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Efficacy of insecticides against tea mosquito bug, *Helopeltis antonii* Signoret in cashew

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Abstract
Field experiment entitled "Efficacy of insecticides against tea mosquto bug, *Helopeltis antonii* Sign. in cashew'' was conducted during 2018-19 with nine treatments, replicated thrice, in the farm of Horticulture Section, NARP, Shenda Park, Kolhapur, (Maharashtra) with the objectives to study the efficacy of insectcides against tea mosquito bug.
The treatment with λ-cyhalothrin 5 EC @ 1.2 ml/lit was found to be significantly superior over all the treatments where least infestation of tea mosquito bug as recoded (4.18%). The treatment with beta cyfluthrin + imidacloprid 300 OD @ 1 ml/lit, buprofezin 25 EC @ 3 ml/lit, deltamethrin 2.8 EC @ 1.8 ml/lit, acetamiprid 20 SP @ 1 g/lit, acephate 75 SP, flonicamid 50 WG @ 0.3g/lit @ 2 g/lit and emamectin benzoate 5 @ 0.4 g/lit were next in order of efficacy with 5.20, 6.12, 6.47, 6.74, 7.01, 7.44 and 8.49 per cent infestation recorded, respectively.

Keywords: efficacy, larval infestation eduction, tea mosquito bug

Introduction
In India, more than 180 pests are infesting the cashew including insects, mites and vertebrates, of which 47 species are observed infesting cashew in the Konkan region of Maharashtra (Navik and Godase, 2017) [10]. However, only few of them are considered as the major pests causing considerable damage *viz*., cashew stem and root borer, *Plocaederus ferrugineus* L., tea mosquito bug, *Helopeltis antoni* Signoret, inflorescence thrips, *Scirtothrips dorsalis* Hood, apple and nut borer (*Nephopteryx* sp.) to cashew in west coast of Maharashtra (Zote *et al*., 2017) [15]. In cashew, the pest often yield losses to the extent of 30-50 per cent through blossom blight, shoot necrosis and damage to nuts and apples (Srikumar and Bhat, 2013).The purpose of this experiment was important for the control of TMB and further management strategies.

Methodology
Experimental detail
To Study the efficacy of insecticides for control of tea mosuito bug
The statistically designed field experiment was conducted at National Agriculture Research Project (NARP), Shenda Park, Kolhapur in Randomized Block Design (RBD) with 9 treatments. The trees having uniform flushes were selected and treatments were imposed randomly.

Table 1: Details of treatments for spraying in cashew

Sr. No.	Name of insecticide	Formulation	Dose/lit
1	Emamectin Benzoate	5 SG	0.4 g
2	Acetamiprid	20 SP	1.0 g
3	Flonicamid	50 WG	0.6 g
4	Deltamethrin	2.8 EC	1.8 ml
5	Lambda cyhalothrin	5 EC	1.2 ml
6	Buprofezin	25 EC	3 ml
7	Beta Cyfluthrin + Imidacloprid	300 OD	1 ml
8	Acephate	75 SP	2 g
9	Untreated Control	-	-

Details of the Experiments
Crop : Cashew
Variety : Vengurla-4
Design : Randomised Block Design
Replication : Three
Treatments : Nine
Spacing : 5 × 5 m^2
Date of Sprayings : 1st spray 25.12.18
2nd spray 25.1.19
3rd spray 25.2.19
Location : NARP, Shenda park, Tal- Karveer, Dist-Kolhapur.

Insecticides application
The spray of insecticides were applied with the help of power sprayer. The quantity of spray fluid required for treating the panicles per plant was calculated by spraying untreated control with water. The quantity of each insecticidal formulation was worked out and mixed in required quantity of water. Care was taken to cover all plant parts thoroughly. Spraying was done in the morning and care was taken to wash the pump with water while switching on from one insecticide to another.

Method of recording observations
The observations were recorded as per the method suggested by Smitha and Pushpalatha (2014) [12]. For recording observations, fifty two uniform tender shoots were selected randomly at four sides (North, East, South and West) on each selected tree and labeled individually for each treatment. The observations were recorded 7, 15 and 30 days after each spray on tea mosquito bug infestation in 0-4 scale. Then data obtained on per cent incidence were subjected to arc sin and analyzed with randomized block design.

Statistical analysis
In order to compare the treatment effect based on generated data of field experiments, the natural counts were subjected to transformation as per the statistical methods suggested by Panse and Sukhatme, (1967) [11]. The data on counts and pre count of tea mosquito bug were converted to arc sin transformation. Critical difference for each efficacy parameter was worked out at 5 per cent level of significance so as to compare significance of various treatments.

Results and Discussion
Efficacy of Chemical Insecticides Against Tea Mosquito Bug (2018-2019)
The field experiment was conducted to find out a suitable treatment for the control of tea mosquito bug, *H. antonii* infesting cashew and the efficacy of different chemical insecticides was evaluated under field conditions against tea mosquito bug. The results of experiments are presented and discussed below.

First Spray
The per cent shoot or panicle damage due to TMB was recorded one day before spraying. The results are found to be non-significant, which indicate the uniform population of TMB in the experimental field.
The observations recorded on tea mosquito bug, *H. antonii* Sign after first spray are presented in Table 2
The overall results on efficacy indicated that, the treatment with λ-cyhalothrin 5 EC found to be significantly superior over all other treatments with 4.33 per cent infestation of tea mosquito bug. This was followed by beta cyfluthrin + imidacloprid 300 OD SC, buprofezin 25 SC, deltamethrin 2.8 EC, acetamiprid 20 SP, flonicamid 50 WG, acephate 75 SP and emamectin benzoate 5 SG with 5.65, 6.08, 6.43, 6.74, 6.90, 7.65 and 8.65 per cent shoot/panicle infestation, respectively.
The treatment with λ-cyhalothrin 5 EC showed the highest per cent recovery over control (85.27). This was followed by beta cyfluthrin + imidacloprid 300 OD SC, buprofezin 25 SC, deltamethrin 2.8 EC, acetamiprid 20 SP, flonicamid 50 WG, acephate 75 SP and emamectin benzoate 5 SG with 80.87, 79.32, 78.13, 76.53, 74.70, 73.98 and 70.58 per cent recovery over control, respectively.

Table 2: Efficacy of insecticides against tea mosquito bug infesting cashew (1st spray)

Sr. No	Treatment	Dose g or ml/lit	Pre-treatment Infestation %	Mean per cent shoot/panicle infestation			Mean	% Reduction over control
				7 DAS	15 DAS	30 DAS		
1	Emamectin enzoate 5 SG	0.2 g	24.35 (29.56)*	7.69 (16.02)	8.86 (17.18)	9.40 (17.82)	8.65 (17.00)	70.58
2	Acetamiprid 20 SP	0.5 g	24.99 (29.99)	4.80 (12.61)	8.33 (16.77)	7.58 (15.86)	6.90 (12.32)	76.53
3	Flonicamid 50 WG	0.3 g	24.78 (29.83)	6.19 (14.35)	8.76 (17.20)	7.37 (15.70)	7.44 (15.75)	74.70
4	Deltamethrin 2.8 EC	0.9 ml	25.64 (30.40)	5.01 (12.92)	7.47 (15.67)	6.83 (15.13)	6.43 (14.57)	78.13
5	Lambda Cyhalothrrin 5 EC	0.6 ml	24.78 (29.83)	2.88 (9.68)	4.69 (12.47)	5.44 (13.35)	4.33 (11.38)	85.27
6	Buprofezin 25 EC	1.5 ml	26.38 (30.88)	5.12 (12.84)	6.41 (14.65)	6.73 (15.01)	6.08 (14.16)	79.32
7	Beta cyfluthrin+ imidacloprid 300 OD	0.5 ml	23.61 (29.04)	4.16 (11.53)	6.62 14.89)	6.18 (14.31)	5.65 (13.57)	80.78
8	Acephate 75 SP	1 g	26.06 (30.69)	7.69 (16.08)	6.19 (14.33)	9.08 (17.53)	7.65 (15.98)	73.98
9	Untreated control		25.10 (30.06)	26.06 (30.69)	29.70 (33.02)	32.47 (34.74)	29.41 (32.81)	
	SEm±		0.96	1.15	1.04	0.96		
	CD 5%		NS	4.48	3.20	2.88		
	CV %		5.37	13.22	10.64	9.39		

DAS- Days After Spraying *Figures in the parenthesis are arc sin transformation

Second Spray
The observations recorded on tea mosquito bug infestation after seven days of spraying are presented in Table 3
The overall results on efficacy indicated that, the treatment with λ-cyhalothrin 5 EC found to be significantly superior over all other treatments with 5.01 per cent infestation of tea mosquito bug. This was followed by beta cyfluthrin + imidacloprid 300 OD SC, buprofezin 25 SC, acetamiprid 20 SP, acephate 75 SP, deltamethrin 2.8 EC, flonicamid 50 WG and emamectin benzoate 5 SG with 6.33, 7.47, 8.22, 8.24, 8.29, 9.00 and 10.25 per cent shoot/panicle infestation, respectively.
The treatment with λ-cyhalothrin 5 EC showed the highest per cent recovery over control (84.48). This was followed by beta

cyfluthrin + imidacloprid 300 OD SC, buprofezin 25 SC, acetamiprid 20 SP, acephate 75 SP, deltamethrin 2.8 EC, flonicamid 50 WG and emamectin benzoate 5 SG with 80.40, 76.87, 74.55, 74.48, 74.33, 72.13 and 68.26 per cent recovery over control, respectively.

Table 3: Efficacy of insecticides against tea mosquito bug infesting cashew (2nd Spray)

Sr. No	Treatment	Dose g or ml/lit	Mean per cent shoot/panicle infestation			Mean	% Reduction over control
			7 DAS	15 DAS	30 DAS		
1	Emamectin benzoate 5 SG	0.2 g	9.18 (17.62)*	10.36 (18.75)	11.21 (19.49)	10.25 (18.62)	68.26
2	Acetamiprid 20 SP	0.5 g	6.73 (14.91)	8.86 (17.07)	9.08 (17.45)	8.22 (16.47)	74.55
3	Flonicamid 50 WG	0.3 g	7.37 (15.46)	9.82 (18.23)	9.82 (18.25)	9.00 (17.31)	72.13
4	Deltamethrin 2.8 EC	0.9 ml	7.26 (15.60)	8.86 (17.28)	8.76 (17.20)	8.29 (16.69)	74.33
5	Lambda cyhalothrin 5 EC	0.6 ml	4.59 (12.34)	4.70 (12.36)	5.76 (13.86)	5.01 (12.85)	84.48
6	Buprofezin 25 EC	1.5 ml	6.51 (14.69)	8.33 (16.64)	7.58 (15.97)	7.47 (15.76)	76.87
7	Beta cyfluthrin+ imidacloprid 300 OD	0.5 ml	6.19 (14.15)	5.98 (13.99)	6.83 (15.13)	6.33 (14.42)	80.40
8	Acephate 75 SP	1 g	8.62 (16.86)	6.83 (15.13)	9.29 (17.73)	8.24 (16.57)	74.48
9	Untreated		33.54 (35.39)	34.03 (36.16)	28.84 (32.47)	32.30 (34.67)	
	SEm±		1.45	1.34	0.85		
	CD 5%		4.37	4.05	2.55		
	CV %		14.45	12.70	7.93		

DAS- Days After Spraying *Figures in the parenthesis are arc sin transformation.

Third Spray

The observations recorded on tea mosquito bug after third spray are presented in Table 4

The overall results on efficacy indicated that, the treatment with λ-cyhalothrin 5 EC found to be significantly superior over all other treatments with 3.20 per cent infestation of tea mosquito bug. This was followed by beta cyfluthrin + imidacloprid 300 OD SC, deltamethrin 2.8 EC, buprofezin 25 SC, acetamiprid 20 SP, acephate 75 SP, flonicamid 50 WG and emamectin benzoate 5 SG with 3.62, 4.69, 4.83, 5.12, 5.15, 5.90 and 6.59 per cent shoot/panicle infestation, respectively.

The treatment with λ-cyhalothrin 5 EC showed the highest per cent recovery over control (83.09). This was followed by beta cyfluthrin + imidacloprid 300 OD SC, deltamethrin 2.8 EC, buprofezin 25 SC, acetamiprid 20 SP, acephate 75 SP, flonicamid 50 WG and emamectin benzoate 5 SG with 80.87, 75.22, 74.48, 72.95, 72.79, 68.83 and 65.18 per cent recovery over control, respectively.

Table 4: Efficacy of insecticides against tea mosquito bug infesting cashew (3 rd spray)

Sr. No	Treatment	Dose g or ml/lit	Mean per cent shoot/panicle infestation			Mean	% Reduction over control
			7 DAS	15 DAS	30 DAS		
1	Emamectin benzoate 5 SG	0.2 g	6.19 (14.15)*	6.85 (15.07)	6.73 (14.91)	6.59 (14.71)	65.18
2	Acetamiprid 20 SP	0.5 g	3.84 (11.05)	4.69 (12.47)	6.83 (15.13)	5.12 (12.88)	72.95
3	Flonicamid 50 WG	0.3 g	5.44 (13.48)	6.08 (14.21)	6.19 (14.15)	5.90 (13.94)	68.83
4	Deltamethrin 2.8 EC	0.9 ml	4.59 (11.79)	4.69 (12.33)	4.80 (12.61)	4.69 (12.24)	75.22
5	Lambda cyhalothrin 5 EC	0.6 ml	2.88 (9.64)	3.09 (9.94)	3.63 (10.78)	3.20 (10.12)	83.09
6	Buprofezin 25 EC	1.5 ml	4.27 (11.64)	4.80 (12.12)	5.44 (13.41)	4.83 (12.39)	74.48
7	Beta cyfluthrin+ imidacloprid 300 OD	0.5 ml	3.52 (10.54)	3.52 (10.54)	3.84 (11.24)	3.62 (10.77)	80.87
8	Acephate 75 SP	1 g	5.12 (13.00)	4.91 (12.76)	5.44 (13.41)	5.15 (13.05)	72.79
9	Untreated		22.79 (28.52)	19.11 (25.92)	14.90 (22.69)	18.93 (25.71)	
	SEm±		1.44	1.41	1.23		
	CD 5%		4.33	4.24	3.70		
	CV 5%		19.80	18.79	15.62		

DAS- Days After Spraying *Figures in the parenthesis are arc sin transformation

The overall results after three sprays envisaged the order of efficacy viz., λ-cyhalothrin, beta cyfluthrin + imidacloprid, buprofezin, deltamethrin, acetamiprid, acephate, flonicamid and emamectin benzoate. The present findings in respect to effectiveness of λ-cyhalothrin are in agreement with the findings of Sundararaju (2004) [14] who reported from Karnataka, Dwomoh *et al*., (2007) [1], Mahapatro and Mathew, (2007) [5] and Mahapatro (2008) [6] from Kerala. Similarly, Jalgaonkar *et al*., (2009 and 2011) [2-3], Manjanaik *et al*., (2012), Smitha and Puspalatha (2014) [12], Manjanaik *et al*., (2015) [8], and Mohite (2017) [9].

Jalgaonkar *et al*., (2015) [4] also reported that λ-cyhalothrin was found to be significantly superior treatment as compared to the recommended schedule of tea mosquito bug.

Conclusion

The treatment with λ-cyhalothrin 5 EC was found significantly superior over all other treatments. The next order efficacy is the beta cyfluthrin + imdidacloprid 300 OD > buprofezin 25 EC > deltamethrin 2.8 EC > acetamiprid 20 SP > acephate 75 SP > flonicamid 50 WG > emamectin benzoate 5 SG.

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