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Cover Page Footnote
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Abstract:

This study presents a preliminary analysis of archaeobotanical remains recovered during the 2012 excavations at the site of Huqoq, Israel. The site, located near the Sea of Galilee, was continually occupied from the Roman period through the 19th and 20th centuries until it was finally depopulated during the 1948 Palestine war. Although excavations at Huqoq have focused on a Late Roman/Byzantine synagogue building and domestic structures in the associated village, the remains of the modern village overlying the ancient synagogue are being excavated carefully to document all phases of occupation at the site. This analysis of the archaeobotanical assemblage aids site interpretation by providing evidence of crop production relating to the local and regional economy of the site. The results of this preliminary research support the region being agriculturally productive and provide data on changes in agricultural techniques and trends practiced through time. This study also looks at taphonomy as samples from the 19th and 20th centuries contexts show abundant and excellent preservation compared with earlier period samples. To date, several economic crop species have been identified, such as wheat (*Triticum aestivu, T. durum* and *T. aestivo-compactum*), barley (*Hordeum vulgare*) and several legumes, such as lentils (*Lens culinaris*), chick peas (*Cicer arietinum*) and bitter vetch (*Vicia ervilia*). There is also considerable evidence in the assemblage of crop by-products (chaff) and weeds specific to crop fields, like *Lolium temulentum*, *Phalarus sp.*, *Medicago* sp., *Galium* sp. and *Malva* sp., which indicate intense local cultivation. Historical records suggest that Huqoq was well known for its mustard production and seed (*Brassica* sp.) have been identified at the site, supporting the documentary evidence. Olives (*Olea europaea*) and Christ's thorn (*Ziziphus spina-christi*) also feature prominently in the assemblage.

Key Words: Archaeobotany, Agriculture, Roman Galilee, Late Roman/Byzantine Period

Introduction

The excavation of Huqoq, Israel is an ongoing project started in 2011 and is co-directed by Jodi Magness (Department of Religious Studies at the University of North Carolina at Chapel Hill) and David Amit and Shua Kisilevitz of the Israel Antiquities Authority. Huqoq is located in the Roman Galilee region of Israel (Figs. 1 & 2). In Roman times, the region was divided into three areas: Judea, Samaria and Galilee, the latter comprising the whole northern section of the country. Huqoq is located 12.5 kilometers north of the city of Tiberias and uphill from the sites of Capernaum and Magdala, making Huqoq an important Biblical site. The Galilee is the presumed home of Jesus for at least thirty years of his life and therefore is Biblically significant. Jesus' public ministry in the Upper Galilee is accounted for in the first three Gospels of the New Testament, the most well-known towns being Nazareth and Capernaum (Freyne, 2004). Besides Jesus, many of the important writers of the Talmud (which is a central text of Rabbinic Judaism) spent their lives there (Freyne, 2004).

Figure 1 Regional Map indicating location of Huqoq (Courtesy of Google Earth)

Figure 2 Location of Huqoq relative to Tiberias and Capernaum (Courtesy of Google Earth)

Archaeological and historic texts support that the area was inhabited during the Iron Age, Persian, Hellenistic, Roman, Byzantine, Crusader, Mamluk, and Ottoman periods and was then depopulated during the 1948 Palestine War (Magness, 2012). Magness's goals for Huqoq were to locate the synagogue in the center of the village and then excavate it to determine the building's chronology. She also intended to examine two or three house structures in order to have an idea of how the synagogue related to the village as well as ascertain the chronology and typology of the Late Roman/Byzantine pottery that was discovered on the site (Magness, 2012). Additionally, modern remains are being excavated to be complemented by historical evidence, such as written and oral histories (Magness, 2012). Magness excavated three sections of the site. Area 2000 encompasses the ancient village, Area 3000 is the modern village and synagogue, and area 4000 is the ritual *miqwe* (Magness, 2012). Archaeobotanical samples from the 2012 season

received for lab analysis were from Areas 2000 and 3000 (Figures 3 and 4), the ancient and modern villages and the synagogue.

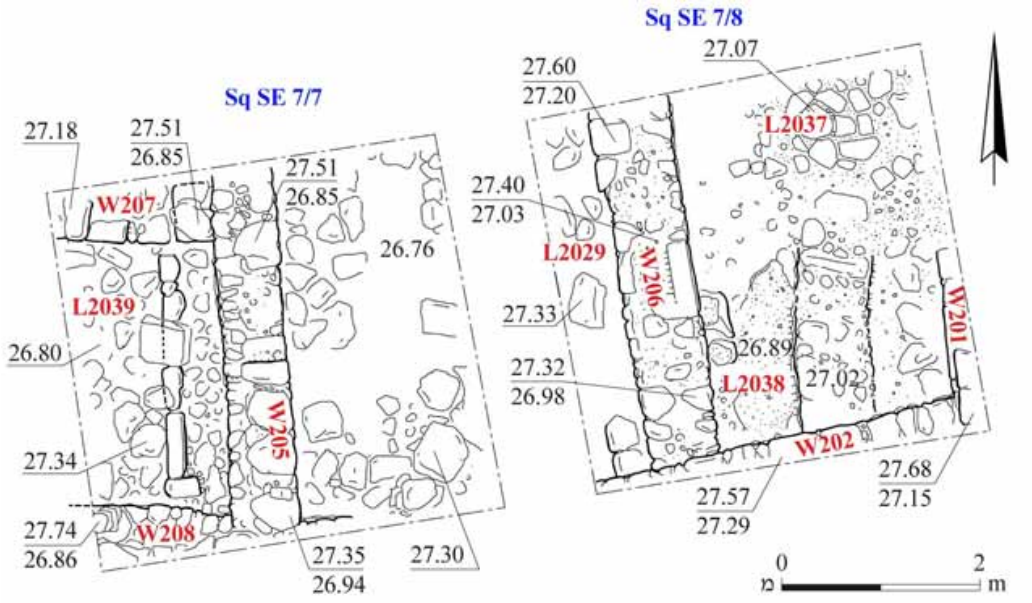

Figure 3 Area 2000 (Courtesy of Magness, 2012)

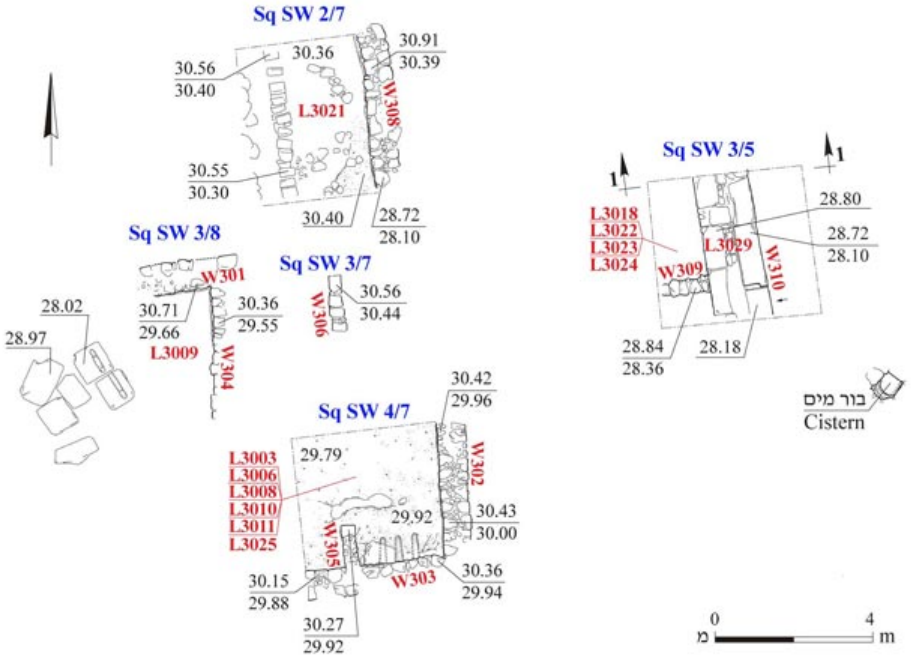

Figure 4 Area 3000 (Courtesey of Magness, 2012)

According to Magness, a synagogue lies in the approximate center of the ancient site with finely decorated elements carved into white limestone. During the 2012 season, a mosaic floor was uncovered in the synagogue that dates to the Late Roman Period (5th century CE). The scene is biblical and depicts Samson as well as two females whose identities are unknown (Malkah, 2012). The find is significant because the stones used in the mosaic are small and of a high quality while the stones used to build the actual synagogue are large, suggesting the village was prosperous. In addition to the suspected wealth of the village, the mosaics are important because not many Roman/Byzantine synagogues have mosaics, and there are only two others of Samson. Hebrew inscriptions are also out of character for the area (Malkah, 2012). Other evidence of ancient occupation exists in rock-cut tombs, mausoleums, cist-graves and quarries. Production is apparent through a winepress, an olive press, and agricultural systems (Magness, 2012). Magness's two project goals are to establish a chronology for the synagogue and to provide a context for a synagogue by excavating the village, therefore coming up with a chronology for the site as a whole through pottery. The Modern part of the site is also being excavated to be compared to the oral histories of Yakuk (the modern name for Huqoq) (Magness, 2012). The data from all periods of this site are important because they will help in provided a chronology and context for all occupations.

The modern state of Israel lies in a transition zone between Mediterranean and Desert climates. Climatic conditions have remained relatively stable since the Hellenistic Period, approximately 300 BCE (Bruins, 1994; Goldreich, 1998). The site is in the Northern Hemisphere and lies between 29°N and 33°N Latitude. Therefore, Huqoq is in a subtropic zone and experiences a warm and dry season in the summer and a cool and wet season in the winter

(Orni and Efrar, 1964; Karmon, 1971). During the Roman Period, Israel experienced a time of increased humidity, which would have had a positive effect on agriculture and allowed for sustaining the Roman Armies who only just brought their irrigation technology to the region. There was a shift in the Byzantine Period to a drier climate that would not have supported the large population in the area, implying food was imported in order to sustain the population during this period (Sperber, 1978). The climate stayed relatively dry until the Islamic period, but did become gradually wetter through the Islamic to the Crusader Period based on geo-climatic studies by Bruins (1994).

The agricultural importance of the region is evident through the taxes that were paid for wheat, barley, olives, goats, and beehives, plus a press which was either used for processing grapes or olives (Magness, 2012). Furthermore, the archaeobotanical remains from Huqoq indicate the site's agricultural significance. Broad-scale botanical investigations are important and focus should not only be on cultivated crops but also on associated weed species, since several weed species have very specific habitats and can tell us a great deal about the surrounding area. The value of this data stems from the field of plant ecology and is the basis for past ecological interpretation. As such, charred plant remains were recovered from the site during the 2012 season from multiple contexts that dated to the Late Roman/Byzantine periods through to modern contexts. The goal of the archaeobotanical analysis at Huqoq is to document the agricultural economy and the changes in trends and techniques through time as well as look at the evidence that may support the idea that the village was affluent, either in the form of exotics or specialized commodities, such as the mustard plant.

Methodology

During the 2012 season at Huqoq, Israel, 45 samples ranging from 8 L to 28 L were taken from multiple contexts from the Late/Roman Byzantine, Islamic, Crusader, Mamluk, 19th/20th centuries and Modern periods (Table 1). Dates were determined based on stylistic seriation of pottery. Samples were collected by Jessie George (then at the University College London) from contexts which were considered likely to be connected to food processing and production, such as storage vessels, destroyed ovens, ashy layers and floors, as well as areas where charred material was visible to the naked eye. The samples were collected subjectively, although effort was made to collect from every context, however, due to time constraints, staff awareness and logistical issues this was not always possible. This sampling strategy provides site-wide generalizations about the flora of the site.

Table 1 Archaeobotanical Sample with Identified Remains – Contexts and Dates from Huqoq

Site/Year	Sample No.	Area	Square	Locus	Bucket No.	Date	Context	Period
HEP2012	1 (HF)	3000	3/5	L3024	B30300 (B)	4-Jun	Cobble and plaster surface	19th-20th Centuries
HEP2012	1 (CF)	3000	3/5	L3024	B30300 (A)	4-Jun	Cobble and plaster surface	19th-20th Centuries
HEP2012	2	3000	3/5	L3037	B30320 (1/3)	5-Jun	Fill beneath cobble and plaster surface	19th-20th Centuries
HEP2012	3	3000	3/5	L3034	B30314 (1/3)	5-Jun	Cobble and plaster surface	19th-20th Centuries
HEP2012	4	3000	3/5	L3036	B30428	6-Jun	Fill beneath cobble and plaster surface	19th-20th Centuries
HEP2012	5	3000	3/8	L3045	B30421	6-Jun	Fill and collapse	Modern
HEP2012	6 (HF)	3000	3/5	L3035	B30315 (1/3)	5-Jun	Cobble and plaster surface	19th-20th Centuries
HEP2012	6 (CF)	3000	3/5	L3035	B30315	5-Jun	Cobble and plaster surface	19th-20th Centuries
HEP2012	7	3000	3/5	L3047	B30449	7-Jun	Compact dark soil	Modern
HEP2012	8	3000	2/7	L3056	B30506	10-Jun	Stone and roofing collapse	Modern
HEP2012	9	3000	3/5	L3057	B30504	10-Jun	Compact dark soil	Islamic
HEP2012	10	3000	2/7	L3054	B30529	11-Jun	Roof/Ceiling Collapse	19th-20th Centuries
HEP2012	11	2000	7/6	L2048	B20341	11-Jun	Collapse	Byzantine-Early(?) Islamic
HEP2012	12	3000	3/5	L3019	B30178	19-Jun	Ash pit	19th-20th

HEP2012	13	2000	7/8	L2016	B20095	12-Jun	Pit Fill	Centuries 19th-20th Centuries
HEP2012	14	2000	5/3	L2005	B20051	6-Jun	Midden (Garbage)	19th-20th Centuries
HEP2012	15	2000	5/3	L2005	B20040	6-Jun	Midden (Garbage)	19th-20th Centuries
HEP2012	16	2000	7/7	L2039	B20376	12-Jun	Collapse from walls W205, W207, W208	Late Roman - Byzantine
HEP2012	17	2000	6/7	L2054	B20384	12-Jun	Fill	Mamluke
HEP2012	18	2000	6/7	L2059	B20405	13-Jun	Plaster Surface	Byzantine
HEP2012	19	2000	7/6	L2058	B20382	12-Jun	Fill beneath collapse	Late Roman - Byzantine
HEP2012	20	3000	4/5	L3071	B30683	18-Jun	Ashy pit	19th-20th Centuries
HEP2012	21	3000	4/5	L3067	B30643	17-Jun	Interior of tabun	Byzantine-19th/20th Centuries
HEP2012	22	3000	4/5	L3068	B30680	18-Jun	Surface surrounding tabun	19th-20th centuries
HEP2012	23	3000	4/5	L3067	B30645	17-Jun	Interior of tabun	Byzantine-19th/20th Centuries
HEP2012	24	2000	SE 7/7	L2070	B20538	18-Jun	Fill	Hellenistic/Early Roman-9th/10th century Crusaders
HEP2012	25	2000	SE 6/7	L2051	B20459	14-Jun	Fill	Byzantine-Crusader/ Mamluke
HEP2012	26	2000	SE 6/7	L2051	B20457	14-Jun	Fill	Byzantine-Crusader/ Mamluke
HEP2012	27	2000	SE 7/7	L2051	B20449	14-Jun	Fill	Byzantine-Crusader/ Mamluke
HEP2012	28	3000	4/5	L3070	B30706	19-Jun	Fill-Compact dark soil	19th-20th Centuries
HEP2012	29	3000	4/5	L3082	B30755	20-Jun		19th-20th Centuries
HEP2012	30	2000	SE 7/7	L2060	B20560	19-Jun	Collapse	Late Roman/ Byzantine
HEP2012	31	2000	6/7	L2067	B20574	19-Jun	Fill	Late Roman/ Byzantine
HEP2012	32	2000	SE 7/7	L2060	B20654	21-Jun	Collapse	Late Roman/ Byzantine
HEP2012	33	3000	2/7	L3086	B30781	21-Jun		
HEP2012	34	3000	4/5	L3088	B30776	21-Jun	Ring of soil and ash around tabun	19th-20th Centuries
HEP2012	35	3000	4/5	L3088	B30775	21-Jun	Ring of soil and ash around tabun	19th-20th Centuries
HEP2012	36	3000	4/5	L3088	B30800	22-Jun	Ring of soil and ash around tabun	19th-20th Centuries
HEP2012	37	3000	4/5	L3090	B30798	22-Jun	Interior of tabun	19th-20th Centuries
HEP2012	38	3000	4/5	L3090	B30803	22-Jun	Interior of tabun	19th-20th Centuries
HEP2012	39	3000	2/7	L3080	B30790	22-Jun	Ceiling collapse	Modern
HEP2012	40	3000	4/5	L3090	B30805	22-Jun	Interior of tabun	19th-20th Centuries
HEP2012	41	3000	4/5	L3090	B30807	Jun	Interior of tabun	19th-20th

HEP2012	42	3000	4/5	L3050	B30806	23-Jun	Collapse	Centuries Modern
HEP2012	43	2000	7/7	L2076	B20753	25-Jun	Surface and its makeup	Pre-Hellenistic-Late Roman/ Byzantine
HEP2012	44	3000	2/7	L3092	B30844	25-Jun	Highest floor in SW 2/7 - Plaster	Modern
HEP2012	45	2000	SE 7/6	L2075	B20765	25-Jun	Fill above a surface	Late Roman/ Byzantine

George retrieved the carbonized plant remains from the soil samples using the flotation technique. This technique involves the soil samples being suspended in a liquid medium, in this case water, where the surface tension of the liquid together with the lower specific gravity of the carbonized material combine to keep the carbonized seeds floating at or just below the surface of the water, while the inorganic material sinks to the bottom of the tank. The suspended material was then poured off through 1mm and 250 micron sieves, dried, labeled, packaged and then sent to the lab at the College at Brockport, SUNY. The dry heavy and coarse floatation samples were sorted under a stereoscopic microscope at up to 40x magnification, separating carbonized plant remains, such as nuts and seeds, from the charcoal and other materials that remained after floatation. The carbonized seed and nut remains were then examined and identified by Ramsay and the charcoal was labeled and stored for future analysis. Identification was performed by using Ramsay's modern comparative collection, reference seed atlases Anderberg, 1994; Berggren, 1969 and 1981; Beijerinck, 1947; Feinbrun-Dothan, 1978 and 1986; Zohary, 1966; Post, 1932), illustrations from publications (Cappers *et al*., 2006);, on-line comparative sources, as well as consultation with colleagues.

Results

A total of 3537 seeds were identified from the samples recovered from Huqoq, Israel. There were a total of 55 taxa that were identified. The economic species include six cereals, six

legumes, five fruit and two nuts (Table 2). There were also 36 species of weed and wild species identified (Table 2). For the 2012 analysis there were nine samples from the Late Roman/Byzantine period, five from the Byzantine/Crusader/Mamluk periods, 23 from the 19th-20th Centuries, and seven from the Modern period. The more recent samples outnumber the ones from older periods, and they also have better preservation of the remains. To compensate for the bias, the raw numbers were turned into percent representations of a plant species or of a category of species in the larger archaeobotanical assemblage. Still, 19th/20th centuries represent almost 65% of the samples and this bias will be addressed further below.

Table 2 Names of Botanical Remains Identified

Category	Scientific Name	Common Name
Cereals:	*Hordeum vulgare* L.	Barley
	Triticum aestivum L.	Bread Wheat
	Triticum durum Desf.	Macaroni Wheat
	Secale L. sp.	Rye
	Setaria (L.) Beauv. sp.	Foxtail Millet
	Panicum L. sp.	Broomcorn Millet
Legumes:	*Vicia ervilia* L.	Bitter Vetch
	Lens culinaris Medik.	Lentil
	Vicia faba L.	Horse Bean
	Cicer arietinum L.	Chick pea
	Lathryus L. sp.	Vetchling
Fruit and Nut:	*Olea europaea* L.	Olive
	Vitis vinifera L.	Grape
	Ficus carica L.	Fig
	Phoenix dactylifera L.	Date
	Juglans regia L.	Walnut
	Prunus L. sp.	Prune
Wild and Weed Species:	*Rumex* L. sp.	Dock/Sorrel
	Chenopodium L sp.	Fat Hen (*C. album*)
	Raphanus raphanistrum	Wild Radish
	Scorpiurus sp.	Scorpionstail

Chrysanthemum corinarium	Chrysanthemum Greens
Avena sp.	Wild Oats
Bromus sp.	Grass
Scripus sp.	Grassweed
Capparis spinosa	Caper Bush
Bupleurum sp.	Thorow Wax
Spergularia sp.	Sandspurry
Atriplex L. sp.	Orache
Amaranthus L. sp.	Pigweed
Astragulus L. sp.	Milk-vetch, Wild-lentil
Melilotus P. Mill. sp.	Melilot
Medicago L. sp.	Lucerne/Medick
Trifloium L. sp.	Clover
Coronilla L. sp.	Scorpion vetch
Euphorbia L. sp.	Spurge
Malva L. sp.	Mallow
Viola L. sp.	Violet
Galium L. sp.	Woodruff/Bedstraw
Plantago L. sp.	Plantain
Lolium sp.	Ryegrass
Phalaris L. sp.	Canary Grass
Carex L. sp.	Sedge

From the nine samples recovered from the Late Roman/Byzantine period there are a total of 149 botanical remains that were identified to either genus or species level. The percent distribution of these remains (Fig. 5) shows that weed and wild species dominate the assemblage with 46%, the majority of which are field weeds, like *Malva* sp., *Lolium* sp. and *Phalarus* sp. Fruit and Nut species accounted for 26% of the identified remains with the vast majority being accounted for by *Olea europaea* (Olive). The remaining portion of the assemblage contained cereal grains and legumes, at 19% and 8% of the total respectively.

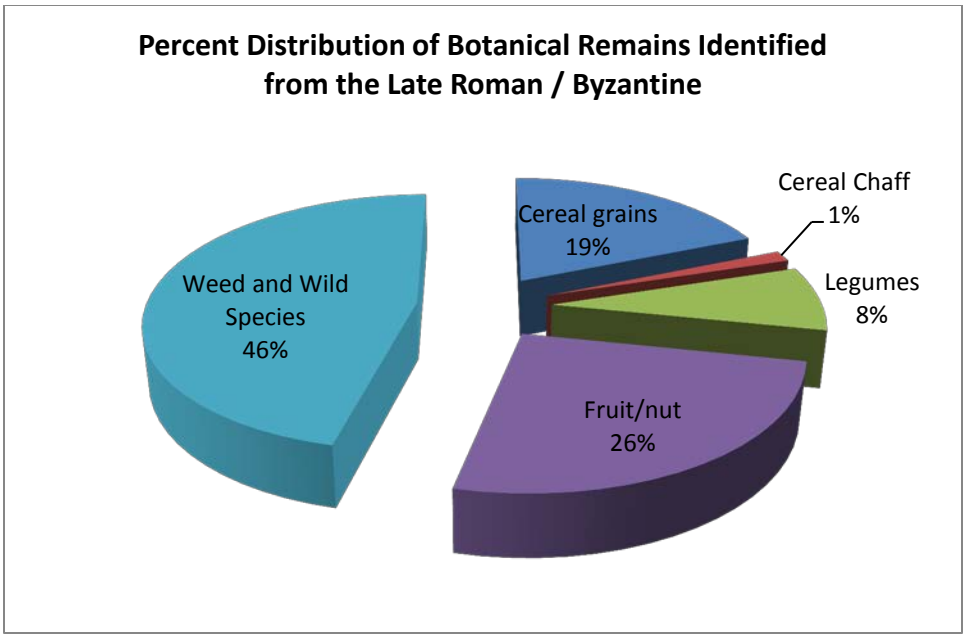

Figure 5 Percent Distribution of Botanical Remains from the Late Roman/Byzantine Period at Huqoq

The samples from contexts that have pottery dates ranging from the Byzantine through the Mamluk period are very similar in composition to the Late Roman/Byzantine period samples (see Fig. 6). There were only five samples that were processed from this context and only 63 botanical specimens identified. Nonetheless, weeds and wild species, which are dominated by agricultural weeds, represent 44% of the assemblage, fruit and nut account for 30% and cereal grain and chaff account for 16% and the final 10% are legumes.

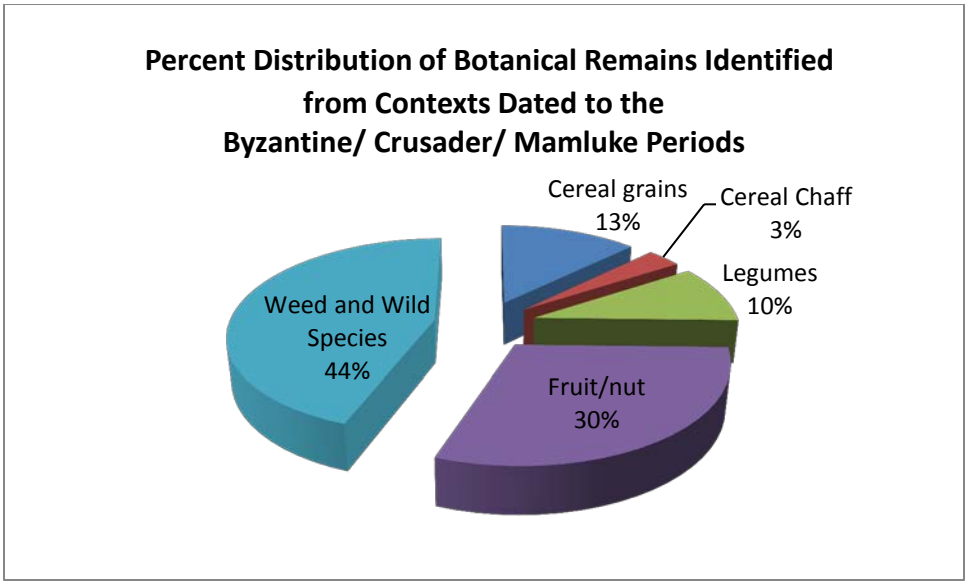

Figure 6 Percent Distribution of the Botanical Remains from the Byzantine/Crusader/Mamluke Periods

The largest number of samples that were taken during the 2012 season were recovered from contexts that are dated to the 19th and 20th centuries. There are 2000 identified remains from these 23 samples. Similarly to the Late Roman/Byzantine and Byzantine/Crusader/Mamluk contexts, weed and wild species dominate the botanical remains at 46% (Figure 7). The 19th to 20th century samples showed a major increase of cereal chaff (39%) compared to the two earlier contexts where cereal chaff consisted of only 1% and 3% respectively (refer to figures 5 and 6). Fruit/nut species and cereal grains both comprise 6% of the sample. *Ziziphus spina-christi* consists of 74% of the fruit/nut species, with the next largest species being *Ficus carica* at 11% (see Figure9). The remaining 3% of identified botanical remains are legumes.

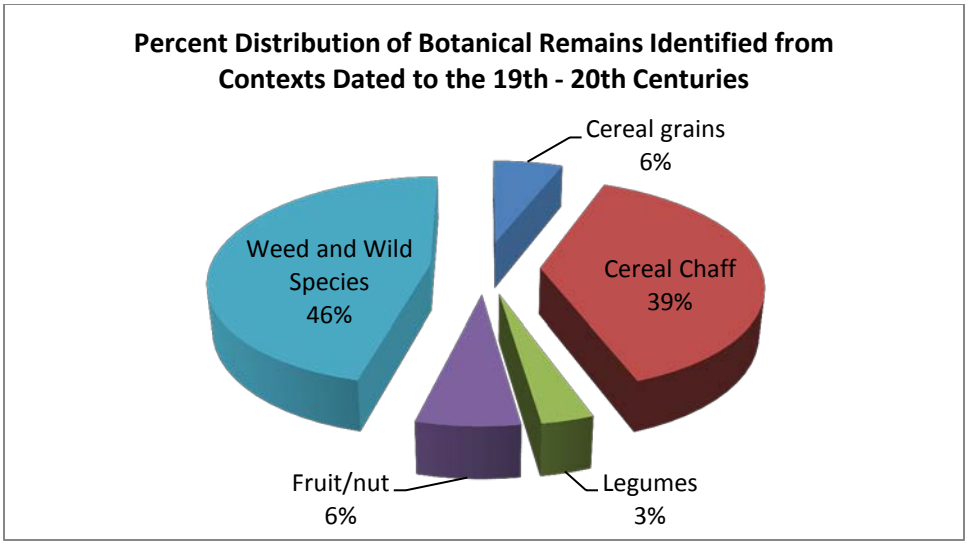

Figure 7 Percent Distribution of Botanical Remains from 19th-20th Centuries

And finally there was seven samples recovered that dated to the modern period. A total of 630 botanical remains were identified from the modern samples. Cereal grains are the largest species for the modern period representing 41% of the sample (Figure 8). Cereal chaff is the second largest species group, making up 21% of the botanical distribution. Weed and wild species are 22% while legumes are 9%. The final 7% is comprised by fruit/nut species. *Ziziphus spina-christi* again dominates the fruit/nut species at 93% (Figure 9).

As this is a preliminary study, the amount of samples from each occupation period will have an effect on the interpretation of the contexts.

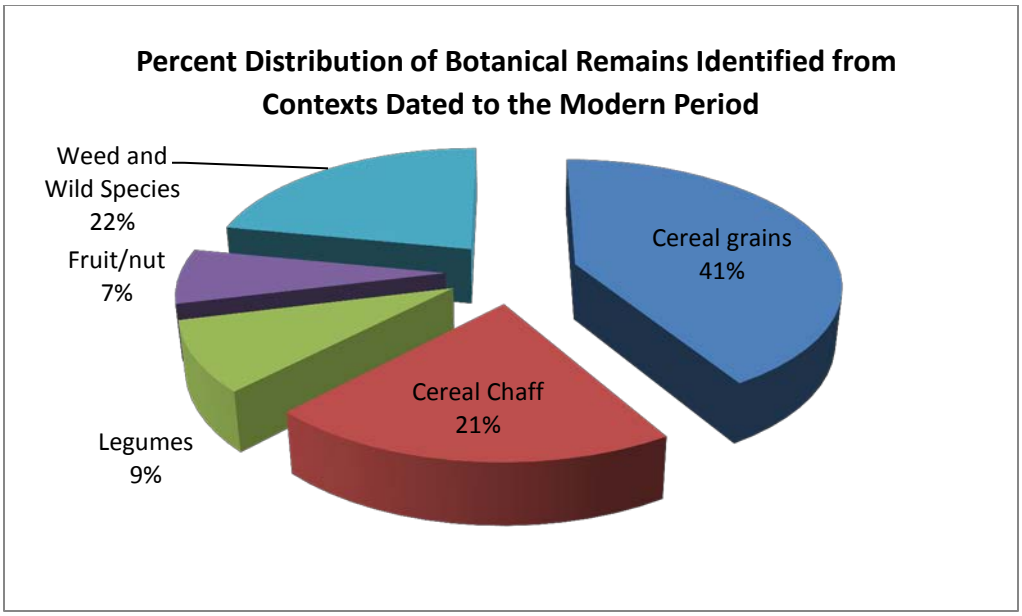

Figure 8 Percent distribution of Botanical Remains from the Modern Period

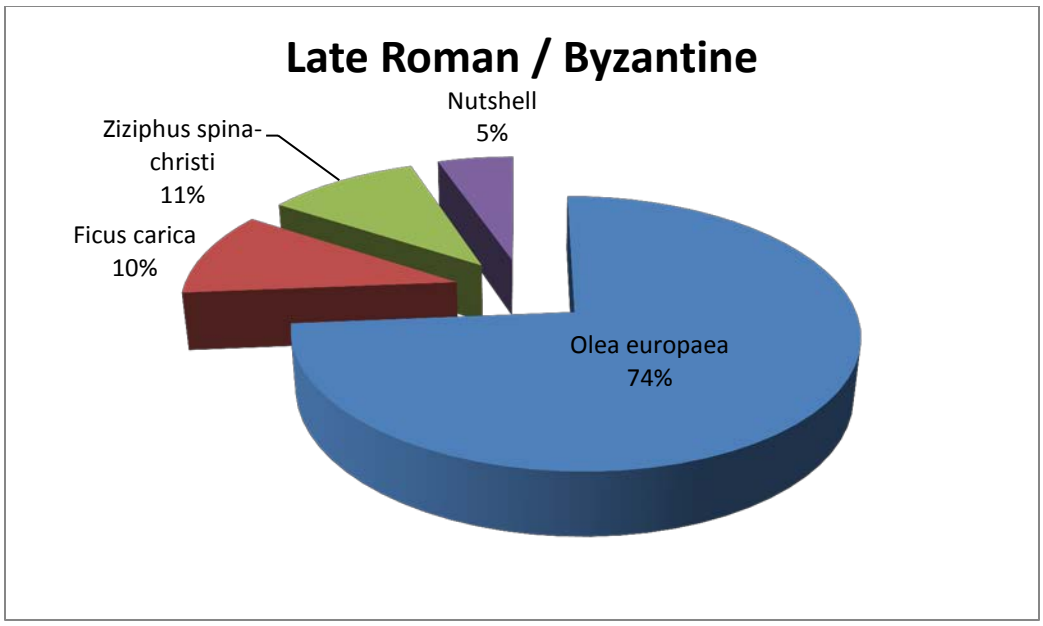

Figure 9 Percent Distribution on Fruit and Nut Species

Discussion

This information provides data on the actual agricultural commodities that were grown at the site and formed a significant part of the local economy of the region through time. Percentages are used to even out the bias between sample sizes and the four categories are Fruit/Nut, Cereal Grains, Cereal Chaff, and Legumes. Legumes do not occupy a large percentage in any period which is most likely due to the way they are processed. Legumes are not charred, but instead are soaked or boiled to ensure the expulsion of toxins. Cereal chaff is evidence of crop cultivation which increases from 3% in the Roman/Byzantine Period to 39% in the 19th-20th centuries (Figures 5 & 7). Even so, based the quantities of cereal crops and cereal chaff, grain agriculture has been an important component of the region during all periods of occupation, even in the Byzantine/Crusader/Mamluk period which appears to have a larger quantity of fruit/nut remains. However, the abundance of fruit/nut and seemingly lack of cereals may be an artifact of sampling since there were only five samples from the occupation period.

The profusion of cereal chaff, which is a by-product of crop cultivation, indicates crop agriculture was present in all areas of occupation. The majority comes from the 19th/20th centuries and the modern period, but that is in all probability a result of taphonomic processes. Likewise, the overwhelming majority of weeds species that were identified are associated with crop and fallow field systems, with only a few species representing those found in rocky and sandy places, those from open and dry habitats, and hydrophilic species. In all of the occupation periods, field and fallow species consist of over 70% of the habitats found at Huqoq (Figure 10).

Figure 10 Percent Distribution of Weed and Wild Plant Taxa by Habitat

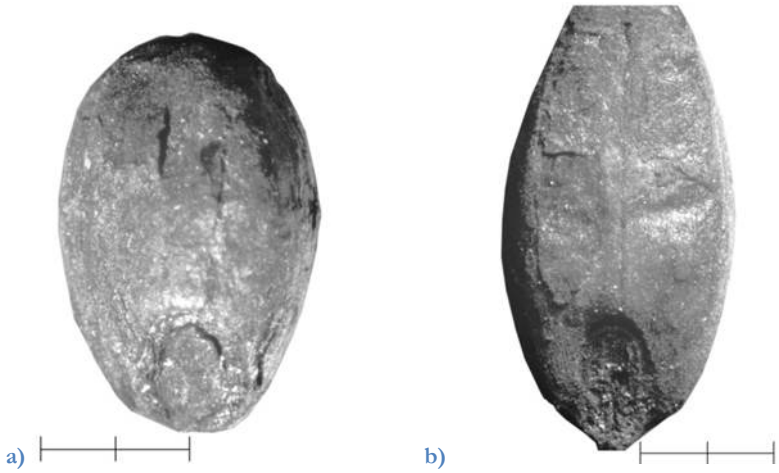

Figure 11 a) *Triticum aestivum* (Bread Wheat), b) *Hordum vulgare* (Barely)

In all of the occupation periods, there is a preponderance of wheat, specifically bread and macaroni wheat (*T. aestivum* (Figure 11 a) and *T. durum*), as well as barley (*Hordum vulgare*) (Figure 11 b) that has been identified in the samples to date. Taxonomy resulted in poor preservation of cereal grains in the Byzantine/Crusader/Mamluk period. However the indeterminate seeds are still evidence of agriculture. Millet and Rye are also evident, but do not appear as abundantly as wheat and barley. Legumes were present, although due to preparation processes such as boiling, only a few botanical remains were observed.

The most abundant fruit and nuts identified were *Olea europaea* (olives), *Ficus carica* (fig), *Vitis venifera* (grape) and *Ziziphus spina-christi* (jujube). The preponderance of *Ziziphus spina-christi (*Figure 12) is important because it is considered a sacred tree in Christian and Islamic traditions. The jujube fruit is made into a paste and utilized as hair and body wash. Furthermore, an Islamic custom is to spread paste from dried leaves on a body to prepare it for burial (Dafani et al., 2005). To enrich its significance in relation to Huqoq, *Ziziphus spina-christi* is reputed to be the source of Christ's crown of thorns (Dafani et al., 2005). Spina-christi means "Christ's thorn" in Latin. Considering the biblical importance of the area, *Ziziphus spina-christi*

may have played an important role in the culture and customs of everyday people through rituals and domestic use.

Figure 12 *Ziziphus spina-christi*

Another identified carbonized seed with biblical significance, and therefore significance in Huqoq, was *Brassica* sp., commonly called the mustard plant. Mustard is mentioned in the bible (Matthew 13:31-32, World English Bible) and it thus can be assumed that the seed was an important commodity in antiquity. In addition to biblical importance, Black Mustard (*Brassica nigra*) is produced for its seeds, which are used in spices and as medicinal purposes (Duke, 2008). While the mustard seeds identified were poorly preserved, they were still part of the archaeobotanical assemblage from Huqoq, Israel.

Conclusion

Botanical commodities have always played a fundamental role in the economy of the Near East: not only as food, but also as fuel, building materials, medicines, and for a multitude of other uses. In the past, the cultivation of crop plants was the major occupation of most of the

population, which literally lived or died by its success in food production. Given the status of crop production as the major economic activity in pre-industrial societies, clearly it must form a central part of any study of ancient civilizations. Equally importantly, the study of plants in the past will illuminate the daily life of the villagers who formed the great bulk of the people and are generally under-represented archaeologically and historically.

This preliminary analysis of Huqoq, Israel has provided us with data related to the agricultural economy of the region and demonstrates that agriculture was practiced continuously in the region since the Late Roman period. Clearly more samples are needed from similar contexts and dates to have a better idea of the complete archaeobotanical assemblage of Huqoq, Israel and if the plant remains can aid in illuminating aspects of the economy that may have made the village prosper, such as the mustard trade.

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