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Management of tea mosquito bug, *Helopeltis antonii* Sign. on guava using entomopathogen fungus

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ABSTRACT: Field experiments were conducted during 2015-2018 at three locations *viz*., Periyakulam (Tamilnadu), Tinsukia (Assam) and Bengaluru (Karnataka) on the efficacy of *Beauveria bassiana* against tea mosquito bug, *Helopeltis antonii*. The results revealed that 3-4 weekly sprays of *B. bassiana* (IIHR) at fruit setting stage of guava either in talc formulation @ 10g/l or wettable formulation @ 1 g/l was effective for management of the tea mosquito bug on guava.

Key words: *Beuveria bassiana*, biopesticides, guava, tea mosquito bug, *Helopeltis antonii*

INTRODUCTION

Guava is one of the most commercially important fruits in India. Guava cultivation is gaining popularity in the recent past because of its hardy and regular and early bearing nature (Singh, 2010). In India, Guava production is 4,107 tonnes in 2019 with an increase from the previous number of 4,054 tonnes in 2018. Fruit is a good source of vitamin C, pectin, calcium and phosphorus. The vitamin C of guava is four times that of an orange. The fruit is used for the preparation of processed products like jams, jellies and nectar. Guava jelly puree is very popular for its attractive purplish-red colour, pleasant taste and aroma. Fruits can be preserved by canning as halves or quarters, with or without seed core (shells). Good quality salad can be prepared from the shell of ripe fruits. Leaves of guava are used for curing diarrhoea and also for dyeing and tanning. Large number of insect pests has been reported to occur on guava at various growth stages, but a few are a real menace to the cultivation of this crop.

More than 80 species of insects and mites have been recorded on guava trees affecting the growth and yield. Among these, the tea mosquito bug, *Helopetis antonii* Sign. is one of the serious pests. In India, there are three species of tea mosquito bug *viz., Helopeltis antonii*, *H. bradyi* and *H. theivora*. Among them, *H. antonii* is the most dominant species. It has a wide host range such as tea, cashew, moringa, guava, neem, cocoa and other host plants such as annona, Singapore cherry, mango, pomegranate, beetel, moringa. (Kamala Jayanthi, 2016; Reddy, 2000; Devasahayam and Nair, 1986; Sundararaju and Babu, 1996)

The tea mosquito bug, *Helopeltis antonii* Signoret (Hemiptera: Miridae) is gaining importance as a pest on guava in recent years. Its eggs are inserted in the midribs of young terminal leaves. The nymphs and adults desap all parts of the plant such as terminal shoots, young leaves, flowers and fruits that are just formed causing a maximum of 61.79 % fruit loss (Patil and Naik, 2004a). Chemical pesticides are to be auspicious but for the concern of natural enemies and environment, botanicals and microbial pesticides are considered as promising methods to manage the pests without any secondary response. With this background, the present study was undertaken on the management of tea mosquito bug, *H. antonii* using biopesticides

The entomopathogenic fungus, *B. bassiana* is one of the most effective agents in biological control widely described in the literature. It's found in all soil types (Jamal 2008; Lambert 2010). Different isolates were identified to attack a wide range of insects (707 species belong to 15 orders) and mites (13 species) (Lambert 2010; Zimmermann 2007). The use of *B. bassiana* is an environmentally friendly control mean compared to chemical pesticides. In addition to being more environmentally sound control method, *B. bassiana* is harmless to human health (Althouse *et al.* 1997; Faria and Wraight, 2001).

Several studies revealed the insecticidal potential of *B. bassiana* as mycopesticides and commercial endophytic fungi. The entomopathogenic fungus *B. bassiana* was reported to be effective against the palm weevil *Rhynchophorus ferrugineus* (Oilv.) (Coleoptera: Curculionidae) when applied three methods (Injection of *B. bassiana* in naturally infested palm trees, periodical dusting application of fungal spores on palm trees,

Table 1. Evaluation of different bio formulations against tea mosquito bug in guava (Pooled data of 2015-16, 2016-17 and 2017-18) at Periyakulam

Tr. No	Treatment	Mean fruit damage (%)	Yield (t/ha)	B:C ratio
T_1	*B. bassiana* (IIHR) wettable formulation @ 1g/L	19.69	10.60	1.77
T_2	*B. bassiana* (IIHR) water formulation @ 1ml/L	25.09	9.60	1.69
T_3	Lamda cyhalothrin @ 0.5 ml/L	16.98	10.70	2.32
T_4	Control (Water spray)	34.68	8.57	1.16
CD (p=0.05)		1.66	0.90	-
SEm±		0.51	0.51	-

release of contaminated males of red palm weevil with fungal spores). Injection of naturally infested palm trees using *B. bassiana* reduced by up 90% of the weevil population (Sewify *et al.* 2009).

On cucumber grown in greenhouse, single application of either fungus *B. bassiana* or the predatory mite *Neoseiulus barkeri* significantly reduced both larval and adult *F. occidentalis* populations (Wu *et al.* 2013) performed laboratory and greenhouse evaluation of a new entomopathogenic strain of *B. bassiana* for control of the onion thrips, *Thrips tabaci* (Wu *et al.* 2016). *B. bassiana* had the ability to be used as an effective biocontrol agent for the control of stored grain insect pests such as *C. cephalonica* (rice meal moth) and *T. castaneum* (red flour beetle). In this context, the experiment was carried out to identify the environment friendly technology for management of tea mosquito bug on guava using entomopathogen fungus at three different locations.

Field experiments were carried out during 2015 to 2018 at Periyakulam, Tinsukia and Bengaluru to find out the efficacy of bio formulations against tea mosquito bug in a Randomized Block Design with four treatments and five replications. Treatments were imposed at weekly intervals for $T_{1(}$*B. bassiana* (IIHR) wettable formulation),T_2 (*B. bassiana*(IIHR) water formulation) and for treatment $T_{3\,(}$ Lamdacyhalothrin- 0.05 %) at 15 days interval. first Spraying was initiated at fruiting setting stage of guava. Second spray was given after 7 days of first spray and third spray after 7 days of second spray. Total three sprays were given and the observations were recorded on fruits damaged by tea mosquito bug by counting the total number of fruits and infested fruits and calculated the percent damage and also recorded the weight of healthy fruits and infested by tea mosquito bug in guava.

Preparation of spray suspension: Dissolve 400 g of wettable formulation + 400 g jiggery in 400 l of water. Keep it for 48 hours under room temperature and then spray.

The data on damaged fruits and yield were recorded at respective intervals and the averages were worked out to draw the conclusion.

Table 2. Evaluation of different bio formulations against tea mosquito bug in guava (Pooled data of 2016 – 17, 2017 – 18) at Tinsukia

Tr. No	Treatment	Mean fruit damage (%)	Yield (kg/tree)	B:C ratio
T_1	*B. bassiana* (IIHR) wettable formulation @ 1g/L	12.72	18.11	2.25
T_2	*B. bassiana* (IIHR) water formulation @ 1ml/L	22.17	14.82	2.04
T_3	Lamda cyhalothrin @ 0.5 ml/L	24.07	13.33	1.91
T_4	Control (Water spray)	33.71	11.36	-
CD (p = 0.05)		1.97	3.12	-
SEm±		0.95	1.85	-

Results and Discussion

In periyakulam, the lowest mean percent fruit damage (19.69) of tea mosquito bug in guava was observed in T_1 (*B. bassiana* (IIHR) wettable formulation @ 1g/lit) followed by T_2 (*B. bassiana* (IIHR) water formulation @ 1ml/lit) with 25.09 mean percent fruit damage whereas, highest mean fruit damage (34.68) was observed in T4 control. The highest yield (10.7 t/ha) was recorded in T3 (lamda cyhalothrin@0.05%) followed by T_1 (*B. bassiana* (IIHR) wettable formulation @ 1g/lit) with yield of 10.60 t/ha, while lowest yield (8.57) was observed in T4 control. Highest BC ratio was recorded in T_3 (lamda cyhalothrin@0.05%) followed by T1 (*B. bassiana* (IIHR) wettable formulation @ 1g/lit) with 1.77 while T2 (B. *bassiana* (IIHR) water formulation @ 1ml/lit) recorded 1.69 ratio (Table 1). These results are also supported with the findings of Feng *et al.,* 2004 as they reported high-rate of *B. bassiana* and imidacloprid resulted in the most significant leafhopper control, yielding an overall mean efficacy of 69%.

In Tinsukia, the lowest mean percent fruit damage (12.72) of tea mosquito bug in guava was observed in T1 (*B. bassiana* (IIHR) wettable formulation @ 1g/lit) followed by T2 with 22.17 percent fruit damage, while highest mean fruit damage (33.71) was observed in T4 control. The highest yield (18.11 t/ha) was recorded in T1 (*B. bassiana* (IIHR) wettable formulation @ 1g/lit) followed by T2 (*B. bassiana* (IIHR) water formulation @ 1ml/lit) with yield of 14.82 t/ha, while lowest yield (11.36) was observed in T4 control. Highest BC ratio was recorded in T1 (*B. bassiana* (IIHR) wettable formulation @ 1g/lit) followed by T2 (*B. bassiana* (IIHR) water formulation @ 1ml/lit) with 2.04 while T3 recorded 1.91 ratio (Table 2). Similar results reported by Baby *et al.,* 2020 reported Beauveria spp, (BKN 1/14) at concentration 1×10^8 CFU/ml were effective on different life stages of tea mosquito (*Helopeltis theivora*).

In Bengaluru center, highest yield was observed in T_2 (*B. bassiana* (IIHR) water formuation 1ml/ litre of water) with 27.1 t/ha followed by T_3 (lamda cyhalothrin@0.05%) with 27.0 t/ha, while lowest yield was recorded in T_1 with 24.5 t/ha. These results are supported with the findings of Patil and Naik, 2004 as they reported *Beauveria bassiana* is identified as a potential biological control agent of *H. antonii* causing 100 percent mortality in bio-assay studies. It is also reported as an effective biological control agent of tea mosquito bug, *H. theivora* (Hemiptera: Miridae) in Assam (Hazarika *et al*., 2009).

The overall experiment gives conclusion that, 3-4 weekly sprays of *Beuveria bassiana* (IIHR) `at fruit setting stage of guava with wettable formulation @1 g per litre is recommended for effective control of the guava tea mosquito bug in Karnataka, Tamilnadu and Assam centres. The present findings were in accordance with that of Navik *et al*., 2015 who have found that the entomopathogenic fungus, *B. bassiana* was the most effective against tea mosquito bug, H. antonii and recorded 91.67% nymphal mortality after 10 days of application. Similarly, Borkakati and Saikia 2019 recorded lowest number of tea mosquito bug was recorded in the plots treated with IIHR strain of *B. bassiana* (15.76 and 18.60) as compared to untreated control (26.75 and 53.00) but was at par with Azadirachtin 1000 ppm and commercial formulation *B. bassiana* per 10 plants.

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Table 3. Evaluation of different bio formulations against tea mosquito bug in guava (2015 - 16 to 2016 - 17) at Bengaluru

Tr. No	Treatment	Mean fruit damage (%)	Yield (t/ha)
T_1	*B. bassiana* (IIHR) wettable formulation @ 1g/L	13.1	24.5
T_2	*B. bassiana* (IIHR) water formulation @ 1ml/L	14.2	27.1
T_3	Lamda cyhalothrin @ 0.5 ml/L	10.9	27.0
T_4	Control (Water spray)	60.5	13.15
CD (p = 0.05)		1.12	-
SEm±		0.36	-

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