

Efficient production of eriodictyol-7-*O*- β -glucoside from eriocitrin by enzymatic hydrolysis

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Ryohei Yamamoto, Norio Muto

Graduate School of Comprehensive Scientific Research, Prefectural University of Hiroshima

Abstract

The modified glycosides prepared from various flavonoids are attractive materials for the production of functional foods. In this study, the conversion of eriocitrin, a major flavonoid in lemon peel, to its monoglucoside, eriodictyol-7-*O*- β -glucoside (eriodictyol-7-glucoside), was studied using acidic and enzymatic hydrolysis methods. eriodictyol-7-glucoside is a promising bioactive compound having a potent α -glucosidase-inhibitory activity. The conversion of eriocitrin to eriodictyol-7-glucoside by acidic hydrolysis reached to a maximum yield of 25%. When hesperidinase and naringinase were used as catalysts, the transformation rates from eriocitrin to eriodictyol-7-glucoside reached to approximately 80% and 70%, respectively, under the controlled reaction conditions. Furthermore, hesperidinase and naringinase showed similar time-course profiles on the hydrolysis of eriocitrin. These results indicate that the efficient and selective production of the reaction intermediate from eriocitrin could be accomplished by the enzymatic hydrolysis.

Keywords : eriocitrin, eriodictyol-7-*O*- β -glucoside, enzymatic hydrolysis, hesperidinase, lemon

I Introduction

Flavonoids are widely distributed as secondary metabolites in most of plants, especially in vegetables, fruits and flowers, and they have structural similarity in the aglycon moiety as a member of polyphenols. They are also known to be important dietary constituents having the health-promoting effects such as antioxidative activity, anti-inflammatory and anti-allergic activities and anti-proliferative activity to cancer cells^{1, 2}. Among them, eriocitrin, a major flavonoid compound distributed in lemon fruit, has been reported to have a potent antioxidative activity^{3, 4}, improvement effect on lipid metabolism⁵ and anti-hypertensive effect⁶. Eriocitrin has a chemical structure of flavanone in the aglycon moiety as well as naringin and hesperidin, the major flavonoids in citrus fruits. These flavonoids have been known to possess an improvement effect of the permeability of blood vessel, so-called vitamin P-like effect⁷. However, their chemical properties are different from each other on the aspect of substituted groups on B' ring and conjugated carbohydrates,

especially showing that eriocitrin has the extremely high solubility in water and high antioxidative activity compared to other two flavonoids. Thus, eriocitrin is considered to have interesting properties as a food factor, but its utilization in food production has not yet been done.

Eriocitrin is a rhamnoglucose (rutinose) conjugate of eriodictyol at C7 position and it is abundantly contained in lemon and lime peels at the levels of 30-100 folds higher than those of citrus fruits³. This flavonoid is considered to produce both eriodictyol-7-*O*- β -glucoside (eriodictyol-7-glucoside) and eriodictyol through the spontaneous hydrolysis of glycoside bond during long storage and/or food processing of fruit extracts (Scheme 1). Although these eriodictyol-related compounds have been confirmed to have almost the similar potential of antioxidative activity in *in vitro* assay, it is easily speculated that they have different chemical and biological properties including solubility in water, biological activities, and absorption behaviors after ingestion based on their chemical structures. Very interestingly, we recently found eriodictyol-7-glucoside in the compressed extract of lemon