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PLANT GENETICS

GAMMA RAY INDUCED FLOWER COLOUR AND SEED MUTANTS IN FRENCH BEAN (*PHASEOLUS VULGARIS* L.)

S. E. Mahamune* and V. S. Kothekar

Cytogenetics and Mutation Breeding Laboratory, Department of Botany, Dr. Babasaheb Ambedkar MarathwadaUniversity, Aurangabad-431004. (M.S.), India

Abstract

Gamma ray doses of 0 (control),15,20 and 25 kR were applied to dormant seeds of *Phaseolus vulgaris* L. cv. Waghya. Mutations affecting flower colour and seed characteristics were detected in M_2 generation. Highest mutation frequency for flower colour and seed characteristics were induced by 20 kR dose.Mutants with different flower colour and altered size, shape and coat colour of seeds were obtained.

Introduction

French bean botanically described as *Phaseolus vulgaris* L. belongs to family Fabaceae. It is also known as *rajmash*, *rajma (Hindi),* haricot bean, kidney bean, common bean, snap bean or navy bean. It is valued for its protein rich (23%) seeds. Seeds are also rich in calcium, phosphorus and iron. The fresh pods and green leaves are used as vegetable. Mutation induction is an important complementary method of breeding crop species. The utilization of induced mutations for the improvement of crop plants has yielded several mutants which have been used directly as new cultivars (Gottschalk and wolff,1983).Mutants in French bean (*Phaseolus vulgaris* L.) having improved grain yield have been obtained (Gotoh,1968; Rubaihayo, 1975; Husseina and Disouki,1979;Al-Rubeal 1982). The mutants resistance to diseases (Fadal, 1983; Micke, 1983) and altered seed characteristics such as colour, brightness and size are also on record .(Barbosa et.al.;1988).Present paper reports data on flower colour and seed mutants induced by different doses of gamma rays in French bean cv. Waghya.

Material and Methods

French bean cv. Waghya obtained from National Agricultural Research Project (NARP), Ganeshkhind-7, Pune wasused in the present study. Healthy and uniform seeds of Frenchbean cv. Waghya were dried in sun light to decrease the moisture content below 13%.These dormant seeds were exposed to 0 (control),15, 20 and 25 kR doses of gamma ray from a Co^{60} source at Government Institute of Sciences, Nipat Niranjan, Aurangabad. The gamma ray treated seeds were planted in the field 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 selected M_1 plants were planted in a single row each 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_1Plants.

Mutants affecting flower colour were detected by observing the plants from budding to flowering stages in M_2 generation. Mutants affecting colour, shine, size and shape of seeds were determined by opening six to eight pods from each M_2 plant

Results and Discussion

20kR dose induced the highest frequency of flower colour and seed mutants while lowest frequency could be noticed at 25 kR dose. Three different flower colour mutants were found. It included Violet flower, Dark pink flower and white flower mutants. These mutants were characterized by comparing with faint pink colour of control flowers. The 15 kR dose induced maximum Flower colour mutants. White flower mutants were detected in Milionrio 1732 variety.(Barbosa and Clibas, 1991). Three M_2 progenies segregated for White Flower, five for violet flower and four for dark pink flower mutants.

Two seed coat colour mutants were isolated from 20 kR and 25 kR doses. Dark red seed coat phenotypes were shown byfour M_2 progenies and two progenies segregated for Cream seed coat colour. These types of seed coat colour mutants were also recorded in different varieties of French bean (Barbosa et al. 1988)

Eleven progenies segregated for seed size and seed shape mutants. Three progenies of 15 kR dose showed small seeds (18 to20 g/100 seeds). 20 kR

* Corresponding Author, *Email*: swapnil1985m@gmail.com

dose induced four bold seed mutants (45 to 48 g/100 seeds).Wrinkled seed mutants could be noticed at 25 kR dose in four progenies (06 to 08 g/100 seeds).Seed weight of 100 seeds of parental variety was 37 to 39 g.Bold seeded mutants have been reported by Gotoh(1968) and Barbosa et.al. (1991).Bold seed mutants have also been induced in other legumes (Gottschalk and Wolff, 1983).

In the progeny of 20 kR dose two M_2 plants produced seeds with strong seedcoat shine. Similar type of mutant was reported by Barbosa and Clibas (1991) in Milionario 1732variety.Shiny seed coat has been known to be conditioned by a single dominant gene (Prakken, 1934; Moh and Alan, 1964).Shiny seed coat is one of the rare case of dominant mutations as it has been estimated (Gottschalk and Wolff, 1983) that about 99 % of all mutations are recessive.

The results presented here show that gamma irradiation of bean seeds may be efficiently used to induce changes in flower colour and seed charactristics,supporting previous results (Gotoh,1968; Moh, 1971; Hussein and Disouki,1976 ;Al-Rubeai,1982 and Barbosa et al.;1991).Several different mutants were also obtained.The agronomic potential of these mutants should be evaluated as was done by Guimarases et al.(1989) with EMS induced seedcoat colour mutants in Milionario 1732 variety.Even those mutants with lower yielding ability are of value because they may be used to incorporate desired changes in the original variety by conventional backcrossing method.

Fig1. Flower colour mutants in French bean

Fig 2 Seed size, shape and coat colour mutants in French bean

Table 1 Frequency of M_2 progenies segregating for flower colour and seed mutants

Gamma ray dose(kR)	No. of M_1 seeds sown	No.of M_2 plants observed	No.of M_2 plants segregating for flower colour and seed mutants	% Frequency
0	400	390	--------	
15	400	381	11	2.88
20	400	377	14	3.71
25	400	356	06	1.68

Table 2 Phenotype of flower colour and seed mutants in M_2 progenies

Gamma ray dose (kR)	M_2 progenies segregating for flower colour and seed mutants.	Mutant phenotype	No. of plants
		Violet flower	05
15	11	White flower	03
		Small seed	03
		Dark pink flower	04
20	14	Bold seed	04
		Shiny seed coat	02
		Dark red seed coat	04
	06	Cream seed coat	02
25		Wrinkled seeds	04

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