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Safety of newer biological insecticide spinetoram 12 SC to *Cryptolaemus montrouzieri* in the grapevine ecosystem of Tamil Nadu

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ABSTRACT

A field experiment was conducted at farmers' field in Dindigul district, Tamil Nadu, India during the year August 2012 - December 2012 to study the effect of new biological insecticide spinetoram 12 SC to *Cryptolaemus montrouzieri* of grapevine mealy bug, *Maconellicoccus hirsutus*. Three foliar applications were carried out at an interval of fifteen days after nymphs and adults *C. montrouzieri* population reached economic threshold level. The result showed that the overall mean population of *C. montrouzieri* was found to be more in the untreated check followed by spinetoram 12 SC 27 g a.i/ha in the first, second and third foliar application. The overall mean population of *C. montrouzieri* was high in the untreated check, followed by spinetoram 12 SC 30 g a.i/ha over the other treatments.

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INTRODUCTION

Grapevine, *Vitis vinifera* (L.) cultivation is one of the most remunerative farming enterprises in India as grapes are a sed for table purpose, resin and wine making with good medicinal value due to the presence of large amount of antioxidants. It is cultivated in an area of 1,17,632 ha with a total annual production of 24,83,094 MT and productivity of 21.1 tonnes per ha in 2012-2013 (Anonymous, 2013). Insect pests are the important production constraints in grape cultivation apart from diseases. In grape, 85 species of insect pests have been reported in India (Atwal and Dhaliwal, 2005). The natural enemies, predators and parasitoids will imparts the effect over the population of grapevine pests under favourable environmental conditions. The newer insecticides were evaluated in grapevine ecosystem to control grapevine mealy bug in Tamil Nadu. However, there are no reports on field evaluation of spinetoram 12 SC against *C. montrouzieri* on grapes. Therefore, this study was undertaken with the objectives to investigate field toxicity

of spinetoram 12 SC and other insecticides against *C. montrouzieri* on grapevine during 2012 *Kharif* season.

MATERIAL AND METHODS

A experiments with grapevine (cv. MAKKIRIKKODI LOCAL) was laid out to evaluate the effect of spinetoram 12 SC against *C. montrouzieri* on grapes plants. The plot size of 5 x 5 m which 26 numbers of grape vines TNAU recommended agronomic practices were followed to maintain healthy grape vines throughout experimental period. Spinetoram 12 SC was assessed at 30 g a.i./ha, 36 g a.i./ha and 45 g a.i./ha and compared with fibronil 80 WG @ 40 g a.i/ha, spinosad 45 SC @ 120 g a.i/ha, thiamethoxam 25 WG @ 62.5 g a.i/ha and untreated check (water spray) against *C. montrouzieri*. There were three applications at 20 days interval based on ETL of target pests. Through coverage of plants (to a run off point) with the spray fluid of 500 lit./ha was ensured by using high volume knapsack sprayer with hydraulic cone nozzle. Observations on the grubs and adults of *C. montrouzieri* on number basis per plot from ten randomly selected vines were recorded at one day before and on 1, 3, 7 and 10 DAT after each spray. Data obtained were subjected to analysis of variance (ANOVA) after transformation (arc sine for per cent data and square root for population data) of data as per the procedure suggested by Gomez and Gomez (1984) and original values are given in Tables. The observations on phytotoxicity symptoms (leaf injury, wilting, vein clearing, necrosis, epinasty and hyponasty) were recorded on 7th day after each spray by using visual scoring system.

RESULTS AND DISCUSSION

In the field experiment, population of grubs and adults of *C. montrouzieri* on insecticide treated and control plots are given in the Table 1. The initial population of *C. montrouzieri* ranged from 3.0 to 4.1 per vine before imposing first spray. *C. montrouzieri* population, however was 3.3, 3.2, 3.3 and 3.3 per vine at 1, 3, 7 and 10 DAT, respectively after first spray; 3.4, 3.5, 3.7 and 3.9 per vine at 1, 3, 7 and 10 DAT, respectively after second spray; and 4.2, 4.2, 4.4 and 4.5 per vine at 1, 3, 7 and 10 DAT, respectively after third spray in the untreated plot. There was negligible reduction on *C. montrouzieri* population due to spinetoram 12 SC 30 g a.i./ha (2.8 to 3.3/vine; 2.9 to 3.6/vine; and 2.9 to 3.1/vine from 1 to 10 DAT after first, second and third, respectively). This was followed by spinetoram 12 SC 36 g a.i./ha (2.4 to 3.3 per vine; 2.5 to 3.7 per vine; and 2.6 to 2.9 per vine from 1 to 10 DAT after first, second and third sprays, respectively); and spinetoram 12 SC 45 g a.i./ha (2.6 to 3.1/vine; 2.1 to 3.1/vine; and 2.1 to 2.7/vine from 1 to 10 DAT after first, second and third, respectively) which also resulted in higher population of coccinellids. Population of coccinellid was however, 2.5 to 3.1 per vine, 2.1 to 2.9 per vine and 2.1 to 2.7 per vine from 1 to 10 DAT after first, second and third sprays, respectively due to spinosad 45 SC at 120 g a.i./ha; 2.3 to 3.0 per vine, 2.1 to 2.7 per vine and 2.0 to 2.6 per vine from 1 to 10 DAT after first, second and third sprays, respectively due to thiamethoxam 25 WG at 62.5 g a.i./ha; and 2.5 to 3.0 per vine, 2.1 to 2.6 per vine and 2.0 to 2.4 per vine from 1 to 10 DAT after first, second and third sprays, respectively due to fipronil 80 WG at 40 g a.i./ha.

Table 1 : Effect of spinetoram 12 SC against *Cryptolaemus montrouzieri* on grapevine (Aug 2012 – Dec 2012)

Treatments and doses	Number of grubs and adults/vine on days after treatment													Mean
	Pre count	1st spray				2nd spray				3rd spray				
		1	3	7	10	1	3	7	10	1	3	7	10	
Spinetoram 12 SC 30 g a.i./ha	3.4	3.3^{a}	3.1^{a}	2.8^{b}	3.1^{b}	3.6^{a}	2.9^{b}	3.0^{b}	3.3^{c}	3.1^{b}	3.1^{b}	2.9^{b}	3.0^{b}	3.1^{bc}
Spinetoram 12 SC 36 g a.i./ha	3.9	3.3^{a}	2.9^{b}	2.4^{de}	2.6^{d}	2.7^{cd}	3.0^{b}	2.5^{c}	3.7^{b}	2.9^{c}	2.8^{c}	2.6^{c}	2.8^{c}	2.9^{b}
Spinetoram 12 SC 45 g a.i./ha	4.0	3.1^{b}	2.8^{bc}	2.6^{c}	3.0^{bc}	2.8^{c}	2.5^{c}	2.1^{d}	3.1^{d}	2.7^{d}	2.4^{d}	2.1^{d}	2.4^{d}	2.6^{bc}
Fibronil 80 WG 40 g a.i./ha	3.5	3.0^{b}	2.7^{c}	2.5^{cd}	2.9^{c}	2.6^{d}	2.4^{cd}	2.1^{d}	2.6^{f}	2.4^{e}	$2.^{1f}$	2.0^{d}	2.0^{e}	2.4^{bc}
Spinosad 45 SC 120 g a.i./ha	4.1	3.1^{b}	2.7^{c}	2.5^{cd}	2.9^{c}	2.7^{cd}	2.4^{cd}	2.1^{d}	2.9^{e}	2.7^{d}	2.3^{de}	2.1^{d}	2.0^{e}	2.5^{bc}
Thiomethoxam 25 WG 62.5 g a.i./ha	3.4	3.0^{b}	2.5^{d}	2.3^{e}	2.5^{d}	2.4^{e}	2.3^{d}	2.1^{d}	2.7^{f}	2.6^{d}	2.2^{ef}	2.0^{d}	2.0^{e}	2.3^{c}
Untreated check	3.0	3.3^{a}	3.2^{a}	3.3^{a}	3.3^{a}	3.4^{b}	3.5^{a}	3.7^{a}	3.9^{a}	4.2^{a}	4.2^{a}	4.4^{a}	4.5^{a}	3.7^{a}
C.D. (P=0.05)	-	0.17	0.12	0.10	0.12	0.16	0.12	0.11	0.18	0.13	0.16	0.10	0.07	0.17
S.E.±	-	0.08	0.05	0.04	0.05	0.07	0.55	0.05	0.08	0.06	0.07	0.04	0.03	0.08

Data are mean values of three replications
Figures were transformed by square root transformation and the original values are given
Means within columns lacking common lower case superscript are significantly different (P<0.05)

Mean population of *C. montrouzieri* after three sprays revealed that *C. montrouzieri* population was maximum in untreated check (3.7/vine). *C. montrouzieri* population was also higher in spinetoram 12 SC 30 g a.i./ha (3.1/vine), spinetoram 12 SC 36 g a.i./ha (2.9/vine) and spinetoram 12 SC 45 g a.i./ha (2.6/vine) treated plots. Spinosad 45 SC at 120 g a.i./ha, fipronil 80 WG at 40 g a.i./ha and thiamethoxam 25 WG at 62.5 g a.i./ha resulted in population of 2.5 per vine, 2.4 per vine and 2.3 per vine, respectively. The present results are in corroboration with the findings of Sharma and Kaushik (2010) spinosad proved safe to the natural enemies (parasitoids and predators) found on eggplant crop. The populations of whitefly pupae parasitized by *Encarsia lutea* Masi (28.5 per 10 leaves), the adult *Chrysoperla zastrowi sillemi* (18.7 per plot) and lady bird beetles (25.3 per plot) in spinosad treated plots were at par with untreated control (30.1, 20.7 and 29.1). According to Amalendu *et al.* (2011) spinosad 45 SC was safe to *Tripheles* sp., *Antilochus* sp. and *Chrysoperla* sp. on okra. Emine *et al.* (2011) reported that spinosad showed little or no effect on natural enemies of the pest whereas it had a significant impact on larvae of *L. cicerina*. However, in spinosad-treated plots, chickpea yield rate was higher than control plots.

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