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PHYSICO-CHEMICAL PROPERTIES AND PLANT GROWTH ANALYSIS IN TERMITE MOUND SOIL AND NORMAL SOIL

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ABSTRACT Termites are social or colonial insects which prefer to live in soil, woods and muds. The properties of soil are affected by termites and play an important role in plant growth. The physical properties such as soil texture, porosity and bulk density and chemical properties such as PH, soil organic carbon and minerals like N, P, K, Fe, Cu, B, Zn of termite mound soil and normal soil were studied. In addition to these properties, plant growth was also determined. The clay content and bulk density were almost the same in both soil samples. The silt content, amount of coarse sand and all minerals studied were greater in termite mound soil whereas percentage of fine sand, porosity, PH, organic carbon were greater in normal soil.

KEYWORDS : Termite Mound Soil, Normal Soil, Physicochemical, Plant Growth

INTRODUCTION

Termites are one of the main groups of soil ecosystem engineers which can alter the properties of soil (Lavelle *et al*., 2006). The three important characteristics of soil include physical, chemical and biological properties. These properties are essential for the growth of plants. The physical properties were soil texture, bulk density and porosity. Soil texture is the most important property of soil and is determined by three components such as sand, silt and clay (Xudong *et al*., 2003). Chemical property is the ability to provide nutrients for the growth of plants which include P^H, organic carbon and minerals. Minerals are of two types: macronutrients and micronutrients. Study of macro and micronutrients are important to agricultural chemist for plant growth and soil management (Jaishree *et al*., 2008; Kanimozhi and Panneerselvam, 2011). Macronutrients include N, P, K and micronutrients include Fe, Cu, B, Zn.

There are differences in the properties of termite soil and normal soil in most cases. Termites build the mounds to protect themselves against predators and sunlight and for the maintenance of high humidity, temperature and food (Jouquet *et al*., 2016).

The main objective of the present study is to analyse the Physico-chemical properties and plant growth in termite mound soil and normal soil.

MATERIALS AND METHODS

The study was conducted in Puthukkodu of Peringottukurussi panchayath of Palakkad district, Kerala. The termite mounds of the study site were destructed and the termite mound soil was collected in a plastic bag. Normal soil was collected from the same place a few meters away from the termite mound in another plastic sac to compare it with termite mound soil.

Soil texture was estimated by international pipette method. Porosity is the ratio of the volume of pore space to the total volume of soil. The bulk density is the mass per unit volume of dry soil. The P^H meter was used to measure P^H. The determination of organic carbon in the samples was carried out as per the procedure of Walkey and Black (1974). Following the wet digestion method the aliquots were used for determination of mineral constituents. Plant growth was observed by simple pot method. The plant species selected was *Amaranthus cruentus* (Red Amaranthus). After 30 days their root length and stem length were measured.

RESULTS

PHYSICAL ANALYSIS

From the study it was shown that the percentage of clay content was almost the same in both samples, whereas the percentage of coarse sand, bulk density and silt were greater in termite mound soil but the percentage of porosity and fine s and were greater in normal soil. (Table-1).

CHEMICAL ANALYSIS

The results of chemical analysis showed that P^H and organic carbon were greater in normal soil whereas, all the minerals studied were greater in termite mound soil than normal soil. Zinc was present in negligible amount in both termite mound and normal soil. (Table-2).

Plant Growth

When the growth of the *Amaranthus cruentus* plant were compared, it was observed that the plants grown in termite mound soil produced longer stems and roots when compared to plants grown in normal soil. (Table-3).

Table: 1 Physical Analysis Of Termite Mound and Normal Soil

Sl. No:	Characteristics	Termite Soil	Normal Soil
1	Bulk density (g/cc)	1.21	1.174
2	Porosity (%)	30.76	36.84
3	Coarse sand (%)	40.65	5.69
4	Fine sand (%)	58.00	93.03
5	Silt (%)	1.12	1.04
6	Clay (%)	0.22	0.23

Table: 2 Chemical Analysis Of Termite Mound Soil and Normal Soil

Sl.No:	Parameter	Termite Soil	Normal Soil
1	P^H	6.40	6.49
2	OrganicCarboncontent(mg/g)	2.22	2.82
3	Nitrogen(µg/10mg)	20	16
4	Phosphorous(µg/25mg)	30.54	29
5	Potassium(µg/25mg)	48.39	44.78
6	Iron(µg/10mg)	1.2	0.88
7	Copper(mg/25mg)	8.41	6.4
8	Boron(µg/25mg)	0.00032	0.00026
9	Zinc(µg/25mg)	Negligible	Negligible

Table 3: Plant Growth

Parameters	Termite Soil	Normal Soil
Length of the stem	6.92±0.34	6.14±0.55
Length of the root	3.85±0.80	2.31±0.90

Values are mean± SD of triplicate values

DISCUSSION

Kaschuk *et al.,* (2006) observed no differences between the clay content in mounds and surroundings. A similar result was obtained in the present study that clay content was almost the same in both soil samples. In the study of Echezona *et al.,* (2011) it was estimated that the soil engineers ensured greater mineralisation of silt which was found to be higher in biogenic structures than in adjacent soil. The present study shows that termite soil has more silt content. The study of Sandra *et al.,* (2018) observed higher sand contents in the centre of the mounds, with greater differences from mound to adjacent soil. Coarse sand was found to be greater in termite soil whereas fine sand was greater in normal soil in the present study. The high air filled porosity indicates low moisture content in the soil (Hossain *et al.,* 2008). The results of the present study showed a higher porosity in normal soil and bulk density was almost the same in both soils.

Li *et al.,* (2017) showed that the observed termites prefer an acidic environment and their activities elevate the P^H of termite mound soil compared with surrounding soil. Here both soils were slightly acidic but a slightly greater P^H in normal soil. In the study conducted by Fallah *et al.,* (2017) the value of soil organic carbon were greatest in mound soils and declined with distance from the mounds. On the contrary, the result of the present study showed a hig her carbon content in normal soil.

The study of Seymour *et al.,* (2014) showed that the maximum foliar values of macro and micronutrients in the study area were found in mound species. A similar result was obtained in the present study that all minerals studied were greater in termite mound soil when compared to normal soil. The study of Debelo and Degaga (2015) reported that the significantly higher length, grain size and dry plant biomass of teff grown in the mound perimeter than adjacent soil could be an indication of higher nutrient content in the termite mound. The present study showed that maximum minerals were present in termite mound soil and plants grown in termite soil produced larger stems and roots compared to plants grown in normal soil.

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