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Effect of Termite Mound on Growth of Maize in the Humid Forest of Southern Nigeria

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Abstract: *Pots experiments were conducted to assess the effect of termite mound on growth of maize in the humid forest of southern Nigeria during the 2011 cropping season at the Teaching and Research Farm of Federal College of Education (Technical), Omoku, Rivers State, Nigeria. Three treatments were imposed in the study. The treatments were replicated five times and fitted into a completely randomized design(CRD) with maize as test crop. Data analysis indicates that termite mound significantly increased soil pH, nitrogen, phosphorus and potassium than surface soil. Nutrient concentrations in maize plant were also higher in pots treated with termite mound than either inorganic fertilizer or surface soil. On average, termite mound significantly enhanced height, leaf area, stem girth and dry matter weight of maize than inorganic fertilizer and surface soil. Utilization of termite mound as plant nutrient source for crop production might reduce the cost of inorganic fertilizer thereby improving the economic returns to the farmers.*

Key Words: *Termite, Mound, Maize, Humid forest and fertilizer*

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I. Introduction

The increasing demand for food occasioned by high population growth rate has intensified the quest for more yield per unit area of land. Consequently, this has led to intensive continuous cultivation, and under such situation soil fertility maintenance through soil organic matter built up is difficult or impossible. Hence, high demand for external fertilizer sources is necessary. According to Ojeniyi (1995), mineral fertilizer plays important role in enhancing soil fertility status and subsequently increases crop yields if judiciously utilized. However, farming with such innovation has not been sustainable in Nigeria because of many limitations among which are high cost, poor distribution network, scarcity, possible soil acidification, especially with acid forming ones, and ground water pollution (Funtua, 1987; Evbuomwan, 1991; Tandon, 1993; Okigbo, 2000; Lilkika, 2001). Attention therefore, has shifted to the use and research on organic sources of plant nutrients. Several works have been done on animal manures, crop residues, industrial wastes and bio-fertilizers such as mycorrhiza, azolla, etc (Ojeniyi, *et al*, 2006; Oguzor and Ezekiel, 2006; Ezekiel *et al*, 2004) leaving out termite mound which has potential for improving crop yield in the rain forest of southern Nigeria where they abound.

This work therefore investigated the effect of termite mound on growth of maize in the humid forest of southern Nigeria.

II. Materials And Methods

Two pot experiments were conducted at the Teaching and Research Farm of Federal College of Education (Technical) Omoku in the humid forest zone of South - South Nigeria during the 2011 cropping season. The College Farm is on the coordinates 5.342°N 6.656°E, and on an elevation of 17.68m above sea level. The experiments were laid out as complete randomized design (CRD) with three treatments replicated five times. The treatments include termite mound, NPK 15:15:15 fertilizer and surface soil (Control). Ten kilogram of surface soil and ground termite mound were weighed each into the appropriate plastic buckets. The buckets were perforated at the bottoms to prevent inundation. The experiments were then set up in a green house format. All buckets were watered a day before applying fertilizer and sowing maize seeds. Fertilizer was applied to the required buckets at the rate of 150kg/ha. Variety of maize used was ELD_3-C_2 procured from Green River Project of Nigerian Agip Oil Company, Obrikom, Rivers State, Nigeria.

Four seeds were sown per bucket and at two weeks after planting thinned down to two. Weeding was by hand picking and weeds were deposited on their respective buckets to decompose. All buckets were watered daily to field capacity throughout the experimental period.

The following growth parameters were observed and measured at 2, 4 and 6 weeks after planting respectively: Percentage emergence, plant height, leaf area, stem diameter, fresh shoot and root weights.

At the beginning of experiment, surface (0-15cm) soil samples were analyzed for pH, Organic carbon, nitrogen, phosphorus, potassium, calcium, magnesium and particle size whereas, termite mound was analyzed for N, P and K (Table 2) as described by Tel and Rao (1982).
Data were subjected to analysis of variance and means compared using the least significant difference at 5% level of probability.

III. Results And Discussion

Selected properties of the soils at the experimental site and those of the termite mound are shown in Tables 1and 2 respectively. The surface soil is acidic, low in nutrients and is sandy loam in texture. The termite mound is moderately acidic, and high in soil nutrients suitable for the growth and development of crops especially maize plant. Table 3 contains data on some soil properties after experimentation. It indicated that soil nitrogen, phosphorus and potassium increased significantly in all treatments.

Leaf nutrient contents of maize are presented in Table 4. Termite mound increased leaf N, P and K contents relative to the control. The NPK fertilizer also increased leaf N, P and K than the control. There was no significant difference between the increases in leaf P and K as those of the termite mound.

Data on growth and dry matter yield of maize are presented in Table 5. Termite mound significantly increased plant height, leaf area and stem girth at 2, 4 and 6WAP respectively compared to inorganic fertilizer and surface soil. Total dry weight of maize was also better in pot treated with termite mound than inorganic fertilizer and surface soil. Mean total dry weight of maize in the various treatments were 2.52, 0.97 and 0.70 t ha^{-1} respectively for termite mound, inorganic fertilizer and surface soil.

The increase in N, P and K contents of maize leaf due to application of termite mound is consistent with its use as a major source of nutrients for maize production (Fageria and Baligar 2004, Ricardo *et al*, 2004). Enhanced growth performance and dry matter yield of maize associated with termite mound is related to increased availability of nutrients to maize plant. Ruanysoongnern (1990) asserted that growth and yield of shallot were significantly increased by termite mound. The increase was adduced to increased availability of nutrients.

IV. Conclusion

It is therefore, concluded that termite mound has fertilizing effect on maize growth and could be used to supplement inorganic fertilizer.

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Table 1: Some properties of the experimental sites (0-15cm) before experimentation

Soil properties	**Mean Values**
pH (H_2O)	4.60
Org.C (%)	1.08
Total N (%)	0.053
Avail.P (mg kg $^{-1}$)	16.00
Exch. K (cmol kg $^{-1}$)	0.16
Exch.Ca (cmol kg $^{-1}$)	0.26
Exch.Mg (cmol kg $^{-1}$)	0.18
Sand (%)	74.0
Silt (%)	10.0
Clay (%)	16.0
Texture	Sandy loam

Table 2: Chemical properties of termite mound

Properties	N	P	K	Ca	Mg	Org. M	pH	Cu	Zn	Fe	Mn
	%	mg/kg	___	cmol kg^{-1}	___	%	(H_2O)	_____	mg kg^{-1}		_____
Mean Values	0.10	18.2	13.5	3.1	2.0	3.2	5.6	2.3	3.5	124	69

Table 3: Soil properties after experimentation

Treatment	**N (%)**	**P (mg/kg)**	**K (cmol/kg)**
Termite mound	0.130	23.33	6.292
NPK15:15:15	0.270	53.20	8.083
Control	0.017	9.33	3.708
LSD (0.05)	0.133	28.42	1.685

N=Nitrogen, P=Phosphorus, K=Potassium

Table 4: Leaf nutrient content of maize after experimentation

Treatment	**N %**	**P %**	**K %**
Termite mound	1.163	0.005	1.380
NPK 15:15:15	0.703	0.004	1.442
Control	0.247	0.002	0.794
LSD (0.05)	0.442	0.001	0.078

N=Nitrogen, P=Phosphorus, K=Potassium

Table 5: Nutrient contribution of termite mound to growth and biomass yield of maize

Treatment	**Plant Height (cm)**			**Leaf Area (cm^2)**			**Stem girth (cm)**			**Total dry matter yield (t/ha)**
	2WAP	**4WAP**	**6WAP**	**2WAP**	**4WAP**	**6WAP**	**2WAP**	**4WAP**	**6WAP**	
Termite mound	18.71	41.96	81.44	128.36	208.90	6118.37	1.46	3.59	4.08	2.52
NPK 15;15:15	17.47	37.20	42.01	119.81	134.08	4335.75	1.28	2.43	2.45	0.97
Control	12.97	20.79	36.19	116.09	117.91	743.37	1.23	2.03	2.06	0.70
LSD (0.05)	4.08	3.65	32.43	6.11	35.67	1638.87	0.12	0.35	0.37	0.25

WAP=Weeks after planting