Theor Appl Genet (1986) 72:737–738

Short communication

The allelic relationship of genes giving resistance to mungbean yellow mosaic virus in blackgram*

R. P. S. Verma and D. P. Singh

G. B. Pant University of Agriculture and Technology, Pantnagar-263145, India

Received April 1, 1986; Accepted May 25, 1986
Communicated by J. MacKey

Summary. The allelic relationship of resistance genes for MYMV was studied in blackgram (*V. mungo* (L.) Hepper). The resistant donors to MYMV – 'Pant U84' and 'UPU 2', and their F_1, F_2 and F_3 generations – were inoculated artificially using an insect vector, whitefly (*Bemisia tabaci* Genn.). The two recessive genes previously reported for resistance were found to be the same in both donors.

Key words: Blackgram – *Vigna mungo* – Allelic relationship – Resistance genes – Mungbean yellow mosaic virus

Introduction

Blackgram or urdbean is one of the important grain legumes of India and Mungbean yellow mosaic virus (MYMV) disease is one of its most devastating diseases. Therefore, breeding for MYMV resistance is of prime importance in blackgram varietal improvement programmes. 'UPU 2' and 'Pant U84' resistant lines are being used extensively in hybridization. Inheritance of resistance in varietal crosses of these resistant donors with 'UL 2', a susceptible cultivar, has been studied by Singh (1980) and in the interspecific cross, 'Pant U 84' × *V. mungo* var. 'silvestris' type B (susceptible) by Dwivedi and Singh (1985). Both of these studies suggested that resistance was due to two recessive genes. However, information on the allelic relationships of the resistance genes is not available. This paper deals with the allelic relationship of these genes in these two donors for MYMV resistance.

* Part of Ph.D. Thesis submitted by the senior author. Research Paper No. 4271

Materials and methods

Two resistant lines of blackgram, 'UPU 2' and 'Pant U 84' were used in this study. 'UPU 2' is derived from the variety 'D6-7' (Nene 1972). The resistance of 'Pant U 84' derives from collections containing natural variability (Singh 1980). Both of these lines are of the spreading type with ovate leaves and black seeds. 'UPU 2' and 'Pant U 84' were crossed to each other in the greenhouse during the summer (dry) season of 1984. The parents and F_1 generations were raised in the field in the *kharif* (wet) season of 1984. The F_1's were advanced to F_2 in the summer season of 1985 and the parents and segregating generations (F_2 and F_3) were screened for MYMV resistance in *kharif* 1985. The row to row and plant to plant distances were 50 and 10 cm, respectively. The row length was 5 m. 'UL 2', a green seeded susceptible line of blackgram, was planted as a spreader after each five rows of test material, in order to intensify MYMV inoculum from natural sources. No chemical was sprayed during the crop season in order not to disturb the natural population of the vector, whitefly (*Bemisia tabaci* Genn.). The artificial inoculation of single plants of parents and F_1s was carried out by using insect-proof transparent plastic pots with screwcaps. The mass inoculation of about 18–20 F_2 and F_3 plants at one time was done by covering the rows with muslin cloth cages of 60×90×120 cm dimensions. In both methods 8–10 viruliferous whiteflies per plant were used for inoculation (Nene 1972; Singh 1981). The disease rating was recorded on individual plants 15 days after inoculation using a 1–9 scale (Singh 1980). The mean disease score of parents and F_1s was calculated as Σ (infection rate × frequency)/total number of plants. The plants in the F_2 and F_3 generations classified as resistant were given the score of 1; susceptible, the score of 3 to 9. Both parents had a mean disease score of 1.00.

Results and discussion

The total number of plants, mean disease score and disease reaction of parents and F_1s is presented in Table 1. Both parental lines, 'Pant U 84' and 'UPU 2', and their F_1s had a mean disease score of 1.00, i.e. the

Table 1. Reaction of parents and F_1 hybrids to mungbean yellow mosaic virus in blackgram

Parent/F_1	Year	No. of plants tested	MYMV score/no. of plants					Mean disease score	Disease reaction
			1	3	5	7	9		
Pant U 84	1984	17	17	–	–	–	–	1.00	resistant
	1985	41	41	–	–	–	–	1.00	resistant
UPU 2	1984	18	18	–	–	–	–	1.00	resistant
	1985	71	71	–	–	–	–	1.00	resistant
Pant U 84 × UPU 2	1984	10	10	–	–	–	–	1.00	resistant
UPU 2 × Pant U 84	1984	10	10	–	–	–	–	1.00	resistant

resistant type of reaction. The crosses of 'Pant U 84' and 'UPU 2' with the susceptible 'UL 2' had been previously reported to show a digenic and recessive mode of inheritance (Singh 1980). Therefore, the resistant disease reaction of the F_1 generation in this study could only be possible if the genes carried by the 'Pant U 84' and 'UPU 2' parents are identical and without maternal influence. In the F_2 generation, 337 and 331 plants were studied in 'Pant U 84' × 'UPU 2' and 'UPU 2' × 'Pant U 84' crosses, respectively. All the plants had shown a disease score of 1.00, i.e. all were resistant. In case of the F_3 generation, 12 and 20 families were screened for segregation of resistance in 'Pant U 84' × 'UPU 2' and 'UPU 2' × 'Pant U 84' crosses, respectively. All the progenies were true breeders for resistance. Thus, the observations of the F_2 and F_3 generations confirmed that the two recessive genes reported by Singh (1980) in 'Pant U 84' and 'UPU 2' lines are the same.

It is suggested that a larger number of resistant sources to MYMV could be analyzed in the search for new genes for resistance. It is important to have different resistance genes from diverse sources.

Acknowledgement. The senior author is grateful to the Indian Council of Agricultural Research, New Delhi for financial assistance in the form of a Senior Research Fellowship.

References

Dwivedi S, Singh DP (1985) Inheritance of resistance to yellow mosaic virus in a wide cross of blackgram (*Vigna mungo* (L.) Hepper). Z Pflanzenzücht 95:281–284

Nene YL (1972) A survey of the viral diseases of pulse crops in Uttar Pradesh. G B Pant Univ Agric Tech, Pantnagar (India) Res Bull 4:192

Singh DP (1980) Inheritance of resistance to yellow mosaic virus in blackgram (*Vigna mungo* (L.) Hepper). Theor Appl Genet 57:233–235

Singh DP (1981) Breeding for resistance to diseases in greengram and blackgram. Theor Appl Genet 59:1–10