

# Bioassay of five leaf extracts against *Petrobia harti* Ewing (Acari: Tetranychidae)

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## Abstract

The report has been made to find the effect of leaf extracts of five different medicinal plants on ovicidal activity against *Petrobia harti* Ewing (Acari: Tetranychidae) infesting *Oxalis corniculata* L. through bioassay under laboratory conditions at 25±5°C, 65±5% relative humidity (RH) and a photoperiod of 12:12 (L:D). Monocrotophos (36wsc) was used as a chemical standard, causing 0.35% of egg mortality. The leaf extract of *Clerodendron inerme* and *Tagetes erecta* at 1.5% concentrations registered mean mortality of 92.50% and 82.63% respectively on *P. harti*. The ovicidal activity of *Azadirachta indica* extract was most effective on hatching of eggs than others and *Cymbopogon martini* extract was less effective in comparison to others. This experimental report was made to find out suitable alternatives for pest control purpose. In this regard the use of botanical pesticides are appearing to be good alternative and quite promising.

**Keywords:** *Petrobia harti*, *Oxalis corniculata*, mortality, ovicidal activity, plant extracts

## Introduction

*Petrobia harti* Ewing (Acari: Tetranychidae) usually associated with *Oxalis* spp. (Oxalidaceae), they are also common on other plants in India (Chatterjee and Gupta, 1996)<sup>[2]</sup>. The five different medicinal plants leaf extract against *Petrobia harti* Ewing infesting medicinal weed *Oxalis corniculata* L. (Oxalidaceae) known as creeping wood sorrel. In view of this, some of the plant extracts like- Bhat (*Clerodendron inerme*), Neem (*Azadirachta indica*), Lemon grass (*Cymbopogon martini*), Nishinda (*Vitex negundo*), Marigold (*Tagetes erecta*), were assessed against *Petrobia harti* which seriously infested a medicinal weed, *Oxalis corniculata*. Monocrotophos (36wsc) was taken as standard acaricide. Along with mortality, another experiment for repellency was conducted on the same mite (*Petrobia harti*) where in the plant extracts of Nishinda (*Vitex negundo*), Neem (*Azadirachta indica*), Lemon grass (*Cymbopogon martini*), Marigold (*Tagetes erecta*) and Lemon leaf (*Citrus limon*) were assessed on the same medicinal weed (*Oxalis corniculata*). The objective of this study was to determine the ovicidal activity of different plant leaf extracts.

## Materials and Methods

### 1. Test Mite

*Petrobia harti* Ewing (Acari: Tetranychidae) was found seriously infesting a medicinal weed, *Oxalis corniculata* L. causing chlorosis and other biotic stress of plants.

### 2. Laboratory condition

The present study was carried out in the laboratory of the Zoology Department, University of Calcutta, during 2017–2018. All experiments were carried out in a growth chamber maintained at 25±5°C, 65±5% relative humidity (RH) and a photoperiod of 12:12 (L:D). Collected mites were reared and

maintained at the above mentioned conditions.

### 3. Collection method of leaf samples from medicinal plants

*Petrobia harti* and medicinal plant leaves were collected from Medicinal Plants Garden of Ramakrishna Mission Ashrama, Medicinal Plant Research and Extension Centre [22.4385° N, 88.4002° E], Narendrapur about 26 km south of Kolkata during March, 2017 to April, 2017. The selected medicinal plant leaves were plucked and examined by using a 10X hand lens. The tested fresh leaf samples were separately put in labeled zipper bags and then were brought to the laboratory where leaves were examined under a stereoscopic research microscope [Motic SMZ-168 Stereo Zoom Microscope]. *Petrobia harti* populations which were reared on *Oxalis corniculata* under laboratory condition and leaves were periodically picked up at random from 10-20 plants in the Medicinal Plants Garden. The experimental plot for this study was undertaken clean insecticides free area.

### 4. Rearing of mite colony

Adult *Petrobia harti* were reared under the laboratory condition to maintain mite colonies on *Oxalis corniculata* L. To maintain the mite colonies for the study, 1.5 cm diameter leaf discs were cut from the fresh leaves of *O. corniculata*. The leaf discs were placed on water saturated cotton in the Petri dishes (9 cm diameter × 2 cm height) with the ventral surface of the leaf down. After three days, the leaf discs were gently removed and replaced with fresh leaves. The excised leaf edges were surrounded with cotton strips as water barrier. The water added when needed to keep the humidity high. The mite developmental period from egg to adult, their longevity, fecundity rate, hatchability rate and fertility of adults are studied for mites reared on each plant.

## 5. Preparation of crude extracts

The test mite was collected from cultured pots. The plant leaves were dried under shade and powdered by using electric grinder and kept in dark condition at room temperature in the zipper bags until used. The tested plant extracts were prepared using acetone as solvent and the powder of leaves were kept in a conical flask (150cc), immersed in acetone and then was shaken vigorously for 24 hrs in a horizontal shaker at 120 rpm at room temperature. On third day, the supernatant liquid was taken out, filtered and kept into evaporating flask and evaporated under vacuum using a rotary vacuum evaporator (RV 05 Basic 1B, IKA Group) at 30°C. After the evaporation was over, the resulting residue was dissolved in water to yield extract solutions and kept in refrigerator until used in the bioassay.

## 6. Study of acaricidal activity

The leaf-disc technique (Helle and Sabelis, 1985) [3] was followed for determining mortality percentage of plant extracts in bio-assay study. For control treatment, distilled water was sprayed. The leaf-discs of 1.5 cm diameter were immersed in the desired concentration of the extracts for 1 minute and then were taken out and kept under a ceiling fan for drying. Thereafter, those were kept on wet cotton pads in Petri dishes and 10 adult mites were released on each leaf-disc. The observations were recorded 24, 48 and 168 hours after treatment. The mites were considered to be dead when they made no movement of their appendages with a prick of a needle. Each treatment was replicated 4 times. The percentage mortality was calculated by using the formula as:-

$$\text{Percentage (\%) Mortality} = \frac{\text{No. Of Dead Mites}}{\text{Total No. Of Mites}} \times 100$$

(Mc. Donald *et al.* 1970) [4]

## 7. Study of ovicidal activity

For the assessment of ovicidal properties of plant extracts, 10 adult females of *Petrobia harti* were resealed on leaf disc to allow them for oviposition and kept overnight in the Petri dish. The leaves were padded with water soaked cotton and after 24 hrs. female mites were removed with the help of brush. The

eggs laid on leaves were counted under microscope as pre-treatment count. The each leaf disc containing 10 eggs were sprayed with each plant extract by using glass atomizer and for control treatment distilled water was used instead of plant extract. Trials were repeated 4times. The egg viability was determined for both experimental and control batches of eggs for a period of 10 days after oviposition. Those eggs that did not hatched were considered as non-viable.

## 8. Statistical Analysis

The data were corrected for mortality testing in the control using Abbott's formula (Abbott, 1925) [1]. The data was subjected to statistical analysis using SPSS software 2000 (version10.00).

## Results and Discussions

The result of mean percentage of ovicidal activity, the mean percentage mortality of eggs was concerned that treatments can be arranged in the following descending order (Table1) – Neem (0.77% egg mortality) > Nishinda (0.38% egg mortality) > Monocrotophos (0.35% egg mortality) > Bhat (0.21% egg mortality) > Marigold (0.17% egg mortality) > Lemon grass (0.16% egg mortality).

In this study, the Neem leaf extract was very much potential against egg hatching of *Petrobia harti* as compared to control. Hence, it is clearly proved that besides the direct acaricidal effects of plant extract on adult mites, their ovicidal effects were also very significant. This experiment provided a view that plant extracts could be suitable alternatives of synthetic chemical pesticides in management of mite pest. The ovicidal activity of five plant extracts had shown good ovicidal nature against eggs of mite pest, ranging from 0.77% to 0.16% (Table1). Among all the treatments, Neem plant extracts was found to be the best and was closely followed by Nishinda and Bhat extracts. Lemon grass extracts was the poorest among all for both adult and egg mortality. This experiment suggested that Monocrotophos which is a conventional acaricide was found to be no way superior to plant extracts so that plant extracts could be suitable alternatives of synthetic chemical pesticides in management of mite pest and also helpful for environment.

**Table 1:** Percentage egg mortality (ovicidal activity) of *Petrobia harti* infesting *Oxalis corniculata* by application of different plant extracts at different concentrations

Percentage of egg mortality (ovicidal activity) of <i>Petrobia harti</i> on <i>Oxalis corniculata</i> by the application of five plant extracts at different concentrations						
Treatments (Plant Extracts)	Initial Population	Slope ± SE	LC <sub>25</sub>	LC <sub>50</sub>	LC <sub>95</sub>	χ <sup>2</sup> (df) % of total ovicidal activity
Neem ( <i>Azadirachta indica</i> ) T <sub>1</sub>	10	1.28±0.23	1.63 (1.21-1.19)	4.40 (2.69-7.10)	12.15 (8.33-40.17)	0.77%
Nishinda ( <i>Vitex negundo</i> ) T <sub>2</sub>	10	1.67±0.86	1.30 (1.45-1.24)	2.91 (1.93-4.44)	12.14 (7.08-39.46)	0.38%
Lemon Grass ( <i>Cymbopogon martinii</i> ) T <sub>3</sub>	10	1.36±0.08	1.56 (1.23-2.50)	5.17 (3.11-7.19)	8.13 (6.31-17.18)	0.16%
Marigold ( <i>Tagetes erecta</i> ) T <sub>4</sub>	10	1.37±0.08	1.57 (1.24-2.49)	5.19 (3.15-7.21)	8.33 (6.39-17.88)	0.17%
Bhat ( <i>Clerodendron infortunatum</i> ) T <sub>5</sub>	10	1.88±0.50	2.16 (2.12-10.16)	4.18 (3.13-7.24)	11.08 (6.07-29.11)	0.21%
Monocrotophos (36 WSC)	10	1.65±0.85	1.28 (1.43-1.21)	2.97 (1.95-4.65)	12.11 (7.03-39.16)	0.35%
Control	10	0	0	0	0	0

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