

苹果属观赏海棠*McUFGT*的克隆及其在不同叶色品种间的表达差异分析

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Cloning and Expression Analysis of *McUFGT* in Different Cultivars of Crabapple

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摘要 为探讨*UFGT*基因在观赏海棠叶片呈色过程中的作用,以观赏海棠常紫红色类品种‘王族’叶片总RNA为模板,通过RACE扩增,获得一个长度为2 186 bp的cDNA序列,其编码区共1 425 bp,编码475个氨基酸,命名为*McUFGT*。利用高效液相色谱法和实时荧光定量PCR技术,对3个不同叶色的观赏海棠品种‘王族’(叶片常紫红色类)、“绚丽”(新叶红色类)和“火焰”(叶片常绿色类)叶片中的花色苷含量、*McUFGT*相对表达量进行测定分析。结果表明,在3个品种中矢车菊色素苷是主要的花色素苷物质,并且随着叶片的生长发育,不同叶色品种间矢车菊色素苷差异显著,其中以叶片常紫红色品种‘王族’矢车菊色素苷积累最多。同时矢车菊色素苷含量的变化与*McUFGT*相对表达量变化趋势基本一致,说明*McUFGT*在苹果属观赏海棠叶片花色苷合成及色泽形成过程中具有重要的作用。

关键词: 苹果属 观赏海棠 UFGT 矢车菊色素苷 花色苷

Abstract: More attention has been paid to the utilities of ornamental crabapple for landscape use, because all kinds of color in leaves, flowers and fruits. Anthocyanins are a class of secondary metabolites which contribute to the coloration in higher plants, and also play a vital role in enhancing plant resistance and attracting pollinators. In phenylpropanes metabolism, UFGT (uridine diphosphate glucose flavonoid 3-O-glucosyltransferase) is a key enzyme in anthocyanins biosynthesis pathway. Using the total RNA from the leaves of *Malus* ‘Royalty’ (ever-red leaf) as the template, the cDNA of *McUFGT* (2 186 bp) was cloned by reverse transcription polymerase chain reaction (PCR) and rapid-amplification of cDNA end (RACE). The gene was named as *McUFGT*, containing an open reading frame (1 425 bp) and encoding a protein of 475 amino acids. The expression of *McUFGT* and the content of anthocyanins and flavonoids was determined by real-time quantitative PCR and HPLC in the leaves of *Malus* ‘Royalty’ (ever-red leaf), *Malus* ‘Radiant’ (red young leaf and green mature leaf), *Malus* ‘Flame’ (ever-green leaf). Here we report that the cyanidin is the major of anthocyanins in different crabapple cultivars. The results showed that with the development of leaves, there is a significant difference exists in cyanidin contents among these three crabapple cultivars, and the accumulation of cyanidin in ‘Royalty’ is higher than other two cultivars. At the same time, the content of cyanidin was correlated to the expression level of *McUFGT*. It is supposed that *McUFGT* plays an important role in anthocyanins accumulation in different crabapple cultivars.

Keywords: *Malus*, crabapple, UFGT, cyanidin, anthocyanin

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