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Characterization of Peroxidase Secreted from Asparagus Somatic Embryo

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Asparagus (*Asparagus officinalis* L. cv. Y6) is regenerated from cultured cells into whole plants through somatic embryogenesis. A 41 kDa protein was secreted into cell walls during the embryogenesis. Full length cDNA sequence of this protein was determined by RT-PCR (*AspPOX1*). AspPOX1 had a moderate similarity with plant peroxidases. *AspPOX1* transcripts were abundant during early in somatic embryogenesis. Peroxidase plays an important role in lignin synthesis by polymerization of monolignols. AspPOX1 protein specifically metabolized coniferyl alcohol, one of the lignin precursors. However, the content of lignin in the cell walls drastically decreased during somatic embryogenesis. We isolated the reaction product by HPLC and characterized by GC-MS. Mass spectrometric analysis assigned the product as dehydrodiconiferyl alcohol.

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GROWTH RESTORATION IN AZUKI BEAN AND MAIZE SEEDLINGS BY REMOVAL OF HYPER-GRAVITY STIMULUS

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Hypergravity inhibited elongation growth of azuki bean epicotyls and maize coleoptiles and mesocotyls by decreasing the cell wall extensibility via the increase in the molecular mass of matrix polysaccharides. Hypergravity also inhibited the breakdown of matrix polysaccharides by increasing the pH in the apoplastic fluid, which may be involved in the processes of the increase in the molecular mass of matrix polysaccharides. When the seedlings grown under hypergravity conditions were transferred to 1 *g* conditions, the growth rate of these organs increased within few hours. The recovery of growth rate of these organs was caused by the increase in the cell wall extensibility via the decrease in the molecular mass of matrix polysaccharides. By the removal of hypergravity stimulus the apoplastic pH was decreased, thereby promoting the breakdown of the matrix polysaccharides. All of the effects of hypergravity disappeared promptly when hypergravity-treated seedlings were transferred to 1 *g* conditions. These results suggest that plants regulate the growth rate of shoots in response to the magnitude of gravity by which they adapt themselves to different gravity conditions.

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Humidity-modified viscoelastic extensibility of root cell walls.

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The apoplast of roots is open to outer environment, since most of root surface has no cuticles nor outer barrier against water transport. Thus the cell walls of roots may directly be affected by outer environment. We tested the possibility if the extensibility of root cell walls are affected by outer humidity surrounding the cell walls.

Viscoelastic properties of cell walls were measured by a creep meter (Yamaden, Tokyo) and analyzed by a Voigt-Kelvin-Burgers' six-element model to obtain elastic moduli(E0, E1, E2) and plastic coefficients ($\eta 0$, $\eta 1$, $\eta 2$). Lateral roots of Alaska peas were used.
Effect of dehydration by ethanol: Methanol-killed root segments were equilibrated with a series of ethanol concentration and extensibility of cell walls were measured in the same ethanol solution. Increasing the ethanol concentration increased all parameters, E0 was 8-times and $\eta 0$ was 11 times greater than those of fully hydrated control cell walls.
Effect of humidity: Root segments were dried at critical point to keep intact root morphology. The viscoelastic properties were measured in air-stream at different humidity. All parameters decreased by increasing humidity. Viscosity coefficients decreased more quickly than the elastic moduli against increasing humidity.

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Gibberellin-mediated modification of cell wall polysaccharides - Effects on molecular-mass of hemicellulosic polymers of pea roots along root axis

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The cell-wall matrix polysaccharides are thought to play a role in gibberellin(GA)-regulated root growth. We have reported the increase in molecular-mass of pectic polysaccharides by GA. The hemicellulosic polysaccharides, however, remains to be analyzed. We report here the effect of GA on the molecular-mass of hemicellulosic polysaccharides of pea roots.

GA-treated roots contained larger xyloglucan and hemicelluloses than those of Ancymidol-repressed roots. Such effect of GA was observed in elongation zone and maturation zone but not in apical meristematic zone of the roots. The role of these modifications of polymers will be discussed in relation to cell wall extensibility and aging of root cells.