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TERMICIDAL PROPERTIES OF *Schizachyrium exile* (Hochst) EXTRACTS ON *Daniellia oliveri* AND *Parkia biglobosa* WOOD SAMPLES

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SUMMARY

***Schizachyrium exile was investigated for its termicidal properties on Daniellia oliveri and Parkia biglobosa woods using test woods processed into 2x2x6 cm dimensions.* Root and stem s of *S. exile* extracted in three solvents N-hexane, methanol, and ethyl acetate separately were used for the trial. Root and stem extracts of *S. exile* at *1*.2 %, 0.6 % and 0.3 % c*concentrations* were used to treat woods by immersion for 24 hours. The trial was set-up in a termitarium using Completely Randomized Design (CRD) with three replicates. The trial consisted of a total of 12 treatments with each solvents as positive checks and untreated wood samples as the control. Results showed that *D. oliveri had significantly higher* percentage absorption of extracts (46.53 and 45.27 %) *using both root and stem extracts of S. exile* while it was lower *(*45.27 % and 36.51 %) in *P. biglobosa wood samples*. Higher percentage retention of extracts (5.90 % and 6.34 %) was observed in *D. oliveri* treated with root and stem extracts compared to *P. biglobosa with* lower retention (4.94 % and 4.99 %) for both root and stem extracts respectively. Termites' infestation on *D. oliveri* and *P. biglobosa* wood samples commenced one and two months' post treatment respectively. Percentage weight loss in wood samples was highest (100 %) in *D. oliveri* and *P. biglobosa wood samples treated with* only solvents (positive check) and untreated wood samples (control). Percentage weight loss was lower in wood treated with 1.2 % concentrations. The study revealed that 1.2 % concentration of all extracts were the most effective against termite infestation.**

Keywords: Termites, extracts, wood, weight loss

Wood, serving as a renewable natural source, holds a significant position in the global economy, especially within the realms of construction and furniture industries. It is a cellular and renewable natural resource. It possesses outstanding strength-to-weight characteristics and comes at a relatively low cost. It is utilized in the creation of botanical composite materials. Wood has distinctive structural and chemical attributes that make it appealing for a diverse range of end users. Its applications span various purposes, including roofs, ceilings, furniture, doors, and windows (3).

Termite attacks have compromised the strength, durability, and aesthetic appeal of wood. It poses a significant threat, damaging both crops and structural materials and even electric cables, leading to substantial financial losses annually. There are reported termite species globally, with 185 recognized as pests (19). Termites are capable of attacking both living trees and wood, acting as a formidable devouring force that degrades wood and cellulose in terrestrial environments. Remarkably, termites can inflict damage on a wide array of materials, including paper, fabrics, wooden structures, and even non-cellulose substances like asphalt, asbestos, bitumen, lead, and metal foils (13). Furthermore, termites inflict significant harm to a variety of crops, including wheat, sugarcane, paddy, cotton, groundnut, maize, and soybean (16).

Research has shown that certain plants have developed specific defense mechanism such that secondary metabolic pathways produce metabolites that may be toxic to parasites or act as repellents against pest invasions. Over the years, use of synthetic pesticides has not effectively controlled termite infestations but rather led to various toxicities in ecosystems. The discovery of plant defense systems and phytochemicals has opened up new avenues in the fields of medicine and pestology (10). The consensus is that substituting persistent synthetic pesticides with biodegradable compounds derived from living systems can help mitigate the adverse environmental effects associated with synthetic pesticides. Plants offer a diverse array of phytometabolites, some of which serve as pesticides or insecticides to address pest resistance (8;15).

Schizachyrium exile (Hochst.) Pilg (1917) belonging to the Family Poaceae is a slender annual grass with erect culms growing 60-120 cm tall (2). It is called 'Acho' in Tiv language in Nigeria. *Schizachyrium exile* thrives in Nigeria and throughout tropical Africa, with a plentiful presence along roadsides and field edges. The matured *S. exile* is widely used for making coarse matting, for thatching and being chopped up and mixed with mud for use as a building material (2). In Benue, *S. exile* is commonly utilized for thatching in Benue State and exhibits resistance to termite attacks. Despite its significance as a thatching material among Tiv communities in Benue State, the antitermic or pesticidal properties of *S. exile* have not been thoroughly investigated.

Biological control measures, being cost-effective and easily accessible, are highly favored in termite management. As a result, there is ongoing evaluation of environmentally friendly treatments and naturally resistant plant species. This research focuses on exploring the termicidal properties of *S. exile*, aiming to develop an efficient biopesticide formulation that acts as a repellant and toxin against termite infestation.

MATERIALS AND METHODS

Study Area

The research was conducted at the Federal University of Agriculture, Makurdi (FUAM) (latitude 8°35'E and 8°41'E and Longitude 7°45'N and 7°52'N). The topography of the area features gentle hills, clay soils, and a tropical climate with distinct rainy and dry seasons. The vegetation is predominantly guinea savannah, and the fertile land supports extensive arable cropping and animal rearing. Common trees in the region include *Daniellia oliveri, P. biglobosa, Vitellaria paradoxa, Vitex doniana, Prosopis africana,* and *Azadirachta indica* (11). The population consists mainly of rural farmers who rely on farming for sustenance, cultivating crops such as maize, millet, benniseed, rice, cassava, and yam. Additionally, they raise animals like sheep, goats, pigs, and poultry (3). See Figure 1 for a map of Makurdi town indicating the location of the University of Agriculture Makurdi.

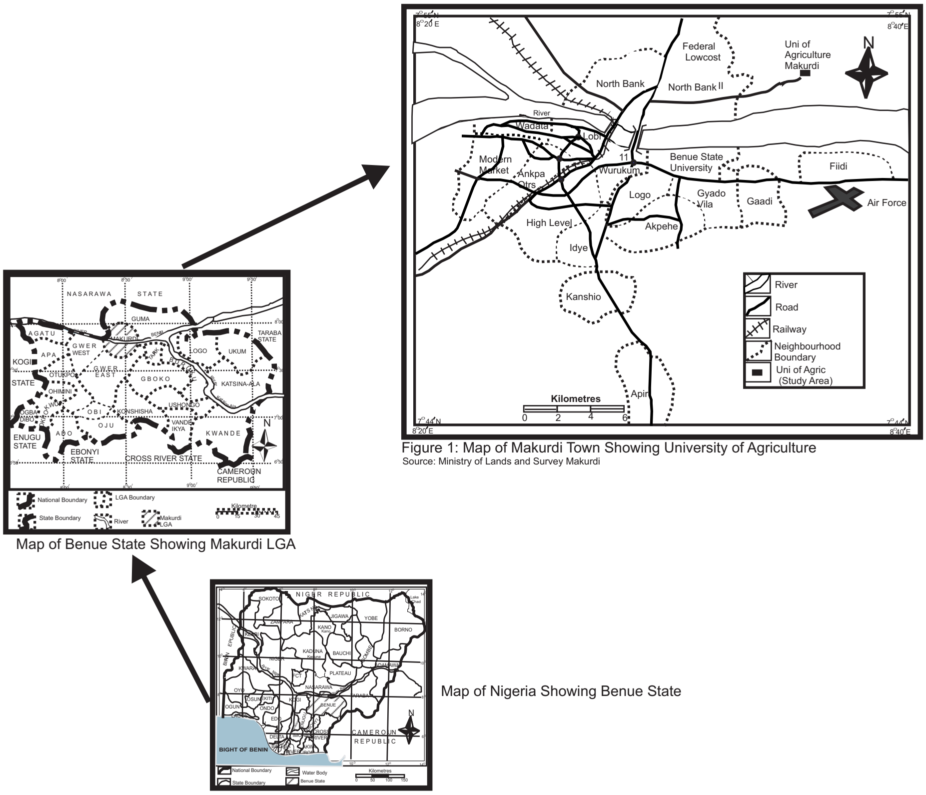

Figure 1: Map of Makurdi Showing University of Agriculture.
Source: Ministry of Land and Survey Makurdi

Collection of Materials

Schizachyrium exile was sourced from Mbatyav in Gboko Local Government Area of Benue State, while wood samples of *D. oliveri* and *P. biglobosa* were acquired from a Timber Shed in Makurdi, Benue State. These samples were then prepared into dimensions of 2 cm x 2 cm x 6 cm, considering width, breadth, and length.

Preparation of Extracts

S. exile underwent thorough washing under running tap water, followed by a rinse with distilled water to eliminate any dirt. After air drying, it was pulverized into a powder using a clear pestle and mortar, as outlined by Muktar and Tukur (2000). Extracts were then prepared utilizing ethyl acetate, N-Hexane, and Methanol solvents. Two grams of *S. exile* powder (stem/leaves and root) were combined with 1000 mL of each solvent, allowing for the extraction of secondary metabolites. The mixture was subjected to shaking at 24-hour intervals for a total of 72 hours, followed by filtration and solvent evaporation. The resulting extract was stored at 4ºC.

Plate 1:

A. Pulverized *S. exile*

B. Processed wood samples for experiment

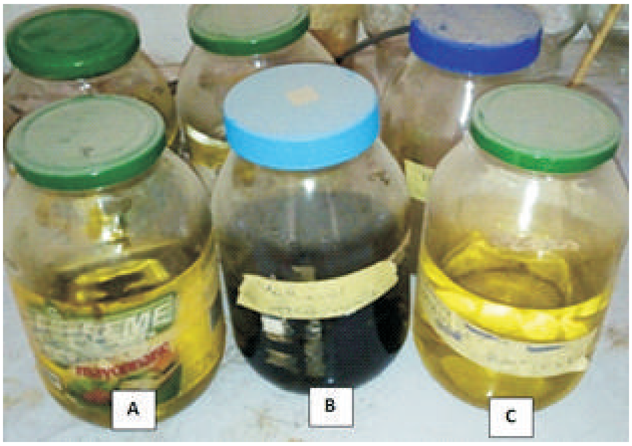

Plate 2:

A. **_S. exile_ root extract in front and stem ethyl acetate extracts at the back**

B. **_S. exile_ stem in front and root methanol extracts at the back**

C. **_S. exile_ root in front and stem N-hexane extracts at the back**

Experimental Design

The treated wood samples were arranged in a Completely Randomized Design (CRD) involving 2 wood species (*D. oliveri* and *P. biglobosa*), 3 solvents (N-hexane, methanol, and ethyl acetate) as positive control and untreated wood (negative control). In other words: [Solvent =3, plant parts = 2, wood type = 2, concentrations = 3 (+) and 1 (-) = 4, replicates = 3. Hence, the total treatments were = 3x2x2x4x3 = 144] treatments. In sum, 288 pieces of wood samples were utilized for the the study. The test wood samples were then buried at a depth of 10 cm in a graveyard experiment, which spanned a period of 5 months. The spacing between treatment holes was 3 m, and there was a 1 m gap between replicates, following the methodology outlined by (3).

Wood Treatments

Double serial dilution was employed on *S. exile* extracts by dissolving them in methanol solvent to achieve concentrations of 0.3%, 0.6%, and 1.2%. Wood samples were then treated by immersing them in three different concentrations (0.3%, 0.6%, and 1.2%) of root and stem/leaves extracts for 24 hours. Subsequently, the treated wood samples were dried for an additional 24 hours before being subjected to the field experiment. The absorption and retention of the extracts by the wood samples were calculated using the following method

Determination of percentage absorption and retention of extracts in test wood samples.

$$\text{Absorption } (kgm^{-3}) = \frac{1000\,(G)}{V} \text{----------1}$$

$$\text{Retention } (kgm^{-3}) = \left[\frac{(G \times C)}{V}\right] \times 10 \text{ ------2}$$

Where:

G= (w_2-w_1) = amount of the treating solution absorbed by the wood samples (g);

V = volume of wood sample (cm^3); and

C = is the concentration level of the solution or extracts.

Data Collection

Wood samples underwent inspection and evaluation on a monthly basis over a 5-month period to detect any signs of termite attack. During each visit, specimens were extracted from the soil, cleaned, and then assessed for termite activity using the following criteria:

(a) Incidence of termite attack – it was recorded as:

- No attack and,

+ Attack.

(b) Severity of termite attack -this was recorded by weighing the wood sample using the equation below:

Percentage weight loss =

$$\frac{W_1 - W_2}{W_1} \times 100 \text{ ------3}$$

Where:

W_1= is the dry weight before attack exposure test,

W_2= is the dry weight after attack test.

Plate 11: Test Wood samples after exposure to Termite

Data Analysis

The data obtained from the experiments were subjected to analysis using one-way Analysis of Variance (ANOVA) along with descriptive statistics. In cases where significant differences were observed, a follow-up test was conducted using the Duncan Multiple Range Test (DMRT) to identify specific pairwise differences among the treatments. This approach allows for a comprehensive examination of the variability in the data and pinpointed statistically significant distinctions between the experimental conditions.

RESULTS

Percentage (%) Absorption of two wood samples treated with root and stem extracts of *Schizachyrium exile*.

The mean percentage absorption of 46.53 % and 46.43 % were found in *D. oliveri* for the stem and root extracts respectively 45.27 % and 36.51 % were recorded in *P. biglobosa*. Among the treatments, the highest mean percentage absorption of 64.79 % was observed in *D. oliveri* wood for 1.2 % N-hexane root extract while in *P. biglobosa* wood, the highest mean value of 58.79 % was obtained in1.2 % ethyl acetate root extract (Table 1). In the stem extract, the highest mean percentage absorption of 73.42 % was observed in *P. biglobosa* at 1.2 % methanol concentration while it was 62.55% in *D. oliveri* at 1.2 % N-Hexane concentration. The interactions among species, treatment concentrations were not significantly different ($p < 0.05$) (Table 1).

Table 1: Mean of Percentage Absorption of Root and Stem extracts of *S. exile* on treated wood samples

Treatment	Root extracts		Stem extracts	
	D. oliveri	*P. biglob osa*	*D. oliveri*	*P. biglobosa*
	Mean±Std.	**Mean±Std**	**Mean±Std.**	**Mean±Std**
1.2 % *S. exile* N' Hexane extract	64.79±30.68[a]	51.01±6.49[cd]	62.55±30.08[a]	50.24±6.61[abc]
0.6 % *S. exile* N' Hexane extract	30.60±15.69 [a]	33.68±3.88[abc]	36.80±5.24 [a]	37.28±5.81 [ab]
0.3 % *S. exile* N' Hexane extract	57.98±14.746[a]	25.63±6.86 [a]	45.59±14.06 [a]	43.61±10.37[abc]
N' Hexane Control	**47.12±24.27 [a]**	**38.19±6.01[abcd]**	**47.12±24.27 [a]**	**38.19±6.01 [ab]**
1.2 % *S. exile* Ethyl acetate extract	53.29±17.20 [a]	58.79±29.47[d]	49.84±26.59 [a]	61.63±31.50[bc]
0.6 % *S. exile* Ethyl acetate extract	43.94±10.84 [a]	38.39±17.04[abcd]	28.99±18.46 [a]	36.87±4.13 [ab]
0.3 %*S. exile* Ethyl acetate extract	42.01±1.72 [a]	23.66±7.31 [ac]	38.68±6.45 [a]	35.38±17.84 [ab]
Ethyl Control	**32.09±1.46 [a]**	**23.38±9.10 [a]**	**32.09±1.46 [a]**	**23.38±9.00 [a]**
1.2 % *S. exile* Methanol extract	55.11±16.76 [a]	48.10±7.06[bcd]	59.96±30.32 [a]	73.42±30.75c
0.6 % *S. exile* Methanol extract	28.25±14.16 [a]	36.88±5.95[abc]	39.79±13.27 [a]	62.12±16.82[bc]
0.3 % *S. exile* Methanol extract	44.50±39.05 [a]	33.33±0.61[b]	59.44±40.11 [a]	54.06±21.72[abc]
Methanol control	**57.46±30.40 [a]**	**27.08±7.22 [ab]**	**57.46±30.40 [a]**	**27.08±7.22 [a]**
Total	**46.43±20.89**	**36.51±14.54**	**46.53±22.19**	**45.27±20.29**

Percentage Retention of two wood samples treated with root and Stem extracts of *Schizachyrium exile***.** The root extract of *S. exile* on *D. Oliveri* had the highest mean percentage retention (5.90 %) while in *P. biglobosa* the total highest mean percentage retention value of (4.94 %) was obtained. Similarly, in the stem extracts, the highest mean percentage retention (6.34 %) was observed in *D. oliveri* treated with stem extracts of *S. exile while* the highest value of (4.99 %) was obtained in *P. biglobosa* (Table 2). The result further showed the mean percentage retention of *D. oliveri* wood in the root extract was highest in all the treatments control methanol (28.73%) followed by N-hexane (24.04%) and ethyl acetate (16.11%). In *P. biglobosa* root extract, it was also higher in all the treatment control, ethyl acetate, N-hexane and methanol with value of (21.75%), (21.18%) and (13.54%) respectively (Table 2).

In addition, the result in table 2 also showed the mean percentage retention of stem extract in *D. oliveri* wood was highest in the methanol control (28.86%), N-hexane control (24.04%), and ethyl acetate control (19.97%). The mean percentage retention of stem extract in *P. biglobosa* was also highest in ethyl acetate control (21.75%), N-hexane control (21.18%) and methanol control (13.54%).

Table 2: Percentage Retention of *S.exile* Root and Stem extracts on treated wood samples

Treatment	Root extracts		Stem extracts	
	Daniellia oliveri	***P. biglobosa***	***Daniellia oliveri***	***P. biglobosa***
	Mean±Std.	**Mean±Std**	**Mean±Std.**	**Mean±Std**
1.2 % *S. exile* N' Hexane extract	0.77±0.37 a	0.61±0.08 a	0.67±0.43 a	0.60±0.08 a
0.6 % *S. exile* N' Hexane extract	0.18±0.00 a	0.19±0.02 a	0.22±0.04 a	0.22±0.04 a
0.3 % *S. exile* N' Hexane extract	0.17±0.04 a	0.07±0.02 a	0.11±0.05a	0.13±0.03 a
N' Hexane Control	**24.04±11.3b**	**21.18±0.60b**	**24.04±11.3b**	**21.18±0.60c**
1.2 % *S. exile* Ethyl acetate extract	0.64±0.21 a	0.70±0.36 a	0.76±0.30 a	0.74±0.37 a
0.6 % *S. exile* Ethyl acetate extract	0.26±0.06 a	0.23±0.10 a	0.13±0.08 a	0.22±0.03 a
0.3 % *S. exile* Ethyl acetate extract	0.12±0.01a	0.07±0.02a	0.12±0.05 a	0.10±0.06a
Ethyl Control	**16.11±0.68b**	**21.75±13.21b**	**19.97±7.37b**	**21.75±13.21c**
1.2 % *S. exile* Methanol extract	0.66±0.20 a	0.57±0.08 a	0.75±0.37 a	0.88±0.37 a
0.6 % *S. exile* Methanol extract	0.17±0.09 a	0.22±0.03 a	0.27±0.11 a	0.37±0.10 a
0.3 % *S. exile* Methanol extract	0.13±0.12 a	0.00±0.01 a	0.14±0.09 a	0.16±0.07 a
Methanol control	**28.73±15.20b**	**13.54±3.61b**	**28.86±15.4b**	**13.54±3.61b**
Total	**5.90±11.24**	**4.94±8.97**	**6.34±11.75**	**4.99±8.95**

Means followed by the same letter are not significantly different ($p < 0.05$)

Termite infestation on two wood species treated with Root and Stem extracts of *Schizachyrium exile*

Termite infestation on *D. oliveri* and *P. biglobosa* treated with1.2 % and 0.6 % N-hexane stem extracts started five months' post treatment. There was termite infestation on *D. oliveri* and *P. biglobosa* wood samples treated with 0.3 % hexane stem extracts month. Similarly, termite attack on *D. oliveri* and *P. biglobosa* wood samples treated with N-hexane control started second month of exposure. While untreated started from the 1st month. The results also showed that attack on *D. oliveri* and *P. biglobosa* treated with 1.2 % root extracts began five months post treatment (Table 4).

D. oliveri and *P. biglobosa* wood treated with 1.2 % stem extract had termite infestation from five months after treatment (Table 6). The results revealed that attack on *D. oliveri* and *P. biglobosa* treated with 1.2 % and 0.6 % Ethyl acetate root extracts began five months post treatment. Similarly, attack on *D. oliveri* and *P. biglobosa* wood samples treated with ethyl acetate control started from the 2nd month. While attack on untreated wood samples started from the 1st month.

5Termite infestation on *D. oliveri* and *P. biglobosa* treated with 1.2 % and 0.6 % methanol stem extracts started from the 5th month. Termite attack on wood samples treated with methanol control started from the 2nd month of exposure, while attack on untreated wood samples of *D. oliveri and P. biglobosa* started from the 1st month of exposure. Attack on untreated *D. oliveri* started from the 1st month, while attack on untreated *P. biglobosa* started from the 2st month of exposure (Table 5).

Table 3: Incidence of termite attack on *D. oliveri* and *P. biglobosa* treated with *S. exile* stem and root N-Hexane extracts

Treatments /Control	Effect of *S. exile* Stem Extracts Duration in months										Effect of *S. exile* Root *E*xtracts Duration in months									
	1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	5th
	D. oliveri					*P. biglobosa*					*D. oliveri*					*P. biglobosa*				
1.2 %	-	-	-	-	+	-	-	-	-	+	-	-	-	-	+	-	-	-	-	+
0.6%	-	-	-	+	+	-	-	-	+	+	-	-	-	-	+	-	-	-	-	+
0.3%	-	-	+	+	+	-	-	-	+	+	-	-	+	+	+	-	-	+	+	+
N' Hexane Control	-	+	+	+	+	-	+	+	+	+	-	+	+	+	+	-	+	+	+	+
Untreated woods	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Key: *- No Attack; + Attack*

Table 4: Incidence of termite attack on *D. oliveri* and *P. biglobosa* treated with *S. exile* stem and root Ethyl acetate extracts

Treatments /Control	Effect of *S. exile* Stem Extracts Duration in months										Effect of *S. exile* Root *E*xtracts Duration in months									
	1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	5th
	D. oliveri					*P. biglobosa*					*D. oliveri*					*P. biglobosa*				
1.2 %	-	-	-	-	+	-	-	-	-	+	-	-	-	-	+	-	-	-	-	+
0.6%	-	-	-	+	+	-	-	-	+	+	-	-	-	-	+	-	-	-	-	+
0.3%	-	-	+	+	+	-	-	+	+	+	-	-	+	+	+	-	-	+	+	+
N' Hexane Control	-	+	+	+	+	-	+	+	+	+	-	+	+	+	+	-	+	+	+	+
Untreated woods	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Key: *- No Attack; + Attack*

Table 5: Incidence of termite attack on *D. oliveri* and *P. biglobosa* treated with *S. exile* stem and root Methanol extracts

Treatments /Control	Effect of *S. exile* Stem Extracts Duration in months										Effect of *S. exile* Root *E*xtracts Duration in months									
	1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	5th
	D. oliveri					*P. biglobosa*					*D. oliveri*					*P. biglobosa*				
1.2 %	_	_	_	_	+	_	_	_	_	+	_	_	_	_	+	_	_	_	_	+
0.6%	_	_	+	+	+	_	_	+	+	+	+	+	+	+	+	_	_	+	+	+
N' Hexane Control	_	+	+	+	+	_	+	+	+	+	_	+	+	+	+	_	_	+	+	+
Untreated woods	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	_	+	+	+	+

Key: *- No Attack; + Attack*

The mean percentage weight loss of *D. oliveri* and *P. biglobosa* wood in the root extracts was lower with 1.2 % hexane extracts of *S. exile* (23.61 %), and *P. biglobosa* hexane (25.70%). N-hexane control and untreated control of *D. oliveri* and *P. biglobosa* wood had the highest percentage weight loss of 100 % each. Percentage weight loss of *D. oliveri* wood was lower with 0.6 % ethyl acetate extracts (11.80 %) and *P. biglobosa* was also lower with 1.2 % ethyl acetate extracts (17.78 %) in the root extracts. Weight loss in wood specieswas very high in ethyl acetate control and untreated control with value of 100 % each. The result of 1.2% methanol extracts treated *D. oliveri* had the lowest percentage weight loss of 17.44 %, while *P. biglobosa* wood has (18.58%) weight loss in the root extracts (Table 6).

Also, mean percentage weight loss of *D. oliveri* (18.89%) and *P. biglobosa* (22.76 %) treated wood samples were lower with 0.6 % extracts of hexane. It was also higher in N-hexane control and untreated control with percentage weight loss of 100%. Percentage weight loss of *D. oliveri* treated wood was lower with 0.6 % ethyl acetate extracts (21.71 %), and *P. biglobosa* were also lower with 1.2% ethyl acetate extracts (19.26 %). Both ethyl acetate control and untreated control *D. oliveri* and *P. biglobosa* wood had the highest percentage weight loss of 100%. *D. oliveri* treated wood with 1.2 % methanol had the lowest percentage weight loss of 17.51 % and *P. biglobosa* wood has lower percentage weight loss (16.66 %), while untreated control *D. oliveri* and *P. biglobosa* wood had the highest percentage weight loss of 100 %. Mean percentage weight loss of methanol control treated *D. oliveri* wood was 85.13 % and methanol control treated *P. biglobosa* wood was 90.99 % both in the root and stem extracts. There was significant difference (p>0.05) between *S. exile* extracts and control.

Table 6: Mean of Percentage Weight loss of wood samples treated with *S. exile* Root and stem extracts

Treatment	Wood Samples treated with Root extracts		Wood samples treated with Stem extracts	
	D. oliveri	*P. biglobosa*	*D. oliveri*	*P. biglobosa*
	Mean±Std.	**Mean±Std**	**Mean±Std.**	**Mean±Std**
1.2 % *S. exile* N' Hexane extract	23.61±19.10^{ab}	25.70±6.90^{a}	25.90±18.25^{a}	34.28±6.08^{ab}
0.6 % *S. exile* N' Hexane extract	28.31±32.35^{ab}	29.41±22.91^{a}	18.89±7.94^{a}	22.76±11.23^{ab}
0.3 % *S. exile* N' Hexane extract	73.89±45.22^{c}	42.54±29.71^{ab}	87.56±15.56^{b}	77.43±26.75^{cd}
N'Hexane Control	100.00±0.00^{c}	100.00±0.00^{c}	100.00±0.00^{b}	100.00±0.00^{d}
Untreated NH Control	100.00±0.00^{c}	100.00±0.00^{c}	100.00±0.00^{b}	100.00±0.00^{d}
1.2 % *S. exile* Ethyl acetate extract	17.39±9.07^{a}	17.78±8.08^{a}	35.74±32.74^{a}	19.26±14.49^{a}
0.6 % *S. exile* Ethyl acetate extract	11.80±10.97^{a}	43.11±13.52^{ab}	21.71±22.74^{a}	29.78±10.14^{ab}
0.3 % *S. exile* Ethyl acetate extract	60.39±35.51^{bc}	66.52±38.21^{bc}	80.22±34.27^{b}	71.76±48.92^{cd}
Ethyl Control	100.00±0.00^{c}	100.00±0.00^{c}	100.00±0.00^{b}	100.00±0.00^{d}
Untreated Ethyl Control	100.00±0.00^{c}	100.00±0.00^{c}	100.00±0.00^{b}	100.00±0.00^{d}
1.2 % *S. exile* Methanol extract	15.00±4.69^{a}	27.33±10.27^{a}	19.46±5.92^{a}	16.66±6.12^{a}
0.6 % *S. exile* Methanol extract	17.89±19.62^{a}	18.58±19.45^{a}	17.51±10.14^{a}	27.75±19.68^{ab}
0.3 % *S. exile* Methanol extract	68.75±44.23^{c}	83.72±28.19^{c}	43.25±49.30^{a}	59.69±42.41^{bc}
Methanol control	85.13±25.75^{c}	90.99±15.61^{c}	85.13±25.75^{b}	90.99±15.61^{cd}
Untreated control	100.00±0.00^{c}	100.00±0.00^{c}	100.00±0.00^{b}	100.00±0.00^{d}
Total	**60.15±40.84**	**63.05±36.76**	**62.36±39.40**	**63.36±37.67**

DISCUSSION

The findings revealed that *D. oliveri* wood exhibited the highest percentage absorption and retention of extracts, suggesting a potential vulnerability to deterioration because of much absorption of moisture content. Oberst *et al.,* (2019) reported that termites regulate moisture levels according to the circumstances and employ it for multiple purposes: increased moisture softens wood fibers, facilitating foraging, while keeping the wood dry improves structural to prevent buckling especially important when foraging on weight-bearing wood. The discrepancy in percentage extract absorption between *D. oliveri* and *P. biglobosa* treated woods may be attributed to differences in their anatomical structures or variations in the proportions of lignin, tannin, and other extractives present in each species. This aligns with Neena's (9) assertion that wood properties, including pH, lignin structure and content, and extractive content, influence the fixation of chemicals.

The susceptibility of *D. oliveri* wood to termite attacks was consistently higher than that of *P. biglobosa* wood across all treatments. The variation in termiticidal resistance among wood species is influenced by factors such as natural durability, density, and extractive types and quantities. This result is in line with a study by Ekhuemelo *et al*. (3) on termiticidal evaluation of certain seed extracts, where *D. oliveri* wood was found to be more susceptible to termite attack compared to *P. biglobosa* wood. The resistance of *P. biglobosa* wood to termite attack suggests its potential for cultivation to meet the growing demand for wood and wood products.

Notably, 1 both stem and root extracts of *S. exile at* 1.2 % concentrations of ethyl acetate, n-hexane, and methanol solvents demonstrated superior wood protection against termites compared to the untreated control. This finding aligns with previous studies highlighting the effectiveness of various plant extracts against termite infestation. The use of high concentrations of plant extracts, as seen in this study, offers a promising alternative to traditional toxic chemicals with negative environmental impacts.

Termite attack on wood samples commenced earlier at one month after treatment for *D. oliveri* compared to *P. biglobosa at second month* indicating a significant difference in mean weight loss during these periods. The early onset of termite activity may be influenced by seasonal factors, as the study was conducted during the rainy season, and climate parameters like rainfall, temperature, and humidity have known effects on termite behavior. This finding agrees with finding of (5) who reported that temperature and moisture play a crucial role in shaping the distribution of termite species and also impact the seasonal foraging behavior of certain termite species.

The 1.2 % and 0.6 % concentrations of *S. exile* ethyl acetate, n-hexane, and methanol extracts consistently exhibited the least percentage weight loss, indicating a higher resistance to termite destruction. The observed protective effects may be attributed to the high phytochemical content produced by plants known for their toxic effects against harmful organisms. This suggests that these extracts may serve as effective agents for the protection of wood or wood-based objects against destructive organisms.

CONCLUSION

The results indicate that *D. oliveri* wood exhibited the highest percentage absorption and retention, and there was a positive correlation between concentration and the rate of absorption and retention. In contrast, *S. exile* extracts demonstrated varying levels of protection against termite attacks on wood. *D. oliveri* wood was found to be more susceptible to termite attacks compared to *P. biglobosa* wood. All 1.2 % concentrations of *S. exile* extracts were more effective in treating wood against termite attacks than the untreated control. *D. oliveri* is the most commonly used wood species in the study area, these findings emphasize the importance of treating this wood before use to enhance its resistance against termite damage. The utilization of plant extracts, such as those from *S. exile,* presents a potential avenue for developing eco-friendly wood preservatives.

It is therefore recommended that 1.2 % *S. exile* extract, should be employed as wood preservative in safeguarding wooden structures, timbers, plants, and trees while minimizing environmental impact and human health risks associated with traditional chemical preservatives.

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