

Original Research Article

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Integrated Management of Yellow Mosaic Disease (YMD) of Mungbean

Sunil Kulkarni*, M. Shobharani and Raja

Agricultural Research Station, Bidar-585401, University of Agricultural Sciences,
Raichur, Karnataka, India

*Corresponding author

ABSTRACT

The field experiment was conducted for the management of mungbean YMD by integrating different combination of insecticides and yellow sticky trap during *Kharif* 2015-16 and 2016-17. Among the different treatments imposed, seed treatment (ST) with imidacloprid 60 FS @ 5 ml/kg + foliar spray (FS) of diafenthiuron 50 WP @ 0.1 % at 20 DAS + yellow sticky trap showed significantly less YMD incidence (23.93%) and lowest whitefly population (1.85/plant) and highest seed yield of mungbean (18.23 q/ha). This treatment was followed by seed treatment (ST) with imidacloprid 60 FS @ 5 ml/kg + foliar spray (FS) of Triazophos 40 EC @ 0.15% at 20 DAS + yellow sticky trap which recorded 26.01% disease incidence of YMD and whitefly population of 2.92 whiteflies/plant and mung bean yield of 15.28 q/ha. However, untreated control recorded highest per cent disease incidence of 59.65%, highest whitefly population of 11.88/plant and lowest mungbean seed yield of 2.77q/ha.

Keywords

Mungbean,
Imidacloprid,
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disease, Whitefly

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Introduction

Greengram or mungbean [*Vigna radiata* (L.) Wilczek] is a vital crop grown throughout Asia, Australia, West Indies, South and North America, tropical and subtropical Africa. India accounts for 54 per cent of the world production and covers 65 per cent of the world acreage. In India, greengram is grown in an area of 34.4 lakh ha with production and productivity of 15 lakh tones and 407 kg/ha, respectively (Anon., 2014). In Karnataka, major greengram growing districts are Koppal,

Kalburagi, Bidar, Dharwad, Gadag, Belgaum, Chitradurga, Haveri, Shivamogga, Vijayapura, Bellary and Davangere, occupies an area of 5.28 lakh ha with production and productivity of 1.08 lakh tones and 205 kg/ha, respectively (Anon., 2014).

The crop has been found suffering from many diseases which included fungi and viral diseases *viz.*, leaf spot, powdery mildew, damping off, wilt, rust, scab, anthracnose, Yellow Mosaic Disease, Leaf Crinkle Virus, Alfa Alfa Mosaic Virus, Bean Common

Mosaic Virus, Cucumber Mosaic Virus and Mosaic Mottle Virus. Among viral diseases, Yellow Mosaic Disease (YMD) caused by Mungbean Yellow Mosaic Virus (MYMV) is the most destructive in Indian subcontinent and adjacent areas of South-East Asia, causing upto 100 per cent yield losses. This disease was first reported by Nariani (1960) from IARI (Indian Agricultural Research Institute), New Delhi with 20 to 30 per cent disease incidence. Apart from India, its occurrence and severity was reported from Sri Lanka, Pakistan, Bangladesh, New Guinea, Philippines, Thailand and Pakistan (Honda *et al.*, 1983; Chenulu and Verma, 1988; Malik and Bashir, 1992; Ahmad and Harwood, 1973).

The crop infected at early stages, exhibited complete yellowing of all the leaves with puckering symptoms (Salam, 2005) and at irregular green and yellow patches on older leaves. Infected plants produce few flowers, small pods, malformed and discoloured seeds. This interim affected the quality and quantity of the seed yield (Nene, 1973 and Dhingra and Chenulu, 1985).

Current management of YMD includes planting resistant varieties, vector management, alternate hosts mungbean and modifying the cultural practices of the crop which are not effective in managing the disease remarkably. Therefore, there is need to develop a better management practices. In this context, the present study was undertaken on using different chemicals, neem based pesticides and yellow sticky trap for the management of yellow mosaic disease.

Materials and Methods

A field experiment was conducted at Agricultural Research Station, Bidar during Kharif 2015-16 and 2016-17 to know the effectiveness of different insecticides as seed

treatment and foliar sprays for the management of YMD in mungbean. Experiment trial was laid in Randomized block design with eight treatments replicated thrice. Mungbean Var, Chinamoong was sown at 30cm × 10cm spacing and all the recommended package of practices was followed to raise the crop, except plant protection measures. Spraying was done at 20 days after sowing and the treatment details for experiment have shown in Table 1.

The observation on disease incidence was done at 10 days interval by counting the number of plants infected and total number of plants in an experimental plot (for each treatment) and Per cent Disease Index (PDI) was worked out using the formula given below.

$$\text{Percent disease incidence (PDI)} = \frac{\text{Number of infected plants in a plot}}{\text{Total number of plants in plot}} \times 100$$

Further, data was transformed to arc sine values and subjected for statistical analysis.

Observation of whitefly population was made at ten days interval on randomly selected 10 plants in each treatment and subjected for Square root transformation and statistical analysis.

The seed yield was recorded plot wise after harvest and converted to hectare basis and subjected for statistical analysis.

Results and Discussion

Percent disease incidence and whitefly population

The pooled results of two years indicated that all the treatments were found comparatively effective in reducing disease incidence and whitefly population compared to untreated control (Table 1).

Among the different treatments imposed, T7 treatment (ST with Imidacloprid 60 FS @ 5 ml/kg + FS of Diafenthiuron 50 WP @ 0.1 % at 20 DAS + yellow sticky trap) found significantly superior by recording lowest YMD incidence of 23.93 % and lowest whitefly population of 1.85 whiteflies/plant and recorded highest seed yield of 18.23 q/ha.

This treatment was followed by T4 treatment (ST with Imidacloprid 60 FS @ 5 ml/kg + FS of Azadirachtin 1500 ppm @ 0.2% at 20 DAS + yellow sticky trap) and T6 treatment (ST with Imidacloprid 60 FS @ 5 ml/kg + FS of Acephate 95 SG @ 0.1% at 20 DAS + yellow sticky trap) by recording the disease incidence of 26.01 and 28.90, whitefly population of, 2.92 and 3.81 whiteflies/plant and mungbean seed yield of 15.28 q/ha and 12.33 q/ha respectively.

However untreated control recorded highest per cent disease incidence of 59.65%, highest whitefly population of 11.88 whiteflies/plant and lowest mungbean seed yield of 2.77q/ha.

Benefit Cost ratio

Benefit cost ratio gives information on whether the technology is economically viable in the farmers' fields or not. Hence, cost benefit ratio is an important parameter for recommendation of any treatment for successful control of plant diseases.

In the present study, highest CB ratio (3.81) was obtained in T7 treatment (ST with imidacloprid 60 FS @ 5 ml/kg + FS of difenthiuron 50 WP @ 0.1 % at 20 DAS + yellow sticky trap), followed by T4 treatment (ST with imidacloprid 60 FS @ 5 ml/kg + FS of Triazophos 40 EC @ 0.15% at 20 DAS + yellow sticky trap) which recorded BC ratio of 3.26 and T6 treatment (ST with imidacloprid 60 FS @ 5 ml/kg + FS of acephate 95 SG @ 0.1% at 20 DAS + yellow sticky trap) with BC

ratio of 2.55. However lowest BC ratio of 0.61 was recorded in untreated control.

In the present study, T7 treatment (ST with imidacloprid 60 FS @ 5 ml/kg + FS of diafenthiuron 50 WP @ 0.1 % at 20 DAS + yellow sticky trap) and T4 treatment (ST with imidacloprid 60 FS @ 5 ml/kg + FS of Triazophos 40 EC @ 0.15% at 20 DAS + yellow sticky trap) proved effective in managing the disease and whitefly population with increased yield. In T7 and T4 treatment mungbean seeds were treated with imidacloprid 60 FS @ 5 ml/kg of seeds which managed the early season incidence of whitefly. These findings are in accordance with the findings of Ghosh *et al.*, (2009) who reported that, the application of the insecticide imidachloprid having a great impact in controlling the insect vector whitefly, which resulted in significantly less infestation of YMV in the plants under treatment. Similarly Archana *et al.*, (2018) also reported that 2 sprays of Imidacloprid 17.8 SL (@ 0.5 ml/l, 30 and 45 DAS had significantly effective in the management of whitefly population (1.86/plant).

The systemic effect of imidacloprid on the insect vector at initial stages might be the reason for low disease incidence (Wang, 2009). Our results are agreed with Malathi and John (2008) and Sethuraman *et al.*, (2001) where they have reported that seed treatment and spaying with imidacloprid contributed to relatively low disease incidence of YMV on mungbean. Similarly, Jayappa (2017) observed that seed treatment with imidacloprid @ 5 ml/kg of seeds and two spray of imidacloprid @ 0.5 ml/l recorded significantly lowest mean disease incidence and Archana *et al.*, (2018) also reported that seed treatment with imidachloprid 600 FS @ 5.0 ml/ kg and 2 sprays of imidacloprid 17.8 SL (@ 0.5 ml/l, 30 and 45 DAS had significantly less YMD incidence (13.33%).

Table.1 Integrated management of Yellow Mosaic Disease (YMD) of Mungbean during 2015-16 and 2016-17 (Pooled analysis)

Tr. No	Treatment details	YMD incidence (%)	Per cent reduction over control	No of white flies per plant	Yield (q/ha)	BCR
T ₁	ST with Imidacloprid 60 FS @ 5 ml/kg + yellow sticky trap	52.45 (46.40)*	12.07	10.21 (18.63)**	5.42	1.15
T ₂	ST with Imidacloprid 60 FS @ 5 ml/kg + FS of Azadirachtin 1500 ppm @ 0.2% at 20 DAS + yellow sticky trap	46.08 (42.75)	22.74	8.58 (17.03)	7.05	1.51
T ₃	ST with Imidacloprid 60 FS @ 5 ml/kg + FS of neem oil @ 0.5% at 20 DAS + yellow sticky trap	44.15 (41.64)	25.98	8.16 (16.59)	8.94	1.87
T ₄	ST with Imidacloprid 60 FS @ 5 ml/kg + FS of Triazophos 40 EC @ 0.15% at 20 DAS + yellow sticky trap	26.01 (30.66)	56.39	2.92 (9.81)	15.28	3.26
T ₅	ST with Imidacloprid 60 FS @ 5 ml/kg + FS of Dimethoate 30 EC @ 0.2% at 20 DAS + yellow sticky trap	35.21 (36.39)	40.97	6.07 (14.25)	10.70	2.29
T ₆	ST with Imidacloprid 60 FS @ 5 ml/kg + FS of Acephate 95 SG @ 0.1% at 20 DAS + yellow sticky trap	28.90 (31.44)	51.55	3.81 (10.49)	12.33	2.55
T ₇	ST with Imidacloprid 60 FS @ 5 ml/kg + FS of Diafenthiuron 50 WP @ 0.1 % at 20 DAS + yellow sticky trap	23.93 (30.36)	59.88	1.85 (8.55)	18.23	3.81
T ₈	Control	59.65 (50.56)	00.00	11.88 (20.14)	2.77	0.61
	S. Em.± CD at 5%	0.63 1.92		0.68 2.05	0.89 2.71	

Note: ST- Seed treatment, FS- Foliar spray

*Figures in the parenthesis indicate arc sine transformed values

**Figures in the parenthesis indicate square root transformed values

Further, later season incidence was managed by foliar spray of diafenthiuron 50 WP @ 0.1 % at 20 DAS. These results agreed with Bontha Rajasekar and Mallapur (2017) who reported that, diafenthiuron 50 WP (@ 0.6 g/l) more effective in reducing the sucking pests (aphids, leafhoppers, thrips, whiteflies and mirid bugs) population.

Sreekanth and Reddy (2011) who reported that Diafenthiuron was most effective in reducing whitefly population. Patel *et al.*, (2010) also reported that chemical insecticide of thio-urea class, diafenthiuron was most effective and provide maximum number of reduction in population of whitefly. Management of insect vector in turn reduced the disease incidence.

The next best treatment was T4 treatment (ST with imidacloprid 60 FS @ 5 ml/kg + FS of Triazophos 40 EC @ 0.15% at 20 DAS + yellow sticky trap), where ST with imidacloprid 60 FS @ 5 ml/kg of seeds followed by foliar spray of Triazophos 40 EC @ 0.15% at 20 DAS managed the vector population by reducing the YMD incidence.

These findings are in accordance with the findings of Singh *et al.*, (2018) who reported that, Seed treatment with Imidacloprid 17.8% SL @ 5ml/kg of seeds and two sprays of Triazophos 40% EC @ 1.5 ml/Lt found effective in managing the mungbean Yellow Mosaic Virus disease incidence by managing whitefly population.

T7 treatment (Seed treatment with imidacloprid 60 FS @ 5 ml/kg + foliar spray of diafenthiuron 50 WP @ 0.1 % at 20 DAS + yellow sticky trap) and T4 treatment (Seed treatment with imidacloprid 60 FS @ 5 ml/kg + foliar spray of Triazophos 40 EC @ 0.15% at 20 DAS + yellow sticky trap) can be used for the effective management of YMD incidence and whitefly population.

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