Suggestion on Management Strategy of the sucking pest of tea Helopeltis theivora

Preventive measures based on cultural practice:

Good plucking and tending

A more frequent plucking schedule helps to remove inserted eggs and early nymphs before they can grow large enough to cause more damage.

In severe infestations, LOS (level of skiff) operations should be followed to minimize the infestation of the next generation.

Elimination of alternate host (plants)

Removal of the alternate host of *H. theivora* such as Guava (*Psidium guajava),* Oak (*Quercus* spp.), Melastoma (*Melastoma* sp.), Thoroughwort (*Eupatorium* sp.), Fragrant thoroughwort (*Eupatorium odoratum),* Dayflower (*Commelina* spp.), Sesbania (*Sesbania cannibina),* Jackfruit (*Artocarpus heterophylla*), Bortengeshi (*Oxalis acetocello*), Ornamental jasmine (*Gardenia jesminoid*), Mulberry (*Morus alba*), Kadam (*Enthocephalus cadamba*), Jamun (*Eugenia jambolana*), Boal (*Ehretia acuminata*), Mikania (*Mikania micrantha*), *Acacia moniliformis* and *Premna latifolial* from in and around plantations would give a good control. Wild plants (non economic) nearby the fields having feeding spots of *H. theivora* have to be eradicated, as far as possible.

Clearing and treatment of forest fringe

The ecotone (border) between forest line and tea plantation need to be kept clear of weed and non-economic plants. The clear area needs to be treated with persistent

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insecticides such as chlorinated hydrocarbon or organophosphate to prevent migration of pest including *H.theivora.*

Optimum shade for tea bushes

H.theivora prefer moist conditions and mild temperatures. For that reason, this pest populations are often higher under heavy shade (>89% shade). On other hand, unshaded condition reciving full sunshine is equally detrimental, since such condition enhances attacks by other pests (especially leafhoppers, thrips, and red spider mites) thus causing crop loss otherwise.

So moderate shade in field is recommended. Tea plantation in the Dooars with moderate shade status of 60% suffer least attack and have best crop yield (Rahaman *et al.*, 2005).

Field monitoring and decision-making

H. theivora populations increase most quickly when the temperature is within 20 - 27^0 C and high humidity (above 90%). rainy season. In the Dooars *H. theivora* populations show the following cycle:

- from Jan - May: Start to occur in small numbers, causing little damage
- from June - August: building up of population, causing moderate damage
- from September - November: Peak population, causing serious damage.

In view of these population cycles of *H. theivora,* planters should continue to monitor the presence the pest even after application of insecticides in the grown and peak population seasons.

There are two methods recommended for measuring *H. theivora*: (1) counting the average number of bugs per shoot, or (2) counting the percent of affected shoots (shoots i.e. showing feeding stains, blackened, shriveled conditions etc.) It is easier to count the percent of affected shoots. Planters might end up spraying after the *H. theivora* had already stopped damaging the field. So the following points should also considered during application:

- Monitor population change in the number of *H. theivora* or affected buds for the past few weeks (going up or going down?)
- Manually collect the adults (Morning – 06.30 h – 08.30 h; Evening – 16.00 h – 18.00 h) by the trained labour force.
- Evaluate number of natural enemies (specially *Oxyopes* spiders) found in the field
- Observe weather forecast (hot dry weather and rainfall may help control the pest).
- Explore possibility of *H. theivora* control without spraying (for example, by plucking more often).

Conventional practice of management through insecticide application

Generation of data based on the efficacy of insecticide to manage H.theivora

Pesticide selection:

Jan –Feb One round of spray in *Helopeltis* prone sections

1 ⇒ **Unpruned condition:**

Use oxydemeton methyl/ acephate/ thiomethoxam/ monocrotophos

2⇒ **DS/MS condition :**

□ Use either any systemic

(oxydemeton methyl / acephate / thiomethoxam / monocrotophos)

□ Use either contact

cypermethrin / alphamethrin/ betacyfluthrin/ lamda cyhalothrin/

fenpropathrin / profenofos / ethofenprox

3 ⇒ **LP/MP condition:**

□ Use systemic

(oxydemeton methyl/ Acephate/ Thiomethoxam/ Monocrotophos) immediately after

bud breaking

Selection of insecticides as per the degree of infestation in different months

Insecticide index no.	**Name of insecticide**
1	acephate/ oxydemeton methyl/ dimethoate
2	Phosalone /quinalphos/ profenofos
3	betacyfluthrin/ lamdacyhalothrin / fenvalerate/ cypermethrin
4	alphamethrin/ fenpropathrin
5	etofenprox/ profenofos
6	monocrotophos/ thiomethoxam
7	diflubenzuron/ neem formulations (5000 ppm)
8	neem formulations (1: 600) + endosulfan (1: 400) / neem formulations (1: 600) + Deltamethrin (1:2000).

Digit in the parenthesis indicates the insecticide mentioned under the above index no. under in the following recommendations

Mar –Apr

1st round -Low infestation – (2); Moderate infestation – (2) ; Heavy infestation – (6).

2nd round - Low infestation – (8); Moderate infestation – (8) ; Heavy infestation – (4).

May –June

1st round - Low infestation – (1); Moderate infestation – (6); Heavy infestation – (6).

2nd round - Low infestation – (2); Moderate infestation – (2); Heavy infestation – (3).

July –Aug

1st round - Low infestation – (5); Moderate infestation – (3); Heavy infestation – (6).

2nd round - Low infestation – (8); Moderate infestation – (6); Heavy infestation – (4).

Sept –Oct

1st round - Low infestation – (2); Moderate infestation – (5); Heavy infestation – (2).

2nd round - Low infestation – (7); Moderate infestation – (8); Heavy infestation – (4).

Nov –Dec

1st round - Low infestation – 8; Moderate infestation – 2; Heavy infestation – 2

- Control should not be based on single insecticide class; in other word the insecticides should be altered in such a way that their modes of actions are different.
- Apply insecticides for killing the rising *H.theivora* population as per requirement, not as a routine spray.

Dilution of insecticides:

Both under and over dilutions are harmful and hence should be avoided. Sublethal doses would not only be ineffective but may help in the development of resistant strains, while overdose of pesticide would invariably increase the cost, pollute the environment and lead to the undesirable residue problem. The following guidelines should be adhered to at the time of preparation of the spray fluid.

Preparation of Spray fluid: (after the method of Kakoty, 1994)

- Recommended quantity of the liquid insecticides, Emulsifiable concentrate (EC) or Soluble liquid (SL), are to be added slowly to measured quantity of water in the mixing tank.
- Wettable powdered (WP) insecticides should be turned into pastes with a little water and then diluted by mixing slowly with the measured quantity of water in the tank.
- When using more than one insecticide simultaneously these should be added to the water. The prepared solutions should then be mixed thoroughly in a drum by stirring with a bamboo or wooden rod.
- Cleaning of sprayers is essential because mixture of another insecticide with the left over of insecticide, sprayed earlier may affect the efficacy of

the insecticide due to non-compatibility or it may react with the latter insecticide to form some toxic chemical. The sprayers should therefore, be washed first with soap water and then 2-3 times with clean water at the end of the day's operation.

- Incompatible chemicals must be avoided in tank-mix formulations in severely affected sections.
- Use the following general guidelines once you have determined the pH of the spray water.

- pH 4.0 – 7.0 is satisfactory for most spraying and short-term (12 hours) storage of most insecticide mixtures in the spray tank.
- pH 7.0-8.0 is adequate for immediate spraying of most insecticides. Do not leave the spray mixture in the tank for over 2 to 12 hours to prevent loss of effectiveness.
- For pH 8.0 and higher, add buffer or acidifier (Examples are: Buffer-X (Kalo Lab.), Nutrient Buffer Spray (0-8-0 Zn Fe, 0-16-9 Zn) and Spray-Aide (Miller).
- ***Time of spraying:***

Time of spraying should coincide with surfacing of the pest at the bush table. Nymphs and adults of *H. theivora* generally feed in the morning and late afternoon hours. Hence, spraying operation against this pest should be carried out early in the morning or late in the afternoon. Spraying during the hot midday hours should be avoided as strong sunshine may cause decay of the insecticide.

Persistency of Insecticides:

- Toxicity persistence of different insecticides at recommended dose falls between 7 – 16 days. Hence interval between two subsequent rounds must be 7-15 days. It was evident from the present study that the higher concentration (0.25%) may be helpful in tiding over any long holiday period . Thus longer persistence insecticides such as fenpropathrin (28 days), imidacloprid (24 days), thiomethoxam (23 days), deltamethrin (23 days), λ-cyhalothrin (21 days), alphamethrin (20 days) and monocrotophos (18 days) can be chosen for the purpose of protection through of 18 - 28 days against *H. theivora.*
- Avoid spraying of endosulfan, quinalphos and cypermethrin in severely infested sections due to their shorter persistence.
- During rainy season, deltamethrin, alphamethrin, fenpropathrin and lamda-cyhalothrin are found suitable because in intermittent a rain-free period of less than one hour after spraying these insecticides can be adsorbed in the leaf surface, thus maintaining enough toxicity for desired *Helopeltis* control.

Chemical compatibility of insecticides:

In order to combat the situation like mixed infestation of mite and *H. theivora,* normally the planters have been practicing the tank mixing of insecticides with acaricides. Effective *H. theivora* control is not achieved when acaricides mixed with insecticides are incompatible viz. fenazaquin and propargite with deltamethrin, alphamethrin, λ-cyhalothrin, β-cyfluthrin are not effective. Therefore the above combinations are not recommended.

Region wise *H. theivora* management package in Dooars tea plantations

Control practices of *H.theivora* differ considerably with plant varieties, local environment and practices of tea subdistricts. Therefore, any general strategy cannot be recommended. Effective implementation in the pest management strategies based on local conditions therefore must adopted. These are follows: -

1. Since a high degree of resistance to endosulfan was reported to occur in all tea growing subdistricts, its use should be discontinued in the Dooars.

2. Since 10 to 20-folds tolerance to deltamethrin and imidacloprid has been reported in Kalchini, Nagrakata, Dalgong and Binnaguri sub districts in the Dooars these insecticides should be avoided or applied when absolutely necessary.

3. Use of synergist such as piperonyl butoxcide (PB; 90% w/v) with quinalphos and deltamethrin, imidaclopyrid and endosulfan at 1:5 ratio to enhance the toxicity of given insecticide by suppressing the detoxification mechanism should be encouraged, particularly in Kalchini region.

4. The label of the insecticide before use must be carefully read, as there may be pH restrictions. Particularly the planters of Central and Eastern Dooars are advised to determined the pH of the carrier water (by pH paper) and maintain acidic to neutral pH before mixing insecticide for spraying.

The above-mentioned recommendations if adopted for management of *H.theivora* pest population of the Dooars tea plantations are expected to bring in a control of the growing menace, that often have cause heavy loss of tea production. The suggestion if implemented in letters and spirit would possible reduced the load of chemical

insecticide on the crop and also the environment, all the same inculcate region wise practice of integrated management of the pest, the necessity of the hour.