Research Report

Physical parameters affecting morning glory density

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6 March 2024

Abstract

The objective of this research is to investigate the physical factors influencing the density of sea morning glory in the Ratchamongkol beach area, Trang province. The study area is divided into three areas: an area devoid of sea morning glory, an area with 25% sea morning glory density, and an area with 75% sea morning glory density, each further subdivided into 6 study points. Soil sampling, measurement of soil and subsoil temperatures, and collection of sea kale roots were conducted. The study revealed that soil and subsoil temperatures were higher than air temperature, with no significant difference in temperature between subsoil and air. The soil in all areas consisted of sandy soil with consistent pH levels, attributed to being beach soil. Analysis of soil nutrient content indicated that the area with 75% sea morning glory density had higher levels of organic matter due to greater accumulation of organic debris, correlating with nutrient levels such as nitrogen, phosphorus, and potassium, which were consistent with the weight of sea morning glory roots. The area with 75% sea morning glory density exhibited significantly higher root mass and the lowest shoreline erosion due to the root structure preventing sand loss into the sea, effectively mitigating beach erosion.

Keywords: beach, morning glory density, temperature

Introduction

Trang province is located on the western coast of the Andaman Sea, with a coastline extending approximately 136.33 kilometers. The coastal morphology includes erosion covering an area of 18.80 kilometers. Currently, Trang province is facing issues related to coastal erosion, particularly in Sikao district, where the erosion rate ranges from 1-5 meters per year to over 5 meters per year, ranging from moderate to severe levels. Urgent action is needed to address coastal erosion problems in the coastal areas of Trang province. Additionally, sea morning glory is commonly found along the beaches and estuaries, blooming and fruiting throughout the year. It is a creeping plant, with stems ranging from 5-30 centimeters in length. Studies have shown that sea morning glory helps to prevent coastal erosion by covering sandy areas, making it more difficult for the sea to erode the coastline. Furthermore, it has medicinal properties, as research conducted by the Thailand Institute of Scientific and Technological Research in 2024 found that the essential oil extracted from sea morning glory leaves effectively inhibits the inflammation caused by venomous insect bites. Given the impact of coastal erosion on Ratchamongkol Beach in Trang province, the density of sea morning glory varies along the beach, prompting researchers to investigate the relationship between soil quality, weather conditions, and sea morning glory density as a guide for future propagation studies to help mitigate coastal erosion.

Research question

1. How is the relationship between air temperature and soil temperature in areas with sea morning glory?
2. Does soils in areas with different densities of sea morning glory differ?
3. Do sea morning glory plants with different densities have varying root quantities?

Research hypothesis

1. The air temperature is correlated with the soil temperature in areas with sea morning glory
2. Soils in areas with varying densities of sea morning glory exhibit differences.
3. Sea morning glory with different densities exhibit variations in root quantitie.

Materials and methods of conducting research Equipment materials

1. Hot Air Oven
2. Quick Soil Test
3. Flag
4. Pipette
5. pH meter (pH pen)
6. Tape measure
7. shovel
8. Distilled Water
9. quadrat
10. Muffle furnace
11. DIgital Scale
12. orcelain Crucible T/F and metal tray
13. Wash Bottle
14. Infrared Thermometer
15. Soil Survey Instrument

Methodology

1. **Study Site**

This research conducted a survey in the area of Ratchamongkol Beach, Sikao District, Trang Province, as shown in Figure 1

Figure 1 depicts the area where sea morning glory is being surveyed.

2. Experimental Procedure

2.1 Sample Collection Procedure

Divide the study area on Ratchamongkol Beach into 3 zones, based on the density of sea morning glory, with each zone measuring 20 x 25 square meters. Starting from the shoreline, Zone 1 represents an area without sea morning glory, Zone 2 represents an area with 25% density of sea morning glory, and Zone 3 represents an area with 75% density of sea morning glory. Establish 3 sampling points in Zone 1, and 6 sampling points each in Zones 2 and 3, and collect soil samples, roots, and stems within each study point in a quadrate with dimensions of 50x50 square centimeters.

2.2 Soil Quality Study

Examine the soil samples for soil texture, pH level, nutrient content, and organic matter content, using methods consistent with GLOBE protocols as follows

1. Soil Fertility Testing

Nitrogen Testing in Soil

1. Prepare soil solution following steps 1-4 as follows:

1. Weigh 25 grams of dried and sieved soil and place it in a plastic cup.

2. Add 80 milliliters of distilled water to achieve a soil-to-water ratio of 2.5:8.

3. Stir the soil-water mixture for 30 seconds, then let it sit for 3 minutes, repeating this process 5 times.

4. After the 5th stirring, let the cup stand until the soil settles at the bottom, leaving clear water at the top.

5. Use a pipette to extract 2.5 milliliters of the soil solution and place it into a test tube.

6. Add 1 sachet of HI 3895-N reagent into the soil solution.

7. Close the test tube and shake it for about 30 seconds to dissolve the chemicals.

8. Then compare the pink color formed with the nitrate color comparison chart.

Phosphate Testing in Soil

1. Prepare soil solution following steps 1-5.

2. Add 1 sachet of HI 3895-P reagent into the soil solution.

3. Close the test tube and shake it for about 30 seconds to dissolve the chemicals.

4. Then compare the blue color formed with the phosphate color comparison chart.

Potassium Testing in Soil

1. Prepare soil solution following steps 1-4.
2. Use a pipette to extract 0.5 milliliters of the soil solution and place it into a test tube.
3. Add distilled water to make a total volume of 2.5 milliliters.
4. Add 1 sachet of HI 3895-K reagent into the soil solution.
5. Close the test tube and shake it for about 30 seconds to dissolve the chemicals.
6. Then compare the turbidity formed with the potassium color comparison chart"

2. Measure Soil Acidity-Alkalinity as Follows:

1. Prepare soil solution following steps 1-4 and proceed as follows:
2. Weigh 100 grams of dried and sieved soil and place it in the apparatus.
3. Add 100 milliliters of distilled water to achieve a soil-to-water ratio of 1:1.
4. Stir the soil-water mixture for 30 seconds, then let it sit for 3 minutes, repeating this process 5 times.
5. After the 5th stirring, let the apparatus stand until the soil settles at the bottom, leaving clear water at the top.
6. Immerse the pH meter probe adjusted to standard pH values into the clear water area without touching the soil below. Wait until the reading stabilizes, then record the pH value.

3. Measure Soil Organic Matter:

1. Take 100 grams of soil from the study point.
2. Oven dry the soil at 95-105 degrees Celsius for 24 hours.
3. Weigh the soil after drying and calculate the moisture content using the formula:

[(Weight of wet soil - Weight of dry soil)] / Weight of dry soil - Container = Soil moisture content (grams/grams).

4. Burn the dried soil at 450 degrees Celsius for 6 hours.
5. Weigh the soil after burning and calculate the soil organic matter content.

4. Soil Texture Examination:

1. Take soil samples from Ratchamongkol Beach area and sun-dry them for 8 hours.
2. Sprinkle water on the dried soil until it can be molded into a mass with a diameter of 2-3 centimeters.

3. If step 2 is achievable, shape the soil into a cylinder (approximately 5 centimeters long with a diameter of about 1.5 centimeters).

4. If step 3 is achievable, shape the soil into a thread (approximately 13 centimeters long with a diameter of about 0.6 centimeters).

5. Soil Moisture Determination:

Collect samples from 15 study points. Weigh them before and after oven-drying at 95-100 degrees Celsius for 6 hours, and calculate the soil moisture content.

2.3 Study of Air Temperature:

Study air temperature and humidity every hour from 8:00 to 15:00.

2.4 Root Study:

Collect root samples from the study points and measure their quantity.

Data Analysis

1. Analyze air and soil temperature data.

2. Analyze soil pH values using arithmetic mean and present them using bar charts with ANOVA statistical testing at a significance level of .05.

3. Analyze soil fertility from all 3 zones and present them using bar charts.

4. Analyze the relationship between sea morning glory root weight and study area using ANOVA statistical testing at a significance level of .05.

Result

From the study of physical factors affecting the density of sea morning glory, the research findings are as follows:

Part 1: Study on the Relationship between Air and Soil Temperature

When considering the average air temperature, it was 31.80 ± 1.08 degrees Celsius in the area without sea morning glory, 34.19 ± 1.85 degrees Celsius in the area with 75% density of sea morning glory, and 36.10 ± 2.03 degrees Celsius in the area with 25% density of sea morning glory, respectively. Similarly, the average soil temperature was 41.48 ± 4.43 degrees Celsius in the area without sea morning glory, 46.04 ± 4.40 degrees Celsius in the area with 75% density of

sea morning glory, and 46.59 ± 3.75 degrees Celsius in the area with 25% density of sea morning glory, respectively. It was observed that the soil surface temperature was higher than both the average soil temperature and air temperature, as show in Figure 1.

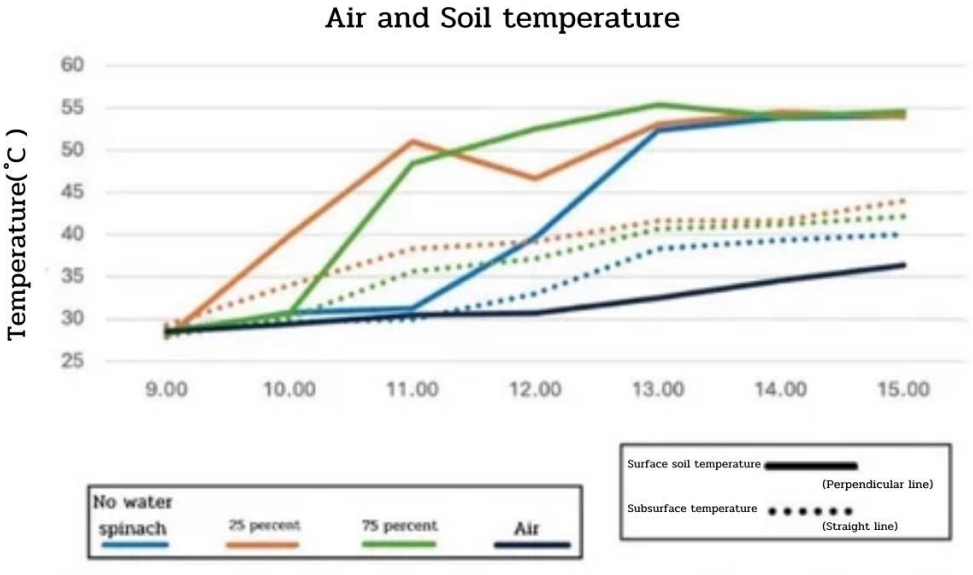

Figure 1 illustrates the relationship between air temperature and soil temperature

Part 2: Soil Quality Study

2.1 Characteristics of soil texture in Hat Ratchamangkhla Beach, Trang, revealed that all three areas consist of sandy soil.

2.2 The study results of the quantity of organic matter in the soil are depicted in Figure 2

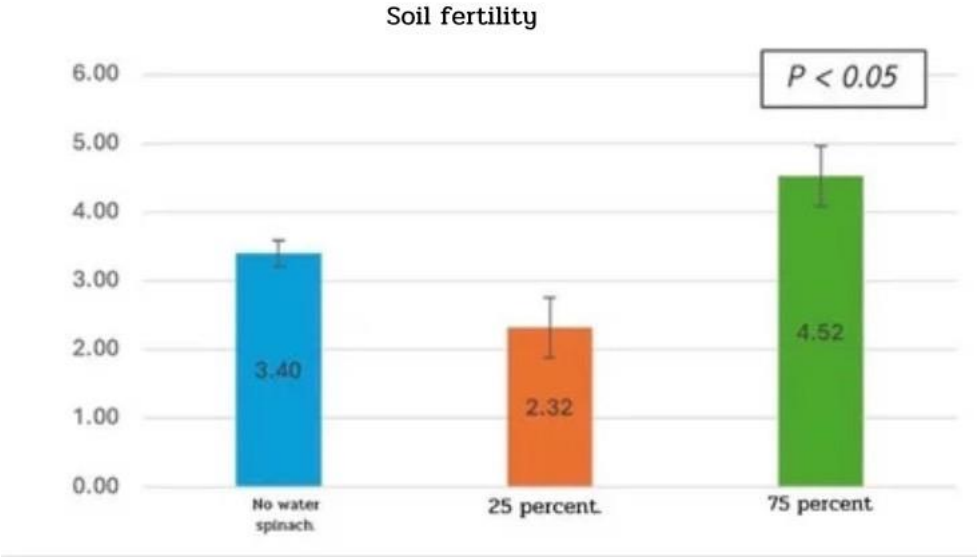

Figure 2 shows the results of the study on the quantity of organic matter in the soil

The study results on the quantity of organic matter in the soil revealed significant differences in the density of sea morning glory in different areas, with statistical significance at the .05 level.

2.3 The study results of soil pH are shown in Figure 3.

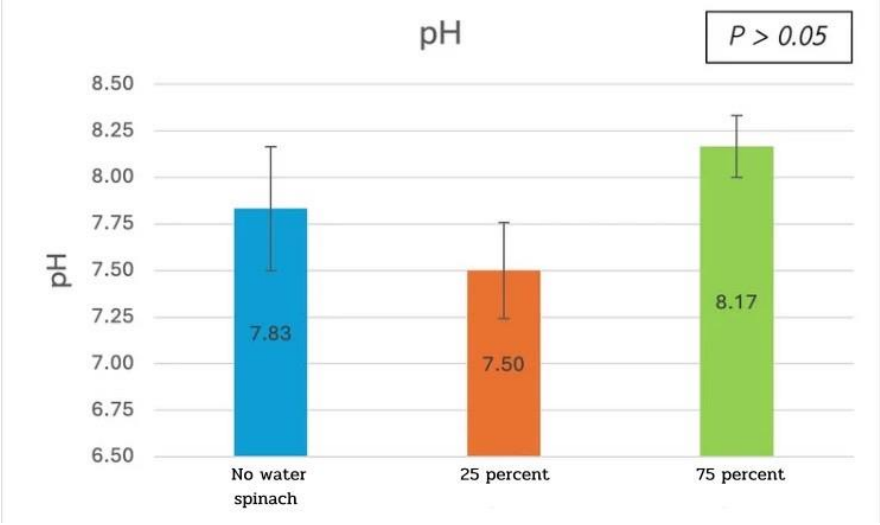

Figure 3 illustrates the study results of soil pH.

The study found that the soil pH values varied across different densities of sea morning glory plants but did not differ significantly at the .05 statistical significance level.

2.4 The results of the study on the levels of nutrients in the soil are depicted in Figure 4.

The study of soil fertility in all three areas revealed that nitrogen, phosphorus, and potassium levels were higher in the soil areas with a density of sea morning glory at 75% than those with a density of sea morning glory at 25% and the areas without sea morning glory. Specifically, phosphorus, nitrogen, and potassium levels were found in descending order.

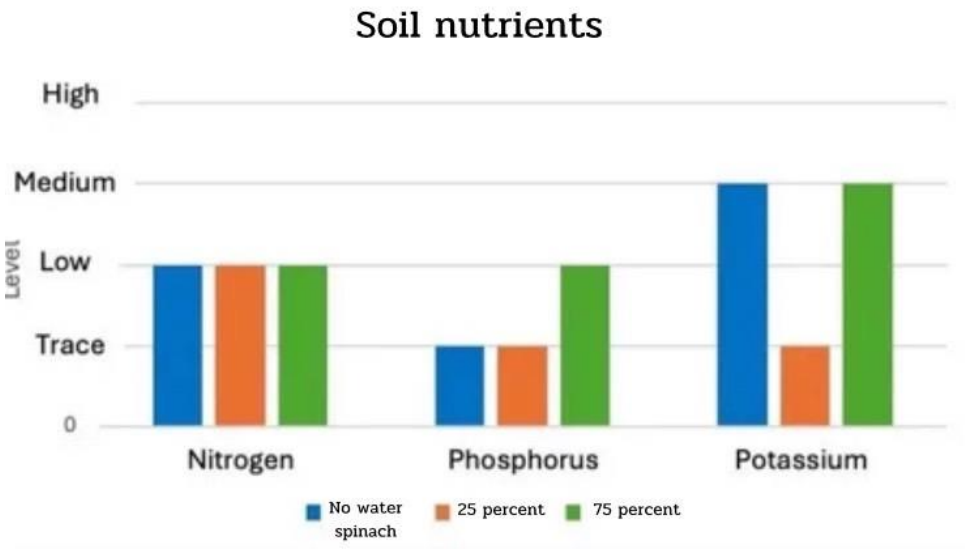

Figure 4 shown the levels of nutrients in the soil

Part 3: Root Study

1. The study results of sea morning glory root weights are depicted in Figure 5.

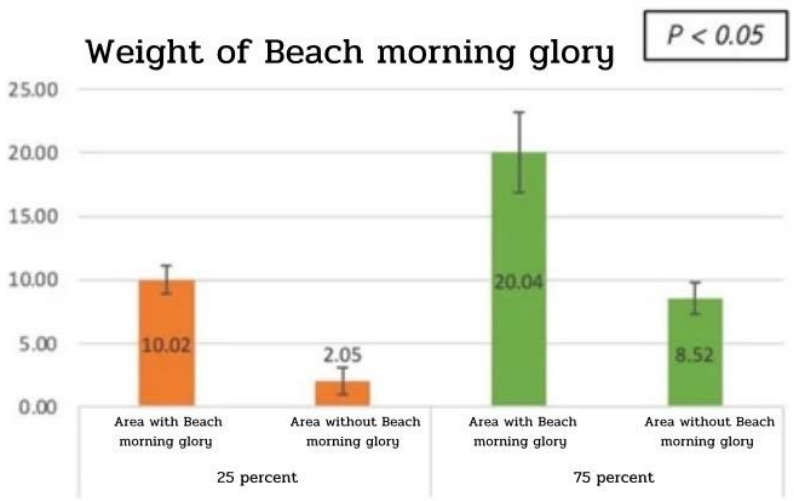

Figure 5 shows the results of the study on the weight of sea morning glory roots.

The study found that the root weight of sea morning glory varies significantly across different densities of sea morning glory , with a significance level of 0.05.

Discussion

From a study of 3 areas, it was found that morning glory helps in increasing the amount of nutrients in the soil. Helps slow down coastal erosion because areas with 25 percent and 75 percent sea morning glory had less coastal erosion than areas with no morning glory at all. In addition, it has been found that sea morning glory helps in maintaining the temperature of the soil surface as well. Therefore, it is a guideline for increasing the growing area of sea morning glory. Especially helping with coastal erosion. This is now a major problem on the coast in Thailand and on the sea in Trang Province as well.

Conclusion

From the study of sea morning glory in Hat Ratchamangkhla Beach, Trang province, dividing the study area into 3 zones: an area without sea sea morning glory, an area with a sea morning glory density of 25%, and an area with a sea morning glory density of 75%, it was found that the soil temperature in the upper and lower soil areas was higher than the air temperature, and the soil temperature in the lower soil area did not differ from the air temperature. Regarding soil quality, it was found that all three areas had the same sandy soil type, with no significant difference in soil pH. This is because they are all beach soils and consistent with, which studied the chemical properties of soil for sea morning glory and found that soil pH varies with soil salinity levels. Soil pH increases with increasing soil salinity, and beach plants are most likely to thrive in areas closest to the sea and have a high survival rate.

The study of soil organic matter content found that the soil in the area with a sea morning glory density of 75% had a higher organic matter content than the soil in the area with a sea morning glory density of 25% due to a higher accumulation of plant and animal residues in the former area. The organic matter content was consistent with the nutrient levels in the soil, namely nitrogen, phosphorus, and potassium. These nutrients were higher in the soil area with sea morning glory density of 75% compared to the area with a sea morning glory density of 25%, and this correlated with the weight of sea morning glory roots. It was found that the soil in the area with a sea kale density of 75% had a greater amount of underground roots and experienced the least coastal erosion, consistent with the Department of Marine and Coastal Resources (DMCR) (2011) statement that beach forests stabilize sand dunes and protect against coastal erosion.

Acknowledgement

We would like to thank Assoc. Prof. Dr. Mullica Jaroensutasinee from Walailak University, who gave advice Consultation on the project process. We would like to director and teachers of Princess Chulabhorn Science High School Trang especially Mrs.Patchara Pongmanawut and Mrs.Pacharee Chaipetch the project advisors who help and give advice, suggestions that are useful in doing this project. My younger student in grade 7 who take part of collect data.Thank you my parent , my friend and the tourist, who cooperated very well in collecting data for this research study.

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Badge

I am collorator

This study was carried out together with our members. The team consisted of two members: Pimlapat Sontimuang and Suchanan Phanwongrat. In the first step, we brainstormed a project name from the problems encountered and then surveyed the study location, namely Rajamangala Beach. We have found physical characteristics along the coast where morning glory is found, but in each area, sea morning glory is found with different densities. So we divided the area. Then we do land cover for each divided area. We will then survey the area where the morning glory is and collect soil, roots, stems and leaves samples. During that work, We also worked with a teacher who helped collect samples of soil, roots, stems and leaves. We also had a junior member of the same school who helped measure the temperature of the soil surface and soil once per hour starting with Work from 9:00 a.m. - 3:00 p.m. And when you get to school We will check the weight of the soil, roots, stems and leaves, and check the soil's fertility, pH and carbon storage. Our research in collaboration with Walailak University provide advice on research planning and data analysis. To plan systematically and have more accurate information.

I make an impact

At present, Thailand's coastline is experiencing severe coastal erosion. Resulting in the loss of public and government property. spoil the scenery which affects the tourism business. It also causes damage to coastal resources. Especially the impact on the coastal ecosystem. This is because coastal erosion contributes to the coastal ecosystem. Damage occurred until it may cause the natural abundance to decrease or ultimately be destroyed. Therefore, it is necessary to have a plan to prevent and solve problems in the right way. From the study of this project, it was found that the density of morning glory has an effect on helping to prevent coastal erosion. The area has a high density of sea grass. will be eroded the least. An area that doesn't have a lot of morning glory. But it was found that there was still less coastal erosion than in areas without morning glory because those areas have roots that help support the beach and prevent it from being easily eroded. Moreover because of the climate change that can destroyed the coast,and the root of the morning glory can protected, it can be the carbon capture and sequestration.

I am a stem storyteller

Trang is one of the 10 provinces in Thailand that has the most coastal area in Thailand and because it is an area with many beaches, it makes it an important tourist attraction. Generally, at the beach, we will find sea morning glory. These morning glory. It helps add green space to coastal areas and studies have found that morning glory has many benefits, both in terms of being used as medicine and helping to slow down coastal erosion. But from studying the data, it was found that different physical factors Affects the density of sea morning glory. The area has a high density of morning glory. It will help reduce the temperature around the soil surface. Increases the amount of organic matter in the soil and helps slow down coastal erosion better than areas with no morning glory and areas with little morning glory. It has roots that help support on the beach, causing less erosion than areas where there are no morning glory at all. Therefore, it is evident that morning glory plays a role in reducing coastal erosion.