# EFFECTS OF NERIUM OLEANDER TO THE SUBTERRANEAN TERMITE; COPTOTERMES HEIMI (WASMANN)

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**ABSTRACT:** The present study was aimed to learn the changes in the behavior and mortality and of *Coptotermes heimi* in response to the Nerium oleander leaves. The leaves were placed in Petri dishes with the termite workers and setups were maintained for 15 days. There were no significant changes in the foraging activity and tunnel construction by the termite workers. However, mortality was observed along with the changes in the temperature and humidity.

**Key words:** *Coptotermes heimi, Nerium oleander.*

## INTRODUCTION

Nerium oleander is an evergreen shrub, four meters high having dark or grey-green leaves, 10 to 22cm long, narrow, un-toothed with short-stalk leaves with prominent midrib, leathery texture in groups of three leaves. The plant produces pink or white terminal flower, 5 cm in diameter with five petals. The fruit consists of a long narrow capsule 10-13cm in diameter which opens to disperse fluffy seeds, fruiting is uncommon in cultivated plants. The plant exudes a thick white sap when a twig or branch is broken or cut (Bell and Bryan, 2008). This plant has a wide distribution, grows in wild, along watercourses and damp rauines. It is widely cultivated as ornamental plant worldwide particularly in warm, temperate and sub-tropical outdoor in parks, gardens and along roadsides. This plant is highly toxic to living organisms. The main poisonous components of the toxicity are cardiac glycosides e.g. oleandrine (Heriteau, 2005). Termites are an integral part of the extensive fauna of the temperate countries of the world (Anonymous, 2000(. They are neither conspicuous as individual, nor do they attract attention by any violent fluctuation in number. Social and polymorphic species living in large communities composed of reproductive forms together with numerous apterous, sterile workers and soldiers. Termites may be found in all regions of the world between 47 North and South latitudes but they are most abundant in the tropics. Different kinds of termites present in any locality are greatest in tropical rain forests but the general level of their activity appears to be highest in deciduous woodlands.

Termites normally feed on cellulose (wood, grass, dung, leaf litter) although some species utilize living parts of plants and fungus growing on the plants matter brought into the nest. The amount of damage that termites do to growing crops is small in relation to the opportunity, which their ubiquity would appear to offer. Termites cause serious damage to different crops and cause such conditions in which crops never grow healthy (Chaudhry and Ahmad, 1972; Robinson, 2005; Staunton, 2007). Different methodologies are in practice to control the termite infestation like chemical control, bait system, etc. However, use of such insecticide has always been a threat to the environment. One safe approach could be use of plant origin materials, (plant or plant extracts). Coptotermes heimi belongs to sub family Coptotermitinae. They are relatively small, pale colored termites whose soldiers have an oval head with a prominent frontal opening from which whitish milky secretion is discharged when disturbed or attacked. All species attack wood and some of them are serious pest of wood working in the buildings. Coptotermes heimi is commonly found throughout India and Pakistan. A few records of its introduction in South Eastern Asia are also available (Gay, 1967; Roonwal, 1970). C. heimi is one of the most notorious pests of woodworking in buildings in Pakistan (Akhtar, 1981a) with their nests under ground or inside the trunk of tree. Coptotermes travians is found in India. (Assam, West Bengal, Orissa) in the east through Bangladesh (East Bengal), Burma, Malaya and Singapore to java, Sumatra and Borneo (Roonwal and Chhotani 1962; Roonwal and Maiti 1966) Coptotermes heimi is widely distributed throughout the country establishing the colonies

up to an elevation of 4000 ft above the sea level (Chaudhry and Ahmad, 1972). It causes extensive damage to coffins in Fukien (Light, 1931). It also attacks crops (sugarcane) in Hawaii. Lethal dose of N. oleander leaves have been reported for several animal species is about 0.5 mg/kg (Szabuniewicz et. al., 1971). Animals poisoned by eating the plant often develop bloody diarrhea to a direct effect on the gastrointestinal tract. Single dose of N. oleander results myocardial degeneration, necrosis, degeneration and focal necrosis of hepatocytes, necrosis of tubular epithelium in kidneys, edema in the lungs, and ischemic changes in the cerebrum (Aslani et. al., 2004). Many plants have evolved a wide range of defensive mechanism to protect themselves from termites therefore a large number of formulation extract have been developed around the world to control termites in the recent past.

## MATERIALS AND METHODS

Soil Preparation: The soil used for laboratory experiment was sandy loam and was obtained from a plot near the zoology department with no known application of chemicals to the soil. Soil was sieved through 10×18 mesh screen and incubated at 100°C for 48 hours. Methods: Fifty grams soil was evenly spread at the bottom of Petri dish so that the soil completely covers the base of the petri dish. The leaves of Nerium oleander weighted 0.89 grams were placed in the center of petri dish. The soil was moistened with 13-15ml of water. Three replicates were established for leaves and control setup. One hundred termites were released in each petri dish and observed with an interval of 24h for 15 days. The number of moribund termites was recorded and the area of activity of termites was also observed.

## RESULTS AND DISCUSSION

The experimental setups were maintained at room temperature for 15 days. There was an increase in temperature with decrease in the humidity during the course of the study. The mortality of the termites was directly related with the temperature and inversely with the humidity (Table 1). However, the presence of N. oleander leaves have no impact on the behavior of the termite workers, foraging area and tunnel construction activity (date not shown).

**Table 1: %age mortality of C. heimi workers in relation to temperature and humidity.**

| Serial No. | Temp. (°C) | Humidity (%) | Mortality (%) |
|---|---|---|---|
| 1. | 24.0 | 84.0 | 22.0 |
| .2 | 25.0 | 84.0 | 29.0 |
| 3. | 24.0 | 84.0 | 34.6 |
| 4. | 24.0 | 80.0 | 35.6 |
| 5. | 25.0 | 76.0 | 36.6 |
| 6. | 25.0 | 76.0 | 37.6 |
| 7. | 25.0 | 75.0 | 38.6 |
| 8. | 23.0 | 74.0 | 39.6 |
| 9. | 23.0 | 75.0 | 39.6 |
| 10. | 26.0 | 55.0 | 40.6 |
| 11. | 31.0 | 59.0 | 43.6 |
| 12. | 22.0 | 54.0 | 43.6 |
| 13. | 24.0 | 66.0 | 45.6 |

The plants are naturally resistant to defend themselves due to the naturally existing defense mechanisms. One of such mechanisms is the presence of certain chemicals/extractives that are distasteful, repellent, or toxic to the termites (Carter, 1976). However, it is reported experimentally that different termite species have different food preference therefore have difference response to the toxic components of the plant. The results obtained for any specific food for any specific termite species does not necessarily apply to the other species and may be misleading (Gay, 1967). P. wallichiana was not resistant to B. beesoni but were found toxic to C. heimi (Akhtar, 1981b). Therefore one should be careful in the selection of wood for the use. Naturally resistant timbers to the native species of termites could be used for wood work in building reducing the damage caused due to the termites. Plant extracts can be used as an alternative of the commercial insecticides to control the termite infestation. Extract from D. sissoo affected the survival of O. obesus to some extent but had no effect on the survival of B. bessoni (Akhtar 1981b). D. sissoo wooden blocks were highly resistant to the attack of C. heimi but the AHW (acetone, hexane and water) extract had no effect on the survival of this termite. The essential oil of D. sissoo, however, affected the survival of C. heimi some extant (Akhtar and Habeeb 1981). The leaf extract led to 100 percent mortality of stage 4 anopheles Aedes and Culex larvae at a concentration of 0.08 percent within 24-

48 hours where as 100percent of stage 1 larvae at lower concentration 0.0032percent for Aedes aegypti 0.016 percent for Culex quinquefasciatus and 0.08percent for anopheles (Dharmshkatu et al 1987). Plant extract could be performed from different parts, like leaves and wooden blocks. Different parts of the plant can be used for extraction of the naturally existing toxic components that could be applied for the control of the termite infestation. Further studies with leave extract in AHW (acetone, hexane and water) could be performed to analyze the repellent and toxic effect of Nerium oleander using different parts of the plant.

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