

A Study of Soil Quality to Compare the Growth of Lemongrass in Integrated Farming Areas

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Abstract

Soil Quality Study To compare the growth of lemongrass in an integrated plantation area, Nong Bo Sub-district, Yan Ta Khao District, Trang Province. The objective was to study soil quality in relation to the growth of lemongrass by measuring soil quality according to GLOBE protocols, including soil temperature, pH, soil structure, soil texture, soil consistency, and soil fertility affecting the biomass of lemongrass. It was found that Area 1 had a higher soil temperature than Area 2. The soil pH in Area 1 was lower than that of Area 2. The soil structure in Area 1 and Area 2 was similar, and the soil texture in both areas was the same. The soil consistency in Area 1 was "very firm," while Area 2 was "firm." These factors affected the growth of lemongrass in the two areas differently, resulting in Area 1 having a lower biomass than Area 2.

Research Question

How do different soil qualities affect the growth of lemongrass in the integrated plantation area of Nong Bo Sub-district, Yan Ta Khao District, Trang Province?

Introduction

Lemongrass (*Cymbopogon citratus*) is a medicinal herb native to tropical Asia and has been significant to the Thai way of life for generations. Belonging to the grass family, Poaceae, it is a perennial herbaceous plant that grows in clumps with long, slender leaves. It possesses a unique aroma due to its essential oil content. Lemongrass thrives in Thailand's humid tropical climate and is easily cultivated in various areas without requiring high costs or complex maintenance. In daily life, lemongrass is utilized in a wide variety of ways, particularly in culinary applications. It is a key ingredient in many Thai dishes, such as Tom Yum, curries, and various local cuisines, as it enhances fragrance and neutralizes fishy odors. Furthermore, lemongrass plays a vital role in traditional Thai medicine and herbal therapy. Its properties include aiding digestion, relieving flatulence, alleviating muscle aches, reducing fever, and stimulating the digestive system. Additionally, its essential oils possess antibacterial and antifungal properties and can be used as a natural insect repellent. Beyond health benefits, lemongrass is utilized in industrial and consumer products, such as soaps, shampoos, cleaning agents, and mosquito repellents. These applications add value to local herbs and promote the efficient and sustainable use of natural resources. Processing lemongrass into various products also generates supplementary income for communities and strengthens the local economy. PictureThis (2024) states that lemongrass thrives in well-drained soil rich in organic matter, which promotes robust growth and superior flavor. Monitoring soil pH is essential to maintain an optimal range between 6.5 and 7.5. This slightly acidic to neutral pH range enables the plants to efficiently access essential nutrients such as Nitrogen (N), Phosphorus (P), and Potassium (K). Maintaining the correct pH level is critical, as soil that is too acidic or too alkaline can lead to nutrient deficiencies and stunted growth. Lemongrass requires a variety of nutrients to flourish. The primary macronutrients include Nitrogen (N), Crucial for healthy green foliage, Phosphorus (P), Vital for strong root development, Potassium (K), Enhances overall plant health and disease resistance. Consequently, the researchers conducted this study to compare soil quality and its effects on the growth of lemongrass in an integrated plantation area in Nong Bo Sub-district, Yan Ta Khao District, Trang Province, to provide beneficial data for future applications.

Map of Study Site(s)

GLOBE Badges

Be a Collaborator
I am The research process is organized through a coordinated workflow, where tasks are distributed into three main components: sample collection, experimentation, and documentation. Each component maintains constant communication and consults with others before proceeding with any action to ensure seamless integration.
Be a Data Scientist
I am This research employs a comprehensive range of scientific process skills. It begins with observation and problem identification, followed by hypothesis formulation. The process continues through systematic experimental planning and execution, data collection and analysis, and finally, drawing conclusions. Every stage strictly adheres to the scientific method, ensuring precise experimental procedures and a principled approach to interpreting results.
Make an Impact

I am This research aims to identify the optimal planting locations to ensure that lemongrass farmers can achieve superior growth and quality. Furthermore, the study determines the most suitable environments and provides guidelines on soil fertility enhancement to maximize nutrient uptake. Ultimately, the findings reveal which soil characteristics are most conducive to the healthy development of lemongrass.

Research Methods

Study Site Selection
This research was conducted in two specific locations within an integrated plantation
In Nong Bo Sub-district, Yan Ta Khao District, Trang Province. The study involved on-site field visits to perform random sampling of the areas.
Research Planning
1. Identify the research topic Select the topic intended for study.
2. Research and gather knowledge and theories related to the research Study, research, and collect information and theories relevant to the study.
3. Define the objectives of the study Establish the purpose of the research.
4. Determine sampling points within the study area Specify the locations for random sampling within the designated study area.
Research Implementation
1. Plan the research operations
2. Survey the area to be researched
3. Measure soil quality according to GLOBE soil measurement protocols
Soil Temperature Measurement
Determine the sampling points by collecting soil samples from 2 areas. Measurements are taken starting from the soil surface to a depth of 5 centimeters and 10 centimeters. Measure the temperature of the soil sediment at these 2 points using a soil thermometer. Read the soil sediment temperature values and repeat the process 3 times.
Soil pH Measurement
Measure the acidity and alkalinity (pH) using a pH Meter. Read the values and collect the data 3 times.

Results

Soil Quality Analysis

- Temperature: Site 1: 35°C Site 2: 34.5°C
- Average pH Levels: Site 1: 6.53 Site 2: 6.83
- Soil Physical Properties: Soil Structure: Subangular blocky
Soil Texture: Sandy loam Soil
Consistency/Consistency: Very firm
- Soil Fertility Status (Nutrients): Nitrogen (N): Low Phosphorus (P): Low Potassium (K): Low

Growth

The growth performance in Site 2 was superior to that of Site 1.

References

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PictureThis – Plant Identifier App.

Discussion

The results showed that the average soil temperature was 35 degrees Celsius in Area 1 and 34.5 degrees Celsius in Area 2. These findings are consistent with PictureThisAI (2024), which states that lemongrass is native to tropical regions and requires a warm temperature range between 20 degrees Celsius and 38 degrees Celsius. The average soil pH was 6.53 in Area 1 and 6.83 in Area 2. These results are consistent with PictureThisAI (2024), which states that for optimal growth, lemongrass prefers consistent warmth and thrives in well-drained soil. Furthermore, maintaining the soil pH within the ideal range of 6.5 to 7.5 ensures that the plants can effectively access essential nutrients. The soil structure in Area 1 was characterized as subangular blocky, with a sandy loam texture and a very firm soil consistency. These findings are consistent with PictureThisAI (2024), which states that the ideal soil type for growing lemongrass is loam. Loam is a balanced mixture of sand, silt, and clay that provides excellent structure and fertility, allowing for easy root penetration, good water retention, and proper aeration. These characteristics are essential for lemongrass as they enable the plant to absorb nutrients and moisture efficiently. The soil fertility analysis showed that in both Area 1 and Area 2, the levels of nitrogen (N), phosphorus (P), and potassium (K) were low. These findings are inconsistent with the study "Estimation of Plant Nutrient in Fingertroot Growth on Sandy Clay Loam Soil at Nakhon Phathom Province, which states that high levels of nitrogen (N), phosphorus (P), and potassium (K) are essential for promoting plant development. Such nutrients ensure that crop yields meet both quantity and quality standards, thereby enhancing production levels and the long-term potential of the soil for agricultural purposes. The plant biomass was recorded at 74.99% in Area 1 and 73.58% in Area 2. It was observed that the growth rate in Area 2 was superior to that of Area 1. These findings are consistent with the Thailand Voluntary Emission Reduction Program (2022), which states that biomass should exhibit a trend of steady or accelerated increase relative to the age of the plant.

Conclusions

Part 1: Physical Characteristics of Soil Sediment Affecting Lemongrass Growth in Two Areas of an Integrated Farm

Soil Temperature
According to the study of soil temperature, it was found that the temperature should be approximately 35 degrees Celsius.

Soil pH levels
According to the study, the soil pH should be between 6.8 and 7.0.

Soil Structure Soil Texture and Soil Consistency
According to the study, Area 1 exhibited a blocky soil structure, a sandy loam texture, and a firm soil consistency.

Part 2: Soil Quality Factors Affecting the Growth of Lemongrass in Two Areas of an Integrated Farm
According to the study of soil fertility, Area 1 was found to have low average levels of Nitrogen (N), low average levels of Phosphorus (P), and low average levels of Potassium (K). Similarly, Area 2 was found to have low average levels of Nitrogen (N), low average levels of Phosphorus (P), and low average levels of Potassium (K).

Bibliography

- Cites prior literature correctly (See www.english.purdue.edu/guide and resources)
- Lists GLOBE materials and NASA assets used
- Provides sources beyond those provided by GLOBE