

Methods of Exterminating Biological Destructive Agents from Household Furniture in Jos Metropolis, Plateau State, Nigeria

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Abstract

This study identified methods of exterminating biological destructive agents from household furniture in Jos metropolis, Plateau State, Nigeria. It discovered types of biological destructive agents such as wood borers, ants and termites that infest household furniture in that area. The type of wood used for household furniture was also identified. Methods used in exterminating biological destructive agents were discussed. Three research questions were answered. A descriptive survey research design was adopted for the study. A structured questionnaire was used to gather data from one hundred and sixty-eight respondents. No sampling since the population wasn't much. Percentage and mean ratings were used for the analysis of data. Spearman Rank Order correlation Coefficient was used to determine the reliability of the instrument. The reliability coefficient of the instrument was found to be 0.82. The findings of the study revealed that majority of the cabinet makers used oil can to apply kerosene and use brush to apply creosote oil for exterminating biological destructive agents. The wood mostly used by cabinet makers for constructing household furniture was Achuwele (Hardwood). The biological agents that infest household furniture in that area were powder post beetles, ants and termites. It was recommended that baygun spray (insecticide) should be used since it is stronger, effective and faster in killing wood borers, hardwood such as Mahogany, Iroko and Agbuntu should be used for constructing household furniture. The wood to be used for furniture should be properly seasoned and the moisture content of such wood should not be more than twenty percent.

Key words: Biological agents, cabinet maker, Furniture, Insecticide, Preservative, termites, wood borer.

Introduction

Furniture are items such as tables, chairs, beds, cupboards and so on used in the houses offices, hospitals, schools, hotels and recreational areas for the comfort of man. Hornby (2000) defined furniture as moving articles such as tables, chairs or beds put into a house or an office to make it suitable for living or working. In the same opinion, Walton (1981) classified furniture as case furniture e.g wardrobes, wall cabinets and book cases; tables e.g tea, coffee or silver tables, beds and chairs. Walton further said that furniture can be made of metal or wood. Walton disclosed that the increase in domestic comfort especially in the palaces and houses led to the demand for more and better furniture expected to be constructed by cabinet makers.

Love (1979) identified wood used for furniture construction and these are softwood and hardwood. The softwood include yellow or red deal, (North or Scots pine) (*Pinus sylvestris*); douglas fir, sitka spruce; Larch and sequoia pine. Hardwood used for furniture are American white wood, Ash Beech, Birch, Ecma, Greenheart, Jarrah, Lime, Mohogany, Maple Oak, Teak and walnut. The wood commonly available in west Africa including Nigeria are Agba, Ebony, Gaboon, Mohagony, Mansonia, Obeche and Sapele(Love,1979).

Biological destructive agents are the biological agents that infest household furniture. This includes Beetles, Insects, termites, fungi and so on. Household furniture can be infested due to several reasons such as high moisture content of the wood, failure to select the right wood for the furniture and also the workmanship.

Literature Review

The most common powder post beetles that infest furniture are Anobiid powder post beetles, Bostrichid powder post. Beetles and Lyctid Powder post Beetle. The other wood infesting pests are old house borers and carpenter bees (Kochler & Oi, 2012). The Larvae of powder post beetles lived in and consumed dry seasoned wood. It was revealed that the Anobiid powder post beetle infest seasoned softwood and sapwood of seasoned hardwood. These Anobiid powder post beetles infest hardwood furniture, wall paneling, window, door mouldings. Woods such maple, beech, poplar and pine are susceptible to attack. The Bostrichid Powder post Beetles infest seasoned softwood and hardwood especially unfinished furniture while the Lyctids infest sapwoods of hardwoods mainly ash, oak and mahogany. It easily attack items made from wood that was improperly dried or stored (Kochler & Oi,2012). Below are the biological agents that infest household furniture in Nigeria.



Courtesy:Carpenter, J(2012), Fig.1 Anobiid Power Post Beetle

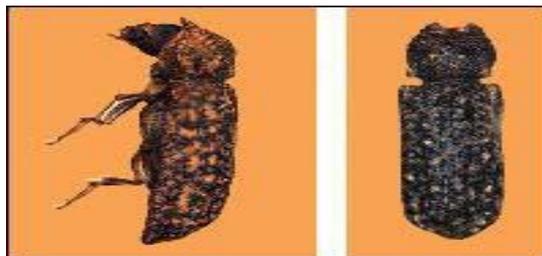


Fig.2 Bostrichid Power Post Beetle

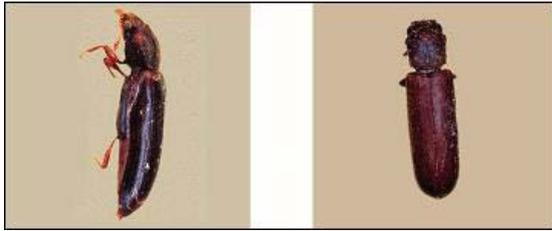


Fig.3 Lyctid Power post Beetle

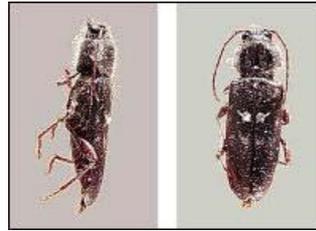
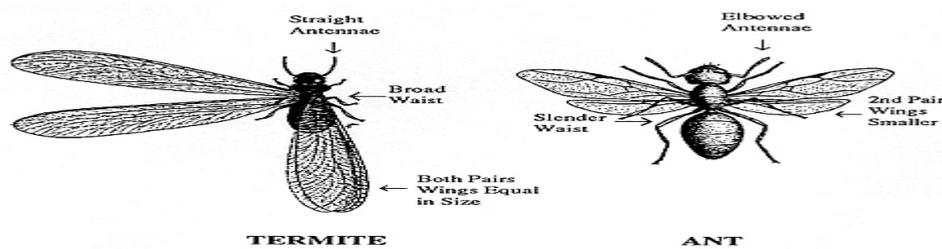


Fig.4 Old House Borer

The old house borer infests softwoods in Florida and also in Nigeria. They bore through the wood making irregular galleries. The Larvae damage both inside and surface of the wood and create tunnels. The carpenter bees cause damages to wood by creating tunnel on the wood. Koehler and Oi also described ants and termites as one of the biological agents that cause damages to furniture. Most ants and termites eat a variety of foods, although, some have specialized tastes such as fire ants feed on honeydew, sugars, proteins oils, seeds, plant and insects.



Ecosmart (2012) said that carpenter bees (*Xylocopa latrecille*) prefer to lay eggs in wood that are unpainted. It infest Furniture made of redwood, cedar, cypress and pine. Powder Pest Beetles Control Service (2012) disclosed that in India, the adult beetles are small ranging from 2-7mm in length, high sign of infestation is manifested by yellowish powder falling from furniture like an excreta of the organism. The Larvae eat hardwood and made tunnels in timbers. Ecosmart (2012) identified other wood borers to be shipworms (*Bankia Setacea*), Metallic wood Bores (*Buprestidae* Coleoptera), Horntails (*Siricidae* Tremex). The shipworms situate themselves on a wood source and begin their tunneling from there. They dwell in water and often attach themselves to vessels. Metallic wood borers are also called jewel beetles.

Poster and Reg (2006) discovered another wood destroying agent to be fungi. This could be non-rotting fungi and wood-rotting fungi. The non-rotting fungi (Sap stain) take their nourishment from the tree's food reserves left within sapwood of timber produced from softwood species and light coloured hardwoods. These fungi may attack softwood with distinct heart wood such as pines and larches, temperate hardwood e.g poplar, ash and tropical hardwoods e.g obeche, Jelutong, ramin and balsha wood.

In wood-rotting fungi, whenever the following conditions exist, one or more of these types of fungi will eventually establish. The types of fungus and its characteristics life style will be determined by the amount of moisture present in the wood. Fungi need the following to be established (a) food in form of cellulose from the wood tissue of sapwood and non-durable hardwood. (b) The wood must have moisture content above 20% (c) Temperature between 30°C and 37°C. Low temperature may reduce growth; high temperature will kill the fungi (d) There must be presence of air which is an essential requirement for growth and respiration of fungi.

Preventive Measures

Kochier and Oi (2012) Suggested the following preventive measures:

- Inspect wood to ensure that wood is not infested at the time of home construction.
- Beetles emerging from painted or varnished wood were either in the wood before finishing or were as a result of reinfestation by eggs that were laid in emergence holes of adult beetles. Sealing holes prevents reinfestation from eggs laid within the hole.
- spraying or brushing insecticide onto the infested holes on the wood can kill adult beetles as they chew the wood
- The infested furniture can be fumigated inside the fumigation chamber.
- Carpenter bees can be controlled by removing and replacing infested wood. Insecticides can be used to treat parts of wood where carpenter bees are active.

Ecosmart (2012) was of the view that pressure treated wood is less susceptible to wood borer, therefore, wood should be subjected to the above process before usage. Spot treatment was also mentioned to control wood moisture by way of surface coverings.

Porter and Reg (2006) identified the following remedies for fungi (dry rot and wet rot).

Prevention of dry rot

- Eliminate all sources of dampness
- Remove all affected woodwork and fungus from the building.
- Surrounding walls and concrete floors etc may require sterilizing and treatment with fungicide
- All replacement timber should have moisture content less than 20% and be treated with preservative.

Prevention of Wet Rot

- Dry out the building and dampness should be avoided.
- Remove and safely dispose the affected timber
- suitable preservative should be applied to timber before use to avoid fungi
- All replacement timber must be dried and moisture content below 20% (Porter & Reg, 2006).

The development in technology in this modern society has led to increase in domestic comfort which has brought high demand for more better and sophisticated furniture in our homes. The destruction of household furniture by biological agents in Jos metropolis is at alarming rate which demands urgent attention. The researcher wonders whether this high rate of infestation of household furniture could be attributed to the type of wood used for the furniture construction or the inability of the cabinet makers to select the appropriate method of exterminating biological agents from household furniture. Kochler and Oi (2012) disclosed that Dealt Watch beetle (Anobiid) infest hardwood furniture and wall paneling. It was revealed by Kochler and Oi that this type of pest prefers to infest wood with high moisture content in poorly ventilated areas in crawl spaces of houses, utility rooms and garages.

Purpose of the Study

The purpose of the study is to determine methods of exterminating biological destructive agents from household furniture. Specifically, the study sought to:

1. Identify wood mostly used by cabinet makers for furniture construction in Jos.

2. Identify biological agents that infest household furniture in Jos metropolis.
3. Determine methods used by cabinet makers in exterminating biological agents that infest household furniture in Jos metropolis.

Research Questions

The following research questions were used for the study.

1. What type of wood Cabinet makers mostly use for furniture construction in Jos?
2. What kind of biological agent infest household furniture in Jos metropolis?
3. What are the methods used by cabinet makers in exterminating biological agents that infest household furniture in Jos metropolis?

Materials and Methods

The methodology adopted for the study is presented under the following subheadings: Research design, Area of the study, population of the study, sample and sampling procedure, instrument for data collection, validation of the instrument, method of data collection and method of data analysis.

Research Design

The study adopted survey research design based on the nature of the study.

Area of the Study

The study was carried out in Jos metropolis, Plateau State Nigeria.

Population of the Study

The population for the study was drawn from one hundred and eighty two cabinet makers and the information about the number of cabinet makers was obtained from wood workers trade union secretariat at Jos, Plateau State, Nigeria.

Simple and sampling Techniques

No sampling since all the cabinet makers were used for the study.

Instrument for Data Collection

A structure questionnaire was used for data collection. Section A sought for information on the type of wood used for furniture construction in Jos metropolis, section B sought for opinion of respondents on the type of biological agents that infest household furniture in Jos metropolis, section C sought for information on methods used by cabinet makers in exterminating biological agents that infest household furniture in Jos metropolis.

Validation of the Instrument

The instrument was subjected to face and content validation by four experts of wood technology. These experts were from Federal University of technology, Minna, Niger State, Nigeria. The recommendations of the experts were used to draft the final copy of the instrument. To check the reliability of the instrument, a pilot study was conducted using sixty cabinet makers in Minna City, Niger State, Nigeria. The researcher used test-retest to seek responses on methods of exterminating biological destructive agents from household furniture. The questionnaire was administered to the respondents at interval of two weeks. Spearman rank order correlation coefficient was used to determine the reliability of the instrument. The reliability coefficient of the instrument was found to be 0.86.

Method of Data Collection

The questionnaire was administered and collected by the researcher with two research assistants. Out of one hundred and eight two (182) questionnaire distributed, one hundred and sixty eight (168) were returned i.e 92.30% return rate.

Method of Data Analysis

Percentage and mean were used to answer the research questions. A five point likert scale was used for the study. Items having above 3.0 were accepted while those items having below 3.0 were rejected. Spearman rank order correlation coefficient was used to determine the reliability coefficient of the instrument.

Results and Discussion

Research Question 1

What type of wood Cabinet makers used for furniture construction in Jos metropolis? The data answering this research question is presented in Table 1.

Table 1

Percentage of responses of the respondents on the type of wood used for furniture construction in Jos metropolis.

S/NO	WOOD	NO	%
1.	Marobiya (Hardwood)	18	10.71
2.	Obeche (softwood)	12	8.33
3.	Agbuntu or Iron wood (Hardwood)	14	9.52
4.	Akpu (soft wood)	12	7.14
5.	Malina (Medium Hardwood)	10	5.14
6.	Akpo (Hardwood)	11	6.55
7.	Achuwele (Hardwood)	30	17.86
8.	Mahogany (Hardwood)	16	7.14
9	Abura (Hardwood)	7	4.17
11.	Iroko (hardwood)	7	4.17
12.	Afara (Hardwood)	8	4.76
13.	Mansonia (hardwood)	7	4.17
14.	Agba (Harwood)	6	3.57
15	Larch (softwood)	5	2.98

N= 168

The analysis of the result in Table 1 revealed that most cabinet makers used Achuwele, followed by marobiya and mahogany. They are all hardwood but Achuwele can easily be infested by wood borers if some parts of the timber contain sap while the other two can be infested by wood borers if they are not properly seasoned before usage. Achewele is cheaper in price when compared to Marobiya and Mahogany.

Research Question 2

What kind of biological agents infest household furniture in Jos metropolis? The result of the analysis is presented in Table 2.

Table 2

Mean of responses of the respondents on biological agents that infest household furniture in Jos metropolis.

S/NO	Biological Agent	Mean	Remark
1.	Anobiid powder post beetles	3.46	Accepted
2.	Bostrichid powder post beetles	3.35	Accepted
3.	Lyctid powder post beetles	4.08	Accepted
4.	Carpenter bees	2.92	Not Accepted
5.	Ants	3.23	Accepted
6.	Termites	3.00	Accepted
7.	Fungi	2.17	Not Accepted
8.	Wood wasp	2.58	Not Accepted

N = 168

With reference to Table 2, the respondents accepted items 1,2,3,5,6 and didn't accept items 4,7 and 8. This means household furniture were not infested by carpenter bees, fungi and wood wasp in Jos metropolis.

Research Question 3

What are the methods used for exterminating biological agents from household furniture?
The response to research question 3 is presented in Table 3 below.

Table 3

Mean of responses of respondents on ways or methods cabinet makers used to exterminate biological agents from household furniture in Jos metropolis.

S/NO	Methods of exterminating biological agents	Mean	Remark
1.	Spraying Insecticides	2.38	Not Accepted
2.	Fumigation in the Chamber	1.93	Not Accepted
3.	Removing and replacing infested wood with another wood	3.81	Accepted
4.	Applying kerosene using eye dropper / oil can	4.91	Accepted
5.	Dry out the building and avoiding dampness	1.39	Not Accepted
6.	Use opaque and transparent finishes	2.92	Not Accepted
7.	Avoid using wood having moisture content above 20%	4.33	Accepted
8.	Apply creosote oil using brush	4.17	Accepted
9.	Methyl bromide	2.25	Not Accepted
10.	Mineral Turpentine	2.2	Not Accepted

N = 168

The data in table 3 showed that respondents accepted items 3,4,7,8 and didn't accept items 1,2,5,6,9 and 10. This means cabinet makers accepted using brush to apply creosote oil, applied kerosene using oil can, remove and replace infested wood with another wood and avoid using wood having moisture content above 20% for furniture construction.

Discussion

The infestation of furniture items by biological agents in Jos metropolis is so high which needs urgent attention. It was discovered from the study that cabinet makers used Achuwele (Hardwood) more than any other type of wood because it less expensive. Though, mahogany and Agbuntu are stronger and expensive than achuwele. Poster and Reg (2006) postulated that for wood to be free from wood borers and termites, the moisture content of the wood

should not be more than twenty percentage and durable wood should be selected for woodwork.

It was disclosed in the study that powder post beetles, ants and termites were the biological agents that infested household furniture in Jos metropolis. Biose (2005) explained that to prevent termite attack, termite resisting wood such as Iroko should be used and impregnate the timber with suitable preservative. To treat infested timber, the use of arsenic trioxide powder is essential. Biose reported that to prevent powder post beetles, the cabinet maker should avoid using untreated sapwood in construction work. Liquid insecticide can be forced into the tunnels with a syringe to penetrate the infested wood.

The study also revealed that use of brush to apply creosote oil, removing and replacing infested wood, use of oil can to apply kerosene and avoid using wood with moisture content above 20% were accepted by respondents. In the same opinion, love (1979) explained that much can be done to protect household furniture by sealing the open joints with wax or furniture cream and use of aromatic oil in some furniture also discourages beetles. Pest Control Service (PEPSOP) (2012) revealed that the treatment for powder post beetles is the use of oil based solution injected into the holes created then spray the holes and plug them with wood wax.

Conclusion

It is difficult to secure complete immunity from attack by biological agents such as wood borers, insects and termites. But when sound woods are selected for constructing household furniture and treated with preservative before usage, then, the rate of infestation will be reduced if not completely stopped. When household furniture is infested, it reduces the strength and durability of the furniture item. Therefore, serious attention should given to household furniture when infestation of furniture items by biological agents are noticed.

Recommendation

The following recommendations are hereby made.

1. Sound wood such as Mahogany, Agbuntu, Abura, Manosonia, iroko should be used for constructing household furniture irrespective of the price. Wood borers and termites hardly infest these woods if properly seasoned.
2. Woods should be properly seasoned at least not more than 20% moisture content before utilizing it for constructing household furniture. This will prevent or minimize attack by biological agents.
3. Household furniture should be renewed every three years by application of finishes. It can also assist in preventing wood borers, termites and ants from attacking furniture..
4. The infested part of the wood should be removed and replaced with another wood. The whole furniture piece should be protected with the application of preservatives e.g insecticide and finishes such as transparent or opaque finishes.
5. Insecticide such as baygun should be used to kill powder post beetles, ants and termites. This type of insecticide is very strong, poisonous and reliable.

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