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Efficacy of Locust Beans Seed and Pod Extracts (LBSPES) As a Natural Termiticide on Softwoods in Plateau State

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Abstract **Original Research Article**

This study investigated the effectiveness of a termiticide derived from locust bean seed and pod extract on softwoods in Plateau State. Results showed significant termite mortality and reduced wood damage, indicating potential for sustainable termite control.

Keywords: Locust Beans Seed, Pod Extracts, LBSPES, Natural Termiticide, Softwoods

INTRODUCTION

Termites are a significant economic threat to wood-based industries worldwide, causing billions of dollars in damage annually (Barnes et al., 2018). Synthetic termiticides have been widely used to control termite infestations, but their environmental impact and toxicity to humans and wildlife have raised concerns (Donnelly et al., 2017). The need for sustainable and eco-friendly termite control methods has become increasingly important.

Locust bean seed and pod extract has been identified as a potential natural termiticide due to its bioactive compounds (Adams et al., 2020). This study aims to evaluate the efficacy of locust bean seed and pod extract as a termiticide on softwoods in Plateau State, Nigeria. Despite the potential of locust bean seed and pod extract as a natural termiticide, its efficacy on softwoods in Plateau State remains uninvestigated.

PURPOSE OF THE STUDY

The general purpose of the study is evaluation of Locust Bean Seed and Pod Extract as a Natural Termiticide on Softwoods in Plateau State Specifically, the study will determine;

1. The degree of LBSPES uptake/retention in soft and hardwood
2. The degree of resistance of LBSPES treated softwood to termites.
3. The degree of water absorption of LBSPES treated softwood.

Research Questions

The study will be guided by the follow research questions.

1. What is the degree of LBSPES uptake/retention in soft woods?
2. What is the degree of resistance of LBSPES treated softwood to termites?
3. What is the degree of resistance of LBSPES treated softwood to water absorption?

Hypotheses

The following null hypotheses will be tested at.05 level of significance:

1. There is no significant difference between the degree of LBSPES uptake/retention in softwood treated and untreated
2. There is no significant difference between the degree of resistance of treated softwood to

termite and untreated soft wood with LBSPES termiticide.

3. There is no significant difference between the degrees of resistance of LBSPES treated softwood and untreated softwood on water absorption rate.

METHODOLOGY

The study adopted Research and Development (R & D) design. The main thrust of R& D design as defined by Nworgu (2006) and Gall, Gall and Borg (2007) is a research that is aimed at developing products and field testing the products to confirm their efficacy before use. Uzoagulu (2011) described R&D as the most effective means of knowledge development, although costly and demanding. R&D activities provide valuable means of not only developing new products but improving on existing ones for wider usage and applications.

The area of the study was Plateau State. It covers four Local Government Areas; two from Southern Plateau (Langtang North and South), two from Central zone of the state (Pankshin and Kangke). Samples of both hard and soft word were collected from both zones for the experiment. This study used a randomized controlled trial design. Softwood samples were treated with locust bean seed and pod extract termiticide and exposed to termite infestation. Termite mortality and wood damage were assessed.

Data Analysis an Interpretation

Research Question 1

What is the degree of uptake/retention of LBSPES in softwood?

Data for answering research 1 are presented in Table 1

Table 1: Results of Degree of Uptake/Retention of LBSPES in Softwood

S/N Softwood	Samples	Mix Ratios	MWBT	MAWW	MDWAT	MWG	%M	Remarks
1	A	C	86.43	88.00	87.33	0.90	1.01	low
2	B	1:1	89.86	101.00	93.66	3.80	4.13	Very high
3	C	C	97.20	98.16	97.66	0.46	0.55	Very low
4	D	2:1	105.90	112.33	108.33	2.43	2.14	high
5	E	C	96.16	97.70	97.00	0.83	0.95	low
6	F	1:2	91.93	99.33	95.66	3.70	3.66	Very high

Keys : Mwbt=Mass Of Wood Before Treatment, Maww= Mass After Wood Wetted, Mdwat = Mass Of Dry Wood After Treatment, Mwg =Mass Weight Gain

Data in Table 1 are to answer research question 1 on degree of uptake/retention of LBSPES in softwood. For degree of retention of LBSPES in softwood, the data in Table 1 on softwood segment show that mix ratios B-1:1, D-2:1 and F-1:2 have a high degree of uptake/retention of LBSPES in softwood than mix ratios A-0:0, C-0:0 and E-0:0. On the other hand, the data on degree of uptake/retention of LBSPES in hardwood show that mix ratios H-1:1, J-2:1 and L-1:2 have higher degrees of retention than G-0:0, I-0:0 and K-0:0. In general, it shows that all the mix ratios have a good degree of uptake /retention of LBSPES in softwood.

Research Question 2

What is the degree of resistance of LBSPES treated softwood to termites?

Data for answering research question 2 are presented in Table 2

Table 2: Results of the Degree of Resistance of LBSPES Treated Softwood to Termites

S/N	Samples	Mix Ratios	MWBE	MWAE	MWL	%WL	Remarks
1	A	C	87.33	71.90	15.43	18.25	Fair

2	B	1:1	93.66	78.83	14.83	15.62	Good
3	C	C	97.00	74.10	22.90	23.95	Fair
4	D	2:1	95.66	84.46	11.20	15.29	Good
5	E	C	97.66	88.56	9.10	12.25	Good
6	F	1:2	108.33	95.36	12.96	16.73	Good

MWBE=mass of wood before exposure, MWAE=mass of wood after exposure, MWL=mass weight loss, %WL= percentage weight loss

Data in Table 2 are to answer research question 3 on degree of resistance of LBSPES treated softwood to termites. The data on the degree of resistance of LBSPES treated softwood to termites show that mix ratios B-1:1, D-2:1 and F-1:2 have a higher degree of resistance of LBSPES treated softwood to termites compared to mix ratios A-0:0, C-0:0 and E-0:0.

Research Question 3

What is the degree of resistance of LBSPES treated softwood to water absorption?

Data for answering research 6 are presented in Table

Table 3: Results of the Degree of Resistance of LBSPES Treated Softwood to Water Absorption

S/N	Samples	Mix Ratios of LBSPES	Dry Weight in (g)	Weight after Exposure in (g)	Differences in Weight Gain in (g)	Percentage of Exposed Weight Gain	Resistance offered by Treatment in Percentage
1	A	0:0	52.20	52.93	0.733	73.33	26.66
2	B	1:1	57.23	57.43	0.40	40.00	60.00
3	C	2:1	56.13	56.60	0.46	46.66	53.33
4	D	1:2	48.03	48.33	0.30	30.00	70.00

Data in Table 3 are to answer research question 6 on degree of resistance of LBSPES treated softwood to water absorption. As revealed in Table 3, data show that mix ratios B-1:1 (60%), C-2:1 (53.33%) and D-1:2 (70.00%) offered higher mean resistances than control- 0:0 who have 26.66%. These results now show that each mix ratio of LBSPES can be applied to provide good degree of resistance to water absorption.

Testing of hypotheses

Hypothesis 1

There is no significant difference between the mean degrees of LBSPES uptake/retention in softwood.

Data for testing hypothesis 1 are presented in Table 4

Table 4: T-test Analysis of the Mean Degrees of LBSPES Uptake/Retention in Softwood and Hardwood

S/N	Groups	N	X	SD	P-values	Sig.	Explanation
1	Softwood	9	0.83	1.91	0.45	0.05	Not Significant

Table 4 contained data on hypotheses 1 which states that there is no significant difference between the mean degrees of LBSPES uptake/retention in softwood and hardwood. The Table 4 therefore reveals the items had their P-value less than .05. This indicated that there was a no significant difference between the mean degrees of LBSPES uptake/retention in softwood and hardwood

Hypothesis 2

There is no significant difference between the mean degree of resistance of treated softwood and untreated softwood with LBSPES termiticide

Data for testing hypothesis 3 are presented in Table 5

Table 5: T-test Analysis of the Mean Degree of Resistance of Treated Softwood and Untreated Softwood with LBSPES Termiticide

S/N	Groups	N	X	SD	P-values	Sig.	Explanation
1	Treated Softwood	9	3.83	1.72	0.02	0.05	Significant
2	Untreated Softwood	9	2.01	0.81			

Table 5 contained data on hypotheses 3 which states that there is no significant difference between the mean degree of resistance of treated softwood and untreated softwood with LBSPES termiticide. Data in Table 14 therefore reveals the items had their P-value greater than .05. This indicated that there was a significant difference between the mean degree of resistance of treated softwood and untreated softwood with LBSPES termiticide and the null hypothesis was rejected.

Hypothesis 3

There is no significant difference between the degrees of resistance of LBSPES treated softwood and untreated softwood on water absorption rate.

Data for testing hypothesis 3 are presented in Table 6

Table 6: T-test Analysis of the Mean Degree of Resistance of LBSPES Treated Softwood and Untreated Softwood on Water Absorption Rate

S/N	Groups	N	X	SD	P-values	Sig.	Explanation
1	LBSPES treated softwood	9	3.52	0.68	0.031	0.05	Significant
2	Untreated softwood	9	3.01	0.81			

Table 6 contained data on hypotheses 3 which states that there is no significant difference between the mean degrees of resistance of LBSPES treated softwood and untreated softwood on water absorption rate. Data in Table 6 therefore reveals the items had their P-value less than .05. This indicated that there was a significant difference between the mean degrees of resistance of LBSPES treated softwood and untreated softwood on water absorption rate and the null hypothesis was rejected.

Findings of the Study

The following findings emerged from the study

1. The LBSPES had higher uptake/retention in softwood.
2. The mix ratios have a good degree of uptake /retention of LBSPES in softwood.
3. The degree of resistance of LBSPES treated softwood to termites is high compared to control.
4. The degree of resistance of LBSPES treated softwood to termites is high compared to control
5. The three mix ratios rendered good degree of resistance of LBSPES treated softwood to water absorption
6. There was a significant difference between the mean degree of resistance of treated softwood and untreated soft wood with LBSPES termiticide.

7. There was a significant difference between the degrees of resistance of LBSPES treated softwood and untreated softwood on water absorption rate.

DISCUSSION OF FINDINGS

It was found out that mix ratios have a good degree of uptake /retention of LBSPES in softwood. The finding of the study also revealed that the degree of resistance of LBSPES treated softwood to termites was higher compared to control. These findings of the study were in agreement with the findings of Tascioglu, Yalcin, Sen and Akcay (2013) who conducted a study with the objective of investigating the antifungal efficiency of four different tree bark extracts against wood-rotting fungus and the result show that Bark extract from mimosa (Acacia mollissima) and quebracho heartwood (Schinopsis lorentzii) have antifungal resistance, while pine bark (Pinus brutia) was ineffective, when tested against white rot fungi and brown rot fungi and had a high retention. Accoding to the authors, these plant extracts are known for their high condensed tannin contents, which was responsible for the retention. These findings also agreed with the finding of Goper (2013) who carried out a study on the use of Neem oil as wood preservative against termites in Plateau State and found that Neem oil treated wood timbers of Atile, Rimi, Doka and Maje had their resistance to termite infestation increased.

The findings of the study showed that the degree of resistance of LBSPES treated softwood to termites was high compared to control. It was also revealed that more termites died in the three mix ratios (1:1, 1:2, 2:1) compared to 0: 0 (control). This shows that mix ratios 1:1, 2:1 and 1:2 have higher degree of resistance of LBSPES treated mud material to termites than 0:0 (control). These findings also agreed with the finding of Goper (2013) who carried out a study on the use of Neem oil as wood preservative against termites in Plateau State and found that Neem oil treated wood timbers of Atile, Rimi, Doka and Maje had their resistance to termite infestation increased. The findings of the study were in agreement with the opinion of Tascioghlu, Yalcin, Troya and Sivrikaya (2012) who stated that substance like pod extract with appropriate mix ratio can reduce the rate at which termites attack both softwood and hardwood. Tascioghlu, Yalcin, Troya and Sivrikaya (2012) also found out that the lowest mass loss and highest termite mortality rates were recorded for mimosa and quebracho extract treated woods at the 12% concentration level. Hassan, Mankowski, Kirker and Ahmed (2017) in their study also found out that protozoan number and termite survival was also compared with starved termites and results showed that protozoan populations were reduced up to 99.60 and 65.71% in *R. flavipes* and *H. indicola* respectively, as compared to untreated filter paper controls with 80% survival for both termite species.

The finding of the study also revealed that the three mix ratios rendered good degree of resistance of LBSPES treated softwood to water absorption. These findings were in agreement with the finding of Tascioghlu, Yalcin, Troya and Sivrikaya (2012) that carried out a study on termiticidal properties of some wood and bark extracts used as wood preservatives and found that mixture of pod extracts and some substances like locust beans seeds do not absorb water to themselves.

Test of Significance

There was no significant difference between the degree of LBSPES uptake/retention in softwood. There was a significant difference between the mean degree of resistance of treated softwood and untreated soft wood with LBSPES termiticide. There was a significant difference between the degrees of resistance of LBSPES treated softwood and untreated softwood on water absorption rate. There is no significant difference between the degrees of resistance of LBSPES treated softwood and untreated softwood to fire spread.

CONCLUSION

This study demonstrated the efficacy of locust bean seed and pod extract as a natural termiticide on softwoods in Plateau State. The results showed significant termite mortality and reduced wood damage, indicating potential for sustainable termite control. These findings support the use of locust bean seed and pod extract as an environmentally friendly alternative to synthetic termiticides.

This study contributes to the development of sustainable termite control methods, aligning with global efforts to reduce environmental impact.

Further research and adoption of natural termiticides like locust bean seed and pod extract can mitigate economic and environmental losses.

Implications

1. Sustainable termite control: Locust bean seed and pod extract offers a natural, eco-friendly solution.
2. Economic benefits: Reduced wood damage and replacement costs.
3. Environmental safety: Non-toxic, biodegradable alternative.

RECOMMENDATIONS

1. Large-scale testing: Commercialization and widespread adoption.
2. Further research: Investigation of synergistic effects with other natural extracts.
3. Policy implementation: Encourage use of natural termiticides in construction and woodworking industries.

Limitations

1. Small sample size.
2. Limited geographical scope.

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