A comparison of bio-fermented solutions from fish waste, shrimp waste, and crab waste on water quality and the growth rate of sea grapes (*Caulerpa lentillifera*).

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Abstract

This study aimed to compare the effects of bio-fermented liquids derived from shrimp, crab, and fish waste by-products of seafood processing on water quality and the growth performance of Green Caviar (Caulerpa lentillifera). Three formulas were prepared using equal proportions of each waste type and assigned to four experimental treatments: 1. Control, 2. Shrimp waste bio-ferment, 3. Crab waste bio-ferment, and 4. Fish waste bio-ferment. These treatments were applied to one-month-old Green Caviar cultivated under identical environmental conditions for a duration of 8 weeks, with water quality and growth parameters (weight and frond length) monitored every 7 days. The results revealed that the pH levels in all experimental treatments remained neutral, while Treatment 3 (crab waste) achieved the highest Dissolved Oxygen (DO) level at 6.80±0.21 mg/L. This superiority is attributed to the calcium carbonate in crab shells, which helps stabilize the water's pH, and the slower decomposition rate of crab waste, which reduces microbial oxygen consumption. Regarding salinity, Treatment 2 (shrimp waste) recorded the highest value at 33.90±1.09 ppt, likely due to the high mineral and salt content typically accumulated in shrimp from their marine habitats, which is released during fermentation. The surface water temperature remained consistent across all treatments at 29.01±0.59 degrees Celsius. In terms of growth performance, Treatment 3 showed the greatest increase in both weight and frond length, followed by Treatment 4, 1, and 2, respectively. This optimal growth in the crab waste treatment is due to its high chitin content, which serves as a crucial nitrogen source and growth stimulant. Furthermore, the presence of calcium carbonate and essential minerals not only buffers the pH but also reinforces the cellular structure of the Green Caviar.

Keyword : bio-fermented liquids, water quality, growth performance

Introduction

Sea grapes contain a variety of beneficial nutrients.

Research Question

1.Does bio-fermented liquid derived from seafood processingaffect the growth of sea grapes (Caulerpa lentillifera)?
2.Does the use of bio-fermented liquid influence water quality in sea grape cultivation?

Research Hypothesis

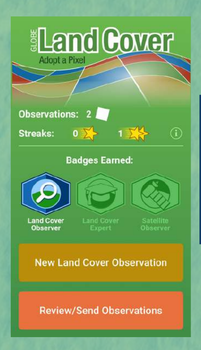
1. Bio-fermented liquid derived from seafood processing can affect the growth of sea grapes (Caulerpa lentillifera).
2.The use of bio-fermented liquid influence water quality in sea grape cultivation.

Method

Study sites

lue Crab Learning Center ,Trang
(Latitude 7°32'11"N)
(Longitude 99°18'47"E)

Methodology



GLOBE

1

Sampling of sea grapes and seawater was conducted within the designated study site and sent the data into the GLOBE Data Entry

2

Analysis of Growth Performance

3

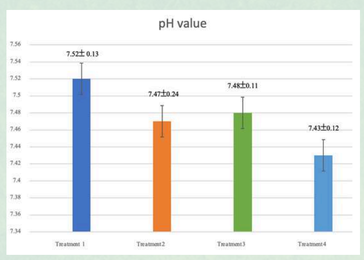
The water quality parameters analyzed in this study included pH, dissolved oxygen (DO), salinity, and temperature.

4

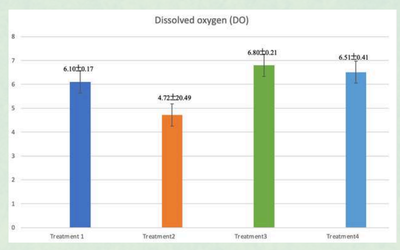
Statistical data

Results

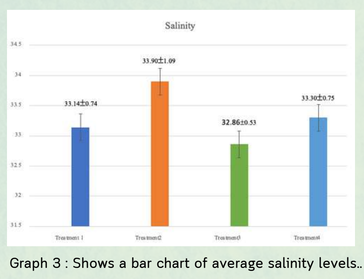
Study of Water Quality



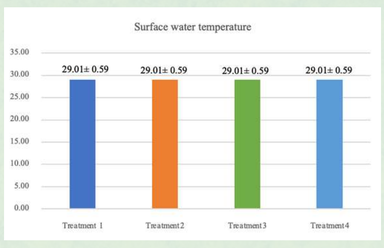
Graph 1 : Shows a bar chart of average pH values.



Graph 2 : Shows a bar chart of average DO values.

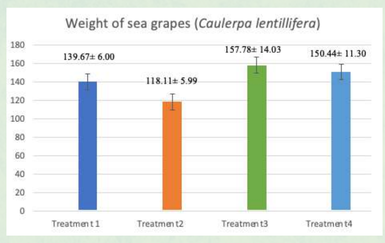


Graph 3 : Shows a bar chart of average salinity levels..

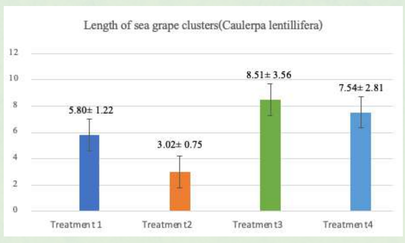


Graph 4 : Shows a bar chart of average temperatures.

Study of Growth Rate



Graph 5 : Shows a bar chart displaying the average weight of sea grapes.



Graph 6 : Shows a bar chartdisplaying the average length of sea grapes.

Discussion and Conclusion

The study on the application of bio-fermented liquids from fish, shrimp, and crab waste for Sea Grapes cultivation revealed that while all experimental groups maintained a neutral pH balance, the crab waste bio-ferment achieved the highest dissolved oxygen level at 6.80±0.21 mg/L. This superior water quality is attributed to the presence of calcium carbonate in crab shells, which effectively buffers the water and stabilizes acidity. Furthermore, the slower decomposition rate of crab waste resulted in minimal oxygen consumption by microorganisms, thereby maintaining high dissolved oxygen levels. Regarding salinity, the shrimp waste bio-ferment recorded the maximum value at 33.90±1.09 ppt because shrimp remains contain high concentrations of salts and minerals that dissolve into the water during the fermentation process. Meanwhile, the surface water temperature remained consistent across all treatments at 29.01±0.59 degrees Celsius.

In terms of growth performance, the crab waste bio-ferment produced the most significant results with a maximum weight of 175 grams and a frond length of 14.2 cm, followed by the fish waste bio-ferment, the control group, and the shrimp waste bio-ferment, respectively. The optimal growth observed in the crab waste group is due to its high chitin content, which serves as a vital nitrogen source and a primary growth stimulant for the algae. The combination of calcium carbonate and essential minerals also reinforced the cellular structure of the Sea Grapes and ensured environmental stability. In contrast, the shrimp waste bio-ferment resulted in the lowest weight and frond length because the high salt content in shrimp shells led to unstable salinity levels, while the lower chitin content provided an insufficient nitrogen source for healthy development.

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