Is the Use of Yellow Sticky Trap Detrimental to Natural Enemy Complex of Tea Pests?

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Abstract: Yellow Sticky Traps are excellent tools for precision monitoring of thrips, jassids, white flies and leaf miners and largely used in the tea plantations of North East India. But the question comes in the tea planters’ mind whether there is any adverse effect of such traps on the natural enemy complex of tea pest. In view of this, the present study was undertaken in organically managed tea garden of Meghalaya having higher diversity and density of natural enemies. The study revealed that there is no negative impact on natural enemy population concerning the use of yellow sticky traps. In addition a clear picture was received on type of arthropods trapped in the sticky traps.

Key words: Yellow sticky trap • North East India • Tea plantation • Pest • Natural enemy

INTRODUCTION

India is the second largest black tea producer in the world. North East India contributes more than 60% of the gross national tea production. India is also the world’s largest tea drinking nation; 90% of all Indian households are regular tea drinkers [1]. Tea plants are attacked by a variety of herbivores and the profile of pests vary from region to region. The biggest challenge for tea growers of India nowadays is to battle against pests and diseases. Crop loss due to pests varies between 15 to 20% [2]. The major tea pests of North East India are red spider mite (Oligonychus coffeae), tea mosquito bug (Helopeltis theivora), tea thrips (Scirtothrips dorsalis), tea jassid (Empoasca flavescens) and loopers (Buzura suppressaria, Hyposidra talaca, Hyposidra infixaria) which have gained considerable importance during the last one decade owing to the severity of damage and magnitude of crop loss to tea in North East India. Red slug caterpillars (Eterusia magnifica), bunch caterpillar (Andraca bipunctata), flush worm (Cydia leucostoma), leaf roller (Caloptilia theivora), leaf miner (Tropicomyia theae), termites (Microcerotermes sp. & Odontotermes sp.), aphid (Toxoptera aurantii), black caterpillar (Arctornis submarginata), scale insects and mealy bugs are recognized as minor pests which may also adversely affect the production of tea bushes [3-5]. The minor status of several pests is due to the action of the natural enemies which are mostly arthropods. Arthropods occupy a wide variety of functional niches and microhabitats and play a major role in the sustainable and healthy functioning of tea ecosystem [6]. Species diversity of arthropods in the tea ecosystem of India comprised of 721 species belonging to 13 Orders and 141 Families. Out of the 721 species, 380 are pests while, 341 species are natural enemies [7]. The accumulation of arthropod species on tea is influenced by various factors including the age of plants; the older tea plantations harbor more number of insect species [8].

Pest control decisions are often based on trap catches as a physical control tool of IPM. Insects are differentially attracted to coloured surfaces, particularly yellow as a general insect attractant. Yellow trap has often been used in the ecological studies of sucking insect pests in agro-ecosystems. Insects that are attracted to this yellowish device include important crop pests such as plant hoppers, leafhoppers, aphids, white flies, thrips and leaf miner flies [9-16]. Use of yellow sticky trap works
best in tea for controlling the population radix of sucking pests viz. thrips, jassids, white flies and adults of tea mosquito bugs. This traps are environment-friendly, cost-effective and reducing the number of pesticide spraying round [17-20]. Towards the physical pest control operation, the planters of North East India were advised to use such sticky plates to monitor and control sucking pests mainly thrips, jassids & white flies. But several times we have been asked with the following questions: 1) What are the arthropod species other than tea pest trapped in sticky traps? 2) Is the use of such trap detrimental to the natural enemies of tea pests? Systematic studies on the potential effect of using the sticky traps for mass trapping of harmful insects or non-targeted insects (predators and parasitoids), are lacking. The present study therefore, is aimed at unfolding the trapping of arthropod species in yellow sticky traps used in the tea ecosystem of North East India. The diversity and density of predators are believed to be more in organically managed tea gardens as compared to conventional ones at any point of time [21-22]. Therefore, the present study has been conducted in an organic tea garden of Meghalaya, North East India.

MATERIALS AND METHODS

The study has been conducted in the experimental field of Horticulture Department, Govt. of Meghalaya at Tea Development Centre, Umsning, District Ri-Bhoi, Meghalaya. The garden is bio-organic in practice and situated at 800m msl. The investigation was conducted in 1ha area over a period of 4 months (March-June 2016). No bio-pesticide has been applied during the period of study. The yellow sticky traps were placed above the bush canopy randomly in the tea field @ 5 yellow sticky traps per 1000m². Position of the traps were changed at weekly interval and replaced at fortnightly interval. The surface area of a sticky trap was 630cm² (30cm×21cm). Interval of 15 days, the traps with arthropods were brought to the laboratory and the number of arthropods per trap was recorded order wise. The arthropods were identified with the help of available taxonomic literatures [3,23,24].

RESULTS AND DISCUSSIONS

The present study was conducted during the cropping period in a specific time frame which coincides with the activity of sucking pests and their natural enemies. The study revealed that the Order Hemiptera contained the highest number of trapped arthropod species (39.08%) followed by Diptera (27.15%), Thysanoptera (25.06%), Hymenoptera (4.86%), Blattodea (1.05%), Lepidoptera (1.05%), Coleoptera (1%) and Araneae (0.75%) [Fig.1 & 2].

![Image: Arthropod fauna trapped on the yellow sticky traps used in a tea garden of Meghalaya](image1)

![Image: Proportion (%) of different Arthropod Orders trapped on yellow sticky traps in a tea garden of Meghalaya during cropping period.](image2)

**Fig. 1:** Arthropod fauna trapped on the yellow sticky traps used in a tea garden of Meghalaya

**Fig. 2:** Proportion (%) of different Arthropod Orders trapped on yellow sticky traps in a tea garden of Meghalaya during cropping period.

<table>
<thead>
<tr>
<th>Arthropod Orders</th>
<th>Representatives</th>
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<tbody>
<tr>
<td>Araneae</td>
<td>Jumping &amp; Crab spiders</td>
</tr>
<tr>
<td>Blattodea</td>
<td>Termites &amp; Cockroach nymphs</td>
</tr>
<tr>
<td>Coleoptera</td>
<td>Lady bird beetles &amp; Scarab beetles or Scarabaeida</td>
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<tr>
<td>Diptera</td>
<td>Leaf miner flies , Syrphids or Hover flies, Shore flies, House flies , Mosquitoes &amp; Tipulidae or Crane flies</td>
</tr>
<tr>
<td>Hemiptera</td>
<td>Jassids, White flies, Aphids &amp; Tea mosquito bugs</td>
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<tr>
<td>Hymenoptera</td>
<td>Ants, Bees &amp; Wasps</td>
</tr>
<tr>
<td>Lepidoptera</td>
<td>Leaf roller adults &amp; other moths</td>
</tr>
<tr>
<td>Thysanoptera</td>
<td>Thrips</td>
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</tbody>
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It is estimated that more than 1000 species of arthropods infest tea all over the world [25] as pests, casual visitors and also as predators and parasitoids of pests [26]. The presence of insects feeding on the tea plants and shade trees invariably has led to the buildup of several species of insect parasitoids and predators [6, 27] and the foliage below the plucking surface is important as a refuge for natural enemies [6]. The intensity of activities of predators and the parasitoids have been found to be very high in North East India [28]. Among the predators active in the tea plantations of North East India, lady bird beetles and spiders are the most dominant and number of predators are more than that of parasitoids [21, 29]. Instead of this high diversity of natural enemies in the tea plantation of NE India, it is worth to mention that only negligible percentages (2.95%) of predators (spiders & lady bird beetles) as well as parasitoids (Hymenopteran wasps) were trapped in the sticky traps along with their prey.

During the period of study red spider mites, tea mosquito bugs, thrips, jassids, white flies, leaf rollers and leaf miners were found to be active in the experimental plots of Horticulture Department. Considering their peak period of activity [3, 30-32] the study phase was thus selected. But the potential natural enemies of sucking pests like *Chrysoperla carnea* (Neuroptera), praying mantis (Mantodea), reduviid bugs (Hemiptera) etc. [3, 30-32] have not been ensnared in the sticky devices. Therefore, the natural enemy complex has not been disturbed at all and maximum percentage (66.68%) of trapped arthropod species are recognized as pests of tea.

**CONCLUSION**

The present study revealed that the use of yellow sticky trap in tea plantation has no detrimental effect on the natural enemy population of tea pests. Therefore, the planters can use such trap in their tea fields without any hesitation. This sticky trap works best for sucking pests and helps in tapping the population of thrips, jassids, white flies and adults of tea mosquito bugs. They are environment-friendly and cost-effective. It is always wise to follow the respective TRI’s recommendation before installing such traps in the tea fields. Tea is unique because only of its vegetative parts ‘two leaves and bud’ are commercially exploited where pollinator has no role to play and use of such sticky plates has no adverse effect upon tea ecosystem. On the other hand, prey-predator & parasitoid coactions prevailing in the tea ecosystems of North East India should be optimized by minimizing...
chemical control of tea pests and adopting IPM strategies in order to produce residue free healthy tea for consumption.

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