Title : A study of plant species diversity in mangrove forests towards soil quality in Ban Khok- Ok, Hat Samran District, Trang, Thailand.

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Abstract or Summary

A study of plant species diversity in mangrove forests towards soil quality aims to investigate the relationship between ground cover plants and soil quality in the study area of mangrove forests in Ban Khok Ok, Hat Samran District, Trang. The study focuses on mangrove tree species, soil moisture, pH levels, temperature, soil color, soil texture, and major soil nutrients as indicators of soil quality in each study area.

Key words: Plant Species in Mangrove Forests, Ground cover plants,Soil quality

Introduction

Mangrove forests are ecological systems consisting of various plant and animal species coexisting in environments such as mudflats, brackish water, or areas regularly inundated by seawater. They are commonly found along river estuaries, bays, and coastal areas with tidal fluctuations. Mangrove forests comprise numerous species and genera of non-deciduous trees, primarily belonging to the Rhizophoraceae family. They are significant for their biodiversity, with important species including Rhizophora, Xylocarpus granatum and Bruguiera. Moreover, mangrove forests serve as vital nurseries for marine life, contributing significantly to the marine ecosystem of Thailand.

Upon studying data related to mangrove forests, the research team observed variations in environmental conditions within the mangrove area, depending on the distance from the coastline. Recognizing the significance and differences in ground-

covering plant species and soil characteristics in each study area, the research team divided the study area into four zones based on mangrove tree species. The team will investigate mangrove tree species, moisture levels, pH levels, temperature, as well as nitrogen, phosphorus, and potassium levels in the soil, serving as indicators of soil quality.

Objective of the research: to investigate the relationship between ground cover plant species and their impact on soil quality within the study area of the mangrove forest.

Research Question: Will mangrove forests with different species covering the soil exhibit different soil properties?

Research Hypothesis: If the mangrove tree species vary in each study area of the mangrove forest, then the soil quality will differ.

Methods and materials

1)Measuring tape
2) GPS
3) Marker pen
4) Trowel
5) Color comparison book
6) Thermometer
7) Indicater
8) Weighing scale
9) Soil fertility measurement kit
10) Photography equipment
11) Notebooks and writing utensils
12) Soil sample containers
13) Glass rods
14) Shovel
15) Beakers
16) Filter
17) Test tubes

Study Locations Selection

Study Locations: Mangrove forests Ban Khok Ok,Moo 8, Hat Samran District, Trang. The research team will enter the field to randomly collect samples from four Designated areas which are Rhizophora apiculata area, Rhizophora mucronata area, Xylocarpus granatum area and Bruguiera area.

Research Operation Procedure

1. Research Preparation

1) Set the research topic.

2) Gather relevant knowledge and theories.

3) Set the study objective.

4) Determine the sampling points for collecting samples within the study area.

2. Operation

1) Develop a research operation plan.

2) Conduct a survey of the research area.

3) Collect samples for measurement, considering factors relevant to the study, such as geographical coordinates, soil color, soil texture, soil moisture, soil temperature, soil pH, soil structure and soil density. The study period is from 10:00 AM to 12:00 PM.

Soil sampling and ground cover plant survey procedure

1. Specify the points for soil sample collection and the area for surveying ground cover plants in the mangrove forest area.

2. Collect soil samples from the designated areas, place the soil in plastic bags and tie the bags securely.

3. Measure the soil moisture and light intensity using specialized equipment.

4. Measure soil temperature by inserting a soil thermometer about 10 centimeters deep. Place the thermometer in the prepared soil groove, wait for 1 minute, read the soil temperature for the first time and record the reading along with the time in the data sheet.

5. Read the soil temperature two more times, with a 1-minute interval between readings. If the readings do not differ by more than 1 degree Celsius in the three measurements, consider it an acceptable value then record the final value.

6.Measure the pH of the soil by taking a quantity of soil, dissolving it in 100 milliliters of distilled water, allowing it to settle and then using litmus paper to compare the color with the standard values on the side of the box.

7. Measure the levels of nitrogen, phosphorus and potassium in the soil by dissolving the collected soil in distilled water, filtering the dissolved soil and then testing it with nitrogen, phosphorus and potassium testing kits. Compare the results with standard values and record the measurements.

8. Examine the soil structure by comparing the soil samples with a knowledge sheet for studying soil structure.

3. Analysis and summary of research results

1) Analyze and compare the data using statistical methods. The parameters for analysis include soil temperature, average soil pH, and average soil moisture.

2)Reate graphs to illustrate the average values and make comparisons.

3) Summarize the experimentalresults.

Results and data

Geographical Coordinates

studying the Mangrove forests area within Ban Khok Ok, Hat Samran District, Trang, Thailand.

Table 1: Geographic Coordinates Table

Area	Geographic Coordinates	
	Latitude (N)	Longitude (E)
Ban Khok Ok, Hat Samran District.	7.21984	99.59403

Soil Structure,Soil Cohesion, Soil Color and Soil Texture

Table 2 : Soil Structure, Soil Cohesion, Soil Color and Soil Texture

Area	Soil Structure	Soil Color	Soil Texture
Rhizophora apiculata	Massive	5YR 2.5/1 black	Silty clay loam
Rhizophora mucronata	Massive	5YR 2.5/1 black	Sandy clay loam
Xylocarpus granatum	Massive	5YR 2.5/1 black	Sandy clay loam
Bruguiera	Massive	5YR 2.5/1 black	Silty clay loam

From the results of the soil structure, soil cohesion, soil color and soil texture study,it was found that the soil structure in all areas is characterized by massive structures. The soil cohesions in Rhizophora apiculata and Bruguiera areas are silty clay loam,while the soil cohesions in Rhizophora mucronata and Xylocarpus granatum areas are sandy clay loam.The soil color in all areas is darkest with a color code of (5YR 2.5/1 black).Regarding soil texture, Rhizophora apiculata and Bruguiera areas exhibit a silty clay loam texture, while Rhizophora mucronata and Xylocarpus granatum area have a sandy clay loam texture.

Soil fertility

Table 3 : Soil Fertility in Each Area

Area	Soil Fertility		
	Nitrate	**Phosphorus**	**Potassium**
Rhizophora apiculata	Trace	Medium	Trace
Rhizophora mucronata	Trace	Medium	Medium
Xylocarpus granatum	Trace	Medium	Low
Bruguiera	Trace	Low	Trace

1. Nitrate

The examination of nitrate levels in the soil of the mangrove forest area revealed that the soil from Rhizophora apiculata area, Rhizophora mucronata area, Xylocarpus granatum area and Bruguiera area had very low nitrate values.

2. Phosphorus

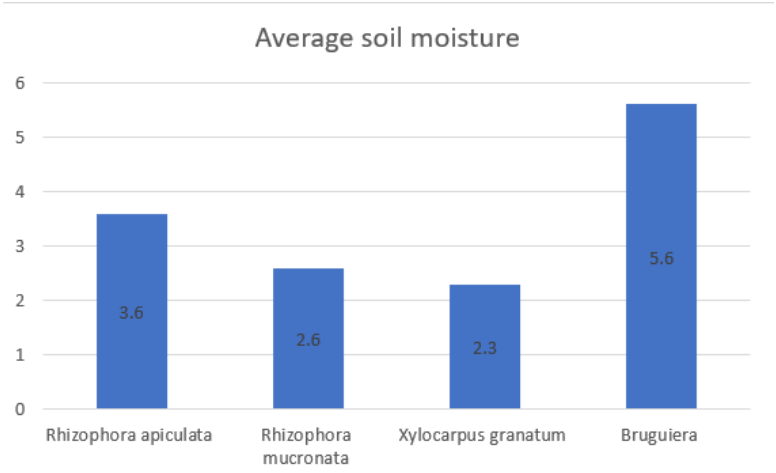
The examination of phosphorus levels in the soil of the mangrove forest area revealed that the soil from Rhizophora apiculata zone, Rhizophora mucronata zone and Xylocarpus granatum zone areas had medium phosphorus values, while the soil from Bruguiera area had low phosphorus values.

3. Potassium

The examination of phosphorus levels in the soil of the mangrove forest area revealed that the soil from Rhizophora apiculata and Bruguiera area had very low potassium values, Xylocarpus granatum area had low potassium values, while Rhizophora mucronata area had medium potassium values.

Soil moisture values

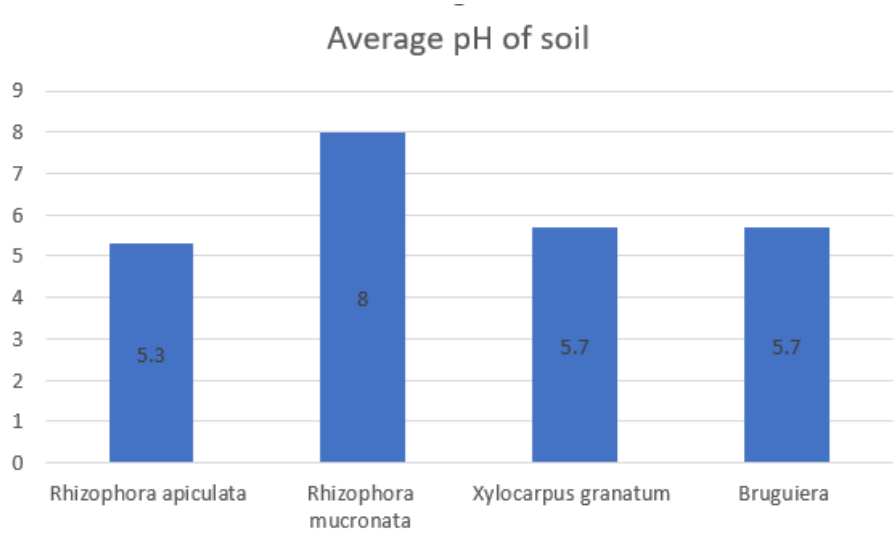
Chart 1 : Soil moisture (measured at the lowest tide)



According to the results of the study, the soil moisture is measured at the lowest water. It was found that the soil in the Rhizophora apiculata Blume area has humidity value 3.6 .The soil in the Rhizophora mucronata area has a moisture value of 2.6 . The soil in the Xylocarpus granatum area has a moisture value of 2.3 . And the soil in the Bruguiera area has a humidity value of 5.6

pH in the soil

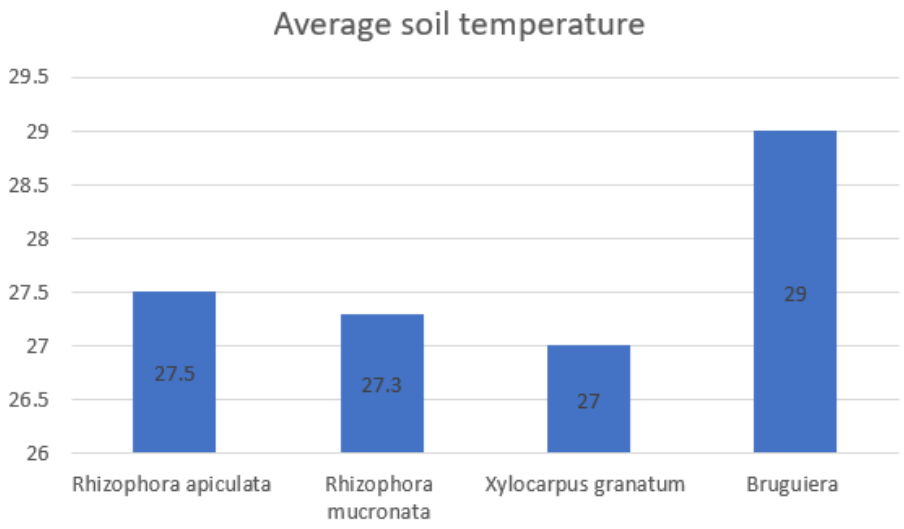
Chart 2 : the pH in the soil.



From the results of the study of soil pH values, it was found that the soil in the Rhizophora apiculata Blume area had a pH of 5.3, the soil in the Rhizophora mucronata area had a pH of 8, the soil in the Xylocarpus granatum area had a pH of 5.7, and the soil in the Bruguiera area had a pH of 5.7.

Soil temperature

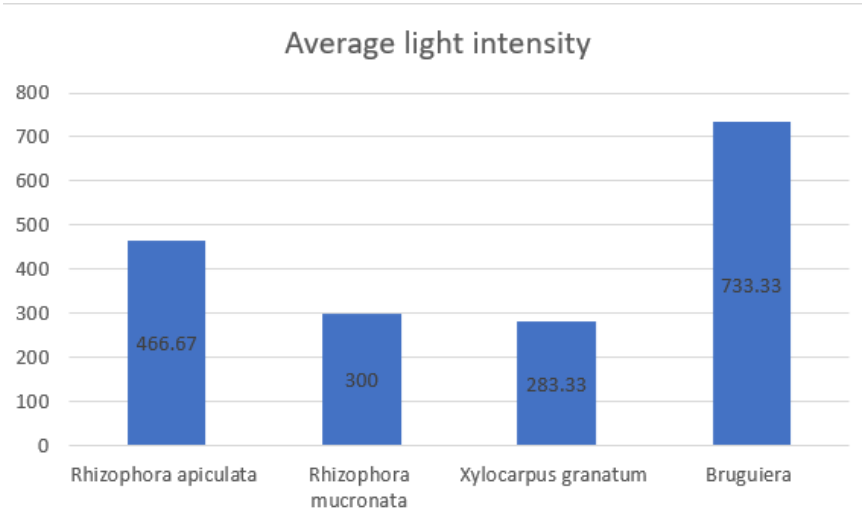
Chart 3 : soil temperature in each plant zone.



From the results of the study on the average soil temperature at a depth of 10 centimeters, it was found that the Rhizophora apiculata Blume area has an average temperature of 27.5°C, the Rhizophora mucronata area has an average temperature of 27.3°C, the Xylocarpus granatum area has an average temperature of 27°C, and the Bruguiera area has an average temperature of 29°C.

Light intensity value

Chart 4 : Average light intensity values in soil.



From the results of the study of the average light intensity, it was found that the Rhizophora apiculata Blume area had an average light intensity of 466.67, the Rhizophora mucronata area had an average light intensity of 300, the Xylocarpus granatum area had an average light intensity of 283.33, and the Bruguiera area has an average light intensity of 733.33.

Discussion and Conclusion

1. Soil Structure , Soil Cohesion and Soil Texture

The study revealed that the soil structure in all areas is characterized by massive structures. The soil cohesions in Rhizophora apiculata and Bruguiera areas are silty clay loam,while the soil cohesions in Rhizophora mucronata and Xylocarpus granatum areas are sandy clay loam. The soil texture, Rhizophora apiculata and Bruguiera areas exhibit a silty clay loam texture, while Rhizophora mucronata and Xylocarpus granatum area have a sandy clay loam texture.

2. Soil Fertility

1. Nitrate : From the study it was found that the soil in every area had very low nitrate levels. The nitrate is absorbed and used by plant roots. And is absorbed by bacteria and used to make N2 and nitrous oxide. This gas will spread into the air.

2. Phosphorus : From the study it was found that the soil in the Rhizophora apiculata area ,Rhizophora mucronata area , Xylocarpus granatum District has moderate phosphorus. As for Bruguiera District Has a low phosphorus value This is because it is soil in an area that is constantly waterlogged. Phosphorus has a complex condition. The phosphate moves out of the water and is absorbed into the sediment to become ferric phosphate. which is insoluble in water Phoric phosphate is reduced to ferrous phosphate. which is a water soluble form Therefore, phosphate is washed out from the soil (Sarayuth., 2001).

3. Potassium : From the study, it was found that the soil in the Rhizophora apiculata area Bruguiera District has very low potassium values. The Rhizophora mucronata area has moderate potassium values. And the Xylocarpus granatum area has low potassium values because plants in each area absorb and use a large amount of

potassium. As a result, potassium remains in the soil in some areas at moderate, low and very low levels.

3. Soil moisture values

From the study it's revealed that The soil in the Xylocarpus granatum area has the lowest moisture value. Which is an area that relatively elevated and only experiences seawater or occasional tidal inundation on certain occasions.

4. Soil pH

The study found that the soil in the areas of Rhizophora apiculata, Rhizophora mucronata, Xylocarpus granatum, and Bruguiera had a low pH value, which is consistent with information from the study that found that areas are constantly flooded with sea water. As a result, the soil has a high salt concentration.

5. Soil temperature at various depths

At a depth of 10 centimeters, it was found that the soil in the Bruguiera area had the highest temperature. and the soil in the Xylocarpus granatum area has the lowest temperature.

6. Soil color

The study revealed that the soil color in all areas is darkest with a color code of (5YR 2.5/1 black). Due to the high fertility of the soil in this area and the substantial accumulation of organic matter.

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