

**The reaction wood of *Buxus sempervirens* L. Tension or compression ?**

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## THE REACTION WOOD OF *Buxus sempervirens* L. TENSION OR COMPRESSION ?

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*Buxus* is a genus whose xylem contains both tracheids and vessels. Some observations made on this genus on the nature of the reaction wood had shown that some species have been reported to develop compression wood (Lämmermayt 1901, Onaka 1949, Timell 1986, Yoshizawa et al 1993 ...), a wood only observed in the gymnosperms. Timell (1986), in its monograph on reaction wood, claimed « whether the thick-walled tracheids in *Buxus sempervirens*, which lack intercellular spaces and helical cavities, should be classified as compression wood tracheids is still open to doubt. [...] More information regarding their ultrastructure and chemical composition is required before their nature can be fully assessed. ». In this poster we present some characteristics of *Buxus sempervirens* L. wood with the aim to precise the real nature of its reaction wood.

Growth stresses originate in surface growth strains, induced in cambial layer during the differentiation and maturation of new cells, impeded by the mass of the whole trunk. The longitudinal growth strains at the stem surface is appraised by stresses release on the stem periphery by means of cutting in the wood located under the cambium. This cutting is supposed to release locally, in the measured spot, existing stresses, in the stem, and thus, the observed strains are proportional and have opposite signs to the initial stresses. The technique for appraising the longitudinal growth strains at the stem surface uses a classical extensometric sensor. The total longitudinal stress is relieved by sawing two grooves above and below the sensor. After this operation we achieve the longitudinal growth strain expressed in microstrain ( $= 10^{-6}$  m/m). A compression stress (like in compression wood) induces a swelling between the grooves thus the longitudinal growth strain is positive. A tension stress (like in tension wood) induces a shrinkage between the grooves thus the longitudinal growth strain is positive.

On 19 box trees we have measured 143 growth strains. On the crooked stem, we can note large positive values on the lower side, coming from compression stress just like in compression wood of softwoods. This stress, combined with a tension stress on the opposite side, contributes to reorient the tree in a more favorable position.

The histogram of growth strain values is presented at the **Fig. 1**. We can note a large proportion of high positive values with a tail « stretched out » more on the right side of the distribution. By comparison with a hardwood (*Fagus sylvatica*) and a softwood (*Pinus pinaster*) (with the same technique of measurement), boxwood have a different distribution. However we can note that boxwood have a distribution close to the pine (the distribution is skewed to the right).

The wood with high positive growth strains has a dark color and a pronounced radial growth promotion characteristics of severe compression wood in the gymnosperms.

The wood with high positive growth strains has a significant higher basic density than the one with low growth strains, as can be seen in **Fig. 2**.

The tracheids of wood with high positive growth strains have a significant higher microfibril angle in S2 layer than the one with low growth strains, as can be seen in **Fig. 3**.

Sliced, unstained, transverse sections were observed with fluorescence microscope. In the pronounced reaction zone with high positive growth strains, both the vessels and the tracheids

apparently had an excessive lignification in the outer part of S2 layer, underscored by a high luminescence. Moreover the reaction wood tracheids had no S3 layer.

In conclusion, these results suggest that the reaction wood of *Buxus sempervirens* L. is very similar to that of compression wood in conifers. It is almost exactly the same as in some species of the genus Ginkgo, Taxus, Toreya, and Cephalotaxus that are described as primitive gymnosperm species (Timell 1986). The growth strain measurement is shown to be an efficient method to reveal reaction wood. Further information on chemical components (rate of lignins and sugars, monomers ratio and cellulose cristallinity) are needed on Boxewood and on others species with non typical reaction woods to understand for better the determinism and the properties of reaction woods.

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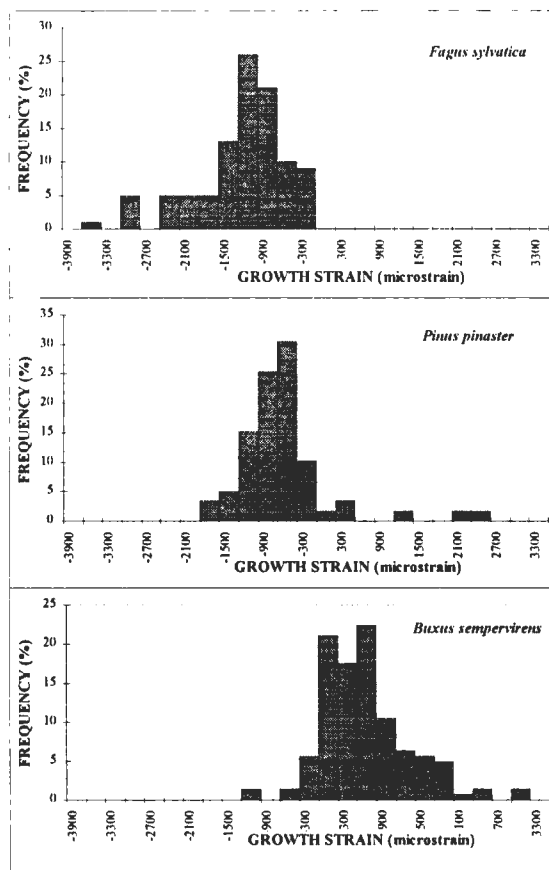


Fig. 1

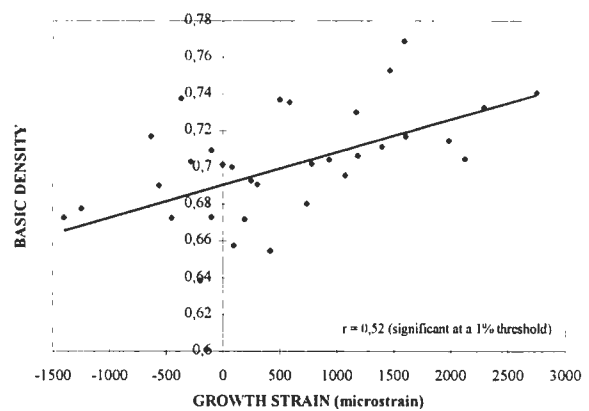


Fig. 2

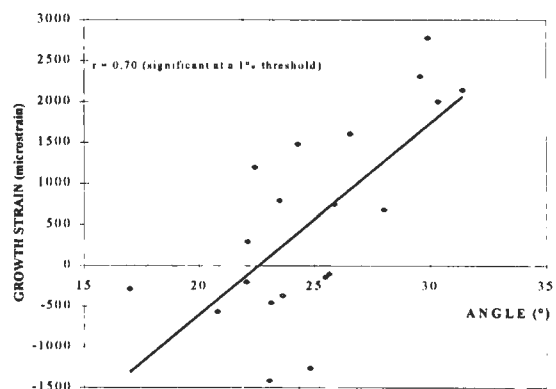


Fig. 3