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Assessment of Resistance of Selected Nigerian Wood Species Treated with Rocket Fungicide and *Mimosa pudica* Linn. extracts against fungal infestation

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Abstract: *The study investigated the resistance of three wood species—*Afzelia africana*,* Vitex doniana*, and* Irvingia gabonensis*—to fungal infestation after treatment with Rocket fungicide and* Mimosa pudica *extract. Wood samples measuring 30 mm × 30 mm × 70 mm were collected from a sawmill, dried at 103 ± 2°C for 24 hours, and then soaked in 500 ml of either* Mimosa pudica *extract or Rocket fungicide for 24 hours. The experiment was conducted as a 3 × 3 factorial design with three replicates per treatment. Moisture content, absorption, retention, and visual assessment tests were performed, and the data were analyzed using descriptive statistics and ANOVA to determine significant differences.Results showed that* Vitex doniana *had the highest moisture content at 55.30%, followed by* Afzelia africana *at 38.45%, while* Irvingia gabonensis *had the lowest moisture content of 12.79%. Absorption rates varied significantly among species and treatments, with* Irvingia gabonensis *exhibiting the highest absorption ranging from 85.71% (treated with* Mimosa pudica*) to 80.16% (treated with Rocket fungicide). In contrast,* Vitex doniana *had the lowest absorption rate of 27.17% when treated with* Mimosa pudica*. Retention rates followed a similar pattern;* Irvingia gabonensis *showed the highest retention of 79.74 kg/m³ with* Mimosa pudica *treatment and 73.74 kg/m³ with Rocket fungicide, while* Vitex doniana *had the lowest retention of 23.46 kg/m³ with Rocket fungicide. ANOVA results confirmed a significant interaction effect between wood species and treatment method on both absorption and retention ($p < 0.05$). Visual assessments corroborated these findings, revealing better fungal resistance in wood treated with* Mimosa pudica *compared to Rocket fungicide. The study concludes that Mimosa pudica is a more effective organic preservative than Rocket fungicide for enhancing wood durability against fungal infestation. It is recommended that extension education programs promote the use of organic preservatives to improve wood preservation practices and encourage sustainable use of indigenous wood species.*

Keywords: *Preservation, Afzelia africana, Vitex doniana, Irvingia gabonensis, preservatives.*

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1.0 Introduction

Wood is one of the most widely used natural resources, valued for its versatility, availability, and role in construction, furniture production, and local economies. However, its biological origin makes it susceptible to degradation, especially in environments with high humidity. In tropical regions such as Nigeria, fungal rot is a persistent challenge that significantly impairs the structural integrity, durability, and economic value of wood products (Juan *et al.*, 2023). The warm and moist conditions in raditionally been used to preserve wood, but growing environmental and health concerns have driven interest in eco-friendly alternatives. One such option is Rocket (*Eruca sativa*), which is known for its high content of glucosinolates and isothiocyanates—compounds with proven antifungal properties (Marwat and Rehman, 2016). These bioactive compounds act by disrupting fungal cell walls, inhibiting spore germination, and impairing vital enzymatic functions necessary for fungal survival. Another promising plant-based treatment is *Mimosa pudica*, a sensitive plant that contains a broad spectrum of antifungal phytochemicals including alkaloids, flavonoids, tannins, and saponins. These these environments create ideal circumstances for fungal growth and proliferation, leading to decay, discoloration, and loss of mechanical strength.

Among the commonly used hardwood species in Nigeria are *Afzelia africana*, *Vitex doniana*, and *Irvingia gabonensis*. *Afzelia africana*, locally known as "Ubia," is a valuable tropical hardwood prized for its strength and resistance to wear. However, it is not immune to fungal attack, which threatens its longevity and economic utility. Similarly, *Vitex doniana*, also known as African black plum and referred to as 'Ojo' by the Yoruba people, plays a significant socio-economic role in sub-Saharan Africa. It has traditionally been used for its edible fruits, medicinal properties, and durable timber (Dharani *et al.*, 2022). Indigenous communities have relied on this species for treating fever, wounds, and digestive ailments, and it is often integrated into agroforestry systems due to its adaptability. *Irvingia gabonensis*, commonly referred to as bush mango or African mango, is native to the tropical woodlands of West and Central Africa and is notable for its nutritious fruits and seeds (Iponga *et al.*, 2018). Beyond its economic importance in food systems, the tree contributes to soil fertility, biodiversity conservation, and serves as a source of durable construction wood.

Chemical fungicides have

compounds not only interfere with the fungal cell membrane integrity but also induce oxidative stress within fungal cells, ultimately leading to cell death. The antifungal potential of *Mimosa pudica* has been explored in medical and agricultural contexts, but its application in the wood preservation industry remains under-researched and largely untapped.

Despite existing literature on the individual antifungal properties of *Eruca sativa* and *Mimosa pudica*, there remains a **significant knowledge gap** in understanding their efficacy in preserving indigenous hardwood species against fungal infestation. In particular, there is limited comparative analysis of these natural treatments in relation to commonly used synthetic fungicides, and their interaction with specific wood species is yet to be clearly elucidated. This gap is particularly critical in Nigeria, where wood degradation has both economic and environmental implications, and where access to sustainable preservation methods is essential.

Therefore, the aim of this study is to assess the resistance of selected Nigerian wood species—*Afzelia africana*, *Vitex doniana*, and *Irvingia gabonensis*—when treated with Rocket fungicide and *Mimosa pudica* extract against fungal infestation. The research further evaluates absorption and retention characteristics of these treatments to determine their effectiveness across different wood types.

The **significance of this study** lies in its potential to provide a scientifically validated, low-cost, and environmentally friendly alternative to chemical wood preservatives. By leveraging the antifungal properties of local plant resources, the findings will support sustainable forestry practices, promote the use of organic preservatives, and offer viable solutions to wood decay in humid tropical environments. This could benefit local communities, wood-based industries, and environmental conservation efforts, while also contributing to broader goals of reducing dependence on synthetic chemicals and enhancing natural product-based innovation in wood preservation.

1.1 Study Area

The research was carried out at the general laboratory of School of Agriculture and Agricultural Technology (SAAT), Federal University of Technology, Owerri (FUTO) in Imo State, Nigeria. Federal University of Technology, Owerri (FUTO) is located in Owerri West Local Government Area of Imo State, Nigeria, between latitudes 5^{0}28~34.7160"N and longitudes 7^{0}1~33.0708"E. Owerri has a humid tropical climate with two distinct seasons—dry and wet—with an average annual rainfall of roughly 2500 mm and a mean annual temperature of 29^{0}C. The rainy season has a high relative humidity.

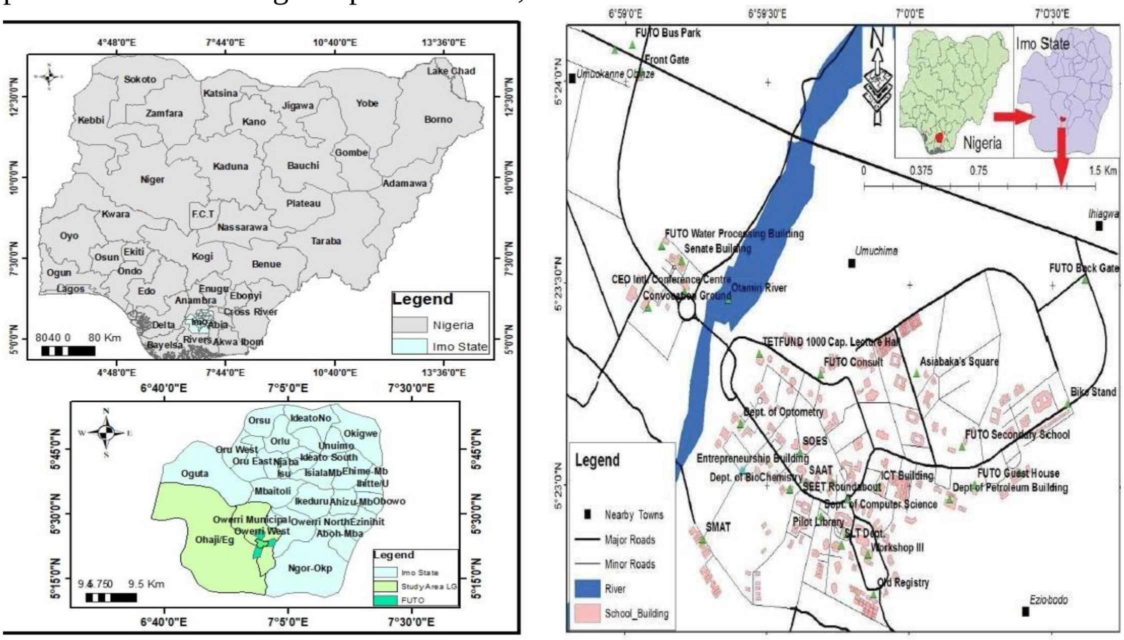

Fig. 1: Map showing study area.

2.0 Materials and Methods

2.1 Procurement and Preparation of Experimental Materials

Three wood species, namely, *Afzelia africana*, *Vitex doniana*, and *Irvingia gabonensis*—were procured from a timber market in Owerri, Imo State, Nigeria. Rocket fungicide and Potato Dextrose Agar (PDA) were obtained from reputable chemical and laboratory equipment shops in Owerri.

2.1.1 Preparation of Mimosa pudica Extract

Mimosa pudica extract was prepared following the procedure described by Zhang (2018). Fresh leaves of *M. pudica* were harvested, shade-dried, and ground into a fine powder. A total of 45 g of the powdered material was soaked in 500 mL of ethanol for 48 hours with intermittent shaking. The mixture was then filtered using Whatman No. 1 filter paper to remove plant residues, and the filtrate was stored in an airtight container for use as a preservative.

2.1.2 Sample Labeling and Pre-treatment Procedures

All wood samples were cut into uniform blocks and labelled according to the wood species and type of preservative treatment. The initial weights (W_0) of the samples were determined using a precision weighing balance. The samples were then oven-dried at 103 ± 2°C for 8–10 hours until constant weight was achieved, after which the oven-dry weights (W_1) were recorded.

2.1.3 Treatment Procedure

The preservatives—Rocket fungicide, *M. pudica* extract, and a control (no treatment)—were each used to treat three replicates per wood species. The wood samples were dipped in their respective preservatives for 24 hours to ensure absorption. After treatment, the samples were weighed again (W_2) to determine the weight gain. Treated samples were conditioned for 72 hours under laboratory conditions to stabilize before exposure to fungal attack.

2.1. 4 Fungal Inoculation

The fungus *Aspergillus fumigatus* was cultured on Potato Dextrose Agar (PDA) in Petri dishes under aseptic conditions. After sufficient growth, the cultured fungus was introduced to the treated and untreated wood blocks in enclosed transparent containers. Each container was maintained under laboratory conditions for 8 weeks to allow for fungal colonization. After the exposure period, the wood blocks were carefully removed, cleaned of fungal mycelium, and weighed to obtain the final weight (W_3).

2.2 Data Collection and Measurements

2.2.1 Moisture Content (Before Treatment)

The moisture content of each wood sample was determined using the following formula (Owoyemi et al., 2020):

$$\text{Moisture content (\%)} = \frac{W0-W1}{W1} \times 100 \quad (1)$$

2.2.2 Preservative Absorption (After Treatment)

Preservative absorption was calculated according to ASTM D2395-2014el:

$$\text{\% Absorption} = \frac{W2-W1}{W1} \times 100 \quad (3)$$

2.2.3 Preservative Retention

Preservative retention was also calculated using ASTM D2395-2014el as follows:
Retention=G·CV×100(3)\text{Retention} = \frac{G \cdot C}{V} \times 100 \tag{3}Retention=VG·C×100(3)

$$\text{Retention} = \frac{GC}{V} \times 100 \quad (4)$$

$G = W_3 - W_1$, C = is the quantity of the treating solution and V = volume of the wood samples (cm^3)

2.2.4 Weight Loss Due to Fungal Infestation

The extent of fungal degradation was quantified by measuring weight loss after 8 weeks using ASTM D2395-2014el:

$$\text{\% Weight loss} = \frac{W2-W3}{W2} \times 100 \quad (5)$$

where. W_0 = Initial weight of the wood samples before oven drying (g), W_1 = Oven dry weight of sample (g), W_2 = Conditioned weight after preservative treatment (g) and W_3 = Final weight after fungi exposure (g).

2.3 Data Analysis

All data obtained for absorption, retention, and weight loss were subjected to descriptive statistical analysis. Differences among the treatment groups and wood species were tested using Analysis of Variance (ANOVA). Where significant differences were observed, the Duncan Multiple Range Test (DMRT) was used for post-hoc comparisons at a 5% level of significance.

3.0 Results and Discussion

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3.1 Moisture Content

According to the results presented in Fig. 2, *Vitex doniana* exhibited the highest moisture content (55.30%) among all the wood samples tested, while *Irvingia gabonensis* had the lowest moisture content at 12.79%. The analysis of variance (ANOVA) in Table 1 shows a statistically significant difference ($p < 0.05$) in moisture content among the different wood species. This indicates that moisture content is largely influenced by the inherent properties of each wood species.

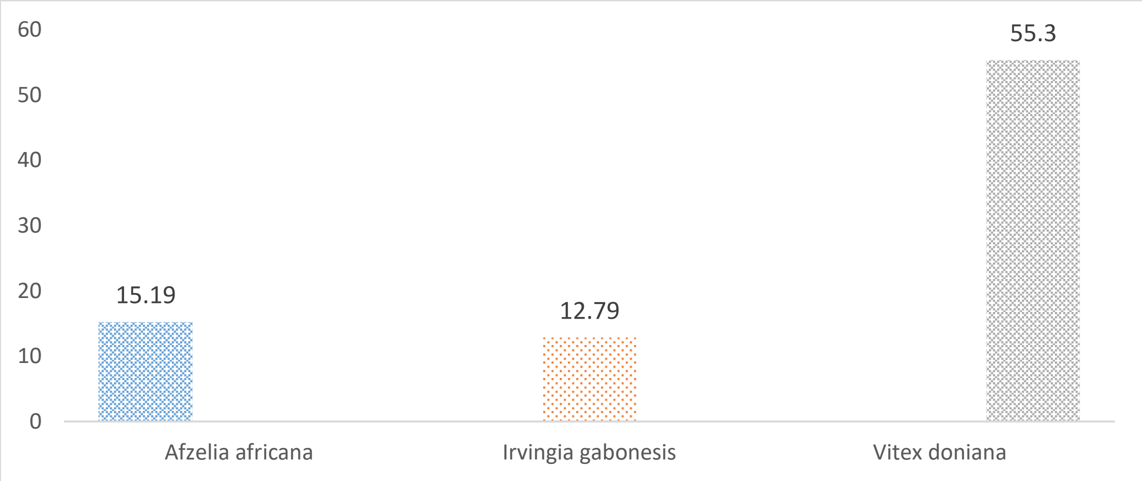

Fig. 2: Percentage moisture content of wood samples

Table 1: ANOVA for moisture content among wood species

Source of Variation	SS	df	MS	F	p-Value	F crit
Rows	159.7536	1	159.7536	54.91985	0.017726	18.51282
Columns	2849.894	2	1424.947	489.8991	0.002037	19
Error	5.8177	2	2.90885			
Total	**3015.465**	**5**				

***Note*: *p* < 0.05 indicates significant differences**.

3.2 Percentage Absorption

Table 2 presents the percentage absorption values of two preservatives, namely, ocket Fungicide **and** Mimosa pudica extract—across the three wood species. For *Afzelia africana*, absorption was higher with *M. pudica* (59.02 ± 1.17%) compared to Rocket Fungicide (51.14 ± 3.79%), with a mean of 55.08 ± 4.89%.

Irvingia gabonensis showed the highest absorption overall, especially for *M. pudica* (85.71 ± 9.68%), indicating a higher porosity or favorable chemical structure for preservative uptake. *Vitex doniana*, in contrast, had the lowest absorption rates for both *M. pudica* (27.17 ± 0.60%) and Rocket

Fungicide (28.72 ± 1.26%), yielding a mean absorption of 27.94 ± 1.25%.

These results suggest that *Vitex doniana* is less permeable to preservatives compared to the other species. The relatively low standard deviations across all measurements highlight consistency and reliability in the absorption data. ANOVA analysis confirmed that wood species had a significant effect ($p < 0.05$) on absorption, while treatment type did not show a statistically significant influence ($p = 0.107$).

Table 2: Percentage absorption of wood samples

Wood Species	Treatment	Mean ± SD
Irvingia gabonensis	*M. pudica*	85.71 ± 9.68
	Rocket Fungicide	80.16 ± 6.20
Vitex doniana	*M. pudica*	27.17 ± 0.60
	Rocket Fungicide	28.72 ± 1.26
Afzelia africana	*M. pudica*	59.02 ± 1.17
	Rocket Fungicide	51.14 ± 3.79

3.3 Percentage Retention

Retention values followed a similar trend as absorption. *Irvingia gabonensis* recorded the highest retention for both preservatives—79.74 ± 7.79% for *M. pudica* and 73.74 ± 6.85% for Rocket Fungicide. *Afzelia africana* showed moderate retention, while *Vitex doniana* had the lowest values: 25.82 ± 7.10% and 23.46 ± 0.20% for *M. pudica* and Rocket Fungicide respectively.

Table 3: Percentage retention of wood samples

Wood Species	Treatment	Mean ± SD
Irvingia gabonensis	*M. pudica*	79.74 ± 7.79
	Rocket Fungicide	73.74 ± 6.85
Vitex doniana	*M. pudica*	25.82 ± 7.10
	Rocket Fungicide	23.46 ± 0.20
Afzelia africana	*M. pudica*	53.35 ± 2.88
	Rocket Fungicide	48.42 ± 2.44

These findings confirm that *Irvingia gabonensis* is the most receptive to preservatives, making it suitable for applications where high retention is desired.

3.4 Percentage Weight Loss

Fig. 3 shows the percentage weight loss of wood samples after fungal exposure. Untreated samples experienced the highest weight loss. Among the treated samples, *Vitex doniana* showed the highest weight loss (18.31%) when treated with Rocket Fungicide, followed by *Irvingia gabonensis* (8.01%) and *Afzelia africana* (6.08%). Treatments with *M. pudica* extract resulted in lower weight loss across all species: 7.68% in *Afzelia africana*, 7.04% in *Irvingia gabonensis*, and 4.97% in *Vitex doniana*.

3.5 Visual Ratings of Fungal Decay

Figs. 4, 5, and 6 display the visual ratings of fungal attack on the treated wood samples over time. Fig. 4 (*Vitex doniana*) shows that samples treated with *M. pudica* displayed more pronounced fungal staining and slimy mold growth compared to those treated with Rocket Fungicide. Based on Fig. 5 (*Irvingia gabonensis*), it is indicative that from week 3, Rocket Fungicide-treated samples showed more fungal growth than those treated with *M. pudica*. However, based on Fig. 6 (*Afzelia africana*), rocket fungicide-treated samples exhibited greater discoloration and fungal decay, possibly due to its deeper penetration and reactive interaction with cell structures.

The wide differences in moisture content among the wood species are consistent with literature. *Vitex doniana* had the highest moisture content (55.30%), while *Afzelia africana* and *Irvingia gabonensis* had lower values (15.19% and 12.79%, respectively). These differences can significantly influence wood strength, stability, and preservative uptake (Glass & Zelinka, 2021).

The observed moisture content in *Afzelia africana* aligns with Aviara et al. (2019), who reported moisture ranges between 6.1% and 32.3%. Similarly, *Irvingia gabonensis* falls within the dry basis range (7.52–20.60%) as confirmed by the same study. However, the moisture content of *Vitex doniana* (55.30%) does not align with existing literature and may be attributed to procedural deviations, such as over-drying beyond the standard 3 hours at 105°C (Charles & Mgina, 2023).

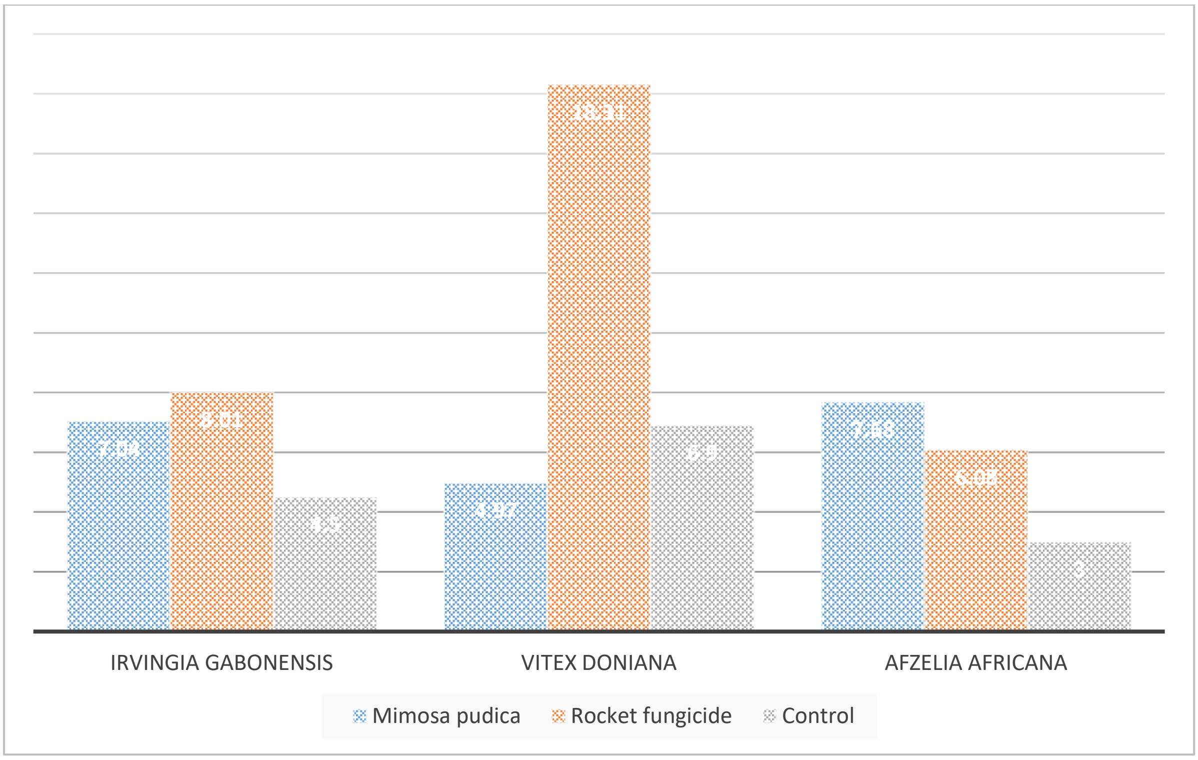

Fig. 3: **Percentage weight loss of wood species**

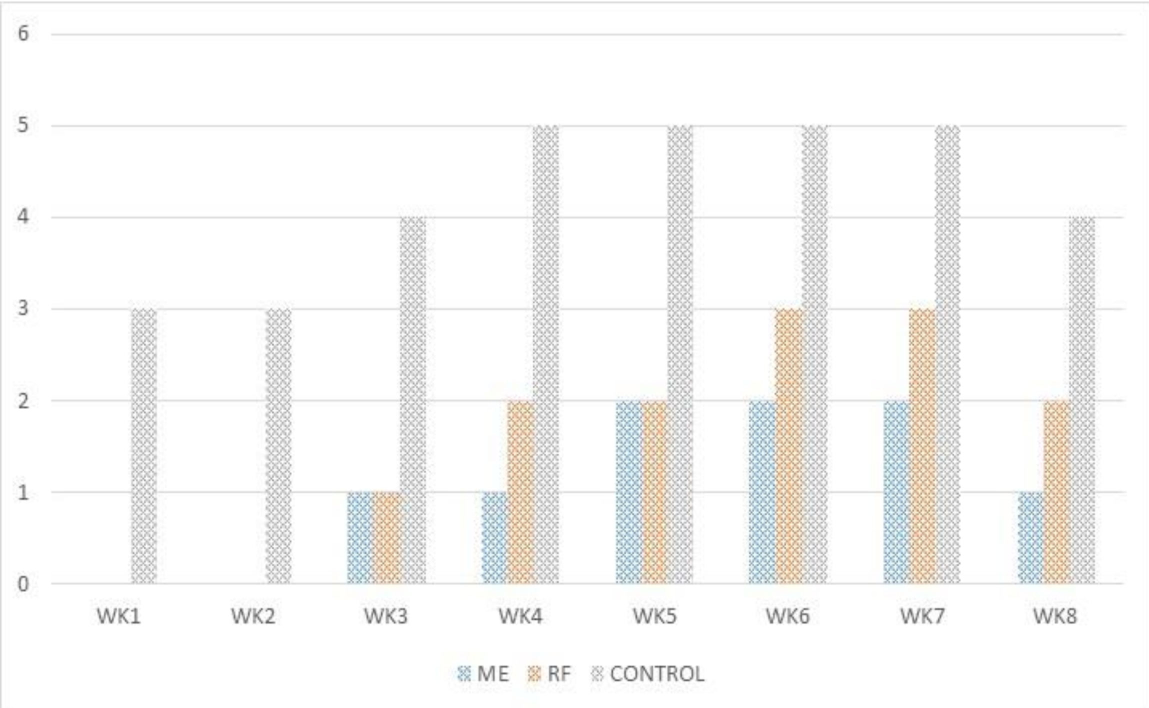

Fig. 4: Visual rating of *Vitex doniana.* ME: *Mimosa pudica* extract. RF: Rocket fungicide

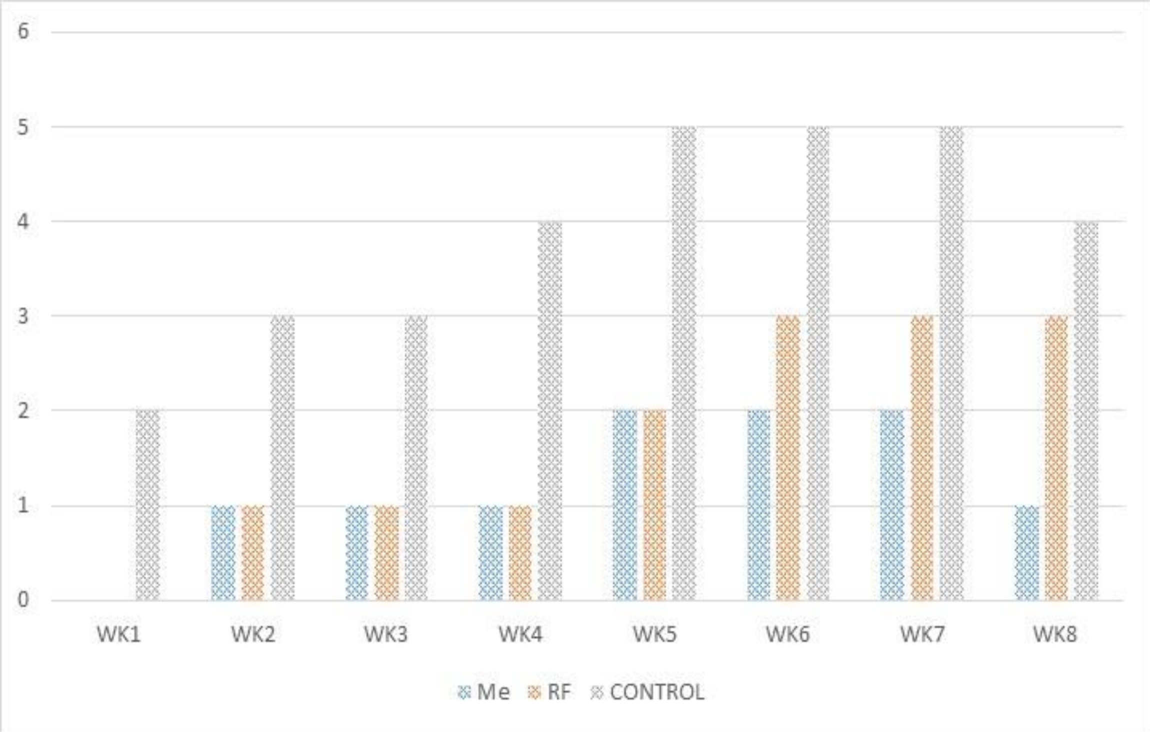

Fig. 5: Visual rating of *Irvingia gabonensis.*

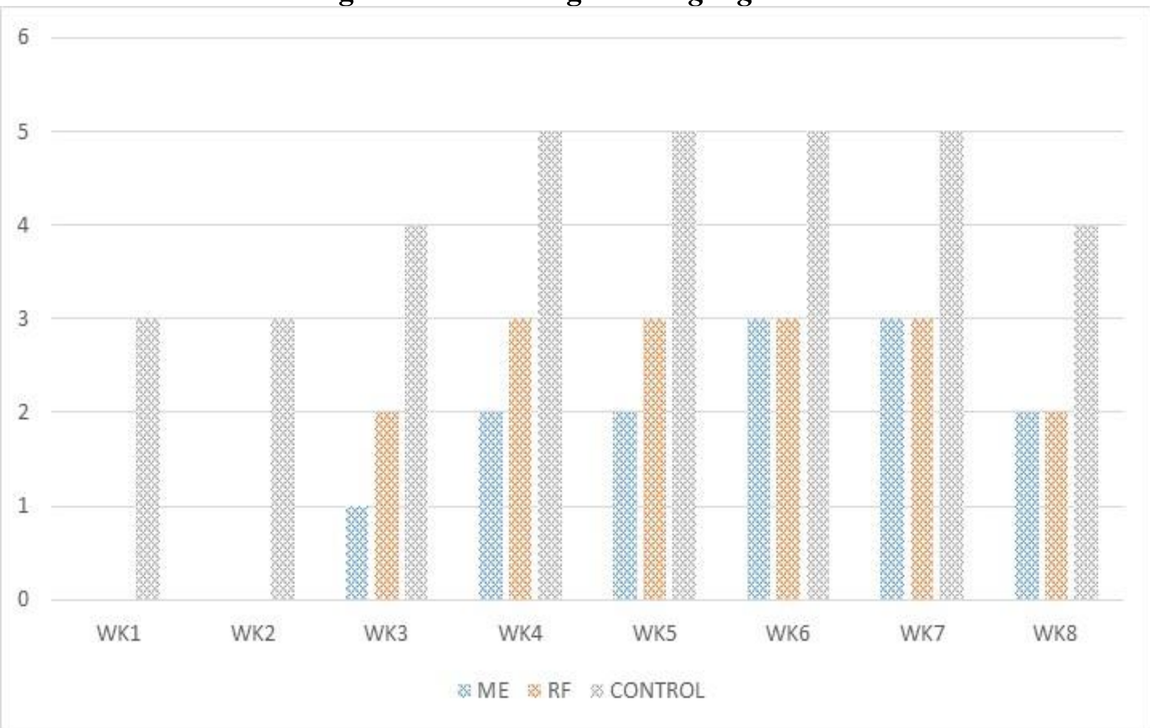

Fig. 6: Visual rating of *Afzelia africana*. ME: *Mimosa pudica* extract. RF: Rocket fungicide.

In terms of preservative absorption, *Irvingia gabonensis* consistently demonstrated superior performance, likely due to its porous structure and favorable chemical properties. The relatively small standard deviations validate the consistency of the absorption data. ANOVA confirmed that absorption varied significantly with wood species but not with treatment type, indicating species-specific affinity rather than treatment efficacy alone.

The retention values also follow this trend, reinforcing the suitability of *Irvingia gabonensis* for preservative treatments.

Visual assessments further suggest that *M. pudica* was more effective in limiting fungal growth compared to Rocket Fungicide, particularly in *Afzelia africana* and *Irvingia gabonensis*. Rocket Fungicide tended to cause deeper discoloration and structural changes, possibly due to chemical reactivity.

Weight loss analysis supports these observations, as untreated samples decayed most rapidly, while those treated with *M. pudica* retained better structural integrity. Since cellulose is a primary target of fungal degradation, and is abundant in wood, higher cellulose content could correlate with greater susceptibility. These findings agree with Ogunjobi *et al.* (2014) who demonstrated the role of cellulose degradation in fungal-induced wood decay.

Table 4 presents the descriptive statistics of key wood properties assessed after treatment with *Mimosa pudica*, including moisture content, percentage absorption, percentage retention, and percentage weight loss. The statistics were calculated for each of the three selected wood species: *Afzelia africana*, *Vitex doniana*, and *Irvingia gabonensis*.

From Table 4, it is observed that *Vitex doniana* exhibited the highest moisture content (38.63%), absorption (23.44%), and retention (12.83%), while *Irvingia gabonensis* had the lowest moisture content (28.60%) and retention (8.96%) but recorded the highest weight loss (12.53%), indicating greater susceptibility to biodeterioration. In contrast, *Vitex doniana* showed the lowest weight loss (5.46%), suggesting superior preservative efficacy of *Mimosa pudica* on this species.

Table 5 provides the Pearson correlation matrix showing the strength and direction of relationships among the variables: moisture content, percentage absorption, percentage retention, and percentage weight loss across the wood samples

Table 4: Descriptive Statistics by Wood Species

Wood Species	Moisture Content (Mean ± SD)	% Absorption (Mean ± SD)	% Retention (Mean ± SD)	% Weight Loss (Mean ± SD)
Afzelia africana	34.90 ± 1.60	19.61 ± 0.80	10.56 ± 0.20	9.43 ± 0.31
Vitex doniana	38.63 ± 0.67	23.44 ± 0.75	12.83 ± 0.17	5.46 ± 0.33
Irvingia gabonensis	28.60 ± 0.75	17.92 ± 0.26	8.96 ± 0.07	12.53 ± 0.25

Table 5: Pearson Correlation Matrix

	Moisture Content	% Absorption	% Retention	% Weight Loss
Moisture Content	1.00	0.88	0.95	-0.96
% Absorption	0.88	1.00	0.95	-0.95
% Retention	0.95	0.95	1.00	-1.00
% Weight Loss	-0.96	-0.95	-1.00	1.00

Strong positive correlations were observed between moisture content, absorption, and retention ($r > 0.88$), indicating that more moisture facilitates better absorption and retention of the bio-preservative. Notably, weight loss was strongly negatively correlated with retention ($r = -1.00$), suggesting that increased retention of *Mimosa pudica* significantly reduces deterioration, supporting its bio-preservative efficacy.

Table 6 summarizes the ANOVA (Analysis of Variance) results used to determine whether there are statistically significant differences in moisture content among the three wood species after treatment.

The ANOVA results indicate a highly significant difference in moisture content among the wood species (p = 0.0001), suggesting that the species type influences the wood's capacity to retain moisture post-treatment. This variability may be attributed to inherent differences in porosity and structure among the woods, which affect treatment uptake.

Table 6: One-Way ANOVA on Moisture Content

Source	Sum of Squares	df	F-value	p-value
Wood Species	154.30	2	64.77	0.0001
Residual (Error)	7.15	6		

Table 7 reports the Tukey's Honest Significant Difference (HSD) post hoc test, performed to identify which specific pairs of wood species differ significantly in their moisture content.

The post hoc analysis confirms significant differences in moisture content across all wood species pairs. The most pronounced difference was between ***Irvingia gabonensis*** and ***Vitex doniana*** (mean difference = 10.03%), emphasizing the unique behavior of each wood type in response to *Mimosa pudica* treatment.

Table 7: Tukey's HSD Test for Moisture Content

Comparison	Mean Diff	p-adj	Lower CI	Upper CI	Reject
Afzelia africana* vs *Irvingia gabonensis	6.30	0.001	3.99	8.61	True
Afzelia africana* vs *Vitex doniana	-3.73	0.021	-6.04	-1.42	True
Irvingia gabonensis* vs *Vitex doniana	-10.03	0.001	-12.34	-7.72	True

Table 8 shows the effect size using Eta squared (η^2) for the moisture content analysis, which quantifies the proportion of variance explained by the species factor.

Table 8: Effect Size (Eta Squared) for Moisture Content

Variable	Eta Squared
Moisture Content	0.956

An eta squared value of 0.956 indicates that 95.6% of the variability in moisture content is accounted for by differences among wood species. This large effect size supports the ANOVA findings and reinforces the conclusion that wood species significantly influence moisture uptake and, by extension, the effectiveness of the bio-preservative.

The empirical results obtained from the study showed that the selected wood species (*Afzelia africana*, *Vitex doniana*, and *Irvingia gabonensis*) responded differently to treatment with *Mimosa pudica*. These variations observed in the experimental data were further confirmed and clarified through statistical analyses, which provided a more rigorous interpretation of the treatment's effectiveness.

For moisture content, the study revealed that *Vitex doniana* had the highest mean moisture content (38.63%), followed by *Afzelia africana* (34.90%), with *Irvingia gabonensis* recording the lowest value (28.60%). Statistical analysis using one-way ANOVA showed that this difference was highly significant (p = 0.0001), and Tukey's post hoc test further confirmed that the differences among all the species were statistically significant. Moreover, the eta squared value (η^2 = 0.956) indicated a large effect size, meaning that 95.6% of the variation in moisture content was attributed to differences among the wood species. This strong statistical support validates the experimental observation and highlights the influence of wood species on moisture uptake, which may, in turn, affect the efficiency of the bio-preservative.

In terms of absorption and retention, the empirical data showed that *Vitex doniana* absorbed and retained the most preservative solution, with values of 23.44% and 12.83%, respectively, while *Irvingia gabonensis* recorded the lowest values. The descriptive statistics supported this trend. Furthermore, Pearson correlation analysis demonstrated strong positive relationships among moisture content, absorption, and retention (with correlation coefficients above 0.88). This finding supports the conclusion that wood species with higher moisture content are more capable of absorbing and retaining the bio-preservative, indicating that species-specific anatomical or physiological properties significantly influence treatment outcomes.

Weight loss data further illustrated differences in resistance to biodeterioration among the wood species. *Irvingia gabonensis* suffered the highest weight loss (12.53%), suggesting poor resistance and less effective treatment, while *Vitex doniana* had the lowest weight loss (5.46%), indicating greater resistance and better preservative action. Statistical analysis confirmed this pattern, as Pearson correlation showed a perfect negative relationship between weight loss and retention ($r = -1.00$), and similarly strong negative correlations with moisture content and absorption. These results imply that higher levels of preservative retention are associated with reduced biodeterioration, reinforcing the conclusion that *Mimosa pudica* offers effective protection when the wood adequately absorbs and retains the treatment.

In summary, the patterns observed in the experimental data were strongly corroborated by the statistical analyses. The hierarchy of treatment effectiveness among the wood species—*Vitex doniana* being the most responsive, followed by *Afzelia africana*, and lastly *Irvingia gabonensis*—was consistently reflected in both sets of results. The high degree of agreement between the empirical and statistical outcomes affirms the efficacy of *Mimosa pudica* as an eco-friendly wood preservative. Statistical modeling added credibility and clarity to the findings, confirming that the wood species significantly affect preservative uptake and resistance to biodeterioration, thereby validating the overall conclusions of the study.

4.0 Conclusions

The study investigated the moisture content, absorption, and retention characteristics of three selected wood species—*Afzelia africana*, *Irvingia gabonensis*, and *Vitex doniana*—when treated with two different preservatives: Rocket fungicide and an extract from *Mimosa pudica*. The results showed significant variation in moisture content among the wood species, with *Afzelia africana* and *Vitex doniana* recording higher moisture levels, while *Irvingia gabonensis* exhibited the lowest moisture content, suggesting better dimensional stability. In terms of absorption, *Irvingia gabonensis* had the highest uptake of preservatives, followed by *Afzelia africana*, while *Vitex doniana* recorded the lowest values. Retention of preservatives followed a similar trend, with *Irvingia gabonensis* maintaining the highest levels, indicating its strong capacity to retain applied chemicals.

Statistical analysis using ANOVA and Duncan's multiple range test confirmed significant differences in the responses of the wood species to the preservatives, particularly in their moisture content, absorption, and retention capacities. Among the preservatives, *Mimosa pudica* consistently outperformed Rocket fungicide, significantly enhancing both absorption and retention across the wood species. This suggests that *Mimosa pudica* may be a more effective and environmentally friendly alternative for wood preservation, especially in enhancing the service life and durability of imber in structural and industrial applications.

The findings also revealed that each wood species responded differently to the preservative treatments, underscoring the importance of species-specific approaches in wood preservation practices. *Irvingia gabonensis*, with its superior absorption and retention characteristics, may be more suitable for long-term applications requiring high durability, despite its lower natural moisture content. *Afzelia africana*, with moderate absorption and retention, demonstrated adequate responsiveness to treatment, while *Vitex doniana*, despite lower preservative uptake, may still benefit from optimized treatment protocols, particularly with *Mimosa pudica*.

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Compliance with Ethical Standards Declaration

Ethical Approval

Not Applicable

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The authors declare no known competing financial interests

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Data shall be made available on request

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The authors declare no conflict of interest

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