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FIELD EVALUATION OF EMAMECTIN BENZOATE 5 WG AGAINST SPIDER PREDATORS IN OKRA ECO-SYSTEM

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ABSTRACT:

Two field experiments on okra (Cv: Shakti) were conducted, at Nathapatti (I season : July 2012 to October 2012) and Pazhayasukkampatti (II season : December 2012 to March 2013) of Tamil Nadu to evaluate the safety of new formulation Emamectin benzoate 5 WG at different doses (100, 125 and 150 g/ha) against the standard check, Emamectin benzoate 5 SG (135 and 170 g/ha), Lambda cyhalothrin 5 CS (300 ml/ha) and Pyridalyl 10% EC at 500 ml/ha for their safety to spider predators in okra eco-system. Observation on the population of spider was recorded prior to spraying and at 5 and 10 days after each spraying from ten randomly selected plants in each replication and untreated check. The results showed that Emamectin benzoate 5 WG was found to be safer to spider at all concentrations tested. The highest population recorded in plots treated with Emamectin benzoate 5 WG at 100 g/ha followed by Emamectin benzoate 5 WG at 125 g/ha, respectively.

KEY WORDS: *Emamectin benzoate 5 WG, Okra, Safety, Spider.*

INTRODUCTION:

Okra is an important vegetable occupies major component of our food. India ranks first in the World production of okra which is 67 per cent of the total World production (India stat., 2013). Okra is infested by more than 72 species

of insects (Srinivasa Rao and Rajendran, 2003), The major pests are leafhopper, *Amrasca biguttula biguttula* (Ishida), whiteflies, *Bemisia tabaci* (Gennadias), aphid, *Aphis gossypii* (Glover), mite, *Tetranychus cinnabarinus* (Boisduval), fruit borer, *Earias vittella* (Fabricius) and *Helicoverpa armigera* (Hubner). Among them, fruit borers are the most destructive pests (Mani *et al.*, 2005). Since high cost is incurred in the cultivation of high yielding okra, the farmers have to rely upon pesticides to get a high net income. The indiscriminate and irrational use of chemical insecticides at higher doses resulted in resurgence, resistance and residues. The indiscriminate usage had increased the cost of cultivation and also has led to some irreversible changes in our biosphere. It is important to adopt or use some newer insecticide molecule with high toxicity even at lower doses and should also be safer to the natural enemies present in the agro eco-system.

One of such insecticides is Emamectin benzoate which is a semi synthetic derivative of avermectin produced as fermentation metabolites of soil actinomycetes, *Streptomyces avermitilis* Burg. (Lasota and Dybas, 1991). This was discovered in 1984 and has both stomach and contact action effective against lepidopteran pests. Emamectin 5 SG is one of the formulations, being marketed in the name of Proclaim and its efficacy has been demonstrated on several lepidopteran pests of agricultural and horticultural crops (Kuttalam *et al*., 2008; Sharma and Kausik, 2010; Ajanta Biraii and Raguraman, 2011; Aulakh *et al*., 2012; Govindan *et al*., 2012; Parthiban *et al*., 2014 & 2014). Field efficacy of this formulation has been enhanced by developing new one with UV protectant *ie*., Emamectin benzoate 5 WG. It has been developed by M/s Syngenta India Ltd. which is in pipeline for registration. Keeping in view, the present study was taken up to study the impact of Emamectin benzoate 5 WG to spider predators in okra eco-system.

MATERIALS AND METHODS:

Field experiments were conducted for two seasons, one at Nathapatti (I season : July 2012 to October 2012) at 30 ± 2° C and 79 ± 5 % RH and another at Pazhayasukkampatti (II season : December 2012 to March 2013) at 27 ± 2° C and 83 ± 5 % RH to evaluate the safety of new formulation Emamectin benzoate 5 WG against spider predators of okra (Cv: Shakti). The experiments were carried out in plots of 4 × 10 m size in a RBD with eight treatments and each was replicated thrice. During first season, three rounds of spraying were given on 11.09.2012, 21.09.2012 and 03.10.2012, respectively at ten days interval, starting from 45 days after sowing. During second season, three rounds of spraying were given on 06.02.2013, 18.02.2013 and 28.02.2013, respectively at ten days interval, starting from 43 days after sowing. Pneumatic knapsack sprayer (Aspee sprayer) using 500 litres of spray fluid per hectare was used to spray various doses of test insecticide.

TREATMENT DETAILS:

Various doses of Emamectin benzoate 5 WG and check insecticides imposed are given below.

S. No.	Treatment	Dose (g ai/ha)	Dose Product (g/ml ha^{-1})
1.	Emamectin benzoate 5 WG	5.00	100
2.	Emamectin benzoate 5 WG	6.25	125
3.	Emamectin benzoate 5 WG	7.50	150
4.	Emamectin benzoate 5 SG	6.75	135
5.	Emamectin benzoate 5 SG	8.50	170
6.	Lambda cyhalothrin 5 CS	15.00	300
7.	Pyridalyl 10% EC	50.00	500
8.	Untreated check	--	--

POPULATION OF NATURAL ENEMY:

Population of spider predators (number of spider / 10 plants) was recorded in all treatments and untreated check prior to spraying and at 5 and 10 days after each spraying from 10 randomly selected plants.

STATISTICAL ANALYSIS:

Data were subjected to analysis of variance (ANOVA). Before analysis, data on population were transferred by square root transformation. In order to know the interaction between treatments, data from field experiment were subjected to factorial RBD analysis and the means obtained were separated by DMRT (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION:

The population of spiders (number of spider/plant) ranged from 8.67 to 9.67 nos. per 10 plants before imposing treatments in the first field experiment (Table 1). Mean number of spider predators was high in okra sprayed with Emamectin 5 WG @ 100 g/ha, resulting 7.67 nos./10 plants which was on a par with Emamectin 5 WG @ 125 g/ha (7.33 nos./10 plants) and 150 g/ha (6.67 nos./10 plants). Emamectin 5 SG @ 135 and 170 g/ha were equally safe to spider, recording 6.11 and 5.61 nos./10 plants, respectively (Table 1). Lambda cyhalothrin 5 CS @ 300 ml/ha and Pyridalyl 10% EC @ 500 ml/ha were moderately toxic to spiders, recording the lowest mean population of 4.06 and 4.39 nos./10 plants, as against 12.06 nos./10 plants in control..

After the first round of spray, Emamectin 5 WG @ 100 g/ha, resulting 7.00 and 7.67 nos./10 plants on 5^{th} and 10^{th} day respectively, which was on a par with Emamectin 5 WG @ 125 g/ha (6.67 and 7.33 nos./10 plants on 5^{th} and 10^{th} day) and 150 g/ha (6.00 and 6.67 nos./10 plants on 5^{th} and 10^{th} day). Emamectin 5 SG @ 135 and 170 g/ha were equally safe to spiders, recording 5.67 and 6.33 and 5.33 and 6.00 nos./10 plants on 5^{th} and 10^{th} day, respectively (Table 1). Lambda cyhalothrin 5 CS @ 300 ml/ha and Pyridalyl 10% EC @ 500 ml/ha were moderately toxic to spiders, recording the lowest mean population of 4.00 and

4.67 and 4.33 and 5.00 nos./10 plants on 5th and 10th day, as against 9.67 and 10.33 nos./10 plants on 5th and 10th day respectively, in control. The same trend was noticed in the second and third round also (Table 1).

In the second field experiment, the pretreatment population of spider (number of spiders/plant) ranged from 7.00 to 8.00 nos. per 10 plants (Table 2). Mean number of spider predators was high in okra sprayed with Emamectin 5 WG @ 100 g/ha, resulting 6.61 nos./10 plants which was on a par with Emamectin 5 WG @ 125 (6.33 nos./10 plants) and 150 g/ha (5.83 nos./10 plants). Emamectin 5 SG @ 135 and 170 g/ha were equally safe to spiders, recording 5.22 and 4.72 nos./10 plants, respectively (Table 2). Lambda cyhalothrin 5 CS @ 300 ml/ha and Pyridalyl 10% EC @ 500 ml/ha was moderately toxic to spiders, recording the lowest mean population of 3.06 and 3.39 nos./10 plants, as against 11.72 nos./10 plants in control. The similar trend was noticed in the first, second and third round also (Table 2).

Field evaluation of Emamectin 5 WG for toxicity against spider predators in okra eco-system showed that there was a considerable decrease in spider predators population initially in all the treatments. Later it started increasing, but it was less than the population recorded in untreated check. Emamectin 5 WG and Emamectin 5 SG treatments were safer to spider predators when compared with Lambda cyhalothrin 5 CS and Pyridalyl 10% EC. Amalin *et al*. (2000) opined that abamectin and imidacloprid applied as sprays had moderate toxicity to predatory spider (*Hibana velox*) of citrus leaf miner under laboratory conditions. This is supported by Reis *et al.* (1999) that abamectin was slightly harmful to spider in laboratory conditions and Giribabu *et al*. (2002) concluded that abamectin at 15 g a.i. ha^{-1} was found to be relatively safer to predatory spiders. This result was supported by Tillman and Mulrooney (2000), Chizhov *et al*. (2000), Acharya *et al*. (2002) and Udikeri *et al.* (2004) who stated that Avermectins were generally safe to coccinellids. Standard check, Lambda cyhalothrin 5 CS and Pyridalyl 10% EC @ 15 (300 ml/ha) and 50 (500 ml/ha) g ai/ha, respectively, used in the present study were moderately toxic to coccinellids as indicated by Sharma *et al*. (1991) in cypermethrin, dimethoate, methyl dematon and fenvalerate which were toxic to *Menochilus sexmaculatus*. Avermectins were safe to non-target organisms *viz*., *Dolycoris bauarum* (L.), *Pentatoma rufipes* (L.), *Adalia bipunctata* (L.) and *Coccinella septempunctata* (L.) (Jyoti and Goud, 2008; Yogesh Patel *et al*., 2009; Govindan *et al*., 2012). The populations of lacewings and coccinellids were not significantly different between insecticide treated (emamectin benzoate, indoxacarb, and spinosad) and untreated plots (Anwar Ruly, 2008).

CONCLUSION:

The present study concludes that three rounds of application of Emamectin benzoate 5 WG and Emamectin benzoate 5 SG were recorded more or less equal population of coccinellid predators in all treatments and were safer when compared with Lambda cyhalothrin 5 CS and Pyridalyl 10% EC.

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Table 1. Population of Spiders on okra, as influenced by Emamectin benzoate 5 WG (I Season : July to October 2012)

Treatment*	Dose Product g/ml/ha	Pre-count Nos./10 plants	Population of Spiders (Nos./10 plants) (Days after treatment)						Mean
			1st spray		2nd spray		3rd spray		
			5	10	5	10	5	10	
T1 - Emamectin Benzoate 5 WG	100	9.67	7.00 (2.64)^{b}	7.67 (2.77)^{b}	6.33 (2.51)^{b}	8.67 (2.94)^{b}	7.33 (2.71)^{b}	9.00 (3.00)^{b}	7.67 (2.77)^{b}
T2 - Emamectin Benzoate 5 WG	125	9.33	6.67 (2.58)^{bc}	7.33 (2.71)^{bc}	6.00 (2.45)^{bc}	8.33 (2.88)^{bc}	7.00 (2.64)^{bc}	8.67 (2.94)^{bc}	7.33 (2.71)^{bc}
T3 - Emamectin Benzoate 5 WG	150	9.00	6.00 (2.45)^{cd}	6.67 (2.58)^{cd}	5.33 (2.31)^{cd}	7.67 (2.77)^{cd}	6.33 (2.51)^{cd}	8.00 (2.83)^{c}	6.67 (2.58)^{cd}
T4 - Emamectin Benzoate 5 SG	135	9.33	5.67 (2.38)^{d}	6.33 (2.51)^{d}	5.00 (2.23)^{de}	7.00 (2.64)^{de}	5.67 (2.38)^{de}	7.00 (2.64)^{d}	6.11 (2.47)^{de}
T5 - Emamectin Benzoate 5 SG	170	9.33	5.33 (2.31)^{d}	6.00 (2.45)^{d}	4.33 (2.08)^{ef}	6.33 (2.51)^{e}	5.00 (2.23)^{e}	6.67 (2.18)^{d}	5.61 (2.37)^{e}
T6 - Lambda cyhalothrin 5 CS	300	9.00	4.00 (2.00)^{e}	4.67 (2.16)^{e}	3.33 (1.82)^{g}	4.67 (2.16)^{f}	3.33 (1.82)^{f}	4.33 (2.08)^{e}	4.06 (2.01)^{f}

T7 - Pyridalyl 10 % EC	500	8.67	4.33 (2.08)^{e}	5.00 (2.23)^{e}	3.67 (1.91)^{f}g	5.00 (2.23)^{f}	3.67 (1.91)^{f}	4.67 (2.16)^{e}	4.39 (2.09)^{f}
T8 - Untreated check	--	9.00	9.67 (3.11)^{a}	10.33 (3.21)^{a}	11.67 (3.42)^{a}	12.00 (3.46)^{a}	13.67 (3.70)^{a}	15.00 (3.87)^{a}	12.06 (3.47)^{a}
SEd		--	0.0821	0.0774	0.0876	0.0744	0.0837	0.0743	0.0793
CD (0.05)		--	0.1761	0.1660	0.1880	0.1596	0.1795	0.1595	0.1701

*Mean of three replications; Three rounds of spraying at 10 days interval starting from 45 DAT
Figures in parentheses are square root transformed values
In a column means followed by same letter(s) are not significantly different by DMRT (P= 0.05)

Table 2. Population of Spiders on okra, as influenced by Emamectin benzoate 5 WG (II Season : December 2012 to March 2013)

Treatment*	Dose Product g/ml/ha	Pre-count Nos./10 plants	Population of Spiders (Nos./10 plants) (Days after treatment)						Mean
			1st spray		2nd spray		3rd spray		
			5	10	5	10	5	10	
T1 - Emamectin Benzoate 5 WG	100	7.67	5.67 (2.38)^{b}	7.00 (2.64)^{b}	5.33 (2.31)^{b}	8.00 (2.83)^{b}	6.33 (2.51)^{b}	7.33 (2.71)^{b}	6.61 (2.57)^{b}
T2 - Emamectin Benzoate 5 WG	125	8.00	5.33 (2.31)^{b}	6.67 (2.58)^{b}	5.00 (2.23)^{bc}	7.67 (2.77)^{b}	6.33 (2.51)^{b}	7.00 (2.64)^{bc}	6.33 (2.51)^{b}
T3 - Emamectin Benzoate 5 WG	150	7.00	5.00 (2.23)^{bc}	6.33 (2.51)^{bc}	4.33 (2.00)^{cd}	7.33 (2.71)^{b}	5.67 (2.38)^{bc}	6.33 (2.51)^{cd}	5.83 (2.41)^{bc}
T4 - Emamectin Benzoate 5 SG	135	8.00	4.33 (2.08)^{cd}	5.67 (2.38)^{cd}	4.00 (2.00)^{de}	6.33 (2.51)^{c}	5.00 (2.23)^{cd}	6.00 (2.45)^{d}	5.22 (2.28)^{cd}
T5 - Emamectin Benzoate 5 SG	170	8.00	4.00 (2.00)^{d}	5.33 (2.31)^{d}	3.33 (1.82)^{ef}	5.67 (2.38)^{c}	4.33 (2.08)^{d}	5.67 (2.38)^{d}	4.72 (2.17)^{d}
T6 - Lambda cyhalothrin 5 CS	300	7.67	2.67 (1.63)^{e}	3.67 (1.91)^{e}	2.33 (1.52)^{g}	4.00 (2.00)^{d}	2.67 (1.63)^{e}	3.00 (1.73)^{e}	3.06 (1.75)^{e}
T7 - Pyridalyl 10 % EC	500	7.33	3.00 (1.73)^{e}	4.00 (2.00)^{e}	2.67 (1.63)^{fg}	4.33 (2.08)^{d}	3.00 (1.73)^{e}	3.33 (1.82)^{e}	3.39 (1.84)^{e}
T8 - Untreated check	--	7.00	8.33 (2.89)^{a}	9.67 (3.11)^{a}	10.33 (3.21)^{a}	12.33 (3.51)^{a}	13.67 (3.70)^{a}	16.00 (4.00)^{a}	11.72 (3.42)^{a}
SEd		--	0.0938	0.0821	0.0989	0.0777	0.0898	0.0836	0.0866
CD (0.05)		--	0.2012	0.1761	0.2122	0.1668	0.1925	0.1794	0.1858

* Mean of three replications; Three rounds of spraying at 10 days interval starting from 43 DAT
Figures in parentheses are square root transformed values
In a column means followed by same letter(s) are not significantly different by DMRT (P= 0.05)