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Distinct biosynthesis pathways for flavone C-glycosides and O-glycosides in rice

Clive Lo
University of Hong Kong, Hong Kong

Flavones are flavonoids found extensively in land plants with important physiological functions like UV protection, interactions with other organisms, co-pigmentation in flowers, etc. They are increasingly popular as dietary constituents or supplements due to their health-beneficial properties. In grasses, flavones are predominantly accumulated as C- or O-linked conjugates in vegetative tissues. The enzymology of flavone biosynthesis in monocot remained largely elusive until recent years. Our recent work established the cytochrome P450 enzymes CYP93G1 and CYP93G2 as key branch point enzymes in rice channeling flavanones to the formation of flavone O-linked conjugates and C-glycosides, respectively. CYP93G1 functions as a flavone synthase II, which generates flavone aglycones for different O-linked modifications. On the other hand, CYP93G2 is a flavanone 2-hydroxylase, which produces 2-hydroxyflavanones for immediate C-glycosylation, followed by the formation of the flavone nucleus. We further filled the remaining gap in the tricin biosynthesis pathway with CYP75B4. In tricin, the 3', 5'-dimethoxyflavone nucleus is formed before O-linked conjugations. CYP75B4 functions as a unique flavonoid 5'-hydroxylase that converts chrysoeriol to selgin, the immediate precursor of tricin. In addition, transgenic expression of CYP93G2 and CYP75B4 in Arabidopsis resulted in accumulation of different tricin O-glycosides which are not normally present in the mustard family. CYP93G1, CYP93G2, and CYP75B4 homologous sequences are unique but highly conserved in *Poaceae*, suggesting that they are specifically recruited for the biosynthesis of different flavone-derived metabolites that are prevalent in many grass species today.

Biography

Clive Lo received his PhD from the Purdue University. He is currently an Associate Professor at the University of Hong Kong. He has been working on the biosynthesis pathways of flavonoids in the cereal crops rice and sorghum. His team has recently identified a number of phylogenetically conserved enzymes for biosynthesis of flavones which are prevalent in vegetative tissues of grasses. They represent good targets to engineer flavones in edible tissues which do not normally synthesize these health-beneficial phytochemicals.

clivelo@hku.hk

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