DOI:10.33451/florafauna.v24i1pp63-66
FLORA AND FAUNA
ISSN 2456 - 9364 (Online)
2018 Vol. 24 No. 1 PP 63-66
ISSN 0971 - 6920 (Print)

DEVELOPMENT OF AN INTEGRATED MANAGEMENT APPROACHES FOR MUNGBEAN YELLOW MOSAIC VIRUS OF GREEN GRAM [*VIGNA RADIATA* (L.) WILCZEK] IN BUNDELKHAND ZONE

ANIL KUMAR SINGH[1], J.K.BABELE * AND R.K.S.TOMAR[1]

[1]Krishi Vigyan Kendra Datia,
R.V.S.K.V.V. GWALIOR (M.P.)
*Department of Plant Pathology,
Institute of Agriculture Sciences,
Bundelkhand University, JHANSI (U.P.)
* Corresponding Author
Email : jkbabele@yahoo.com

Received : 18.02.2018; ***Accepted*** : 15.04.2018

ABSTRACT

Mungbean yellow mosaic virus (MYMV) disease is one of the most vicious diseases of green gram and has been renowned in India for more than five decades. The economic losses due to this virus account up to 85% in green gram which is spreading faster towards newer areas. A field experiment was carried out by Krishi Vigyan Kendra during *kharif* seasons at the farmers' fields in villages Sitapur, Datia district of BundelKhand zone to evaluate the five integrated pest management module including conventional farmers' practices against green gram sucking pest (white fly) and YMV. Among the test modules, Module 3 (Resistant variety TJM 3+ Seed treatment with Imidacloprid 17.8 % SL @ 5 ml/kg seeds +2 sprays of Imidacloprid 17.8 % SL @ 0.5 ml/l water) found as the most effective treatments with more than 91.58 percent mean reduction in nymphal population of whiteflies and below 2 percent incidence of YMV followed by Module 2 (Module 1 +2 sprays of Neem oil (5% Azadirachtin) @ 3.0 ml/l), Module 4 (Module 1 + 2 sprays of Triazophos 40 % EC @ 1.5 ml/l), Module 1(Resistant variety TJM 3+ Seed treatment with Imidacloprid 17.8 % SL @ 5 ml/kg seeds). All the IPM modules were found significantly superior over the conventional farmers' practices in reducing the incidence of YMV in black gram. Higher mean yield of 9.35 q/ha in Module 3 followed by Module 2, Module 4, and Module 1 were recorded in the IPM fields against 6.75 q/ha in farmers' practise fields. Module 3 obtained maximum return with higher benefit cost ratio followed by Module 2, Module 4, and Module 1.

Figure : 00 References : 14 Tables : 02
KEY WORDS : Disease incidence, MYMV, Resistant variety, White fly,

Introduction

Vigna radiata Wilczek, commonly known as green gram or mungbean (originated in India or the Indo-Burmese region), is a vital crop grown throughout Asia. India is the world's largest mungbean producer accounting for about 65% of world's acreage and 54% of its global production [11]. The standard worldwide yield of green bean is very low (384 kg/ha) and besides many efforts its production has not considerably increased. The major reason for the low yield is the sensitivity of the crop to insects; weeds and diseases caused by fungi, virus and bacteria [6]. Among the three, yellow mosaic disease of green gram is the most serious disease and the main constraint in increasing the production of this crop. The disease was reported from India in 1955 on green gram [7]. It has potential to inflict 100% damage to this crop [8]. It is incited by mungbean yellow mosaic virus (MYMV), which is a whitefly transmitted geminivirus. The initial symptoms of the yellow mosaic disease in green gram appear in the forms of irregular yellow patches of various sizes, which coalesce to form larger patches of bright yellow colour. This is accompanied with general stunting of plants [10]. In severe cases almost entire leaves may turn yellow, plants bear few flowers and pods are smaller with immature seeds. Extensive records from the past showed that the disease occurs with different intensities in all of the green gram producing areas in India. The magnitude of loss depends on the stage of the crop when infected; the severity of disease on individual plant and number of plants infected [4].

Though, many options are available for the management of whitefly population and consequent reduction in YMV disease incidence. Farmers are mostly using numbers of synthetic chemicals because of their quick knock-down effect with or without knowing the ill effects of these chemicals. To minimize the use of hazardous chemicals, IPM strategies are suggested to avoid toxicity to human health, environment and beneficial insects. The objective of present study was to evaluate and demonstrate the performance of integrated pest management modules against sucking pests of green gram as well as yellow mosaic disease under field condition.

Materials and Methods

Field experiments were carried out during the *Kharif* season of 2012 and 2013 by Krishi Vigyan Kendra, Datia, Madhya Pradesh at village Sitapur in Datia block to evaluate the four integrated pest management module with conventional farmers' practice against Green gram sucking pest (whitefly) and MYMV under farm testing activity of the KVK at farmers' field. All the recommended cultural and agronomical practices were followed to raise a healthy crop. Following treatment modules were conducted and compared:

Module 1: Resistant variety TJM 3+ Seed treatment with Imidacloprid 17.8 % SL @ 5 ml/kg seeds

Module 2: Module 1 + 2 sprays of Neem oil (5% Azadirachtin) @ 3.0 ml/l water

Module 3: Module 1 + 2 sprays of Imidacloprid 17.8 % SL @ 0.5 ml/l water

Module 4: Module 1 + 2 sprays of Triazophos 40 % EC @ 1.5 ml/l water

Module 5: Conventional farmers' practices (unidentified variety + Non judicious use of insecticide)

The first insecticide sprays was conducted at starting with the initiation of insect pests by using knapsack sprayer at 500 l of spray fluid/ ha and second spray was conducted after 15 days of first spray. For white flies, three trifoliate leaves each from top, middle and bottom canopies were taken into a polythene cover

TABLE-1: Incidence of whitefly and MYMV in different management module of green gram (Pooled data of Kharif 2012 and 2013)

Treatments	Nymphal-population of whiteflies (per leaf/plant)	Mean reduction in nymphal-population of Whiteflies (%)	YMV incidence (%)	Percent redu-ction	Yield (q/ha.)	Yield increase over control (%)
Module 1: Resistant variety TJM 3+ Seed treatment with Imidacloprid 17.8 % SL @ 5 ml/kg seeds	**1.45**	71.11	**6.63 (14.92)**	75.09	**8.30**	22.96
Module 2: Module 1 + 2 sprays of Neem oil (5% Azadirachtin) @ 3.0 ml/l water	**0.85**	83.10	**3.50 (10.78)**	86.86	**8.72**	29.14
Module 3: Module 1 + 2 sprays of Imidacloprid 17.8 % SL @ 0.5 ml/l water	**0.42**	91.58	**1.27 (6.47)**	95.24	**9.35**	38.52
Module 4: Module 1 + 2 sprays of Triazophos 40 % EC @ 1.5 ml/l water	**1.28**	74.49	**3.63 (10.98)**	86.36	**8.42**	24.69
Module 5 Conventional farmers' practices (unidentified variety+ Non judicious use of insecticide)	**5.03**	00	**26.63 (31.07)**	00	**6.75**	0.00
SE (±)	0.060		0.322		0.073	
CD at 5%	0.198		1.050		0.240	

* figures in ( ) are arc sine transformed values

from ten plants in each treatment. The samples were taken to the laboratory and the live nymphal population count was taken using stereo zoom microscope. Data on pest population was recorded at 3 and 5 days after spraying. The observations were recorded from ten randomly selected plants in each plot leaving the border rows. Per cent disease incidence of YMV was recorded from the whole field at 60 days after sowing from all the treatments. The per cent YMV incidence was recorded by counting the number of plants infected with YMV and the total number of plants in the plot and converted to per cent incidence.

Experiments conducted with three replications, data was analyzed by using Two-way ANOVA with CD at 5%. Experimental Design used was Randomized complete block design.

Results and Discussion

On farm evaluation of green gram IPM modules to reducing the white fly population and incidence of yellow mosaic virus were carried out at the farmer's field. The results showed that all IPM modules tested were found significantly superior over the untreated (control) in terms of protection and production The mean data pertaining to the efficacy of different treatments in reducing the whitefly population showed that, module 3 was the most effective treatment among all the test modules which recorded lowest white flies population (0.42 per leaf /plant) and around 91 percent reduction in nymphal population of whiteflies over untreated control. The next best treatment in reducing the whitefly nymphal population was module 2 with around 83 percent mean reduction over farmers' practices and recorded 0.85 per leaf/plant nymphal population followed by module 4, around 74 percent and module 1 showed 71.11 percent reduction in whiteflies population. Workers[2,14] showed that Imidacloprid reduced the whitefly populations to significant levels. Others[5] also found that Imidacloprid was most effective and resulted in a minimum population of whitefly.

The observations of five treatments revealed that Resistant variety PDM-139 + seed treatment with Imidacloprid @ 5 ml/kg seeds and two sprays of Imidacloprid @ 0.5 ml/l recorded significantly lowest mean disease incidence (1.27) followed by Module 2, Module 4 and Module 1 with mean incidence of 3.50, 3.63 and 6.63 per cent in order of their effectiveness respectively. However, disease incidence was found in module 2 is statistically on par with module 4.Whereas, the mean disease incidence in conventional farmers' practices field was 26.63 percent which is represented in Table.1. Similarly, Module 3 recorded highest percent disease reduction over control (95.24) followed by Module 2(86.86%), Module 4 (86.36%) and Module 1 which is 75.09 percent. The results obtained in the present study were in accordance with earlier work[11], that the incidence of YMV was low in insecticide treated plots compared to the untreated plots. Other workers[1,9] also reported that Imidacloprid was significantly superior in efficacy against sucking insect pests.

Among seven treatments, the mean seed yield varied from 6.75 to 9.35 q/ha. Module 3 recorded highest yield of 9.35 q/ha, and significantly superior over the rest of the treatments. Module 2, Module 4 and Module 1 were recorded next best at yield 8.72, 8.42 and 8.30 q/ha respectively. However yield q/ha was found in module 1 is statistically on par with module 4. Between treatments, highest per cent grain yield increase over control was recorded in Module 3 (38.52) whereas least was recorded in Module 1 which is 22.96 per cent. The seed yield was low from the experimental field with high incidence of YMV which was in accordance with earlier

TABLE - 2 : Detail of Economics of treatments

(Pooled data of Kharif 2012 and 2013)

Treatment	Cost of cultivation	Gross return	Net Return (Rs)	Net Return increase over control (%)	Benefit Cost ratio
Module 1	15140	36520	21380	40.66	2.41
Module 2	16100	38353.3	22253	46.50	2.38
Module 3	16100	41140	25040	64.74	2.56
Module 4	15960	37033.3	21073	38.74	2.32
Module 5	14500	29700	15200	0.00	2.05

reports. Scientists[13] reported that yield attributes in green gram decreased with increased level of YMV incidence. A strong negative correlation was observed between the severity of YMV and total seed yield[3].

Module 3 (Resistant variety TJM 3+ Seed treatment with Imidacloprid 17.8 % SL + Two spray with Imidacloprid @ 0.5 ml/l) provided the highest gross returns (Rs. 41140/ha) followed by module 2, module 4 and module 1. The lowest gross returns (Rs. 29700/ha) was computed from conventional farmers' practices. The highest benefit cost ratio (2.56) with highest net return (Rs.25040) was also obtained from module 3 followed by module 2, module 4, and module 1 (Table-2).

Conclusion

From the present study, it was clearly evident that the management of YMV should be done through integrated approach, rather than relying upon chemical insecticides alone.

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