

## Managing Tea Plantation Using Vrikshayurveda<sup>1</sup>

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Deckiajuli Tea Estate in Assam, India has been grappling with the issue of what should be considered as an ideal crop management system for tea plantation. Is the use of pesticides the right approach? If yes, then why are the yields showing a declining trend? Why do our tea bushes look weak? Why do pests recur with a vengeance?

We felt that the use of chemicals was not giving satisfactory results, probably because pests were becoming immune and resistant to the pesticides being used. An alternative was to follow the organic way of tea cultivation. Once the consensus was reached on trying to cultivate tea without the use of chemicals such as pesticides and growth promoters, our major concern was the implementation of alternative technology.

Our knowledge on alternatives to pesticides was limited to bio-products marketed by a few companies. However, the bio-products available in the market were not only very expensive but also unreliable. Left without any viable option, these bio-products were tried. The results were inconsistent and the whole team of workers started losing confidence of managing tea organically. While practicing organic farming, the following objectives were kept in mind:

- Produce and sustain the present level of yields of tea.
- Churn out healthy produce to maintain and uphold human health.
- Make tea production sustainable and cost-effective for both producer and consumer.
- Completely diminish the use of inorganic fertilizers.

To achieve these objectives, the ancient classics published by the Asian Agri-History Foundation (AAHF), Secunderabad, India were used for obtaining useful and practical information. The bulletins of AAHF referred were Vrikshayurveda (Sadhale, 1996), Vishvavallabha (Sadhale, 2004), Nuskha Dar Fanni-Falahat (Razia Akbar, 2000), Kashyapiyakrishisukti (Ayachit, 2002), Lokopakara (Ayangarya, 2006), and Krishi-Parashara (Sadhale, 1999). We called procedures based on the old classics as “Growing Tea the Natural Way”.

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1. Based on the paper “Migration from western cultivation culture to eastern ethnicity in tea” presented at the National Conference on Traditional Agricultural Practices with Potential for Growing Plantation Crops held from 22 to 24 February 2007 at Assam Agricultural University, Jorhat, Assam organized by the Asian Agri-History Foundation.

Tea is a medium size perennial tree which is given a bushy frame for ease of operation. The leaves are of commercial interest. That is why the art of managing a tea plantation lies in:

- Maintaining the tea bush in its vegetative phase and in this phase, increasing the flush period and reducing the *Banji* period or dormant period (flush period is the growth of the bud between two phases of dormancy).
- Managing the pests below the EIL (economic injury level).

Tea is affected by a series of pests. Some major pests are: (1) red spider mite (*Oligonychus coffeae*); (2) tea mosquito bug (*Helopeltis theivora*); (3) green fly (*Empoasca flavens*); (4) looper caterpillar (*Buzura suppressaria*); and (5) red slug caterpillar (*Eterusia magnifica*). Of these, the first three are sucking insects and the last two are leaf-eating caterpillars. These pests cause severe damage to tea leaves.

## Experiments with organic extracts

The main objective of the trials conducted in Deckiajuli Tea Estate was to increase productivity of the tea bush by managing the pests with organic extracts. Of a large number of trials conducted, a few concoctions that showed positive results are discussed here.

### Fermented weeds extract

#### Preparation

- Fresh weeds growing in the area, such as *Mikania cordata*, *Ageratum houstonianum*, *Eupatorium triplinerve*, *Cynodon dactylon*, *Centella asiatica*, and *Borreria hispida* were collected and chopped.
- These weeds were fresh and full of life, i.e., lush green and free from insect pests or diseases.
- The chopped weeds were placed in a 200 L barrel which was filled up to the brim. Then 2 kg of molasses and 20 kg of raw cow dung were added.
- The barrel was filled with water almost up to the top and stirred well.
- It was closed with a lid and the concoction was left to ferment for 10–12 days.
- The concoction was stirred 2–3 times a day to release the gas formed.
- The concoction was filtered after it stopped producing gas and then used.

This fermented weeds extract (FWE) was applied at 1% concentration, twice a month throughout the season.

#### Benefits drawn

- Green fly and aphid (*Toxoptera aurantii*) attacks on tea plants were negligible.
- After plucking, dieback of tea shoots reduced drastically thereby improving the number of plucking points.
- Tea shoots were healthy and grew vigorously.

Our experience showed that FWE cannot overcome any specific problem after it has emerged. But FWE works wonders if it is used regularly as prophylactic.

## Modified fermented weeds extract

Seeing the positive results of FWE, we tried various concoctions to have a formulation at our disposal, which could be used in case of emergencies of severe pest attack. Finally, we observed that the combination of *Vitex negundo* and *Clerodendrum serratum* extract worked very well against the dreaded pest of tea, i.e., *Helopeltis*.

### Preparation

Fresh leaves of *V. negundo* and *C. serratum* were chopped into small pieces and were put into a 200 L barrel. Raw cow dung (20 kg) and molasses (2 kg) were added to it. The barrel was closed with a lid and the mixture was allowed to ferment for 12–15 days. It was then filtered and used at desired concentrations.

### Observations

Three sprays of the concoction (i.e., modified FWE) were applied to tea plants at weekly intervals at 1% and 2% dilutions. In another treatment, the pure extract, i.e., without dilution was sprayed only once. A check was maintained for comparison. The results are presented in Table 1.

The modified FWE was found very effective against *Helopeltis* at all concentrations. The mode of action of this extract has not been studied but the results are evident. Spraying at weekly intervals at 2% dilution will definitely ward off this dreaded pest from tea plantations. The best result was when the extract was used without dilution. Only one spray was enough to completely free the field of *Helopeltis*.

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**Table 1. Efficacy of modified fermented weeds extract (FWE) against *Helopeltis theivora* on tea.**

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Treatment/ dosage	Pest control (%) after 4 weeks
Modified FWE 1%	70
Modified FWE 2%	90
Pure extract	100
Check	15

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## Fruit concoction

After having tried weeds, the studies were oriented towards fruits. Assam produces plenty of papayas, bananas, and pumpkins. These fruits can be very handy in preparing another low-cost concoction.

### Preparation

Pumpkin, banana, and papaya (8 kg each) were taken and chopped into small pieces. These were placed in a 200 L barrel. Six kg molasses and 6 kg of raw cow dung were added. The contents were topped up with water. The barrel was closed with a lid and the concoction was left to ferment for 15–20 days. It was then filtered and used at 0.5% concentration at 15-day intervals along with cow dung water. The results were very encouraging. This concoction can be used for the control of red spider mite.

### Observations

Two plots of tea plants that were affected with red spider mite were selected. During the first week these plots were sprayed with a conventional chemical to control the pest. The fruit concoction was sprayed in

Plot A at fortnightly intervals starting from the second week. Plot B was left as it is for the chemical pesticide to control the pest. There was resurgence of red spider mite in Plot B after 15 days. But in Plot A, where fruit concoction was used, the plants showed healthy flush and there was no resurgence of the pest.

## Water pepper for red spider mites

Once we had a concoction that provided acceptable control of *Helopeltis*, we also wanted a product in our hand which could bail us out if there was an outbreak of red spider mite. We had read about *Polygonum hydropiper* (water pepper) in literature. This information was enough to undertake studies.

### Preparation

Finely chopped *P. hydropiper* plants were placed in a 200 L barrel and filled up to the brim; 20 kg raw cow dung was added and the barrel was filled with water. The mixture was left to ferment for 36–48 h and then filtered. The extract was used on the same day.

### Observations

Best results were achieved when the extract was used on the same day of preparation. The application of *P. hydropiper* extract was repeated in the same block as it did not show any effect on eggs of red spider mite. There was resurgence of mites from the eggs in 7–8 days. Two applications sprayed during the 1<sup>st</sup> week and 3<sup>rd</sup> week gave the best results (Table 2).

**Table 2. Efficacy of *Polygonum hydropiper* extract against red spider mite on tea.**

Treatment/Dosage <sup>1</sup>	Pest reduction (%) over control			
	1 <sup>st</sup> week	2 <sup>nd</sup> week	3 <sup>rd</sup> week	4 <sup>th</sup> week
0.5% extract	50	70	60	90
1% extract	70	80	70	95

1. The extract was sprayed during the 1<sup>st</sup> week and 3<sup>rd</sup> week.

## Cow dung water with molasses and starch

### Preparation

About 30 kg fresh cow dung, 2 kg cane jaggery or molasses, and 4 L rice water (starch) (CDJR) were placed in a nylon bag. This bag was tied and suspended in a 200 L barrel filled with water. The CDJR mixture in the bag was allowed to ferment for 36 to 48 h, after which it was ready to be used.

Cow dung water (CDW), containing 10% CDJR, forms the base liquid for all our sprayings. All other concoctions are mixed in CDW. The CDW is also sprayed by itself.

### Observations

- In the year (2006) under experimentation, we faced drought at the peak of the cropping period and had no rain for 45 days in July/August. A few neighboring gardens reported huge casualties of tea

plants. But at Dhekiajuli not a single plant died. We believe that CDW enabled the tea plants to survive in drought conditions.

- In such adverse climatic conditions, usually the shoots will turn leathery and hard and will not be suitable for manufacture of quality tea. However, tea shoots in our estate were supple and succulent.
- Shoots were less fibrous thereby improving the quality of the end product.

The temperature ranged from 42 to 44°C during the season. Temperatures above 35°C are unfavorable to tea. Despite the heat, no drooping of shoots was noticed in our trials.

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