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GENETICS OF SEED YIELD IN BLACK GRAM FOLLOWING MUTAGENESIS

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ABSTRACT

Seeds of black gram varieties COBG 301, PDU 1 and their hybrid COBG 301 x PDU 1 were treated with gamma rays in order to obtain high yield. The treated seeds of three different genotypes showed negative shift for M_1 generation and positive shift for M_2 and M_3 generations. The seed yield increased in M_2 generation at higher doses while lower doses in M_3 generation.

KEY WORDS : Black gram, Gamma Rays, Mutagenesis, Genetic Advance.

Limited success has been achieved in augmenting yield of black gram (*Vigna mungo* (L.) Hepper). Inadequate information on genetic nature of yield may be one possible reason for low yield. The gene complexes of parents in the hybrid produce considerable variability. In India, much attention has not been given on mutation through gamma irradiation on parents and their hybrid in black gram. Keeping this in view, the investigation was undertaken to analyse the influence of gamma rays on seed yield in parents and their F_1 hybrid to obtain high yield.

MATERIALS AND METHODS

The experimental materials comprised of black gram varieties, COBG 301, PDU1 and their F_1. Conventional crossing as well as rapid method of hand pollination technique were adopted for producing the hybrid seeds (Rachie *et al.*, 1975). The dry seeds of parents and hybrid were exposed to 30KR, 40KR and 50 Krad of gamma rays from ^{60}Co source at the School of Genetics, Tamil Nad Agricultural University, Coimbatore. The emissio of gamma rays from the cell at the time c treatment was at the rate of 0.286229 Milli Roengent units per h. For each treatment, fi samples of 250 seeds were taken along with t control. The treated seeds were then sown in fie along with control and data were gathered fro five replications laid out in factorial randomise block design. In the M_1 generation, the plants wer bagged to ensure self fertilization. The seeds wer gathered separately from each M_1 plant progen basis to raise M_2 population in randomised bloc design (RBD) with four replications. Similarly M generation was raised on individual M_2 plan progeny basis in RBD with two replications. In M_1 M_2 and M_3 generations, the grains yield of eac plant was recorded in g. In the M_1, correlatio co-efficients were calculated between dose o mutagen and per cent reduction compared wit control for the genotypes. The significance was

Table 1. M_1 Generation - Effect of mutagen on seed yield per plant

Mutagen / Dose	COBG 301			PDU 1			COBGG 301 x PDU 1		
Gamma rays (krad)	Mean (g)	Per cent of Control	Per cent reduction	Mean (g)	Per cent of Control	Per cent reduction	Mean (g)	Per cent of Control	Per cent reduction
0	58.4	100.0	-	40.4	100.0	-	54.4	100.0	-
30	47.6	81.5	18.5	28.4	70.3	29.7	42.8	78.7	21.3
40	40.8	69.9	30.1	22.8	56.4	43.6	34.0	62.5	37.5
50	19.6	33.6	66.4	14.8	36.6	63.4	20.4	37.5	62.5
		Significance				S.E.	SEd	C.D.	
		(a) Types **				0.41	0.58	1.17	
		(b) Doses **				0.48	0.67	1.36	
		(c) Types x Doses **				0.82	1.16	2.35	

** Significant at 1 per cent

Dose		GOBG 301							PDU 1							COBG 301 x PDU 1						
Gamma ray (krad)	Generation	Mean	S 2 g	S 2 p	GCV (%)	PCV (%)	h 2	GA as % of Mean	Mean	S 2 g	S 2 p	GCV (%)	PCV (%)	h 2	GA as % of Mean	Mean	S 2 g	S 2 p	GCV (%)	PCV (%)	h 2	GA as % of Mean
0	M_2	56.80	11.69	12.47	6.02	6.21	0.94	12.00	53.50	8.59	10.25	5.48	5.98	0.84	10.34	64.50	94.82	96.77	15.11	15.26	0.98	30.81
	M_3	61.50	138.73	139.83	19.15	19.23	0.99	39.30	48.30	43.69	44.73	13.69	13.85	0.98	27.87	62.80	94.71	95.78	15.50	15.58	0.99	31.50
30	M_2	52.30	4.62	5.37	4.11	4.43	0.86	7.86	48.80	27.93	28.61	10.83	10.96	0.98	22.05	59.80	24.61	25.53	8.30	8.45	0.96	16.79
	M_3	64.90	116.61	117.49	16.64	16.70	0.99	34.14	51.80	69.34	69.73	16.09	16.13	0.99	33.05	67.20	8.75	9.94	4.40	4.69	0.88	8.51
40	M_2	62.20	16.31	17.53	6.49	6.73	0.93	12.89	60.30	5.59	6.20	3.99	4.13	0.93	7.94	68.30	8.88	9.66	4.36	4.55	0.92	8.62
	M_3	60.10	16.01	17.51	6.66	6.96	0.91	13.11	57.60	8.97	9.84	5.20	5.45	0.91	10.23	61.30	138.07	139.47	19.17	19.27	0.99	39.28
50	M_2	64.50	33.29	33.78	8.94	9.01	0.99	18.29	61.20	34.31	35.02	9.57	9.67	0.98	19.51	69.50	13.40	14.56	5.27	5.49	0.92	10.40
	M_3	58.20	9.36	10.26	5.26	5.50	0.91	10.35	47.10	67.90	68.93	17.50	17.63	0.99	35.77	57.10	11.43	12.71	5.92	6.24	0.90	11.58

tested and regressions were also computed (Panse and Sukhatme, 1967). The mean of variances of the M_2 and M_3 generations of the different treatments were subjected to biometrical analysis (Allard, 1960).

RESULTS AND DISCUSSION

The differences between treatments were highly significant in M_1 generation. The seed yield per plant ranged from 33.6 to 81.5 per cent of control in COBG 301, 36.6 to 70.3 per cent of control in PDU 1 and 37.5 to 78.7 per cent of control in hybrid. The data computed for seed yield per plant in M_1 is furnished in Table 1. In both parents and hybrid, the maximum and minimum values were found in lower and higher doses respectively. Highly negatively significant correlations were observed in the genotypes between the dose levels and seed yield per plant.

In the untreated population of the hybrid, the mean for seed yield per plant was 64.5. The mean of treated population resulted in a significant increase in the yield than that of control. The seed yield per plant in M_2 generation is presented in Table 2. In all the genotypes, a positive shift in the mean value was found and the highest value recorded at 50 krad. In COBG 301 and PDU 1, the genotypic variance, phenotypic variance, genotypic co-efficient of variation *gcv* phenotypic co-efficient of variation *pcv* heritability and genetic advance as percentage of mean increased with increase in doses. As the dose increased, the treatments were able to create less amount of *gcv* heritability and genetic advance on percentage of mean in hybrid.

In both parents and hybrid, an upward shift in the mean value was recorded at lower doses while decline at higher doses. The seed yield per plant in M_3 generation is given in Table 2. The maximum seed yield was found in hybrid. All the treatments except 40 krad in PDU 1 caused high *gcv* heritability and genetic advance as percentage of mean than the control as the dose of gamma rays increased. The lesser values for *gcv* heritability and genetic advance as percentage of mean in COBC 301 than the control. The highest value of *gcv* (19.17), *pcv* (19.27) and genetic advance as percentage of mean (38.28) were recorded at 40 krad in hybrid while at higher doses in PDU 1.

The mean values of treated parents and hybrid of all the doses were lesser than their respective controls in M_1 generation. Similar response was recorded by Ahmed John (1991) in black gram varieties of CO_5 and Vamban 1 and in their hybrid. The genotypes showed significant differences for seed yield. Negative shift in the mean values following mutagen treatment, was reported due to the occurrence of harmful mutations which are supposed to occur more frequently than the favourable once (Virupakashappa *et al.*, 1980). The reduction of seed yield was more pronounced in COBC 301 followed by PDU 1 and hybrid. similar trend was made in different pulse crops (Uprety, 1968; Sharma, 1969; Mujeeb and Greigh, 1973; Ahmed John, 1991. With radiation dose, the genetic variability increased but the relation between varience and dose was not always linear. The mutagenic treatment increased the variability of quantitative characters in M_2 and M_3 generation (Scossiroli *et al.*, 1961). In mutagen treated population, the mean values were gradually on the increase (Borojevic and Borojevic, 1972)

In the present study, there was no consistent relationship between the doses and genetic variability. The increased genetic variance and heritability estimated pointed out the indication of micro- mutation in the yield components. Irradiated hybrid in M_3 generation showed higher genetic variability compared to varietal irradiation of M_2 generation. It is found that the irradiated hybrid (COBG 301 x PUD 1) produces higher genetic variability and it is possible to get segregants with better yield in black gram.

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COMPONENT ANALYSIS FOR SEED YIELD ON SESAME IN ACID SOIL UNDER HIGH RAINFALL MID ALTITUDE CONDITIONS

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ABSTRACT

Path analysis of seed yield was done in two sesame *Sesamum indicum* L.) varieties, JLT 26 and JLT 27 grown separately in acid soil (pH 4.0-5.5) under high rainfall mid altitude (1,000 m msl, 26^0N and 92^0E) conditions during the rainy *(kharif)* season of 1988. Seed yield was positively and significantly correlated with plant height, number of leaves, primary branches, length of main branch, number of capsules on main branch, number of capsules per plant, capsule length and seeds per capsule in both the varieties. Partitioning of total correlation coefficient of these characters with seed yield into the components of direct and indirect effects revealed that number of capsules per plant followed by seeds per capsule were the only two characters which contributed to seed yield directly. The direct contribution of rest of the traits was considerably low. However, their indirect contribution to seed yield through the number of capsules per plant was substantial. It is thus suggested that number of capsules per plant and seeds per capsule could be taken as indices while improving seed through selection.

KEY WORDS : Yield Components, Correlation Coefficients, Path Analysis

The knowledge of association is useful to the breeders in the improvement of complex characters like yield through selection. Sometimes selection is not much effective and the progress of improvement remains slow due to some other unknown factors acting behind to produce a given correlation. The relative importance of such causal factors and their direct and indirect contribution towards the total correlation could be ascertained with the help of path analysis. These informations in sesame are meagre under the agro-climatic conditions of north eastern hill region of the country. The region often meets an annual rainfall ranging from 200 to 1,000 cm. The present study, therefore, was conducted to determine the direct and indirect effect to various characters on seed yield in sesame under these situations.

MATERIALS AND METHODS

Two promising sesame varieties, JLT 26 and JLT 27, were grown during the rainy season *(kharif)* of 1988 in a terrace in two different plots adjacently keeping a distance of 30 cm between rows and 10 cm between plants within a row at the research farm of Indian Council for Agricultural Research Complex for North Eastern Hills Region, Barapani situated at the mid altitude (1,000 m msl). The soil of the experimental site was highly acidic (pH 4.0-5.5). The crop was maintained under the recommended cultural practices. From each variety, 102 plants were randomly selected to record observations on days to first flowering, plant height, number of leaves, primary branches, length of main branch, number of capsules on main branch, number of capsules per plant, capsule length, capsule width, capsule thickness, seeds per capsule, 1,000 seed weight and seed yield per plant.