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BRIEF COMMUNICATION

Induced Mutation in *Petunia nyctaginiflora* JUSS.

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Abstract. Seeds of *Petunia nyctaginiflora* JUSS. a common ornamental garden plant, were treated with two alkylating agents (methyl methane sulphonate and N-methyl-N'-nitro-N-nitrosoguanidine). Six morphological and seven chlorophyll mutants were isolated from M_2 segregating families. The isolated induced mutants are described and genetically analysed.

A few studies have been reported on the effect of chemical mutagens on *Petunia violacea* (MALUSZYNSKI *et al.* 1977) and *P. hybrida* (KHALATKAR and KASHIKAR 1980, PADMAJA 1983), but none on *P. nyctaginiflora*, commonly grown in Rajasthan (India) as an ornamental garden plant. Therefore, in the present investigations, the mutagenic response of two alkylating agents on *P. nyctaginiflora* JUSS. has been worked out. The isolated mutant lines have been described and genetic studies of selected mutants are reported.

The seeds of white diploid *Petunia nyctaginiflora* JUSS., obtained from a single bulk population were used for chemical treatments. Two mutagens used for seed treatment were methyl methane sulphonate (MMS) and N-methyl-N'-nitro-N-nitrosoguanidine (MNNG). Solutions of MMS were prepared in phosphate buffer, pH 7.4 and MNNG was dissolved in dimethyl sulphoxide. Seeds soaked in distilled water (12 h) were treated with different concentrations of MMS (0.009; 0.012; 0.018 and 0.025 M) for 3 h and of MNNG (0.012; 0.025; 0.037 and 0.050 M) for 1/2 h at 28 °C. A control was also run using phosphate buffer instead of mutagen. Chemically treated seeds were washed in running tap water and then sown in pots. Seeds were collected from the individual M_1 plants and used for growing M_2 progenies. The mutants isolated from M_2 segregating population were analysed genetically from the segregation pattern and single crosses between mutant and control.

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In response to two chemical mutagens, *P. nyctaginiflora* JUSS. yielded six morphological and seven chlorophyll mutants in M_2 segregating families. The frequencies of mutants were recorded as mutations per cent M_1 plants and mutants per cent M_2 seedlings (Table 1). A brief description of the isolated mutants along with their genetic behaviour are given below:

TABLE 1
Percentage survival and mutation frequency in *Petunia nyctaginiflora*

Treatment Concentration [M]	Survival [%]	Population size		Mutation [%]		
		M_1 plants	M_2 plants	M_1 plants	M_2 plants	
					Morphological	Chlorophyll
Control	36	25	240	—	—	—
MNNG						
0.012	32	26	240	16.6	2.8	0.41
0.025	32	36	308	11.11	—	2.57
0.037	23	24	160	08.33	1.87	—
0.050	22	10	84	—	—	—
MMS						
0.009	30	18	145	11.11	—	3.42
0.012	18	20	156	5.00	0.66	—
0.018	11	12	98	8.33	1.02	—
0.025	11	11	85	9.09	1.17	—

150 seeds per treatment and control group.

Bushy Mutant (Fig. 1B)

The mutant plant was short, erect and showed bushy habit. Branches in this plant were compactly arranged as compared to sparsely arranged in control. Leaves were thick, pale green and slightly elongated. A few flowers were formed with very low pollen fertility. Mutant was sterile.

Fasciated Stem Mutants (Fig. 1 B–F)

Three categories of mutants exhibiting stem fasciation were screened:

F–1 (Fig. 1 C): Mutant plant showed fasciation in the upper part of the stem. In the flattened part of the stem, the pedicel of each flower remained fused with the stem before becoming independent.

F–2 (Fig. 1 D): Mutant plant showed fasciation at the base of the stem which led to the fusion of two branches.

F–3 (Fig. 1 E, F): In the young plant, the main stem was thicker and changed its shape to a ribbon-like structure due to fasciation. At the apex, a whorl-like

arrangement of the leaves was seen producing a rosette shaped structure. On maturity, the stem split into many individual stems in the upper part (Fig. 1 F). The flattened stem was swollen and longitudinally striated up to the apex. Stem fasciation of F–1 and F–2 types with slight variations in the degree of fasciation reappeared in M_3 population. Although F–3 type could not be recovered as such in M_3 plants it showed some sort of stem fasciation indicating true behaviour of the gene.

Leathery leaf mutant: Leaves were dark green and leathery. Leaf characters bred true in M_3. The mutant trait was monogenic recessive.

Large leaf mutant: Leaves were ovate like control but had an enlarged lamina as compared to control leaves. The mutant trait was monogenic recessive.

Dissected corolla mutant: Abnormal flowers were formed in the mutant plant showing deep dissected corolla up to 1/3 length of the flower. Tips of the flower petals were toothed. The mutant trait was monogenic recessive (Fig. 2A).

Dentate corolla mutant: (Fig. 2B) Flowers of this mutant had large broad corolla with dentate margin. The mutant trait was transmitted to M_3 population. Inheritance of a few mutants is given in Table 2.

TABLE 2

Inheritance of morphological mutants of *Petunia nyctaginiflora*

A) Segregation of mutants in heterozygous lines in M3

Mutant type	Frequency of		Total	x^2 = (3 : 1)	*P* value
	Normal	Mutant			
Leathery leaf	30	9	39	0.134	0.75–0.70
Large leaf	45	12	57	0.378	0.70–0.50
Dissected corolla	35	11	46	0.029	0.90–0.80
Dentate corolla	36	11	47	0.112	0.75–0.70

B) Crosses between normal and mutant plants

Parents	Segregation in F_2		Total	x^2 = (3 : 1)	*P* value
	Normal	Mutant			
Normal × Leathery leaf	32	9	41	0.133	0.75–0.70
Normal × Large leaf	26	7	33	0.165	0.70–0.50
Normal × Dissected corolla	40	12	52	0.103	0.75–0.70
Normal × Dentate corolla	35	10	45	0.120	0.75–0.70

Chlorophyll mutants: A brief description of isolated chlorophyll mutants follows:

Virescens: Mutant was characterized by having uniform light green leaves. Mutation viable and bred true in M_3.

Maculata : Initially the leaves were normal but later on, small dots of yellow colour appeared on the lamina. The mutant character was poorly expressed in M_3 plants.

Marginata : Decolourisation of the margin of the leaf was seen. Mutation viable and bred true in M_3.

Albescens : In the young leaves, white patches appeared on lamina. The patches coalesced to form white or yellowish white lamina in mature leaves. Mutation bred true in M_3.

Chlorina : Yellowish green leaves were formed in the young seedlings. On maturity, intercostal region became yellow white and costal part remained green. Mutation non-viable.

Lutescens : Chlorosis of the leaves would start from margin or middle or base of lamina forming yellow patches. Mutation bred true in M_3.

Deep green : Leaves of this plant were dark green. Mutation viable and breed true in M_3.

Out of six induced morphological mutants, the bushy mutant was found to be completely sterile in homozygous state and the other five showed partial sterility. KAUL (1983) has argued that mutant genes being foreign elements in the genome and cytoplasm, are usually of negative selection value to the survival of an organism as observed in our studies. Flower mutants (Dissected and Dentate corolla mutants) detected in the present study could be of ornamental value.

REFERENCES

KAUL, M. L. H.: The positive and negative mutant genes. – In: VERMA, S. C. (ed): Progress in Botanical Research. Nat. Seminar, Abstract 14. Punjab University Publ., Chandigarh 1983.

KHALATKAR, A. S. KASHIKAR, S. G.: Sodium azide mutagenicity. – Mut. Res. **79** : 81–85, 1980.

MALUSZYNSKI, M., GORNY, A., GACKOWSKA, Z.: Variability in *Petunia violacea* LINDL. exposed to N-nitroso-N-methyl urea. – Pr. Nauk. Uniw. sląsk. Katowicach **175** : 33–39, 1977.

PADMAJA, V.: Cytomorphological study of four induced mutants in *Petunia*. – Indian J. Bot. **6** : 210–214, 1983.

Figures at the end of the issue.