

# STUDY OF THE DIFFERENCES IN CELL WALL STRUCTURE BETWEEN A CONIFER AND A WEED SPECIES, USING X RAY DIFFRACTION AND FLUORESCENCE SPECTROSCOPY

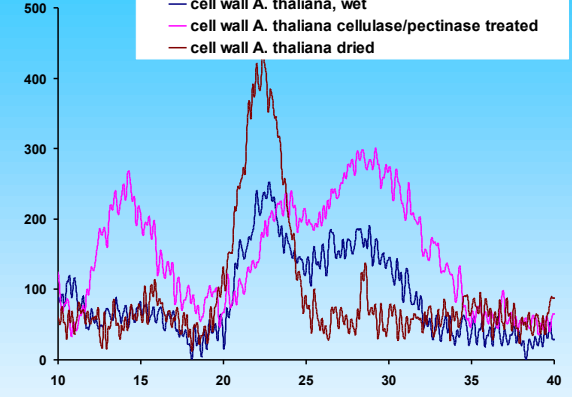
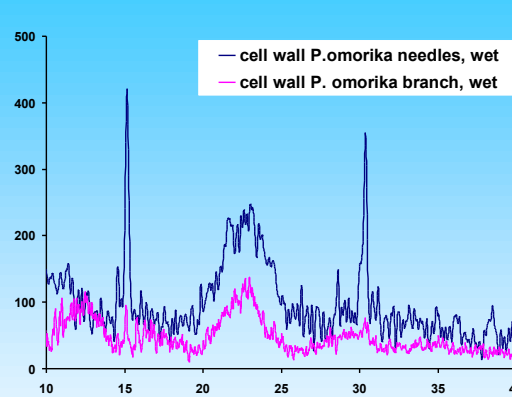
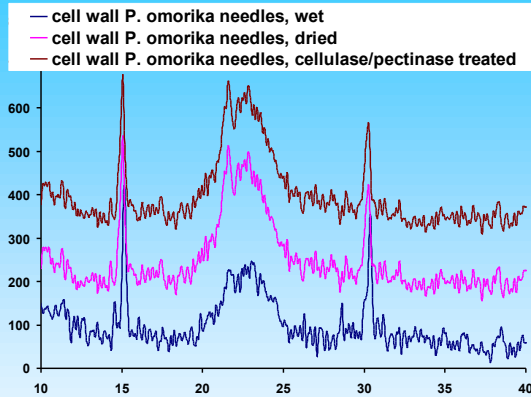
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# X ray diffractograms of the three cell wall samples



Scattering angle (2 θ)

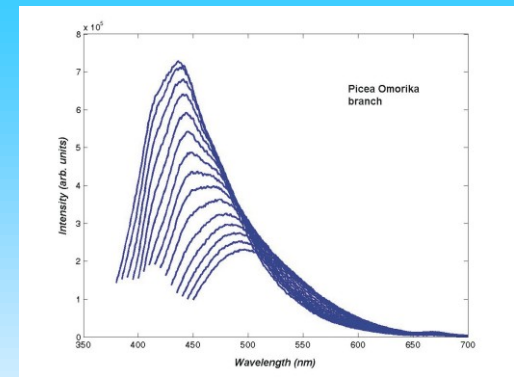
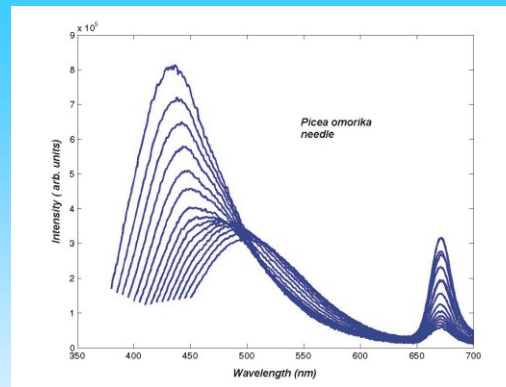
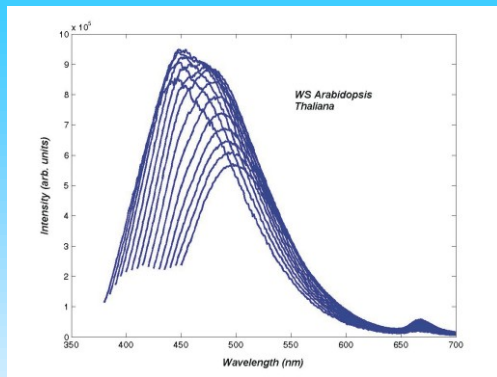
**\*The percentage crystallinity of the cell walls was calculated from the ratio of the area under the diffraction peaks to the total area under the whole diffraction pattern**

The cell walls from omorika needles have several sharp peaks in X ray diffractograms, indicating high ordering of macromolecules in this sample.

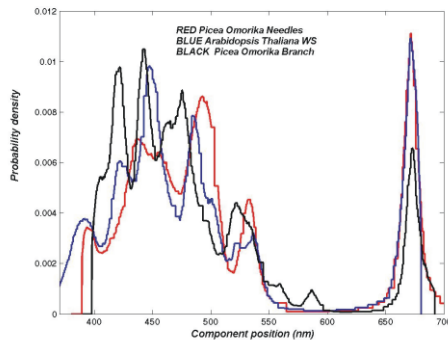
- Most peaks in the diffractograms may be correlated to the peaks in the diffractogram of cellulose.

- The structure of the cell walls from the omorika needles shows a higher crystallinity in comparison with the cell walls from both omorika branch and arabidopsis stems. This may be related to the chemical differences between the cell wall structure in the samples, and/or to the different physical organization in the walls. Drying and cellulase/pectinase treatment (which cuts polysaccharides to smaller fragments, removing them partly in this way) change crystallinity of the cell walls. The direction of changes depend on the plant species. The treatments have not the same effect on all peaks, showing that different parts of the cell walls are not affected evenly.

Cell walls from	Crystallinity (%)*
<i>P. omorika</i> needles (wet)	10.82
<i>P. omorika</i> needles (dried)	24.77
<i>P. omorika</i> needles (cellulase/pectinase treated)	25.35
<i>P. omorika</i> branch	3.14
<i>A. thaliana</i> stems (wet)	15.05
<i>A. thaliana</i> stems (dried)	2.17
<i>A. thaliana</i> stems (cellulase/pectinase treated)	0



**Overlaid series of emission spectra of the three cell wall samples. Starting excitation wavelength was 360 nm.**



**Approximate distribution of the probability (APD) that a fitted component of all emission spectra of the three samples occupies a position on the  $\lambda$ -axis (reconstructed from the histograms). Here are overlaid APDs of the three cell wall samples**

- **The three cell wall samples show differences in the series of emission spectra. The red peak at 670 nm is common for all samples, but most intense in P. Omorika needles.**
- **Some of the APD peaks are overlapping among the three cell wall samples. Some of APD peaks of the P. Omorika needles are red shifted in comparison with the other two samples. The position of some of the APD components of arabidopsis cell wall are between the components of omorika needles and branch. This shows that emitting species and their interaction with environment in cell wall reflect structural differences that are also visible in X ray measurements.**
- **All recorded fluorescence of the cell walls originates from lignin and/or hydroxy-cinnamic bridges between wall polymers. Therefore, the results of this combined X ray and fluorescence study complementary show contribution of lignin and polysaccharides to the whole organization of the cell wall structure at the molecular level.**