

Bioefficacy of diafenthiuron 50 WP against cardamom thrips, *Sciothrips cardamomi* Ramk

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ABSTRACT

Diafenthiuron 50 WP, a thiourea compound was tested for its efficacy against cardamom thrips, *Sciothrips cardamomi*, Ramk at two locations viz Murukkadi and Onnamile, Idukky district, Kerala. At Murukkadi diafenthiuron 50 WP new source (NS) @ 800 g ai/ha 30 days after application (DAA) of third spray resulted in per cent capsule damage of 2.39 which was on par with diafenthiuron 50 WP (NS) @ 400 g ai/ha and diafenthiuron 50 WP existing source (ES) @ 400 g ai/ha which gave a per cent damage of 2.51 and 2.64 respectively. Standard checks quinalphos 25 EC @ 150 g ai/ha and phenthoate 50 EC @ 100 g ai/ha resulted in damage of 10.25 and 8.70 per cent respectively 30 DAA after third spray. The trend continued to be the same at second location Onnamile where diafenthiuron 50 WP (NS) @ 800 g ai/ha recorded a per cent reduction of 85.81 closely followed by diafenthiuron 50 WP (NS) @ 400 g ai/ha and diafenthiuron 50 WP (ES) @ 400 g ai/ha which resulted in reduction of 84.90 and 83.27 per cent respectively. Difenthiuron 50 WP (NS) @ 300 g ai/ha recorded 78.22 per cent reduction while diafenthiuron 50 WP (NS) @ 200 g ai/ha gave 71.70 per cent reduction over check. The order of effective treatments was diafenthiuron 50 WP (NS) @ 800 g ai/ha > diafenthiuron 50 WP (NS) @ 400 g ai/ha > diafenthiuron 50 WP (ES) @ 400 g ai/ha > diafenthiuron 50 WP (NS) @ 300 g ai/ha > phenthoate 50 EC @ 100 g ai/ha > diafenthiuron 50 WP (NS) @ 200 g ai/ha > quinalphos 25 EC @ 150 g ai/ha.

Keywords: Diafenthiuron; *Sciothrips cardamomi*; bioefficacy; capsule damage

INTRODUCTION

Cardamom, *Elettaria cardamomum* Maton (Zingiberaceae) called Queen of Spices enjoys a unique position in the international spices market as one of the most sought after spices. In India it is mainly cultivated in the southern states of Kerala, Karnataka and Tamil Nadu. Kerala accounts for 60 per cent of the total cultivation followed by Karnataka

(32%) and Tamil Nadu (8%) (Anon 2009). The total area under cardamom in India during 2009-2010 was around 98144 hectares and the production was about 14255 tonnes (Anon 2011).

One of the major constraints in the production of cardamom is the loss caused by insect pests. About 72 insect pests have been recorded on cardamom (Chakravarthy and Khan 1987). Thyagaraj et al (2000)

reported that cardamom thrips are the most important pest on cardamom. Nymphs and adults of greyish brown thrips are known to feed from the inner side of the bracts, perianth, unopened flower buds and peduncle and would reach up to the spindle of sheaths. Thrips infestation leads to formation of corky encrustations resulting in malformed capsules which lack aroma and seeds within and the affected capsules fetch very low price in the market. The infestation also results in shedding of flowers and young capsules leading to nearly 47 per cent crop loss (Anon 2009).

Diafenthiuron, a thiourea compound which inhibits mitochondrial energy metabolism (ATP synthesis) (Ruder and Kayser 1992) and moulting has been viewed as a viable chemical for managing insects and mites. Diafenthiuron has been reported to be effective against sucking pests like *Bemisia tabaci* Gennadius and *Amrasca biguttula biguttula* Ishida in brinjal (Patel et al 2006), *Trialeurodes vaporariorum* Westwood (Javed and Matthews 2002), *Myzus persicae* Sulzer and *Frankliniella schultzei* Tyrbom in tomato (Scarpellani 2000), *Scirtothrips dorsalis* Hood and *Oligonychus coffeae* Nietner in tea (Anon 2005), diamondback moth, *Plutella xylostella* L (Ishaaya et al 1993, Lingappa et al 2004) and all sucking pests in cotton (Chinnabbai et al 2000, Kranthi et al 2004).

Registered insecticides which provide adequate control of the pests

require repeated application in higher doses and might result in adverse effects on the environment and health. In order to circumvent the problem, replacement of conventional insecticides with new powerful molecules at lower doses is necessary (Shivanna et al 2012). New formulations and new sources of existing molecules are likely to hold superiority in terms of higher toxicity, pest suppression, safety to natural enemies and non-target organisms, reduced spray dosages and rounds of spray and the benefits accrued in terms of savings in labour and time.

In this backdrop newer molecule diafenthiuron 50 WP was tested for its efficacy against *Sciothrips cardamomi* Ramk in cardamom.

MATERIAL and METHODS

Field trials were laid out in randomized block design (RBD) with three replications in farmers' holdings at Murukkadi, Kerala during November 2011 to February 2012 and at Onnammile, Kerala during February to May 2012 with varieties Njellani Green Gold and Paalakodi respectively in Idukki district. Plot size adopted was 40 m² and three sprays were given at 30 days interval and observations were made on damage caused by thrips before the spray and at 10, 20 and 30 days after each application (DAA). The treatments were diafenthiuron 50 WP new source (NS) @ 200, 300, 400 and 800 g ai/ha which were compared along with

diafenthiuron 50 WP existing source (ES) @ 400 g ai/ha and standard checks quinalphos 25 EC @ 150 g ai/ha and phenthoate 50 EC @ 100 g ai/ha.

Observations on the thrips damage were made on five panicles from five plants selected at random. Damage was assessed as number of capsules exhibiting scab to the total number of capsules and expressed as per cent damage. The observations were taken prior to and 30 days after each application. The per cent damage was subjected to statistical analysis by adopting RBD using IRRISTAT version 3/93 after converting it to arc sine percentage. The mean values of treatments were then separated by Duncan's Multiple Range Test (DMRT) (Gomez and Gomez 1984).

RESULTS and DISCUSSION

At Murukkadi the mean capsule damage by thrips prior to first spraying ranged from 16.27 to 20.59 per cent and was not significant. Thirty days after first application, diafenthiuron 50 WP (NS) @ 800 and 400 g ai/ha registered 10.04 and 11.49 per cent damage respectively while diafenthiuron 50 WP (ES) @ 400 g ai/ha recorded 11.30 per cent. Trend in the reduction of thrips was similar to that of first application. At 30 DAA after second spraying, diafenthiuron 50 WP (NS) @ 800 g ai/ha recorded 7.29 per cent thrips damage and was on par with 400 g ai/ha (7.78%) and diafenthiuron (ES) @ 400 g ai/ha (7.89%).

After third spray the similarity in the trend of reduction of thrips damage in diafenthiuron 50 WP (NS and ES) treated plots continued at 30 DAA. The maximum mean reduction in capsule damage over check was 80.51 per cent in diafenthiuron 50 WP (NS) @ 800 g ai/ha followed by 400 g ai/ha (78.66%), diafenthiuron 50 WP (ES) @ 400 g ai/ha (78.24%), diafenthiuron 50 WP (NS) @ 300 g ai/ha (70.61 %), phenthoate 50 EC @ 100 g ai/ha (68.58%), diafenthiuron 50 WP (NS) @ 200 g ai/ha (65.01%) and quinalphos 25EC @ 150 g ai/ha (62.40%) (Table 1).

The capsule damage by thrips prior to first spraying ranged from 15.04 to 16.36 per cent at Onnamile. At 30 DAA diafenthiuron 50 WP (NS) @ 800 and 400 g ai/ha recorded 7.30 and 7.76 per cent damage respectively which were on par with each other. Standard check phenthoate 50 EC @ 100 g ai/ha (10.08%), quinalphos 25 EC @ 150 g ai/ha (12.66%) and untreated check recorded 23.20 per cent damage respectively at 30 DAA. After second spray diafenthiuron 50 WP (NS) @ 800 and 400 g ai/ha were significantly superior over other treatments. At 30 DAA diafenthiuron 50 WP (NS) @ 800 g ai/ha recorded 4.18 per cent thrips damage which was on par with diafenthiuron 50 WP (NS) @ 400 g ai/ha (4.37%). The standard check quinalphos 25 EC @ 150 g ai/ha recorded 9.95 per cent damage while it was 30.64 per cent in the untreated check. After the third spray the order of efficacy in terms

Table 1. Effect of diafenthiuron 50 WP (NS) on capsule damage by *S cardamomi*

Location/treatment	Dose (g ai/ha)	% capsule damage*				% reduction over check
		Pre-treatment count	30 DAA (I spray)	30 DAA (II spray)	30 DAA (III spray)	
Murukkadi						
Diafenthiuron 50 WP NS	200	18.97 (25.82)	13.74 (21.76) ^{bc}	11.97 (20.24) ^c	9.70 (18.14) ^{cd}	11.80
	300	17.87 (25.01)	12.22 (20.46) ^{ab}	9.67 (18.12) ^b	7.85 (13.60) ^b	9.91
	400	18.43 (25.42)	11.30 (19.65) ^{ab}	7.78 (16.19) ^a	2.51 (9.12) ^a	7.20
	800	16.27 (23.79)	10.04 (18.47) ^a	7.29 (15.66) ^a	2.39 (8.89) ^a	6.57
	400	19.16 (25.96)	11.49 (19.81) ^{ab}	7.89 (16.32) ^a	2.64 (9.35) ^a	7.34
Quinalphos 25 EC	150	18.40 (25.40)	15.50 (23.19) ^c	12.30 (20.53) ^c	10.25 (18.67) ^d	12.68
Penthoate 50 EC	100	18.82 (25.71)	13.02 (21.15) ^{bc}	10.07 (18.50) ^b	8.70 (17.15) ^c	10.60
Untreated check	-	20.59 (26.99)	25.80 (30.53) ^d	34.01 (35.68) ^d	41.37 (40.03) ^e	33.73
Onnamile						
Diafenthiuron 50 WP NS	200	15.80 (23.42)	11.86 (20.14) ^c	8.36 (16.80) ^d	5.11 (13.06) ^c	8.44
	300	15.04 (22.82)	9.44 (17.89) ^b	6.44 (14.70) ^b	3.62 (10.97) ^b	6.50
	400	15.32 (23.04)	7.76 (16.18) ^a	4.37 (12.07) ^a	1.39 (6.76) ^a	4.51
	800	16.36 (23.86)	7.30 (15.67) ^a	4.18 (11.80) ^a	1.22 (6.34) ^a	4.23
	400	15.75 (23.38)	8.13 (16.57) ^a	4.80 (12.66) ^a	2.05 (8.23) ^a	4.99
Quinalphos 25 EC	150	16.33 (23.83)	12.66 (20.84) ^c	9.95 (18.39) ^e	5.88 (14.03) ^c	9.50
Penthoate 50 EC	100	15.04 (22.82)	10.08 (18.51) ^b	7.32 (15.70) ^c	3.97 (11.49) ^b	7.12
Untreated check	-	16.04 (23.61)	23.20 (28.80) ^d	30.64 (33.61) ^f	35.68 (35.68) ^d	29.84
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*Mean of three replications, DAA= Days after application, NS= New source, ES= Existing source, Figures in parentheses are arc sin square root per cent transformed values, Means in a column followed by a common letter(s) are not significantly different by DMRT (P= 0.05).

of per cent reduction of thrips damage over control was diafenthiuron 50 WP (NS) @ 800 g ai/ha (85.81%) > diafenthiuron 50 WP (NS) @ 400 g ai/ha (84.90%) > diafenthiuron 50 WP (ES) @ 400 g ai/ha (83.27%) > diafenthiuron 50 WP (NS) @ 300 g ai/ha (78.22 %) > phenthoate 50 EC @ 100 g ai/ha (76.13%) > diafenthiuron 50 WP (NS) @ 200 g ai/ha (71.70%) > quinalphos 25 EC @ 150 g ai/ha (68.17%) (Table 1).

Studies conducted by Rajabaskar (2003) earlier revealed that diafenthiuron at 0.16 per cent reduced the capsule damage by *S cardamomi* to an extent of 64.57 per cent and stood superior among other treatments. Later Stanley (2007) indicated that diafenthiuron at 0.16 and 0.08 per cent effected 93.28 and 90.23 per cent reduction over thrips damage in a field trial conducted at Bodimettu, Theni district. Diafenthiuron has also been evaluated for its efficacy against various thrips, *Scirtothrips dorsalis* Hood in hot pepper and chillies (Patel et al 2009), scarlet mite, *Raoiella indica* Hirst in arecanut (Shivanna et al 2012), *Thrips tabaci* Lindeman in mung bean, okra and cotton (Masood et al 2004, Bhai and Mohammad 2007), *S dorsalis* in grapes and chillies (Balikai 2007, Patel et al 2009), broad mite *Polyphagotarsonemus latus* Banks on hot pepper (Goldsmith and James 2002) and was proved effective. This is in conformity with the present investigation where diafenthiuron 50 WP (NS) proved

its superiority over cardamom thrips *S cardamomi*.

CONCLUSION

Though the effect was dose dependent, considering the efficacy and cost, diafenthiuron 50 WP (NS) @ 400 g ai/ha could be used for the management of *S cardamomi* in cardamom. Also diafenthiuron has been proved safer to natural enemies viz parasitoids and predators. Hence diafenthiuron can be effectively used in integrated management of thrips in cardamom.

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