

Anatomical Structure of the Axis of *Arceuthobium minutissimum* Hook. f., the Smallest Dicotyledonous Plant

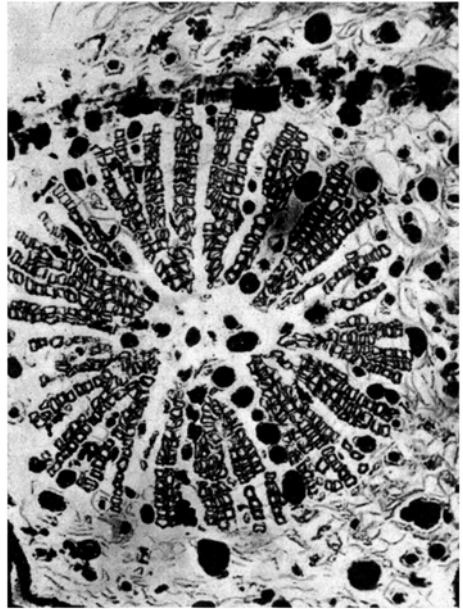
Arceuthobium minutissimum Hook. f. (*Arceuthobiae*), the most minute dicotyledonous plant, is endemic in India, and, according to HOOKER¹, it occurs as a leafless parasite restricted to a single host-species *Pinus excelsa* Wall., in the Kumaon Himalayas at an altitude of 10,700 ft. It exhibits perhaps the highest degree of adaptation to a parasitic mode of life known in the family *Loranthaceae*.

According to HOOKER¹, there is no stem but only an inconspicuous stock that ramifies within the bark which the minute branches perforate but scarcely rise above the surface, appearing as a 2-lipped cup, male flower sessile in the cup, 3–5-partite, female flower pedicelled. DATTA², however, found a hermaphrodite flower of this plant in which the positions of the cup, the petals, the minute pedicel, etc., were shown. The aerial shoot system is very much reduced, while the endophytic vegetative system is well-developed and mycelium-like, consisting of the strands and the sinkers, fuller details of which will form the subject matter of a separate communication.

In the course of the present investigation, the writer came across a few sections of the host bark containing transverse sections of the axis (the end portion of the minute pedicel of the female flower). The photomicrograph of the axis shows that xylem is more or less uniformly distributed in the form of radiating plates separated by medullary rays, which are generally 1 to 2 cells wide and are made up of non-lignified parenchyma cells. Ray cells, filled with taniferous compounds, are quite common. Xylem elements are represented by short-celled simple pitted tracheids. Vessels are completely absent. No distinct bundles are observed, but one broad and two narrower segments can be discerned which may, on careful observation, compare favourably with the Figure 287 B of *A. oxycedri*³. No phloem or phloem-like cells, or any fibre, were observed. There is a tendency to pith formation. Here the pith is made up of thin-walled rounded parenchyma cells, certain cells of which contain taniferous compounds. Outer tissues of the axis consist of thin-walled parenchyma and at places it shows a little meristematic activity, as is evident from their richer protoplasmic contents.

THODAY and JOHNSON⁴ refer to the vascular tissue of the aerial shoot of *A. pusillum* thus:—The groups of vascular tissue seen in T.S. bear a very close resemblance to sectors of an endophytic strand minus the large peripheral cells. The bulk of the group is composed of mixed xylem elements and living cells, while, on its outer margin, there are indications of meristematic activity here and there. Outside it again are cells some of which are elongated and tapering, although in contents and general characters the transition seems quite gradual from these to the typical cortical parenchyma. None of the cells show typical phloem characters. In L.S. most of the elements of the vascular strand are much longer than those of the endophytic strand. There are protoxylem elements, narrower tracheids pulled out in the reticulum. The oblique common end-walls of the tracheids often show a widening of the

reticulation to form several round pits, a feature less pronounced in the endophytic strand.



Transverse section of the axis of *Arceuthobium minutissimum* embedded in the host tissues.

Although this plant is most minute (more minute than *A. pusillum*), entirely parasitic, and much reduced in the scale of evolution within the genus *Arceuthobium*, it still exhibits a little similarity in the axis structure, when compared to its sister species *A. oxycedri*, which has well-developed aerial parts, although parasitic in nature.

In conclusion, I wish to offer my sincere and grateful thanks to Dr. S. P. AGHARKAR, Prof. of Botany (Retd), Calcutta University, under whose guidance, as a Ghose Research Scholar, I carried out this work.

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Zusammenfassung

Querschnitte der Achse zeigen, dass das Xylem nur aus kurzcelligen Tracheiden mit einfachen Tüpfeln besteht. Es ist mehr oder weniger gleichförmig in radiären Platten angeordnet und durch ein- bis zweizellige Markstrahlen getrennt, die Gerbstoffe enthalten. Anstelle ausgeprägter Leitbündel können ein breites und zwei schmale Segmente unterschieden werden. Phloem-elemente sind nicht vorhanden.

Weitere Untersuchungen zur Induktion von Keimblattveränderungen durch Röntgenstrahlen¹

In einer kürzlich erschienenen Mitteilung² wurde auf die Möglichkeit hingewiesen, Änderungen der Keimblatt-

¹ Sir J. D. HOOKER, *Flora of British India*, 5, 227 (1890).

² R. M. DATTA, *Nature* 167, 203 (1951).

³ Cf. C. R. METCALFE and L. CHALK, "Anatomy of the Dicotyledons" 2, 1191 (1950); 3, 1192 (1950).

⁴ D. THODAY and E. T. JOHNSON, *Ann. Bot.* 44, 393 (1930).

¹ Die Arbeit wurde mit Unterstützung der Deutschen Forschungsgemeinschaft durchgeführt.

² B. HACCUS und E. REINHOLZ, *Naturwissenschaften* 40, 533 (1953).