**Bulletin of Environment, Pharmacology and Life Sciences**
Bull. Env. Pharmacol. Life Sci., Vol 7 [SPL 1] 2018 : 125-128

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.876
Universal Impact Factor 0.9804
NAAS Rating 4.95


**ORIGINAL ARTICLE** **OPEN ACCESS**

# Screening of Blackgram (*Vigna Mungo* L. Hepper) Germplasm For Resistance To Mungbean Yellow Mosaic Virus Under Ricefallow Situation

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**ABSTRACT**

*Thirty six germplasm accessions of urdbean [Vigna mungo (*L.*) Hepper] were screened for Mungbean Yellow Mosaic Virus (MYMV), transmitted through the white fly (Bemisia tabaci), in natural conditions in complete randomized block design with two replications during the rabi, 2016-17 under rice fallow situation revealed that the Percent Disease Incidence ranged from 0.00 (PU 31 and KUG 216 x PU 40) to 69.94 (LBG 645). Based on the Per cent of Disease Index (PDI), disease scoring to individual genotype recorded and reveled, differential response against MYMV were characterized from resistance to susceptible reaction. In spite of the variable response to MYMV the genotypes PU 31, KUG 216 x PU 40, TU 18, KUG 216 x SPS 5 and LBG 20 exhibited resistance response to MYMV during the rabi, 2016-17. The resistance response might be due to the ideotype/pant morphology of the genotype or may be the genes responsible for resistance. Thus, utilization of these genotypes as donors for MYMV resistant, by introgression of the genes to agronomically potential but susceptible to MYMV genotypes through backcross or marker assisted backcross selection (MABS), would leads to development of high yielding varieties resistance to MYMV.*
***Keywords:*** *Urdbean, Mungbean Yellow Mosaic Virus, PI and PDI.*

Received 22.05.2018 Revised 19.06.2018 Accepted 29.07.2018

## INTRODUCTION

Blackgram (*Vigna mungo* (L.) Hepper) was popularly known as urdbean, urid or mash. In India it is cultivated in 32.60 lakh ha producing 17.60 lakh tons with an average productivity of 534 kg/ha (Source: Project co-ordinates (MULLaRP) Report, IIPR, Kanpur 2011-2012). In Andhra Pradesh blackgram is traditionally cultivated as a rabi pulse crop under rice fallows mainly along the coastal areas, in an area of 5 lakh ha with a production and productivity of 3.29 lakh tons and 728 kg/ha, respectively during 2016-17. Blackgram consists of good nutritional values of high seed protein (25-26%), carbohydrates (60%), fat (1.5%), minerals, amino acids and vitamins. Hence, it is usually known as "poor man's meat" particularly in the vegetarian population of the Indian subcontinent (Chubatemsu and Malini, 2017). As yield is the resultant product of various morphological, physiological and biological (biotic and abiotic) components. Among biotic stresses, yellow mosaic disease (MYMV) is the most destructive disease on blackgram. The infected plants show alternating green and yellow patches on leaves. The disease is transmitted through white fly (*Bemisia tabaci)* (Basandrai *et al.,* 1999), epiphytotic form both in *Kharif* and *Rabi* seasons, thereby causing immense loss in farmers. Due to MYMV, effect blackgram crop area is diverted towards other cereals crops like maize and sorghum, due to non-availability of resistant varieties (*Mohan et al*., 2014). Identifying source of resistance to MYMV on blackgram is a priority area towards research efforts screening blackgram germplasm against MYMV for the identification of resistance source under natural environmental conditions and a number of resistant genotypes have been reported by workers (Alice and Nadarajan, 2007, Basandrai *et al.,* 1999). Hence, the present investigation was envisaged to screen the urdbean germplasm accessions and identify the resistant MYMV genotypes through field screening under natural condition.

## MATERIALS AND METHODS

The study was carried out with thirty six blackgram (*Vigna mungo* (L.) Hepper) germplasm accessions of diverse origin were sown/raised in rice fallow situation in a Randomized Block Design in three replications, each of 4 rows of 4 meters length with spacing of row to row 30 cm and plant to plant of 10 cm at Agricultural Research Station, Ghantasala, Krishna District, during *Rabi*, 2016-17 under ricefallow situation. Resistance screening was conducted in the natural epidemic conditions, severity was recorded on plot basis at the time of pod filling stage. Per cent disease infestation was calculated using the formula (Chandrajini Devi *et al*., 2016) as mentioned below

$$\text{Per cent MYMV incidence (PI)} = \frac{\text{Number of plants infected in a plot}}{\text{Total number of plants in a plot}} \text{ X } 100$$

Per cent Disease Index (P.D.I) was computed using the formula given by Wheeler (1969).

$$\text{Per cent disease incidence (PDI)} = \frac{\text{Sum of all the numerical ratings}}{\text{Number of observations} \times \text{Maximum disease rating}} \text{ X } 100$$

Mungbean yellow mosaic virus (MYMV) severity is recorded on plot basis by using 0-9 modified scale of All India Co-ordinated Research Project on MULLARP (Alice and Nadarajan, 2007 ) and the following categories were used in assessing the resistant reaction for *mungbean yellow mosaic virus* disease (Gantait and Kantidas, 2009).

**Categorization of blackgram genotypes based on *mungbean* yellow mosaic disease rating (Gantait and Kantidas, 2009).**

| Percent disease severity | Rating | Reaction |
|---|---|---|
| 0.1-5 | 1.0 to 2.0 | Resistant ( R) |
| 5.1-15 | 2.1 to 4 | Moderately resistant (MR) |
| 15.1-30 | 4.1 to 5 | Moderately susceptible (MS) |
| 30.1-75 | 5.1 to 7 | Susceptible (S) |
| 75.1-100 | 7.1 to 9 | Highly susceptible (HS) |

**Table 1: Per cent of MYMV disease incidence in Urdbean germplasm lines under ricefallow situation**

| S.No | Genotype | Per cent of MYMV disease incidence | S.No | Genotype | Per cent of MYMV disease incidence |
|---|---|---|---|---|---|
| 1 | LBG 623 | 40.24 | 19 | TBG 104 | 11.12 |
| 2 | VBG 4-008 | 4.35 | 20 | WBG 108 | 10.98 |
| 3 | VBG 4-14 | 8.98 | 21 | KUG 216 x PU 40 | 0.00 |
| 4 | Uttara | 1.55 | 22 | LBG 648 | 49.97 |
| 5 | LBG 17 | 27.39 | 23 | PU 40 | 24.51 |
| 6 | TGBG 40 | 8.59 | 24 | TU 18 | 4.04 |
| 7 | LBG 402 | 60.25 | 25 | LBG 685 | 37.49 |
| 8 | KKB 05011 | 32.09 | 26 | PU 31 | 0.00 |
| 9 | TU 94-2 | 1.46 | 27 | TGBG 258 | 5.95 |
| 10 | LBG 787 | 2.69 | 28 | IPU 2-43 | 24.04 |
| 11 | TGBG 26 | 2.35 | 29 | LBG 788 | 18.35 |
| 12 | TGBG 344 | 3.87 | 30 | KUG 216 x SPS 5 | 0.00 |
| 13 | TGBG 74 | 2.99 | 31 | TGBG 136 | 15.19 |
| 14 | TGBG 143 | 1.79 | 32 | T 9 | 15.59 |
| 15 | TGBG 281 | 9.69 | 33 | TGBG 401 | 9.95 |
| 16 | KUG 216 x BG 018-2 | 24.89 | 34 | LBG 752 | 19.19 |
| 17 | DPU 88 31 x VBG 4-008 | 3.05 | 35 | LBG 709 | 5.60 |
| 18 | LBG 645 | 69.94 | 36 | LBG 20 | 1.05 |

### Mungbean Yellow Mosaic Disease Severity

Mungbean yellow mosaic disease severity was recorded on plot basis at the time of pod filling stage. Modified scale of All India Coordinated Research Project on MULLaRP was used for disease scoring (Alice and Nadarajan, 2007).

**Modified MULLaRP scale (0-9)**

| Scale | 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 discolouration of 15.1-30% leaf area of plant |
| 6 | Yellow discolouration of 30.1 to 50% leaf area of plant |
| 7 | Pronounced yellow mottling and discolouration of leaves and pods, reduction in leaf size and stunting of plants covering 50.1-75% foliage of plant |
| 8 | Severe yellow discolouration of leaves covering 75.1 to 90% of foliage, stunting of plants and reduction in pod size |
| 9 | Severe yellow discolouration of leaves covering above 90.1% of foliage of plant, stunting of plants and no pod formation |

**Table 2: Per cent of MYMV Disease Index (PDI) in Urdbean germplasm lines under rice fallow situation**

| S.No | Genotype | Per cent of MYMV disease index | Scale | Disease Reaction |
|---|---|---|---|---|
| 1 | LBG 623 | 34.72 | 7 | Susceptible |
| 2 | VBG 4-008 | 11.11 | 4 | Moderately Resistant |
| 3 | VBG 4-14 | 11.11 | 4 | Moderately Resistant |
| 4 | Uttara | 8.33 | 3 | Moderately Resistant |
| 5 | LBG 17 | 30.78 | 6 | Susceptible |
| 6 | TGBG 40 | 12.50 | 4 | Moderately Resistant |
| 7 | LBG 402 | 31.94 | 6 | Susceptible |
| 8 | KKB 05011 | 25.00 | 5 | Moderately Susceptible |
| 9 | TU 94-2 | 6.94 | 3 | Moderately Resistant |
| 10 | LBG 787 | 12.50 | 4 | Moderately Resistant |
| 11 | TGBG 26 | 9.72 | 3 | Moderately Resistant |
| 12 | TGBG 344 | 9.72 | 3 | Moderately Resistant |
| 13 | TGBG 74 | 8.33 | 3 | Moderately Resistant |
| 14 | TGBG 143 | 11.11 | 4 | Moderately Resistant |
| 15 | TGBG 281 | 12.50 | 4 | Moderately Resistant |
| 16 | KUG 216 X BG 018-2 | 19.44 | 5 | Moderately Susceptible |
| 17 | DPU 88 31 X VBG 4-008 | 5.56 | 3 | Moderately Resistant |
| 18 | LBG 645 | 30.17 | 6 | Susceptible |
| 19 | TBG 104 | 13.89 | 4 | Moderately Resistant |
| 20 | WBG 108 | 12.50 | 4 | Moderately Resistant |
| 21 | KUG 216 X PU 40 | 5.02 | 2 | Resistant |
| 22 | LBG 648 | 31.24 | 6 | Susceptible |
| 23 | PU 40 | 18.06 | 4 | Moderately Susceptible |
| 24 | TU 18 | 6.94 | 3 | Moderately Resistant |
| 25 | LBG 685 | 31.94 | 7 | Susceptible |
| 26 | PU 31 | 0.00 | 0 | Resistant |
| 27 | TGBG 258 | 9.72 | 3 | Moderately Resistant |
| 28 | IPU 2-43 | 9.72 | 3 | Moderately Resistant |
| 29 | LBG 788 | 26.39 | 5 | Moderately Susceptible |
| 30 | KUG 216 X SPS 5 | 0.00 | 0 | Resistant |
| 31 | TGBG 136 | 16.67 | 4 | Moderately Susceptible |
| 32 | T 9 | 22.22 | 5 | Moderately Susceptible |
| 33 | TGBG 401 | 20.83 | 5 | Moderately Susceptible |
| 34 | LBG 752 | 20.83 | 5 | Moderately Susceptible |
| 35 | LBG 709 | 11.11 | 4 | Moderately Resistant |
| 36 | LBG 20 | 4.17 | 2 | Resistant |

## RESULTS AND DISCUSSIONS

In the present study, thirty six urdbean germplasm accessions were screened under field condition in rice fallow situation, to identify the resistant donors for evolving/developing the urdbean varieties with MYMV resistance coupled with higher seed Yield. Which can be screened by using Per cent Disease Incidence, which was ranged from 0.00 (PU 31 and KUG 216 x PU 40) to 69.94 (LBG 645) (Table 1) and Per cent of Disease Index (PDI) was calculated as suggested by Wheeler (1969), ranged from 0.00 (PU 31

and KUG 216 x PU 40) to 34.72 per cent (LBG 623) and the disease scoring were given based on the PDI per cent, ranged from 0 to 8 score (Table 2), at Agricultural Research Station, Ghantasala, Krishna District. The study revealed that maximum of 17 genotypes *viz.,* VBG 4-008, VBG 4-14, Uttara, TGBG 40, TU 94-2, LBG 787, TGBG 26, TGBG 344, TGBG 74, TGBG 143, TGBG 281, DPU 88 31 x VBG 4-008, TBG 104, WBG 108, TGBG 258, IPU 2-43 and LBG 709 were grouped under moderately resistant reaction, followed by 10 genotypes (KKB 05011, KUG 216 x BG 018-2, PU 40, LBG 788, TGBG 136, T 9, TGBG 401 and LBG 752) in under moderately susceptable category. The genotypes LBG 623, LBG 17, LBG 645, LBG 648, LBG 402 and LBG 685 total of 6 genotypes were fall under susceptible reaction; 4 genotypes such as PU 31, KUG 216 x PU 40, TU 18, KUG 216 x SPS 5 and LBG 20 are grouped under resistant category and non of the genotypes under study were grouped under highly susceptible reaction (Table 3).

**Table 3:** Grouping of Urdbean genotypes based on their disease reaction to MYMV

| S. No | Rating | Reaction | Number of genotypes | Genotypes |
|---|---|---|---|---|
| 1 | 1.0 to 2 | Resistant (R) | 4 | PU 31, KUG 216 x PU 40, TU 18, KUG 216 x SPS 5 and LBG 20 |
| 2 | 2.1 to 4 | Moderately Resistant (MR) | 17 | VBG 4-008, VBG 4-14, Uttara, TGBG 40, TU 94-2, LBG 787, TGBG 26, TGBG 344, TGBG 74, TGBG 143, TGBG 281, DPU 88 31 x VBG 4-008, TBG 104, WBG 108, TGBG 258, IPU 2-43 and LBG 709 |
| 3 | 4.1 to 5 | Moderately Susceptible (MR) | 10 | KKB 05011, KUG 216 x BG 018-2, PU 40, LBG 788, TGBG 136, T 9, TGBG 401 and LBG 752 |
| 4 | 5.1 to 7 | Susceptible (S) | 6 | LBG 623, LBG 17, LBG 645, LBG 648, LBG 402and LBG 685 |
| 5 | 7.1to 9 | Highly Susceptible (HS) | --- | ----- |

## CONCLUSION

However, variable response to MYMV was observed among the genotypes ranged from resistant to susceptible, the resistance response might be due to the ideotype/pant morphology of the genotype or may be the genes responsible for resistance. The lines such as PU 31, KUG 216 x PU 40, TU 18, KUG 216 x SPS 5 and LBG 20 exhibited resistance during the *rabi*, 2016-17 at Agricultural Research Station, Ghantasala, Krishna district, Andhra Pradesh, suggests that these genotypes could possibly be utilized as donors to develop MYMV resistant lines, by introgression of the genes to agronomically potential but susceptible to MYMV genotypes through ideotype breeding, backcross or marked assisted backcross breeding, for the development of high yielding varieties resistance to MYMV.

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