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Preservation of Forest Trees against Pests and Insects Attack

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Abstract The study identified types of forest. It explained botanical classification of trees. The study described the structure of a tree and mentions its parts that are mostly infested. Types of insects and pests that mostly infest forest trees were identified in the paper. The causes of insects and pests in the forest were discussed. Methods to be implored in controlling these biological agents infesting trees in the forest were explained. This includes fumigation of the forest; avoid injury to plants during pruning to avoid heart rot fungi etc. The following should be adhered to towards preservation of forest trees against insects and pests attack. This includes public enlightenment on simple method of controlling insects and pests that infest trees at home and public places by using insecticide, use disease resistant trees and infested trunks of trees should be injected using abamection, acephate and other good preservatives.

Keywords Angiosperm, Forest, Gymnosperm, Insect, Pest, Preservation

1. Introduction

Forest is a large area of land covered with trees. Reference[1] explains that some legal definition of forest is based on the actual vegetation on the land. India's forest conservation act of 1980 states that any land recorded as forest is legally a land with or without vegetation on it. The Philipines has a definition based on the slope of the land which says that any untitled land having a slope greater than 18% is considered to be forest land. The European Commission has defined forest land as having at least 20% canopy closure (10% in Mediterranean forest) and a minimum area of 0.5 hectare.

Reference[2] reveals three main types of forest. These are tropical forest, temperate forest and boreal forest. Tropical forests occur near the equator and they are the most ecologically rich forest and they regenerate very rapidly. The only problem is that reforestation is rare. These forests are classified into four types. They are evergreen rain forest, seasonal rain forest, semi ever green forest and mist/ dry deciduous forest. Temperate forests are found in the North America, North Eastern Asia, west and central Europe. In these types of forest regeneration is slow because the growing season is short. Though, plantations have gradually replaced these types of forest. Boreal forests or Taiga are forests found in areas with shorter, warm summers and long winters. Regeneration occurs slowly in these types of forest. They are found in Europe, Asia, Siberia and North America because of the cold climate. It consists of mainly evergreens and other resilient vegetation. The canopy of the forests is so dense in such a way that it allows small quantity of sun light to reach the forest floor.

It has been observed that many trees in the forest which suppose to be used for furniture and other constructional work have been destroyed by pests and insects. If these trees are properly harvested, it saves the problem of importing wood from other countries and also it can contribute to economic development of Nigeria. Therefore, this demands urgent attention in order to preserve forest trees against pests and insects attack.

A tree consists of roots stem or trunk and branches. The timbers are mostly obtained from the trunk of a tree. Trees grown in the forest are classified into two botanical classes. These are Angiosperm and Gymnosperms. Angiosperms are trees that spread out as they grow and have more rounded shape. They are flowering plants with seeds encased in the broad or flat leaves. The timber from Angisoperms or dictylodens is called pored wood or hardwood. For example, Oak,Maple, mahogany, Iroko, Manosonia, Afara, Achuwele, Agbuntu etc. while Gymnosperms are trees that grow upward rather outward and have a triangular shape. The leaves of coniferous trees are either long, pointed needles or are small and flat scale. They are non flowering plants and have naked seeds. Most of the conifers are ever green. The timbers from these classes of tree are called non-pored wood or soft wood. Examples are pines, fir,spruce and cedar etc as shown in[3].

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Pests and insects infect parts of trees such as the roots, leaves, bark and sapwood. There is a need to know the structure of a tree or the inner part of the tree that are mostly infested by biological agents such as insects and pests.

1.1. The Structure of a Tree

The structure of a tree comprises of pith or medulla, true wood or heartwood, sapwood, cambium layer, bark or cortex, medullary rays, growth ring. Reference[4] describes the structure of a tree as follows:

1. Pith or medulla: It is usually brown, soft and spongy tissue which extends through out the centre of the trunk and branches. It is formed as the tree grows by special cells near the growing tips and serves as a passage for the sap moving to the growing tips. After the wood cells called xylem have formed around it, the cells stop to function and die. In some hard woods, the pith may not be visible while in others, it may be hardened. The pith is usually visible in softwoods.

2. True wood or heartwood, It is the fully developed wood (xylem) surrounding the pith. It is the central and supporting pillar of the tree. Most timber for constructional purpose is obtained from the true wood. At times, it may be dead or loose strength while the outer layers are intact. The cellulose fibers are bound together by chemical glue called lignin.

3. Sap wood: It is the tree's pipeline for moving water from the soil through the roots to the leaves. Sapwood is a new wood and as the new rings of sapwood are laid down, the inner cells loose their vitality and turn to heartwood. The formations of the cellulose walls of the sap wood cells gradually become hardened i.e lignified as the tree increases in girth and mature into heart wood. Owing to the food substances stored in some of the cells of the sapwood render it liable to be attacked by insects.

4. Cambium layer: It is the growing part of the tree. It usually produces new bark and new wood in response to hormones that pass down through the phloem with food from leaves. The hormones called "auxins" stimulate growth in cells. Auxins are produced by leaf buds at the ends of branches as soon as they start growing in spring. Cambium layer is a thin layer of cells between the inner bank and the sapwood of the roots, trunk and branches. The cambium layer grows and divides thus producing woody tissue called Xylem. After the xylems cells become lignified their living contents die leaving mature wood cells. The new inner bark cells are called phloem. The phloem cells are living and do not have lignin in their walls, they transport the food solutions throughout the tree. For instance, the sugar solutions manufactured in the leaves.

5. Bark or cortex: It is a layer of non-woody fibrous material surrounding the roots, trunk and branches. It keeps the inner part of the tree from rain, prevents it from loosing moisture when the atmosphere is dried. It keeps the inner part of the tree from animals. Though, some insects and pests still penetrate through the bark to the sapwood. The inner bark (Phloem) convey the food substance to the growing parts of the tree while the outer bark forms an impervious skin which restricts transpiration and desiccation of the phloem and cambium layer.

6. Medullary rays, as in[5], it indicates that the rays are lines of bundles of the walled cells running from the bark to the pith or growth rings. The rays circulate nutrients horizontally within the trunk.

7. Growth rings: It is also called annual rings. Reference[6] explained that each of the concentric circles represents the layer of wood produced in one year. The age of the tree can be determined by the number of rings. It indicates the yearly growth of the trunk. The structure of a tree is presented in figure 1.

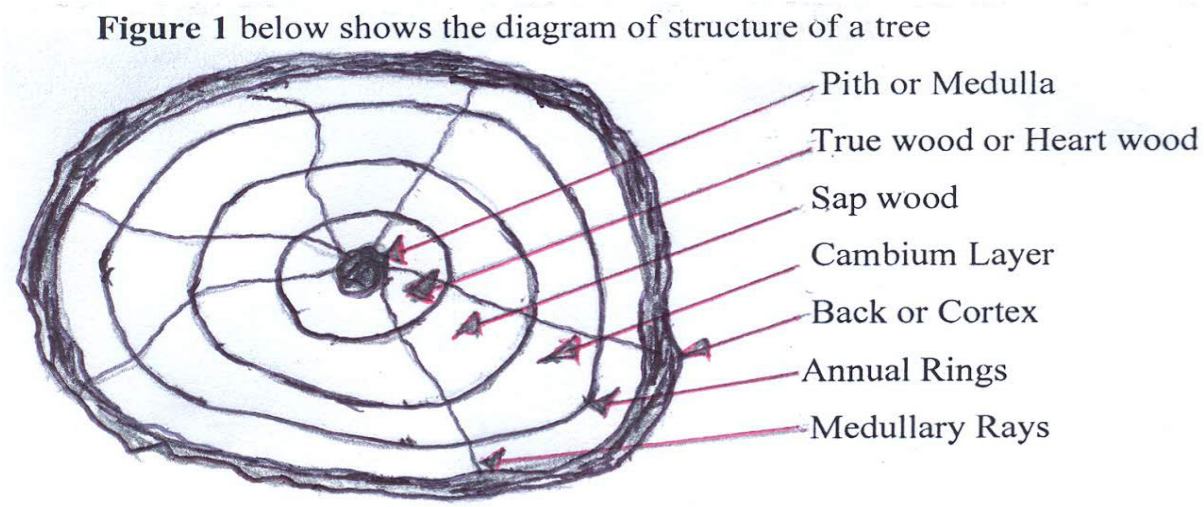

Figure 1. Diagram of structure of a tree

Courtesy: A.M. Armstrong,, 2000 The Picture of structure of a tree

2. Types of Insect and Pest That Infest Forest Trees

Many insects make their homes in the bark, trunks and branches of tress in Nigeria. These insects and pests that weaken the tree by taking away the sap resulting to damage or dead plant is called secondary invader as shown in[8]. They attack tress when it has been weakened by another stress. The secondary invaders include termites, carpenter bees and carpenter ants. The wood boring insects that attack healthy tress and shrubs are called "Primary invaders". Primary invaders at times kill the tree. The primary invaders include long-horned beetles or rounded-headed borers (coleoptera: cerambycidae); locust borer (Megacyllene robiniae); cotton wood borer (plectrodera scalator), Red –Headed ash borer (Neoclytus acuminatus); Twig Girdler (Onciderers species); Twig and branch pruners (Elaphidionoides and Agrillus species); metallic wood-boring beetles or flat headed borers (coleoptera: Buprestidae); bark bettle (Coleoptera: Scolytidae); southern pine beetle (Dentroctonus frontalis); Ips engravers (IPS. Spp); weevils (Coleoptera: Curculionidae); Wood boring caterpillar (Lepidoptera) and peach tree borer (Synanthedon exitiosa),as in[8]. Reference[9] shows that metallic wood borer (Buprestidae Caleoptera) called jewel beetles also kill young tress by their larvae boring through the bark making D-shape holes.

2.1. Causes of Insects and Pests in the Forest

Insects and pests spread in the forest due to the following reasons: when trees are planted very close to each other without enough space. The branches of trees or shrubs touching each other allow spreading of diseases. Reference[10] pointed out that declining trees may serve as reservoirs for various insects and diseases problem. Large, old trees can become hazardous, threatening lives or property as they decline and decay. Such trees should be removed from the site.

Reference[11] disclosed that pests and insects can be brought about when large amount of leaves and branches of trees are left on the ground in the forest. This creates favourable condition for insects and pests to spread. Lace bugs (Corythucha spp) feed on leaves of many tree species often resulting in chlorotic flecks or tiny chlorotic spots on the upper leaf surface. Reference[12] disclosed that grasshoppers and crickets destroy tree by stripping off seedling bark at lower levels and feed on the underlying tissue. It can even chew through thin stems and branches of trees.

Poor ventilation, dampness or lack of soil sterilization can also spread disease. Trees under stress or not appropriate for a particle site are prone to organic damage and this is a source for insect to infest trees.

Pruning: Pruning helps to improve the structure of a tree but these operations can expose trees to infection if it is not properly done. The sap and resin of the tree pruned can attack insects to other trees. Even, wounds on the trunk or branches during pruning operation can make heart rot fungi to gain entry through the wounds and some times improper pruning occurs prior to purchase, as revealed in[10].

2.2. Measures for Controlling Insects and Pests Infesting Forest Trees

The following are outlined for controlling insects and pests infesting trees in the forest. Woody residues in the forest should be cleared in order to avoid attracting insects and pests. After thinning and pruning, all branches and leaves cut from the plants should be removed from the forest. Reference[13] showed that the tent caterpillar attacks broad leaved trees and shrubs. Insecticides are very useful for killing them. Any source acting as a breeding site such as dead branches and debris should be removed from the forest. The best management approach to pest control is to keep the forest healthy, remove dying or diseased trees and strive to maintain a robust stand. Insecticides of different kinds are effective in controlling grasshoppers and crickets, as

disclosed in[12]. When pests and insects are much in the forest, it causes a lot of destruction to the trees that useful for furniture construction. The best remedy is to fumigate the forest to preserve the trees essential for domestic and industrial use.

With respect to reference[10] it reveals that selecting well adopted species of tree that are not easily attacked by pests and insects such as Arizona teak, birch, Iroko, soft maple, sash pine, willow, Ironbark, Totara, Puriri, Kauri and poplar is vital to guide against insects and pests attack. Choosing good site to avoid plant stress is essential for pest and insect control followed by Proper irrigation and fertilization of the trees. During thinning and pruning avoid injury to plants to guide against heart rot fungi. All infested plants should be removed and destroyed. Using plastic trunk protectors to help prevent injury from mowers and weed trimmers is a good practice to prevent fungi from having access to trees. Inspect damage on the tree closely and if possible extract the larva from the plant with a knife, or other tools. Remove and destroy infested trees.

Reference[8] explained that once trees are infested, it is only chemical that is effective in bring them back to life. They said that infested trees need repeated applications of insecticide. Some of the insecticide products registered for wood borers mentioned include residual insecticides e.g bendicarb, carbaryl, chlorpyrifos, endosulfan, esfenvalerate, fluvarlinate, lindane, methoxychlor, cyfluthrin, befenthrin, permethrin and sumithion. These insecticides only kill the pest and larvae but it doesn't kill the larvae that have already penetrated the sapwood and heartwood. Some products such as paradichlorobenzene and ethylene dichloride can repel egg laying adults or kill accessable larvae. The trunk of the infested tree can be injected and the products used include abamectin, acephate, dicrotophos, imicladaprid and oxydemeton – methyl. They are for treatment of wood borers and used as sprays to trunks and branches. The wounded trees should be painted to prevent transmitting of diseases such as fungi. Natural method of controlling insects and pest are some how effective while chemical control is better used on high value shade and ornamental trees, as revealed in[11]. While reference[14] identifies other methods of controlling insects and pests. This includes silvicultural control and biological control. In silvicultural control, one of the primary requirements is the treatment of the standing crop as well as during harvesting. It is known in Germany as clean hygienic management. This involves selective cutting and thinning including the removal of suppressed, physiologically weakened trees, cleaning methods of harvesting and logging. Biological control involves the use of pathogen such as bacillus thuringiensis and beauveria. Attaching noxious forest insects is another field of biological control that is currently much investigated in many countries. Another aspect of biological control is the enrichment of the habitats with flowering plants producing pollen and nectar for adult entomophagous insects are transient to pest control.

Management control method was discovered in[15] which consist of various management practices that a forester can employ. This includes the remover of infested trees and tree parts, the maintenance of proper tree population and prescribed burns. Reference[16] discloses that the only method of to determine the actual nutrient level in the tree to know the level of nutrient deficiency is to obtain a leaf tissue sample and send it to laboratory set up to perform such a tissue test.

3. Conclusions

Forest comprised of trees and shrubs. There are three main types of forest. This includes tropical forest, temperate forest and boreal forest. Trees in the forest are botanically classified into two. These are Angiosperms and Gymnosperms. The structure of a tree is made up of pith, heart, cambium layer, sapwood, bark, medullary rays and annual rings. The biological destructive agents that infest forest trees are grasshoppers, crickets, wood worms, caterpillars etc. The insects include termites, ants and carpenter bees.

Trees that are expected to be used for domestic and industrial work have been rendered useless by pests and insects. To avoid forest trees infestation, dead branches, debris and declining trees should be removed from the forest. Adequate care should be taken during pruning and thinning in order to avoid injury to trunks and branches so that heart rot fungi will not gain entry into tree. It was discovered from the study that forest should be fumigated from time to time for eradication of pests and insects. Trunk of trees infested by pests should be injected using abamectin, acephate and dicrotopos.

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