STUDIES OF CARBONIZED VEGETATION REMAINS FROM PISTIROS

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The importance of archaeobotanical research has increased considerably in recent years. It has allowed the diet of ancient peoples to be partly reconstructed on the basis of the crops that they grew. The analysis of carbonized wood fragments should make the picture of the vegetation around the settlements even more complete.

MATERIALS AND METHODS

Material has been collected by flotation. Several archaeological structure have been examined:
In sector AB I -squares A7; A8; A13; B'2; B11; B22.
In sector AB II - squares 3265/1120; 3270/1120.
Carbonized grains and seeds have been identified on the basis of their morphological characteristics using a binocular microscope. Study of some of the characteristics, and the use of published atlases, has allowed the identification of the plant remains[1].
The carbonized wood has been identified with the help of an **optical(B)** microscope using reflected light. Alases and samples of newly carbonized wood have been used to provide material for comparison with the sieved material[2].

RESULTS

This report aims to present some preliminary results for the material provided as well as to suggest a primary interpretation of the data.
The carbonized vegetation remains examined have been divided in to two main groups - carbonized grains and seeds, and carbonized wood fragments.

A. Analysis of archaeobotanical material.

The material is divided into several groups, partly on the basis of the nature of the context or structure from which

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[1] J. Montegut,Cle de determination des semences de mauvaises herbes.Lab.De bot,Ecole Nat.Super.d`Horticulture de Versailles.,1988,p.98; W.Schoch, B.Pawlik and F.Schweingruber, Botanical macroremains, Bern, Stuttgart: Haupt,1988, p.217; J.L.Vilarias, Atlas de malas hierbas, Ed.Mundi – Prensa, Madrid, 2ed., 1992, p.300.

[2] P.Gregus, Holzanatomie der Europäischen LaubhÖlzer und Sträucher, Budapest, 1959, p.330; P.Gregus, Identification of living gymnosperms on the basis of xylotomy, Budapest, 1995, p.264.

the sample was taken, and partly on the basis of the results of sieving.

The first includes the material from sector AB I, square A7; A8; A13. Samples from that group are extremely poor. In the sample from square A8, a millet grain has been found which might have got there by accident.

The second group contains the samples from an area around the altar, in square B'2**.** Relatively rich material has been derived from all these samples. **It could be seen that from the area around the altar and from soil N3 there are more remains of vegetation than the other areas around the altar(D)**. The following species of cereal plants have been found: emmer - Triticum diococcum **Scrank(E);** mild/compact wheat - Triticum aestico/compactum L; naked barley - Hordeum vulgare var. nudum L.; rye - Secale cereale L., and millet - Panicum miliaceum L. Of the legumes, vetch - Vitia sativa, has been recorded. Similar species and quantities have been derived from the samples taken from between the pieces of masonry and the altar in layer four.

The third group includes twelve samples from the southern half**(F)** of the well. Some of them do not contain any vegetational material. Seeds and grains identified as einkorn, emmer, mild/compact wheat as well as barley, vetch and grapes have been found in the southeastern part of the sixtieth layer of the well.

Samples in the fourth group have been derived from square B 7’; B11; B12/15; B21/18. Carbonized material has been found only in square B'7/fourth layer/ and square B21/18. The species composition of cereals and legumes is not considerably different from that of the other groups. The weed species found in square B21/18 are of great interest. These are:Chenopodium album; Sanguisorba minor; Rumex cf. crispis v. minor; Falopia canvovulus; Polygonu lapatifolium; Salvia cf. officinalis Vicia sp.

The fifth group is the most interesting and deserving of attention. At a gradually increasing depth from 3.30 m to 4.40 m, seven samples have been taken from sq. B22, where a fire-place was excavated. The wide variety of the cereal and legume species present is striking. Oats, peas, vetchling and relatively more millet have been found as well as the previously listed species. Barley is the commonest, followed by the mild/compact wheat and vetch. The data in table 1 allows a very interesting distribution to be observed in terms of the distribution of quantity of different species at various depths. At deeper depths there were larger quantities of finds. A definite explanation can not be given so far. Soil conditions might have been more favourable to preservation of carbonized remains in lower

sediments. Upon the fire-place, (at a depth of 3.70-3.90 m) in square B22, the following weed species have been also found:cf.Arcticum lapa L.; Circea lutentiana; cf Echinocloa crus - galli L.; Centaurea cyanis L.; Convovulus cf. arvensis L.; Veronica hederifolia L.; Polygonum aviculare L.; Polygonum persicaria L.; and there was a considerable quantity of Chenopodium album.

Sector ABII. The paleobotanical material from this sector has been taken from the following two squares: 3265/1120 and 3270/1120. Ten samples from sq. 3265/1120 have been examined including layers VI, IX, XI and XVI. All samples include carbonized vegetation remains, though the material is of limited quantity. Single grains of all species have been found. Grains from these sectors are often badly fragmented and are easily broken when touched which makes their identification quite difficult.
Samples from square 3270/1120 include horizon VI, VII, XXV and XXVI. Single grains of mild/compact wheat and grapes seeds have been found only in a sample from horizon VII.

CHARACTERISTIC OF SPECIES FOUND

CEREALS
Mild/compact wheat - Triticum aestivo/compactum
This is the commonest among the crops of the settlement. Data have shown that this species of wheat was spread everywhere after the Bronze Age and replaced einkorn and the emmer. The mild/compact wheat gives higher yields but it needs a more humid climate and it is vulnerable to fungi and drought.
The lack of double hulled crops at Pistiros, such as emmer and einkorn, hence the term "hulled wheats", may have been a convenience in terms of threshing the ears as the grains are easily removed(I).

Einkorn and Emmer - Triticum monococcum; Triticum dicoccum.

These two species have been found as single grains in some samples. Apparently, they were not grown regularly. They may have been used as an alternative to other crops or might have been sown in reserve, in case the main crops failed.

Einkorn grows well on poor, stony and mountain soils. Its ears are not vulnerable to damage by birds owing to their hard hulls. The ears of emmer do not fall apart after having ripened and thus the plant could remain in the field for a long time after ripening without loss of grain. These advantages were valued and kept them being sown.

Barley - Hordeum vulgare var. nudum

Barley is found in two variants: naked and hulled. At the site under examination, the naked variant prevails. It may have been preferred because of its easier manipulation, which takes less time.

Millet - Panicum Miliaceum

Evidence for primitive millet in prehistoric Bulgaria is very scarce, but data from the period after the Bronze Age indicate it spread quickly.[3] Its use is connected with its total independence of climatic changes. The crops provide a rich harvest. The plant ripens in a short time, and the preparation of food is quite simple. That is why it became a valued food.

Oats and Rye - Avena sativa; Secale cereale

These are not present in our material in any significant quantity. These two species were among the so-called secondary crops. Originally, they were merely weed plants present with the major cereals. Oats, on its way to the north together with emmer, became differentiated as a separate crop. The ecological needs of oats require a more humid and cooler climate typical of northern areas. Perhaps that is why it spread to our territory later.

Legumes
Together with the major cereals, several legumes have been identified in the settlement. The first of these are lentils of the small-bean variant. On archaeological evidence, that variant was domesticated considerably later than some other variants typical of the West Mediterranean [4]. Vetch was a plant already known by the Neolithic and still present during all later periods[5]. It was used as food by people, as well as fodder by the animals.

Peas - Pisum sativum
Several seeds of this plant indicate that it was less frequently sown than vetch and the lentils.

Fruit and wild plants

Grapes - Vitis vinifera

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[3] T.Popova,Plant remains from Bulgarian Prehistory (7000-2000B.C.). In Bailey D.W., Panayotov,eds.Prehistoric Bulgaria., Monogr. World Archaeol.22, Madison,1994,p.193-208; T.Popova,E.Bozilova, Paleoecological andpaleoethnobotanical data for the Bronze Age in Bulgaria. In:The Steps of Games Harvey Gaul (James Harvey Gaul in memorium) ; Sofia,1,1998,p.391-397.
[4] I.Sinskaya, Istoriceskaja geografia kulturnoj floraj , L., Nauka,1969
[5] T.Popova, 1994,op.cit.

This was present in most of the samples. All seeds found belong to the domesticated type of grapes, though that is not surprising bearing in mind the period when the settlement existed.

Prunus sp.

In the same samples pieces of fruit pips have been identified, but only a few of them have identifiable features that could be discerned. With some reservations, the fragments could be referred to some species of plum or damson.

Weed species
Of weed plants, seventeen species have been established and 14 of them identified. Bad preservation is the reason the others not been identified. The weed species identified have represented the ruderal vegetation and are found in fields, stony and grassy places. Some of them occasionally grow in more humid environments, like riverbanks, shady places and woods. Some of the weeds identified have been depicted in pic.1

The following species have been found:

Arctium lapa L. - More often found in vegetable gardens than in wheat fields.

Convovulus arvense L. can be present with all crops but is commonest among earthed-up crops. The plant is a perennial weed, which grows on every kind of soil. This plant can have medicinal uses and can also act as a poison.

Centaurea cyanis L.- a biennial plant which can occur with all crops. Its seeds germinate at a depth of 2 to 8 cm. It prefers light soils rich in nutrients. It is often present with crops of naked wheat such as the mild, compact and hard types. It also occurs with the autumnal species. A lot of moisture is needed for the seeds' germination. It contains blue pigment.

Chenopodium album L. Prefers clayey, sandy soils rich in humus. This plant is an indicator of enhanced nitrogen content in the soil. It is spread among spring and earthed-up crops, mainly vegetables - peas, broad beans and lentils. It contains a red pigment. There is evidence that in years of poor harvest it was added to the flour.

Polygonum aviculare L. Is present mainly along the roads, in ruderal locations as well as in soils rich in nutrients. It is also used in medicine.

Polygonum persicaria L. – Occurs in wet places, such as along river banks. It prefers aerated wet and rich soils. To be found among earthed-up crops and spring crops. Yellow paint to be obtained from its roots.

Galium aparine L. - a typical ruderal plant, to be found everywhere, though mainly along the roads. Its seeds are used as food by birds. It contains red pigment.

Veronica hedrifolia L. Plant typical of grassy places, fields etc. Eaten by sheep. To be seen among winter crops. Light-seeking plant.

Lytospermum arvense L. - in damp areas, along rivers. Occurs with winter crops of rye and wheat.

Rumex crispis L. - It is associated with cereal crops, often seen by fields and roads.

Sanguisorba minor L. - It is often found in grassy and hilly places, among ruderal crops. It is often associated with rye and wheat. It grows on eroded terrain and withstands drought. There is evidence that it have been used: the leaves for soup, and roots for making tanning substance.

Plants are good indicators of the environment. According their characteristics they can be classified by different factors. There are many different classifications which can be applied to the study of ancient techniques of agriculture and to the palaeo-environment. In interpreting the results, data from [6]; have been used as a reference point to help resolve these problems. The wild and weed species that have been found have been examined with two aims. Firstly with regard to the agricultural practices, were the crops sown in winter or spring ones? Secondly with regard to the type of the culture, was it predominantly - earthed-up or cereal? The twelve species studied have provided the following results: six of them are associated with earthed-up crops, and six with cereals. Four out of seven plants are typical of spring crops, and three of winter crops. Unfortunately, the data is totally insufficient to allow us to make firm conclusions to the problem right now.

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[6] R. Cappers,An ecological characterisation of plant macro-remains of Heveskeskloster (the Niderlands). A methodical approach, Rijksuniversitet, 1994, p.9-49; M.Van der Veen, Crop husbandry regims, Gröningen, J.J.Collis Publ., Univ. of Scheffield, 1992,p.227; U.Willerding, Paläo-ethnobotanische Befunde äber Ernährungund und Umwelt im Mittelalter Braunschweigs. Forschungen z.Denkmalpflege in Niedersachsen 3,1985,p.201-214; U.Willerding, Erhaltung und Representanz von Pflanzenreste in archäologischen Fungut, -In: Van Zeist, W.et.all.(eds.):Progress in Old World. Palaeoethnobotany. A.A.Balkena,Rotterdam,Brokfild, Präsenz 1991,p.25-51; I.Stranski,Plevelite v zemedelieto, Plovdiv 1919, p.179; I.Stranski, Divi I polezni rastenia v Balgaria, BAN 1963,p.215

The weed species can be divided in to two groups, those that could be used as food and fodder, and those which are of no special importance. In table 3 their common uses are presented.

B.Results from the study of carbonized wood

This report only presents materials covering squares 3265/1120/Xi; XII; XIV/ and square 3270/1120/XXIV; XXVI/. A large part of the assemblage of carbonized materials is not well preserved and could be broken at a slight touch. The wood is strongly deformed and curved which suggests that it was exposed to high temperature in a fire. In such cases it is difficult to identify the species present.

As far as quantity of different species is concerned, oak is dominant /table 3/. It is present in all layers. There is a relative lower presence of coniferous trees. Elm, yoke-elm, maple and alder have been found only as single fragments. The examination of material from an ecological point of view has been impeded by an insufficient number of samples from different contexts. That would provide us in the future with a more complete picture of the paleoenvironment.
From the paleobotanical point of view there is no doubt about the fact that the oak was one of the most frequently found species and had a basic role in every-day life. As a fuel the wood supplies a very high temperature in a short time and as a building material it was certainly highly esteemed. Types of maple, elm are typical of low lands, along the riverbanks, and also in residential areas.

Conclusions

The preliminary analysis of the carbonized material from the site of Pistiros has provided us with a wide range of domesticated plants. The major cereal crops were mild/compact wheat and barley. In addition, in cases of insufficient yields or failure of the harvest, einkorn and emmer were sown. Among legumes, the lentils and the vetch were preferred to the peas.
We could also assume that viniculture was practiced in the region. A large part of the wild and the weedy flora was also in springtime as additional fodder for birds and cattle.
In future, the research will increase and deepen so that the paleoenvironment will be studied in more detail

Table 1 Quantitative distribution of species with regard to the depth of the altar in square B22.

Table 2. Distribution of carbonized fragments of wood with regard to the different horizons of the altar

Table 3. Use of various wild species found at the site of Pistiros

TAXONS	HUMAN	ANIMALS
	leaves	fodder seeds