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Sugar Depletion Induces Enzymes Involved in Degradation of Cell Wall

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We screened for cDNAs whose transcript levels changed under sugar-depleted condition using macroarrays containing ~13,000 Arabidopsis cDNAs. Among the up-regulated genes in response to sugar depletion, we focused on genes encoding α -galactosidase and α -xylosidase. Predicted structure of these two proteins, having signal peptides targeting to the extracellular matrix, suggested that they are secreted into the apoplasts. This led us to speculate that they are involved in hydrolysis of cell wall components, by releasing galactose and xylose from cell wall polysaccharides. This idea was tested in cultured Arabidopsis cells. The enzymatic activities of these two proteins were clearly induced by sugar depletion. Transcript for these two genes were induced during sugar depletion, but could not be detected when cultured cells were supplied with glucose, galactose, fructose and xylose as well as sucrose. Also, when cells were cultured in the presence of galactose, xylose or fructose, they showed almost equivalent growth as fed with sucrose. These findings suggested that cell wall may function as 'storage of carbon source' in addition to structural support of cell.