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EFFICACY TEST OF BIFENTHRIN AGAINST TEA MOSQUITO BUG, *HELOPELTIS THEIVORA* WATERHOUSE. UNDER FIELD CONDITION, ASSAM, INDIA

K. Choudhury[1], D. Sharmah[2*] and AALH Baruah[3]

1. K. Choudhury, Ph.D. Scholar, Department of Entomology, Assam Agricultural University, Jorhat-13, Assam, India.

2. D. Sharmah, SMS (T_6) (Plant Protection), KVK (ICAR), Tripura, India,

3. A.A.L.H. Baruah, Prinicipal Scientist, Department of Entomology, Assam Agricultural University, Jorhat-13, Assam, India.

ABSTRACT

A Field experiment was conducted in the Experimental Tea Garden, Department of Entomology, AAU, Jorhat to study the "Efficacy of bifenthrin against tea mosquito bug, Helopeltis theivora Waterhouse." All the insecticidal treatment viz., bifenthrin at 40, 60, 80g a.i/ha and dimethoate 450g a.i./ha were found significantly superior over control. The lowest number of fresh punctures obtained after one, seven and fifteen days of spraying were 8.45, 8.70 and 8.70 respectively in plots treated with bifenthrin 80g a.i./ha which were at par with dimethoate 450g a.i./ha. The increase in number of punctures at one, seven and fifteen days of spraying showed that bifenthrin 80g and dimethoate 450g a.i./ha successfully check the increase. The lowest number of infested leaves per bush were recorded with dimethoate 450g as 8.05, 8.45 and 8.95 at one, seven and fifteen days after spraying respectively followed by 8.73, 9.10 and 9.35 in bifenthrin. However, the increase in number of infested leaves with that of pre-counting was 1.70, 2.10 and 2.60 at one, seven and fifteen days of spraying respectively with dimethoate and 1.75, 2.10 and 2.35 with bifenthrin 80g a.i./ha indicating effectiveness of bifenthrin 80g. These two treatments were better than 40 and 60g in all respects.

Key Words: *Camellia sinensis*, Tea mosquito bug, Incidence, Insecticides and Bifenthrin.

Introduction

Tea, *Camellia sinensis* (L.) O. Kuntze belonging to the family *Theaceae* and tribe *Gordonaceae* (Wight,1962) is a commercially grown , industry oriented evergreen crop. Made tea is manufactured from the apical growing shoots of a tea plant .In India, tea covers an area of 0.43 million hectare producing annually 870.40 million kilogram of made tea . This crop is also widely grown in Assam extending over an area of 2, 30, 978 ha with a total production of 4, 62,783 kg (Anonymous, 2009).

Tea is mainly grown as perennial mono-crop and is subjected to infestation of a large number of insects and non insects pests because of the favourable climatic condition prevailing throughout the crop season. As a result of their attacks tea crop suffers a heavy loss ranging from 11-30 per cent in general ,but in particular case, it may be much higher (Chakravarty and Hazarika, 1995).

Among the tea pests, tea mosquito bug, *Helopeltis theivora* Waterhouse (hemiptera: Miridae) was recorded for the first time in 1865 in Cachar which was subsequently reported from many districts of Assam and Darjeeling in 1869 (Borbora and Singh, 1994.). Now it is the most widely distributedpest of tea in North East India which causes crop loss up to 25 per cent (Prasad,1992).The nymphs and adults of tea mosquito bug suck the cell sap of the young leaves, buds and tender stems which appear as a discoloured necrotic area around the point of entry of the labial style (Das, 1965; Devasahayaman and Nair,1986).They also inject toxic saliva which not only break down the tissues around the points of sucking but also kill the young stems. Such stems die off and ultimately fail to regenerate shoots. As a result, there is a heavy loss of the crop.

Several insecticides had been tried in the past to achieve adequate control of this pest. Now several workers also tried with synthetic pyrethroids for quick knockdown of this pest. Bifenthrin, a new synthetic pyrethroid having both insecticidal and acaricidal properties is used effectively against some crops such as chilli (Thusaliram *et al.*, 2005) etc. to control insect pest. This insecticide is characterized by greater photo stability and greater insecticidal activity than previous pyrethroids. The pesticide has low oral and dermal toxicity, without any evidence of a clear compound related effect. This insecticide has another added advantage over other insecticides of requiring very small dosages to achieve good mortality of the pests. The information on the bio-efficacy of bifenthrin at different concentration against *H. theivora* is very limited. Therefore, the present study was undertaken to determine

the efficacy of bifenthrin at three concentrations along with dimethoate against tea mosquito bug, *H. theivora* Waterhouse.

Materials and Methods

The present studies entitled "Efficacy of bifenthrin against tea mosquito bug, *Helopeltis theivora* Waterhouse" was carried out in the laboratory and field during the year 2004-2005. The laboratory studies were conducted in the Pesticide Residue Laboratory, Department of Entomology, Assam Agricultural University, Jorhat. The field experiments were carried out in the Experimental Tea Garden, Department of Tea Husbandry and Technology, Assam Agricultural University, Jorhat. The material used and methods adopted for studying efficacy of bifenthrin is mentioned below.

Field studies

A field experiment was conducted to assess the efficacy of different concentrations of bifenthrin along with dimethoate. The experiment was laid out in a Randomized Block Design (RBD) with 4 replications. The plot size was 5m x3m having about 15 tea bushes per plot. The tea bushes were maintained following recommended plantation practices.

Bioefficacy of insecticides against *H.theivora*

After the pest appeared and started puncturing the leaves, the crop was sprayed with difference doses of the insecticides with following treatments.

T1 = Bifenthrin (Talstar 8%SC) @ 40 g a.i./ha

T2 = Bifenthrin (Talstar 8%SC) @ 60 g a.i./ha

T3 = Bifenthrin (Talstar 8%SC) @ 80 g a.i./ha

T4 = Dimethoate (Rogor 30 EC) @ 450 g a.i./ha

T5 = Control (water spray)

For spraying of insecticides, 700 litres of spray solution per hectare, was used in operated hydraulic energy compression knapsack sprayer.

To evaluate the efficacy, two criteria were considered. These were (a) the numbers of fresh punctures in five tagged leaves and (b) number of infested leaves in five tagged bushes. The observations were recoded one day before and one, seven and fifteen days after spraying. The nature of infestation in tea leaves made by *H.theivora* and a nymph of *H.theivora* were also recorded.

Estimation of number of fresh punctures

For recoding the number of fresh punctures per leaf made by tea mosquito bug, five apical leaf along with shoots in five different bushes were tagged randomly. The number of punctures in the five tagged leaves were counted one day before spraying and observed for further infestation in one, seven and fifteen days after spraying. The increase in number of punctures were also worked out by deducting the number of punctures recorded at one day before spray with that of one, seven and fifteen days after spray. The data recorded on number of fresh punctures and increase in number of fresh punctures were subjected to statistical analysis.

Estimation of number of infested leaves

The total numbers of infested leaves were counted one day before and one, seven and fifteen days after spraying on five randomly selected tagged bushes. The increase in number of infested leaves was also worked out by deducting the pre-count data with that of one, seven and fifteen days after spraying. The data so recorded were subjected to statistical analysis.

Result and Discussion

Results obtained on the studies entitled "Efficacy of bifenthrin against tea mosquito bug, *Helopeltis theivora* Waterhouse" are presented and discussed below. To study the efficacy of different concentrations of bifenthrin viz., 40, 60 and 80 g a.i./ha along with dimethoate 450 g a.i./ha, as a standard check for comparison, two criteria were considered. These were the number of fresh punctures in five tagged leaves and number of total infested leaves in five tagged bushes.

Effect of insecticides on number of fresh punctures made by *H.theivora*

Data on average number of fresh punctures on tea leaves made by *H. theivora* at one day before, one day, seven days and fifteen days after spraying are summarized in Table 1.

The average number of fresh punctures due to *H. theivora*, prior to spraying, in different treatments including untreated plots did not vary significantly. Their average indicated that the punctures due to *H. theivora* were almost uniform in the experimental plots. The mean number of leaf punctures varied from 6.20 to 6.65 (Table 1).

After one day of spraying, the average number of punctures were 10.80, 10.25, 8.45, 8.50 and 16.50 in bifenthrin 40 g, bifenthrin 60 g, bifenthrin 80 g, dimethoate 450 g a.i./ha and untreated plots respectively (Table 1). All the insecticidal treatments were found significantly superior over control in reducing the number of fresh punctures. However, there were no significant differences among the treatments in reducing the number of fresh punctures made by tea mosquito bug.

The data obtained after seven days of spraying showed that the average number of punctures were 12.35, 10.85, 8.70, 8.90 and 18.40 in bifenthrin 40, 60, 80g a.i /ha, dimethoate 450 g a.i/ha and untreated plots respectively. There were significant differences between the treated and untreated plots in minimizing the number of fresh punctures. The minimum number of fresh punctures were recorded in plots treated with bifenthrin 80 g a.i./ha (8.70) followed by dimethoate 450 g a.i./ha (8.90) whish were significantly superior to bifenthrin 40 g a.i./ha (12.35). However, there were no sig Increase of punctures number/leaf One day before spray One day after spray can differences among the treatments of bifenthrin 60 g, 80g and dimethoate 450 g a.i./ha (Table 1). Again, there was also no significant difference between bifenthrin 60 g a.i./ha and bifenthrin 40 g a.i./ha.

After fifteen days of spraying, the number of fresh punctures were 12.65, 11.00, 8.70 and 8.90 in bifenthrin 40,60, 80 and dimethoate 450 g a.i./ha respectively and 20.90 in untreated plots. Perusal of the data presented revealed that all the insecticidal treatments significantly reduced the number of fresh punctures made by tea mosquito bug than untreated plots. Among the treatments same trend was observed as that of the data of seven days in reducing the number of fresh punctures except that, bifenthrin 80 g marginally vary with that of bifenthrin 60g.

Effect of insecticides on increase in number of fresh punctures made by *H. thievora*

The average increase in number of fresh punctures in tea leaves after one, seven and fifteen days of spraying are presented in Table 1. After one day of spraying, the increase in number of fresh punctures were 4.15, 3.70, 2.15 and 2.00 in bifenthrin 40, 60 and 80 g a.i./ha and dimethoate 450 g a.i./ha treated plots, respectively and 10.30 in untreated plots. All the insecticidal treatments proved significantly superior to the control plots in reducing the increase in number on punctures. Among the treatments bifenthrin 80 g a.i./ha and dimethoate 450 g a.i/ha significantly different with that of bifenthrin 40 g a.i./ha but did not

vary significantly with bifenthrin 60 g a.i./ha in reducing the increase in number of fresh punctures made by tea mosquito bug. There was also no significant difference between the bifenthrin 40 g a.i./ha (4.15) and bifenthrin 60 g a.i./ha (3.70).

The number of increase in fresh punctures after seven days of spraying were 5.70, 4.30, 2.40, 2.40 and 12.20 in bifenthrin 40 g, 60 g, 80 g, dimethoate 450 g a.i./ha and untreated plots respectively. All treated plots were significantly superior over the untreated plots in reducing the increase in number of fresh punctures. The lowest number of increase in fresh punctures was recorded in plots treated with bifenthrin 80 g (2.40) and dimethoate 450 g a.i/ha (2.40) which significantly varied from that of bifenthri 60 and 40 g a.i./ha in checking the increase in number of fresh punctures. On the other hand, there was no significant difference in increase in number of fresh punctures in bifenthrin 60 and 40 g a.i./ha treated plots (Table 1)

After fifteen days of spraying, the increase in number of fresh punctures reed were 6.00, 4.45, 2.40, 2.40 and 14.70 in bifenthrin 40 g, 60 g, 80 g, dimethoate 450 g a.i./ha and untreated plots respectively. All the insecticidal treatments significantly reduced the increase in number of fresh punctures over control plots (Table 1). Among the treatments bifenthrin 40 g a.i./ha failed comparatively to reduce the increase in number of fresh punctures than the other treatments. The lowest increase in number of fresh punctures was recorded in bifenthrin 80 and dimethoate 450 g a.i./ha which were significantly better in checking the increase in number of fresh punctures than bifenthrin 60 g a.i./ha (Table 1)

In the present study, bifenthrin 80 g and dimethoate 450 g a.i./ha were recorded as the effective treatments considering the number of fresh punctures made by tea mosquito bug and the corresponding increase in number of fresh punctures. As no work has been reported in the past on the effect of different concentrations of bifenthrin and dimethoate on number of punctures on tea leaf made by *H.theivora*, therefore, the present findings could not be compared. However, the present study partially support the work of Thusaliram et al. (2005) who reported lower number of thrips per leaf in bifenthrin 80 g (6.63) than 60 g (8.33) and 40 g a.i./ha (9.77) and was at par with standard check oxydemeton methyl 200 g a.i./ha (6.85). It was noted that bifenthrin 80 g was at par with dimethoate 450 g a.i./ha in reducing the number of fresh punctures made by *H.theivora* on tea leaf. The present results also support the work of Narkiewicz (1995), Chinniah (2001) and Chinniah and Ali (2000) where almost similar control of aphids was reported in case of bifenthrin and dimethoate.

Effect of insecticides on number of infested leaves per bush made by *H.theivora*

Data on average number of infested leaves made by *H.theivora* at one day before, one, seven and fifteen days after spraying are presented in Table 2. The data on number of infested leaves prior to spraying, in different treatments including untreated plots did not vary significantly and thereby indicating that the infestation was uniformly distributed which varied from 6.35 to 7.25 (Table 2)

After one day of spraying, the infestation was 11.20, 8.75, 8.05 and 13.05 in bifenthrin 40, 60, 80 g a.i./ha, dimethoate 450 g a.i./ha and untreated plots respectively. Perusal of the data presented revealed that all the treatments were highly significant in reducing the number of infested leaves over control. There were no significant difference among the treatments of bifenthrin 80 g, 60 g dimethoate 450 g a.i./ha which recorded 8.75, 8.73 and 8.05 infestation respectively, but they differ with the lower dosage of bifenthrin 40 g a.i./ha (11.20) significantly (Table 2). The data recoded after seven days of spraying showed that all the insecticidal treatments reduced the number of infested leaves per bush than in untreated plots. There was significant difference in infestation by H. thievery in plots treated with bifenthrin 40 g a.i./ha (12.40) with that of bifenthrin 80 g (9.10), 60 g (10.25) and dimethoate 450 g a.i./ha (8.45) treated plots. However, there was no significant difference between bifenthrin 60 g and 80 g a.i./ha, but there was significant difference in bifenthrin 60 g a.i./ha (10.25) and dimethoate 450 g a.i./ha (8.45 (Table 2).

After fifteen days of spraying, significant differences regarding leaf infestation which were 13.65, 11.05 and 9.35 in bifenthrin @ 40, 60, and 80 g a.i./ha respectively. However, no difference was observed in between bifenthrin 80 g a.i./ha and dimethoate 450 g a.i./ha. Bifenthrin 80 g a.i./ha recoded lower numbers of infested leaves (9.35) per bush and found to be superior over the other two concentrations of bifenthrin, but recorded higher infestation than dimethoate (8.95). All the insecticidal treatments were significantly effective in reducing the number of infested leaves over control plots.

Effect of insecticides on increase in total number of infested leaves per bush made by *H.theivora*

Average data on increase in number of infested leaves per bush after one, seven and fifteen days of spraying are presented in Table 2. After one day of spraying, the increase in number of total infested leaves was 3.95, 2.15, 1.75, 1.70 and 6.65 in bifenthrin 40 g, 60 g, 80 g,

dimethoate 450 g a.i./ha and untreated plots respectively. Perusal of the data revealed that the treated plots were highly significant over the untreated plots in checking the increase of infested leaves. There were no significant differences among the dosage of bifenthrin 60 a.i./ha, bifenthrin at 80 g a.i./ha and dimethoate at 450 g a.i./ha, but they were significantly superior over the lower dosage of bifenthrin at 40 g a.i./ha.

The increase in number of total infested leaves after seven days were 5.15, 3.65, 2.10 and 2.10 in bifenthrin at 40, 60, 80 g a.i./ha and dimethoate 450 g a.i./ha, respectively, which were significantly better in reducing the increase of infested leaves over the untreated (9.30) plots (Table 2). There were significant differences in increase of the total number of infested leaves in plots treated with bifenthrin 60 g (3.65), bifenthrin 80 g (2.10) and dimethoate 450 g a.i./ha (2.10) over bifenthrin 40 g a.i./ha (5.15). The data also indicated that the higher dosage of bifenthrin at 80 g a.i./ha and dimethoate at 450 g a.i./ha recorded a minimum increase in number of infested leaves (2.10 and 2.10) which vary significantly with that of bifenthrin at 60 g a.i./ha.

After fifteen days of spraying, the increase in number of infested leaves recorded was 6.40, 4.45, 2.35, 2.60 and 11.30 in treated plots and untreated plots respectively. It was observed that all the insecticidal treatments significantly reduce the increase in number of infested leaves over control. The lowest increase in number of infested leaves (2.35) was recorded in plots treated with bifenthrin 80 g a.i./ha followed by dimethoate 450 g a.i./ha which were significantly superior over bifenthrin 40 and 60 g a.i./ha. Again bifenthrin 60 g a.i./ha was significantly better than 40 g a.i./ha in checking the increase in number of infested leaves.

The data presented in Table 2 revealed that bifenthrin 80 g a.i./ha and dimethoate 450 g a.i./ha were at per in reducing the number of infested leaves as well as in the increase in number of infested leaves. Although bifenthrin 40 g a.i./ha recorded significantly lower infestation and increase in number of infested leaves than the untreated plots, but was less effective than the other two concentrations of bifenthrin viz., 60 and 80 g a.i./ha.

The present findings are in accordance with the findings of Thusaliram et. al. (2005) who found that Bifenthrin 80 g a.i./ha was effective in reducing fruit damage and with higher green chilli yield than in bifenthrin 60 and 40 g a.i./ha as well as standard check oxidemeton methyl.

Katole *et.al.*, (1995) reported that the higher concentration of bifenthrin viz., 60 and 50 g a.i./ha gave effective control of citrus black fly infesting mandarins while 40 g a.i./ha had

minimum effect and this supports the present finding in respect of different concentrations where bifenthrin 40 g a.i./ha had minimum effect in reducing the number of punctures as well as number of infested leaves.

Narkiewicz (1995) revealed that 95 per cent control of aphid, Brevicoryne brassicae was provided by bifenthrin, dimethoate and carbosulfan. Chinniah and Ali (2000) repoted that against Aphis gossypii bifenthrin (0.015%) and carbosulfan (0.05%) were highly effective and comparable with dimethoate (0.06%). These results are in continuity with the present study that bifenthrin 80 g a.i./ha was at par with dimethoate 450 g a.i./ha. However Chinniah (2001) recorded that dimethoate (0.06%) was the most effective followed by bifenthrin (0.015%) and carbosulfan (0.05%) which recorded more than 80 per cent mortality of aphid attacking bhendi on 7^{th} day after spray.

The superiority of higher concentration of lambda cyhalothrin (0.04%), a synthetic pyrethroid, against tea mosquito bug attacking cashew was reported by Selvamuthukumaran and Nachiappan (2004) and ethofenprox (75 g a.i./ha) against *H.theivora* attacking tea by Mallikarjunappa *et al.*, (2000) which corroborate the present work where bifenthrin 80 g a.i./ha was found to be the most effective then 60 and 40 g a.i./ha.

Superiority of bifenthrin among synthetic pyrethroids as well as some conventional insecticides was reported by several workers. Ramiro et al. (1995) recorded that among synthetic pyrethroids, bifenthrin was the most effective resulting in 100 per cent mortality of cotton boll weevil. Younis and Ibrahim (1996) found that bifenthrin was the most effective against Tetranychus urticae than fluvalinate, cyhalothrin, propargite and dicofol. Similar type of results were also reported by Mitchell and Hatfield (2000) and Khan *et al.*, (2001) on thrips attacking *Thrips tabaci* Linn. onion bulb crop.

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Table 1. Effect of insecticides on number of fresh punctures and increase in number of fresh punctures made by *H.theivora*

Treatment	Number of fresh punctures/leaf		Increase of punctures number/leaf	Number of fresh punctures/leaf	Increase of punctures number/leaf	Number of fresh punctures/leaf	Increase of punctures number/leaf
	One day before spray	One day after spray	One day after spray	Seven days after spray	Seven days after spray	Fifteen days after spray	Fifteen days after spray
T1 : Bifenthrin (Talstar 8% SC) @ 40 g a.i./ha	6.65*	10.80	4.15	12.35	5.70	12.65	6.00
T2 : Bifenthrin (Talstar 8% SC) @ 60 g a.i./ha	6.55	10.25	3.70	10.85	4.30	11.00	4.45
T3 : Bifenthrin (Talstar	6.30	8.45	2.15	8.70	2.40	8.70	2.40

8% SC) @ 80 g a.i./ha							
T4 : Dimethoate (Rogor 30 EC) @ 450 g a.i./ha	6.50	8.50	2.00	8.90	2.40	8.90	2.40
T5 : Control (water spray)	6.20	16.50	10.30	18.40	12.20	20.90	14.70
S.Ed. (+)	**0.64**	**1.09**	**0.82**	**1.02**	**0.67**	**1.05**	**0.63**
CD at 0.05	**NS**	**2.39**	**1.80**	**2.23**	**1.48**	**2.29**	**1.38**

* Based on four replications and average of five randomly selected leaves.

Table 2. Effect of insecticides on number of infested leaves and increase in total number of infested leaves per bush made by *H.theivora*

Treatment	Number of infested leaves/bush		Increase in number of infested leaves/bush	Number of infected leaves/bush	Increase in number of infested leaves/bush	Number of infested leaves/bush	Increase in number of infested leaves/bush
	One day before spray	One day after spray	One day after spray	Seven days after spray	Seven days after spray	Fifteen days after spray	Fifteen days after spray
T1 : Bifenthrin (Talstar 8%SC) @ 40 g a.i./ha	7.25*	11.20	3.95	12.40	5.15	13.65	6.40
T2 : Bifenthrin (Talstar 8%SC) @ 60 g a.i./ha	6.60	8.75	2.15	10.25	3.65	11.05	4.45
T3 : Bifenthrin (Talstar 8%SC) @ 80 g a.i./ha	7.00	8.73	1.75	9.10	2.10	9.35	2.35
T4 : Dimethoate (Rogor 30 EC) @ 450 g a.i./ha	6.35	8.05	1.70	8.45	2.10	8.95	2.60
T5 : Control (water spray)	6.40	13.05	6.65	15.70	9.30	17.70	11.30

S.Ed. (+)	**0.59**	**0.76**	**0.59**	**0.81**	**0.61**	**0.71**	**0.66**
CD at 0.05	**NS**	**1.67**	**1.30**	**1.78**	**1.33**	**1.56**	**1.44**

Based on four replications and average of five randomly selected bushes