatment (Krishnaswami and Rathinam, 1980 a) *viz*, Kopergaon, Pusa Baisakhi (more sensitive), L.24/2 and Sel. 122 (less sensirive) were subjected to the following six mutagenic treatments:

1. gamma rays 20 krad and 40 krad, EMS 20 m*M* and 40 m*M* gamma rays 20 krad + EMS 20 m*M* and gamma rays 40 krad + EMS 40 m*M*. Gamma irraditiion wae given to dry seeds from a 1000 curie ^{60}CO gamma cell installed at the Tamil Nadu Agricultural University (dose rate 5000 rads/min). EMS treatment was given at a temperature of 25±2°c and H 7.0 for 4 hr after presoaking the seeds in water for 12 hr. The seeds were thoroughly washed after treatment and dried between folds of blotting paper. The treated seeds were sown in field in a completely randomised block design replicated thrice at an espacement of 15 x 10 cm. Controls were maintained in each cultivar. In each plot. 20 plants (M_1) were selected at random and seeds collected clusterwise from the first three clusters in their chronological order of emergence. M_2 generatiou was raised by sowing these seeds in

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a split plot design with three replications. Varieties were assigned to the main plot, mutagen treatments to the sub plots and cluster families to the sub-sub plots. The frequency and spectrum of chlorophylly mutations were scored following Santos (1969). These apart' the frequency and spectrum of viable mutations were also scored.

RESULTS AND DISCUSSION

The behaviour of cultivars and cluster families alone are discussed here. The effect of mutagen doses has already been reported (Krishnaswamy and Rathinam, 1980 b).

(i) *Frequency and spectrum of chlorophyll mutations*: Data on these are presented in Tables 1 and 2 respectively. Among the cultivars, L. 24/2 recorded the lowest mutation frequency; the other three cultivars displayed identical frequencies. In the present study, intercluster differences in mutation frequency were not significant. The mutation spectrum consisted of *Xantha*, *Viridis Xanthoviridis*, *Chlorina* and *Albino* and in general, *Viridis* and *Xanthovitidis* were preponderant and *Albi o* less represented. Preponderance of *vir'dis* and *Xanthoviridis* has been reported in *Vicia faba* (Sjodin, 1962). Similarly, rare induction of *Albino* has been observed in blackgram (Ramaswamy 1973) and in Cowpea (Palaniswamy, 1975) However, the proportion of the different chlorophyll mutations varied with variety and the age of tho cluster. Thus, Xantha was less represented in Cv. Pusa Baisakhi aud Sel. 122 in all the three cluster families than in Kopergaon and L.24/2. In Kopergaon, the first and the third clusters recorded more *Xantha* than the second. In Pusa Baisakhi, the second cluster recorded nearly two and a half times as much *Viridis* as the third cluster. Similarly in Sel.122, the third cluster recorded less *Viridis* and *Xanthoviridis* than either the first or the second cluster.

(ii) *Frequency and spectrum of viable mutations*: The cv. Kopergaon recorded the maximum number of viable mutations and Sel.122 the minimum. The frequency in Pusa Baksakhi and L.24/2 were both comparable. The behaviour of clusters, however, varied with the variety. While the progenies of the third cluster gave high frequency in Pusa Baisakhi and L.24/2, those of first cluster did so in Sel.122.

In Kopergaon, high frequency was discernible in the first cluster (Table 3). Such differential response may be ascribed to the level of differentiation of the apical and branch meristems at the time of mutagenic treatment. Those that have already differentiated at the time of mutagen treatment are expected to respond differently from those that are yet to differentiate (Blixt 1972; Blixt and Gottschalk, 1975). Thus, mutability was reported to be restricted to one spike in barley (Nybom *et al* 1956) and one branch or part of branch in garden pea (Blixt, 1966). The spectrum of viable mutations comprised those differing in duration, stature, leaf size anb seed colour and of these, those affecting duration and plant height were predominant. Leaf size and seed colour variations were least induced.

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Table : 1 Frequency of chlorophyll mutations in clusterwise progenies of four green gram cultivars.

Variety	Total population	Cluster I	Cluster II	Cluster III	Mean
Kopergaon	26249	1.07	1.37	1.04	1.16
Pusa Baisakhi	36839	0.81	0.94	0.66	0.86
L. 24/2	41838	0.92	0.47	0.46	0.55
Sel. 122	52095	0.82	1.23	1.58	1.21
Mean		0.76	1.09	0.93	

CD 5%
Varieties (V) 0.50
Clusters (C) NS
V x C NS

Table 2. Spectrum of chlorophyll mutations in clusterwise progenies of four green gram cultivars.

Variety	Cluster I					Cluster II					Cluster III				
	x	v	xv	chl	Al	x	v	xv	chl	Al	x	v	xv	chl	Al
Kop.	35.0	42.5	15.0	7.5	—	19.5	26.8	34.1	9.8	9.8	50.0	40.0	10.0	—	—
PB.	5.6	20.8	35.3	32.4	5.9	2.2	53.4	40.0	4.4	—	8.0	32.0	40.0	8.0	12.0
L. 24/2	44.4	38.9	5.6	11.1	—	21.6	51.4	8.1	18.9	—	20.0	53.3	6.7	20.0	—
Sel. 122	18.4	52.7	26.3	2.6	—	7.7	48.7	30.7	10.3	2.6	9.0	27.0	10.2	51.5	2.3

x - Xantha v - viridis xv - xanthoviridis chl - chlorina Al - Albino

Table : 3 Frequency of viable mutations in clusterwise progenies of four green gram cultivars.

Variety	Total population	Cluster I	Cluster II	Cluster III	Mean
Kopergaon	18875	1.71	2.26	2.19	2.05
Pusa Baisakhi	22509	1.43	1.62	2.01	1.68
L. 24/2	24354	1.75	1.43	2.05	1.74
Sel 122	27092	1.98	1.02	1.11	1.43
Mean		1.72	1.54	1.84	

C D 5% Varieties (V) 0.15 Clusters (C) 0.13 V X C 0.26

Table 4 : Spectrum of viable mutations in clusterwise progenies of fourgreen gram clutivars.

Variety	Cluster I							Cluster II							Cluster III						
	E	L	D	T	SI	SC	O	E	L	D	T	SI	SC	O	E	L	D	T	SI	SC	O
Kop	10.3	48.7	10.2	30.8	—	—	—	13.6	42.3	11.9	28.8	3.4	—	—	3.6	50.0	10.7	25.0	3.6	7.1	—
PB	13.1	41.3	4.3	41.3	—	—	-	10.0	36.0	8.0	40.0	2.0	2.0	2.0	4.0	24.0	8.0	48.0	4.0	8.0	4.0
L. 24/2	14.3	41.1	10.7	32.1	1.8	--	—	12.3	38.5	8.8	24.6	7.0	8.8	—	21.7	34.8	3.7	8.7	8.7	17.4	-
Sel. 122	21.7	26.1	10.9	39.1	—	2.2	—	10.3	24.2	20.7	39.7	1.7	1.7	1.7	8.7	6.7	17.4	26.1	[illegible]	17.4	8.7

E-Early L-Late D-Dwarf T-Tall SI-Small levels SC-Seed Colour O-others