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Short communication

Inheritance of the dwarf plant type in blackgram (*Vigna mungo* (L.) Hepper) *

S. Dwivedi and D. P. Singh

G. B. Pant University of Agriculture and Technology, Pantnagar-263 145, U.P., India

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Summary. The inheritance of the dwarf plant type was studied in blackgram (*V. mungo* (L.) Hepper). 'Type 9' has erect plant type with normal internode length. The mutant line, 'EMSD' has reduced internode length. The F_1, F_2 and F_3 generations of a cross between 'Type 9' and 'EMSD' and its reciprocal were studied. The extreme dwarf plant type appeared to be governed by a single recessive gene, dw_1 dw_1 with no cytoplasmic effect.

Key words: Blackgram – *Vigna mungo* – Plant type – Mutant – Gene symbol – EMS – Inheritance

Introduction

Blackgram or urdbean is one of the important grain legumes of India. It is also grown in Pakistan, Bangladesh, Sri Lanka and Burma. In India it is grown mainly in the wet season in mixed culture with cereals and other legumes and in the dry season as a pure culture. As natural variability is rather limited in this crop attempts are being made to increase it through induced mutations as a breeding tool to supplement other conventional methods.

Dry seeds of 'Type 9', a widely cultivated variety of blackgram, were treated with ethyl methane sulfonate (0.25%) for 6 h at room temperature. An extreme dwarf mutant was found in the M_1 generation. The mutant bred true in succeeding generations and showed a drastic reduction in the length of the internodes, petioles, size of leaves and peduncles although it had normal flowers and produced pods and seeds. The leaves were dark green in colour. It matured a week earlier and was less productive as compared to the parental variety. The mutant bred true in the M_2 generation (Kundu 1980). This paper deals with the studies on the inheritance of this mutant.

Materials and methods

'Type 9' (pure line) is an erect plant type with normal internode length. The crosses between 'Type 9' and the EMS treated extreme dwarf mutant ('EMSD') were made in the wet (*Kharif*) season of 1981. The F_1's were raised in the glasshouse. The F_2 generation was grown in the wet season of 1982. Plant progenies (F_3) were grown in the dry (spring) season of 1983. The individual plants of the F_2 and F_3 generations from 'Type 9' × 'EMSD' cross and its reciprocal were classified either as normal or dwarf. The normal plants were similar to 'Type 9', while the mutant plants were akin to the 'EMSD' type. The goodness of fit of the genetic ratios were tested by Chi-square.

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Results and discussion

The F_1 plants in 'Type 9' × 'EMSD' cross and in its reciprocal were of normal type; indicating that the mutant phenotype is recessive and that there is no maternal effect in its expression. In the F_2 generation of 'Type 9' × 'EMSD' cross, 820 plants were normal and 261 plants were dwarf; a ratio of 3:1 ($\chi^2 = 0.42$). Similarly, in the 'EMSD' × 'Type 9' cross, 101 plants were normal and 22 were of mutant phenotype; a 3:1 ratio ($\chi^2 = 3.32$). It is suggested that the dwarf plants of the mutant are governed by single recessive gene. In the F_3 generation progenies randomly selected from normal plants were observed for genetic segregation. In the 'Type 9' × 'EMSD' cross, out of 50 F_3 families 39 segregated in a monogenic ratio with no heterogeneity among the progenies. Eleven families were non-segregating normal types. Pooled overall, there were 922 normal plants and 280 mutant plants in the segregating progenies, a good fit to a 3:1 ratio ($\chi^2 = 2.05$). Forty F3 progenies were observed in the 'EMSD' × 'Type 9' cross: 33 showed a within progeny segregation of 3 (normal):1 (dwarf) with no heterogeneity; 7 were of a homozygous normal type. The pooled segregation of the segregating progenies of this cross in the F3 generation also showed a genetic ratio of 3 normal (756 plants):1 mutant (225 plants), $\chi^2 = 2.23$. The results of the F_3 within progeny segregation confirmed results seen in the F_2 generation. The findings of the present investigation indicate that the dwarf plant types in the EMS treated mutant ('EMSD') of blackgram is governed by a single recessive gene. No cytoplasmic factor is involved. The gene symbol dw_1 dw_1 is hereby proposed. The mutant is recessive and governed by a single gene. One explanation can be that both alleles of the gene in question mutated through the EMS mutagen simultaneously, resulting in a dwarf and recessive phenotype.

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References

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