METLA cost UNIVERSITY OF HELSINKI

COST Action FP 0802

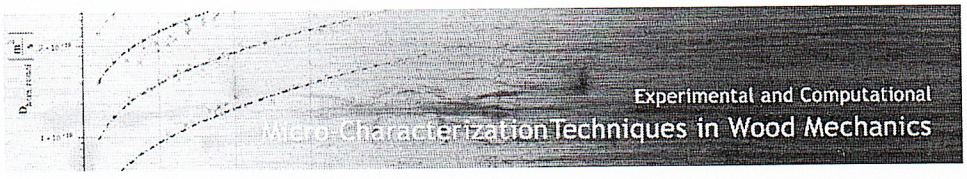
EXPERIMENTAL AND COMPUTATIONAL MICRO-CHARACTERIZATION TECHNIQUES IN WOOD MECHANICS

WORKSHOP

Hierarchical structure and mechanical characterization of wood

24–25 August, 2011
Helsinki, Finland

cost Action FP0802



Cell wall-bound phenols, lignin content and peroxidase activity in *Dioscorea balcanica* stem

Jelena Bogdanović Pristov[1*], Jasna Simonović[1], Aleksandra Mitrović[1], Vuk Maksimović[1], Dragoljub Grubišić[2], Ksenija Radotić[1*]

[1]Institute for Multidisciplinary Research
Kneza Viseslava 1, 11000 Belgrade,
mala@imsi.rs

[2]Institute for Biological Research "Siniša Stanković"
Despota Stefana 142, 11000 Belgrade

Key words: *Dioscorea balcanica*, cell wall, phenols, cell wall bound peroxidases, lignin

ABSTRACT

Dioscorea balcanica is an endangered endemic species of the south-west Serbia, Macedonia and northern Albania. It is right-twining climber with herbaceous stem, growing up to 2m. The stems consist of several internodes. This species is tuberous, dioecious and perennial. This plant is very important source of secondary metabolite, diosgenin, used in the pharmaceutical industry [1].

The structural and functional roles of plant cell walls are controlled by the composition and organization of individual wall components, including cellulose, hemicelluloses, pectin, proteins and lignin. Cross-linking of cell wall components is expected to have a marked influence on numerous wall properties such as accessibility, extensibility, plasticity [2]. Phenols, hydroxycinnamic acids present in complex plant cell walls, is covalently cross-linked to polysaccharides by ester bonds and to components of lignin mainly by ether bonds.

We studied activity and isoenzyme pattern of cell wall bound peroxidase, lignin and cell wall-bound phenols, in the internodes of *Dioscorea balcanica.* The extraction of cell wall and lignin was performed according to the procedure of Chen [3]. Lignin and cell wall-bound phenols content were determined in the extractive-free cell wall material by alkaline hydrolysis in 1 M warm (80°C) NaOH during 17 hours at room temperature.

In the NaOH extract of cell wall, vanillin, *p*-coumaric acid, syringic acid and ferulic acid were detected. Vanillin was the most abundant low-molecular mass phenol in cell wall, followed by syringic acid. We compared the cell walls isolated from the basal, straight, internodes, and the cell walls from the apical, twisted, internodes. If referred to the cell wall dry weight, content of phenols esterified and etherified to the cell walls and extracted using NaOH, showed a significantly higher value in the apical, twisted internodes in comparison with the basal, straight internodes. On the other hand, (cell wall dry weight)/(internode dry weight) ratio was significantly higher in the basal internodes in comperison with apical, twisted internodes.

This work was supported by the Ministry of Education and Science of the Republic of Serbia, Grant number 173017.

References

[1] Lj. Ćulafić, K. Šavikin-Fodulović, D. Grubišić, and M. Nešković: *Dioscorea balcanica* Košanin and *D. caucasica* Lipsky: *in vitro* culture and production of diosgenin. In: Biotechnology in agriculture and forestry, vol 43. Medicinal and aromatic plants XI. Ed by Bajaj YPS, 1999.

[2] S.C. Fry and J.C. Miller: Toward a working model of the growing plant cell wall. Phenolic cross-linking reactions in the primary cell walls of dicotyledons. In: Plant Cell Wall Polymers, Biogenesis and Biodegradation, Ed by Lewis NG and Paice MG, ACS, Washington, DC, 1989.

[3] M. Chen, A.J. Sommer, J.W McClure: Fourier transform-IR determination of protein contamination in thioglycolic acid lignin from radish seedlings, and improved methods for extractive-free cell wall preparation. *Phytochemical Analysis,* 11 (2000), 153–159.