



Research Note

Gamma ray induced Spanish bunch mutant with foliar disease resistance in groundnut (*Arachis hypogaea* L.)

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Abstract :

One radiation induced small leaf mutant with foliar disease resistance was isolated in a Spanish bunch variety of VRI 2 groundnut. The mutant VGM-1 was dwarf in nature with small pods and kernels. The mutant showed resistance mechanism for both late leaf spot and rust diseases. The mutant can be utilized as donor parent to develop cultivar with increased level of resistance.

Key words:

Groundnut, mutant, foliar disease, resistance

Groundnut (*Arachis hypogaea* L.) a self-pollinated crop with limited genetic variability, restricts the scope for further improvement by selection. Induced mutation paves the way for widening the genetic base of groundnut. The usefulness of physical and chemical mutagens for inducing mutations in polygenic characters was realized after the work of Gregory (1968) in groundnut. The present study was undertaken with a view to develop mutant with desirable agronomic traits.

Fully dried kernels of a Spanish bunch variety VRI 2 was irradiated with 300 Gy gamma-rays during Rabi/summer 2007-08. Treated seeds were sown immediately along with the untreated control in plots of 4 x 3 m². All the M₁ plants were harvested individually and raised as progeny rows during Kharif 2008. A sum total of 126 M₂ single plants were harvested with good pod features and raised as M₃ families during Rabi/summer 2008-09. Within each family, proven single plants with superior yield was harvested and raised as M₄ families during Kharif 2009. Severe incidence of late leaf spot and rust was observed during this season was utilized to screen the progenies. While screening the M₄ families, for late leaf spot and rust diseases, one

single plant with good level of resistance was identified. The pods from the resistant mutant plant was harvested separately and raised as progeny rows during Rabi/summer 2009-10. All the plants in the M₅ generation were phenotypically similar and exhibited resistance for both late leaf spot and rust diseases and designated as Vridhachalam Groundnut Mutant 'VGM-1'.

VGM-1 was similar to the Spanish bunch cultivar VRI 2 in growth habit, branching pattern and sequential flowering behaviour. Plant height in VGM-1 was reduced (19.25 cm) compared to the control VRI 2 (41.45 cm). Numbers of primaries (n+1) were more or less similar in number. However, number of secondaries (n+2) was higher in the mutant (11.45) which suggested that a genetic change has been induced for secondaries. Both the mutant and control possessed green foliage. The control variety matured earlier than the mutant. Leaves were smaller in size with a mean length of 3.76 cm. The leaf shape of the mutant has been changed as obovate unlike lanceolate in VRI 2. Mutant had more number of pegs and mature pods than the control VRI 2 (Table 1).

Even though, the number of mature pod was lesser in control, the pod yield was higher due to larger pod and kernel size. Mutant possessed smaller pods and kernels with a mean pod and kernel length of 1.55 and 0.662 cm respectively (Table 2). Contrary to the



control VRI 2 pod beak was absent and the pod constriction was shallow. Pod reticulation was also slight. Hundred kernel weight was significantly low in mutant (18.2 g) compared to the control (47.44 g). Similarly shelling outturn was comparably low (70.68 %) in mutant. However the mutant possesses resistance for late leaf spot (3.8) and rust diseases (4.2). Mutants for different agronomic traits have also been reported by many workers (Chandra Mouli and Kale, 1982; Vijaykumar *et al.*, 1993; Chandrashekhar *et al.*, 1997; Naik and Nadaf, 1997 and Venkatachalam and Jayabalan, 1997). Although the yield was low, the mutant can be utilized as a donor for the development of a cultivar with increased level of resistance.

References

- Chandra Mouli and D.M. Kale. (1982). Gamma-ray induced Spanish bunch mutant with large pod groundnut. *Olegineux*. Vol.37, no 12, December.
- Chandrashekhar, C.H., Gowda, M.V.C and M.S. Manjula. (1997). Role of transposon induced mutation in the intraspecific differentiation of *Arachis hypogaea* (L.). *Crop Res.* 14(2): 243-251.
- Gregory, W.C (1968). A radiation breeding experiment with peanuts. *Radiation Bot.* 8: 81-147.
- Naik, S.I. and H.L.Nadaf. (1997). Induced variability for quantitative characters in groundnut (*Arachis hypogaea* L.). *Crop Improv.* 24(2): 226-230.
- Venkatachalam, P and N. Jayabalan (1997). Frequency and spectrum of viable mutations in groundnut induced by physical and chemical mutagens. *Crop Res.* 14(1): 61-75.
- Vijayakumar, S. Gopal, K, Ravikumar, R.L. and H.D. Upadhyaya. (1993). Induced mutation for higher yield in groundnut (*Arachis hypogaea*). *Indian J. Agrl. Sci.*, 63(1):716-718.

**Table 1. Morphological description of groundnut foliar disease mutant VGM 1**

Growth habit	:	Erect
Branching pattern	:	Sequential
Stem hairiness	:	Sparse
Stem pigmentation	:	Absent
Leaf colour	:	Green
Leaflet shape	:	Obovate
Hairiness on young leaf	:	Medium
Hairiness on mature leaf	:	Sparse
Inflorescence type	:	Compound
Peg colour	:	Absent
Standard petal colour	:	Orange
Pod beak	:	Absent
Pod constriction	:	Shallow
Pod reticulation	:	Slight
Seed colour	:	Tan
Secondary seed coat colour	:	Tan

Table 2. Quantitative characters of groundnut foliar disease mutant VGM 1

Characters	Mean \pm S.E.	
	Foliar Disease Resistant Mutant VGM 1	Control (VRI 2)
Days to maturity	114.9 \pm 0.433	102.3 \pm 0.472
Plant height (cm)	19.25 \pm 2.70	41.45 \pm 1.604
Number of primaries	6.5 \pm 1.93	6.1 \pm 0.585
Number of secondaries	11.45 \pm 3.54	6.0 \pm 1.619
Number of flowers/inflorescence	2.5 \pm 0.166	2.6 \pm 0.163
Leaflet length (cm)	3.76 \pm 0.151	4.562 \pm 0.115
Leaflet width (cm)	2.34 \pm 0.096	2.207 \pm 0.055
Length/Width ratio	1.608 \pm 0.024	2.089 \pm 0.051
Number of seeds per pod	1.8 \pm 0.133	1.8 \pm 0.133
Pod length (cm)	1.55 \pm 0.037	2.66 \pm 0.039
Pod width (cm)	0.738 \pm 0.021	1.15 \pm 0.024
Seed length (cm)	0.662 \pm 0.024	1.34 \pm 0.023
Seed width (cm)	0.513 \pm 0.016	0.735 \pm 0.0184
100 seed weight (g)	18.2 \pm 0.207	47.44 \pm 0.424
Shelling per cent	70.68 \pm 0.168	72.43 \pm 0.567
Pod yield (g)	7.437 \pm 0.049	25.23 \pm 3.873
Oil content (%)	48.4	49.6
Reaction to rust (1-9 scale)	4.2	8.8
Reaction to late leaf spot (1-9 scale)	3.8	8.6



Fig.1 Foliar Disease Resistant Mutant (left) with VRI 2 (right)



Fig.2. Pod characteristics of FDR mutant (left) with VRI 2 (right)



Fig.3. Leaves of FDR mutant (left) with VRI 2 (right)