FACTSHEET

Naturland ACADEMY

THE TEA MOSQUITO BUG *HELOPELTIS THEIVORA*

Abundance and Host Range

The genus of *Helopeltis* includes different subspecies that are important pests of various crops. They can lead to damage on important cash crops like apple, cashew, cocoa, cotton, mango, neem, and tea. This factsheet deals with the subspecies *Helopeltis theivora*, also known as tea mosquito bug (TMB), which is a major pest of tea (*Camellia sinensis L.*), leading to severe damage.

This pest is common in most of the countries where tea is produced, i.e., Bangladesh, India, Sri Lanka, Vietnam, China, Kenya, and Uganda. There, the TMB established itself as an important pest of tea and continues to be the cause of major yield losses in the present day. Scientists found evidence that the genetic variability of the tea plants influences the damage by TMB. For example, tea plants from Chinese or hybrid origin are found to be more susceptible than varieties that are specific to Assam.

In addition to spreading on important cash crops such as cashew, cocoa and pepper, the TMB is also found on economically insignificant plants. Some of these plants are found in close proximity to or even directly in most tea gardens. These include, for example *Acacia mangium* and *Azadirachta indica*, which are often used as shade trees in tea plantations.

Figure 1: *Helopelti theivora © Wikimedia / Vengolis*

The elimination of surrounding plants and unshaded conditions, in general, do not reduce the pest occurrence, but would rather benefit other pests like leafhoppers, thrips and red spider mite. Furthermore, shade trees and the surrounding vegetation provide a habitat for many generalist predators like spiders, predatory beetles and birds, which also prey on TMB.

It is important to note this, as these plants are used as host plants when the actual preferred food source, tea for instance, has been treated with repellents. The last chapter of this factsheet presents the different possible ways of controlling TMB in organic farming without using synthetic pesticides and while still using shade trees in the teagardens. Prior to this, important biological characteristics of this pest are presented.

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PEST BIOLOGY

The pest is generally a 6.5 to 8.5 mm in length, with a dark brown to reddish brown base coloring. In addition, various bright colors, such as orange, appear on the thorax. However, this color can vary depending on the region, and population.

Also conspicuous are the legs of the TMB, as they resemble the legs of mosquitoes, because they are long and thin. Usually, a single individual spends its entire life cycle on a tea bush.

The table below describes the approximate life cycle of the TMB in India (Source: Roy et al. (2015) and Queensland Government (2022)):

Life Stages and Development	
Seasonal incidence	North-East India: May, June, July, September (when rainy) Southern India: • High: July to December • Low: January to June • Peak populations: June-July, August-September
Duration of life cycle	• Maximum life cycle (November - March): 22-57 days • Minimum life cycle (April - October): 15-19 days
Sexual maturity	• Females: after 4 days • Males: after 2 days
Egg hatching	• Around 7 days • Females lay an average of 6.7 eggs per day
Larval development	• 5 nymphal instars • Total development period until adult: 10-16 days

Table 1: Life stages and development of *Helopeltis theivora*

In principle, it appears that the incidence of TMB increases as soon as the weather is wet or humid. In addition, warm temperatures with simultaneous occasional rain such as during the flushing season are also beneficial to the population. In addition, Das (1965) listed other main activities that affect the occurrence and population trends of *Helopletis* spp.

Reported factors that affect the incidence of the TMB according to Das (1965):

1) The nature of pruning
2) The time of pruning
3) The degree of pruning
4) The height of the plucking
5) Defoliation
6) The shade status
7) Abandoned tea and seed trees (alternate hosts)
8) The type of "Jats" (origin of the tea bush, e.g., Chinese, Assam, Cambod)
9) The type of the manure

Figure 2: Management practices that affect the incidence of *Helopeltis theivora*

Due to the typical sucking damage pattern the TMB causes two different damages. On the one hand, the sucking of the adults but also of the larvae on the various plant parts leads to red-brown feeding punctures. This causes the tea buds, shoots and tender leaves to curl and change color and eventually die. A direct decrease in harvestable leaves and thus yield can be the result. However, eggs are additionally laid in the softer parts of the plant. This, together with the sucking damage, leads to acute impairment and eventual death of the entire tea bush.

PEST CONTROL IN ORGANIC FARMING

Mechanical control

For the control of TMB cultural or mechanical control methods are limited. Although collecting the nymphs, as well as adult pests from the bushes by hand is one of the most important management strategies. Additionally, a regular leaf plucking schedule can help with heavy shading and therefore hiding of bugs inside of the bushes. Furthermore, removing the branches closest to the ground can prevent nymphs from climbing and infesting those bushes. Through personal communication, a farm shared their experience with using nets to cover the ground and the bushes up to a certain height. This stops the crawling nymphs from reaching and attacking those bushes. Nevertheless, those methods can be unsuccessful as the main means of control in case of heavy infestation but can help constrain a small TMB population. Some tea gardens use inorganic acaricides, like lime sulphur and paraffinic oil, to control various pests like TMB and the Red Spider Mite (*Oligonychus coffeae).*

Natural enemies

One method of biological control is the use and maintenance of the pest's natural enemies. In general, it can be argued that a natural environment promotes the presence of many beneficial insects, and synthetic pesticides harm not only pests but also beneficial insects. Below are listed some beneficial insects against TMB on tea in India (Sources: Basnet and Mukhopadhyay (2014), Queensland Government (2022), Roy et al. (2015), Srikumar et al. (2018))

Beneficial Organisms	
Ants	• *Crematogaster wrougtoni* • *Oecophylla smaragdina*
Chrysopidae	• *Chrysoperla carnea* • *Mallada* sp.
Entomopathogenic fungi	• *Beauveria bassiana* • *Trichoderma* spp.

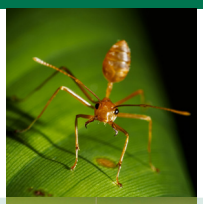


Figure 3: *Oecophylla smaragdina*
© Wikimedia / Christian Gloor

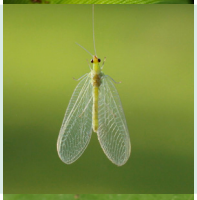


Figure 4: *Chrysoperla carnea*

Figure 5: *Beauveria bassiana*
© Wikimedia / skitterbug

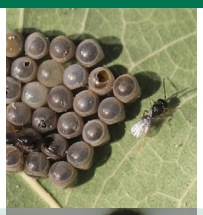
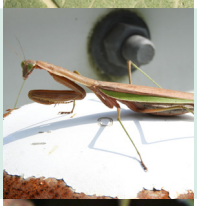
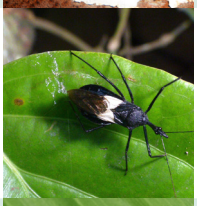
Beneficial Organisms			
Parasitoid wasps *Egg parasitoids lay their eggs inside of the eggs of the pest insects*	• *Chaetostricha* sp. • *Erythmelus helopeltidis* • *Telenomus* sp.		**Figure 6:** *Telenomus* sp. hatching from parasitized eggs © Wikimedia / Ralf Huber
Praying mantids	• *Acromantis insularis* • *Hierodula membranacea* • *Hierodula* sp. • *Statilia maculate* • *Tenodera aridifolia*		**Figure 7:** *Tenodera aridifolia*
Reduviid bugs (Assassin bugs)	• *Panthous bimaculatus* • *Rihirbus trochantericus luteous* • *Sycanus collaris* • *Sycanus croceovittatus*		**Figure 8:** *: Sycanus* sp. © Wikimedia / L. Shyamal
Spiders	• *Marpissa* sp. • *Oxyopes javanus* Thorell • *Oxyopes shweta* Tikader • *Phidippus* sp. • *Plexippus* sp.		**Figure 9:** *: Oxyopes javanus* © Wikimedia / 2016 Jee & Rani Nature Photography

Table 2: Beneficial organisms prey on *Helopeltis theivora*

The list above includes some organisms that are not naturally occurring in tea gardens, like the entomopathogenic fungi, but must be applicated or released for biological control. Most of them can be bought commercially and the producer's information on application and environmental conditions must be followed for successful control of TMB.

Please note

In general, first check with Naturland standards and member support staff before intentional application of botanical substances or beneficial organisms like entomopathogenic fungi.

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Use of pheromones

Furthermore, the use of sex pheromones is a common practice for the control of various pests. A few years ago, scientists were able to identify the chemical compounds of female sex pheromones. This blend can be bought commercially and can be used for the control of TMB. It can either be used to lure the pest away from the plantations or into traps to remove high proportion of individuals from population. Another method called "mating disruption" uses the pheromones to disrupt the reproduction pattern. Males will get disoriented when they try to follow various pheromone plumes and less male bugs will reach female bugs to reproduce. Through personal communication, the pest management measure of a farm was shared, where they crush the collected Helopeltis bugs and mix them with an aqueous solution of nettle leaves. This mixture is supposed to scare away the pest from the tea bushes due to alarm pheromones emitted by the dead bugs.

Botanical pesticides

The use of botanical pesticides can be effective against TMB populations. For example, the use of extracts of neem seed kernels or generally the active substance of neem, Azadirachtin, stops the feeding of TMB and furthermore hinders the egg laying and hatching. This adds up to a maximum control of 65 % and can slow down the population growth, so that other biological control methods like regular plucking schedules or present natural enemies can fully eliminate TMB as a pest.

Traditional practices & preparations

For some researchers it was possible to frame traditional practices and preparations that have anti-insect properties to help with TMB populations and other pests in tea plantations. For Bhuyan et al. (2017) it was possible to collect local knowledge from Indian tea growers. The following table 3 shows their findings in a modified way.

Target pests	Material used	Practice/preparation/method of application	According to farmer
TMB *(Helopeltis theivora)*	Neem *(Azadirachta indica)*- 2kg, Chilli *(Capsicum annum)*- 2kg, Garlic *(Allium sativum)*- 2kg, Fish waste- 3kg, Cow urine- 10L, Water- 50L.	Neem, chilli and garlic are crushed and mixed with fish waste and cow urine and kept for 3 days, before water is added to it. At an interval of 15 days, 1L of solution in 20L water is sprayed.	~ 60% control
TMB	Cattle urine- 15 L/10 L, Water- 10L/50 L.	Cattle urine is collected in a bucket, diluted with water and sprayed in the infested bushes.	~ 30-40% control
Red Spider Mite *(Oligonychus coffeae)*, TMB	Neem- 10kg, Neem seed- 2kg, Water- 200L, Cow dung- 5kg, Cow urine- 50L.	Neem leaves and seeds are crushed, dipped in water and cow dung and cow urine are mixed in. Let sit for 15 days and afterwards apply the solution at an interval of 15 days.	~ 50% control
Red Spider Mite, TMB	Water- 10L, Fresh cow dung- 1 kg, Fish waste- 4kg.	Fresh cow dung is stirred properly in 10L of water along with fish waste and kept for 3 days. 100ml of solution in 100L water is applied at an interval of 15 days.	~ 80% control
Red Spider Mite, TMB	Fish fin- 80kg, Cow urine- 50L, Cow dung- 15kg, Water 100 L.	Fish fins, cow urine, cow dung and water are kept in a plastic drum for 7 days. Afterwards it is filtered and sprayed in the field at 2L of solution in 200L of water at 30 days interval.	Satisfactory control
Red Spider Mite, TMB	Banana pseudostem- 5kg, Fish waste- 3kg, Cow dung- 15kg, Vermi compost- 5kg, Water/Cow urine- 50L.	Banana pseudostem is cut into small pieces and mixed with fish waste, cow dung, vermi compost along with water 50L. If cow urine is used, keep solution 5 days before spraying. Apply at an interval of 15 days	~ 60% control

Target pests	Material used	Practice/preparation/method of application	According to farmer
All pests	Neem- 5kg, Fish waste- 2kg, Cow dung- 15kg, Mustard cake- 5kg, Water- 50L.	Neem leaves are crushed and mixed with cow dung, mustard cake, fish waste and water, kept it for 7 to 15 days and then filtered and sprayed in the field at 16L of solution in 200L of water at an interval of 7 days.	~ 80% control
All Pests	Peepal *(Ficus religiosa)* root zone soil- 4kg, Rice- 2kg, Black gram *(Vigna mungo)*- 2kg, Cow dung- 10kg, Cow urine- 20L, Water- 200L.	Rice and black gram are crushed and mixed with peepal tree root zone soil along with cow dung, cow urine and water and sprayed in the field. The solution is applied at an interval of 7 days.	~ 100% control

Table 3: Traditional practices and preparations with anti-insect properties against TMB and other pests (modified and based on Bhuyan et al. (2017))

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