

## Impact of Termite Activity on Physical and Chemical Properties

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### ABSTRACT

Nowadays, termites like earthworms are seen as very important soil organisms that effect soil functioning and ecosystem activity. In tropics, termites play an important role in nutrient recycling, transportation of soil material and soil formation. Cause of their activity, the amount of absorbed elements is increased. Usually research on the impact of termites on soil properties and performance has been studied on termite mound, but in this study a comparison was conducted between tree termite nests that was exist in surveyed area and surrounding soil that was not evident termite activity in them. Results showed that the amount of nutrients such as total nitrogen, available potassium, calcium and magnesium in termite nests is evaluated and phosphorus is reduced. Also, the activity of the termites is increasing the contents of some trace elements in the termite nests such as manganese and copper.

**Key words:** Nutrient, Soil physical and chemical properties, Termite.

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### INTRODUCTION

Modern agriculture in order to maintain interest farming and environmental are oriented toward soil biological activity. Termites are common biological agents that produce significant physical and chemical modifications to tropical and subtropical soils [1]. Termites are not only destructive agents; they can also play an important ecological role, particularly in desert with low fertility. Therefore most scientists have known termites that are in tropical and subtropical regions as an ecological counterpart of earthworms in temperate zone. The ability of termites to adapt to dry environments because they operate as a decomposer in areas that another common decomposer cannot act such as bacteria and fungi. Termites feeding on wood plant material and dry tissues such as cellulose and lignin. Termites cannot produce cellulose and lignin, but they have a relationship with cellulose-producing bacteria in their digestive to break down cellulose and lignin. Termites break down plant derbies, dead trees and wood, so digest them and apply their waste to building nests. Termite's activity increases the amount of organic matter and changes the composition of clay mineral in soils that used for building their nests [2]. Termites increase soil permeability with drilling and poke the soil profile foam construction production. Types of termite nests are underground, termite mound, tree termite nests and one piece nests. Underground nests are common on lowly temperature area; maintain temperature and moisture on optimal level [3]. Termite mound are seen often in tropical regions such as Africa. The height of the mounds is more than a few meters. The mounds are made with materials from underlying soils. It was reported that African farmers collect termite mound soils and apply to cropped field as it can be rich in available nitrogen, total phosphorus and organic carbon than adjacent soil [4].

### MATERIALS AND METHODS

To study the impact of termites on chemical and physical properties of soil, two soil samples selected as statistically communities. Soil samples were collected from tree termite nests and three surrounding soil as control. Samples were analyzed for pH, carbon, soil macro and micro nutrient. Carbon was determined by the Walkley-Black method and total soil nitrogen by the Kjeldahl technique, available potassium were extracted using with ammonium acetate and determined on a flame photometer. Phosphorus was determined by spectrophotometer by Olsen method. Exchangeable calcium and magnesium were extracted and titrated with sulfuric acid. Zinc, manganese and copper were extracted with a Mehlich solution in a 1:5 ratio and determined on an atomic absorption spectrophotometer.

### RESULTS AND DISCUSSION

Analysis variance for termite's soil and adjacent soils showed that termite treatment was significantly on the total soil nitrogen, available phosphorus and exchangeable potassium ( $p \leq 0.05$ ), calcium and magnesium concentration ( $p \leq 0.01$ ),

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Below table show that nitrogen, calcium and magnesium concentration in the tree termite nests were depleted. Also, a comparison of the soils from termite nests with corresponding soils without activity reveals that termite activity apparently increased concentration for a number of trace elements, such as copper and zinc, but decreased the concentration of manganese.

(Table 1) Comparison of mean for termite's soil and adjacent soil

Clay* (%)	Magnesium** (meq/L)	Calcium** (meq/L)	Potassium* (mg/kg)	Phosphorus* (mg/Kg)	Nitrogen* (%)	soil
20	10.60	19.06	345.6	15.36	0.06	Adjacent soil
25	13.55	24.16	385.31	13.56	0.07	Termite's Soil
EC** (ds/m)	pH	Manganese (mg/Kg)	Zinc** (mg/Kg)	Copper** (mg/Kg)	soil	
3.81	7.71	3.46	3.39	1.41	Adjacent soil	
4.63	7.94	3.64	2.83	0.97	Termite's soil	

\*The mean difference is significant at  $p \leq 0.05$

\*\* The mean difference is significant at  $p \leq 0.01$

Manuwa (2009) in the study of chemical and physical properties of termite mounds is obtained similar conclusion about potassium, calcium and magnesium concentration, but unlike this survey results is reported reducing the amount of nitrogen and phosphorus [5]. In order to study the effect of termite mounds on plant establishment and development of native plant species in Amazonian forests have shown that nitrogen and potassium were elevated in termite mound, also phosphorus and magnesium did not differ significantly between termite mound and control soil [6]. Semhi et al., (2008) also reported that the activity of termites often increases most macro elements but decreases the amount of potassium. Also, reported that the activity of the termites is increasing the contents of some trace elements, except for manganese [7].

Soil analysis showed an increase in clay percent in the soil with termite activity. One reason of this may be related to preferred selection of clay particles by termites. Similar results have been reported by Manuwa (2009), but Akreman et al., (2007) were seen lower percentage of clay in the termite soils [5][6]. Increase in the amount of organic matter was observed. Roose et al., (2004) also have shown that termite activity increase the content of organic matter in the soils that they use for the construction of their nests [8]. The researches conducted so far have shown that termites such as earthworms have impact in soil and its function. Their role has been observed in decomposition of plant material, nutrient cycling, soil formation and etc. The role of termites has been surveyed as pests in Iran and to determine the effect of them on chemical and physical properties of soil more studies are needed.

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