Evaluation of Antioxidant Activity of Flavonoids - Remarkable Effect of Hydroxy Groups in the B Ring and the Substituent in the C Ring -

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Onion, ginger and tea, which are common foods, have antioxidant activity due to polyphenolic compounds such as flavonoids. In this study, I employed 1,1-diphenyl-2-picrylhydrazyl (hereinafter abbreviated as DPPH) radical scavenging reaction, which is an indicator of antioxidant ability, for flavonoid compounds with various structures, to investigate how the substituents on the B and C rings of flavonoids affect their antioxidant activity. The purpose of this study is to clarify the structure-antioxidant ability relationship. The DPPH radical scavenging rate of nine flavonoid compounds with hydrogen (H), hydroxy group (OH), or sugar (Glc) bonded to the 3-position of the C ring and one (-1), two (-2) or three (-3) hydroxy groups in the B ring was measured using visible absorption spectroscopy. The rate was in a complicated order: H-3 > OH-1 > H-2 > Glc-2 > OH-2 > OH-3 > Glc-3 > H-1 = Glc-1. This order was also supported by a comparison of the antioxidant activities of two compounds with different numbers of hydroxyl groups using 13C-NMR spectroscopy. These results revealed that the substituent structure on the C ring and the number of hydroxy groups on the B ring collaborate to determine the antioxidant activity. The order suggested that the hydroxy group on the C ring controls the reducing ability of the hydroxy group(s) on the B ring, which impacts the antioxidant reaction, via the electronic effect, and that Glc group on the C ring does via the steric effect.

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