

Wood remains from Ahichchhatra, District Bareilly, Uttar Pradesh (ca. 475 B.C. to A.D. 1280)

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ABSTRACT

Srivastava Chanchala 2004. Wood remains from Ahichchhatra, District Bareilly, Uttar Pradesh (ca. 475 B.C. to A.D. 1280). *Palaeobotanist* 53 (1-3) : 161-168.

The paper describes the anatomical investigation of wood remains from an ancient mound at Ahichchhatra in Bareilly District of Uttar Pradesh along with their archaeological significance. The wood charcoals are the only botanical finds described from this ancient site. The studies have brought to light the exploitation of locally available timbers by the ancient settlers from the surrounding Sal forests in this region of Ganga-Yamuna Doab, from late Painted Grey Ware and Northern Black Polished Ware periods up to Historical levels (approximately from ca. 475 B.C. to A.D. 1280). The taxa recovered viz., *Shorea robusta* (Sal), *Terminalia tomentosa* (Laurel), *Dalbergia sissoo* (Sheesham), *Anogeissus latifolia* (Axle-wood) and *Acacia* sp. (Babul), indicate prevalence of tropical monsoon climate in the ancient times, similar to the present day conditions.

Key-words—Archaeobotany, Wood charcoals, Ahichchhatra, Uttar Pradesh, India.

उत्तर प्रदेश प्रान्त में बरेली जिले के अहिच्छत्र से प्राप्त काष्ठ अवशेष (475 ई.पू. से 1280 ई.)

चंचला श्रीवारस्तव

सारांश

यह शोध पत्र अपने पुरातात्विक महत्त्व के साथ-साथ उत्तर प्रदेश प्रान्त के बरेली जिले में अहिच्छत्र के प्राचीन टीले से प्राप्त काष्ठ अवशेषों का शारीरिक अन्वेषण अंकित करता है। इस प्राचीन स्थल से अंकित की गई काष्ठ चारकोल ही केवल वानस्पतिक प्राप्ति हैं। इस अध्ययन से, गंगा-यमुना दोआब के साल वनों के इस क्षेत्र के प्राचीन अधिवासियों द्वारा (पश्च चित्रित धूसर मृद भाण्ड एवं उत्तरी काली पोलिश मृद भाण्ड काल से ऐतिहासिक काल तक (लगभग 475 ई.पू. से 1280 ई.)) स्थानीय स्तर पर उपलब्ध काष्ठों का उपयोग प्रकाश में आया है। प्राप्त वर्गक अर्थात् *शोरिया रोबस्टा* (साल), *टर्मिनेलिया टोमेन्टोसा* (लोरेल), *डलबर्जिया सिस्सू* (शीशम), *एनोजिसस लेटिफोलिया* (एक्सल-वुड) एवं *अकेसिया* प्रजाति (बबूल) प्राचीनकाल में उष्णकटिबन्धीय मानसून जलवायु की व्यापकता का संकेत करता है जो कि विद्यमान परिस्थितियों के सदृश है।

संकेत-शब्द—पुरातत्वव्यवस्थाविज्ञान, काष्ठ चारकोल, अहिच्छत्र, उत्तर प्रदेश, भारत।

INTRODUCTION

AHICHCHHATRA (Lat. 28°22' N, Long. 79°7' E), a large city in northern India, is known in ancient literature also as Ahicchatra and Adhicchatra, the capital of N. Pancala, identified by A. Cunningham (ASI-1862-3-AR, I, p. 255-63) with the ruined fort near village Ramnagar between the Ramganga and Ghangan, 11 km north of Aonla, a tehsil headquarter, though the fort is in the revenue limits of Nusratganj, the adjacent village. The fortification, 5.60 km in circuit, rises prominently above the surrounding fields and encloses a series of rolling mounds, the highest of which, representing a ruined temple, rises to height of 23 m from the field level (Ghosh, 1989).

The Archaeological Survey of India under K.N. Dikshit (Dikshit, 1952) assisted by A. Ghosh and others conducted extensive excavations here during 1940-44. The cultural sequence was divided into four periods: Pd. I-Ochre-Coloured Ware, Pd. II-Painted Grey Ware, Pd. III-Northern Black Polished Ware, Pd. IV-Kushan and Gupta relics (IAR 1964-5, p. 39 Ghosh, 1967, 1969).

The botanical remains collected from this site are only in the form of wood charcoals. Radio-carbon dating of the wood charcoal samples collected during 1964 was done at Tata Institute of Fundamental Research, Bombay but only few of them (TF-296, 301, 310, 311 and 317) have been reported (IAR 1965-66, Ghosh, 1973, p. 91). In the year 1969 these charcoal samples left after their date-determination were sent to late Vishnu-Mittre, former Head, Department of Quaternary Biogeography and Archaeobotany, B.S.I.P., Lucknow from there by then Director General of Archaeology for identification. Out of 21 samples, only six samples were found to contain wood charcoals, studied in the paper. Culturally the charcoals broadly fall between late Painted Grey Ware and Northern Black Polished Ware deposits to Historical levels and dating from 475 B.C. to A.D. 1280.

MATERIAL AND METHODS

Only the selected pieces were processed. After repeated washing in water, they were dehydrated in ascending series of ethyl alcohol and then passed on to xylene series for clearing. The infiltration of the material was done in histo-wax (melting-point 50°-60° C) in an electric oven running at 60°C temperature

for about a fortnight. The charcoals embedded in a block of histo-wax were sectioned by Reichert sliding microtome. For obtaining the sections with tissues held together, celloid in solution in alcohol and ether, was smeared on the surface of the charcoal to be sectioned. Dewaxing of the sections was done in xylene. The thin sections revealing the desired anatomical details, were mounted in canada-balsam.

The anatomical studies of wood charcoals led the identification of different timber species in the light of their published account in literature and also by comparing the wood sections with those of their living counter parts.

SYSTEMATICS

The anatomical details of the timber taxa recovered are described collectively to avoid repetition.

ACACIA sp. (Babul)

Sample No. TF- 307

(Pl. 3.1-6)

Description—It is a diffuse-porous wood. Growth-rings indistinct to distinct, due to the occasional presence of terminal parenchyma. Vessels moderately large to small sized, solitary or in radial multiples of 2-3, round to oval in outline, often filled with gummy deposits; more or less evenly distributed, few to moderately numerous, 6-18 per mm² (av. 12.5); with the tangential diameter of 49-195 µm (av. 117.5 µm); perforations simple, inter-vascular pits bordered, alternate with orbicular aperture, vestured. Parenchyma paratracheal, paratracheal-zonate and apotracheal; paratracheal parenchyma fairly abundant, forming 1-several seriate sheath or as eyelets (aliform) round the vessels or vessel groups and extending laterally to connect two or more adjacent vessels (confluent) as paratracheal-zonate; and forming an inconspicuous line delimiting the growth rings (terminal); also apotracheal parenchyma sparsely diffuse type or in group of several cells. Fibres libriform, round to oblong in cross section, aligned in radial rows, non-septate. Rays are fine to moderately broad, 1-5 (mostly 3-4) seriate, 48-105 µm (av. 70 µm) in width; 7-15 cells and 178-416 µm (av. 300 µm) in height; homogeneous.

Affinity—The charcoal resembles most with *Acacia* species of family Leguminosae (Pearson & Brown, 1932;

PLATE I

(Wood charcoal sections from Ahichchhatra, District Bareilly, U.P.)

- | | | | |
|----|---|----|---|
| 1. | T.S. of wood charcoal of <i>Terminalia tomentosa</i> (Laurel) showing vessel and parenchyma distribution. x 40. | 4. | T.S. of wood charcoal of <i>Shorea robusta</i> (Sal) showing tylosed vessel and their distribution. gum canals arranged in a row. x 40. |
| 2. | T.L.S. of the above wood charcoal showing fine mainly uniseriate rays. x 70. | 5. | T.L.S. of the above wood charcoal showing distribution of mainly 2-4 seriate rays. x 40. |
| 3. | T.L.S. (higher magnification) of the above wood charcoal showing inter-vascular pits. x 240. | 6. | T.L.S. of the above wood charcoal showing nearly homogeneous (higher magnification) rays. x 100. |

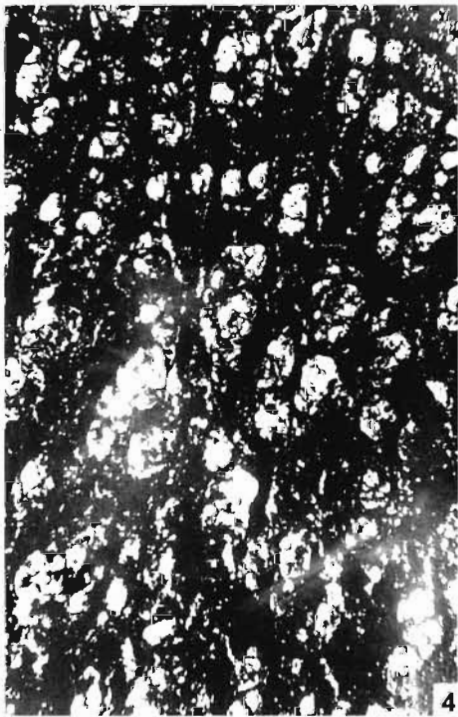


PLATE I

Ramesh Rao & Purkayastha, 1972; Chowdhury *et al.*, 1977). It can be referred to *Acacia nilotica* L. Del, abundantly growing in the region of the excavation site.

DALBERGIA SISSOO Roxb. ex Dc. (Sissoo, Shami/
Sheesham)
Sample No. TF-314
(Pl. 2.1-3)

Description—A diffuse-porous wood. Growth-rings not seen. Vessels large to medium-sized or small, oval to round, solitary as well as in radial multiples of 2-3; tangential diameter 77-187 μm (av. 122.4 μm); 9-12 per mm^2 ; perforations simple, inter-vascular pitting alternate, lenticular with vestured aperture. Parenchyma paratracheal, paratracheal-zonate and apotracheal, paratracheal parenchyma forming 1-several seriate sheath around the vessels or vessel groups, and also forms tangential extensions which end blindly or unite with those of other vessels forming paratracheal-zonate type; paratracheal-zonate parenchyma make concentric, more or less continuous bands alternating with the bands of fibres; apotracheal parenchyma scattered through the fibrous tissue. Fibres libriform, almost round in cross section, non-septate and arranged in concentric, more or less undulate bands, which are broader than the intervening bands of parenchyma. Rays fine to very fine, closely spaced, 1-3 (mostly 2-3) seriate, homogeneous as well as heterogeneous, 11-33 μm (av. 22 μm) wide, 5-8 cells and 66 to 121 μm (av. 95 μm) in height; ripple marks faintly seen.

Affinity—The above wood charcoals show the characters of leguminous group with predominantly narrow aliform-confluent parenchyma (Rao & Purkayastha 1972, p. 10). Along with this other anatomical features such as oval to round vessels, closely spaced fine rays having a faint tendency of ripple marks suggest that they belong to the member of family Leguminosae (Fabaceae), particularly *Pterocarpus* and *Dalbergia* species (Pearson & Brown, 1932). On a comparative study the unknown wood is found to match best with genus *Dalbergia* in having mostly 2-3 seriate rays with few uniseriate ones which are homogeneous as well as heterogeneous with inconspicuous ripple marks unlike *Pterocarpus*. Since *Dalbergia sissoo* is of common occurrence in the surroundings, the unknown wood is referred to the same.

SHOREA ROBUSTA Gaertn. F. (Sal)
Sample Nos. TF-297, 308, 314 & 315
(Pl. 1.4-6)

Description—It is a diffuse-porous wood. Growth-rings not seen. Vessels are fairly large-sized, oval to round, solitary as well as in radial-multiples of 2-3, heavily tylosed; tangential diameter 121 to 297 μm (av. 182.6 μm); frequency 12 to 14 per mm^2 . Parenchyma is in fair abundance, paratracheal, paratracheal-zonate, apotracheal and in bands surrounding the gum canals; paratracheal type forming a narrow sheath round the vessels and vessel groups; lateral extensions of paratracheal parenchyma confluent with adjacent rays or unite with the extensions of neighbouring vessels as paratracheal-zonate; apotracheal type relatively scanty, scattered and in short, tangential rows; parenchyma surrounding the gum ducts forming several seriate bands; gummy deposits in the cells copiously present. Gum canals aligned in tangential rows; ducts at irregular and often distant intervals, extending to long distances and embedded in the band of parenchyma. Fibres libriform, almost round in cross section, not in radial rows and forming broad tracts between the rays and the vessels; non-septate, lumina commonly filled with brownish gummy infiltration. Rays 1-5 (mainly 3-5) seriate, nearly homogeneous; 22 to 55 μm (av. 38.5 μm) wide; 15 to 40 cells and 110 to 770 μm (av. 484.00 μm) high.

There is complete anatomical similarity between the above wood charcoal and the extant *Shorea robusta* wood, of family Dipterocarpaceae.

ANOGEISSUS LATIFOLIA Wall. (Axle-wood,
Dhaura)
Sample No. TF-297
(Pl. 2.4-6)

Description—It is a diffuse-porous wood. Growth-rings not seen. Vessels very small, the majority solitary and in radial rows of 2-3, frequently in long radial rows (mostly 3-5), roundish to oval in shape, tangential diameter of vessels 44-77 μm (av. 65 μm), frequency 45-52 per mm^2 , perforation simple, inter-vascular pitting orbicular to oval or angular through crowding with wide border. Parenchyma paratracheal,

PLATE 2

(Wood charcoal sections from Ahichchhatra, District Bareilly, U.P.)

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|----|--|----|---|
| 1 | T.S. of wood charcoal of <i>Dalbergia sissoo</i> (Sissoo) showing vessel and ray distribution. x 40. | 4. | T.S. of the wood charcoal of <i>Anogeissus latifolia</i> (Axle-wood) showing closely-spaced vessels mainly in radial multiples and parenchyma distribution. x 50. |
| 2. | R.L.S. of the above wood charcoal showing heterogeneous rays. x 240. | 5 | T.S. (higher magnification) of the above wood charcoal showing vessel and parenchyma distribution. x 100. |
| 3 | T.L.S. of the above wood charcoal showing 2-3 seriate rays and their storied arrangement. x 240. | 6. | T.L.S. of the above wood charcoal showing fine mainly uniseriate rays. x 100. |

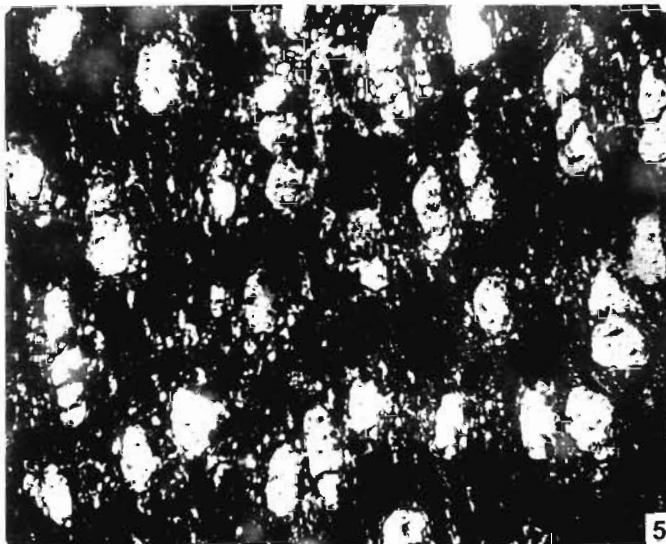
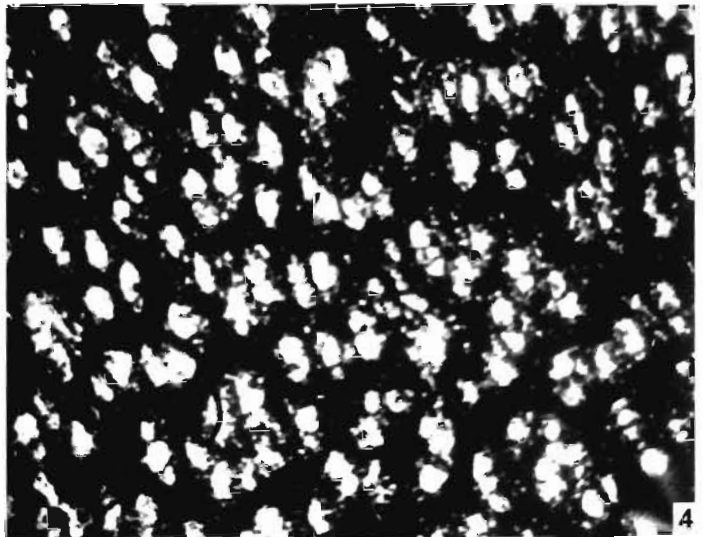
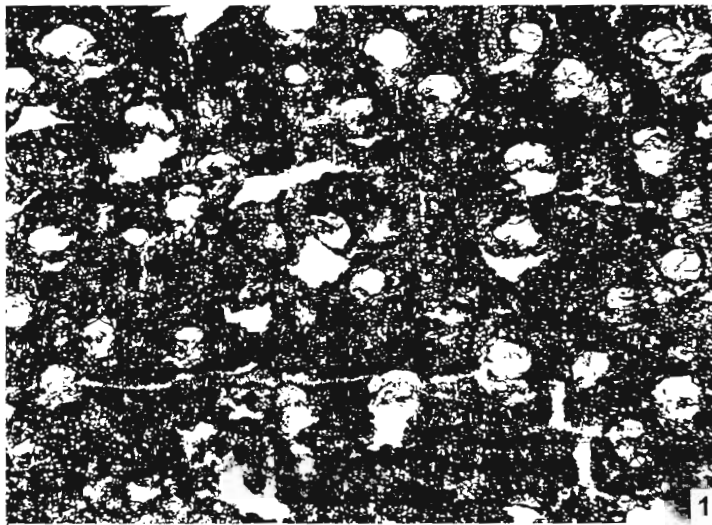


PLATE 2

paratracheal-zonate and apotracheal, predominantly paratracheal parenchyma forming a thin sheath or 'eyelet' round the vessels or vessel groups, often connecting the tangentially or obliquely arranged vessels as paratracheal-zonate type in the form of narrow connecting bands; apotracheal parenchyma sparse. Fibre semi-libriform, rounded in the transverse section and arranged in radial rows, forming extensive nearly solid tracts between the vessels and the rays, frequently septate. Rays very fine, closely spaced, 1-2 (mainly uni-) seriate, heterogeneous, 17-22 μm (av. 19.5 μm) wide, 4-12 cells and 77-275 μm (av. 176 μm) in height, crystals present in the upright cells.

Affinity—The above wood charcoal resembles with the wood of *Anogeissus* in family Combretaceae. Out of four tree species viz., *Anogeissus sericea*, *A. acuminata*, *A. latifolia* and *A. pendula* distributed in U.P. (Bor. 1953); it is more near to *A. latifolia* Wall. in having frequently septate fibre, mostly uniseriate rays, vessels in part in radial rows of 4-5 and clearly defined concentric bands of parenchyma (Pearson & Brown, 1932).

TERMINALIA TOMENTOSA W & A. (Laurel)

Sample Nos. TF- 309, 314 & 315
(Pl. 1.1-3)

Description—It is a diffuse-porous wood. Growth-rings faintly distinct, delimited by a ragged and more or less undulate fine line of parenchyma. Vessels are medium to large-sized, oval to round in shape, solitary and in radial multiples of 2-4, tangential diameter 110-275 μm (av. 174.6 μm); frequency 5-9 per mm^2 ; more or less evenly distributed, perforations simple, inter-vascular pitting alternate, orbicular to oval or angular through crowding with linear-lenticular orifice and vestured. Parenchyma is fairly abundant, paratracheal, apotracheal and initial type, paratracheal predominantly aliform with short lateral extensions, sometimes becoming confluent connecting adjacent vessels, initial parenchyma delimiting the growth-ring as a fine more or less continuous line; apotracheal diffuse type. Fibre non-libriform, frequently septate, more or less aligned in radial rows and forming broad tracts between the rays and the vessels. Rays very fine, closely spaced, uniseriate or occasionally with paired cells, homogeneous, 11-22

μm (av. 16.5 μm) wide, 4 to 7 cells and 110-418 μm (av. 231 μm) in height.

Affinity—The anatomical characters of the above wood charcoal bring it close to *Terminalia tomentosa* W & A i.e., Laurel of Combretaceae.

ARCHAEOLOGICAL SIGNIFICANCE

The decline of the Indus Valley civilization by 1200-1000 B.C. in western U.P. was followed by the growth of several incomplete settlements in North India in the upper plains of the river Ganges. Collectively termed as the Painted Grey Ware Culture, some of its important settlements have been excavated at Ahichchhatra, Hastinapur in western Uttar Pradesh (Lal, 1954-55) and Purana Quila in Delhi. The epicentre of the Painted Grey Ware culture (1100-600 B.C.) was in the Ganga-Yamuna Doab, and the main excavated sites are Hastinapur, Alamgirpur, Kausambi, Atranjikhhera and Ahichchhatra.

Towards the end of second millennium B.C., discovery of Iron was by far the most important factor that heralded a new era in the cultural advancement in the Indian subcontinent. A new stimulus and technology emerged by the use of iron as a principal metal for food production, which affected more effectively the forest clearance to obtain extensive tracts for settlement and agriculture.

The anatomical investigation of wood charcoals from the ancient site at Ahichchhatra, district Bareilly in western parts of U.P. has revealed the use of five types of timber taxa viz., *Acacia* sp., *Anogeissus latifolia*, *Dalbergia sissoo*, *Shorea robusta* and *Terminalia tomentosa* by the ancient settlers during 475 B.C. to A.D. 1280; culturally falling between late Painted Grey Ware and Northern Black Polished Ware deposits to Historical levels by the author (see Saraswat *et al.*, 1987, 1990). There is no idea of the uses that the settlers made of them, because no wooden artifact has been recovered so far.

Sissoo (*Dalbergia sissoo*), Sal (*Shorea robusta*) and Babul (*Acacia nilotica*) grow in the plains of north India (Brandis, 1971; Pearson & Brown, 1932; Troup, 1921) and are now in much demand because of their excellent working qualities. Sissoo is a large deciduous tree, its branches and

PLATE 3

(Wood charcoal sections from Ahichchhatra, District Bareilly, U.P.)

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|----|---|----|---|
| 1. | T.S. of wood charcoal of <i>Acacia</i> sp. (Babul) showing vessel and parenchyma (mainly paratracheal-vasicentric type) distribution. x 40. | 4. | T.S. of another wood charcoal of <i>Acacia</i> sp. (Babul) showing vessel and parenchyma (paratracheal and terminal type) distribution. x 40. |
| 2. | T.L.S. of the above wood charcoal showing ray distribution. x 100. | 5. | T.L.S. of the above wood charcoal of <i>Acacia</i> sp. (Babul) showing ray distribution. x 200. |
| 3. | T.L.S. of the above wood charcoal (higher magnification) to show ray width. x 200. | 6. | R.L.S. of wood charcoal of <i>Acacia</i> sp. (Babul) showing homogeneous rays. x 200. |

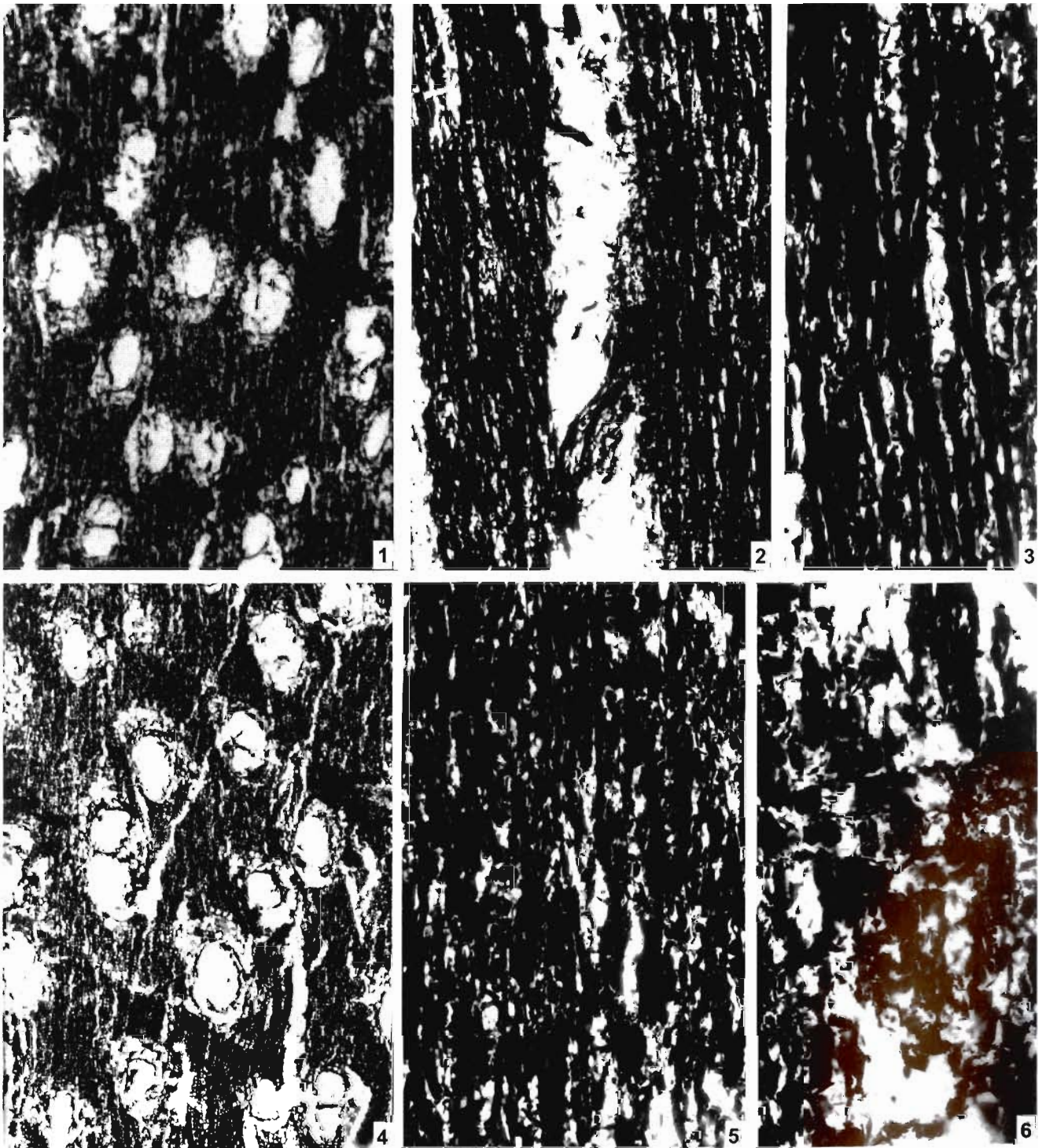


PLATE 3

waste wood form an excellent fuel. Sal is the most important timber yielding tree in the upper Gangetic plain (Duthie, 1960; p. 71). Laurel (*Terminalia tomentosa*) is a large deciduous tree which is also confined to the plains of North India and is one of the important commercial timbers of the north. It is common in all the forests within the area. In the Sal forests, *Anogeissus latifolia* is one of principal associates of Laurel, besides Sal. All these were exploited by the ancient settlers as they were available in plenty in the surrounding forest of the excavation site.

In the Upper Ganga-Yamuna Doab, the exploitation of the timbers of *Acacia* sp., *Dalbergia sissoo* and *Shorea robusta* is well known from their wood charcoals at ancient Atranjikhera in District Etah of U.P. from much earlier cultural settlement i.e. Ochre Coloured Pottery dated to ca. 2,000-1,500 B.C. and that of *Terminalia tomentosa* from the following Northern Black Polished Ware Horizon dated to ca. 600-200 B.C. (Chowdhary *et al.*, 1977; Saraswat, 1992). In western Uttar Pradesh timber utilisation of *Dalbergia sissoo* is also known from its wood charcoals by ancient settlers at Hastinapur in district Meerut, a site of contemporary cultural settlement dated to ca. 900-500 B.C. (Chowdhury & Ghosh, 1954-55).

Climate of ancient site Ahichchhatra is to great extent similar to that of the other districts in western Uttar Pradesh. It has been given the name tropical monsoon climate. Inhabitants of this ancient site had considerable experience with the forest flora of that time in order to enable them to exploit the timbers of good working quality. In view of the wood remains discussed in the present paper, it appears ancient settlers at Ahichchhatra exploited the locally available timbers from the surrounding forests in the region.

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