

Abstract

Research title: A study of air quality and soil on bryophyte diversity in rainforests, Southern International Botanical Garden (Thung Khai), Yan Ta Khao District, Trang Province

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A study of air quality and sediment on bryophyte diversity in the rainforest. Southern International Botanical (Thung Khai), Yan Ta Khao District, Trang Province the objective of this study was to study air quality on bryophyte diversity in rainforests and to study the physical properties of soil affecting the diversity of bryophytes in the rainforest at the Southern Botanical Garden. The method of operation is to measure soil quality according to the GLOBE method by measuring temperature, pH, soil moisture, air relative humidity and surveying the diversity of bryophytes. The study air and soil quality on bryophyte diversity in the rainforest at Southern Botanical Garden (Thung Khai), Yan Ta Khao District, Trang Province, found that the factors affecting the diversity of bryophytes in the evergreen forests of the Southern Botanical Garden (Thung Khai) were temperature, pH, moisture of soil and air relative humidity for 6 types of bryophytes were found in study area. For five species of bryophytes and one species of liverworts were found, mainly on trunks, two species found on logs, branches, rocks and stumps.

Keywords: bryophyte, air quality, soil quality

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Introduction

Bryophytes are the most diverse non-vascular plants of the bryophytes. About 13,000 species are found worldwide (Goffinet et al., 2008) and approximately 8,000 in the tropics (Frahm et al., 2003). Bryophytes play a very important role in the ecosystem, for example as a food source and habitats of small animals. It also influences changes in rock and soil conditions. This affects the displacement (Gradstein et al., 2001). The bryophyte can also be used as an index to tell the quality of the environment due to the ability to absorb water and gas exchange directly through the leaf cells. It responds to changes in environmental conditions such as temperature, soil acidity, toxic air and heavy metals quickly (Vanderpoorten & Goffinet, 2009). In addition, bryophytes are important for use as planting material, place decoration (Ando & Matsuo, 1984) used in medicine (Beike et al., 2010), such as antimicrobial and biopharmaceutical. From these reasons, the researcher is interested in studying species diversity and distribution of bryophytes. In Trang Province, it is home to the Southern Universal Botanical Garden (Thung Khai), which covers 2,600 rai of moist evergreen forest, swamp forest and low hills. The Southern Universal Botanical Garden (Thung Khai) therefore has a diverse ecosystem. And have studied the nature closely with a length of 175 meters and a height of 18 meters, located above the forest at the same level as the treetops. This will allow tourists to see various plants in the Southern Universal Botanical Garden (Thung Khai) that are abundant, clearly including various animals that live on trees such as birds, squirrels, monkeys, lemurs, etc. Including, there is a path to study the nature of the swamp about 1,200 meters. It takes about 30-45 minutes on foot to explore.

Southern International Botanical Garden (Thung Khai) is a source of natural knowledge that is worth searching for. Therefore, it is popular with tourists of all ages. Another cute charm is that there are few guides, which is a youth from a school in a nearby community to help as a guide to educate about various plants as well. At the Southern Universal Botanical Garden (Thung Khai), Trang Province, sub-habitats of bryophytes can be divided as follows: Rocks, on branches, on logs, on trunks, on dead stumps.

research objectives

To study air quality and soil on bryophyte diversity in rainforests at Southern International Botanical Garden (Thung Khai), Yan Ta Khao District, Trang Province.

research questions

Air quality and physical characteristics of soil affect the diversity of bryophytes in the rainforest.

research hypothesis

Air quality and physical characteristics of sediments are different. The affects of bryophytes diversity in the rainforests of the Southern Universal Botanical Garden are different.

Materials and equipment and methods of conducting research

- 1) tape measure
- 2) tape measure
- 3) compass
- 4) quacrat
- 5) Bigger
- 6) Calculator
- 7) Soil pH test kit
- 8) Light intensity test kit
- 9) Geo-coordinate measuring machine
- 10) Soil moisture meter
- 11) Inclinator (Clinometer)
- 12) CU smartlens
- 13) Marking pen
- 14) Bryophyte scraping tool
- 15) Sampling cans
- 16) Photographic equipment
- 17) Notebooks and stationery

GLOBE Protocols

Principles of Soil Measurement Pedosphere (Soil)

Principles of Biosphere Coverage Inspection Methods

Principles of Atmosphere Measurement Methods

study point determination

In the area of the Southern Botanical Garden (Thung Khai), Thung Khai Sub-district, Yan Ta Khao District, Trang Province, will be fielded for sampling.

research method

1. Research preparation stage

- 1) Set up a study issue and select the topic that you want to study.
- 2) Study research gather knowledge and theories related to research
- 3) Determine the purpose of the study.
- 4) Determine the sampling point in the study area.

2. Procedure

- 1) Make a research action plan.
- 2) Conduct a survey of the area to be researched.
- 3) Soil quality was measured according to the GLOBE method by measuring temperature, pH and soil moisture as follows:

- 1) Determine the sampling point was divided into 5 study points: logs, rocks, branches, trunks and dead tree stumps.

2) Measure the temperature of sediment at every point by bringing a thermometer to measure temperature and read the soil temperature, store the data 3 times.

3) Measure pH by using pH Meter to read soil temperature and collect data 3 times.

4) Measure the air relative humidity using a hygrometer and read the air relative humidity, collect data 3 times.

5) Send data to GLOBE Data Entry.

Bryophyte Sampling

Find the temperature, humidity and pH of the sediment.

1. Examine and collect bryophyte samples. In the Southern Botanical Garden (Thung Khai), Thung Khai Subdistrict, Yan Ta Khao District, Trang Province, between February and March 2022, samples were collected covering all sub-habits including those that grow on rocks, ground, on trees, branches and Leaves, both in open and well-lit areas, and in areas with relatively little light Recorded habitats and growth patterns of individual bryophytes classified by Bates (1998).

2. The morphology of bryophytes collected in the field was studied in detail under stereo and microscope. To be classified by family and genus level, Moss is classified according to Goffinet et al. (2008). Crandall-Stotler et al. (2008) and determine the correct scientific name of each bryophyte. by using taxonomy images from related taxonomic documents at the Department of Biology Faculty of Science Prince of Songkla University.

Analysis and conclusion of research

- 1) The data obtained were analyzed and compared the relationship. The statistics used in the data analysis were soil temperature, soil pH average, soil moisture average. Mean values of nitrogen, phosphorus and potassium in the soil.
- 2) Make a graph showing the average of the comparative data.
- 3) Summarize the results of the experiment.

research results

Table 1 shows the geographic coordinates of the bryophytes studied.

Area found	geographic coordinates	
	Latitude (N)	Longitude (E)
Tropical Rainforest, International Botanical Garden, Southern Region	7.46974	99.63982

From Table 1, the geographic coordinates of the study of the area around the Southern Universal Botanical Garden (Thung Khai), Yan Ta Khao District, Trang Province, which are moist evergreen forests studied for bryophytes, consisted of 5 areas, each with Latitude (N) at 7.46974 and Longitude (E) at 99.63982

Table 2 shows the sediment temperature in the bryophyte study area.

Area found	Sediment temperature (degrees Celsius)			
	1 st time	2 st time	3 st time	Average
on log	28.6	28.7	28.5	28.8
on rock	28.3	28.4	28.5	28.4
on branch	29.4	29.3	29.5	29.3
on trunk	29.2	29.3	29.1	29.2
on dead tree stump	28.9	28.7	28.8	28.6

From Table 2, the sediment temperature at the bryophyte study area found that the highest was the area on branch. The sediment temperature was measured at Average 29.3 degrees Celsius, followed by the area on trunk. The sediment temperature was Average 29.2 degrees Celsius, while on log area, the sediment temperature was Average 28.8 degrees Celsius. The sediment temperature was Average 28.6 degrees Celsius and the least was on rock area. The sediment temperature was Average 28.4 degrees Celsius.

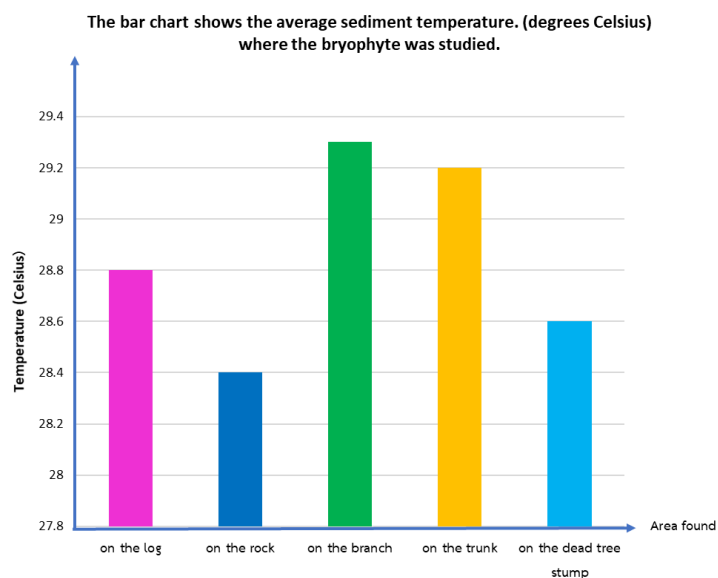


Table 3 shows the sediment moisture content in the bryophyte study area.

Area found	Sediment moisture (PPT)			
	1 st time	2 st time	3 st time	Average
on log	1.1	1.2	1.0	1.10
on rock	1.0	0.9	1.0	0.96
on branch	4	4.1	3.8	3.96
on trunk	1.5	1.6	1.6	1.56
on dead tree stump	1.2	1.0	1.0	1.06

From Table 3, the sediment moisture content in the bryophyte study area showed that the highest was the area on branch. The sediment moisture was measured at Average 3.96, followed by the area on trunk. The sediment moisture value was Average 1.56, the on log area was the soil sediment moisture value was Average 1.10, the area on dead tree stump was the soil sediment moisture value was Average 1.06 and the lowest was on rock area. Sediment has an Average value of 0.96.

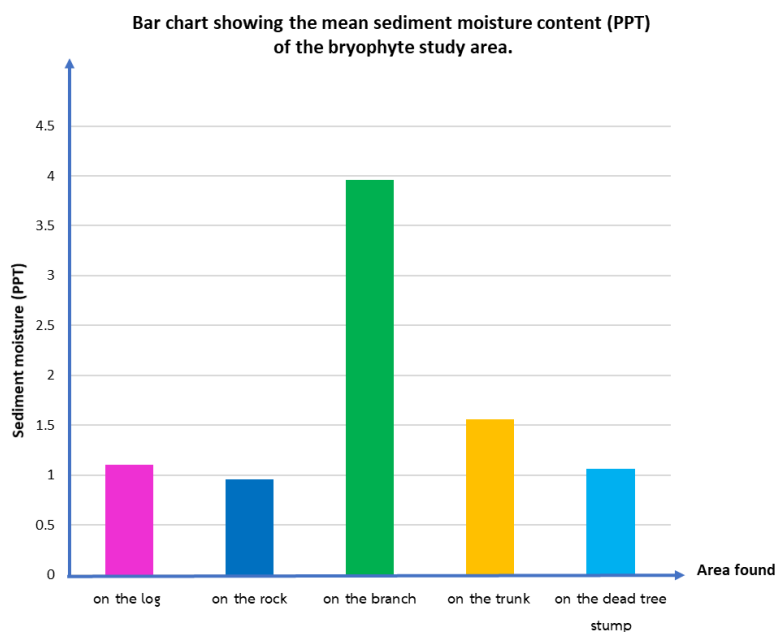


Table 4 shows the sediment pH in the bryophyte study area.

Area found	Sediment pH			
	1 st time	2 st time	3 st time	Average
on log	7.5	7.8	7.5	7.6
on rock	7.9	7.8	7.7	7.8
on branch	7.6	7.4	7.5	7.5
on trunk	7.5	7.5	7.5	7.5
on dead tree stump	7.8	7.8	7.5	7.7

From Table 4, the sediment pH at the bryophyte study area found that the highest was the on rock area, the sediment pH value was average 7.8, followed by the on log area, the sediment pH was average. 7.6 The area on dead tree stump was measured at the sediment pH value of 7.7 and the lowest was on branch and on trunk, the sediment pH level was equal to 7.5.

The bar chart shows the average sediment pH of the bryophyte study area.

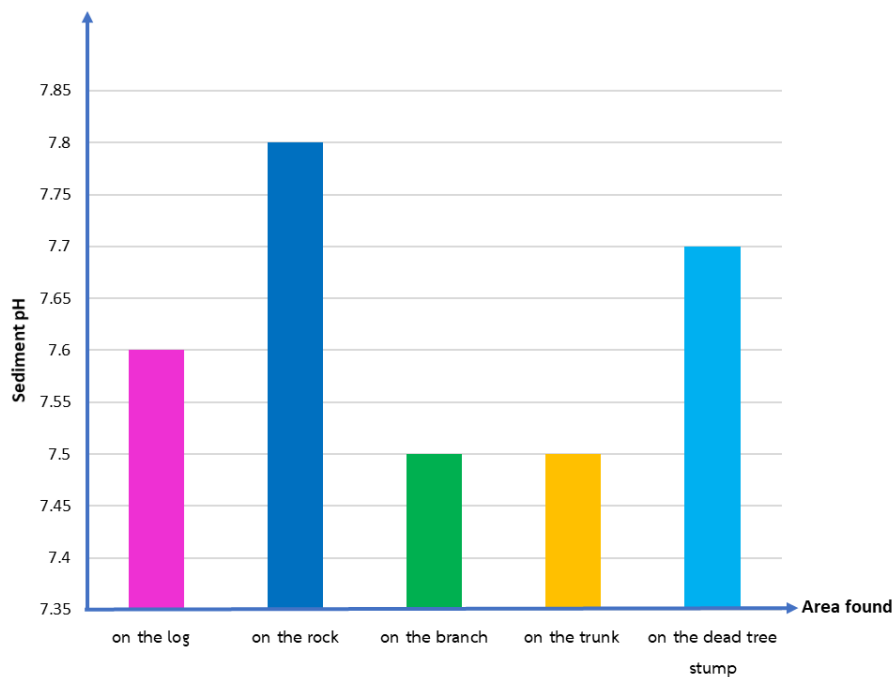


Table 5 shows the relative humidity of the air in the bryophyte study area.

Area found	air relative humidity (percent)			
	1 st time	2 st time	3 st time	Average
on log	72	73	70	70
on rock	70	68	68	68
on branch	75	73	74	73
on trunk	73	75	74	74
on dead tree stump	74	72	70	72

From Table 5, the relative humidity in the air at the bryophyte study area was found that the highest was on trunk. The relative humidity in the air was measured at Average 74%, followed by the area on branches. The relative humidity in the air was measured at 73% average. Relative humidity in the air was 72% Average. On log area, relative humidity in the air was 70% Average, and the lowest was on rock area relative humidity in the air was 68% Average.

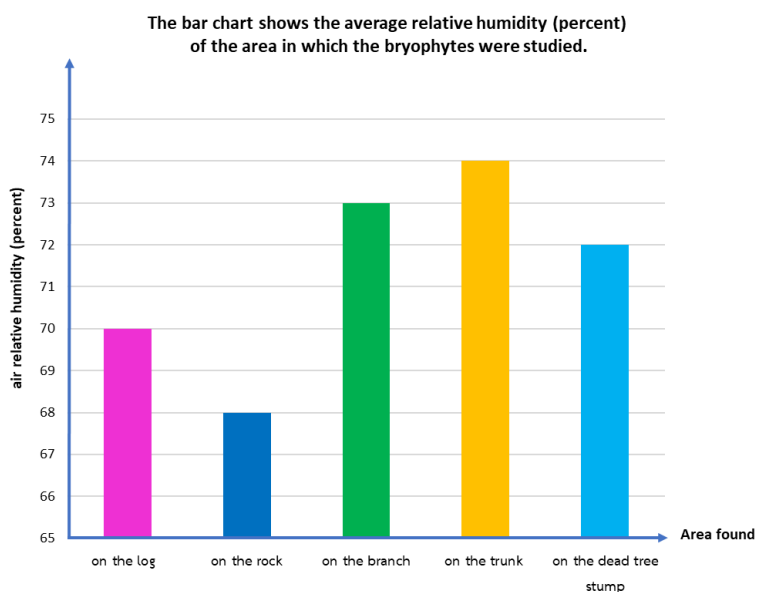


Table 6. Types and densities of bryophytes

Area found	types of bryophytes	density (cm ² , m ²)
on log	<i>Porella platyphylla</i> L.	0.37
on rock	<i>Leucobryum glaucum</i> Hedw.	0.28
on branch	<i>Dicranoloma</i> (Renauld) Renauld	1.2
on trunk	<i>Distichophyllum freycinetii</i>	1.9
	<i>Fissidens nobilis</i> Griff.	1.07
on dead tree stump	<i>Leucobryum aduncum</i> Doz. & Molk. Var. <i>scalare</i> (C.Mull.ex Fleisch.) A. Eddy	1.12

From Table 6, the study of species and densities of bryophytes found that the highest was on stems of *Distichophyllum freycinetii*, *Fissidens nobilis* Griff., with a density of 1.9 and 1.07 square centimeters/m², followed by on branches. *Dicranoloma* (Renauld) Renauld, density 1.2 square centimeters/square meter, on the stump of *Leucobryum aduncum* Doz. & Molk. Var. *scalare* (C.Mull.ex Fleisch.) A. Eddy, density 1.12 square centimeter/square meter, area on log will find *Porella platyphylla* L. with a density of 0.37 square centimeters/square meter. and the least on rock found *Leucobryum glaucum* Hedw. with a density of 0.28 square centimeters/square meter.

Summary of research results

Chapter 1 The physical characteristics of sediments affect the diversity of bryophytes in the rainforest Southern International Botanical Garden.

1. Sediment temperature

From the study of soil sediment temperature, it was found that the sediment on the trunk had the highest temperature. Because this area has less vegetation cover. Due to the rainy season, the sediment temperature decreases, causing a large number of bryophytes to grow.

2. Sediment moisture

from the study of soil sediment moisture. The area on the trunk had the highest sediment moisture content. The area on the rock has the lowest sediment moisture. This is because bryophytes should have enough moisture. Use to select the appropriate planting area. In the cultivation of bryophytes, it is commonly planted in rocks such as sponge rocks, sandstone, mountain rocks, laterite with rough surfaces for bryophytes to adhere easily. The type of rock also affects the growth of bryophytes and also affects the moisture retention of bryophytes. Caring for it is to keep the bryophyte in constant humidity.

3. Sediment pH

From the study of pH, sediment in the rock region had the highest sedimentary pH. In the area on the trunk and on the branches the sedimentary pH was the least. This may be due to the thick deposits of sediment at the base of the plant making it suitable for short life cycle bryophytes. while the area of the trunk that is about 1-2 meters above the ground and has light to be diverse. of high bryophyte.

Chapter 2 Air quality affects bryophyte diversity in rainforests.

Southern International Botanical Garden

4. Relative humidity in the air

from the study of relative humidity in the air the area on the stump had the highest relative humidity. The area on the rock has the lowest relative humidity. Because bryophytes in this group are found in areas with direct sunlight and high humidity. In areas

with low light intensity, even with high humidity, bryophytes are found in this group very rarely.

Chapter 3 Diversity of Bryophytes in the Rainforest Southern International Botanical Garden

5. Type and density of bryophytes

Five species of bryophytes were found: *Leucobryum glaucum* Hedw, *Dicranoloma* (Renauld) Renauld, *Distichophyllum freycinetii*, *Fissidens nobilis* Griff., *Leucobryum aduncum* Doz. & Molk. Var. *scalare* (C.Mull.ex Fleisch.) A. Eddy and there is 1 type of Liverworts, *Porella platyphylla* L. The area on the trunk is covered with bryophytes the most. This may be due to the fact that forests with high humidity were found to have the highest diversity of bryophytes in the upper stems and branches. This area is the area that gets the most sunlight, making it suitable for growing bryophytes. Furthermore, it was found that sediment accumulation in the area of the large branch with longitudinal branch resulted in the large branch area with erect stem bryophytes, which was the same species found. tree base. The branch area was the area where bryophytes were found the least. Because this habitat is a small branch with a minimum surface area. Most of the bryophytes found in this area are bryophytes with a pendent growth pattern. which has a growing pattern hanging from the habitat, so it doesn't need a large living area and is a growth pattern that can trap water droplets in the air as well.

Discuss the results of the research

The study of air quality and soil on bryophyte diversity in the rainforest. It was found that the factors affecting the diversity of bryophytes in the rainforests of the Southern Botanical Garden (Thung Khai) were soil of sed temperature moisture pH and relative humidity in the air. For 6 types of bryophytes were found in the areas found in the rainforest. Five species of bryophytes and one species of liverworts were found, mainly on trunks, two species found on logs, branches, rocks and tree stumps, respectively. Affecting the growth and reproduction of bryophytes, which are microscopic plants that are very valuable. Although Thailand still does not see the value and benefits of this group of plants much. But for foreign researchers are keeping an eye on the resources in Thailand. This study is therefore another knowledge that can be developed to bring the benefits of small plants from the forest to further use.

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OPTIONAL BADGES

I AM A COLLABORATOR

Our group has a total of 3 members. We work in group every step, plan, survey, collect data, analyze, make a report under the following topics: Abstract, Introduction, Objectives, Assumptions, Materials, Equipment, Methods of Study, Results, Summary of Research. and discuss the research results until this research success.

I MAKE AN IMPACT

In Thailand have high temperature. So we thought that a moss-type bryophyte could be planted in place of grass in the middle of the road. Because moss is a plant that is highly tolerant of various climates and helps to retain moisture in the air, it helps to reduce global warming.

I AM A DATA SCIENTIST

From the study of the relationship between sediment temperature, sediment moisture content, sediment pH, relative humidity, type and density of bryophyte. According to science, the values obtained from the survey are averaged in the table. When it has been taken from the table to create a bar chart.