



# **COMPARATIVE ANALYSIS OF SEaweEDS, REARED WITH OYSTERS IN CAPTIVE ENVIRONMENT**

Roll No.: 0123/05

Registration No.: 1285

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**A thesis submitted in the partial fulfillment of the requirements for the degree of  
Master of Science in Aquaculture**

**Department of Aquaculture  
Faculty of Fisheries  
Chattogram Veterinary and Animal Sciences University  
Chattogram-4225, Bangladesh**

**JUNE 2024**

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**Sadia Afrin**  
**June 2024**

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

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**JUNE, 2024**

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## List of Abbreviations

Acronym	Definition
AA	Amino Acids
ANOVA	Analysis of Variance
AOAC	Association of Official Analytical Chemists
DHA	Docosahexaenoic Acid
DO	Dissolved Oxygen
EAA	Essential Amino Acids
EPA	Eicosapentanoic Acid
FAME	Fatty Acid Methyl Esters
GCMS	Gas Chromatography and Mass Spectrophotometry
GI	<i>Gracilaria verrucosa</i> (Indoor)
GO	<i>G. verrucosa</i> (Outdoor)
MUFA	Mono Unsaturated Fatty Acids
NEAA	Non-essential Amino Acids
OI	Oyster (Indoor)
OO	Oyster (Outdoor)
ORP	Oxidation Reduction Potential
PCA	Principal Component Analysis
PUFA	Poly Unsaturated Fatty Acids
SAFA	Saturated Fatty Acids
SRP	Soluble Reactive Phosphorus
TAN	Total Ammonia Nitrogen
TFA	Total Fatty Acids
TSS	Total Suspended Solids
TUFA	Total Unsaturated Fatty Acids
UI	<i>Ulva lactuca</i> (Indoor)
UO	<i>U. lactuca</i> (Outdoor)

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## Abstract

Two seaweed species, *Gracilaria verrucosa* and *Ulva lactuca*, as well as oysters, *Crassostrea belcheri*, were co-cultured under different treatments for 120 days in captivity. The study assessed the water quality parameters, growth performance, and proximate and biochemical composition of the organisms. *G. verrucosa* and *C. belcheri* were co-cultured (T1), *U. lactuca* and *C. belcheri* co-cultured (T2), and *G. verrucosa*, *U. lactuca*, and *C. belcheri* were cultured independently (C1, C2, C3), with three replications in each case. The experiment's conclusion involved a comparison of the treatments and control group's oyster growth, survival, and water quality. Apart from that, both indoor and outdoor seaweeds and oysters were compared to assess their proximate and biochemical indices. The salinity ranged from 32.75 to 22.05 psu, the dissolved oxygen from 7.19 to 4.22 ppm, and the pH from 8.72 to 6.45 ppm for each treatment. Significant relationships between salinity, conductivity, and temperature were found using principal component analysis. Significant variations were seen in the growth rates of the two seaweeds, *U. lactuca* exhibiting the highest live weight gain and specific growth rate in T2. The percentage of surviving oysters varied from 60% to 80%, with T2 showing the fastest growth rates. The seaweeds' moisture, ash, protein, carbohydrate, and fiber contents varied significantly, according to proximate composition analysis, with *U. lactuca* (indoor) having the highest protein and carbohydrate content ( $p < 0.05$ ). Biochemical indices indicate that indoor *U. lactuca* contained the maximum total chlorophyll, carotenoids, and fucoxanthin. Significant variations were found in the fatty acid analysis of the seaweed and oyster samples. The results showed that the outdoor oyster samples had more omega-3 fatty acids ( $p < 0.05$ ) while the indoor seaweed samples had lower saturated fatty acids and higher polyunsaturated fatty acids. *U. lactuca* grown indoors exhibited the highest quantities of both essential and non-essential amino acids (NEAA). However, oyster samples did not significantly differ in their EAA content when grown indoors or outdoors, they did exhibit higher levels of NEAA in outdoors. The study emphasizes how culture circumstances affect the nutritional and biochemical profiles of seaweeds and oysters, and it offers indoor co-culture as a workable substitute for bad environmental conditions that yet allow for optimal growth and nutritional quality.

**Keywords:** *Gracilaria verrucosa*, *Ulva lactuca*, *Crassostrea belcheri*, co-culture, biochemical composition