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Determination of Termites Attack on *Eucalyptus grandis* And *Grevillia robusta* (Untreated Timber)

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ABSTRACT

Termites are one of the major wood destroying agents in the tropics and with the increasing rate of deforestation, there is a need to protect wood from biodegradation in order to extend its service life. Bowyer *et al*. (2003) indicated that wood products in use throughout the world are subject to infestation by insects. Peralta *et al*.(2004) discovered that Cellulose being the principal food of termites, wood and wood products such as paper, fabrics and wood structures are avidly consumed, and hence, a constant effort is directed towards their control. Venmalar and Nagaveni (2005) suggested that Over the past few decades, there has been a substantial global quest to develop eco-friendly wood preservatives which do not cause any ill effect on the health of mammals. The research on effective bio-control methods for wood preservation is continuing but one that could be useful is the natural insect growth regulator, azadirachtin (AZA) and organochlorines. This botanical compound can be effective yet it is biodegradable and rapidly metabolizes in the environment that was suggested by (Weathersbee and Tang 2002). AZA can be extracted from the seeds of *Azadirachta indica* i.e. the neem tree. Venmalar and Nagaveni (2005) discovered that neem possesses a number of toxic constituents exhibiting high toxicity against wood destroying microbes. The objective of the study is determination of Termites Attack on Eucalyptus grandis And Grevillia robusta (Untreated Timber)

Key words: Determination, Termites Attack, Eucalyptus grandis , Grevillia robusta ,Untreated Timber

MATERIALS AND METHODS

Description of Study Site

The research was carried out at the Forest Products Research Centre of the Kenya Forestry Research Institute (KEFRI) located at Karura Forest, Nairobi.

Experimental Design

The experimental research was carried out in September 2017 to July 2018 .The experiments were laid out in a randomised group design carried out in “graveyard” trial tests with five treatments and ten replicates. Testing was carried out on Fipronyl at the rate of 200g/l and fipronil 25g/l. The treated wood samples and untreated wood sample set up in a “grave yard” (in the field – at the KEFRI’s Kibwezi Sub-centre) by following the “Protocols for assessment of wood preservatives; A production of the Australian wood preservation committee (2007 revision)”.This was a wood preservation experiment whereby the main target was to use timber used in building; *Eucalyptus grandis* and *Grevillea robusta* .

Study Sample

E. grandis was tested against *G. robusta*. Both species have equal number of treated and untreated wood samples. On treated samples, chemicals were applied in one way that is by dip diffusion, treated wood samples are 80 in numbers not equal to that of intervention that is 20 in numbers. Both treated and untreated wood samples add up to 100 timbers.

Field trial graveyard test

Procedures

Eucalyptus and Grevillea timber measuring 4 by 2 inches were measured from the market then cut into 1metre length and their

weights were recorded. Labelling was done by giving each sample a code. The treated samples were immersed for four days in Fipronyl and fipronil 25g/l. Untreated wood samples were not treated with the chemicals.

Data Analysis

Data analysis was performed using STATA version 13 special edition after the data had been entered in Excel package before being exported to STATA software. Categorical variables were summarized as frequencies and its corresponding percentages, while weight loss, the only continuous variable of interest, was positively skewed because of some weighted outlier, therefore it was summarized as median and it's corresponding inter quartile range (IQR). Two-way ANOVA was the only statistical technique which was used to find out if there was any difference in weight loss given that different concentration of treatments were applied using different modes of application in the field trial test

RESULTS

There were a total of 100wood samples whose data from graveyard trial test respectively was included for analysis this represented 100% evaluation in experimental trial. In graveyard trial test experiments, the number of wood samples in the control group 20(20%) and 80(80%) for both ***Eucalyptus grandis*** **And** ***Grevillia robusta*** respectively. Data on weight loss captured during graveyard trial experiments for both overall and group summary statistics like median, minimum, maximum and inter quartile range (IQR) were presented. The median weight loss value for ***Eucalyptus grandis*** was 0(IQR: 0-0) kilograms and its respective minimum and maximum weight loss were 0 kilogram and 0.9 kilogram, and ***Grevillia robusta*** had a median 0(IQR:0-0) and its minimum value of 0 kilogram and a maximum value 1kilogram. In the experiments this variable (weight loss) was significant for the grouped factors median and IQR statistics which is a measure of variability in data. This shows that ***Grevillia robusta*** were attacked more than ***Eucalyptus grandis***. Majority of the treated wood samples in the test treated with either fipronil 25g/l or Fipronyl did not have their weights changed from the weights after exposure to termites, representing 80(80%).

Untreated wood samples for both species which were under experimental test in the field trial experiment and had a weight loss of approximately 0.1 were (4%), those with a weight loss of 0.2 represented (5%), with 0.3kilograms loss in weight were (5%), with 0.4 kilograms change from initial weight before exposure to termites were (3%) while all those which had a weight loss of 0.5, 0.8 and 1 kilogram represented a total of (1%). The median weight losses for untreated and treated timber were different.

Furthermore, the shape of distribution was assessed and was not similar, treated group had IQR: 0-0 grams while the untreated group had (IQR: 0.1-0.4 grams).

All wood samples which were subjected to different concentration of treatment and showed no change in their weight were in total 80(80%) during the field trial test, while timbers which were untreated and were attacked by the termites showed different weight loss of (0.1, 0.2, 0.3,0.4, 0.5, 0.8 and 1)kilograms being in total 20(20%) indicated that there was a significant difference, p- value (0) with adjusted R-squared value of 39.2% for the explanatory variable.significant difference in weight loss between untreated and treated timbers in their weight loss where mode of application of Fipronyl or fipronil 25g/l was achieved through dip diffusion, p- value (0) and adjusted R-squared value (30.91%) of explanatory variable explaining the effect of treatment on termites among 80 treated timbers

Distribution of timber by species

In the field trial the total number of timbers which were used were 100(100%), Eucalyptus 50(50%) and Grevillea 50(50%) timbers, were included in the studies. under field trial test, every concentration of treatment was allotted equal number of timbers for each species .

4.1.2 Difference of termites attack on timber basing on visual characteristics.

Those treated timbers which were not attacked by the termites and ranked visually as sound were 80(80%), those which were attacked by termites slightly during laboratory experimental and ranked as slight were (7.5%) was noticed under field trial test, those which were attacked moderately and ranked as moderate was (4%) was visually noticed during field trial test and those which were severely attacked by termites and classified as severe was (8.5%) was visually observed and classified as trace under graver yard trial test. The test for difference in ranking visually of weight loss findings was significant, p- value (0) in both studies. The results from grave yard trial test experiment supports that the difference between the weight loss of the treated and untreated timbers basing on the visual ranking of the timbers after being exposed to termites was present. That was due to the fact that approximately 69% of the explanatory variable (different concentration of treatments) gave enough evidence of no destruction of timbers by the termites treated with either Fipronyl or termidor .

DISCUSSIONS

There was no difference in termite attack on timbers treated with different levels of concentration of either Fipronyl or fipronil 25g/l, have equal impact on termites since there was no significant difference in weight loss in the treated timbers, while ***Eucalyptus grandis*** (untreated timbers)had a weight loss of varying values of 0 to 0.9 kilograms and ***Grevillia robusta***(untreated timbers) had a weight loss of varying values of 0 to 1 kilograms.. Termite's prevalence in Eucalyptus and Grevillia wood was noted to vary.

The Grevillia wood species had more termite attack compared with the Eucalyptus wood. From the results of this study it is clear that there is sufficient support for significant difference in termite attack between untreated and treated timbers with termiticides basing on visual and weight loss rating of termite's attack, p-value (0) . The study found out that the difference was from untreated wood samples which lost their weights after exposure to termites.

CONCLUSIONS

Termite galleries were evident after 10 months on untreated timber in the grave yard trial test, which showed that they were attacked. Termites generally did not get in contact with treated treated timbers. Significant difference in termites attack between untreated and treated timbers with termiticides can be based on visual and weight loss where treated timbers was ranked as sound indicating that it was not attacked and untreated wood block samples were ranked slight, moderate, trace and severe to give clear indication of magnitude of attack. Further exposure time of wood samples to termites is advisable to give a clear difference in termite attack on treated timber under different levels of concentrations.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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