Discovery of the first gene for flavonoid-specific prenyltransferase

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The prenylation of aromatic compounds is a major contributor to the diversity of plant secondary metabolites due to differences in prenylation position on the aromatic ring, various lengths of prenyl chain, and further modifications of the prenyl moiety, e.g. cyclization and hydroxylation, resulting in the occurrence of more than 1,000 prenylated compounds in plants. Tropical trees are often rich natural resources of those prenylated aromatic compounds. In particular, prenylated flavonoids are reported as being protectants in higher plants to protect them by exhibiting strong antibacterial and antifungal activities, and also recognized as natural compounds that often represent the active components in various medicinal plants and exhibit beneficial effects on human health. In fact, many prenylated flavonoids have been identified as active components in medicinal plants with biological activities, such as anticancer, anti-androgen, anti-leishmania, and anti-NO production. It has been demonstrated that the contribution of prenyl moieties are crucial for these biological activities. However, none of the genes responsible for the prenylation reactions have been identified despite more than 30 years of research in this field.

We have isolated a novel prenyltransferase gene from *Sophora flavescens*, SfN8DT-1, responsible for the prenylation of the flavonoid naringenin at the 8-position, which is specific for flavanones and dimethylallyl diphosphate as substrates [1]. The gene expression of SfN8DT-1 is strictly limited to the root bark where prenylated flavonoids are solely accumulated in planta.

Phylogenetic analysis shows that SfN8DT-1 has the same evolutionary origin as prenyltransferases for vitamin E and plastoquinone. The ectopic expression of SfN8DT-1 in *Arabidopsis thaliana* resulted in the formation of prenylated apigenin, quercetin, and kaempferol, as well as 8-prenylnaringenin. SfN8DT-1 represents the first flavonoid-specific prenyltransferase identified in plants and paves the way for the identification and characterization of further genes responsible for the production of this important class of secondary metabolites.

This achievement was posted by 6 newspapers and several web pages of internet news, as well.

REFERENCES

[1] Sasaki, K., Mito, K., Ohara, K.,Yamamoto, H., Yazaki, K., Cloning and characterization of naringenin 8-prenyltransferase, a flavonoid-specific prenyltransferase of *Sophora flavescens*. *Plant Physiology*, **146 (3)**, 1075-1084 (2008)