CHARACTERISTICS DIPPING BROWN SEAWEED *Sargassum filipendula* in LIME SOLUTION as SEAWEED-TEA INGREDIENT

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ABSTRACT

The aim of this research was to know the characters of *Sargassum filipendula* brown sea weed as sea weed-tea ingredient. Fresh *Sargassum filipendula* was dipped in lime solution with different pH (2, 3, 4, 5, 6) for 6 hours, dried in vacuum dryer 80^{o}C for 30 minutes. All the treatments were replicated three times and compared with control (without dipping in lime solution). The treatment used Fully Randomized Design. The research showed that the best dipping in lime solution was pH 2. It was supported with smell organoleptic in 2.5; color in 3.45; pH seaweed 4.2. Polyphenol content 3.02 mg/g GAE, antioxidant activity 64.13%; lightness intensity 42.23; color red (a) 9.53; color yellow (b) 15.65; Pb content 0.26 ppm; Cd content 0.15 ppm; Hg content 0.22 ppm; proximate protein 9.53%; fat 0.4%; water content 8.3%; ash 9.24%. *Escherischia coli* 1.23 x 10^2 cfu/mL; total plate count 1.7 x 10^5 cfu/mL. It should be supported with other testing such as content of pigment, phycocolloid, cellulose and toxicology testing before it as seaweed-tea for human consumption.

Key words: lime solution, pH, *Sargassum filipendula*

INTRODUCTION

Drinking tea is a world common habit, especially in East Asia. Researchers have been studied pharmacology effect of tea. Tea leaves rich polyphenol especially flavanols and flavonols. These polyphenols have radical scavenging activity and neutralized free radicals in the body. A cup of tea usually contains 100 mg of polyphenol. As antioxidant, polyphenol prevent stress oxidative in cell and decrease risk degenerative diseases (Scalbert *et al*., 2005). Part of resident in Talango, Sumenep, Madura, East Java, Indonesia have been used brown seaweed Sargassum as “tea leaves” Sargassum abundant antioxidant content. Liem *et al* (2002) studied the content of polyphenol of brown seaweed *Sargassum siliquastrum* as antioxidant. Antioxidant activity ethanol 70% extract of *Sargassum paliidum* had studied by Hong-Ye *et al* (2009). Chandini, Ganesan and Bhaskar (2008) research showed antioxidant activity of *Sargassum marginitum* higher than *Turbinaria conoides* and *Padina tetratomastica*.

Drinking tea from brown seaweed is a kind of extract water soluble antioxidant. Water soluble antioxidant from species Sargassum for radical scavenging activity in lipid peroxidation had been investigated by Soo-jin Heo *et al* (2003). Consumers brown seaweed-tea annoyed the smell of seaweed-tea. The strong tastes associated with seaweeds is allied with the many

macronutrients they contain (Mac Artain *et a*l (2007).Macro minerals in brown seaweed are Na, K, Ca, Mg and also contain high proportion of ash and sulphate (Ruperez, 2002). Cooking or washing processes may remove many of these tastes. Decreasing brown sea weed nutritional contents are caused by drying method (Chan *et al* ,1997) as well as canning process (Machado *et al* (2004). In order to decrease the smell of brown seaweed-tea, it dips in lime solution. Using acids in brown seaweeds usually as bio absorption heavy metals (Rey-Castro *et al*. 2003; Yeong-Sang Yun *et a*l, 2001; Figueira *et al*, 2000), but dipping brown seaweed in acid solution as the way to decrease smell of brown seaweed is little known. The aim of the research was to evaluate dipping brown seaweed in lime solution as sea weed-tea ingredient.

MATERIAL AND METHOD

Sargassum filipendula was caught from waters of Cabbiya, Talango, Sumenep, Madura, East Java, Indonesia, It was rinsed with marine water and then fresh water, put in the cool box with ice block. In the laboratory, it was rinsed with fresh water, picked up from gravels and impurities, rinsed again with aquadest, dipped n lime solution, 1:11 (w/v) in pH 2, 3, 4, 5, 6 and control (withot dipping in lime solution) for 6 hours, dried in vacuum dryer 80^{o}C 30 minutes and then grinded for analyzed. Research used Fully Randomized Design with three replications and analyzed by ANOVA. Dependent variables were water content (gravimetric method), protein (kjeldahl method), ash (tenure method), fat (soxhlet method), heavy metals (Pb, Cd, Hg with AAS), color intensity (L, a*, b*), pH, total polyphenol (Lim *et al* ,2002**),** antioxidant activity (Blois, 1958), organoleptic test (hedonic test, scale 1-5).*E coli* and plate count were counted for microbiological quality.

RESULT AND DISSCUSSION

Table 1 shows the summary of the research. Dipping in lime solution for 6 hours caused pH decreasing brown seaweed-tea. Brown seaweed are high of minerals due to their marine habitat (Mac Artain *et a*l, 2007) Citric acid from lime citrus was thought can replenish H ions and organic ligand thus minerals be dissolution, so that flavor and taste increased in pH 2 but the color tend to be decreased. Brown seaweed contained carotenoid and fucoxanthin, responsible for brown color. These pigment were unstable in light and pH. It also was thought that H^{+} ion from citric acid bind water soluble polysaccharide, a specific food reserve in Phaeophyta. Lower pH means more H ions binding. The largest amount of amorphous matrix in the cell wall of

brown seaweed consists of mainly alginic acid and some sulfated polysaccharides. Alginic acid found in form different part of seaweed, in intracellular and cell wall (Percival, 1979). Its play a role of electrostatics attraction of metal bio sorption (Figueira et al, 2000). Binding H^+ ion with water soluble polysaccharides caused metal bio sorption decreased. For the vast majority of brown seaweed, the content of heavy metals were below food safety limit naturally (Mac Artain *et a*l, 2007).

Table 1. Summary of the research

Parameters	Control	pH 6	pH 5	pH 4	pH 3	pH 2
pH	6,83^{c}	6,74^{b}	6,46^{b}	6,23^{b}	4,32^{a}	4,20^{a}
Proksimat (%)						
Protein	9,80^{b}	8,14^{a}	8,50^{a}	8,89^{a}	8,97^{a}	9,53^{b}
Fat	1,16^{c}	0,77^{b}	0,73^{b}	0,66^{a}	0,61^{a}	0,48^{a}
Ash	19,53^{d}	12,50^{c}	10,69^{b}	9,29^{a}	10,14^{b}	9,24^{a}
Water	5,00^{a}	5,33^{a}	5,67^{a}	5,67^{a}	7,33^{b}	8,33^{c}
Color intensity						
L*	38,63^{a}	40,00^{b}	40,57^{b}	41,22^{c}	41,87^{c}	42,23^{d}
a*	12,38^{d}	11,25^{c}	10,87^{b}	10,38^{b}	9,79^{a}	9,53^{a}
b*	22,56^{c}	20,80^{b}	19,43^{b}	19,05^{b}	16,00^{a}	15,65^{a}
Heavy metals (ppm)						
Pb	1,18^{d}	0,93^{c}	0,78^{b}	0,64^{b}	0,54^{a}	0,43^{a}
Cd	0,46^{d}	0,44^{c}	0,39^{c}	0,27^{b}	0,23^{b}	0,19^{a}
Hg	1,16^{d}	0,80^{c}	0,46^{b}	0,39^{b}	0,34^{a}	0,26^{a}
Organoleptik						
Taste	1.8^{a}	1.8^{a}	2.3^{b}	2.8^{b}	3.6^{c}	3.7^{c}
Flavor	1.00^{a}	1.00^{a}	1.00^{a}	1.00^{a}	1.8^{b}	2.50^{c}
Color	5.45^{d}	4.90^{c}	4.25^{c}	3.30^{b}	2.45^{a}	2.1^{a}
Poliphenol content (mg/g extract)						
GAE	5.02^{c}	4.79^{b}	4.65^{b}	4.49^{b}	4.36^{a}	4.25^{a}
Antioxidant activity(%)	72,98^{c}	72,67^{c}	70,27^{b}	68,40^{a}	68,00^{a}	64,13^{a}
Total Plate Count (cfu/ml)	$7.0\times10^{5\,c}$	$5.7\times10^{5\,b}$	$5.8\times10^{5\,b}$	$6.1\times10^{5\,b}$	$6.4\times10^{5\,b}$	$1.7\times10^{5\,a}$
E coli (cfu/ml)	$6.9\times10^{2\,b}$	$5.2\times10^{2\,b}$	$5.7\times10^{2\,b}$	$6.5\times10^{2\,b}$	$6.9\times10^{2\,b}$	$1.2\times10^{2\,a}$

Nutrient content from brown seaweed had great variety. It related with season, habitat, temperature, salinity. Light and nutrients. The changes in ecological conditions can stimulate or

inhibit biosynthesis of several nutrients (Manivannan *et a*l. 2009).Brown seaweed protein was dominated by aspartate and glutamate. Testing protein content used Kjeldhal method only measured N total. H+ ions from citric acid unable in breaking amino acids in thallus of Phaeophyta. Fat content in brown seaweed is low relatively, but almost of them dominated by Poly Unsaturated Fatty Acids (PUFA).

Seaweed had spent large of time exposed to direct sunlight and live in aqueous environment which rich in minerals and heavy metals, The consequences of these that sea weed contained many form of antioxidant. H^+ ion from citric acid tend to break hydroxcyl binding in phenol. Decreasing in Total Plate Count and count of *E coli* were caused by dipping in lime solution. It was thought that H^+ ion from citric acid can inhibit the growth of microbes. E coli growed best in pH 7 or higher pH.

CONCLUSION

Dipping brown seaweed in lime solution at pH 2 was the best treatment in decreasing seaweed flavor. It should be supported with other testing such as content of pigment, phycocolloid, cellulose and toxicology testing before it as seaweed-tea for human consumption.

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