Synopsis of Original Research Paper

The inhibitory effects of 4-substituted resorcinol derivatives on melanin biosynthesis

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The color of mammalian skin and hair is determined by a number of factors. The most important factor is the degree and distribution of melanin pigmentation. Melanin synthesis inhibitory compounds are useful not only for the material used in cosmetics as skin-whitening agents but also as a remedy for disturbances in pigmentation. Tyrosinase (phenol oxidase) is known to be a key enzyme for melanin biosynthesis in plants, microorganism and mammalian cells. Therefore, many tyrosinase inhibitors have been tested in cosmetics and pharmaceuticals as a way of preventing overproduction of melanin in epidermal layers. Also, various types of stimulation, including exposure to ultraviolet (UV) radiation, induce lipid peroxidation in the skin, which might in turn cause damage to epidermal cells, leading to postinflammatory hyperpigmentation. Considering the importance of counteracting oxidative stress caused by UV to prevent harmful skin damage, it is important to design the multifunctional skin whitening agent with both antioxidant and anti-tyrosinase abilities.

A novel vitamin E derivative, (6"-hydroxy-2",5",7",8"-tetramethylchroman-2"-yl) methyl 3-(2',4'-dihydroxyphenyl)propionate (TM4R) which has chromanoxyl ring and 4-substituted resorcinol moieties, was synthesized and its inhibitory effect on tyrosinase, antioxidant ability and lightning effect of ultraviolet B (UVB)-induced hyperpigmentation were estimated. TM4R showed potent inhibitory activity on tyrosinase, which is the rate-limiting enzyme in the melanogenesis. The scavenging activities of TM4R on 1,1-diphenyl-2-picrylhydrazyl (DPPH) and hydroxyl radicals were found to be nearly the same as those of α-tocopherol. Furthermore, an efficient lightening effect was observed following topical application of TM4R to UVB-stimulated hyperpigmented dorsal skin of brownish guinea pigs. These results suggest that TM4R may be a candidate for an efficient whitening agent, possibly by inhibiting tyrosinase activity and biological reactions caused by reactive oxygen species.