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Synthesis of resveratrol dimer catalyzed by grapevine peroxidases

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The ability of grapevine to activate defense mechanisms against some pathogens has been shown to be linked to the synthesis of stilbenes by the plant such as resveratrol and viniferins. δ-Viniferin and ε-viniferin are stilbenoid compounds and a resveratrol dehydrodimer. In the previous study, viniferin synthesis is occurred by human cyclooxygenase-1 and horse radish peroxidase via dimerization of resveratrol. However, major biosynthetic genes involved in ε-viniferin and δ-viniferin biosynthesis have not yet been identified in grapevine. In the previous study, we found that co-treatment of methyl jasmonate (MeJA) and solubilizing agent PX of grapevine suspension cells resulted in enhanced production of ε-viniferin and δ-viniferin in the culture media. To identify resveratrol dimerizing genes in grapevine, we isolated 7 putative grapevine peroxidase genes (*APX1, GPX2, VvPrx1, -2, -3, -4, -5*) which were specifically up-regulated in MeJA+PX treatment using transcriptome analysis. To examine the enzymatic activity of their genes for production of viniferins, the peroxidase genes under the control of CaMV 35S promoter were transiently expressed in tobacco leaves. Among them, overexpression of *VvPrx1*, *VvPrx2* and *VvPrx3* exhibited strong guaiacol peroxidase activities. Furthermore, HPLC analysis revealed that crude protein extracts from tobacco leaves overexpressing *VvPrx1* and *-2* catalyzed dimerization of resveratrol to δ-viniferin *in vitro*. Our results suggest that *VvPrx1* and *VvPrx2* might be involved in resveratrol dimerization in grapevine cells.

Biography

Sung-Chul Park received his Master's Degree in Plant System Biology from Chungnam National University and has conducted graduate work on metabolic engineering. He is a PhD student at Korea Research Institute of Bioscience and Biotechnology (KRIBB). His project is finding molecular mechanisms of stilbene compounds dimerization in grape callus. He is interested in mechanisms of metabolite biosynthesis in plants.

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