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IMPROVEMENT OF GENETIC ARCHITECTURE OF A LOCAL CULTIVAR KALITUR OF SOYBEAN BY MUTATION

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ABSTRACT

In course of an experiment, two useful mutants were induced by gamma rays in Kalitur, a locally adapted Indian cultivar of soybean. The mutants mature earlier by 17–19 days. The plants of the mutants are determinate and the seeds brown. The plant morphology, yield and utility of mutants are described.

Key words: Kalitur, dwarf mutants, brown seed, shattering habit.

A local type of soybean is cultivated in the name of Kalitur. It is a tall, medium late (117 days) genotype, highly shattering, with black seeds. In the present study, an attempt has been made to correct the deficiencies without altering background of parental lines through induced mutagenesis [1].

MATERIALS AND METHODS

Dry seeds of cv. Kalitur, a locally adapted medium late (117 days) genotype, having high shattering behaviour and black seeds were used for treatment with gamma rays and methyl methanesulphonate (MMS). The doses of gamma irradiation were 5, 10, 15 and 20 kR. The source used for gamma irradiation was ^{60}Co at Division of Genetics, Indian Agricultural Research Institute, New Delhi. For chemical treatment, seeds presoaked in distilled water for 10h at room temperature were treated with 0.02%, 0.04%, 0.06% and 0.08% MMS concentration for 6 h with intermittent shaking. The treated seeds were washed with water.

The two mutants were isolated in the M_2 population of 15 kR gamma-ray treatment. The selfed seeds of the mutants were collected and grown in M_3 where they bred true. In

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M_4 generation these mutants were planted along with the parent variety Kalitur. Different quantitative characters of ten random plants were studied (Table 1).

RESULTS AND DISCUSSION

Table 1 provides general information on the morphology of the local cultivar Kalitur and its mutants No. 7 and No. 13. The mutants were shorter with about 53% height of parent variety Kalitur at maturity. The dwarfism resulted from reduction in the internodal length as compared to the control. This prevents yield losses due to the plants lodging under heavy rains. This reduction in height may be due to DNA breakage and reduction in DNA content or it could also be due to gene mutation [1, 2]. The mean number of days to flowering and maturity indicated that both mutants were earlier than the parent variety Kalitur (Fig. 1). This can be utilised in breeding programmes for the development of early varieties. Similar results have been reported by Kulshreshtha and Singh [3], who suggested that earliness to be a consequence of the destruction of the flowering inhibitor leading to flower initiation due to the release of florigen at an early stage of growth. These early types, almost at par in yield with the parent variety, are suitable for multiple cropping and have better opportunity to express their full potential under stress. Early and late mutants were also isolated in soybean by Plensnik [4]. The present mutants No. 7 and No. 13 had 3–4 days delayed shattering as compared to the control (highly shattering genotype). Delayed shattering has an advantage of preventing yield losses. The seed colour of the mutants was brown while the parent variety Kalitur produced black seeds. Seed colour mutants have been reported in Brassica [5]. The variety Kalitur has indeterminate growth habit while the mutants have determinate growth. This will ensure uniform maturity and prevent losses due to shattering.

Table 1. Mean performance of some characters in soybean variety Kalitur and its mutants

Character	Kalitur	Mutant No. 7	Mutant No. 13
Plant height (cm)	97.3 ± 2.90	52.7 ± 2.10	42.4 ± 1.90
Days to flowering	72.6 ± 1.47	43.2 ± 1.07	43.5 ± 0.93
Days to maturity	117.9 ± 1.32	84.3 ± 1.02	81.3 ± 0.82
No. of branches/plant	3.7 ± 2.13	3.47 ± 1.87	2.92 ± 1.32
No. of pods/plant	40.3 ± 10.32	39.3 ± 13.27	34.4 ± 15.37
No. of seeds/plant	82.4 ± 3.17	75.13 ± 4.13	69.3 ± 4.20
No. of seeds/pod	2.01 ± 1.96	1.82 ± 2.13	1.72 ± 2.03
Seed yield/plant (g)	8.12 ± 1.08	7.91 ± 1.37	6.43 ± 1.43
100-seed weight (g)	9.11 ± 0.12	8.31 ± 0.47	8.11 ± 0.63
Seed colour	Black	Brown	Brown
Growth habit	Indeterminate	Determinate	Determinate
Shattering	High	Delayed	Delayed

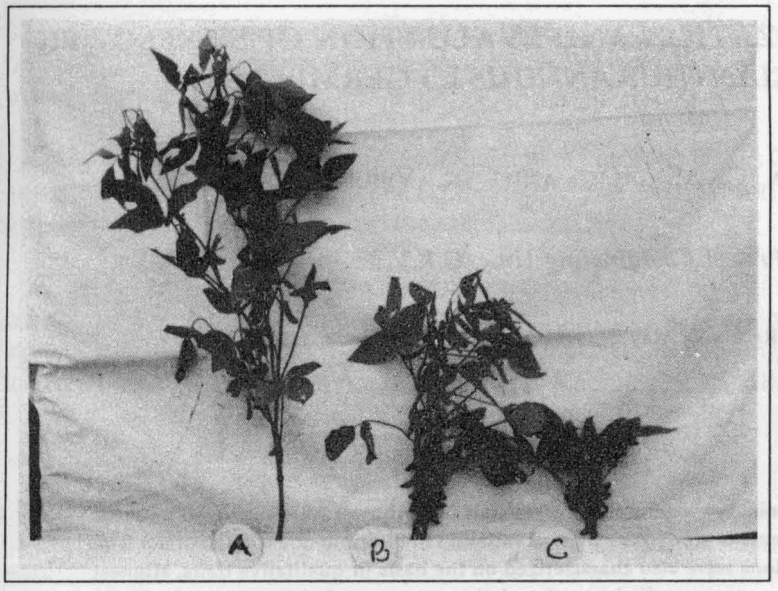

Fig. 1. **Plants of soybean variety Kalitur (A) and its mutants No. 7 (B) and No. 13 (C).**

The data presented above show that the mutants are superior to the parent variety in many respects. The constellation of characters in the mutants make them a desirable plant type, which may be utilised by hybridization for further improvement.

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