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NEW MORPHOTYPES ISOLATED AFTER EMS TREATMENT IN WINGED BEAN (*PSOPHOCARPUS TETRAGONOLOBUS* [L.] D.C.)

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Abstract: A field experiment to study mutagenicity in winged bean, variety PT-62 was carried out at the College of Agriculture Vellayani, Trivandrum. The seeds were treated with five doses of EMS (40, 80, 120, 160 and 200 mM). The mutagenicity assessed based on morphological variations in the M2 generation revealed that 200 millimole of EMS was the most mutagenic. A wide spectrum of viable mutants with change in leaf, stem, pod and seed characters were isolated.

Key words : EMS, morphological variation, mutagenicity, winged bean.

INTRODUCTION

Winged bean (*Psophocarpus tetragonolobus* [L.] D.C.) is an under exploited nutritious legume with many positive attributes. It is highly productive in tropical environment and an excellent source of protein. It produces an array of economically important products including pods, seeds, tuberous roots, seed oil and fodder (Hag, 1982). In spite of its scope as vegetable, protein, fodder and oil bearing crop, efforts so far made for its improvement are scarce. Versatile use and under-exploited nature necessitate a systematic crop improvement programme.

In winged bean, being a self-pollinated crop, induced mutation technique can successfully be employed to create and expand the genetic variability. The present study was undertaken to assess the mutagenicity of winged bean in respect of morphological characters and isolate viable mutants.

MATERIALS AND METHODS

Seeds of PT-62, a variety of winged bean were treated with five doses of ethyl methane sulphate viz. 40, 80, 120, 160 and 200 millimoles for a period of 6 hours. The M_2 population screened for estimating mutagenicity was raised in non-replicated progeny row trial with seeds collected individually from each M_1 plant, which was initially subjected to mutagenic treatments. Control rows were sown as a check in alternate with 10 M_2 progeny rows. M2 population method was followed to isolate new morphotypes, which exhibited deviation with respect to various morphological characters. Frequency analysis of these mutants was done quantitatively and qualitatively. The identified mutants in each treatment were quantitatively expressed as mutation frequency viz. number of mutations per 100 M_2 plants (Gaul, 1960) and qualitatively as spectrum. Segregation percent was calculated as number of mutants per cent of total plants in segregating progeny rows.

RESULT AND DISCUSSION

The viable mutation frequency on the progeny row basis ranged from 17.65 to 36.36 per cent (Table 1). It showed an increase with dose in all the cases except in 120 mM. The maximum frequency was at 200 mM and minimum at 40 and 120 mM. The viable mutation frequency on M_2 plant basis ranged from 2.36 to 3.33 per cent.

Mutation frequencies on M2 progeny row or plant basis show dose dependence especially for rows. This was in agreement with Reeja (1993) that mutagenic effects on several characters were less pronounced for EMS especially in lower doses.

Spectrum

Many morphological variants were identified with respect to leaf, stem, pod and seed characters (Table 2). In this study, mutants with modification in leaf size (small sized), tetrafoliate and leaf texture (thick soft) were identified as leaf mutants. Similar leaf mutants were reported by Kesavan and Khan (1978) and Veeresh and Sivasanker (1987) in winged bean.

In this study, the normal green stem colour changed to brownish green and light green in stem colour mutants. Variation in stem colour was reported by Rangaswamy (1989) in cowpea after EMS treatment. Mutation affecting

Table 1. Frequency of viable mutants

Treatment	No. of M_2 progeny rows scored	No. of M_2 plants scored	Viable mutation frequency			
			M_2 progeny row basis		M_2 plant basis	
			Segregating rows (No.)	Percentage	No. of mutants	Percentage
Control	9	90	-	-	-	-
40 mM	17	203	3	17.65	5	2.47
80 mM	18	162	4	22 22	4	2.47
120 mM	17	212	3	17.65	5	2.36
160 mM	12	120	4	33.33	4	3.33
200 mM	11	120	4	3.36	4	3.33

Table 2. Spectrum and segregation per cent of different viable mutation (EMS)

Spectrum of mutation	Number of mutants (segregation per cent in parentheses)						Relative per cent
	Dose (millimole)						
	40	80	120	160	200	Total	
Leaf							
Small sized	-	-	1 (4.55)[a]	-	1 (5.56)	-	-
Tetra foliate	1 (4.55)	-	-	-	-	-	-
Thick and soft	1 (4.55)	-	-	-	-	-	-
Total	2 (4.55)	-	1 (4.55)	-	i (5.56)	4 (4.76)	13.79
Stem colour							
Brownish green	-	-	-	1 (10.0)[a]	-	-	-
Light green	-	-	1 (3.85)[b]	-	1 (5.0)[a]	-	-
Total	-	-	1 (3.85)	1 (10.0)	1 (5.0)	3 (5.36)	10.34
Pod length							
Small	-	-	1 (3.13)	-	-	-	-
Total	-	-	1 (3.13)	-	-	1 (3.13)	3.45
Seed size							
Flat	1 (6.67)[a]	-	-	-	-	-	-
Bold	-	1 (12.5)	-	-	-	-	-
Small	1 (4.55)	-	-	1 (8.33)	-	-	-
	1 (6.67)	1 (6.25)	1 (4.55)[a]	1 (5.56)	1 (7.14)[b]		
	-	-	-	1 (10.0)[a]	-	-	-
Long	-	-	1(3.85)	-	1 (7.69)	-	-
Total	3(8.11)	2 (8.33)	2 (4.16)	3(7.5)	2(7.41)	12 (6.25)	41.38
Seed colour							
Dark brown	-	1 (7.14)	-	1 (10.0)[a]	-	-	-
Yellowish brown	-	-	1 (3.13)	1 (8.33)	1 (5.0)[a]	-	-
Greenish brown	-	-	-	-	1 (7.14)[b]	-	-
White	1 (6.67)[a]	1(8.33)[b]	-	-	-	-	-
Total	1 (6.67)	2 (7.69)	2 (3.45)	2 (9.09)	2 (5.88)	9 (5.81)	31.03
Associated mutations	1	-	2	1[z]	2	-	-
Total mutants	5 (8.47)	4 (8.00)	5 (6.25)	4 (7.69)	4 (6.15)	22 (7.19)	-

[a, b] Associated mutations (nutant with change in 2 characters); [z] Mutant with change in three characters

pigmentation might cause colour changes in stem and seed. Such mutation affecting anthocyanin pigmentation was reported in stem petiole and seed by Jana and Rao (1974) in black gram after x-ray irradiation.

Pod length mutants include only one, small type of mutation, seed size or shape mutants including flat, bold, small and long and seed colour mutants like dark brown, yellowish brown, greenish brown and white type. Coloured types were isolated with distinct change from the normal one. Distinct changes in pod length and seed size were reported by Bhadra and Jain (1986) after EMS treatment in black gram.

Twenty-two plants with distinct changes were identified as mutants, while five of them exhibited changes in two characters and one, in three characters. All the three stem colour mutants showed variation in seed colour also, but not the same colour change and one such mutant exhibited small seed size also. In two mutants, seed size variation was associated with seed colour variation and in another seed size mutant, leaf size was also reduced. Among different types, seed size mutants were observed as the most frequent (41.38%) followed by seed colour mutants (31.03%).

The results of present investigation reveal the potential of EMS to create variability in winged bean. Dose range tried in EMS was mutagenic. Since growth habit of pod length and seed size mutants did not change except the number of seeds per pod in pod length mutants and 100 seed weight in seed size mutants, these mutants would be advantageous for yield improvement. Incorporation of the selected genetic variants in breeding programme provides scope for evolving varieties with added advantage.

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