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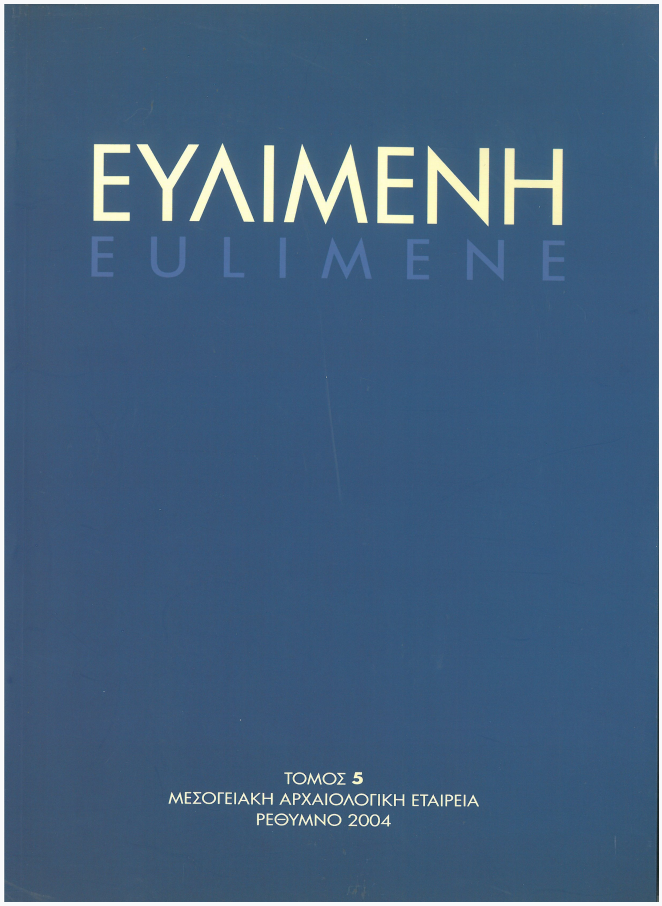

Agriculture in mainland Greece at the Protogeometric period: A view from the archaeobotanical remains

Fragkiska Megaloudi

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ΕΥΛΙΜΕΝΗ

ΜΕΛΕΤΕΣ ΣΤΗΝ ΚΛΑΣΙΚΗ ΑΡΧΑΙΟΛΟΓΙΑ,
ΤΗΝ ΕΠΙΓΡΑΦΙΚΗ, ΤΗ ΝΟΜΙΣΜΑΤΙΚΗ ΚΑΙ ΤΗΝ ΠΑΠΥΡΟΛΟΓΙΑ

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Antonio Corso, The Position of Portraiture in early Hellenistic Art Criticism, ΕΥΛΙΜΕΝΗ 5 (2004), 11-25

La posizione del ritratto nella critica d'arte del primo ellenismo. L'autore cerca di delineare quale sia stato lo svolgimento della ritrattistica delineato dai critici d'arte del primo ellenismo e in particolare da Senocrate di Atene, un allievo della scuola sicionia attivo nei decenni centrali del III sec. a.C. Notizie desunte dai due trattati di Senocrate sulla bronzistica e sulla pittura sembrano infatti esser confluite nella trattazione sulle arti antiche di Plinio il Vecchio cosiccome in altre opere letterarie di eta' ellenistica o romana imperiale. L'inizio dell'arte di rappresentare un individuo in particolare sarebbe stato attribuito a Butade di Sicione, che avrebbe fatto un primo ritratto coroplastico del fidanzato della figlia. Meno certa é invece l'eventualitá che Senocrate avesse incluso nella sua sequenza storica le immagini iconiche di Cleobi e Bitone, erette a Delfi e replicate ad Argo, ad opera di scultori argivi. Invece, la caricatura di Ipponatte ad opera di Bupalo e Atenide e l'autoritratto di Teodoro di Samo dovevano aver costituito momenti salienti nella dinamica storica ricostruita da Senocrate. Altri momenti importanti della medesima ricostruzione sembrano esser state statue di Olimpionici, il gruppo di Armodio e Aristogitone di Antenore e le raffigurazioni dei generali Greci e Persiani nella battaglia di Maratona dipinta nella *Stoa Poikile*. L'etá di Pericle potrebbe aver costituito –nella teoria senocratea– una battuta d'arresto nel processo di affermazione del ritratto realistico. La compiuta espressione del ritratto fisiognomico sarebbe stata attribuita a Demetrio di Alopeke.Infine, il culmine di quest' arte sarebbe stato posto nell'etá di Alessandro e dei primi diadochi e sarebbe stato segnato dalle personalitá di Lisippo, Lisistrato, Apelle e Protogene.

Γιάννος Κουράγιος, Δεσποτικό: Ένα νέο ιερό σε μια ακατοίκητη νησίδα των Κυκλάδων, ΕΥΛΙΜΕΝΗ 5 (2004), 27-89

Despotiko: a newly discovered sanctuary at an uninhabited isle of the Cyclades. Despotiko lies to the west of Paros and Antiparos, in a strategic position, in the centre of Cyclades. The site of Mandra is located at the island's north-east corner. The island has been identified with ancient Prepesinthos, mentioned by Strabo and Pliny. The archaeological remains of Despotiko were first explored in the late nineteenth century by Ch. Tsountas, who excavated early Cycladic cemeteries at Livadi and Zoumbaria and identified remains of a prehistoric settlement at the site Chiromilos. Rescue excavations were initiated in 1997 under the auspices of the Ministry of Culture. Short annual campaigns of excavation continued through 2000, focused on the site at Mandra, where a large sanctuary dedicated to Apollo has been located. Up to date eight large buildings have been found. Apart from the Archaic building of the sixth century BC, Classical and Hellenistic buildings have been unearthed. Although the temple has not been located yet, many parts of the temple's upper structure, built in later walls, have been identified. The

excavation has yielded a great number of finds, many of which are of prime importance as to the interpretation of the site, its role in the Aegean and its relations with the Near East, from the Archaic to the Roman period.

Σταυρούλα Οικονόμου, Νεκρικά κοσμήματα: Τα ελάσματα κάλυψης του στόματος, ΕΥΛΙΜΕΝΗ 5 (2004), 91-133

Burial jewels: the custom of mouth bands. Mouth bands made of gold, or rarely of silver, appear in different types of burials mostly in the area of the south Balkans as early as the Neolithic period until the early Christian era. The custom seems to apply especially to regions under direct or indirect Mycenaean influence, such as Cyprus of the Late Bronze Age and Macedonia of the archaic and classical periods. Some of these bands are decorated with floral, geometrical or pictorial patterns whereas others bare no decoration.

The few inscribed gold bands, usually in the shape of a leaf, mention either the name of the deceased or a dedication to the underworld deities and date from the fourth c. B.C. to the first c. A.D. These are associated to the gold «dionysiac-orphic» sheets and to the mystery cults of Dionysus and Persephone.

Sophia Kremydi-Sicilianou, Patterns of monetary circulation in Roman Macedonia: The hoard evidence, ΕΥΛΙΜΕΝΗ 5 (2004), 135-149

Νομισματική κυκλοφορία στη Ρωμαϊκή Μακεδονία: Η μαρτυρία των θησαυρών. Στο άρθρο αυτό παρουσιάζονται οι «θησαυροί» που έχουν βρεθεί στην περιοχή της Μακεδονίας κατά τους ρωμαϊκούς χρόνους με ιδιαίτερη έμφαση στα πρόσφατα ευρήματα. Συζητείται η διάδοση του ρωμαϊκού νομίσματος στην περιοχή και αντιδιαστέλλεται η σχετικά συχνή εμφάνιση των αργυρών υποδιαιρέσεων, κυρίως των δηναρίων, με την εξαιρετικά σπάνια εμφάνιση των χαλκών και την πλήρη απουσία των χρυσών.

Οι «θησαυροί» που περιέχουν χάλκινες κοπές των επαρχιακών νομισματοκοπείων ταξινομούνται σε τέσσερεις γεωγραφικές ενότητες που αντιστοιχούν στις τέσσερεις μερίδες. Τα συμπεράσματα που προκύπτουν από το υλικό είναι τα ακόλουθα: Η συντριπτική πλειονότητα των χάλκινων κοπών που κυκλοφορούσαν στη περιοχή ανήκαν στα μακεδονικά νομισματοκοπεία ενώ, εντελώς εξαιρετικά, εμφανίζονται νομίσματα από τη Μικρά Ασία. Επιπλέον, παρόλο που οι «θησαυροί» του πρώτου αιώνα είναι ελάχιστοι, φαίνεται πως την περίοδο αυτή τα νομίσματα δεν απομακρύνονταν σχεδόν καθόλου από την περιοχή που κόπηκαν. Κατά τον δεύτερο αλλά κυρίως κατά τον τρίτο αιώνα, οι επαρχιακές κοπές κυκλοφορούσαν ευρύτερα μέσα στη Μακεδονία· οι κοπές της πρώτης μερίδας ωστόσο εξακολουθούσαν να μετακινούνται λιγότερο, τουλάχιστον προς δυσμάς. Η ευρύτερη κυκλοφορία των νομισμάτων του τρίτου αιώνα θα πρέπει να συνδέεται με την παρατηρημένη μετρολογική αλλά και τεχνοτροπική τους ομοιομορφία.

Τέλος προτείνεται πως, αντίθετα με ότι συνέβαινε σε παλαιότερες περιόδους, οι κοπές των επαρχιακών πόλεων στους αυτοκρατορικούς χρόνους μπορούσαν να γίνουν αμοιβαία αποδεκτές ως νόμιμο μέσο συναλλαγής από γειτονικές πόλεις. Εάν η υπόθεση είναι ορθή, τότε η πρακτική αυτή αποτελεί ένα πρώτο βήμα προς την κατεύθυνση της

νομισματικής ενοποίησης της αυτοκρατορίας που επεβλήθη με τις μεταρρυθμίσεις του Διοκλητιανού.

Fragkiska Megaloudi, Agriculture in mainland Greece at the Protogeometric period: A view from the archaeobotanical remains, ΕΥΛΙΜΕΝΗ 5 (2004), 151-160

*Agriculture et alimentation en Grèce Proto-geométrique: les restes carpologiques***.** La présente étude réalise la première synthèse des données archéo-botaniques disponibles en Grèce concernant la période proto-géométrique. Cinq sites situés dans la partie continentale de la Grèce et datés de la première phase de la période proto-géométrique ont été analysés de manière descriptive. Leur étude a permis d'attester la présence de céréales (orge, engrain, amidonnier, froment, épeautre, millet), de légumes (lentilles, pois, gesses, fèves, ers), d'oléagineux (pavot, cameline, lin) et d'espèces fruitières (figue, vigne).

AGRICULTURE IN MAINLAND GREECE AT THE PROTOGEOMETRIC PERIOD: A VIEW FROM THE ARCHAEOBOTANICAL REMAINS

Introduction

Over the past twenty years numerous studies have appeared regarding the analysis of Protogeometric culture in Greece[1] and have shed light to many aspects of daily life at that time. The traditional approach of analyzing everyday life and agriculture in protohistoric societies is a study of literary reference (when is available) together with archaeological survey. Environmental studies, such as archaeobotanical investigation, on protohistoric and historic periods are still scarce. Many excavators do not apply any technique for the collection of bio-archaeological remains, assuming, wrongly, that all the information can be found in literary sources, stone architecture or in the various artifacts. However, plant remains, charcoal, charred seeds and fruits are present in almost every stratigraphical layer of an archaeologically investigated site. The study of these remains is usually conducted on prehistoric sites but classical archaeology still lags behind in this respect. This paper proposes the first review of the macro-botanical remains (fruits and seeds)[2] discovered in Protogeometric sites in mainland Greece.

Archaeobotanical investigation is one of the most reliable methods of studying agricultural practices and daily life in past societies. However the problems of taphonomy and recovery bias must be outlined in order to provide a statistically acceptable basis on which to rest any interpretations. Not all plants remains are equally well preserved or recovered systematically, and there is a whole range of plant species that is not recoverable. On Aegean sites, where nearly all of the botanical remains have been preserved through carbonisation, it is more common to find only species that are likely to be exposed to fire in some way.[3] Cereals are often parched at some stage of their processing, which increases their chances of preservation in archaeological contexts. On the other hand, vegetables and soft plant remains are highly perishable and are unlikely to be preserved through carbonisation. This can result to the under-representation of several species in our archaeobotanical record.

There is also a recovery bias that involves the attitude of the excavator and the type

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[1] The archaeology of the PG Aegean was recently reviewed by Irene Lemos 2002.

[2] A detailed review of all archaeobotanical studies conducted between 1879 and 2003, regarding prehistoric and historic Greece was included by the author in her dissertation thesis: Megaloudi 2004. Économie végétale et alimentation en Grèce du Néolithique à l'époque Hellénistique: Les apports de la carpologie. Thèse de doctorat à l'EHESS, Paris (in publication). A synopsis of archaeobotanical data from the beginnings of the century to 1936 was published by K.F. Vickery. V. Logothétis published in 1970 a book on modern and archaeological discoveries regarding the vine in Greece. Complementary lists of archaeobotanical remains from prehistoric and historic sites have also been presented by Sarpaki 1992 and Hansen 1999.

[3] Dennell 1976; Hillman 1981; Sarpaki 1992.

of site excavated. This can be seen in the paucity of archaeobotanical data from protohistoric and historic sites. In Protogeometric Greece –which is the study area in this article– the total number of sites that have yielded plant remains is limited: Only five sites presenting Protogeometric occupation levels have been recorded: Kastanas, Iolkos, Kalapodi, Delphi and Nichoria, as shown in the table below.

The plant species found at Protogeometric deposits

		Kastanas Kroll 1983	**Kalapodi** Kroll 1993	**Delphi** Luce *et al.* in press	**Nichoria** Shay and Shay 1978	**Iolkos** Jones 1982
Hordeum vulgare L.	Barley	x	x	x	x	x
Panicum miliaceum L.	Broomcorn millet	x	x			
Triticum aestivum L.	Bread wheat	x	x	x		
Triticum dicoccon L.	Emmer wheat	x	x	x		
Triticum monococcum L.	Einkorn	x	x	x		
Triticum spelta L.	Spelt wheat	x	x			
Triticum sp.	Wheat				x	
Cicer arietinum L.	Chick pea				x	
Lathyrus sativus L.	Grass pea	x	x	x		
Lens culinaris Med.	Lentil	x	x	x		
Pisum sativum L.	Peas		x			
Vicia ervilia L.	Bitter vetch					x
Vicia faba L.	Broad bean	x	x	x		
Camelina sativa L.	Gold of pleasure	x	x			
Linum usitatissimum L.	Flax	x	x			
Papaver somniferum L.	Opium poppy	x	x			
Ficus carica L.	Fig	x	x	x	x	x
Vitis vinifera L.	Vine	x	x	x	x	x

These Protogeometric sites correspond to 6% of the total number of published archaeobotanical studies conducted in Greek archaeological sites between 1879 and 2003.[4] This under-representation of proto-historic sites in archaeobotany, is mostly due to the archaeological emphasis which is laid on architecture, art history and luxury, as argued above.

I have chosen in this paper to present an overview of Protogeometric Greek mainland sites based on the data currently known for the primary edible plants that have been recovered from proto-historic sites. It is important to note that the aim of this article is to propose a synthetic view of the macro-botanical remains dated to Protogeometric period, as such a synthesis did not exist so far. With this goal in mind, the paper is focused on Protogeometric archaeobotancal findings (fruits and seeds) and literary evidence was not included.

[4] These numbers are based on the statistical analysis conducted by the author in her PhD dissertation: Megaloudi 2004.

Archaeological Background

At *Kastanas Toumba* the botanical findings of layers 12-9 correspond to the Protogeometric period of Macedonia.[5] Inside the layers 12-11 some levels correspond to late Helladic III C but the botanical remains (all carbonized) are attributed to the Protogeometric phase of Northern Greece.[6] The Protogeometric macro-botanical findings from Kastanas come from domestic deposits («timber houses») and represent food remains[7]. It is important to notice that for the recovery of the material both manual and mechanical flotation was used.

Excavations conducted at *Iolkos* in Thessaly revealed a burnt destruction episode on a Protogeometric floor: the carbonised plant material was found in three distinct concentrations and was floated in water. According to the archaeobotanist of the site the plant remains resulted from the destruction of cleaned stored crops.[8]

In central Greece, the sanctuary at *Kalapodi*, has yielded a sequence of well-dated and studied burnt plant remains and animal bone deposits ranging from post-palatial, late Mycenaean (LHIIIC) to Classical times.[9] In the Protogeometric levels of the sanctuary macro-botanical remains are retrieved from a sacrificial context and probably represent ritual meals. Moreover, associated finds of cooking, serving and drinking vessels may indicate that the plant remains were debris of religious festivities in the sanctuary.[10]

During the restauration program that was undertaken at *Delphi* from 1990 to 1992 by the French School of Archaeology at Athens stratigrafic excavations were conducted in a small distance from the temple of Apollo, in the area called «*Pilier des Rhodiens*».[11] The excavation has yielded nine occupation deposits ranging from Mycenaean (13th century BC) to Archaic times. The burnt botanical remains belonging to the Protogeometric period come from sacrificial contexts and represent wastes of food consumed by the visitors of the sanctuary.[12] For the recovery of the plant remains a flotation machine was built up in the suroundings of the site.

Archaeobotanical evidence (seeds and charcoal) from the settlement of *Nichoria*, in the SW Peloponnese (region of Messenia) is summarized under seven major periods: Middle Helladic, Late Helladic II and III, Dark Age I and II, Dark Age III, Fourth century BC and Byzantine.[13] The 91 samples of seeds and fruits were retrieved by water flotation while in some cases the material was recovered by hand. In the Protogeometric levels cereals, legumes and fruits occur in low numbers and come from occupation levels. However, due to their sparse distribution is difficult to state on the importance of various crops during that period.[14]

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5 Kroll 1983; Jung 2002.

6 *Op. cit.* n. 5.

7 Kroll 1983.

8 Jones 1982.

9 Kroll 1993.

10 *Op. cit.* n. 9.

11 Luce *et al.* in press.

12 *Op. cit.* n. 11.

13 Shay and Sahy 1978.

14 *Op. cit.*, p. 52, n. 13.

Archaeobotanical evidence

In Protogeometric Greece, the crops of the arable land can be grouped in cereals, millets, pulses, oil plants and fruit trees.[15] There is sufficient archaeobotanical evidence of the use of at least six sorts of cereals: hulled barley (*Hordeum vulgare vulgare*), which is probably the main crop produced during this period, followed by einkorn wheat (*Triticum monococcum*), emmer wheat (*Triticum dicoccon*), bread wheat (*Triticum aestivum*) spelt wheat (*Triticum spelta)* and millets (at least *Panicum miliaceum*).

Six-row hulled barley appears in Greece at least since the earliest Neolithic levels in Thessaly[16] and in Macedonia.[17] Barley is a very resistant species and can tolerate poor and dry soils, and some salinity; these qualities would have been quickly recognized by the farmers. By the first millennium BC hulled barley is testified in 70% of Greek archaeological sites dated to that period. The increase of finds of barley could indicate the need of proto-historic farmers to cultivate less rich soils in order to feed their communities. The importance of barley during that period is evidenced by the archaeological record as important quantities of barley remains are reported from the Protogeometric layers of Kastanas, Iolkos, Kalapodi, Delphi and Nichoria.

Hulled barley was discovered in a distinct concentration in a burnt Protogeometric floor at Iolkos.[18] The absence of any weed seeds indicates that barley was stored for human consumption and may reflect rigorous hand sorting.[19] It seems that the crop played an important role in the economy of the site during that period.

Important quantities of hulled barley were recorded at the sanctuary of Artemis and Apollo at Kalapodi.[20] The finds were retrieved from a sacrificial context and according to the archaeobotanist of the site they could have been resulted from ritual meals.

A single seed of what it seems to be barley is reported from a floor deposit at Nichoria but as no other remains of the species or parts of the plant were found, is difficult to conclude on the status of barley at Nichoria.[21]

At Delphi barley represent 7% of the total number of plant remains in the Protogeometric levels of the sanctuary.[22] It seems that the barley findings represent wastes of food consumed by the visitors of the sanctuary during the time they spent there.

Emmer and einkorn constituted the principal grain stock of Neolithic and Bronze Age Greece. Both species are present in nearly all Neolithic sites in Greece at least since the 6th millennium BC. Emmer wheat seems to be the most common wheat throughout the Bronze Age in southern Greece while einkorn seem to be predominant in the north.[23] In the Protogeometric period emmer and einkorn are identified in Kastanas,

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15 See also Kroll 2000.

16 Hopf 1962; Renfrew 1966; Halstead and Jones 1980; Kroll 1983.

17 Valamoti 1995.

18 Jones 1982.

19 Jones 1982, p. 78.

20 Kroll 1993.

21 Shay and Shay 1978.

22 Luce *et al*. in press.

23 Hansen 1988.

Kalapodi, Delphi and Nichoria. The archaeobotanical evidence from Protogeometric sites is limited and does not allow any statements regarding the geographical distribution of emmer and eikorn at that time. The available macrofossil data indicate that both species continue to be widely used in the Protogeometric period but barley and bread wheat develop considerably at that time and in some cases they start to replace emmer and einkorn.

Bread wheat is a demanding crop in terms of soil moisture and nutrient requirements and it is a rarer find in Neolithic and Bronze Age Greece. In the Protogeometric period bread wheat is very well documented in Kalapodi and Delphoi where it even replaces other wheat, as the main cereal besides barley.[24] *Triticum aestivum* is a highly nutritious plant as it is very rich in gluten and therefore is the most suited in bread making. The increased number of bread wheat finds during the Protogeometric period could be related to culinary practices. In Kalapodi and in Delphi, in addition to the *Triticum aestivum* remains a large number of mortars and millstones was dicovered. Their presence is related to bread making and it seems that leavened bread –made of *Triticum aestivum*– started to become very popular at that time.

Spelt wheat appears to be a later arrival. The species makes its first appearance in the Late Neolithic in Macedonia.[25] In the Protogeometric period spelt wheat becomes more common as it is recorded in 35% of the sites. The species is discovered in small quantities in Kastanas and in Kalapodi. It seems that spelt wheat was cultivated in Greece to a small extent and it was never a main cereal. This is also the case for rye (*Secale cereale*), which is reported for the first time (as a cereal weed) from the Late Neolithic Cave of Skoteini in Euboia.[26] Rye findings from proto-historic Greece also represent weedy species possibly used as fodder: only few grains were discovered in the protogeometric layers of Kastanas and Kalapodi. The limited number of rye findings indicates that the species could not have been used for human consumption. This changes only in the Byzantine period as large quantities of rye have been discovered in Byzantine layers of 12th and 14th century AD in Agios Mamas on Chalkidiki.[27]

Broomcorn millet (*Panicum miliaceum*) appears in Greece in Middle Neolithic[28] and it becomes a staple food in North Greece by the beginning of Protogeometric Period: sufficient evidence of its use we have from Kalapodi where an important concentration of *Panicum miliaceum* seeds was found in the protogeometric layers of the sanctuary. Broomcorn millet is also discovered at Kastanas in the layers dated at the same period. The distribution of the species is limited to the Northern part of the country as in Central and south Greece, millets were regarded as exotic and barbaric and they seem to have been considered the food of the lower class.[29]

The predominant legumes cultivated in Protogeometric Greece are bitter vetch

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[24] Kroll 1993; Luce et al. in press.

[25] Spelt wheat is reported from Dikili Tash, Materne 1993 and from Stavroupoli in Thessalonica, Margariti 2002.

[26] Mangaffa 1993.

[27] Kroll 1999.

[28] M. Hopf (1962b) reports a grain of *Panicum miliaceum* in a Pre-ceramic level of Argissa but the chronological attribution of this find is under discussion.

[29] Kroll 2000.

(*Vicia ervilia*), lentils (*Lens culinaris*), chick peas (*Cicer arietinum*), peas (*Pisum sativum*), grass peas (at least *Lathyrus sativus* and *Lathyrus cicera*) and broad bean (*Vicia faba*).

Lentils and bitter vetch are reported from Kastanas, Kalapodi, Delphi, and Iolkos.[30] In the latter, bitter vetch may have been contained in a small pottery vessel found broken near by and it seems that the species resulted from a cleaned stored crop.[31] *Lens culinaris* and *Vicia ervilia*, seem to be higly esteemed in the Protogeometric period as it is evidenced by the frequency and the numbers of the findings. In Greece, *Vicia ervilia* is fairly common at Prehistoric settlements and from the mode of storage it seems that it was a crop legume for humans and not exclusively an animal fodder. This was also the case in the Protogeometric period as the species is very well documented. The seeds of bitter vetch are bitter-tasting and the species contains toxins that are harmfull for man, horses and pigs, but not for ruminants, such as cows and sheep[32] making the legume an excellent fodder. However these toxins are easily eliminated by cooking and the species can be consumed by humans.

Chick peas and peas are not missing in the Protogeometric period but they occur only in small quantities in Nichoria (chick peas) and in Kalapodi (peas). The archaeobotanical evidence is still scanty and at the present stage of research we have no evidence that *Cicer arietinum* and *Pisum sativum* formed important components of the subsistence of agricultural system in the Protogeometric period.

Broad beans make their first appearance in the Late Neolithic but they become important in Protogeometric period where they are found in 50% of the sites. They are found in important quantities at Delphi and to a small extent at Kastanas and Kalapodi. It is possible that broad beans were cultivated in small plots in gardens (as *Vicia faba* is a demanding species in terms of water) and fresh pods were plucked as a fine vegetable. *Vicia faba* causes the disease known as favism, an hemolytic anemia found to people presenting a genetic deficiency of the red blood cell enzyme G6PD.[33] However soaking fava beans and removing the seed-coat may alter their toxic effects as the seed-coat has the higher concentration of toxins.[34]

Grass peas are reported from Kastanas, Delphi and Kalapodi. In the latter the species is very well documented as more than 3000 seeds of *Lathyrus sativus* were recorded. The species demands special care while growing as it needs a support for climbing, either cereal stalks or mechanical aids. It is more likely that in the Protogeometric period the species was grown into gardens but sowing in the field cannot be excluded. *Lathyrus* spp. can be highly toxic if consumed in large quantities as the species contains the neurotoxic amino acid BOAA that causes lathyrism in humans.[35] However processing of the *Lathyrus* seeds by soaking and boiling in high temperatures can in most cases deprive its seeds of their harmful effect.[36]

The main oil crops of Protogeometric Greece seem to be poppy (*Papaver somiferum*),

[30] At Iolkos only bitter vetch is reported.

[31] Jones 1982.

[32] Grmek 1994

[33] Grmek 1994.

[34] *Op. cit.* notice no 33

[35] Lathyrism is a neurological syndrome that causes spastic paraplegia of the legs.

[36] Hansen1999; Marinval 1986; Jean-Blain et Grisvard 1973.

gold of pleasure (*Camelina sativa*) and flax or linseed (*Linum usitatissimum*). Among these species only flax is known to have been cultivated as early as the Early Bronze Age in North Greece, either for its oil or for its fibres.[37] Linseed oil dries like lacquer and is not very usefull in nutrition but it can be used for numerous purposes in the household and crafts. The species can be used in cooking either as intact seeds or ground or crushed for many dishes. Charred linseeds are not easily preserved in archaeological deposits as the high oil content causes the seed to burst when charring. However various archaeological sites have yielded important quantities of charred flax seeds, suggesting that flax remains are not scarce if the species had played a prominent role in the economy of the site concerned. Flax is well documented in the Protogeometric layers of Kalapodi and Kastanas and it becomes together with poppy and gold of pleasure the main oil crops of Northern Greece.[38] At Kastanas, flax was mainly used as a source of oil but an industrial use of the species (in clothing) cannot be excluded.[39] The presence of *Lolium remotum* which is a flax weed, at Kastanas indicate clearly that *Linum usitatissimum* was widely cultivated at that time, at least at this site.

Camelina sativa becomes by the first millenium BC a considerable oilseed crop as it has been found in Kastanas[40] and to a lesser extent in Kalapodi.[41] Like flax, charred seed of *Camelina sativa* are highly perishable but the seed fragments can easily be recognized in archaeological deposits due to their typical shape. Gold of pleasure is a very resistant and productive crop and this must have been the main reason that the species became so important throughout the Iron Age.

Papaver somniferum remains were discovered in a Protogeometric context in the sanctuary of Kalapodi;[42] at Kastanas, at the same period, poppy remains represent 7% of the botanical remains, and the plant was probably used as a substitute for olive oil.[43] Poppy seeds are used as a flavouring in confections, pastry and baking, but they can also be pressed for oil.

Olive tree seems to be less important in North Greece as olive stones are not recorded outside the range of olive cultivation.[44] It seems that olive was the main source of oil for Central and South Greece, where other oil plants, such as gold of pleasure and poppy are absent in the archaeological sites. This seemed to be the case not only in the Protogeometric period but also in the following periods.[45]

Among fruits, we have sufficient evidence for the use of two species, which seem to be predominant in Protogeometric arboriculture, fig (*Ficus carica*) and the grape vine (*Vitis vinifera*).

Fig seeds are a common find at many sites in Greece from the Neolithic period

[37] Large quantity of linseeds were discovered in Early Bronze Age layers of Kastanas, Kroll 1983.

[38] Kroll 2000; Kroll 1983.

[39] Kroll 1983.

[40] Kroll 1983.

[41] Kroll 1993.

[42] Kroll 1993.

[43] Kroll 1983.

[44] Olive nuts have been found neither in Kastanas, nor in Assiros, nor in Agios Mamas nor in inner Thessaly. See Kroll 2000.

[45] Megaloudi 2004; Kroll 2000.

onward. This is not surprising as a single fruit contains several hundred seeds. In the Protogeometric levels fig seeds are reported from Kastanas, Kalapodi, Delphi and Nichoria. At Delphi, in addition to the fig pips, remains of the fruit were discovered. Figs can be eaten fresh or dried and it is impossible to determine whether the charred fragments of figs or the seeds were derived from fresh or dried fruit. However such a distinction can be very usefull as the discovery of dried figs would indicate a more systematic harvest and processing of this fruit.

Grapes were also known from the Neolithic period and were made into wine at least as early as the Late Bronze Age as it is attested by the Linear B tablets.[46] In the Protogeometric deposits seeds of cultivated grape are reported from Kastanas, Kalapodi, Delphi and Nichoria. The archaeobotanical evidence indicates that vine was cultivated at that time but it is difficult to determine the importance of viticulture in Protogeometric Greece, only through the archaeobotanical remains. The counts of grape seeds suggest that grape was used at that time but in small amounts. At the present stage of research a large wine industry cannot be proved. In Protogeometric Greece vine production could have taken place in small vineyards, as it is still the case in many Mediterranean countries.

Conclusions

In this paper is presented the first review of available archaeobotanical data concerning the Protogeometric period. To summarize the data on crop diversity in Protogeometric Greece, we have seen that cereals (barley, einkorn and emmer wheat, spelt wheat, bread wheat, broomcorn millet), legumes (bitter vetch, lentils, chick pea, grass pea, pea, broad bean), oil plants (poppy, gold of pleasure, flax) and fruit trees (at least fig and vine) were cultivated at that time. The most interesting case seem to be that of bread wheat: the species develops considerably and becomes –together with barley– the major crop. It seems that in the Protogeometric period the frequencies of barley and bread wheat had increased proportionally more than those of einkorn and emmer wheat. Concerning legumes, there is no significant change in Protogeometric Greece: the same range of legumes were exploited from the Neolithic through the Protogeometric period. However a slight expansion of the cultivation of small seeded variety of broad bean can be observed in the Protogeometric period. As the exploitation of oil crops, the Bronze Age species persist and the main change can be seen in the case of *Camelina sativa*: the plant occurs regularly and in larger quantities in the Protogeometric deposits. It is important to note that the number of Protogeometric sites, where an archaeobotanical investigation has been conducted, is limited and there is a need for more archaeobotanical studies. However, a slight expansion of resources in the Protogeometric period can be documented.

A combined study of archaeological survey, archaeobotanical and archaeozoological finds from excavations could be the only way to establish a pattern of Protogeometric economy and shed light to the impact of human activity in the landscape and the changes that took place in it.

[46] Palmer 1995.

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