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ON THE HISTORY OF THE WALNUT (JUGLANS REGIA L.) IN SOUTHEASTERN EUROPE

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SUMMARY

The finds of micro- and macro-subfossils of the walnut (*Juglans regia* L.) in southeastern Europe strongly suggest that this tree was introduced by man. The appearance of *Juglans* in Greece is connected with that of *Castanea* and *Platanus*. The time of arrival of this species and a way in which it was possibly introduced on the southern mainland of Greece will be discussed in this article with reference to a pollen diagram from Lake Trikhonis. A relation of the walnut with the Mycenaean culture is suggested, linked in time with the Santorini eruption.

1. INTRODUCTION

All authors agree that man was responsible for the appearance of *Juglans* or the combination of *Juglans*, *Castanea* and *Platanus* in Europe (BEUG 1962a,b, 1967a,b, 1975; BRANDE 1973; BOTTEMA 1974a, 1975; ZOLLER 1960; ATHANASIADES 1975; FILIPOVITCH 1977a,b). The arrival of *Juglans* or the combination of these species is not simultaneous in all areas, but seems to have taken place along certain routes. In some parts they escaped cultivation, became established and subspontaneous. In other parts conditions were probably not suitable for the formation of naturally-appearing forests.

Up to now, as concluded from available radiocarbon dates, there is no evidence for *Juglans* or *Castanea* appearing before about 3500 B.P. This date not only applies to Greece, but seems to be valid also for Southwestern Turkey (VAN ZEIST et al. 1975). As for *Juglans*, this tree occurred in the Balkan area during the Eemian interglacial. Pollen finds are reported from Ljubljana (SERČELJ 1966) and in Staro-Orjachovo near Varna on the Black Sea coast (BOZILOVA & DJANKOVA 1976). The species seems to have vanished from the Balkan area completely during the Würm glacial. During the Würm glacial and later in the Holocene it still occurred in the Ghab valley in Syria (NIKLEWSKI & VAN ZEIST 1970). Stray grains dating from the same periods have been found in many locations in Southwestern Turkey (VAN ZEIST et al. 1975). Real *Juglans* phases in Turkey, connected with agricultural phenomena, begin a little after 2900 B.P. in Söğüt Gölü, and after about 2500 B.P. in Hoyran Gölü, whereas relatively high *Juglans* pollen values appear at about 3500 B.P. in Beysehir Gölü.

Juglans and *Castanea* are reported by BEUG (1962a) for northern Turkey at least since 6000–5000 B.P. and the first species appears about 3500 B.P. in Iran.

However, in the Zeribar area in Iran *Juglans* appears only about 2000–2500 B.P. (VAN ZEIST & BOTTEMA 1977).

The difference between Greece and Turkey is that in Greece *Juglans* does not occur during the last glacial and during most of the Postglacial, and that in Turkey *Platanus* does not play a role in the group of three as it does in Greece. In Turkey *Castanea* pollen occurs in combination with *Juglans* only once, in Beysehir (VAN ZEIST et al. 1975).

Juglans pollen first appears in Greece and Southeastern Turkey at about the same time, *viz.* somewhere in the middle of the second millennium B.C. There must have been close contact between the two areas, that resulted in the spread of *Juglans* to Greece as soon as it was used as an orchard tree in Turkey.

In Bulgaria palynological information is supplied by FILIPOVITCH (1977a, 1977b), who deals especially with the behaviour of *Juglans* and *Castanea* in the Stara Planina and Sredna Gora Mountains. As in the Pirin Mountains (BOZILOVA 1977) the appearance of *Juglans* is dated to around the beginning of the Christian era or later. This must be partly attributed to the elevation of the coring sites, ranging from 1400–1900 m. It is assumed that *Juglans* and *Castanea* arrived in the Thracian lowlands earlier. This idea is supported by the find of walnut fruits near Plovdiv, ascribed to the Bronze Age (FILIPOVITCH 1977a).

The average time of arrival or increase of *Juglans*, *Castanea* and *Platanus* in western Macedonia is about 3100–3300 B.P. (BOTTEMA 1974a) for those areas adjacent to the coast or not very far inland. According to ATHANASIADES (1975) *Castanea* and *Juglans* appear in Litochoro (25 m), south of Katerini, at about 3000 B.P. In Pertouli (1275 m), west of Trikkala, they appear at about 1000 B.P., although some stray grains appear already some time before 3200 B.P.

In a core from the former lake of Xinias, pollen of this group is only found in the top sample (BOTTEMA 1979). The arrival of *Juglans* happened there rather late, unless part of the sediment has disappeared. The same can be said for the Tenaghi Philippon diagram from eastern Macedonia (WIJMSTRA 1969). In southern Switzerland (ZOLLER 1960) and on the Dalmatian coast (BEUG 1962b, 1967a; BRANDE 1973) this event took place 2400–2000 B.P.

2. PALYNOLOGICAL INVESTIGATION

The behaviour of *Juglans* will be compared with other information obtained from a pollen diagram from Lake Trikhonis *(fig. 1)*. The coring was performed by Readman et al. (University of Edinburgh, Department of Geophysics) by means of a Mackereth corer for palaeomagnetic investigation. The palynological study of this material was done principally for dating of the sediment.

For the purpose of discussion a selection of pollen curves is presented in *fig. 2*. The calculation of these curves is based upon a pollen sum that includes all types apart from those of water and marsh plants. Of the non-arboreal pollen types those of the Gramineae constitute the main part, but curves for such pollen types are not presented in this concise diagram.

Fig. 1. Map of Greece showing the coring locality of lake Trikhonis.

3. DISCUSSION OF THE DIAGRAM

In *fig. 2* the following pollen types are presented: *Quercus coccifera*-type, *Olea*, *Quercus cerris*-type, *Ostrya*-type, *Ulmus*, *Juniperus*, *Castanea*, *Juglans*, *Platanus*, *Artemisia*.

The diagram represents the younger part of the Holocene. The oldest part of the diagram must be younger than 6500 B.P., as the increase of *Carpinus orientalis/Ostrya* that happened at that time had already taken place (BOTTEMA 1974a). The upper part is dated younger than A.D. 1700 at 110 cm by the find of a *Zea mays* pollen grain (HUBER 1962).

A conspicuous event is located around spectrum 16. For the first time *Juglans* pollen is found, while *Platanus* forms a continuous curve, increasing towards the upper part. The appearance and increase in pollen of *Juglans*, often in combination with either *Platanus* or *Castanea* or both, has been noticed in various areas in Greece. In Trikhonis *Castanea* is hardly represented.

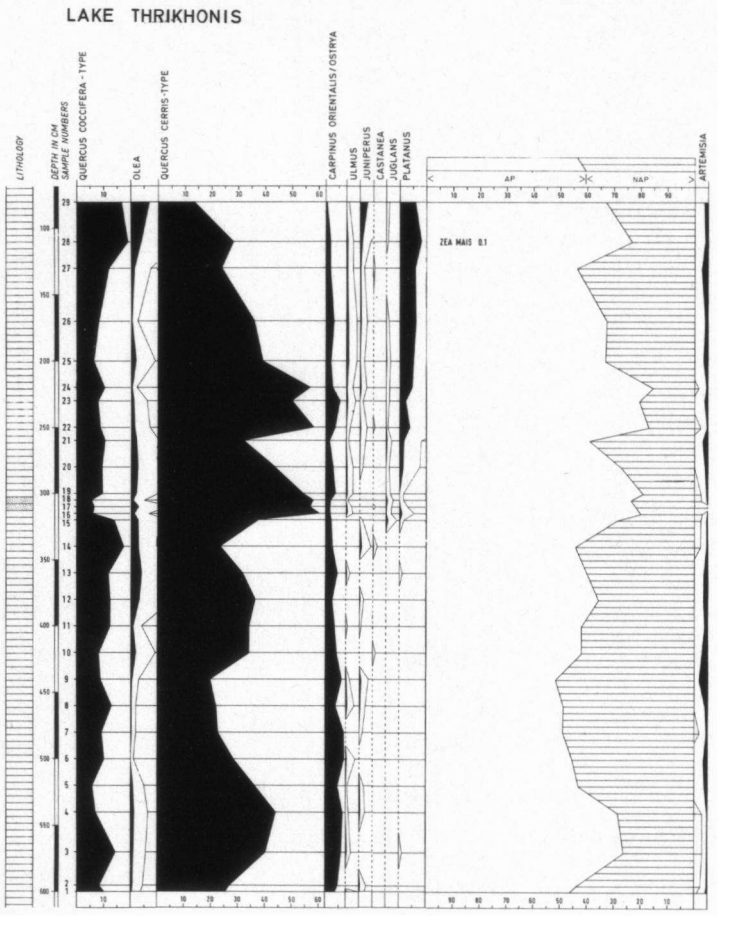

Fig. 2. Pollen diagram of lake Trikhonis presenting a selection of pollen curves.

4. THE APPEARANCE OF JUGLANS, PLATANUS AND CASTANEA IN TRIKHONIS

The event as discussed above, mainly with reference to the walnut, turns out to be rather widespread. At what time did this event occur in the Trikhonis area?

The dating of the Trikhonis diagram will be quite difficult as the clay is not very suitable for radiocarbon dating. Comparing with the other Greek diagrams the age of spectrum 16 must be as old as or younger than about 3500 B.P. This is the oldest date that has been obtained by radiocarbon dating in Greece. The palaeomagnetic and the radiocarbon datings which provide alternatives in the field of dating of Trikhonis will be discussed in a later paper.

Now the Trikhonis diagram shows a very remarkable feature traced by

palaeomagnetic analysis. At the level of about 310 cm a narrow band with volcanic material, deposited together with the clay, was found and kindly identified by Prof. Dr. L. M. J. U. van Straaten. The problem remains as to which of the younger Holocene volcanic eruptions caused the shin ash layer.

There are two obvious possibilities: the 79 A.D. eruption of the Somma-Vesuvius, connected with Pompeii, or the Santorini-eruption, radiocarbon-dated 3370 ± 100 B.P. and 3527 ± 44 B.P. (OPDYKE et al. 1972). The pollen diagram of the Adriatic sea core 240 (BOTTEMA 1974b), at about 650 km of Trikhonis, shows the first appearance of *Juglans* somewhere in between the Santorini and the Pompeii eruptions. Pollen of *Castanea* and *Juglans* is very well represented there at the level of the Pompeii eruption. This is what one would expect, as BRANDE (1973) gives a date of about the same time or a little later for the appearance of *Juglans* on the Dalmation coast.

The Greek sources for these three species are much closer to Lake Trikhonis, a reason for ascribing the beginning of the distinct curves of *Juglans* and *Platanus* to the level of the Santorini eruption. The date for this eruption of about 3425 B.P. agrees very well with the date of about 3300 B.P. for the appearance of *Juglans* and *Platanus* in Macedonia (BOTTEMA 1974a).

The spectra 15–19, at the level of the thin ash layer, show some other particularities. The percentages of *Quercus cerris*-type (deciduous oak) increase from 20–30% to about 60%. At the same time *Quercus coccifera*-type demonstrates much lower values. *Ulmus*, although irregularly present previously, starts a closed curve for the rest of the diagram. Of the herbs or weeds, *Artemisia* values are lower, reattaining higher values later. This may be an indication of lower and higher agricultural pressure.

After spectrum 19 *Quercus cerris*-type values decrease again. It is reasonable to suppose that the period covered by spectra 15–19 represents a regeneration of deciduous oak forest. Maquis, mainly *Quercus coccifera* take advantage of herding, logging for timber etc., makes way for deciduous forest that suffers in its return form renewed human depredation some time afterwards.

5. ARCHAEOLOGICAL EVIDENCE

It seems impossible that the limited amount of volcanic ash killed or changed the vegetation to any great extent. Nor would its effect have been great enough to force the people to leave the area. Thus, the contemporaneity of the volcanic eruption and the forest regeneration may be pure coincidence. Marinatos (in: EDEY 1975) thinks that the downfall of the Minoan culture was effected by the Santorini eruption. Especially the enormous tidal waves resulting from the eruption could have destroyed coastal habitation on the Greek west coast. On the other hand the assumed decline of the Minoans may have had political consequences for the mainland, in which case the lowlands around Trikhonis may have been abandoned temporarily. Somewhat later this area came under the influence of another culture (the Mycenaeans), which had strong ties with

Turkey, as indicated by the spread of the walnut.

Archaeological surveys for the study of the prehistory as done by David French in Thessaly and Macedonia are lacking for Aetolia-Akarnania. Hardly any or no historical information is available for the period 1500–500 B.C. (communic. S.C. Bakhuizen). The plain of the Acheloos River possibly became more densely populated after 1500 B.C.; at least this was a general tendency in other parts of Greece (RENFREW 1972). In Thessaly most of the lowland was in agricultural use between 1400 and 1100 B.C. (HALSTEAD 1976). The period from about 1500–1000 B.C. is roughly defined as the Late Bronze Age.

In Trikhonis at about 1450 B.C., if the postulated time proves to be right, the area was abandoned to a great extent but only for a short time. Judging from the sedimentation rate and the amount of sediment present, the area will not have been abandoned for more than a few centuries. This is rather incompatible with the assumed population increase in the Late Bronze Age.

It is difficult to explain why on one hand natural forest around Lake Trikhonis regenerated, while on the other hand *Juglans* and *Platanus* ascribed to human interference, became established in the area and began to spread.

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