

Survey Of Termites And Physico-Chemical Parameters Of Termite Soil Samples Collected From Karnatak University Campus, Dharwad

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Abstract: Termites are terrestrial social insects with highly organized polymorphic colonies, are detritivores, consuming dead plant materials at any level of decomposition. They play a vital role in ecosystem by recycling of plant nutrients. Survey was carried at Karnatak University Campus, Dharwad to know the diversity of termites and also to analyze the physico-chemical parameters of different termite soil samples collected in the campus for its fertility test. The survey work was done during August, 2016 to January, 2017. Termites were identified based on morphological features. Collected soil samples were analyzed for pH, EC, Nitrogen (N), Phosphorus (P) and potassium (K) in the Department of Soil Science and Agro-Chemistry, Agriculture College, Dharwad. During our survey, we got three different species of termites belonging to the same genus *Odontotermes* (family: Termitidae) such as *Odontotermes obesus*, *O. longignathus* and *O. horni* that too we observed only soldier and worker casts in different sites. During our observation, out of total 19 nests, 11 belongs to *Odontotermes obesus*, 5 belongs *O. longignathus* and only 3 belongs to *O. horni* species. The physico-chemical parameters of various soil samples varied from species to species, feeding habit, food types etc. Soil analysis revealed that termite soils are fertile and that can be used for sustainable agricultural practice.

Key words: Termite survey, Physico-Chemical parameters, Soil samples

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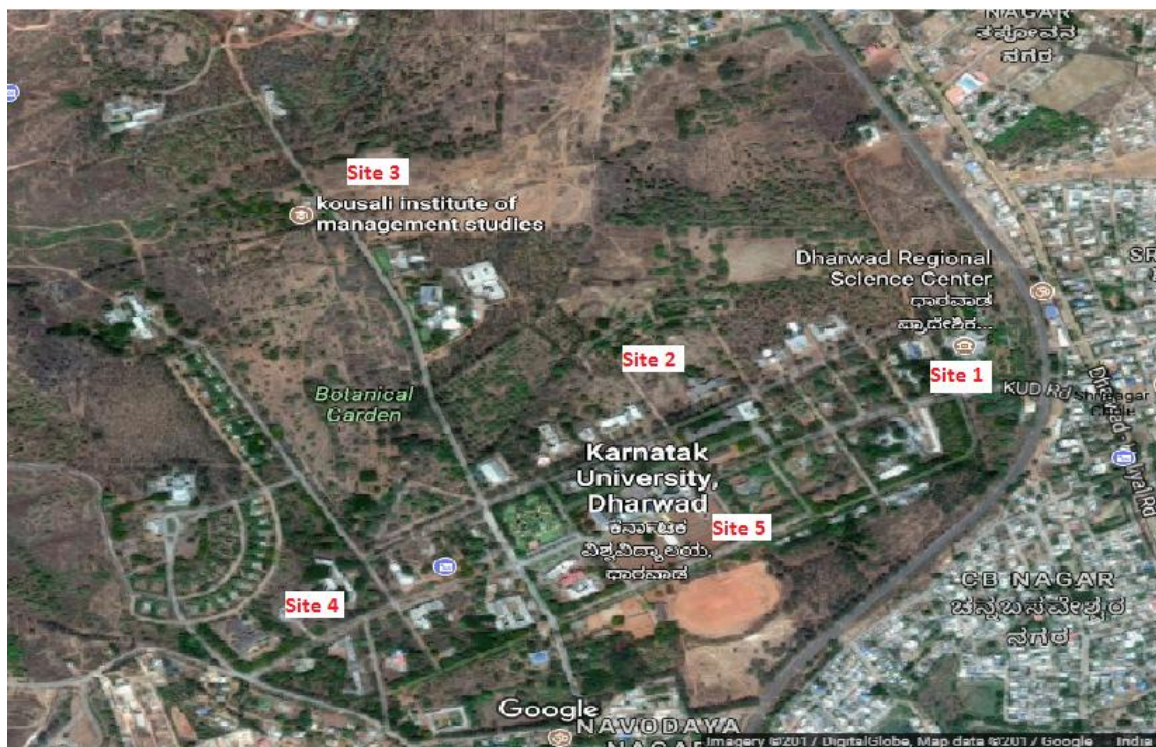
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I. Introduction

Termites (Isopterans) are terrestrial eusocial insects with highly organized polymorphic colonies. The colony usually contains 'queen', 'king' (winged caste) and is dominated by sterile casts known as 'workers' and soldiers. Soldiers have quite distinctive head heavily sclerotized and are called as "Kashtra Harika" (wood feeder) in ancient Sanskrit literature. They play vital role in ecosystem by recycling of plant nutrients because of their detritivorous nature and consuming dead plant materials at any level of decomposition. There are more than 2300 species of termites (Cedric Gillot, 2005) from tropical to warm temperate areas, though a few species are found in cool temperate climates. In Indian sub-region there are totally 337 species of termites in 59 genera have been listed out and comprehensively described by Roonwal and Chhotani, (1989) and Chhotani, (1997). Bose (1984) have reported distribution of about 95 species of termites belonging to 05 families in Southern India. Most of the termites are soil inhabiting, either as mound builders or sub-terrestrial nest builders. Roonwal, (1979) have also listed out some 72 species of wood destroying termites from Southeast Asia and about 92 termite species have been reported to damage agricultural crops and timber items in buildings. Kumar and Veeresh (2001) have also reported 12 different termite species from Bangalore. Therefore, it is necessary to study the diversity and distribution of termites of each and every region to know their importance and role in nature. Hence, the survey of termites was carried out along with the physico-chemical parameters of collected termite soil samples in the Karnatak University campus, Dharwad from August, 2016 to January, 2017.

II. Materials and methods

Study area: Karnatak University campus, Dharwad (location 15° 26' 28.5" N and 74° 59' 2.1") endowed with dry deciduous type of plant vegetation. The campus is spread over an area of 750 acres at an elevation of 698.97m above the MSL. Whole study area (KU Campus) was divided into 5 different sites such as



Site 1: University Gate No. 1, Dharwad Regional Science Centre, Girls Hostel's and their surrounding area.

Site 2: Department of Physics, Vivekananda Studies, MBA Department, University Canteen and their surrounding area.

Site 3: Central Library, Computer Science Department, New Boys Hostel and their surrounding area.

Site 4: Nijalingappa Boys Hostel, Golden Jubilee Building and their surrounding area.

Site 5: Green Garden, Administrative Building, University Main Building, Rani Channamma Stadium and their surrounding area.

Termite sampling: Survey work was done month-wise from August, 2016 to January, 2017 by using following two methods

- a. **Quadrat method:** A small area of quadrates was chosen randomly from a large area which contains termite population (Quadrat 5m × 5m)
- b. **Line transect method:** In this method, a person will walk in a straight line at a constant speed through a particular habitat, the number of individuals encountered can be counted

Termites were collected in glass vials and preserved in 80% alcohol for identification. Photography of different casts of each species was done through Stereo zoom microscope.

Analysis of physico-chemical parameters of termite soils: Physico-chemical analysis of termite soil samples was done through standard methods as follows at Department of Soil Science and Agro-Chemistry, Agriculture College, Dharwad so as to confirm the level of soil fertility.

Parameters	Methods followed
1. pH	pH meter
2. Electric conductivity (EC)	Electric Conductivity Bridge Method
3. Nitrogen (N)	Kjeldahl Method
4. Phosphorus (P)	Olsens Method
5. Potassium (K)	Flame Photometry Method

III. Results

The overall observation of the study is represented in Table 1, Graph 1 and Table 2 with respect to survey and distribution of termites in Karnatak University Campus, Dharwad and physico-chemical parameters of various termite soil samples.

Survey and distribution of termites: There are three different species of termites namely *Odontotermes obesus*, *O.longignathus* and *O.horni* belonging to family termitidia were dominantly found on different host plants in different sites of the campus (Table 1). During our survey, we observed only two casts (soldier and worker) with respect to all three species. We got more number of individuals especially worker

compared with soldiers and other casts (Table-1). There is a distribution of only three termite species throughout the campus. The percent occurrence in distribution of termites was more (graph-1) with respect to *O.obesus* (46.83%) followed by *O. longignathus* (34.17%) and *O.horni* (18.98%). During our observation, totally 19 nests were observed, out of which 11 belongs to *Odontotermes obesus*, 5 belongs *O.longignathus* and only 3 belongs to *O.horni* species.

Table 1: Termite species observed at different sites of Karnatak University campus, Dharwad.

Sl. No.	Name of the species	Casts and no. of individuals	Location/Site	Host plants
1	<i>Odontotermes obesus</i>	Soldier -7 Worker -30	Botanical garden (Site 3) Green garden (Site 5) Central library (Site 3)	<i>Eugenia</i> , <i>Pheltophorum pterocrpum</i> , <i>Tamarindus indicus</i> , <i>Cassia auriculata</i>
2	<i>Odontotermes longignathus</i>	Soldier -9 Worker -18	Main canteen (Site 2) Golden jublie building (Site 4)	<i>Eucaplyptus globulus</i>
3	<i>Odontotermes horni</i>	Soldier -5 Worker-10	University gate 1 (Site 1)	<i>Delonixregia</i>

Graph 1: Percentage (%) occurrence of different termite species in Karnatak University campus, Dharwad.

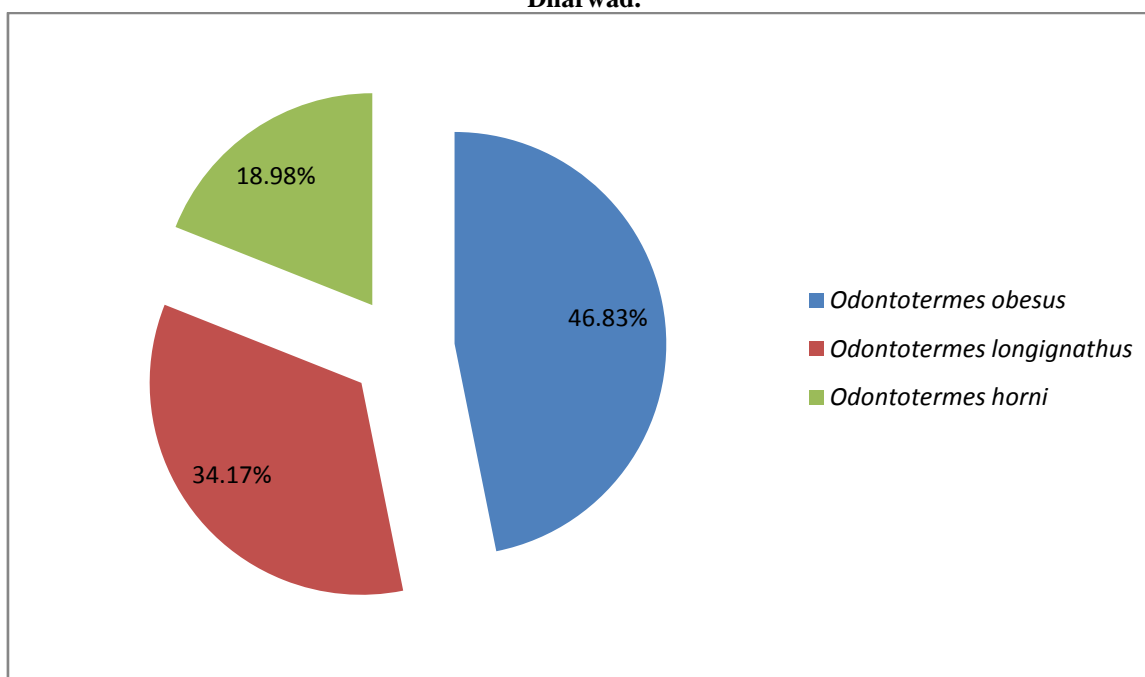


Table 2: Analysis of Physico-chemical parameters of different termite species soil samples.

Sl.No	Termite species Soil sample	pH	EC (S/m2/mole)	N (Kg/ha)	P (Kg/ha)	K (Kg/ha)
1	<i>Odontotermes obesus</i> (Tree)	6.65	1.13	302.00	39.30	240.00
2	<i>Odontotermes obesus</i> (Mound)	6.50	1.23	258.00	45.50	144.00
3	<i>Odontotermes longignathus</i> (Tree)	6.60	1.06	252.00	42.50	216.00
4	<i>Odontotermes longignathus</i> (Mound)	6.40	0.79	290.00	31.00	120.00
5	<i>Odontotermes horni</i> (Mound)	7.42	1.11	265.00	51.75	372.00

The physico-chemical parameters of different termite soil samples varied with respect to pH and EC, N, P and K. Nitrogen was higher in all the soil samples compared to Potassium and Phosphorous. The pH of all soil samples is towards neutral between 6.40 to 7.42. Electrical conductivity (EC) ranges from 0.79 of *O.longignathus* (Mound) to 1.23 S/m2/mole of *O. obesus* (Mound). Nitrogen content was in the range of 252.00 to 302.00 Kg/ha. Phosphorous was least in *O.longignathus* (Mound-31.00 Kg/ha) and higher in *O.horni* (Mound-51.75 Kg/ha). *O.longignathus* (Mound) had low Potassium content of 120.00 Kg/ha and it was highest in *O.horni* (Mound) with 372 Kg/ha.

IV. Discussion

The present study provides evidence for termite diversity and physico-chemical analysis of different termite soil samples. Termites comes under the order Isoptera, which contains nearly 3000 species organized into 282 genera (Krishna *et al.*, 2013) under seven families such as Mastotermitidae, Termopsidae, Hodotermitidae, Kalotermitidae, Serritermitidae, Rhinotermitidae, and Termitidae. The most advanced termites form a monophyletic group known as Termitidae, which is ecologically dominant in terms of abundance and species richness; over 70 % of all living termite species belong to this group (Krishna *et al.*, 2013). Termites are taxonomically classified through different criteria such as external morphology, food and nest type, chemical and behavioral differences etc. During our survey, we got three species of termites such as *Odontotermes obesus*, *O.longignathus* and *O.horni* belongs to same genus Termitidae (Plate-1), which are dominate species in our campus may be due to congenial habitat, food and proper environmental conditions for their survival. Reddy (1985) observed two species of termites in the soil associated with chilli (*Capsicum annum*) in Dharwad (Karnataka) and Basu *et al.*, (1996) witnessed 12 species of termites from different parts of Western Ghats, South India. The distribution and diversity of termites will depend upon various factors like food, habitat, vegetation, soil type and climatic factors.

Higashi and Burns (1992) outlined, as termites generally feed on dead plant material that has higher carbon-nitrogen ratio than their body tissues because they have to balance their Carbon-Nitrogen (C: N) ratio inputs for their survival. The results of the physico-chemical parameters varies with termite soil samples of different species from different sources (Table 2) that again depends on the type of species and their casts, feeding habit, food types and habitat for the production of fertile soil. Termites are ecologically crucial since they decompose any plant materials, such as wood, grass, and leaf litter, and modify physico-chemical properties of soils (Bignell and Eggleton, 2000). The results of physico-chemical parameters varies with different species termite soil samples. (Table 2) that again depends on the type of species and casts, their feeding habit, food types in the production of fertile soil. The termite processed soil can be utilized to improve the fertility of agriculture land for sustainable agriculture so as to increase the crop production.

V. Conclusion

During our survey work in Karnatak University Campus, there are totally three different species of termites were found belong to same genus *Odontotermes*. Out of total 19 termite nests, maximum 11 belong to *O.obesus*, 5 belong to *O.longignathus* and 3 represents *O.horni* species. The *O.obesus* species is dominant and distributed throughout the campus especially in thick vegetation and larger trees. The physico-chemical parameters of various termite soil samples of different species varied with respect to pH, EC, N, P and K. Nitrogen is towards higher range in all the termite soil samples compared to P and K. pH and EC were towards neutral and normal range respectively with respect to soil fertility.

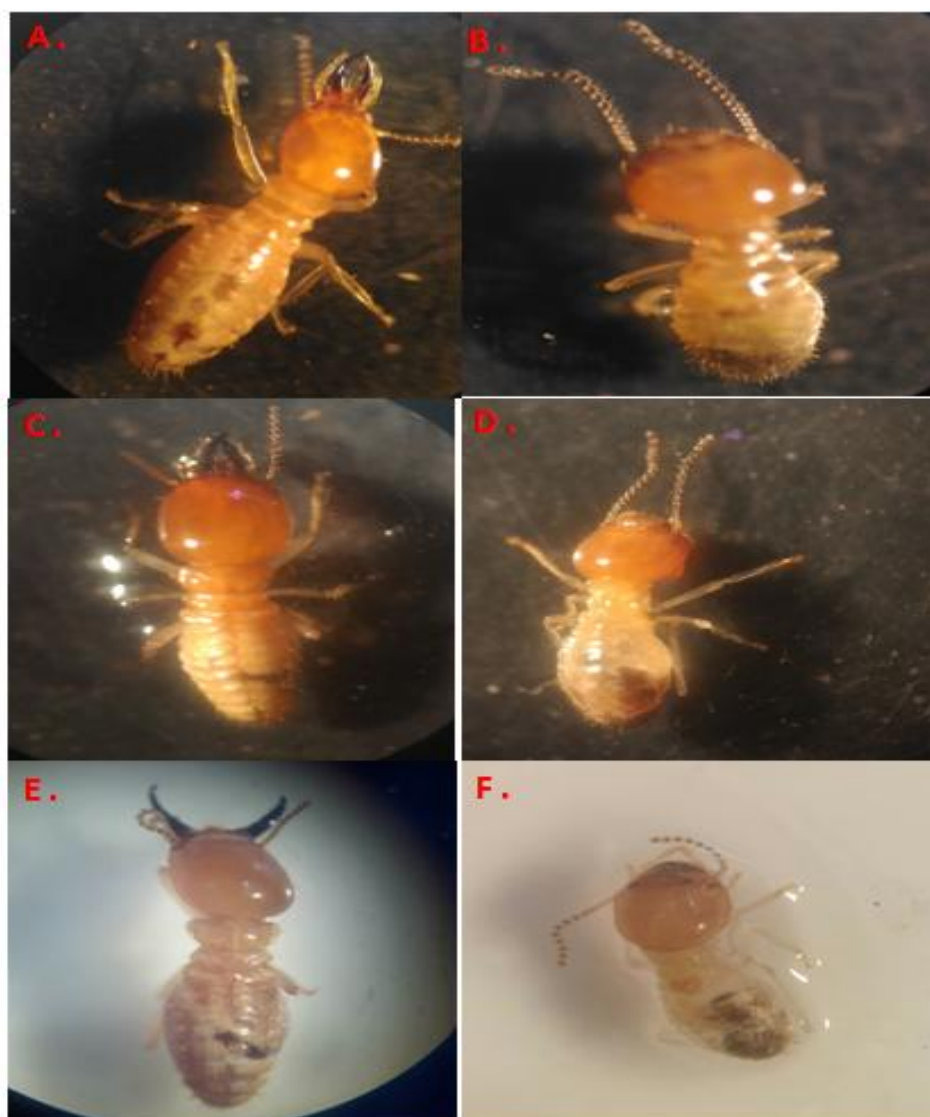
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Plate 1:



Figures: A. *Odontotermes.obesus* (soldier) B. *O.obesus* (worker) C. *O.longignathus* (soldier) D. *O.longignathus* (worker) E. *O.horni* (soldier) F. *O.horni* (workerer).

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