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Bioefficacy of Bio-rational insecticides against pod borer complex of Mungbean, *Vigna radiata* (L.)

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ABSTRACT

The experiments were carried out at GPB Farm and Students' Instructional Farm of Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya during *Kharif* 2019. Among the various insecticides evaluated against pod borer complex of mungbean, the overall mean of pod borer damage per cent was lowest in Indoxacarb 14.5 SC @ 60 g a.i./ha (1.2%) followed by Rynaxypyr 20 SC @ 40 g a.i./ha (1.7%) and Cow urine 5% (2.5%) treated plot. Neem oil, Garlic extract and Kaner powder were significantly superior over control (5.4%). The maximum Cost: Benefit ratio was obtained in plot treated with cow urine (1:86.40) and maximum net returns (Rs.37160) obtained with Indoxacarb 14.5 SC followed by Rynaxypyr 20 SC (Rs. 26695).

Key words: *Pod borer complex, Mungbean, Vigna radiata (L.), Biorational Insecticides against pod borer*

Introduction

Pulses are excellent source of dietary protein and these leguminous crops maintain soil fertility by fixing atmospheric nitrogen. India is the largest pulse growing country in the world both in terms of area as well as production covering 43.30 per cent of land area under pulses with 33.15 per cent production. Mungbean (*Vigna radiata* L.) commonly known as green gram is an important legume crop widely grown in many Asian countries including India, Bangladesh, Bhutan, China, Myanmar, Nepal, Sri Lanka, Thailand and Pakistan. The important mungbean grown state are Rajasthan, Maharashtra, Madhya Pradesh, Tamil Nadu, Andhra Pradesh, Odisha, Bihar. In India, mungbean crop is cultivated in about 3.83 mha production of 1.60 million tonnes with an average productivity of 418 kg ha^{-1}. In Uttar Pradesh, green gram is being cultivated on 97000 hectares that produce 44000 tonnes with an average productivity of 454 kg ha^{-1} (Anonymous, 2017). Mungbean is a good source of proteins, carbohydrates, vitamins for mankind all over the world.

Insect pest play a major role in low production in green gram in India. The green gram is attacked by various insect- pests such as white fly (*Bemisiatabaci*), jassid (*Empoasca* spp.), green leaf hopper (*Nephotettix* spp.) and flower thrips (*Caliothrips* spp.) appeared as sucking insect pests. Grasshopper (*Atractomorpha* spp.), tobacco caterpillar (*Spodoptera litura*), bihar hairy caterpillar (*Spilosoma obliqua*) and gram pod borer (*Helicoverpa armigera)* appeared as foliage feeders. Among them, the pod borer damage is one of the major constraints for low yield. The various pod borer species that affect mungbean are *Maruca testulalis* Geyer, *Helicoverpa armigera* Hb., *Etiella zinckenella*, *Exelastis atomosa* and *Adisura atkinsoni* Moore. Among the insect pests, pod borers (*Etiella*

zinckenella and *Helicoverpa armigera*) is a serious pest of mungbean (Chandrayudu, 2008). It attacks the crop right from the pre flowering to pod maturing stage causing huge yield loss. Spraying of chemical insecticides for controlling the borer is costly and results in environmental pollution and other health hazards. With organic farming gaining importance, microbial bio-pesticides can provide an alternative safe option for the control of this insect pest. Insecticides are used as effective means to control insect population in the field and store. The toxic residues of these chemicals have adverse effects on humans and the environment. They can persist in the soil; hence, their use has been discouraged (Isman and Machial, 2006). Neem seed kernel extract has been reported to be effective in reducing insect damage on mungbean. Neem oil and tamarind extracts are also effective against major sucking insect pests of mungbean (Kabir *et al.,* 2014). Hence, the present investigation has been contemplated to evaluate the bio- efficacy of bio-rational insecticides against pod borer complex of mungbeen.

Material and Methods

An Experiment on the field evaluation of novel insecticides and botanicals against pod borer in mungbean was carried out with following layout at Students' Instructional Farm of Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya during *Kharif*, 2019. The mungbean variety SML-668 was sown on 1 August, 2019. All the recommended agronomical practices were used to grow a good crop. The experiment was laid out in Randomized Block Design with seven treatment and three replications. The seed were sown at spacing of 30×10 cm.

Larval populations of pod borer complex were recorded at weekly intervals on 5 randomly selected plants starting with 50% flowering till harvest. Larval populations of pod borer complex were recorded at one day before and 3 and 7 days after foliar application of each treatment. The percent reduction in pod borer population at 3 & 7 days after spraying of insecticides was also calculated with following formula.

$$\text{Reduction percent} = \frac{\text{Initial population} - \text{Reduced population}}{\text{Initial population}} \times 100$$

Results and Discussion

The data presented in Table 1 revealed that Pod borer damage per cent in control at 3 days after treatment (DAT) was significantly higher than all other treatments. The lower pod borer damage (1.3%) was recorded in the treatment Indoxacarb 14.5 SC @ 60 g. a.i./ ha. It was at par with treatment Rynaxypyr 20 SC @ 40 g. a.i./ha (1.8%). Next best treatment was Cow urine @ 5% (2.5 % pod borer damage) which was at par with treatment Neem oil @ 4% (2.9 % pod borer damage). Treatment Garlic extract @ 5% has 3.1% pod borer damage which was at par with Neem oil @ 4% and Kaner powder @ 5% (3.7% damage) treatments.

The damage done by pod borer in mungbean was recorded at 7 days after treatment ranged from 1.1 to 5.6 per cent damage. The minimum pod borer damage (1.1 %) was observed in Indoxcarb 14.5 SC treated plot followed by Rynaxypyr 20 SC (1.6%). Cow urine (2.5%) and Neem oil (3.0%) treated plot were at par with each other. Rest treatments were less effective against pod borer damage but significantly superior over control (5.6 % pod borer damage). The overall mean of pod borer damage per cent was lowest in Indoxacarb 14.5 SC (1.2%) followed by Rynaxypyr 20 SC (1.7%) and Cow urine (2.5%) treated plot. Neem oil, Garlic extract and Kaner powder were next best treatments which were significantly superior to control (5.4%).

Overall damage reduction over control was maximum in Indoxacarb 14.5 SC treated plot (78.1%) followed by Rynaxypyr 20 SC (68.2%) and Cow urine (53.4%) treated plot.

These observations are in partial agreement with the earlier findings of Singh *et al.* (2014) revealed that Indoxacarb 14.5 SC was effective for *H. armigera* management. These findings are also in accordance with the earlier findings of Yadav *et al.* (2015) showed that Indoxacarb 14.5 SC was most effective in reducing the pod borer damage. Bairwa and Singh (2015) have also reported that *Maruca* larval population showed more or less uniform distribution of the pest in the crop. The mean number of larval populations varied from 1.98 to 2.65 per plant in all the treatments including untreated control. The data recorded one day after spray revealed that larval population ranged from 1.0 to 3.87. The population reduction range was from 36.26 to 66.06 per cent over untreated control. Most effective treatment

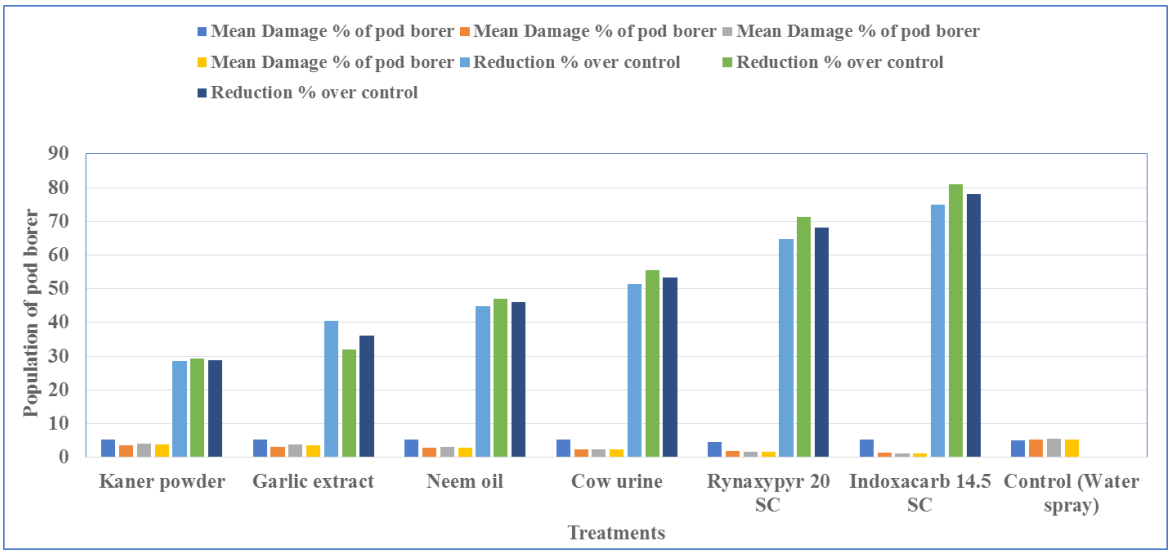

Fig. 1. Efficacy of different treatments against pod borer complex of mungbean during *Kharif*, 2019

Table 1. Efficacy of different treatments against pod borer complex of mungbean during *Kharif*, 2019

S. No.	Treatments	Dosages	Mean damage % of pod borer				Reduction% over control		
			1 DBS	After Spray			3 DAS	7 DAS	Overall reduction
				3 DAS	7 DAS	Overall mean			
1	Kaner powder	5%	5.2(2.39)	3.7(2.05)	4.0(2.11)	3.8(2.08)	28.6	29.2	28.9
2	Garlic extract	5%	5.3(2.41)	3.1(1.90)	3.8(2.07)	3.5(1.99)	40.4	32.1	36.1
3	Neemoil	4%	5.3(2.41)	2.9(1.83)	3.0(1.86)	2.9(1.84)	44.9	47.0	46.0
4	Cowurine	5%	5.2(2.39)	2.5(1.74)	2.5(1.73)	2.5(1.74)	51.3	55.4	53.4
5	Rynaxypyr 20SC	40 ga.i./ha	4.6(2.27)	1.8(1.53)	1.6(1.45)	1.7(1.49)	64.7	71.4	68.2
6	Indox acarb 14.5 SC	60 ga.i./ha	5.3(2.41)	1.3(1.34)	1.1(1.25)	1.2(1.30)	75.0	81.0	78.1
7	Control (Waterspray)	-	5.0(2.35)	5.2(2.39)	5.6(2.48)	5.4(2.43)	0.0	0.0	0.0
SEm±		-	0.06	0.06	0.05	-	-	-	
C.D.(P=0.05)		NS	0.19	0.17	0.16	-	-	-	

Figures in parentheses indicates transformed value (√x+0.5), **DBS**- Days Before Spray, DAS- Day After Spray

one day after spray was Indoxacarb with 66.06 % reduction in population over control followed by Spinosad 65.28% and Profenophos 60.66 % reduction in population over control.

Conclusion

These finding revealed that management of pod borers in mungbean crop was found effective in reducing infestation by insect. Indoxacarb 14.5 SC (60 g a.i./ha) was the most effective insecticide among all the treatments. Among the carbonic molecules, cow urine (5%) was the most effective against the pod damage caused by pod borers. Indoxacarb 14.5 SC @ 60 g a.i./ha treated plot gave 12.9 q/h grain yield which was significantly superior with all the treatments followed by Rynaxypyr 20 SC @ 40 g. a.i./ha (11.4 q/h). The maximum Cost: Benefit ratio was obtained in plot treated with cow urine (1:86.40). The maximum monetary gain (Rs.37160) obtained with Indoxacarb 14.5 SC @ 60 g a.i./ha followed by Rynaxypyr 20 SC @ 40 g. a.i./ha (Rs. 26695).

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