Indian J. Genet., **67**(2): 177-179 (2007)

Short Communication

An induced dominant seed coat colour mutation in groundnut

Suvendu Mondal, Anand M. Badigannavar, D. M. Kale and G. S. S. Murty

Nuclear Agriculture and Biotechnology Division, Bhabha Atomic Research Centre, Trombay, Mumbai 400 085

(Received: May 2006; Revised: May 2007; Accepted: July 2007)

Testa color is an important attribute of many crop species, especially those in which the whole seed is utilized for human food. Seed coat color is one of the varietal descriptors commonly used by breeders, seed multiplying and certifying agencies as a determinant of the degree of cultivar's purity as well as an account of consumer's acceptability. In groundnut (*Arachis hypogaea* L.) spectrum of testa colors were reported. Some are in natural accessions and others are resultant of induced mutations. So far, five colours namely, white, flesh (rose, pink, tan, russet), red, purple and wine are identified in groundnut germplasm.

Basically two sets of duplicate genes (designated F_1F_2 and D_1D_2) are responsible for testa pigmentation in groundnut. A dominant allele of one each of F and D genes must be present to condition pigmentation. If either the F or the D is recessive, it results in white testa. Many colors are controlled by duplicate loci, as expected for tetraploid species like groundnut [1]. Norden *et al.* [2] reported spontaneous mutants wherein white testa was dominant over pink and red. In another report, red testa was found governed by single recessive gene in several groundnut cultivars [3]. In the present study, isolation of nine dominant rose testa mutants in groundnut is reported.

A recombinant TFDRG 5, derived from the cross between TAG 24 and VG 9514 was used [4]. It has red seed coat with resistance to late leaf spot and rust. TAG 24 and VG 9514 have rose and red testa respectively. Seeds of TFDRG 5 (200 each) were treated with gamma rays (200 and 300 Gy) or sodium azide (NaN_3 1, 2 and 3 mM) and a combination of both gamma rays and NaN_3. For NaN_3 treatment seeds were initially soaked in distilled water for 4 h and then treated with NaN_3 at 1, 2 and 3 mM for 17 h at pH 7.0. M_1 generation was grown in the experimental fields at Trombay during summer 2004. In M_2 population, among several variants identified, were nine seed coat colour mutants. They were advanced to the subsequent generations as plant to row progenies. Segregation pattern for testa color was studied in M_3 and M_4 generations and analyzed by χ^2 test for goodness of fit.

In M_2 generation, comprising of 20,619 plants, nine plants having rose colour testa were isolated from the parent TFDRG 5 with red testa colour. Of the nine rose testa coloured variants, seven were obtained from NaN_3 (1, 2 and 3 mM) treatment with a frequency of 0.068%. Two more were from two combination treatments, gamma rays (300Gy) + NaN_3 (1mM and 2mM) with 0.235% mutation frequency. In M_3 generation, testa color in all plants segregated into a ratio of 3 rose: 1 red testa (Table 1). Progenies in M_4 generation fitted well to the expected ratio of 1 (all rose): 2 (3 rose: 1 red): 1 (all red) (Table 1). Both phenotypic and genotypic segregation revealed that rose testa is monogenic dominant over red testa.

Occurrence of rose testa mutants from red testa parent (TFDRG 5) whose one of the parents had rose testa (TAG 24) is an example of revertants. Earlier, Smart [5] noted reversion of the red testa to parental variegated type in a red-seeded selection from groundnut variety Mani Pintar (variegated testa). This reversion of testa color was only in a small proportion of the seeds and this was ascribed to rearrangement of chromosomal material (position effect). The reversion of white flower color allele to yellow color at low frequency was attributed to the excision of genetic element [6]. Gowda *et al.* [7] reported occurrence of unstable and true breeding revertants for plant habit in groundnut. In the earlier report, it was found that both pink and tan (rose) testa colour were monogenic dominant over red testa [3]. In another report, it was suggested that Makulu Red cultivar was governed by two homozygous recessive genes [8]. Conversely, red testa color in PI 393527B was reported to be controlled by single dominant gene over tan testa color [9]. Norden *et al.* [2] reported monogenic dominant inheritance of a naturally white seed coat mutant. Mouli *et al.* [10] reported a purple seed coat colored mutant, which was governed by duplicate recessive genes. The present seed coat colour

Table 1. Segregation for induced rose seed coat colour mutations in groundnut.

Mutant and generation		No. of progenies studied	Phenotypic testa color segregation		Expected ratio	χ^2 value	Probability
			Rose	Red			
F-1-2	M_2	1	2	23	-	-	-
	M_3	1	9	3	3:1	0.000	1.00
	M_4	3	50	-	-	-	-
		6	103	19	3:1	5.77	0.01-0.02
		3	-	52	-	-	-
	Total	12	(3:6:3)		1:2:1	0.000	1.00
G-43-1	M_2	1	1	3	-	-	-
	M_3	1	33	10	3:1	0.069	0.70-0.80
	M_4	10	217	-	-	-	-
		23	458	158	3:1	0.139	0.70-0.80
		10	-	195	-	-	-
	Total	43	(10:23:10)		1:2:1	0.208	0.90-0.95
I-120-1	M_2	1	1	12	-	-	-
	M_3	1	30	8	3:1	0.314	0.50-0.70
	M_4	11	219	-	-	-	-
		24	546	185	3:1	0.036	0.80-0.90
		14	-	279	-	-	-
	Total	49	(11:24:14)		1:2:1	0.387	0.80-0.90
J-23-1	M_2	1	1	39	-	-	-
	M_3	1	23	5	3:1	0.760	0.30-0.50
	M_4	8	129	-	-	-	-
		15	252	64	3:1	3.79	0.05-0.10
		5	-	85	-	-	-
	Total	28	(8:15:5)		1:2:1	0.785	0.50-0.70
J-120-1	M_2	1	1	28	-	-	-
	M_3	1	30	8	3:1	0.314	0.50-0.70
	M_4	10	200	-	-	-	-
		20	496	168	3:1	0.032	0.80-0.90
		8	-	164	-	-	-
	Total	38	(10:20:8)		1:2:1	0.315	0.80-0.90
K-30-1	M_2	1	1	39	-	-	-
	M_3	1	30	10	3:1	0.00	1.00
	M_4	13	237	-	-	-	-
		17	208	53	3:1	3.065	0.05-0.10
		10	-	164	-	-	-
	Total	40	(13:17:10)		1:2:1	1.35	0.50-0.70
K-34-1	M_2	1	1	20	-	-	-
	M_3	1	29	7	3:1	0.592	0.30-0.50
	M_4	10	273	-	-	-	-
		19	510	164	3:1	0.160	0.70-0.80
		7	-	196	-	-	-
	Total	36	(10:19:7)		1:2:1	0.610	0.70-0.80
K-95-1	M_2	1	1	20	-	-	-
	M_3	1	47	16	3:1	0.005	0.90-0.95
K-111-1	M_2	1	1	20	-	-	-
	M_3	1	31	7	3:1	0.876	0.30-0.50
Pooled	M_3	9	267	80	3:1	0.700	0.30-0.50
Pooled	M_4	124	(2573:811)		3:1	1.930	0.10-0.20
Pooled	M_4	246	(65:124:57)		1:2:1	0.536	0.70-0.80

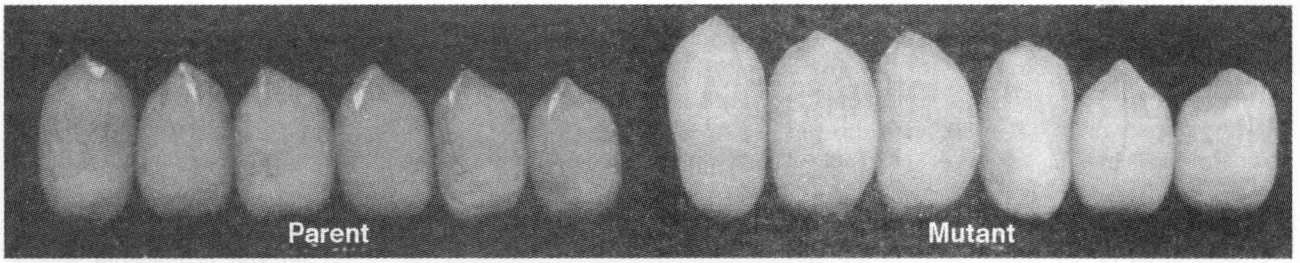

Fig. 1. TFDRG 5 and its rose seed coat mutant

mutants are perhaps the first report of occurrence of induced rose coloured seed coat mutants from red seed coat background in groundnut, that is a dominant mutant allele over red and it is monogenic in nature. Studies on allelic relationship among the mutants will be undertaken in due course of time.

References

1. **Knauft D. A. and Wynne J. C.** 1995. Peanut breeding and genetics. Adv. Agron., **55**: 393-445.
2. **Norden A. J., Knauft D. A. and Gorbet D. W.** 1988. A dominant gene for white seed coat in peanut (*Arachis hypogaea* L.). The Journal of Heredity, **79**(3): 212-214.
3. **Branch W. D. and Holbrook C. C.** 1991. A note on testcross between tan or red testa color and recessive red peanut genotypes. Peanut Science, **18**: 109-110.
4. **Badigannavar A. M., Kale D. M., Mondal S. and Murty G. S. S.** 2005. Trombay groundnut recombinants resistant to foliar diseases. Mutation Breeding Newsletter and Reviews, **1**: 11-12.
5. **Smartt J.** 1960. Genetic instability and outcrossing in the groundnut variety Mani Pintar. Nature, **186**: 1070-1071.
6. **Dwivedi S. L., Singh A. K. and Nigam S. N.** 1996. Unstable white flower color in Groundnut (*Arachis hypogaea* L.). The journal of Heredity, **87**(3): 247-248.
7. **Gowda M. V. C., Nadaf H. L. and Sheshagiri R.** 1996. The role of mutation in intraspecific differentiation of groundnut (*Arachis hypogaea* L.). Euphytica, **90**: 105-113.
8. **Branch W. D. and Holbrook C. C.** 1988. Genie relationship between R1, R2 and R3 for red peanut testa colour. Peanut science, **15**: 13-14.
9. **Vasanthi R. P. and Reddy C. R.** 1997. Inheritance of testa colour and resistance to late leaf spot and rust in groundnut (*Arachis hypogaea* L.). Journal of Oilseed Research, **14**(2): 244-248.
10. **Mouli C., Kale D. M. and Patil S. H.** 1981. Inhibition of purple seed coat colour in groundnut. Current Science, **50**(11): 499-500.