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Evaluation of insecticides and natural products for their efficacy against cardamom thrips (*Sciothrips cardamomi* Ramk.) (Thysanoptera: Thripidae) in the field

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Abstract

Eleven insecticides and natural products were evaluated in the field at Appangala (Karnataka) for their efficacy against cardamom thrips (*Sciothrips cardamomi*) for three years. Combined analysis of three years data indicated that all the treatments were significantly effective in reducing the damage caused by thrips on capsules compared to control when sprayed during February-March, March-April, April-May and September and October. Fipronil 0.005% treated plots recorded the lowest percentage of damage (6.5%) that was on par with imidacloprid 0.0089%, thiamethoxam 0.0075% and spinosad 0.0135%. The trials indicated that spinosad can substitute synthetic insecticides for thrips control in cardamom, due to their less adverse effects on the environment.

Keywords: cardamom, cardamom thrips, insecticides, natural products, *Sciothrips cardamomi*

Cardamom thrips (*Sciothrips cardamomi* Ramk.) (Thysanoptera: Thripidae) is the most destructive and persistent insect pest of cardamom (*Elettaria cardamomum* Maton) (Zingiberaceae), a commercial spice crop of high value, mainly grown in India, Guatemala and Sri Lanka. In India, the crop is mainly grown in Kerala, Karnataka and Tamil Nadu (Gopakumar & Chandrasekar 2002; Devasahayam 2006). Adults and larvae of cardamom thrips damage the plants by sucking sap from shoots, panicles (inflorescences) and young capsules resulting in shedding of flowers and immature capsules and 'scab' formation on mature capsules. The infested capsules shrivel and lack the usual aroma and fetch a low price in the market. The extent of capsule damage by cardamom thrips is 60%-90% and the estimated crop loss is 45%-48% (Gopakumar & Chandrasekar 2002; Dharmadasa *et al.* 2008). A schedule of 4-9 sprays with insecticide groups like organophosphates, synthetic pyrethroids, phenylpyrazole and neonicotinoids is recommended against the pest (Gopakumar & Chandrasekar 2002; Dharmadasa *et al.* 2008; Spices Board 2009). In the present paper, we report the results of evaluation of 11 newer

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insecticides and natural products in the field for the control of cardamom thrips.

The trials were carried out in the farm of ICAR-Indian Institute of Spice Research, Regional Station at Appangala (Karnataka) (12°26'N latitude and 75°45'E longitude) for three years during 2011–2014. The experimental location is situated at high altitude (1000 m above MSL) and high rainfall (2000-3000 mm year) region. The treatments included 11 insecticides and natural products and a control (water spray) (Table 1). The insecticides and natural products evaluated included one botanical formulation (neem soap), two natural products (abamectin, spinosad), four neonicotinoids (thiamethoxam, imidacloprid, thiacloprid, dinotefuran), one synthetic pyrethroid (lamda cyhalothrin), two organophosphorus (phosalone, quinalphos) and one phenylpyrazole (fipronil) insecticide. The trials were conducted in a randomized block design and each treatment was replicated three times with 12 plants per replication. The plants (variety: *Appangala-1*) were spaced at 3 × 3 m, and all recommended agronomic practices were adopted. The treatments were imposed during February-March, March-April, April-May, September and October in each year and maintaining one month interval between sprays. The percentage of capsule damage by cardamom thrips was recorded in a sample of 100 g capsules in each treatment plant-wise, during peak periods of harvest in July, September and December each year. The data were subjected to arcsine transformation and means were separated by LSD, year-wise and pooled analysis was also carried out.

Combined analysis of data for three years indicated that all the treatments were significantly effective in reducing the damage caused by cardamom thrips on the capsules when compared to control. Plots treated with fipronil 0.005% recorded the lowest damage of 6.5% that was on par with imidacloprid 0.0089%, thiamethoxam 0.0075% and spinosad 0.0135%. Earlier, Dharmadasa *et al.* (2008) reported that thiamethoxam and fipronil were effective in controlling cardamom thrips in Sri Lanka. Recent reports in other crops in India

Table 1. Field evaluation of insecticides and natural products for the control of cardamom thrips

Treatment	Concentration	Capsule damage (%)			
	(%)	2011-12	2012-13	2013-14	2011-2014
Neem soap	1.0	15.7 (23.3)	25.5 (30.3)	22.1 (28.0)	21.1 (27.2)
Spinosad 45% SC	0.0135	4.1 (11.7)	21.4 (27.5)	12.9 (21.0)	12.8 (20.1)
Abamectin 3% EC	0.0012	9.9 (18.3)	16.0 (23.4)	20.8 (27.1)	15.6 (23.0)
Thiamethoxam 25% WG	0.0075	5.4 (13.3)	12.6 (20.7)	12.2 (20.3)	10.1 (18.2)
Thiacloprid 21.7% SC	0.0108	8.1 (16.5)	17.2 (24.2)	15.5 (23.1)	13.6 (21.4)
Imidacloprid 17.8 SL	0.0089	5.3 (13.3)	9.5 (17.9)	11.6 (19.9)	8.8 (17.1)
Lamda cyhalothrin 5% EC	0.0025	21.1 (27.3)	24.9 (29.4)	23.0 (28.3)	23.0 (28.6)
Phosalone 35% EC	0.007	12.6 (20.7)	20.2 (26.4)	16.0 (23.4)	16.2 (23.7)
Fipronil 5% SC	0.005	2.4 (8.8)	8.5 (16.9)	8.8 (16.0)	6.5 (14.4)
Quinalphos 25% EC	0.05	16.7 (24.1)	13.4 (21.3)	9.2 (17.5)	13.1 (21.1)
Dinotefuron 20% SG	0.012	32.0 (34.2)	24.5 (28.3)	16.0 (23.1)	24.2 (29.2)
Control (Water spray)	-	38.6 (38.4)	32.1 (34.2)	38.2 (38.2)	36.3 (37.0)
LSD (0.05)		12.9 (6.4)	9.4 (8.9)	7.2 (5.9)	7.9 (6.4)

Figures in parentheses are transformed values

also demonstrate the effectiveness of these chemicals for thrips control in cotton and onion (Kumar *et al.* 2013; Singh *et al.* 2013). Our finding on the efficacy of spinosad is also similar to the reports on control of thrips on other crops such as cucumbers, chilli and onion (Jones *et al.* 2005; Srinivas *et al.* 2007; Mautino *et al.* 2012).

Spinosad (derived from the actinomycetes *Saccharopolyspora spinosa*) is considered as natural insecticide with relatively low honey bee toxicity (Mayes *et al.* 2003). Abamectin (derived from the bacterium *Streptomyces avermitilis*) was on par with spinosad in reducing the damage caused by thrips. Neem soap was significantly less effective than these two natural products. Earlier reports indicate that certain neem products and neem oil formulations were effective in controlling cardamom thrips (Naik *et al.* 2006; Stanley *et al.* 2014). Any chemical recommended for pest management in cardamom needs to be safe for honey bees, the principal pollinator of the crop. Hence a natural insecticide like spinosad may be preferred for insect pest management in cardamom agro-ecosystems along with other biological manipulators like *Wolbachia* endosymbiont (Jacob *et al.* 2015) and entomopathogenic fungus like *Lecanicillium psalliotae* (Senthil Kumar *et al.* 2015) for developing IPM schedules.

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