Annals of Plant Sciences 8.3 (2019) pp.3514-3516

ANNALS OF PLANT SCIENCES
ISSN: 2287-688X
OPEN ACCESS
www.annalsofplantsciences.com

Research Article

Efficacy of new insecticide molecules against leaf eating caterpillar, *Diaphania indica* in bitter gourd

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Abstract: Field experiment was conducted to evaluate the efficacy of seven new insecticides against leaf-eating caterpillar, *Diaphania indica* in bitter gourd, being maintained by farmer field in Thuyyaneri, Madurai district, Tamil Nadu. It revealed that Chlorantraniliprole @ 150ml/ ha was most effective, followed by Chlorantraniliprole 18.5 SC 125 ml/ha, spinosad 45 % SC 160 ml/ha, Thiodicarb 75 %WP 750 g/ha, and Imidacloprid 17.8 SL 250 ml/ha, were moderately effective. While Dichlorovos 76 %EC 325 ml/ha and spiromesifen 22.9 SC 500 ml/ha, were least effective against bitter gourd leaf-eating caterpillar.

Keywords: Bitter gourd; *Diaphania indica*; insecticides; field efficacy

Introduction

Bitter gourd (*Momordica charantia* L.; Cucurbitacae) is one of India's important cucurbitaceous vegetables. Among the cucurbits, it is considered a prized vegetable because of its high nutritive value. It ranks first among cucurbits in terms of nutritional value, being rich in iron, phosphorus, and ascorbic acid [1]. Numerous medicinal uses have been documented or claimed particularly, with reference to diabetes treatment [5] and prevention of breast cancer [12]. Insect pests are the major constraint for increasing the production and productivity of this crop. Several insect pests attack it during different growth stages, including melon fruit fly, *Bactrocera cucurbitae*, Epilachna beetle, *Henosepilachna vigintioctopunctata*, pumpkin beetle, *Aulacophora foveicollis,* pumpkin caterpillar, *Diaphania indica*, and white fly, *Bemisia tabaci*. Among these *D. indica* is chiefly an oligophagous pest of Cucurbitaceae [2]. Though principally a leaf feeder, the pumpkin caterpillar is also known to infest flowers, new tender shoots, and young and mature fruits. Attack on fruits reduces its commercial value, leading to substantial crop losses during outbreaks [4]. To overcome these escalating insect pest problems, farmers solely rely on pesticides. Hence, the present study is focused on optimizing the field dose of certain new insecticides for the management of leaf-eating caterpillar under bitter gourd ecosystem

Materials and Methods

The field experiment was conducted at two farmers field namely, Thuyyaneri (Field experiment I) village of Madurai District, Tamil Nadu. The experiment was laid out in a randomized block design with three replications. The crop was sown on 17th August (2017), with the variety Akash (Hybrid). The plot size was 5 x 3m. There were eight treatments (Chlorantraniliprole 18.5 SC @ 150ml/ha, Chlorantraniliprole 18.5 SC @ 125ml/ha, Spinosad 45 % SC @ 160 ml/ha, Imidacloprid 17.8 SL @ 250ml/ha, Spiromesifen 22.9 SC @ 500 ml/ha, Thiodicarb 75% WP 750 ml/ha, Dichlorovos 76% EC 325 ml/ha, including control); which were given as foliar spray with a knapsack sprayer, with the first application done at 40 days after planting and second done at fortnightly interval. The data on the leaf-eating caterpillar population were recorded from randomly selected ten tagged plants in each plot. Pre-treatment count was taken just one day before the sprays and the post-treatment counts on the 3rd, 7th, 10th, and 14th days after, and the yield was recorded on harvest (weekly intervals). The data obtained were transformed into square root values and subjected to statistical analysis.

Results and Discussion

Field experiment I

After 1st spray: All the treatments proved significantly superior over control (6.42 larvae/ plant) with the most effective one being Chlorantraniliprole 150ml/ ha (1.23 larvae/plant). This was followed by Chlorantraniliprole 125 ml/ ha (1.54 larvae /plant). Spinosad 160 ml/ha, and Thiodicarb 75% WP 750 g/ha were statistically on par with each other. Chlorantraniliprole 150ml/ ha was significantly superior compared to Thiodicarb 750g/ha, Dichlorovas 325 ml/ha, and Spiromesifen 500 ml/ha.

After seven days, Chlorantraniliprole 150ml/ ha (0.80 larvae/ plant) was the most effective followed by Chlorantraniliprole 125 ml/ ha and Spinosad 160 ml/ha (0.97 and 1.53 larvae/ plant, respectively).

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The next best treatments are Imidacloprid 250 ml/ha and thiodicarb 750 g/ha (1.24 and 1.20), which are statistically are at par with each other. After ten days again Chlorantraniliprole 18.5 SC 150ml/ ha (1 larvae/ plant) was the most effective followed Chlorantraniliprole 18.5 SC 125 ml/ ha (1.07 larvae/ plant). This was followed by Spinosad 45 % SC, Thiodicarb 75%WP, and Spiromesifen 22.9 SC (1.27, 1.32 and 1.94 larvae/ plant, respecttively). The order of effectiveness after ten days after application was found to be Chlorantraniliprole 150ml/ ha > Chlorantraniliprole 125 ml/ ha > Spinosad 160 ml/ha> Thiodicarb 750g/ha> Imidacloprid 250 g/ha > Spiromesifen 500ml/ha > Dichlorovos 325 ml/ha. (Table 1).

Table 1. The population of *D. indica* as influenced by Newer molecular insecticides in Bitter gourd - Field experiment I (Aug 2017 – Dec 2017)

Treatment	Dosage	PTC	Number of larvae / plants*								Reduction over control (%)	Yield
			I Spray			II Spray						
			7 DAS	10DAS	14 DAS	3 DAS	7 DAS	10DAS	14 DAS	MEAN		
T1-Chlorantraniliprole 18.5% SC	125 ml/ha	5.42	31.8 (5.64)^{b}	0.95 (0.97)^{b}	1.15 (1.07)^{b}	1.56 (1.25)^{b}	0.78 (0.88)^{b}	0.33 (0.57)^{b}	0.62 (0.79)^{b}	0.86 (0.93)^{b}	0.98 (0.98)^{b}	87.50	31.8 (5.64)^{b}
T2-Chlorantraniliprole 18.5 % SC	150ml/ha	5.56	33.5 (5.79)^{a}	0.64 (0.80)^{a}	1.00 (1.00)^{a}	1.35 (1.16)^{a}	0.62 (0.79)^{a}	0.22 (0.47)^{a}	0.48 (0.69)^{a}	0.69 (0.83)^{a}	0.78 (0.88)^{a}	90.05	33.5 (5.79)^{a}
T3-Spinosad 45 % SC	160ml/ ha	5.25	30.9 (5.56)^{c}	1.53 (1.24)^{c}	1.61 (1.27)^{c}	1.78 (1.33)^{c}	0.98 (0.99)^{d}	0.52 (0.72)^{c}	0.76 (0.87)^{c}	0.97 (0.98)^{c}	1.41 (1.19)^{c}	82.01	30.9 (5.56)^{c}
T4-Imidacloprid 17.8 % SL	250ml/ha	5.36	28.2 (5.31)^{e}	3.37 (1.84)^{d}	3.62 (1.90)^{d}	3.79 (1.95)^{d}	2.92 (1.71)^{e}	2.47 (1.57)^{d}	3.22 (1.79)^{e}	3.46 (1.86)^{e}	3.39 (1.84)^{d}	56.76	28.2 (5.31)^{e}
T5-Spiromesifen 22.9 % SC	500 ml/ha	5.65	26.8 (5.18)^{g}	3.51 (1.87)^{e}	3.75 (1.94)^{d}	3.93 (1.98)^{d}	2.97 (1.71)^{e}	2.69 (1.64)^{e}	3.25 (1.80)^{e}	3.57 (1.89)^{e}	3.50 (1.87)^{d}	55.35	26.8 (5.18)^{g}
T6-Thiodicarb 75 % WP	750 g/ha	5.2	28.9 (5.38)^{d}	1.52 (1.23)^{c}	1.73 (1.32)^{c}	1.85 (1.36)^{c}	0.92 (0.96)^{c}	0.52 (0.72)^{c}	0.80 (0.89)^{c}	0.98 (0.99)^{c}	1.43 (1.20)^{c}	81.76	28.9 (5.38)^{d}
T7-Standard check – Dichlorovos 76 % EC	400ml/ha	5.45	27.6 (5.25)^{f}	3.57 (1.89)^{e}	3.82 (1.95)^{d}	3.95 (1.99)^{d}	3.18 (1.78)^{f}	2.68 (1.64)^{e}	2.8 (1.67)^{d}	3.25 (1.80)^{d}	3.43 (1.85)^{d}	56.25	27.6 (5.25)^{f}
T8-Untreated check		6.35	23.6 (4.86)^{h}	6.79 (2.61)^{f}	7.12 (2.67)^{e}	7.59 (2.75)^{e}	8.23 (2.87)^{g}	8.39 (2.90)^{f}	8.91 (2.98)^{f}	9.26 (3.04)^{f}	7.84 (2.80)^{e}	-	23.6 (4.86)^{h}
S.Ed			0.018	0.015	0.024	0.022	0.015	0.011	0.019	0.018	0.022		0.066
CD(0.05)			0.039	0.032	0.053	0.047	0.033	0.023	0.041	0.039	0.048		0.144

PTC=Pre-Treatment Count, DAS= Day(s) after spraying, NS – Non-significant
*Each value is the mean of three replications
Figures in parenthesis are square root transformed values
In a column, means followed by same letter(s) are not significantly different by LSD (p= 0.05)

After 14 days, Chlorantraniliprole 18.5 SC @ 150ml /ha with 1.16 larvae/ plant was the most effective followed by Chlorantraniliprole18.5 SC @ 125 ml/ ha (1.25 larvae/ plant), Spinosad 45% SC (1.33 larvae/ plant). Then Imidacloprid 17.8 SL (1.90 larvae/ plant), Spiromesifen 22.9 SC (1.94 larvae/plant) and Dichlorovos 76% EC (1.95 larvae /plant) were statistically at par to each other.

After 2nd spray: The pre-treatment mean aphid population was observed to vary from 5.20 to 6.35 larvae/plant, with differences being non-significant. After 1st spray, all the treatments were found significantly superior in reducing the leaf eating caterpillar, but with considerable variations in efficacy. The minimum population of leaf eating caterpillar was recorded in Chlorantraniliprole 18.5 SC @ 150ml/ ha (with 0.79 larvae/ plant), followed by Chlorantraniliprole18.5 SC @ 125 ml/ ha (0.88 larvae/ plant) and thiodicarb 75% WP @ 750g/ha (0.92 larvae/ plant) and with order of effectiveness at third day after application being – Chlorantraniliprole 18.5 SC 150ml/ ha > Chlorantraniliprole 18.5 SC 125 ml/ ha > Thiodicarb 75%WP > Spinosad 45 % SC >Imidacloprid 17.8 SL > Spiromesifen 22.9%SC > Dichlorovos 76 % EC.

After seven days, again all the treatments were significantly superior, with the most effective one being Chlorantraniliprole 18.5 SC 150ml/ ha (0.47 larvae/ plant) followed by Chlorantraniliprole 18.5 SC 125 ml/ ha (0.57 larvae/ plant), Spinosad 45% SC, Imidacloprid 17.8 SL, Spiromesifen 22.9% SC and Dichlorovos 76 % EC (with the larval populartions of 0.72, 1.57, 1.64 and 1.63 larvae/ plant respecttively). After ten days, Chlorantraniliprole 18.5 SC 150ml/ ha (0.69 larvae/ plant) was most effective followed by Chlorantraniliprole 18.5 SC 125 ml/ ha (0.79 larvae/ plant). Then spinosad 45 %EC and thiodicarb 75% WP (with 0.87 and 0.89 larvae/ plant) were statistically at par to each other.

Fourteen days after application the most effective one was Chlorantraniliprole 18.5 SC 150ml/ha (0.83 larvae/ plant) followed by Chlorantraniliprole 18.5 SC 125 ml/ha (0.86 larvae/ plant). The next best treatments are Spinosad 45%SC, Thiodicarb 75% WP and Dichlorovos 76% EC (0.98, 0.99 and 3.25 larvae/ plant, respectively).

Fruit Yield

The observations on yield were also taken, in this**,** the highest yield was recorded in the treatment Chlorantraniliprole 18.5 SC 150 ml/ha (33.5 t/ha). This was followed Chlorantraniliprole 18.5 SC 125 ml/l (31.8 t / ha) followed by a spray of Spinosad 45 % SC @ 160 ml/ha (30.9 t/ha), Thiodicarb 75% WP 750 g/ha (28.9t/ha), Imidacloprid 17.8% SL 250 ml/ha (28.2 t/ha), Dichlorovos 76% EC 325

ml/ha (27.6 t/ha) and Spiromesifen 22.9% SC 500 ml /ha (26.8 t/ha) and all these treatments were superior over control (23.6 t/ha).

Overall efficacy:

The overall efficacy data revealed that Among the newer insecticide molecules, Chlorantraniliprole 18.5 SC 150ml/ ha was consistently most effective, followed by Chlorantraniliprole18.5 SC 125 ml/ ha and spinosad 45% SC, Thiodicarb 75% WP, and Dichlorovos 76% EC were moderately effective. At the same time, Imidacloprid 17.8 SL was less effective, followed by Spiromesifen 22.9%SC. The findings on the overall efficacy of two sprays of Chlorantraniliprole 18.5 SC corroborate with those of [10] who reported that Chlorantraniliprole 18.5 SC had significantly reduced the larval population of *Diaphania indica*. According to [14] and [6] rynaxypyr @ 30 g a.i/ha was effective against larval population of *Spodoptera litura* and *Helicoverpa armigra* in chilli. Likewise [3] reported that rynaxypyr @ 30 g a.i. /ha was found to be most effective in reducing larval population of pod borer and plume moth. Similarly, these findings were also in with the findings of [9], [11], [13], and [7] The data on fruit yield were also in corroborated with the findings of [8], who reported that Chlorantraniliprole treated plot recorded maximum marketed yield (32.03 t /ha) followed by Spinosad (30.93 t/ha) respectively in brinjal fruits.

References

1. Awasthi, C. P., & Jaiswal, R. C. (1986). Biochemical composition and nutritional quality of fruits of bitter gourd grown in Uttar Pradesh. Prog. Hort., 18, 265-269.
2. Ayyar, T. V. R. 1940. Hand Book of Economic Entomology for South India. Govt. Of Madras press, 536p.
3. Bhosale BB, Nishantha KM, Patinge NR, Kadam DR. Comparative efficacy of microbial insecticides with new insecticide molecule E2Y45 against pod borer complex pigeon pea. Pestology. 2009; 33:38-42
4. Choi, K. M, Han S.C, Lee, M. H, Cho. W.S., Ahn S. B., And, Lee S. H. Ecology and control of pests in vegetable crop. Natl. Inst. Agric. Sci. Technol. RDA 1990; 224.
5. Grover, J. K, Yadav. S, And Vats. V., Medicinal plants of India with anti-diabetic potential, *J.* Ethno pharmacology 2002; 81: 81-100.
6. Hosamani AC, Sharanabasappa, Bheemanna M, Sreenivas AG, Suresh BK, Shivaleela *et al.* Bioefficacy of Chloranthraniliprole against chilli fruit borer complex in irrigated chilli ecosystem. Pesticide Research Journal. 2008; 20:240-242
7. Jarrod T, Gus Lorenz, Kyle Colwell, Craig Shelton, Richard Edmund. Rynaxypyr: A Novel Insecticide for Control of Heliothines in Conventional and Bollgard Cotton. Belt wide Cotton Conference, Memphis. 2008, 8-11.
8. Mainali RP, Peneru RB, Pokhrel P, Giri YP. Field Bio-Efficacy of Newer Insecticides against Eggplant Fruit and Shoot Borer, *Leucinodes orbonalis* Guenee. *International Journal of Applied Science and Biotechnology*. 2015; 3:4-12.
9. Misra HP. New promising insecticides for the management of brinjal shoot and fruit borer, *Leucinodes orbonalis Guenee.* Pest Management of Horticultural Ecosystems. 2008; 14:140-147.
10. Nagaraju, M.C. Nadagouda S, Hosamani. A.C, and Hurali.S. Field evaluation of insecticides for the management of cucumber moth, *Diaphania indica* (Saunders) (Lepidoptera: Crambidae) on bitter gourd 2018;
11. Rajavel DS, Pandi R, Usha Rani B. Efficacy of Rynaxypyr 20% SC in the control of Sugarcane early shoot borer *Chilo infuscatellus* (Snell). Pestology. 2009; 33:41-43
12. Ray, R. B., A. Raychoudhuri, R. Steele., And P. Nerurkar, Bitter melon (*Momordica charantia*) extract inhibits breast cancer cell proliferation by modulating cell cycle regulatory genes and promotes apoptosis, Cancer Res., 2010; 70: 1925-1931
13. Singh J, Prasad CS, Sirohi A, Kumar A, Ali N. Field evaluation of Rynaxypyr 20 SC against Insect pests of Sugarcane. Annual Plant Protection Science. 2009; 17:50-52
14. Vinod SK. Seasonal incidence of insect pests of cucumber and their management through newer molecules of insecticides. M. Sc. (Agri) Thesis 2010; the University of Agricultural Science, Raichur.

Cite this article as:

Janani M., Usha Rani B., and K. Suresh. Efficacy of new insecticide molecules against leaf-eating caterpillar, *Diaphania indica* in bitter gourd. Annals of Plant Sciences 8.3 (2019) pp. 3514-3516.

http://dx.doi.org/10.21746/aps.2019.8.3.3

Source of support: Nil; **Conflict of interest:** Nil.