Research Title : Studying canopy coverage and carbon sequestration of Dipterocarpaceae species in the field botany garden, Trang Province.

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Abstract

The study aims to investigate canopy coverage and carbon sequestration of Dipterocarpaceae species in the Field Botany Garden, Thung Khai, Trang Province. 1) To study the air quality in the Dipterocarpaceae plant area in the Field Botany Garden, Thung Khai, Trang Province. 2) To investigate the carbon sequestration quantity of Dipterocarpaceae species in the Field Botany Garden, Thung Khai, Trang Province. The study defines specific study points for Dipterocarpaceae species in the garden, including Dipterocarpus alatus Roxb, Shorea roxburghii G.Don, Cotylelobium lanceolatum Craib, Dipterocarpus baudii Korth, and Parashorea stellata.

The study on canopy coverage and carbon sequestration of Dipterocarpaceae involves measuring the circumference and height of tree trunks to calculate carbon sequestration quantities. It is found that Dipterocarpaceae species with larger circumference, greater height, and larger trunk size exhibit robust growth and possess higher carbon sequestration capabilities compared to species with smaller circumference and height, which show less complete growth and lower carbon sequestration capacity.

Key words: Air quality carbon sequestration Dipterocarpaceae species

Introduction

The problem of global warming is a major concern worldwide, as the atmosphere sees an increase in carbon dioxide emissions from transportation, industrial factories, combustion of fuels, and human activities. The escalating levels of carbon dioxide in the atmosphere contribute to the destruction of the ozone layer, leading to a rise in global temperatures. Forests play a crucial role in carbon dioxide sequestration, relying on the photosynthesis process of plants to absorb carbon dioxide from the atmosphere, accumulating and storing it in trees and green plants.

Dipterocarpaceae plants have the capability to effectively sequester carbon, and they are abundant in the Field Botany Garden, Trang Province. This location serves as a natural tourist attraction and a learning center for flora.

The research team has undertaken a study on canopy coverage and carbon sequestration of Dipterocarpaceae species in the Field Botany Garden, Trang Province.

Objectives

1) To study the air quality in the Dipterocarpaceae plant area in the Field Botany Garden, Trang Province.
2) To investigate the carbon sequestration quantity of Dipterocarpaceae species in the Field Botany Garden, Trang Province.

Research Questions

1.Is there a difference in air quality among various types of Dipterocarpaceae species in the Field Botany Garden, Thung Khai?

2. Does growth affect the carbon sequestration quantity of Dipterocarpaceae species in the Field Botany Garden, Thung Khai?

Research Hypothesis

1. The air quality among different types of Dipterocarpaceae species in the Field Botany Garden, Thung Khai, may vary.

2. Different growth patterns of Dipterocarpaceae species may result in variations in the carbon sequestration quantity in the Field Botany Garden, Thung Khai.

Relevant Variables

Hypothesis 1 The air quality among different types of Dipterocarpaceae species in the Field Botany Garden, Thung Khai, may vary.

Independent Variable : Type of Dipterocarpaceae Species

Dependent Variable : Air Quality

Control Variable : Surveying Instruments

Hypothesis 2 Different growth patterns of Dipterocarpaceae species may result in variations in the carbon sequestration quantity in the Field Botany Garden, Thung Khai.

Independent Variable : Growth of Dipterocarpaceae species

Dependent Variable : Amount of carbon sequestration by Dipterocarpaceae species

Control Variable : Study area size, survey dates, surveying tools used

Equipment and Materials

1. Measuring tape
2. Clinometer
3. Google Map
4. Digital Sensing Instrument
5. Website for assessing carbon sequestration of trees

Primary Measurement Methods of GLOBE

Primary Methods for Assessing Soil Cover in the Biosphere

Primary Methods for Measuring Atmospheric Conditions

Research Methodology

Setting Study Points

This research is conducted in the Dipterocarpaceae areas of the Southern Botanical Garden, Thung Khai Subdistrict, Yan Ta Khao District, Trang Province, located at coordinates 7.459481 latitude and 99.637422 longitude.

Part 1 Study of air quality by measuring temperature and relative humidity in the Dipterocarpaceae areas of the Thung Khai Botanical Garden. The selected study points in the botanical garden include Dipterocarpus alatus Roxb, Shorea roxburghii G.Don, Cotylelobium lanceolatum Craib, Dipterocarpus baudii Korth, and Parashorea stellata. Digital measuring devices are employed for this purpose.

Part 2 Study of Plant Growth Impacting Carbon Sequestration

1. Measure the circumference of the trunks of Dipterocarpaceae species, including Dipterocarpus alatus Roxb, Shorea roxburghii G.Don, Cotylelobium lanceolatum Craib, Dipterocarpus baudii Korth, and Parashorea stellata. Use a measuring tape at approximately 130 centimeters above ground level, conduct measurements three times, and then calculate the average circumference.
2. Measure the height of Dipterocarpaceae species using a Clinometer. Calculate the carbon credit value of the Dipterocarpaceae species by combining the height and circumference measurements. The data will demonstrate the biomass of the trees and calculate the carbon credit quantity.
3. Calculate the carbon credit of the Dipterocarpaceae species by entering the data into the tree carbon sequestration assessment website.
4. Record the data

Research Results

Study Area

The table presents geographic coordinates for the study area.

Table 1 Shows the geographical coordinates investigated in the study.

Area Found	Geographic Coordinates	
	Latitude (N)	Longitude (E)
Thung Khai Botanical Rainforest, Trang Province	7.459481	99.643186

From Table 1, the geographic coordinates were studied in the area around Thung Khai Botanical Garden, Thung Khai Subdistrict, Yan Ta Khao District, Trang Province. This area, a tropical rainforest, was investigated for tree carbon sequestration. The coordinates are Latitude (N) 7.459481 and Longitude (E) 99.643186.

Study Results Part 1

From the study of air quality in the Dipterocarpaceae areas of Thung Khai Botanical Garden, the results are as follows

Table 2 Shows the air temperature

Tree Species	Average Temperature (Degrees Celsius)
Dipterocarpus alatus Roxb	**35.67**
Shorea roxburghii G.Don	**36.60**
Cotylelobium lanceolatum Craib	**34.37**
Dipterocarpus baudii Korth	**35.20**
Parashorea stellata	**34.73**

From Table 2, in the Dipterocarpaceae areas of Thung Khai Botanical Garden, the area around Shorea roxburghii G.Don trees has the highest average temperature, reaching 36.60 degrees Celsius. Dipterocarpus alatus Roxb follows with an average temperature of 35.67 degrees Celsius, Dipterocarpus baudii Korth with 35.20 degrees Celsius, Parashorea stellata with 34.73 degrees Celsius, and Cotylelobium lanceolatum Craib has the lowest average temperature at 34.37 degrees Celsius.

Table 3 Shows the air humidity

Tree Species	Average Relative Humidity
Dipterocarpus alatus Roxb	**41.67**
Shorea roxburghii G.Don	**40.67**
Cotylelobium lanceolatum Craib	**50.30**
Dipterocarpus baudii Korth	**43.34**
Parashorea stellata	**46.67**

From Table 3, in the Dipterocarpaceae areas of Thung Khai Botanical Garden, the area around Shorea roxburghii G.Don trees has the lowest average humidity, at 40.67%. Dipterocarpus alatus Roxb follows with an average humidity of 41.67%, Dipterocarpus baudii Korth with 43.34%, Parashorea stellata with 46.67%, and Cotylelobium lanceolatum Craib has the highest average humidity at 50.30%.

Experiment Results Part 2

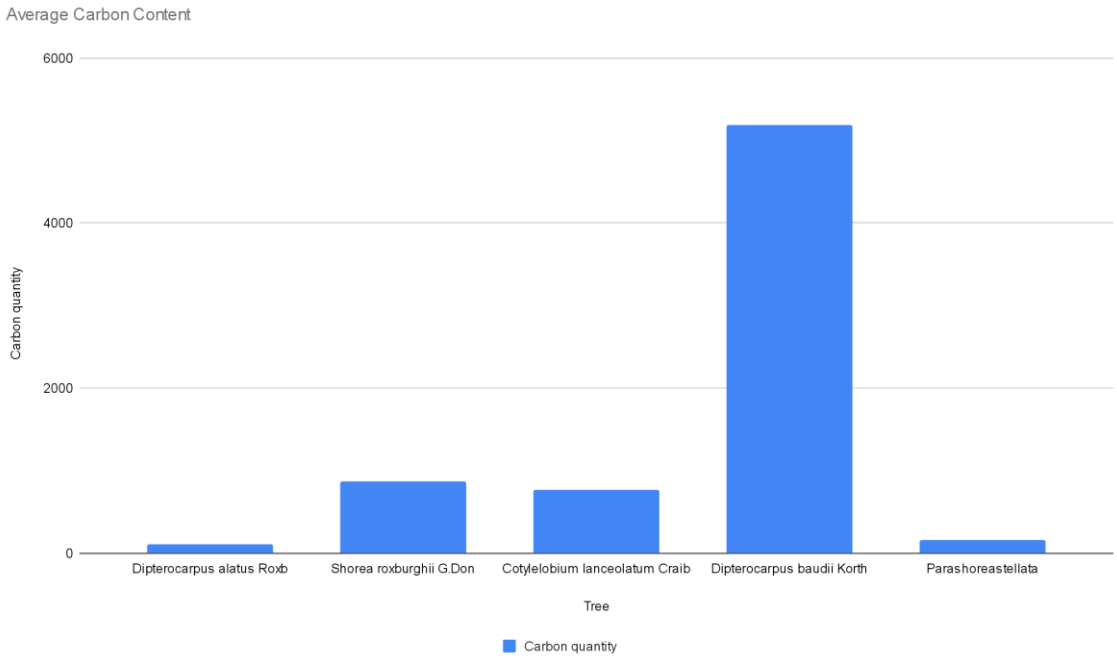
From the study of carbon sequestration levels of Dipterocarpaceae species in Thung Khai Botanical Garden, with designated study points for Dipterocarpaceae species including Dipterocarpus alatus Roxb, Shorea roxburghii G.Don, Cotylelobium lanceolatum Craib, Dipterocarpus baudii Korth, and Parashorea stellata, the results are as follows

Table 4 Shows the carbon sequestration quantity of Dipterocarpaceae species in Thung Khai Botanical Garden.

Tree Species	Circumference (Centimeters)	Distance (Meters)	Hiegh (Meters)	Carbon Quantity (kgC)
Dipterocarpus alatus Roxb	**58.67**	**25.75**	**15.76**	**105.71**
Shorea roxburghii G.Don	**87**	**39.25**	**51.48**	**869.44**
Cotylelobium lanceolatum Craib	**109.67**	**17.71**	**38.18**	**769.91**
Dipterocarpus baudii Korth	**234**	**21.38**	**51.67**	**5189.24**
Parashorea stellata	**51.67**	**16.70**	**33.48**	**152.01**

From Table 4, the carbon sequestration quantities of Dipterocarpaceae species in the Tungkai Experimental Agricultural Station are ranked from highest to lowest as follows: Hevea brasiliensis var. m. RO. 5189.24, Hevea brasiliensis var. m. PU. 869.44, Hevea brasiliensis var. m. K. 769.91, Hevea brasiliensis var. m. Y. 152.01, and Hevea brasiliensis var. m. N. 105.71.

Bar Chart illustrating the Carbon Sequestration of Dipterocarpaceae species in the Botanical Garden



Summary and Discussion of Research Results

From the geographical coordinates study of the Botanical Garden in Thung Khai, Tambon Thung Khai, Yantakao District, Trang Province, Thailand, which is a tropical rainforest area investigated for carbon sequestration of five tree species, the following results were observed. The air quality around Dipterocarpaceae species in Thung Khai Garden showed variations in temperature and humidity. The highest average temperature was recorded near Hevea brasiliensis, with 36.60 degrees Celsius, followed by Hevea benthamiana at 35.67 degrees Celsius, Hevea brasiliensis var. brasiliensis at 35.20 degrees Celsius, Hevea brasiliensis var. eggs at 34.73 degrees Celsius, and Hevea brasiliensis var. fastigiata with the lowest average temperature at 34.37 degrees Celsius. In terms of humidity, the Dipterocarpaceae species in the Thung Khai Garden had the lowest average humidity near Hevea brasiliensis, measuring 40.67%, followed by Hevea benthamiana at 41.67%, Hevea brasiliensis var. brasiliensis at 43.34%, Hevea brasiliensis var. eggs at 46.67%, and Hevea brasiliensis var. fastigiata with the highest average humidity at 50.30%. It was observed that the temperature was higher around trees that received more sunlight, and the humidity was lower around trees with higher temperatures.

Furthermore, regarding the carbon sequestration study of Dipterocarpaceae species in the Thung Khai Garden, the results showed variations in carbon sequestration levels. The Dipterocarpaceae species, ranked from highest to lowest carbon sequestration, were Hevea brasiliensis var. fastigiata with 5189.24 kgC, Hevea benthamiana with 869.44 kgC, Hevea brasiliensis var. eggs with 769.91 kgC, Hevea brasiliensis var. fastigiata with 152.0 kgC, and Hevea brasiliensis var. fastigiata with 105.71 kgC. It was noted that the carbon sequestration quantity depends on the growth of the trees, with trees having more circumference and greater height exhibiting higher carbon sequestration.

Summary of Results

From studying the air quality in the Dipterocarpaceae plant area in the Field Botany Garden, Trang Province, it was found that areas with large and tall trees receiving full sunlight have higher temperatures and lower humidity. In contrast, areas with small-sized and low-height trees receiving less sunlight exhibit lower temperatures and higher humidity.

From studying the carbon sequestration quantity of Dipterocarpaceae species in the Field Botany Garden, Trang Province, it was found that Dipterocarpaceae species with larger circumference, greater height, and larger trunk size exhibit robust growth and possess higher carbon sequestration capabilities compared to species with smaller circumference and height, which show less complete growth and lower carbon sequestration capacity.

Declaration of Conformity

The study on canopy coverage and carbon sequestration of Dipterocarpaceae species in the Field Botany Garden, Trang Province, was successfully completed with great efficiency. This success was achieved due to the encouragement and support from the director, Yongyut Pukhao, the school director of Wichaermat School, and the excellent cooperation from the staff of the Field Botany Garden, Thung Khai.

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