

Original Research Article

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## Screening and Chemical Management of Mungbean against Mungbean Yellow Mosaic Virus in Jammu Region

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### ABSTRACT

#### Keywords

Mungbean mosaic virus, Disease incidence, Disease severity, Screening and Chemical management

#### Article Info

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Mungbean yellow mosaic is the most destructive disease widely prevalent in summer and rainy season and a major constraint to the cultivation of legumes in India. Screening of mungbean germplasm was done at research farm of SKUAST Jammu and the study showed that out of ten germplasm SML-668, ML-613, ML-5, PS-16, ML-818 were moderately resistant whereas PAU-911 and PDM-116 were moderately susceptible and T-9, T-44 and K-851 were susceptible. Also, different insecticides (arbofuran 3G, imidacloprid 17.8 SL, metasystox 25 EC, thiomethoxam 25WG and profenofos 50 EC) were evaluated against mungbean yellow mosaic virus under field condition and the result revealed that at 60 DAS, imidacloprid (seed treatment) + carbofuran (soil application)+ imidacloprid (Foliar spray) showed the lowest disease intensity (7.33 %) followed by thiomethoxam (seed treatment) + carbofuran (soil application) + profenofos (Foliar spray) (10.00 %), imidacloprid (Foliar spray) (10.66%), imidacloprid (seed treatment) (11.33%), thiomethoxam (seed treatment) (12%), metasystox (Foliar spray) (12.33%), profenofos (Foliar spray) (14.00%), imidacloprid (seed treatment) + carbofuran (soil application) + metasystox (Foliar spray) (14.33%) and carbofuran (soil application) (15.33%).

### Introduction

Green gram commonly known as Mungbean or Mung (*Vigna radiata* L.) is one of the thirteen food legumes grown in India and third most important pulse crop after chick pea and pigeon pea. It is an important short duration summer food legume in the tropical and sub tropical countries of the world. In India the total area sown under mungbean is around 4.26 million ha, with a production of 2.01million tons and productivity of 472 kg/ha (Anonymous,, 2018). In Jammu and

Kashmir, mungbean is grown over an area of 1.4 thousand ha with an annual production of 0.8 thousand tons and average yield of 587kg/ha (Anonymous, 2015). Mungbean is prone to several fungal, bacterial and viral diseases. Among all the viruses, mungbean yellow mosaic virus (MYMV) is the most destructive.

The virus is not seed or soil borne or sap transmissible (Nene, 1973) but only by its vector whitefly *B.tabaci* (Hemiptera: Aleyrodidae), which causes severe damage to

crops by feeding on sap, secreting honey dew and transmitting virus diseases (Jose and Usha, 2003). In India the virus was first reported from fields of IARI, New Delhi in 1960. MYMV belongs to the genus Begomovirus of the family Geminiviridae (Bos, 1999). The virus has geminated particle (20 x 30 nm) and the coat protein encapsulates circular, single stranded DNA genome of approximately 2.8 kb. MYMV causes irregular green and yellow patches in older leaves and complete yellowing of younger leaves. The disease can reduce mungbean yield upto 100 per cent or even kill a plant (Kitsanachandee *et al.*, 2013). Thus keeping in view the importance of the disease and losses caused, studies on screening and chemical management of mungbean against yellow mosaic disease was done at research farm of SKUAST- Jammu under field condition.

## Materials and Methods

### Screening of mungbean germplasm

Ten germplasm of mungbean *viz.* ML-5, PAU-911, T-44, K-851, ML-613, PS-16, PDM-116, ML-818, SML-668 and T-9 were collected from various sources and grown under natural epiphytotic conditions for determining resistance against MYMV and no plant protection measures were adopted. Observation on disease incidence and severity were recorded at 15 days interval. Severity of the disease was determined by using 0-5 scale (As per modified scale of Bashir *et al.*, 2005) (Table 1).

### Scoring

The percentage of disease incidence and percentage of disease index (PDI) were calculated by using the standard formula (McKinney, 1923):

$$\text{Percentage of Disease Incidence} = \frac{\text{Number of plants infected}}{\text{Total number of plants observed}} \times 100$$

$$\text{Percentage of Disease Index (PDI)} = \frac{\text{Sum of all numerical rating}}{\text{Maximum disease grade} \times \text{Total number of plants observed}} \times 100$$

## Evaluation of insecticides against Mungbean Yellow Mosaic Virus (MYMV) under field conditions:

The experiment was laid out using susceptible variety of mungbean (T9) in Randomised Block Design with nine treatments and three replications including untreated control. The different insecticides used for the experiment were carbofuran 3G, imadacloprid 17.8 SL, metasystox 25 EC, thiomethoxam 25WG and profenofos 50 EC.

The first spray of insecticide was given at the appearance of the disease symptoms followed by two sprays at 15 days interval. In case of control only water was sprayed. Per cent Diseases intensity of MYMV in treated and untreated plots was calculated by using 0-5 scale (As per modified scale of Bashir *et al.*, 2005) (Table 1).

## Results and Discussion

Ten mungbean germplasm were screened for resistance against mungbean yellow mosaic virus (MYMV) under field conditions. The results showed that at 60 DAS the disease incidence ranged from 60.00- 96.67% (Table 2) while the per cent disease severity ranged from 14.33 - 42.33 % (Table 3). Further the study revealed that no germplasm was immune to the disease, however, SML-668, ML-613, ML-5, PS-16, ML-818, were found moderately resistant, PAU-911 and PDM-116 showed moderately susceptible, while T-9, T-44 and K-851 showed susceptible (Table 3) against the disease. Similar type of varietal evaluations were also documented previously by several workers (Chenulu *et al.*, 1979; Singh, 1980; Singh *et al.*, 1996; Marappa *et*

*al.*, 2003; Ganapathy, 2003 and Peerajade *et al.*, 2004).

The evaluation of different insecticides for the management of MYMV was done under field conditions and the results revealed that all the chemicals were effective in reducing the spread of the disease by controlling the population of whiteflies which are the main vector of the virus except control plots. At 60 DAS, imidacloprid (seed treatment) + carbofuran (soil application) + imidacloprid (foliar spray) (7.33%) was found stastically

superior to other treatments followed by thiomethoxam (seed treatment) + carbofuran (soil application) + profenofos (foliar spray) (10.00%), imidacloprid (foliar spray) (10.66%), imidacloprid (seed treatment) (11.33%), thiomethoxam (seed treatment) (12%), metasystox (foliar spray) (12.33%), profenofos (foliar spray) (14.00%), imidacloprid (seed treatment) + carbofuran (soil application)+ metasystox (foliar spray) (14.33%) and carbofuran (soil application) (15.33%) (Table 4).

**Table.1** Scale used to measure intensity of mungbean yellow mosaic virus

Disease Severity	Per cent Infection	Reaction Group
0	No symptom	Highly Resistant
1	Up to 10 % Infection	Resistant
2	More than 10 % to 20 % Infection	Moderately Resistant
3	More than 20% to 30 % Infection	Moderately Susceptible
4	More than 30 to 50 % Infection	Susceptible
5	More than 50 % Infection	Highly Susceptible

**Table.2** Incidence of mungbean yellow mosaic virus (MYMV) on different germplasm at different dates after sowing (DAS) under field conditions

Germplasm	Disease Incidence (%)		
	30 DAS	45DAS	60DAS
ML-818	56.67	56.67	60.00
SML-668	53.33	56.67	66.67
ML-613	50.00	53.33	66.67
PAU-911	60.00	70.00	86.67
T-9	76.67	83.33	93.33
ML-5	56.67	66.67	76.67
PS-16	50.00	66.67	70.00
T-44	73.33	83.33	96.67
K-851	70.00	83.33	96.67
PDM-116	66.67	70.00	80.00

**Table.3** Intensity of mungbean yellow mosaic virus (MYMV) on different germplasm at different dates after sowing (DAS) under field conditions

Germplasm	Disease Incidence (%)			Grade
	30DAS	45DAS	60DAS	
ML-818	11.33	14.33	16.33	MR
SML-668	12.60	14.66	16.00	MR
ML-613	22.67	25.33	27.00	MS
PAU-911	31.33	39.33	42.33	S
T-9	12.00	16.33	18.00	MR
ML-5	12.33	14.33	16.00	MR
PS-16	30.33	32.33	42.00	S
T-44	30.33	32.33	42.00	S
K-851	21.44	24.67	26.33	MS
PDM-116	11.33	13.33	14.33	MR

**Table.4** Evaluation of different insecticides against mungbean yellow mosaic virus (MYMV) under field conditions on variety (T-9)

Treatment	Disease Intensity (%)		
	30 DAS	45 DAS	60 DAS
Soil application of Carbofuran 3G	13.33 (21.66)	14.00 (21.93)	15.33 (22.88)
Seed treatment with Imadacloprid 17.8 SL	6.00 (14.17)	8.33 (17.09)	11.33 (19.34)
Foliar application of Metasystox 25 EC	6.66 (14.92)	9.66 (17.75)	12.33 (20.65)
Foliar application of Profenofos 50 EC	7.00 (15.17)	12.33 (20.65)	14.00 (21.93)
Foliar application of Imidacloprid 17.8 SL	5.66 (13.72)	8.00 (16.69)	10.66 (18.69)
Seed treatment with Thiomethoxam 25WG	6.33 (14.67)	8.66 (17.09)	12.00 (19.64)
Seed treatment with Imidacloprid 17.8 SL + soil application of Carbofuran 3G+Foliar spray of Imidacloprid 17.8 SL	2.66 (9.26)	4.66 (12.41)	7.33 (15.67)
Seed treatment with Imidacloprid 17.8 SL + Soil application of Carbofuran 3G+ Foliar spray of Metasystox 25EC	7.33 (15.67)	9.00 (17.27)	14.33 (22.24)
Seed treatment with Thiomethoxam 25WG+ Soil application of Carbofuran 3G+Foliar spray of profenofos 50EC	4.33 (12.20)	6.00 (14.14)	10.00 (18.37)
Control	25.33 (30.01)	28.00 (31.74)	33.33 (35.15)
SE	<b>0.864</b>	<b>0.481</b>	<b>0.385</b>
CD(P=0.05)	<b>1.56</b>	<b>1.019</b>	<b>1.815</b>

Based on the results, it is clear that the application of insecticides like imidacloprid,

profenofos, thiomethoxam and metasystox in combination with carbofuran were effective in

minimizing the disease severity in the field. Effectiveness of imidacloprid for the management of whiteflies which is the main vector of the disease was earlier reported by Mote *et al.*, (1993), Walunj and Mote (1995) and Dandale *et al.*, (2001). The effectiveness of the insecticides was attributed to a great extent due to high level of protection, quick knockdown effect on viruliferous vectors and delaying disease appearance as reported by Baranwal and Ahmed (1997) or becoming toxic to vectors before inoculating virus as reported by Somasekara *et al.*, (1997).

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