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Research Article

ETHNOBOTANICAL AND ANATOMICAL STUDY OF *Ceratopteris Thalictroides* (L.) BRONGN

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ABSTRACT

Ceratopteris thalictroides is an important aquatic fern having high medicinal value. Ethnobotanical uses of this frond were cooked and eaten as a vegetable. So the anatomical studies were carried out to avoid the misidentification of the species.

Keywords:

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INTRODUCTION

Ceratopteris thalictroides (L.) Bronan. (Parkeriaceae) is an annual aquatic fern. The comprehensive study of *Ceratopteris* was first published by Lloyd (1974) and he combined the eleven species of *Ceratopteris* into four: (1) *Ceratopteris cornuta* (2) *Ceratopteris pteridoides* (3) *Ceratopteris richardii* (4) *Ceratopteris thalictroides*. *C. thalictroides* is found growing in the tropics in marshes, pools and running streams. In shallow water the plant roots in the mud at the bottom; in deeper water, however, it is found floating freely. In some rivers it is reported as being exceedingly abundant, almost blocking up the stream with its growth. The plant has a wide geographical distribution, being found practically in all tropical regions of the globe (Ford, 1974). *C. thalictroides* is a diverse species; it was widely distributed occurring in Asia, Australia, and America. It was included in the IUCN Red List of Threatened Species (Irudayaraj, 2011; IUCN, 2011). The external morphology of the stem was great reduction, the most noticeable part of the mature plant lies in the leaves. The leaves are of two kinds, the sterile and the fertile, the latter bearing on their underside numerous scattered sporangia (Ford, 1974). The objective of the study is to identify the plant parts by anatomical study.

MATERIALS AND METHODS

C. thalictroides was collected from Idichakkaplamoodu (8°21'16.03"N & 77°08.41.07' E), Thiruvananthapuram - Dist. The temperature and the humidity were 28° C and 78% respectively.

Anatomical studies

The plant material was fixed by Sass's (1940) methods. Freehand sections of various parts were used for the anatomical studies. These sections were stained with safranin, mounted in glycerin and observed under the 10 X and 40X objective of the light microscope.

RESULTS AND DISCUSSION

Botanical description

Succulent tufted fern, up to 1 m in height (Plate -1). Rhizome short, erect, fibrous or fleshy long roots present, scaly; scales soft, uniformly pale brown. Fronds dimorphic, green; stipe 2-30 cm, fleshy, rooted, light brown, succulent, glabrous; fertile fronds erect, bi- tri pinnate, longer than sterile ones, 10 - 100 x 2.4 - 4.5cm, lanceolate; pinnae 4-6 pairs, alternate, 2 - 10 cm, petiolate lanceolate or ovate, apex acute, margins recurved; sterile fronds pinnate; lamina 1-2 pinnate, 4-38 x 3-8 cm, succulent, pinnae 3-5 pairs, 1-10x 2-4cm, alternate, petiolate, floating, oblong-elliptic or lanceolate or ovate, margin entire, apex acute; veins reticulate with small areoles, veinlets present. Sori 1-3 rows, sporangia globose, indusiate, stalked. Spores large, ribbed, 30-32 spores per sporangium, tetrahedral, trilete, yellowish brown, 80 - 120 μm, exine with characteristic parallel ridges. Fertile from July to October.

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Ethnobotanical uses

The previous researchers, Joshi *et al.*, (2019), Singh and Rajkumar, (2017) and Adebisi *et al.*, (2019) reported that its frond was cooked and eaten as a vegetable. Leaf juice was used to stop bleeding immediately, and the paste of leaves was used for skin diseases, Furthermore, it is used as medicine for foetal toxins and accumulation of phlegm. Apart from this, it is widely used as an ornamental plant in fish aquariums

Anatomical studies

The result of the present anatomical study of different parts of *C.thalictroides* was corroborated with earlier reports described by Thomae K, 1886. The dorsiventral leaf of *C.thalictroides* showed the abaxial hump is formed by the midrib. Both sides of the (adaxial and abaxial) epidermis is single-layered and thin-walled. A prominent vascular bundle is present at the midrib region with distinct endodermis and pericycle. The radial endodermal walls are fairly thick, but in the cells of the succeeding layers, the thickening becomes less until the tissue gradually merges into the surrounding parenchyma. Phloem tissues are indistinctive and a group of 6-8 xylem tracheids are present. Glandular trichomes emerged from the abaxial epidermal layer. Laminal tissues are mainly composed of spongy parenchymatous cells with large air spaces and stomata are distributed over both surfaces of epidermal layers (Plate -2). The stem showed six or more angled in the outline. The epidermis is single-layered and thin-walled. The ground tissue is formed of thin-walled parenchymatous cells with intercellular spaces. And it correlates with its aquatic life. Trabeculae of parenchyma are found bridging over the air spaces between the vascular bundles and passing across from the epidermis of the stem to nearby vascular bundles. The vascular strand is enclosed by 1-2 layered endodermis, which is formed of thick-walled cells. The endodermis is followed by a thin-walled pericycle. The stem is polystelic, bundles are five in number. The steles in the stem are of two kinds, a ring of large conspicuous steles being ranged around the periphery, and within this ring, a number of small inconspicuous steles are irregularly scattered in the parenchymatous tissue and which is already reported by Beck., 2010. And this feature resembles the character of Polypodiaceae members. The large outer bundles are very much in shape, some being circular in outline, others oval or long and narrow. Where a bundle, occurs, more parenchymatous tissue is found surrounding it. Each stele is bicollateral, but here again, owing to the incomplete differentiation of the tissues, the sieve tubes have often not yet acquired their characteristic appearance. Each stele consists of a group of tracheids 4-8 in number, and which is supported by the study of Carlquist and Schneider, 2000., i.e, members of genus *Ceratopteris* possess both tracheids and vessels in the conducting tissues. The xylem frequently abutting directly on the pericycle.. The phloem is feebly developed and cannot be distinguished from ordinary parenchymatous cells (Plate-2). And this fact is noteworthy. In general, these results agreed with the previous study of Ford., 1974.

The anatomical portion of the root was a single-layered epidermis with a wavy outline. There are elongated rootlets that emerged from the epidermal layer and it is already described by the Poirault, 1891. The mature root is traversed by large air spaces, generally, six in number, which are separated from each other by strands of tissue or trabeculae, which run across from the central cylinder to the outer peripheral layer. Central single vascular bundle with an exarch pattern of xylem arrangement

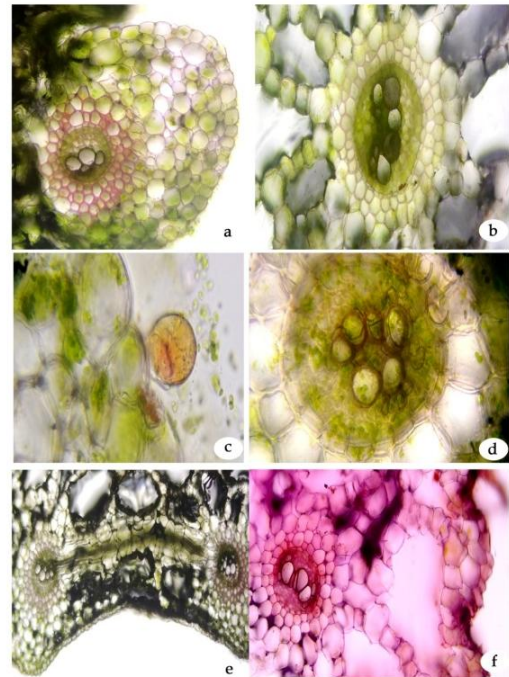
followed by phloem tissues in *C.thalictroides* was supported by the findings of Tiwari *et al.*, 1985 (Plate 2).

Plate -1 *Ceratopteris thalictroides* (L.)Brongn.



a) Habit ; b) Fertile pinnae.

Plate 2 : **Anatomical studies of *Ceratopteris thalictroides* (L.)Brongn.**



a) T.S of Stem- entire view ; b) Stem - aerenchyma chambers & vascular bundle ; c-d) Leaf - glandular trichome with leaf mid rib; e) Stem : internal connection view of Vascular bundle; f) Root : vascular bundle

CONCLUSIONS

This anatomical study is intended to identify the cellular characteristics of the fern, *C.thalictroides*.

Conflict of interests

No conflicts declared

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