



Characterisation of an induced mutant and its inheritance in grasspea (*Lathyrus sativus* L.)

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In the present communication an induced mutant showing unique morphological variations in the post irradiated M_2 progeny of grasspea (*Lathyrus sativus* L.) has been described highlighting inheritance pattern of the mutant traits. A perusal of literature depicts only limited information about morphological mutations in grasspea [1-3].

Dry and healthy seeds of grasspea Var., Bio R-231 were treated with different doses of gamma rays (5, 10, 15, 20, 25, 30, 35, 40 kR) for the induction of mutations. The post-irradiated seeds were grown treatment wise in separate plots under identical conditions keeping 30 cm. and 50 cm. distance uniformly between the plots and rows, respectively, to obtain the M_1 generation. Seeds harvested separately from individual M_1 plants were sown in different rows following R.B.D. during *rabi*, 1998 to raise the M_2 generation. An exstipulate mutant was detected in the M_2 generation and the selfed seeds (58) of the mutant were grown for raising M_3 progenies.

The mutants (M_3) were crossed reciprocally with the normal control plants. The F_1 was selfed to obtain F_2 seeds and also back crossed with the mutant parent. Chi-square test was used to estimate the goodness-of-fit of the segregation ratios. Pollen sterility was studied using 2% aceto-carmin solution.

The mutant plant was distinguished from control and other treated plants at the seedling stage by the conspicuous absence of stipe (Fig. 1). Subsequently, it was characterised by several other morphological features. The mutants were found to be shorter in height and late in 50% flowering by about 7 cm and 20 days, respectively, as compared to the control plants, but time taken for maturity was similar to control (Table 1).

Striking abnormalities in the floral morphology in the exstipulate mutant provided it with unique phenotypic distinction. In place of five petals in the papilionaceous flower of the control parts, there were six petals (Fig. 2) in the mutant. Pistil and androecium are enclosed

Table 1. Range and mean of different characters of morphological mutant and normal control plants (var Bio R 231) of grasspea

Characters	Control (Bio R-231)		Mutant	
	Range	Mean \pm SE	Range	Mean \pm SE
1. Plant height (cm)	50.0-55.0	52.40 \pm 0.03	42.2-47.2	45.51 \pm 0.03
2. Internodes/plant	208.0-212.0	210.12 \pm 0.01	160-220	201 \pm 0.07
3. Internode/length (cm)	03.21-03.25	3.22 \pm 0.01	2.9-3.2	3.1 \pm 0.03
4. Branches/Plant	10.0-15.0	12.4 \pm 0.11	13-17	14 \pm 0.08
5. Stipule length (cm)	1.60-1.66	1.62 \pm 0.01	-	-
6. Stipule width (cm)	0.50-0.53	0.51 \pm 0.02	-	-
7. Pollen sterility (%)	1.32-1.41	1.37 \pm 0.02	31.01-39.22	36.01 \pm 0.08
8. Days to first flowering	45.0-52.0	48 \pm 0.04	49-51	49.8 \pm 0.02
9. Days to 50% flowering	60.0-65.0	62 \pm 0.01	80.0-83	81.9 \pm 0.01
10. Days to maturity	132.0-136.0	134 \pm 0.01	132-137	134 \pm 0.01
11. Pods/Plant	80.0-88.0	84 \pm 0.03	25-32	27.76 \pm 0.08
12. Seeds/Pod	3.0-4.0	3.6 \pm 0.14	1-4	3.2 \pm 0.03
13. Pod length (cm)	3.53-3.55	3.53 \pm 0.002	3.01-3.11	3.08 \pm 0.008
14. Seed yield/plant	10.6-12.2	11.6 \pm 0.04	6.9-9.7	7.9 \pm 0.09

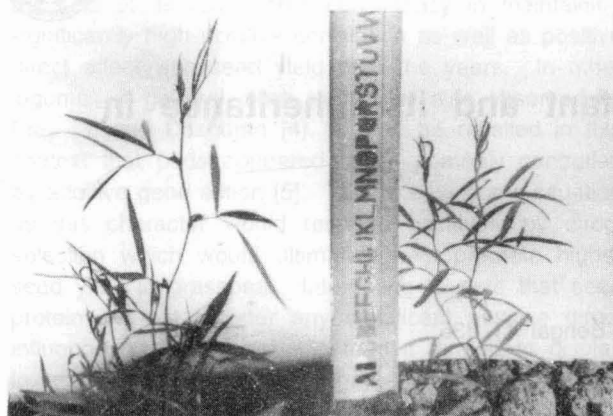


Fig. 1. Control (stipulate) and mutant (exstipulate) plants in M_2 generation of grasspea

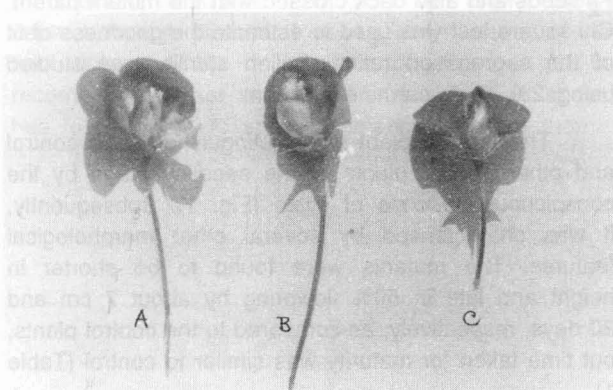


Fig. 2. Flowers of mutant (A, B) and control (C) plants of grasspea

Table 2. Segregation for stipule corolla characters in F_2 and back cross generation of grasspea

Cross	F_1 phenotype	Segregation in F_2 /back cross progeny		Total	Ratio	χ^2
Control (Bio R-231) \times mutant	Stipulate leaves	57	20	77	3:1	0.04
Back cross (F_1 times mutant)	-	27	23	50	1:1	0.32
Control (BioR-231) times mutant	Pentamerous corolla	Pentamerous	Hexamerous			
		48	17	65	3:1	0.04
Back cross ($F_1 \times$ mutant)	-	33	30	63	1:1	0.14
Pentamerous stipulate	Hexamerous exstipulate					
Control (Bio R-231) \times mutant	Pentamerous Corolla and stipulate leaves	98	31	129	3:1	0.06
Back cross ($F_1 \times$ mutant)	-	35	32	67	1:1	0.13

within the cavity formed by the closely appressed boat-shaped innermost petals, i.e. the keel in the control, but in the exstipulate mutant, the keel was not closed due to its reduced size and structural deformities, and as a result of this, the stigma and the stamens were exposed outside (Fig. 2). Similar observation was recorded earlier in chickpea mutant [4]. The extra petal (sixth) in this mutant was anterior in position and whitish in colour like the keel but not properly adherent (Fig.

2) to the two lateral wings (blue coloured). Pollen sterility increased remarkably in the mutant plants, resulting in reduction in the number of fruits (pods) as well as the seed setting (Table 1).

The exstipulate mutant with hexamerous malformed flowers when crossed with the normal plants having pentamerous papilionaceous flowers gave rise to F_1 progeny line the normal parent, but in the selfed F_2 progeny the plants with stipulate vs. exstipulate leaf and those with pentamerous vs. hexamerous corolla segregated into 3:1 ratio each (Table 2). The F_1 for each character were back crossed with the respective mutant parents and produced normal and mutant progenies in 27:23 (stipulate : exstipulate) and 33:30 (pentamerous : hexamerous) ratios. The segregation pattern was also identical when both the pairs of characters (stipulate leaf with pentamerous corolla and exstipulate leaf with hexamerous corolla) were involved together in the selfed F_2 progeny and the back crosses (Table 2).

Inheritance pattern for each of the two different traits as well as for both the traits considered together revealed the possibility of origin of the mutant traits through monogenic recessive mutation, and presumably the traits were inherited *en block* in linked state or there might be pleiotropic effect of the gene in question.

References

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