



## RESEARCH ARTICLE

### SARGASSUM TEA: ITS ACCEPTABILITY AND QUALITY

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#### ABSTRACT

The acceptability and quality evaluation of Sargassum tea was studied from May 1 to April 31, 2012 to determine the most acceptable formulation of sargassum tea mixed with different flavorings (lemon grass, pandan and sweet basil leaves and pure sargassum), chemical, nutritional, microbial and heavy metals component of the best treatment were analyzed. The product were prepared in 2 grams tea bags and the different treatments were subjected to acceptability test by 60 taste panelist. The most accepted formulation was submitted for microbial and chemical analysis to Food and Nutrition Research Institute, DOST Taguig, while the heavy metals content was analyzed by the Regional Standard and Testing Laboratory, DOST Region 7, Cebu, Philippines. Results of the analysis showed that the best Sargassum tea formulation was the mixture of sargassum and sweet basil leaves followed by sargassum mix with lemon grass leaves. Analysis of variance on the acceptability of sargassum tea revealed a significant difference between treatment mean and this was further analyzed using the Least Significant Different test. Results also revealed that these two formulations did not significantly differ from each other. The chemical analysis showed that per 100 grams of Sargassum tea contain 300 kcal of ene-rgy, total fat of 2.3 grams, total carbohydrates of 57.7 grams, protein of 12.1 grams and iron is 88 mg. The Sagassum tea has calcium content 7 percent, iron of 15 percent, potassium of 2 percent and vitamin A of 2 percent of recommended energy and Nutrient Intake (RENI) for males 19 years old and above. The microbiological and heavy metals content of the product have passed the standard limit for food.

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## INTRODUCTION

*Sargassum* is a genus of brown (class Phaeophyceae) macroalga (seaweed) in the order Fucales. Numerous species are distributed throughout the temperate and tropical oceans of the world, where they generally inhabit shallow water and coral reefs (<http://www.tititudorancea.com>). *Sargassum* is frequently the largest and dominant seaweed species in terms of standing crop, percent cover and height in tropical high subtidal and low subtidal zones of the marine environment (Doty, 1971). In Eastern Samar, *Sargassum* is the dominant seaweed genera found in the coral reef area (Alura et al., 2002). Inshore fishermen consider *Sargassum* as a nuisance in fishing operations since the floating thalli entangle with the propeller of motor boats and thalli attached to the reef also obstruct setting of gill nets. The sargassum biomass can also be seen drifted to the shore creating dirty and unpleasant condition of beaches.

Contrary to the notion that Sarassum is a seaweed nuisance to fishermen, it has many uses as fertilizer, feeds and medicine. In some parts of Northern Samar, *Sargassum* is cooked and mixed with rice bran and used as feed to pigs (ESSU, 1997). In northern Luzon, sargassum leaves are used as vegetables mixed with fish sinigang (Trono, 2000). In the Visayas and Northern Mindanao, natives utilize *Sargassum* as fertilizer, flower inducer and insect repellent. Cebuano and Boholano communities in the area also use the seaweed as animal feed. In certain parts of the island of Bohol, a *Sargassum* drink is made and is reported to have health benefits. However, there is a declining trend of the folk uses of *Sargassum* due to Western and modern influences (<http://www.researchgate.net/publicliterature>). This study developed tea product out of *Sargassum* sp. collected from the reef of Maydolong, Eastern Samar. Traditionally, this seaweed is used as herbal tea in China. Information from [www.o-cha.net](http://www.o-cha.net), states that many Chinese herbalists prescribe powdered sargassum in paper packets of 0.5 gm, to be dissolved in warm water and drunk as tea. It is said to remove excess phlegm. *Sargassum* contain carotenoid known as fucoxanthin found in the chloroplast (Trono, 1997). Fucoxanthin is a popular nutrient in Asia and

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Europe. One of the first benefits discovered by scientists was the ability of fucoxanthin to help lose belly fat (<http://hubpages.com>). Pure Sargassum is not acceptable as food product due to its fishy odor. This study therefore aimed to develop new product out of Sargassum that is acceptable by the consumers, namely, Sargassum tea. Due to variety of methods in literature and actual practice in processing tea, this study was designed to determine the effect of the natural flavorings such as pandan, lemon grass and sweet basil on the sensory quality of the product.

### Objectives of the Study

This study was conducted to determine the best Sargassum tea formulation, Specifically it aimed to:

- Determine the most acceptable formulation of sargassum tea mixed with flavorings (lemon grass, pandan and sweet basil) and pure sargassum tea
- Determine the chemical and nutritional component of the best treatment;
- Determine the microbial content of the best treatment and;
- Determine the heavy metals content of the product.

## MATERIALS AND METHODS

### Gathering of Raw Materials

Sargassum was collected from the coastal fringing reef of Maydolong by cutting the thalli approximately 10 cm. from the holdfast. During harvesting, the sargassum were washed with seawater before packing and transporting to ESSU Food Laboratory. The flavorings (lemon grass leaves, pandan leaves and sweet basil leaves) were collected/purchased from the farmers and backyard of the researchers.

### Drying

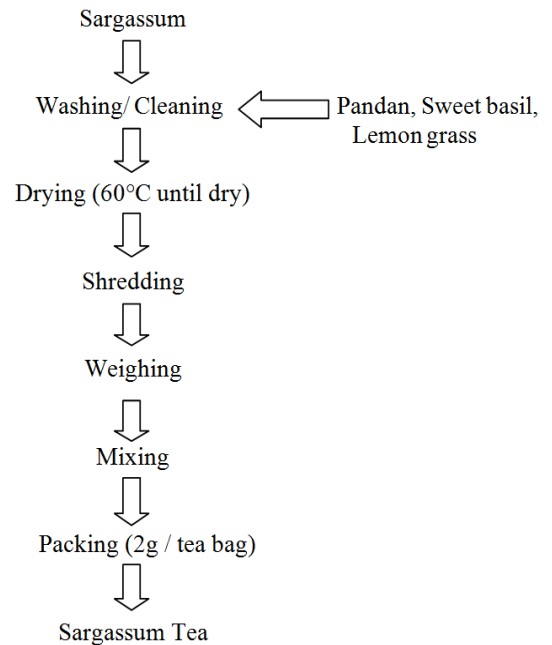
The collected sargassum seaweeds and flavorings (lemon grass, pandan leaves and sweet basil leaves) were washed in fresh water to remove the salt and epiphytes from sargassum seaweeds and soil and dust from the flavorings. The sargassum and the flavorings were weighed separately and oven dried at 50-60°C until constant weight was attained. These were shredded immediately right after drying to facilitate easy shredding and minimize moisture absorption.

### Sample Preparations

The shredded sargassum was divided into four (4) parts to represent each treatment. Every formulation contained 70% or seven hundred (700 g) grams of shredded sargassum and thirty percent (30%) or three hundred grams (300 g) of flavorings (pandan, lemon grass and sweet basil). The four formulation of sargassum tea were then packed into the tea bags. Each tea bag contained two grams (2 g) of the tea mix. The process flow of sargassum tea is shown in (Figure 1).

**Table 1. Experimental treatments and formulation of Sargassum tea**

Treatments	Formulation
ST <sub>0</sub>	100% shredded sargassum
ST <sub>1</sub>	70% shredded sargassum + 30% pandan leaves
ST <sub>2</sub>	70% shredded sargassum + 30% lemon grass leaves
ST <sub>3</sub>	70% shredded sargassum + 30% sweet basil leaves



**Figure 1. Process flow diagram of sargassum tea**

### Sensory Evaluation of the Product

The flavored sargassum tea was subjected to sensory evaluation employing 60 untrained panelists which were distributed as follows; 10 plain housewives, 10 working housewives, 10 non employed husbands, 10 employed men, 10 female college students and 10 male college students. There were four (4) samples in each tray arranged randomly in each presentation to equalize the sample sequence effect on food preference. The sensory attributes of the product such as color, aroma, flavor and overall acceptability were evaluated using a combination of quality description as perceived by the panelists and 9-point Hedonic scale for acceptability evaluation. The panelists were given a score sheet that indicate the degree of the acceptance to the product in terms of the sensory attributes. To interpret the perceptions of the taste panelists on their mean acceptability rating results, the numerical range (Table 2, column 3) was used on the description for color, flavor, odor and texture based on Alura's method (2011).

## RESULTS AND DISCUSSION

### General Acceptability of Sargassum Tea

Results of the acceptability evaluation by taste panelist showed that the Sargassum Tea with sweet basil flavoring (Treatment 3) was the most preferred with a rating of 6.71 or "like

moderately” based on the numerical range value used for preference test. It was followed by Sargassum tea with lemon grass flavoring (treatment 2) with a rating of 6.46 or “like moderately”. The Sargassum tea with no flavoring and with pandan leaves were “liked slightly” by the taste panelist with a rating of 5.73 and 6.06, respectively. The group of taste panelists who rated the highest acceptability of Sargassum tea was the non working husband for tea with 30% sweet basil with a rating of 7.17. It was noted that the acceptability of all treatments ranges only from “like slightly” to “like moderately” with no “like very much” and “like extremely” ratings. This is probably due to fact that Filipinos are not used to drink tea compared to coffee. However the Sargassum tea produced in this research, is for the health conscious individuals. Analysis of variance on the acceptability of Sargassum tea revealed a significant difference between treatments at 5 percent level of significance. This shows that the different kinds of flavoring of Sargassum tea statistically affected the perception on the general acceptability by the taste panelists. Further analysis using the least significant difference test showed no significant difference between tea with 30 percent sweet basil mixed with 70 percent Sargassum and 30 percent lemon grass mixed with 70 percent Sargassum leaves, which means that the two tea formulations statistically have the same acceptability ratings.

### Product Analysis and Packaging Design

Nutritional, chemical and microbial analysis were conducted by the Food and Nutrition Research Institute (FNRI) of DOST Taguig Metro Manila. The heavy metals were analyzed by the Regional Standard and Testing Laboratory of the Department of Science and Technology Region 7, Cebu. While the packaging design was undertaken by the Packaging Division of the Industrial Technology Development Institute also of DOST Taguig.

### Microbial content

Results of the microbial analysis showed that the product has an aerobic plate count of 10,000 CFU/g. Based on <http://www.foodstandards.gov.au>, aerobic plate count greater than 100,000 is unsatisfactory while that at 10,000 cfu/g is still considered satisfactory. The coli form count was 3.0 MPN/g while the mold and yeast content was 100/g, it has a negative salmonella sp, Staphylococcus aureus of 10 CFU/g and the Bacillus cereus 100 CFU/g. All of the microbial content of the Sargassum tea are below the standard limit for food based on the Standard 1.6.1 of the Microbiological Limits for Food ([www.comlaw.gov.au](http://www.comlaw.gov.au)). This shows that the sargassum tea passed the microbial content. The chemical component of Sargassum tea is presented in Table 6. Results showed that for a 100 gram sample, the energy is 300 kcal, total fat is 2.3 grams, total carbohydrates is 57.7 grams, protein is 12.1 grams and iron is 88 mg. Compared to common tea products which has no protein and no iron content, Sargassum tea has added advantage.

### Heavy Metals

Results of the analysis showed that the product is free from toxic heavy metals except for a trace of cadmium (Table 6). The authors are not aware of literature on the toxic level of cadmium in sargassum tea, However, the Food and Drugs Administration (FDA) limits the amount of cadmium in food colors to 15 parts per million (15 ppm) (<http://extoxnet.orst.edu>) which is much higher compared to the trace amount is sargassum tea. To ensure that no trace of calcium that can be detected in the this tea product, a sample taken from an of shore reef and was analyzed by the Regional Standard and Testing Laboratory of the Department of Science and Technology Region 7, Cebu. Results of the analysis showed that no cadmium detected in the sample.

**Table 1. Hedonic scale and numerical range used for preference test results**

Description for color, Flavor, Odor and Texture Attributes	Hedonic Scale	Numerical range
Like Extremely	9	8.11 – 9
Like very much	8	7.22 – 8.10
Like Moderately	7	6.33 – 7.21
Like Slightly	6	5.44 – 6.32
Neither Like nor Dislike	5	4.55 – 5.43
Dislike Slightly	4	3.66 – 4.54
Dislike Moderately	3	2.77 – 3.65
Dislike Very Much	2	1.88 – 2.76
Dislike Extremely	1	1.00 – 1.87

**Table 2. General Acceptability of Sargassum Tea by group of taste panelist**

Treatment	Taste Panelist						Mean±SD*
	WHW	PH	WHB	NHB	FCS	MCS	
T <sub>0</sub> - Pure Sargassum	5.77	5.90	5.73	5.90	5.40	5.66	5.73±1.70 <sup>b</sup>
T <sub>1</sub> - 30% Pandan Leaves + 70% Sargassum	6.23	6.03	6.03	6.17	5.80	6.12	6.06±1.76 <sup>b</sup>
T <sub>2</sub> - 30% Lemon Grass Leaves + 70% Sargassum	6.93	6.20	7.07	6.33	5.97	6.24	6.46±1.61 <sup>a</sup>
T <sub>3</sub> - 30% Sweet Basil Leaves + 70% Sargassum	6.97	6.30	6.70	7.17	6.30	6.86	6.71±1.73 <sup>a</sup>

\*Means with common letter are not significantly different at .05 level of significance.

Legend: WHW- Working housewives; NHB- Non working husband; PH-Plain housewives; FCS-Female college students; WHB- Working husband; MCS- Male college students

**Table 3. Analysis of variance on the general acceptability of Sargassum Tea**

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Treatment	77.010	3	25.670	6.837	.000
Replication	1998.439	688	2.905		
Total	2075.449	2.905			

**Table 4. Results of the Microbial analysis of Seaweed Tea**

Microbiological Parameters	Results	Method Used	Date of Analysis
Aerobic Plate Count (CFU/g)	10,000.00	FDA BAM-3 2001	05-08-2012
Coliform Count (MPN/g)	3.0	FDA BAM-4 2001	05-17-2012
E. coli Count (MPN/g)	3.0	FDA BAM-4 2001	05-17-2012
Mold & Yeast Count (CFU/g)	100	FDA BAM-18 2001	05-22-2012
Salmonella sp. (per 25g)	Negative	FDA BAM-5, 2007	05-19-2012
Staphylococcus aureus (CFU/g)	10	FDA BAM-5, 2007	05-17-2012
Bacillus cereus (CFU/g)	100	FDA BAM-14, 2001	05-16-2012

**Table 5. Results of the Chemical Analysis of Seaweed Tea**

Analyte Per 100 g	Results	Method Used	Date of analysis
Moisture, g	12.7	AOAC 925, 10/ AOAC 920, 151A/ AOAC 930, 15	03-13-2012
Ash, g	15.2	AOAC 923.03/ AOAC 925.51A/ AOAC 920, 100A,B	03-21-2012/ 03-18-2012
Energy*, kcal	300	Computed using Atwater factors	-
Total Fat, g	2.3	Acid Hydrolysis (Tecator)	03-28-2012
Total Carbohydrates*, g	57.7	Computed by difference	-
Total Sugars*, g	-	AOAC 968.28	03-21-2012
Protein, g	12.1	Automated Kjeldahl Method (Buchi)	03-25-2012 03-28-2012 03-22-2012
Sodium, mg	167	AOAC 985.35 (modified)	03-21-2012
Iron, mg	88	AOAC 985.35 (M0dified)	03-22-2012

**Table 6. Results of the Heavy Metals Analysis of Sargassum Tea**

Parameters	Results			
	First Sample		Second Sample	
Cadmium (as Cd)	Traces	3.5 mg/kg	Not detected	2.40 ppm
Lead (as Pb)	Not detected	14.2mg/kg	Not detected	2.20 mg/kg
Iron (as Fe)	17.8 mg/kg		-	
Zinc (as Zn)	155 mg/kg		47 mg/kg	

Note: Source of First Sample - Inshore reef; Source of Second Sample – Offshore reef

## Nutritional Information

The nutrition facts (Table 7) of Sargassum tea showed that it is high in energy, vitamin A, iron, potassium fat, carbohydrates, protein and calcium compared to the common commercial tea which has no fat, carbohydrates, protein and calcium. The competitive edge of the Sargassum tea over other commercial tea is the presence of calcium which is 7 percent of recommended energy and Nutrient Intake (RENI) of males 19 years old and above. Most physicians do not recommend to old age women of drinking tea because tea is diuretic and it drain calcium with the urine, ironically, the sargassum tea will not drain calcium but it will add calcium intake due to its high calcium content of 55 mg per serving and can supply 2 percent of RENI.

## Summary and Conclusion

The acceptability and quality evaluation of Sargassum tea was studied from May 1 to April 30, 2012 to the products were prepared in 2-grams tea bags and the different treatments were subjected to acceptability test by 60 taste panelist. The most accepted formulation was submitted for microbial and chemical analysis to Food and Nutrition Research Institute,

DOST Taguig, while the heavy metals content was analyzed by the Regional Standard and Testing Laboratory, DOST Region 7, Cebu, determine the most acceptable formulation of sargassum tea mixed with different flavorings (lemon grass, pandan and sweet basil leaves and pure sargassum), chemical, nutritional, microbial and heavy metals component of the best treatment were analyzed. Results of the sensory evaluation showed that the best Sargassum tea formulation was the mixture of sargassum and sweet basil leaves followed by sargassum mix with lemon grass leaves. The chemical analysis showed that 100 grams of Sargassum tea contain 300 kcal of energy, total fat of 2.3 grams, total carbohydrates of 57.7 grams, protein of 12.1 grams and iron is 88 mg. The Sargassum tea has calcium content 7 percent, iron of 15 percent, potassium of 2 percent and vitamin A of 2 percent of recommended energy and Nutrient Intake (RENI) for males 19 years old and above. The microbiological and heavy metals content of the product passed the standard limits for food. Based on the results of the study, it was concluded that the best Sargassum tea formulation is 30 percent sweet basil leaves and 70 percent Sargassum seaweed. It is high in nutritional content compared to the common commercial tea products particularly on calcium, iron, potassium and vitamin A. The microbial and heavy metals content is below the standard limit set for food products.

## Implications and Recommendation

Sargassum seaweed is abundantly found in almost all coastal waters of the country, its utilization as raw material in the commercial production of nutritious tea product will provide supplemental livelihood to fisherfolk by selling dried sargassum to tea manufacturers. The Sargassum Tea product has a potential to compete with the imported tea, and is also potential export product of the country, thereby contributing to the Philippine economy. In the manufacture of Sargassum tea, it is recommended to formulate 30 percent sweet basil leaves and 70 percent Sargassum seaweed and to conduct researches on other food products utilizing Sargassum seaweed as main ingredient due to its high nutritional content.

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