Indian Journal of Applied Entomology **27**(2) : 81–85 (2013)

BIOEFFICACY OF FLUBENDIAMIDE 480 SC AGAINST SHOOT AND FRUIT BORER *EARIAS VITELLA* (FABRICIUS) INFESTING OKRA (*ABELMOSCHUS EXCULENTES* L.)

HEMANT SWAMI AND O.P. AMETA

Department of Entomology, Rajasthan College of Agriculture, MPUAT, Udaipur (Raj.) – 313001

ABSTRACT

The bio–efficacy of flubendiamide 480 SC @ 75, 100 and 125 ml/ha along with Cypermethrin 10 EC and Pyridalyl 10 EC each at 500 ml/ha was evaluated against fruit and shoot borer in okra during summer and *kharif* 2012. Flubendiamide 480 SC at 125 ml/ha caused maximum reduction of shoot damage of 6.89, 7.71; 3.42 and 4.15 percent at 7 days after first and second spray during summer and *kharif* 2012, respectively . It was followed by flubendiamide 480 SC at 100 ml/ha which exhibited 9.90, 10.34; 6.75 and 7.69 percent mean shoot damage at 7 days after first and second spray during summer and *kharif* 2012, respectively Similarly, least fruit damage was also observed in Flubendiamide 480 SC at 125 ml/ha followed by Flubendiamide 480 SC at 100 ml/ha. Spray of Flubendiamide 480 SC at 125 ml/ha recorded significantly highest marketable yield of 71.80 and 73.25 q/ha during summer and *kharif* 2012, respectively. It was followed by Flubendiamide 480 SC @ 100 ml, Cypermethrin 10 EC @ 500 ml and Pyridalyl @500 ml/ha.

Key words: E*arias vitella*, Flubendiamide, okra, fruit and shoot borer

INTRODUCTION

Several insecticides have been recommended for the management of okra fruit and shoot borer in India, which mainly belong to organophosphate, organochlorine, and carbamate groups. However, okra being a vegetable crop, reduction in use of harmful insecticide and popularization of use of newer broad spectrum chemicals should be the primary objective in vegetable pest management programme. Flubendiamide is one such new compound and is one that has excellent action on insects with abnormal symptoms such as body contractions and feeding cessation. It causes a gradual contraction of the insect body thickening and shortening without convulsions and activates the ryanodine receptor, a calcium release channel which is involved in muscle contraction. Flubendiamide is a broad spectrum foliar contact insecticide used in wide range of crops against several economically important insect pests of order Lepidoptera. It has activity on all developmental stages of the target insect. The present investigation was undertaken to evaluate the insecticidal property of the compound Flubendiamide against fruit and shoot borer of okra.

MATERIALS AND METHODS

The bio–efficacy of Flubendiamide 480 SC @ 75, 100 and 125 ml/ha along with Cypermethrin 10 EC and Pyridalyl 10 EC each at 500 ml/ha was evaluated against fruit and shoot borer in okra during summer and *kharif* 2012.The experiment was conducted in randomized block design with six treatments replicated four times. Okra variety Arka Anamika was sown on 1st April and 10th July, 2012. Each treatment was applied two times at intervals of seven days. The observation on shoot damage was recorded by counting total number of shoots and infested shoot on five randomly selected plants in each plot. The observation was recorded before and at 5 and 7 days after each spray.

$$\text{Mean shoot damage} = \frac{\text{Number of damaged shoots}}{\text{Total number of shoots}} \times 100$$

The fruit damage caused by fruit and shoot borer was recorded on five randomly selected plants in each replication at each picking by counting the total number of fruits and damaged fruits on 5 plants selected randomly at 3,5and 7 days after each spray. Mean fruit damage was calculated as below:

$$\text{Mean fruit damage} = \frac{\text{Number of damaged fruits}}{\text{Total number of fruits}} \times 100$$

The observations on the population of common predator's *viz.;* grubs and adults of *Coccinella* sp. and *Chrysoperla* sp. was recorded at regular intervals in each replication on 20 plants selected randomly and population per plant was worked out. The mature fruits were picked from each treatment replicate at regular intervals and the healthy fruits were separated and weighed. The weight of healthy fruits of all pickings was pooled together for each treatment separately and marketable yield per hectare was computed.

RESULTS AND DISCUSSIONS

The data on the bio–efficacy of Flubendiamide 480 SC (Fame 480 SC) at 75,100 and 125 ml/ha against shoot and fruit borer, *Earias* spp. recorded in terms of shoot and fruit damage have been presented in Tables 1 to 4.

The mean shoot damage among different treatments ranged from 6.89 to 12.67 and 3.42 to 10.21, 7.71 to 14.89 and 4.15 to 13.34 as against 31.80 and 38.65, 33.65 and 41.29 percent in control at 7days after first and second spray during summer and *kharif* 2012, respectively. All the treatments were significantly superior to untreated control. The lowest shoot damage of 6.89, 7.71, 3.42 and 4.15 percent at 7 days after first and second spray during summer and *kharif* 2012, respectively was recorded in case of Flubendiamide 480 SC at 125 ml/ha. It was followed by Flubendiamide 480 SC at 100 ml/ha which exhibited 9.90, 10.34; 6.75 and 7.69 percent mean shoot damage at 7 days after first and second spray during summer and *kharif* 2012, respectively.

The data presented in Table 3–4 reveal that spray of Flubendiamide 480 SC at 125 ml/ha was most effective in reducing fruit damage in okra and recorded least fruit damage with a mean of 14.09, 10.86, 8.55 and 8.47, 7.31, 2.97 and 14.61, 10.09, 9.38 and 8.40, 7.26 and 3.86 as against 23.43, 28.93, 32.61 and 34.26, 36.71, 37.89 and 23.87, 27.90, 31.90 and 35.93, 37.59 and 39.61 percent in control after first and second spray at 3, 5, and 7 days after application during summer and *kharif* 2012, respectively. It was followed by Flubendiamide 480 SC at 100 ml/ha which exhibited 10.90, 9.92 and 7.46; 10.75, 9.24 and 6.98 mean fruit damage at 3, 5 and 7 days after second spray during summer and *kharif* 2012, respectively. However, all the treatments were found significantly superior over untreated control.

The data on marketable yield of okra in different treatments recorded during summer and *kharif* 2012 have been presented in Table 5. All the treatments yielded significantly higher marketable yield over control. Spray of Flubendiamide 480 SC at 125 ml/ha recorded significantly highest marketable yield of 71.80 and 73.25 q/ha as against 38.72 and 36.95 q/ha in untreated control during, during summer and *kharif* 2012, respectively. It was followed by Flubendiamide 480 SC at 100 ml, Cypermethrin 10 EC at 500 ml and Pyridalyl at 500 ml/ha. The data presented in Table 5 reveal that no significant difference in the population of grub and adults of *Coccinella* spp. and *Chrysoperla* sp. was recorded among different treatments of Flubendiamide 480 SC at 75, 100 and 125 ml/ha along with other treatments and untreated control. It indicates that Flubendiamide 480 SC at 75, 100 and 125 ml/ha did not cause adverse effects on common natural enemies.

The results of study are also in line with findings of Sinha and Nath (2009), who found indoxacarb and chlorpyriphos + cypermethrin effective against *E. vittella.*

Table 1. Effect of Flubendiamide 480 SC on shoot damage caused by okra shoot and fruit borer during summer, 2012

S. No	Treatment g .a .i./ha	Formulation dose ml/ha	Pre–treatment Damage (percent)	Mean shoot damage (%) days after spray			
				First spray		Second spray	
				5 DAS	7 DAS	5 DAS	7 DAS
1.	Flubendiamide 480 SC at 36	75	18.25	22.53 (14.68)	20.85 (12.67)	20.85 (12.66)	18.64 (10.21)
2.	Flubendiamide 480 SC at 48	100	17.75	20.92 (12.75)	18.34 (9.90)	17.79 (9.33)	15.06 (6.75)
3.	Flubendiamide 480 SC at 60	125	18.50	17.22 (8.76)	15.22 (6.89)	16.17 (7.75)	10.65 (3.42)
4.	Cypermethrin 10 SC at 50	500	19.25	21.51 (13.44)	19.64 (11.29)	18.67 (10.24)	17.23 (8.78)
5.	Pyridalyl 10 EC at 50	500	20.75	21.11 (12.97)	20.07 (11.77)	19.16 (10.77)	17.61 (9.15)
6.	Untreated control (Water spray)		18.75	31.42 (27.18)	34.33 (31.80)	36.05 (34.63)	38.44 (38.65)
	S. Em. ±		0.63	0.41	0.42	0.42	0.42
	C. D. at 5 %		1.88	1.26	1.26	1.27	1.26

* Figures in parenthesis are arcsine transformed values of population.

Table 2. Effect of Flubendiamide 480 SC shoot damage caused by okra shoot and fruit borer during *kharif*, 2012

S. No	Treatment g .a .i./ha	Formulation dose ml/ha	Pre– treatment Damage (percent)	Mean shoot damage (%) days after spray			
				First spray		Second spray	
				5 DAS	7 DAS	5 DAS	7 DAS
1.	Flubendiamide 480 SC at 36	75	20.07	23.38 (15.74)	21.88 (13.89)	22.30 (14.39)	21.42 (13.34)
2.	Flubendiamide 480 SC at 48	100	22.25	21.42 (13.34)	18.76 (10.34)	18.42 (9.96)	16.10 (7.69)
3.	Flubendiamide 480 SC at 60	125	20.50	18.68 (10.26)	16.13 (7.71)	15.29 (6.95)	11.75 (4.15)
4.	Cypermethrin 10 SC at 50	500	19.75	23.06 (15.34)	20.40 (12.15)	19.16 (10.77)	17.81 (9.36)
5.	Pyridalyl 10 EC at 50	500	19.75	21.78 (13.77)	22.70 (14.89)	20.00 (11.69)	19.04 (10.64)
6.	Untreated control (Water spray)		22.50	31.87 (27.88)	35.46 (33.65)	39.17 (39.89)	39.98 (41.29)
	S. Em. ±			0.43	0.44	0.46	0.45
	C. D. at 5 %			1.30	1.33	1.39	1.36

* Figures in parenthesis are arcsine transformed values of population.

Table 3. Effect of Flubendiamide 480 SC on fruit damage caused by okra shoot and fruit borer during summer, 2012

S. No	Treatment g .a .i./ha	Formulation dose ml/ha	Pre– treatment Damage (%)	Mean shoot damage (%) days after spray					
				First spray			Second spray		
				3 DAS	5 DAS	7 DAS	3 DAS	5 DAS	7 DAS
1.	Flubendiamide 480 SC at 36	75	19.50	23.78 (16.26)*	22.59 (14.75)	24.95 (17.79)	23.00 (15.27)	21.33 (13.23)	21.11 (12.97)
2.	Flubendiamide 480 SC at 48	100	21.25	23.69 (16.14)	20.57 (12.35)	19.58 (11.23)	19.28 (10.90)	18.36 (9.92)	15.85 (7.46)
3.	Flubendiamide 480 SC at 60	125	20.50	22.05 (14.09)	19.24 (10.86)	17.01 (8.55)	16.92 (8.47)	15.69 (7.31)	9.92 (2.97)
4.	Cypermethrin 10 SC at 50	500	21.25	23.73 (16.19)	22.75 (14.95)	20.10 (11.81)	22.16 (14.23)	19.62 (11.27)	18.22 (9.78)
5.	Pyridalyl 10 EC at 50	500	22.25	24.74 (17.51)	23.02 (15.29)	21.86 (13.86)	21.56 (13.50)	20.38 (12.13)	18.39 (9.95)
6.	Untreated control (Water spray)		19.75	28.95 (23.43)	32.54 (28.93)	34.83 (32.61)	35.83 (34.26)	37.29 (36.71)	37.99 (37.89)
	S. Em. ±			0.41	0.43	0.43	0.47	0.45	0.43
	C. D. at 5 %			1.25	1.31	1.30	1.42	1.36	1.28

* Figures in parenthesis are arcsine transformed values of population.

Chowdary *et al.* (2010) reported lower larval population of *E. vitella* as well as lower fruit damage due to application of spinosad, emamectin benzoate and flubendiamide.

The findings of present studies corroborate with the results obtained by Ameta *et al.,* (2007 and 2010), Mishra (2008) and Jagginavar *et al*., (2009). The new generation chemicals used in this study belong to different groups of IRAC (Insecticide resistance action committee) and offer unique modes of action.

Chlorantraniliprole 18.5% SC and/or flubendamide 39.4% SC can be used to reduce the initial infestation in fields and can be followed by sprays of spinosad 45% SC, indoxacarb14.5% SC and/or chlorfenapyr 10% SC. These chemicals can also be used in rotation for effective management of fruit and shoot borer populations in brinjal.

Several authors have reported efficacy of chlorantraniliprole (Rynaxypyr) 18.5% SC and flubendamide 39.4% SC in managing lepidopteran insect pests such as

Table 4. Effect of Flubendiamide 480 SC on fruit damage caused by okra shoot and fruit borer during *kharif*, 2012

S. No	Treatment g .a .i./ha	Formulation dose ml/ha	Pre–treatment Damage (%)	Mean shoot damage (%) days after spray					
				First spray			Second spray		
				3 DAS	5 DAS	7 DAS	3 DAS	5 DAS	7 DAS
1.	Flubendiamide 480 SC at 36	75	20.50	24.28 (16.91)*	23.10 (15.39)	21.93 (13.95)	24.53 (17.24)	23.14 (15.44)	21.45 (13.37)
2.	Flubendiamide 480 SC at 48	100	21.75	23.53 (15.93)	22.07 (14.11)	20.44 (12.19)	19.14 (10.75)	17.70 (9.24)	15.32 (6.98)
3.	Flubendiamide 480 SC at 60	125	21.00	22.48 (14.61)	18.52 (10.09)	17.83 (9.38)	16.84 (8.40)	15.63 (7.26)	11.33 (3.86)
4.	Cypermethrin 10 SC at 50	500	20.25	24.83 (17.63)	23.49 (15.89)	21.37 (13.27)	21.10 (12.96)	20.24 (11.96)	18.68 (10.25)
5.	Pyridalyl 10 EC at 50	500	19.75	23.84 (16.34)	22.07 (14.11)	22.97 (15.23)	21.95 (13.97)	20.61 (12.39)	19.55 (11.19)
6.	Untreated control (Water spray)	–	21.75	29.25 (23.87)	31.89 (27.90)	34.39 (31.90)	36.83 (35.93)	37.81 (37.59)	39.00 (39.61)
	S. Em. ±			0.45	0.41	0.42	0.44	0.44	0.43
	C. D. at 5 %			1.36	1.23	1.25	1.34	1.31	1.28

*Figures in parenthesis are arcsine transformed values of population.

Table 5. Effect of Flubendiamide 480 SC on natural enemies and marketable yield of Okra

S. No.	Treatments	Formulation dose (ml or g/ha)	Natural enemies/plant 2012 (Mean of two seasons)				Marketable yield (q/ha) 2012	
			Coccinella spp.		*Chrysoperla* sp.			
			Grub	Adult	Grub	Adult	Summer	Kharif
1	Flubendiamide 480 SC at 36	75	0.90 (0.31)*	0.94 (0.38)	0.90 (0.31)	0.88 (0.27)	50.47	49.68
2.	Flubendiamide 480 SC at 48	100	0.88 (0.27)	0.93 (0.36)	0.94 (0.38)	0.89 (0.29)	64.25	66.20
3.	Flubendiamide 480 SC at 60	125	0.89 (0.29)	0.92 (0.34)	0.92 (0.35)	0.87 (0.25)	71.80	73.25
4.	Cypermethrin 10 SC at 50	500	0.87 (0.26)	0.95 (0.40)	0.89 (0.30)	0.86 (0.24)	63.18	64.81
5.	Pyridalyl 10 EC at 50	500	0.88 (0.27)	0.95 (0.40)	0.92 (0.35)	0.87 (0.25)	60.90	58.68
6.	Untreated control (Water spray)	–	0.90 (0.29)	0.95 (0.40)	0.92 (0.35)	0.85 (0.22)	38.72	36.95
	S. Em. ±	–	0.006	0.008	0.007	0.007	3.14	3.06
	C.D. at 5%	–	NS	NS	NS	NS	9.47	9.23

*Figures in parenthesis are arcsine transformed values of population

gram pod borer, okra shoot and fruit borer, rice stem borer complex in various crops (Latif *et al*., 2009, Tatagar *et al*., 2009, Temple e*t al*., 2009, Chowdary *et al*., 2010, Mandal *et al*., 2010).The high efficacy of flubendiamide against *Helicoverpa* has also been confirmed by Lakshmi Narayana and Rajashri (2006) and Meena *et al.* (2006).

ACKNOWLEDGEMENT

The senior author is thankful to Bayer Crop Science Ltd. for providing financial assistance and Director Research, MPUAT, Udaipur, Dean,RCA, Udaipur and Head, Department of Entomology for providing necessary facilities to carry out the present research work.

REFERENCES

Ameta O.P**.**, Kumar, Ajay. And Dashora P.K. 2010.Efficacy of Flubendiamide 480 SC against shoot and fruit borer, *Leucinodes orbonalis* (Guen) in brinjal. *Pestology*, **34** : 41– 45.

Ameta, O. P. and Bunker, G. K. 2007. Efficacy of Flubendiamide against fruit borer, *Helicoverpa armigera in tomato* with safety to natural enemies. *Indian Journal of Plant Protection*, **35** : 235–37.

Chowdary, L. R., Bheemanna, M. and Kumar, L. R. (2010). Field efficacy of rynaxypyr (coragen) 20 SC against fruit and shoot borer, *E. vitella* (Fab.) in okra. *International Journal of Plant Protection,* **3**: 316–318.

Jagginavar S. B., Sunitha N. D. and Biradar, A. P. 2009. Bioefficacy of flubendiamide 480 SC against brinjal fruit and shoot borer, *Leucinodes orbonalis* Guen. *Karnataka Journal of Agricultural Sciences* **22:** (3–Spl. Issue) 712–713.

Lakshmi Narayana, S. and Rajasri, M. (2006). Flubendiamide 20 WDG (RIL–038)–A new molecule for the management of American bollworm, *Helicoverpa armigera* on cotton. *Pestology,* **30** : 16–18.

Latif, M. A., Rahman, M. M., Alam, M. Z., Hossain, M. M. and Solaiman, A. R. M. 2009. Threshold based spraying of flubendamide for the management of brinjal shoot and fruit borer, *Leucinodes orbonalis* Gunee (Lepidoptera: Pyralidae) in eggplant. *Journal of Entomological Society of Iran*, **29:** 1–10.

Mandal, Swapan K, Karam, Nilim, Das and Arup 2010. Bioefficacy of Rynaxypyr 0.4%g (ferterra 0.4g), a new molecule, against stem borer complex of rice, 3rd International Rice congress, Hanoi, Vietnam, 8–12 November, 2010.

Meena, R.S.; Srivastava, C.P. and Joshi, N. (2006). Bioefficacy of some newer insecticides against the major insect pests of short duration pigeonpea. *Pestology.* **30**: 13–16

Mishra, N. C. and Dash, D. 2007. Evalution of synthetic and Neem based pesticide schedule against shoot and fruit borer (*Leucinodes orbonalis* Guen) on brinjal. *Journal of Plant Protection and Environment* **4:** 93–96.

Naresh Kanwar , Ameta O.P.2011. Dissipation kinetics of residue of Flubendiamide 480SC in/on tomato. *Indian journal of Applied Entomology.* **25**: 15–17.

Sinha, S. R. and Nath, V. (2009). Efficacy of insecticides and mixtures against insect pest of okra. *Annals of Plant Protection Science.* **17** : 328–331.

Tatagar, M. H., Mohankumar, H. D., Shivprasad, M. and Mesta, R. K. 2009. Bio–efficacy of flubendamide 20WG against chilli fruit borers *Helicoverpa armigera* and *Spodoptera litura. Karnataka Journal of Agricultural Science.* **22** (3–Spl. issue) **:** 579–581**.**

Temple, J. H., Pommireddy, P. L., Cook, D. R., Marcon, P. and Leonard, B. R. 2009. Susceptibility of selected lepidopteran pests to Raynaxpyr, a novel insecticide. *Journal of Cotton Science* **13:** 23–31.