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INDUCTION AND ANALYSIS OF SHORT THICK FRUIT MUTANT IN *TRICHOSANTHES ANGUINA* L.

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ABSTRACT

A true breeding Short Thick Fruit Mutant was isolated in the M_2 generation of the green-white stripe variety of *Trichosanthes anguina* after treatment with 30 kR X-rays. The mutant differed from the mother line in shape and size of the fruits. Genetic analysis revealed that fruit characteristics are monogenic and recessive in nature.

Key words: *Trichosanthes anguina*, X-ray, mutant.

Trichosanthes anguina belongs to the family Cucurbitaceae and is cultivated throughout India, particularly in the plains of Eastern India, for its fruit, which is used as a summer vegetable. Its seeds yield oil of drying nature. One of the essential constituents of this oil is punicic acid, which is an isomer of α-eleostearic acid from tung oil. Tung oil is used for manufacturing protective coatings, especially in quick-drying, oleoresinous varnishes and enamels. Two fruit colour varieties viz. white (white stripe on white background) and green-white stripe (white stripe on green background) were subjected to crop improvement programme through X-ray induced mutation breeding. The present paper deals with the induction, isolation and analysis of a Short Thick Mutant.

MATERIALS AND METHODS

One Short Thick Fruit Mutant was selected in M_2 generation of the green-white stripe variety of *T. anguina* after treatment with 30 kR X-rays. The present paper deals with the comparative analysis of the mutant and its mother line. The methods followed for thin layer chromatographic studies of phenolic compounds in leaves, seed oil and punicic acid content in the oil, have been described earlier [1–3].

RESULTS AND DISCUSSION

The mutant differed from the mother line in shape and size of the fruit. The fruits of the mutant were short and thick, but long and slender in the mother line (Fig. 1). The fruit

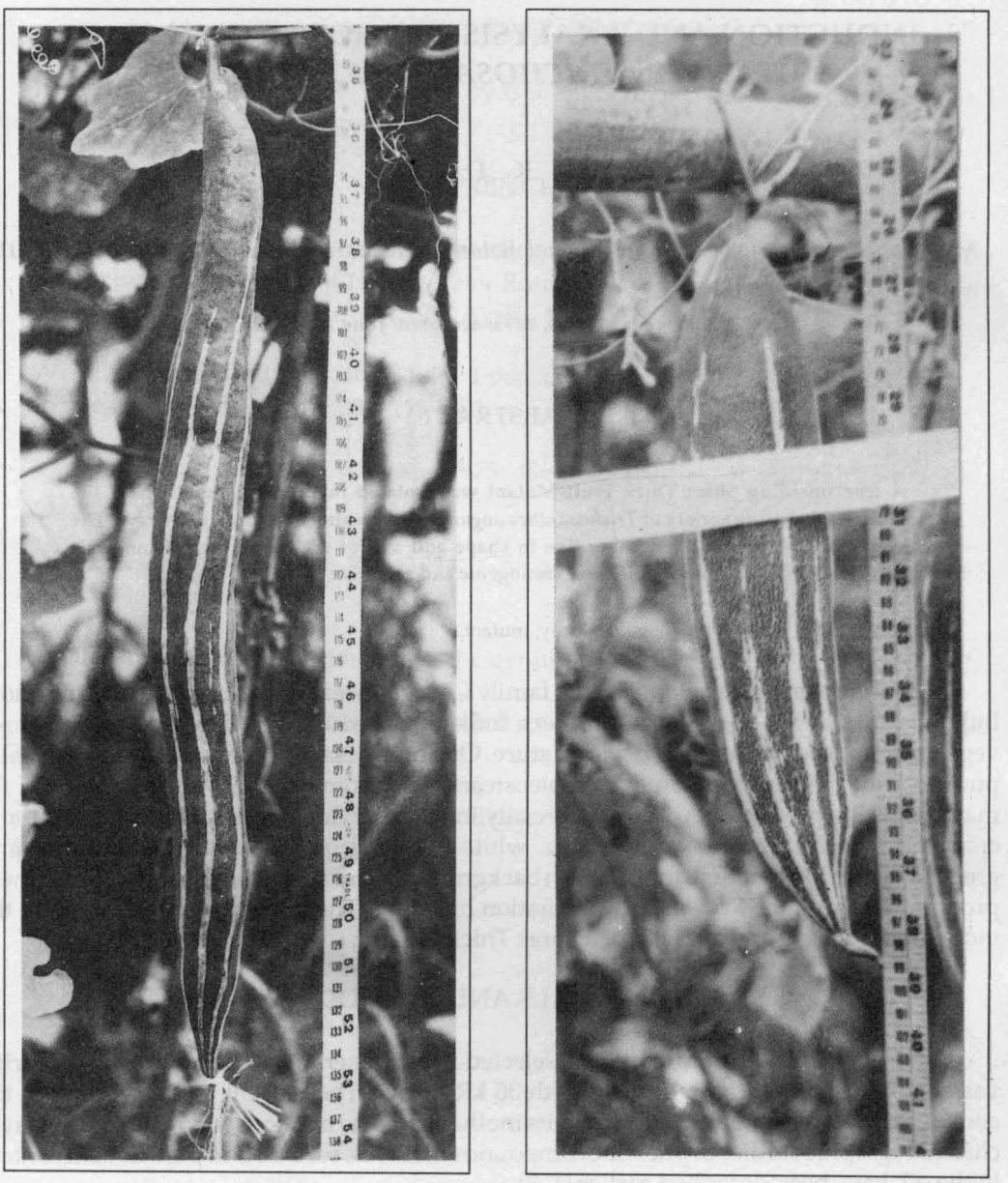

Fig. 1. Fruits of mother line with green–white stripes (right) and the short thick-fruit mutant (left).

length was significantly less in the mutant than in the mother line, while the circumference was significantly greater than in the mother line. The mutant flowered 44 days after sowing as against a mean flowering time of 56.6 $\pm$ 6.3 days in the mother line. The mutant bred true

in M3 and M4 generations with respect to fruit shape and size. In these generations the differences in fruit length, fruit circumference, pollen mother cells with chromosomal aberrations and pollen grain sterility between the mutant and the mother line were found to be significant (Table 1).

Table 1. Characters of Short Thick Fruit Mutant and the mother line in three generations of snakegourd

Character	M_2		M_3		M_4	
	mother line	mutant	mother line	mutant	mother line	mutant
Fruit/plant	16.2 ± 2.0	16.0	17.0 ± 2.1	16.4 ± 2.2	16.5 ± 1.9	16.2 ± 2.1
Fruit length (cm)	45.2 ± 1.1	34.2 ± 1.2***	46.8 ± 1.1	36.3 ± 1.0***	48.4 ± 0.9	33.0 ± 0.9***
Fruit circumference (cm)	11.2 ± 0.1	15.4 ± 0.5***	10.8 ± 0.1	15.6 ± 0.4***	10.9 ± 0.1	15.2 ± 0.3***
Fruit wt. (g)	242.0 ± 21.4	231.0 ± 21.6	244.0 ± 20.3	232.0 ± 20.3	235.0 ± 21.6	226.0 ± 19.0
Seed/fruit	19.9 ± 1.3	21.5 ± 1.3	21.2 ± 1.3	23.4 ± 1.4	21.8 ± 1.2	22.9 ± 1.3
Seed/plant	321.0 ± 20.6	346.0	361.0 ± 20.0	384.0 ± 26.2	360.0 ± 20.1	372.0 ± 24.3
Flowering time (days)	56.6 ± 6.3	44.0	44.0 ± 6.4	42.0 ± 5.1	46.6 ± 6.0	43.8 ± 5.4
PMCs with chromosomal aberrations (%)	0.3 ± 0.1	1.2 ± 0.2**	0.4 ± 0.2	1.1 ± 0.2*	0.4 ± 0.2	1.2 ± 0.2+
Pollen grain sterility (%)	0.5 ± 0.1	1.3 ± 0.1***	0.5 ± 0.1	1.2 ± 0.1***	0.4 ± 0.1	1.3 ± 0.1**
Total seed oil (%)	26.8 ± 0.7	27.2 ± 0.8	25.7 ± 0.5	26.4 ± 0.7	25.8 ± 0.7	26.1 ± 0.7
Punicic acid (%)	52.4 ± 1.9	55.7 ± 2.9	51.9 ± 1.7	56.5 ± 1.6	51.9 ± 1.7	54.2 ± 1.6

*P < 0.05; +P < 0.02; **P < 0.01; ***P < 0.001.

The inheritance of fruit shape of the Short Thick Fruit Mutant followed monohybrid ratio. In crosses between the mutant and the mother line the F1s had long slender fruit and the segregation in F_2 was as follows:

Family	Long slender fruit	Short thick	Total	χ^2 (3 : 1)	P
1	25	9	34	0.0392	0.90–0.80
2	29	11	40	0.1333	0.80–0.70
3	20	7	27	0.0122	0.95–0.90

Distribution of phenolic compounds varies not only in different species but also in cultivars of the same species. The presence of phenolic compounds can be readily detected by chromatographic methods. Number of phenolic compounds, colour reaction and Rf values are specific for individual plant materials. Thin layer chromatographic study of the phenolic compounds in leaves revealed striking differences in the distribution of spots for phenolic compounds between the mutant and the mother line. The spray reaction and mean hRf (Rf x 100) values of the spots of the mutant and the mother line are given in Table 2. While the mother line had nine (spot numbers 1, 2, 5–11) spots, the mutant had 10 (spot

Table 2. Colour and mean hRf + S.E. of spots in Short Thick Mutant and the mother line of snakegourd with two solvents

Spot number	Colour	Short Thick Fruit Mutant		Mother Line	
		solvent I	solvent II	solvent I	solvent II
1	Yellow	16 ± 0.5	58 ± 0.8	14 ± 0.5	58 ± 0.8
3	Light Pink	25 ± 0.5	60 ± 1.7	26 ± 0.9	59 ± 1.0
5	Dirty	39 ± 0.7	41 ± 0.8	39 ± 0.9	42 ± 0.8
6	Yellow	44 ± 0.6	67 ± 0.8	43 ± 1.0	68 ± 0.8
7	Bluish green	51 ± 0.7	56 ± 0.5	51 ± 0.9	56 ± 0.7
8	Green	56 ± 0.7	83 ± 1.4	56 ± 0.9	83 ± 1.4
9	Blue	60 ± 0.5	77 ± 0.7	59 ± 0.8	77 ± 0.9
10	Blue	69 ± 0.4	74 ± 1.0	68 ± 0.8	75 ± 1.1
11	Blue	66 ± 0.7	41 ± 1.5	67 ± 1.2	75 ± 1.1
12	Greenish blue	14 ± 0.8	71 ± 1.0	—	—

numbers 1, 3, 5–12) spots. In the present material, spot number 12 which is a new spot for phenolic compounds in leaves of the mutant has originated probably due to alteration of biosynthetic pathway of certain phenolic compounds or degradation of some of the existing phenolic compounds of the mother line following treatment with X-rays. Degradation of anthocyanins in *Maranta leuconeura* [5], *Trichosanthes anguina* [4, 6] and in rose [7, 8] have been reported. They have suggested that gene mutation induced by X-rays and gamma rays produce qualitative changes without altering the basic moiety of the pigment leading to formation of new compounds in the mutants.

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