**Research Title :** A Study on Physical Factors Affecting Ant Diversity in School Botanical Gardens Wichianmatu School, Mueang District, Trang Province

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## Abstract

This research investigated the influence of soil and air quality on ant diversity within the school botanical garden of Wichian Matu School, Mueang District, Trang Province. Environmental parameters were measured following the GLOBE (Global Learning and Observations to Benefit the Environment) protocols, focusing on soil temperature, pH, and moisture content, alongside ambient air temperature and relative humidity. The results demonstrated that physical factors, particularly soil temperature, significantly influence the distribution and diversity of ants in this ecosystem. A total of five ant taxa were identified, namely Paratrechina longicornis, Odontoponera sp. (Black predatory ant), Camponotus sp., Oecophylla smaragdina, and Diacamma sp. These species were predominantly distributed across the ground surface, beneath leaf litter, under decaying logs, and on tree branches.

**Keywords:** ants, air quality, soil quality

## Introduction

Ants are social insects that play a pivotal role in ecosystems as organic matter decomposers, soil structure enhancers, and essential bioindicators of environmental quality due to their high sensitivity to habitat alterations. While over 14,000 ant species have been documented worldwide, a vast number remains unidentified, particularly in tropical regions characterized by high biodiversity and complex habitats.

The Botanical Garden of Wichienmatu School in Trang Province serves as a significant ecological site, offering diverse flora and habitats suitable for ant populations. Consequently, this study sought to investigate the diversity and distribution of ants within this area. The findings aim to provide fundamental taxonomic and ecological data, fostering the development of natural learning resources and supporting sustainable local resource conservation within educational institutions..

### Research Objectives

To investigate the physical factors influencing ant diversity within the Botanical Garden of Wichienmatu School, Mueang District, Trang Province.

### Research Question

How do physical factors influence ant diversity within the Wichienmatu School Botanical Garden?

### Research hypothesis

Physical factors significantly influence the diversity of ants within the Wichienmatu School Botanical Garden

### Scope of study

This study focuses on the physical factors influencing ant diversity within the Botanical Garden of Wichienmatu School, Mueang District, Trang Province. The investigation is delimited to the assessment of soil quality (temperature, pH, and moisture) and air quality (ambient temperature and relative humidity). The data collection was conducted over a three-month period, spanning from October to December 2025

### Definition

Soil Quality: Refers to the measurement of soil temperature, moisture content, and pH levels within the Botanical Garden of Wichienmatu School, Mueang District, Trang Province.

Air Quality: Refers to the measurement of ambient air temperature and relative humidity within the Botanical Garden of Wichienmatu School, Mueang District, Trang Province.

**Materials, equipment, and research methodology.**

1) Compass
2) Photography Equipment
3) Soil Moisture Meter
4) Thermometer
5) Hygrometer
6) CU smartlen
7) Notebooks and stationery
8) Geocoordinates

**GLOBE Measurement Methodology**

Principles of Pedosphere (Soil) Measurement Methods

Principles of Biosphere Cover Inspection

Principles of Atmosphere Measurement Methods

**Designation of study points**

The study site is located within the Botanical Garden of Wichienmatu School, Mueang District, Trang Province. Field investigations will be conducted to assess physical environmental factors, specifically soil quality and air quality parameters

**Research Methodology**

1. Preparatory Phase
    1) Establish the research focus and select the study topic.
    2) Conduct a literature review to gather relevant knowledge and theories.
    3) Define the research objectives.
    4) Designate the measurement sites for air quality and soil quality within the study area.
2. Implementation Phase
    1) Formulate the research action plan.
    2) Conduct a field survey of the study site.
    3) Perform soil quality measurements at specific latitude and longitude coordinates, adhering to GLOBE protocols for measuring soil temperature, pH, and relative moisture as follows:

1) Define the measurement sites by dividing the study route into 5 areas: the area adjacent to the parking lot, the school fence area, the area near the drainage ditch, the Gate 2 area, and the center of the botanical garden.

2) Measure the soil temperature at every site using a soil thermometer, record the temperature values, and observe soil sediment characteristics to classify soil types (e.g., loam, clay, sand).

3) Measure soil pH using a soil pH meter and record the soil temperature.

4) Measure air relative humidity using a hygrometer and record the humidity values.

5) Submit the collected data to GLOBE Data Entry.

**Data collection**

**Measure soil temperature, humidity, and pH.**

Soil temperature, humidity, and pH levels were measured across all designated areas within the school botanical garden. Data regarding the morphological characteristics of each ant species were recorded. For taxonomic identification, the collected specimens were examined in detail under a stereomicroscope to classify them at the subfamily and genus levels, following the classification system of Bolton (1994). Species-level identification was subsequently conducted using relevant taxonomic keys to determine the valid scientific names. This analytical process was performed at the Department of Biology, Faculty of Science, Prince of Songkla University

**Analysis and summary of research results**

1) The collected data were analyzed to determine correlations and compare relationships. The statistical parameters utilized for data analysis included the mean soil temperature, mean soil pH, mean soil moisture content, mean air temperature, and mean relative humidity.

2) Make a graph showing the average of the comparison data.

3) Summary of Experiment Results

Research results

**Table 1 shows the study area.**

| Found area | Geographic coordinates | |
|---|---|---|
| | Latitude (N) | Longitude (E) |
| Area 1 | 7.50389 | 99.63030 |
| Area 2 | 7.50506 | 99.63096 |
| Area 3 | 7.50523 | 99.63018 |
| Area 4 | 7.50472 | 99.63018 |
| Area 5 | 7.50479 | 99.62984 |

From Table 1, the study area is divided into 5 areas, namely the area adjacent to the parking garage. Around the school fence Near the drainage ditch, at Exit 2 in the center of the Botanical Garden.

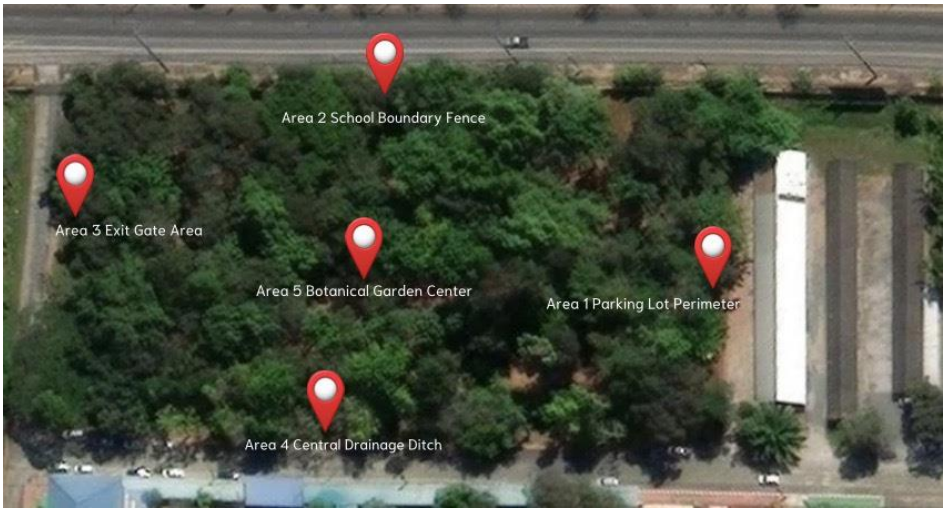



Figure 1 shows the coordinates of the study area.

**Table 2 soil temperature**

| Found area | Temperature (°C) | | | |
|---|---|---|---|---|
| | 1st time | 2nd time | 3rd time | Average |
| Area 1 | 30.0 | 31.0 | 30.0 | 30.3 |
| Area 2 | 30.0 | 30.0 | 29.0 | 29.6 |
| Area 3 | 30.0 | 30.0 | 30.0 | 30.0 |
| Area 4 | 30.0 | 31.2 | 31.0 | 30.7 |
| Area 5 | 30.0 | 31.0 | 31.0 | 30.6 |

According to the data presented in Table 2, soil temperature measurements across the designated sampling sites varied slightly. Area 4 exhibited the highest mean soil temperature at 30.7°C, followed closely by Area 5 (30.6°C), Area 1 (30.3°C), and Area 3 (30.0°C). The lowest mean temperature was recorded in Area 2, with a value of 29.6°C.

**Table 3 Soil moisture value.**

| Found area | Soil Moisture (%) | | | |
|---|---|---|---|---|
| | 1st time | 2nd time | 3rd time | Average |
| Area 1 | 3.0 | 3.0 | 3.3 | 3.33 |
| Area 2 | 4.0 | 4.0 | 4.1 | 4.03 |
| Area 3 | 2.0 | 2.3 | 2.0 | 2.10 |
| Area 4 | 2.5 | 2.7 | 2.7 | 2.63 |
| Area 5 | 4.1 | 4.0 | 4.1 | 4.06 |

According to the data presented in Table 3, the analysis of soil moisture across the sampling sites revealed that Area 5 exhibited the highest mean moisture level at 4.06. This was followed by Area 2 (4.03), Area 1 (3.33), and Area 4 (2.63). Conversely, the lowest average soil moisture was observed in Area 3, which recorded a mean value of 2.10.

**Table 4 Soil pH**

| Found area | Soil pH | | | |
|---|---|---|---|---|
| | 1st time | 2nd time | 3rd time | Average |
| Area 1 | 7.0 | 7.0 | 7.1 | 7.0 |
| Area 2 | 8.0 | 8.0 | 8.1 | 8.0 |
| Area 3 | 7.0 | 7.3 | 7.3 | 7.2 |
| Area 4 | 7.0 | 7.0 | 7.1 | 7.0 |
| Area 5 | 7.2 | 7.0 | 7.2 | 7.1 |

According to the data presented in Table 4 ,soil pH levels varied across the study sites, ranging from neutral to slightly alkaline. Area 2 exhibited the highest mean pH value of 8.0, followed by Area 3 (7.2) and Area 5 (7.1). The lowest mean values were observed in Area 1 and Area 4, both of which recorded a neutral pH of 7.0.

**Table 5 Air temperature**

| Found area | Air Temperature (°C) | | | |
|---|---|---|---|---|
| | 1st time | 2nd time | 3rd time | Average |
| Area 1 | 33.3 | 33.1 | 33.0 | 33.13 |
| Area 2 | 31.4 | 31.0 | 31.0 | 31.13 |
| Area 3 | 31.9 | 32.2 | 32.0 | 32.02 |
| Area 4 | 32.0 | 31.8 | 32.0 | 31.93 |
| Area 5 | 32.0 | 32.0 | 31.9 | 31.96 |

According to the data presented in Table 5,the air temperature measurements across the study areas indicated that Area 1 exhibited the highest mean temperature at 33.1°C. This was followed by Area 3 (32.13°C), Area 4 (31.96°C), and Area 5 (31.93°C). The lowest mean air temperature was recorded in Area 2, with a value of 31.1°C.

**Table 6 Relative humidity in the air**

| Found area | Relative humidity in the air (percentage) | | | |
|---|---|---|---|---|
| | 1st time | 2nd time | 3rd time | Average |
| **Area 1** | 50 | 50 | 51 | 51 |
| **Area 2** | 51 | 51 | 52 | 51 |
| **Area 3** | 51 | 51 | 53 | 51 |
| **Area 4** | 50 | 50 | 50 | 50 |
| **Area 5** | 51 | 51 | 50 | 51 |

According to the data presented in Table 6 the relative atmospheric humidity measurements across the study areas exhibited minor variations. Area 3 recorded the highest mean relative humidity at 51.6%, followed closely by Area 2 at 51.3%. Interestingly, Area 1 and Area 5 exhibited identical mean values of 50.6%. The lowest average relative humidity was observed in Area 4, with a recorded value of 50.0%.

**Table 7 Types of ants**

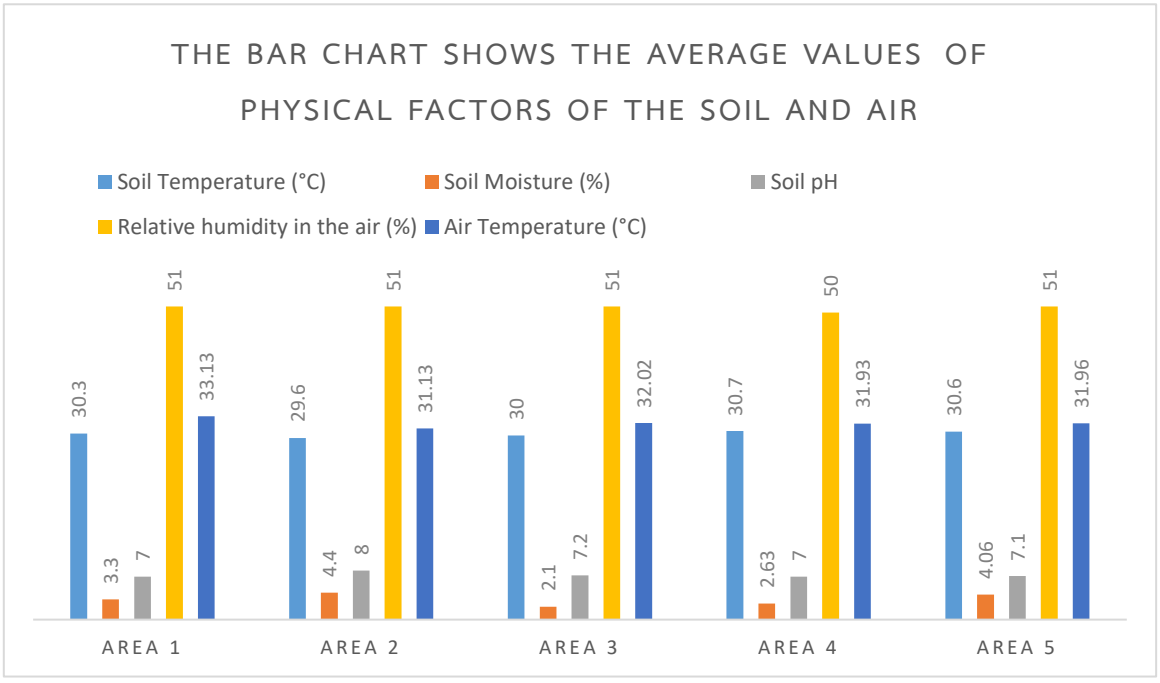
| Found area | Types of ants |
|---|---|
| **Area 1** | *Paratrechina longicornis* (Latreille, 1802) |
| **Area 2** | 1.*Paratrechina longicornis* (Latreille, 1802)<br>2.*Black predatory ant* (Odontoponera sp.) |
| **Area 3** | 1.Camponotus *sp.*<br>2.*Oecophylla smaragdina* (Fabricius, 1775) |
| **Area 4** | 1.*Oecophylla smaragdina* (Fabricius, 1775)<br>2. *Camponotus* sp. |
| **Area 5** | 1.*Diacamma* sp.<br>2.*Paratrechina longicornis* (Latreille, 1802) |

According to the data presented in Table 7,The distribution of ant species across the sampling sites was characterized as follows: Area 1 was inhabited solely by Paratrechina longicornis (Latreille, 1802). Area 2 exhibited a coexistence of P. longicornis and the predatory ant Odontoponera sp. Area 3 and Area 4 shared a similar species composition, consisting of Camponotus sp. and Oecophylla smaragdina (Fabricius, 1775). Finally, within Area 5, both Diacamma sp. and P. longicornis were identified.

**Table 8 Average physical factors of soil and air**

| Found area | Soil Temperature (°C) | Soil Moisture (%) | Soil pH | Relative humidity in the air (%) | Air Temperature (°C) |
|---|---|---|---|---|---|
| Area 1 | 30.3 | 3.33 | 7.0 | 51 | 33.13 |
| Area 2 | 29.6 | 4.03 | 8.0 | 51 | 31.13 |
| Area 3 | 30.0 | 2.10 | 7.2 | 51 | 32.02 |
| Area 4 | 30.7 | 2.63 | 7.0 | 50 | 31.93 |
| Area 5 | 30.6 | 4.06 | 7.1 | 51 | 31.96 |

**The graph shows the average of the comparative data of the 5 study areas.**



**Discussion of research results**

Based on the study of soil and air quality in relation to ant diversity at the School Botanical Garden of Wichienmatu School, Mueang District, Trang Province, it was found that the key factors influencing ant biodiversity include soil temperature, soil moisture, soil pH, and relative humidity.

Specifically, Site 5 exhibited the highest soil moisture and high air temperature, where *Diacamma sp.* was identified. This is attributed to the soil's efficient heat absorption and release properties, alongside its high water retention capacity. In contrast, Site 2 recorded the lowest soil temperature and alkaline pH levels, creating a favorable habitat for *Odontoponera sp.* Furthermore, Site 3 and Site 4 showed similar pH levels, which are suitable for *Oecophylla smaragdina* (Fabricius, 1775) and *Camponotus sp.* Meanwhile, the consistent environmental parameters—including temperature, moisture, soil pH, and relative humidity—across Sites 1, 2, and 5 resulted in the presence of *Paratrechina longicornis* (Latreille, 1802).

In conclusion, a total of five ant species were identified: *Paratrechina longicornis*, *Odontoponera sp.*, *Camponotus sp.*, *Oecophylla smaragdina*, and *Diacamma sp.* These species were distributed across various microhabitats, including the ground surface, leaf litter, decaying logs, and tree branches.

**Conclusions**

The study on physical factors affecting ant diversity at the School Botanical Garden of Wichienmatu School, Mueang District, Trang Province, concludes that physical soil properties and environmental conditions directly influence ant populations and their distribution. The recorded environmental parameters were as follows: Soil temperature ranged from 29.6 to 30.0°C. Soil moisture was measured between 2.10% and 4.06%. Soil pH levels remained within the 7.0 – 8.0 range. Air temperature fluctuated between 31.1 and 33.13°C. Relative humidity was observed at 50% – 51%.

These findings suggest that such physical variables play a critical role in maintaining the biodiversity of ants within the study area.

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