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The overexpression of *Arachis hypogaea resveratrol synthase 3 (AhRS3)* modified the expression pattern of phenylpropanoid pathway genes in developing rice seeds

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Abstract

Our previous study for developing seeds of Iksan 526 (I.526), an inbred line of resveratrol-producing transgenic rice line, showed that, in 20 days after heading (DAH) seeds, resveratrol was almost saturated and accumulation of piceid was highest though the expression of *Arachis hypogaea resveratrol synthase 3 (AhRS3)*, GenBank DQ124938) was highest in 31 DAH seeds. In this study, it was investigated how the overexpression of *AhRS3* affects phenylpropanoid pathway genes. *p*-Coumaroyl-CoA is derived from phenylpropanoid pathway and used as a substrate of *AhRS3* reaction for resveratrol production. In 6, 13, 20, 31 and 41 (45 for Dongjin) DAH seeds of I.526 and Dongjin, a wild type of I.526, respectively, the expression pattern of phenylpropanoid pathway genes, including *phenylalanine ammonia-lyase (PAL: LOC_Os02g41630.2, LOC_Os04g43760.1)*, *cinnamate 4-hydroxylase (C4H: LOC_Os05g25640.1)*, *4-coumarate-CoA ligase (4CL: LOC_Os02g08100.1)*, *cinnamoyl-CoA reductase (CCR: LOC_Os09g25150.1, LOC_Os08g34280.1)*, *hydroxycinnamoyl-CoA shikimate/quinic hydroxycinnamoyl transferase (HCT: LOC_Os04g42250.2, LOC_Os02g39850.1)* and *cinnamyl alcohol dehydrogenase (CAD: LOC_Os02g09490.1)*, was examined using real time (RT)-PCR. Compared to developing seeds of Dongjin, RT-PCR results showed that the expression pattern of phenylpropanoid pathway genes was modified in developing seeds of I.526. In most genes, except for *CAD*, of I.526 developing seeds, the gene expression was highest in 20 DAH corresponding to biosynthesis of resveratrol and piceid, i.e. the expression of phenylpropanoid pathway genes was gradually increased by 20 DAH and decreased as seeds develop. Especially, in Dongjin, the highest expression of *PALs* and *4CL* was in 6 DAH and their expression was gradually decreased as seeds develop. These genes expression data also exhibited that, in developing seeds of I.526, phenylpropanoid pathway genes were slightly or significantly (in some genes) upregulated compared to Dongjin. Therefore, the overexpression of *AhRS3* changed the expression pattern of phenylpropanoid pathway genes in I.526 developing seeds and this modification for gene expression is closely related to biosynthesis of resveratrol and piceid.

Keywords: rice, resveratrol, *Arachis hypogaea resveratrol synthase 3 (AhRS3)*, phenylpropanoid pathway

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