Male sterile mutant in *Vigna radiata*

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Abstract. Single and combined treatment of γ-rays and 0.25% EMS were tried on *Vigna radiata* variety K851. A male sterile mutant was isolated in M2 generation. Experiments indicated male sterility to be recessive and monogenic in nature.

Keywords. *Vigna radiata*; male sterile mutant; gray unit; EMS.

1. Introduction

The utilization of male sterility in the production of hybrid seeds is one of the outstanding achievements of plant breeders (Heyne and Livers 1968; Duvick 1968). An experiment of inducing mutations was conducted on *Vigna radiata* variety K851 released from CSA, University of Agriculture and Technology, Kanpur. Single and combined treatment of γ-rays and EMS were tried. This paper reports a male sterile mutant observed in M2 generation.

2. Materials and methods

Seeds of *V. radiata* variety K851 were irradiated with γ-rays at 100, 200 and 300 gray units followed by treatment in 0.25% EMS solution in buffer at pH 7 at 30 ± 1°C for 1 h. M1 and M2 generations were raised.

3. Observations

A male sterile mutant was isolated in combined treatment (200 gray units + EMS) in M2 generation. The male sterile plant (figures 3, 4) was indistinguishable from the fertile one (figure 1), however, with the initiation of pod formation it could be clearly identified. As the maturity advanced the differences became more pronounced. The sterile plant attained the height of 65 cm (30 cm in control) and had profuse branching. The mutant had thick leaves and the whole inflorescence was long, thick, fleshy and barren. It is likely that the photosynthates which are normally channeled for the development of pods, are accumulated in leaves, stem and inflorescence of plant resulting in vigour.

To test the genetic nature of male sterility, the mutant was crossed with control taking former as female parent and latter as male parent. It was possible to get hybrid pods (figure 5). The hybrid seeds normal in appearance were sown to raise F1 generation. The F1 plant (figure 2) was male fertile having 95.2% pollen fertility. The F1 plant was smaller than the male parent. The leaves were thick and dark green in colour. Pod formation took place when F1 plant was selfed. Seeds were sown to raise
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Figures 1-6. 1. Control plant of *V. radiata*, variety K851. 2. Fertile *F*$_1$ plant having 95.2% pollen fertility. 3. Male sterile mutant obtained in combined treatment having 7.66% pollen fertility. 4. Close up of the male sterile mutant having barren and fleshy inflorescence and 2 hybrid pods. 5. Hybrid pods obtained after crossing male sterile (female parent) and control plant (male parent). 6. *F$_2$* progeny of male sterile mutant: Fertile (pollen fertility 96.5%) and sterile plant (pollen fertility 5.05%).
F₂ generation. Though only two F₂ plants could be obtained but clear segregation into male fertile and male sterile plants took place. The fertile plant attained the height of 25 cm and had 1 branch, 11 nodes, 5 leaves, 17 pods and 66 flowers. Intennodal length was 2.18 cm and pod length was 5.30 cm. The length of inflorescence stalk was 2.18 cm. The sterile plant attained the height of 35 cm, it had 2 branches and 13 nodes. In spite of producing 85 flowers, no pod formation took place. The inflorescence stalk was 4.98 cm, just the double of the inflorescence stalk of sterile plant.

4. Discussion

The male sterile mutant was identified by the presence of large amount of sterile pollens in the anthers. Genetic nature of male sterility was assessed by crossing it with control. The plant did not produce any seed on selfing but seed setting occurred when pollinated with fertile pollen grains. This clearly indicated that the sterility manifested only in male parts. Fertile F₁ and its segregation into male sterile and male fertile progenies in F₂ generation clearly indicates that male sterility was recessive as well as monogenic in nature.

References

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