International Journal of Agriculture, Environment and Biotechnology
Citation: IJAEB: 9(3): 457-461, June 2016
DOI Number: 10.5958/2230-732X.2016.00059.0

ENTOMOLOGY

Comparative study on ecofriendly management of chilli thrips, *Scirtothrips dorsalis* hood in mungbean by using different bio- and chemicals pesticides

Vijay Kumar Mishra*, Sandeep Kumar Sathua, Sanjeet Singh and Deepika chauhan

Department of Entomology and Agricultural Zoology, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi-221005, India
Depatrment of Entomology, College of Agriculture, G.B. Pant University of Agriculture and Technology, Pantnagar-263145 (Uttarakhand), India

*Corresponding authors: premvijaybhu@gmail.com

Paper No. 462 Received: 19 Dec 2015 Accepted: 18 June 2016

Abstract

Effect of certain ecofriendly insecticides against thrips (*Scirtothrips dorsalis* Hood) was studied at Varansi, Uttar Pradesh on mungbean. Ten different treatments (including control) of microbial and chemical insecticides were taken in different combinations and used at different crop stages. Among various insecticidal treatments, the combination of seed treatment with *Pseudomonas fluorescens* and spraying of *Beuvaria bassiana* gave better responses and was found most effective against thrips (*Scirtothrips dorsalis*) followed by seed treatment of *P. florescens* was found effective to minimise the infestation of thrips (*Scirtothrips dorsalis* Hood).

Highlight

- The bio-pesticides like *Pseudomonas fluorescens* and *Beuvaria bassiana* have rarely been tested for control of *Scirtothrips dorsalis* Hood.

Keywords: Ecofriendly management, thrips, microbial insecticides, mungbean

Pulses being a rich source of protein constitute an integral part of the vegetarian diet of the Indian people to overcome to malnutrition problems. Pulses are the cheap and best source of protein. It contains about 25 % protein, which is almost three times that of cereals. Mungbean, *Vigna radiata* (L.) commonly known as greengram, is an important pulse crop of many Asian countries including Pakistan. It is a rich source of vegetable protein. In India, the area under mungbean is 3.34 million ha with the production of 1.06 million tonnes having an average yield of 317 Kg/ha (Anonymous 2008) .They are important for sustainable agriculture as they improve physical, chemical and biological properties of soil and function as mini nitrogen factory. They maintain soil fertility through biological nitrogen fixation by bacteria, *Rhizobium* spp. prevalent in their root nodules. Among the pulses, green gram (*Vigna radiata*) is one of the important pulse crop of Indian cropping system also. Pulses are very prone to insect pests. Among these sucking insect pests whitefly, jassids, and thrips are of the major importance (Khattak *et al*. 2004). In flowers, both larvae and adults of thrips nourish on pollen and scratch other flower parts and suck the plant sap oozing out from the injured plant parts. As a result of this type of damage, flowers drop off and none pods formation. Sometimes these pests cause total yield loss. Mungbean Yellow Mosaic Begomovirus (MYMV) is very important and serious disease which is transmitted by the white fly (Honda and Ikegami 1986, Sachan *et al*. 1994). Pigeonpea alone harbour 31 different types of insect pests (Yadav, *et al*. 2009), of which sucking pest contribute heavy losses in yield. The most serious pest problem is of white fly and thrips in mungbean. Thrips infested inflorescence becomes abnormal showing symptoms of flower drop. Even if any such flower opens and pod is formed, it is abnormal and the grains in mature pods get shrivelled and small in size. Losses caused by different insect pests in mung bean at pre-flowering and post-flowering stage are about 42% and 58%, respectively (Malik 1992). Considering above problems the research work has started on eco-friendly management of thrips by using bio and chemical pesticide.

Materials and Methods

Details of experiment

The present study was coducted during *Kharif* season of 2009 and 2010 at the Agricultural Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, India. The research farm is situated approximately in the center of North Gangetic alluvial plains on the near river Ganga. It is located on 25°20¢ N latitude and 83°0¢ E longitude and at an altitude of 75.70 meters above the mean sea level. Its climate is sub-tropical, getting a mean precipitation ranging approximately from 75 cm to 100 cm, which is mostly confined to *Kharif* season. Scanty showers are also received during *Rabi* season. Extreme climate is experienced in Varanasi with mercury reaching as high as 48°C during hot summer and as low as 3°C during peak winter.

The mungbean (*Vigna radiata*) variety HUM-12 which is commonly cultivated in this area was grown in plots having 10 rows, in plot size 4 x 3 square meter each. The plant spacing between rows and plants to plant were maintained 30 cm and 10 cm, respectively. The crop was grown as per the normal agronomical practices during the *Kharif* season of 2009-2010 following Factorial Randomized Block Design. There were total 10 treatments (Table 1) including control and these treatments were replicated 3 times each. The crop was sown on 17th July 2009 and harvested on 25th September 2009.

Table 1: Details of eco-friendly insecticides applied in the trial

Treatment No.	Name of the treatments	Rate of application
T_1	Beauveria bassiana (ST)	10 g/kg
T_2	Pseudomonas fluorescens (ST)	10 g/kg
T_3	B. bassiana + P. fluorescens (ST)	5 g + 5 g/kg
T_4	Imidacloprid (ST)	5 g/kg
T_5	B. bassiana (ST) & B. bassiana (Sp.)	10 g/kg. + 1200 g/ha
T_6	P. fluorescens (ST) & B. bassiana (Sp.)	10 g/kg + 1200 g/ha
T_7	B. bassiana (ST) & Profenophos (Sp.)	10 g/kg + 1200 g/ha
T_8	P. fluorescens (ST) & Profenophos (Sp.)	10 g/kg + 1200 g/ha
T_9	Imidacloprid (ST) & Profenophos (Sp.)	5 g/kg + 1200 g/ha
T_{10}	Control	Water spray

Legend: ST - Seed treatment, Sp – Spraying

Methodology for application of treatments

The seed treatment was done by mixing the required quantity of the insecticides formulation in desired quantity of seed along with gum manually. The treated seeds were dried in shade. The spray mixture of each treatment was prepared by mixing the required quantity of the insecticides formulation (mentioned in Table 1) in water to make it equivalent to 600 liters/ha. The spray mixtures were freshly prepared for each treatment. The spraying was done by foot sprayer fitted with hollow cone type nozzle. The sprayer was duly calibrated with water for the application rate of 600 liters spray mixture/ha. The applications of the treatment started with the start of flowering stage of the crop (40 DAS) and were applied twice at the interval of 15 days during the experimentation. In control, the water was sprayed. Insecticides were applied during early hours of the day when wind velocity was suitable for spraying. Due care was also taken to spray each plot uniformly and the sprayer was thoroughly washed after spraying of each insecticides.

Methodology for sampling, observation and data analysis

The observations were recorded using rectangular split cage which were arranged in the treatments randomly. The mungbean plants were maintained inside cages consisting of a PVC frame covered with wire mesh of 0.36 mm hole size and fitted with a sleeve for access. From each plot five observations were taken at five random spot. After spraying of bio-pesticides the cages were slightly irrigated to maintain the humidity(more than 90%) inside the cage for better microbial growth and to prevent the leaf dryness. Insect population was counted one day before the insecticidal application and three and seven days after spraying for determining the effect of eco-friendly insecticides on % reduction in population of thrips. The data collected from the two sprays were averaged and presented in population per cage basis. The data was statistically analysed and the critical difference was obtained was at 5% level of significance.

Results and Discussion

Population study after first spraying

The population of thrips was almost homogenously distributed throughout the experimental field. The application of eco-friendly insecticides in experimental plot revealed variation in % reduction of thrips population. The data showed that seed treatment and its combination with foliar spray were found effective to reduce the thrips population. A perusal of data presented in table 1 indicated the impact of various treatments on the per cet reduction of thrips population. It was observed that all the treatments showed reduction in thrips population. After 3 days of first application significantly highest reduction in thrips population was recorded in seed treatment *B. bassiana* + *P. fluorescens* (T3) wit T7h 70.7 % followed by treatment T1, T7, T4, T8, T5 and T2 with 70.6, 55.1, 54.2, 50.0, 47.8 and 36.8 % whereas treatment T6 and T9 had showed lower % reduction with 26.1 and 29.9 %. After 7 days, it was observed that seed treatment with *Beauveria bassiana* (T1) recorded significantly highest % reduction of 62.35 in the thrips population followed by treatment T9, T6, T4, T2, T7, T5 and T8 with 67.86, 57.05, 47.29, 46.62, 46.01, 45.67 and 40.35 whereas lowest % reduction in thrips population was recorded in treatment T3 with 28.22 %. Among combination of seed treatment and foliar application, *B.bassiana* + Profenophos (T7) was most effective in reducing thrips population (55.17%) at three days after spray, while seed treatment and spraying with imidacloprid + Profenophos (T9) reduced maximum % of thrips population (67.86%) at 7days after spray. On the basis of average % reduction of thrips population in treatments given at forty days after sowing revealed that the maximum reduction of thrips population (71.35%) was observed in seed treatment with *B. bassiana* (T1) followed by in seed treatment of imidacloprid (T4) with 50.79 % while minimum % reduction was observed in treatment seed treatment with *P. fluorescens* (T2)

Sreekanth *et al*. (2003) also reported the imidacloprid schedule tested significantly reduced the *Thrips palmi* population in the urd bean crop field. Nayak *et al.* (2004) also evaluated the efficacy of different combinations of insecticides amongst the imidacloprid as seed treatment against thrips was most effective

Population study after second spraying

In second application schedule *i.e.* treatments were given at fifty five days after sowing observed that among seed treatments, imidacloprid (T4) were found most superior by reducing 39.76% population of thrips at three days after spraying followed by treatment T5, T6, T8, T7, T2, T1 and T3 with 28.72, 23.67, 23.50, 20.78, 20.75, 17.94 and 16.17 whereas lowest % reduction was recorded in T9 with 14.45 %.

After 7 days, significantly highest % reduction in thrips population was observed in treatment T7 with 32.92 % however T5, T9, T1, T4, T6, T2 and T8 recorded 28.53, 26.11, 26.10, 24.15, 24.01, 23.39 and 22.17 % reduction respectively. The lowest % reduction was recorded in T3 with 12.86 %. Our results are similar to finding of Cermeli *et al.* (2002), which result showed that the application of imidacloprid reduced the thrips (*Scirtothrips dorsalis* Hood) population. Afzal *et al.* (2002) also observed that the spray of imidacloprid was found to be most effective for control of thrips population.In combinations of seed treatment and foliar spray, *B. bassiana* (ST) + *B. bassiana* (Sp) (T5) was observed most effective in reducing population of thrips (28.72%) at 3 days after spray. whereas *B. bassiana* (ST) + Profenophos (Sp) (T7) reduced 32.92 %

Table 2: Study of the effect of application schedule of ecofriendly insecticide against thrips infesting mungbean during *Kharif*, 2009

Treatments	Population/cage						
	After 1st spray			After 2nd spray			Total
	3 DAS	7 DAS	Average	3 DAS	7 DAS	Average	Average
Beauveria bassiana (ST)	70.6 (8.47)	72.01 (8.54)	71.35 (8.51)	17.94 (4.35)	26.10 (5.21)	22.02 (4.80)	46.69 (6.91)
Pseudomonas fluorescens (ST)	36.8 (6.15)	46.62 (6.90)	41.74 (6.54)	20.75 (4.66)	23.39 (4.94)	22.07 (4.80)	31.91 (5.74)
B. bassiana+P. fluorescens (ST)	70.7 (8.47)	28.22 (5.41)	49.48 (7.11)	16.17 (4.14)	12.86 (3.72)	14.52 (3.94)	31.99 (5.74)
Imidacloprid (ST)	54.2 (7.44)	47.29 (6.95)	50.79 (7.20)	39.76 (6.38)	24.15 (5.02)	31.96 (5.74)	41.37 (6.51)
B .bassiana (ST) & *B .bassiana* (Sp.)	47.8 (6.99)	45.67 (6.83)	46.75 (6.91)	28.72 (5.45)	28.53 (5.43)	28.63 (5.44)	37.68 (6.22)
P. fluorescens (ST) & *B .bassiana* (Sp.)	26.1 (5.21)	57.05 (7.62)	41.60 (6.53)	23.67 (4.97)	24.01 (5.00)	23.84 (4.98)	32.73 (5.81)
B .bassiana (ST) & Profenophos (Sp.)	55.1 (7.49)	46.01 (6.86)	50.59 (7.18)	20.78 (4.67)	32.92 (5.82)	26.85 (5.28)	38.72 (6.30)
P. fluorescens (ST) & Profenophos (Sp.)	50.0 (7.15)	40.35 (6.43)	45.21 (6.80)	23.50 (4.95)	22.17 (4.81)	22.83 (4.88)	34.02 (5.92)
Imidacloprid (ST) & Profenophos (Sp.)	29.9 (5.56)	67.86 (8.30)	48.89 (7.06)	14.45 (3.93)	26.11 (5.21)	20.28 (4.61)	34.58 (5.97)
C.D	**2.44**	**2.64**	**4.17**	**3.13**	**2.44**	**2.84**	

Legend: ST - Seed treatment, Sp – Spraying, DAS= Days after spraying, figures in parentheses are transformed as √x+1

Thrips attack on mungbean plant causing damage to the vegetative part

Plants with seed treatment with B. bassiana

Photograph1: Affected plant of mungbean and treated plant showing good growth

population of thrips at 7days after spray. On basis of average % reduction of thrips population in treatments given at 55 days after sowing, it reduced 31.96 % population of thrips reduced in treatment combination of seed treatment with imidacloprid (T4) and foliar spray with followed by *B. bassiana* (ST) + *B. bassiana* (Sp) which reduced about 28.63 % population of thrips. All the microbial and chemical insecticidas seperately and in combination were effective. Ganapathy and Karuppiah (2004) reported the efficacy of imidacloprid used as seed treatment. Shah *et al.* (2007).

Overall, 1st spray and 2nd spray data of both the application schedule *i.e.* spraying at forty and fifty five days after sowing revealed that maximum % reduction in population of thrips was observed in seed treatment with *B. bassiana* (ST) 46.69 % followed by seed treatment of imidacloprid (ST) which reduced 41.38 % population of thrips (Photograph 1).

Conclusion

Overall performance of all the microbial and chemical insecticidal treatments showed that all the insecticides (except seed treatment with *P. fluorescens* and seed treatment with *B. bassiana* + *P. fluorescens*) were effective in controlling the thrips population after three and seven days after spraying which gave higher crop yield in comparison to control plot. Seed treatment with *B. bassiana* most effective in controlling the thrips. Also the performance of treatment combination of showed next in order to effectiveness, although population of thrips was comparatively higher in plot treated with imidacloprid alone but when these insecticides are used in combination with profenophos, these showed better effect in reducing the thrips population.

References

Afzal, M., Ahmad, T. and Bashir, M.H. 2002. Relative toxicity of different insecticides against whitefly, (*Bemisia tabaci* Genn.) and black thrips, *Caliothrips indicus* on NM-92 mung bean, (*Vigna radiata* L.). *Pakistan Journal of Agricultural Sciences* **39**(3): 224-225.

Anonymous, 2008. Project Coordinator Report. Directorate of Economics and Statistics, New Delhi, India.

Ganapathy, T. and Karuppiah, R. 2004. Evaluation of new insecticeds for the management of white fly (Bemisia tabaci Genn.), mungbean yellow mosaic virus (MYMV) and urdbean leaf crinkle virus (ULCV) diseases in mungbean (*Vigna radiata* (L.) Wilczek). *Indian Journal of Plant* Protection **32**: 35- 38.

Honda, Y. and Ikegami, M. 1986. Mungbean Yellow Mosaic Virus.CMI/AAB *Description of Plant Viruses* No. 323.

Khuroo, M.S., Khare, C.P., Tiwari, P.K. and Shrivastava, S.K. 2003. Possibilities of imidacloprid incorporation for the management of white fly *Bemisia tabaci* Gann. on chilli. *Environment and Ecology* **21**(1): 214-217.

Khattak, M.K., Ali, S., Chishti, J.I., Saljiki, A.M. and Hussain, A.S. 2004. Efficacy of certain Insecticides against some sucking insect pest of Mungbean (Vigna radiate L.). *Pakistan Entomologist* **26**(1):75-80.

Malik, M.R. 1992. Economics of insecticides used in mungbean. *Pakistan Journal of Agricultural Research* **13**(3): 267-272.

Nayak S.K., Ujagir, R and Chhibber, R.C. 2004. Control of thrips andwhite fly infesting blackgram (*Vigna mungo* L.) by newer groups of insecticides*. Environment and Ecology* **22**(3): 538-542.

Ramesh, R. and Ukey, S.P. 2006. Bio-efficacy of eco-friendly insecticides against tomato jassids and whitefly. *Journal of Plant Protection and Environment* **3**(1): 122-126.

Rao, N.M. and Rao, P.S. 2007. Evaluation of certain seed dressers and foliar sprays against thrips of mungbean (*Vigna radiata* L. Wilczek). *Journal of Plant Protection and Environment* **4**(1): 37-41.

Shah, M.J., Amir Ahmad, A., Hussain, M., Yousaf, M.M. and Ahmed, B. 2007. Effeciency of different insecticides against sucking insect pest complex and effect on growth and yield of Mungbean (*Vigna radiata* (L). *Pakistan Entomologist* **29**(2): 181-184.

Srivastava, K.M. and Singh, L.N. 1976. A preview of pest complex of Kharif pulses in Uttar Pradesh. PANS **22** (3): 333-335.

Yadav *et al.* 2009. Diversity of insect pests in Pigeonpea, *Cajanus cajan* (L) Millsp. In Eastern Uttar Pradesh. *Journal of Applied Zoological Researches* **20**(1): 127-131.

Yadav, P. 2006. Forecast models against thrips (*Caliothrips indicus*), jassid (*Empoasca kerri*) and whitefly (*Bemisia tabaci*) attacking mung bean crops Experiments were conducted during summer and rainy seasons of 2003 and 2004 in Kanpur and Etawah, Uttar Pradesh, India.