ISSN-0728-1801

Sub now due

ASSOCIATED SOCIETIES FOR GROWING AUSTRALIAN PLANTS

CYCAD & ZAMIAD STUDY GROUP NO. 30

JUNE - JULY, 1987

Leader: Len P. Butt - Phone No. 07 - 8483515

Asst: Brian Runnegar - Phone No. 07 - 2861164

Here we go once more hopefully to unravel the many mysteries that surround our indigenous cycads, and as always trying to get others opinions about their description, their taxonomy and just where they fit in the order of things of this great country.

You will see by this long report on Cycas media, the thoroughness the author has treated it from material given. The given height of five metres must be taken lightly, but this was probably the maximum height viewed by the collector.

I have photos of C. media on the coast with at least 8 metres in trunk height.

So far I have had little or no response regarding the data sheet included in a newsletter No. 28? I urge you all to use this sheet or pass it on to someone who will use it. John Hendricks and I would greatly appreciate your co-operation, as without it what is the sense of functioning as a study group? - Len Butt

C. media

Xylotomy of Cycas after Professor Pal Greguss

Cycas media R. Br. (1810)

The area of distribution of the species is the northern and north-eastern warm coastal zone of Australia. It is a tree reaching a maximum height of 5 m, whose leaves 50 to 120 cm long, form a tuft on the top of the stem. A compound leaf consists of about 120 leaflets of 6 to 25 cm length and 3·5 to 7 mm width.

The material examined was received from Prof. Gottwald of Hamburg who collected it on the spot.

Macroscopical examination. On the stem fragment received, the layers characteristic of the Cycads [the pith, the double vascular ring (cd, cd) and a portion of the cortex (e)] could be observed (Photo 1). Worsdell described a stem of *C. media* in which he found 12 abnormal rings.

Microscopic examination. Cross section. The pith. Unfortunately, our fragmentary sample carries but a very small portion of pith insufficient for a description of pith anatomy. Since the pith structure of the Cycads fully agrees with their cortical structure, the latter will be dealt with in rather more detail.

Vascular bundle rings. Both the xylem and the phloem of the first ring (Photo 1cd) are divided into collateral bundles by the primary pith rays. This structure repeats itself in the two abnormal rings. Hence, the wood is polyxylic as are the other Cycads (Photo 1cd, cd [× 5]).

Fig. 2. *Cycas media* (from Australian News and Information Bureau, Canberra)

Xylem ring. The xylem is twice to three times as thick as the phloem (Photo 2cd, cd [× 30]). The primary pith rays separating are 6 to 10 cell layers wide (Photo 1h). The ray cells are substantially elongate radially; their radial dimension is 200 to 220 μ, their width 30 to 40 μ. Among them, close-packed pairs, threes or fours of thick-walled sclereids are fairly frequent. Their walls consist of several layers, their lumina are narrow, almost slit-like (Photo 7 [× 100]). The normal ray cells are, on the other hand, thin walled and frequently contain calcium oxalate druses.

Occurring also in the uniseriate pith rays, these thick-walled sclereids are sharply distinct from the adjacent thin-walled ray cells.

The tracheid bands separated by the uni- and biseriate pith rays, are 3 to 8 tracheids wide. The cross sections of the tracheids are of about 50 to 60 μ diameter. Their lumina, as is the case with most tracheids, are square or slightly rounded polygonal (Photo 6c). The outline of the lumen does not follow that of the cell: the walls are triangular and somewhat thickened between the corners. Among the tracheids there are sporadic thin-walled axial parenchyma cells, most of which are in connection with the pith ray parenchyma (Photos 5 [× 200], 6 [× 200]).

Phloem. The xylem bundles are followed by 1 or 2 layers of cambium and then by the phloem bundles (Photos 2c, d, 3 c, d [× 50]). The latter are divided by the primary and also by the uni- or biseriate secondary pith rays into minor or major segments. The radial length of most pith ray cells is 80 to 120 μ, their width is 40 to 50 μ. The phloem bundle consists in its overwhelming majority of thick-walled fibres which, alternating with the phloem parenchyma cells, are arranged in plates or clusters (Photos 4 [× 100], 5). There are two types of phloem fibre, thin- and thick-walled ones. The walls of the former are 7 to 8 μ thick; those of the latter measure 12 to 14 μ. The lumina of the latter are circular or elliptical and but very seldom slit-like (Photo 4). The phloem parenchyma cells are thin walled.

At the end of the fibre bundles or near them the holes of sieve tubes can usually be observed; their diameter is 110 to 120 μ (see lower part of Photo 5). Also, there occur among them thick-walled sclereids whose number increases in the cortex (Photo 5, lower right corner).

Cortex. At the edge of the phloem ring, on the border of the cortex, the mucilage canals are arranged in a circle. Their diameter is 280 to 300 μ; their walls are lined with thin epithelial cells (Photo 7g). Around them, the parenchyma cells of the cortex are thin walled and loosely packed. Small and larger clusters of sclerenchyma fibres are rather frequent among the parenchyma cells. Their thick walls are in sharp contrast with the thin ones of the adjacent cortical cells (centre of Photo 7). The walls of most parenchyma cells are smooth and thin but some bear scattered simple pits. The thick-walled sclerenchyma fibres communicate through simple and reticular pits.

Cortical bundles. In the cortex, particularly near the mucilage canals, there are collateral vascular bundles which arrive from the pith by way of the primary pith rays. The xylem bundles may include up to 100 tracheids.

The periderm was missing from our specimen. Its structure agrees to all probability with those of the *Cycas* species examined up to now.

In the *tangential section*, most pith rays are seen to be either uni- or biseriate (Photo 8h [× 100]); broad primary pith rays are few and far between. The primary rays are 1 to 10 cell layers high; the biseriate rays are higher, and the multiseriate ones may be up to 60 cells high. The mean ray cell is 110 to 120 μ high and 30 to 32 wide. The exceedingly tiny pits arranged in axial rows in the tangential walls of some ray cells, being randomly scattered in other. Among the ray cells, exceptionally thick-walled sclerenchyma fibres occur (Photo 8h); their lumina are narrow or pin-prick-like, their walls layered. Among the ray cells, axial parenchyma cells are rather frequent; the walls of these are smooth and thin.

The walls of most tracheids are smooth but in places a definite spiral thickening, or what is more likely, a thickening resembling a scalariform perforation develops. This structure can be as readily observed in the tangential as in the radial view (right side of Photo 12 [× 600]). These exceedingly thin transverse lamellae are not sections of a spiral thickening but veritable ladder-steps, as proved by the circumstance that they flare out into a triangle before merging into the tracheid wall, which goes to show that these thin laths developed owing to the horizontal elongation of the bordered pits. On the opposite side of the tracheid, on the other hand, there are no laths but bordered pits, which fact also argues for the hypothesis just outlined.

Radial section. The pith ray cells are squares or upright rectangles; the height of the latter is 180 μ, their width 90 to 100 μ; the former are 70 to 80 μ square (Photos 9 [× 300], 10 [× 300], 11 [× 300]). Their walls are thin and unpitted. In the cross fields there are 6 to 12 simple pits, scattered or arranged in the araucarioid pattern; the lumina are slit-like or linear. In the pith rays, there are in places thick-walled parenchyma cells; in other places, no cross fields develop on the crossing of ray cells and axial tracheids.

Among the axial tracheids there are a few thin-walled parenchyma cells whose axial dimension is 250 to 300 μ; their width is 40 to 50 μ.

In the radial wall of the *tracheids* the bordered pits are arranged in 1, 2, 3 or 4 rows, partly in the araucarioid pattern, partly scattered. In such cases, the chambers are circular, the lumina linear or slit-like and the slits rather frequently placed crosswise (Photo 12).

This araucarioid pitting is almost invariably accompanied by the scalariform thickening of the radial walls, in which case the opposite tangential walls of the tracheids are connected by thin laths or broad bands creating the impression as if on the one side the tracheids communicated in their full length at least in certain sections through scalariform perforations. This structure, which can be observed not only in the tracheids in contact with the phloem but in the ones lying farthest from the phloem as well, is an interesting feature of *Cycas media*. Similar structures can be observed also in other Cycads, e.g. in *Lepidozamia hopei*. The right side of Photo 12 clearly illustrates this structure. In this photo the wall of the tracheid on the left shows araucarioid pitting while that of the adjacent one exhibits the scalariform perforation. On the distant wall of this latter tracheid, the arrangement of the bordered pits is clearly seen.

Another stem specimen of *C. media* was received from the Botanical Garden at Brisbane. Its diameter was 8 cm. From this, 2·5 cm fell to the pith, 1 cm each to the xylem and phloem ring and about 4 mm to the cortex.

The leaf bases remained on the stem whose surface was densely covered by the stumps. The width of the leaf scars was about 1·5 cm, their thickness about 5 mm. The specimen was during the long voyage attacked by mould fungi and the parenchymatous cells had rotted, but the xylem ring and the cortex remained in good condition so that sections suitable for examination could be prepared from them.