Evaluation of Insecticides for Management of *Bemisia tabaci* and MYMV disease in Mung bean [*Vigna radiata* (L.) Wilczek]

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ABSTRACT

Results revealed that foliar spray of thiomethoxam 25 WS @ 0.005% followed by spirotetramat 150 OD @ 90 g a.i./ha and acetamprid 20% SP @ 0.002% were found to be the most effective treatments and recorded low population of whiteflies (2.66, 3.44 & 4.88/5 plants, respectively) and low mungbean yellow mosaic virus (MYMV) incidence ranging from 10.7% to 14.2%. Seed treatment with thiomethoxam 25 WG @ 0.0035% and imidacloprid 70 WS @ 0.0035% though protected the crop from whiteflies up to 25 days after sowing but later resulted in more vector population (6.00 & 7.33/ 5 plants) and high MYMV incidence (19.8% & 24.3%) than the other treatments.

Key words: *Bemisia tabaci,* MYMV, *Vigna radiata.*

Mung bean [*Vigna radiata* (L.) Wilczek] is one of the important pulse crops grown in India. It is widely grown food legume crop during summer, spring and rainy seasons.

Mung bean is attacked by a variety of sucking and lepidopteran insect pests. Among these pests, whitefly *Bemisia tabaci*, jassids *Empoasca spp* and thrips *Thrips palmi* are of major importance. Whitefly sucks the sap from the leaves and in case of severe damage, it secretes honeydew which causes sooty mould and hampers the photosynthetic activity. It also acts as vector of mung bean yellow mosaic virus (MYMV), a very serious disease of this crop. For control of vector transmitted viral diseases, controlling the insect vectors using chemical insecticides has been the common practice among the farmers. Previously many research workers have evaluated synthetic chemicals against sucking pests of mungbean (Gopal & Srivastava 1997). A drastic reduction in the incidence of MYMV was recorded where whitefly population was reasonably controlled by using chemical insecticides. Thus, this study was undertaken and results are reported herein.

Materials and Methods

The field trial was conducted in a RBD using a susceptible mung bean cv. LGG-450 with ten treatments and three replications during *rabi* season 2009-2010. A plot size of 12m^2 was maintained per treatment.

Seed treatment for T_1 and T_2 were done with thiomethoxam 25 WG @ 0.0035% and imidacloprid 70 WS @ 0.0035%, respectively at recommended concentrations before sowing the seed in the field. Seed treatment was carried out in polythene bag by adding sufficient quantity of gum to the seeds and shaking thoroughly to get an uniform coating of gum over the seed. Later required quantity of seed dressing chemical was added to the gum-coated seeds and shaking was continued till an uniform coating of the insecticide was obtained. The insecticide treated seeds were dried under shade for 2 hrs and later used for sowing in the field and these

two treatments (T_1 & T_2) were raised without spraying of insecticides in the field.

In case of all spray formulations (T_3 to T_9), only one spray was given at 25 DAS. The spraying of insecticides was done by using a hand compression sprayer. Pre-treatment counts of the whitefly were taken one day before spraying and post-treatment counts were recorded at 2, 5 and 7 days after spraying.

For recording pre and post treatment counts of whitefly, observations were taken on 5 plants from each treatment and from each plant 3 leaves representing top, middle and bottom part of the plant were selected and population counts were recorded before spraying the insecticides and at 2, 5 and 7 days after spraying and overall mean was computed. For recoding MYMV incidence, observations were recorded after 15 days of spraying and per cent disease incidence was calculated.

Results and Discussion

Pre treatment counts of whitefly (Table 1) in different treatments showed lowest population in seed treatment plots with thiomethoxam (T_1) (3 whiteflies/5plants) and imidacloprid (T_2) (4.66 whiteflies/5plants) than the untreated seed plots (T_3 to T_9 & control). Significant differences were observed even between T_1 and T_2 where plots sown with thiomethoxam treated seeds recorded significantly lowest population (3 whiteflies/5 plants) than imidacloprid treated plot (4.66 whiteflies/5 plants). Pre treatment counts of whiteflies recorded in untreated seed plots varied from 5.66 to 7.66. Mean population counts of whitefly recorded at 2 days after spray revealed that T_3 plot sprayed with thiomethoxam 70 WS @ 0.005% proved significantly superior in suppressing whitefly population (1.33 whiteflies/5plants) followed by spirotetramat (T_9) @ 90 g a.i/ha and acetamprid (T_7) 20% SP @ 0.002% with 2.33 and 2.66 whiteflies/ 5 plants, respectively which were statistically on par with each other. Seed treatment plot with imidacloprid (T_2) and dimethoate sprayed plot (T_6) recorded significantly high population over T_1, imidacloprid (T_4), acetamprid (T_7), but spinosad (T_8) and spirotetramat (T_9) sprayed treatments recorded significantly less population than control (T_{10}).

Data taken after 5 days of spray showed that T_3 and T_9 recorded significantly low population of 2.0 and 2.66 whiteflies/5 plants, respectively and were on par with each other. The remaining treatments T_4 (4.33), T_7 (4.66), T_5 (5.33) and T_8 (5.33 whiteflies/5plants) were found superior to T_1, T_2 and T_6 (6.00, 7.33 & 6.33 whiteflies/5plants, respectively) which were on par with each other. But all the treatments were significantly superior to control (9.00 whiteflies/5plants, respectively). Observations at 7 days after spray also showed the same trend and the treatments, T_3 and T_9 with 4.66 and 5.33 whiteflies/ 5 plants were proved to be the significantly superior treatments over the rest of the treatments in suppressing whiteflies on mungbean. Overall mean efficacy of seed treatment and insecticidal sprays on whitefly vector, *Bemisia tabaci* on mungbean, distinctly showed that thiomethoxam (T_3) and spirotetramat (T_9) spray were the most effective treatments and recorded less number of whitefly population of 2.66 and 3.44 whiteflies/ 5 plants, respectively.

MYMV incidence (Table 2) recorded after 15 days of spraying with different insecticides was also found to be significantly influenced by different treatments during *rabi* season, 2009-2010. T_3 (10.7%) followed by T_9 (12.9%) and T_7 (14.2%) were significantly superior in reducing the MYMV incidence over control (40.0%). T_6 (17.1%) and T_5 (17.7%) with statistically parity, were next in the line and were superior to T_4 (19.3%) and T_1 (19.8%), which were on par with each other. The remaining treatments, T_8 and T_2 recorded 23.1% and 24.3% MYMV incidence, respectively but all were significantly superior in reducing the MYMV disease incidence over control (40%).

Among the treatments, thiomethoxam (T_3) (1086 kg/ha) followed by spirotetramat (T_9) (1014 kg/ha) and acetamprid (T_7) (987 kg/ha) which recorded less whitefly population and low incidence of MYMV recorded significantly higher yield than the rest of the treatments. T_6 and T_5 with 828 kg/

Table 1. Efficacy of insecticides on incidence of *Bemisia tabaci.*

Treatments	Concentration (%)	Mean number of whiteflies / 5 plants				
		Pre count	2 DAS	5 DAS	7 DAS	Mean
T_1 Seed treatment with Thiomethoxam*	0.0035	3.00 (1.85)	3.66 (2.03)	6.00 (2.54)	8.33 (2.97)	6.00 (2.51)
T_2 Seed treatment with Imidacloprid*	0.0035	4.66 (2.27)	5.33 (2.41)	7.33 (2.79)	9.33 (3.13)	7.33 (2.77)
T_3 Thiomethoxam	0.005	7.00 (2.73)	1.33 (1.34)	2.00 (1.55)	4.66 (2.27)	2.66 (1.72)
T_4 Imidacloprid	0.008	5.66 (2.47)	3.66 (2.03)	4.33 (2.19)	7.00 (2.73)	5.00 (2.31)
T_5 Clothionidin	20-25 g a.i. /ha	6.66 (2.67)	4.66 (2.27)	5.33 (2.41)	8.33 (2.97)	6.10 (2.55)
T_6 Dimethoate	0.06	7.66 (2.85)	5.33 (2.41)	6.33 (2.61)	9.33 (3.13)	7.00 (2.71)
T_7 Acetamprid	0.002	6.66 (2.67)	2.66 (1.77)	4.66 (2.27)	7.33 (2.80)	4.88 (2.28)
T_8 Spinosad	0.009	6.00 (2.54)	4.00 (2.11)	5.33 (2.41)	7.66 (2.85)	5.66 (2.45)
T_9 Spirotetramat	90 g a.i. /ha	6.33 (2.61)	2.33 (1.67)	2.66 (1.76)	5.33 (2.41)	3.44 (1.94)
T_{10} Control*		7.33 (2.79)	7.66 (2.85)	9.00 (3.07)	12.00 (3.53)	9.55 (3.15)
C.D. (P=0.05)		0.32	0.26	0.32	0.21	0.26

Figures in parentheses are square root transformed values; Spraying was done at 25 days after sowing
DAS – Days after spraying; * Spraying was not done in the treatments (T_1, T_2 and T_{10})

ha and 790 kg/ha were the next best treatments but all were significantly superior to T_{10} (control), which recorded 482 kg/ha. Gopal *et al.* (1997) tested the efficacy and persistence of imidacloprid for the control of *Bemisia tabaci* and yellow mosaic virus in two pulse crops *viz.*, mung bean and soybean. Seed treatment with imidacloprid 70WS@0.2% reduced the population of whitefly in mungbean and soybean. Higher grain yield was recorded in plots sown with imidacloprid treated seeds and sprayed with monochrotophos 36 SL @ 0.06%. Patel *et al.* (2010) tested acetamprid (Pride 20 SP) @ 100, 150 and 200 g a.i/ha, and compared their efficacy with the recommended dosages of oxydemeton methyl 25 EC (750 ml/ha), triazophos 40 EC (1500 ml/ ha) and ethion 50 EC (2000 ml/ha) for the control of whitefly, *B. tabaci* on cotton. Acetamprid 20 SP @ 150 and 200 g/ha, being on par with each other, proved significantly better than other treatments for the control of whitefly up to 7 days after spray. The present study conducted on efficacy of different insecticides on whitefly vector indicated the superior performance of thiomethoxam and spirotetramat in effectively controlling the vector even after 7 days after spraying followed by acetamprid and imidacloropid treatments. The seed treatment plots with imidacloropid (T_1) and thiomethoxam (T_2) though protected the crop to certain extent up to 25 days after sowing, later increase in the population of whitefly was noticed in those plots. Singh *et al.*

Table 2. Efficacy of insecticides on incidence of *MYMV* and yield of mung bean.

Treatments (%)	MYMV incidence (%) at 40 DAS	Yield (kg/ha)
*Seed tr. with Thiomethoxam (0.0035)	19.8 (26.43)	771
*Seed tr. with Imidacloprid (0.0035)	24.33 (29.55)	632
Thiomethoxam (0.005)	10.72 (19.11)	1086
Imidacloprid (0.008)	19.36 (26.10)	673
Clothionidin (20-25 g a.i. /ha)	17.75 (24.90)	790
Dimethoate (0.06)	17.12 (24.43)	828
Acetapmrid (0.002)	14.29 (22.21)	987
Spinosad (0.009)	23.19 (28.76)	659
Spirotetramat (90 g a.i. /ha)	12.91 (21.05)	1014
*Control	40.00 (39.23)	482
C.D. (P=0.05)	1.49	11.58

Figures in parentheses are angular transformed values. DAS: Days after sowing

(2000) evaluated varieties of mung bean and no one was found resistant.

MYMV incidence recorded at 40 DAS and yield obtained in different treatment plots indicated the prevalence of low MYMV incidence and higher yields in thiomethoxam 25 WG @ 0.0035% treatment followed by spirotetramat 150 OD 90g a.i./ha and acetamprid 20% SP @ 0.002% treatments. Seed treatment plots (T_1 and T_2) could not protect the crop from MYMV incidence and recorded low yields next to control (T_{10}). Gopal and Srivastava (1997), Vendan *et al.* (2008) evaluated imidacloprid 70 WS and thiomethoxam 70 WS @ 0.2% as seed treatments alone and in combination with imidacloprid 200 SL, and thiomethoxam 25 WG and found that combination effect was more effective rather than individual treatments. Mathirajan and Regupathy (2002) recorded minimum whitefly population and low incidence of MYMV in thiomethoxam 25 WG sprayed @ 0.2 g/lit after 15 days of sowing and they also reported the maximum grain yield of 860 kg/ha in thiomethoxam plot followed by acetamprid (665 kg/ha). Sinha and Sharma (2010) found that spirotetramat 150 OD @ 25 g a.i./ha reduced the whitefly population up to 87% in brijal. Kanna *et al.* (2007) opined that two sprays of acetamprid 20 SP @ 40 g a.i./ha was effective in reducing YMV incidence and whitefly population in okra and enhanced yield.

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