

Identification of Morphological Characteristics of *Christella Dentata* in the UGM Wisdom Park Area

Luthfia Farha Azkia, Eno Rahma Septina, Bintang Tsaqibul Mannan, Galang Pandu Wijaya

Biology Education Department, Faculty of Islamic Education, UIN Sunan Kalijaga,
Jl. Marsda Adisucipto No 1 Yogyakarta 55281, Indonesia. Tel. +62-896-3899-2237.

Corresponding author*

bomferotion@gmail.com

Abstract: Ferns (*Pteridophyta*) have distinctive characteristics in the form of roots, stems, and leaves equipped with spores as a means of reproduction. One type of fern is the sword fern (*Nephrolepis biserrata*) which thrives in the UGM Wisdom Park area. This study aims to analyze the morphological characteristics of the sword fern (*Nephrolepis biserrata*) in the UGM Wisdom Park area. This type of research is qualitative with observation methods (direct observation) and literature studies. Data analysis was carried out on December 24, 2024 by observing and recording the morphology of the roots, stems, leaves, and spores of the sword fern (*Nephrolepis biserrata*). The results of this study showed that the sword fern (*Nephrolepis biserrata*) has brown fibrous roots, upright rhizome-shaped stems covered in hair, compound leaves in the form of lanceolate (pinnate) with serrated edges, and spores arranged in sori under the leaves. This plant is more commonly found in shady places and moist soil.

Keywords: *Christella dentata*, morphology, characteristics, spores, descriptive, wisdom park UGM.

Introduction

Indonesia's forests possess a high diversity of plant species that play an essential role in maintaining ecosystem processes such as nutrient cycles and energy flow. Plant diversity contributes significantly to preventing soil erosion and sustaining photosynthesis. Indonesia's forests cover an area of approximately 750 million hectares and are home to around 20,000 animal species and about 28,000 plant species (Hotmatama, 2016). As a tropical country, Indonesia also has a high diversity of plant biodiversity. One of the plant groups rich in species is the ferns (Sulfina, 2018).

Ferns (*Pteridophyta*) are a division of plants whose members clearly possess a true cormus, meaning their bodies are distinctly differentiated into three main parts: roots, stems, and leaves. However, ferns do not produce seeds. Their main reproductive structures are spores. Ferns are highly diverse in terms of both habitat and lifestyle (Tjitrosepomo, 2012). Some species grow attached to tree trunks or rocks as epiphytic ferns, while

most species live on land (terrestrial). These conditions create suitable habitats for various plants, including ferns (*Pteridophyta*). Among the many fern species found is *Christella dentata*, commonly known as the small fern. Its classification is as follows:

- Kingdom : Plantae
- Division : Pteridophyta
- Class : Pteridopsida
- Order : Filicales
- Family : Thelypteridaceae
- Genus : *Christella*
- Species : *Christella dentata*

Christella dentata is a fern species with brown spores located on the underside of the leaf. The leaves are green, pinnate, and lanceolate to elliptical in shape, with pointed tips. The rhizome is erect, the stipe is brown, and the leaf blade tapers at the tip and narrows toward the base (Lin et al., 2013). This fern typically inhabits flat or sloping soil on cliffs and in rock crevices. Based on soil pH

measurements at the plot where *Christella dentata* was found, the species grows in slightly acidic soil with a pH of 6.16. The environmental temperature in the plot ranged from 28°C to 31°C, which is relatively suitable for fern growth. The average temperature for Pteridophyta occurrence is 27.8°C, with the lowest at 26°C and the highest at 29°C. The average air humidity is 73.3%. The recorded light intensity averages 4894 lux, and the elevation where Pteridophyta are found ranges from 700 to 1200 meters.

Christella dentata is utilized as an antimicrobial agent and is traditionally used to treat menstrual disorders and coughs (Ridianingsih et al., 2017). It is expected that this study, titled "Morphological Characteristics of *Christella dentata* in the UGM Wisdom Park Area", will enhance public knowledge about the widely distributed ferns in nature and optimize their potential benefits for broader use.

Materials And Methods

This research is an observational study using direct observation methods. Observations were conducted on December 24, 2024, in the Gadjah Mada University (UGM) Wisdom Park area, between 10:00 and 11:00 a.m. Western Indonesian Time (WIB). Data analysis was conducted using descriptive qualitative methods, with sampling, documentation, and identification. The subject of this study was the morphological characteristics of ferns (*Christella dentata*). Direct observation was used, a method of data collection primarily through close visual inspection of the natural environment.

The observation location was in the UGM Wisdom Park area. Wisdom Park UGM is a Wisdom Park built by Gadjah Mada University to facilitate teaching, research, and community service activities for sustainable development. It is located on the eastern side of the main campus, precisely on Jl. Prof. Dr. Notonagoro, Karang Malang, Caturtunggal, Depok District, Sleman Regency, Yogyakarta Special Region.



Figure 1. Wisdom Park UGM Area

The tools used included observation sheets, writing utensils, white manila paper, a ruler, a disassembled lens, a mini microscope, and a mobile phone. The materials used were staghorn ferns. Observations were conducted once using the direct observation method.

The direct observation procedure was as follows: the location was in the Wisdom Park area of Gadjah Mada University (UGM). Observations of the *Christella dentata* fern were conducted by observing one plant for one hour from 10:00 AM to 12:00 PM WIB. Direct observation was conducted by recording and observing the morphology of the roots, stems, leaves, and spores. The data obtained were then analyzed using qualitative descriptive analysis, which identified various morphological characteristics of the *Christella dentata* fern. This identification process was carried out by comparing the observed plant characteristics with related literature or references to ensure the validity and accuracy of the data obtained.

Results And Discussion

Result

Morphological Characteristics of (*Christella Dentata*)

Based on the results of research conducted on ferns (*Christella dentata*) in the Wisdom Park area of Gadjah Mada University (UGM), the morphology of the plant was obtained. The research was conducted through observations of the roots,

stems, leaves, and spores. The following table presents the data obtained.

Table 1. Observation Results of Morphological Characteristics (*Christella dentata*)

No.	Observation Aspect	Description
1	Roots Root system	The root system of <i>Christella dentata</i> is fibrous, indicating that it consists of many thin roots spreading out from the base of the plant. This species also possesses an upright rhizome, which supports its vertical growth and helps in anchoring the plant firmly to the ground and root length ± 26 cm.
2.	Stem: Above/underground	The stem of <i>Christella dentata</i> is clearly visible and grows above the ground with an upright and straight structure. Its surface is smooth, and it grows vertically without forming branches. The stem ranges from 3 to 60 cm in length, with a diameter of about 0.6 to 0.8 cm, and is characterized by a dark green coloration.
3.	Leaves	The leaves of <i>Christella dentata</i> are compound and arranged alternately on the stem, with each node bearing approximately sixteen leaf blades. The leaves have complete structures with petioles, and the blades are divided with wavy margins. The base tapers, while the tip is pointed. The surface appears smooth and glossy, supported by pinnate venation. These leaves are relatively thick and waxy, measuring about 18 cm in length
4.	Sori	The sori of <i>Christella dentata</i> are found on the abaxial surface of the leaves, forming small, evenly distributed yellowish-brown round clusters known as sorus. These sori appear in multiple rows and are separated by the secondary veins of the leaf, which is a typical characteristic of fern reproductive structures.

Next are the pictures morphological of the *Christella Dentata* in the form of roots, stems, leaves, and spores:



Figure 2. Roots of the *christella dentata*



Figure 3. Stem of the *christella dentata*

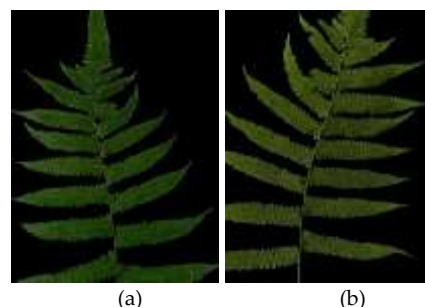


Figure 4. (a) Adaxial of leaf, (b) Abaxial of leaf

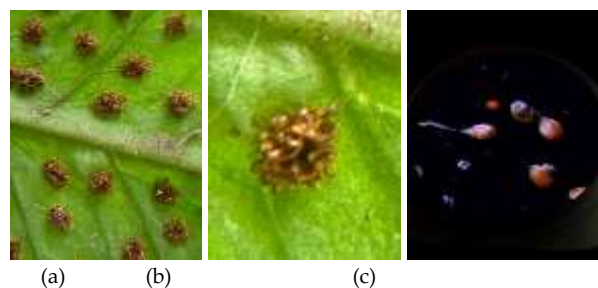


Figure 5. (a) Sorus, (b) sori, (c) Sporangium

This research was conducted using a descriptive exploratory approach at Wisdom Park UGM regarding the morphology of ferns (*christella Dentata*). The findings listed in the table above provide a general overview of the structure of roots, stems, leaves, and spores. These observations aim to facilitate understanding of the

morphological characteristics of ground ferns (*Christella Dentata*). The results of this research can also be presented in graphical form.

Discussion

Habitus

The *Christella dentata* plant also attaches itself to the stems of larger plants or rocks. It is an epiphytic fern, and most ferns live on land (terrestrial). This plant can also live in grasslands, along riverbanks, and along roadsides. (Brownsey & Perrie, 2018).

Leaves

The leaves of *Christella dentata* are elongated lanceolate with a pointed tip and a blunt base. Each stem node has approximately 23 leaflets. The leaves are compound and incomplete, arranged in a bipinnate form, with spore-bearing (fertile) leaflets. The leaflets are also lanceolate with serrated edges. The leaves are arranged alternately opposite and have a rough surface. The leaves are light green, with a thin texture, pinnate veins, and a forked venation pattern (Priyambodo, 2022; Halimatun et al., 2024; Yudhistian & Wulandari, 2024). The leaves are characterized by a spicy aroma and exudate that can cause slight irritation when crushed (Almeida et al., 2023).

Stem

The stem of *Cristhtella dentata* is tubular, like most ferns, elongated with a somewhat rough and stiff texture when old, and fine-haired and more flexible when young (Nery Sofiyanti). The base of the stem appears brownish, and the area closest to the roots becomes darker and more intense. As the stem approaches the tip/shoot, it becomes increasingly light green (Puja Nurcahyanti). The numerous fine hairs found at the base of the stem near the roots enable this plant to maintain humidity and prevent water shortages by filtering/trapping morning dew and storing it in the lower, shadier part of the stem, preventing it from evaporating easily during the day (Abdul Majid, 2022). The stems of this plant are unbranched, 0.5-1 cm wide and up to 30-40 cm long. They are curved and break easily, but they are not easily broken because the fibers extend from the base to the tip. The outermost fibers, the

bark, are stronger than those found inside the stem (Maria, 2022). The stems are non-woody and lack cambium, which is why this plant is classified as a herb (Amin, 2019).

Spores

Christella dentata is a type of fern with yellowish-brown spores. These spores are located along the underside of the leaves, neatly arranged in rows between the sori, forming clusters of sori. The kidney-shaped sori are located on the abaxial side of the leaf. The sori are arranged in two rows on each leaf notch, with 2-4 sori per row (Priyambodo, 2022). The sori are also protected by paraphyses, which are hairs that grow between the sporangia (sporangia are where spores form). Judging by the size of the spores, they are homosporous (spores of equal size) because there is no difference in size in the trophophyll of the sporofilm, thus lacking dimorphism (Alan, 2009). The specific characteristics of the sori, in terms of shape, location, and color, influence the dispersal process of ferns. This aligns with the statement (Bambang, 2002) that ferns generally disperse by spores. These organs are highly efficient for dispersal purposes because they can reach distant locations with the help of wind and are produced in large quantities.

Sorus Arrangement and Sporangium Location

In *Christella dentata*, the sori are arranged regularly on the underside (abaxial) of fertile leaves, generally along the sides or near the edge of the leaflet (pinna), so they are classified as marginal to submarginal. The sori are circular (concentric sori type) and follow a pattern parallel to the small leaf veins. Each sorus is protected by a reniform (kidney-shaped) indusium that tends to be thin and can easily fall off as the sporangium matures. The sporangium in *Christella dentata* is a small, stalked capsule containing an annulus, a circular structure of thick-walled cells that plays a role in the spore release mechanism when the sporangium dries and ruptures. Each sporangium produces haploid spores that will develop into prothallus (gametophytes) after falling in a suitable environment.

Roots

Christella dentata has a fibrous root morphology with an upright rhizome. This fibrous root functions to efficiently absorb water and nutrients from the soil and provides stability to the plant. The upright rhizome also allows the plant to grow well in various media and contributes to vegetative dispersal. Furthermore, this strong and branched root structure helps the plant adapt to its surroundings, enabling it to survive in a variety of conditions. Thus, the morphology of fibrous roots and erect rhizomes in *Christella dentata* plays an important role in the survival of the plant.

Conclusions

Based on the results of research on the identification of morphological characteristics of (*Crishtella dentata*) in the Wisdom Park UGM area, it can be concluded that the morphological characteristics of this fern can be observed from the roots, leaves, stems, and spores. *Crishtella dentata* has fibrous roots with upright rhizomes. Young stems are finely haired and flexible, while older stems have a rough and stiff texture. The stems are unbranched and have no cambium. *Crishtella dentata* leaves have a lanceolate shape, pointed leaf tips, blunt bases, pinnate leaf veins, forked venation patterns, light green in color and thin textured. *Crishtella dentata* spores are yellowish brown, located along the underside of the kidney-shaped sorus leaves, the sorus arrangement is divided into two rows and in each leaf curve there are 2-4 sorus in each row. The results of this study are expected to be used as an illustration of the characteristics of *Crishtella dentata* plants in other areas.

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on the morphological characteristics of *Christella dentata* in the Wisdom Park UGM area will be beneficial to everyone and increase our knowledge of the species involved.

Conflict of Interest: The authors declare that there is no conflict of interest regarding the conduction, analysis, and reporting of this study. All observations, data collections, and interpretations related to the morphological characteristics of *Christella dentata* were carried out objectively and independently without any financial, personal, or professional influences that could affect the research outcomes.

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