VIVEKANANDA COLLEGE

THAKURPUKUR

KOLKATA-700063

NAAC ACCREDITED 'A' GRADE

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Name of the Department:	Botany (Morning)

Williamsonia

Introduction:

Willamson (1870) discovered from the Jurassic of Yorkshire, the fossil remains of a plant which he had named *Zamia gigas*. It had a cycad like habit, but later studies and presence of flower-like reproductive bodies showed that it actually belongs to the bennettitales. Then the name *Williamsonia gigas* was given to it. Five sp. of *Williamsonia* have been reported from the Rajmahal hills of Bihar. These are *W. sewardiana*, *W. sahni, W. microps*, *W. santalensis*, *Bucklandia indica* whose petrified trunks were discovered from Rajmahal hills is actually *W. sewardiana*.

Systematic position :

Class: Cycadopsida
Order: Bennettitales
Family: Wlliamsoniaceae
Genus: *Williamsonia*

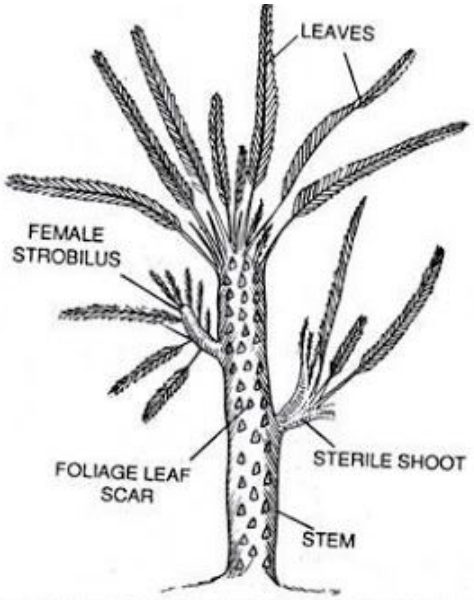


Fig. 2.21. *Williamsonia sewardiana* Sahni. Reconstruction showing a female strobilus and a sterile shoot.

External features :

Sahni (1932) reconstructed *Williamsonia* from the Jurassic period of upper gondwana of Rajmahal hills (Bihar).

Plant body is erect, stout, branched, slender with a columnar trunk about 2mt. Tall.

Trunk (stem):

- The trunk is beset with persistent rhomboidal leaf scars.
- The branching of the stem is lateral (monopodial) and projects through thick armour of leaf bases.
- Lateral branches armoured with scales and bracts are given off from the base of leaf bases.
- The upper portion of lateral branches bear foliage leaves.
- Two kinds of lateral shoots can be recognised- sterile shoot and fertile shoot that bore flowers.
- Distinct constriction is evident at the base of lateral shoots that served as a means of vegetative propagation.

Frond:

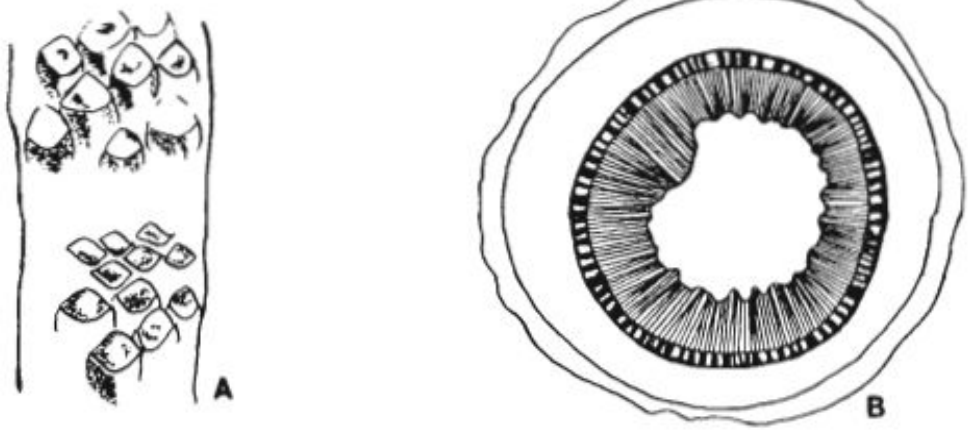
- ➢ Leaves are of two kinds- i. Simple pointed scale like leaves and ii. Pinnately compound foliage leaves.
- ➢ At the summit, there is a crown of pinnate compound fronds like of *Cycas* plant. They have been described under the name *Ptilophyllum cutchense.*
- ➢ Pinnae liner-fulcate in shape has smooth margin,
- ➢ with acute, sub-acute to obtuse apices (it is blunt or obtuse in *P. cutchense* but acute in *P. acutifolium*.)
- ➢ basal acroscopic margin round basal basiscopic margin decurrent and veins sub parallel to slightly diverging towards the apical margin.

Fig: a petrified *Williamsonia,* a) tree trunk, b) *Ptilophyllum* leaf, c) pinna showing venation

Anatomical features :

a. A cross section of trunk *(Bucklandia indica)* reveals a rough circular outline-

1. It had a wide parenchymatous cortex with secretory sacs.
2. The primary vasculature consisted of a ring of endarch conjoint and collateral vascular bundle.The combium was distinct
3. The pith was narrow and parenchymatous with secretory ducts.
4. The pith is extended between the vascular bundles in the form of uni, bi, or triseriate pith ray.
5. The secondary wood formed an extensive cylinder around the primary xylem. It was traversed by both uniseriate and bi or tri seriate secondary medullary rays.
6. The secondary wood was manoxylic consisting of scalariform bordered pitted tracheids.
7. Multiseriate bordered pits were also present. They were found on radial walls of tracheids.
8. Leaf traces were multiple but not girdling.



Text-figure 2—A, *Bucklandia*—stem; **B,** T.S. of *Bucklandia*—stem.

b. A cross section of rachis reveals the following features:

1. A double arc of collateral vascular bundles comparable to the pteridosperms,
2. Sclerenchymatous patches and sclereids are found in the cortex,
3. Single bundle arises from the upper corner of the double arc of the vascular bundle of rachis which divides into two at the base of the pinna.
4. It is repeatedly forked at different levels to form more or less parallel venations.

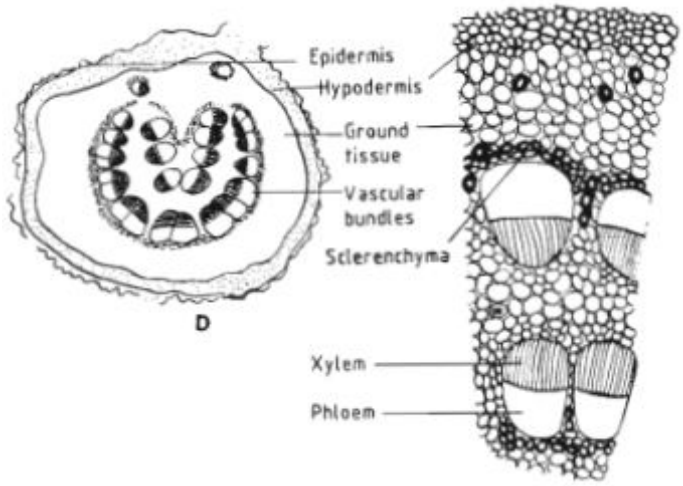


Fig: T.S of rachis

c.The anatomy of pinna (*Ptilophyllum*) shows :

1. Collateral exarch xylem with a parenchymatous bundle sheath.
2. Sclereids occur isolated or in groups in the palisade and spongy mesophyll.
3. The salient features of the leaf cuticles are hypostomatic condition with syndetocheilic stomata.

4. But vary in the pattern of distribution of stomata, papillae and its morphological differences being the main criteria for speciation.

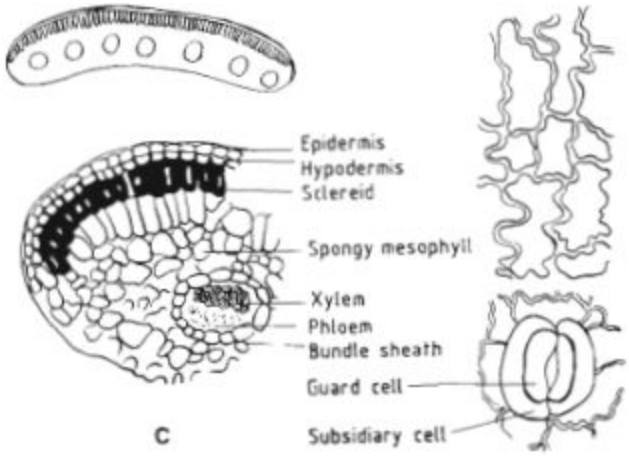


Fig: T.S of pinna

Reproductive structures:

The genus was unisexual and dioecious. The flowers were borne on lateral shoots arising in leaf axils. Every female flower was surrounded by a series of perianth like bracts, whereas in male flowers such perianth lobes were not present.

N.B : *Williamsonia gigas* possessed hermaphrodite flower *Sturiella langeri* bearing a whorled of microsporophylls borne below gynoecium by Krausel (1945) from triassic of Austria, although they were in bad state of preservation.

FEMALE FLOWERS :

Female flowers of *Williamsonia gigas* & *Williamsonia sewardiana* have been investigated in detail. Instead of strobili or cone Sporne(1965) has proposed to use the term ‘flower’ in Williamsonia. The features of female flower are discussed below:

a. RECEPTACLE :

1. They have a distinct conical receptacle surrounded by simple perianth like bract, that has scales at their bases and hair like ramenta above.
2. The apex of the receptacle is sterile in nature and naked.
3. The stalked ovules and interseminal scales were arranged in closed spirals around the conical receptacle.
4. The tip of the receptacle was naked.

b. OVULES :

5. The orthotropous ovules had short stalks that bear the body of the ovule which consisted of a single integument surrounding the nucellus.
6. The integument was fused with the nucellus and was vascularised.
7. The integument was prolonged beyond the surface layer forming micropylar beak.
8. The nucellus had a prominent pollen chamber.

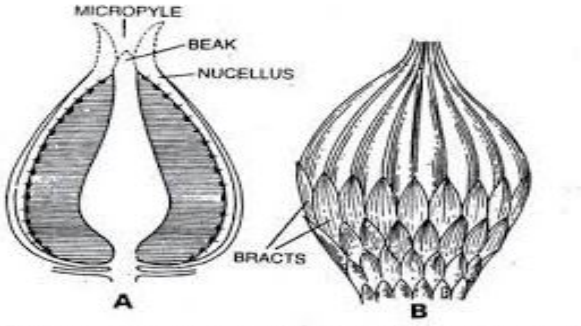


Fig. 2.22. *Williamsonia gigas*. A, V.S. of ovuliferous flower; B, floral bud.

c. INTERSEMINAL SCALES :

9. The interseminal scales were interspersed among the ovules and were fleshy structure with expanded tips that formed a protective covering with small pores through which micropyles were slightly projected.
10. These scales were supplied with vascular tissue, even stomata observed on their exposed distal surfaces.
11. Number of such scales is greater than the number of ovules.

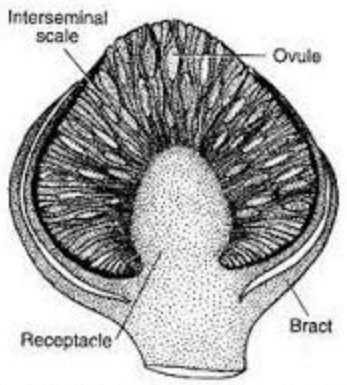


Fig. 1.29 : L.S. of cone of *Williamsonia harrisiana*

SEED:

At maturity, the ovule ripened into seeds protected by seminal scales. The seeds were dicotyledonous, stalked, endospermic. The seed coat is differentiated into three layers-

I. Outer layer composed of tubular cells.
II. Parenchymatous middle layer.
III. Inner vascularized, parenchymatous zone.

MALE FLOWER *(Wiltrichia)*:

All of them consist of a whorl of varying numbers of microsporophylls united at the base to form a cup like structure.

In ***Williamsonia spectabilis,***

- ➢ The sporophylls were branched pinnately.
- ➢ The flower measured about 9cm across above and upto 3 cm in the region of the basal cup.
- ➢ There are about 12 segments which tend to bend out horizontally and then turn abruptly upwards.
- ➢ Numerous slender branches arose from the inner side of the free ends of the microsporophyll. Each such branch bore rows of synangia. The flowers were stalked.

Fig. 6.17. *Williamsonia spectabilis.* Pollen-bearing organs. (after Thomas).

Fig. 6.18. *Williamsonia spectabilis,* showing upper side of one lobe of pollen-bearing organs. (after Nathorst).

Whereas in ***Williamsonia whitibiensis,***

- ➢ The sporophylls were branched.
- ➢ Flowers were sessile and
- ➢ The synangia were borne in 2 rows directly on the inner surface of the microsporophyll.

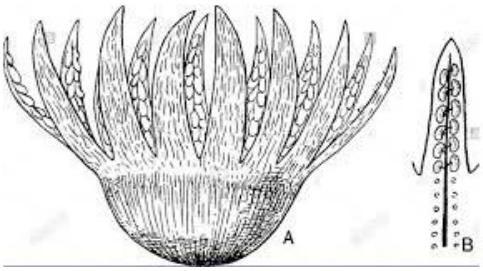
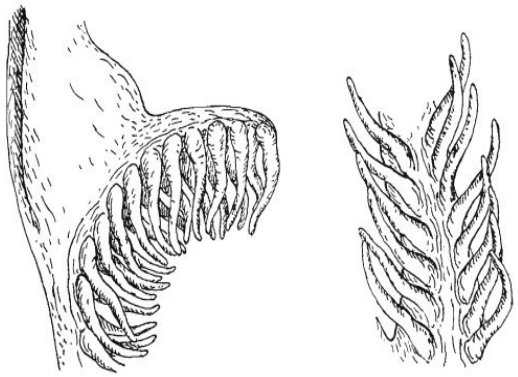


Fig: a) *W.whitibiensis* , b) a microsporophyll showing attached synangia

In ***Williamsonia santalensis***,

- ➢ Here, the basal cup was comparatively shallow
- ➢ and microsporophylls were bifid.
- ➢ Each microsporophyll is forked into two parts : a blunt sterile terminal portion and a fertile narrow side branch,
- ➢ The fertile branch of bifid sporophyll bore 2 rows of tapering fingers like appendages or synangia.
- ➢ They were arranged along the inner surface of the microsporophylls.
- ➢ Each synangium contained 2 rows of chambers which enclosed many monocolpate pollen grains.



a b

Fig: a) *W. santalensis,* the upper part of a microsporophyll with the fertile appendages in two rows, b) the lower part of microsporophyll with two rows of fertile appendages.