Soil Quality Factors Influencing the Growth of *Kaempferia galanga* L.

The Study of Soil Quality Characteristics Affecting the Growth of Kaempferia galanga L. (Prao Hom) at Wichienmatu School, Trang

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Abstract

This study investigates the environmental factors influencing the cultivation of Proh Hom (*Kaempferia galanga* L.) at Wichienmatu School, Trang Province. By adopting the GLOBE Thailand protocols, the research meticulously analyzed soil structure, NPK nutrient content, light intensity, pH levels, temperature, and humidity across three distinct locations to determine their impact on plant development.

The analytical results indicate a clear correlation between soil quality and vegetative vigor. Site 3 emerged as the most fertile location, boasting superior levels of Nitrogen (N) and Potassium (K), alongside the highest soil moisture and pH stability. In contrast, while Site 1 excelled in Phosphorus and Site 2 recorded the highest light intensity and temperature, these factors did not translate into optimal growth.

Comprehensive measurements of plant height, leaf length, and leaf count confirm that Site 3 provides the most conducive environment for Kaempferia galanga L. The findings suggest that the synergy of high moisture retention and essential macro-nutrients at this site significantly enhances the overall growth performance of Proh Hom compared to the other studied areas.

Research Questions

Environmental factors significantly impact the growth of Proh Hom (*Kaempferia galanga* L.), especially in specific micro-climates like Wichienmatu School in Trang Province. Trang's tropical climate provides high humidity, but local variations within the school grounds can create different growth outcomes.

Introduction

Proh Hom (*Kaempferia galanga* L.) is a vital local medicinal herb in Thailand, highly valued for its economic and pharmaceutical applications. The success of its cultivation depends heavily on environmental factors, particularly soil characteristics. Well-structured soil with optimal pH levels and nutrient availability is essential for the healthy development of its stems, leaves, and rhizomes.

This research investigates the relationship between soil properties and plant growth within Wichienmatu School, Trang Province. By utilizing the GLOBE Thailand protocols, the study analyzed physical and chemical soil properties—including NPK nutrients, pH, temperature, and moisture—across different sites to determine their impact on Proh Hom.

The findings demonstrate that soil variability significantly influences growth outcomes. Site 3 was identified as the most suitable location, as its superior levels of Nitrogen (N), Potassium (K), and high soil moisture directly correlated with maximum plant height, leaf length, and leaf count. Ultimately, this study provides a critical guideline for soil management and the efficient cultivation of medicinal herbs in educational and local agricultural settings.

Research Methods

The research followed a structured scientific approach to collect data on soil quality and plant growth. The procedure began with soil sampling across designated areas, where samples were collected and analyzed in triplicate to ensure accuracy.

To evaluate soil physical and chemical properties, the team utilized standardized tools and charts. Soil structure and texture were identified using comparative soil charts, while a soil thermometer was used to measure temperatures at depths of 5 cm and 10 cm. Furthermore, a multi-purpose meter was employed to determine the moisture content and pH levels at a consistent depth of 5 cm.

The analysis of essential nutrients—Nitrogen (N), Phosphorus (P), and Potassium (K)—was performed using specialized NPK soil nutrient testers. Finally, the growth of Proh Hom was quantified by measuring leaf width, leaf length, and plant height, alongside a total leaf count. All measurements for every parameter were recorded three times to establish a reliable average and ensure the validity of the findings.

Carrying Out Investigations
Describes what happened

2.1 Soil Sampling: Collect soil samples from the Proh Hom planting areas, place them in soil collection bags for analysis, and record data 3 times.

2.2 Study of Soil Physical Properties: Study the soil structure and texture by comparing them with soil charts.

2.3 Measuring Soil Temperature: Use a soil thermometer to measure the temperature at depths of 5 cm and 10 cm, and record the readings 3 times.

2.4 Measuring Soil Moisture: Use a multi-purpose meter to measure soil moisture at a depth of 5 cm at all study points, and record the data 3 times.

2.5 Measuring Soil pH (Acid-Base): Use a multi-purpose meter at a depth of 5 cm to read the pH levels of the soil, and record the data 3 times.

2.6 Measuring Nitrogen (N), Phosphorus (P), and Potassium (K): Use an NPK soil nutrient tester to measure the levels of Nitrogen, Phosphorus, and Potassium in the soil, and record the data 3 times.

2.7 Examining Physical Characteristics of Proh Hom: Measure the width and length of the leaves, measure the plant height, and count the number of leaves, and record the data 3 times.

Map of Study Site(s)

The study was conducted within the grounds of Wichienmatu School, Trang Province, at the following geographic coordinates: Latitude:7.5032371 Longitude:99.6293169

GLOBE Badges

1.Problem Solver
Aromatic Ginger grows best when soil nutrients, moisture, pH, and light are well balanced. Site 3 showed the best growth because it had high N and K, suitable pH, and sufficient moisture, proving that no single factor works alone.

2.Collaborator
Using GLOBE Thailand standards, our team found that ecological harmony is the key to success. Site 3 outperformed other sites due to balanced conditions, while too much light and heat at Site 2 caused plant stress.

3.Create an Impact
This study provides a practical ecological blueprint for improving plant growth at Wichienmatu School. By adjusting moisture, pH, nutrients, and shading, less successful areas can be improved to match the success of Site 3.

Results
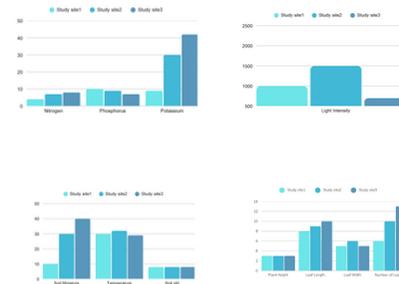
Site	Soil structure image	Soil structure	Soil adhesion	Soil texture
Study site1		Granular structure	Firm soil consistency	Loamy soil
Study site2		Blocky structure	Firm soil consistency	Silty clay loam
Study site3		Granular structure	Firm soil consistency	Sandy Clay Loam

Materials and Equipment

Moisture Meter

Soil Thermometer

NPK Tester (Soil nutrient analyzer)

pH Meter

Soil Test Kit

Light Intensity Meter (Lux Meter)

CU SmartLens
(Smartphone-based microscope lens)

Discussion

This study confirms that soil nutrients (N-P-K) and environmental factors—including moisture, pH, temperature, and light—significantly influence the development of Proh Hom (*Kaempferia galanga* L.).

The analysis reveals that Site 3 is the most optimal environment, recording the highest Nitrogen and Potassium levels, along with superior soil moisture and pH. Consequently, plants at Site 3 showed the best growth in height, leaf length, and leaf count. In contrast, Site 2 had the highest light intensity, while Site 1 had the most Phosphorus but the lowest overall growth. This concludes that high nutrient levels combined with consistent soil moisture are essential for maximizing Proh Hom's productivity.

Conciusions

Based on the study of environmental factors and the growth characteristics of Proh Hom (*Kaempferia galanga* L.) across three measurements, it was found that soil nutrient factors—namely Nitrogen (N), Phosphorus (P), and Potassium (K)—along with physical and chemical properties, including soil moisture, temperature, pH levels, and light intensity, significantly influenced the growth of Proh Hom. These findings support the hypothesis that soil quality and environmental conditions directly affect plant development.

The analysis of average values revealed that Site 3 had higher average Nitrogen and Potassium levels compared to Sites 1 and 2, while Site 1 recorded the highest average Phosphorus levels. Regarding soil environmental conditions, Site 3 exhibited the highest average soil moisture and pH levels. In contrast, the highest average temperature and light intensity were recorded at Site 2.

When considering these factors alongside growth characteristics—including plant height, leaf length, and the number of leaves—the results showed that Site 3 achieved the highest overall average growth, followed by Site 2 and Site 1, respectively. Therefore, it can be concluded that Site 3 provides the most optimal environment for the overall growth of Proh Hom.

Bibiography

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