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Short Communication

Induced viable macromutants in coriander (*Coriandrum sativum* L.)

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Induced mutagenesis has been successfully used in a large number of plant species in India for developing new varieties [1&2]. With a view to develop superior plant types in coriander (*Coriandrum sativum* L.), an important spice of commerce [3], a research project on induced mutagenesis in coriander has been initiated. The present communication deals with the frequency and types of viable macromutations induced in two cultivated varieties of *C. sativum* following gamma irradiations and EMS treatments.

Dry seeds of two coriander varieties NP(D)95 - (moisture content 16%); and TNP(D)92 (moisture content 18%), released from ICAR, New Delhi [4] and obtained from Globe Nursery, Kolkata, were gamma irradiated with 1, 2, 4, 8 and 10 kR doses from ^{60}CO source at the Central Research Institute for Jute and Allied Fibres, Nilganj, West Bengal. The seeds were also treated with 0.25, 0.50 and 1.0% EMS solutions (prepared in 0.2 M phosphate buffer, duration of treatment 4 and 8 hours with intermitant shaking at 21 ± 1^{o}C, pH 6.8) followed by thorough wash in running water for 3 to 4 hours. These doses were applied after pilot trials. Control (dry seeds) and treated seeds were sown (50 seeds in each case) in the experimental field at a spacing of 10 cm between plants and 30 cm in between rows to raise M_1 generation. Selfed seeds of each surviving M_1 plant were harvested separately and the M_2 was raised as plant progenies. The treated as well as control populations were carefully screened for macromutations throughout the growth period of the M_2 plants in field and the frequency of viable macromutants was estimated.

The types of viable macromutants (Table 1, Figs. 1b-1h) (the mutant traits were confirmed in the M_3) noted are: *cone* I (cone growth habit, broader pinnae in decompound leaves with luxuriant growth and delayed senescence, multiple shoot formation, and high leaf and seed yield); *cone* II (cone growth habit, broad pinnae, and high seed yield per plant); *cone* III (cone growth habit and narrow pinnae); *prostrate* I (prostrate growth habit, broad and evergreen nature of pinnae, multiple shoot formation, high leaf and seed yield per plant, and delayed flowering); *prostrate* II (prostrate growth habit with broad pinnae, and high leaf and seed yield per plant); *prostrate* III (prostrate growth habit with narrow pinnae); *lax branching* (high number of primary branches); *lilac purple* flowers ('031/1' as compared to *mallow purple* '630' in control plants); *dwarf* (height 15 to 19 cm, mean 16.38 cm±0.76 as compared to 37.2 cm±0.97 and 38.1 cm±0.92 in the control varieties); *early flowering* (12 to 14 days earlier than control plants, the mutants were erect like normal plants [Fig. 1a] but were taller (55.6 cm±0.89) without lodging tendency; the control plants flowered within 49 to 55 days from sowing and *dusky red* (3/4), *reddish grey* (4/4) and *yellowish red* (4/6) leaf mutants. The mutant types were mostly common in both varieties (except flower colour and yellowish red mutants which were isolated only from the mutagenized population of NP(D)95 and TNP(D)92, respectively). Over the M_2 population, they occurred in the following order: *cone* II > *cone* III > *prostrate* III > *prostrate* II > *cone* I > *dwarf* > *early flowering* > *dusky red* = *reddish grey* > *prostrate I* > *yellowish red* > *lax branching* > *lilac purple* flowers. The colour of leaves and flowers in the mutants and control were confirmed using leaves and flowers of identical maturity from Horticultural Colour Chart (1968) and Munsell Soil Colour Chart (1975).

The viable mutation frequency in most cases demonstrated inverse relationship with dose and they appeared with higher tendency in lower doses of treatments. EMS treatment showed higher frequency of mutations [22.22% to 57.89% in NP(D)95; 13.33% to 44.18% in TNP(D)92] as compared to gamma-rays [13.58% to 34.11% in NP(D)95; 11.11% to 23.98% in TNP(D)92]. The mutation frequency was higher in NP(D)95 than in TNP(D)92. Both varieties yielded maximum viable mutations in 4 kR dose of gamma rays and 4 hour treatments with 0.25% EMS. The higher mutation rate at lower doses of the mutagens may be due to the fact that the biological damage increased with higher doses at a faster rate than the

Table 1. Types and frequency of macromutations in coriander (*Coriandrum sativum* L.)

Attributes	Nos. of plants scored	Macromutation types (%)													Frequency (%)
		Leaf colour I	Leaf colour II	Leaf colour III	Cone I	Cone II	Cone III	Prostrate I	Prostrate II	Prostrate III	Lax branching	Lilac flower	Early flowering	Dwarf	
Gamma rays	1058	0.47	0.00	0.00	2.08	0.66	5.76	0.76	2.46	5.86	0.00	0.00	1.04	1.98	22.40
EMS	984	0.30	0.61	0.00	0.00	21.04	3.66	0.00	9.15	2.74	0.30	0.10	1.22	1.22	44.16
Total	2042	0.39	0.29	0.00	1.07	10.48	4.70	0.39	5.68	4.36	0.15	0.15	1.13	1.62	31.44
Gamma rays	748	0.53	0.00	0.00	2.67	1.87	5.35	0.00	6.15	3.07	0.13	0.00	0.80	0.27	22.46
EMS	1101	0.00	0.54	0.54	0.00	6.27	12.81	0.27	1.63	9.00	0.00	0.00	0.00	0.54	31.97
Total	1849	0.49	0.11	0.32	1.08	4.49	9.79	0.16	3.46	6.60	0.05	0.00	0.32	0.43	28.12
Grand total	3891	0.31	0.31	0.15	1.08	7.63	7.09	0.28	4.63	5.42	0.10	0.03	0.75	1.05	29.86

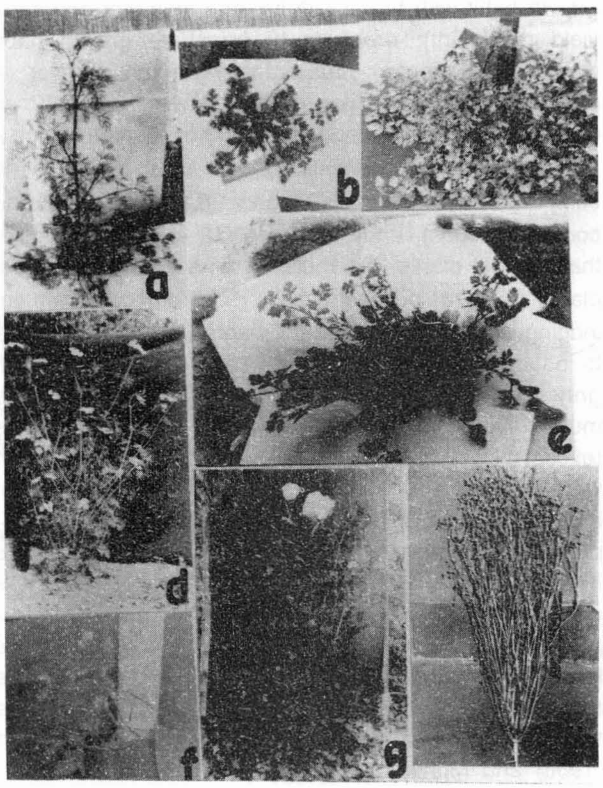

Fig. 1 Normal and mutant plants of *C. sativum.* (a) Normal plant with erect growth habit; (b) *Prostrate* mutant; (c) *Cone* I mutant showing luxuriant growth of leaf pinnae; (d) *Lax branching* mutant; (e) *Cone* mutant; (f) *Dwarf* mutant; (g) *Prostrate* I mutant showing multiple shoot formation; (h) *Prostrate* I mutant at harvest demonstrating high seed yield.

mutational events [5]. Spectrum of viable macromutations noted among treatments was 2 to 7 and was wider in the lower doses in both varieties.

Induced mutations have affected various plant parts of coriander resulting into alteration of the plant ideotype. Plant type mutations have been attributed to changes in the 'major genes' [6]. Cone, prostrate growth and lax branching nature may not be suitable as such for increasing plant population per unit area but their high yield potential could compensate the loss. These macromutants can, however, be effectively used in cross breeding with other desirable mutants or standard agronomic bases. Leaf and flower colour mutants may be exploited as genetic markers in different breeding experiments of coriander. Further, coloured leaves of coriander might add to their decorative value in salad preparations, while *early flowering* mutants are most desired by the breeders.

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