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## Phylogenetic Relationship of Six *Glycyrrhiza* Species Based on rbcL Sequences and Chemical Constituents.

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The nucleotide sequences of ribulose-1,5-bisphosphate carboxylase/oxygenase large subunit gene (rbcL.) of *Glycyrrhiza glabra, G. uralensis, G. echinata, G. macedonica* and *G. pallidiflor*a have been determined to construct their phylogenetic tree. Based on these sequences, the six *Glycyrrhiza* species were divided into two groups*: three, G. glabra, G. uralensis,* and *G. inflata*, which produce glycyrrhizin as a major saponin, and the others, *G. echinata, G. macedonica* and *G. pallidoflora*, which produce macedonoside C as a major saponin. Among the three glycyrrhizin-producing species, only two nucleotide substitutions were observed between the rbcL. Sequences of *G. glabra* and *G. uralensis*, and the sequence of *G. uralensis* was identical to that of *G. inflata*, indicating that *G. uralensis* and *G. inflata* were closely related. Among the three macedonoside C-producing species, only one nucleotide substitution was observed between those of *G. echinata* and *G. macedonica*, indicating that these two species are also closely related.

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## Caffeic Acid Oligomers in *Lithospermum erythrorhizon* Cell Suspension Cultures.

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*Lithospermum erythrorhizon* cells cultured in pigment production (M-9) medium produced lithosperumic acid B, a dimerized caffeic acid ester derivative, in quantities similar to the production of shikonin. The cell also produced a related dimer, (+)-rabdosiin. In Linsmaier-Skoog liquid medium, which suppresses shikonin production, both lithospermic acid B and (+)-rabdosiin were still formed. Lithospermic acid, a caffeic-rosmaric acid conjugate, was isolated as a main constiruent in *Lithospermum* hairy root cultures. In the aerial parts of *L. erythrorhizon*, the content of these phenylpropanoid oligomers was relatively low compaired to that rosmarinic acid.

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## Flavanone 8-Dimethylallyltransferase in *Sophora flavescens* Cell Suspension Cultures.

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Dimethylallyl diphosphate: naringenin 8-dimethylallyltransferase (EC 2.5.1) was characterized. The enzyme was enantiospecific for (-)-(2S)-naringenin and utilized 3,3-dimethylallyl diphosphate as sole prenyl donor. It required $Mg^{2+}$ (optimum concentration, 10 mM), and has an optimum pH of 9-10. The apparent Km values for 3,3-dimethylallyl diphosphate and naringenin were 120 and 36 $\mu$M, respectively. The microsomal fraction prenylated several other flavanones at the c-8 position less effectively as compared with naringenin. Interestingly, when 2'-hydroxynaringenin was used as a prenyl acceptor, the 8-lavandulyl (sophoraflavanone G) and the 6-dimethylallyl derivatives were formed, together with the 8-dimethylallyl derivative, leachianone G. These results suggest that the 2'-hydroxy group of naringenin plays an important role for the formation of a lavandulyl group.

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## Stilbene Oligomers in Roots of *Sophora davidii*.

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Three stilbene oligomers, davidiols A-C were isolated from the roots of *Sophora davidii* in addition to the seven known phenols, leachianone A, sophoraflavanones G, H and I, miyabenol C, α-viniferine and ε-viniferin. Their structures and relative configurations were established by means of 2D-NMR spectroscopy including COLOC and PSNOESY.