A Pollen Diagram From a River Sediment in Central Anatolia

Orta Anadolu'da
Bir Nehir Tortuluna Ait
Polen Çizelgesi

Henk WOLDRING*

Keywords: Pollen, Sediment, Core, Aşkılı, Central Anatolia
Anatolian Series: Pollen, Torul, Buru, Aşkılı, Orta Anadolu


Düşük AP değerler gösteren ve Erken Holosen ot bitki örtüsünün görüldüğü bu bitki tohumlarının kayıtları güney-bati Türkiye’deki, örneğin Beyşehir Gölü, Söğüt ve Akgöl/Konya gibi göl çökeltilerinden toplanan bitki kalınlarıyla bazı benzerlikler göstermektedir.

Melendiz nehrinin su tablosundaki yerel değişiklikler Liguliflorae ve Chenopodiaceae bitkilerinin yüzeylerindeki dönüşümü hareketlendirdiği izlenimini vermektedir. Bitki kalınları çökelme sırasında bozuk koşullarının var olduğunu göstermekte ve Orta Anadolu’nun Son Buzulyahıt İlk Holosen Devre ait bitki örtüsünün küçük bir parçasını yansıtmaktadır.

Introduction

Since 1989 excavations have been carried out under the direction of Professor U. Esin at the Pre-Pottery Neolithic site of Aşkılı Höyük (Esin, 1996). The site is situated near the village of Kızılıkaya, 25 km. south-east of Aksaray in Central Anatolia. Aşkılı Höyük lies in a bend of the river Melendiz. Upriver, strong meanders can be observed in a fairly broad valley. At the western flank of the dwelling mound a few metres of deposit have been exposed by the river.

*Groningen Institute of Archaeology, State University of Groningen, Poststraat 6 9712 EB Groningen - The Netherlands
In 1990 and 1991 the author floated samples for palaeobotanical remains, which revealed large amounts of *Celtis* seed (Turkish: çitlembik), but otherwise the samples turned out to be rather poor in botanical remains. In 1991, the base of the occupation was reached at the northern flank. Underneath, a sediment consisting of clay was uncovered. The sediment was cored (Fig. 1) with a Dachnowsky sampler, because of the scarce palynological information on the area a number of samples were processed (Fig. 2).

**Geography and Climate of the Site**

Aşıklı Höyük (coord. 38 21’N, 34 13’E) is situated at an elevation of 1119.45 m. at the transition of the xero-eukhinian steppe forest and the timberless Central Anatolian steppe west of Aksaray. The site lies in an undulating plain that is at some distance surrounded by mountains. In the south mountain ranges of the volcanic Hasan and Meisendiz Dağ are found. In the north and east the area is bordered by the Ekeceik and Erdas Dağ, respectively.

The average annual precipitation is 300 - 400 mm. of which the bulk falls during the winter and spring. The average temperature for July is in the range of 20°-24° and for January in the range of 0-4° C.

**Modern Vegetation**

According to Zohary (1973) the primary vegetation of the xero-eukhinian sector is a steppe forest (Querco-Artemisietea santonicum), in which the trees are dominated by oak species such as *Quercus cerris*, *Q. pubescens* and *Q. robur*. The ground flora is dominated by *Artemisia santonicum* (= *A. fragrans*). Selective felling of trees and grazing turned the steppe forest into a striking landscape, the so-called ‘wild orchards’ in which fruit-bearing trees and shrubs such as *Pyrus, Crataegus, Amygdalus* and *Cotoneaster* dominate. Zohary states that intensive grazing gave rise to mixed xeromorp-

hic formations of tragacanthic species such as *Astragalus* and dwarf shrubs. Plant communities in which *Astragalus* dominates occur in the vicinity of the site.

In the fields around Aşıklı Höyük the author recorded solitary trees and shrubs of *Pyrus elaegnitofolia, Crataegus laciniata, C. orientalis* and *Rosa* species. *Apricots (Prunus armeniaca)* are widely planted for the fruits.

Deciduous oak species are rare in the vicinity of Aşıklı Höyük. One specimen of pedunculate oak (*Q. robur*) has been recorded at Kutuaya, c. 0.5 km. from Aşıklı Höyük. Another specimen was found in a garden in Doğantara, at c. 2 km. distance from Aşıklı Höyük. A few specimens of this species were growing in the village of Demirci, c. 7 km. north of Aşıklı Höyük. Open oak forests, mainly consisting of Turkey oak (*Quercus cerris*), occur at the piedmont and the slopes at lower altitudes of the Hasandağ near Helvadere, c. 20 km. south of Aşıklı Höyük. Interesting are the oak species recorded in hedges surrounding the sun-bakeden arable fields north of Helvadere. Here *Quercus cerris*, *Q. infectoria* ssp. boissieri, *Q. ithaburensis* ssp. macrolepis, *Q. pubescens* and (probably) *Q. macranthera* alternate with fruit-bearing species such as *Prunus divaricata, P. spinosa, Colutea arborescens, Cotoneaster nummularia, Pyrus elaegnitoflius* and *Juglans regia* (!).

The large-scale cultivation of cereals and other agricultural crops has no doubt contributed to the reduction of the arborescent vegetation south and east of the Mamasın Baraji.

**Lithology**

The upper 20 cm. of the sediment was devoid of pollen. The part of the sediment containing pollen is represented in the diagram. Gravel prevented deeper cooring: 0 - 35 cm. sandy 35 - 115 cm. sandy clay
Dating of the Core

Because of the low organic content, the core is not suitable for radiocarbon dating. The river sediment is located just below the settlement deposits of the trenches 4G and 4H on the northern flank of the site. The earliest calibrated 14 C date of the occupation deposit is 7952 BC and accordingly is the minimum age of the river deposit.

The Pollen Diagram

Non-arboreal pollen make up the bulk of the pollen sum. Arboreal pollen do not exceed 20%, except in spectrum 9, where Salix attains 30%.

It seems reasonable to conclude that both Elaeagnus and Salix are of local origin. In Turkey they are often found in the river landscape. The fluctuating curves, too, suggest stands of these shrubs along the Melendiz, Juglans, Alnus and Populus may have grown elsewhere along the river. Betula and Quercus cerasi-type may come from higher elevations in the surrounding mountains.

Nowadays Betula forms the upper tree line of the Erciyas Dağ, about 100 km. east of Asilki Höyük. Davis (1965-1985) mentions volcanic slopes as a favourite habitat of birches. For this reason it is possible that at the time of deposition birches were present on the slopes of the Hasan Dağ.

As mentioned before, deciduous Quercus species are relatively common components of the present-day anthropogenic steppe of Inner Anatolia.

Corylus avellana has a scattered distribution in the Pontic and Taurus mountains. Its presence in the pollen diagram is probably due to long-distance transport. Nowadays Juniperus species (e.g. excelsa, J. foetidissima) are common in the mountainous areas of Inner Anatolia, but for instance Juniperus oxycedrus also forms part of the steppe forest.

The relatively high share of Pinus in the Asilki Höyük diagram must be ascribed to long-distance transport. In the pollen diagrams of southwestern Turkey, pine is not an important component of the Late Glacial and Early Holocene vegetation.

A peculiar phenomenon, difficult to explain, is the presence of Olea together with Quercus calliprinos-type. Both species belong to the Mediterranean vegetation and do not occur in Inner Anatolia. Their presence must be attributed to long-distance transport from coastal areas.

The absence of Celtis pollen is remarkable, though the pollen of this species is not very well dispersed. A surface sample of the Ilhara gorge yielded 1.9 % Celtis pollen. Not far from the sampling location a few specimens of Celtis tournefortii were recorded. The stony seeds of this tree were found in almost all flotation samples. In some occupation levels, layers consisting solely of Celtis stones were observed. The absence of Celtis pollen could mean that the shrub did not grow in the vicinity of the site at the time of deposition, but spread later in the area.

With the exception of Elaeagnus and Salix, the low values for the arboreal species suggest that they did not grow in the vicinity of the site. The non-arboreal pollen make up 80-90% of the total pollen sum, with Chenopodiaceae and Liguliflorae figuring as main groups. The curves of these groups show a clearly negative correlation. The high values of Liguliflorae and other Compositae have been discussed in Bottema and Woldring (1984(1986)). In southwestern Turkey, the high values of some groups of Compositae have been correlated with deforestation. In this context Bottema and Woldring described a special phenomenon, which they observed in a crater lake in Thessaly, Greece. While coring, their attention was drawn to some harvesting machines, above which a column of dust was lifted up by thermals. At the same
moment a settling of chaff, pieces of straw etc., was observed in the lake around the coring site. It is explained that such air flows are caused by the difference in temperature between the air above the sun-baked fields and the much cooler air above the body of water. Such events can of course only occur in the months with the highest temperatures (July and August), the flowering time of many Compositae. In this way such types may well become over-represented in the pollen rain. On the basis of this explanation we may also conclude that the area around Aşıklı Höyük must have been largely devoid of trees at the time of deposition.

Do the spectra with low values for Liguilirionae at the same time imply that the cooling effect of water had disappeared? In this case the formerly flooded places would become exposed and for instance Chenopodiaceae could settle on the mud flat. According to Davis (1965-1985), Chenopodium botrys actually is the only Chenopodiaceae of river banks in Central Anatolia. The present author recorded this species near the coring site. The Chenopodiaceae pollen found in the Aşıklı core is matched by that of Chenopodium botrys in the reference collection of the Biologisch-Arheologisch Institut. The values of Chenopodiaceae in the pollen diagram could easily have been produced by this species.

Finally, a few remarks will be made on the remaining pollen types. Contrary to the fluctuating curves of Chenopodiaceae and Liguilirionae, a number of Compositae (Artemisia, Cirsium – type, Centaurea solstitialis-type and others) together with Brassica-type, Cyperaceae, Gramineae and Cerelis-type, show more regular curves. It is probable that these types represent the then-existing steppe vegetation. An exception is made for Cyperaceae, because this curve shows some similarity to that of the local Elaeagnus. Cyperaceae may have grown in marshy habitats along the river. Cyperus tuscus is a common species in the river bed near the site.

At present the most common wormwood of the Inner Anatolian steppe is Artemisia santonicum, a species which is advantaged by grazing. Some other species, growing in steppe habitats, also are considered. Artemisia herba-alba has a more eastern and local distribution in Turkey. Artemisia vulgaris too, does not occur in Central Anatolia. A species with identical pollen grains is Artemisia scoparia. This species is mentioned by Zohary (1973) for volcanic tuff in the Konya plain.

The Cerelia-type (pollen size > 40 µm) in Turkey includes several grasses, for instance Aegilops, Hordeum, Stipa and Bromus. Many species of these genera are common elements of the steppe vegetation. The corresponding curves of Gramineae and Cerealia-type suggest that the Cerelia formed part of the ground flora and do not indicate any form of agriculture.

Comparison With the Pollen Diagram of Akgöl in the Konya/Ereğli Basin

As for a possible time-correlation of the Aşıklı Höyük diagram, it seems justified to place it before 7952 BP.

A pollen diagram of Akgöl, situated near Ereğli in the eastern part of Konya plain, starts around 13,000 BP. Like Aşıklı, Akgöl is situated at the fringe of the zero-euxini-
an steppe forest and the timberless steppe conditions, with low values for arboreal pollen, while the values for non-arboreal pollen make up more than 90% of the total pollen sum. The arboreal pollen are mainly produced by Quercus cerris-type. Further Quercus calliprinos-type, Juniperus and Betula are represented, chiefly in the subzones 1B-1D. In the arboreal assemblage of the Aşıklı diagram these pollen types are likewise found in low values, again with the highest values for Q. cerris-type. The non-
arboreal pollen types in subzone 1B-1D are dominated by Artemisia, Gramineae and Chenopodiaceae. The values of chenopodiaceae pollen in the Akgöl diagram origi-
nate from halophytic vegetations. As in Ak-
göl (subzone 1B-1D), Artemisia and Grami-
nae play a substantial part in the steppe
vegetation around Aşıklı Höyük.

So far, the assemblage of the pollen
types mentioned above, shows some con-
formity with the subzones 1B-1D of the
Akgöl diagram. However, it must be ad-
mitted that other curves in the diagrams
differ considerably. In subzones 1B-1D of
the Akgöl diagram, values for Pinus, No-
aea-type, Centaurea solstitialis-type and
Cerealia-type are strikingly lower than
those of their counterparts in the Aşıklı
Höyük diagram. The discrepant values of
these pollen types preclude a clearly defined
dating of the pollen diagram.

Table 1. Not included in the pollen diagram of Aşık-
lı Höyük are:

Spectrum 1: Phyllyrea 0.1, Vitis 0.1, Humulus/Cann-
abis 0.1, Xanthium 0.1, Convolvulus 0.1 Euphor-
bia 0.1, Hippocym 0.1;
Spectrum 2: Plantaginaceae 0.5;
Spectrum 3: Anchusa/Pulmonaria-type 0.3, Cerint-
he-type 0.3;
Centaurea 0.3, Plantago coronopus -type 0.3, Myri-
ophyllum spicatum/verticillatum 0.5;
Spectrum 4: Platanus 0.2, Symphym-type 0.2, Evek 0.2, Plantaginaceae 0.2;
Spectrum 5: Hedera 0.5, Sorbus -type 0.5, Crucif-
erae 0.5, Ericaceae 0.5, Rumex acetosa-type 0.5;
Spectrum 6: Crataegus-type 0.2, Bidens-type 0.2, Centaurea 0.5;
Limon 0.2, Plantago tenuiflora-type 0.2, Rumex pa-
tienia -type 0.2,
Aquilegia -type 0.2, Ranunculus repens-type 0.2, Rosaceae 0.2,
Zygophyllum 0.7, Equisetum 0.2;
Spectrum 7: Cedrus 0.1, Convolvulus 0.1, Crucif-
ereae 0.1, Matthiola 0.1, Cuscuta 0.1, Allium 0.1, Scrophularia/Vervascum-type 0.1;

Conclusion

The pollen diagram of Aşılı Höyük co-
vers an early phase in the vegetation his-
tory of Central Anatolia. The regional ve-
etation is poorly represented, may be
due to a rapid sedimentation rate. Salix,
Elaeagnus, Chenopodiaceae and Ligulif-
lora are in some way or another over-
represented in the pollen rain.

The low share of regional tree pollen
(AP) in the pollen rain justifies the con-
clusion that the Aşılı Höyük diagram re-
lects a probably short part of the Late Glacial or Early Holocene vegetation history of Central Anatolia.

REFERENCES

"Late Quaternary vegetation and climate of southwestern
Turkey." Palaeohistoria 26. Part II, 125-149.
Flora of Turkey and the East Aegean Islands. 10 Vols.
Edinburgh, University Press.

ESIN, U. 1996.
"Aşılı, ten thousand years ago: A habitation model from
Central Anatolia." Housing and settlement in Anatolia, a
Historical Perspective. 31-42. Istanbul, Tarih Vakfı.
Geobotanical Foundations of the Middle East. 2 Vols. Stutt-
gart, Gustav Fischer Verlag.

Spectrum 8: Ostrya/Carpinus orientalis 0.2, Abies
0.2, Cedrus 0.3, Ulmus 0.2, Spinacia-type 0.2, Bi-
dens type 0.3, Cuscuta 0.2,
Ericaceae 0.2, Lotus-type 0.2, Onobrychis -type
0.2, Polygonum cognatum-type 0.3, Polygonum
persicaria-type 0.2, Bunium-type 0.2
Spectrum 9: Fagus 0.1, Morus 0.1, Fraxinus excelsi-
or 0.1, Platanus 0.1,
Crataegus-type 0.1, Bryonia 0.1, Thymus-Mentha-
type 0.1,
Glacium 0.4, Consolida 0.2, Hyoscyamus 0.2,
Ernygium -type 0.1;
Spectrum 10: Juniperus sabina 0.5, Taxus 0.1, Ec-
hinum -type 0.1, Ononis -type 0.1, Vicia-type 0.1,
Hippocym 0.1, Papaver 0.1, Aquilegia-type 0.1,
Hyoscyamus 0.1;
Spectrum 11: Pistacia 0.1, Tilia 0.1, Ulmus 0.1, Arcti-
tum-type/Jurinea 0.1, Cousinia 0.1, Filago-type
0.1, Plantago tenuiflora-type 0.2,
Consolida 0.2;
Spectrum 12: Ostrya/Carpinus orientalis 0.1, Spinaci-
type 0.2, Arctium-type/Jurinea 0.2, Capsella-type 0.7, Ru-
mez acetosa-type 0.4, Polygodiaceae 0.2;
Spectrum 13: Juniperus sabina 0.4, Abies 0.4.
Figure 1: Drilling for pollen sampling at Aşıklı

Figure 2: Pollen core sample consolidated by wrapping with plastic
TÜBA-AR
Türkiye Bilimler Akademisi Arkeoloji Dergisi

YAYIN KURULU
Ufuk ESİN
Yayın Kurulu Başkan

Mehmet ÖZDOĞAN
Sema BAYKAN

Bruce HOWE
Zafer KARACA

ONURSAL YAYIN KURULU
Ekrem AKURGAL
Sedat ALP
Halet ÇAMBEL
Jale İNAN
Nimet ÖZGÜÇ
Tahsin ÖZGÜÇ

DANIŞMA KURULU

Haluk ABBASOĞLU
İstanbul Üniversitesi

Sedat ALP
Türkiye Bilimler Akademisi

Ayda AREL
Ege Üniversitesi

Güven ARSEBÜK
İstanbul Üniversitesi

Nuşin ASGARİ
İstanbul Arkeoloji Müzeleri

Güven BAKIR
Ege Üniversitesi

O. BAR YOSEF
Harvard Üniversitesi

Cevdet BAYBURTOĞLU
Ankara Üniversitesi

Marie-Claire CAUVIN
CNRS

Ali DINÇOL
İstanbul Üniversitesi

Kutlu EMRE
Ankara Üniversitesi

Harald HAUPTMANN
İstanbul Alman Arkeoloji Enstitüsü

Peter KUNIHOLM
Cornell Üniversitesi

Machtheld MELLINK
Brynn Mawr Koleji

Nimet ÖZGÜÇ
Türkiye Bilimler Akademisi

Wolfgang RADT
İstanbul Alman Arkeoloji Enstitüsü

YAZIŞMA ADRESİ

Sema Baykan - Uzman Arkeolog Prehistorya Anabilim Dalı
Edebiyat Fakültesi İstanbul Üniversitesi, Beyazıt 34459 İstanbul, Türkiye
Tel: 0 212-519 45 92 Fax: 0 212-519 45 92

ISSN 1301-8566
Fiyat: 2.000.000 TL  Kurumlar: 5.000.000 TL  Yurtdışı: $ 30
Banka Hesap No: Türkiye İş Bankası Başkent Şubesi 4899 304210 4532824

Yayın Yönetmeni: Zafer Karaca, Senat Yönetmeni: Ödül (İzvel) Tengür, Teknik Yönetmen: Duran Akca
Yayın Ekibi: Sema Subaş-Alp Akoğlu Teknik Ekip: Aytaç Kaya-Vığıt Övgür

TÜBA (TÜRKİYE BİLIMLER AKADEMİSİ)
TÜBİTAK Atatürk Bulvarı No: 221, Kavaklidere 06100 Ankara, Türkiye
Tel: 0 312-427 06 25 Fax: 0 312-427 66 77
e-posta: tuba-ar@tubitak.gov.tr Internet: www.tuba-ar.tubitak.gov.tr