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Evaluation of newer insecticides against citrus leaf miner, *Phyllocnistis citrella* Stainton in acid lime.

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ABSTRACT

The results revealed that two sprays of abamectin 1.9 EC (0.0007%) at 15 days interval just after initiation of new flush found most effective and recorded minimum per cent infestation of leaves caused by citrus leaf miner, followed by thiamethoxam 25 WG (0.025%) and spinosad 45 SC (0.02%) respectively, which were at par with abamectin. The rest of the treatments viz. novaluron 10 EC (0.005%), diafenthiuron 50 WP (0.05%), acephate 75 SP (0.1125%) and thiodicarb 75 WP (0.075%) were also found effective in controlling citrus leaf miner as against untreated control.

Introduction

The citrus leaf miner, *Phyllocnistis citrella* Stainton (Phyllocnistidae: Lepidoptera) is a major insect pest inflicting severe damage in citrus orchard. The average infestation rate of citrus leaf miner varied from 17 to 57 per cent. The activity of the pest is normally observed throughout the year due to its overlapping generations, however new flushes are more exposed. The larvae feed on the epidermis of the tender leaves making serpentine mines due to which leaves become distorted and crumpled. Severe infestation results in decrease of photosynthetic activity leading to reduction in vigour and plant growth (Makar et al., 1984). Although citrus leaf miner causes indirect damage to young leaves, which predisposes them to infestation by canker so, controlling citrus leaf miner is a vital component of cancer management. It was estimated that nearly 45 per cent of new leaf area was lost due to citrus leaf miner mining (Garcia- Mari et al., 2002). To combat this pest damage and for qualitative and increase of yield, sustainable approaches for pest management are very much essential. In present investigation on efficacy of newer insecticides was tried for management of this pest and to overcome the problem of resistance and resurgence.

Materials and Methods:

Field experiment was conducted to evaluate efficacy of different novel groups of insecticides for the management of citrus leaf miner on acid lime (*Citrus aurantifolia* Swingle) at Research Farm of AICRP on Fruits, MPKV, Rahuri (Maharashtra) during January -February 2014. This was planned in randomized block design with three replications on 4 years old acid lime (*kagzi* lime). The treatments evaluated in experiment were abamectin 1.9 EC @ of 0.0007%, spinosad 45 SC @ of 0.002%, novaluron 10 EC @ of 0.005%, diafenthiuron 50 WP @ of 0.05%, acephate 75 Sp @ of 0.1125%, thiamethoxam 25 WG @ of 0.025% and thiodicarb 75 WP @ of (0.075%) along with untreated control (water spray). The insecticides were applied as foliar spray twice at 15 days interval initiating during emergence of new flush in the month of January. Two plants were designated as the unit for each replication per treatment. Observations were recorded on total leaves and damaged leaves (total damaged with leaf curled and twisted) in thirty terminal shoots per treatment on one day before spray and 3, 7 and 14 days after each spray application. The data per cent infestation of leaves was transferred to arc – sin transformed values.

Results and Discussion:

The data on efficacy of newer insecticides against citrus leaf miner after first spray is presented in Table 1, revealed that the initial per cent infestation of citrus leaf miner was in the range of 61.54 to 69.30 per cent on one day before first spray**.** Abamectin 1.9 EC @ of 0.0007 per cent was found most effective against citrus leaf miner and recorded lower per cent infestation (33.46, 27.59 and 21.46 %) at 3rd, 7th and 14th days after spray, respectively. The next best treatments were thiamethoxam 25 WG @ of 0.025 per cent (34.57, 29.91 and 23.12 %) and spinosad 45 Sc @ of 0.002 per cent (36.64, 30.13 and 23.67 %) on 3rd, 7th and 14th days after spray, respectively and which were at par with abamectin 1.9 EC. The next superior treatments were novaluron 10 EC @ of 0.005 per cent (38.00, 31.00 and 26.09 %), diafenthiuron 50 WP @ of 0.05 per cent (38.27, 32.63 and 28.00 %) acephate 75 SP V 0.1125 per cent (40.00, 33.40 and 29.14 %) and thiodicarb 75 WP @ of 0.75 per cent (49.13, 39.27 and 33.66 %) significantly recorded less infestation over untreated control (62.33, 65.03 and 66.78%) on 3rd, 7th and 14th days after spray application

The data on per cent infestation of leaves caused by citrus leaf miner in acid lime after second spray presented in Table 2, it reveals that, the untreated control recorded maximum infestation of leaves (65.00, 61.00 and 67.00 %) on 3rd, 7th and 14th days after spray, respectively. The treatment with abamectin 1.9 EC @ 0.0007 % recorded lowest per cent infestation of leaves caused by citrus leaf miner (19.11, 14.23 and 9.16 %) on 3rd, 7th and 14th days after spray, respectively. The next best treatments were thiamethoxam 25 WG @ 0.025 % which recorded (21.13, 15.36 and 10.26 %) and spinosad 45 SC @ 0.002 % (21.33, 16.00 and 10.58 %) per cent infestation on 3rd, 7th and 14th days after spray, respectively. The next best treatments in recording per cent infestation were novaluron 10 EC @ 0.005 %, diafenthiuron 50 WP @ 0.05 %, acephate 75 SP @ 0.1127 % and thiodicarb 75 WP@ 0.075 % and recorded24.27,17.21 and 12.60; 25.18, 17.45 and 14.10 ; 26.00, 20.11 and 16.40 and 30.00, 23.47 and 20.132 per cent on 3rd, 7th and 14th days after spray, respectively.

The mean data of two sprays in respect of per cent leaf infestation caused by citrus leaf miner in acid lime are presented in Table 3, revealed that all the insecticidal treatments significantly recorded less infestation (26.29-39.57, 20.91-31.37 and 15.31-26.89%) over untreated control (63.67, 63.02 and 67.00%) 0n 3rd, 7th and 14th days after spray application.

Abamectin 1.9 EC @ 0.0007 per cent was recorded minimum infestation of leaves (26.29, 20.91 and 15.31 %) followed by thiamethoxam 25 WG @ 0.025 per cent (27.85, 22.64 and 16.69 %) and spinosad 45 SC @ 0.002 per cent (28.99, 23.07 and 17.74 %) on 3rd,7th and 14th DAS, respectively which were at par with abamectin. The rest of the treatments viz. novaluron 10 EC @ 0.005 per cent, diafenthiuron 50 WP @ 0.05 per cent, acephate 75 SP @ 0.1125 per cent and thiodicarb 75 WP @ 0.75 per cent also reduced the leaf miner infestation and it was 31.14, 24.11 and 19.35; 31.73, 25.04 and 21.05;

33.00, 26.76 and 22.77 and 39.75, 31.37 and 26.89 per cent on 3rd, 7th and 14th DAS, respectively. The present findings are in accordance with the results reported by earlier workers (Howard, 1993; Raga et al., 2001; Sarvanan and Savithri, 2005; Shinde et al., 2013 and Patil, 2013).

Table 1. Efficacy of newer insecticides against citrus leaf miner in acid lime after first spray

Tr. No.	Treatments	Dose (qty/lit.)	Infestation of leaves (%) 1 DBS	3 DAS	7 DAS	14 DAS
T_1	Abamectin 1.9 EC	0.4ml	67.33 (55.15)*	33.46 (35.33)	27.59 (31.68)	21.46 (27.59)
T_2	Spinosad 45 SC	0.04ml	69.30 (56.36)	36.64 (37.25)	30.13 (33.29)	23.67 (29.13)
T_3	Novaluron 10 EC	0.5ml	65.64 (54.11)	38.00 (38.05)	31.00 (33.83)	26.09 (30.71)
T_4	Diafenthiuron 50 WP	1.0 g	61.54 (51.67)	38.27 (38.21)	32.63 (34.83)	28.00 (31.94)
T_5	Acephate 75 SP	1.5 g	69.01 (56.18)	40.00 (39.23)	33.40 (35.30)	29.14 (32.67)
T_6	Thiamethoxam 25 WG	0.1 g	62.38 (52.17)	34.57 (36.01)	29.91 (33.14)	23.12 (28.74)
T_7	Thiodicarb 75 % WP	1.0 g	66.70 (54.76)	49.13 (44.50)	39.27 (38.80)	33.66 (35.46)
T_8	Control (Water spray)	-	64.31 (53.32)	62.33 (52.14)	65.03 (53.74)	66.78 (54.94)
	S.E. ±	-	0.72	0.69	0.62	0.54
	CD at 5 %	-	2.18	2.09	1.88	1.63

* Figures in the parenthesis are arc-sine transformed values DBS: Day before spray, DAS: Days after spray

Table 2. Efficacy of newer insecticides against citrus leaf miner in acid lime after second spray

Tr. No.	Treatments	Dose (qty/lit.)	Infestation of leaves (%) 3 DAS	7 DAS	14 DAS
T_1	Abamectin 1.9 EC	0.4ml	19.11 (25.9)*	14.23 (22.15)	9.16 (17.61)
T_2	Spinosad 45 SC	0.04ml	21.33 (27.50)	16.00 (23.57)	10.58 (18.98)
T_3	Novaluron 10 EC	0.5ml	24.27 (29.49)	17.21 (24.50)	12.60 (20.77)
T_4	Diafenthiuron 50 WP	1.0 g	25.18 (31.12)	17.45 (24.68)	14.10 (22.02)
T_5	Acephate 75 SP	1.5 g	26.00 (30.65)	20.11 (26.64)	16.40 (23.89)
T_6	Thiamethoxam 25 WG	0.1 g	21.13 (27.24)	15.36 (23.06)	10.26 (18.63)
T_7	Thiodicarb 75 WP	1.0 g	30.00 (33.20)	23.47 (28.97)	20.13 (26.64)
T_8	Control (Water spray)	-	65.00 (53.73)	61.00 (51.38)	67.00 (54.98)
	S.E. ±	-	0.54	0.77	0.92
	CD at 5 %	-	1.65	2.33	2.79

Table 3. Efficacy of newer insecticides against citrus leaf miner in acid lime mean of two sprays

Tr. No.	Treatments	Dose (qty/lit.)	Infestation of leaves (%) 3 DAS	7 DAS	14 DAS
T_1	Abamectin 1.9 EC	0.4ml	26.29 (30.84)*	20.91 (27.21)	15.31 (23.02)
T_2	Spinosad 45 SC	0.04ml	28.99 (32.57)	23.07 (28.69)	17.14 (24.45)
T_3	Novaluron 10 EC	0.5ml	31.14 (33.91)	24.11 (29.40)	19.35 (26.09)
T_4	Diafenthiuron 50 WP	1.0 g	31.73 (34.28)	25.04 (30.02)	21.05 (27.29)
T_5	Acephate 75 SP	1.5 g	33.00 (35.05)	26.76 (31.15)	22.77 (28.50)
T_6	Thiamethoxam 25 WG	0.1 g	27.85 (31.84)	22.64 (28.40)	16.69 (24.11)
T_7	Thiodicarb 75 % WP	1.0 g	39.57 (38.72)	31.37 (34.05)	26.89 (31.24)
T_8	Control	-	63.67 (52.93)	63.02 (52.55)	67.00 (54.95)
	SE (±)	-	**0.48**	**0.55**	**0.51**
	CD at 5%	-	**1.45**	**1.65**	**1.56**

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