Original Research Article

Morphological Screening of Black Gram Genotypes with reference to Mungbean yellow Mosaic virus

Abstract

Mung bean yellow mosaic is a major destructive disease affecting blackgram productivity in India. It is transmitted by whitefly *Bemisia tabaci.* The present investigation was to identify resistant blackgram genotypes against MYMV at natural condition through field screening. Infector row method was followed to screen the genotypes. Screening was done with 12 blackgram genotypes VBN 2, VBN 3, VBN 5, VBN 6, VBN 7 VBN8, VBN9 VBN 10, VBN 11, ADT5, ADT 6 and CO5 during summer 2022. Genotypes which were found to be VBN 6, VBN10 and VBN11 were resistant and moderately resistant *viz.*, VBN4, VBN5, VBN 7, and VBN 8 during summer season 2022. Genotypes *viz.*, VBN 6, VBN 10 exhibited resistance. It suggests that utilization of these genotypes as donors for YMV resistance, leads to development of high yielding MYMV resistant varieties through backcross or marker assisted backcross selection by introgression of the genes to agronomically potential genotypes which were susceptible to MYMV.

Key words: Screening, Black gram, Mung bean yellow mosaic virus, Resistant, Susceptible.

Introduction:

Blackgram is an important legume crop of the family *leguminaceae* and it is grown mainly in Indian subcontinent. On comparison with other pulse crops, blackgram is highly priced. It is considered as rich source of protein, potassium, iron, calcium, thymine (B1), niacin (B3), riboflavin (B2) and it is nutritious for human diet. It also helps in fixing atmospheric nitrogen to the soil. In India, blackgram cultivation is followed not only in kharif season, it can also be grown in Rabi and summer seasons.

In Indian sub-continent Yellow Mosaic Disease (YMD) is caused by two virus species *viz.*, Mungbean Yellow Mosaic India Virus (MYMIV) commonly occurring in northern part of India and Mungbean Yellow Mosaic Virus (MYMV) confined to southern India (Shamim and Pandey, 2014). The initial symptoms of the yellow mosaic disease in black gram appear in the

forms of irregular yellow patches of various sizes, which coalesce to form larger patches of bright yellow colour (Mohan *et al.*, 2014). This is accompanied with general stunting of plants height. In severe cases almost entire leaf may turn yellow, plants bear few flowers and pods are smaller with immature seeds showing very poor germination [1].

MYMV in India cannot be transmitted by mechanical means and it can easily be transmitted by whitefly *Bemisia tabaci* [2]. Due to non-availability of resistant varieties, cultivation of black gram crop land is diverted to other cereal crops cultivation [3] and for MYMV management in Black gram production, breeding with the resistant cultivars is effective which is also ecofriendly [4]. It is essential to find more number of resistant varieties which performs well at all growing seasons and hence to identify MYMV resistant Black gram cultivars several attempts have been made by researchers (5). In view of the above facts, the present study was targeted to screen the MYMV resistant blackgram varieties under natural field condition

Materials and methods

The present research work was carried out on the farm of Adhiparasakthi Agricultural College, Kalavai, Ranipet, Tamil Nadu and India. Experimental materials include 12 genotypes of black gram collected from the National Pulse Research Centre, Vamban. The details of genotypes were listed in Table 1. The genotypes were raised in the flat bed method with a spacing of 30 x 10 cm in Randomized Block Design (RBD) under the irrigated condition with two replications. Varieties were taken for screening against MYMV. Infector row method was followed for providing MYMV infection to all the test genotypes. CO 5 Black gram was used as a susceptible check and VBN 10 Black gram was used as a resistant check. Agronomic practices like hand weeding, proper irrigation, fertilizer application, herbicide application were provided for successful growth of the plants. No insecticide was sprayed to ensure natural white fly population. Scoring was done after 80% of the plant showed incidence based on 1-9 modified scale All India Coordinated Research Project on MULLARP proposed by Alice and Nadarajan (6).

Table 1.Modified MULLARP scale (0-9)

Scales	Description
0	No visible symptoms on leaves

1	Very minute yellow specks on leaves
2	Small yellow specks with restricted spread covering 0.1-5% leaf area of plant
3	Yellow mottling of leaves covering 5.1-10% leaf area of plant
4	Yellow mottling of leaves covering 10.1-15% leaf area of plant
5	Yellow mottling and discolorations of 15.1-30% leaf area of plant
6	Yellow discolouration of 30.1-50% leaf area of plant
7	Pronounced yellow mottling and discolorations of leaves and pods, reduction in leaf size and stunting of plants' height covering 50.1-75% foliage of plant
8	Severe yellow discolorations of leaves covering 75.1-90% of foliage, stunting of plants' height and reduction in pod size
9	Severe yellow discolorations of leaves covering above 90.1% of foliage of plants, stunting of plants' height and no pod formation

The categories used for assessing the resistant genotypes against yellow mosaic virus was given in the following table [3]

Table 2. **Disease Severity Rating and reaction**

Percent Disease Severity Rating	**Rating**	**Reaction**
0.1-5	1 to 2	Resistant
5.1-15	2.1 to 4	Moderately Resistant
15.1-30	4.1 to 5	Moderately Susceptible
30.1-75	5.1 to 7	Susceptible
75.1-100	7.1 to 9	Highly Susceptible

Percentage disease index was calculated by using the formula given by Wheeler [10] Percent Disease Index = Sum of all the numerical rating Number of observations × Maximum disease rating × 100.Percentage disease index was calculated by using the formula given by Wheeler [8].

Table 3 : Screening of black gram genotypes against MYMV

Genotypes	Rating	Reaction	Number of genotypes
VBN 6, VBN10, VBN11	1 to 2	Resistant	3
VBN4, VBN 7, VBN 8, VBN5	2.1 to 4	Moderately Resistant	4
VBN3, VBN 2	4.1 to 5	Moderately Susceptible	2
ADT 4, ADT5	5.1 to 7	Susceptible	2
CO5	7.1 to 9	Highly Susceptible	1

Plate 1. Field trials of blackgram genotypes against yellow mosaic disease

Result and discussion

MYMV disease infecting leguminous crops can effectively be controlled by using the resistant varieties. To identify the resistant varieties, the foremost step is screening varieties against MYMV at field condition with natural infection by *Bemisia tabaci*. Even though several genotypes showing resistance to MYMV have already been screened, lack of durable resistance

is observed. Hence continuous screening is required for identifying resistance source against MYMV. Evaluation of 12 Black gram genotypes under field conditions against MYMV was carried out at natural condition on the basis of 0-9 scale and percent disease incidence was worked out. After every test entry, presence of most susceptible check CO5 and good population of white fly in summer minimizes the chance of disease escape. Genotypes which were found to be VBN 6, VBN10 and VBN11 were resistant, VBN4, VBN 7, VBN 8 were moderately resistant and VBN5 VBN3 and VBN 2 were Moderately Susceptible, ADT 4 & ADT5 were Susceptible, Highly Susceptible- CO5 during summer season 2022. The results obtained in the present study were in accordance with the findings of the Ganapathy *et al*., 2003 (9); Pathak and Jhamaria, 2004; Obaiah *et al*., 2013 (11); Shamim and Pandey, 2014 (13); Gopi *et al*., 2016 (10) in blackgram.

Conclusion

On the basis analyzed results it is concluded that genotypes such as VBN 6, VBN10 and VBN11 were resistant and moderately resistant *viz.*, VBN4, VBN 7, VBN 8, and VBN5 during summer season 2022. It suggests that utilization of these genotypes as donors for YMV resistance, leads to development of high yielding MYMV resistant varieties through backcross or marker assisted backcross selection by introgression of the genes to agronomically potential genotypes which were susceptible to MYMV. Based on the priority, the local varieties which are well adapted to the specific environmental conditions which otherwise give high yield can be improved by incorporating the resistant genes, however a thorough research is needed for further developing resistant varieties.

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