Title of the Research: Study of Air Quality at Different Time Periods When Butterflies Act as Pollinators in Thung Khai Botanical Garden, Trang Province

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Abstract

This study aims to explore the diversity of butterflies that act as pollinators and examine air quality during the periods when butterflies perform their pollination role in Thung Khai Botanical Garden, Trang Province. The research includes measuring temperature, relative humidity, and identifying butterfly species found in the area. The expected findings will help understand the relationship between air quality and butterfly pollination, which may contribute to ecosystem conservation and green space management.

Keywords: Butterflies, Pollination, Air Quality, Thung Khai Botanical Garden

Introduction

Pollination is a crucial process in ecosystems, supporting the reproduction of flowering plants and agricultural production. Butterflies play a significant role in pollination, similar to bees, by transferring pollen from one flower to another, a common pollination method in many flowering plants.

Air quality is essential for ecosystems and influences butterfly pollination. Measuring air quality involves monitoring atmospheric temperature, relative humidity, cloud cover, and precipitation levels.

Butterfly diversity results from a long evolutionary process, where each species has adapted to its environment and available resources. Preliminary data indicate that Thung Khai Botanical Garden hosts various butterfly species, including: Large Blue Leaf Butterfly, Long-striped leaf-worm butterfly, Yellow leaf caterpillar butterfly, Blue-leaf caterpillar butterfly, Swallowtail butterfly, Black and white crow butterfly, Green Swallowtail Butterfly, Common Swallowtail Butterfly (male)

Thus, this study aims to investigate air quality at different times when butterflies serve as pollinators in Thung Khai Botanical Garden, Trang Province.

Objectives

1. To study the diversity of butterfly species that act as pollinators in Thung Khai Botanical Garden.
2. To analyze air quality during different periods when butterflies perform their pollination role.

Research Questions

1. Is there diversity among the butterfly species in Thung Khai Botanical Garden?
2. Does air quality affect butterfly pollination in the botanical garden?

Research Hypothesis

1. There is diversity in butterfly species in Thung Khai Botanical Garden.
2. Air quality influences butterfly pollination in the botanical garden.

Methodology

Variables

Hypothesis 1:

Independent Variable: Thung Khai Botanical Garden

Dependent Variable: Diversity of butterfly species found in the garden

Controlled Variable: Study duration

Hypothesis 2:

Independent Variable: Air quality

Dependent Variable: Butterfly pollination

Controlled Variable: Data collection period

Equipment

- Camera
- Notebook
- Binoculars
- Butterfly net
- GPS or map
- Sample collection bottles
- Video camera with tripod
- Thermometer
- Hygrometer
- Stopwatch
- Microscope

Study Area

- **Location:** Thung Khai Botanical Garden, Trang Province
- **Latitude:** 7.468918219686996
- **Longitude:** 99.63836257722336

Part 1 To study the species of butterflies that act as pollinators in Thung Khai Botanical Garden, Trang Province

1. Set up a video camera around the flowers to study the species of butterflies that act as pollinators during the time the flowers bloom. Study the behavior of butterflies in clinging to flowers, inflorescences, timing the inflorescence, and the characteristics of inflorescences. Record the results.

2. Collect flowers and examine them under a microscope to find pollen grains attached to the stigmas. Count the number of pollen grains paired with the species of butterflies. Record the results.

Part 2 To study the air quality during each period when butterflies act as pollinators

1. Set up a video camera around the flowers to study the air quality during each period when butterflies act as pollinators.

2. Measure the air quality as follows:

- Measure the air temperature during the period when butterflies act as pollinators by measuring the temperature in the area where butterflies act as pollinators by installing a thermometer at an appropriate level and recording the temperature value.

- Measure the relative humidity during the period when butterflies act as pollinators by measuring the relative humidity in the area where butterflies act as pollinators by installing a hygrometer in the desired location. Wait for about 5-10 minutes (or depending on the device) for the sensor to adjust to the environment and record the relative humidity value.

Results

Table 1. Results of the study on butterfly species acting as pollinators.

	Survey results		
Butterfly	Types of plants that butterflies land on	picture	nature
1. Leafworm Butterfly Love the Big Sky	Nectar-bearing flowering plants		The wing base is black with white and blue-white stripes all over the wings.
2.Long-striped leaf-worm butterfly	A variety of flowering plants that provide nectar		The wings are black-brown with white lines and spots.
3. Yellow leaf caterpillar butterfly	Flowers that provide nectar are brightly colored and fragrant.		Black-brown wings with yellow-light yellow stripes and spots
4. Blue-leafed caterpillar butterfly	Plants with nectar-producing flowers		The wings are black-dark brown with white stripes and spots scattered all over the wings.
5. Swallowtail butterfly	Plants with brightly colored flowers		The wings and body are black. The sides of the hind wings have water drop-like projections. The hind wings have yellow spots.

6. Black and white crow butterfly	Brightly colored and fragrant plants		Upper wings: dark brown, almost black, forewings are iridescent blue with white spots.
7. Green Swallowtail Butterfly	A flowering plant with bright colors and a high nectar content.		The wing base is black with green scales scattered all over the wings.
8. Common Swallowtail Butterfly (male)	Flowering plants that produce high nectar content		The wing edges of the hind wings extend long like the tail of the upper wings. The wing surface is black.

From the table, The study identified eight butterfly species acting as pollinators in the botanical garden: Large Blue Leaf Butterfly, Long-striped leaf-worm butterfly, Yellow leaf caterpillar butterfly, Blue-leaf caterpillar butterfly, Swallowtail butterfly, Black and white crow butterfly, Green Swallowtail Butterfly, Common Swallowtail Butterfly (male)

Table 2 shows the air quality in Thung Khai Botanical Garden.

Points of Study	Dry season		Relative Humidity	Rainy season		Relative Humidity
	Dry Bulb	Wet Bulb		Dry Bulb	Wet Bulb	
1	33	19	70	30	29	91
2	32	28	64	30	28	83
3	32	27	64	31	29	83
Average	32.33	28	66	30.33	28.67	85.67

From the table, it was found that the average humidity in the rainy season was 68.67, the temperature was 30.33. In the dry season, the humidity was 66, the temperature was 32.33

	Air quality	
	Average temperature	Average humidity
Dry season	32.33	66
Wet season	30.33	86.67

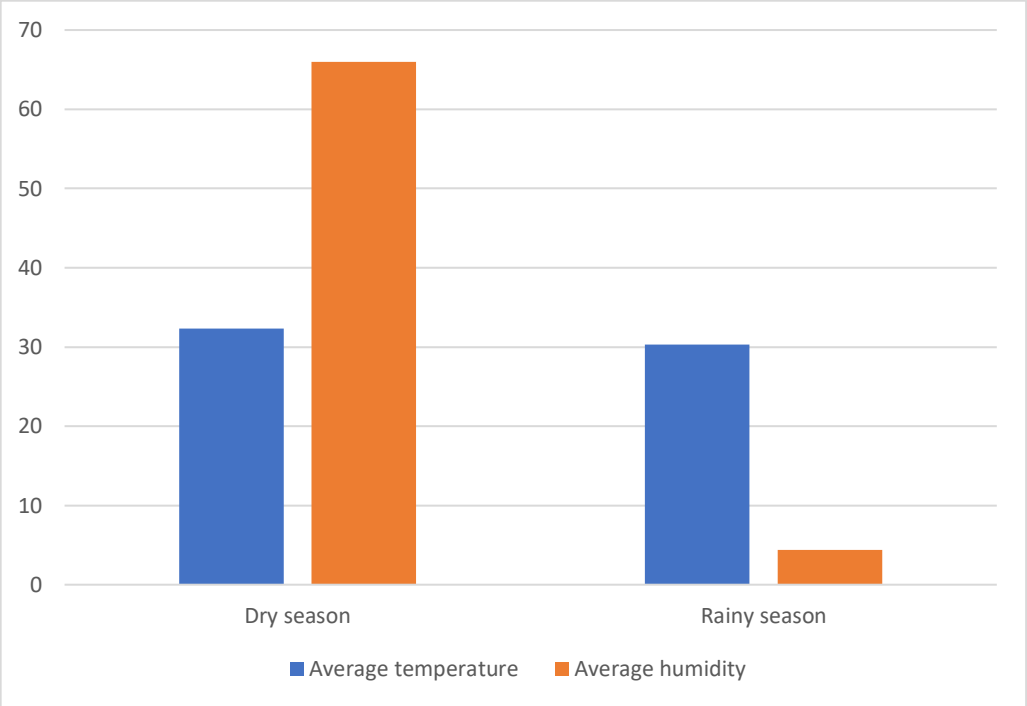

Figure 1. Bar chart showing air quality.

Conclusion

The study confirmed the presence of eight butterfly species in Thung Khai Botanical Garden. Additionally, air quality varied across seasons, with higher humidity in the rainy season and higher temperatures in the dry season, which affected butterfly pollination activity.

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Reference documents

GBIF (Global Biodiversity Information Facility) https://www.gbif.org The Global Biodiversity Database, which includes information on butterfly species in Thailand and other regions.

Butterfly Conservation Europe https://www.butterfly-conservation.org A website that compiles information on research and conservation of butterflies in Europe.

Thai Biodiversity https://www.thaibiodiversity.org Thailand Biodiversity Database