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EMS INDUCED POLYGENIC MUTATION IN TILOTTAMA CULTIVAR OF *SESAMUM INDICUM* L.

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Abstract

EMS induced genetic variability is studied for yield and six yield contributing traits (plant height, number of primary and total branches per plant, capsule per plant, seeds per capsule and total seeds per plant) in M_2 and M_3 generations of tilottama variety of *Sesamumindicum* L. (family: Pedaliaceae). EMS treatment is found to induce wider magnitude of positive genetic variations for most of the traits at M_3 than M_2. Treatment with 1.00%, 4h (M_3) is found most promising for induction of positive genetic variations.

Key words : Sesame, EMS, Polygenic variation, Micromutation, Random, Selection.

Introduction

Yield and yield related attributes are controlled by polygenes and assessment of variations in polygenic traits at M_2 and M_3 following induction of mutation is a dependable criteria for selection of desirable macromutant line(s) for efficient breeding and crop improvement. Present investigation explores EMS induced polygenic variations released in M_2 and M_3 generations of *Sesamum indicum* L. var. tilottama (Family: Pedaliaceae; oil seed crop of commerce) considering yield and six yield related traits with an objective to raise superior lines with quantitative genetic variations as because reports on induced polygenic mutations in *Sesamum indicum* are meagre (Hossan *et al*., 1984; Reddy, 1984; Govindarasu *et al*., 1997; Sengupta and Datta, 2004).

Materials and Methods

Dry filled seeds (moisture content: 10.12%) of sesame (*Sesamum indicum* L. vartilottama; family: Pedaliaceae) were treated with the chemical mutagen ethyl methanesulphonate - EMS (0.25%, 0.50% and 1.00% for 2, 4 and 6h durations; pH adjusted to 6.8; temperature $24^0C\pm1^0C$) and the treated seeds were washed in water and subsequently sown in the Experimental plots of Department of Botany, University of Kalyani (along with untreated control seeds) to raise M_1 plant population (50 seeds from each lot were sown). Fifty seeds from each M_1 surviving plant were grown in plant to row at M_2 and subsequently M_2 progenies were raised at M_3. Phenotypically superior plants (excluding border plants) were selected at M_2 and M_3 generations were spaced 30 cm apart in between lines and 20 cm between plants.

Quantitative data was recorded in M_2 as well as M_3 generations (5-10 plants were scored from each M_2 and M_3 lines and subsequently the data was composited dose wise). Selfed control lines were also evaluated for comparison (data of M_2 and M_3 control lines were pooled). Phenotypic variables on which observations were performed included plant height (cm), number of primary and total branches per plant, number of capsules per plant, number of seeds per capsule and per plant and total seed yield per plant (g). Mean and co-efficient of variations (C.V.) were recorded for each variable and Critical difference (CD at 0.05 probability level) was performed for each variable to assess significant variation, if any, between/among doses of treatments.

Results and Discussion

The comparative assessment of polygenic variability released at M_2 and M_3 in different treatments than control for the studied traits is found to be shifted in both positive as well as in negative directions (table 1), thereby indicating that mutations for different variables are random in nature. Results corroborates with the studies performed

Table 1 : Quantitative traits assessed in *S. indicum* at M_2 and M_3.

Treatment		Generation	Plant height (cm)		No. of primary branches/ plant		No. of total branches/plant		No. of capsule/ plant		No. of seeds/ capsule		No. of seeds/ plant		Seed weight (g)/ plant	
Conc. (%)	Duration (h)		Mean	CV (%)	Mean	CV (%)	Mean	CV (%)	Mean	CV (%)	Mean	CV (%)	Mean	CV (%)	Mean	CV (%)
0	-	-	124.40±2.53	12.50	3.83±0.28	10.20	5.79±0.58	11.20	44.33±4.91	16.30	45.92±0.80	10.86	941.25±40.44	41.00	2.08±0.05	35.84
0.25	2	M_2	127.30±3.51	22.60	3.90±0.25	11.50	6.20±0.60	14.20	59.20±4.20	18.25	37.20±0.92	12.92	934.00±39.14	34.00	1.83±0.04	28.40
		M_3	129.00±3.92	25.80	3.98±0.21	11.30	5.80±0.50	16.30	61.32±4.10	20.50	44.80±3.30	18.92	1038.10±40.12	39.10	2.28±0.05	34.20
0.50	2	M_2	119.20±4.63	21.50	3.20±0.60	11.80	5.62±0.53	15.80	58.90±3.90	18.50	38.90±1.20	16.28	523.70±38.12	28.90	1.07±0.12	33.60
		M_3	124.50±6.21	27.82	3.50±0.50	12.20	5.66±0.61	16.20	63.80±4.60	21.00	39.50±2.80	8.64	827.10±64.90	27.60	1.61±0.11	29.80
1.00	2	M_2	112.10±11.10	22.13	4.00±0.00	0.00	5.00±0.48	21.91	32.20±8.42	58.44	44.73±3.61	18.04	667.40±15.72	13.14	1.22±0.05	16.39
		M_3	99.00±2.12	3.71	2.67±0.27	17.68	2.33±0.27	14.14	41.67±4.48	16.62	48.33±0.58	14.64	628.67±32.29	24.46	1.14±0.03	28.66
0.25	4	M_2	127.95±10.59	16.55	5.75±0.96	33.40	10.25±2.07	40.45	61.50±10.83	35.22	38.55±1.89	9.83	759.50±48.20	37.17	1.58±0.04	14.86
		M_3	131.6±12.60	24.32	5.92±1.10	35.60	11.62±2.61	44.32	73.20±11.20	38.74	45.40±6.20	25.32	827.20±39.20	38.50	1.88±0.11	28.90
0.50	4	M_2	95.08±1.62	3.41	3.00±0.25	23.57	3.50±0.56	31.94	21.25±2.70	25.42	29.11±5.18	35.61	462.00±40.82	50.39	0.88±0.10	20.53
		M_3	98.10±4.20	12.63	3.62±0.51	25.61	4.20±0.42	27.62	23.33±2.81	32.10	37.10±2.30	26.30	671.10±72.05	18.19	1.29±0.04	23.50
1.00	4	M_2	79.10±3.64	15.93	3.08±0.36	40.27	3.08±0.36	40.72	37.33±1.86	37.27	31.50±2.36	28.49	623.83±8.46	23.66	1.25±0.02	21.55
		M_3	98.50±5.48	11.13	5.00±0.35	14.14	5.00±0.35	14.14	64.75±3.32	10.27	43.00±2.18	10.14	1421.25±20.13	28.16	2.70±0.43	23.15
0.25	6	M_2	151.90±4.66	6.85	5.60±0.67	26.73	7.60±0.73	21.38	64.40±6.90	23.97	44.00±1.33	6.76	856.60±46.91	22.97	0.92±0.08	19.17
		M_3	160.30±4.98	7.83	6.80±1.02	21.93	8.40±0.79	21.73	73.40±7.20	25.80	48.20±3.70	34.90	920.70±32.80	51.25	1.92±0.13	48.92
0.50	6	M_2	105.00±4.61	8.78	3.01±0.61	40.82	3.00±0.61	40.82	21.75±0.96	16.34	38.14±7.65	40.12	479.50±17.18	19.15	0.87±0.07	35.86
		M_3	142.40±11.40	17.90	3.00±0.28	21.08	4.20±0.87	46.17	23.81±1.12	17.81	46.33±2.99	14.41	467.40±53.84	55.42	0.99±0.31	69.75
1.00	6	M_2	87.10±3.33	10.11	3.14±0.59	49.38	3.42±0.75	53.03	35.43±3.75	64.34	24.31±5.12	56.72	158.57±42.81	71.43	0.35±0.12	88.62
		M_3	112.0±0.45	7.51	3.60±0.67	41.57	4.80±1.18	54.96	60.20±5.50	20.44	45.40±2.35	11.55	682.00±28.61	42.17	1.40±0.31	49.61
CD at 0.05 probability level			14.60		0.83		1.70		8.40		6.62		80.74		0.46	

in different plant species for polygenic mutation by Gaul (1965), Goud *et al*. (1971), Singh *et al*. (1979), Datta and Biswas (1993), Kharkwal (2001), Sengupta and Datta (2004) among others. Reduction in mean values in different treatments of different variables in relation to control is in agreement with the hypothesis that due to mutagenic treatment mean is shifted to a direction opposite to selection (Bhatia and Swaminathan, 1962). Scossiroli (1967) opined that decrease in mean is due to detrimental mutations occurring more frequently than the favourable ones. Although, the M_2 means shifted in both directions over control means, a great majority of the treatments for different variables show increase in mean at M_3 suggesting that the selection made in M_2 population is effective. Total seeds per plant and seed yield per plant are found to enhance significantly in 1.00%, 4h treatment in M_3 generation in relation to control and M_2 mean values indicating a positive line of macromutation for efficient breeding. CV for different variables did not reflect any promising outcome.

Study on EMS induced polygenic variability highlights that selection at M_2 is successful to induce mean in desirable direction at M_3 mostly for different variables thereby offering scope of raising superior micromutant lines in subsequent generations.

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