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Full Length Research Paper

Effect of two local preservatives and solignum on *Triplochiton scleroxylon* (obeche) exposed to termites in Sokoto North-Western Nigeria

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Abstract

The study was carried out to investigate the performance of Euphorbia balsamifera (Aguwa) extract (LBI I) Khaya senegalensis (Madacci) bark mixed with Ocimum basilium (Dodoya) (LBI II) and Solignum on Triplochiton scleroxylon (Obeche). Non-pressure method (Brushing) was used in applying the preservatives. The treatment combination consisted of three treatments and a control replicated five times and laid out in randomized complete block design (RCBD). The wood was exposed to termite mound to test the efficiency of the preservatives on the wood species. Data obtained were analyzed using analysis of variance (ANOVA) at 5% probability level. The results showed that there were significant differences between the treatment p>0.05. Solignum treated samples had the lowest percentage weight loss of 19.8gm, followed by Aguwa extract (46.4g) and the control sample had the highest percentage weight loss of 217.1g. Based on the results, it can be concluded that Solignum and Aguwa extract were effective in reducing the biodegradation on Triplochiton scleroxylon (obeche) and are therefore recommended.

Keywords: Solignum, aguwa extract, performance, bio-insecticide, obeche and termite

INTRODUCTION

Wood is a valuable natural resource. It is widely available and relatively inexpensive in most areas. Wood has many uses because of its electrical and thermal conductivity, workability, beauty, density and strength. Unfortunately, wood is subject to attack by insects, bacteria, fungi and marine worms and if left unprotected in the landscape, wood deteriorates. Fortunately, some woods are naturally durable or resistant to deterioration (Pinyuh, 1995). Inner heartwood is more resistant than outer, more porous sapwood of all species. Because wood is porous or permeable, it can be protected for many years with preservatives.

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Wood being a hard, fibrous tissue has been used for centuries for both fuel and as a construction material for several types of living area such as houses (Briffa, 2008). It is an organic material, a natural composite of cellulose fibres (which are strong in tension) embedded in a matrix of lignin which resist compression. In the strict sense, wood is produced as secondary xylem in the stems of trees and other woody plants (Samuel, 2004). In a living tree it transfers water and nutrients to the leaves and other growing tissues, and has a supporting function, enabling woody plants to reach large sizes or to stand up for themselves.

Jerrold (2005), reported that wood is an extremely versatile material with a wide range of physical and mechanical properties; it is also a renewable resource with an exceptional strength to weight ratio. He further reported that wood is a desirable construction material

because the energy requirement of wood for producing a usable end product are much lower than those of competitive materials such as steel, concrete or plastics. Wood is the only self-regenerating building material that is extremely energy efficient (FAO, 2006). It can be used for several purposes ranging from household to industrial uses, and it has also been identified as a raw material for a number of industries (Opeyemi, 2001). Among the industries that depend on wood for production activities are sawmills, particle board, fibre board, plywood, furniture and pulp and paper. Wood and wood products are export commodities for some of the West African countries. Useful chemicals and byproducts can be obtained from wood. The products include animal feeds, adhesives, lacquers, turpentine, plastics, photographic film, rayon and artificial vanilla. Chemicals obtained from wood are used to give special properties to various materials, including explosives and concrete.

There are several attempts and approaches on termite control. In the past, research was on chemical methods of control with an obvious lack of concern over side effects caused by the use of these chemicals (Femi-ola et al., 2008). Researchers are now focused towards alternative non toxic and biological methods of control. These methods include baiting, extreme temperatures, barriers of various types and biological control. Naturally resistive woods and extractives have great promise for prevention of termite attack (Femi-ola et al., 2008). These extractives in form of phenolic compounds like terpenes and falconoid have insecticidal activities.

Of course, synthetic pesticides have some benefits, but they are also known to harm the environment and the plants and animals it controls. Therefore, there is need to develop an alternative method with low adverse effect on consumers and one that is less persistent to the environment. These facts influence researchers to develop interest in plants and plant products as sources of insecticides. Plants and plant products are useful and desirable tools in most pest management programs because they are effective and often complement the action of natural enemies..

METHODOLOGY

The study was carried out in Sokoto state. With a land area of 28,232.37 Square kilometers, the state is located between longitude 11° 13’ to 13° 50’ E and Latitude 4° to 6’ N. It is bordered in the North by Niger Republic, Zamfara State to the East and Kebbi State to the south and west (SSTG, 2010). It has a population of 4,244,399 (Census, 2006).

The Climate is dry sub-humid with mean annual rainfall and temperature of about 550mm and 34.9°C, respectively (Baba and Alhassan, 2011). There are two major seasons in the state namely wet and dry. The dry season starts from October and lasts up to April and may extend to May or June. The wet season on the other hand begin in most part of the state in May and last up to September or October (SSTG, 2010). The Harmattan, a dry cold and fairly dusty wind is experienced in the state between November and February. Heat is more severe in the State in March and April. However, the weather in the State is always cold in the morning and hot in the afternoons.

The Vegetation is Sudan savannah type which consists of few scattered trees and grasses that cover about 30% of the ground (Baba et al., 2005).

Experimental Procedure

The treatment combination consisted of four treatments and a control replicated five times and laid out in randomized complete block design (RCBD), the wood was exposed to termite mound (Termitaria) for a peiod of 12 months to test the efficiency of the preservatives on Obeche. The method used in applying the preservative was brushing - a non pressure method. The dried wood of Triplochiton scleroxylon were processed into test samples measuring 30cm (1ft) in length and 5cm x 5cm in width and breadth each. Fifteen defect free samples were selected. Five samples each were treated with Solignum, E. Balsamifera (Aguwa extract) (LBI 1), K. Senegalensis (Madocci) mixed with Ocimum bacilium (Dodoya) (LBI 11) and a control.

Experimental field was cleared, followed by staking of the sampling unit (treated and untreated wood samples) at random around the termite mound (termitaria) for a period of 12 weeks (Mailumo and Falemara, 2013). Data collected include, weight of the sample before and after applying preservation and weight of the sample after exposure to termite attack at two weeks intervals for a period of 12 weeks. The data were subjected to the analysis of variance (ANOVA). Means were separated using Duncan’s Multiple Range Test (DMRT), where significant differences exist.

RESULTS AND DISCUSSION

Effect of Solignum and Local Preservatives on Density Change in Termite Infected *T. sclexoxylon* (Obeche) Samples

From the results (Table 1) *Triplochiton sclexoxylon* treated with Solignum had a density of 338.38kg/m^3. This figure was only slightly affected by the treatment giving a final value of 338.78kg/m^3. This shows that there was a slight increase in weights after treatment of the sample as a result of preservative retention hence the slight increase in density. Similarly, Obeche treated with Aguwa extract (LBI II) had an initial density of 367.97kg/m^3 which

Table 1: Effect of Solignum and local preservatives on Density of termite infected *T. sclexoxylon* (Obeche) samples

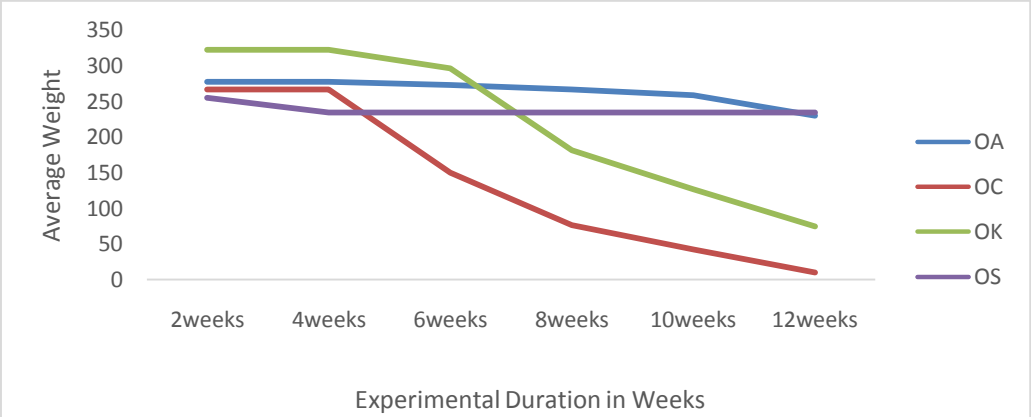
Treatment	Density (Kg/m^3)		Preservative retention (%)
	Initial	Final	
Solignum	338.38	338.78	0.4
LBI I	367.97	371.02	3.05
LBI II	421.58	407.68	13.9
Control	349.39	349.39	No change

Table 2: Effect of solignum and local preservatives on mean weight loss of termite infected *T. scleroxylon* (Obeche)

Treatment	Density (g)	Initial weight (g)	Final weight (g)	Mean weight loss (g)
Solignum	338.38	253.93±52.69	234.13 ±40.2	19.8 ± 44.67^b
LBI I	367.97	276.31 ± 71.8	229.87 ± 48.2	46.44 ± 23.59^b
LBI II	407.68	321.39 ± 80.96	74.49 ± 66.4	246.9 ±147.39^a
Control	349.38	266.54 ± 18.4	49.4 ± 1	217.14 ± 17.3^a

*Means in column with different superscript are significant at the 0.05 level (P<0.05).

Figure 1: Weekly Effect of solignum and local preservatives of termite infected *Triplochiton scleroxylon* (Obeche)



Key:
OA = Obeche treated with *E. balsamifera* (*Aguwa*) extract (LBI I)
OC = Obeche untreated samples (control)
OK = Obeche treated with *K. Senegalensis* (*Madacci*) mixed with *Ocimum bacilium* (*Dodoya*) extract (LBI-II)
OS = Obeche treated with Solignum.

shoot up to 371.02kg/m3 after treatment giving an increase of about 3.05kg/m3. Obeche treated with LBI-II, showed that increase in density was very high giving a value of 407.68kg/m3 which is about 13.91kg/m3 higher than the density value recorded after preservation (421.58kg/m3). Due to hygroscopicity of wood, the increase in density is normal. The increase is particularly higher, where the preservative is water borne. However, Obeche control treatment recorded no increase what so ever, thus remaining at 349.39kg/m3.

Effect of solignum and Local Preservatives on Mean Weight and Mean Weight Loss of Termite Infected *T. scleroxylon* (Obeche)

The effect of different wood preservatives on weight loss in Obeche wood exposed to termites (Coptotermes formosanus) is illustrated in Table 2. Solignum with the mean weight loss (19.8 ± 44.67) recorded the best preservative effect. This value is statistically different (P < 0.05)

Plate 1: Obeche treated with Solignum after exposure to termite

Plate 2: Obeche treated with Aguwa milk after exposure to termite

Plate 3: Obeche treated with Madocci+Dodoya after exposure to termite

Plate 4: Obeche untreated sample (Control)

compared to those treated with LBI II (246.9 ± 147.39) with a weight loss of 246.9 and the control (217.14 ± 17.3) but similar to those treated with LBI I (46.44 ± 23.59). This confirms the effectiveness of extract solutions in enhancing decay resistance of wood (Goktas, *et. al.*, 2007). This support the findings of Adegeye, *et. al.*, (2009) that also worked on *T. scleroxylon* and *Gmelina arborea* treated with kerosene and solignum in which similar weight loss was obtained. Similar findings were obtained from *Erythropleuns spp.* by Mailuma and Falemera (2003).

Weekly Effect of Solignum And Local Preservatives on Termite Infected *T. scleroxylon* (Obeche)

Figure 1 indicates that Obeche treated with LBI I remained constant from week 2 to week 10 and had slight fall from week 10 to week 12. Similarly, Obeche treated with Solignum suffered decline from week 2 to week 4 and then remain constant from week 4 to week 12, while Obeche treated with LBI II and the control treatment remain constant from week 2 to week 4 from where it continuous declining up to week 12. This confirms the effectiveness of extract solutions in enhancing decay resistance of wood (Gotkas, *et. al.,* 2007) and is in line with the findings of Adegeye *et. al.,* (2009) on *T. Scleroxylon* and *Gmelina arborea* treated with kerosene and Solignum. Similar results were obtained by Mailuma and Falemera (2003) on *Erythropleum suaveozens*. Conspicuously, the control had the highest weight loss compared to values recorded for treated samples. This is indicative of the high termite susceptibility of the untreated samples.

CONCLUSION

The major reason for preserving wood is to increase its life span and to improve its usefulness. The effectiveness of any wood preservative depend on the active ingredients of the preservative itself, also on the depth of penetration and relative properties of the wood being subjected to preservative treatment. The study revealed that *E. balsamifera* (Aguwa extract) (LBI II) and Solignum has a potential of reducing termite attack on tropical hardwoods. It is recommended that the use of bio-insecticides should be encouraged to cut costs and environmental hazards posed by conventional insecticides.

RECOMMENDATIONS

The use of locally available bioinsecticides like *E. balsamifera* (Aguwa extract) and *K. Senegalensis* (*Madacci*) mixed with *Ocimum bacilium* (*Dodoya* extract) can go a long way in solving problems of termites as well as other wood destroying biological agents in the study area. Looking at the cost of conventional chemicals like Solignum vis–a-vis the environmental hazards associated with their usage, one can only but recommend the use of locally available alternatives. Similarly, further research can exploit other locally available and environment friendly sources of protection for wood and wood products.

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