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Faculty of Sciences and Mathematics, University of Niš
Biological Society "Dr Sava Petrović" Niš

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Kopaonik 16 to 19 June 2016

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Cellulose fibril order in radial wood cell walls of juvenile Serbian spruce: estimation of compression wood severity

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In conifers, leaning stems develop reaction wood known as compression wood (CW). Wood from growth rings that do not contain any CW is termed normal wood (NW). CW occurs in a range of gradations from mild to severe. Juvenile trees produce large amounts of randomly distributed mild CW. CW is characterized by higher amounts of lignin and lower amounts of cellulose. In the forest products industry, compression wood has limited values, and therefore, determination of its amounts is of great importance.

Fluorescence-detected linear dichroism (FDLD) microscopy provides observation of structural order in a microscopic sample and its expression in numerical terms, enabling both quantitative and qualitative comparison among different samples. We applied FDLD microscopy to compare cellulose fibril distribution and alignment in radial and tangential cell walls of tracheids on stem cross-sections of juvenile *Picea omorika* (Pančić) Purkynĕ trees. Our data show a considerable difference in cellulose fibril order between NW and CW, in radial walls gradualy decreasing in relation to CW severity. This suggest cellulose fibril order in radial cell walls of conifers as an indicator of CW severity.

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2D fractal analysis in plant analytical morphology and microscopy

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Fractals are described as self-similar patterns. Self-similar objects are common in Nature. In botany, application of different fractal methods led to significant progress in analytical morphology and microscopy for understanding the complex structural features characterizing cells and tissues during ontogenesis or in developmental processes.

We examined the precision of 2D fractal analysis using micrographs representing different stages of *Tacitus bellus* (L.) Moran and J. Meyrán, syn. *Graptopetalum bellum* direct shoot organogenesis from leaf explants in vitro. Significantly different fractal dimension values, as a measure of cell organization complexity, demonstrates that the proposed method is efficient for the fine distinction of histologically similar structures. Additionally, we determined the preferable resolution of micrographs for use in 2D fractal dimension analysis.

We suggest this method to be used for quantification of structure complexity in different growth and developmental processes in plants, as well as for the assessment of synchronization of selected processes. Our method is much simpler than other similar methods; it allows fast computational analysis of images and it can be used alone or in combination with other methods.

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