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Short Communication

Induced *narrow leaf* mutant of sesame (*Sesamum indicum* L.)

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Narrow leaf mutants were identified in the M_2 generation of sesame (*Sesamum indicum* L.), cultivar B-67 treated with nitrous acid (0.25%, 2h-6.25% and 0.25%, 6h-2.50%) and hydrogen peroxide (0.25%, 2h-6.25%; 1.0%, 4h-0.63%; 0.25%, 6h-4.69% and 1.0%, 6h-3.28%) and have been reported as a part of research initiated in the species on induced chemical mutagenesis [1-2] to screen useful mutations. The estimated frequency of the mutant plant over the M_2 population (6137 plants scored) was 0.28%. The leaves of the mutant plants were narrow (length: range 10.2 cm to 15.1 cm, mean 12.33 cm $\pm$ 0.41; breadth: range 3.6 cm to 4.7 cm, mean 4.1 cm $\pm$ 0.08; area: range 24.30 sq. cm to 29.50 sq. cm, mean 26.08 sq.cm $\pm$ 2.23) and oblong to lanceolate in shape with entire to undulated margins (Fig. 1B and 1b). The control had leaves (Fig. 1A and 1a) which were palmately forked ovate with irregular margins (length: range 11.5 cm to 15.2 cm, mean 13.65 cm $\pm$ 0.41; breadth : range 12.0 cm to 15.8 cm, mean 14.02 cm $\pm$ 0.25; area : range 90.0 sq.cm to 110.0 sq.cm, mean 106.05 sq.cm $\pm$ 4.19).

Meiotic analysis from control and mutant plants showed that the mean chromosome (2n = 26) association per cell at metaphase I was 12.91 II + 0.19 I (106 meiocytes scored) in control and 13 II (52 PMCs assessed) in mutant. Balanced (13:13) separation of anaphase I chromosomes was noted in 86.87% (rest had 12-1-13) and 100.00% cells of control and mutant respectively. Pollen fertility as measured by pollen stained in 1% propionocarmine solution was high (control 86.92%; mutant 86.96%) in both the plant types.

Reciprocal crosses were made between normal plants and *narrow leaf* mutants. All F_1S had normal leaves. The F_2 segregation ratio from the cross with the mutant as the stigma parent was normal : mutant :: 63 : 24 (χ^2 = 1.31 for 3:1 ratio, p value 0.20 - 0.30) and the ratio from the cross with the mutant as the pollen parent was normal : mutant :: 44 17 (χ^2 = 0.268 for 3:1 ratio, p value 0.50 - 0.60). The narrow leaf shape was recessive to normal and was due to a single gene mutation. This was further supported with

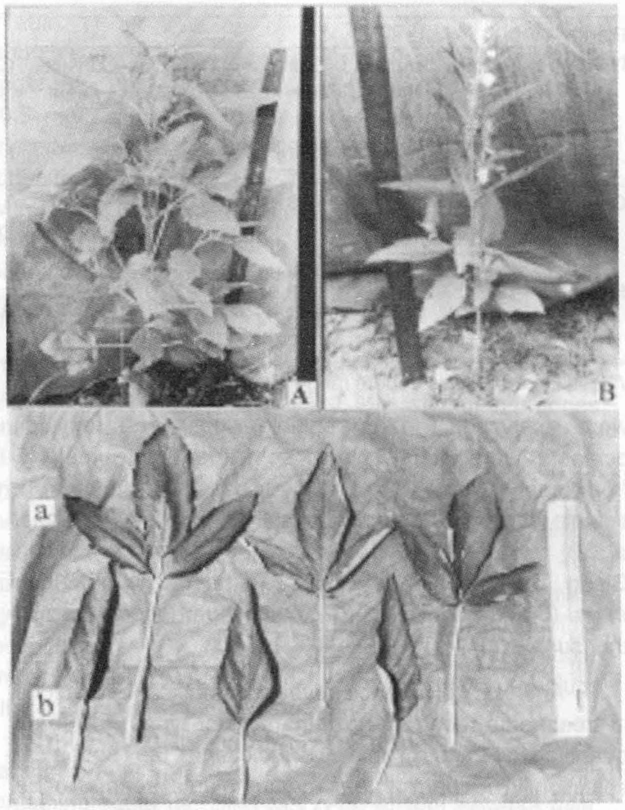

Fig. 1. Normal (A) and mutant (B) plants of sesame and leaves of normal (a) and mutant (b)

B_1 (F_1 $\times$ *narrow leaf* mutant) segregation by 56 normal: 50 mutant types (χ^2 = 0.34 for 1:1, p value 0.50 - 0.60).

Mutant types in the M_4 generation of selfing (progenies from 6 treatments were forwarded) and normal plants were compared for yield and yield related traits by an experiment grown in a randomized block design with three replications. Plot size was 3m $\times$ 1.5m with 4 rows in each plot and each row being the 250 cm long. Spacing was 30 cm between rows and 10 cm between plants. A number of quantitative characters (5 plants were randomely selected from each replication of each treatment for assessment of agronomic traits)

Table 1. Analysis of variances for control and mutant plant types for different parameters in sesame

Sources of variation	df	Mean squares											
		Plant height (cm)	Primary branches /plant	Distance from base to first branching (cm)	Capsules on the main axis	Capsules /plant	Capsule length (cm)	Seeds/ capsule	100-seed weight (g)	Seed yield/ plant (g)	Harvest index (%)	Flower fertility (%)	Capsule fertility (%)
Treatments	1	1.59	0.02	143.47*	101.35"	245.76*	0.0017	6.30	0.0011*	1.33	35.87*	290.23***	10.70*
Replication	2	2.95	0.02	2.50	2.00	13.07	0.0017	1.50	0.00001	0.01	0.18	12.71	2.50
Error	2	2.98	0.01	2.76	1.01	3.89	0.0001	3.44	0.00002	0.08	1.58	0.29	0.50

*,** and *** Significant at 0.05, 0.01 and 0.001 probability level respectively.

Table 2. Range and mean for different quantitative characters in control and mutant plant types in sesame

Plant types	Attributes											
	Plant height (cm)	Primary bran-ches/ plant	Distance from base to first branching (cm)	Capsules on the main axis	Capsules /plant	Capsule length (cm)	Seeds/ capsule	100-seed weight (g)	Seed yield/ plant (g)	Harvest index (%)	Flower fertility (%)	Capsule fertility (%)
Control	77.74	2.83	28.42	14.48	36.57	2.27	40.88	0.27	3.92	18.03	76.88	92.88
	(63.0-95.0)	(2-5)	(22.0-38.5)	(7-27)	(12-67)	(2.0-2.6)	(19-62)	(0.26-0.28)	(0.90-7.0)	(16.92-24.74)	(70.10-83.68)	(86.70-98.97)
Mutant	76.70	2.96	18.64	22.70	49.39	2.23	38.83	0.24	4.86	13.14	90.79	90.76
	(55.5-98.0)	(1-6)	(13.0-24.5)	(3-37)	(19-86)	(1.6-2.9)	(9-63)	(0.23-0.25)	(2.20-9.70)	(9.23-16.26)	(85.68-93.79)	(82.79-94.00)

Values in parenthesis denote range

were analyzed. Protein, soluble sugar and fatty oil contents were estimated in both the plant types (5 from each) from M_4 harvested seeds. Proteins and soluble sugar contents were analyzed as per Lowry *et al.* [3] and Osborne [4], and Dobois *et al.* [5] and Clegg [6], respectively. Oil was extracted in petrolium ether (60-70°C b.p. for 5 hours) from seed dried in the sun.

Analysis of variance revealed significant variations in treatments (control and mutant plant types) for some quantitative traits (Table 1) indicating the scope of selection. The *narrow leaf* mutant plants seems to be promising as they possessed higher number of capsules per plant, and on the main axis and smaller distance from base to first branching compared to controls (Table 2). Further, the seeds of the mutant were with enhanced soluble sugar content (control 0.78%, mutant 1.01%, significant at 0.001 probability level, t value 6.6 at 8 DF). The other traits including protein contents (control 24.74%, mutants 26.04%) assessed were more or less similar excepting that the mutant had significantly lower 100 seed weight and harvest index and lesser amount of fatty oil (control 66.7%, mutant 32.7%, significant at 0.001 probability level, t value 6.85, DF 8) content in seeds. Flower fertility (flowers transformed into capsules) was markedly higher in the mutant than control but capsule fertility (capsules with filled seeds) decreased in the mutants (Table 2).

Thus, the *narrow leaf* mutant can be exploited in sesame breeding for improvement in yield as the mutant possessed some desirable traits like higher number of capsules per plant and on the main axis, smaller distance from base to first branching, higher soluble sugar content in seeds and higher flower fertility. The leaf trait can be used as a morphological marker.

Acknowledgement

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References

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