



**REPORT ON CAUSE OF YELLOWING AND DEATHS OF PINES IN HOIMA AND
KIBOGA DISTRICTS**

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and

SAW LOG PRODUCTION GRANT SCHEME

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Introduction

The ability of Uganda's forests to continually provide forest products is diminishing as they become degraded under pressure of current demands.

Plantation forestry is one of the key approaches for increasing supply of tree products and services in Uganda. SPGS 2005 estimates forest plantations in Uganda to be approximately 25,000 ha consisting of mainly exotic tree species namely Pines, Eucalypts and other exotics such as Cypress. The plantations are established as monocultures in new environments and are quite susceptible to insect pests and diseases, owing to their exotic nature. Currently *Leptocybe invasa* Fisher & La Salle is causing heavy damage in Eucalypts, with some establishments having 100% damage. In the last decade, conifers have also been bedeviled by a number of insect pests. They include Pine woolly aphid (*Pineus boreneri*) which infested Pines and the cypress aphid (*Cinara cupressivora*) which infested Cypress. The latter two have been controlled by NaFORRI using a predator (*Tetrableps raoi*) and a parasitoid (*Pauesia juniperorum*) respectively.

Serious problems of diseases have emerged in most African countries (Alemu et al. 2003). During the period 1964-68, *Dothistroma pini*, the needle blight of *Pinus radiata* was confirmed in most areas of Uganda where *P.radiata* had been planted Kiwuso et al (2007).It was most serious in Mafuga and Lendu where it caused considerable defoliation of the trees. It was because of the threat from *D.pini* and the generally poor form that large field scale planting of *P.radiata* was stopped. Instead planting of slower growing *P.patula*, regarded as immune and *P. oocarpa* regarded as fairly resistant were encouraged. Control of the disease using copper fungicides though effective in experimental trials, was found to be expensive and impractical on large scale. *Pinus caribea* has also been planted widely in the lower altitude sites but also faces challenges of diseases and insect pests.

Following the pine disease reports made by farmers in Hoima to SPGS, a research team (comprising of members listed above) from the National Forestry Resources Research Institute (NaFORRI) and SPGS; assessed the diseases in pines in Buggyawe Central Forest reserve in Hoima district and Katogo Central Forest reserve in Bukomelo subcounty Kiboga district.

Specific objectives were:

To establish the cause of Pine yellowing and deaths

To assess the severity and incidence of the damage.

To collect samples for further studies

Information on study sites

Buggyawe CFR

Site 1:

Owner: Mr. Isaac Ampire

Species: *Pinus caribea*. Planted 2014 i.e. 4 years old. Some rocky areas noticed in sites where pines were unhealthy. Unhealthy condition had been noticed about 4 months earlier.

Site 2:

Owner: Mrs. Margret Mwebesa

Planted 2012

Woodlot bushy but clearing of bush was ongoing.

Site 3: Katogo CFR

Owner-

Unhealthy condition started 4 months earlier. Site has some rocky parts. There are some live termite mounds. Attempts had been made to eliminate them but seem to have become active again.

Methods and Materials

Pine wilt assessment

Assessments were made in three woodlots in the two districts of Hoima and Kiboga. Two methods were used random sampling and purposive sampling. Purposive sampling was made on woodlots that showed symptoms of unhealthy conditions while random sampling was made in the middle and corners of the woodlots.

To establish if insect pests were the cause of the damage, observations were made on Pine trees looking out for physical presence and symptoms of the insect attacks. When insect pest attack was ruled out, disease assessments were conducted to observed unhealthy or dying trees. Scoring for severity and incidence was done as below: eight trees in the middle and corners of each plantation were sampled and scored for disease severity and incidence and the values obtained from each tree summed and averaged. Pine wilt disease incidence was estimated as the number of trees showing disease symptoms divided by the total number of trees in the sampled area multiplied by 100 [(No. of diseased Trees/Total No. of Trees) x 100].

Diagnosis for the pathogen(s) causing pine wilt and other observed diseases

The information on extent of damage caused and disease symptomology were collected. Stems of dying or dead trees were examined in the field for exit holes while some trees of dying and unhealthy trees were dug out (Picture 1) and examined in the field. Samples were collected and brought to the laboratory where they were surface disinfected using 0.5% NaOCl solution for 5 minutes and incubated on Potato Dextrose agar (PDA) medium contained in petri-dishes and re-incubated for 5 days at 23⁰C in light-darkness. Some samples were kept in freezer for further studies if they were required. Some specimens were also immersed in a bucket of water and observed under compound microscope for possible nematode attack.

Detailed observations were made on samples under a compound microscope for fungal growth associated disease symptoms.

Results

(a) Field Results

All the 3 pine plantations (in Bugyawe and Katogo had some dead or unhealthy trees representing an incidence of 100% for the three pine plantations (Fig 2 and 3). The unhealthy trees were characterised by yellowish to brownish needles (Fig 3), top and branch diebacks (Figure 4) and in severe cases entire trees were dead (Figure 4).

However, the trees that had died or observed yellowing were negligible in all the sites: In site 1, incidence was 0.071%, in compartment A, and 0.024% in compartment B. In site 2 incidences was 0.026%. In site 3, incidence was 0.04. The yellowing/deaths are not localised but scattered in different parts of the plantations ruling out a localised cause of death.

Although live termite mounds were observed in the three sites termite were not the cause of the unhealthy condition or deaths of the pines observed in the three study sites. *Cinara cronortii* (black pine aphid) Fig. 6 was observed in Katogo CFR Kibogo, However, it was not the cause of the unhealthy condition as some of the trees observed yellowing had no *Cinara cronortii* pest.

Field analysis of the root system of the dugout unhealthy pines were also found to be normal, ruling out poor development of the root system as the cause of the observed conditions.

Laboratory Results

Laboratory analyses did not identify any fungi such as *Sphaeropsis sapinea* recently observed in Kabale and Rukungiri to be the cause of the diebacks observed in Pines in Hoima and Kiboga. In addition, samples that were analysed for presence/absence of nematode did not confirm any presence of nematodes.

Discussion

The cause of death as observed in the field and laboratory is not fungal, nor is it due to insect pests and nematodes. The cause of the pine conditions observed

Possible cause of the unhealthy condition and death of Pines could be bacterial wilt or isolated cases of localised nutrient deficiencies due to unknown causes. Unless the condition gets worse, observed incidence and damage is too low to cause economic damage and should not be a source of worry as symptoms of major diseases and insect pests have been ruled out.

Conclusion

The cause of death to the pines is certainly not fungal nor insect pests. It could be inadequate food nutrients probably due to the nature of localised soil structure below e.g rock. It could also be due to other minor and rare causes such as bacterial wilt, the latter of which we have not been able to do laboratory investigations. However, there is no particular threat to the pines in the three sites given that the major threats from devastating fungi has been ruled out. It is however advised that dead trees or those with severe yellowing should be removed from the plantations and destroyed to prevent further spread (if it is bacteria wilt). Proper maintenance of the woodlots which was lacking in one woodlot should be carried out to avoid stress in terms of nutrient competition from weeds.

Annex (Pictures)



Fig. 1: Digging up root of yellowing pine



Fig. 2: Dying or dead trees are scattered in plantations



Fig.3: Progression of yellowing on a pine in Bugyewa CFR



Fig. 4: A dead *Pinus caribea* tree



Fig. 6: *Cinara cronortii* on pines in Katogo CFR (not cause of deaths and yellowing)



Fig.7: Examining dying pine