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### **Sub-Theme 1**

#### **TVET And Local Technologies In Sustainable Agriculture For National Transformation**

1. Effects of locally sourced Preservative From Neem Seed Oil And Nigeria Black Soap on Wood Destroyer Agent (insects). : Kareem, W.B & Bashir Bukar
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## Effects of locally sourced preservative from Neem Seed Oil and Nigeria black soap on Wood destroyer agent (Insects).

Kareem, W.B<sup>1</sup> & Bashir Bukar<sup>2</sup>

<sup>1</sup>Department of Industrial and Technical Education

Federal University of Technology, Minna Niger State, Nigeria

<sup>2</sup>Kaduna polytechnic, Department of Technical Education Kaduna, Kaduna state Nigeria.

### Abstract

*The purpose of the study was to develop, produce and evaluate the performance specification of local wood preservative and to determine the degree of its effectiveness on different types of insects such as ants, beetles and termites as well as the shelf life span of the preservative. Research and developmental design was adopted for the study. Three research questions were formulated to guide the study. 200ml of neem seed oil was mixed with 100ml of liquid black soap and water in appropriate ratio 2:1 to form the preservative which was spread on 43 different types of insects such as ants, beetle and termites. Mean rating and percentage were the statistical tools used to answer the research questions. The findings reveal among others that the major properties of the preservatives were neem seed oil 66.4% and soap 23.49%. The average effectiveness of the preservative was 92.21%. The preservative was very effective on all the three types of insects. Its shelf life was between 7-14 days. Based on these findings of the study, six recommendations were made which among others include: the developed wood preservative should be subjected to quality assessment by the Standard Organization of Nigeria (SON) and also the Federal Government of Nigeria should put in place a mechanism for the commercialization of the developed wood preservatives.*

### Introduction

The term preservation refers to the processes involved in the treatment of an item to prevent it from spoilage either for specific period of time or as a life time process to keep such an item in a stable condition (Eaton 1993). Preservatives work in a way to either inhibit the activities of insects such as laying of eggs by larva of insects or to inhibit their metabolic activities. Preservatives also inhibit the synthesis of toxins by fungi as well as other harmful enzymes. John (1984) defines wood preservation as the process of treating wood with substances that are poisonous to fungi and insects.

According to Blew *et al* (1997), Preservative is a natural or synthetic chemical that is added to products such as food, pharmaceutical, paints and wood to prevent decomposition by microbial growth or by undesirable chemicals changes. Wood preservation is inevitable in wood industry and to the woodworkers generally, reason being that deterioration of wood is a factor that demands proper preservative process and this deterioration is mainly caused by three agents namely fungi rot, borers and termites. These pests according to Beesley (2006) include various termites, ants, and beetles. He stretched further that termites use woods for food and shelter and are the most destructive of all wood insects. Ants cannot use woods for food, but they are often confused with termites because the two look somewhat similar. However there are distinct differences in their physical appearance. Ants have 'elbowed' antennae; termites do not. Ants have narrow waist whereas termites' bodies are broad. Ants' wings have few veins and hind wing are smaller than front wings, both paws of termites' wings are similar in shape and size and have very small veins. Carpenter ants which are black or red in color usually live on trees or logs, but often damage poles or structural timbers set in the ground. Elevation positions of buildings, such as windows sills and pouch columns are susceptible to damage. Carpenter ants use wood for shelter not for food. They usually prefer wood that is naturally soft or has been softened by decay. The galleries are large, smooth and unlike those of termites are free of refuse and powdery wood. Moulds sawdust indicates their presence

Borers like fungi are other agents of wood destroyers, though damage to timber by wood borers is generally minor and rarely needs treating. However, some borers can cause considerable destruction and ability to identify the difference can save unnecessary treatment (Annon 2006). Most known borers are beetles with a four-stage life cycle beginning with eggs, which are laid in vessels or in cracks on the wood surface. These hatch into the larval or grub stage, which burrow out of the wood and fly off new breed of insect. The exit or flight holes of the adult are generally the first signs that bores are present, often with fine dust (frass) which is borer excrement. Gutzman and Crawford (2008) stated in their work that powder post beetles (*lyctus*)

attack only the sapwood of some hardwoods, freshly cut and seasoned softwood. They attack the sap of ash, hickory, oak and other hardwoods. Initially attack by powder post beetle damage can be alarming, but the effects can be found years after the attack has ceased.

The available commercial preservatives are synthetic chemicals that contain heavy metal such as zinc and copper which are not environmentally friendly to both livestock and human being because of their toxicity. They are also imported preservatives and very costly. These made users to avoid it and resultant is a severe damage done to wood materials, properties and life. The consequences of the expensiveness of foreign preservatives, degradation and deterioration caused by these insects call for locally sourced wood preservatives.

### **Statement of problem**

Wood materials have become very scarce and expensive and very liable to degradation due to microbial agencies and insects such as termites causing significant losses. As a result of this wood need to be treated so as to increase its durability. The available synthetic wood preservative material contains heavy metals such as zinc and copper that are toxic and not environmentally friendly to both human being and livestock (Kartal 2009). They are also imported preservative and very expensive. The expensive and toxic nature of the preservative material made it often impossible for the users to apply on wood materials. This nonchalant attitude towards effective use of preservative causes a lot of hazards ranging from destruction of properties and in many cases loss of life. Also wood harvested from both government reservations and free areas are not constantly replaced there by limiting the availability of wood material and as such required that wood in services need to be protected for durability. The challenge in developing alternative wood preservative is to ensure that the products are environmentally friendly, non toxic, metal free, less costly and very effective. The constraint solved by this study is the need for an indigenous wood preservative from local materials such as Neem seed oil and Nigerian black soap (Ose dudu).

### **Purpose of the study**

The purpose of the study was to produce and determine

1. The percentage composition of the developed preservative
2. The effectiveness of the developed preservative on different insects.
3. Shelf life span of the preservative

### **Research questions**

1. What is the percentage composition of the preservative?
2. What are the effects of the developed preservative on different types of insects?
3. What is the shelf life of the preservative?

### **Methodology**

The design adopted for this study is research and development. This design was found most appropriate because the objective of the study was to develop wood preservative form locally sourced material such as Neem seed oil and Nigeria black soaps and to determine the following; percentage composition of the preservative, effectiveness of the preservative on different insects and shelf life of the preservative.

The steps involved in the design are;

1. Development of an idea to solve immediate problems.
2. Identifying appropriate material for the development.
3. Translating the idea into products and testing for its effectiveness or workability. (Aloysius 1998)

### **Preparation procedure**

#### **Specimen**

The major material according to Swathi *et al* (2004) for the production of local wood preservative is neem seed oil and local soap because of its proven characteristics such as analgesic, bacteriocidal, fungicidal, insecticidal, insect repellent and shampoos.

**Neem seeds:** 45kg of ripe neem fruits collected from various parts of local government area in Niger state. The seed was dried, shelled and dried again. The seed was then processed for extraction of its oil. The process of oil extraction was carried out in chemistry departmental laboratory of Federal University of technology, Minna, Niger state. Soxhlet Extractor was used for the extraction process.

**Local soap:** the local soap otherwise called (Ose dudu) was produced with material which includes cocoa pods, plantain skins, palm tree leaves, shear tree back which burnt in kettle. Palm oil was added, mixed and cooked in ash resulting to semi liquid hot soap which was placed on a table to cool and hardened. The soap was then cut and weighed.

Sixty grams (60 grams) of soap was involved in each production of preservative.

**Insect:** three types of insects' specimen were collected for test sampling. These include Ants, Beetles and termites.

### Mixture of preparation

200ml of Neem seed oil was added to 30ml of water and 70ml of liquid soap which represents 66.44%, 10.07% and 23.07% respectively.

### Research question 1

What is the percentage composition of the developed preservatives?

Table 1: percentage composition of the developed preservative

S/No	Content	Percentage	Volume
1	Neem oil	66.44	200ml
2	Water	10.07	30ml
3	Liquid Soap	23.07	70ml
	Total	100	300ml

Table 1 above shows the composition of wood preservatives from neem and soap. The percentage of oil was 66.4% while water and soap was 10.07% and 23.49% respectively.

### Research question 2

What are the effects of developed preservatives on different types of insects?

The research question was answered using the data presented in the table 2 as follows

Table 2: Effect of preservatives on insects

S/No	Insects	No sprayed	No died	Survival time	Percentage died	Effect
1	Ants	12	12	15 seconds	100	Death of all
2	Beetles	13	6	25 seconds	46.15	Death of few
3	Beetles	13	8	30 seconds	61.53	Death of more
4	Beetles	13	12	40 seconds	84.62	Death of many
5	Termites	14	0	20 seconds	-	All inactive
6	Termites	14	12	35 seconds	85.7	Death of more
7	Termites	14	13	50 seconds	92.8	Death of many

Table 2 above shows the percentage rate at which the death of insect occurred after the application of the local preservative. The results show that 50seconds after application of the local preservatives many of the insects died except 1 termite. Item 1 shows that all the ants died representing 100% while 13 out of 14 termites died representing 92.8% the only termite left was already inactive and seems not surviving the condition. This is an indication that the preservative was effective on the three types of insect.

### Research question 3

What is the shelf life of the preservative?

The researcher collected 50ml of preservative sample and exposed it to atmospheric condition for a period of 28 days. 10 ml of the preservative was sprayed on the insects at an interval of 7 days. The results obtained are illustrated below.

**Table 3:** Average shelf life of the preservative.

S/No	Observable days	Av no of dead insects	% of dead insects	Rating
1	7days	41/45	91.1%	3.64
2	14 days	38/45	84.4%	3.37
3	21 days	33/45	73.3%	2.93
4	28 days	25/45	55.6%	2.22

The result in table three above shows that the active ingredient in the preservative was lost after 14 days of exposure with 84.4% of dead insects representing 3.37.

### Major findings

The major findings of the study were

1. The major local material used are Neem tree and local black soap.
2. The average percentage of the effectiveness of the preservative is 92.8%
3. The preservative was effective on targeted insects thereby proving its potency
4. The study shows that the local preservative is best for use within 7 to 21 days after production

### Discussion of Results

The discussion of findings for this study were organized and presented in line with the research questions. Analysis in table 1 shows the composition of developed wood preservative from neem and soap with 66.44% and 10.07% respectively. It implies that the highest percentage of oil make a potential wood preservative because of neem proven characteristics such as analgesic, insecticidal, fungicidal and bacteriocidal properties. The result in table 2 as regards research question 2 revealed that all 12 insects (ants) in item 1 died in less than 15 seconds after application of the developed preservative. This adjudged the preservative high effectiveness. Kovo (2006) in his study on characterization of insecticidal soap from neem oil is of the view that neem is a slow but sure killer of insects and pest.

The percentage of the dead insects in items 2-4 are 46.15, 61.53, 84.62 and 100%. This is an indication that the developed preservative acted gradually on the insects. Item 5 show that there was no death of any of the 14 insects (termites) within 20 seconds of application of preservative but most of them remain inactive. The percentage rate of insects in item 6 to 7 is 85.71 and 92.8 respectively. This shows that the percentage effectiveness of the preservative was high at 92.8%.

According to Gyesely (2004) shelf life span is the recommendation of time that product can be stored. During which the defined quality of specified of good remain acceptable under expected condition of distribution, storage and display. In line with Gyesley opinion items 1-4 in table 3 shows specifically the period of time by which the developed preservative was suitable. It was observed that preservative remain suitable for use 14 days after production with a percentage of dead insect representing 91.1%.

Anon (1981) the Nigerian neem plant is abundantly available in the northern and middle belt regions ad part of the southern area. The plant is also in the western part of Nigeria.

### Conclusion

This study was focused on development of preservative from locally sourced material (neem seed oil and local black soap (Ose Dudu) for the purpose of eliminating wood destroyer agents (insects) so as to protect wood from bacteria, fungi and insects attack. The following conclusions were drawn based on the findings.

1. The physical appearance of the oil was brown in color with garlic like odor
2. The efficacy of the developed preservative was tested and results shows that it took less than 30 minutes to exterminate all the 14 insects. It can be inferred that the developed preservative is effective.

### Recommendations

The following recommendations were based on the following findings of the study

1. The developed preservatives to be subjected to quality assessment by the standard organization of Nigeria (SON).

2. Collaborative local products straining centre to be established by Government and Nongovernmental organization (NGO) in all geo-political zones of the Federation.
3. Replanting or replacement of harvested timbers is very necessary to encourage availability of wood in abundance. This will encourage long time natural wood seasoning

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