

## ***Bombacoxylon owenii* (Carr.) Gottwald from Gebel Shabraweet, Eastern Desert, Egypt**

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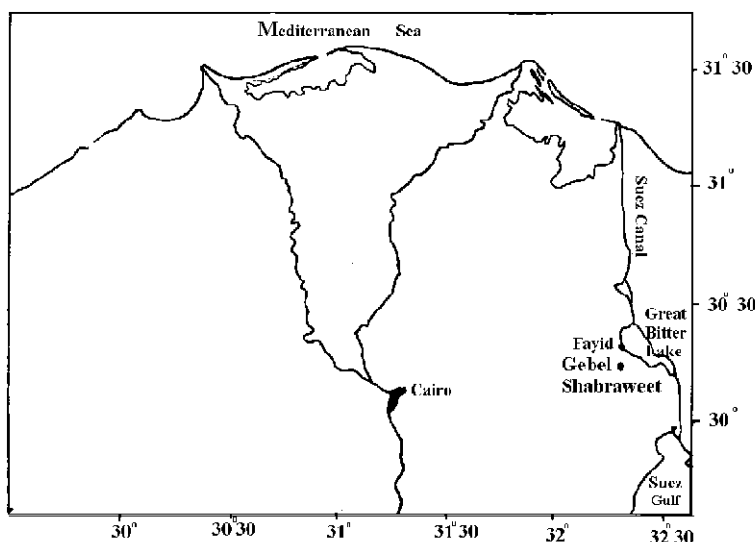
*Bombacoxylon owenii* (Carr.) Gottwald (Bombacaceae), was widespread in Egypt in ages ranging from Oligocene to Quaternary. This is the first record of this species from Gebel Shabraweet. Comments on the distribution of all species of *Bombacoxylon* in the world are given.

**Key words :** *Bombacoxylon*, fossil wood, Gebel Shabraweet, Oligocene, wood anatomy.

### **Introduction**

*Bombacoxylon owenii* had wide distribution in Egypt. It had been reported from 23 sites (Kräusel & Stromer, 1924; Kräusel, 1939; Youssef, 1993; Kamal El-Din, 1996). Most of these sites exist in the Western Desert and a few in the Eastern Desert. It has a long vertical extension from Oligocene to Quaternary (cf. Kräusel, 1939).

This is the first record of fossil wood (*Bombacoxylon owenii*) from Gebel Shabraweet, which lies in the northern part of the Eastern Desert (latitude 30° 18' and longitude 32° 17'), about 5 km to the south of Fayid city (Fig. 1). It is an Oligocene site.



**Fig. 1:** Map showing location of Gebel Shabraweet (study area).

The aim of this paper is to provide a detailed description of the wood structure of the new specimens of *Bombacoxylon owenii* and to compare it with earlier descriptions from other sites in Egypt and other parts of the world. It aims also to discuss the global distribution of genus *Bombacoxylon*.

### **Materials and Methods**

Two loose hand specimens were collected in 1997 from Gebel Shabraweet. The two specimens are about 17-20 cm in length and 6-8 cm in diameter. Thin ground cross, tangential and radial sections were prepared according to the method described by Lacey (1963). The specimens and the prepared slides are numbered and deposited in the palaeobotanical collection of the Department of Botany, Ain Shams University. Careful study showed that the two specimens belong to *Bombacoxylon owenii*.

### **Description**

The following description of *B. owenii* is in accordance with the format of IAWA list of the features suitable for hardwood identification (IAWA Committee, 1989).

Family : Bombacaceae

Genus : *Bombacoxylon* Gottwald 1969

Species : *B. owenii* (Carruthers) Gottwald 1969

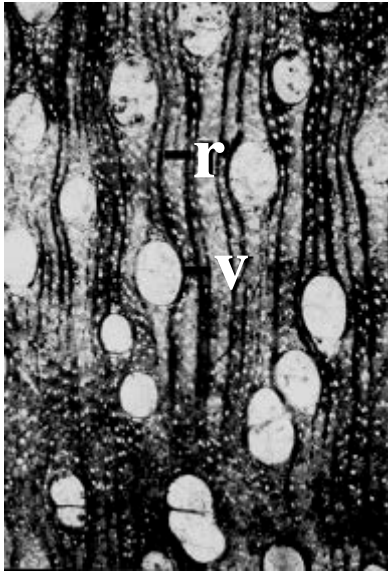
### ***B. owenii* (Figs. 2 – 6 )**

Growth rings boundaries intermediate between distinct and indistinct. Wood diffuse to semi-ring-porous. Vessels large, solitary or in radial multiples of 2-4 ( mostly in pairs), elliptic in shape, in diagonal pattern. Tangential diameter 200-260  $\mu\text{m}$  ( mean 220  $\mu\text{m}$ ), radial diameter 330-420  $\mu\text{m}$  (mean 350  $\mu\text{m}$ ). Vessels per sq. mm 2-5. Perforation plates simple with horizontal to oblique end walls. Intervessel pits alternate. Mean vessel element length 430  $\mu\text{m}$ . Tyloses present.

Axial parenchyma mainly apotracheal diffuse in aggregates and paratracheal scanty to vasicentric but with narrow sheath. In LS parenchyma occur in strands.

Rays biseriate and a few uniseriate, 14-25 cells in height, 330-450  $\mu\text{m}$  in length (mean 400  $\mu\text{m}$ ), mostly ended by a row of 2-3 cells, storied, homogenous with procumbent cells. Tile cells present (pterospermum type).

Fibers with simple to minutely bordered pits, nonseptate and have very thick walls.



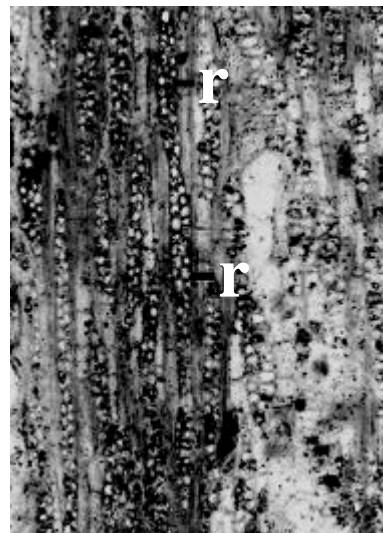
**Fig. 2:** Cross-section of *Bombacoxylon owenii* showing diffuse to semi-ring-porous wood, solitary vessels, paired vessels and diffuse parenchyma, x 30. (v = vessel, r = ray).



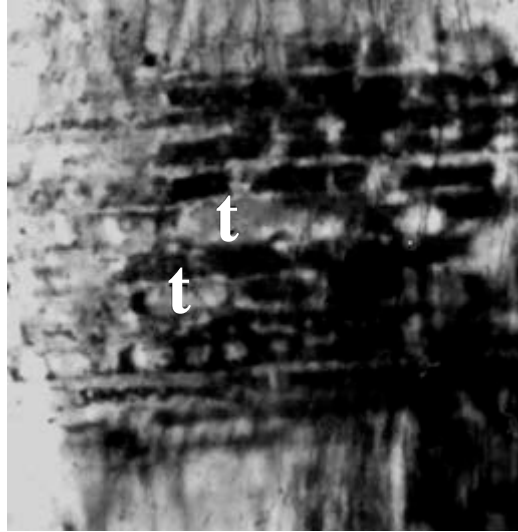
**Fig. 3:** Cross-section of *Bombacoxylon owenii* magnified to show scanty paratracheal and aggregates of diffuse apotracheal parenchyma, rays, paired vessels and tyloses, x 65. (v = vessel, r = ray)



**Fig. 4:** Tangential-section of *Bombacoxylon owenii* showing mainly biseriate rays, x 50. (r = ray).



**Fig. 5:** Tangential-section of *Bombacoxylon owenii* magnified to show storied biseriate rays, x 50. (r = ray)



**Fig. 6:** Radial-section of *Bombacoxylon owenii* magnified magnified to show procumbent cells and tile cells (t = tile cell ), x 100 .

### Comparisons and Discussion

**Table 1a.** Wood structure of *B. owenii* from Gebel Shabraweet is compared here with that described from other mainly Tertiary sites in Egypt, as given below.

Features	Sites, ages and reference			
	21 sites in Egypt, Tertiary and Quaternary, Kräusel (1939)	West of Giza Pyramids, Miocene, Youssef, (1993)	Gebel El-Khashab (southern forest), Miocene, Kamal El-Din (1996)	Gebel Shabraweet, Oligocene, Present work
Mean tangential diameter	200 µm	260 µm	240 µm	220 µm
Mean radial diameter	300 µm	410 µm	-	350 µm
Mean vessel element length	400 µm	-	500 µm	430 µm
Vessels per sq. mm	1-6 (mostly 2-3)	-	4-8	2-5
Rays	Up to 40 (mostly 10-20) cells in height	6-20 cells in height	Up to 35 cells in height	14-25 cells in height

Table 1a shows that the characteristic features of *B. owenii* from Gebel Shabraweet are slightly different from those of other parts of Egypt and the closest description to it is that given by Kräusel (1939). It must be mentioned, however that the description of *B. owenii* by Kräusel (1939) is apparently based on the study of specimens collected from 21 sites in Egypt ranging in age from Oligocene to Quaternary.

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Specimens of *B. owenii* from Gebel Shabraweet are further compared with specimens described from other parts of the world (Table 1b).

**Table 1b.** Anatomical features of *B. owenii* from different ages and different countries of the world.

Features	Sites, ages and reference				
	Sahara West of Tunisia, Oligocene, Gottwald (1969)	Algeria, Neogene, Koeniguer (1972)	Ethiopia, terminal Cretaceous-Eocene, Beauchamp & Lemoigne (1973b)	France (Bas-et-Lezat), Oligocene, Privé-Gill & Pelletier (1981)	Egypt (Gebel Shabraweet), Oligocene, this work
Mean tangential diameter	200 µm	130-220 µm	250 µm	200 µm	220 µm
Mean vessel element length	425 µm	-	-	-	430 µm
Vessels per sq. mm	-	5-6	3-5	3-5	2-5
Rays	6-28 cells in height	-	1-4 seriate	2-19 cells in height	14-25 cells in height

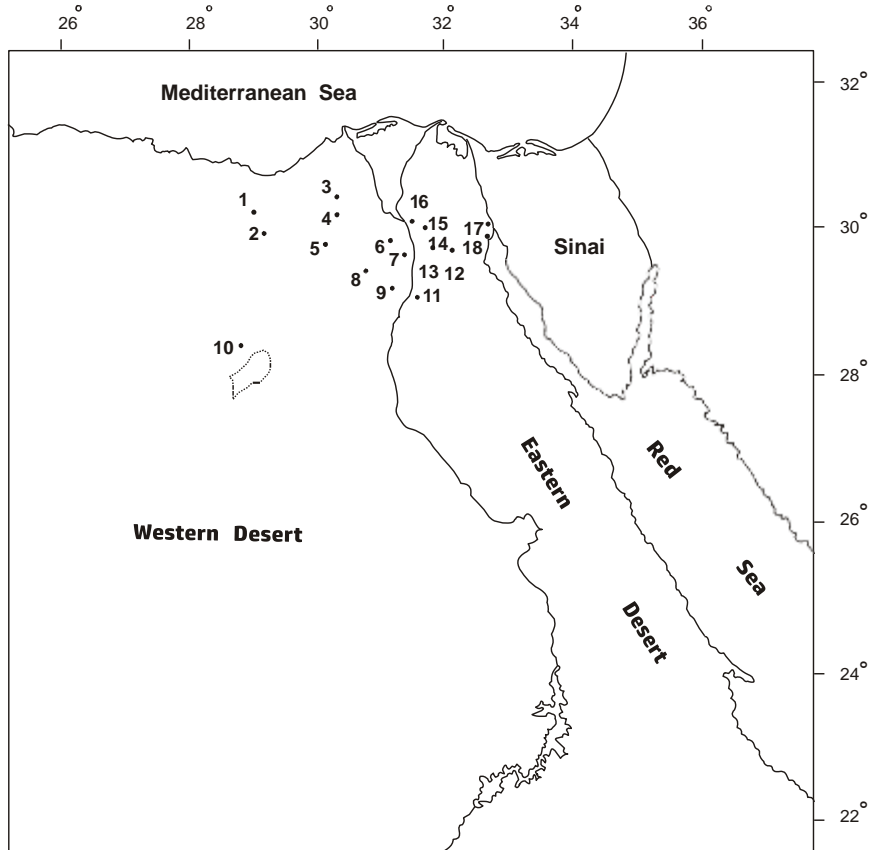
It will be noticed that, *B. owenii* specimens described by Gottwald (1969) from Tunisia are the nearest in anatomical features to specimens from Gebel Shabraweet, even nearer than description given by Kräusel (1939).

The geologic age of *B. owenii* in Egypt ranges from Oligocene to Quaternary. However, it seems to have been most widespread in the Miocene since the number of sites was largest during that age compared to earlier and later ages (Fig. 7): Oligocene (7 sites; Qattamiya, Mokattam, Gebel Ahmer, Bir El-Fahme, Turra, Wadi Ankebieh and Fayum), Oligocene-Miocene (3 sites; Bahariya, Giza Pyramids and Gebel El-Khashab "northern petrified forest" ), Miocene (10 sites; Wadi Faregh, Garet Aujan, Dêr Baramûs, Bir Lebuk, Moghara, Wadi El-Natron, Gebel Geneffe, Suez, west of Giza Pyramids and Gebel El-Khashab "southern petrified forest"), Pliocene (2 sites; Gebel Ahmer and Wadi Sanur) and Quaternary (one site; Birket Qerûn).

Specimens of more or less similar age (Tertiary and Quaternary) are known also from Asia (Jordan or Israel, Pakistan), Europe (France, Sardinia) and Africa (Algeria, Ethiopia, Libya, Rio de Oro, Somalia and Tunisia). However, in Africa (Ethiopia) specimens as early as terminal Cretaceous-Eocene have been reported (Kräusel, 1939; Koeniguer, 1966, 1967, 1972; Gottwald, 1969; Beauchamp & Lemoigne, 1973 a, b; Beauchamp *et al.*, 1973; Louvet, 1973; Privé-Gill & Pelletier, 1981; Boureau *et al.*, 1983; Dupéron-Laudoueneix & Dupéron, 1995; Dupéron *et al.*, 1996)

Genus *Bombacoxylon* comprises seven species, which are known from Africa except *B. owenii* which exists in Asia and Europe besides Africa as well as *B. langstoni* which has been discovered recently (Wheeler & Lehman, 2000) from USA as shown in Table 2.

Table 2 shows that four species of *Bombacoxylon* occur in Ethiopia, justifying the idea that Ethiopia (Africa) may be the center of evolution of *Bombacoxylon*, especially that *Bombacoxylon* had a much longer vertical extension in that continent.



**Fig. 7.** Map showing the sites of *Bombacoxylon owenii* reported from Egypt, based on Kräusel (1939), Youssef (1993) & Kamal El-Din (1996). 1- Bir Lebuk, 2- Moghara, 3- Wadi El-Natron, 4- Dèr Baramûs, 5- Wadi Faregh and Gareh Aujan, 6- Gebel El-Khashab (southern and northern petrified forest), 7- Giza Pyramids and west of Giza Pyramids, 8- Birket Qerûn, 9- Fayum, 10- Bahariya, 11- Wadi Sanur, 12- Wadi Ankebieh, 13- Qattamiya, 14- Mokattam, 15- Gebel Ahmer and Bir El- Fahme, 16- Turra, 17- Gebel Geneffe, 18- Suez.

Table 2 also shows that *B. owenii* is the most widespread species of *Bombacoxylon* being represented in Asia, Europe and Africa, where it was reported from seven countries. Further more *B. owenii* was the most common tree in the Oligocene forests of Egypt. Thus Kamal El-Din (1996) reported 39 well preserved dicot tree trunks from the site of the petrified forest at Gebel El-Khashab, 21 out of which were found to belong to *Bombacoxylon owenii* (Fig. 8) and the rest (18) were related to 7 other species.

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**Table 2.** Distribution of the seven known *Bombacoxylon* species in different countries of the world:

Species name	Age	Country	Reference
1- <i>B. affine</i> (Felix) Gottwald	Tertiary	Ethiopia	Felix, 1887; Gottwald, 1969; Privé-Gill & Pelletier, 1981; Dupéron- Laudoueneix & Dupéron, 1995
2- <i>B. bombacoides</i> (Bancroft) Kräusel	Miocene	Kenya	Bancroft, 1932; Kräusel, 1939; Privé-Gill & Pelletier, 1981; Dupéron- Laudoueneix & Dupéron, 1995
3- <i>B. gallettii</i> Beauchamp & Lemoigne	terminal Cretaceous- Eocene	Ethiopia	Beauchamp & Lemoigne, 1973 a, b; Privé-Gill & Pelletier, 1981; Dupéron- Laudoueneix & Dupéron, 1995
4- <i>B. grambastii</i> Lemoigne	Pliocene- Quaternary	Ethiopia	Lemoigne, 1978; Privé-Gill & Pelletier, 1981; Dupéron- Laudoueneix & Dupéron, 1995
5- <i>B. monodii</i> (Boureau) Gottwald	Tertiary	Algeria and Mali (Sudanese Sahara)	Boureau, 1949; Gottwald, 1969; Privé-Gill & Pelletier, 1981; Dupéron- Laudoueneix & Dupéron, 1995.
6- <i>B. owenii</i> (Carr.) Gottwald	terminal Cretaceous- Quaternary	Jordan or Israel, Pakistan, France, Sardinia, Algeria, Egypt, Ethiopia, Libya, Rio de Oro, Somalia & Tunisia	Kräusel & Stromer, 1924; Kräusel, 1939; Koeniguer, 1966, 1967, 1972, Gottwald, 1969; Beauchamp & Lemoigne, 1973 a, b; Beauchamp <i>et al.</i> , 1973; Louvet, 1973; Privé-Gill & Pelletier, 1981; Boureau <i>et</i> <i>al.</i> , 1983; Youssef, 1993; Dupéron- Laudoueneix & Dupéron, 1995; Dupéron <i>et al.</i> , 1996; Kamal El-Din, 1996.
7- <i>B. langstoni</i> Wheeler & Lehman	Late Cretaceous	USA	Wheeler & Lehman, 2000



**Fig. 8.** One of the 21 *Bombacoxylon owenii* trunks found at the site of the southern petrified forest at Gebel El-Khashab.

In addition, an eighth species of *Bombacoxylon* reported by Kamal El-Din (1996) from Gebel El-Khashab, and believed to be new to science, will be the subject of a future publication.

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