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Antioxidant activity of *Sargassum polycystum* (Phaeophyta) and *Laurencia obtusa* (Rhodophyta) from Seribu Islands

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Abstract

Fresh and dry specimens of *Sargassum polycystum* and *Laurencia obtusa* were collected from the Seribu Islands waters, Indonesia, and crude methanol, diethylether and hexane extracts were tested for antioxidant activity using the thiocyanate method. None of the extracts of dry *S. polycystum* and *L. obtusa* showed antioxidant activity, but extracts of fresh material did show activity. *L. obtusa* extracts had higher antioxidant activity than those of *S. polycystum*. The methanol extract of *S. polycystum* was more active than the other extracts, and the n-hexane extract of *L. obtusa* was more active than the diethylether and methanol extracts.

Introduction

Research in natural products of marine algae has made significant advances in recent years and marine algae have been shown to produce a variety of compounds and some of them have been shown to possess biological activity of potential medicinal value (Moore, 1979; Konig et al., 1994). For centuries, several Indonesian seaweeds have been utilised traditionally as food supplements and for various medicinal purposes. Uses include traditional cosmetics, as antipyretic and antiseptic compounds, vermifuges, and as treatments for sunstroke, coughs, haemorrhoids, stomach ailments, nose-bleeds, goitre and urinary diseases (Anggadiredja, 1992). Several studies have investigated the potential for antioxidant activity (e.g. Fujimoto & Kaneda, 1980; Matsukawa et al., 1997). The purpose of the present study was to examine what level of activity is shown by extracts of two common Indonesian seaweeds, *Sargassum polycystum* and *Laurencia obtusa*.

Materials and methods

Sargassum polycystum and *Laurencia obtusa* were collected from Seribu Islands waters. Epiphytes, salt and sand were removed using tap water and the seaweeds were rinsed with deionised water before cutting. For fresh samples, the seaweeds were freeze-dried and cut into small pieces before extraction. For dry samples, the seaweeds were cut into small pieces, sun dried and then homogenised with a grinder before extraction.

Fresh and dry seaweeds were extracted by continuous maceration with methanol, diethylether or hexane. All the crude extracts were tested for antioxidant activity using the thiocyanate method of Osawa and Namiki (1981). The substrate for the stability test was as follows: 0.15 mL lineolate acid, 10 mL ethanol, 10 mL of 0.2 M phosphate buffer, distilled water to give a final volume of 25 mL. The substrate was mixed well with the sample (200 μg extract), incubated at 40 °C and tested after 2, 7 and 14 days. Antioxidant activity was measured by mixing 0.1 mL extract with 9.7 mL of 75% ethanol and 0.1 mL ammonium thiocyanate. After 3 min, 0.1 mL of 0.02 M $FeCl_2$ in 3.5% HCl was added and the absorbance measured at 500 nm.

The Induction Period (IP) is taken as the incubation time (days) required to obtain an absorbance reading of 0.3 at 500 nm. The Protective Factor (PF) is defined as the ratio between the sample IP and the control IP. If the PF is > 1 then this indicates that the sample has antioxidant activity.

Table 1. Induction period (IP) and protective factor (PF) of *Sargassum polycystum* extracts.

Extracts	Fraction	$AbS_{500\,nm}$ after different incubation times			IP	PF
		2 days	7 days	14 days		
Fresh *Sargassum polycystum*	methanol	0.0904	0.2486	0.4506	8.8957	1.4935
	diethylether	0.0860	0.2714	0.4732	8.3885	1.4083
	n-hexane	0.1182	0.1488	0.7980	6.7340	1.1306
Dry *Sargassum polycystum*	methanol	0.2828	0.4008	0.8148	3.2619	0.5476
	diethylether	0.2786	0.3932	0.5930	3.0519	0.5124
	n-hexane	0.3016	03638	0.5265	2.5539	0.4288
Control		0.1622	0.3290	0.5941	5.9563	

Table 2. Induction period (IP) and protective factor (PF) of *Laurencia obtusa* extracts.

Extracts	Fraction	$Abs_{500\,nm}$ after different incubation times			IP	PF
		0 days	7days	14days		
Fresh *Laurencia obtusa*	methanol	0.0544	0.3842	1.2244	3.9567	1.1008
	diethylether	0.0514	0.1966	0.5950	7.4893	2.0837
	n-hexane	0.0598	0.0694	0.6750	7.7267	2.1497
Control		0.0810	0.1710	2.1794	3.5943	–
Dry *Laurencia obtusa*	methanol0.2886	0.6300	0.6415	-1.7290	-0.3459	
	diethylether	0.2070	0.5616	0.6524	1.5412	0.3083
	n-hexane	0.2200	0.2802	0.6153	4.4559	0.8914
Control		0.1622	0.3290	0.5940	4.9985	

Results and discussion

The results are shown in Tables 1 and 2. The protective factor of all extracts of dry *Sargassum polycystum* and *Laurencia obtusa* was < 1, indicating that they had no antioxidant activity. On the other hand, extracts of fresh *S. polycystum* and *L. obtusa* had a $PF > 1$, indicating antioxidant activity. Extracts of *L. obtusa* showed higher activity than the extracts of *S. polycystum*. The methanol extract of *S. polycystum* was more active than the diethylether and *n*-hexane extracts, and the *n*-hexane extract of *L. obtusa* was more active than the diethylether and methanol extracts.

The extracts having antioxidant activity were examined by TLC and tested by the Liebermen Burcard method, which indicated that they contained terpenoids. This suggests that the antioxidant compounds may have been carotenoids or sesquiterpenoids. Gonzales et al. (1983) have reported that extracts of *L. obtusa* contained sesquiterpene, and Anggadiredja et al. (1996) have reported that extracts of *Laurencia* sp. contained carotenoids while extracts of *Sargassum* sp. contained triterpenoids.

These studies show that two common seaweeds contain materials with antiooxidant. In order to use these seaweeds as antioxidants for food or other purposes, further studies are now required to assess their effectiveness and possible toxicity.

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