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ASSESSMENT OF TIMBER SUSCEPTIBILITY TO TERMITE SPECIES IN MAIDUGURI, BORNO STATE NIGERIA

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ABSTRACT

This study assesses timber susceptibility to termite species in Maiduguri and environs. A structured questionnaire was administered on 10% of target population giving a sample size of 235 respondents. The result shows that 27 identified timber tree species wood are used locally. The most susceptible timber to termite attack were Arere/Obeche (20.0%), 14.5% for Afun and Akwamili (9.6%), Abu (7.6%), Afara (7.3%), Oro (6.3%), Abago (5.1%). It is not established whether to attribute termite attack to either susceptibility or the preponderance of usage. The result also shows no significant difference within location but between locations, like old/new building site, outskirt/urban centres, where newly established and outskirt areas experience higher termite devastations compared to the old and urban centres. It was recommended that people should use local methods that do not require use of chemical; that are relatively affordable and environmentally friendly such as use of wood ash, death animal using cow dungs, expired engine oil and kerosene to combat termite attacks. Where necessary solignum, permethrin and cypermethrin which do not kill but scare away termite should be employed at right time and place to control termites because despite their devastating effects on wooden and agricultural materials, they plays important ecological and environmental roles in recycling soil nutrients for productive agricultural land use.

Keywords: Termite, Timber, Susceptibility, Damage

INTRODUCTION

Termites are insects that belong to the order isopterans in animal classification hierarchy. They live in colonies consisting of workers, soldiers, a queen and a king which collectively form well-organized social formations. This group of insects play important contrasting ecological roles in

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reworking the soil profile and the destruction of material meant for building construction, agriculture and forestry (Lee and Wood, 1971; Mielke and Mieke, 1982; Jone, 1990; Black and Ekwakol, 1997; Gumnior and Nyanganji, 2005). The effect of termite in the environment can be seen in the economic loss incurred by the general public. In most part of the world, there is the need to recognize, understand and combat the destructiveness of termites and offer protection to wooden structures like buildings, food and fiber. (Haris, 1971; UNEP/FAO/Global IPM, 2000).

OBJECTIVE OF THE STUDY

The aim of this paper is to determine the damage termites cause to timber products in Maiduguri, focusing on the susceptibility of timber to termite attack in the study area.

Environmental Effects of Termites

Termites have significant impact on plantation and urban forestry as well as on agricultural tree crops. Some termite species however are able to kill healthy trees and, therefore, have the potential to cause much greater losses to agro-forestry. Even where termite do not cause death to the tree they may cause damage by consuming the hardwood, hollowing the trunk and reducing the value of the tree as a source of timber (UNEP, 2000). The effects of termite as a result of high intensity of infestation has become an important factor in the characterization of the dominant farming system in Nigeria, as it affects the productivity and livelihood of farmers in the agronomic, economic, social, environmental and psychological realms. The agronomic influence includes the role of termite as pest (Saxena, 1999; Logan *et al*, 1990; Umeh, 1999), and soil modifiers (Jouquet *et al*, 2004; Jouquet *et al*, 2005). The economic aspect involves the destruction of ligno-cellulose materials ranging from wooden furniture, books and clothes, (Myles, 2002).

Termite activities constitute major constraints to the farmer, both in field and in the store as they destroy all cellulo-lignotic materials within reach. The perceived threat of termite infestation creates some psychological fear of possible attack on either the farm produce or household properties; these generally affect the overall livelihood of the farmers and dwellers. The raising and maintenance of our existing forest today is partly for the provision of adequate and continuous supply of wood for housing and wooden structures such as bench, desk and cupboards (FAO, 2005). It is imperative therefore, to obtain available information on how termites affect timber species products used for the construction of houses in Maiduguri, Borno State, Nigeria.

STUDY AREA AND METHODOLOGY

Study Area

Location of the study area is Maiduguri the capital of Borno State established in 1907 by the British for administrative purpose. It lies in the Sudan-Sahel transition zone, located on latitude 11^0 52'N and longitude 13^0 06'E with a land mass of 550 square kilometers (Omoja, 1996).

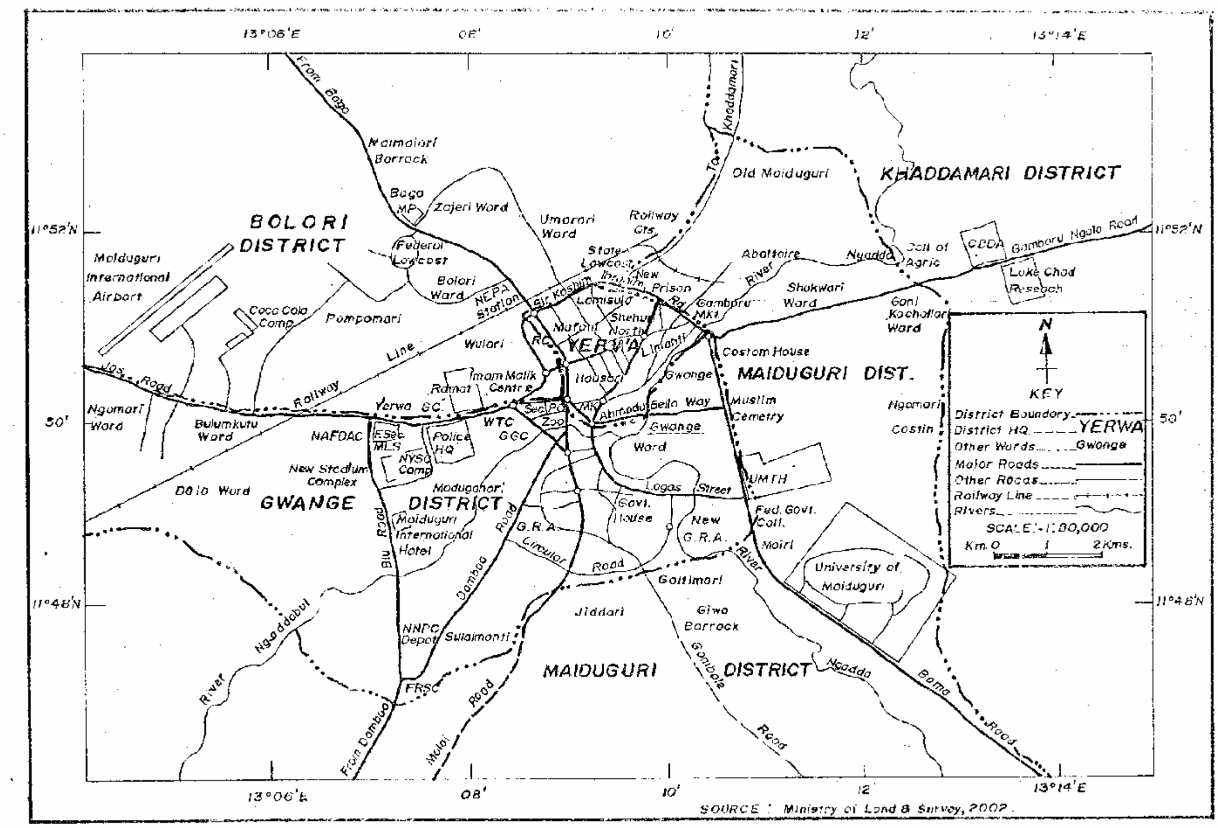

Fig. 1: Maiduguri Township Map Prior to 2003, showing location of the study area.

MATERIAL AND METHOD

Information required for the study include data on termite activity which was obtained from both primary and secondary sources (Stoop,1964; Richard and Davies,1977; Bolza and Keating,1978; Desch and Dinwoodie,1981; Chudnoff,1984; Gumnior and Nyanganji,2005). The primary information were collected by the use of structured questionnaire administered to 235 randomly selected timber traders, residential household in two wards, Bolori I and Shehuri North,

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Government Establishment comprising Schools, Health Center, Government Offices, Hotels and Government residential Quarters in Maiduguri Metropolitan area.

Sampling methods used was the random sampling techniques, to select the old and newly established timber sheds, residential houses in the two wards – Bolori I, Shehuri North, in both urban and outskirts, considering old and recent constructions as indicated in the distribution table below, using a 10% (235) sample population of the study area.

S/No	Location Area	Total No. of houses in the area	10% Sample size
1.	Timber shed		
	a. old shed	106	11
	b. New shed	27	3
2.	Residential Houses		
	a. Bolori I (outskirt)	785	79
	b. Shehuri North (Urban)	312	31
3.	Government Establishments		
	a. Schools	137	14
	b. Health Center	45	5
	c. Offices	78	8
	d. Hotels	33	3
4.	Government Quarters		
	a. Old Quarters (Abbaganaram)	606	61
	b. New Quarters(Pompommari)	200	20
		Total respondents = 235	

Sources Field survey

Table 1: Distribution of sample population in the different locations in study area.

Questionnaire Administration was by ballot and pick random sampling method after which the 235 questionnaires were distributed to the selected heads of house hold in the wards (Table 1).

RESULTS AND DISCUSSIONS

The findings showing the effects of termites on wooden construction materials of the various houses as given by the household are presented in the various sections below.

Bio-Data of respondents

The result revealed that the higher number of respondents fall within the ages of 41–50 (29.4%), 31-40 (27.7%) and 21-30 (28.9%) constituting 66% of the sample population (Fig 2).

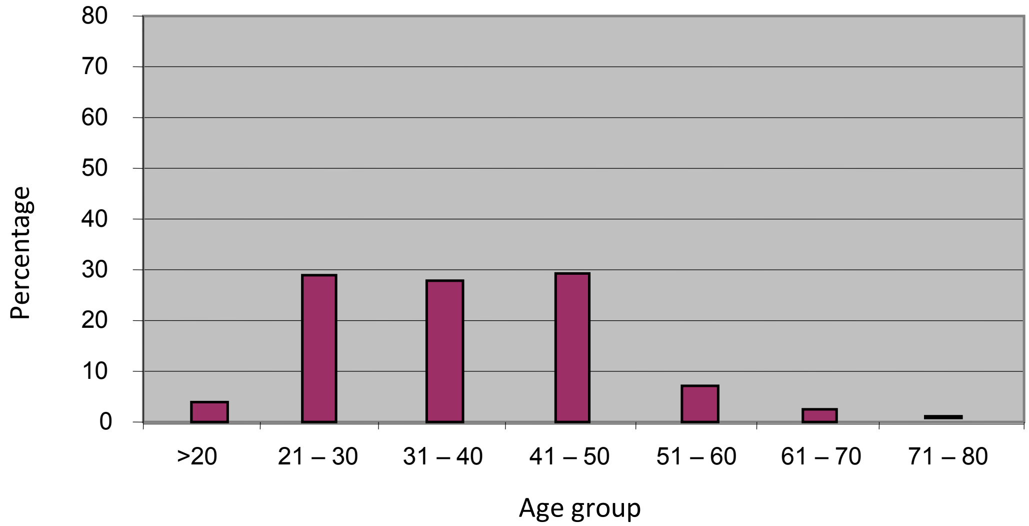

Fig 2: Age groups of respondents

This category of age groups represent the most active population in various aspects of socio-economic activities and owners of landed property in the city. On the basis of gender, the males constitute 87.7% of the heads of households in the area, as compared with only 12.3% females (Fig. 3). This is because men are the major sellers owners and users of wooden materials for construction purpose. It also indicates that men are the major owners of properties constructed with wooden materials and are also responsible for their maintenance over time. Some time women who own property allow their husbands or male relatives to be caretakers, due to social and cultural restriction.

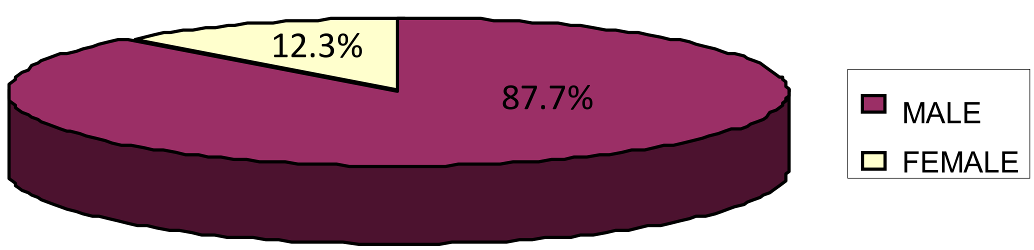

Fig 3: Ratio of males and females response in the study area

Focusing on the occupational characteristics of the respondent (Fig 4) the Civil servants comprise the highest (42.1%) group followed by traders (businessmen/women) or those who sell wooden construction materials in Maiduguri. Among the respondents students also form a major group of those that use wooden materials or are the major consumers or owners of the wooden

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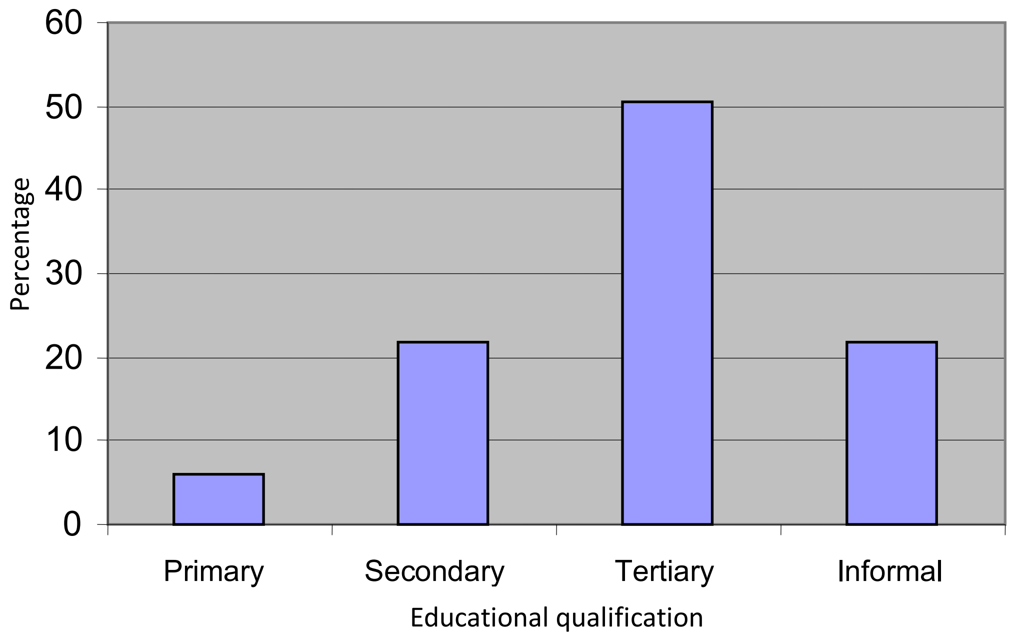
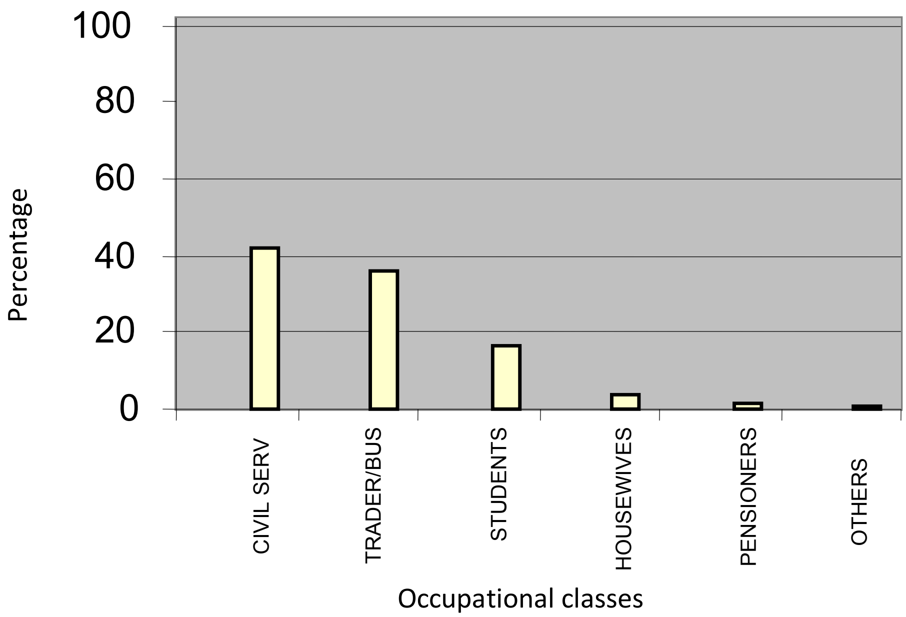
construction materials in form of furniture like table, bed, house etc. Figure 4 show that 50.6% of the respondents attained tertiary education, while 21.7% each acquire secondary and informal education.





S/No	Names of Timbers used in M/guri	Botanical/Scientific Names	Frequency	Percentage
1	Arere/Obeche	*Triplochiton screloxylon*	163	16.0
2	Mahogany	*Khaya Ivorensis*	135	13.2
3	Afara	*Terminalia superb*	95	9.3
4	Iroko	*Milicia excels*	81	7.9
5	Afun	*Treculia Africana*	77	7.5
6	Oro	*Antiaris Africana*	62	6.1
7	Korokoro	*Pterygota macrocopa*	59	5.8
8	Abago	*Isoberlinia doka*	55	5.4
9	Akwamili	*Ricinodendron heudolottii*	53	5.2
10	Abu	*Mitragyna ciliate*	51	5.0
11	Teak	*Tectona grandis*	42	4.1
12	Ire	*Funtumia elastic*	28	2.7
13	Omo	*Cordia millanii*	27	2.6
14	Mansonia	*Mansonia altissima*	20	2.0
15	Coconigo	*Sterculia oblonga*	16	1.6
16	Black Afara	*Terminalia ivorensis*	4	0.4
17	Opepe	*Nauclea diderrichii*	3	0.3
18	Omu	*Entandrophragma candellei*	3	0.3
19	Apple	*Malus sylvestris*	2	0.2
20	Akika	*Lecanioliscus cupanioides*	2	0.2
21	Akume	*Guibourtia pellengriniana*	2	0.2
22	Ororo	*Antidesma venosun*	2	0.2
23	Akomu	*Pycnanthus angolensis*	1	0.1
24	Ashore	*Dichaentathera Africana*	1	0.1
25	Efo	*Piptadeniastrum africanum*	1	0.1
26	Sapele	*Entandrophragma cylindricum*	1	0.1
27	Akwakwa	*Oxystigma oxyphyllum*	0	0
28	Non respondents		34	3.3
	Total		1020	100

Source: Survey, 2010

Table 2: Local and Botanical names of trees used in sourcing wooden construction materials

This study attempted to find out the species of trees used in sourcing wooden material used in the construction industry in Maiduguri. Table 2 presents timber species, their botanical names and

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frequencies of preference by the respondents in the study area. The table reveals that the most preferred ten species of trees are Arere/Obeche (16%), Mahogany (13%), Afara (9%), Iroko (8%), Oro (6%), Korokoro (6%), Abago (5%), Akwamili (5%) and Abu (5%).

Source: Field Survey, 2010

Plate 1 Display of different timber species for sale at timbersheds

The list was obtained from the respondents at various locations, comprising both buyers and sellers who have ideas on common types of timber imported to Maiduguri. Their corresponding scientific names were obtained using the common names from the following literature (Desch and Dinwoodie, 1981; Bolza and Keating, 1972; Chudnoff, 1984; Forest Stewardship Council, 1996).

It was understood from respondents and literature that Arere/Obeche, Afun were preferred because they are among the soft woods with density range between 350-700kg/m^3 (Desch and Dinwoodie, 1981). Soft wood are cheaper and easy to process, hence they are prepared in the

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local wooden industry markets. This has motivated most of the respondents to use them more for their construction work. However, these soft timber products are highly susceptible to termite attack. The reason why some of the timbers are not being demanded for in the market may be largely due to lack of availability, difficulty to process and above all their high cost of procurement in our local market scarcity.

S/No	Names of susceptible Timbers	Frequency	Percentage	Order of Susceptible	Order of Use or Preference
1	Arere/Obeche	184	20.0	1	1
2	Afun	134	14.5	2	5
3	Akwamili	88	9.6	3	9
4	Abu	70	7.6	4	10
5	Afara	67	7.3	5	3
6	Oro	58	6.3	6	6
7	Abago	47	5.1	7	8
8	Korokoro	44	4.8	8	7
9	Omo	42	4.6	9	13
10	Efo	40	4.3	10	25
11	Opepe	40	4.3	11	17
12	Ire	39	4.2	12	12
13	Mahogany	15	1.6	13	2
14	Iroko	15	1.6	14	4
15	Omu	5	0.5	15	18
16	Teak	4	0.4	16	11
17	Ororo	3	0.3	17	22
18	Akomu	2	0.2	18	23
19	Akwakwa	2	0.2	19	27
20	Akika	2	0.2	20	20
21	Mansonia	2	0.2	21	14
22	Apple	1	0.1	22	19
23	Sapele	1	0.1	23	26
24	Akume	-	-	24	21
25	Ashore	-	-	25	24
26	Black Afara	-	-	26	16
27	Coconigo	-	-	27	15

Source: Survey, 2010

Table 3: Perception of timber susceptibility to termite attack by respondents and order of preference

The table 3 shows the rate at which termite attack various timber species based on the respondents perception in the study area. Table 3 shows that Arere/Obeche wooden materials are highly susceptible to termite attack, the other six vulnerable species as confirmed by respondents are the Afun (15%), Akwamili (10%), Abu (8%), Afara (7%), Oro (6%) and Abago (5%). Comparing the results in tables 2 and 3, it is not clear if one should attribute termite attacks on wooden materials to either termite preference (susceptibility) or the preponderance of usage in the study area. For example, in table 3, Mahogany, the second most preferred wooden material is ranked as the 13th most susceptible wooden product to termite! But on the order of preference and susceptibility of wooden materials, the tally as shown on table 3 does not agree with the order. Some respondents reported that wooden products from trees like Coconigo, Akume, Ashore and Black Afara were scarcely attacked by termites. However, some respondents observed that some species such as Apple, Sapele, Mansonia, Akwakwa, Akomu, Teak tree products and Omu were often damage by termites.

Plate 2 showing roof at barge of collapsed as a result of termite infestation at one of the private residential areas.

Source: Field Survey, 2010

Plate 4 showing termite infestation at one of the school laboratory in the study area

Locations	Mean	TMO	TMN	BLO	SHU	SCH	HLC	OFC	HTL	OAG	NPH
TMO	8.1579										
TMN	0.0000	8.1579*									
BLO	29.1899	1.0320	9.1899*								
SHU	7.9504	0.2025	7.9504*	1.2396							
SCH	6.6857	1.4722	6.6857	2.5042*	1.2646						
HLC	6.6000	1.5579	6.6000	2.5899	1.3504	0.0857					
OFC	8.0625	0.0954	8.0625	1.1274	0.1121	1.3768	1.4625				
HTL	9.6667	1.5088	9.6667*	0.4767	1.7163	2.9810	3.0667	1.6042			
OAG	7.0097	1.1482	7.0097	2.1803*	0.9407	0.3239	0.4097	1.0528	2.6570		
NPH	7.4167	0.7412	7.4167	1.7733*	0.5337	0.7310	0.8167	0.6458	2.2500	0.4070	

Source: Survey, 2010

Table 4: Susceptibility of timbers to termite attack between locations

Key

TMO – (Old Baga Road Shed)

TMN – (New Bulabulin, Gwange, Custom area)

BLO – (Bolori Outskirt)

SHU – (Shehuri North Urban)

SCH – (Schools)

HLC – (Health Centres)

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OFC – (Offices)
HTL – (Hotels)
OAG – (Old Abbaganaram Housing Estate)
NPH – (New Pompommari Housing Estate)
* - Significant difference

Table 4 shows susceptibility of timber to termite attack in the study area. The result shows significant difference in susceptibility between some locations. It can be observed from the table that new/old and urban/ outskirt locations shows variation due to nature of settlement. The newly established residential areas on the outskirt experienced frequent termite activities resulting in high wooden damages. On the other hand, the older part of the urban areas tends to experience lesser degree of termite activities, probably this may be as a result of higher human activities and presence causing obstructing to termite colonies and reducing their population, hence low susceptibility in these areas

CONCLUSION

The study concludes that termite and their activities causes considerable amount of damages to wooden construction materials in household. Therefore, there is the need for people to use local methods especially those that are environmentally friendly, healthier and relatively affordable, less destructive to termite population in the environment such as spreading ash on termite nest, breaking their over ground tunnel while moving towards timber, flooding their nest with water, so as to reduce their activity. There is also the need for routine checking of wooden materials used in construction of rafter, furniture and ceiling so as to avoid late notice of termite damage that can lead to collapse of ceiling or furniture in the house.

RECOMMENDATIONS

Bearing in mind the significance attached to termite damages to wood and related timber products meant for construction, the following recommendations are made to control their menace and reduce the economic loss resulting from it.

(a) There is the need for routine checking of wooden materials used in constructions of furniture and ceiling to avoid serious termite damages to property.

(b) Local and environmentally friendly methods such as use of wood ash expired engine oil and kerosene that are relatively affordable and less destructive to termite population be employed in the environment to control termite activity.

(c) Also recommended for use are environmentally friendly chemicals such as <u>solignum</u>, <u>permetrin</u> and <u>cypermethrin</u> which do not kill but scare away termites.

REFERENCES

Black, H. I. J. and Okwakol, M.J.N. (1997) Agricultural Intensification, soil biodiversity and agroecosystem function in tropics: The role of termites, ***Applied Soil Ecology*** 6(1):37-53.

Bolza, E., and Keating, W.G., (1978) African Timbers – The properties, uses and characteristics of 700 species, C.S.I.R.O. ***Div. of Building Research****,* Australia.

Chudnoff, M. (1984) Tropical Timbers of the World. ***USDA Forest Service. Ag. Handbook No. 607***. Stationery office, London.

Desch, H.E. and Dinwoodie, J.M. (1981) **Timber, its structure, properties and utilization**. Macmillan Educational Publication, London.

Food and agricultural organization (F.A.O). (1986) Some Medicinal Forest Plants of Africa and Latin America, Forest Resources Development Branch. ***Forest Resources Division***. Forestry Department.

Food and Agricultural Organization (FAO), (2005) Corporate Document repository, ***Non Wood News***, Nigeria.

F.S.C., (1996) The mark of responsible forestry, ***forest stewardship council*** A.C. – Meerdink (U.K) Ltd.

Gumnior, M. and Nyanganji, J.K. (2005) The perception, use and evaluation of termite mounds by local farmers in the Maiduguri – Auno area of North-eastern Nigeria Savannah, published by ABU Press Limited, P.M.B. 1094, Zaria Vol. 20, No. 1 & 2.

Harris, W. V. (1977) **Termite their recognition and control**. Macmillan Publication Limited.
http://www.foogle.biz/2000-2005termsinsectspage.genusisopte.thetermite13/11/2008
http://www.ipminstitute.org/schoolbibliobuildings.htm#wood13/11/2008

Jones, J.A. (1990) Termites, Soil fertility and carbon cycling in dry tropical Africa: a hypothesis. ***Journal of Tropical Ecology*** 6:291-305.

Jouquet, P., Barrè, P. Lepage, M. and Velde, B. (2004) Impact of subterranean fungus – growing termites (Isoptera, Macrotermitinae) on chosen soil properties in a West Africa Savanna, ***Biol. Fert. Soils***, 41: 365-370

Lee, K. E., Wood, T.G. (1971) **Termites and Soils**. London: Academic Press.

Logan, J.M., Cowie, R.H., Wood, T.G. (1990) Termites (Isopera) control in Agriculture and Forestry by non chemical method: ***A Review. Bull. Entomol. Res.***, 80: 309-330.

Mielke, H.W., and P.W. Mielke. (1982) Termite mounds and chitemene agriculture: a statistical analysis of their association in southwestern Tanzania. ***Journal* of Biogeography 9:499-504**.

Myles, T.G. (2002) Termite Biology. Termite Taxonomy, Termite Phylogeny, beneficial uses of termites and distribution of Northern termites. ***Urban Entomology programme***. Faculty of Forestry, University of Toronto, Canada.

Nyanganji, J.K. (1996) Towards a sustainable management of the Ngadda catchment, Maiduguri, Borno State Nigeria: ***Issues in environmental Monitoring in Nigeria***, later Day Publishers NGA, Geography Department, University of Maiduguri. Pp 120-128.

Omoja, L.O. (1996) Urbanization and Environmental problems in Maiduguri, Borno State: ***Issues in environmental monitoring in Nigeria***, later Day Publishers. NGA, Geography Department University of Maiduguri. Pp 239-243. Nigeria.

Richard, O. W., Davies, R. G. (1977) **Imm's Genera Textbook of entomology** – Vol. 2 classification and biology. Pp. 634 – 635.

Saxena, R.C. (1999) Insecticides from the neem. In: Insecticides of plant region. Amadon, J.T., B. J. R. Philogène and P. Morand (Eds.). ***ACS symposium Series No. 387.*** Washington, DC, AM. Chem. Soc., pp: 110-135.http://www.leisa.info/index.php?url=magazinedetails.tpl&p[_id]=81274.

Stoops, G. (1964) 'Application of some pedological method to the analysis of termite mounds'. ***In Etude sur les termites*** (Bouillon, A.ed.), pp 379-398, Universitè Leopoldrille.

Umeh, V. C and Lvbijaro, M. F. (1999) Effects of Termites damage to maize of seed extracts of Azandrichta indica and Piper guineense in farmers field. ***J. Agric Sci.***, 133: 403-407.

UNEP, (2000) facility expert group on termite Biology and management. **Termites in forestry covered by Stockholm convention.**

ISSN: 2455-6939

Volume:03, Issue:01

UNEP/FAO/Global IPM Facility Expert group on termite Biology and Management, (2000) **Finding Alternatives to persistent organic pollutants (POPs)** for termite management. To support International activities on persistent organic pollutants (POPs) covered by the Stockholm convention.

