

A Review of the Problems of Tree Protection in Nigeria with Special Reference to Insect Pests

M.O. ASHIRU
Forestry Research Institute of Nigeria
P.M.B. 5054
Ibadan, Nigeria

(Accepted 3 December, 1982)

ABSTRACT

The status of forest insect pests in Nigeria is discussed from the inception of the former Federal Department of Forest Research (now Forest Research Institute of Nigeria, Ibadan) to the present time. The major insect pests of the economic tree species in Nigeria are discussed and successful attempts at controlling some of them are highlighted.

The major factors, such as shortage of personnel and inability to make maximum use of the resources available, militating against pest control are discussed with a note on the prospects for future campaigns against forest insect pests.

INTRODUCTION

Nigeria is predominantly a savanna area with high forest extending inland to varying distances. Forestry in Nigeria was mainly concerned with logging and extraction with little or no attention being paid to the pest problems that may occur as a result of disturbances to the natural ecosystem of the forest.

However, some Nigerian foresters had been aware of some of the important forest insect problems of indigenous trees. Kennedy (1933) reported on the incidence of the 'Iroko-gall fly' (*Phytolyma* sp. nr. *lata*) Walker and suggested various silvicultural practices for its control.

In his 'Forest Flora of Southern Nigeria' Kennedy (1936) included comments on the relative susceptibility of different Meliaceae to attack by the shoot borer (*Hypsipyla robusta*). He was the first authority to note that in West Africa the larvae of this moth will attack both the fruits and cambium as well as the shoots of the living tree.

With the development of the timber industry between 1935 and 1955, Mackey (1943) recommended control measures against pin-hole borer attack on logs and powder-post beetle damage to converted timber. The boom in the industry at this time was partly responsible for the establishment of the West African Timber Borer Research Unit (W.A.T.B.R.U.) at Accra, Ghana, which also had responsibilities for Nigeria. Results of some biological studies carried out on ambrosia beetles and other important timber insects were published in W.A.T.B.R.U. Reports — 1953—58, 1959, 1960, 1961—62.

Nigerian forest policies were originally aimed at encouraging the growth and regeneration of indigenous species to produce poles, fuel and marketable timber in the natural high forest. The policies were later modified to cater for the establishment of plantations of indigenous trees on

favourable sites. Exotic tree species were also planted as uniform stands.

Forestry contributed ₦136.8m, 126.6m, 124.4m, 148.0m, 140.4m, 150.0m, 138.4m, 73.4m, 74.2m, and ₦80.0m to the Gross Domestic Product of Nigeria respectively between 1960/61—1969/70 financial years (Anonymous, 1973). The sharp fall from ₦138.4m in 1966/67 to ₦73.4m in 1967/68 can be attributed to a myriad of factors including the effect of the 1967 Nigeria Civil War, a high rate of timber exploitation without replenishment in the preceding years and pest attack which cannot be quantified.

The Forest Research Branch (of the office of the Inspectorate General of Forests) was established in 1952 with its headquarters in Ibadan. The first general studies on forest insect were started in 1961 by Eidt who initiated a forest insect survey in Nigeria (Eidt, 1963). This was restricted to insect pests of indigenous plantation trees of the lowland rain forest. The survey was continued by Roberts in 1962, when the programme was modified to include pests of exotic tree species, and savanna area.

Review of pest status up to 1963

Kennedy (1933) studied the morphology and biology of the 'iroko gall bug,' *Phytolyma l. Walker*. He described the gall formation and the galls and recommended silvicultural measures of control. Kennedy (1936) commented on aspects of the phenology of *Triplochiton scleroxylon* K. Schum and observed that the tree was frequently defoliated by caterpillars shortly after flush. He also observed that logs of *Triplochiton* which were not extracted soon after fell were very badly attacked by pin-hole borers. He reported that trees of *Nauclea diderrichii* (Wild & Th. Dur.) Merrill attacked by *Orygmophora mediofoveata* Hampson (Opepe Sh Borer) are slower growing than those not attacked.

Mackay (1943) in thirty three illustrations showed the damage done to timber species by various insect pests such as the longhorn beetle *Analeptes trifasciata* (Fabricius) and the borer *Apate* spp.

Kemp (1956) wrote on the control of root feeding nursery pests, with special references to mites, especially those attacking *Eucalyptus* spp. in Northern Nigeria.

Henry (1960) recorded attack by *Hecphora testator* F. ranging from 1.4% — 60.3% in *Nauclea diderrichii* D. compartments of Akilla. Such attacks were recorded from ground level to a height ranging from 0.9m (1') to 1.8m (6'). He postulated that if subsequent control indicated a further build up in the population of *Hecphora testator* F. and a consequent increase in the percentage of damaged plants, it would be advisable to replace *Nauclea* with some other filler species as nurse crops for the Meliaceae. He further observed that infestation of four to six larvae on a two-year plant of *Nauclea* appeared to be enough to kill the plant. The need for greater variety in the species planted so as to reduce the chances of a build up of the pest population was stressed.

Sands (1962 a) found that in West Africa both food and tree crops are usually attacked by termites at a time when their resistance to any kind of damage is lowest, i.e. towards the end of the growing season in annual crops and during the dry season in tree crops. He observed that *Macrotermes natalensis* (Hav.) will attack vigorous new growth of *Isobertinia doka* (Craib Stapf) with fatal results, and that *Eucalyptus* spp. are the most consistently and seriously damaged plantation trees. The termites responsible for such damage belong to the family Termitidae, mainly members of sub-family Macrotermitinae with one or two species of Armitermitinae and Nasutitermitinae. Recommended control for these termites include the application of insecticide to the individual plants, direct attack with insecticide on the ter

Tree Crop protection in Nigeria

colony (mound poisoning) and general application of insecticide to the soil.

Eidt (1963) made an extensive survey of forest insects. A few of his important findings will be mentioned under host plant headings.

Nauclea diderrichii

Orygmophora mediofoveata Hmps. the 'Opepe shoot borer' was recorded attacking *Nauclea*. The terminal shoots were bored and multiple attack caused stunting. In most parts of the former Western State, 30 to 80% of the plants in 1961 transplant beds were attacked by the time the plants were moved to the *taungya** farms. Other pests recorded on *Nauclea* include *Hecphora testator* F. (Coleoptera: Lamiidae), a stem borer, and *Zonocerus veriegatus* L. (Orthoptera: Acrididae), a defoliator of Opepe seedlings in the nursery.

*Planning of food and cash crops together.

***Terminalia ivorensis* (A. Chev.):**

Apate monachus F. (Coleoptera: Bostrychidae) was recorded boring into the stem and large branches of *Terminalia ivorensis*. Larvae of *Tridesmodes ramiculata* Warren (Lepidoptera: Thyrididae) bored into shoots of *Terminalia*. About 5% of the terminals were usually affected. The pest was regarded as potentially serious.

***Triplochiton scleroxylon* K. Schum (Obeche)**

Larvae of a noctuid, *Anomis leona* Schaus, were commonly associated with Obeche in nursery transplant beds. Larvae reportedly ate both old and new foliage. *Gymnogryllus lucens* (Wlk) (Orthoptera: Gryllidae) was reported to cause damage to Obeche in nurseries every year. These crickets come out at night to cut the foliage, which they carry into their burrows. Wastage was reported to be high.

A notodontid, *Anaphe* sp., was reported to cause severe defoliation of large trees in natural forests. An un-named psyllid was also recorded attacking young trees of Obeche in their first year in the transplant beds. Heavy infestation killed the plants. Malathion spray (0.1%) applied to the undersurface of the leaves was recommended.

***Khaya* spp.**

Hypsipyla sp. (Lepidoptera: Pyralidae) was recorded on the fruits and shoot of *Khaya grandifoliola* (C.Dc). Damage to the shoot was always heavy and caused excessive branching. The pest was also recorded on other members of the Meliaceae including *Lovoa*, *Eriandrophragma* and *Cedrella*. Eidt estimated that up to 10 years growth was lost in the life of a tree. Trees under heavy shade were attacked less than exposed ones, but their growth was depressed by a reduction of incident light. Attempts at a compromise were unsuccessful.

Eidt found that insects were not the primary problem in nurseries and plantations. The primary problem was inadequate knowledge of the varying soil, light and moisture requirements of the various tree species used.

Pest status from 1963 to the present time

Information on the status of forest insect pests from 1964 to the present time is based mostly on Robert's work. The major insect problems are classified as follows:

Insect pests of natural high forest and savana woodland

- (a) *Triplochiton scleroxylon* K. Schum is infested by many pests which do appreciable damage to the tree. The pests include:-

(i) *Anaphe venata* Butl. (Lepidoptera: Notodontidae). Larvae of this notodontid defoliate *Triplochiton* (Pomeroy, 1923), and are found throughout the lowland rainforest. Larvae have been recorded defoliating *Triplochiton* in August, September, and October in Nigeria (Roberts, 1969, Ashiru, unpublished data). Up to 70% damage due to defoliation has been recorded (Ashiru, unpublished data). The egg and pupal stages of this insect are cryptic but the adults are nocturnal (Ashiru, unpublished data). Control of the pest will be most successful if aimed at living larvae.

Chemical control may be difficult, if not impracticable, at the moment because of the great heights attained by the host tree.

(ii) *Diclidophlebia harriconii* (Osisanya) (Hemiptera: Psyllidae) is a sap sucker which attack is particularly severe on young seedlings in nursery and transplant beds before they are well established (Osisanya, 1969). The effect of attack is stunted growth and coppicing of the stems to produce trees unsuitable for timber.

(iii) *Apion (Catapion) ghanaense* Voss (Coleoptera: Curculionidae) is a fruit borer of *Triplochiton*. This pest was recently discovered on the tree and seed loss ranging from 10% to 90% has been recorded (Ashiru, 1975). Studies have begun on the biology, ecology and possible control of the pest.

- (b) *Terminalia superba* (Eng. & Diels) is attacked while still alive by a pin-hole borer, *Doliopygus dubius* (Sampson) (Coleoptera: Platypodidae).
- (c) *Daniellia oliveri* (Hutch & Daalz), a dominant southern savanna tree sometimes considered a potential timber for local consumption, is commonly attacked by two beetles — *Malldon downesi* (Hope) (Coleoptera: Prionidae) and *Pachydissus camerunensis* Aurivillius (Coleoptera: Carambycidae). The larvae of both beetles tunnel through the heart and sapwood.

Insect pests of indigenous trees in plantation

Very few indigenous trees have proved successful as plantation species in Nigeria. Attempts at growing the valuable Meliaceae have been almost completely abandoned because of depredation of various lepidopterous borers, especially *Hypsipyla robusta* (Moore).

High forest plantations

- (a) *Terminalia ivorensis* (A. Chev.) is a major plantation species in Nigeria. Its pests include shoot borer, *Tridesmodes ramiculata* (Warren) (Lepidoptera: Thyrididae) (Edit 1963) and a powder-post beetle, *Apate monachus* (Fabricius) (Coleoptera: Bostrychidae).
- (b) *Nauclea diderrichii* (D & D) Merrill is extensively planted in a mixture with other species sometimes as line plantings in Nigeria. The pest associated with this timber species is *Orygmophora mediofoveata* (Hamp.) (Lepidoptera: Noctuidae) (Edit 1963, Roberts 1963).

Tree Crop protection in Nigeria

1964). Attack by this pest is very evident in young plants and up to 50% of the plantation can be affected.

- (c) *Khaya ivorensis* (A. Chev.), *K. grandifoliola* (C. Dc), and *K. anthotheca* (Welw.) D. Dc are members of the Miliaceae. Attempts to raise very extensive plantations of these species have invariably failed due to the mahogany shoot borers *Hypsipyla* sp. (Lepidoptera: Pyralidae) (Eidt 1963, Roberts, 1966, 1968, 1969; Akanbi, 1970). *K. ivorensis* appears particularly susceptible with up to 100% of the stand commonly affected. Eidt (1963) considers that up to ten years' growth can be lost to shoot borer attack. The use of sackband (as practised to some extent in India), colour attraction and strip techniques and biological control using natural enemies hold no promise in Nigeria (Akanbi, 1970). The suggested use of sex attractant and male sterilization techniques has not been tried.
- (d) *Chlorophora excelsa* (Welw.) Benth. is attacked by *Phytolyma* sp. (Hemiptera: Psyllidae) and attempts to grow this species in plantations have failed. Gall formation is the characteristic symptom. Some measure of control of the gall bug can be obtained with systemic insecticides but costs make the treatment prohibitive (White, 1966).

Some measure of resistance to the bug through breeding was achieved by Omoyiola (1970) but he recorded loss of vigour in terminal growth.

Savanna plantations

Acacia nilotica (Linn.) Willd. ex Del. is reportedly infested by *Pachyonyx* spp. (Coleoptera: Curculionidae) in Kudagangara in Kano State (Ashiru, 1983). Attack by this insect causes galls or knots to be formed on the branches. Removal and burning of the affected trees is a tentative measure of control.

Insect pests of exotic trees in plantations

Other than termites, there are no known insect pests in Nigeria that have either limited the planting of, or necessitated special control measures to ensure the establishment of exotic tree species in Nigeria. However, a few incidences are of concern.

- (a) *Gmelina arborea* (Roxb.) is attacked at the nursery stages by *Zonocerus variegatus* (Orthoptera: Acrididae). These grasshoppers nibble at the boles of *Gmelina* to the wood. A plot at J4 Omo Sawmill planted by the former Western State Ministry of Agriculture and Natural Resources, showed a heavy incidence of attack during the 1973 dry season (Ashiru, unpublished data). Measures to control this pest have been initiated.
- (b) *Tectona grandis* (Linn.) F. (teak) is regularly defoliated by *Zonocerus variegatus* (Orthoptera: Acrididae) in the dry season. In the Guinea Savanna Zone it has been reported to strip trees two to three years old over comparatively large areas (Roberts, 1964). *Amitermes evuncifer* (Silvestri) (Isoptera: Termitidae) attacks teak in the drier areas and often kills young trees.
- (c) All the *Eucalyptus* spp. established in Nigeria are very susceptible to termite attack (Roberts, 1969). *Macrotermes bellicosus* (Smeathman), *Macrotermes natalensis* (Haviland) and *Pseudacanthotermes militaria* (Hagen) (Isoptera: Termitidae) cause the greatest amount of damage in savanna areas. All three insect species can ring-bark and fell young trees. Consequently, all *Eucalyptus* species are pot-planted with deildrin added to the potting mixture as a control measure.

In the Guinea Savanna areas lepidopterous larvae, notably *Nadasia amblycalyma* (Tams) (Lasiocampidae), *Eumeta cervina* F. (Psychidae) and *Strepsicrates* sp. nr. *rorthia* (Meyrick) (Tortricidae), (F. Muell) have been observed defoliating *Eucalyptus*. A longhorn borer *Analeptera trifasciata* F. (Coleoptera: Lamidae) has been found in the Southern Savanna girdling *Eucalyptus*, particularly *E. torreliana* (F. Muell).

(d) *Populus* spp. is attacked by a defoliator *Phalanta phalanta* D. (Lepidoptera: Nymphalidae). Larval defoliation impairs plant vitality and retards growth. Young plants are more susceptible than old plants. Applying fertilizers at the rate of 56.68g ammonium sulphate + 56.68g super phosphate gives the young plants a good start and this, coupled with the addition of 0.01% Aldrex 30 E.C. at twenty-day intervals, protects the plant from serious attack (Akanbi, 1971). The avoidance of sites where *Tridax procumbens* (Linn), the alternate host of *P. phalanta*, thrives, is a recommended silvicultural control measure.

Some areas of successful pest control

A few successful attempts at pest control include:

1. The effective control of termite damage in newly established plantations of exotics in the savanna (Kemp, 1956; Sands, 1962a, 1962b).
2. Treatment with fungicides successfully protects logs of *Antiaris africana* (Engl.) from insects associated with blue-stain for a maximum of six days. Combinations of fungicide and insecticide are more effective. An oil-miscible formulation consisting of pentachlorophenol (0.85%) and dieldrin (0.22%) in diesoline controlled staining for periods up to five weeks (Odeyinde and Akanbi, 1972).
3. Fertilizers that give the young plants a good start and the addition of 0.01% Aldrex 30 E.C. was effective in controlling attack by *Phalanta phalanta* D. on *Populus euphratica* B. (Akanbi, 1971).

Problems of pest control in Nigeria

An attempt has been made to discuss some of the important timber species in Nigeria with reference to the insect pests found on them. Aspects of work done on these pests since the inception of work on control by the West African Timber Borer Research Unit and later by the Pathology and Entomology Division of the Forestry Research Institute of Nigeria have also been discussed.

With the Meliaceae, there is no known control for *Hypsipyla* and related species, especially in relation to forestry practices in Nigeria.

Investigations carried out on the 'iroko-gall fly', *Phytolyma lata* (Walker) have failed to reveal any point at which the insect could best be attacked by conventional means. A number of hymenopterous parasites have been recorded, but a high degree of damage is caused by a relatively low insect population and this increases the difficulties of biological control. Chemical control attempts did not yield any remarkable results.

The Opepe shoot borer have not been fully studied and no control attempts have been made either. For the Psyllid on *Triplochiton*, a spray of 0.1% malathion applied to the under surface of the leaves was found to be effective for up to 10-14 days. This treatment was effective for young seedlings only. Early planting was also recommended because the insects are troublesome only in the dry season.

Tree Crop protection in Nigeria

A lot of basic ground work has been done on the major insect pests of trees in Nigeria. Information about the intricate biological, ecological and physiological characteristics of the pest is, however, inadequate. This information is essential for successfully controlling them.

One major factor which militated against a detailed study of the major forest pests is the shortage of personnel.

Equipment suitable for studies on some problem areas of forest pest control was available but the adverse effect of the instability of staff did not allow for maximum use of such equipment.

Future prospects

As more and more areas of virgin high forest and savanna are distributed, the natural ecological and biological equilibria of such areas will be affected and many more insects which hitherto had been non-pests are likely to attain pest status. We cannot afford to allow pests to continue to ravage our valuable resources.

Forestry in Nigeria is undergoing a transition from natural forest to plantation work on many tree species. However, it is too early to predict the future of the campaign against insect pests of forest trees in Nigeria. Control possibilities would be greatly strengthened if every forester considers himself a participant in pest survey and reports insect problems to the Headquarters of the Forestry Research Institute of Nigeria.

REFERENCES

- Akanbi, M.O. (1970). The major insect borers of Mahogany: A review towards their control — what step next? *Proc. Inaug. Con. For. Ass. Nig.* pp. 394—402.
- (1971). The biology, ecology and control of *Phalanta phalanta* Drury (Lep: Nymphalidae). A defoliator of *Populus* spp. in Nigeria. *Bull. Ent. Soc. Nigeria* 3: 19—26.
- Anonymous (1973) *Nigerian Digest of Statistics* 22(2), p. 108.
- Ashiru, M.O. (1975) *Proceedings of the Symposium on Variation and breeding systems of T. scleroxylon* K. Schum. Fed. Dept. of For. Res. Ibadan, Nigeria, 21—28 April, pp 42—52.
- Ashiru, M.O. (1983) Recent observations on *Pachyonyx* sp. Schonherr (Coleoptera: Curculionidae) and *Bruchidius baudoni* Caillol L. (Coleoptera: Bruchidae) two pests of *Acacia nilotica* (Bagaruwa) in Nigeria. *Nigerian Ent. Mag.* 4: 5-8.
- Eidt, D.C. (1963) A survey of insect pests of indigenous trees in plantations and nurseries. *F.A.O. publication No. 1775. Rome.* pp. 68.
- Henry, P.W.T. (1960) (*Hecphora testator* F.) - A pest attacking *Nauclea diderrichii*, its incidence at Akilla and notes on the damage to the host. *Nig. For. Inf. Bull. (New series) No. 7*, pp. 18—20; *No. 9*, pp 1—5.
- Kemp, R.H. (1956) *The control of root feeding nursery pest, with special reference to termites (especially those attacking Fucalypus spp. in N. Nigeria)*. Unpublished thesis Imp. For. Inst. Oxford, 39 pp.
- Kennedy, J.D. (1933) The Iroko gall-maker. *Emp. For. J.* 12: 37—55
- (1936) *Forest flora of Southern Nigeria*. Lagos Government printing department. 242 pp
- Mackay, J.H. (1943) *Utilization of forest products in Nigeria*. Unpublished thesis. Fed. Dept. of Forest Research, Ibadan 72 pp.
- Odeyinde, M.A. & Akanbi, M.O. (1972) Combined insecticide and fungicide against blue-stain in *Antiaris africana* logs. *Nig. Jour. For.* 2(1): 40.
- Omoiyola, B.O. (1970) Breeding against gall attack by *Phytolyma lata* on *Chlorophra excelsa* : Preliminary studies. *Proc. Inaug. Con. For. Ass. Nig.*, pp. 437—39.

- Osisanya, E.O. (1969) The effect of attack of *Diclidoplebia eastori* (Vond.) (Homoptera: Psyllidae) on the survival of *Triplochiton scleroxylon* K. Schum. *Nigerian Ent. Mag.* 2: 19—25.
- Pomeroy, A.W. (1923) The production of *Anaphe* silk in Nigeria for export and its possible economic value. *2nd Ann. Bull. Nig. Agric. Dept.*, pp 59—79.
- Roberts, H. (1964) Forest insect conditions in West Africa *F.A.O./IUFRO Symposium on internationally dangerous forest diseases and insects*. Oxford. pp 1—11.
- (1966) A survey of the important shoot, stem, wood, flower and fruit boring insects of the Meliaceae in Nigeria. *Nig. For. Inf. Bull. (New Series) No. 15* p. 38.
- (1968) An outline of the biology of the (mahogany shoot borer), *Hypsipyla robusta* Moore (Lep: Pyralidae) in Nigeria, with comments on other insect bark, stem and fruit borer of Nigerian Meliaceae. *Comm. For. Rev.* 47: 133: 225—232.
- (1969) Forest insects of Nigeria, with notes on their biology and distribution. *Comm. For. Inst. Paper No. 44*, p. 37.
- Sands, W.A. (1962a) Observations on termites destructive to trees and crops *Tech. No. 26, Regional Research Station Min. of Agric. Northern Nigeria*, 48 pp.
- (1962b) The evaluation of insecticides as soil and mound poisons against termites in agriculture and forestry in West Africa. *Bull. Ent. Res.*, 53: 179—192.
- West, African Timber Borer Research Unit reports 1953—62.
- White, M.G. (1966) The problems of the *Phytolyma* Gall Bug in the establishment of *Chlorophora*. *Institute Paper No. 37, Comm. For. Inst.*, Oxford, 52 pp.