**The plant remains from Hazor**

Andrea Orendi, University of Tübingen

**1. Introduction**

The Southern Levant is one of best studied areas in regards to archaeobotanical investigations. Yet, the number sites from the Northern Jordan Valley yielding archaeobotanical data is modest in comparison to other regions of the Southern Levant (Riehl / Kümmel 2005). Therefore, the archaeobotanical material from Hazor will certainly complement the archaeobotanical data of the Late Bronze and Iron Age Southern Levant. Moreover, the plant remains including 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 Hulah. The annual mean precipitation in this region is about 550 mm, with most of the rainfall occurring from December to February. The summers are hot and dry. Therefore, cultivated plants were mostly grown 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 as well requiring irrigation for the cultivation of crops.

Next to water supply, soil conditions also predefine the character of the agricultural landscape. The surrounding of Hazor is made of a composition of brown rendzinas, alluvial, and basaltic soils (Ravikovitch 1969). The alluvial plains north of Hazor were formed on the one hand by erosional events from the uplands and on the other hand by the drained swamp of the Hulah plain. The high moisture-holding capacity of the heavy alluvial soils are adequate substrates for extensive arable farming. The basaltic soils are found south-east of Hazor. Although the basaltic soils also show a high water retention, these soils tend to dry out more rapidly than the alluvial soils (Zohary 1962: 12, 14).

The Hulah plain and the northern Jordan valley are situated within the Mediterranean phytogeographical zone (Zohary 1962: Map 4). Extensive agricultural activities and the expansion of settlements for 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 started in 2009 and continued through all seasons of excavation. The sediment material of single contexts like basins, storage jars, tabuns, destruction layers, and pithoi were sampled. One sample covered one bucket of sediment material (= 10 l). The samples were processed by bucket flotation. Therefore, the sediment of one sample was spilled to a wide plastic garbage bin. The sediment then was 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 which was left in the garbage bin was poured through a 1 mm mesh to separate the muddy and sandy sediment from the big fraction material (heavy fraction). The light and heavy fraction were separately dried. The heavy fraction was sorted on-site. Leftovers of the plant material, charcoal as well as archaeological finds like pottery were put aside.

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

The samples were sieved with different mesh-size (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 a binocular with 10x magnification. Charcoal fragments were also sorted but put apart from the seed and fruit remains as the charcoal was not investigated, yet. The reference collection of the archaeobotanical laboratory, as well as identification literature (Jacomet 2006; Nesbitt 2008; Neef et al. 2011), helped to identify the seeds and fruits.

A whole seed or fruit was counted as one. Fragmented macro remains of most of the taxa were also counted as one if preserved at least in halves. Exceptions were made for cereals and olive. Four quarters of cereal grains have been 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, therefore, weighing was the method used for quantifying the olive pits. The highest number in macro remains come from pithos 77462 (sample BP 170) dating to the Late Bronze Age. The grains of free-threshing wheat (*Triticum durum/aestivum*) and of the weedy darnel grass (*Lolium remotum/temolentum*) had to be weighed as well. For this purpose, the grains of the free-threshing wheat were divided for several times with a sample divider to receive smaller heaps of grains. From these 3 x 100 grains were put aside and weighed. The average of all three measurements forms the reference value. As the grains of darnel grass were less in number, only 100 kernels were sorted and weighed to form the reference value. Finally, the seeds of both species have been calculated for the whole sample size.

As for the interpretation of the archaeobotanical material, percent proportion of the identified seeds were calculated. To complement the analyses percent ubiquity was generated as well. Percent ubiquity represent the percentage of samples containing a single taxon. According to this the ubiquity of 100 % means that the taxon was present in all the samples, and for 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 have been analysed (Appendix xxx). In general, the number of macro remains per sample was low. Alone, the samples from the pithos mentioned above provided more than 20.000 plant remains. In the following the plant remains will be discussed 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 from these samples clearly differ from 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 122 samples is composed of 48 different taxa separated into 30 taxa of cultigens and 18 taxa of wild species (Table 1). Many samples (N = 13) contained no identifiable macro remains, at all. Whereas many samples (N = 87) only contained less than 10 identifiable plant remains. In total, 630 macro remains form the base for archaeobotanical interpretation with an average of five seeds per sample. The seeds and fruits were preserved in carbonized status with some exception of mineralized seeds (some fig nutlets, grape pips, and mericarps of stoneseed).

The crops show a high variety in cereals and pulses. The cereals are dominated by wheat which is attested by kernels of potential Emmer-wheat (*Triticum* cf. *dicoccum*) and free-threshing wheat (*Triticum durum/aestivum*). Most of the cereal finds, though, could not be identified to species level (Cerealia). Glume remains of wheat as well as barley grains only were found in low amount. The archaeobotanical material is complemented by a rich variety of edible legumes. Next to lentils (*Lens culinaris*) also chickpea (*Cicer arietinum*), common pea (*Pisum sativum*), broad bean (*Vicia faba*), and Spanish vetchling (*Lathyrus clymenum*) supplement the list protein rich pulses. Opposite to cereals and pulses, the remains of fruits like grape (*Vitis vinifera*) and fig (*Ficus carica*) as well as oil bearing fruits are low in number. Even though olive pits (*Olea europaea*) were found in 60 % of the samples.

The wild species take less than one quarter of the whole archaeobotanical 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 number. 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 other Southern Levantine sites of these periods like 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). The free-threshing wheat is the dominant cereal with a small number of barley supplementing the cereal remains. Compared to the sites mentioned, the proportion of cereals and pulses are almost evenly distributed strengthening the importance of the edible legumes as 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 in which almost 250 macro remains were identified (Table 2). The cultigens outnumber the wild plants in regards to the number of taxa and the number of seeds. The data resembles the overall assemblage of Hazor. Yet, the cereals are less frequent than the edible legumes. The high variety of pulses is dominated by lentil. Also, the number of barley grains are almost equal to 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 at Hazor during the Late Bronze Age. The wild plants are very low in number. Darnel grass are the most frequent wild seeds found and fit to the overall picture of wild plants found at the site.

**3.2.1 The storage assemblage of pithos 77462**

From the pithos and its surroundings (L12-313) five samples have been taken (Table 3). Three samples did not contain any macro remains, at all. The other two samples provided more than 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 not possible to differentiate between the hexaploid and tetraploid variety of free-threshing wheat. The Southern Levant is divided into two areas in which either barley or wheat was the prominent cereal cultivated. The fact that barley is more tolerant towards less precipitation and saline soils resulted in the cultivation of barley in semiarid and arid regions in the south(-east). Hazor is located in the sub-humid belt of the Southern Levant in which mainly wheat was grown. While Emmer-wheat was cultivated in Early and Middle Bronze Age, this variety was replaced by free-threshing wheat during the Late Bronze Age period. The reason for the ubiquitous change in wheat cultivation might be connected to economic factors as the grain processing of free-threshing wheat varieties is not as time-consuming as of Emmer-wheat (Nesbitt / Samuel 1996).

Some finds like the one lentil and the two grape pips randomly entered the storage context or might be leftovers of former storage material. The barley and Emmer-wheat grains probably are intrusive plants of the free-threshing wheat fields. Most of the wild plant species represent 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). The grains of darnel grass and the dispersal units of the feared scabious 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. The wild Emmer is the progenitor of domesticated Emmer-wheat (*Triticum dicoccum*). Both species are of the tetraploid variety and interfertile with each other. The wild Emmer-wheat is restricted to the northern part of the Southern Levant (Zohary et al. 2012: 40-41). The wild Emmer-wheat, in general, grows in wild stands together with wild oat and wild barley (*Hordeum spontaneum*). Of the latter two grains have been found in the pithos as well. It is commonly found in the Northern Jordan valley where it grows on rocky ground and basaltic soils (Feinbrun-Dothan 1986: 178) which are found in vicinity of Hazor.

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

The plant remains from the early Iron Age strata are unfortunately not significant due to the low number of samples and finds. The one sample from the 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) is scarce. Olive is the most abundant species found in these samples next to cereals and darnel grass. The two samples from the 9th century BCE were rich in charcoal but not in seeds and fruits (N = 5). The eight samples from the transitional phase of the 9th to 8th century BCE contained only 19 seeds (Appendix xxx).

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

Thirty-three samples from the Iron Age IIB contained 314 identifiable macro remains which is nearly half the number of seeds and fruits of the Hazor archaeobotanical material (Table 4). The cereals outnumber the pulses, whereas in the Late Bronze Age the legumes were slightly more abundant than the cereals (Figure 2). Possible Emmer-wheat takes 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 show a high variety of species with lentils and unidentifiable legumes being the most frequent. The assemblage of the Iron Age IIB contain more fruit remains than the samples from the Late Bronze Age. Fig appears for the first time at Hazor and olive stand behind the number of olive pit finds from the Late Bronze Age contexts. Moreover, the proportion of wild 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 proportion 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, although charred, might be the result of modern contaminants.

**4. Conclusion**

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

The storage context of the Late Bronze Age pithos is made of almost pure free-threshing wheat kernels. The low number of impurities like other cereal grains and the seeds of weedy plants are remnants of the grain processing operations. The composition of 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 the naked wheat for the Late Bronze Age Southern Levant.

The archaeobotanical assemblage of the 8th century BCE does not differ significantly from the data of the Late Bronze Age. Still cereals and pulses played a major role in the dietary habits at Hazor. The fruit remains increase during the late Iron Age. Similar composition of the archaeobotanical data, although richer in number, are to be found in Ashkelon (Weiss et al. 2011) and Horvat Rosh Zayit (Kislev 2000) of which the latter is located about 30 km south-west of Hazor along the lower Galilee mountains.

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