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Efficacy of Different Insecticides Against Spotted Pod Borer, *Maruca Vitrata* (Geyer) in Rice Fallow Blackgram

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ABSTRACT

A field experiment was conducted during *rabi* 2009-10, to evaluate the field efficacy of newer insecticides against spotted pod borer in rice fallow blackgram. The data revealed that there was significant impact of sprayed new insecticide treatments on larval population, flower damage and pod damage due to spotted pod borer and grain yield at harvest. Spinosad was found to be the most effective insecticide among all the insecticides against larvae of spotted pod borer followed by emamectin benzoate and they were statistically on par with each other.

Key words : Pest management, Spotted pod borer, *Maruca vitrata,* Newer insecticides

In India, blackgram is cultivated in about 2.97 million ha with a production of only 1.25 million tonnes (Anonymous, 2008). In Andhra Pradesh, blackgram is cultivated in 3.38 lakh ha, with a production of 2.2 lakh tonnes and productivity of 653 kg/ha during 2008-09 season (AICRP Report on Pulses (MULLARP) 2009). It is cultivated to an extent of 64,161 ha in Guntur district as rice fallow blackgram (Joint Director of Agriculture, 2009). Majority of this production of the state is from rice fallows. It is evident that contribution of Andhra Pradesh and Guntur district towards production of blackgram is very important. It is observed that *Maruca vitrata* is the major pest causing significant losses in blackgram in the Guntur district. In spite of adoption of large scale insecticidal sprays against spotted pod borer, none of them effectively controlled the insect pest necessitating the search for newer insecticide molecules. Hence, the present studies were conducted to evaluate the field efficacy of newer insecticides against *M. vitrata* and to recommend to the farmers about the most effective new insecticide for managing the target pest. From the farmers perspective, this is very essential to increase the blackgram productivity in rice fallows with an ultimate goal of self sustainability in blackgram production.

MATERIAL AND METHODS

A field trial was conducted during *rabi* 2009-10 with variety of blackgram LBG-645 in the farmers field at Munipalle village in Guntur, Andhra Pradesh. The experiment was laid out in a randomized block design consisting of ten insecticides with one untreated control. Each treatment replicated thrice and each plot size of 5m × 5m was maintained. Schedule a sprayings were given at 10 days interval starting from incidence of spotted pod borer in blackgram. Data on the pest population was recorded at one day before spraying as pre-treatment count and 1st, 5th, 9th day after spraying as post treatment counts. The observations were recorded from five randomly selected plants per plot leaving the border rows. The data on total number of larvae/plant, total number of flowers/plant, number of damaged flowers/plant, total number of pods/plant and number of damaged pods/plant were recorded. The per cent population reduction in different treatments was calculated by modified Abbot's formula (Fleming and Ratnakaran, 1985) and the data was subjected to ANOVA.

Per cent population reduction

$$= 1 - \left[\frac{\text{Post treatment population in treatment}}{\text{Pre treatment population in treatment}} \times \frac{\text{Post treatment population in untreatment check}}{\text{Pre treatment population in untreatment check}} \right] \times 100$$

The yield data on marketable grains (in kg per plot) was recorded treatment wise and per cent yield increase over control was calculated by using the formula,

Table 1. Cumulative efficacy three sprays of different insecticides against larvae of *M. vitrata* in rice fallow blackgram

Treatments	Dose/ l(Conc.)	Larval population 1 DBT	Percentage reduction in larval population over control			
			1DAT	9DAT	5DAT	Overall efficacy
T_1 Spinosad 45 SC	0.33 ml (0.015)	4.65	86.64[a] (68.57)	76.12[a] (60.76)	92.85[a] (74.52)	85.20[a] (67.38)
T_2 Indoxacarb 14.5 SC	1 ml (0.0145)	5.72	71.64[cd] (57.83)	61.95[d] (51.91)	76.80[d] (61.20)	70.13[d] (56.88)
T_3 Thiodicarb 75 WP	1 g (0.075)	5.23	75.62[c] (60.42)	67.34[b] (55.15)	81.82[c] (64.76)	74.93[c] (59.96)
T_4 Emamectin benzoate 5 SG	0.5g (0.0025)	4.41	85.32[ab] (67.49)	75.72[a] (60.48)	92.00[ab] (73.59)	84.35[ab] (66.70)
T_5 Novaluron 10 EC	1 ml (0.01)	5.46	74.70[de] (59.80)	68.02[b] (55.56)	80.89[c] (64.08)	74.54[c] (59.70)
T_6 Flubendiamide 39.35 SC	0.15 ml (0.006)	6.12	83.43[b] (65.98)	74.64[a] (59.76)	91.10[b] (72.67)	83.06[b] (65.70)
T_7 Rynaxypyr 20 SC	0.2 ml (0.009)	5.44	75.38[c] (60.29)	66.50[b] (54.64)	82.80[c] (65.50)	74.89[c] (59.93)
T_8 Chlorpyriphos 20 EC	2.5 ml (0.05)	6.38	70.55[e] (57.14)	52.04[e] (46.17)	68.63[e] (55.94)	63.74[e] (52.98)
T_9 Dichlorvos 76 EC	1 ml (0.076)	7.21	62.30[f] (52.13)	48.68[f] (44.24)	61.07[f] (51.40)	57.35[f] (49.23)
T_{10} Chlorpyriphos 20 EC + Dichlorvos 76 EC	2.5 + 1ml (0.05 + 0.076)	5.31	75.32[c] (60.24)	64.35[c] (53.34)	81.13[c] (64.27)	73.60[c] (59.08)
T_{11} Control	—-	14.33	0.00	0.00	0.00	0.00
F test			Sig.	Sig.	Sig.	Sig.
SEm±			0.78	0.36	0.49	0.36
CD (P=0.05)			2.29	1.06	1.45	1.05

Values in the parentheses are angular transformed values Sig : Significant
Values in each column followed by the same alphabet are not significantly different (P=0.05)
DBT = Days before treatment

Per cent yield increase

$$= \frac{\textit{yield in treatment} - \textit{yield in untreated control}}{\textit{yield in untreated control}} \times 100$$

Later the yield data were subjected to statistical analysis.

RESULTS AND DISCUSSION

The data presented in Tables 1, 2, 3 and 4 shows that there was significant impact of sprayed treatments on larval population, flowed damage and pod damage due to spotted pod borer and grain yield at harvest.

Table 1 shows that all the treatments were significantly effective in reducing larval population. Among all the test insecticides spinosad was found to be highly effective treatment as it recorded 85.20% mean larval reduction followed by emamectin benzoate 84.35% these two treatments were and statistically on par with each other.

Table 2. Cumulative efficacy three sprays of different insecticides on flower damage due to *M. vitrata* in rice fallow blackgram

Treatments	Dose/ l(Conc.)	%flower damage 1 DBT	In flower damage			
			Percentage reduction over control			
			1DAT	9DAT	5DAT	Overall efficacy
T_1 Spinosad 45 SC	0.33 ml (0.015)	7.24	82.31^{a} (66.58)	93.79^{a} (75.68)	91.61^{a} (73.29)	87.92^{a} (70.42)
T_2 Indoxacarb 14.5 SC	1 ml (0.0145)	13.02	50.06^{f} (45.04)	63.30^{de} (52.75)	61.90^{d} (51.90)	58.39^{de} (49.84)
T_3 Thiodicarb 75 WP	1 g (0.075)	7.92	61.03^{cd} (51.37)	75.68^{c} (60.47)	73.82^{c} (59.24)	69.85^{c} (56.82)
T_4 Emamectin benzoate 5 SG	0.5g (0.0025)	6.94	81.51^{ab} (64.54)	91.76^{ab} (73.34)	91.33^{a} (72.95)	86.81^{ab} (68.76)
T_5 Novaluron 10 EC	1 ml (0.01)	10.62	66.40^{c} (54.62)	79.15^{c} (62.96)	74.34^{c} (59.58)	72.25^{c} (58.32)
T_6 Flubendiamide 39.35 SC	0.15 ml (0.006)	8.63	78.77^{b} (62.63)	88.91^{b} (70.62)	86.69^{b} (68.62)	83.80^{b} (66.30)
T_7 Rynaxypyr 20 SC	0.2 ml (0.009)	13.13	61.24^{cd} (51.50)	65.36^{d} (54.04)	64.64^{d} (53.53)	63.35^{d} (52.76)
T_8 Chlorpyriphos 20 EC	2.5 ml (0.05)	14.88	53.88^{ef} (47.23)	55.79^{e} (48.35)	53.88^{e} (47.25)	54.27^{e} (47.45)
T_9 Dichlorvos 76 EC	1 ml (0.076)	15.49	36.77^{g} (37.28)	43.93^{f} (41.47)	42.30^{f} (40.53)	40.54^{f} (39.54)
T_{10} Chlorpyriphos 20 EC + Dichlorvos 76 EC	2.5 + 1ml (0.05 + 0.076)	8.32	57.63^{de} (49.39)	62.36^{de} (52.19)	61.97^{d} (51.93)	60.51^{d} (51.07)
T_{11} Control	—-	32.71	0.00	0.00	0.00	0.00
F test			Sig.	Sig.	Sig.	Sig.
SEm±			1.31	1.55	1.33	1.06
CD (P=0.05)			3.87	4.57	3.93	3.12

Values in the parentheses are angular transformed values Sig : Significant
Values in each column followed by the same alphabet are not significantly different (P=0.05)
DBT = Days before treatment

Flubendiamide was the next best treatment with 83.06% reduction in larval population. Where as in remaining treatments the mean larval reduction was observed vary from 57.35 to 74.93 per cent. The present findings on spinosad are in confirmity with findings of Lakshmi *et al*. (2002) who reported about 63.99% larval reduction with spinosad in blackgram. Similarly Mutkule *et al*. (2010) observed lowest defoliator (0.2 larvae/plant) and leafminer (0.2 larvae/plant) in ground nut with spinosad.

Similarly against flower damage (Table 2) spinosad was found be the most effective treatment with 87.92% reduction in flower damage followed by emamectin benzoate (86.81%). Flubendiamide was the next best treatment with 83.80% reduction in flower damage. In the remaining treatments the per cent flower damage reduction was varied from 40.54 to 72.25 per cent. Literature on this flower damage was scanty. Hence initially work has been initiated on this aspect.

Table 3. Cumulative efficacy three sprays of different insecticides on pod damage due to *M. vitrata* in rice fallow blackgram.

Treatments	% pod damage	% reduction over control
T_1 Spinosad 45 SC	11.83[a] (20.11)	50.16
T_2 Indoxacarb 14.5 SC	19.16[d] (25.96)	35.68
T_3 Thiodicarb 75 WP	17.22[cd] (24.51)	39.28
T_4 Emamectin benzoate 5 SG	12.13[a] (20.30)	49.71
T_5 Novaluron 10 EC	15.96[bc] (23.54)	41.67
T_6 Flubendiamide 39.35 SC	13.70[ab] (21.67)	46.31
T_7 Rynaxypyr 20 SC	16.21[bc] (23.74)	41.19
T_8 Chlorpyriphos 20 EC	23.16[e] (28.77)	28.72
T_9 Dichlorvos 76 EC	29.13[f] (32.66)	19.07
T_{10} Chlorpyriphos 20 EC + Dichlorvos 76 EC	17.84[cd] (24.95)	38.19
T_{11} Control	27.52[g] (40.35)	0.00
F test	Sig.	
SEm±	0.74	
CD (P=0.05)	2.18	

Values in the parentheses are angular transformed values; Sig : Significant
Values in each column followed by the same alphabet are not significantly different (P=0.05)

The incidence of spotted pod borer on the basis of per cent pod damage was lowest in spinosad (11.83%) against 27.52% pod damage in control (Table 3). Similarly highest per cent pod damage reduction of 50.16% was also recorded in spinosad. Emamectin benzoate was the next best treatment with 12.13% pod damage and 49.7% reduction in pod damage over control. In the remaining treatmens per cent pod damage varied from 17.84 to 13.7 per cent. The present findings are in confirmity with Ranga Rao *et al*. (2007) who recorded 8.5% pod damage due to spinosad in pigeonpea against spotted pod borer.

The results on efficacy of insecticide treatments on grain yield is presented in Table 4. It revealed that spinosad as a result of its higher efficacy in reducing the pest incidence in terms of per cent larval population, flower and pod damage recorded highest yield of 1760 kg/ha which is 93.55% higher over untreated control. These studies were in accordance with the reports of Mittal and Ujagir (2005), Gowda *et al*., (2004) and Ranga Rao *et al.* (2007). However it was statistically on par with flubendiamide (1746.67 kg/ha) and emamectin benzoate (1733.67 kg/ha). The present findings of flubendiamide are in confirmity with the findings of Raghavani and Poshiya (2006), Gaikwad *et al.* (2009) and Dodia *et al.* (2009). The results of emamectin benzoate are in line with the reports of Patil *et al.* (2008) and Ameta and Ajay Kumar (2008).

Table 4. Effect of different insecticides for control *M. vitrata* on yield of rice fallow blackgram.

Treatments	Mean plot yield(kg)	Yield per ha (kg)	% increase over control
T_1 Spinosad 45 SC	4.40	1760.00[a]	93.55
T_2 Indoxacarb 14.5 SC	3.53	1413.33[b]	55.43
T_3 Thiodicarb 75 WP	3.83	1533.33[b]	68.62
T_4 Emamectin benzoate 5 SG	4.33	1733.33[a]	90.62
T_5 Novaluron 10 EC	3.87	1546.67[ab]	70.09
T_6 Flubendiamide 39.35 SC	4.37	1746.67[a]	92.08
T_7 Rynaxypyr 20 SC	3.80	1520.00[b]	67.16
T_8 Chlorpyriphos 20 EC	3.57	1426.67[b]	56.89
T_9 Dichlorvos 76 EC	2.80	1120.00[c]	23.17
T_{10} Chlorpyriphos 20 EC + Dichlorvos 76 EC	3.60	1440.00[b]	58.36
T_{11} Control	2.27	909.33[d]	0.00
F test		Sig.	
SEm±		65.71	
CD (P=0.05)		193.83	

Conclusion:

The present studies were conducted in rice fallow blackgram where the ecosystem due to different plant spacings and microclimate was different from upland blackgram.

From the above it can be concluded that spinosad was highly effective insecticide against spotted pod borer in rice fallow blackgram and was found to be statistically on par with emamectin benzoate. Flubendiamide was the next best treatment against target pest in rice fallow blackgram.

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