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SHORT COMMUNICATION

Induction of a Novel, High Yielding Mutant of Pigeon Pea

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ABSTRACT

Pigeonpea [Cajanus cajan (L.) Millsp] is one of the major pulse crop of Maharashtra grown in Kharif season. It is cultivated in 35.54 lakh hectares in Maharashtra. In spite of its demand the yield of the pulse is low. In the present investigation an effort was made to improve the yield of the crop by mutation breeding. Germplasms of authentic sample of Pigeonpea (Var. ICPL-87) were procured from 'Pulses Improvement Division' of Mahatma Phule Agricultural University (M.P.K.V.), Rahuri, and District: Ahmednagar (Maharashtra). Seeds, presoaked in water for 12 hrs.,were treated with different concentrations (10, 20, 30 and 40mM), of the chemical Mutagen, Ethyl Methyl Sulphonate (EMS) for 6 hrs., at 25 ± 2^{0}C, followed by through washing under tap water. Presoaked seeds, untreated with EMS served as control. Both Control and EMS treated seeds were sown in the field to raise M_1 progeny. M_1 seeds, along with their controls were sown in next Kharif season to raise M_2 progeny. M_2 progeny plants were screened for Yield contributing traits like, Plant Height, Number of Branches per plant, Number of pods per plant, Pod length, Number of Seeds per Plant, 100 seed weight and Yield per Plant. M_2 Progeny were also screened for useful mutants.Results indicated that genetic variability in Yield contributing Traits, and viable mutants could be observed only at M_2 generation. The M_2 progeny raised from seeds treated with 40 mM concentration of EMS produced novel mutants showing two fold increases in number of branches per plant, number of Pods per plant and Yield per plant. This Mutant was named as High yielding (Robust) mutant. Differences observed between the High yielding (Robust) mutant and corresponding control plants and correlation between the parameters were discussed in the text. The High yielding (Robust) mutant seems to be very promising and can be release as variety after appropriate field tests.

KEYWORDS*: Mutation Breeding, Pigeon Pea, Cajanus cajan*

INTRODUCTION

Pigeonpea [*Cajanus cajan* (L.) Millsp] is one of the major pulse crops of Maharashtra grown in Kharif season. It is cultivated in 35.54 lakh hectares with a production of 18.36 lakh tones in Maharashtra [1]. It is consumed as split Dhal, but is also consumed as green vegetable in many countries. Seed and fodder contains approx 20-22% protein. Seeds are rich in iron, iodine, and essential amino-acids like lycine, cystine and arginine. In spite of its nutritional importance, the yield of Pigeonpea is very low. Mutation breeding has become an alternative to conventional breeding since last three decades with the sole objective of developing better verities of economically important crops [2].Mutation breeding is one of the plant breeding techniques used for creating genetic variability in yield contributing traits and to improve the yield of crop plants [3]. In the present investigation, attempts were made to induce genetic variability in Yield contributing traits of Pigeonpea with an objective of isolating agronomically important, high yielding mutants, if any, at M_2 generation.

MATERIALS AND METHOD

The experimental material selected for the present study is Pigeonpea [*Cajanus cajan* (L.) Millsp] var. ICPL-87. Germplasm of the variety was procured from 'Pulses Improvement Division' of Mahatma Phule Agricultural University (M.P.K.V.), Rahuri, (Maharashtra). The variety is a desi type; commercially and widely cultivated extensively in various parts of Maharashtra.

A chemical mutagen, Ethyl Methane Sulphonate (EMS), was used in the present investigation to induce genetic variability. Test solutions of different concentrations of EMS (10, 20, 30 and 40mM) were prepared in 0.1 M Phosphate buffer (pH 7.0). Two hundred fifty seeds were used for each treatment. The seeds were immersed in distilled water for 6 hours to initiate presoaking. The presoaked seeds were dried in blotting paper and later on

immersed in freshly prepared solutions of mutagens for 12 hours. The volume of mutagenic solution is about 5 times as that of seed for uniform absorption. The seeds treated with chemical mutagen were thoroughly washed under running water for 1 hr. The post soaking treatments were carried out to leach out the residual chemical. The treated and control seeds were dried in blotting paper. The 200 treated and control seeds were sown on the same day in well-prepared seed beds in the field. The seeds were sown in randomized block design (R B D) at a spacing of 20 cm. in rows of 5M long and 45 cm between rows.

Seeds from M_1 progeny were harvested separately and carefully from each treatments as well as control and sown for M_2 progeny. In M_2 progeny plants are carefully screened for Morphological mutations such as early mutant, high yielding (Robust) mutant, tall mutant, late maturing mutant etc.

RESULTS

Results indicated that all concentrations of EMS are effective in inducing genetic variability in yield contributing traits at M_2 generation in Pigeonpea. However, the 40 mM concentration of EMS was found to be very effective in inducing novel agronomically important, high yielding (Robust) mutant (Fig. 2).

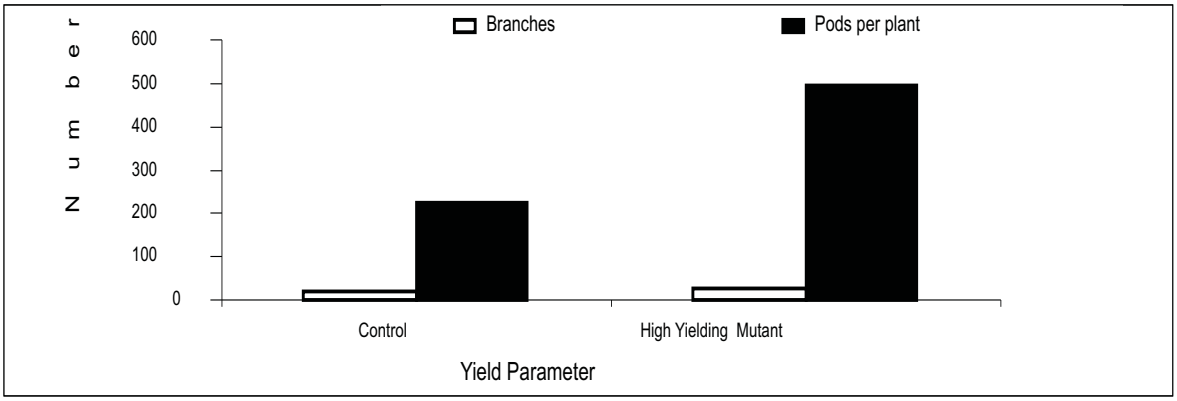

Fig. 3 Number of pods and branches per plant of control and high yielding mutant of Pigeon pea.

The M_2 progeny raised from seeds treated with 40 mM concentration of EMS produced novel mutants showing two-fold increase in number of branches per plant (Table), number of Pods per plant (Fig. 3) and Yield per plant (Fig. 4). This Mutant was named as High yielding (Robust) mutant. Differences in yield contributing traits, observed between the High yielding (Robust) mutant and corresponding control plants are shown in the table. No significant difference in plant height, pod length, number of seeds per pod and hundred seed weight could be observed between the control and the mutant (Table).

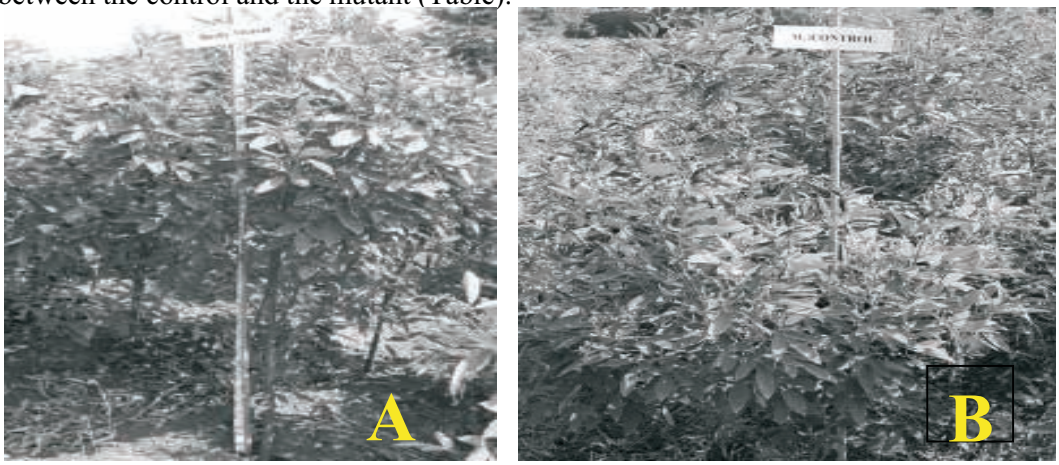

Fig 2 Variation between the mutant and control. A- High yielding Robust Bushy Mutant, BControl

Parameters	Control	High Yielding (Robust) Mutant
Plant Height	48	49
Number of Branches per plant	18	27
Number of pods per plant	223	497
Pod length	6.4	7.2
Number of Seeds per Plant	4	5
100 seed weight in gms.	12	13
Yield per Plant in gms.	108	307

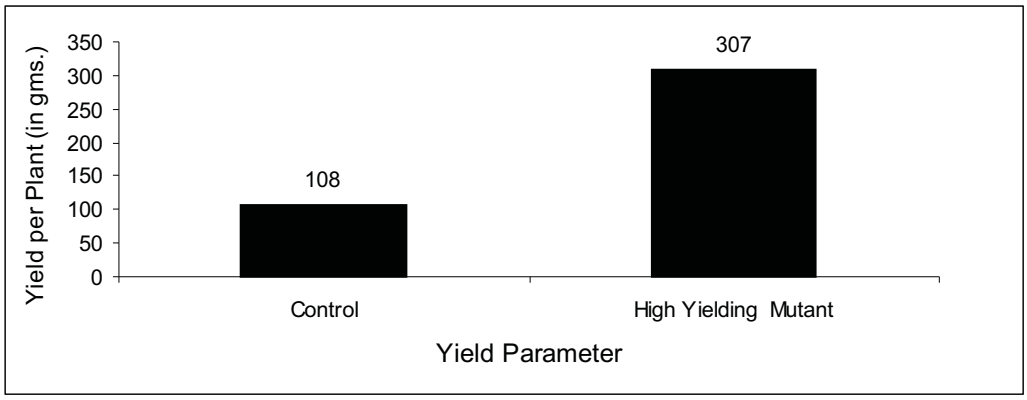

Fig 4 Yield per plant of control and high yielding mutant

DISCUSSION

Isolation of mutants of agronomic and economic significance was a major goal of mutation breeding [4]. In the present investigation we were able to isolate a mutant which is high yielding and agronomically significant. Similar agronomically important mutants in Pigeonpea were also reported earlier by [5, 6]. Our results clearly indicate that mutation breeding can be applied for inducing genetic variability in yield contributing traits and to change specific characters in otherwise good varieties by incorporating some useful changes such as, number of branches, pods per plant and yield per plant, in a comparatively shorter time than conventional breeding methods.

CONCLUSION

In the present investigation an effort was made to improve the yield of Pigeonpea by mutation breeding. Seeds, presoaked in water for 12 hrs. were treated with different concentrations (10, 20, 30 and 40mM), of the chemical Mutagen, Ethyl Methyl Sulphonate (EMS) for 6 hrs., at 25 ± 2^{0}C. Presoaked seeds, untreated with EMS served as control. Both Control and EMS treated seeds were sown in the field to raise M1 progeny. M1 seeds, along with their controls were sown in next Kharif season to raise M2 progeny. M2 progeny plants were screened for Yield contributing traits like, Plant Height, Number of Branches per plant, Number of pods per plant, Pod length, Number of Seeds per Plant, 100 seed weight and Yield per Plant. M2 Progeny were also screened for useful mutants.

The M_2 progeny raised from seeds treated with 40 mM concentration of EMS produced novel mutants showing two fold increases in number of branches per plant, number of Pods per plant and Yield per plant. This Mutant was named as High yielding (Robust) mutant. Differences observed between the High yielding (Robust) mutant and corresponding control plants and correlation between the parameters were discussed in the text. The High yielding (Robust) mutant seems to be very promising and can be release as variety after appropriate field tests.

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