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Short Communication

Inheritance of flower colour mutant in groundnut

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Groundnut has been treated extensively to different mutagens for induction of genetic variability. A number of reports in groundnut showed that several mutations affected qualitative traits such as leaf size, shape and colour, plant height, plant habit, flower colour, pod and seed traits [1-6]. Groundnut has five distinct flower colours (white, yellow, orange, burnt orange and amber). Of these, yellow and orange flowers are most common.

Seeds of groundnut cultivar TAG 24 treated with 150, 250 and 350 Gy gamma rays during rainy season 2000 and the M_2 plants were grown at the Bhabha Atomic Research Centre, Mumbai. Groundnut mutant, TGM 112, was isolated with white to light orange flower from the 250 Gy treatment with a frequency of 0.02% based on M_2 plant population. The color of petals, namely, standard, wing and keel ranged from different grades of white to light-orange (hence it was referred as light-orange) in mutant as compared to orange petals found in the parent variety. Further, the central crescent area of the standard was also light-orange in mutant, while it was orange in the parent. At any given time, the mutant had either all the flowers in white colour or a combination of white and light-orange flowers. The mutant was bred true in the M_3 and its true breeding behaviour was confirmed up to the M_8 generation.

In the crosses between the parent variety and mutant during rainy season 2003, all the F_1 plants had orange flowers indicating dominance of orange flower over light-orange. The F_2 plant population segregated to the 3:1 ratio for orange: light-orange flowered plants (Table 1). Reciprocal crosses also did not differ from the expected 3:1 ratio, indicating absence of maternal effect for this trait. The F_3 progenies were classified on the basis of plants with orange and light-orange flowers with a good fit to the ratio of 1 (all plants with orange flowers) : 2 (3 orange: 1 light-orange) : 1 (all plants with light-orange flowers) (Table 1). Thus, both phenotypic and genotypic segregation in F_2 and F_3 generations confirmed that the light-orange flower colour was due to a single recessive gene. In the earlier reports, orange flower trait was reported as incompletely [4] or completely [5] monogenic dominant over white flower. Dwivedi *et al.* [6] observed inconsistent segregation for white flower and opined that this

Table 1. Segregation of flower colour in F_2 and F_3 generations in groundnut

Cross	No. of progenies	Flower colour		Expected ratio	χ^2	df	P
		Orange	Light-orange				
F_2 generation							
TAG 24 × TGM 112	3	133	50	3:1	0.526	1	0.25-0.50
TGM 112 × TAG 24	8	292	118	3:1	3.125	1	0.05-0.10
				3:1	3.651	2	0.10-0.25
Pooled	11	425	168	3:1	3.508	1	0.05-0.10
Homogeneity				3:1	0.143	1	0.50-0.75
F_3 generation							
TAG 24 × TGM 112	22	422	-	-	-		
	52	790	283	3:1	1.081	1	0.25-0.50
	16	-	391	-	-		
	90	χ^2 for 22:52:16		1:2:1	2.977	2	0.10-0.25
TGM 112 × TAG 24	9	184	-	-	-		
	42	889	335	3:1	3.664	1	0.05-0.10
	16	-	411	-	-		
	67	χ^2 for 9:42:16		1:2:1	5.776	2	0.05-0.10

Table 2. Comparison of TGS 119 and TGS 120 plant type with TGM 112 and TAG 24 in groundnut

Trait	TGM 112	TAG 24	TGS 119	TGS 120
Leaflet length (cm)	5.6±0.11	4.8±0.08	2.3±0.03	2.9±0.04
Leaflet breadth (cm)	2.8±0.06	2.4±0.05	1.4±0.03	1.7±0.02
Plant height (cm)	37.3±0.91	44.3±0.45	21.5±0.60	34.4±0.75
No. of primary branches	4.9±0.23	5.1±0.23	5.3±0.26	6.6±0.45
No. of secondary branches	3.1±0.23	3.0±0.26	4.3±0.65	7.0±0.97
Pod weight (g/plant)	28.9±2.66	27.1±2.31	4.5±0.48	11.9±0.83
No. of pods/plant	30.2±3.12	27.8±2.57	7.8±1.11	16.4±1.20
No. of seeds/pod	2.1±0.07	2.4±0.05	1.7±0.04	1.9±0.06

phenomenon could possibly be due to activity of unstable genetic elements along with the white flower alleles.

In F_2 generation from the crosses between TAG 24 and its TGM 112 mutant, two segregants (named as TGS 119 and TGS 120) had altogether new phenotype, which was not present in both the parents. These segregants have dwarf plant height, small with few imparipinnate leaves, thin branches and reduced pod setting compared to TGM 112 and TAG 24 (Table 2). They invariably had light-orange flowers. Occurrence of these segregants was observed only in TGM 112 × TAG 24 crosses in both F_2 and F_3 generations, but not in TAG 24 × TGM 112 crosses.

The F_1 plants in the crosses of TAG 24 with TGS 119 or TGS 120, were like TAG 24 plants with orange flowers. Similarly, the F_1 plants in the crosses of TGM 112 with TGS 119 or TGS 120, were like TGM 112 plants with light-orange flowers. The F_2 generation segregated into the 3:1 ratio for TAG 24 or TGM 112 type plants and TGS 119 or TGS 120 type plants (Table 3). All the TGS 119 or TGS 120 type plants in the F_2 generation had light- orange flowers. These results indicated TGS 119 and TGS 120 plant types were due to single recessive gene in relation to both TAG 24 and TGM 112 type plants.

Table 3. Segregation of plant type in F_2 generation

Cross	No. of proge-nies	Plant type		χ^2 (3:1)	df	P
		Nor-mal	Mu-tant			
TGM112 × TGS 119	5	78	19	1.515	1	0.20-0.30
TGM 112 × TGS 120	7	118	46	0.813	1	0.30-0.50
TAG 24 × TGS 119	8	169	43	2.515	1	0.10-0.20
TAG 24 × TGS 120	10	201	55	1.687	1	0.10-0.20
TGS 120 × TAG 24	2	28	10	0.035	1	0.70-0.90
				6.566	5	0.20-0.30
Pooled		594	173	2.444	1	0.10-0.20
Homogeneity				4.122	4	0.30-0.50

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