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Entomology

Bio-efficacy of chemical Insecticides against Spotted Pod Borer, *Maruca testulalis* (Geyer) on Cowpea

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Abstract

Studies were conducted at Agricultural Research Farm, Banaras Hindu University, Varanasi during *Kharif* 2010 and 2011 to know the efficacy of some new molecule insecticides (azadirachtin, *Bt*, endosulfan 35% EC, thiodicarb 75% WP, spinosad 45% SC, lambda cyhalothrin 5% EC, indoxacarb 14.5% SC, profenophos 50% EC and acetamiprid 20% SP) against spotted pod borer, *Maruca vitrata* (Geyer) on mungbean. The spinosad 45% SC and indoxacarb 14.5 % SC were the most effective treatments and significantly superior to other treatments with 80.7 and 79.2 per cent larval reduction over control. The least effective treatment was acetamiprid 20%SP, followed by azadirachtin with 38.8 and 44.9 per cent reduction in larval population over control. The maximum yield was recorded in treatment indoxacarb 14.5%SC (11.8q/ha) followed by spinosad 45%SC (11.1q/ha) which were at par with each other. While lowest yield was recorded in azadirachtin (9.7q/ha).

Highlights

- The spotted pod borer, *Maruca vitrata* (Geyer) is serious pest of grain legume crops including mungbean, urdbean, pigeonpea and common beans.
- The spinosad 45% SC and indoxacarb 14.5 % SC were the most effective treatments and significantly superior to other treatments with 80.7 and 79.2 per cent larval reduction over control.
- The least effective treatment was acetamiprid 20% SP, followed by azadirachtin with 38.8 and 44.9 per cent reduction in larval population over control.
- The maximum yield was recorded in treatment indoxacarb 14.5% SC (11.8q/ha) followed by spinosad 45%SC (11.1q/ha) which were at par with each other.

Keywords: Bioefficacy, New molecules insecticides, *Maruca vitrata*, mungbean.

Introduction

The spotted pod borer, *Maruca vitrata* (Geyer) is serious pest of grain legume crops including mungbean, urdbean, pigeonpea and common beans (Chandrayudu, 2008). It attacks crops right from the pre-flowering to pod maturing stage causing yield loss. Singh and Allen (1980) reported the estimated Losses in grain yield of 20 to 60% due to *Maruca* damage. In cowpea, loss in grain yield has been estimated to be 72% in 1985 and 48% in 1986, and the economic threshold is nearly 40% larval infestation in flowers (Ogunwolu, 1990). According Ohno and Alam (1989), pod borer damage has been estimated to be 54.4% during harvest in cowpea. In pigeonpea, losses due to *M. vitrata* have been estimated to be $US 30 million annually

(ICRISAT, 1992). Vishakantaiah and Jagadeesh Babu (1980) observed between 9 and 51% infestation. Patnaik *et al*., (1986) reported 8.2 to 15.9% pod damage, resulting in 3.7 to 8.9% loss in grain yield. The pod borer has been reported to cause up to 84% damage in pigeonpea (Dharmasena *et al.*, 1992, Dharmasena, 1993). *M. vitrata* larvae feed on flowers, buds, and pods by webbing with leaves (Sharma, 1998). So it is difficult to kill them due to this typical feeding habit larvae protect from natural enemies and older class of insecticides. The repeated use of older class chemicals results in development of resistance to insecticides. Now days, attempts are being focused on safer insecticides, plants products, microbial pesticides to reduce the resistance development and ecofriendly pesticides. Hence the present study was conducted to evaluate the certain new molecule insecticides which recently developed having unique mode of action, non target to beneficial insects and ecofriendly, microbial and biorational insecticides against the spotted pod borer on mungbean.

Materials and Methods

The experiments were laid out in a Randomized Block Design with ten treatments including control replicated thrice in 3 x 3 m plot size during *Kharif*, 2010 and 2011 at Agricultural Research Farm, Banaras Hindu University, Varanasi, Uttar Pradesh, India. The mungbean variety HUM-12 was raised in 30 x 10 cm spacing and recommended package of practices except plant protection measures. Nine insecticides azadirachtin, *Bt*, endosulfan 35% EC, thiodicarb 75% WP, spinosad 45% SC, lambda cyhalothrin 5% EC, indoxacarb 14.5% SC, profenophos 50% EC and acetamiprid20% SP were evaluated against *Maruca*. Water sprayed plots were kept as control and volume of the spray liquid was taken as 500 $l.ha^{-1}$. The number of pod borers was counted on five randomly selected plants in each treatment. The pre treatment count was made a day before, 3rd, 7th and 10th days after spray on ten treatments. The mean *Maruca* larval populations of 3rd, 7th and 10th days after spray was worked out for which reduction in population over control was calculated for each spray. Yield data were recorded plot wise and then converted to hectare basis. The larval population and yield data were subjected to statistical analysis after square root transformation (“x+0.5).

The insecticidal spray solutions were prepared by the following formula:

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

$$\text{Per cent reduction over control} = 1 - \frac{\text{post treatment population in treatment}}{\text{pre treatment population in treatment}} \times \frac{\text{pre treatment population in control}}{\text{post treatment population in control}} \times 100$$

Fig: Nature of damage of spotted pod borer, *M. vitrata* and *Larvae feeding on pod in mungbean*

Table 1: Evaluation of insecticides on larval population of spotted pod borer, *M.vitrata* in mungbean during *Kharif* 2010 & 2011 (Pooled)

Treatments	Dose	*M. vitrata* population at different days after spray									Yield (q/ha)
		Pre- spray	3 DAS	PROC	7 DAS	PROC	10 DAS	PROC	Mean	PROC	
T1:Azadirachtin10000ppm	2 ml/lit.	1.77(1.50)	1.27(1.33)	33.1	0.77(1.12)	46.0	0.43(0.97)	55.7	0.82(1.15)	44.9	9.7
T2:Bt	2gm/lit	1.90(1.55)	0.83(1.15)	59.1	0.53(1.02)	65.1	0.30(0.89)	71.5	0.56(1.03)	65.2	10.0
T3:Endosulfan35%EC	0.07%	1.70(1.48)	0.47(0.98)	74.4	0.27(0.88)	80.5	0.37(0.93)	61.0	0.37(0.93)	72.0	10.2
T4:Thiodicarb75%wp	0.04%	1.87(1.54)	0.47(0.98)	76.7	0.27(0.88)	82.2	0.37(0.93)	64.5	0.37(0.93)	74.5	10.9
T5:Spinosad45%SC	0.2ml/lit	1.80(1.52)	0.33(0.91)	82.7	0.20(0.84)	86.2	0.27(0.87)	73.2	0.27(0.88)	80.7	11.1
T6:Lamda cyhalothrin 5%EC	0.004%	1.73(1.49)	0.43(0.97)	76.7	0.50(1.00)	64.1	0.47(0.98)	51.4	0.47(0.98)	64.1	10.5
T7:Indoxacarb14.5%SC	50g a.i./ha	1.87(1.54)	0.40(0.95)	80.0	0.20(0.84)	86.7	0.30(0.89)	71.0	0.30(0.89)	79.2	11.8
T8:Profenophos50%EC	1lit/ha	1.70(1.48)	0.53(1.02)	70.7	0.60(1.05)	56.1	0.47(0.98)	50.4	0.53(1.02)	59.1	10.9
T9: Acetamiprid20%SP	0.004%	1.80(1.52)	1.27(1.33)	34.3	0.83(1.15)	42.4	0.60(1.05)	39.8	0.90(1.18)	38.8	10.3
T10: Control (WaterSpray)	-	1.87(1.54)	2.00(1.58)		1.50(1.41)		1.03(1.24)		1.51(1.42)		7.7
S.Em±			(0.02)		(0.03)		(0.02)		(0.02)		0.2
CD @5%		NS	(0.06)		(0.08)		(0.05)		(0.06)		0.7

Note: Figure in parenthesis are "x+0.5 transformed value, DAS: Days after spraying, PROC: Per cent reduction over control.

Per cent reduction over control calculated by using following modified formula given by Henderson and Tilton (1955).

Results and Discussion

The perusal of data showed that larval populations of *Maruca* non-significant among the various treatments at one day before spray (Table). However, at three days after spray the least larval population was noticed in spinosad 45% SC (0.33 larvae/plant), followed by indoxacarb 14.5% SC (0.40 larvae/plant), lambda cyhalothrin 5% (0.43larvae/plant), thiodicarb 75% WP (0.47 larvae/plant), endosulfan 35% EC (0.47 larvae/plant) and profenophos % EC (0.53 larvae/plant) with 82.7,80.0, 76.7, 74.4 and 70.7 per cent larval reduction over control, respectively. The treatments lambda cyhalothrin 5%, endosulfan 35% EC and thiodicarb 75% WP were at par with each other. In *Bt* larval population was recorded 0.83 larvae/plant with 59.1 per cent larval reduction over control. The highest larval count was found in azadirachtin (1.27 larvae/plant) and acetamiprid 20%SP (1.27 larvae/plant) were at par with each other and 33.1 and 34.3 per cent larval reduction over control, respectively. Similar trend was trend was noticed at seven days and ten days after spray. On the basis of overall efficacy showed that the spinosad 45% SC and indoxacarb 14.5 % SC were the most effective treatments and significantly superior to other treatments with 80.7 and 79.2 per cent larval reduction over control. The least effective treatment was acetamiprid 20%SP, followed by azadirachtin with 38.8 and 44.9 per cent reduction in larval population over control. The treatment *Bt* was recorded 65.2 per cent reduction in larval population. The remaining treatments were significantly superior in reduction of larval population of over control. The maximum yield was recorded in treatment indoxacarb 14.5%SC (11.8q/ha) followed by spinosad 45%SC (11.1q/ha) which were at par with each other. While lowest yield was recorded in azadirachtin (9.7 q/ha). The present findings are agreement with the reports of Mohapatra and Srivastava, 2002, Chandrayudu *et al*. (2008), Sandhya Rani and Eswari (2008), Ashok Kumar and Shivaraju (2009) and Sonune *et al*. (2010).

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