

# Intra-settlement use of space in Late Bronze Age mainland Greece: a preliminary archaeobotanical study on crop storage and refuse disposal strategies in the 2<sup>nd</sup> millennium BC

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## ABSTRACT

Preliminary archaeobotanical data are used to explore crop storage and refuse disposal strategies in four LBA settlements of mainland Greece, attempting to reconstruct intra-settlement use of space in the of 2<sup>nd</sup> mil. BC Aegean. Two taphonomic factors are especially considered, sampling strategy and destruction by fire. Results show that both greatly affect the archaeobotanical visibility of storage and refuse. Though further analysis is needed, there is evidence showing short-term crop storage in the palace of Ayios Vassileios, at least circumstantially and possibly intended for ceremonial consumption, and possibly at Mitrou. At Kynos, another simple Mycenaean settlement, long-term storage was practiced at a house-hold level reminiscent at different respects patterns evidenced in the North. Thessaloniki Toumba seems rather dirty, with refuse deposited indiscriminately within settlement space and its composition strikingly different compared to the southern Mycenaean settlements, palatial or not, potentially reflecting regional level differences in refuse disposal strategies.

## KEYWORDS

Late Bronze Age Greece, storage, refuse, Thessaloniki Toumba, Mitrou, Kynos, Ayios Vassileios

## Introduction

Major changes occurred in the sociopolitical and economic landscape of the 2<sup>nd</sup> mill. BC Aegean (tab. 1), resulting in significant variability both in material culture and settlement pattern (Cline 2010; Shelmerdine 2008). In mainland Greece they are vividly expressed in the later part of the LBA (14<sup>th</sup>–12<sup>th</sup> c. BC) through the rise and collapse of Mycenaean palatial centers in the South (Shelmerdine, Bennet 2008), and in the North, through the involvement of complex communities in loose local hierarchical systems, also participating in wider contact networks (Andreou 2001; 2010). The role of agricultural production in the LBA economies has been discussed, but more extensively for Mycenaean Greece and mostly on the basis of textual evidence (Gilman 1981; Halstead 1992; 1999; 2001; Halstead, O’Shea 1982; Jones et al. 1986). Meanwhile, recovery of charred plant remains has become intensive and systematic, with studies from northern Greece adding substantially to the body of data collected mostly incidentally during the early excavations, and more systematically lately, in the South (Hillman 2011; Karathanou, Valamoti 2013; Kotsachristou 2008; Kroll 1982; 1984; Petridou 2014; Valamoti 2010; Vettters et al. 2016)<sup>1</sup>. Thus, combined with other evidence, the archaeobotanical discussion of issues closely related to the organization of the LBA societies is enhanced, including human and animal diet, plant uses, land

1 For extensive bibliography see Valamoti 2009.

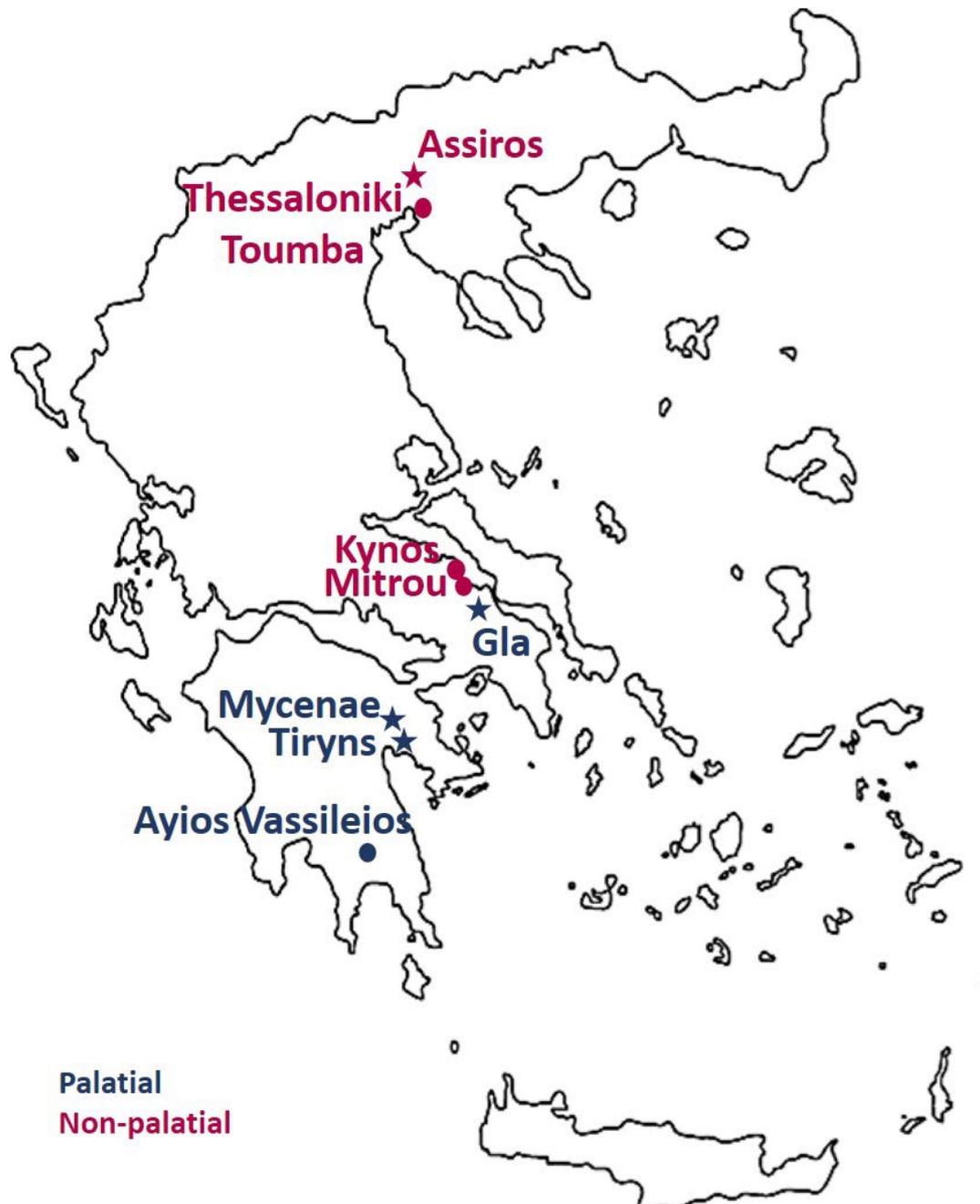


Fig. 1. Map of Greece showing the location of the sites studied (dots) and of other key sites mentioned in the text (stars)

Обр. 2. Карта на Гърция с местоположението на изследваните обекти (точки) и на други ключови места, споменати в текста (звезди)

use and scale of production, viticulture, wine-making and consumption, contact networks and plants' movements (e.g. Mangafa *et al.* 1998; Nitch *et al.* 2017; Valamoti 2007; 2009; 2013a; b; Valamoti, Jones 2010). The aim of this paper is to discuss intra-settlement use of space as regards *crop-storage* and *refuse disposal strategies*. Both are explored on the basis of preliminary contextual archaeobotanical analysis of four LBA sites scattered along the North-South axis of mainland Greece: Ayios Vassileios, a palatial center in the Peloponnese, Mitrou and Kynos, two rural/urban settlements in central Greece, and Thessaloniki Toumba, a tell settlement in the North (fig. 1). The comparative and on large scale exploration of

these aspects among settlements encompassing different sociopolitical realities, provides a basis for further discussion of LBA community organization in the Aegean, contextualized in the flowing sociopolitical landscape of the 2<sup>nd</sup> mill. BC.

## Data and methods

The low hill of Ayios Vassileios was settled towards the end of the 17<sup>th</sup> c. BC. An extramural cemetery was built close to the early Mycenaean settlement (Voutsaki, in press), for which little is yet known, other than it was destroyed by fire in the late 15<sup>th</sup>–early 14<sup>th</sup> c. BC. Soon after, extensive raising of monumental buildings took place around an impressive central court. The archive of Linear B tablets kept in the *stoa* west of the court (Aravantinos, Vasilogamvrou 2012) suggests the building's administrative character, in which storage of fluids (probably oil) and/or possibly of crops was also practiced. Cult practices are suggested by luxurious and ceremonial items found in Building A, including a hoard of 21 bronze swords, bull-shaped figurines, *rhyta* and feasting remains, as well as a barley cache found spilled on a floor, associated with *pithos* fragments (Karathanou, Valamoti 2013). Other species consumed at the site include bread/macaroni wheat, millet, bitter vetch and flax. The palace was severely destroyed by fire in the late 14<sup>th</sup> c. BC, but life at the site didn't stop during the second palatial century (13<sup>th</sup> c. BC), though the function and extent of the administrative and political scope of the palace at the time are not known (Karadimas 2016; Vasilogamvrou 2013).

Mitrou, today a small tidal islet of 3.6 ha surface, is located in the Northern Euboean Gulf, on the route of important land and sea ways. Successive occupational layers provide a sequence from the 2<sup>nd</sup> half of the 3<sup>rd</sup> mill. BC to the Late Protogeometric (900 BC). During the early LBA phases, it was an urban settlement with several rectilinear buildings partially rebuilt on top of each other and arranged along wide orthogonal streets. The community's social stratigraphy is indicated by an early *elite* presence (Van de Moortel 2016). Fire destroyed the excavated part of the settlement early in the 14<sup>th</sup> c. BC and building activity recurred at the spot after the demise of the palaces, from the 12<sup>th</sup> c. BC onwards. The settlement was rebuilt largely following the earlier plan, which changed radically only later in the 13<sup>th</sup> c. BC, when the existing buildings were abandoned and new isolated structures with non-rectilinear flimsy walls and exterior courtyards were constructed. This change is argued to represent a shift from urban to rural occupation (Van de Moortel, Zahou 2012). Of the various species identified, hulled barley, einkorn, emmer and bitter vetch were certainly favored, found spilled on top of partially preserved floors inside buildings.

Kynos is a ca. 3 ha coastal tell settlement, a few kilometers north, with stratigraphy spanning the Neolithic to Byzantine time, albeit with gaps (Dakoronia 2010). The material derives from two post-palatial architectural phases distinguished from each other by fire destruction events. The tightly built settlement space was organized following broadly the same architectural plan through the phases, with multi-roomed buildings of the same size and orientation, delineated by narrow streets. Craft production (e.g. textiles, pottery), food preparation and storage facilities identify them as domestic units (Kounouklas 2011). Thanks to fire destruction, abundant charred plant remains of barley, broad bean, lentils, and einkorn were *in situ* preserved mostly in vessels and other facilities, sealed under later building activity. Stable carbon and nitrogen analysis indicate that barley was heavily fertilized/manured, and pulses were selectively watered and manured, implying intensive cultivation methods, possibly combined with high labor investment for animal feeding in

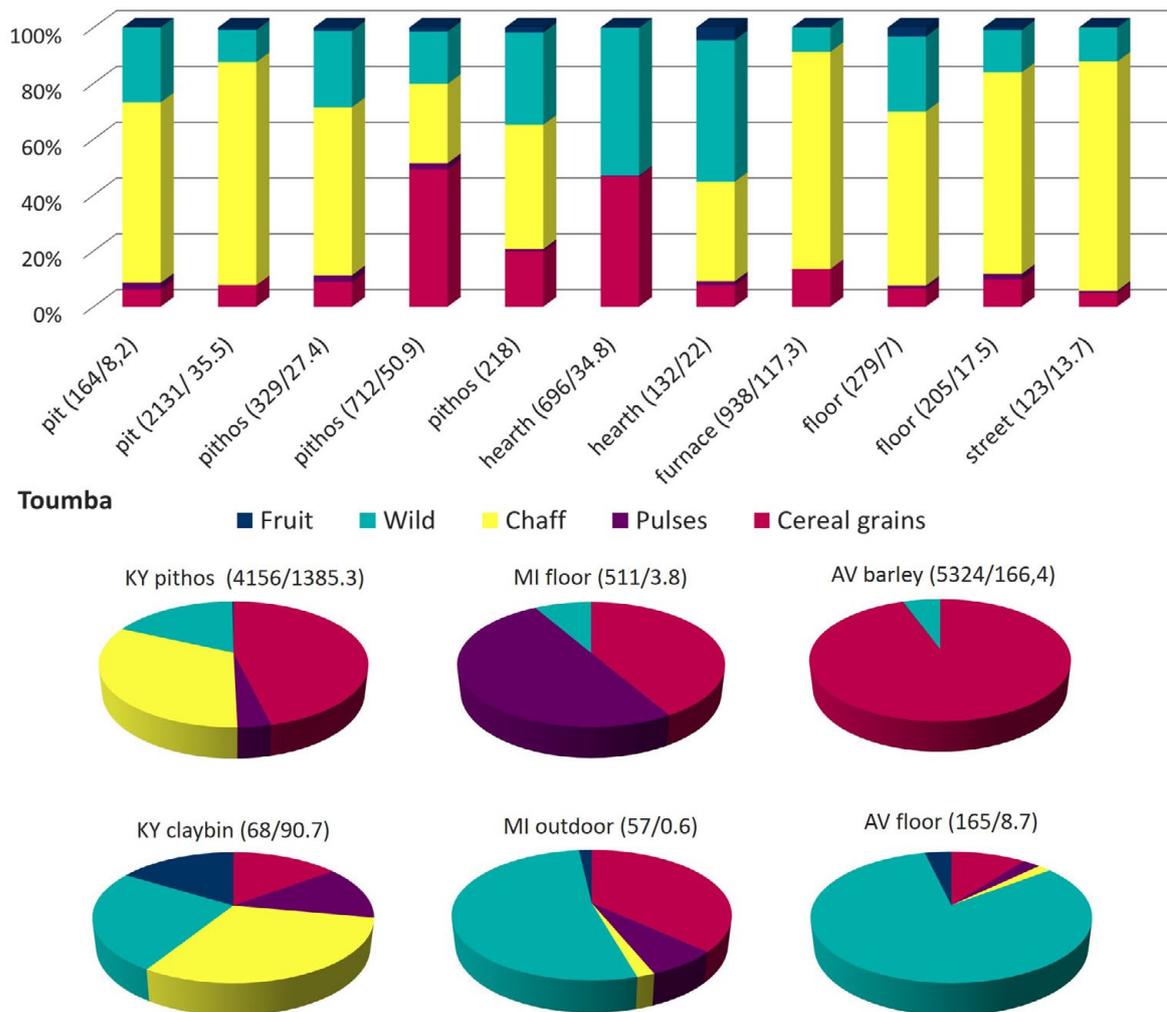


Fig. 2. Bar and pie charts for Toumba, Kynos (KY), Mitrou (MI) and Ayios Vassileios (AV) showing total sample composition in plant categories per context for the 17 samples analyzed. In parentheses the absolute number of plant remains contained in each sample and density of plant remains per liter of sediment. Plant categories include: cereal grains (wheat, barley, and millet), pulse seeds, cereal chaff (glume bases, rachises, and culm nodes), wild species and fruits/nuts

Обр. 2. Диаграми за Toumba, Кynos (KY), Mitrou (MI) and Ayios Vassileios (AV), показващи общия състав на пробите в категориите растения за контекст за 17 анализирани проби. В скоби абсолютният брой на растителните останки, съдържащи се във всяка проба и концентрацията им на литър седимент. Категориите растения включват: зърна от житни растения (пшеница, ечемик и просо), семена от бобови, плява от житни (основи на плевниците, фрагменти и възли от житни стебла), диворастващи плодове / ядки

various environmental niches (Isaakidou et al. 2016).

Thessaloniki Toumba (Toumba) is a coastal tell settlement in the Thermaic Gulf, with almost continuous stratigraphy from the 2<sup>nd</sup> mill. to the 4<sup>th</sup> c. BC. A fire destruction never occurred at the site. In the final LBA, several multi-roomed buildings clustered in an area of 0.2ha on the top of the tell, separated by narrow streets. Similar in size and rebuilt on the same plan throughout the LBA, they accommodated one or several small households organized by strict community rules that prevented any overt expression of inequalities (Andreou 2001; 2010). All were engaged in small scale metal working, textile and purple

dye production, and food preparation and consumption. Various cereals and pulses, “new” type glume wheat, einkorn, emmer, bread/macaroni wheat, possibly spelt, barley, millet, lentil, grass pea and bitter vetch, were consumed along with several fruits and nuts. Isotope analysis indicates intensive and possibly integrated production of cereal and pulses (mixed cropping or rotation). Better watered soils were preferred for wheats compared to barley, though the latter along with millet were more intensively manured, with potential contribution of available traction animals (Nitsch *et al.* 2017). On a regional level the community hold a pronounced or central place among its neighbors, suggested by the large-scale surrounding wall of the settlement, emphasizing its visibility in the landscape. Extensive storage and food preparation facilities point to hoarding of agricultural surpluses, possibly displayed and *consumed* in special occasions of hospitality, communally manipulated in the field of competition among local communities (Andreou 2001; 2010; Efkleidou *et al.* 2017; Margomenou 2008).

All sites have yielded archaeobotanical remains from well-defined contexts, including storage facilities and discarding areas. They were recovered by flotation from about 2170 soil samples from indoor and outdoor contexts, like floors, pits, constructions, *pithoi* and other vessels, hearths, burnt “lenses”, rubbish pits, fill and street deposits. As a rule, systematic sampling was applied (Pearsall 1989), with the exception of Kynos, where samples were collected judgmentally (tab. 2). The data used in this investigation derived from a) scanning all samples, and b) preliminary quantitative analysis of 17 samples representing the majority of contexts in all sites (tab. 3). One flot sample per context was chosen for analysis<sup>2</sup>, containing >100 countable items but for two, containing though >50 items. Sample composition analysis was used to detect storage and refuse deposits, with relative proportions of cereal grains, pulse seeds, cereal chaff, wild species and fruits/nuts expressed in bar and pie charts, aided by density ratios<sup>3</sup> (fig. 2). In assessing the taphonomic formation and visibility of the assemblages, the role of particularly two factors was examined, destruction by fire and sampling strategy (tab. 2).

### LBA storage and refuse disposal strategies: the state of the art

Storage is understood as a set of processes, techniques and strategies to produce, prepare, set aside and preserve (not only) material things for short- or long-term future use (Smyth 1989). In archaeological literature it is linked to the emergence and maintenance of social complexity through its connection with surplus production and manipulation (Christakis 2008; Halstead 1994; 1999; Jones *et al.* 1986; Margomenou 2008). Its relationship with surplus, though, isn’t always straightforward: not all surpluses produced by a society can actually be stored. In our case, dealing with a certain type of storable material food this relates to the perishability of foodstuff to be stored. Grains can be stored for long due to their long shelf-life, but meat is more difficult to preserve, unless treated accordingly. Therefore, it has been proposed that surpluses shouldn’t be looked for only in storerooms and vessels, but also in the events of their destruction, or else consumption (Hayden 1995). Elaborating on the idea of social storage (Halstead, O’Shea 1982), food-sharing events may include commensal occasions as those described for the LBA northern communities (An-

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2 Items from heavy residues were not considered, apart from Kynos.

3 Densities are actual for Kynos. The rest are indicative, but not dramatically lower, the majority of plant remains having been collected in the flots.

Phase		Years BC
Early Bronze Age		3300/3100-2300/2200
Middle Bronze Age		2300/2200-1700/1500
Late Bronze Age		1700/1500-1100-1050
Prepalatial	Late Helladic I	1700/1675-1635/1600
	Late Helladic IIA	1635/1600-1480/1470
	Late Helladic IIB	1480/1470-1420/1410
	Late Helladic IIIA1	1420/1410-1390-1370
Palatial	Late Helladic IIIA2	1390/1370-1330/1315
	Late Helladic IIIB	1330/1315-1200/1190
Postpalatial	Late Helladic IIIC	1200/1190-1075/1050

Table 1. Absolute chronology of Bronze Age phases in mainland Greece and of Late Bronze Age sub-phases (adjusted after Cline 2010)

Таблица 1. Абсолютна хронология на фазите на бронзовата епоха в континентална Гърция и на подфазите в късната бронзова епоха (коригирани след Cline 2010).

dreou 2001; 2010) where food was consumed both literally and through display, and certainly the institutionalized diacritical banquets of Mycenaean palaces (Halstead 2007; 2012). Nonetheless, agricultural surpluses were produced and apparently stored. Provided that caches may represent social and symbolic signifiers associated with the storage practices themselves (Hendon 2000), the desired link between storage, social complexity and change is restored thus allowing the exploration of sociopolitical dimensions of prehistoric community organization through the study of surplus production, manipulation and storage. Moreover, exploring the exclusivity, visibility and accessibility of direct storage evidence can become even more meaningful when such evidence is contextualized in terms of intra-settlement distribution (Margomenou 2008).

Details of storage practices during the LBA are available from a few sites in mainland Greece. At Assiros in the North, *in situ* semi-cleaned cereal and pulse crops indicate storage centrally or collectively organized, either way suggestive of existent social dynamics capable to mobilize and pool surpluses against times of risk on a community level (Jones *et al.* 1986). Surpluses were produced under intensive husbandry regimes through application of thorough tillage and manuring, and preferential selection of well-watered land and/or watering of land for certain crops (Jones 1992; Wallace *et al.* 2015), all pointing to a horticultural mode of cultivation practiced in a small scale by many different producers (Halstead 1992, 112). Spatial analysis of the large *pithoi* in Toumba on the other hand, implies a rather dispersed storage pattern, with facilities evident within every residential block, often in rooms serving exclusively this purpose. Nevertheless, such a pattern was not meant to inspire nor fulfil intra-settlement controversies between households, but rather to strengthen their sense of communality in the regional field of inter-settlement battle for power and status (Andreou 2001; 2010; Margomenou 2008). Stored surpluses were not preserved in the settlement, but stable isotope analysis suggests that that intensive agricultural practices were applied for their production too (Nitch *et al.* 2017). For Southern Mycenaean Greece, Halstead's model of palatial mobilization (1992; 1999; 2001; 2011) proposes extensive palatial grain production strategies targeting in the cultivation of specialized staple crops, though the range of species actually produced and consumed by both palatial and non-palatial populations was far wider according to the available archaeobotanical data. Weed species accompanying the post-palatial crops at Mycenae are compatible with extensive cultivation (Hillman 2011), a fact offering support to the idea that palatial grain production was maintained under a different agricultural regime compared both to simple Mycenaean settlements (e.g. Kynos) and those in the North. On the other hand, intensive horticultural

Settlement	Samples (ca.)	Sampling	Fire destr. layer(s)
Toumba	1500	systematic	-
Kynos	40	judgemental	x
Mitrou	100	systematic	x
Ayios Vassileios	530	systematic	x

Table 2. Table summarizing a) the number of samples scanned, b) the method of sampling strategy applied, and c) the presence (x) or absence (-) of *in situ* destruction layers in each site

Таблица 2. Обобщаващи данни за: а) броя на сканираните проби, б) прилагания метод за вземане на проби, и в) наличието (x) или отсъствието (-) на *in situ* слоевете за унищожаване във всеки обект.

Settlement	Floor	Hearth	Pithos	Pit	Claybin	Outdoor	Total
Toumba	2	3	3	2		1	11
Kynos			1		1		2
Mitrou	1					1	2
Ayios Vassileios	1		1				2
Total	4	3	5	2	1	2	17

Table 3. Table summarizing the contextual origin of the 17 samples preliminary analyzed per site

Таблица 3. Обобщаващи данни за контекстуалния произход на 17-те предварително анализирани проби на място

cultivation has been proposed for late palatial and post-palatial Tiryns (Kroll 1984), a fact arguably reflecting the application of variable agricultural techniques though possibly in land indirectly managed by the palaces (if at all?). Certainly, direct palatial produce was geared to specifically serve the political, administrative, social, cult and economic needs of the palace, in a completely institutionalized *and staged* reality (Halstead 2011; 2012). One could further argue that the very specific character of agricultural produce recorded in the texts, is projected to the storage practices themselves, as cached crops are often found in association with specific and large-scale storage facilities (Mycenae Granary, Hillman 2011; Glstorerooms, Jones 1995).

Opposite to storage, stands refuse disposal. As ethnographic and anthropological research has shown, the choice of trash areas is culturally assigned and related to structural community perceptions regarding purity, space and its limits (Douglas 1966; Hodder 1987; Moore 1992; Murray 1980; Valamoti 2005). Exploring waste management and its deposition within settlement space in communities that exhibit so apparent sociopolitical and economic differences, can bring us closer to the basic notions and ideas that structure the communities themselves. Strategies of waste management haven't been explored much archaeobotanically in LBA Greece. On the contrary, differential use of space, regarding waste management, has been detected between tell and flat-extended Neolithic settlements, tying different perceptions of the relationship between refuse and space to different socio-economic organization (Valamoti 2005). For the LBA only preliminary results are available from Toumba (Karathanou et al. 2007), discussed below. Worth mentioning here is the shift noticed in the composition of waste from LBA to Early Iron Age (1050-900 BC), especially that discarded in *pithoi* which by then were out of use as storage containers (Karathanou et al., in press).

Discussion on crop storage and refuse disposal practices in LBA Aegean is hoped to

be further enlightened by results preliminary presented here. Toumba has been so extensively excavated and sampled both across space and through the successive occupational phases, that allows for a thorough spatial and diachronic investigation of refuse management. Though the settlement was not destroyed by fire so as to preserve *in situ* stored crops, indirect visibility of storage through the archaeobotanical analysis will be assessed. Ayios Vassileios and Mitrou both preserve burnt destruction layers, more or less localized, and contrary to the most Mycenaean sites thus far, they have been systematically sampled. Therefore, a comparative exploration of these issues in palatial *versus* non-palatial contexts could be obtained. At Kynos the outstandingly preserved cached crops within at least two different residential buildings, will allow the study of storage patterns between domestic units. At the same time, the site can work as case-study for assessing the archaeobotanical visibility of refuse when judgmental sampling has been applied.

## Results

Sample composition is in most cases heterogeneous with plant categories present in variable percentages (fig. 2). However, grain-rich and fairly homogeneous samples are also encountered in all sites. The claybin sample from Kynos is mixed but quite balanced and dense despite its low absolute number of items. Samples from Toumba are dominated by glume bases in their majority and their density in plant remains fluctuates, mainly around and below a “medium zone”, with floor, street and a pit sample being the less dense, and a furnace sample - the densest. One mixed hearth sample from the same site is dominated by wild flora seeds, as also are the mixed samples from the outdoor context at Mitrou and the indoor floor at Ayios Vassileios, all of low density. In another hearth sample from Toumba, millet was accompanied in almost equal proportion by a variety of wild species, while in Ayios Vassileios, the latter make up only a minor component of the almost exclusively *in situ* dense barley concentration in Building A. The grain-dominated sample from a Mitrou floor was rather mixed and of extremely low density, containing both cereals and pulses with few wild species. The *pithos* sample from Kynos, on the other hand, shows the highest density encountered, with the prevailing barley grains and few wild seeds also accompanied by numerous barley chaff.

For interpreting samples' composition, the source of origin of plant components needs to be identified taking into consideration the taphonomy of the assemblage's formation. Cereal grains and pulse seeds in the dense samples can be considered as the final product. When in small numbers in mixed/low-density samples, they could represent food consumption residues, cooking accidents or even crop processing by-products. The most common kind of the latter, cereal chaff, when predominating indicates both early (rachises, culm nodes and silicified awns<sup>4</sup>) and late processing stages (glume bases). In mixed samples they could result from their burning as fuel, either on their own or contained in dung/dung-cakes. Wild seeds could have also been included in crop by-products, especially if typical weeds of cultivation. Additionally, they could have been used on their own as herbs or medicine, or contained in dung from animals grazing them. Fruits and nuts, like fig, grape and blackberry, were probably consumed by humans and animals, ending up in the assemblages as food residues and/or through dung (Boardman, Jones 1990; Charles 1998; Dennell 1976; Hillman 1981; Jones 1990; Van der Veen 2007).

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4 Not included in analysis, but present at Toumba.

## Discussion

Based on their contextual analysis, dense grain-rich samples can safely be considered to represent stored deposits, as the cases of Ayios Vassileios and Kynos demonstrate. Even when such samples are found mixed on top of floors and with lower densities than expected (Mitrou), they most probably suggest stored crops, with admixture having occurred during destruction and/or due to pre- and/or post-depositional activities, including large sample volume (in that case 133lts). Dense grain-rich samples are by rule associated with *in situ* fire destruction layers, as both the cases of Ayios Vassileios and Kynos point out. Still, even at Toumba, where such a destruction never occurred, crop storage is indicated indirectly, on the basis of small crop concentrations in secondary deposits (millet hearth sample). Besides, preserved residues of daily food-related activities, all attested at Toumba, can be seen as further indirect evidence for storage. At Mitrou and Ayios Vassileios crops are only accompanied by low quantities of wild species commonly considered as cultivation weeds (*Lolium* sp., *Galium* sp., *Avena* sp.). They are expected within cleaned product even in the latest of crop-processing stages, especially those mimicking the crops, as the above mentioned (Hillman 1981). Thus, this coexistence could indicate storage of almost fully cleaned products, requiring only weed removal by hand prior to cooking. Further analysis is needed though, to exclude other taphonomic factors that might have affected sample composition. At Kynos, not only weeds were not removed from the barley crop, but neither was its chaff, indicating that it was stored semi-cleaned, as in Assiros. Storage of not fully processed products (e.g. threshed spikelets or cereal ears), offers further crop protection against mold and pests (Sigaut 1988), simultaneously expanding the strenuous and time-consuming cleaning process throughout the year. In this view, such a strategy is advantageous regarding long-term storage, possibly indicating indirectly a more short-term character of storage at Mitrou and Ayios Vassileios contrary to Kynos. At Ayios Vassileios, the short-term character of barley store could also be underlined by the function of the building in which it was cached, possibly for immediate consumption on a ritual occasion. Distribution of stored crops within functionally different buildings at Ayios Vassileios, and different rooms or domestic units/households at Mitrou and Kynos cannot be reconstructed in detail at the moment, but an emerging pattern could be preliminary discussed.

At Kynos, close to the *pithos* where the barley was stored, broad beans were found spilled on the room's floor. This room of Building O10 was interpreted as exclusively dedicated to storage being clustered with *pithoi* and claybins (Kounouklas 2011). The same pair of crops were stored in a room of another building to its south (O11), possibly reflecting a specific storage patterning. Archaeobotanical analysis seems to confirm the house-hold level of crop storage suggested by other finds, and in this respect, it reminds strategies applied at Toumba, rather than at Assiros. Interestingly, barley stored in both houses was produced in intensively manured fields<sup>5</sup>, not unlike other northern settlements (Nitch et al. 2017). This could indicate extra care for the production of desired surpluses of certain crops, further adding to barley's status as a crop, presumably stored primarily intended for

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5 Isaakidou, V., Karathanou, A., Nitsch, E., Gkotsinas, A., Halstead, P., Dakoronia, F., Kounouklas, P., Bogaard, A. 2016. Crop and animal husbandry in Late Bronze Age Kynos: a preliminary investigation integrating macroscopic and isotopic data. In *The Agricultural Origins of Urban Civilization: 'Intensification' in Late Prehistoric Western Eurasia and Beyond*. Ioannou Centre for Classical and Byzantine Studies, University of Oxford, 18-20 March, 2016, Oxford, UK. (Unpublished conference paper)

human consumption.

Samples heterogeneous in composition and of low density most likely correspond to refuse, being a result of certain taphonomic processes, such as preparation of food and fodder, fuel spending, use of dung, etc. Analysis of refuse spatial distribution in the settlement level is still ongoing, but some preliminary results are available to discuss. At Toumba waste apparently wasn't related to any specifically defined area, since it is found accumulated both in outdoor areas and within buildings, on their floors, in and around hearths, in *pithoi* in secondary use, and pits. This slackness could reflect a *loose* relationship of people with refuse, possibly due to the tightly built residential space on the tell settlement. It would be interesting to regionally compare refuse disposal patterns among LBA settlements in Northern Greece, but for the moment there are no available data. At Mitrou on the other hand, plant remains were preferably deposited in the form of ashy refuse in places like pits, outdoor areas and streets. Moreover, at all Mycenaean sites, palatial and not, low-density refuse samples are in their majority very poor in plant remains, usually containing less than 20 or even 10 items. This could be suggestive of a more *clean* settlement space compared to Toumba. Furthermore, unlike Toumba, refuse at Mitrou and Ayios Vassileios is mostly made up by wild species and not by chaff. These disparities, if confirmed by further analysis, could imply different management of ash-containing refuse within settlement space, potentially reflecting regional level differences between settlements in Southern and Northern Greece.

## Conclusions

Preliminary archaeobotanical analysis shows that taphonomic factors greatly affect sample composition and the degree to which crop storage and refuse disposal patterns can be reconstructed. Preservation by burnt destruction episodes reveals direct storage evidence allowing for a discussion of storage organization within and among settlements. Systematic sampling combined with contextual analysis successfully detects indirect evidence for storage, even when *in situ* stored deposits are not preserved. Moreover, it detects refuse deposits, thus allowing a thorough study of their spatial distribution and management practices within settlement space. Based on these, an interesting picture regarding crop storage and refuse disposal strategies in LBA mainland Greece already emerges. Crop storage in non-palatial Mycenaean settlements seems to resemble the *dispersed* pattern claimed for Toumba on the grounds of *pithoi* distribution. Preliminary data suggest that in palatial contexts, storage of fully cleaned crops could be intended for immediate consumption on special occasions, but further analysis is needed for the exploration of storage distribution among buildings with different functions. At the urban/rural settlement of Kynos on the other hand, cereal crops at least, were apparently cached semi-cleaned probably targeted towards a more-long term domestic storage. At Thessaloniki Toumba, refuse is deposited practically everywhere, a *habit* possibly adjusted to the clustered space on the summit of the tell. Its composition highly contrasts with refuse composition from the Mycenaean sites potentially reflecting a true "North-South Divide". Completion of analysis of each data-set will allow for a detailed reconstruction of crop storage and refuse disposal strategies on a site level, providing a sound methodological basis for a diachronic comparative investigation of intra-settlement use of space in the Aegean during the 2<sup>nd</sup> mil. BC, when major sociopolitical changes occurred.

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## Вътре-селищно използване на пространството в континентална Гърция през късната бронзова епоха: предварително изследване на стратегиите за съхранение на реколтата и изхвърляне на отпадъци през II хил. пр. Хр.

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Ангелики Каратану

(резюме)

Статията представя данни от предварителни палеоботанически анализи на материали от четири селища от късната бронзова епоха в континентална Гърция. Тези данни са използвани за проучване на стратегиите за съхранение на реколтата и за изхвърляне на отпадъците с цел да се реконструира вътре-селищното използване на пространството през II хил. пр.Хр. Обръща се особено внимание се тафономичните фактори, свързани съответно със събирането на образци и опожарените останки.

Резултатите от палеоботаническият анализ показват, че тафономичните фактори оказват голямо влияние върху състава на пробата и степента до която могат да бъдат реконструирани стратегиите за съхранение на реколтата и за изхвърляне на отпадъците. Степента на запазеност на съоръженията след опожаряване предоставя конкретни данни за начините на съхранение, които хвърлят светлина върху цялостната организация на съхранение в рамките на селищата и между тях. Систематичното вземане на проби, комбинирано с контекстуален анализ, предоставя косвени данни за съхранение, дори в случаите, когато няма запазени *in situ* материали. Въпреки че е необходим по-нататъшен анализ, има свидетелства за краткосрочно съхранение на реколтата в двореца на Айос Василийос (а възможно и в Митру), която е евентуално предназначена за церемониална консумация. В Кинос, друго микенско селище, дългосрочното съхранение се практикува на ниво домакинство, което напомня за различни практики, засвидетелствани северно от обсъждания регион. Селищната могила в Солун изглежда доста „замърсена“, с отпадъци, разхвърляни безразборно в селищното пространство. Съставът на отпадъците е драстично различен в сравнение с тези от южните микенски селища, което вероятно е отражение на регионалните различия в стратегиите за изхвърляне на отпадъци.