Abstract

Research Name: A Study on the Physical and Chemical Factors Affecting the Growth of Ferns between Wichianmatu School Palm plantation and Rubber plantation, Ban Khuan Subdistrict, Trang Province

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This project aims to study the diversity and factors affecting the growth of ferns in the palm plantation area of Wichianmatu School, which is located 20 meters above sea level, and in the rubber plantation area of Ban Khuan Subdistrict, Trang Province, which is located 24 meters above sea level. Samples were collected between December 11 - 25, 2024, and both physical and chemical comparisons were made. The study examined the structure and characteristics of the soil. In the palm plantation area of Wichianmatu School, three types of ferns were found growing on the ground: Black-stemmed fern in Loamy sand, Tamarind-leaf fern in Loamy sand, Silt clay loam, Sand, and King cobra fern in Silt clay loam, Sand. On the trees, seven species of ferns were identified: Black-stemmed fern, Peacock fern, Squirrel fern, Shoelace fern, Bird's nest fern, and Skeleton Fork Fern. In total, ten families of ferns were found both on the ground and on trees. In the rubber plantation area of Ban Khuan Subdistrict, Trang Province, two species of ferns were found on the ground, representing two families: Black-stemmed fern in Silt clay loam, Clay loam, and Peacock fern in Silt clay loam, Silty clay.

The study results from the palm plantation at Wichianmatu School in Khok Lo Subdistrict, Mueang District, Trang Province show an average light intensity of 419.2 LUX, an average temperature of 28.42°C, average soil moisture of 23%, pH of 5.4, and average mineral content in the soil (N, P, K) of 1, 0.8, and 5.4 mg/L, respectively. In the rubber plantation area of Ban Khuan, Ban Khuan Subdistrict, Mueang District, Trang Province, the average light intensity was 351.66 LUX, average temperature was 26.05°C, average soil moisture was 18%, pH was 6, and average mineral content in the soil (N, P, K) was 0.167,

0, and 0.167 mg/L. The study found that the palm plantation area at Wichianmatu School had higher light intensity, temperature, and nutrient content (N, P, K) than the rubber plantation area at Ban Khuan, which positively affected the growth of ferns both on the ground and on trees.

Keywords : Physical Analysis , Chemical Analysis,
Soil Minerals , Soil Quality

Introduction

Ferns are one of a group of at least plants 20000 species classified in Pteridophyta phylum, which is propagated using spores instead of seeds, ferns are flowerless plants found in different environments from moist ground to living on other trees without parasites. Each fern needs physical and chemical factors suitable for the growth of different ferns. These factors are moisture in the soil. Air humidity, soil temperature, relative temperature, amount of sunlight intensity, acidity-base of the soil and types of soil used as a food source or island. Some ferns grow well in highly organic soil, while some can grow on other trees.

Because in Trang Province, there are two main types of agricultural areas: palm and rubber gardens, which have different physical and chemical characteristics of soil. Palm gardens are often heavily shaded and humid, while rubber gardens are more transparent and have lower humidity. In addition, the use of fertilizers and chemicals in palm and rubber gardens is different. This may affect the growth of ferns found in each area and behind the library of Wichian Matu School. There are many ferns in the palm trees and the ground around the palm trees and rubber gardens located near Wichian Matu School, Trang Province, where ferns are located on the ground of the rubber plantation.

Research Question

1. Physical factors such as the intensity of light, humidity, and temperature in each area affect the growth of ferns?
2. Does the difference in the chemical composition of soil between the two areas affect the growth of ferns?

Hypothetically

1. Differences in the amount of sunlight received in a palm garden and a rubber plantation and differences in temperature and humidity affect the variety and type of growth ferns.

Tree variable: type of garden (a palm garden, a rubber plantation)

Variables according to : amount of light intensity, temperature, humidity in the atmosphere

Control variables: How to collect samples and measure physical factors

2. The larger base acidity and mineral content of soil compared between the two areas contribute to the higher growth rate of ferns.

Tree variable : soil quality in palm and rubber plantations

Variables according to : Minerals and pH values of soil

Control variables : Method of soil sampling and chemical factor measurement

Materials and equipment

1. Light intensity meter
2. Soil moisture meter
3. Relative humidity meter
4. Temperature meter
5. Soil moisture meter
6. Universal Indicator Paper
7. Glass bar
8.Beaker
9. Refined water
10. Digital scales
11. A scoop for extracting substances
12. The sample soil in the palm plantation of Wichianmatu School, Trang Province
13. Sample soil in the rubber plantation area
Ban Khuan Subdistrict
14. NPK Meter soil tester
15. Field soil inspection manual

Set a point of study

The palm orchard at Wichianmatu School, Khok Lo , Mueang , Trang Province, will collect 5 points of soil samples at a depth of 5-10 cm. And explore the ferns on each palm tree. On December 11, 2024. and around Rubber plantation, Ban Khuan , Mueang , Trang Province. Take 6 points of soil samples at a depth of 5-10 cm. Date December 25, 2024

A method of operation

1. Preparation stage for research
 1. Set study points and topics that you want to study.
 2. study for research related to the subject to be studied
 3. set one's objectives in education
 4. Determine the point where soil samples are collected in the area of the study area.

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Principles of exploration

Pedosphere (Soil) Measurement Methodology, Soil Measurement Methodology

A Study on the Comparison and Analysis of Soil Quality that Affects the Growth of Physical and Chemical Ferns

Check the soil temperature

1. Dig in the area of Wichian Matu School where 5 points of soil are collected and 6 points of Ban Khuan, each about 5 centimeters deep.
2. Take a needle thermometer to measure the temperature of the soil and record the results.

Measure moisture in the soil

1. Dig in the area of Wichian Matu School where 5 points of soil are collected and 6 points of Ban Khuan, each about 5 centimeters deep.
2. Take a moisture meter in the soil, measure each excavated site, and record the results.

Measure the temperature and humidity of the atmosphere

1. Take an electronic thermometer to check the temperature and humidity of the atmosphere at the point of soil collection for inspection.
2. Bringing the thermometer in the open air, measure the air temperature at a height of about 2 meters and wait for the value at the machine body to be recorded.

Measure the intensity of light

1. The light intensity is measured by a Lux Light Meter, taking the light intensity meter in the open air.
2. Turn the sensor to the light position to be measured by turning the sensor perpendicular to the light source, reading the values and recording the results.

Check the acidity-base percentage.

1. Put the sample soil in a beaker and dissolve distilled water. The soil to distilled water ratio is 20g: 20ml.
2. Use earth glass rod for 30 seconds, set aside for 3 minutes, repeat this 5 times.
3. When five times is complete, leave the soil on the sediment until it can be seen as clear water at the top.
4. Immerse the Universal Indicator paper only in clear water areas and compare the pH record color.

Examine minerals in the soil (N/P/K)

1. Put the sample soil in a beaker and dissolve distilled water. The soil to distilled water ratio is 20g: 10ml.
2. Use earth glass rod for 30 seconds, set aside for 3 minutes, repeat this 5 times.
3. At the end of 5 times, the minerals in the soil were measured with an NPK meter and recorded the results.

Research Results

Geographical coordinates. Study on the Palm plantation, Wichianmatu School, Khok Lo , Mueang , Trang Province and around Rubber plantation, Ban Khuan , Mueang , Trang Province The coordinates are as shown in Table 1.

Table 1 Geographical coordinates

Places to study and collect soil samples in the fern area.	Geographical coordinates	
	Latitude(N)	**Longitude (E)**
Wichianmatu School Palm Plantation, Khok Lo , Mueang Trang	7.503310	99.628783
Rubber Plantation, Ban Khuan , Mueang , Trang	7.510378	99.638285

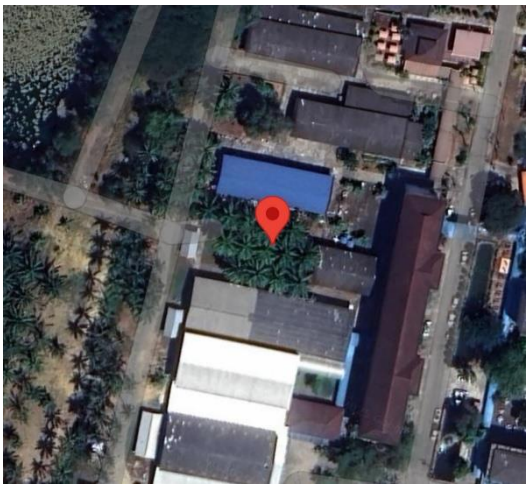

Image 1 shows a map of the soil sampling point at the palm plantation around Wichianmatu School , Khok lo , Mueang ,Trang.

Source : Google Map Application

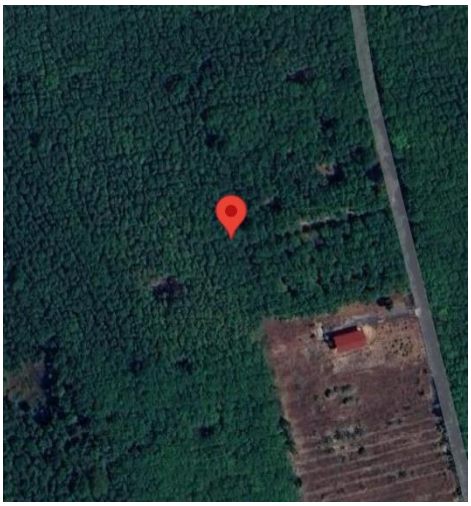

Image 2 shows the map of the soil sample collection points at the rubber plantation in Ban Khuan , Mueang , Trang Province.

Source: Google Map Application.

1. A Table Of Study Results

1.Palm Plantation around Wichianmatu School

On December 11, 2024, the soil area in the palm plantation of Wichianmatu School									
position	Light (LUX)	Soil temperature (° C)	Atmospheric humidity (%)	pH	N (mg/L)	P (mg/L)	K (mg/L)	Soil characteristics	Ferns
1	300	27.9	18%	5	0	0	1	lS	Black-stemmed Fern,Tamarind Leaf Fern
2	585	29.1	12%	6	2	2	8	SiCL	Tamarind Leaf Fern
3	252	29	20%	5	1	1	3	S	Naga Fern,Tamarind Leaf Fern
4	643	29.1	17%	5	0	0	5	LS	Tamarind Leaf Fern
5	316	27	50%	6	2	1	10	SiCL	Naga Fern,Tamarind Leaf Fern

Table 2: Summary of Soil Sample Measurement Results in the Palm Plantation Area at Vichiamat School, Kok Lo Subdistrict, Mueang District, Trang Province, Based on the GLOBE Thailand Protocols.

December 11, 2024 on the palm tree at Wichianmatu School.		
Number of trees	Light (LUX)	Ferns
1	245	Tree-climbing Fern,Shoelace Fern,Tamarind Leaf Fern,Naga Fern
2	258	Tree-climbing Fern,Shoelace Fern,Tamarind Leaf Fern,Naga Fern
3	405	Tree-climbing Fern,Shoelace Fern,Tamarind Leaf Fern,Naga Fern (or Dragon Fern)
4	398	Tree-climbing Fern,Shoelace Fern,Tamarind Leaf Fern,Naga Fern (or Dragon Fern)
5	522	Naga Fern (or Dragon Fern),Tamarind Leaf Fern
6	277	Naga Fern (or Dragon Fern),Tamarind Leaf Fern,Shoelace Fern,Tree-climbing Fern
7	35	Naga Fern (or Dragon Fern),Tamarind Leaf Fern,Shoelace Fern,Tree-climbing Fern
8	75	Naga Fern (or Dragon Fern),Tamarind Leaf Fern,Shoelace Fern,Tree-climbing Fern
9	410	Naga Fern (or Dragon Fern),Tamarind Leaf Fern,Shoelace Fern,Tree-climbing Fern
10	675	Tree-climbing Fern,Tamarind Leaf Fern
11	828	Tree-climbing Fern,Tamarind Leaf Fern,Naga Fern
12	343	Tree-climbing Fern,Tamarind Leaf Fern,Naga Fern,Shoelace Fern
13	296	Tree-climbing Fern,Tamarind Leaf Fern,Naga Fern,Shoelace Fern,Creeping fern

Table 3: summarizes the results of the study of ferns in the palm tree area of Wichianmatu Khoklor School, Trang, by studying the procedures and methods of examination according to GLOBALBE Thailand.

Shoelace Fern

Scientific Name: *Vittaria* sp.

Naga Fern

Scientific Name: *Davallia sp.*

Tree-climbing Fern

Scientific Name: *Drynaria quercifolia* (L) J. Sm.

Tamarind Leaf Fern

Scientific Name: *Nephrolepis biserrate* (Sw.) Schott

Black-stemmed Fern

Scientific Name: *Adiantum flabellulatum* L.

Creeping fern

Scientific Name: *Phlebodium aureum* (L.) J.Smith cv. *Mandianum*

Skeleton Fork Fern

Scientific Name: *Microlepia speluncae* (L.)

Bird’s nest fern

Scientific Name: *Asplenium nidus* L.

2. Ban Khuan rubber plantation

On December 25, 2024, the ground area in Ban Khuan Rubber Plantation									
position	Light (LUX)	Soil temperature (° C)	Atmospheric humidity (%)	pH	N (mg/L)	P (mg/L)	K (mg/L)	Soil characteristics	Ferns
1	320	25.9	19%	6	0	0	1	CL	Black-stemmed fern
2	450	26	14%	6	0	0	0	SiCL	Black-stemmed fern
3	362	25.5	18%	6	1	0	0	SiCL	Black-stemmed fern
4	365	26.2	15%	6	0	0	0	SiCL	Peacock fern
5	327	26.3	21%	6	0	0	0	SiC	Peacock fern
6	286	26.4	18%	6	0	0	0	SiC	Peacock fern

Table 4: Summary of Soil Sample Measurement Results in the Rubber Plantation Area, Ban Kuan Subdistrict, Mueang District, Trang Province, Based on the GLOBE Thailand Protocols.

Black-stemmed Fern

Scientific Name: *Adiantum flabellulatum*

Peacock fern

Scientific Name: *Helminthostachys zeylanica* (L.) Hook

The analysis of soil quality that affects the growth of physical and chemical ferns by collecting soil samples at palm plantation of Wichianmatu School, Khok Lor Mueang Trang and Ban Khuan Mueang Trang Rubber plantation. Field inspection was conducted include light intensity, air temperature, soil temperature, soil humidity, atmospheric humidity, base acidity (pH). Minerals in soil (NPK) by studying the procedures and methods of examination according to GLOBALE Thailand

Summary and Discussion of Research Findings

The study concluded that ferns in Wichianmatu School grow well and become more diverse because palm orchards in Wichianmatu School are slightly higher in soil temperature and NPK is higher than rubber gardens and pH of palm orchards at Wichianmatu School has a greater effect on absorption of nutrients, making the soil more fertile than the soil. As a result, ferns found in Wichianmatu schools are more diverse and more abundant than those found in rubber plantations in Ban Khuan area.

Honorary declaration

Announcement of the Act.

The project was completed with kindness and thanks to the support of Mr. Sakda Paisomboon, Director of Wichianmatu School.

Miss. Jiraporn Sareerat, a project consulting professor who gives advice and successfully corrects the shortcomings of this project.

I thank my parents and parents for their counseling.
be always supportive of good cheer

I would like to thank my friends for their advice, whether it be group consultation or acceptance of their friends' opinions and everything, so that this project can be completed and the organizers would like to thank you very much.

The Team of Contributors
Mister Punnawit Keotphiban
Miss Tiwaporn Kongkaew
Miss Sukanya Rattanapa

References

-Research on the diversity of ferns and plants near ferns in Phu Pha Man National Park, Khon Kaen and Loei Province.
Source : https://ir.swu.ac.th/jspui/bitstream/123456789/2508/2/Wasinee_K_R418783.pdf

-Research on the diversity of Ferns in the Baan Ang Et Community Forest Development Project (Chaipattana Foundation) and nearby areas, Khlung District, Chanthaburi Province.
Source : https://buuir.buu.ac.th/bitstream/1234567890/2042/1/2563_073.pdf

-Woraphan Tinping, 2018, Fern (Institute for the Promotion of Teaching Science and Technology) (IPST)

-Wikipedia, Free Encyclopedia, Fern Fern - Wikipedia

Appendix

Go to the survey area, collect soil samples, and inspect the soil in the

measure minerals in soil with an NPK meter

Measure soil moisture, soil temperature, field soil monitoring.

an examination of the soil in the fieldwork

weigh soil samples for basal acidity and mineral content

Prepare a soil sample for basal acidity measurement.

Badges

I am a data scientist.

Our research team conducted field surveys to investigate the density of ferns in two areas: the Wichianmatu School area in Khok Lo Subdistrict, Mueang District, Trang Province, and the rubber plantation area in Ban Khuan Subdistrict, Trang Province. Soil samples were collected from both areas to examine their chemical properties, including the measurement of mineral content in the soil (N, P, K), pH values, and physical characteristics. We also measured light intensity, air temperature, atmospheric humidity, soil temperature, and soil moisture.

The data collected from these measurements were sourced from the GLOBE database, which provides information on soil and weather. The data was compiled and used to create appropriate tables and bar charts, which were then presented to support the explanation of the findings, with references to the sources of the data obtained through research.

I am a collaborator.

Our team operates efficiently by clearly defining roles and responsibilities. Each member performs their duties to the best of their abilities and provides mutual support throughout the working process. Additionally, our team values listening to feedback and exchanging ideas, promoting unity, and encouraging each other.

When faced with obstacles, the team collaborates effectively to resolve them, ensuring that the work is completed successfully and on target. This experience has been crucial in developing our teamwork skills and strengthening our ability to collaborate with others in the future.

I make an impact

Our research team is interested in studying the physical and chemical properties of soil that affect the growth of ferns between palm and rubber plantations. We conducted a survey on the fern density in the palm plantation area of Wichianmatu School and the rubber plantation area in Ban Khuan Subdistrict, Trang Province, and collected soil samples for chemical analysis. We analyzed and compared the results from the two areas to understand the quality of the soil and the environmental factors that influence the growth of ferns in each area.

We have shared the findings regarding the factors that impact fern growth with people interested in plant conservation, so they can use this knowledge to improve the development and growth of ferns in the future.