

## CYCADEOIDEA (Fossil Gymnosperm)

### CLASSIFICATION

Division: Cycadeoidophyta  
Order : Cycadeoideales  
Family : Cycadeoidaceae  
Genus : Cycadeioidea

### INTRODUCTION

**Cycadeoidea** is the only genus of family **Cycadeoidaceae**, represented by **thirty species**. They are entirely extinct and resemble **cycads** in the outward **stumpy** appearance of **trunk** and an **apical crown** of **pinnate compound leaves**. This **fossil** group of plants flourished during the **Triassic** to **Cretaceous periods** of the **Mesozoic era**. They are reported from various places in the world, in India the **Cycadeoidales** are found in **Rajmahal Hills** in **Bihar**. The **petrified** trunks of ***Cycadeoidea entrusca*** are the **oldest fossil** ever collected by man.

### EXTERNAL FEATURES:

The **genus Cycadeoidea** had a **short, branched, or unbranched spherical, conical, or irregular trunk**. The diameter of the trunk is **50 cm** and the height rarely reaches a meter except in ***C. jenneyana***, it attained the height of several meters. These trunks are covered by **rhomboidal leaf bases** having **multicellular hairs** in between. Crown of **10 ft** long **pinnate compound leaves** are present at the top.

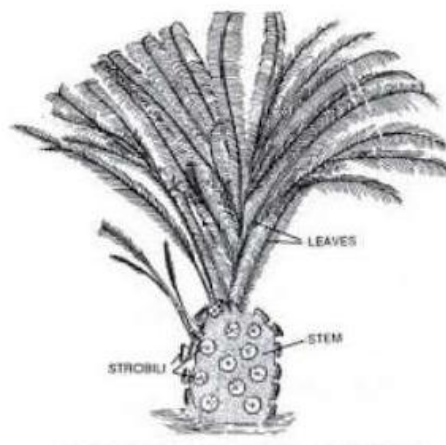


Fig.1. Cycadeoidea sp., showing external features

### ANATOMY OF STEM

The **transverse section** of the stem shows roughly a **circular** outline. The **epidermis** is not very distinct due to the presence of heavy **armor** of **leaf bases**. The **cortex** is **parenchymatous** and

traversed by **mucilage canals** and numerous leaf traces. The **primary vascular structure** consists of a ring of **endarch, collateral, conjoint, and open** vascular bundles encircling the **pith**. **Pith** is wide and **parenchymatous**. A ray-like extension passes between the **vascular bundles** that make their appearance discrete.

There is a **cambium ring** with a thin zone of **secondary wood**. The secondary wood encircles the **primary xylem** and consists of **tracheids** with **scariform** and **bordered pits**. The **secondary medullary rays** traverse the **secondary xylem** and **secondary phloem**.

The **C-shaped** leaf traces arise singly from the primary vascular strand and entering the cortex divides into several **mesarch** strands and enters straight into the leaf.

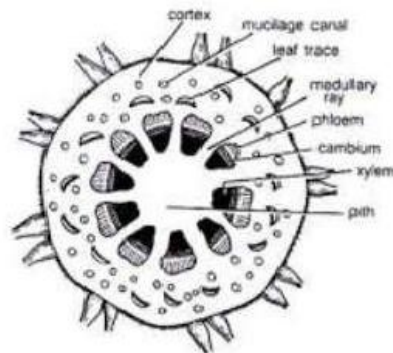


Fig.2. Cycadeoidea sp. T.S. stem showing primary structure

### ANATOMY OF LEAF

The pinnules show **xerophilous** structure. The upper and lower **epidermis** is heavily **cutinized** and thick-walled. The **mesophyll cells** are distinguished into **palisade** and **spongy parenchyma**. The vascular bundles are **mesarch** and surrounded by **bundle sheath**.

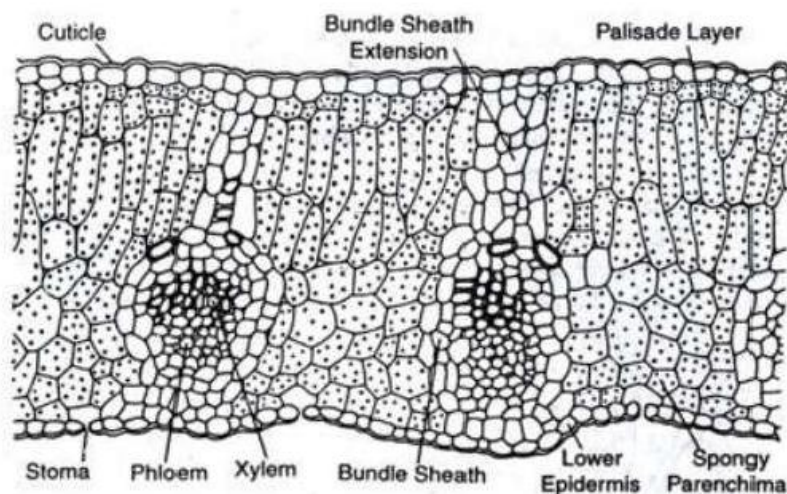


Fig.3. Cycadeoidea sp. T.S. through the pinnule

## REPRODUCTION

The reproductive structure is represented by **flowers**. In most of the **species**, the flowers are **bisexual** and arise in the **axil** of each leaf.

## STRUCTURE OF FLOWER

The flowers are **bisporangiate**, **stalked**, and **partially sunken** in the leaf base armor. Each such mature flower is **5-10 cm** in diameter and **10 cm** long. From the base of such flowers about **100 to 150 hairy bracts** arise in close spiral little below the apex. These bracts formed a **perianth** like structure and protect the **megasporangiate** and **microsporangiate** parts of a flower. The **microsporophyll or androecium** forms a whorl united at the base into a sheath. The **megasporophyll or gynaecium** consists of numerous **stalked ovules** born around a central **receptacle**. Between the ovules an **interseminal scales** with expanded tips are present. These expanded tips fused to form a continuous surface with pores, through which the **micropyle** of ovules extended. The vascular supply of flowers consists of many branches from **leaf traces**.

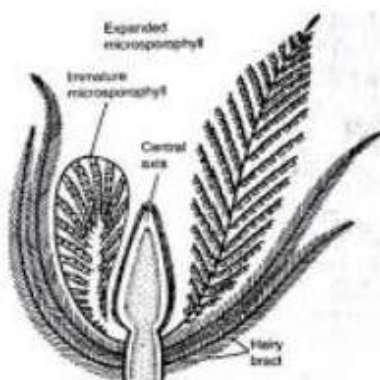


Fig.4. Bisexual flower of *Cycadeoidea dacotensis* (Weiland)

### Micrisporophyll or androecium

The **microsporophyll** is **10 to 12 cm** long, consists of a **central rachis** bearing numerous **pinnae**. The pinnae bear two rows of **bean-shaped** shortly **stalked pollen capsules** or **syngonia**. These pollen capsules are born on the **trabeculae** within the fertile region of **microsporophyll**. A line of **dehiscence** is also visible at the base of each **microsporophyll**. This suggests that the entire microsporophyll might have been shed as a unit. The **pollen capsule** or **syngonia** measures about  $3.5 \times 2.5$  mm and its wall is several layers thick, the outer layer made up of **palisade like cells**, and the inner layer is made up of thin-walled cells followed by a **tapetum**. The tapetum was not demarcated. A ring of microsporangia arranged around the periphery of each syngonium. The microsporangia dehisce longitudinally and release the **microspores** into the syngonial cavity. At maturity, the

synangia liberate these microspores outside by an apical opening that splits into two valves. The liberated **microspores** or **pollens** are **oval**, measures up to **68 $\mu$**  that represents the **male gametophytes**. Pollen grains of Cycadeoidea are **multicellular** (Taylor; 1973).

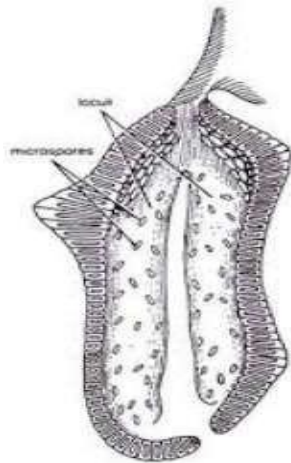


Fig.4. L.S. of synangium showing two pollen sacs containing pollen grains

### **Megasporophyll or gynaecium**

The **gynaecium** consists of a **spherical** or **conical receptacle** that bears numerous stalked **orthotropous ovules** and **interseminal scales**. Each ovule is about **1 mm** long and consists of the single **integument** that fused with the **nucellus** except at its apex (Harris; 1932). According to Lignier, in *C. morieri* nucellus is free from the integument. Each ovule has a **pollen chamber** and a **nucellar beak**. This nucellar beak is the extension of the integument. The ovules also have long **micropyle**, extended from the flat surface of **interseminal scales**. The fused tips of interseminal scales form an external protective covering or **pericarp** surrounding the **seeds**.

**Crept and Delevoryas (1972)** discovered many of **bisporangiate cones Cycadeoidea** from the **Cretaceous** of black hills. They studied the structure of these **ovules** in detail. These ovules are **urn-shaped** and resemble with the ovules of *C. wellsii*. According to them the micropyle of these ovules are funnel-shaped due to constriction below the flaring. The inner wall of the micropyle is lined with large cells, considered to be **epidermal cells**. The integument has three distinct layers. The outer flashy layer of **radially elongated cells**, the middle stony layer is made up of **thick-walled cells** and inner the inner layer is flashy.

The young nucellus is made up of thin-walled cells. The cells at the micropylar end are much elongated (**80 $\mu$  long**) in comparison to the cells of the **chalazal** end. The cell at the **nucellar tip** is pointed up to whereas cells on either side are bend outward to give the nucellus a distinct shape.

**Crepet and Delevoryas (1972)** reported a linear tetrad or row of three cells in the center of the nucellus.

The **seeds** are somewhat elongated or oval and possessed two **cotyledons**.

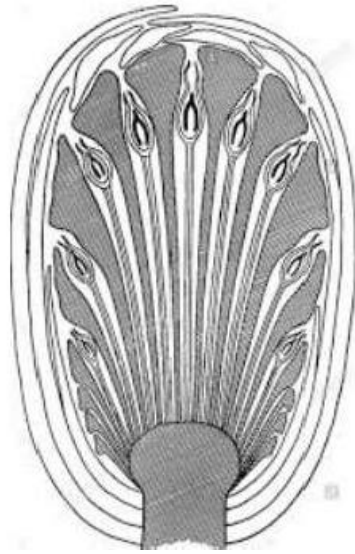


Fig.5. V.S. of *Cycadeoidea* sp. gynaecium showing convex thalamus, stalked ovules and interseminal scales.