

# A COMPARISON OF ANATOMICAL PROPERTIES OF NON-COPPICED AND COPPICED WOOD IN SIX *Eucalyptus* GENOTYPES

A. Zbonak

Forestry and Forest Products Research Centre, CSIR-UKZN, Durban

Eucalypts are an important source of fibre for the South African pulp and paper industry. The genus is largely propagated by seed but it also has an ability to resume growth from harvested tree stumps. The shoots produced from the cambium layer beneath the bark are known as “coppice”. These grow using the same root system that had been developed for planted trees.

Fibre and vessel characteristics in wood are important features since they strongly affect the quality and performance of the final product<sup>1</sup>. While the large variation in the fibre properties among different *Eucalyptus* resources is well documented<sup>2</sup>, little is known whether the quality of wood of the coppice shoots is different from that of the original seedling tree. In this study the anatomical properties of fibres and vessels in coppiced trees and their planted parents were investigated using fluorescent microscopy.

Six genotypes of *Eucalyptus*, namely 2 clones of *E. grandis x urophylla* (*E.GxU*), 2 clones of *E. grandis x camaldulensis* (*E.GxC*), a *E. grandis* clone and a pure *E. grandis*, all aged 7 years, were harvested from the Mavuya research trial in Zululand in 1997. Cut stumps were allowed to coppice and managed to produce 1 - 2 coppice sprouts. In 2005, coppiced stems were sampled at the age of 8 years. Transverse discs were extracted at breast height from both the original and the coppiced trees for subsequent analysis. In total, 54 trees were selected, 9 from each genotype. Pith-to-bark strips (2.4 mm wide) cut from these discs were sectioned transversely using a sledge microtome. The 20 µm thick sections obtained were mounted on glass slides using ethanol and examined using a Leica fluorescent microscope. Images of fibres and vessels (Figs 1 and 2, respectively) were acquired continuously along the length of each section to observe radial variation in the properties measured. Leica QWin image analysis software was used to measure anatomical properties such as fibre and vessel diameter, fibre wall thickness, vessel frequency and the area occupied by vessels.

Examination of sections using fluorescent microscopy revealed significant differences in anatomical properties between genotypes. Major differences were found for fibre and lumen diameter. The *E.GxC* clone had significantly lower fibre and vessel diameter compared to the *E.GxU* clones and the *E. grandis* clone (Fig. 2). Differences in the wood properties between non-coppiced and coppiced trees were significant only in the *E.GxU* clone, where fibre and lumen diameters were larger in the coppiced material. Vessel characteristics showed very similar trend between wood of non-coppiced and coppiced trees.

The detailed pith-to-bark profile of the radial distribution of fibre properties revealed that these

properties are very sensitive to environmental conditions, especially to rainfall. In a period from 1992 to 1994 the serious drought was mirrored by a dramatic decrease of fibre diameter and lumen diameter (Fig. 2). There was also a decrease in vessel diameter during this period but it was not as pronounced as for fibre properties. By contrast, the fibre wall thickness was relatively unaffected

Studies carried out on non-coppiced and coppiced *Eucalyptus* trees suggest that with the exception of the *E.GxU* clone, anatomical properties of both woods are comparable. At least from the anatomical viewpoint, the fibres from coppiced wood can be used for the same purposes as non-coppiced material.

## References

1. Malan F.S., Male J.R. and Venter J.S.M. (1994) Paper Southern Afr., February issue, 16.
2. Zbonak, A. and Wesley-Smith, J. (2005) Proc. Microsc. Soc. South Afr. 35, 42.

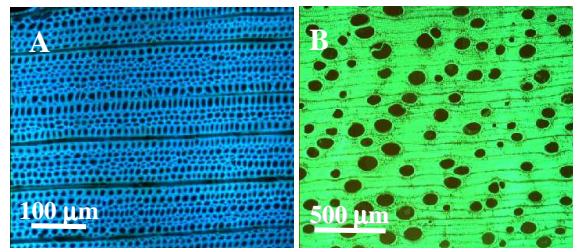


Figure 1. Typical fluorescent images of transverse sections used to measure fibres (A) and vessels (B).

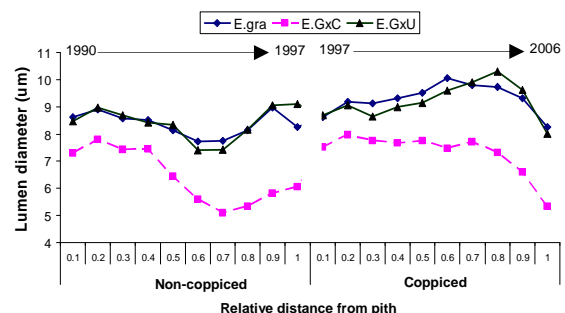


Figure 2. Radial profile of lumen diameter for non-coppiced and coppiced wood of 3 eucalypt species. Note a drop of this characteristic for non-coppiced trees due to the lack of rainfall during the 1992-1994 period.

Corresponding author: azbonak@csir.co.za