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Short Communication

An induced mutant with different flower colour and stipule morphology in grass pea (*Lathyrus sativus* L.)

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Striking variations in flower colour and shape of stipule were conspicuous in a mutant plant detected in the post irradiated (350 Gy of gamma rays) M_3 progeny of grass pea var. Bio R-231. While the parental control cultivar produced characteristic blue coloured flowers during the investigation carried out for nine consecutive years, colour of flower in the mutant had modified into white with blue patches on the largest petal (standard or vexillum) only (Figs. 1-3). In control, the free lateral stipules were navicular in shape with semisagittate base but the two stipules in the mutant were found to be of different shapes, one being acicular-distichous while the other was incurved with linear-fulcate shaped modification. The modified flower colour and stipule character had transmitted in the succeeding selfed generations without any alterations. Transmission of induced modification in flower colour and stipule character had also been reported earlier in other mutant lines derived through gamma rays irradiation in the same variety [1, 2]. Perusal of literature however, cites occurrence of white and mixed colour lines in the west, the Canary islands and the former U.S.S.R. [3].

The control plant was highly fertile (98.47 %) but marked increase in pollen sterility (34.71%) was noted in the mutant. The number of primary branches per plant were more or less similar but number of pods, seeds/pod and plant seed yield reduced marginally in the mutant compared to its parental control (Table 1). The mutant is true breeding and early maturing also.

Table 1. Data on agronomic characteristics of the control and mutant of var. Bio R-231

Characters		Range	Mean ± SE
Plant height (cm)	C	50-55	52.50 ± 0.03
	M	48.90-57.87	53.68 ± 0.67
Leaves/branch	C	24-28	27.50 ± 0.40
	M	19-25	22.05 ± 0.48
Primary branches/plant	C	10-15	12.40 ± 0.11
	M	11-15	13.38 ± 0.29
Leaflets/leaf	C	2-6	4.60 ± 0.27
	M	1-5	4.26 ± 0.28
Pollen sterility (%)	C	1.1-1.9	1.53 ± 0.06
	M	33.9-35.8	34.71 ± 0.21
Days to first flowering	C	45-52	48.0 ± 0.04
	M	42-47	44.5 ± 0.39
Days to maturity	C	132-136	134 ± 0.01
	M	121-125	123.5 ± 0.28
Pods/plant	C	80-88	84.0 ± 0.03
	M	76-82	79.05 ± 0.41
Seeds/pod	C	3-4	3.60 ± 0.14
	M	2-4	3.25 ± 0.17
Seed yield/plant (g)	C	10.6-12.2	11.6 ± 0.04
	M	8.7-11.8	9.65 ± 0.19

C = Control, M = Mutant

The F_1 hybrid obtained through intercrosses (M_5 and M_6 generations) between the control and the mutant manifested similar flower colour and stipule character as in control and data were pooled together. While both the mutant characters exhibited a segregation of 3:1 and 1:1 (control to mutant) proportion in F_2 and backcross progenies, respectively study of joint segregation revealed independent assortment of both the traits showing dihybrid mode of inheritance in F_2 (9:3:3:1) and backcross (1:1:1:1) generations (Table 2). It is thus indicated that these two traits are governed by two different pair of alleles and one pair is independent of the other. Both the mutant characters are recessive to their parental wild type.

Meiotic studies carried out in PMCs revealed regular presence of 7II in the control but frequent occurrence of multivalent association of chromosomes at diakinesis and metaphase-I was the common feature in the mutant (Figs. 4-8). Among the multivalents, quadrivalents appeared predominantly but trivalent association (4II+2III) was rather infrequent. Configuration of quadrivalent (5II+1IV) is 'eight shaped' in maximum number of PMCs (49.1%) while ring and linear configuration of quadrivalents were encountered in 37.58% and 5.45% PMCs respectively. Anaphasic disturbances were recorded in 19.0% cases in the form

Table 2. Segregation of flower colour and shape of stipule in grass pea var. Bio R-231

Cross	F_1 Phenotype	F_2/Backcross segregation		Expected ratio	$\chi 2$	P
Stipule type	Navicular-Semisagittate (control like)	Navicular-Semisagittate	Acicular-linear falcate			
Control × mutant		119	37	3:1	0.136	0.70-0.80
F_1 × mutant (recessive)	-	31	25	1:1	0.643	0.30-0.50
Flower colour		Blue	Blue patched white			
Control (Blue) × mutant (Blue patched white)	Blue	109	30	3:1	0.865	0.30-0.50
F_1 × mutant (recessive)	-	29	22	1:1	0.960	0.30-0.50
Joint segregation						
Gene pair (X)-(Y)	Navicular-semi-	XY Xy	xY xy			
Control (XY) × mutant (xy)	sagittate stipule and blue flower	159 49	55 17	9:3:3:1	0.381	0.90-0.95
F_1 × mutant (recessive)	-	36 27	32 40	1:1:1:1	2.74	0.30-0.50

of unequal (8-6) separation (10%), laggard (5%) and chromosomal bridge formation (4%) but no such irregularities could be traced in the control (Figs. 9-12; Table 3).

Table 3. Meiotic chromosome behaviour in the induced mutant of grass pea var. Bio R-231

Chromosome association/separation	Metaphase-1 Frequency	Anaphase-1 Frequency
Trivalent (4II + 2III)	10 (6.06%)	-
Ring shaped quadrivalent (5II+1IV)	62 (37.57%)	-
Eight shaped quadrivalent (5II+1IV)	81 (49.10%)	-
Linear quadrivalent (5II+1IV)	09 (5.45%)	-
Normal (7II)	03 (1.82%)	-
Unequal separation (8-6)	-	10
Laggard	-	05
Bridge formation	-	04
Normal (7-7)	-	81
Total cells scored	165	100

Induced breakage in non-homologous chromosome followed by reciprocal translocation might have resulted in multivalent association. Usually adjacent orientation of quadrivalents may bring about pollen sterility through anaphasic disturbances; the degree of which may however be reduced to considerable extent through alternate disjunction preventing any chance of such anomalies due to chromosomal separation.

References

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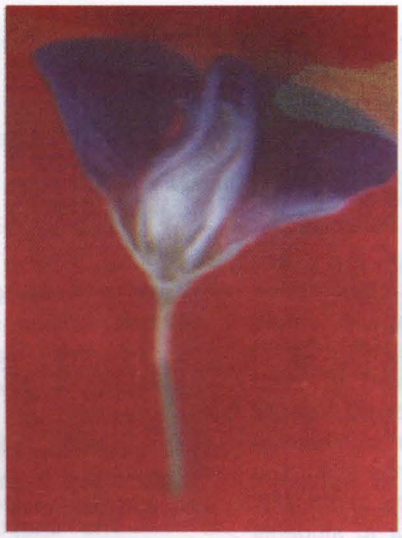
2. **Talukdar D. and Biswas A. K.** 2002. Characterisation of an induced mutant and its inheritance in grass pea (*Lathyrus sativus* L.). Indian J. Genet., **62**: 355-356.

3. **Jackson M. T. and Yunus A. G.** 1984. Variation in the grass pea (*Lathyrus sativus* L.) and wild species. Euphytica, **33**: 549-559.

(1)



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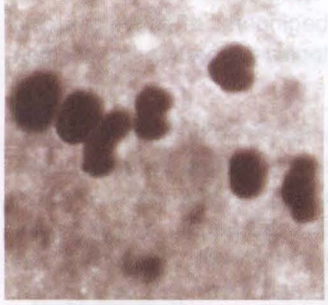

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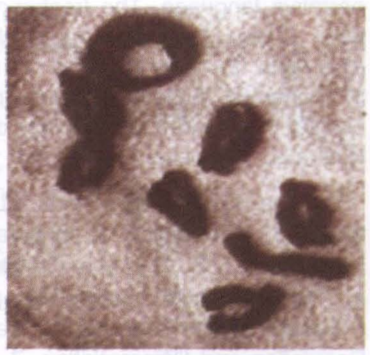

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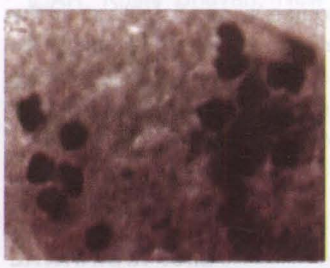

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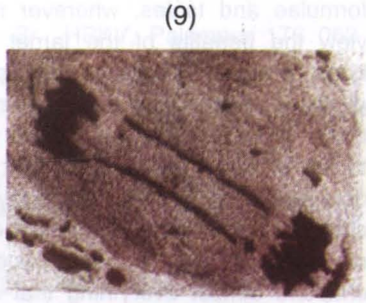

(12)

Fig. 1&2 - Stipule and flower (control): Fig. 3 - Mutant Plant: Fig. 4 - 7II (control). Fig. 5-8 Mutant: Fig. 5 - Metahase I ring quadrivalent: Fig. 6 - Diakinesis - '8' shaped quadrivalent: Fig. 7 - Metaphase I linear quadrivalent: Fig. 8 - Trivalent (Metaphase - 1): Fig. 9-12 - anaphase 1 : Fig. 9: 7-7 separation (control); Fig. 10. 8-6 Separation (Mutant). Fig. 11 - Laggard (Mutant): Fig. 12 - anaphase bridge