Analysis of Archaeobotanical Material from the Tüpraş Field Project of the Kinet Höyük Excavations, Turkey

By: Jennifer Ramsay and A. Asa Eger

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Abstract:

The Tüpraş Field project is located near the high mound of Kinet Höyük in the Hatay Province of Turkey. The site was founded in the 8th century and continually occupied until the 12th century CE. Contemporary Arabic writers described the region as rich in agriculture and known for its cultivation of date palms and for its valuable timber resources. This paper presents the analysis of archaeobotanical macro remains, which are rare from this period, to allow for a greater understanding of the floral diversity, in terms of cereals, weeds, trees and wild species that would have been present in the region during the Islamic through medieval periods. The data supports cereal agriculture, but also documents the emergence of a cotton boom, which is attested to in ethnohistorical sources but has rarely been confirmed through archaeobotanical remains. Substantial quantities of Chenopodium album (common names include lamb's quarters, goosefoot and fat-hen) in single contexts, likely representing storage, were recovered and raise questions about its role as either an agricultural weed species or a more significant contributor to the diet and health of the medieval population. The agricultural economy is clearly more complex than previously believed and this study adds to discussions on the intersections of environmental and Islamic studies with crucial archaeological evidence, which can, for example, counter-balance and nuance certain well-worn debated ideas, such as the nature of the Islamic Green "Revolution"

Keywords: Tüpraş Field project | archaeobotany | Islamic | Turkey | cotton | Chenopodium album

Article:

Introduction

Archaeobotanical analysis from Islamic period sites in the last 15 years has been slowly developing, adding much to our understanding of the landscape and diet during the medieval Near East. Yet, certain regions still remain infrequently studied, where excavations of Islamic levels are few and archaeobotanical recovery occurs in an even smaller percentage of those projects. The proliferation of such botanical studies in the Islamic/medieval periods is necessary not only on a site-specific or even regional level, but to engage in newly appearing discussions of the intersections of environmental and Islamic studies with crucial archaeological evidence, which can, for example, counter-balance and nuance certain well-worn debated ideas, such as the nature of the Islamic Green "Revolution"(Watson 1974, 1983; Decker 2009; Bulliet 2010; Mikhail 2010). The following contribution presents archaeobotanical macro remain analysis from the small site of Tüpraş Field, identified as the 8th—12th century CE frontier settlement of Ḥiṣn al-Tīnāt. Results show slightly different agricultural strategies during the site's four century occupation, and specifically provide more evidence for a widespread cultivation of cotton coupled with pragmatic use of a possibly localized yet nutritionally rich weed Chenopodium album as an important agricultural food source.

Site background

Tüpraş Field is a low flat site located 900 m north of the high mound of Kinet Höyük. It was first surveyed in 2005 and subsequently soundings were dug in 2006, followed by two full excavation seasons in 2008 and 2011 (Figure 1a). The site was excavated under the auspices of Marie-Henriette Gates (Bilkent University). During the three excavation seasons, a small Early Islamic site was revealed over an area of about 1.4 ha. It consisted of a main fortified enclosure identified as a way station with structures built against and around the building down to the coastline, which was 600 m inland from its present position (Figure 1b). The site was newly founded in the 8th century CE and continuously occupied until the early 12th century CE coinciding with a period of abandonment on the main mound of Kinet Höyük. The 'Abbāsid settlement can be identified with Ḥiṣn al-Tīnāt known from Islamic sources as a "fortress" on the Islamic-Byzantine frontier (Ibn Ḥawqal 1964, 167; Ibn Ḥawqal 1967, 173; Istakhrī 1967, 63.) It was later occupied during the Middle Byzantine period of reconquest.

The site functioned not only as a way station along the main route connecting Cilicia (and Byzantine lands north) with Syria, but as a depot and port on the Mediterranean that received timber cut down from the nearby Amanus Mountains for shipment by sea. The site, now under modern agricultural fields, was built along and bounded to the south by a relict channel of the Tüm Çay, a stream originating in the nearby Amanus Mountains. The channel, like all of the mountain streams in this plain, is unpredictable, and the shifting courses, due to weather, precipitation, and heavy flow from the mountains, in part determined where settlements were located and when they were occupied and abandoned. Further, as one of the raisons d'être of Ḥiṣn al-Tīnāt was its timber resources, the placement of a stream that was fast and deep enough to convey the cut logs, was crucial. The site's environmental position is key here. The coastal plain narrows considerably in what was called in antiquity, the Plain of Issos. From here the plain is only about 10 km wide and lessens even more as one proceeds south and the mountains eventually meet the sea. This narrow plain would have been exceptionally wet and humid, as compared to surrounding areas in both Syria and Anatolia. Warm weather systems moving across the Mediterranean from west to east catch on the tall limestone/serpentine and granite topped Amanus Mountains whose peaks reach 2,240 m and as the winds rise, the air cools, condenses, and precipitates. Today, this plain is the second most humid region in Turkey and locals predominately cultivate citrus trees and natural vegetation at higher elevation includes beech, pine, cedar, fir and hornbeam (Türkmen and Düzenli 1998). The levels of humidity and rain would have been relatively and proportionately high in the early medieval period as the physical geography was the same, and the plain in some areas has become even more constrained by the shifted coastline. Contemporary Arabic writers, such as Ibn Ḥawqal, Istakhrī and Mas'udī who wrote in the 10th century CE, described the area around Iskandarūna (about 35.5 km south) and Bayās (about 14.4 km south) as rich in agriculture and fertile, and known for its cultivation of date palms and for its valuable timber resources (Ibn Ḥawqal 1964, 167; Istakhrī 1967, 63). Sugarcane from Persia and oranges from India were cultivated on the coast near Anṭākiya (Antioch), the major urban center of the region (Mas 'ūdī; 1861-[1930], ii. 438-439). Parts of the plain would also have been marsh for part of the year, a factor reported by 19th and early 20th century CE travelers to the region. As such, Ḥisn al-Tīnāt, besides a way station astride the Islamic-Byzantine frontier, was situated in its own micro-region and its settlement, economy, and subsistence of its inhabitants was very much dependent on the environment and agricultural resources of its immediate setting. An investigation of the archaeobotanical material recovered from the Tüpraş Field excavations can provide important evidence for the site's environmental history and subsistence and tradebased economies.

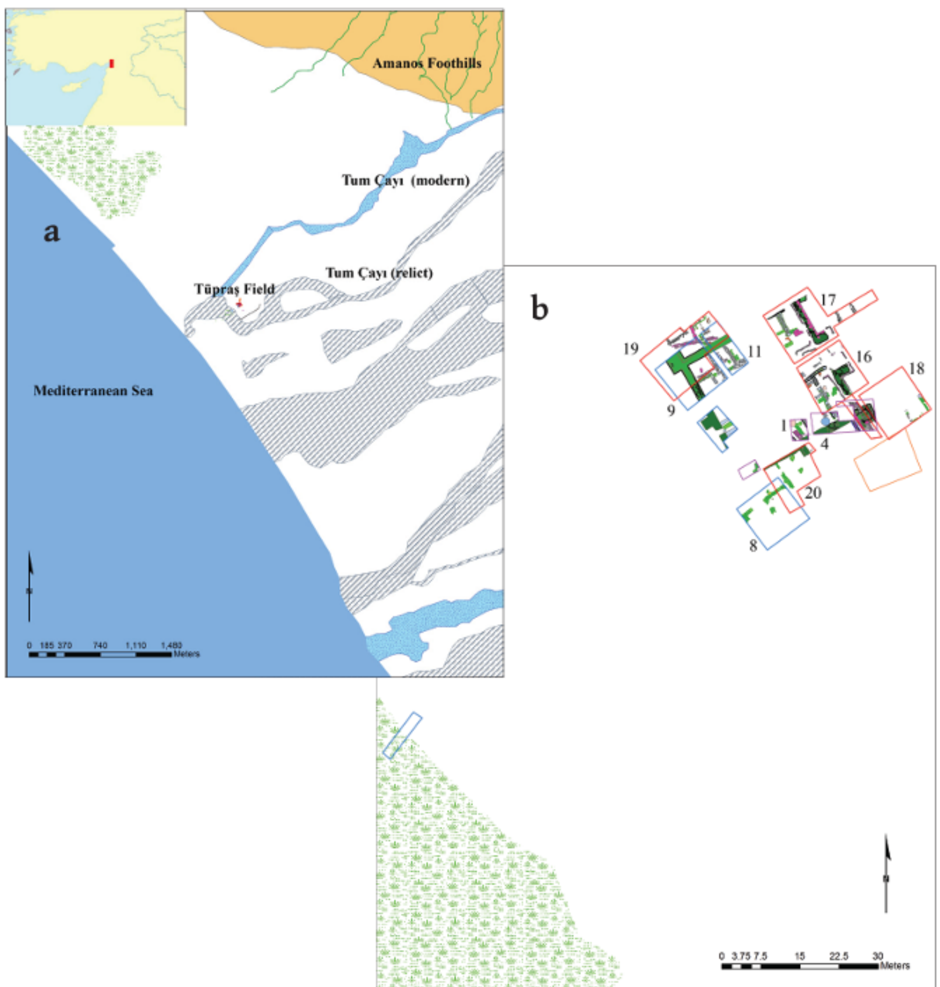

Figure 1. a) Regional site location map; and b) Location of excavation units on site

Archaeobotanical background

The majority of data we have for understanding agriculture during the Islamic period comes from ethnohistorical sources, as archaeobotanical studies from this period in the Near East are rare. Although we have learned a good deal from historic texts, relying solely on these data presents some significant problems. For example, descriptions of agricultural practices and crop species are often absent, and the same plant can have different common names in different contexts (Ashtor 1985; Samuel 2001). The lack of archaeobotanical analysis focusing on Islamic period sites or contexts is likely due to a variety of factors, such as archaeobotany not always being a priority of the excavation and few sites being excavated in the Near East that date to the Islamic period. Ramsay and Holum (2015) have examined the archaeobotanical material from Caesarea Maritima, Israel and determined that Islamic Caesarea put substantial investments into local agriculture, carrying on a tradition of practices that likely predated Islam by many centuries. Ramsay and Holum's (2015) data also support Decker (2009) in which he notes that there is really not that much of a difference in the pre- and post-Islamic Middle East and Mediterranean landscapes.

The only comprehensive work related to Islamic archaeobotany that has been carried out in the Near East to date is Samuel's (2001) archaeobotanical analysis of medieval sites in the Syrian middle Euphrates valley. Samuel does an incredibly thorough job of analysis of archaeobotanical remains, documenting the agricultural practices, the history of agriculture in the Islamic Near East, and outlining identification criteria of economic crops, fruits, nuts and condiments. Unfortunately she did not identify most of the weed or wild species and as a result there is no mention of chenopods recovered or identified in her analysis. In Egypt van der Veen et al. (2009) looked at differences and similarities between food and culture in Roman and Islamic Quseir. They determined that the differences in diet of the inhabitants of Quseir reflected the cultural identity of the population and trade patterns in the region. There was no mention of either weed or wild species having been analyzed at Quseir. To the south of Kinet Höyük, in modern Israel and Jordan, Ramsay has analyzed material from Byzantine period sites, which acts as a good comparison for examining the continuity in agricultural practices in the region (Ramsay 2010; Ramsay and Tepper 2010; Ramsay and Smith 2013). These studies provide examples of the type of agriculture practiced in the region before Islamic culture influenced it and as such provide data on what would have been innovation and what may have been a continuation of agricultural practices.

Methodology

Twenty sediment samples were recovered and processed by excavation staff in the field using the bucket flotation method collected in nested 1 mm and 300µm sieves (Pearsall 2001, 35) during the 2006 and 2011 excavation seasons of the Tüpraş Field Project (Table 1). The light fractions of these samples were separated from the heavy residue which was further dried on screens and handpicked. All botanical materials were dried, packed and sent to the author's lab at the College at Brockport, State University of New York.

Table 1. Archaeobotanical flotation samples analyzed from the Tüpraş Field Project.

Sample No.	Label No.	Phase	OP	Team	Date	Locus	Lot	Context
1	27055	IIIA	18	EK	12.7.11	9	22	Soil from oven/hearth, 12L
2	26717	V	18	EKAD	26.06.11	6	7	Contents of buffware jar for flotation, 1.5L loose soil
3	27439	II	17	AEI/UD	3.7.11	12	21	Contents of small one handed glazed jar for flotation
4	26651	II	17	AEI/UD	29.6.11	12	21	Contents of larger one handed jar for flotation
5	26892	II	17	AEI/UD	1.7.11	11	19	Soil w/I vessel #2, 6.5L soil
6	26836	IA	16	ND		16	29	Upper fill of 26908 pit area
7	26892		17	AEI/UD	3.7.11	12	21	Soil from Pithos #2, 2.5L
8	26839	II	16	ND		18	35	Soil from Pithos in pit
9	27460	IIIA	20	EK	28.7.11	11	10	200mL, soil from inside basin with seeds?
10	26789?	II	17	AEI/UD	5.7.11	2	29	220mL & Soil
11	26734	II	17	AEI/UD	3.7.11	13	13	Soil from hearth, 2.0L loose soil
12	26958	IIIA	18	EK	10.7.11	9	22	Soil inside oven, 12L
15*	26767	IA	16	ND	5.7.11	16	29	burnt soil sample for flotation, 5mL+, 5mL+, 3mL+, 13L
16	26827	II	16	ND	4.7.11	17	32	Soil sample, 13L
17	23189	II	1	AE	1.6.11 (2006)	1	3	KT 23189 – Soil from broken Pithos in pit.
18	23748	II	1	AE	16.6.11 (2006)	8	19	KT 23748
19 & 20	26908	II	16	TF(ND)	10.07.11	18	35	Soil from Pithos in pit.

*merged with 13 and 14

Table 2. Archaeobotanical species identified by Phase from the Tüpraş Field Project.

Species	Common Name	Phase I Totals 2 Samples	Phase II Totals 7 Samples	Phase III Totals 3 Samples	Phase V Totals 1 Sample
Triticum turgidum ssp. *durum* or *Triticum aestivum* ssp. *aestivum*	Bread/Macaroni Wheat	0	5	12	0
Triticum indeterminate	Wheat	5	8	11	0
Hordeum vulgare	Barley	4	3	0	0
Cereal grain Indeterminate	Cereal Grain	7	17	0	0
Culm node		1	0	0	0
Legume indet.	Legume	0	4	2	1
Vitis vinifera	Grape	4	1	0	0
Ficus carica	Fig	0	9	0	0
Rubus sp.	Blackberry; Bramble	0	1	0	0
Papaver sp.	Poppy	0	7	0	0
Lolium temulentum	Rye grass	2	1	0	0
Phalaris sp.	Canary grass	0	2	0	0
Chenopodium album	Fat Hen	3	622	338	2
Amaranthus sp.	Amaranth	0	4	0	0
Silene sp.	Catchfly	0	15	0	0
Medicago sp.	Medick	1	11	0	0
Trifolium sp	Clover	0	4	0	0
Astragulus sp.	Milkvetch	0	1	0	0
Euphorbia sp.	Spurge	0	1	0	0
Sambucus sp.	Elderberry	0	1	0	0
Rumex sp.	Dock	0	1	1	0
Carex sp.	Sedge	0	1	0	0
Scripus sp.	Bulrush	0	1	0	0
Chrysanthemum corinarium	Chrysanthemum	0	1	0	0
Linum sp.	Flax	0	2	0	0
Gossypium sp.	Cotton	0	185	0	0
cf. Gossypium sp.	Cotton	0	15	0	0
cf. Viburnum sp.	Viburnum/ Arrowwood	0	2	0	0
Brassicaceae	Mustard Family	0	0	0	1
Graminaceae	Grass Family	0	4	0	0
Pinus sp. nut shell	Pine	0	1	0	0
Unidentified seeds		12	71	3	5
Totals		39	1001	367	9

The samples of the light fractions were sorted using a Motic stereoscopic microscope using up to x 40 magnification. The plant remains recovered and analyzed consisted of seeds, nut shell, and other plant parts (e.g. cereal chaff).

The author identified the recovered botanical material by comparing morphological characteristics of the archaeological specimens to modern material from her archaeobotanical reference collection at the Department of Anthropology at The College at Brockport, State University of New York. As well as by comparing material to illustrations and images in reference seed atlases (Post 1932; Beijerinck 1947; Berggren 1969, 1981; Zohary 1966, 1972; Feinbrun-Dothan 1978, 1986; Anderberg 1994; Cappers et al. 2006). When needed, colleagues were also consulted.

Results

From the 20 sediment samples that had been packaged separately it was apparent that three of the samples (13–15) were smaller samples that were collected as part of the same context (label 26767, see Table 1) and were merged and treated as one sample for analysis. Likewise, samples 19 and 20 were merged as they were from the same sample context (label 26908, see Table 1). Of the twenty samples that were initially examined, four did not have any botanical remains present (3, 4, 7 and 10) and as some samples were merged, there were a total of thirteen samples analyzed. 1416 macrobotanical specimens were examined, 91 of which were unidentifiable to family or genus. Of the identifiable remains, 23 plant taxa represented by seeds, fruit and/ or plant parts were classified to the family, genus or species level. These remains have been categorized and include 2 cereals, 1 indeterminate large legume, 2 fiber/ oil crops species, 3 fruit species, 17 wild species, and several unidentified seed fragments (Table 2).

The summary of material from the two sparse samples recovered from Phase I deposits and date to the Crusader period (13th century CE and later), show a composition of 43.6% cereal remains, 30.8% unidentified, 15.4 % agricultural weed species and 10.3% Vitis vinifera (grape) (Figure 3a). The cereals that have been identified are Hordeum vulgare (barley) and Triticum turgidum ssp. durum or Triticum aestivum ssp. aestivum bread or macaroni wheat (Figure 2), which is difficult to distinguish without the associated chaff. It was not possible to determine if the barley recovered was tworow or six-row barley due to poor preservation. There were only three agricultural weed species that were identified; Lolium temulentum (rye grass) (Figure 3a), Medicago sp. (Medick or commonly alfalfa) and Chenopodium album (fat hen) (Figure 3b), which can either be cultivated as a cereal crop as it is nutritious and high in vitamin C, or it can grow as a weed of agricultural fields. Due to the low numbers of fat hen (3 seeds identified from Phase I), it is likely it was a weed species in this context. Four grape seeds were identified that make up the remainder of the assemblage from Phase I. Charcoal, insect remains and shell were also noted in these samples.

There were seven samples examined that date to Phase II, the Middle Byzantine/ Early Crusader period of occupation at the site (11th to early 12th century CE). Of the 1001 plant items that were examined, 68.0% represented weed species (most agricultural), 20% of the assemblage was Gossypium sp. (cotton) seeds (Figure 4), 7.1%

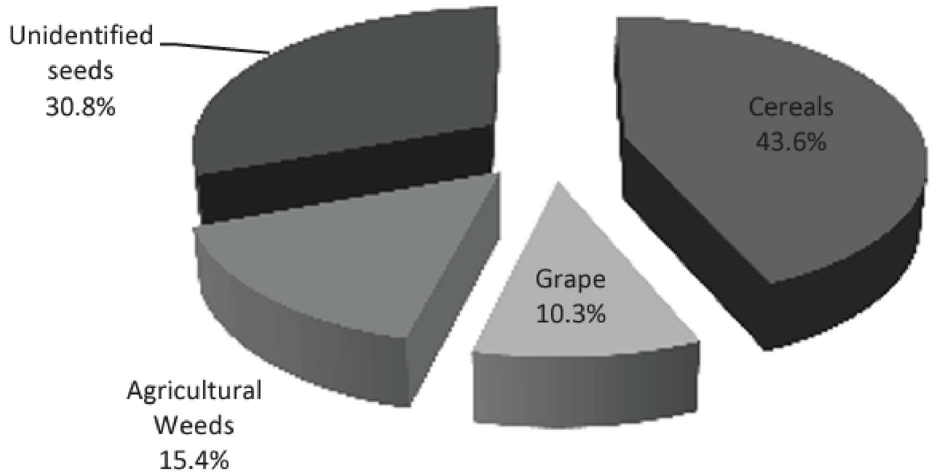

Figure 2. Percent distribution of archaeobotanical categories recovered from Phase I samples.

were not able to be identified, 3.3% were cereal remains, 1.2% were fruit and nut and only 0.4% was represented by legumes (Figure 5a). Interestingly, 622 of the total 1001 plant macroremains identified from this phase were fat hen. Likewise, there were 200 cotton seeds found from contexts in this phase. The quantities of cotton and fat hen skew the analysis in favour of these two species, which may have been stored in the case of fat hen. To gain a better understanding of the general flora pattern from Phase II cotton and fat hen were removed from the analysis (Figure 5b). As you can see in Fig 6b, there is a more even distribution of cereals, weeds and fruit/nut. As in Phase I, wheat and barley represent the cereals. Grape seeds were recovered as seen in Phase I as well as Ficus carica (Figure 2), Rubus sp. (blackberry/bramble) and a Pinus sp. nutshell fragment (pine). There were four legumes that were recovered but were unable to be identified due to poor preservation. There was also a much wider variety of weed species that were recovered from Phase II. In Phase I there were only three weed species recovered whereas in Phase II there were 18 different species, families or genus identified, although seeds were recovered in small numbers. The most commonly occurring remains are agricultural or pasture weeds, such as medick, Silene sp. (catchfly), Trifolium sp. (clover) and Amaranthus sp. (amaranth). There are also wild species that indicate a hydrophillic environment, like Scirpus sp. (bulrush) and Carex sp. (sedge). Papaver sp. (poppy), rye grass and Phalaris sp. (canary grass) also make appearances in Phase II as components of agricultural fields. Also noted in these samples were microfauna, shell, rootlets, insects and possible crop stones.

Figure 3. Charred Triticum turgidum ssp. durum or Triticum aestivum ssp. aestivum (bread/macaroni wheat) grain (scale 2mm).

Figure 4. (above) a) Charred Lolium temulentum grain (scale is 2mm), and b) Chenopodium album seed (scale is 1 mm).

There were three sediment samples processed for archaeobotanical material that represented Phase III (specifically Phase IIIA), which dates to the Abbasid/Middle Byzantine, 10th century CE. Of the 367 plant specimens that were identified, 338 were fat hen. The other remains consisted of 23 grains of wheat, 2 indeterminate legumes, 1 Rumex sp. (dock) and 3 unidentified seeds. Shell and insect remains were also noted in the flotation remains. And finally, one sample was recovered from Phase V, the Abbasid, late 8th century. Only one Brassicaceae seed (mustard family), two fat hen seeds and a legume were identifiable in this sample. Also of note were insect and shell remains, as well as possible crop stones. There were no samples from Phase IV.

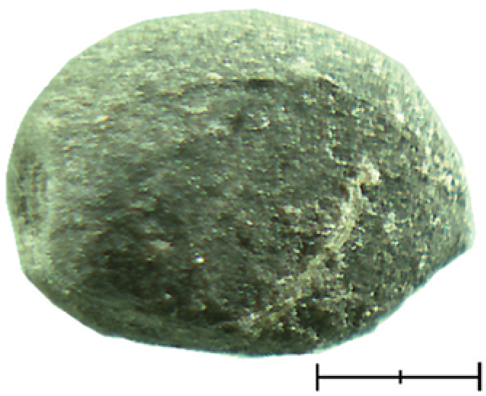

Figure 5. Gossypium sp. seed (scale 2 mm).

Discussion

The assemblage of archaeobotanical remains from the Tüpraş Field Project provides data on the local agriculture and environment in the region during the periods of occupation under study. Interesting information that supports the cotton industry boom during the later phases of occupation is documented as well as the presence of a large quantity of Chenopodium album (fat hen) seeds during the 10th through 12th centuries CE. However, caution must be taken when assessing the entirety of the assemblage as differential preservation of botanical remains and sampling bias must be considered (for greater discussion on this see: Wilson 1984; Boardman and G. Jones 1990).

In the very sparse phase V, Abbasid (late 8th century CE) sample, there was not enough material identified to draw any conclusions or discuss at any length. The only remains positively identified were two C. album seeds, an indeterminate legume and one specimen from the mustard family.

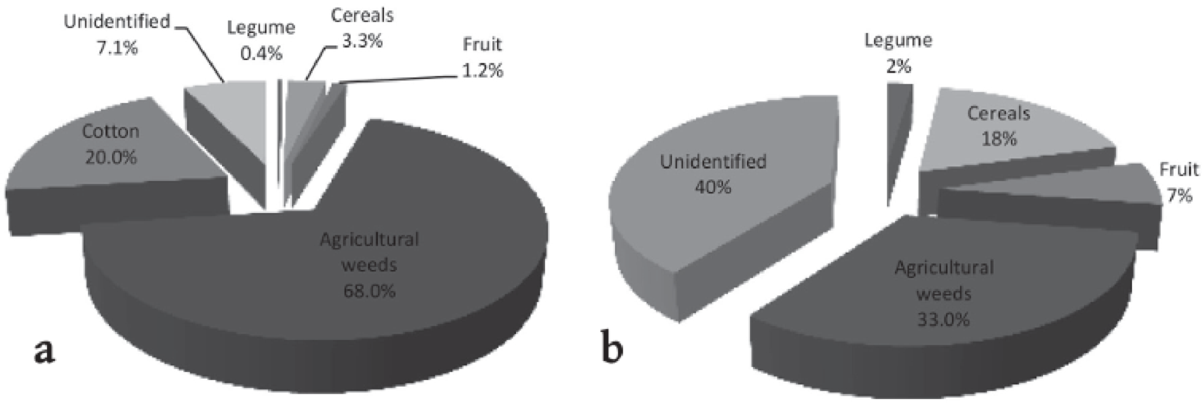

Figure 6. Percent distribution of archaeobotanical samples from Phase II. a) complete assemblage and b) with cotton and fat hen removed.

In the 10th century CE, phase III samples free-threshing wheats and legumes were recovered in small quantities, as well as a single seed of Rumex sp. By far the most interesting data was the 338 C. album seeds that were recovered, all but 4 from one context (sample 9, Table 1). This may indicate that the seeds were being stored as they were recovered from a 200 ml sample taken from a basin. Fat hen can be found as an agricultural weed in crop fields but it can also be grown as a cereal crop or the leaves and shoots may be eaten as a leaf vegetable similar to spinach. The seeds are also commonly used as animal feed, especially for poultry, as the name suggests. C. album was cultivated as a cereal crop in the past since the seeds are nutritious and contain high quantities of vitamin C (Zohary 1966, 142). Archaeological evidence for the presence of C. album has been noted since the Neolithic in Slovakia but is always referred to as a weed or gathered species (Lityńska-Zając et al. 2008; Tolar et al. 2011). With Bruce Smith's (1987) discussing the economic potential of Chenopodium berlandieri in Eastern North America in antiquity perhaps the role of C. album in the Old World should be reassessed.

Recent research has also been carried out on the medicinal properties of chenopods. A study by Begum et al. (2013) validated the claims by folk medicine practitioners in Bangladesh who use the plant for the alleviation of pain. Likewise, a study by Elif Korcan et al. (2013) provides strong evidence for medicinally important antioxidants in C. album that may inhibit free radicals known to be involved in various types of diseases like cancer, diabetic, neurological disorder, and hypotension. Interestingly, several publications make note of the presence of C. album in their assemblages but even when they appear in large quantities they still are not discussed with the possibility that they were cultivated but rather as a weed or fodder plant. For example, the 13th through 17th century CE site of Tartu in Estonia was analyzed for macrobotanical remains and pollen, both of which indicated very high quantities of C. album (larger quantities that almost all other species in the assemblage) but it was still classified as a weed, not even as a collected plant (Kihno and Hiie 2008). Likewise, a study on human diet and land-use from the 13th through 15th centuries CE in Mongolia notes almost 3000 chenopod seeds were recovered, which is more than ten times greater than any other wild species mentioned, but the authors only mention it in discussion as the most frequent weed that may have had a former use (Rösch et al. 2005). Even in Neolithic sites, like ‘‘La Grande Rivoire’’, chenopods show up in the eight most common taxa found in the dung samples but are classified as a weed or ruderal species, although it is noted that these species may have been used for medicinal purposes or as a dietary supplement (Delhon et al. 2008). There are however, studies from various parts of the world that note the importance of chenopods as a dietary staple crop, such as in the Himalayan agroecosystem. According to Partap and Kapoor (1987, 71), ‘the grains have an appreciable food value, containing all the essential amino acids; the nutritive value of these grains is comparable to that of other staple foods’. Clearly more research needs to be carried out with respect to the role of C. album in Near Eastern sites in antiquity.

Phase II, samples from the 11th–12th centuries CE, had the widest variety of taxa that were identified. It is clear there was mixed cereal agriculture being carried out as is illustrated by the significant quantity of barley and free-threshing wheats that were recovered. No chaff or rachis fragments were recovered, which could indicate that the cereal remains recovered were imported from the surrounding region and not processed locally or the lack of this material could simply be an artifact of preservation and sampling. However, supporting local cereal cultivation during the 11th–12th centuries CE was the presence of a large number of weed and wild species that are indicative of agricultural fields or disturbed ground, such as rye grass, canary grass, medick, catchfly, clover and milk vetch. There were also dock, spurge and bulrush identified that indicate more of a hydrophilic environment, which can point towards irrigation although likely reflect the close proximity to a river and lagoon. Other consumables in evidence are legumes, grape, fig and even a single berry achene. Similar to Phase III, there were also large quantities of C. album seeds recovered. There were 622 seeds of which 459 were recovered from a single context (sample 17, label 23189), which contained a large quantity of broken ceramic Pithos vessels, which may indicate that these seeds were being stored. Adding support to there being storage at the site, in samples 19 and 20, 112 fat hen seeds were recovered from the soil in and around another broken Pithos. Although smaller in scale from the previous samples but also significant as having been potentially material that was stored were 40 C. album also identified from a pithos (sample 8). As discussed above, clearly the role of C. album in the agricultural economy of the Middle Byzantine/Early Crusader period needs to be explored.

Samples from Phase II also provide the only evidence on the site of Gossypium sp. (cotton) seed. All but one seed were recovered from a single context, soil from a hearth (sample 11, label 26734) where the seeds had likely been discarded after the fiber was removed. This data supports the research that has been carried out that looks at the increased use of cotton during the time of early Islamic occupation of the region (Decker 2009; Bouchaud et al. 2011; Brite and Marston 2013). Cotton (Gossypium arboreum and Gossypium herbaceum) is a plant with clearly desirable characteristics for fiber production and there is a good deal of evidence that points to its utilization as a fiber plant in Africa, Arabia and India (Brubaker et al. 1999; Samuel 2001; Decker 2009; Bouchaud et al. 2011; Zohary and Hopf 2012). Cotton clearly has significant antiquity as a fiber plant with the earliest archaeological evidence for the use of cotton comes from Neolithic Mehrgarh (Moulherat et al. 2002). There is also evidence that cotton was used as a textile in Arabia during the Chalcolithic (Betts et al. 1994) and certainly it is well attested to from the Hellenistic times onwards through Greek, Roman and Jewish literary sources, however, it was apparently considered a rare and expensive commodity (Watson 2008). However, the later diffusion of Old World cotton agriculture, which is exemplified in the samples identified from the Tüpraş Field Project, has been attributed to the Islamic Agricultural Revolution (Mazzaoui

1981; Watson 1983; Bulliet 2009), when the Islamic Caliphate significantly altered the agricultural landscape of the Old World (Brite and Marston 2013). According to Brite and Marston (2013, 39), trade practices, religious beliefs and new technology created a new international market for cotton goods. This lead to a far broader dispersal of the crop into new environments in Persia, Southwest Asia, North Africa, and the Mediterranean Basin than was known earlier in antiquity (Brite and Marston 2013). There was a notable expansion of cotton trade by around 900–1000 CE and the initial spread of this industry reached the Iranian Plateau first, where it became a major focus of the local agricultural and trade economy for several centuries (Brite and Marston 2013). Bulliet's (2009) work documents a cotton boom in the Early Islamic cultural centers of Nishapur, Qom, Hamadan, Rayy, Isfahan, and Merv beginning in the 9th century CE, which was quickly followed by the diffusion of cotton agriculture throughout the Islamic Empire. By the 10th century CE, cotton was found growing in nearly every region of the Muslim world (Watson 1983, 39–40; Bulliet 2009). Therefore it is not a surprise that cotton only becomes apparent on the site in the 11th and 12th centuries CE.

Phase I, post-Crusader samples were sparse in the number of identifiable remains recovered. Nevertheless, the species identified show a cereal agricultural regime that was being carried out in the region of the site. The presence of free-threshing wheats, barley, a cereal size culm node and grape illustrate these species were likely being cultivated locally. The weed species identified were canary grass, fat hen and medick, all of which support local agriculture as they are commonly found in cultivated fields.

Conclusions

In conclusion, although only a small number of samples were processed for archaeobotanical material, the information gained from this analysis has allowed for a greater understanding of the archaeobotanical diversity, in terms of cereals, weeds and wild species that would have been present in the region during Islamic/medieval periods. The agricultural economy is clearly more complex than can be addressed in this study but wheat, barley, legumes, fig and grape are well documented in this analysis. The majority of the weed species, which are commonly found in cultivated or disturbed ground, confirm an environment that is indicative of cereal and legume agricultural in the region around the site.

The data also supports the emergence of a cotton boom in the area during the 11th and 12th centuries CE, which is attested to in ethnohistorical sources but has rarely been confirmed through the actual seed remains. As such, the results of this study are clearly significant to a greater understanding of the spread of cotton agriculture in the Old World during the Islamic period.

The identification of substantial quantities of C. album in single contexts raises questions about its role as either an agricultural weed species or a more significant contributor to the diet and health of the ancient population. The documented uses of C. album are diverse as it has been used as a cereal crop, fodder food and for medicinal purposes. Although no definite statements about the function of C. album at the site can be made without more research from clearly stratified and intact contexts, it is interesting to at least note that this species may not be just a weed that was accidentally included in certain contexts.

Additional recovery and analysis of archaeobotanical material from the Tüpraş Field Project is necessary to further address important questions regarding cotton utilization and the role of C. album in the area and to broaden our knowledge of the economy and environment of the site through its various occupations. Likewise, analysis from other sites of this period would undoubtedly aid in our understanding of the economic and ecological changes through time.

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