

Morphological Study of the *Platycerium bifurcatum*

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Abstract: This study was conducted to determine the morphology of the fern *Platycerium bifurcatum* in the UGM Wisdom Park area, which is one of the locations rich in biodiversity, including various types of ferns. Supported by Gadjah Mada University, this park is part of an advocacy effort in the fields of education, research, and community service to support sustainable development. This study aims to increase insight into ferns and can contribute to the development of science, especially in the fields of botany and ecology, and can be a reference for further research on ferns in Indonesia. This study uses an observation method with a direct observation method in the UGM Wisdom Park area. *Platycerium bifurcatum* is an epiphytic fern that attaches to large tree trunks, also known as staghorn ferns. The host tree trunk has a thick shell, the roots are fibrous and soft, and grow in clusters. The leaves are shaped like deer antlers. The sporangium on *P. bifurcatum* is protected by sori that grow in groups at the lower end of the leaves.

Keywords: Morphology, *Platycerium bifurcatum*, Epiphyte, Sporangium, Wisdom Park UGM.

Introduction

The diversity of plant species is one form of biodiversity. Based on their habitus or life form, plants can be classified into trees, shrubs, herbs, and grasses (Kusmana & Hikmat, 2015). One group of plants included in the herbaceous category are ferns (*Pteridophyta*). This group of plants is a spore-bearing cormophyte with the ability to adapt to various habitats. Ferns can grow on trees, dead wood, litter, soil, and rocks. *Pteridophyta* generally have well-developed leaves and reproduce generatively through spores (Nurdiana, 2020).

As a group of spore-bearing *cormophytes*, *Pteridophyta* are able to survive in a variety of environmental conditions. However, their existence often receives less attention than other plant groups. People often consider ferns to provide little significant benefit to life, even though many types of ferns have significant economic value, such as as ornamental plants, medicinal plants, vegetables, and other potential that still needs to be explored further (Rismunandar & Ekowati, 1999). Besides their economic value, ferns

also play a crucial ecological role in forest ecosystems. According to Kurniasih (2019), terrestrial ferns function as understory vegetation, helping to form soil nutrients through litter decomposition, preventing erosion as ground cover, and acting as producers in the food chain.

Among the various fern species, *Platycerium bifurcatum*, or staghorn fern, is a species with a unique morphology that has attracted the attention of researchers. In addition to its aesthetic value as an ornamental plant, this species also contributes to the biodiversity of its habitat. The Wisdom Park area of Gadjah Mada University is one location with a high level of fern diversity. Supported by Gadjah Mada University, this area is part of advocacy efforts in education, research, and community service to support sustainable development (Lehberger et al., 2021). Taxonomically, *Platycerium bifurcatum* is classified as follows (Lindasari et al., 2015):

Kingdom: Plantae

Division: Pteridophyta

Class: Pteridopsida

Order: Polypodiales

Family: Polypodiaceae

Genus: *Platycerium*

Species: *Platycerium bifurcatum*

Platycerium bifurcatum is known as an epiphytic plant that attaches itself firmly to its host tree without being parasitic. This species has two types of leaves: sterile, shield-shaped leaves that grow upright and can dry out when water is scarce, and fertile leaves that resemble staghorn ferns with brown sori on the underside (Karimah, 2020). The morphological study of *Platycerium bifurcatum* at the Gadjah Mada University Wisdom Park aims to identify the morphological characteristics of staghorn ferns, particularly their leaves structure and spores. This research is expected to contribute to the development of botany and ecology and serve as a reference for further research on ferns in Indonesia.

Materials And Methods

Observations were conducted on December 24, 2024 at the Wisdom Park area of UGM from 10:00 to 11:00 AM (WIB). Wisdom Park is a garden established by Gadjah Mada University to support various educational, research, and community service activities as part of its commitment to sustainable development. The park is located on the eastern side of the main campus, specifically on Jl. Prof. DR. Drs. Notonagoro, Karang Malang, Caturtunggal, Depok District, Sleman Regency, Yogyakarta Special Region.



Figure 1. Wisdom Park UGM Area

This study employed an exploratory descriptive method in the field of plant morphology, in which direct observations were conducted at the study site to obtain data and identify the morphological characteristics of the staghorn fern. The focus of this research was the morphological traits of *Platycerium bifurcatum*, examined through two stages: (1) Direct field observation in the eastern part of the Wisdom Park area at UGM, (2) Detailed morphological observation at the study site using a lensbong to examine specific structures, including the leaves, sori, sporangia, and spores. The tools used in this study included an observation sheet, pencil, white manila paper, measuring tape, lensbong, mini microscope, and a smartphone. The material used was the staghorn fern (*Platycerium bifurcatum*). A single direct observation was conducted to document the morphology of the leaves and spores.

Results And Discussion

Results

Based on the research conducted on the fern plant (*Platycerium bifurcatum*) in the Taman Kearifan UGM area, data on the morphology of the plant were obtained. The study involved observations of the leaves, and spores. Data collection was carried out systematically, and the observations were recorded in detail. The research aimed to accurately describe the morphological characteristics of the plant. The collected data were then presented in tabular form to facilitate analysis and interpretation.

Table 1. Morphological Characteristics of *Platynerium bifurcatum*.

Character	Description
Number of leaves	5-10
Leaves arrangement	Dichotomous branching
Leaves blade shape	Simple
Leaves completeness	Petiole
Leaves structure	Having a petiole and a leaves blade
Leaves shape	Long, antler-shaped
Leaves margin	Entire
Leaves base	Tapering
Leaves apex	Pointed
Leaves surface	Fine hairs
Leaves venation	Palmate
Leaves texture	Thinly fleshy
Length of fertile fronds	20-42 cm
Sorus position	On lower leaves surface and margins
Sori	Brown, covered with fine hairs, star-shaped

Figure 2. Whole plant of *Platynerium bifurcatum*.

Figure 3. Leaves (a) Shield fronds (sterile), (b) Fertile fronds, (c) Adaxial leaves surface, (d) Leaves surface were observed using a lens.

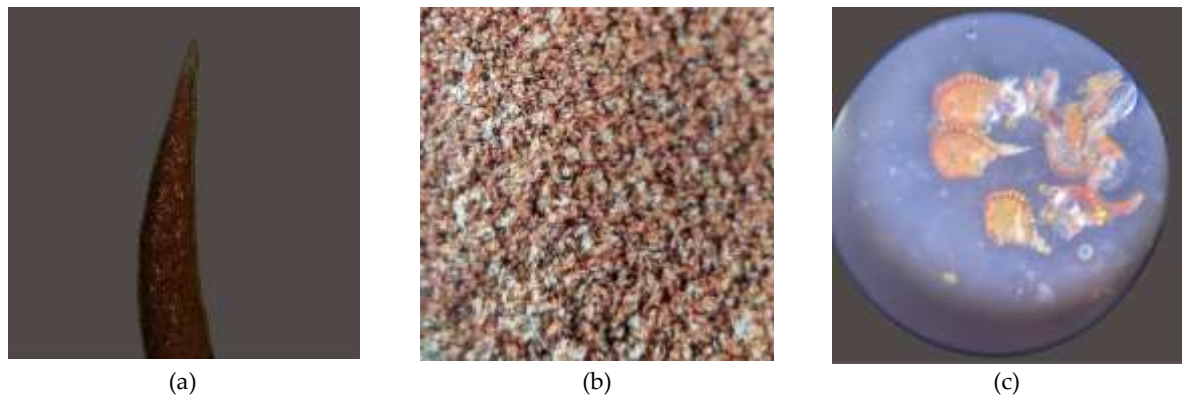


Figure 4. (a) Sori, (b) Sori were observed using a lensbong, (c) Sporangium.

Discussion

Habitus

Platycerium bifurcatum is a fern species belonging to the family Polypodiaceae. This species is widely cultivated as an ornamental plant due to its distinctive frond morphology (Olsen, 2007). In its natural environment, *P. bifurcatum* typically grows epiphytically on the trunks of large trees and can also be found in rubber plantations and teak forests. The rhizome is slender, dark brown, and covered by shield fronds. These shield fronds grow erect, are circular in shape, and feature palmate margins, whereas smaller shield fronds are simple and circular with entire margins. The venation of the shield fronds is palmate, with primary and secondary veins clearly visible, while higher-order veins are less distinct (Hutagaol, 2020).

Leaves

The leaves of the staghorn fern resemble antlers, with distinct texture and veins, and can reach over 150 cm in length. This perennial plant consists of two main leaves types: sterile and fertile leaves. These ferns grow at the base of the fertile leaves in a persistent, overlapping fashion, forming a basket-like structure with lobed tips. The fern's color changes from green to brown as it matures and remains sterile (Romaidi et al., 2012). Fern leaves grow upright with a rounded morphology and palmate edges, while the smaller fern leaves exhibit a simple, rounded shape with flat edges (Lindasari et al., 2015). The primary function of these ferns is to capture and retain organic matter throughout the plant's life cycle (Holttum, 1967). The veins of the fern are arranged in a palmate

manner, with the first and second tier branches still clearly visible, while the advanced tier branches are less visible (Lindasari et al., 2015).

Spores

The reproductive structures of ferns are generally located on the abaxial surface of the frond and consist of spores produced within sporangia (Pranita et al., 2017). In *Platycerium bifurcatum*, the lower surface of the fronds is covered with fine, star-shaped hairs. The spores are contained within sporangial capsules distributed at the tips and across the entire abaxial surface of the fronds (Darma & Peneng, 2007). These sori, or clusters of sporangia, are protected by branched hairs that divide into two to four segments and form star-like structures (Romaidi et al., 2012). This structural arrangement plays an essential role in the reproductive process of the species. Such characteristics indicate a distinctive morphological adaptation in the staghorn fern that contributes to its survival and effective spore dispersal.

Conclusions

The morphological characteristics of the staghorn fern (*Platycerium bifurcatum*) in the Wisdom Park area of Gadjah Mada University show typical morphological characteristics as an epiphytic fern from the Polypodiaceae family. This species attaches to large tree trunks and has a slender, dark brown rhizome covered by shield fronds. The shield fronds are arranged upright, rounded, and have palmate edges, functioning as water and

organic litter traps during its life cycle. Fertile and sterile fronds exhibit distinct morphologies, resembling staghorns, with distinctive textures and can reach lengths of over 150 cm. Fertile fronds have distinct palmate veins that support the formation of reproductive structures on the abaxial surface. The sori are arranged in clusters of sporangia protected by two to four branched, star-like hairs, which are important adaptations for successful reproduction and spore dispersal. Overall, the observed morphological characteristics of *P. bifurcatum* confirm its adaptability as an epiphytic fern, particularly through the structure of the shield fronds, the morphology of the fertile fronds, and the sporangium protection mechanism. This finding contributes to the understanding of the morphology of staghorn ferns in the UGM campus environment and can be the basis for further research in the fields of botany, ecology, and conservation of fern diversity in Indonesia.

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Conflict of Interest: The authors declare that there are no conflicts of interest affecting the execution, analysis, or reporting of this study. All observations, data collection, and interpretations

regarding the morphological characteristics of *Platyserium bifurcatum* were conducted objectively and independently. This study is free from any financial, personal, or professional influence that could potentially bias the results.

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