FUDMA Journal of Agriculture and Agricultural Technology
ISSN: 2504-9496
Vol. 11 No. 3, September 2025: Pp. 16-22

https://doi.org/10.33003/jaat.2025.1103.02

PHYSICAL AND CHEMICAL PROPERTIES OF TERMITE MOUNDS AND THE SURROUNDING SOILS IN MODIBBO ADAMA UNIVERSITY, YOLA ADAMAWA STATE NIGERIA

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ABSTRACT

A study was conducted to investigate if termite mound soils were different from surrounding soils in terms of soil physical and chemical properties in Modibbo Adama University Yola. The dearth of information limits ecological, agricultural, and environmental roles termites play. Soil samples were collected from two sites at two depths in ten different termite mounds. Physical and chemical properties analysis were carried out upon the composite samples. Results were subjected to a t-test and the results revealed that in comparison to the adjacent soil, the termite mound soils at the surface layer (0–20 cm) significantly ($p<0.05$) altered soil texture by increasing clay and silt content from 4.18 and 2.32% to 11.35 and 8.05% while reducing sand content from 93.50 to 80.60%. Mound soils were less acidic (5.97) and richer in organic matter (2.49%), Total nitrogen (TN=0.13%), phosphorus (AvP=24.96 mg/kg), and base cations (TEB=5.19 cmol/kg), with significantly improved base saturation. In the subsurface layer (20–50 cm), similar trends in texture were observed, with higher clay (10.44%) and lower sand (82.15%) content. While bulk density and porosity showed no significant variation, termite mounds had a higher pH (6.14) and significantly greater concentrations of TN (0.09%), AvP (21.21 mg/kg), and exchangeable bases. These enhancements, driven by termites confirm their role in improving soil fertility, structure and contribution to resilient ecosystems. Hence, termite activity significantly enhances physical and chemical properties of soil through the enrichment of fine particles and essential nutrients. Preserving termite mounds is thus crucial for land management.

Keywords: Termite mounds, soil nutrients, soil properties, soil fertility, soil structure

INTRODUCTION

Soil is a fundamental natural resource that supports terrestrial life by regulating water, nutrients, and biological processes essential for ecosystem productivity and sustainability. In the tropical regions of the world, termites are identified as bioturbators, soil engineers and/or as weathering agents (Bottinelli et al., 2015). Soil structure modification by plants or animals to suit their individual needs is called bioturbation and termites have always been engaged in the creation of exotic structures (Corenblit et al., 2016: Jocquet et al., 2016). Termite mounds, a micro landform feature are generally found in the lateritic landscapes of the tropical and subtropical regions (Levick et al., 2010). They are erosion resistant, stable and have increased mineral nutrient reserves (Ackerman et al., 2007). This is primarily because they build structures that are organomineral in nature with modified mineralogical properties of clays and specified soil physical, chemical and/or biological properties (Jouquet et al., 2007). Termites use the constructed biogenic structures (mounds) in protecting their colonies against environmental hazards such as humidity, pathogens and / or variation in temperature (Fuller et al., 2011). Termite activities impact positively on the properties of soils such as aiding in the redistribution nutrient enriched soil particles, repacking and cementing of soils, organic matter decomposition, foraging activities and/ or nutrient cycling (Holt and Lepage, 2000). Termites feed on organic matter including nutrient rich soils thus their choice of nesting areas and abundance. It is typically related to biomass abundance, vegetation cover, soil properties, variation in climate (Jamilu et al., 2019). Biological agents like termites are important for pedological processes because of the modification of the soil that occurs with time due to their activities, they also bring up subsoils for construction of their mounds. Different species of termites consume wood and litters in different stages of decay and humification and more than half of all termites are considered humorous (Siebers et al.,2015; Wang,2018). Despite the established ecological significance of termite mounds in different tropical landscapes across the world, there remains a conspicuous research gap in the Northeastern region of Nigeria, particularly within the semi-arid zones such as the Adamawa region. This area, characterized by sandy soils, increasing land degradation, and limited soil fertility management practices, has not been extensively studied to determine whether termite mounds have a distinguishable and quantifiable effect on soil quality parameters. Modibbo Adama University, Yola, located within this region, is surrounded by numerous termite mounds, yet scientific studies validating their influence on soil physical and chemical properties are lacking. Understanding whether termite mound soils exhibit significantly different characteristics compared to surrounding non-mound soils is of both theoretical and practical importance. Omofunmi et al., (2017) reported that concentration of nutrients in mound soil can sustain some arable crop production. The current study was designed to evaluate and compare the physical and chemical properties of termite mound soils and their adjacent soils within the Modibbo Adama University Yola, Adamawa State environment.

MATERIALS AND METHODS

location of the study area

The study was conducted at Modibbo Adama University Yola teaching and research farm located within latitude $9^{0}20'$ 00" and $9^{0}21'30"$ N and longitude $12^{0}29'00"$ E and $12^{0}30$, 30" E (Adebayo and Tukur,1999; Saka et al.,2024) in the savannah Agro-ecological zone of Nigeria.

Soil sampling, preparation and laboratory analysis

Ten termite mounds were randomly selected within the Modibbo Adama University Yola teaching and research farm for the study. Termite mound samples were collected at 2 heights of 0-20 cm and 20-50 cm using soil auger. The comparative variability in the soil properties of termite mounds in relation to surrounding soils was measured by collecting soils adjacent to the termite mounds also at two depths of 0-20 and 20-50 cm. Average distance from mounds to adjacent soil was 5m. The collected soil samples were clearly marked, labelled and transported to the laboratory for further physical and chemical analysis. Laboratory analysis was carried for the samples collected. The soil physical and chemical properties were measured after air drying the samples and sieving it using 2 mm mesh size. Particle size distributions were measured using dispersion of soil particles in water (w) and dispersion of soil particles with sodium hexametaphosphate addition by the modified bouyoucos hydrometer method (Day, 1965). The bulk density of undisturbed soil was measured using clod method in which the soil is clod coated with water repellant substance like paraffin (Blake and Hartge, 1986a) and particle density by Blake and Hartge, (1986). Soil porosity was measured using Boyle's law porosimeter (Helium porosimeter) as described by Andreola et al., (2000). The soil pH and EC were both measured in a 1:2.5 soil-to-water ratio (Agbenin, 1995). Organic carbon was measured using Walkley-Black method (Walkley and Black, 1934). Total nitrogen was determined by Kjeldahl method (Bremner and Mulvaney, 1982) Available phosphorus was determined as described by Jou (1978) using the Bray-1 method (Bray and Kurtz, 1945). Exchangeable cations were extracted by ammonium acetate (1M NH_4Ac) solution. Calcium and magnesium content of the soils were determined titrimetrically while the exchangeable potassium and sodium was determined by flame photometer. Exchangeable acidity of the soils was measured using KCl extraction method (Thomas, 1982). Exchangeable cations (Na^{2+}, K^{+}, Ca^{+}, and Mg^{2+}) was extracted using 1N ammonium acetate saturation method (pH 7) as described by IITA (1984) was calculated by summing the exchangeable bases. The Effective Cation Exchange Capacity (ECEC) was calculated by the summation of the exchangeable base cations and exchangeable acidity (Al and H) (IITA, 1984)

RESULTS AND DISCUSSION

Table 1: Soil Physical and Chemical Properties of Termite Mound Soil and the Surrounding Soils at Surface (0-20 cm).

0-20cm	Termite mound soil	Adjacent soil	P value
SAND (%)	80.60±5.45	93.50±11.43	0.0068
CLAY (%)	11.35±6.32	4.18±3.90	0.0081
SILT (%)	8.05±6.64	2.32±2.31	0.0255
BD (g/cm^3)	1.55±0.06	1.58±0.01	0.4349
PD (g/cm^3)	2.54±0.07	2.50±0.19	0.5414
POROSITY (%)	38.76±3.43	36.59±5.51	0.3086
pH in H_2O (1:2.5)	5.97±0.13	5.56±0.13	<0.0001
EC (dS/m) (1:2.5)	0.16±0.08	0.20±0.08	0.35
OC (%)	1.49±0.04	1.23±0.15	0.0013
OM (%)	2.49±0.07	2.12±0.26	0.0013
TN (%)	0.13±0.05	0.08±0.05	0.025
AVP (mg/kg)	24.96±13.86	14.28±7.78	0.0517
Ca (cmol/kg)	2.31±0.68	1.57±0.79	0.0382
Mg (cmol/kg)	1.96±0.57	1.34±0.67	0.0392
Na (cmol/kg)	0.28±0.08	0.22±0.05	0.0564
K (cmol/kg)	0.65±0.07	0.25±0.07	0.0007
TEB (cmol/kg)	5.19±1.32	3.38±1.53	0.0112
TEA (cmol/kg)	0.98±0.40	1.52±1.12	0.1765
ECEC (cmol/kg)	6.17±1.38	4.90±2.06	0.1243
PBS (%)	83.82±6.28	69.31±12.02	0.0046

Table 1 presents the results of the student's t-test for surface (0 – 20 cm) soil physical and chemical analysis carried out on the termite mound soils and the adjacent soils. There were significant ($P<0.05$) differences between Sand, silt and clay fractions in the termite mound and adjacent soils. The adjacent soil had a substantially higher sand content (93.50 ± 11.43%) compared to the mound soil (80.60 ± 5.45%).

Conversely, both clay (11.35 ± 6.32% and 4.18 ± 3.90%) and silt (8.05 ± 6.64% and 2.32 ± 2.31%) percentages were significantly greater within the termite mound. The marked difference in the soil particle size especially in the clay fraction can be attributed to termite preference for clay soils as earlier reported by Mujinya et al. (2010) who further explained that termites select smaller sized soil particles with higher clay content from deeper soil layers because they can retain more moisture and have more organic matter. Jin et al (2020) reported in a study that when termites were put in baiting containers, those in clay soils showed greater termite vigor by significantly increasing body water percentage and survival while there was no similar effect in moderate soil moisture conditions thus emphasising that both clay type and moisture affect termite preference for soil type in mound making.

In contrast to the texture differences, the results (Table 1) for the soil physical properties such as bulk density, particle density, porosity, are all not significantly different (P>0.05). The BD of mound soil (1.55 ± 0.06 g cm^{-3}) was statistically similar to the adjacent soil (1.58 ± 0.01 g cm^{-3}). This aligns with findings by Tilahun et al. (2021), Sima and Begna (2024), and Ibrahim et al. (2024), but contrasts with studies like Jembere et al. (2017) and Duran-Bautista et al. (2025) which reported higher BD in mound. Particle density was also similar (2.54 ± 0.07 g cm^{-3} and 2.50 ± 0.19 g cm^{-3}), consistent with PD being governed primarily by the mineral composition, which remained comparable between the mound and its source material. The lack of significant differences in BD and PD in the surface layer may be attributed to factors such as specific termite species behaviour, local soil compaction levels, mound age or condition, or the abundance of mounds in the area. Total porosity followed the same pattern as BD and PD, showing no difference between the termite mound soil (38.76 ± 3.43%) and the adjacent soil (36.59 ± 5.51%). This lack of difference is consistent with the intrinsic relationship between total porosity and bulk density.

The results in the table 1 shows that, pH values for the termite mound soil and the adjacent soil are significantly (P<0.05) different at 0-20 cm depth. The adjacent soil had a lower pH value of 5.56 ± 0.13 as against 5.97 ± 0.13 in the termite mound soil. This could be due to the increase in organic matter decomposition in the termite mound soil. This aligns with the findings of Sima and Begna (2024), indicating termites enrich mounds with less acidic, calcium-rich subsoil materials and debris. In contrast, Electrical Conductivity (EC) showed no significant difference (p>0.05) with values 0.16 ± 0.08 and 0.20 ± 0.08 dS/m for termite mound and its adjacent soils respectively which is consistent with the subsurface findings but differing from studies like Ibrahim et al. (2024) who reported higher mound EC.

Significant differences (p<0.05) were recorded in the organic carbon (OC) and organic matter (OM) content between the adjacent soils and termite mound soils, with the termite soils recording higher OC of value 1.49% ± 0.04% than of the adjacent soils, whose values was 1.23% ± 0.15%. Similarly, OM were elevated in the mound than the adjacent soils with values 2.49% ± 0.07% and 2.12% ± 0.26% respectively. This enrichment may be attributed to termite processing of organic debris and microbial activity. The present result is in stark contrast to a previous study by Jocquet et al., (2004) and Jocquet, et al., (2016) who reported lower soil organic matter contents in termite mound walls than the surrounding soils. They also observed that fungus-growing termite mound soils normally have lower SOM contents than their surrounding soil environments and it was attributed to the fact that termites prefer smaller sized aggregate soils enriched with clays or soils from deeper layers with lower soil organic matter content but richer in clay minerals. The higher clay content, coming partially from deeper soil layers, is thus considered to modify soil pH and increase the CEC and cation saturation in the mound material (Holt and Lepage, 2000). Jocquet et al., (2016) attributed the lower SOM content to the preference for higher clay content soils by the termites which will eventually increases the CEC of the soils and regulate the soil pH. However, Sima & Begna, (2024) reported higher OM in the soils of termite mounds than in the adjacent soils.

Termite mound soil in the surface layer indicated a significant enrichment in key nutrients (Table 1). Total Nitrogen (TN) was higher in the termite mound (0.13% ± 0.05%) than the adjacent soils (0.08% ± 0.05%), and this is directly linked to the increased OM content through microbial fixation and decomposition as reported by Sima & Begna, (2024). Available Phosphorus (Av-P) also showed notable enrichment with Phosphorus content of 24.96 ± 13.86 mg/kg and 14.28 ± 7.78 mg/kg for the mound and soils of the surrounding respectively. This aligns with Sima and Begna (2024) and Ibrahim et al. (2024), likely resulting from termites' feeding habits, construction materials, and potentially the slightly higher pH favoring P availability.

Base cations such as Calcium (Ca), Magnesium (Mg), and especially Potassium (K) were significantly (p<0.05) higher in the mound soil (Ca: 2.31 ± 0.68 vs. 1.57 ± 0.79 cmol/kg; Mg: 1.96 ± 0.57 vs. 1.34 ± 0.67 cmol/kg; K: 0.65 ± 0.07 vs. 0.25 ± 0.07 cmol/kg). This substantial cation enrichment reflects the concentration of mineral nutrients as a results of the termite activity. The enrichment in base cations (Ca, Mg, K, Na) directly resulted in a significantly (p<0.05) higher Total Exchangeable Bases (TEB) for the termite mound soil (5.19 ± 1.32 cmol/kg) as compared to adjacent soil (3.38 ± 1.53 cmol/kg). Conversely, Total Exchangeable Acidity (TEA) was lower in the mound soil (0.98 ± 0.40 cmol/kg) than adjacent soil (1.52 ± 1.12 cmol/kg), although this difference was not statistically significant (p=0.1765). interestingly, the combination of significantly higher TEB and lower TEA led to a significant (p<0.05) high Percent Base Saturation (PBS) in the mound soil (83.82% ± 6.28%) than in the surrounding soil (69.31% ± 12.02%). This indicates a much greater proportion of the mound soil's exchange sites are occupied by nutrient-rich base cations (such as Ca, Mg, K, and Na), enhancing its nutrient retention and buffering capacity against acidification. Despite the significant increases in TEB and PBS, the Effective Cation Exchange Capacity (ECEC), the sum of TEB and TEA, showed no significant ($p>0.05$) difference between the mound soil (6.17 ± 1.38 cmol/kg) and adjacent soil (4.90 ± 2.06 cmol/kg). This suggests that while termites dramatically alter the *quality* of the exchange complex by increasing base saturation and nutrient cations, the *total capacity* for cation exchange in the topsoil layer is not significantly altered. These findings largely align with studies like Sima and Begna (2024) and Ibrahim et al. (2024) regarding nutrient enrichment but highlight the context-dependent nature of changes in properties like EC and ECEC.

Bera et al., (2020) opined that termites have a significant effect on the properties of soils and that the soils in their mounds are more qualitative and they exert an influence on the properties of soil adjacent to their mounds. Corenblit et al., (2016) and Jouquet et al., (2016) both concluded in their study that soil physical properties effect in termite mound soils is more evident upon the type of termites that abound in the specific environment being discussed. In their study in Karnataka India, they observed that O. obesus abound and it has limited effect on soil physical properties when compared to the impact of Macrotermes sp. on soil properties in Africa thus the conclusion that termite mound properties depend on the soil properties of their environment.

Soil Properties of the Subsurface Soils (20-50 cm)

Table 2 presents soil physical and chemical properties at the sub surface (20-50 cm) of the termite mound soils and the adjacent soils. The results show that the sand silt and clay fractions at the subsurface are significantly different ($P<0.05$). Termite mounds exhibit significantly lower sand content of value 82.15% ± 9.06 and higher clay content of 10.44% ± 5.38 compared to adjacent soils whose sand and clay content was 92.24% ± 5.33 and 4.70% ± 3.82 respectively. This reflects termites' selective gathering of fine material, particularly the clay particle from deeper horizons to build their mounds. The results of this study corroborate those of Sarcinelli et al. (2013) and De Lima et al., (2018) who found higher clay contents in mounds than in soils at different sampling distances. Similarly, a study by Sima and Begna (2024) reported a significant ($p < 0.05$) clay contents in internal mound soils around 42%, than the adjacent soil 35% with typical higher sand content in the adjacent soils. The high clay content of the mound may improve soil texture and water holding capacity. Consequently, mounds possess greater aggregate stability due to clay's role in binding particles and termite secretions acting as cementing agents (Krishnan,2020) . Studies in Ghana and Colombia reported 20–30% higher aggregate stability in mounds, which resulted to reducing erosion risks and enhancing pore continuity (Dowuona et al., 2012; Duran-Bautista et al., 2025).

Table 2: Soil Physical and Chemical Properties of Termite Mound Soil and the Surrounding Soils at Sub-surface (20 - 50 cm).

20-50cm	Termite mound	Adjacent soil	P value
SAND (%)	82.15±9.06	92.24±5.33	0.0086
CLAY (%)	10.44±5.38	4.70±3.82	0.0144
SILT (%)	7.41±4.57	3.06±2.53	0.0197
BD (g/cm^3)	1.62±0.05	1.63±0.05	0.8971
PD (g/cm^3)	2.62±0.07	2.62±0.08	0.9276
POROSITY (%)	38.03±2.58	37.99±2.43	0.9747
pH in H_2O (1:2.5)	6.14±0.08	5.75±0.15	<.0001
EC (dS/m) (1:2.5)	0.13±0.08	0.14±0.04	0.8042
OC (%)	1.12±0.35	0.94±0.28	0.2037
OM (%)	1.93±0.59	1.61±0.48	0.2026
TN (%)	0.09±0.02	0.05±0.02	0.0005
AVP (mg/kg)	21.21±11.18	6.16±2.49	0.002
Ca (cmol/kg)	2.19±0.66	1.43±0.39	0.0074
Mg (cmol/kg)	1.87±0.58	1.22±0.34	0.009
Na (cmol/kg)	0.25±0.06	0.23±0.08	0.5076
K (cmol/kg)	0.54±0.22	0.26±0.11	0.0026
TEB (cmol/kg)	4.85±1.40	3.14±0.77	0.0045
TEA (cmol/kg)	0.80±0.13	1.14±0.27	0.0032
ECEC (cmol/kg)	5.65±1.48	4.28±0.91	0.0249
PBS (%)	85.26±2.99	73.05±5.28	<.0001

Table 2 further illustrated that bulk density, particle density and porosity at the subsurface layer are not significantly different ($P > 0.05$) despite containing more clay. The termite mound soils show similar bulk density (1.62 gcm^{-3}) to the adjacent soils (1.63 gcm^{-3}). However, in a study by Jembere et al., (2017) they reported that the bulk density of mound core soil (1.38 gcm^{-3}) was higher than the surrounding soil (1.15 gcm^{-3}) and the control (1.14 gcm^{-3}), indicating a significant difference ($p < 0.01$), which may likely be as a result of variability in the soil and difference in soil compaction. According to Arshad et al. (2010) and Krishnan (2020), termites repack soils using their saliva to create hard protective layers against open air and temperature fluctuations in the mounds, which is likely why termite mounds had a higher bulk density than the surrounding soil. The present study is in line with findings of Tilahun et al., (2021) and that of Sima and Begna (2024) who reported no statistically significant difference ($p > 0.05$) in bulk density between the termite mound and the soils of the surroundings. Sima and Begna (2024) further stated that the high clay content observed resulted in making the inside of termite mounds more compacted, which formed stable, hard protective layers during the termite processing of soil (mixing with saliva and organic debris). Indeed, termite mounds are "incredibly strong earthen structures that are also surprisingly porous" (Krishnan, 2020). Another study in Gombe, Nigeria is also in line with the present finding where the soil bulk density did not differ between the termite mound and adjacent soils (Ibrahim et al., 2024). The particle density (PD) of mineral soil (2.62 g/cm^3) is similar in mound and adjacent soils. This is because the particle density is heavily governed by the mineral content of the soil. Total porosity of the soil under the termite mound and adjacent soil were not significantly ($P > 0.05$) different, as shown in Table 2. This may be due to the direct relationship between TP and BD of the soil. Contrary to the presence finding, Duran-Bautista et al., (2025) reported a significantly ($p < 0.05$) higher bulk density and porosity in termite mounds than the soils of the surroundings. The non-significant in the bulk density, particle density, and porosity in the present study may be attributed to the variation in the soil compaction, the abundance of the termite mound in the area, or the variations in the species of the termite.

The pH at the subsurface (20-50 cm) is significantly ($p < 0.05$) different with the adjacent soil being more acidic (5.75±0.15) than the termite mound soil (6.14±0.08) (Table 2). This trend is attributed to termites bringing up subsoil materials and calcium-rich debris, raising pH and reducing acidity. This is supported by the findings of Sima and Begna, (2024) who concluded that the higher soil pH in termite mound is a result of the composition of the raw material used in building their mound. Some studies find this pH difference is significant, while others report no statistically detectable pH change (Apori et al., 2020; Kathbaruah et al., 2024).

The electrical conductivity (EC), which reflects soluble salts of the termite mound was also not significantly different ($p > 0.05$) from the surrounding soils. However, recent findings indicated that the conductivity of soils in termite mound area is similar, with significantly ($p < 0.05$) higher electrical conductivity from adjacent soils which was attributed to the nature of materials the termites move into their nests for food (Ibrahim et al., 2024). The higher EC observed in mound soils are likely due to concentration of nutrients and minerals Kathbaruah et al., 2024). Higher EC correlates with greater nutrient load in the mound, but values remain non-saline in most cases.

The organic carbon (OC) and organic matter (OM) levels are not significantly different ($p > 0.05$) between the two soils in the subsurface layer. However, the slightly higher organic matter content in the mounds (1.93±0.59) compared to the adjacent soil (1.61±0.48) significantly ($p < 0.05$) influenced the soil chemistry, potentially stabilising organic-mineral complexes and enhancing the effective cation exchange capacity (ECEC) of the soil (Table 2). When termites build their mounds, they degrade potential plant and animal tissues with other soil microbial activities, resulting in a significant increase in soil OM compared to adjacent soil (Sima and Begna,2024).

Total Nitrogen (TN) was significantly ($p < 0.01$) higher with termite mound than the surrounding soils (0.09±0.02 and 0.05±0.02 respectively). The higher TN observed is due to microbial fixation and organic matter processing. This finding is in agreement with Sima and Begna (2024) who also attributed the increase in N with the termite mound to abundance of its OM presence. Statistically, available phosphorous (Av-P) was also significantly different ($p < 0.01$) with termite mound recording higher P value of 21.21$mgkg^{-1}$ than its counterpart surrounding soil of 6.16 $mgkg^{-1}$. This may be due to feeding habit of termite and materials used for construction mounds which may increase phosphorus availability. Alternatively, the relatively lower pH value of the soils of the termite mound may lead to more P availability as more acidic conditions tend to make P unavailable. These results are in agreement with the study conducted by Sima and Begna (2024) and Ibrahim et al., (2024) who all reported that available P under termite mounds were relatively higher as compared to adjacent soil. However, contrary to the presence findings, Tilahun et al., (2021) who worked on nitisols in South West Ethiopia reported that termite mounds were relatively depleted in Av-P and total P as compared to adjacent soils. This variation may be linked to the soil variability. Hence this process of termite mound not only enriches the soil with organic matter, but it also increases nutrient availability such as TN and Av-P, resulting in a healthier ecosystem.

Except for Sodium (Na) the exchangeable bases are all significantly ($p < 0.01$) different at the subsurface (Table 2) which indicates that there are differences in the amount of these acidic and basic cations at this level between the termite mound soil and the adjacent soils. This enrichment arises because termite salivary and fecal secretions often contain calcium carbonate (raising Ca) and they gather minerals from deeper layers. While Na is often low in all these soils, K is usually higher in mounds as in the cited works of Apori et al., (2020);,Kathbaruah et al., (2024). Consequently, the Total Exchangeable Bases (TEB); the sum of Ca, Mg, K (and Na) is higher under mound soils. ECEC was also statistically higher with termite mound than the surrounding soils (Table 2). This difference in CEC between termite mounds and adjacent soil could be due to the increment of clay and OM contents in the mound, as termites work on soil while building the mounds. This findings is in line with the results of Sima and Begna (2024).

CONCLUSION

Significant differences were observed in the soil properties measured at both the surface and sub surface. Termite activity plays a pivotal role in enhancing soil fertility in nutrient-poor tropical environments. Through the selective accumulation of fine particles and organic materials, termite mounds significantly improve soil texture, increase clay content, and enhance aggregate stability. Similarly, these mounds serve as nutrient reservoirs, enriched with organic matter, nitrogen, phosphorus, and essential exchangeable bases such as calcium, magnesium, and potassium. These enrichments lead to higher base saturation and improved cation exchange capacity, especially in the surface and subsurface layers. Hence, termite mounds should be preserved and strategically integrated into land management practices due to their natural enhancement of soil fertility and structure. Rather than being destroyed during cultivation, soils from termite mounds can be selectively harvested and used as organic amendments, particularly in degraded or nutrient-deficient areas, to improve soil quality and crop productivity. Similarly, mound soils can be used in small nurseries to raise vigorous seedlings.

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