Inhibitory effects of *Sargassum polycystum* on tyrosinase activity and melanin formation in B16F10 murine melanoma cells

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**ABSTRACT**

**Ethnopharmacological relevance:** *Sargassum polycystum*, a type of brown seaweed, has been used for the treatment of skin-related disorders in traditional medicine.

**Aim of the study:** The aim of the present study is to investigate the antimelanogenesis effect of *Sargassum polycystum* extracts by cell-free mushroom tyrosinase assay followed by cell viability assay, cellular tyrosinase assay and melanin content assay using B16F10 murine melanoma cells.

**Materials and methods:** *Sargassum polycystum* was extracted with 95% ethanol and further fractionated with hexane, ethyl acetate and water. The ethanolic crude extract and its fractionated extracts were tested for their potential to act as antimelanogenesis or skin-whitening agents by their abilities to inhibit tyrosinase activity in the cell-free mushroom tyrosinase assay and cellular tyrosinase derived from melanin-forming B16F10 murine melanoma cells. The tyrosinase inhibitory activity was correlated to the inhibition of melanin production in α-MSH-stimulated and unstimulated B16F10 cells.

**Results:** *Sargassum polycystum* ethanolic extract and its fractions had little or no inhibitory effect on mushroom tyrosinase activity. However, when tested on cellular tyrosinase, the ethanolic extract and its non-polar fraction, hexane fraction (SPHF), showed significant inhibition of cellular tyrosinase activity. In parallel to its cellular tyrosinase inhibitory activity, SPHF was also able to inhibit basal and α-MSH-stimulated melanin production in B16F10 cells.

**Conclusions:** Our findings showed that (i) cellular tyrosinase assay is more reliable than mushroom tyrosinase assay in the initial testing of potential antimelanogenesis agents and, (ii) SPHF inhibited melanogenesis by inhibiting cellular tyrosinase activity. SPHF may be useful for treating hyperpigmentation and as a skin-whitening agent in cosmetics industry.

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1. Introduction

Melanin is the main component determining the color of skin and up to 10% of cells in the innermost layer of the epidermis produce melanin pigments (Vamos-Vigyazo, 1981; Hearing, 2005). The major role of melanin is to protect the skin from damaging effects of ultraviolet radiation (Tsutamaki et al., 2002). Melanin biosynthesis, or melanogenesis, is a well-known physiological response of human skin upon exposure to ultraviolet light and other stimuli. Melanogenesis is regulated by enzymes such as tyrosinase, tyrosinase-related protein-1 (TRP-1) and tyrosinase-related protein-2 (TRP-2) (Kameyama et al., 1995). The inhibition of tyrosinase is the most common approach to achieve skin whiteness as it is the key enzyme that catalyzes the rate-limiting step of melanin biosynthesis (Solano et al., 2006). Tyrosinase catalyzes the hydroxylation of L-tyrosine to 3,4-dihydroxyphenylalanine (L-DOPA), followed by the oxidation of L-DOPA to dopaquinone. Oxidative polymerization of several dopaquinone derivatives gives rise to melanin (Parvez et al., 2006). Thus substances that inhibit melanin may be useful ingredients to be incorporated into cosmetic preparations.

Marine algae (seaweeds) have long been used as food and medicine in Asian countries such as Japan, China and Korea. For centuries, Greeks and Romans have used them as medicinal remedies and in cosmetics. In folk medicine, seaweeds have been utilised for a wide range of remedial purposes such as treatment of gall-stone, vermifuges, stomach ailments, eczema, cancer and renal disorders (Hoppe and Lerving, 1982; Srivastava and Kulshreshtha, 1989). Presently, a variety of seaweeds have been used extensively in cosmetic applications. Research on seaweeds with the purpose of developing novel skin-whitening agents from marine sources is of great interest in recent years.

*Sargassum polycystum*, belonging to family Sargassaceae, is a kind of edible brown alga (Phaeophyta) that has been used as food and medicine. It is commonly found in tropical and sub-tropical countries such as Indonesia, Malaysia, Thailand and Vietnam.