Cell walls

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Characterization of borate-polysaccharide complexes in *Lemna* spp.

Shinsuke KUWAKI, Takanobu KOYAMA, Masaru KOBAYASHI, Toru MATOH, Jiro SEKIYA; Div. Appli. Life. Sci.,Grad. Sch. Agr., Kyoto Univ., Kyoto 606-8502

Lemna is characterized by an extremely high boron(B) content, which ranged from 600 to 800 mg B/kg plant dry weight. However, the growth reduced with B in the culture media at higher than 1.7 mg B/L.

Nearly all the B was localized in cell walls. Solubilization of B-polysaccharide complexes with cell-wall hydrolyzing enzymes and with CDTA was not successful. By washing the cell walls with CDTA, about a half of the cell-wall uronic acid was released, however, B was not released at all. Polysaccharides which solubilized by removing both B and Ca from cell walls were chromatographed on an ion-exchange resin column. Sugar composition of the resulting three major peaks 1 to 3 was: 1st peak, apiose and xylose; 2nd, apiose, xylose and uronic acid; and 3rd, apiose and uronic acid.

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BINDING SITE OF METAL CATIONS IN RHAMNOGALACTURONAN II-BORATE COMPLEX

Tadashi ISHII, Toshiro MATSUNAGA[1], Hiroshi ONO[2], Forestry & Forest Products. Res. Inst., Ibaraki, 305-8687, [1]Kyushu Nat. Agri. Expt. St, Kumamoto, 861-1192, [2]Nat. Food Res. Inst, Ibaraki, 305-8642

Rhamnogalacturonan II(RG-II) is a low-molecular weight, structurally complex pectic polysaccharide that is released by treating the primary cell walls of higher plants with endo-α-D-polygalacturonase. Recent studies have shown that RG-II is present in the primary wall predominantly as a dimer (dRG-II-B)that is cross-linked by a borate-diol ester. Divalent cations are believed to important for dimer formation and stability in muro, but the mechanisms are not known. Although the naturally occurring dimer contains only small amounts of Pb/Sr/Ba, these cations and Eu/Pr promote rapid dimer formation in vitro. We studied the binding site of metal ions in dRG-II-B. Borate ester formation of mannitol and RG-II in the presence of Eu^{3+} /Pr^{3+} was studied by ^{11}B,^{1}H and ^{13}C NMR spectroscopy and HPLC/ICP-MS. Mannitol formed stable mannitol-borate diester containing Eu^{3+}/ Pr^{3+}. NMR spectral analysis showed that Eu^{3+} /Pr^{3+} binds to borate anion in the complex. dRG-II-B formed in the presence of Eu^{3+} /Pr^{3+} contained Eu^{3+} /Pr^{3+}.

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ABSENCE OF ARABINAN IN THE SIDE CHAINS OF PECTIC POLYSACCHARIDE IN THE MUTANTS (*nolac*) ASSOCIATED WITH INTERCELLULAR ATTACHMENT IN HAPLOID *Nicotiana plumbaginifolia*

Hiroaki IWAI, Tadashi ISHII[1], Shinobu SATOH, Inst. Biol. Sci., Tsukuba Univ., Ibaraki 305-8572, [1]Forestry and Forest Products Reserch Institute Ibaraki 305-8687

During long-term culture in suspension, the callus of various plants gradually become to form small clusters of cells as a result of the loosening of intercellular attachments and lose organogenic competence. In non-embryogenic callus of carrot, there was a significant difference in the branching and the length of the side chains in the pectic polysaccarides compared with embryogenic callus. In our previous study, the mutants of non-organogenic and loosely attached callus were produced in haploid *Nicotiana plumbaginifolia* by T-DNA insertion. Transmission electron microscopy showed that the cell wall of some mutants was very weakly stained by ruthenium red on expanded-middle lamella regions at cell corners, but intensely stained on the peripherally located structure of the callus surface. In *nolac-H14*, sugar content and composition analysis indicate that the amount of pectic polysaccharides decreased in the hemicellulosic fraciton, but increased in culture media. The results of glycosyl linkage analysis suggest that the arabinan were absent in the pectic polysaccharide of *nolac-H14*.

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MORPHOLOGICAL ANALYSIS OF THE TISSUE UNION PROCESS IN THE CUT HYPOCOTYL OF CUCUMBER

Masashi ASAHINA, Hiroaki IWAI, Shinobu SATOH, Inst. Biol. Sci., Tsukuba Univ., Ibaraki 305-8572

In the cell division of higher plants, two daughter cells were at first attached each other as a result of the formation of the cell plate. We call this type of intercellular attachment as "primary intercellular attachment". On the other hand, "secondary intercellular attachment ", in which the separated cells adhere again like animal system, occurs in some cases, such as carpel fusion during gynoecium development, the process of repair in cut tissues and graft union. This study shows morphological and histochemical analysis of secondary intercellular attachment in the process of tissue union in the cut hypocotyls of cucumber with the light and the transmission electron microscopic observations. In the light microscopic observations, cells near the cut surface started cell division at 3 days, subsequently cell division and elongation were occurred vigorously, and the cut surfaces of hypocotyls were almost completely united at 7 days after cutting. In the transmission electron microscopic observations, the surface of union region was stained by ruthenium red (RR), and the entire cell walls in this region were intensely stained by RR after NaOH treatment. But the cell walls, not in union region, were stained by RR only in middle lamella, even after NaOH treatment. The process of tissue union in cut hypocotyls was inhibited when the cotyledons were removed.