**The plant remains from Hazor**

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**1. Introduction**

The Southern Levant is one of best studied areas in regards to archaeobotanical investigations. Yet, the number of sites in the Northern Jordan Valley yielding archaeobotanical data is modest in comparison to those of other regions in the Southern Levant (Riehl / Kümmel 2005). The archaeobotanical material from Hazor will thus certainly complement the archaeobotanical data of the Late Bronze and Iron Age Southern Levant. Moreover, the plant remains, which include a storage find will provide insight into the dietary habits of Hazor’s occupants.

**1.1 Geographical setting**

Hazor is located in the Northern Jordan Valley between Lake Kinneret and the former Lake Hula. The mean annual precipitation in this region is about 550 mm, with most of the rainfall occurring from December to February. The summers are hot and dry. Cultivated plants were therefore grown mostly as winter crops. The average rainfall allows for rain-fed agriculture. Interannual variations in precipitation, however, can result in drought years in sub-humid regions and irrigation may be required for the cultivation of crops.

Aside from water supply, soil conditions also predefine the nature of the agricultural landscape. Hazor’s surroundings are composed of brown rendzinas, alluvial, and basaltic soils (Ravikovitch 1969). The alluvial plains north of Hazor were formed by erosional events in the uplands but also from the drained swamp of the Hula plain. The high moisture-holding capacity of their heavy alluvial soils are adequate substrates for extensive arable farming. The basaltic soils occur southeast of Hazor. Although basaltic soils are also capable of high water retention, they tend to dry out more rapidly than do alluvial soils (Zohary 1962: 12, 14).

The Hula plain and the northern Jordan valley are situated within the phytogeographical zone of the Mediterranean (Zohary 1962: Map 4). Extensive agricultural activities and the expansion of settlements over the course of centuries have destroyed the natural vegetation. The climax vegetation of the *Quercus ithaburensis*-*Pistacia* *atlantica* association is replaced by semi-steppe batha vegetation if not exploited as field and settlement territories (Zohary 1962: Map 5, 114).

**2. Materials and methods**

The archaeobotanical sampling of Area M commenced in 2009 and continued through every season of the excavation. The sediment material of particular contexts, such as basins, storage jars, tabuns, destruction layers, and pithoi ,were sampled. Each sample covered one bucket of sediment material (= 10 l). The samples were processed through bucket flotation. The sediment of each sample was thus poured into a wide plastic garbage bin. The sediment was then filled with water to let it soak. The water was poured through a cloth with a superfine mesh to catch the archaeobotanical macro remains (light fraction). Finally, the muddy, heavy fraction material that had remained in the garbage bin was poured through a 1 mm mesh to separate the muddy and sandy sediment from the large, fraction material (heavy fraction). The light fraction was dried separately from the heavy. The heavy fraction was sorted on site. Leftovers of the plant material, charcoal, and archaeological finds such as pottery were set aside.

In addition, some samples containing archaeobotanical macro remains were picked by hand because the plant remains were large and visible to the eye. The dried light fractions and the hand-picked samples were packed in plastic bags and sent to the Archaeobotanical Laboratory at the University of Tübingen.

The samples were sieved through different mesh sizes (2 mm, 1 mm, 0.5 mm and 0.2 mm) to facilitate the sorting process. The archaeobotanical macro remains were sorted with the help of binoculars with 10x magnification. Charcoal fragments were also sorted, but separated from the seed and fruit remains as the charcoal had not yet been investigated. The reference collection of the archaeobotanical laboratory as well as the literature on identification (Jacomet 2006; Nesbitt 2008; Neef et al. 2011), helped in the identification of the seeds and fruits.

An entire seed or fruit was counted as one. Fragmented macro remains of most of the taxa were also counted as one if preserved at least as halves. Exceptions were made for cereals and olives. Four quarters of cereal grains added up to one grain. The olive stones of some samples (BP 10, BP 79, BP 80, BP 104, BP 124, BP 125, BP 127, BP 128, and BP 130; see Appendix xxx) were broken, so weighing was the method used for quantifying olive pits. The greatest number of macro remains came from pithos 77462 (sample BP 170) dating to the Late Bronze Age. The grains of free-threshing wheat (*Triticum durum/aestivum*) and weedy darnel grass (*Lolium remotum/temolentum*) had to be weighed as well. For this purpose, grains of free-threshing wheat were divided several times with a sample divider to obtain smaller heaps of grains. From these, 3 x 100 grains were put aside and weighed. The average of all three measurements were the reference value. As there were fewer grains of darnel grass, only 100 kernels were sorted and weighed to determine the reference value. Finally, the seeds of both species were calculated for the entire sample size.

To assist in the interpretation of the archaeobotanical material, percent proportion of the identified seeds was calculated. Complementing the analyses, percent ubiquity was generated as well. Percent ubiquity represents the percentage of samples containing a single taxon. Accordingly, the ubiquity of 100% meant that the taxon was present in all the samples; at 50 % the taxon was present in half of the samples.

**3. Results and discussion**

In all, the seeds and fruits of 127 samples from seasons 2009 to 2017 were analysed (Appendix xxx). In general, the number of macro remains per sample was low. The samples from the pithos mentioned above alone provided more than 20.000 plant remains. The plant remains will be discussed below according to their chronological classification. The five samples from the Late Bronze Age pithos (77462), however, will be reviewed separately as the composition and number of archaeobotanical finds in these samples clearly differ from those of the other Late Bronze Age samples.

**3.1 The archaeobotanical remains from Area M (without the samples from the LBA pithos)**

The archaeobotanical material of the 122 samples is composed of 48 different taxa, which can be divided into 30 taxa of cultigens and 18 taxa of wild species (Table 1). Many samples (N = 13) contain no identifiable macro remains at all, and many samples (N = 87) only contain fewer than 10 identifiable plant remains. In total, 630 macro remains form the basis for archaeobotanical interpretation with an average of five seeds per sample. The seeds and fruits have been preserved in a carbonized state with the exception of some mineralized seeds (some fig nutlets, grape pips, and mericarps of stoneseed).

The crops reveal a great variety of cereals and pulses. The cereals are dominated by wheat, as attested by kernels of potential Emmer-wheat (*Triticum* cf. *dicoccum*) and free-threshing wheat (*Triticum durum/aestivum*). Most of the cereal finds, however, could not be identified down to species level (Cerealia). Glume remains of wheat as well as barley grains has been found only in low quantities. The archaeobotanical material is complemented by a rich variety of edible legumes. Aside from lentils (*Lens culinaris*), chickpeas (*Cicer arietinum*), common peas (*Pisum sativum*), broad beans (*Vicia faba*), and Spanish vetchling (*Lathyrus clymenum*) complete the list of protein-rich pulses. As opposed to cereals and pulses, the remains of fruits such as grapes (*Vitis vinifera*) and figs (*Ficus carica*) as well as oil-bearing fruits are few in number. Nonetheless, olive pits (*Olea europaea*) were found in 60% of the samples.

Wild species amount to less than one quarter of the entirearchaeobotanical material (Figure 1). Of the 18 taxa, darnel grass (*Lolium remotum/temulentum*), foxtail/canary grass (*Alopcecurus/Phalaris* sp.) and stoneseed (*Lithospermum* cf. *tenuiflorum*) are abundant. The remaining wild taxa are low in quantity. The wild plants are mostly proxies of field weeds (e.g. *Lolium remotum/temulentum; Vaccaria pyramidata; Alopecurus/Phalaris* sp*.; Hordeum spontaneum*) and open vegetation (e.g. *Trifolium* sp.; *Scorpiurus* sp.; *Lithospermum* cf. *tenuiflorum; Poaceae*).

In general, the composition of archaeobotanical finds from Late Bronze and Iron Age Hazor are comparable to that found at other Southern Levantine sites of these periods such as Tell Beth Shean (Kislev et al. 2009), Timnah (Kislev et al. 2006), Tell Deir ‘Alla (van Zeist / Heeres 1973), Tell el-Ifshar (Chernoff / Paley 1998), and Horvat Rosh Zayit (Kislev 2000). Free-threshing wheat is the dominant cereal with a small quantity of barley supplementing the cereal remains. Compared to the sites mentioned, the proportion of cereals and pulses here are almost evenly distributed, thereby underscoring the importance of edible legumes as a source of nutrition.

**3.2 The archaeobotanical remains from the Late Bronze Age**

The composition of the Late Bronze Age material was analysed from 54 samples, of which nearly 250 macro remains were identified (Table 2). The cultigens outnumbered the wild plants with regard to the number of taxa and seeds. The data resembles the overall assemblage of Hazor. The cereals, however, are less frequent than the edible legumes. The high variety of pulses is dominated by lentils. In addition, the number of barley grains are almost equal to those of wheat grains. Of the free-threshing wheat remains, three rachis fragments were assigned to the tetraploid (*Triticum durum*) variety. In contrast to the general finds from Hazor, olive finds were numerous and might point to the importance of this oil-bearing fruit in Hazor in the Late Bronze Age. The number of wild plants is very low. Darnel grass is the most frequent wild seed found and fits the overall picture of the wild plants found at the site.

**3.2.1 The storage assemblage of pithos 77462**

Five samples were taken From the pithos and its surroundings (L12-313) (Table 3). Three of these did not contain any macro remains at all. The other two provided over 20,000 seeds in total. The archaeobotanical finds of the storage context is clearly dominated by free-threshing wheat (N = 19.896). Due to the lack of rachis remains, it is impossible to differentiate between the hexaploid and tetraploid variety of free-threshing wheat. The Southern Levant is divided into two areas, in each of which barley or wheat was the prominent cereal cultivated. The fact that barley is better able to tolerate less precipitation and saline soils led to its cultivation in semiarid and arid regions in the south(-east). Hazor is located in the sub-humid belt of the Southern Levant, in which wheat was the main crop. While Emmer-wheat was cultivated in the Early and Middle Bronze Age, this variety was replaced by free-threshing wheat in the Late Bronze Age period. This ubiquitous shift in wheat cultivation may be connected to economic factors as the grain processing of free-threshing wheat varieties is not as time-consuming as that of Emmer-wheat (Nesbitt / Samuel 1996).

Some finds, such as the one lentil and the two grape pips, randomly entered the storage context or may be leftovers of former storage material. The barley and Emmer-wheat grains were probably intrusive plants in the free-threshing wheat fields. Most of the wild plant species were field weeds. The grains of darnel grass as well as the dispersal units of feared scabious (*Cephalaria syriaca*) are common remnants of storage finds (e.g. Tel Beth-Shean, Kislev et al. 2009) that resemble the cereal grains in size and shape (Kislev et al. 2009). This allows the weedy seeds to enter the storage assemblage during grain processing. The grains of possible wild Emmer-wheat (*Triticum* cf. *dicoccoides*) are interesting plant remains inside the storage find. Wild Emmer is the progenitor of domesticated Emmer-wheat (*Triticum dicoccum*). The two species are of the tetraploid variety and interfertile. Wild Emmer-wheat is restricted to the northern part of the Southern Levant (Zohary et al. 2012: 40-41). It generally grows in wild stands together with wild oat and wild barley (*Hordeum spontaneum*). The latter two grains have been found in the pithos as well. It is commonly found in the Northern Jordan valley, where it grows in the rocky ground and basaltic soils (Feinbrun-Dothan 1986: 178) found in the vicinity of Hazor.

**3.3 The archaeobotanical material from Iron I to Iron Age IIA**

The plant remains from the Early Iron Age strata, unfortunately, are not significant due to the low number of samples and finds. The one sample from Iron Age I contained no macro remains at all. Although 25 samples were taken from strata dating to the 10th century BCE, the number of finds (N = 44) was scarce. Next to cereals and darnel grass, olive is the most abundant species found in these samples. The two samples from the 9th century BCE were rich in charcoal but not in seeds and fruit (N = 5). The eight samples from the transitional phase between the 9th and 8th century BCE contained only 19 seeds (Appendix xxx).

**3.4 The archaeobotanical remains from Iron Age IIB (8th century BCE)**

Thirty-three samples from Iron Age IIB contained 314 identifiable macro remains, which amounts to nearly half the number of seeds and fruits in the Hazor archaeobotanical material (Table 4). The cereals in this era outnumber the pulses, whereas in the Late Bronze Age legumes were slightly more abundant than cereals (Figure 2). Emmer-wheat may constitute the major part of the cereals. Free-threshing wheat, on the contrary, is represented by single finds of grains and rachis remains. The edible legumes still reveal a broad variety of species, with lentils and unidentifiable legumes being the most frequent. The assemblage from Iron Age IIB contains more fruit remains than do the samples from the Late Bronze Age. Fig appears for the first time in this period at Hazor, and olives stand behind the number of olive pit finds from the Late Bronze Age contexts. Moreover, the ratio of wild to cultivated plants increases from the Late Bronze to the Iron Age IIB. Nevertheless, stoneseed, darnel grass, and foxtail/canary grass are the most abundant wild plants found in the samples from the 8th century BCE. The high ratio of wild species seeds may be explained by the proximity of the Iron Age layers to the modern surface. Hence, the macro remains from wild plants, though charred, may be the result of modern contaminants.

**4. Conclusion**

The archaeobotanical data of Hazor shows the typical Mediterranean composition found in many Late Bronze and Iron Age sites of the Southern Levant. The almost even distribution of cereals, pulses, and olive attested in the Late Bronze Age samples is comparable to that of other assemblages of the Late Bronze Age, such as Tell el-Burak (Riehl and Orendi in press) and Pella (Willcox 1992).

The storage context of the Late Bronze Age pithos consists of almost pure free-threshing wheat kernels. The low number of impurities, such as other cereal grains and the seeds of weedy plants, are remnants of grain-processing operations. The composition of the storage of free-threshing grains is also found at Tel Beth-Shean (Late Bronze Age IIB; Kislev et al. 2009). Both storage assemblages affirm the importance of naked wheat in the Late Bronze Age Southern Levant.

The archaeobotanical assemblage of the 8th century BCE does not differ significantly from Late Bronze Age data. Nonetheless, cereals and pulses played a major role in the dietary habits at Hazor. Fruit remains increased in the late Iron Age. Similar composition of archaeobotanical data, albeit richer in number, is found in Ashkelon (Weiss et al. 2011) and Horvat Rosh Zayit (Kislev 2000), the second of which is located about 30 km southwest of Hazor along the lower Galilee mountains.

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