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Induced mutations in French bean (*Phaseolus vulgaris* L.) affecting seedcoat colour

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Abstract

Ethyl methanesulphonate (EMS) concentrations of 0 (control), 0.05%, 0.10% and 0.15% were applied to dormant seeds of *Phaseolus vulgaris* L. cv. Varun. Mutations affecting seed coat colour were detected in M_2 generation. Highest mutation frequency was induced by 0.10% EMS. The seed coat colour mutants showed diverse shades of colour.

Keywords: Mutation, *Phaseolus vulgaris*, Ethyl methanesulphonate.

Introduction

The french bean (*Phaseolus vulgaris* L.) is an important source of low cost protein in many countries. Its commercial acceptance however depends on various factors, one of which has been the seed coat colour. The modification of seed coat colour is usually accomplished by using conventional back crossing method. However, data obtained by several workers, (Swarup and Gill 1968, Moh, 1969, 1971, 1972), have indicated that mutation induction is an efficient method for modification of seed coat colour. The present paper reports the results of an experiment designed to induce mutations in French bean variety Varun.

Material and Methods

The French bean cv. Varun (ACPR-94040) obtained from National Agricultural Research Project (NARP), Ganeshkhind-7, Pune was used in the present study. Healthy and uniform seeds of French bean cv. Varun were surface sterilized with 0.1% mercuric chloride solution for 1 minute and washed thoroughly with distilled water. Then the seeds were presoaked in distilled water for 6 hours. The mutagenic solutions of 0.05%, 0.10% and 0.15% EMS were freshly prepared. The lot of 200 seeds each was transferred to 500 ml Erlenmeyer flask containing 0.05%, 0.10% and 0.15% EMS solutions respectively. In each case the volume of mutagenic solution was three times as that of seeds so as to facilitate uniform conditions. The Erlenmeyer flasks were covered with aluminium paper and shaken on electric shaker for 6 hours. All chemical treatments were carried out at room temperature of 25 ± 2^0C with intermittent shaking. Seeds were then washed with running tap water to remove excess mutagen. Then the seeds were post soaked in distilled water for 2 hours. The post soaked seeds were dried in folds of filter paper and immediately taken to the field for planting according to randomized block design with three replications. Each plot (10 x10 feet) consisted of 6 rows with a distance of 30 cm between the rows and 15 cm between the plants.

Each M_1 plant was harvested separately. Seeds of each selected M_1 plants were planted in a single row to raise M_2 generation with three replications following randomized block design. Spacing and the experimental area were the same as those used for growing M_1 plants.

Mutants affecting seed coat colour were determined by opening six to eight pods from each M_2 plant.

Fig. 1. Seed coat colour mutants in French bean

Results and Discussion

As shown in Table 1, the M_2 progeny derived from EMS treated seeds segregated for seed coat colour. Mutation frequency was highest at 0.10 % EMS. The mutated seed coat phenotypes and their frequencies in M_2 generation are represented in Table 2. The mutant phenotypes varied from white to pale sandy and several hues of brown with / without stripes. White seed coat was found in only one segregating M_2 progeny and was found associated with plants having white flowers. Due to the multicellular nature of seed embryo a mutated M_1 plant usually has a chimerical structure with the mutated sector reduced in size in comparison with the normal sector. A deficiency of the mutant phenotype is thus expected and is usually found in M_2. In the present study the 0.10% EMS concentration has induced the highest frequency of seed coat colour mutants. More useful mutants are probably induced by low to medium concentrations of the mutagen, as suggested by Kawai (1969) and Yonezawa and Yamagata (1977). The maximum seed coat colour mutants were having brown seed coat with whitish stripes. In the M_3 generation from bean seeds treated with X- rays, Swarup and Gill (1968) also found seed coat mutants having black or brown streaks. Similar kind of results were also btained by Barbosa, (1988) through EMS treatmnents to French bean var. Milinario 1732(BAT 65).

Table 1. Frequency of M_2 progenies segregating for seed coat colour

EMS concentration (%)	Number of treated seeds	Number of surviving M1 plants	M_2 progenies segregating for seed coat colour	% Frequency
0	200	180	0	0
0.05	200	165	3	1.8
0.10	200	158	7	4.4
0.15	200	121	2	1.6

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Table 2. Seed coat colour phenotypes in M_2 progenies

EMS Concentration (%)	M_2 progenies segregating for seed coat colour	Mutant seed coat colour	Number of plants
0.05	3	White	01
		Cream (sandy) colour without stripes	02
0.10	07	Brown with whitish stripes	03
		Cream (sandy) colour without stripes	02
		Grayish with whitish stripes	02
0.15	02	Blackish red seed coat colour	02

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