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Research article

EVALUATION OF CORAGEN (DPX-E2Y45) AGAINST LEGUME POD BORER, *MARUCA VITRATA* (GEYER) (LEPIDOPTERA: PYRALIDAE) ON BLACKGRAM

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ABSTRACT: A field experiment was conducted for two consecutive seasons to evaluate the efficacy of E2Y45 (Coragen 20% SC) against legume pod borer, *Maruca vitrata* (Geyer) at Regional Agricultural Research Station, Lam, Guntur, Andhra Pradesh, India. The experiment was laid out in Randomised Block Design with three replications. Among the different doses evaluated, the higher doses of Coragen, i.e., at 30, 25 and 20 g a.i./ha were proved superior in reducing larval population and pod damage coupled with higher seed yield. Hence, considering the cost of plant protection, Coragen 20 % SC at 20 g a.i./ha can be used against legume pod borer as an alternative for conventional insecticides.
Keywords: Maruca; Legume pod borer; Coragen

INTRODUCTION

Black gram, *Vigna mungo* (L.) is one of the important pulse crops in India due to its nutritional value. In Andhra Pradesh it is being cultivated mostly as r*abi* (winter) crop both in uplands and rice fallows. The legume pod borer (LPB) which is also known as spotted pod borer, *Maruca vitrata* (Geyer) has been observed as a key pest of black gram in Andhra Pradesh. The legume pod borer (LPB) is an important pest effecting the grain legumes in tropics and subtropics and it is reported to feed on 39 host plants [1]. The larvae feed on flower buds, flowers and pods by webbing them and this feeding habit protects the larvae from natural enemies and from the application of insecticides [9]. Hence, control of legume pod borer in worldwide has traditionally relied upon chemical insecticides only [7].

Foliar application of the conventional insecticides and broad spectrum insecticides such as organophosphates, carbamates and synthetic pyrethroids against pod borers at frequent intervals during the growing season leads to increase cost of cultivation which inturn reducing the net profits for the pulse growing farmers. Hence, the newer insecticides with relatively low quantities compared to standard insecticides which had long residual properties should be evaluated for effective management of spotted pod borer. Keeping in view, the present study was taken-up to evaluate the efficacy of SC formulation of a newer insecticide, E2Y45 (Coragen 20 % SC) against spotted pod borer in blackgram under field conditions. Coragen belongs to a novel anthranilic diamide insecticide group which targets the ryanodine receptors in muscle cells. Activation of these receptors causes unregulated release of internal Ca^{2+} stores leading to depletion of calcium, muscle paralysis, and ultimate death. The symptoms of intoxication in treated insects include feeding cessation, lethargy, paralysis, and regurgitation [2].

MATERIALS AND METHODS

A field experiment was conducted at regional agricultural research station, Lam, Guntur during Rabi at seasons of 2008 - 2009 and 2009 - 2010 to evaluate the bio-efficacy of Coragen (E2Y45) 20% SC in blackgram against lepidopteran pests. The trial was laid in Randomized Block Design with eight treatments including untreated control, replicated thrice during both seasons. The crop was sown in first week of December during both the years in 20 sq m plots maintaining a spacing of 30 cm and 10 cm between rows and plants respectively. The crop was grown under rainfed conditions by adopting all the agronomic practices as per recommendations of ANGRAU, Hyderabad.

The crop was protected from sucking pests such as thrips and whiteflies at initial stages through blanket sprays in all the experimental plots uniformly with selective insecticides. The test insecticides *viz.*, Coragen 20% SC at 10, 15, 20, 25 and 30 g a.i./ha along with two standard checks, i.e., Chlorpyriphos + Dichlorovos @ 250 + 380 g ai/ha and novaluron 10 EC at 200 g a.i./ha were applied twice after flowering in blackgram. The first spray was given after observing initial incidence of spotted pod borer and second spray was given after 15 days using knap-sack sprayer with 500 liters of spray fluid per hectare. Pre treatment count was taken at one day before spraying and post treatment counts were recorded at 3, 7 and 10 days after each application from one-meter row length from three spots per plot for both larval count and pod damage. The yield was recorded from each net plot excluding border rows and computed to yield in quintal/ha. The data were subjected to statistical analysis after using suitable transformations. The phytotoxic effects such as injury on leaf tips, leaf surface, necrosis, epinasty (upward curling of leaves), hyponasty (downward curling of leaves), wilting and vein clearing was also recorded for the test chemical at its higher dose.

RESULTS

Larval count

The mean larval incidence was slightly high during 2009-2010 seasons which was ranged from 6.78 to 7.58 larvae/one meter row when compared to 6.22 to 7.42 larvae/one meter row during 2008-09 at one day before spraying. Coragen 20 % SC at different doses resulted effective control of spotted pod borer as evidenced with lower incidence of larvae and pod damage as compared to the untreated control. However, significant effect of all insecticides was observed over untreated control in respect of larval number and percent pod damage after 3 days of spraying which persisted till 10 days of spraying (Table 1).

Table 1. Effect of Coragen 20% SC (E2Y45) on larval incidence, pod damage, natural enemies and yield in blackgram

S.No	Treatment	Mean No.of Larvae/ 1 mt row after 2 sprays *		Mean % pod damage after 2 sprays **		Natural enemies /plant*		Yield (Kg/ha)	
		2008-09	2009-10	2008-09	2009-10	2008-09	2009-10	2008-09	2009-10
T1	Coragen 20 SC (10 g ai/ha)	2.56 (1.88)	3.17 (2.04)	20.61 (26.75)	25.29 (29.91)	1.56 (1.60)	1.34 (1.53)	554.33	563.67
T2	Coragen 20 SC (15 g ai/ha)	2.43 (1.85)	3.00 (2.00)	19.17 (25.81)	23.09 (28.47)	2.00 (1.73)	1.89 (1.70)	549.67	575.00
T3	Coragen 20 SC (20 g ai/ha)	1.07 (1.42)	1.45 (1.57)	9.58 (17.81)	9.93 (18.19)	1.66 (1.63)	1.78 (1.66)	790.67	784.33
T4	Coragen 20 SC (25 g ai/ha)	0.89 (1.37)	1.22 (1.48)	7.69 (15.74)	8.47 (16.89)	1.78 (1.66)	1.54 (1.58)	831.33	841.00
T5	Coragen 20 SC (30 g ai/ha)	0.69 (1.30)	1.10 (1.44)	4.52 (11.49)	6.18 (13.97)	1.77 (1.66)	1.55 (1.59)	858.00	890.33
T6	Chlorpyriphos + Dichlorovos (250 + 380 g ai/ha)	2.56 (1.87)	3.44 (2.10)	33.62 (35.35)	37.43 (37.61)	1.24 (1.50)	1.45 (1.57)	576.00	563.00
T7	Novoluron 10 EC (200 g ai/ha)	1.88 (1.69)	2.26 (1.79)	14.51 (22.43)	16.62 (23.89)	2.11 (1.76)	2.04 (1.73)	643.33	628.67
T8	Control	9.44 (3.23)	10.11 (3.32)	53.14 (46.83)	58.24 (49.96)	2.11 (1.76)	2.10 (1.76)	289.67	267.00
	F Test	Sig	Sig	Sig	Sig	NS	NS	Sig	Sig
	CD	0.33	0.38	8.79	9.20	-	-	138.85	136.23
	CV (%)	10.5	11.0	19.9	19.2	9.80	9.40	12.5	12.2

* Figures in parenthesis are Sqrt X+1 values

** Figures in parenthesis are arcsine transformed values

The mean larval incidence after two sprays revealed that the lowest larval count of 0.69 larvae/ 1 mt row was recorded with Coragen at 30 g a.i./ha. However, it was failed to differ significantly with Coragen at 25 g a.i./ha (0.89 larvae/ 1m row) and Coragen at 20 g a.i./ha (1.07), but significantly superior over the rest of the treatments during 2008-2009. The insecticidal treatments showed more or less similar trend during 2009-2010 also with slightly higher larval population in all the treatments. However, novaluron 10 EC at 200 g a.i./ha (2.26 larvae/ 1m row) was found on par with the higher doses of Coragen 20 % SC in reducing the larval population of legume pod borer during Rabi 2009-2010. But, the other standard checks such as chlorpyriphos + dichlorovos at 250 + 380 g ai/ha was found statistically inferior to the higher doses of Coragen during both the seasons. But, it was found on par with Coragen at its lower doses such as 10 and 15 g a.i./ha in reducing the incidence of Maruca pod borer. However, all the treatments were found significantly superior over the untreated control in curtailing the incidence of legume pod borer during both the years. Since, the larval incidence was very high in untreated control plots which were approximately about 10 larvae/1 mt row during both the seasons.

Pod damage

The percent pod damage at the time of harvesting was slightly higher during 2009-2010 (6.18 to 58.24 %) compared to 2008-2009 (4.52 to 53.14 %) among the different treatments. The pod damage was lowest (4.52 %) with Coragen at 30 g a.i./ha, but it was found at par with Coragen at 25 g a.i./ha (7.69 %) and Coragen of 20 g a.i./ha (9.58 %). However, these three treatments were found significantly superior in reducing the pod damage due to maruca pod borer over the rest of the treatments and untreated control during both the years (Table .1). The next best treatment was novaluron 10 EC at 200 g a.i./ha with less than 17 percent pod damage during both the years. But it was found on par with lower doses of test insecticide, i.e., Coragen at 10 and 15 g a.i./ha in reducing the pod damage. While, the pod damage was more than 30 percent in chlorpyriphos + dichlorovos at 250 + 380 g ai/ha treated plots during both the seasons which indicating less efficacy against spotted pod borer. However, all the treatments were significantly superior in reducing the pod damage over untreated control which recorded more than 50 percent pod damage.

Natural enemies

The natural enemies such as ladybird beetles, *Coccinella* Spp. and *Scymnus* Spp. and spiders were observed in all the experimental plots during the trial period. The mean population of natural enemies ranged from 1.24 to 2.11 nos/plant and 1.45 to 2.10 nos/plant during 2008-2009 and 2009-2010, respectively. There were no significant differences among the treatments with respect to the population of natural enemies. But, the population of natural enemies was numerically low in all the treatments except novaluron at 200 g ai/ha when compared to the untreated control. However, statistically there were no significant differences among the treatments regarding the incidence of natural enemies which indicating that Coragen had no adverse affects on the population natural enemies (Table 1).

Yield

The treatment of Coragen at 30 g a.i./ha recorded the highest yield with 858 kg/ha and 890 kg/ha in 2008-2009 and 2009-2010, respectively, but it was found statistically on a par with Coragen at 25 g a.i./ha and Coragen at 20 g a.i./ha during both the years. The next best treatment was novaluron at 200 g a.i./ha with more than 640 kg/ha of seed yield during both years. But it was found on par with lower doses of test insecticide, i.e., coragen at 10 and 15 g a.i./ha which recorded seed yield of more than 550 kg/ha. However, all the treatments were found significantly superior over the untreated control which recorded lowest seed yield.

Phytotoxicity

The data regarding phytotoxic effects such as injury on leaf tips, leaf surface, necrosis, epinasty, hyponasty, wilting and vein clearing at 3, 5 and 10 days after spraying revealed that Coragen 20 % SC even at its higher dose of 120 g a.i./ha did not show any phytotoxicity in blackgram crop.

DISCUSSION

The bioefficacy of Coragen was reported earlier reported by some researchers in different crops [4,5,8]. Rynaxypyr 20 SC at 100 g a.i./ha was found to be best with the highest germination percentage and lowest damage to sugarcane buds by termites and minimum infestation (0.12%) by early shoot borer [8]. The efficacy of Rynaxypyr 20 SC at two doses of 30 g a.i/ha and 20 g a.i/ha was proved in reducing larval population of fruit and shoot borer and fruit damage with higher fruit yield in bhendi [5]. Prasad and Rao [4] reported that Chloranthraniliprole at 40 g a.i/ha and 30 g .i/ha exhibited similar efficacy as spinosad and indoxacarb in reducing boll damage by *H. armigera* in cotton. Similarly, Rynaxypyr 20 SC at higher doses of 30 and 40 g a.i./ha was found high effective when compared to its lower doses in reducing the pod damage as well as the population of pod borers in pigeonpea [6].

CONCLUSION

Coragen 20% SC at 30, 25 and 20 g a.i./ha was found effective in reducing the larval incidence and pod damage with highest seed yield and were found on par with each other. Hence, in view of effective pest control with environmental safety and considering the economics of plant protection, the test compound Coragen at 20 g a.i./ha could safely be used for management of legume pod borer in blackgram.

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