



BIOCHEMICAL AND MICROBIAL ANALYSIS OF SEAWEEDS AND THEIR VALUE ADDED PRODUCTS

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Session: 2020-2021

**A thesis submitted in the partial fulfillment of the requirements for the degree of
Master of Science in Fishing and Post-Harvest Technology**

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DECEMBER 2022

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The Author

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This is to certify that we have examined the above Master's thesis and have found that is complete and satisfactory in all respects, and that all revisions required by the thesis examination committee have been made.

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ACKNOWLEDGMENTS

All praises are due to **Almighty Allah** for blessing me with the strength, aptitude and patience and enabled me to pursue higher education and to complete the thesis for the degree of **Master of Science (MS) in Fishing and Post-Harvest Technology** under Department of Fishing and Post-Harvest Technology, Chattogram Veterinary and Animal Sciences University, Chattogram, Bangladesh.

The author expresses her gratitude and indebtedness to **Professor Dr. Mohammed Nurul Absar Khan**, Dean, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University, from the bottom of her heart for his immense administrative support to complete her research work.

The author would like to convey her deepest sense of gratitude, sincere appreciation, profound regards to her respected teacher and research supervisor **Dr. Md. Faisal**, Associate Professor and Head, Department of Fishing and Post-Harvest Technology, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University, for his unflinching co-operation, constant inspiration, warmth and indomitable guidance throughout the period of research work and preparation of the manuscript.

The author finds it a great pleasure in expressing her heartfelt gratitude to her research co-supervisor **Tahsin Sultana**, Assistant Professor, Department of Fishing and Post-Harvest Technology, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University, for her valuable suggestions for the completion of the research work.

The author expresses her gratefulness to Mr. Shiddarta Sankar Chowdhury, Wahidul Alam and all other laboratory technicians, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University, for their sincere cooperation.

The author finds it important to mention Md Ariful Islam Milon and S.M. Atikul Alam for their sincere support and help for the completion of the research work.

Last, but not the least, the author expresses her heartfelt gratitude to her beloved parents Md. Jaynal Abedin and Mrs. Sakhina Akter for their selfless love, blessings, care, dedicated efforts, valuable prayers and continuous support during the academic life.

The Author

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LIST OF ABBREVIATIONS

Acronym	Definition
g	Gram
$\mu\text{g day}^{-1}$	Micro Gram Per Day
mg	Milligram
kg	Kilogram
ml	Milliliter
cm^2	Square Centimeter
t	Tons
d wt.	Dry Weight
TDF	Total Dietary Fiber
CFU	Colony Forming Unit
BCF	Bioconcentration Factor
ANOVA	Analysis of Variance
As	Arsenic
Cd	Cadmium
Co	Cobalt
Cr	Chromium
Ni	Nickel
Pb	Lead
Mn	Manganese
Se	Selenium
Cu	Copper
Fe	Iron
SD	Standard Deviation
Zn	Zinc
Al	Aluminum
Hg	Mercury
Ba	Barium
Sr	Strontium
Sb	Antimony

ABSTRACT

Despite a paucity of public data, seaweed output in Bangladesh is expanding rapidly day by day. Three raw seaweed species (green seaweed *Enteromorpha* sp., red seaweed *Gracilaria* sp., and green seaweed *Ulva* sp.) were collected from the nature and dry seaweeds were purchased from a market in Nuniarchora, Cox's Bazar, Bangladesh. The samples were used to determine the proximate composition of the seaweeds as well as the presence of pathogenic bacteria and heavy metals. To create value-added items like biscuits and muffins, collected samples were cleaned with saltwater, dried in an oven, crushed in a grinder, and stored in a zip-lock bag at room temperature ($25 \pm 2^\circ\text{C}$). The samples' proximate composition was determined under wet, lab-dried, and market-dried conditions. *Gracilaria* sp. had the highest crude protein content 3.48% in wet basis and (14.60-20.90%) in dry basis, followed by *Ulva* sp. 2.78% wet wt. while (10.80-13.92%) dry basis and *Enteromorpha* sp. contains lowest in both wet (1.64%) and dry basis (10.43-11.78%). *Gracilaria* sp. had the maximum crude fiber content (2.98-16.67%) d wt., followed by *Ulva* sp. (3.77-6.31%) d wt., and *Enteromorpha* sp. (2.96-5.66%) d wt. based. The lowest levels of crude lipid were observed in three samples: *Gracilaria* sp. (0.13-0.35%) d wt., *Enteromorpha* sp. (0.19-0.39%) d wt., and *Ulva* sp. (0.24-1.01%) d wt. based. Total bacterial load and pathogenic bacteria such as *Salmonella* sp., *Shigella* sp., *E. coli*, *V. vulnificus*, *V. parahaemolyticus*, and *V. cholera* were observed; heavy load was found in *Ulva* sp. (13.50×10^6) CFU/g and lowest in *Enteromorpha* sp. (2.23×10^6) CFU/g; all the studied pathogenic bacteria were present in *Ulva* sp. and *Enteromorpha* sp. ICPMS-2030 was used to examine the concentration of heavy metals, and *Gracilaria* sp. had the greatest concentration of the elements (As, Fe, Mn, Zn, Ni, and Pb). Biscuits had a greater crude protein content (10.60% in *Ulva* biscuits) in value-added items than muffins (8.49% in *Ulva* muffins). Compared to biscuits (65.64% in *Enteromorpha* biscuits), muffins (32.34% in *Enteromorpha* muffins) had a lower carbohydrate level.

Keywords: Seaweed, Heavy Metals, IPCMS-2030, *Enteromorpha* sp., *Gracilaria* sp., *Ulva* sp.