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Short Communication

Effect of mutagens on quantitative traits in M_2 generation in sesame (*Sesamum indicum* L.)

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The productivity level of sesame (*Sesamum indicum* L.) needs improvement by evolving high yielding genotypes, which depends on the availability of variability for yield and its component traits in the population. Artificial induction of variation by means of mutations may be necessary and helpful to generate new variability. The variability created in the mutated populations can be utilized for effective selection only when its heritable (genotypic) component is higher than its non heritable (environment) component. It was also found that high heritability value with high genetic advance is the best criterion for predicting a better conclusion.

Two sesame varieties viz., SVPR 1 and Co1 and two mutagens viz., gamma rays (physical) and EMS (chemical) were used for the present study. Two hundred well filled, dry seeds for each dose/treatment was subjected to gamma irradiation (30, 40, 50, 60 and 70 kR) and EMS (0.8, 1.0, 1.2, 1.4 and 1.6%) treatments. The treated seeds along with their respective controls were sown immediately in the field to raise M_1 generation during July-Sep. 2001 at AC & RI, Madurai with two replications in a Randomized Block Design. Fifteen M_1 plants were selfed and harvested individually for each treatment and the seeds were sown as plant to progeny rows adopting the spacing of 30 × 30 cm during Jan-Mar 2002. The treated as well as control populations were carefully screened for polygenic variability by recording data on eight quantitative traits viz., plant height, number of branches plant^{-1}, number of capsules plant^{1}, capsule length, number of seeds per capsule^{-1}, 1000 seed weight, oil content and single plant yield. Genotypic Co-efficient of variation (GCV), heritability in broad sense [1] and Genetic Advance as % of mean [2] were computed.

Assessment of variance has been the most dependable statistical measure to find the mutagenic effect on the polygenes. Estimation of genotypic variability in irradiated population would reveal the heritable portion of total variation created. GCV provides a mean to study the genetic variability generated in quantitative traits. In the present study, capsule length recorded comparatively higher GCV followed by number of seeds per capsule in both the varieties, 1000 seed weight in Co 1 and single plant yield in SVPR 1 also registered high GCV%. Similar results were reported earlier [3]. The enhanced genetic variability that was observed for seed yield and its component characters in the M_2 generation of the present study indicated the scope for effective selection.

The genetic variability in terms GCV alone is not sufficient for determination of amount of heritable variability. In addition, estimation of heritability and genetic advance as percentage of mean is also needed to assess the heritable portion of total variation and extent of genetic gain expected for effective selection. As heritability in broad sense includes both additive and epistatic gene effects, it will be reliable only if accompanied by high genetic advance.

In SVPR 1, maximum heritability was recorded by 40 krad (99.4%) for number of capsules per plant in gamma rays treated progenies and by 1.0 per cent (98.4%) for single plant yield in EMS treated progenies. In Co 1, 60 krad (99.9%) of gamma rays and 1.4 per cent (99.8%) of EMS registered maximum heritability for number of branches per plant and capsule length respectively.

Heritability estimates along with GA shall be more helpful in predicting genetic gain under phenotypic selection than h^2 alone [2]. GA as percentage of mean was maximum at 30 krad for 1000 seed weight in SVPR 1 (19.53%) and for capsule length in Co 1 (22.62%) in gamma irradiated progenies. In case of EMS, 1.4 per cent (15.77%) in SVPR 1 and 1.6 pert cent (11.59%) in Co 1 exhibited maximum GA for the characters single plant yield and capsule length respectively. High heritability alone does not signify an increased genetic advance. In the present investigation, number of seeds per capsule, 1000 seed weight, oil content and single plant yield showed high heritability but moderate to low genetic advance in most of the

Table 1. Mean and components of variance for quantitative characters in M_2 generation of Sesame var. SVPR 1(S) and CO1(C)

Treat-ment	Variety	Plant height				Number of branches plant^{-1}				Number of capsules plant^{-1}				Capsule length			
		Mean	GCV	h^2	GA	Mean	GCV	h^2	GA	Mean	GCV	h^2	GA	Mean	GCV	h^2	GA
Control	S	100.72	1.63	57.1	2.54	6.92	4.00	65.3	6.65	89.77	1.68	16.3	1.40	2.67	5.0	54.6	7.50
	C	111.79	2.38	84.1	4.50	6.56	2.62	98.4	5.34	117.10	3.93	97.7	8.01	2.59	1.36	25.7	1.54
30 kR	S	74.39	1.00	30.6	1.13	5.13	1.40	70.7	2.34	93.09	1.43	40.3	1.87	2.39	5.46	74.66	9.62
	C	100.79	3.13	90.6	6.13	5.38	1.35	16.1	1.12	92.21	1.50	30.7	1.71	2.52	11.13	96.7	22.62
40kR	S	73.45	5.06	93.7	10.09	4.74	2.11	91.4	4.23	88.40	3.51	99.4	7.22	2.47	3.23	84.0	6.07
	C	98.86	2.01	83.9	3.78	5.35	4.20	93.0	8.41	97.05	2.49	41.8	3.31	2.52	3.22	87.5	6.35
50 kR	S	91.02	1.08	29.3	1.20	7.01	0.46	23.9	0.42	109.38	1.86	21.2	1.76	2.68	1.04	13.2	0.75
	C	115.34	7.50	97.6	15.26	5.90	3.22	92.7	6.44	116.39	2.14	81.6	3.98	2.81	3.24	87.2	6.41
60 kR	S	75.86	1.04	14.8	0.83	4.63	1.53	81.7	2.81	77.26	1.94	59.3	3.07	2.64	5.42	78.5	9.85
	C	84.85	3.11	99.2	6.39	5.35	2.93	99.9	6.91	92.66	6.49	93.7	12.94	2.43	2.21	91.6	1.72
70 kR	S	70.51	1.69	92.5	3.35	4.31	2.65	94.8	5.34	77.17	1.94	92.8	2.70	2.60	6.91	96.8	13.85
	C	77.78	1.27	31.2	1.47	5.21	0.61	11.2	0.38	77.57	1.43	26.5	1.51	2.60	5.24	99.2	10.38
0.8%	S	78.70	2.39	87.5	4.60	7.36	2.04	66.9	3.40	105.03	0.51	16.9	0.44	2.54	4.20	89.7	8.27
	C	92.23	4.87	77.0	8.79	6.19	2.87	76.3	5.17	106.9	2.32	96.8	4.70	2.48	4.14	99.5	8.27
1.0%	S	81.40	2.40	66.8	4.04	5.82	1.98	60.2	3.09	106.55	3.54	82.9	6.64	2.64	5.78	74.4	10.23
1.2%	S	86.66	1.67	84.2	3.15	6.40	2.78	92.1	5.16	117.05	2.71	36.2	3.36	2.64	1.20	35.1	1.52
	C	106.26	3.58	91.0	7.04	7.06	1.83	62.3	2.97	116.78	2.25	95.8	4.54	3.09	3.82	76.4	7.95
1.4%	S	72.43	2.19	58.9	3.47	4.89	3.13	96.3	6.34	78.07	0.91	48.0	1.29	2.44	1.50	58.4	2.46
	C	70.94	2.67	29.6	2.99	6.26	0.75	71.9	1.28	89.7	2.10	73.8	3.71	2.24	4.36	99.8	8.20
1.6%	S	64.52	1.46	13.9	1.12	4.87	2.69	75.0	4.72	75.61	0.84	51.6	1.24	2.33	4.30	69.1	7.30
	C	75.54	1.81	52.7	2.79	5.82	1.47	70.8	2.58	76.93	2.76	68.8	4.72	2.38	5.95	86.8	11.59
		No. of seeds capsule^{-1}				**100 seed weight**				**Oil content**				**Single plant yield**			
Control	S	54.99	0.93	13.6	0.71	3.34	4.37	83.2	8.08	50.08	1.96	65.0	3.25	5.91	1.7	82.6	0.51
	C	52.81	2.96	97.33	6.00	3.28	2.32	98.8	4.88	50.13	1.24	60.8	2.03	6.27	2.59	88.9	5.10
30 kR	S	44.55	2.33	53.9	3.52	3.43	3.83	96.4	19.53	51.0	2.97	54.5	4.50	6.49	2.53	90.6	4.93
	C	45.02	2.11	81.3	3.93	3.28	7.51	97.8	1.52	48.29	0.47	19.4	0.43	5.98	3.09	68.9	5.35
40 kR	S	49.49	3.93	91.6	7.74	3.39	3.50	86.4	4.72	53.57	3.22	86.5	6.18	6.39	1.67	94.5	3.29
	C	46.91	2.56	40.7	3.37	3.29	5.37	95.9	3.95	52.17	6.55	94.2	13.09	6.15	0.68	93.5	1.30
50 kR	S	53.51	4.65	89.8	9.06	3.54	3.54	75.38	6.50	55.1	1.20	74.4	2.12	6.75	1.81	66.9	3.11
	C	53.93	2.37	31.1	2.72	3.58	2.13	73.2	1.96	54.06	1.63	32.5	1.92	6.39	2.14	89.3	4.58
60 kR	S	50.81	4.21	98.4	8.60	3.26	0.66	59.6	0.92	51.24	2.61	62.7	4.27	5.67	2.21	66.9	3.70
	C	43.73	6.47	97.7	13.17	3.48	1.88	26.9	2.15	50.67	1.05	10.6	0.71	5.85	1.63	39.8	2.05
70 kR	S	41.74	5.16	78.0	9.39	3.11	3.66	77.2	6.75	48.64	1.85	76.3	3.33	4.03	1.81	39.9	2.23
	C	39.44	3.43	98.8	7.02	2.95	1.48	12.2	0.96	47.33	5.75	94.1	11.49	4.34	3.74	81.4	6.91
0.8%	S	47.82	3.24	84.8	6.15	3.59	2.89	93.7	5.85	51.27	1.49	63.3	2.44	7.70	1.14	55.4	1.69
	C	48.72	4.14	89.4	8.01	3.59	2.24	87.1	1.18	50.82	2.94	88.2	5.69	5.62	1.99	59.6	3.92
1.0%	S	45.08	2.93	78.8	5.37	3.59	0.88	31.1	4.07	50.79	1.26	16.8	1.06	8.19	1.37	98.4	2.81
	C	52.26	1.98	47.0	2.79	3.43	1.37	64.2	2.33	53.19	2.52	46.7	3.31	6.22	1.63	39.3	2.09
1.2%	S	55.34	2.79	96.0	2.92	3.64	0.23	13.3	0.27	53.99	1.76	51.0	2.59	8.71	0.76	16.7	0.69
	C	56.06	1.59	45.7	2.21	3.66	4.01	91.4	7.92	54.96	2.61	69.9	4.49	6.45	3.72	92.6	7.29
1.4%	S	42.8	4.91	87.1	9.44	3.28	1.76	13.0	1.22	49.12	1.83	20.5	1.71	5.01	7.86	95.1	15.77
	C	43.22	4.78	98.9	9.79	3.58	2.50	56.6	3.91	50.35	3.81	86.5	7.31	5.07	2.16	61.9	3.55
1.6%	S	32.66	1.19	15.9	0.98	3.28	2.65	97.1	5.18	48.48	1.97	92.9	3.92	4.50	1.7	92.3	3.56
	C	34.16	2.68	61.4	4.33	2.71	5.98	62.5	8.11	48.44	1.35	49.0	1.94	3.78	3.61	50.0	5.29

treated progenies. This was reported earlier [4]. This result suggested that these characters were under the control of non additive gene action and they will not respond to early selection.

High heritability (96.7%) and high GA (22.62%) with considerable amount of genetic variability was observed at 30 krad of gamma rays in Co 1 for capsule length. High heritability and GA for a character would indicate the predominance of additive gene action on the trait and as such, this trait is likely to respond effectively to phenotypic selection [2]. Thus, high heritability and genetic advance combined with increased genetic variability realized in the present study for the character capsule length revealed the scope of improving yield through effective selection based on this character.

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