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Bio-efficacy of newer molecules against whitefly (*Bemesia tabaci*, Genn.) infesting cucumber (*Cucumis sativus* L.)

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Abstract

Two field experiments were conducted at the Department of Entomology, College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar during kharif, 2016 and rabi, 2016-17 to evaluate the bio-efficacy of eight insecticides against whitefly, *Bemesia tabaci* Gennadius infesting cucumber *Cucumis sativus*. Both kharif and rabi seasons revealed that 15 days after spraying (DAS) of insecticides, a moderate level of suppression (below 70%) of whitefly population/5 leaves was observed. But all the insecticides evaluated except fipronil (7.67) recorded significantly lower population of whitefly/5 leaves at 15 DAS (3.67-5.67) compared to control (14.56) during kharif, 2016 registering 54.17 to 69.32% reduction over control. On the contrary, Fipronil and Chlorantraniliprole (5.67-7.67) registered significantly higher population of whitefly/5 leaves at 15 DAS compared to other insecticides (3.78-5.33) and control (10.44). The level of suppression in the best treatments viz., Tolfenpyrad, Indoxacarb, Flubendiamide, Spinosad, Cartap hydrochloride and Acephate at 15 DAS during rabi, 2016-17 ranged from 50.21-65.37% over control.

Keywords: Cucumber, whitefly, insecticide, kharif, rabi

Introduction

India being the second largest producer of vegetables in the world next to China cultivates a number of gourd crops. Cucumber (*Cucumis sativus* L.) is one of the important gourd crops grown throughout India. The crop is attacked by a good number of insect pests and mites, of which the whitefly, *Bemesia tabaci* Genn. is one. It attacks the crop during both vegetative and reproductive stages and is a vector of yellow mosaic virus of cucumber crop affecting the vigour and resulting in drastic reduction in yield. Farmers usually rely heavily on the use of conventional synthetic insecticides (Bacci *et al*., 2007; Wafaa and AL-Kherb, 2011; Misra, 2012; Bajpai *et al*., 2014; Golmohammadi *et al*., 2014; Patra *et al*., 2016) for its control, although IPM technologies for its management in other crops are available. Hence, some newer insecticides belonging to different chemical groups have been evaluated in the field against this pest in the present study.

Materials and Methods

Two field experiments were conducted in a randomized block design during kharif, 2016 and rabi, 2016-17 to evaluate the bio-efficacy of some newer insecticides against the whitefly at the experimental farm of Department of Entomology, College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar, Odisha. It is located at a latitude of 20° 15''N and longitude of 85°52''E, with an altitude of 25.9 m above MSL and 64 kms west of Bay of Bengal. Cucumber variety "Machaar" was grown in plots of size 3.5m x 4m during both seasons with a spacing of 1.5m x 1.5m between pits. The crop was grown with package of practices recommended for the state except plant protection. There were nine treatments replicated three times. The insecticides treatments included, T_1 = Tolfenpyrad 15% EC @ 150 g a.i./ha, T_2 = Fipronil 5% SC @ 50 g a.i./ha, T_3 = Indoxacarb 14.5% SC @ 72.50 g a.i./ha, T_4 = Flubendiamide 480 SC @ 78.70 g a.i./ha, T_5 = Chlorantraniliprole 18.5% SC @ 30.83 g a.i./ha, T_6 = Spinosad 45% SC @ 75 g a.i./ha, T_7 = Cartap hydrochloride 50% SP @ 375 g a.i./ha, T_8 = Acephate 75% SP @ 375 g a.i./ha and T_9 = untreated control. The pesticide treatments were imposed first on appearance of the pest, the second and third sprays were done at 20 days interval with a hand compression sprayer using 500 litres of spray fluid/ ha. Observations were recorded in the morning hours (8.00 A.M.) on the adult population of whiteflies per 5 leaves at random from each treatment plots at 1 day before spraying (DBS) and at 5, 10 and 15 days after spraying (DAS) both during *Kharif* and rabi seasons. The data were subjected to square root transformation before statistical analysis following Gomez and Gomez (1984) to test the significance of treatment effects and arrive at a meaningful conclusion.

Results and Discussion

The whitefly population per 5 leaves did not vary significantly (8.77-11.11) during kharif, 2016 depicting a uniform distribution of the pest throughout the experimental plot on 1 DBS (Table 1). All the insecticides evaluated controlled whitefly up to 15 DAS to some extent compared to untreated control (UTC). Among the insecticides T_6, T_7, T_8 proved superior in suppressing whitefly population (0.67-1.33/ 5 leaves) compared to other insecticides evaluated and control (12.89/5 leaves) on 5 DAS during kharif, 2016. On 15 DAS the same treatments proved superior in supressing whitefly population (3.67-5.4.33/5 leaves) moderately (65.80-68.07% reduction over control) except Fipronil (7.67/5 leaves) and control (14.56/5 leaves).

The whitefly population per 5 leaves did not vary significantly (10.16-11.06) during rabi, 2016-17 depicting a uniform distribution of the pest throughout the experimental plot on 1 DBS (Table 2). All the insecticides evaluated controlled whitefly up to 15 DAS to some extent compared to untreated control (UTC).

On 5 DAS during rabi 2016-17 only 2 treatments *viz.*, T_7 and T_8 proved superior in suppressing whitefly population (1.33/5 leaves) compared to other treatments (2.67-4.67/5 leaves) and control (9.22/5 leaves). On 10 DAS, all the insecticides (2.44-3.78/5 leaves) except fipronil and flubendiamide (2.89-5.44/5 leaves) registered significantly lower populations of whiteflies compared to control (10.11/5 leaves). On 15 DAS, moderate suppression of whitefly population /5 leaves (50.21-65.37% reduction over control) was observed in tolfenpyrad, indoxacarb, flubendiamide, Spinosad, cartap and acephate (3.89-4.88) compared to other treatments and UTC (10.44).

Superior control of whitefly- a vector of yellow vein mosaic virus was recorded in all the chemicals evaluated except Fipronil, compared to control during kharif, 2016 with moderate level of suppression (54.17 to 69.32%) and rabi, 2016-17 (47.23-65.37%). Bajpai *et al*. (2014) observed maximum reduction of 92.66 to 99.22 and 93.10 to 98.61% control of whitefly in okra during rabi and kharif, respectively with the application of a new molecule tolfenpyrad 150 g a.i./ha which confirms the present finding in cucumber with a reduced magnitude of control during kharif, 2016 and rabi, 2016-17. Bacci *et al.* (2007) reported 80% mortality of whiteflies with the application of Cartap in the sweet potato crop at field rate. Bokan *et al.* (2016) reported spinosad 45 SC @ 135 g a.i/ha was found effective in reducing whitefly population in chilli. Bharati and Shetgar (2016) found spinosad 0.005% to be most effective insecticide in suppressing whitefly population upto 14 days after application in brinjal, which is in line with the present finding.

Thus, it may be concluded from the present study that newer chemicals like Tolfenpyrad 15% EC @ 150 g a.i./ha, Indoxacarb 14.5% SC @ 72.50 g a.i./ha, Flubendiamide 480 SC @ 78.70 g a.i./ha, spinosad 45% SC @ 75 g a.i./ha, along with conventional chemicals like cartap hydrochloride 50% SP @ 375 g a.i./ha and acephate 75% SP @ 375 g a.i./ha could register more than 50% suppression of the whitefly population 15 days after application on cucumber during both kharif and rabi seasons. Fipronil 5% SC @ 50 g a.i./ha and Chlorantraniliprole 18.5% SC @ 30.83 g a.i./ha did not give satisfactory control of the whitefly adults up to 15 days of application.

Table 1. Bioefficacy of different chemicals against whitefly at Bhubaneswar during kharif, 2016

Tr. No.	Treatments	Dose g/ml, a.i/ha	No. of whitefly/ 5 leaves, *Kharif*, 2016				Reduction over control (%) At 15 DAS
			1 DBS	5 DAS	10 DAS	15 DAS	
T_1	Tolfenpyrad 15% EC	150	9.77 (3.20)	3.33 (1.96)	4.67 (2.27)	5.33 (2.41)	58.37
T_2	Fipronil 5% SC	50	10.44 (3.31)	6.66 (2.68)	7.00 (2.74)	7.67 (2.86)	43.94
T_3	Indoxacarb 14.5% SC	72.5	9.77 (3.20)	3.77 (1.22)	4.44 (2.62)	3.33 (2.41)	58.37
T_4	Flubendiamide 480 SC	78.7	9.33 (3.14)	3.85 (2.09)	4.78 (2.80)	5.44 (2.44)	55.51
T_5	Chlorantraniliprole 18.5% SC	30.83	9.44 (3.15)	5.77 (2.50)	6.33 (2.61)	5.67 (2.48)	54.17
T_6	Spinosad 45% SC	75.0	9.66 (3.19)	0.67 (1.08)	2.44 (1.71)	4.33 (1.20)	65.80
T_7	Cartap hydrochloride 50% SP	375	9.40 (3.15)	1.33 (1.35)	2.78 (1.81)	3.78 (2.07)	69.32
T_8	Acephate 75% SP	375	8.77 (3.04)	1.00 (1.22)	2.00 (1.58)	3.67 (2.04)	68.07
T_9	Control	Water spray	11.11 (3.41)	12.89 (3.66)	13.07 (3.76)	14.56 (3.88)	
SE(m)±			(0.09)	(1.11)	(0.15)	(0.15)	
CD (P=0.05)			NS	(0.33)	(0.46)	(0.44)	
C.V (%)				9.41	11.28	10.24	

Figures in the parentheses are √(x+0.5) transformed values, DBS = Day Before Spraying, DAS= Days After Spraying

Table 2. Bioefficacy of different chemicals against whitefly at Bhubaneswar during rabi, 2016-17

Tr. No.	Treatments	Dose g/ml, a.i/ha	No. of whitefly/ 5 leaves, rabi, 2016-17				Reduction over control (%) at 15 DAS
			1 DBS	5 DAS	10 DAS	15 DAS	
T_1	Tolfenpyrad 15% EC	150	10.58 (3.33)	3.33 (1.96)	3.78 (2.07)	4.67 (2.27)	56.54
T_2	Fipronil 5% SC	50	11.06 (3.40)	4.67 (2.27)	5.44 (2.44)	7.67 (2.86)	31.71
T_3	Indoxacarb 14.5% SC	72.5	10.24 (3.28)	2.67 (1.78)	2.89 (1.84)	4.88 (2.31)	53.07
T_4	Flubendiamide 480 SC	78.7	10.54 (3.32)	2.67 (1.78)	2.89 (1.84)	4.88 (2.31)	50.21
T_5	Chlorantraniliprole 18.5% SC	30.83	10.58 (3.33)	2.89 (1.84)	3.78 (2.07)	5.67 (2.48)	47.23
T_6	Spinosad 45% SC	75.0	10.16 (3.25)	2.89 (1.84)	3.33 (1.95)	4.78 (2.30)	53.67
T_7	Cartap hydrochloride 50% SP	375	10.54 (3.32)	1.33 (1.35)	2.67 (1.78)	3.78 (2.07)	64.69
T_8	Acephate 75% SP	375	11.06 (3.40)	1.33 (1.35)	2.44 (1.71)	3.89 (2.10)	65.37
T_9	Control	Water spray	10.28 (3.28)	9.22 (3.12)	10.11 (3.26)	10.44 (3.31)	
SE(m)±			(0.11)	(0.06)	(0.06)	(0.08)	
CD (P=0.05)			NS	(0.18)	(0.18)	(0.24)	
C.V (%)				9.19	10.93	9.56	

Figures in the parentheses are √(x+0.5) transformed values, DBS = Day Before Spraying, DAS= Days After Spraying

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