International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2020; 8(5): 1336-1338

Received: 04-07-2020
Accepted: 08-08-2020

Mallikarjun CJ
College of Horticulture, UHS, Bagalkot, Karnataka, India

Suvarna Patil
Assistant Professor of Entomology, RHREC, Dharwad, Karnataka, India

Athani SI
Professor of Fruit Science, Dean Students Welfare, UHS Bagalkot, Karnataka, India

Kotikal YK
Professor of Entomology and Director of Extension, UHS, Bagalkot, Karnataka, India

Arunkumar B
Assistant Professor of Entomology, RHREC, Dharwad, Karnataka, India

Ramchandra NK
Professor of Post-Harvest Technology and Head RHREC, Dharwad, Karnataka, India

Vinaykumar MM
Assistant Professor of Entomology, COH, Bagalkot, Karnataka, India

Ambika DS
Assistant Professor, Plant Pathology, COH, Bagalkot, Karnataka, India

Corresponding Author:
Suvarna Patil
Assistant Professor of Entomology, RHREC, Dharwad, Karnataka, India

Efficacy of new insecticide molecules against mango leaf webber, *Orthaga exvinacea* Hampson (Pyralidae: Lepidoptera)

Mallikarjun CJ, Suvarna Patil, Athani SI, Kotikal YK, Arunkumar B, Ramchandra NK, Vinaykumar MM and Ambika DS

DOI: https://doi.org/10.22271/chemi.2020.v8.i5s.10485

Abstract
The field experiment was conducted at Regional Horticultural Research and Extension Centre (RHREC), Kumbapur farm, Dharwad during 2018-19 to evaluate the efficacy of new molecules of insecticides against mango leaf webber in the established mango orchard. The cumulative mean of pest incidence fifteen days after second spray revealed that all the treatments showed comparative decrease in spread of the mango leaf webber infestation, but the treatment chlorantraniliprole 18.5% SC recorded least number of active webs per tree (2.17) and least number of larvae per web (2.82) and same was found effective in the management of *O. exvinacea* infesting mango over untreated control.

Keywords: mango, leaf webber, management, new insecticides

Introduction
The Mango (*Mangifera indica* L.), is described under dicotyledons which fall under the family Anacardiaceae and is classified under the order Sapindales. It is originated in the Indo-Burma region. It is considered as the "King of fruits". Mango flowers are borne on the inflorescence called flower panicles which appear to be creamy white to pinkish in colour. Now a days, incidence of leaf webber has been increasing in many areas. Mango leaf webber *Orthaga exvinacea* Hampson is considered to be a pest of occasional significance in the mango ecosystem. *O. euadrusalis* in the recent years are attaining a major pest status (Rajkumar *et al*., 2013) [4]. The extent of damage caused by this pest under favorable condition was estimated as 35 per cent (Srivastava and Tandon, 1980) [6]. The heavily infested trees appear to be burnt like from a distance wherein the leaves are dried, webbed and filled with excreta. The early instars (*i.e*., 1st and 2nd instars) scrape the chlorophyll content of the leaves and later stage instars start forming the webs by webbing 3-4 leaves together and larvae are very active in their movement inside the web where they will have tunnels made up of silken webs to escape, hide and pupate inside the webbings itself in a silken cocoon like case covered with its excreta outside. So, this severe infestation results in complete failure in flower initiation and finally the yield is affected (Anon, 2017) [1].

Materials and Method
The field experiment was conducted at Regional Horticultural Research and Extension Centre (RHREC), Kumbapur farm, Dharwad during 2018-19 to evaluate the efficacy of new molecules of insecticides against mango leaf webber in the established mango orchard with Alphanso variety with spacing of 7.5 X 7.5 m. The experiment was laid out in simple Randomized Completely Block Design with spacing of 7.5 X 7.5 m. The total number of treatment were ten with three replications. Each tree was considered as one treatment.

Observations recorded: Infested trees with minimum of 10 to 15 webbings were selected and tagged. Observations were recorded a day prior to application of treatments as precount and recorded number of webs per tree and number of larvae per web. Post treatment counts were taken for the presence of larvae in the web at 3, 7 and 15 days after treatment. On the basis of number of active webs per tree and number of larvae per web, the data were analyzed to arrive at conclusion regarding efficacy of various insecticidal treatments. Similarly, second

spray was imposed after one-month of first spray. The new insecticide molecules used under study are listed in Table 1. The fruit yield per tree was also recorded from each treatment separately and economics for each treatment was computed on the basis of fruit yield per hectare and market price.

Statistical analysis: Data on management of mango leaf webber was statistically analyzed (ANOVA) applying Randomized Block Design by using the software - WASP.

Table 1: Treatment details

S. No.	Treatments	Dosage
T1	Azadirachtin 10,000 ppm	1.0 ml/l
T2	Flonicamid 50% WG	2.0 g/l
T3	Flubendiamide 20% WG	0.25 g/l
T4	Lambda cyhalothrin 5% EC	0.5 ml/l
T5	Profenophos 50% EC	1.0 ml/l
T6	Fipronil 5% SC	1.0 ml/l
T7	Chlorantraniliprole 18.5% SC	0.2 ml/l
T8	Cyantraniliprole 10.26% OD	1.2 ml/l
T9	Quinalphos 25% EC (Standard check)	2.0 ml/l
T10	Untreated Control	-

Results and Discussion

Observations were recorded on one day before imposing the treatment and 3, 7, 15 days after application of first and second spray.

Number of active webs per tree: The treatments chlorantraniliprole 18.5% SC and cyantraniliprole 10.26% OD observed to be the best, as least number of active webs per tree were 5.33 and 5.46 respectively. However, the treatments flubendiamide 20% WG was on par with lambda cyhalothrin 5% EC and profenophos 50% EC were next best. (Table 2). Shivmurthy (2014) [5] reported that chlorantraniliprole 0.03 per cent recorded the least number of active webs and was significantly different (4.34 active webs tree^{-1}) from all other treatments. Flubendiamide 0.01 per cent and lambdacyhalothrin 0.005 per cent (5.34 and 6.34 active webs tree^{-1} respectively) were the next best treatments and were significantly different from all other treatments.

Number of larvae per web: The treatments of chlorantraniliprole 18.5% SC and cyantraniliprole 10.26% OD were recorded least number of larvae per web 2.50 and 2.88 respectively. However, the treatments flubendiamide 20% WG which was on par with lambda cyhalothrin 5% EC and profenophos 50% EC found next best. On the other hand, the treatments azadirachtin 10,000 ppm and quinalphos 25% EC, the treatment flonicamid 50% WG and fipronil 50% EC observed to be the least effective and untreated control treatment recorded increase in number of larvae per web. Similar studies were reported by Shivamurthy (2014) [5] that the lowest larval population was recorded in chlorantraniliprole 0.03 per cent, flubendiamide 0.01 per cent and azadirachtin one per cent (4.00, 4.33 and 4.67 larvae web^{-1}, respectively) in treated trees (Table 3).

Good yield of cabbage heads was recorded in chlorantraniliprole 18.50 SC treated plots against *S. litura* (Prathiban *et al.*, 2014) [3]. These reports are in confirmity with the present findings in which chlorantraniliprole 0.002 per cent showed its superior efficacy to manage the shoot webber than other treatments. Chlorantraniliprole, cyantraniliprole and flubendiamide are new molecules and selective insecticides which are belonging to diamide group, their mode of action is by activating the insect ryanodine receptors (RyRs) which stimulates the release and depletion of intracellular calcium stores from the sacroplasmic reticulum of muscle cells, causing impaired muscles regulation, paralysis and ultimately death of sensitive species (Cordova *et. al.* 2006) [2].

Cost economics and fruit yield data analysis indicated that among the different treatments, chlorantraniliprole 18.5% SC recorded highest fruit yield of 69 q/ha with highest B: C ratio (4.94) as compared to other treatments. Similarly, cyantraniliprole 10.26% OD recorded fruit yield of 68.20 q/ha with B: C ratio (4.37), lambda cyhalothrin 5% EC and flubendiamide 20% WG were next best insecticides and quite promising for the management of leaf webber. But, flonicamid 50% WG and fiprionil 5% EC recorded least B:C ratio of 3.27 and 3.02 respectively, when compared to other newer insecticides (Table 4). Chlorantraniliprole is a new molecule and selective insecticide which are belonging to diamide group, their mode of action is by activating the insect ryanodine receptors (RyRs) which stimulates the release and depletion of intracellular calcium stores from the sacroplasmic reticulum of muscle cells, causing impaired muscles regulation, paralysis and ultimately death of sensitive species. It has very low toxicity for mammals (both acute and chronic), high intrinsic activity on target pests, strong ovi-larvicidal and larvicidal properties, long lasting crop protection and no cross-resistance to any existing insecticide and also which are safer, target specific, less persistent, having green label and shows extremely strong insecticidal activity against Lepidopteran insect pests and is very safe to non-target organisms and effective even at low dosages. Based on the results of field experiment treatment chlorantraniliprole 18.5% SC @ 0.2 ml/l recorded least mean active number of webs per tree (2.82) and least mean number of larvae per web (2.17) found effective in the management of *O. exvinacea* infesting mango over control.

Table 2: Efficacy of new insecticides on number of active webs per tree in mango

Treatments	Dose	Mean no. of active webs/tree							Mean
			First spray			Second spray			
		DBS	3 DAS	7 DAS	15 DAS	3 DAS	7 DAS	15 DAS	
T1 - Azadirachtin 10,000 ppm	1 ml/l	15.15 (3.89)	12.97 (3.60)^{d}	10.20 (3.19)^{d}	8.02 (2.83)^{c}	8.99 (3.00) ^{de}	7.62 (2.76)^{c}	5.00 (2.34)^{d}	8.8
T2 - Flonicamid 50% WG	2 g/l	14.36 (3.80)	14.09 (3.75)^{e}	13.09 (3.61)^{f}	11.69 (3.41)^{e}	13.35 (3.64) ^{f}	11.63(3.41)^{d}	8.28 (2.96)^{e}	12.02
T3 - Flubendiamide 20% WG	0.25g/l	15.15 (3.89)	11.84 (3.44)^{bc}	7.99 (2.82)^{b}	5.27 (2.29)^{a}	6.76 (2.59) ^{bc}	3.74 (1.93)^{a}	2.12 (1.61)^{bc}	6.29
T4 – Lambda cyhalothrin 5% EC	0.5 ml/l	16.23 (4.02)	12.88 (3.58)^{cd}	9.47 (3.07)^{c}	6.38 (2.52)^{b}	7.66 (2.76)^{cd}	4.88 (2.21)^{b}	2.33 (1.67)^{bc}	7.27
T5 - Profenophos 50% EC	1.0 ml/l	14.19 (3.77)	13.54 (3.67)^{d}	10.16 (3.18)^{d}	6.64 (2.57)^{b}	7.89 (2.79)^{cd}	4.92 (2.22)^{b}	3.20 (1.91)^{c}	7.73
T6 - Fipronil 5% SC	1.0 ml/l	14.40 (3.80)	14.18 (3.76)^{e}	13.04 (3.61)^{f}	12.08 (3.47)^{e}	13.43 (3.66)^{f}	11.53 (3.40)^{d}	9.50 (3.14)^{e}	12.29
T7 –Chlorantraniliprole 18.5% SC	0.2ml/l	15.60 (3.94)	10.38 (3.22)^{a}	7.58 (2.75)^{ab}	5.19 (2.27)^{a}	4.90 (2.20)^{a}	2.29 (1.51)^{a}	1.63 (1.21)^{ab}	5.33
T8 –Cyantraniliprole 10.26% OD	1.2 ml/l	16.57 (4.07)	11.70 (3.42)^{b}	7.23 (2.68)^{a}	4.98 (2.23)^{a}	5.89 (2.41)^{ab}	2.03 (1.43)^{a}	0.98 (1.45)^{a}	5.46
T9 – Quinalphos 25% EC	2.0 ml/l	14.25 (3.78)	13.00 (3.60)^{d}	11.05 (3.47)^{e}	8.58 (3.25)^{d}	9.58 (3.09)^{e}	7.84 (2.80)^{c}	7.77 (2.87)^{e}	9.68
T10 - Untreated Control	-	14.10 (3.76)	15.47 (3.93)^{f}	18.12 (4.25)^{g}	20.21 (4.49)^{f}	22.36 (4.73)^{g}	23.00 (4.80)^{e}	23.55 (4.90)^{f}	20.45
S.Em±	-	NS	0.04	0.03	0.03	0.7	0.06	0.07	
CD at 5%			0.12	0.11	0.09	0.22	0.18	0.22	

DBS – day before spray Figures in the parenthesis are square root of (x+1) transformed values and DMRT (p= 0.05)
DAS – day after spray **S.Em± –** Standard error mean, **C.D. –** Critical differenceat 5 per cent

Table 3: Efficacy of new insecticides on number of larvae per web in mango – First Spray

Treatments	Dose	Mean no. of larvae/ web							Mean
		DBS	First spray			Second spray			
		DBS	3 DAS	7 DAS	15 DAS	3 DAS	7 DAS	15 DAS	
T1 - Azadirachtin 10,000 ppm	1 ml/l	8.09 (2.84)	6.08 (2.46)^{c}	4.87 (2.20)^{cd}	3.26 (1.80)^{e}	5.95 (2.44)^{c}	4.80 (2.19)^{c}	3.41 (1.85)^{cd}	4.73
T2 - Flonicamid 50% WG	2 g/l	7.15 (2.67)	7.09 (2.66)^{d}	5.57 (2.36)^{f}	5.16 (2.27)^{g}	9.68 (3.11)^{e}	8.01 (2.83)^{e}	6.41 (2.53)^{e}	6.99
T3 - Flubendiamide 20% WG	0.25g/l	6.98 (2.64)	5.37 (2.31)^{b}	3.82 (2.61)^{b}	1.14 (1.06)^{b}	4.95 (2.22)^{ab}	3.56 (1.89)^{b}	1.06 (1.03)^{b}	3.31
T4 – Lambda cyhalothrin 5% EC	0.5 ml/l	8.02 (3.00)	5.64 (2.37)^{bc}	4.49 (2.11)^{c}	2.32 (1.50)^{c}	5.30 (2.30)^{bc}	4.25 (2.06)^{c}	2.80 (1.67)^{c}	4.13
T5 - Profenophos 50% EC	1.0 ml/l	7.00 (2.65)	5.60 (2.36)^{bc}	5.13 (2.26)^{de}	2.86 (1.69)^{d}	5.85 (2.42)^{c}	4.68 (2.16)^{c}	3.26 (1.81)^{c}	4.56
T6 - Fipronil 5% SC	1.0 ml/l	9.08 (2.84)	7.27 (2.69)^{d}	6.00 (2.44)^{ef}	5.07 (2.25)^{g}	10.08 (3.17)^{e}	8.80 (2.97)^{e}	6.54 (2.56)^{e}	7.29
T7 –Chlorantraniliprole 18.5% SC	0.2ml/l	7.09 (2.66)	4.65 (2.15)^{a}	2.25 (1.5)^{ab}	1.00 (1.00)^{ab}	4.29 (2.07)^{a}	2.00 (1.41)^{b}	0.78 (0.88)^{b}	2.50
T8 –Cyantraniliprole 10.26% OD	1.2 ml/l	6.91 (2.63)	5.35 (2.31)^{b}	3.42 (1.84)^{a}	0.89 (0.94)^{a}	4.75 (2.18)^{ab}	2.58 (1.70)^{a}	0.30 (0.55)^{a}	2.88
T9 – Quinalphos 25% EC	2.0 ml/l	7.11 (2.67)	6.24 (2.49)^{c}	5.02 (2.24)^{d}	4.21 (2.05)^{f}	6.93 (2.63)^{d}	5.73 (2.39)^{d}	4.03 (2.01)^{d}	5.36
T10 - Untreated Control	-	6.89 (2.62)	8.05 (2.83)^{e}	8.65 (2.94)^{g}	10.79 (3.28)^{h}	16.80 (4.10)^{f}	18.00 (4.24)^{f}	19.30 (4.39)^{f}	14.75
S.Em±		NS	0.04	0.03	0.03	0.05	0.06	0.07	
CD at 5%			0.13	0.09	0.09	0.16	0.18	0.21	

DBS – day before spray Figures in the parenthesis are square root of (x+1) transformed values and DMRT (p= 0.05)
DAS – day after spray **S.Em± –** Standard error mean, **C.D. –** Critical differenceat 5 per cent

Table 4: Cost economics of new insecticides in management of mango leaf webber during 2018-19

S. No.	Treatments	Dosage	Yield (q/ha)	Total cost (Rs./ ha)	Gross returns (Rs./ ha)	Net returns (Rs./ ha)	B:C ratio
1	Azadirachtin 10,000 ppm	1.0 ml/l	54.78	55,711	2,25,920	1,63,409	3.93
2	Flonicamid 50% WG	2.0 g/l	49.50	64,900	1,98,000	1,33,100	3.27
3	Flubendiamide 20% WG	0.25g/l	63.40	55,199	2,53,600	1,98,433	4.37
4	Lambda cyhalothrin 5% EC	0.5 ml/l	60.12	55,167	2,40,480	1,85,281	4.36
5	Profenophos 50% EC	1.0 ml/l	56.48	55,596	1,84,200	1,69,908	4.03
6	Fipronil 5% SC	1.0 ml/l	45.48	55,596	1,81,920	1,26,324	3.05
7	Chlorantraniliprole 18.5% SC	0.2ml/l	69.55	62,429	2,78,200	2,21,880	4.94
8	Cyantraniliprole 10.26% OD	1.2 ml/l	68.20	56,320	2,72,800	2,10,371	4.60
9	Quinalphos 25% EC	2.0 ml/l	46.05	56,012	2,19,120	1,28,604	3.31
10	Untreated Control	-	40.33	54,000	1,61,320	1,07,320	2.99

B: C – Benefit cost ratio

References

1. Anonymous. Horticultural statistics, NHB, Gurugram, Haryana, 2017, 142p.
2. Cordova D, Benner EA, Sacher MD, Rauh JJ, Sopa JS, Lahm GP *et al*., Anthranilic diamides: A new class of insecticides with a novel mode of action, ryanodine receptor activation, Pestic. Biochem. Physiol. 2006; 84:196-214A.
3. Prathiban P, Baskaran RKM, Thangavel K. Bio-efficacy of emamectin benzoate 5 WG against tobacco caterpillar and diamondback moth in cabbage. Pesticide Res. J. 2014; 26(2):175-180.
4. Rajkumar B, Gundapp Khan RM, Kumar HK. Integrated pest management for enhancing quality production of subtropical fruits under high density planting with canopy modification. In: canopy management and high density planting in subtropical fruit crops, 2013 Eds. Singh V. K and Ravishankar H, CISH, Lucknow, 2013, 269p.
5. Shivamurthy. Population dynamics and management of shoot webber and hoppers infesting mango using safer molecules, M. Sc. (Agri.) thesis, Kerala Agricultural University, Vellayani, and Thiruvananthapuram, 2014.
6. Srivastava RP, Tandon PL. Studies of insect pathogens on mango leaf webber, *Orthaga euadrusalis* Walker (Lepidoptera: Pyralidae). Entomon. 1980; 5:219-221.