

## Reactive Oxygen Species Scavenging Effects of Enzymatic extracts from Brown Seaweeds and Their Protections against DNA damage induced by Oxidative stress

Soo-Jin Heo, Ki-Wan Lee and You-Jin Jeon

Faculty of Applied Marine Science, Cheju National University, Jeju 690-756, Korea

### Introduction

Over the past several decades, seaweeds or their extracts have been studied as novel sources which have been shown to produce a variety of compounds and some of them have been reported to possess biological activity of potential medicinal value. Recently, much attention has been paid on the anti-tumor activity, anticholesterolemic activity and antioxidant activity of seaweed constituents. Especially, antioxidant activity is intensively focused due to the currently growing demand from the pharmaceutical industry where they are interested in anti-aging and anticarcinogenic natural bioactive compounds, which possess health benefits. Almost all photosynthesizing plants including seaweeds are exposed to a combination of light and high oxygen concentrations, which lead to the formation of free radicals and other strong oxidizing agents, but they seldom suffer any serious photodynamic damage during living. This fact implies that their cells have some protective antioxidative mechanisms and compounds. Seaweeds are considered to be a rich source of antioxidants. Recently, the potential antioxidant compounds were identified as some pigments (fucoxanthin, astaxanthin, carotenoid e.g.) and polyphenols (phenolic acid, flavonoid, tannins e.g.). Those compounds are widely distributed in plants or seaweeds and are known to exhibit higher antioxidative activities. The activities have been reported through various methods of reactive oxygen species scavenging activity and the inhibition of lipid peroxidation.

In this work, seven species of brown seaweeds were enzymatically hydrolyzed by five carbohydrases and five proteases and potential antioxidant activities of the

resultant enzymatic extracts were evaluated using four different reactive oxygen species scavenging assays such as DPPH free radical, superoxide anion, hydroxyl radical and hydrogen peroxide scavenging assay.

## Materials and Methods

Seaweeds were collected along Jeju Island coast of Korea during a period from October 2002 to March 2003. The seven species of brown alga samples were enzymatically hydrolyzed to prepare water-soluble extracts by using five carbohydrases and proteases. The enzymatic extracts were obtained according to the method used by Heo et al. (2003). Reactive oxygen species scavenging activities of the enzymatic extracts were determined according to the method of Siriwardhana et al. (2003) and the alkaline comet assay for determination of DNA damage was conducted according to Singh et al. (1995).

## Results and Summary

In the present study, we used enzymatic extracts from seaweeds as a potential natural water-soluble antioxidative source and confirmed free radical, superoxide anion, hydroxyl radical, hydrogen peroxide scavenging activities and inhibitory effect of DNA damage. Some seaweed enzymatic extracts indicated relatively higher antioxidant activity, as compared to commercial antioxidants such as  $\alpha$ -tocopherol, BHA and BHT. Especially, hydrogen peroxide scavenging activity of many seaweed enzymatic extracts was predominant (about 90%) and those samples showed significant inhibitory effect against DNA damage. Therefore enzymatic extracts from seaweeds can be used in food and pharmaceutical industry. Further studies are required in order to identify the antioxidant compounds being responsible for the results observed in this study.

## References

- Heo, S.J., Lee, K.W., Song, C.B., Jeon Y.J., 2003. Antioxidant activity of enzymatic extracts from brown seaweeds. *Algae* 18, 71-81.
- Siriwardhana, N., Lee, K.W., Kim, S.H., Ha, J.W., Jeon, Y.J., 2003. Antioxidant activity of *Hizikia fusiformis* on reactive oxygen species scavenging and lipid peroxidation inhibition. *Food Sci. Tech. Int.* 9(5), 339-346.