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INTRODUCTION

Literature on the geology (e.g. Hlankomorn, 1901 ; Gardner, 1927) and geography (Butzer, 1959) of Egypt includes reference to the occurrence of fossil Tamarix in various places in the country especially in Pleistocene deposits of El-Fayum. This, however, is the first botanical work on fossil remains of Tamarix collected from that Province.

LOCALITY

Specimens of silicified roots of Tamarix were collected a few years ago from the Pleistocene diatomaceous earth at Dimai (Dimê), north of Lake Qarun in El-Fayum (see the Map in Fig. 1). The fossil roots were associated with silicified fragments of shoots of Phragmites (El-Saadawi et al 1975). Fossil diatoms also occur in the fossiliferous area (El-Saadawi et al 1979) which represents shore-line deposits of the old fresh water Pleistocene Moeris Lake (see the Map in Fig. 1).



PLATE III

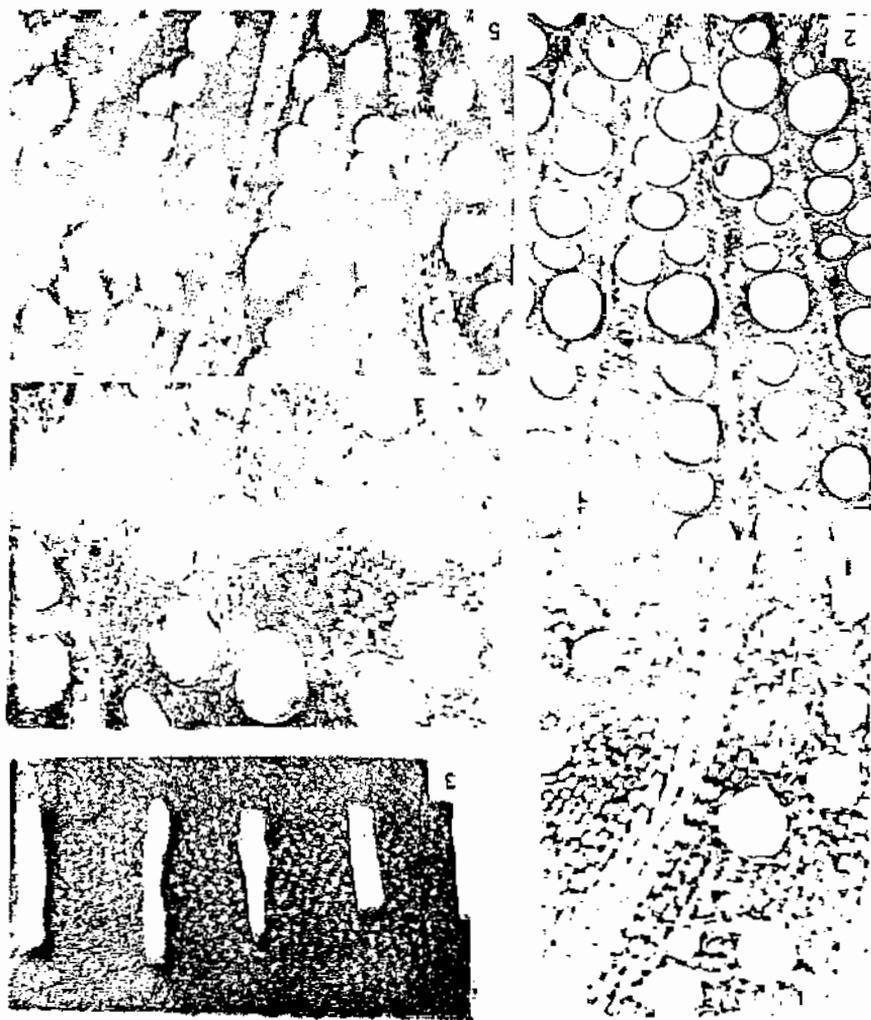


PLATE II

obtained are : T. amplexicaulis Ehrenb., T. aphylla (L.) Karst., T. arborea Bunge, T. nilotica (Ehrenb.) Bunge, and T. tetragyna Ehrenb. Transverse and tangential sections of roots of these species were prepared and stained as usual with living plant material.

DESCRIPTION AND COMPARISON

The fossil root fragments are small being a few centimeters long and about half a centimeter in diameter (Pl. II, Fig. 3). They are of whitish colour and radial vascular rays and feeble annual rings were easily seen by naked eye in transversely cut faces of the root fragments.

Data concerning the main anatomical features of the secondary xylem of roots of all Tanarix species studied are given in Table 1. Figures illustrating these main features of vessels and rays of secondary xylem of all species concerned are given on Plates II - IV. Reference to specific figures of each species is given also in the table.

The table shows that the anatomical features of the fossil root specimens are different from those of all other species. However, the extent of difference varies and is least toward the extant species T. aphylla. Concerning the dead specimens the least difference lies between them and the extant species T. nilotica. This means also that the fossil and dead specimens, though collected from one locality, yet they might belong to two different species.

TABLE 1

CHARACTERISTIC FEATURES OF ROOT SECONDARY XYLEM RECORDED FROM
MOSSIL, DEAD, AND FIVE OF THE ENHART TAMARIX SPECIES.

101	Features	Species spp.	Resist. Generic	Dead Generic	Embryile	Embryile	Embryile	Embryile	Embryile	Embryile	Embryile
1-	Qty. of vessels per sq. mm.	30 - 33	20 - 22	24 - 34	19 - 22	25 - 33	35 - 40	35 - 42			
2-	Shape of vessels in transverse sections	circular (oval)	circular, rarely oval	circular, rarely oval	circular, sometimes oval	oval & circular	oval & circular	circular & oval			
3-	Arrangement of vessels	alternate and opposite	oppositional, some or in single rows	alternate	alternate, opposite	alternate and opposite	alternate and opposite	alternate			
4-	Radial diameter of vessels	36 - 127 μ	54 - 313 μ	36 - 108 μ	55 - 182 μ	36 - 109 μ	36 - 109 μ	36 - 73 μ			
5-	Vertical extent of vessel	very rare	very rare	very rare	present	common	common	common			
6-	Orientation of rays	multiseriate (2-6)	multiseriate (2-6)	multiseriate (2-5)	multiseriate (2-10)	multiseriate (2-10)	multiseriate (2-5)	multiseriate (2-7)			
7-	Qty. of xylem rays per sq. mm.	4 - 5	4	3 - 5	3 - 7	4 - 5	5 - 7	6 - 8			
8-	Ray height in T.L.S.	0.45-1.73 mm.	36 - 73 μ	36-91 μ	0.364-0.91 mm.	1.092-2.184 mm.	0.364-0.91 mm.	0.45-0.91 mm.			
9-	Ray width in T. L. S	(Pl. II, Fig. 4; Pl. IV, Fig. 1)	(Pl. II, Fig. 2; Pl. IV, Fig. 2)	(Pl. I, Fig. 1; Pl. IV, Fig. 4)	(Pl. I, Fig. 5; Pl. IV, Fig. 3)	(Pl. III, Fig. 4)	(Pl. III, Fig. 1, 5)	(Pl. III, Fig. 2, 3)			

DISCUSSION AND CONCLUSION

The comparisons show that neither the fossil nor the dead specimens are identical with any of the studied extant species. This, however, does not mean that two new species should be erected for the fossil and dead plants because the comparison is incomplete for the two following reasons :

1. Some of the extant species of Tamarix that grow in Egypt (T. effusa Ehrenb. and T. passerinoides Del. ex Desv.) have not been included in the comparison.

2. The range of variation of each of the studied characters should be verified by recording the extent of character variation in relation to changes in natural habitat conditions for each species.

Although many specimens of Tamarix (shoots and roots in each case) have been collected from various places in Cairo, Giza, and El-Fayum Provinces yet none of them proved to belong to T. effusa or T. passerinoides though carefully looked for. These two species are among the rare Egyptian Tamarix species Thöckholm (1956, 1974). Herbarium specimens of these rare species, and indeed of all Tamarix species, include only parts of the shoot system but not the root.

It must be mentioned also that our present state of knowledge of the extant Egyptian species of Tamarix is far from complete and Thöckholm (1974) stated that the whole genus is in need of a thorough revision. For example in 1889 Ascherson and Schweinfurth reported 8 species of Tamarix from Egypt, so also did Thöckholm in 1956 but in 1974 she mentioned only 5 species and incorporated some of those mentioned earlier by her and by Ascherson & Schweinfurth in some others. For example T. arborea and T. nilotica which were first treated as two distinct species were later

treated as synonyms. The present study, however, shows that these two species, though close together yet they, are not identical concerning the studied root features. This means that they should perhaps be kept as two distinct species or as two varieties of a single species. The final answer to this, however, requires further investigations in the morphological and anatomical features of the various organs of these two plants. This in fact applies to all other species of the genus.

The above mentioned publications of Ascherson & Schweinfurth and Täckholm show also that there is controversy concerning the geographical distribution of the various Tamarix species within the Egyptian territory. Further collection and investigation of new and old collections is therefore still required.

It may be said in conclusion that although the present study has thrown more light on the extent of the problem of the taxonomy of the genus Tamarix yet it did not solve it and indeed it might have added to its complexity by introducing two new plants (fossil and dead) that still require taxonomic treatment. A more extensive study of the extant Egyptian species of Tamarix should, therefore, be started. A similar extensive study of the fossiliferous area at Dimsi and elsewhere in Egypt, in search for more instructive remains of the fossil Tamarix, should also begin to find out whether the fossil Tamarix plant belongs to one of the extant species or to an extinct one.

ACKNOWLEDGEMENT

Thanks are due to Prof. Vivi Täckholm for kind permission to examine herbarium specimens of Tamarix deposited at the Botany Department of Cairo University.

SUMMARY

Anatomical features of silicified root fragments of Tamarix collected from Pleistocene diatomaceous earth in El-Fayum are described. Root specimens of dead Tamarix collected from the same locality and root specimens of five extant Tamarix species collected from various localities in Egypt are also described anatomically. Comparisons showed that the fossil specimens are not identical with any of the studied species. Further work on fossil and extant species of the genus is required to reach more definite conclusions.

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EXPLANATION OF PLATES

PLATE I

- Fig. 1. Tamarix shrubs growing in desert area near Cairo.
Fig. 2. Tamarix shrubs fringing a small shallow pond thickly inhabited by Phragmites, in desert area near Cairo.

PLATE II

- Fig. 1. Portion of a transverse section of root of Tamarix aphylla. x 130.
Fig. 2. Portion of a transverse section of dead root branch of Tamarix. x 60.
Fig. 3. Fragments of silicified root branches collected from Dimai area. x 1.
Fig. 4. Portion of a transverse section of a silicified root branch. x 140.
Fig. 5. Portion of a transverse section of root of Tamarix nilotica showing free and united xylem vessels. x 60.

PLATE III

- Fig. 1. Portion of a tangential section of root of Tamarix amplexicaulis. x130.
Fig. 2. Portion of a tangential section of root of Tamarix tetragyna showing uni- and multiseriate rays. x 100.
Fig. 3. Portion of a transverse section of root of T. tetragyna showing free and united vessels. x 140.
Fig. 4. Portion of a transverse section of root of Tamarix arborea showing free and united vessels. x 125.
Fig. 5. Portion of a transverse section of root of T. amplexicaulis showing free and united vessels. x 120.

PLATE IV

- Fig. 1. Portion of a tangential section of a silicified root branch. x 125.
Fig. 2. Portion of a tangential section of dead root of Tamarix sp. x 60.
Fig. 3. Portion of a tangential section of root of T. nilotica. x 80.
Fig. 4. Portion of a tangential section of root of T. aphylla. x 100.

PLATE I



The five extant species of Tamarix from which root specimens were

by Bass (1940).

specimens were prepared and stained according to the method described

water for 3-5 minutes. Transverse and tangential sections from these

Specimens of dead Tamarix roots were resuscitated by boiling in soapy

root structure.

Less successful than thin-ground sections in showing fine details of

and described by Lacey (1963) and El-Agnaf (1976). Peel sections were

tangential sections according to the method devised by Hicol and Sanderson

examined superficially and by preparation of thin-ground transverse and

Tamarix roots that were found loose at the locality. The specimens were

Figure 3 of Plate II shows some of the many siltified fragments of

fossils.

of the corresponding plants that are of similar size to the collected

and living root specimens were chosen from portions of the root system

desert areas in Cairo (Pl. I, Figs. 1, 2); Gaza, and El-Fayoum. The

five of the extant Tamarix species collected where they grow wild

of the dead Tamarix collected at the locality and specimens of roots of

specimens but also (and for the purpose of comparison) specimens of roots

The material investigated here includes not only the fossil root

MATERIAL AND METHODS

in position of growth.

culms were observed, near the site of collection, projecting from sand

dry dead stumps of Tamarix trees and basal portions of Tamarix

Fig. 1. Map of El-Fayum showing Lake Moeris, Lake Qarun and Dime fossiliferous locality. After Beadnell, 1905.

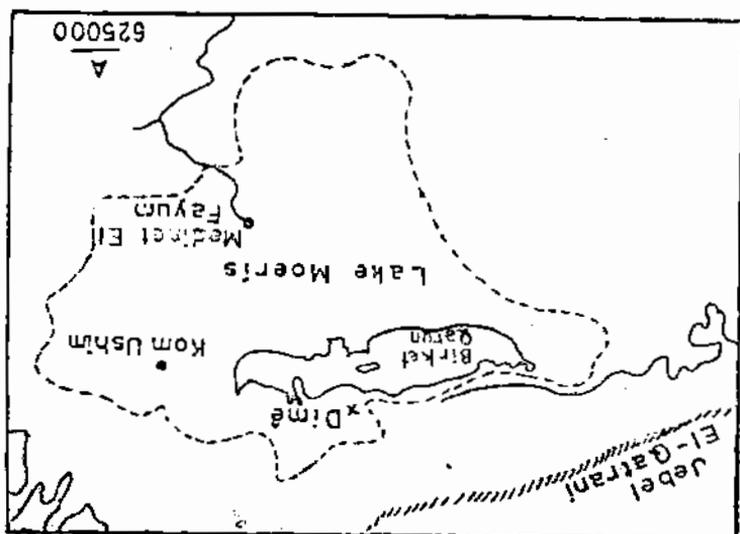


PLATE IV



أجزاءه جذور أثل متجعبة منه العصر البليستوسين من الفينيم

للدكتور/ وجيه السعداوى ك الدكتور/ مضاف بدوى السيد/ أحمد العلامى

ملف

تم في هذا البحث وصف تشريح لجذور نبات أثل شجيرة تم جمعها من أرضه
الديارومات التي تنتمي إلى العصر البليستوسين وكذلك تم وصف التركيب التشريحي
لجذور سائلة لنوع من نبات الأثل الميت الجاف من نفس المنطقة كما تم وصف
التركيب التشريحي لجذور فئة أنواع مختلفة من جنس الأثل التي تعيشه
حاليا مصر . وأثبتت المقارنة أنه جذور النوع الجفون تختلف عن الجذور
الأخرى وأنه لاستكمال البحث في أنواع هذا الجنس الجفون والحية
ضروري للوصول إلى نتائج أكثر اتساعا .