ENHANCEMENT EFFECT OF METHYL α-D-GLUCOSIDE FOR INHIBITORY EFFECTS OF ANTIOXIDANTS ON ADP/Fe²⁺-INDUCED LIPID PEROXIDATION IN RAT LIVER MITOCHONDRIA

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INTRODUCTION

Overproduction of oxygen free radical is closely related to aging, cancer, inflammation, ischemia/reperfusion injury, and arteriosclerosis (Kerr et al., 1996). For protection against these free radical related diseases, many kinds of traditional Kampo medicine and traditional Chinese medicine, which are all crude drugs, have been used clinically (Otsuka, 1988). The data on their pharmacological mechanisms increased, but these data are not enough to be evaluated scientifically (Takahashi et al., 1993, Akamatsu et al., 1998). We found acteoside (ACT) and its derivatives, isolated from oriental medicine Phacellantus tubiflorus, as potent inhibitors of lipid peroxidation in mitochondria (Pan and Hori, 1994, Pan and Hori, 1996). We recently found that methyl α-D-glucoside (Me-Glc; Figure 1) enhanced the anti-peroxidative activity of acteoside in rat liver mitochondria (Sakamaki et al., 1996). For the investigation of the importance of non-antioxidant glycosides contained commonly in Kampo medicines, we present here the enhancement effect of the
simplest glycoside Me-Glc for inhibitory effects of a variety of antioxidants, including ACT and α-tocopherol, in iron-induced mitochondrial lipid peroxidation reaction.

MATERIALS AND METHODS

Chemicals

Methyl α-D-glycoside (Me-Glc), 1, 1-diphenyl-2-picrylhydrazyl (DPPH), 2-(N-morpholino)ethanesulfonic acid monohydrate (MES) and other reagents were purchased from Wako Pure Chemical Industries, Ltd, Osaka. Phenylpropanoids such as acteoside and cistanoside F were isolated from Phacellanthus tubiflorus (Pan and Hori 1994, Pan and Hori, 1996). Other phenylpropanoids such as plantamajoside and forsythiaside were isolated from Plantago asiatica (Ravn et al., 1992) and Forsythia suspensa (Nishibe et al., 1982), respectively. Chemical structures of methyl α-D-glycoside and phenylpropanoid glycosides are shown in Figure 1.

Preparation of Rat Liver Mitochondria (RLM)

RLM were isolated from male Wistar rats (250–300 g) by homogenization followed by differentiated centrifugation in ice-cold medium (pH 7.4) (Myers and Slater, 1957,