Comparative Study of Carbon Sequestration in Rhizophora mucronate, Xylocarpus granatum Koenig, and Avicennia officinalis L., and Analysis of Physical Factors in the Mangrove Forest of Banbawee district, Hat Samran District, Trang Province,Thailand.

Wichienmatu School

THE GLOBE PROGRAM
Global Learning and Observations to Benefit the Environment

Abstract

This research is a comparative study of the carbon sequestration potential among three mangrove species: Black Mangrove (*Avicennia officinalis* L.), White Cannonball Tree (*Xylocarpus granatum* Koenig), and Large-leafed Mangrove (*Rhizophora mucronate*). The primary objective is to analyze the relationship between tree growth and physical environmental factors in accordance with GLOBE Program protocols. The findings reveal that the Black Mangrove possesses the highest carbon sequestration potential.

Research Question

Are there significant differences in the carbon sequestration capacities among Rhizophora mucronate , Xylocarpus granatum Koenig , and Avicennia officinalis L.

Introduction

Content Knowledg

According to the Department of Marine and Coastal Resources (2023) , mangrove ecosystems are among the most efficient environments for carbon sequestration. Mangroves can store significantly more carbon than terrestrial forests because they sequester carbon in both above-ground biomass (trunks, branches, and leaves) and below-ground biomass (roots). Furthermore, the anaerobic conditions in mangrove soil slow down the decomposition of organic matter. However, different mangrove species possess distinct physical characteristics, growth rates, and wood densities. For instance, *Rhizophora mucronate* (Loop-root mangrove) features strong prop roots, *Xylocarpus granatum* Koenig (Cedar mangrove) has buttress roots, and *Avicennia officinalis* L. (Grey mangrove) possesses pneumatophores (breathing roots). These differences directly influence their respective potentials for carbon absorption and storage

Research Methods

Planning Investigations

Describes the planning process

Part 1: Biosphere Protocols

The carbon sequestration measurement procedures are as follows:

1) Tree Selection: Select three different species of mangrove trees, with three individual samples per species.

2) DBH Measurement: Measure the tree circumference at Breast Height (1.30 meters above the ground) in centimeters.

3) Tree Height Measurement: Measure the total height of the trees using a clinometer.

4) Data Processing: Use the measured circumference and height values to calculate carbon sequestration via a standardized carbon estimation website.

Part 2: Pedosphere Protocols

1) Soil Properties Measurement: Measure soil moisture, soil pH, and light intensity at each sampling point using a 3-in-1 Soil Tester.

2) Soil Temperature Measurement: Measure the soil temperature using a Soil Thermometer.

Part 3: Atmosphere Protocols

1) Atmospheric Data Collection: Measure air temperature and relative humidity using a hygrometer.

2) Data Submission: Submit the collected research data to the GLOBE Data Entry system.

Carrying out Investigations

Shows the geographical coordinats

Latitude (N)	Longitude (E)
7.277392	99.574468

Globe Badges

I am a Collaborator A multidisciplinary effort integrating joint planning, fieldwork, and rigorous data analysis to produce high-integrity, publication-ready research.

I am a Data ScientistEvaluated carbon storage performance of Rhizophora mucronate, Xylocarpus granatum Koenig, and Avicennia officinalis L officinalis by modeling the relationship between sequestration rates and environmental variables (soil/atmospheric conditions).

I make an ImpactDeveloped a strategic roadmap for climate mitigation that enhances mangrove ecosystems, supporting both global carbon reduction and the economic stability of local fishing communities.

Results

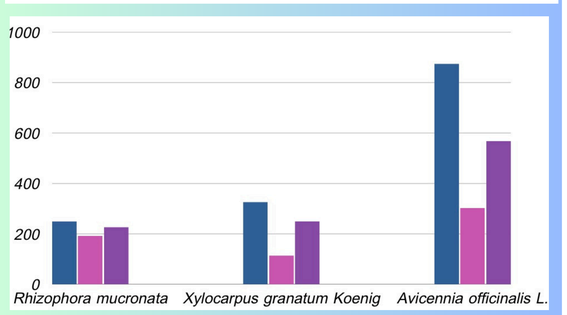
Analizing Data

A Comparative Study of Carbon Sequestration in Rhizophora mucronate, Xylocarpus granatum Koenig, and Avicennia officinalis L., and an Analysis of Physical Factors in the Mangrove Forest of Banbawee district, Hat Samran District, Trang Province

Table 1: Comparison of Carbon Sequestration among Species

Type	Carbon Storage (kgC)
Rhizophora mucronat	226.48
Xylocarpus granatum Koenig	249.66
Avicennia officinalis L.	568.67

The bar chart shows the amount of carbon stored.



Discussion

Interpreting data

First and foremost, the researchers would like to express their sincere gratitude to Mr. Sakda Phaisomboon, Director of Wichienmatu School, for approving the educational research budget. Special thanks are extended to Ms. Orapin Noonum and Ms. Sawitree Duangsook for facilitating the field research, providing invaluable consultations, and offering meticulous suggestions to improve and correct the study's shortcomings. Furthermore, we would like to thank Wichienmatu School for providing the necessary research equipment and facilities, which were instrumental in the smooth progression and successful completion of this study.
The researchers wish to dedicate the value and merits of this research to all our benefactors, as well as to the authors of the various texts and documents referenced throughout this study. We hereby express our deepest and most sincere gratitude.

Conclusion

Drawing Conclusions &Nextstep

In conclusion, the assessment of carbon sequestration in the mangrove forests of Baanbawee Subdistrict, Hat Samran District, Trang Province, showed that the sequestration levels, ranked from highest to lowest, were: 568.67 kgC in Avicennia officinalis L., 249.66 kgC in Xylocarpus granatum Koenig, and 236.48 kgC in Rhizophora mucronata. The amount of carbon sequestered is primarily determined by the growth of the trees. Additionally, physical environmental factors significantly influence the growth patterns of different mangrove species, thereby leading to variations in the carbon sequestration potential among R. mucronata, X. granatum Koenig, and A. officinalis L.

Biologygrap

Referance

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