ARCHAEOBOTANICAL INVESTIGATIONS AT THE GEOMETRIC SITE OF KRANIA, SOUTHERN PIERIA IN MACEDONIA, GREECE

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The site of Krania is one of the very few sites dated in the Geometric period in Greece that has been extensively sampled and analysed for archaeobotanical remains. Archaeobotanical samples presented in the current paper derive from two pits and it is suggested that they indicate different crop processing and depositional activities. It should be noted that these are only the preliminary results of an ongoing study, although based on the vast majority of the material, and some aspects of the presented study require further investigation.

Introduction: the archaeological background

The area of Pieria lies at the southern part of Macedonia (Fig. 1), constituting a fertile passage connecting Thessaly (Central Greece) with Macedonia, Northern Greece (Admiralty 1944/45, 110). In the area of lower Olympus, above the Tembi valley and the Peneios River, the site of Krania is one of various other important sites in the region[1], dating from the Neolithic to the Roman period (Poulaki 2003). More specifically, the excavated site of Krania is situated at the northern foothills of Platamon Hill, 200 m. from the sea and at a height of 10 m above sea level. The site of Krania was possibly a part of the harbour district of the ancient city of *Irakleon* (Poulaki 2001)[2].

The study of the stratigraphy and the archaeological finds has revealed archaeological layers and structures dating to the 3rd millennium BC to the 4th century AD. The archaeobotanical material examined for the present study derives from two large pits, dated to the 9th-8th century BC. The first pit, Pit A (approx. 2m x

[1] Such as the ancient cities of Phila and Leivithra, and the farmhouses of Komboloi, Duvari and Tria Platania, dated to the Hellenistic period (Poulaki 2003; for a thorough archaeobotanical study of the farmhouses, see Margaritis 2007 (forthcoming).

[2] I would like to thank E. Poulaki, Director of the Ephorate at Pieria, for giving me permission to study the archaeobotanical material from Krania. I also thank the British School at Athens for funding my trip and accommodation to Cambridge for studying the material at the Pitt-Rivers Laboratory at the McDonald Institute.

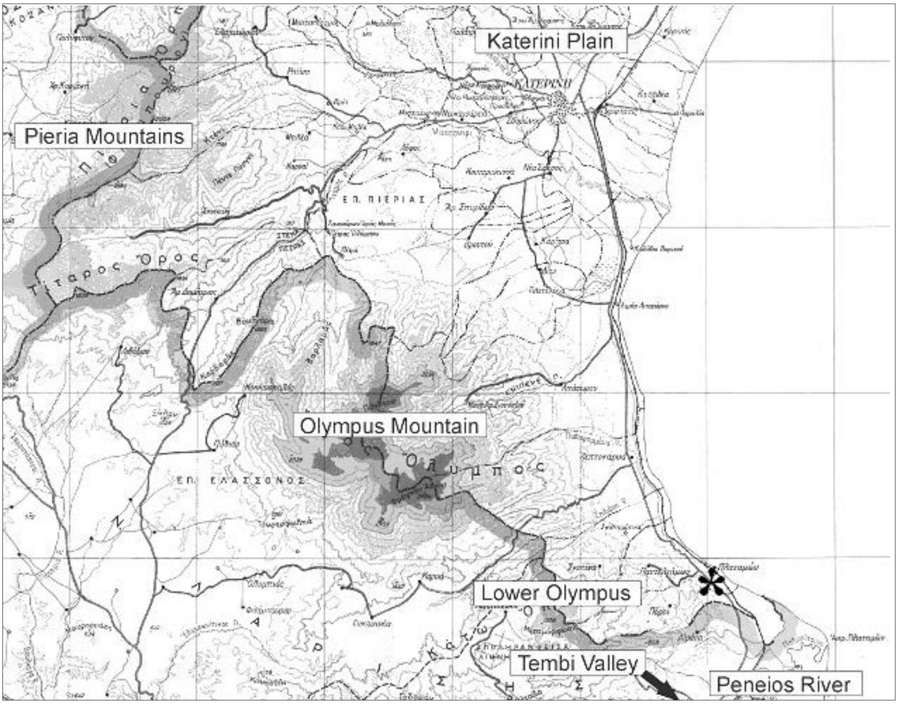

Fig. 1. Map of South Pieria with indications of major landscape features (National Statistical Department of Greece/Pieria Prefecture, 1963). The site of Krania is shown by the star.

1.50m in size and of a meter in depth) contained large amounts of vessels of varying size broken in situ, while charred plant remains were visible among their fragments. Pit B, larger than Pit A, was rich both in pottery and in plant remains. The composition of the samples however differs between the two pits and their interpretation is therefore different (see *infra* under results).

Sampling and processing

The pits under study here were almost completely processed, in approximately 20 cm intervals. The volume of soil collected for each sample varied according to the quantity of the deposit, which in some cases, especially in Pit A, consisted only of charred remains. Maintaining a strategy for detailed sub-sampling of these features was considered necessary in order to retrieve a wide diversity of material and to be able to determine the presence of different loci of origin. In doing so, it was hoped that concentrations of the plant remains could possibly be connected to specific vessels. The sediment samples from the site were processed by the author in a modification of the "Ankara" flotation machine described by French

(1971). The sieves used during flotation were of two mesh sizes: 1mm for the coarse flot and 300µ for the fine flot. The riddle retaining the 'heavy residue' of the samples was of 1mm mesh size. The samples were identified under a Leica stereomicroscope with magnifications ranging from 10x – 40x.

Identification of the species

The plant remains retrieved from the site of Krania are in a very good preservation condition and consisted of:

Cereals: Einkorn (*Triticum monococcum*), emmer (*Triticum dicoccum*), bread wheat (*Triticum durum*), macaroni wheat (*Triticum aestivum*), hulled barley (*Hordeum vulgare*).

Pulses: pea (*Pisum sativum L.*), bitter vetch (*Vicia ervilia*), lentil (*Lens sp.*).

Fruits and nuts: hazelnut (*Corylus avellana*), grape (*Vitis sp.*), fig (*Ficus carica*), olive (*Olea europaea*), pomegranate (*Punica granatum*) and watermelon (*Citrullus lanatus*).

Wild species: Rumex sp., Lithospermum arvensis, Polygonum aviculare, Carex sp., Galium cf. aparine L., Chenopodium album L., Adonis sp., Lathyrus/Vicia sp., Lolium temulentum, Lolium sp., Plantago sp. and *Rumex acetocella*.

In archaeobotanical research, it is not possible to distinguish the grains of bread and macaroni wheat on the basis of their morphology (Zohary/Hopf 2000, 53). The most effective way of differentiating these two species is the morphological variation of their rachis internodes. The limited numbers of rachis fragments found at the present assemblage were identified as tetraploid wheat, *Triticum durum*.

Also based on the morphology of the rachis internodes, domesticated barley can be separated in two major types: two-row and six-row barley (Renfrew 1973, 73). For the two-rowed variety, all kernels are straight and symmetrical and each ear contains only two vertical rows of fertile spikelets while in the six-rowed form the lateral grains are '*often slightly bent and somewhat asymmetrical*' and the ears have six vertical rows of fertile spikelets (Zohary/Hopf 2000, 60ff). Two-rowed and six-rowed barley were treated as separate species until recently because of the striking differences in ear and kernel morphology and they were classified as *Hordeum distichum* L. and *Hordeum hexastichum* L. (*Hordeum vulgare*) (Zohary/Hopf 2000, 60). However, it appears that this traditional taxonomy is genetically invalid and these two barley types represent races of a single species: *Hordeum vulgare* L. Therefore, their modern grouping refers to them as *Hordeum vulgare* L. subsp. *distichum* and *Hordeum vulgare* L. subsp. *vulgare* (Zohary/Hopf 2000, 65). In the current assemblage, both asymmetrical (confirming the presence of *Hordeum vulgare* L. subsp. *vulgare*) and symmetrical grains were present. The symmetrical grains might indicate the presence of *Hordeum vulgare* subsp. *distichum* without, however, excluding the possibility that these straight grains represent the medial spikelet of the six-rowed triplets (Fig. 2). In the absence of rachis fragments, the only method of determining whether a sample of

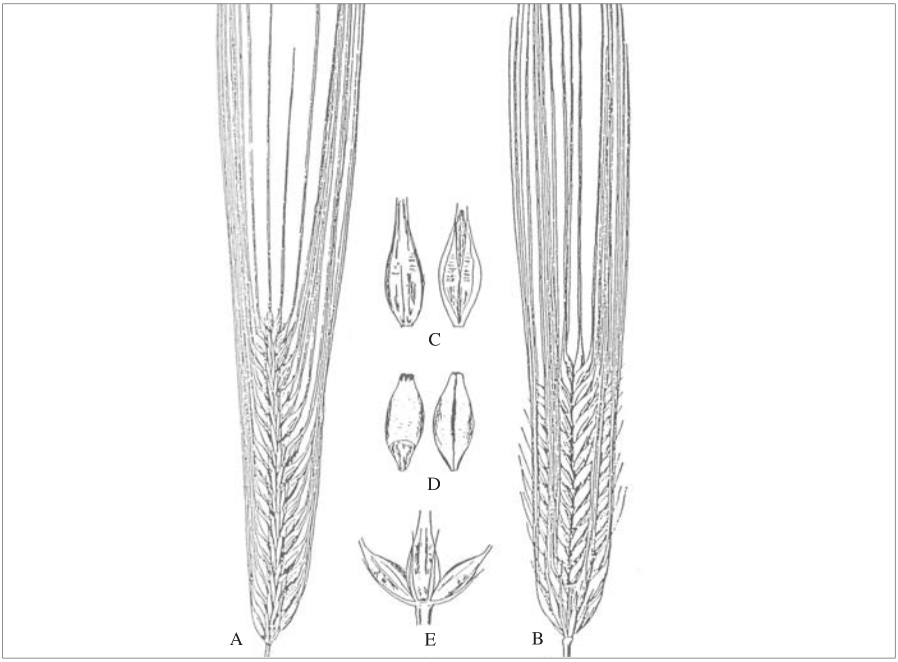

Fig. 2. Main types of barley, Hordeum vulgare. A. Ear of two-rowed barley. B. Ear of six-rowed barley. C. Grain of hulled barley. D. Grain of naked barley. E. Triplet of six-rowed barley (After Zohary/Hopf 2000).

barley containing twisted grains is of pure six-row or whether it contains a mixture of two-row, is by applying statistical tests to the ratio of symmetrical to asymmetrical grains (Hubbard/Clapham 1992, 131), but for the present assemblage this approach needs further study.

Results

Pit A

A total of 58 samples were processed from this feature. It should be also noted that the material derived from Pit A is considered to be from a primary context, where several vessels were found broken in situ. The sampling strategy followed (see above under sampling), allowed for the possibility of connecting the plant remains with the contents of specific vessels.

The majority of the samples consists of large quantities of barley and bread/macaroni wheat, numbering several thousands (Fig. 3). Only in a few samples was barley found as a single crop. Studies focusing on crop processing have proven a valuable tool for the interpretation of the plant remains. Cereals are processed in

Fig. 3. Carbonized seeds of barley and bread wheat from Pit A

a specific logical order so that winnowing, for example, cannot precede threshing, or sieving cannot precede winnowing. In this respect, present day non-mechanised agricultural systems can be relevant to understanding agricultural systems of the past. In this line of thought, pioneer ethnographic studies have suggested that cereal remains can be potentially assigned to various crop-processing stages, based on the relative proportions of grain, chaff and weed seeds (*cf*. Hillman 1981, 1984; Jones 1983; 1984). Mixtures of different crops with the same processing requirements sown together can be interpreted as 'maslin'. This is the case of bread/macaroni wheat and barley, which belong to free threshing cereals and follow the same processing stages. Since different cultigens have diverse requirements, a 'maslin' crop has the advantage of producing a yield in spite of unfavourable growing conditions in any year. Such an interpretation can be given with confidence to stored products, such as the ones found at Assiros (*cf*. Jones 1983).

Fragmented cereals are present in several samples. Fragmented cereals have been interpreted at other sites as already processed products, ready for cooking and consumption. When the organic material is coarse and the fragments of cereal can

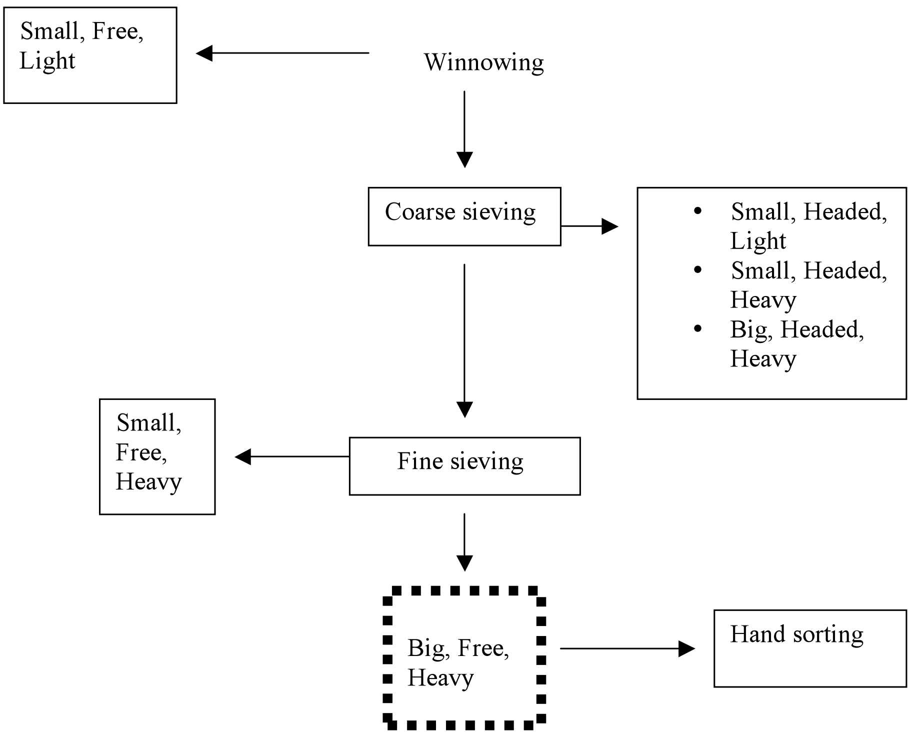

Fig. 4. Processing sequence indicating effects on weed seed categories (after van der Veen 1992).

be seen by the naked eye, cereals are termed as 'bulgur' (Sarpaki 2001, 31). It may be possible to distinguish whether the fragmentation of cereal grains occurred prior to charring, or even if they were soaked in water for the preparation of specific types of food (Valamoti 2002a). Experimental work based on different types of modern bulgur (Valamoti 2002a, 20; see Abdalla 1990, 30, for the modern preparation of bulgur) showed that the fragmented cereals from Bronze Age sites in Greece were possibly treated with water prior to consumption. On the other hand, fragmentation of cereals can be the result of depositional or mechanical damage and human manipulation during excavation and recovery. It is therefore important to establish whether fragmentation of the cereals occurred prior to or after charring. This aspect has not yet been studied in the material under study and needs further investigation.

Species other than the cultivated ones (wild/weed species for the present study), although very few in the assemblage from Pit A, can provide valuable information about crop-processing activities.

Crop processing groups could also be clearly distinguished by using weed seed characteristics (Fig. 4). In this respect, the size of the seed is relevant to sieving: the tendency of some weed seeds to remain in their seed heads, spikes or clusters despite threshing, is relevant to coarse sieving, since these tend to be retained in the sieve while free and small seeds pass through. Jones (1983; 1987) distinguished six categories of weed seeds based on their characteristics: BHH (Big, headed, heavy weed) seeds; BFH (Big, free, heavy); SHH (Small, headed, heavy); SFH (Small, free, heavy); SFL (Small, free, light); SHL (Small, headed, light). Following this classification, by-products from the early stages of the processing of cereals, such as winnowing and coarse sieving, can be separated from other products and by-products occurring at the later stages of the procedure. Moreover, a relative ratio of the components expected to be found can thus be established (Van der Veen 1992, 82).

The assemblage from Pit A contains a single wild/weed species, *Lolium temulentum*, which belongs to the Big Free and Heavy category and is indicative of hand-sorting. Its shape and size, resembling the shape and size of cereal grain, prevents it for being removed during sieving and therefore requires removal by hand sorting. This, in combination with the large quantities of the cereals present, suggests that the botanic remains from Pit A represent material which had been processed up to a stage prior to consumption. The hand sorting for the removal of *Lolium temulentum* could have been done piecemeal during certain periods of time.

Pit B.

A total of 63 samples was processed and analysed from this context.

Pit B is larger than Pit A and apart from the pottery and the archaeobotanical material, large quantities of seashells (*Cardium*), fish- and animal remains have also been retrieved, which are absent in Pit A. The material from Pit B does not represent a primary but rather a secondary deposition. This is indicated by the variety of the archaeological material (such as broken discarded vessels) present, but also by the composition of the archaeobotanical remains.

As is the case in Pit A, barley and bread/macaroni wheat are the principal species, mostly found together followed by pea, bitter vetch, grape, olive, watermelon and pomegranate. It is evident that the samples do not have the uniformity of the samples from Pit A, which suggests that the archaeobotanical remains are the result of different processing and depositional processes. Wild/weed species are also far more numerous in this pit and, moreover, include different species. Most species from this category are weeds of arable land (*cf*. Hanf 1983) and are representative for by-products of various stages of the crop processing chain.

According to Jones' classification (1987, 313) presented above, most taxa belong to the Big Free Heavy category (*Lathyrus*/*Vicia* sp., *Lolium temulentum*, *Lolium* sp. and *Galium* cf. *aparine*), indicative of a fine-sieving and/or hand-sorting by-product. Others, such as *Plantago sp.,* belong to the Small Headed and Heavy group and are likely to be removed during coarse-sieving. *Rumex acetocella*, *Adonis* sp., *Carex* sp., *Lithospermum arvensis* are all Small Free and Heavy, indicative of fine-sieving by-products. However, it is possible that the wild/weed taxa could represent intentional gathering. A wide range of wild greens would have been available for exploitation as a nutritious addition to the diet, rich in vitamins and minerals (*cf*. Clark Forbes 1976, 16).

Based on the presence of seeds from the wild/weed category from Pit B, I suggest that coarse- and fine-sieving took place at the site. The products could have been threshed and initially processed in the fields, then brought back to the site where they were probably processed, stored and consumed. The coarse- and fine-sieving could have been done with the hand sorting prior to – or immediately after – storage and before consumption.

The presence of pomegranate and watermelon is also of interest due to the limited quantities of these species occurring in Greece (particularly watermelon). Pomegranate, together with the grape, the olive, the fig and the date represent the first group of fruits that were domesticated and cultivated (Zohary/Hopf 2000). In the ancient world, the pomegranate was widely considered the fruit of fertility and luck and has been found in different sites such as Bronze Age Tiryns (Zohary/Hopf 1988), including in a context of ritual offerings at Samothrace (Megaloudi, pers. comm.). At Krania, seeds but also fragments of the skin of the fruit have been recovered. The most numerous published material of pomegranate thus far comes from the Archaic period and the Heraion of Samos, numbering several hundreds (Kucan 1995). Watermelon seeds have been found in Egypt in various sites dated from the 12-18th century AD, but it is the first time that they have been recovered in Greece.

Concluding remarks

The archaeobotanical material from Krania represents the first well-preserved and rich assemblage dating to the Geometric period[3]. With the archaeobotanical study of the two pits it was possible to identify different approaches to crop processing and different depositional processes.

The samples from Pit A represent a stored product, ready for human consumption and stored in relatively small quantities, if we evaluate the size of the vessels (e.g

[3] For an account of the agriculture in first millennium Greece, see Kroll 2000; for a review of the proto-geometric finds, see Megaloudi 2004, such as the material from Kastanas (Kroll 1983), and Nichoria (Shay and Shay 1978). The plant remains from Iolkos (Jones 1982) and Mesimeriani Toumba (Valamoti 2002b) also belong to this period but they represent only limited samples and the presence of archaeobotanical material is insubstantial. The samples from Delphi and Kalapodi(?) derive from sacrificial contexts and possibly represent ritual offerings (Megaloudi 2004).

[4] The study of the pottery is still under study.

no pithoi were found)[4].

The samples from Pit B reflect discarded material from various household activities, such as residues of processing and cooking, which may have accumulated on the floors of the buildings and also in the open areas of the site. This interpretation is further supported by the distribution of remains of other foodstuffs indicative of preparation or/and consumption, such as seashells, fish and animal bones. As these samples reflect secondary depositions, they do not leave any space for further interpretation of the different crops and their possible status and uses.

It is possible that barley was cultivated both as single crop, since it was stored separately (Pit A), and as a 'maslin' with bread/macaroni wheat, in view of the fact that they have been found stored together (Pit B). Yet, as the samples from Pit B almost certainly represent the residues of a series of different household activities connected with food processing over a period of time, this remains fully hypothetical.

Our understanding of the taphonomical processes that led to the deposition of the botanical remains in these particular areas of the site and our ability to assess their use by the inhabitants of Krania would greatly benefit from further research. In this respect, the plant remains from Krania should be viewed in a wider context, including further study of the pottery and a closer examination of the other organic remains found in the two pits, such as the animal and fish bones and the seashells.

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