Hypolignification: a decisive factor in the development of hyperhydricity

ABSTRACT

One of the characteristics of hyperhydric plants is the reduction of cell wall lignification (hypolignification), but how this is related to the observed abnormalities of hyperhydricity (HH), is still unclear. Lignin is hydrophobic, and we speculate that a reduction in lignin levels leads to more capillary action of the cell wall and consequently to more water in the apoplast. p-coumaric acid is the hydroxyl derivative of cinnamic acid and a precursor for lignin and flavonoids in higher plant. In the present study, we examined the role of lignin in the development of HH in Arabidopsis thaliana by checking the wild-types (Ler and Col-0) and mutants affected in phenylpropanoid biosynthesis, in the gene coding for cinnamate 4-hydroxylase, C4H (ref3-1 and ref3-3). Exogenously applied p-coumaric acid decreased the symptoms of HH in both wild-type and less-lignin mutants. Moreover, the results revealed that exogenously applied p-coumaric acid inhibited root growth and increased the total lignin content in both wild-type and less-lignin mutants. These effects appeared to diminish the symptoms of HH and suggest an important role for lignin in HH.

Keyword: Arabidopsis thaliana; Apoplast; Hyperhydricity; Hypolignification; Micropropagation; p-coumaric acid; Piperonylic acid