

ABSTRACT

Eucalyptus plantation development has greatly increased to match the demand for timber in Uganda. However, these plantations are experiencing a major problem of canker diseases that has since reduced on their productivity. Evaluating distribution of canker diseases is critical to justify ways of their prevention and management in the plantation forestry industry. Knowledge of the causal agents of canker diseases and the susceptibility levels of *Eucalyptus grandis* and commonly grown hybrid clones are a prerequisite in their management and control. Furthermore, since symptomatic wood is still put on the market irrespective of its strength and appearance, understanding the effect of canker diseases on wood structure and properties is crucial in order to put the wood to the rightful use.

In this study, incidence and severity of canker diseases, pathogenicity of the fungal isolates, susceptibility of *Eucalyptus* species and hybrid clones and effect of diseases on wood structure and properties were examined. Incidence and severity were evaluated in different sizes of plantations in the whole country following the Sawlog Production Grant Scheme (SPGS) clusters. Pathogenicity and susceptibility trials were evaluated experimentally on *Eucalyptus* seedlings. While wood structure of diseased and normal wood was compared macroscopically and microscopically in the laboratory. Variation in cell sizes of the diseased and normal wood were also evaluated after maceration of wood cells. The physical and mechanical and properties of diseased and normal wood were examined and compared experimentally in the laboratory.

Analysis of variance showed that there were significant differences in incidence and severity between SPGS clusters and *Eucalyptus* species and hybrid clones. Students t test showed that there was a difference in disease incidence and severity between single species and mixed species plantations. Fungal pathogens of Botryosphaeria canker disease were identified and pathogenicity tests revealed that isolates that grouped in *Neofusicoccum kwambonambiense* were the most aggressive while those that grouped in *Pseudofusicoccum* species were the least aggressive. In addition, susceptibility tests to both Botryosphaeria and Teratosphaeria canker diseases showed that there were significant differences in level of diseases tolerance among *Eucalyptus grandis* and the different hybrid clones. GU hybrid clones tolerated canker diseases more than the GC hybrid clone. Microscopically, there were differences in wood structure between diseased and normal wood. Diseased wood had much more fibre cells due to hyperplasia while normal wood had few cells. Students t-test confirmed difference in cell sizes between diseased and normal wood. All physical properties of diseased wood increased significantly compared to normal wood while some mechanical properties increased where as others decreased.

The results of this study imply that management and fight of canker diseases may need to start from the area of plantation in order to improve on the plantation industry in Uganda. As mixed species plantations had lower disease incidence and severity, significant productivity gains can be made if they are greatly promoted compared to single species plantations. Knowing the most aggressive pathogen causing canker disease is a starting point to disease management. GU hybrid clone that tolerated canker pathogens should be promoted for plantation growth more than *E. grandis* and other hybrid clones commonly grown. Additionally, timber from diseased wood should be put to the rightful use according to its properties and not according to its availability. To sum up, this study revealed that canker diseases are widely distributed in the country and capable of causing severe losses, thus management strategies should be implemented to avoid further spread.