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Field Efficacy of Panchagavya on Insect Pests Recorded During the Study in *Tectona Grandis*

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ABSTRACT

Field trial was conducted on the incidence of insect pests associated with *Tectona grandis* in an experimental plantation for the period of five months. This study revealed that a total of nine pests, viz., *Hyblaea puera* Cramer, *Chorthippus parallelus* Zetterstedt, *Eutectona macheralis* Walker, *Henosepilachna vigintiopunctata* Fabricius, *Paracoccus marginatus* W.G., *Aphis* sp., *Tetrix undulata* Sowerby, *Oxyops* spp., and *Cerematulus nasalis* Westwood were associated with this plant. Among them, *Paracoccus marginatus, Hyblaea puera* and *Eutectona macheralis* were major pests. Hadda beetle (*Henosepliachna vigintioctopunctata*) and *Aphis* sp. were recorded as minor pests. Predatory spiders (*Oxyopes* sp.) was the only natural enemy noticed in this eco system. Grass hopper, *Chorthippus parallelus*, common ground hoppers (*Tetrix undulata*) and shield bug *Cerematutus nasalis* were also noticed. The Efficacy of Panchagavya and also with neem oil against the above insects was tested. An unsprayed plot was also maintained. Among the different treatments tested, 7% and 5% diluted panchagavya application were found to be more effective in controlling the pests. Cost effective analysis showed 7% diluted panchagvya was found to be cheaper and affordable to the tree growers.

Keywords: Panchagavya, Major pests, ground hoppers, tree growers.

INTRODUCTION

Panchagavya, as the name implies, is an organic preparation made from five different cow products Viz., Milk, curd, ghee, urine and dung, commonly applied to crop plants in organic forming [1]. These formulations were claimed to be useful against infections [2]. Panchagavya contains growth regulatory substances such as IAA, GA, Cytokinin, essential plant nutrients, effective micro organisms like lactic acid bacterium, yeast and Actinomycetes. It also contains biofertilizers like Acetobactor, Azospirillum and Phosphobacterium and plant protection substances [3]. The application of Panchagavya increased the growth and control the disease of *Solanum malanogens* Linn, and reduces the present disease incidences of crop [4].

Teak, *Tectona grandis* (Family : Verbanaceae) is perhaps best known for its long established use in the boat building, deck houses, rails bulwarks, doors furnitures etc., [5]. It grows well in good sites upto 45 meters in height and produces an outstanding timber [6]. Teak is susceptible to various kinds of pests and diseases. Generally, in India, teak is affected by a few serious diseases both in nurseries, extensively premature defoliation. Leaf spot caused by the other pathogens are of less significance, even though, they are capable of causing defoliation in serious cases [7].

Insect pest constitute an important single factor which play a remarkable role in limiting the Forest productivity. Quite often, these pose serious problems and constraints in protecting our resources particularly nurseries and plantation [8]. Therefore, an attempt has been made to evolve a control measure against pests of *T. grandis* using organic compounds as it is eco friendly. The present investigation looked into the effect of Panchagavya on insect pests associated with teak experimental plantation is critically discussed.

MATERIALS AND METHODS

The chosen study was conducted in the field research station of State Forests Research Institute (SFRI) Chennai is located in Kattankulathur, Kancheepuram district about 40 km south wards to

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Chennai and it is a field research station of State Forestry Research Institute (SFRI), Chennai. Experimental period was December 2012 to April 2013. The plantation area covers 1.00 ha with 400 numbers of one year old trees with a space of 3m x 3m and a standard sampling method was adopted with three replications. A sum of 118 seedlings covering 11 rows were selected for the study (29.5% sampling). An appropriate control was maintained without any inputs. Inspects pests associated with teak were observed at morning and evening regularly for a month and recorded. Alive pest specimens were collected in polythene bags for the taxonomical identification. Identification was made based on morphological and taxonomical characters which are essential part of the entomological techniques. Result has been taxonomically categorized and tabulated. The experimental site falls under Northern agro climatic zone and situated at 12 D 47 M 82.725 S latitude and 80D 1 M 10.645 S longitude.

Preparation of Panchagavya

Panchagavya was prepared as described by [9]. It contained fresh Cow dung – 0.5 kg, Cow urine – 1.0 L, Cow milk – 1.0 L, Curd 1.0 L, Ghee 1.0 L, and water 1.0 L. These ingredients were taken in a 25.0 L concrete pot, mixed well and allowed to stand in shade for 21 days with intermittent stirring. This 100% concentrated panchagavya was used for different testing for subsequent treatments.

Table1. *Showing chemical composition and microbial load of Panchagavya*

Chemical composition		**Quantity (ppm)**
pH	:	5.45
EC dSm^2	:	10.22
N	:	229
P	:	209
K	:	232
Na	:	90
Ca	:	25
IAA	:	8.5
GA	:	3.5
Microbial Load		**Microbes per ml**
Fungi	:	38800/ml
Bacteria	:	1880000/ml
Lactobacillus	:	2260000/ml
Total anaerobes	:	10000/ml
Acid formers	:	360/ml
Methanogen	:	250/ml

Source: *[10]; Tamil Nadu Agriculture University Website.*

Treatment Details

In the present study, different combinations of panchagvya and neem oil were used for the treatment to investigate their effect on teak pests and the treatments are as follows:

T1- Control (without any applications).

T2- 1% diluted neem oil (10ml of neem oil & 20ml of soap water (for emulsification only) + 970 ml of water).

T3- 5% panchagavya + 1% neem oil (10 ml of neem oil + 50ml of panchagavya + 940 ml of water)

T4- 5% diluted panchagavya

T5- 7% diluted panchagavya

Treatments were given by the foliar application using a power sprayer of 10 liter capacity. Treatments given at morning and evening regularly on every 15 days intervals but 7% diluted panchagavya was sprayed two times alone with an intervals of 15 days. Whereas other treatments required 3 times spray to have clear observation and tabulated for analysis.

RESULTS AND DISCUSSION

Nine insect pests were recorded during study and grouped according to the damage (Table 2; Plate1-2)

Table2. *Showing chemical composition and microbial load of Panchagavya*

Common Name	Scientific name	Family	Order
Defoliators Teak defoliator	*Hyblaea puera* Cramer.	Hyblaeidae	Lepidoptera
Meadow grass hopper	*Chorthippus parallelus* Zetterstedt	Acrididae	Orthopetera
Teak skeletonizer	*Eutectona macheralis* Walker	Pyralidae	Lepidoptera
Hadda beetle	*Henosepilachna vigintiopunctata* Fabricius	Coccinellidae	Coleoptera
Common ground hopper	*Tetrix undulata* Sowerby	Tetrigidae	Orthoptera
Sucking Pests Hadda beetle	*Henosepilachna vigintiopunctata* Fabricius	Coccinellidae	Coleoptera
Mealy bug *	*Paracoccus marginatus* W.G.	Pseudococcidae	Hemiptera
Aphids	*Aphis* sp.	Aphididae	Homoptera
Natural enemies Predatory spider	*Oxyopes* spp.	Oxyopidae	Araneae
Shield bug	*Cerematulus nasulis* Westwood	Pentatomidae	Heteroptera
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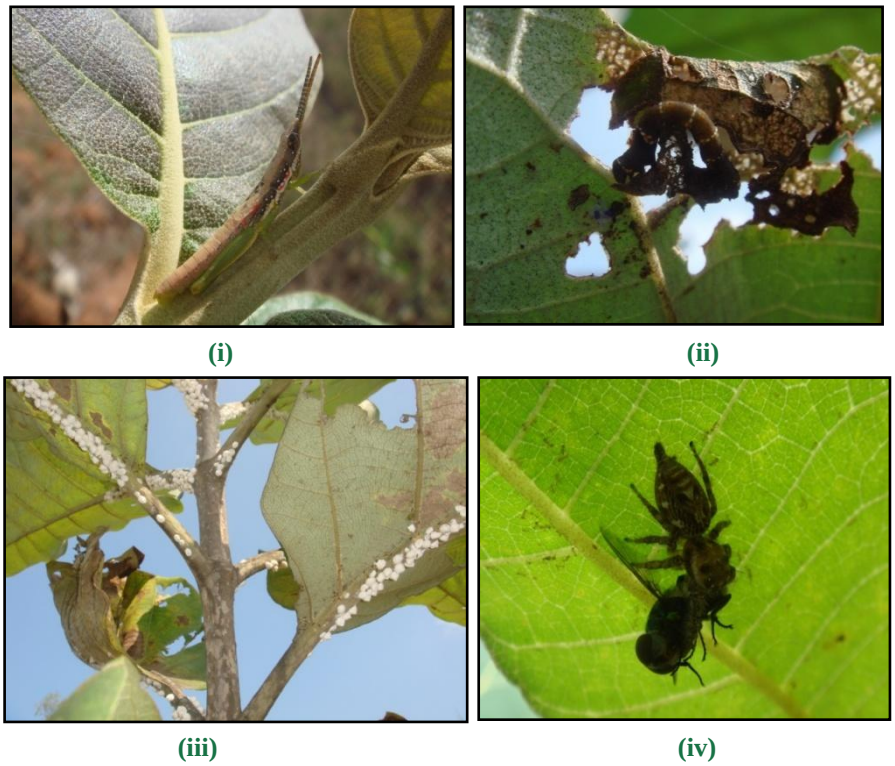
** A new report observed in T. grandis confined to Kanchipuram District.*

Effect of Panchagavya on Teak Associated Insects

The data on effect of foliar application of Panchagavya with different dilution and its combination with neem oil is being described in the succeeding paragraphs (Figure - 1)



(i) **(ii)**

(iii) **(iv)**

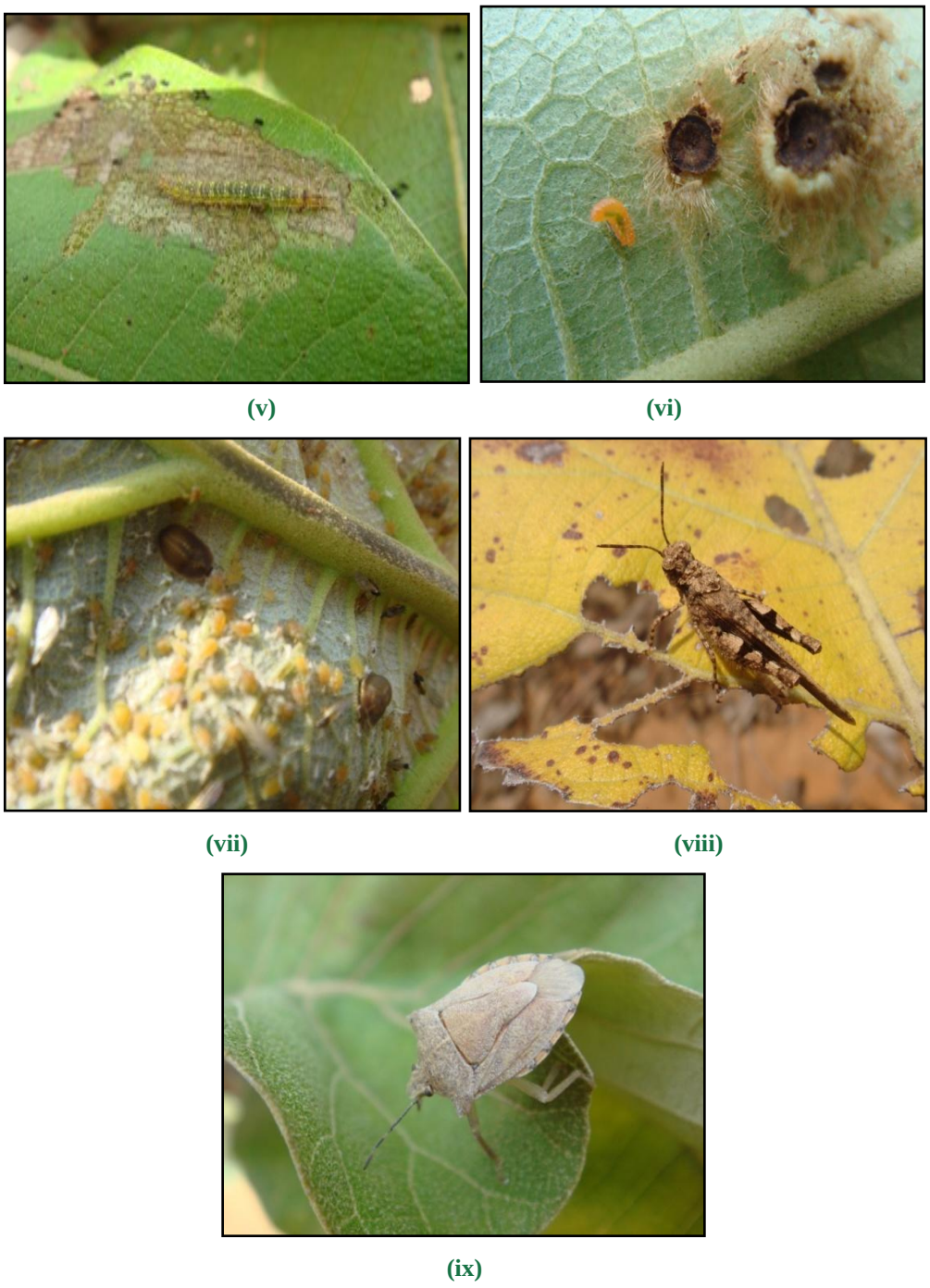


Figure1. *Insect pests observed on teak (T. grandis)*

(i) *Hyblaea puera*, **(ii)** *Chorthippus parallelus*, **(iii)** *Eutectona macheralis*, **(iv)** *Henosepilachna vigintictopunctata*, **(v)** *Paracoccus marginatus*, **(vi)** *Oxyopes* spp., **(vii)** Eggs of *Aphis* sp., **(viii)** *Tetrix undulata* and **(ix)** *Crematulus nasalis*.

Table 3: *Showing the changes in the occurrence of associated insect pests of T. grandis plantation under different treatments. Insect incidents*

Insect Pest	Treatment 1	Treatment 2				Treatment 3				Treatment 4				Treatment 5			
	Infection %	Before	After	B~A	Reduction %	Before	After	B~A	Reduction %	Before	After	B~A	Reduction %	Before	After	B~A	Reduction %
Hyblaea puera	62.5	58.0	25.0	-33.0	56.0	54.0	25.0	-29.0	53.0	50.0	16.6	00.0	80.0	50.0	04.16	-45.8	91.0
Chorthippus parallelus	45.8	50.0	29.0	-21.0	42.0	41.6	33.3	-08.3	19.9	62.5	29.0	-35.5	53.0	62.5	08.3	-54.2	86.6

Eutectona macheralis	45.8	50.0	33.0	-17.0	34.0	45.8	29.0	-26.8	36.0	41.6	20.8	00.0	50.0	33.0	08.3	-25.0	75.0
Henosepilachna vigintiopunctata	50.0	37.5	20.8	-16.7	44.0	50.0	16.6	-83.4	66.0	45.8	00.0	-45.8	100	41.6	00.0	-41.6	100
Paracoccus marginatus	16.6	54.0	04.0	-50.0	92.5	54.0	00.0	-54.0	100	25.0	00.0	-25.0	100	25.0	4.16	-20.8	83.3
Aphis sp.	54.0	45.8	20.8	-25.0	55.0	12.0	08.0	-04.0	33.0	12.0	08.0	-04.0	33.0	45.8	00.0	-45.8	100
Tetrix undulata **	33.3	41.6	16.6	-25.0	60.0	50.0	04.0	-46.0	92.0	41.6	54.0	+12.0	29.0	24.0	00.0	-24.0	100
Cerematulus nasulis **	29.0	16.6	08.0	-08.6	54.0	16.6	04.1	-12.6	76.0	29.0	04.0	-25.0	86.0	37.5	04.1	-33.4	89.0
Oxyops spp. *	29.0	20.8	21.0	-19.4	93.0	20.8	12.5	-08.3	39.9	54.0	25.0	-29.0	53.7	33.3	70.8	+37.5	112

*Note:- * Predatory spider(Beneficial); ** Harmless insects. T1- Control (without any applications),*

T2- 1% diluted neem oil (10ml of neem oil & 20ml of soap water (for emulsification only) + 970 ml of water).

T3- 5% panchagavya + 1% neem oil (10 ml of neem oil + 50ml of panchagavya + 940 ml of water.)

T4- 5% diluted panchagavya T5- 7% diluted panchagavya

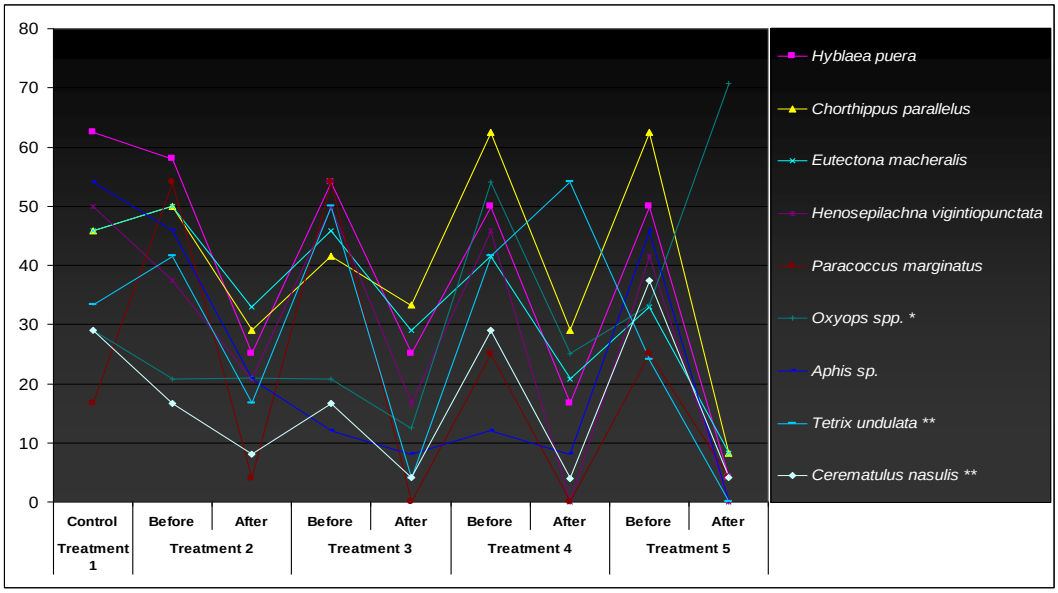


Figure2. *Effect of different Panchagavya treatments on pest infestation*

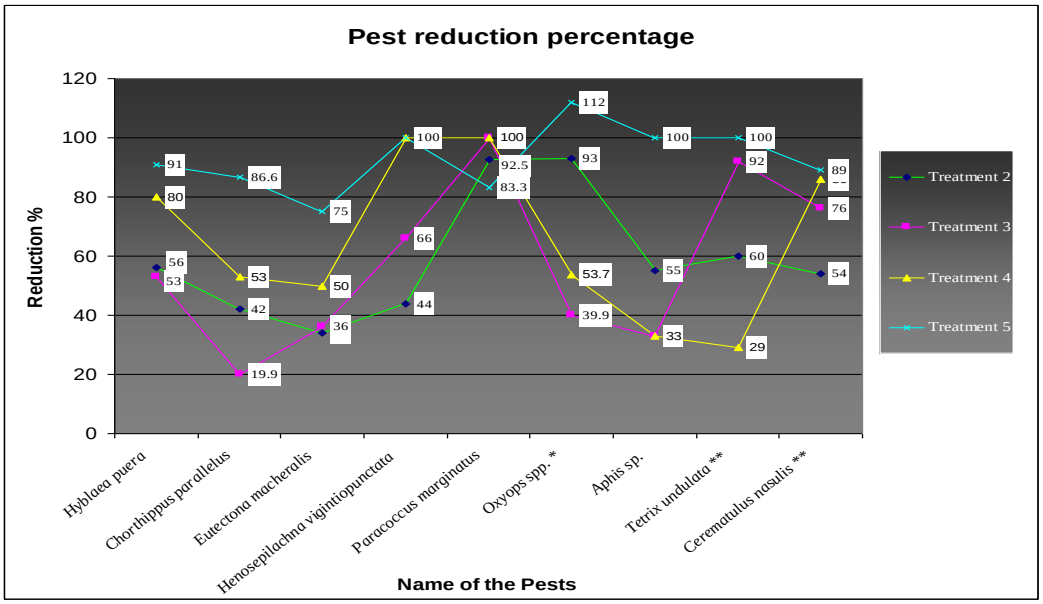


Figure3. *Effect of different Panchagavya treatments on pest reduction percentage on infected teak*

From the results, it is evident that all the panchagavya treatments in different dilutions were proved to become remarkable changes in the reduction of insect pests (Fig 2 & 3). Among them, Treatment 5 resulted in reduction 91,86. Reduction of teak defoliators and teak skeletonizers viz. *H. puera*, *C. parallelus* and *E. macheralis* was 75% respectively.

Percentage inhibition rate of hadda beetle (*H. vigintiopunctata)* and Ground hopper *(T. undulata)* was 100%. Mealy bug, *P. marginatus was* reduced to tune of 83. Predatory spider *Oxyopes* spp. population was increased to 112% after treatment. Simultaneously, shield bug (*C. nasulis)* population was declined to 89% after treatment.

The next best was treatment 4 which resulted in 80, 53 & 50% reduction of teak defoliators and teak skeletonizers. 100% of reduction was observed on the hadda beetle and mealy bug. A reduction percentage of 53, 33.3 and 47 was recorded in *Oxyopes* spp., *Aphis* sp. and ground hopper respectively.

Assessing Cost Effectiveness

An analysis has been undertaken on assessing cost effectiveness of panchagavya treatment compared with a popular botanical insecticide (Neemazel) used by the tree growers. It showed that 7% diluted panchagavya seems to be more cheaper than other treatments and affordable to the farmer (Table-4) The cost of treatments includes the factors such as quantity, dilution, mandays and labour charges. The total cost of 7%diluted panchagavya, 5% diluted panchagavya and a botanical pesticide was found to be Rs.718.30, 1027.75 and 907.5 respectively. The cost covers treatment for 1 hacter area with 400 seedlings. It is inferred that 7% diluted panchagavya application is cheaper and cost effective.

Farmers also use chemical pesticide which kills immediately but plant based and traditional pesticides such as Neem and panchagavya do not work in the same way. These may cause disturbances in the physiology of the insect, rendering it inactive although the insect might still be present in the plant it would not cause any harm (Vijayalakshmi, 2010).

Studies on insect pests occurrence on Teak revealed association of nine pests (Table 1) with this plant in the selected plantation area. [11] reported that Teak plants are vulnerable to attack by a number of insect pests. [12] studied 28 insect pests associated with it. The differences between the findings of the present and earlier workers may be due to differences in geological setting, area covered, and period involved. Two species of insects viz., Teak defoliators (*Hybllaea puera*), Teak skeltonizer (*E. macherallis*) have been found causing server damage to teak. These insects also have been reported as major pests of this plant at several places [11, 12 and 13]. Hadda beetle (*H. vigintioctopunctata*), scraped chlorophyll from epidermal layer of leaves. Simlar damage by these pests has been reported by several workers [11, 12 and 14]. Predation by the spider (*Oxyops* spp.) on insects, *H. puera* had also been recorded earlier by [15 and 16]. Population of *P. marginatus* recorded in present study has not been reported earlier in teak plantation of Kancheepuram district of Tamil Nadu and hence, it is a new report.

Effect of different combination of panchagavya treatment proved that the is a change for the plant to tree acquired resistance against insect pests. The same effects were already documented in soyabean, *Glycine max* L., by [2]. Several reports indicate that panchagavya reported to contain pesticidal and pest repellent activity [17, 18, 19 and 20]. [21] studied panchagavya effect on Southern Sunnhemp Mosaic Virus (SSMV) reported that spraying with Panchagavya improve the plant health and act as immunity booster. In the present work insect pest reduction on the 5% and 7% panchagauya followed by one percent neem oil and one percent neem oil + five percent panchagauya may be due to the improvement of immunity ingredients present in the panchagavya. Panchagavya also significantly increased the yield attributes and decreased the disease compare to control is well documented [22].

Table4. *Showing a comparison of cost analysis of Panchagavya with commercial chemical insecticide*

Treatments	Required quantity of 100% conc. (Lit)	Composition for 27lit/ha	Cost in different quantity (Rs.)	Cost of milliliters (Rs./Lit)	Required mandays	Labour charges @300/day	Total cost (Rs.)	Area covered (ha)	No. of seedlings
5% Panchagavya	1.350	25.650 liter of water + 1.350 liter of panchagavya	65/ liter	87.75/1.350	3	900	1027.75	1	400

7% Panchagavya	1.820	25.180 liter water + 1.820 liter of panchagavya	65/liter	118.30/1.820	2	600	718.30	1	400
5% Commercial chemical insecticide	0.135	26.865 liter of water +` 0.135 liter of insecticide	450/100ml	607.50/0.135	1	300	907.50	1	400

CONCLUSION

There were numerous instances citing the beneficial effect of panchagavya and this was clearly brought out in the present study. Panchagavya, an organic source proved beneficial in suppressing the insect pest on teak in the present study, and in addition, attracted and increased the natural enemies.

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