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Bioefficacy of imidacloprid 17.8 SL against whitefly, *Bemisia tabaci* (Gennadius) in brinjal

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A B S T R A C T

Field experiments were conducted in two crop seasons during 2010 and 2011 with brinjal (*var* Muktakeshi) to evaluate the efficacy of chloro-neonicotinoid as foliar application against whitefly, *Bemisia tabaci* (Gennadius). Imidacloprid 17.8 SL @ 50 g a.i./ha, was found superior against whiteflies among other treatments, received lowest number of whitefly population (1.55/plant) and offered maximum reduction of whiteflies (83.15%) as well as highest marketable fruit yield (146.50 q/ha). However, imidacloprid at lower doses showed nearly similar results. The other neonicotinoid, thiamethoxam also provided similar levels of protection as that of imidacloprid. The conventional insecticide, methyl demeton (125 g a.i./ha) was less effective.

Keywords: Brinjal, neonicotinoids, whitefly

Introduction

Brinjal is one of the important vegetable crops grown throughout the tropical and sub tropical regions. Though it is *kharif* crop but it can be grown throughout the year under irrigated condition in different parts of West Bengal. Its production is badly affected due to damage caused by brinjal shoot and fruit borer, *Leucinodes orbonalis* (Guenee) (Sharma *et al.* 2001) and some important sucking pests like jassid (*Cestius phycitis* (Dist.), whitefly (*Bemisia tabaci* (Gennadius) etc (Regupathy *et al.* 1997). Among the various strategies adopted by farmers, insecticides form most popular defence in spite of many drawbacks like pest resurgence, resistance, harmful effects on natural enemies, pollinators, wildlifes and hazards to human beings. Chloronicotinyls or neonicotinoids, the new group of insecticides which acts on receptor protein of insect nervous system are highly effective against sucking pests. Their selectivity, lower dose and relative safety to non target organism make this group an ideal component in Integrated Pest Management (IPM) resulting in less insecticidal load in the environment. Keeping this view in mind, the efficacy of imidacloprid along with a conventional insecticide such as methyl demeton was evaluated against whitefly, under field conditions.

Materials and Methods

Field experiments were carried out to evaluate the efficacy of imidacloprid 17.8 SL against whitefly on brinjal (var Muktakeshi) during the pre *kharif* season of 2010 and 2011 at University Instructional Farm of Bidhan Chandra Krishi Viswavidyalaya, West Bengal. About a month old seedling of brinjal were transplanted at 60x60 cm spacing in RBD and replicated thrice with 6 treatments of insecticides, and a control. The treatment comprises of Imidacloprid 17.8 SL (Confidor)

@ 15, 25, 50 g a.i./ha, Imidacloprid 17.8 SL (Tatamida) @ 25 g a.i./ha, Thiamethoxam 25% WG (Actara) @ 25 g a.i./ha with Methyl demeton 25 EC (Metasystox) @ 125 g a.i./ha. The crop was maintained adopting standard agronomical practice recommended by Bidhan Chandra Krishi Viswavidyalaya. Two sprays were made with a pneumatic knapsack sprayer with a spray fluid volume of 500 litres/ha. The pretreatment as well as post treatment observations on l, 7, 10 and 14 days were recorded on the incidence of whiteflies. The observations were made on three leaves/ plant one each from top, middle and bottom region. Five plants/plot (8 sqm) were selected at random during each sampling by leaving the border rows.

Results and Discussion

No significant differences between the treatments were observed in respect of whitefly population with a range of 6.96 to 7.47 /plant before first spray. The lowest population of whitefly (1.00 /plant) was recorded at 14 days after first spray at of imidacloprid @ 50 g a.i./ ha followed by imidacloprid (Tatamida) (1.87 /plant), imidacloprid @ 25 g a.i./ha (1.97 plant^{-1}) and thiamethoxam (2.03 /plant) which were mostly at par. Imidacloprid @ 50 g a.i.ha^{-1} recorded the lowest mean whitefly population (1.80 /plant) with 78.04% reduction over control after first spray. Similar trend was observed after second spray, where Imidacloprid @ 50 g a.i./ha proved most effective treatment in respect of mean population (1.15/plant) and per cent reduction of whitefly (90.47%) among the treatments (Table 1).

Mean population of insect prior to first spray during 2011 varied between 6.86 to7.26 /plant in different treatments which were at par with each other. Similar to previous year trial, all the treatments were significantly better compared to untreated check after first spray. Imidacloprid @ 50 g a.i./ha registered minimum whitefly population as compared to the others after both first and second spray (1.99/plant and 1.24/ plant, respectively). Tatamida @ 25 g a.i./ha proved to be next effective insecticidal treatment (2.20 /plant and 1.65 /plant after first and second spray, respectively) which was on par with imidacloprid @ 25 g a.i./ha and thiamethoxam. A steady increase of pest population was noticed in untreated plots. Over all observation revealed that imidacloprid @ 50 g a.i./ha was the best insecticidal treatment with 88.47% reduction of population over untreated plots (Table 2).

Comparing the mean data of two crop season, imidacloprid @ 50 g a.i./ha again proved most effective in keeping the lowest population of whitefly (1.55 /plant) with a per cent reduction of 83.15% population of the insect while imidacloprid (Tatamida) (2.01 /plant), imidacloprid @ 25 g a.i./ha (2.06 /plant) and thiamethoxam (2.19 /plant) offered 78.51%, 77.94% and 76.58% reduction of population over control, respectively (Table 3). Methyl demeton was observed less effective throughout the study. It can be concluded that Imidacloprid 17.8 SL @ 25 g a.i./ha was equally

effective as that of Imidacloprid (Tatamida) @ 25 g a.i./ha and thiamethoxam 25 WG @ 25 g a.i./ha. The efficacy of Imidacloprid lasted for 25 days after application when compared with methyl demeton which persisted only for 10 days. The present findings are in agreement with Misra and Senapati (2003) and Castle and Palumbo (2006). Imidacloprid was also found to be effective but next to acetamiprid and diafenthiuron in controlling *B. tabaci* in cotton (Razaq *et al*. 2003). Benthke and Redak (2008) reported that imidacloprid was effective against *B. argentifollii* in poinsettia without harming the parasitoid, *Encarsia formosa*, and thus can be recommended in IPM programmes. Nath and Sinha (2011) also reported that neonicotinoids could be used effectively in IPM strategies for controlling the sucking pests population including whitefly in okra.

In respect of yield of marketable fruits, all the neonicotinoid treatments were proved superior over the untreated control plots. Imidacloprid 17.8 SL @ 50 g a.i./ha was the best treatment which recorded highest incremental fruit yield (70.01 q/ha) over the untreated check while methyl demeton recorded only 24.70 q/ ha increased yield over control (Table 3).

So it can be concluded that neonicotinoids at lower doses can effectively control the whitefly compared to the conventional insecticides. Hence, for managing whitefly both imidacloprid and thiamethoxam can be incorporated in IPM programme if applied during non- flowering period to avoid toxicity to pollinators.

Literature Cited

Benthke JA Redak RA. 2008 Effect of imidacloprid on the silverleaf whitefly, *Bemisia argentifolii* Bellows and Perring (Homoptera: Aleyrodidae), and whitefly parasitism. *Annals of Applied Biology* **130**: 397- 07.

Castle SJ Palumbo JC. 2006 Relationship of *Bemisia tabaci* adult mortalities and population growth to imidacloprid concentrations in cantaloupes. In. Proceedings of *Bemisia* International Workshop, December 3-8, 2006, Key West, FL, pp.84-81.

Misra HP Senapati B. 2003 Evaluation of new lnsecticides against okra jassid (*Amrasca biguttula biguttula*). *Indian Journal of Agricultural Sciences* **73**: 576-78.

Nath V Sinha SR. 2011 IPM in Okra through neonicotinoids, insecticides and their mixtures. *Annals of Plant Protection Sciences* **19**: 33-36.

Razaq M Aslam M Sharf K Salman B and Aleem MF. 2003 Evaluation of insecticides against cotton whitefly, *Bemisia tabaci* (Genn.) (Homoptera: Aleyrodidae). *Journal of Research* **14**: 199-02.

Regupathy A Palanisamy S Chandramohan N Gunathilagaraj K. 1997 *A Guide on Crop Pests,* Sooriya Desk Top Publishers, Coimbatore, India, pp 264.

Sharma V Lal R Choudhury A. 2001 Screening of brinjal (*Solanum spp*.) germplasm against shoot and fruit borer, *Leucinodes orbonalis* Guen. under Bhubaneshwar climatic condition. *Journal of Applied Zoological Research* **16**: 123-25.

Table 1. Efficacy of Imidacloprid against whitefly in brinjal during 2010

Treatments	Population/3 leaves/plant															
	Days after first spray								Days after second spray (Post treatment)							
	Pre treatment	1	3	7	10	14	mean	reduction (%)	Pre treatment	1	3	7	10	14	mean	reduction (%)
Imidacloprid (Confidor) @ 15 g a.i./ha	7.06 (2.65)	3.03 (1.74)	2.94 (1.71)	3.23 (1.79)	3.73 (1.93)	3.83 (1.95)	3.97	51.49	5.52 (2.34)	4.21 (2.05)	4.09 (2.02)	4.35 (2.08)	4.63 (2.15)	4.69 (2.16)	4.58	62.16
Imidacloprid (Confidor) @ 25 g a.i./ ha	7.12 (2.66)	1.23 (1.10)	1.20 (1.09)	1.27 (1.12)	1.60 (1.26)	1.97 (1.40)	2.40	70.69	4.10 (2.02)	1.57 (1.25)	1.23 (1.10)	1.33 (1.15)	1.37 (1.17)	1.63 (1.27)	1.87	84.54
Imidacloprid (Confidor) @ 50 g a.i./ha	7.28 (2.68)	0.67 (0.81)	0.50 (0.70)	0.60 (0.77)	0.73 (0.85)	1.00 (1.00)	1.80	78.04	3.85 (1.96)	0.50 (0.70)	0.37 (0.60)	0.47 (0.68)	0.80 (0.89)	0.93 (0.96)	1.15	90.47
Imidacloprid (Tatamida) @ 25 g a.i./ha	6.96 (2.64)	1.33 (1.15)	1.10 (1.04)	1.37 (1.17)	1.50 (1.22)	1.87 (1.36)	2.36	71.22	4.12 (2.02)	1.47 (1.22)	1.17 (1.08)	1.23 (1.10)	1.30 (1.14)	1.57 (1.25)	1.81	85.05
Thiamethoxam (Actara) @ 25 g a.i./ha	7.25 (2.69)	1.43 (1.19)	1.37 (1.17)	1.43 (1.19)	1.70 (1.30)	2.03 (1.42)	2.54	69.02	4.09 (2.02)	1.63 (1.27)	1.30 (1.14)	1.47 (1.21)	1.57 (1.25)	1.67 (1.29)	1.96	83.85
Methyl demeton (Metasystox) @ 125 g a.i./ha	7.43 (2.72)	3.20 (1.78)	3.07 (1.75)	3.73 (1.85)	4.23 (2.05)	4.73 (2.17)	4.40	46.25	5.62 (2.37)	4.67 (2.16)	4.37 (2.09)	4.66 (2.15)	4.78 (2.18)	5.25 (2.29)	4.89	59.60
Untreated	7.47 (2.73)	7.83 (2.80)	7.82 (2.80)	8.10 (2.84)	8.80 (2.97)	9.07 (3.01)	8.18	-	10.12 (3.18)	10.29 (3.21)	12.03 (3.47)	12.53 (3.53)	13.47 (3.67)	14.20 (3.76)	12.11	-
SE. m ±	-	0.08	0.07	0.12	0.14	0.09	-	-	-	0.11	0.13	0.23	0.14	0.18	-	-
CD at 5%	NS	0.26	0.13	0.39	0.25	0.19	-	-	NS	0.51	0.31	0.35	0.19	0.29	-	-

Figures in the parenthesis are square root transformed values, NS- non significant

Table 2. Efficacy of Imidacloprid against whitefly in brinjal during 2011

Treatments	Population/3 leaves/plant															
	Days after first spray								Days after second spray (Post treatment)							
	Pre treatment	1	3	7	10	14	mean	reduction (%)	Pre treatment	1	3	7	10	14	mean	reduction (%)
Imidacloprid (Confidor) @ 15 g a.i./ha	6.86 (2.62)	1.83 (1.35)	1.60 (1.26)	1.83 (1.35)	2.23 (1.49)	2.77 (1.66)	2.85	65.09	4.75 (2.17)	3.62 (1.90)	3.06 (1.74)	3.41 (1.84)	4.21 (2.05)	4.42 (2.10)	3.91	63.73
Imidacloprid (Confidor) @ 25 g a.i./ha	7.16 (2.68)	1.10 (1.05)	0.93 (0.96)	1.17 (1.08)	1.57 (1.25)	1.80 (1.34)	2.29	72.00	4.55 (2.13)	0.93 (0.96)	0.70 (0.83)	1.03 (1.01)	1.23 (1.10)	1.57 (1.25)	1.67	84.53
Imidacloprid (Confidor) @ 50 g a.i./ha	7.26 (2.69)	0.80 (0.89)	0.47 (0.69)	0.83 (0.91)	1.23 (1.11)	1.37 (1.17)	1.99	75.61	4.16 (2.03)	0.57 (0.75)	0.33 (0.57)	0.60 (0.77)	0.83 (0.91)	0.97 (0.98)	1.24	88.47
Imidacloprid (Tatamida) @ 25 g a.i./ha	7.05 (2.66)	1.03 (1.02)	0.87 (0.93)	1.10 (1.05)	1.43 (1.20)	1.73 (1.32)	2.20	73.06	4.62 (2.14)	0.87 (0.93)	0.73 (0.85)	0.90 (0.94)	1.17 (1.08)	1.60 (1.26)	1.65	84.72
Thiamethoxam (Actara) @ 25 g a.i./ha	7.15 (2.67)	1.17 (1.08)	1.10 (1.05)	1.27 (1.13)	1.70 (1.30)	1.93 (1.39)	2.39	70.80	4.65 (2.15)	1.03 (1.01)	0.87 (0.93)	1.27 (1.12)	1.53 (1.23)	1.87 (1.36)	1.87	82.66
Methyl demeton (Metasystox) @ 125 g a.i./ha	6.89 (2.62)	2.13 (1.46)	2.07 (1.44)	2.50 (1.58)	3.07 (1.75)	3.63 (1.91)	3.38	58.63	5.01 (2.20)	3.87 (1.96)	3.01 (1.73)	3.67 (1.91)	4.43 (2.10)	4.76 (2.18)	4.13	61.75
Untreated	7.24 (2.69)	7.97 (2.82)	8.20 (2.86)	8.63 (2.94)	8.43 (2.90)	8.57 (2.93)	8.17	-	10.01 (3.16)	10.20 (3.19)	10.43 (3.22)	10.80 (3.29)	11.17 (3.34)	12.10 (3.48)	10.79	-
SE. m ±	-	0.06	0.02	0.03	0.01	0.08	-	-	-	0.03	0.05	0.02	0.07	0.06	-	-
CD at 5%	NS	0.11	0.09	0.07	0.04	0.14	-	-	NS	0.09	0.21	0.11	0.15	0.17	-	-

Figures in the parenthesis are square root transformed values, NS- non significant

Table 3. Efficacy of imidacloprid against whitefly in brinjal (pooled of 2010 and 2011)

Treatments	Dose (g a.i./ha)	Population of whitefly/ 3 leaves	Reduction (%) of population	Yield of marketable fruit (q/ha)	Increased yield over control (q/ha)
Imidacloprid (Confidor)	15	3.83	60.62	122.75	46.25
Imidacloprid (Confidor)	25	2.06	77.94	137.50	61.00
Imidacloprid (Confidor)	50	1.55	83.15	146.51	70.01
Imidacloprid (Tatamida)	25	2.01	78.51	138.90	62.40
Thiamethoxam (Actara)	25	2.19	76.58	135.60	59.10
Methyl demeton (Metasystox)	125	4.20	56.56	101.20	24.70
Untreated	-	9.81	-	76.50	-