International Journal of Agriculture, Environment and Biotechnology
Citation: IJAEB: 8(1): 215-218 March 2015
DOI Number: 10.5958/2230-732X.2015.00027.3

ENTOMOLOGY

Comparative evaluation of IPM module and farmer's practices in Mungbean, Vigna Radiata (L.) Wilczek against major insect pests

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Paper No. 311 Received: 15 January 2015 Accepted: 3 March 2015 Published: 25 March 2015

Abstract

Results indicated that IPM module proved comparatively economical against major insect pests of mungbean over farmer's practices. The results revealed that, IPM module i.e., Mungbean with seed treatment of Imidacloprid 600 FS (5ml kg-1) followed by one spray of NSKE (5%) at 30 days after sowing (DAS) and chemical insecticide Triazophos 40 EC 0.04 per cent of the crop, were effective in reducing the incidence of White fly, MYMV, Jassids and Thrips and gave higher grain yield than farmer's practices. Present study indicates that IPM is definitely better over non-IPM practices under different pest population numbers. IPM implies the rational integration of various methods of insect pests control to suppress the pest population below ETL. Therefore, farmers should be made aware of its benefits and motivated to critically analyze and make decisions regarding pest management practices.

Highlights

- IPM involving intercropping with sorghum, seed treatment with Imidacloprid 5ml $kg^{-1}$and one spray with 5 per cent NSKE and chemical insecticide Triazophos 40 EC 0.04 per cent emerged as an alternative to farmer's practice in controlling major pests in Mungbean.
- The maximum yield was recorded in IPM module (8.70 q ha^{-1} and 5.86 q ha^{-1} in 2012 and 2013, respectively) as compared to Farmer's Practices (6.60 q ha^{-1} and 4.30 q ha^{-1} in 2012 and 2013, respectively).

Keywords: Integrated Pest Management, Farmer's Practices, Mungbean Yellow Mosaic Virus, Economic Threshold Level.

In India pulses are one of the most important sources of protein among the vegetarians. Pulses contain 22-24 per cent protein, which is almost twice protein in wheat and thrice that of rice. Pulses are very important for nutritional and health benefits. They are also known to reduce several non communicable diseases like colon cancer and cardio vascular diseases (Yude *et al.*1993, Jukanti *et al.*, 2012).

Mungbean, Vigna radiata (L.) Wilczek is one of the most important pulse crops in India. Besides India, it is widely cultivated throughout Southern Asia like Pakistan, Sri Lanka, Bangladesh, Thailand, Laos, Vietnam, Indonesia, China and Taiwan. In India, it is extensively grown in Uttar Pradesh, Madhya Pradesh, Rajasthan, Maharashtra, Orissa, Karnataka, Andhra Pradesh, Gujarat, Bihar, Haryana and

Delhi during Kharif and Zaid season. This crop suffers from a large number of biotic and abiotic stresses. Among biotic stresses, insect pests are most important yield reducing factor. The average losses due to insect pests in mungbean and urdbean crops were estimated to be 34.7 and 28.7 per cent respectively in different states of India (Asthana *et al.*, 1997). Lal and Ahmad (2002) reported nearly 60 insect species on mungbean and urdbean. Among these, 34 insects were serious pests on one or more of these pulse crops. Mungbean is attacked by different species of insect pests. Sucking insect pests (whitefly, jassids, and thrips) are of the major importance. These insect pests not only reduce the vigour of the plant by sucking the sap but transmit diseases and affect photosynthesis as well. The spotted pod borer, Maruca vitrata (Geyer) is serious pest of grain legume crops including mungbean, urdbean, pigeonpea and common beans (Chandrayudu 2008, Yadav and Singh 2014). It attacks crops right from the pre-flowering to pod maturing stage causing yield loss.

Materilas and Methods

The experiment was conducted during Kharif cropping seasons in 2012 and 2013 at the Agricultural Research Farm of Banaras Hindu University, Varanasi. Mungbean variety HUM 12 was sown with sorghum in 4:2 ratios and seed treatment done with Imidacloprid 600 FS 5ml kg^{-1} seed. Mechanical control comprised rouging of MYMV infested plants was done at 30 DAS. Foliar spray with botanicals (NSKE @ 5% at 30 DAS) followed by chemical insecticide Triazophos 40 EC @ 0.04 per cent in IPM module. In FP three sprays of Rogor 30 EC @ 625 ml ha-1 was done.

The presence of whitefly (Bemisia tabaci); jassid. (Empoasca kerri) and thrips (Caliothrips indicus) were recorded on 15, 30, 45 and 60 days after sowing. The data on yield (q ha-1) was also recorded. The sampling for pod assessment by pod borer complex (Maruca vitrata and Helicoverpa armigera) was done after harvesting and recorded as per cent pod damage. 100 pods were picked up randomly from IPM module and farmer's practices for pod damage.

MYMV disease incidence calculated by using the following formula:

$$\text{MYMV disease incidence \%} = \frac{\text{Total No. of infected plants}}{\text{Total No. plants}} \times 100$$

The insecticidal spray solutions will be prepared by the following formula:

$$Amount\ of\ formulation = \frac{Concentration\ required\ (\%) \times Volume\ required\ (Litre)}{Concentration\ of\ toxicant\ in\ insecticidal\ formulation}$$

For plot yield all the plant were harvested and the sample yield was added to this yield to get the plot yield and then converted in to yield on hectare basis.

Figure 1. MYMV infection and Nature of damage of spotted pod borer, M. vitrata on Mungbean

Result and Discussion

The result of IPM module evaluation experiment conducted during kharif season in 2012 and 2013 revealed that the insect pests, MYMV infestation and pod damage was least recorded in IPM plot as compared to farmer's practices.

During Kharif-2012 in IPM plot the number of B. tabaci (3.67 whitefly/cage) was low as against (7.67 whitefly/cage) in farmer's practices. The MYMV incidence also recorded minimum in IPM plot (8.76 %) as compared to farmer's practices (14.23%). On the basis of insect count showed that the E. kerri population was low in IPM plot (1.87 jassid/cage) and high in farmer's practices (4.33 jassid/cage). The population of C. indicus was low in IPM plot (1.28 thrips/10 flowers) as compared to farmer's practices (2.53 thrips/10 flowers). The cumulative pod borers damage was low in IPM plots (8.72%) as against farmer's practices (12.73%). The grain yield was also high in IPM plots (8.70 q ha^{-1}) compared to farmer's practices (6.60 q ha^{-1}). IPM module was maximum cost benefit ratio of 1:18.20as against farmer's practices 1:14.90.

During kharif -2013 in IPM plot the number of B. tabaci (2.33 whitefly/cage) was low as against (5.87 whitefly/cage) in farmer's practices. The MYMV incidence also recorded minimum in IPM plot (5.87%) as compared to farmer's practices (11.56%). On the basis of insect count showed that the E. kerri population was low in IPM plot (1.19 jassid/cage) and high in farmer's practices (3.68 jassid/cage). The population of C. indicus was low in IPM plot (1.68 thrips/10 flowers) as compared to farmer's practices (3.72 thrips/10 flowers). The cumulative pod borers damage was low in IPM plots (11.47%) as against farmer's practices (16.24%). The grain yield was also high in IPM plots (5.86 q ha^{-1}) compared to farmer's practices (4.30 q ha^{-1}). IPM module was maximum cost benefit ratio of 1:11.93 as against farmer's practices **1**:9.36.

Table 1. Evaluation of Mungbean IPM module vs. farmer's practices

S. No.	Particulars	Kharif-2012		Kharif-2013	
		IPM Module	FP	IPM Module	FP
1.	Whitefly/Cage	3.67	7.67	2.33	5.87
2.	MYMV incidence (%)	8.76	14.23	5.87	11.56
3.	Jassids/Cage	1.87	4.33	1.19	3.68
4.	Thrips/10 flowers	1.28	2.53	1.67	3.72
5.	Pod damage (%)	8.72	12.73	11.47	16.24
6.	Yield (q/ha)	8.70	6.60	5.86	4.30
7.	Increased yield in IPM over FP (q ha-1)	2.10	0.00	1.48	0.00
8.	Cost of plant protection Module/ha	2265	2075	2265	2075
9.	Gross return	43500	33000	29300	21500
10.	Net Profit	41235	30925	27035	19430
11.	***C:B ratio	1:18.20	1:14.90	1:11.93	1:9.36

*Seed treatment with Imidacloprid/ha = Rs 120;*NSKE@ 5% ha-1 = Rs 215;* Triazophos 40 EC/ha = Rs 530;* Rogor 30 EC/ha= Rs 425;Labour cost (Two spray two persons) = Rs 800;Labour cost (Three persons for rouging of virus infected plants) =Rs 600/ha (* Cost of Insecticide based on availability in local market);**Rate: Mungbean = 50 Rs/kg (**Based on MSP); ***(C: B ratio based on only cost of protection and yield).

The two years consecutive studies on IPM module evaluation in mungbean in comparison with the farmers' practice confirmed the worthiness of adoption of IPM module in terms of reduced insect pest density, pod damage and enhanced return. The effectiveness of the IPM module in the present study is in agreement with the findings of Anonymous (2011) and Anonymous (2012). Seed treatment with Imidacloprid improved the efficacy of IPM module treatment as it could protected the crop from whiteflies up to 25 days after sowing. These findings are in tune with the reports of Panduranga *et al.*, (2011). Spraying of Neem Seed Kernel Extract (NSKE) 5 per cent at flowering phase increased the efficacy of insecticides. These findings are in tune with the reports Gajendran *et al.*, (2006). Anonymous (2011), Anonymous (2012) and Gajendran *et al.*, (2006) were also reported that cost: benefit ratio higher in IPM plots compared to farmers' practice.

Conclusion

Mungbean is one of the major pulse crops grown in India and is attacked by an array of insect pests at its various growth stages. Farmers usually opt for chemical methods of control as a first line of defence. But, indiscriminate use of insecticides leads destruction of natural enemies, pest resistance and resurgence. This approach of pest management is an efficient, comparatively economical and cost effective way without harming the ecosystem.

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