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Effect of biorationals against the thrips, *Scirtothrips dorsalis* Hood infesting chilli

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ABSTRACT

The present investigation was carried out to test the efficacy of biorationals against thrips, *Scirtothrips dorsalis* Hood on chilli. Field experiments were conducted at farmers holding during September 2009 - Febrauary 2010 and November 2009 - April 2010. Among biorationals tested, spinosad 45 SC @ 0.4ml l^{-1} and emamectin benzoate 5 SG @ 0.4g l^{-1} was found to be superior to the standard check dimethoate 30 EC @ 2ml l^{-1} registering the least population of 0.55 and 0.59 / leaf, followed by *Beauveria bassiana* @ 1 x 10^8 spores ml^{-1} and neem oil 3 per cent which recorded thrips population of 1.01 and 1.11 / leaf. With regard to leaf curl damage by thrips, spinosad 45 SC @ 0.4 ml l^{-1} and emamectin benzoate 5 SG @ 0.4g l^{-1} was very effective. Highest dry chilli yield of 1509 kg ha^{-1} was registered in spinosad 45 SC @ 0.4ml l^{-1}, which was on par with emamectin benzoate 5 SG @ 0.4g l^{-1} (1525 kg ha^{-1}) with respective additional income of Rs. 30,300 and Rs. 26,400. The highest cost benefit ratio (1:4.30) was obtained in spinosad 45 SC @ 0.4ml l^{-1} followed by 1:4.30 in emamectin 5 SG @ 0.4g l^{-1}.

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INTRODUCTION

Chilli, *Capsicum annum* L. is an indispensable condiment in Indian dishes, having both vegetable and spice value. Nutritionally, it is rich in vitamin A, C and E, used as paste, powder or in whole forms in all Indian homes and also is used by the poor and rich alike. Among the sucking pests attacking chilli, thrips, *Scirtothrips dorsalis* (Hood) is one of the most important insect pest defy this crop. The characteristic leaf curl damage caused by this pest is known as "Muradu" in Tamil Nadu (Ayyar, 1932). In case of thrips, both nymphs and adults suck the sap from tender crop canopy, resulting in shriveling of leaves and in extreme cases the shoots hardly develop and leafs fall-off. In addition to eruption of internal areas and puckering of leaves, upward curling of leaves is also noticed (Reddy and Puttaswamy, 1983). The yield losses due to chilli thrips ranges from 50-90 per cent (Bagle, 1998). Farmers often used conventional pesticides to protect the crop has posed problems of pest resurgence, insecticidal resistance in controlling pest and also problems like residues in fruits and destruction of natural enemies (David, 1991). Hence, the present study was undertaken to find out the effective biorationals for formulation of IPM modules.

MATERIAL AND METHODS

Two field experiments were conducted at two locations in the farmer's holdings *viz*., Pannikundu, Thirumangalam block of Madurai district, during September 2009 - February 2010 and Manchanaighampatty, Aundipatty block of Theni district of Tamil Nadu during November 2009 - April 2010 to evaluate the effective biorationals for the formulation of IPM modules. The experiments were conducted in Randomized Block Design with three replication with the plot size of 5 x 5 m. A total of three rounds of spray were given at fornight interval on ETL basis of pests starting from 30 days after transplanting.

The thrips population was assessed from three leaves representing the top, middle and bottom portion of the plant prior to spray and 1^{st}, 3^{rd}, 7^{th} and 14^{th} day after each spray. The number of nymphs and adults were recorded from each leaf. For each treatment, five randomly selected plants were sampled per replication. The population was expressed as number of thrips / leaf. Ten plants were selected at random from each replication in all the treatments and severity of upward curling was scored visually by adapting 0 - 4 point scale and leaf curl index was worked out as suggested by Desai *et al*. (2006).

RESULTS AND DISCUSSION

The results of the field study on the impact of biorationals on the population of thrips (Table 1) indicated that spinosad 45 SC @ 0.4ml l^{-1} recorded the lowest population of *S. dorsalis* (0.60 and 0.49 / leaf, respectively) in both the field experiments I (Sep' 2009 - Feb' 2010) and II (Nov' 2009 - Apr' 2010) which was on par with emamectin benzoate 5 SG @ 0.4g l^{-1} (0.65 and 0.52 / leaf, respectively) and found superior to the standard check dimethoate 30 EC @ 2ml l^{-1} (0.74 and 0.70 / leaf), when compared to control (3.12 and 2.98 / leaf). The proportion of plants showing leaf curl damage was the low in the plots treated with spinosad 45 SC @ 0.4ml l^{-1} (0.92 and 0.81 LCI / plant) and at par with emamectin 5 SG @ 0.4g l^{-1} (0.94 and 0.83 LCI / plant) followed by standard check dimethoate 30 EC @ 2ml l^{-1} (0.97 and 0.86 LCI / plant) when compared to untreated control (2.09 and 1.98 LCI / plant) during both field experiments. The findings on the consistent efficacy of biorationals *viz.*, spinosad 45 SC and emamectin benzoate 5 SG against *S. dorsalis* are in agreement with the reports of several authors; Jones *et al.* (2002) and Garzia and Buonocora (2003) who found that Spinosad was effective against thrips, *F. occidentalis* on cucumber. Khalid and Prasad (2009) have reported that emamectin was effective against chilli thrips, respectively.

The next effective treatment was *B. bassiana* @ 1 x 10^8 spores ml^{-1} which recorded thrips population of 1.06 and 0.95/ leaf during both field experiments and with leaf curl index of 1.16 and 1.05 LCI / plant, respectively. This finding is in accordance with the findings of Sujay (2006) who found that application of *B. bassiana* @ $5x10^{13}$ spores ml^{-1} was very effective against *S. dorsalis* on chilli. Neem oil @ 3 per cent ranked next to *B. bassiana* which registered the thrips population of 1.06 and 0.95/ leaf with proportionate leaf curl damage of 1.23 and 1.12 LCI / plant, respectively. The results on efficacy of neem oil 3 per cent was in agreement with findings of Chandrasekharan and Veeravel (1998) and Mallikarjuna Rao *et al*. (1999) who reported that neem oil (3 and 5%) was effective against *S.dorsalis* in chilli.

The highest dry chilli yield and cost benefit ratios presented in (Table 2). Among biorationals tested, spinosad 45 SC @ 0.4ml l^{-1} recorded the highest yield of 1590 kg ha^{-1} with an additional income Rs. 30,300/- and was significantly superior to all other treatments. This was followed by emamectin 5 SG @ 0.4g l^{-1} (1525 kg ha^{-1}), *B. bassiana* @ 1 x 10^8 spores / lit (1220 kg ha^{-1}), *B. t.* var. *kurstaki* @ 1 kg ha^{-1} (1210 kg ha^{-1}), neem oil @ 3 per cent (1195 kg ha^{-1}), castor soap oil @ 2 per cent (1150 kg ha^{-1}) and panchachaviya (1120 kg ha^{-1}) with a respective additional income of 26,400/-, 8100/-, 7500/-, 6600/-, 3900/- and 2100/-. The standard check recorded an yield of 1240 kg ha^{-1}in with additional income of 9300/- against the lowest yield (1085 kg ha^{-1}) in untreated control. The highest cost benefit ratio (1:4.39) was obtained in spinosad 45 SC @ 0.4ml l^{-1} followed by 1:4.26, 1:2.89 and 1:2.34 in emamectin 5 SG @ 0.4g l^{-1}, *B. bassiana* @ 1 x 10^8 spores ml^{-1} and neem oil @ 3 per cent, respectively (Table 2). This findings are in accordance with Roopa and Ashok kumar (2014) who reported that application of Spinosad 45 SC @ 0.01 per

Table 1 : Evaluation of certain biorationals for the management of chilli thrips, *S. dorsalis* and its damage on chilli

		Thrips (No/leaf)*			LCI /plant*			Yield (kg plot^{-1})		
		Field experiment I	Field experiment II	Pooled mean	Field experiment I	Field experiment II	Pooled mean	Field experiment I	Field experiment II	Pooled mean
T_1	Emmamectin benzoate 5SG @ 0.4g l^{-1}	0.65 (1.07)^a	0.52 (1.01)^a	0.59 (1.04)^a	0.94^a	0.83^a	0.89	3.16	2.94	3.05^a
T_2	Spinosad 45 SC @ 0.4ml l^{-1}.	0.60 (1.05)^a	0.49 (0.99)^a	0.55 (1.02)^a	0.92^a	0.81^a	0.87	3.28	3.08	3.18^a
T_3	Neem oil 3%	1.17 (1.29)^d	1.04 (1.24)^d	1.11 (1.27)^d	1.23^c	1.12^d	1.18	2.50	2.27	2.39^c
T_4	Castor soap oil 2%	1.41 (1.38)^e	1.29 (1.34)^e	1.35 (1.36)^e	1.34^{de}	1.23^e	1.29	2.42	2.18	2.30^d
T_5	Panchakavya 3%	1.92 (1.56)^f	1.88 (1.54)^f	1.90 (1.55)^f	1.57^{ef}	1.45^e	1.51	2.36	2.12	2.24^d
T_6	*B. t.var kurstaki* @ 1 Kg ha^{-1}	1.99 (1.58)^f	1.96 (1.57)^f	1.98 (1.57)^f	1.61^f	1.49^e	1.55	2.53	2.30	2.42^{bc}
T_7	*B. bassiana* 1X 10^8 ml^{-1}	1.06 (1.25)^c	0.95 (1.20)^c	1.01 (1.23)^c	1.16^c	1.05^c	1.11	2.55	2.32	2.44^b
T_8	Dimethoate 30 EC @ 2ml l^{-1}	0.74 (1.12)^b	0.70 (1.10)^b	0.72 (1.10)^b	0.97^b	0.86^b	0.92	2.60	2.36	2.48^b
T_9	Control	3.12 (1.90)^g	2.98 (1.87)^g	3.05 (1.88)^g	2.09^g	1.98^g	2.04	2.28	2.06	2.17^e

* Each value is the mean of three replications
Figures in parentheses are $\sqrt{X + 0.5}$ transformed values
Means in a column followed by same letters are not significantly different (P=0.05) by DMRT

Table 2 : Evaluation of certain biorationals on the yield of dry chilli

Treatments	yield (kg plot^{-1})*	yield (kg ha^{-1})	Additional yield over control (kg ha^{-1})	Additional income over untreated check (Rs.)	Management cost (Rs.)	Cost benefit ratio
T_1 Emamectin benzoate 5G @ 0.4g l^{-1}	3.05^a	1525	440	26400	6200	4.26
T_2 Spinosad 45 SC @ 0.4ml l^{-1}	3.18^a	1590	505	30300	6900	4.39
T_3 Neem @ oil 3%	2.39^c	1190	110	6600	2525	2.51
T_4 Castor soap oil @ 2%	2.30^d	1150	65	3900	2400	1.63
T_5 Panchakavya @ 3%	2.24^d	1120	35	2100	1800	1.17
T_6 *B. t.var kurstaki* @ 1 kg ha^{-1}	2.42^{bc}	1210	125	7500	2625	2.34
T_7 *B. bassiana* @ 1x 10^8 spores ml^{-1}	2.44^b	1220	135	8100	2800	2.89
T_8 Dimethoate 30 EC @ 2ml l^{-1}	2.48^b	1240	155	9300	2700	3.44
T_9 Untreated Control	2.17^e	1085	-	-	-	-

* Each value is the mean of three replications
Means in a column followed by same letters are not significantly different (P=0.05) by DMRT

cent recorded the highest yield (30050 kg ha^{-1}) in capsicum with benefit cost ratio (1:4.60), followed by emamectin benzoate 5 SG @ 0.4g / lit with an yield (27000 kg ha^{-1}) and benefit cost ratio (1:4.10).

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