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RESISTANCE OF THREE NIGERIAN HARDWOODS TO DECAY CAUSED BY BROWN- AND WHITE- ROT BASIDIOMYCETES

A.C. ADETOGUN[1], O.M. AINA[1] O.Y.OGUNSANWO[2] AND A. O OMOLE[2]

[1]*Department of Forestry and Wildlife Management, University of Agriculture, PMB 2240 Abeokuta, Nigeria*
[2]*Department of Forest Resources Management, University of Ibadan, Ibadan.*
E-mail: kunletogun@yahoo.com

ABSTRACT

Assessment of resistance of untreated and n - hexane extract wood blocks of *Afzelia africana, Nesogordonia papaverifera* and *Tectona grandis* to decay caused by *Fomes lignosus, Lentinus lepideus* and *Gloephyllum trabeum* using percent weight loss was carried out .The study revealed that the durability of these wood species related primarily to the presence of the extractives in the heartwood. Removal of the extractive from the heartwood increases the susceptibility of the wood species to decay. The weight losses for *A. africana* were 56.3%, 58.1%, and 58.7% for *F. lignosus, L. lepideus* and *G. trabeum* respectively. *N. papaverifera* showed weight losses of 57.2%, 58.3% and 58.9% for *F. lignosus, L. lepideus* and *G. trabeum* respectively while *T. grandis* decreased in weight by 64.2%, 67.4% and 78.2% for *L. lepideus, G. trabeum* and *F.lignosis*, respectively.

Keywords: *Afzelia africana, Nesogordonia papaverifera, Tectona grandis, Fomes lignosus Lentinus lepideus, Gloephyllum trabeum,* Kolle-flask, weight loss

INTRODUCTION

Wood has grown in importance .to become a major structural material owing to its versatility as well as the potentials of its sustainable production. However biodegradation has also been a major limitation to the use of wood (FAO, 1986). There have been various attempts at proffering solutions to this problem and many success stories have been documented. In most of the breakthroughs, chemicals of both organic and inorganic origins have been used in wood preservation against agents of biodegradation The toxic effects of these chemicals on non-target components of the environment has been a source of concern to the environmentalist, hence, emphasis has been on the search for alternatives to the conventional wood preservatives.

Kamdem (1994) evaluated the extracts from

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durable wood species as potential sources of high value chemicals and concluded that these extractives present in highly decay resistant wood are toxic to some fungi and insects. Apart from the point of view of cost reduction, extracts, of organic origin are easily biodegradable and environment friendly.

The objective of this study was to assess the fungal decay resistance of the heartwood of *Afzelia africana, Nesogordonia papaverifera* and *Tectona grandis* when exposed to *Fomes lignosus* (kl) Bresadola (white rot) *Lentinus lepideus* (Frefr) Fr (brown rot) and *Gloephyllum trabeum* pers. Ex. Fr. (brown rot)

MATERIALS AND METHODS

Isolation of pathogens

All the three test fungi *Fomes lignosus*, *Lentinus lepideus* and *Gloephyllum trabeum* were isolated from the fruiting bodies obtained from the decayed logs found within the Botanical Garden of the University of Ibadan, Ibadan, Oyo- State. They were cultured on potato dextrose agar (PDA) which comprised 200g of peeled Irish potato, 17 g dextrose; 12g agar; and 1000ml distilled water (Adetogun, 1998).

Preparation of test blocks

Core planks (2.5cm x 30cm x 360cm) were obtained from the logs of *A. africana, N. papaverifera* and *T. grandis harvested* from Shasha Forest Reserve in South Western Nigeria. Test blocks, each 5x 2.5 x 1.5cm, were prepared from each plank. The blocks were randomly allocated to appropriate treatments with 60 test blocks used for each treatment per species. The 60 test blocks were coded according to species and intensively soxhlet-extracted with n-hexane for 24 hours. The codes were: EA. EN and ET.

where: EA = Extracted blocks of *Afzelia africana*

EN = Extracted blocks of *Nesogordonia papaverifera* and

ET = Extracted blocks of *Tectona grandis*

Another set of test blocks of each species without the removal of the extractives served as control. The blocks were coded UA. UN and UT

where: UA = Unextracted blocks of *Afzelia africana*

UN = Unextracted blocks of *Nesogordonia papaverifera* and

UT = Unextracted blocks of *Tectona grandis*

The two sets wood blocks were sterilized in the oven (Gallenkamp) for 18 hours at 103°C. The weight obtained after oven - drying was taken as the initial dry weight.

Test block infection

The treated blocks were conditioned in a dessicator for 2 weeks and then tested against brown and white-rot fungi in an agar test using Kolle-flask according to Adetogun (1998). Weight loss method was used to evaluate the decay resistance of the wood species against the wood-rotting basidiomycetes (Zabel and Morrell, 1993; Adetogun and Adegeye, 2000). The experiment was replicated five times.

At the end of 16 weeks, the test blocks were carefully removed from the Kolle flask and the adhering mycelia were carefully brushed off weighed to determine the wet weight. The blocks were then dried in the oven for a period of 18 hours at 103°C and weighed again to obtain the final dry weight. The weight loss was determined with the formula below:

$$\frac{\Delta w1 - \Delta w2}{\Delta w1} \times \frac{100}{1}$$

where: Δw1 - Initial dry weight

Δw2- Final dry weight

The means of the percentage weight losses were used to represent the degree of decay caused by the test fungi. The treatments were completely randomized, while the results of the two sets of wood blocks were compared using the 't' test at $P \leq .05$.

RESULTS AND DISCUSSION

Table 1 shows the percentage weight losses of the unextracted and extracted wood samples of *Afzelia africana, Nesogordonia papaverifera* and *Tectona grandis* after 16 weeks of incubation in *Fomes lignosus*, *Lentinus lepideus* and *Gloephyllum trabeum*. *A. africana* showed a very high resistance to the three test fungi used in the study. This was followed by *N. papaverifera,* which showed weight losses of 5.2, 8.7 and 10.3% after exposure to *F. lignosus*, *L. lepideus* and *G. trabeum* respectively. On the other hand. *T. grandis* showed weight losses of 9.2, 10.8 and 11.5%, respectively, after exposure to the three fungi.

The percentage weight losses of the extracted wood samples after 16 weeks of exposure to the test fungi show that all the tree species were badly decayed by the test fungi with *T. grandis* being the most susceptible. The weight losses ranged from 56.3 to 78.2%. *A. africana* showed weight losses of 56.3, 58.1 and 58.9%, respectively, after exposure to the fungi. *T. grandis* was badly decayed by these basidiomycetes, with respective weight losses after incubation of 64.2, 67.4 and 78.2%.
The results of this study reveal that *A. afzelia* exhibited a very good resistance to all the three fungi used, contrary to the findings Gbadegesin and Driver of (1987).The species is thus considered a durable wood and found to contain aromalendrin, kaempfrol, epiafzeliclin and afzelin, which confer natural resistance to decay (Leete, 1963).

The removal of the extractives from the wood in this study reduced the decay resistance of these wood species to the test fungi *A. africana, N. papaverifera* and *T. grandis* which have been reported to be resistant to decay succumbed to deterioration which is an indication that the durability status of the wood of these species is due to the extractives in the heartwood which are deposited during heartwood formation. However, the results of this study contradict earlier reports on the effect of *G. trabeum* on *T.grandis* (Gbadegesin and Driver, *1987). L .lepideus* and *G. trabeum* caused more weight losses in *A. africana* and *N. papaverifera* than the white rot fungus, because the brown rots are more aggressive than the white rot fungus (Zabel and Morrell, 1993). This agrees with observations by Kamdem (1994) on aspen blocks treated with heartwood formation. However, the results of this study contradict earlier reports on the effect of *G. trabeum* on *T.grandis* (Gbadegesin and Driver, *1987). L .lepideus* and *G. trabeum* caused more weight losses in *A. africana* and *N. papaverifera* than the white rot fungus, because the brown rots are more aggressive than the white rot fungus (Zabel and Morrell, 1993). This agrees with observations by Kamdem (1994) on aspen blocks treated with heartwood extracts. However, *F. lignosus* a white rotter caused more damage on *T. grandis* than the brown rotter The reason for this is that *F.lignosus* . has been reported to cause root rot diseases of *T. grandis*

In evaluating the natural durability of wood, efforts should be geared towards evaluating subtle effects such as variation in deposition of extractives in the wood or interaction between different extractives that also play roles in natural wood durability. This variation reflects both the genetic potential of a tree and the environmental conditions under which the tree is grown (Zabel and Morrell, 1993).

Table1: Percentage weight losses of extracted and unextracted test blocks of *A.africana*, *N.papaverifera* and *T. grandis* after 16 weeks of exposure to *F. lignosus*, *L. lepideus* and *G.trabeum* (means of 5 replicates).

Traits		% Weight loss		
		A.africana	*N. papaverifera*	*T. grandis*
F. lignosus	U	0.2	5.2	1.2
	E	56.3	57.2	78.2
L. lepideus	U	0.7	8.7	10.2
	E	58.1	57.2	64.2
G. trabeum	U	0.4	10.3	9.2
	E	58.7	58.9	67.4

- U- Unextracted
- E- Extracted

Student't' test at .05 = 0.24

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