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Archaeobotanical Results from the Late Bronze Age Hillfort Teleac (Alba County, Romania)

The article discusses the plant species found during the 2016 archaeological campaign inside the fortification of Teleac. Analysis of the macro remains recovered from archaeological deposits in Teleac helped to reconstruct the plant species cultivated by the Late Bronze Age inhabitants. The predominant cereal species in the samples was Panicum miliaceum (broomcorn/domestic millet) with 51 seeds, followed by Triticum monococcum (einkorn) with 27 seeds and Triticum spelta (spelt wheat) with 14 seeds. Also revealed were Triticum dicoccum (emmer) with 9 seeds and Secale sp. (rye) with 7 seeds. An overview of the entire Bronze Age, our focus shows that during this period the communities were engaged predominantly in agriculture, preserving their habits from the area of their origin. The results of specific analyses show that peasant farming was the mainstay of Bronze Age life.

Introduction

In this article we discuss and try to reach some preliminary conclusions regarding the plant species included in the diet of communities, who lived inside the fortification at Teleac. The results presented here are from the first archaeological campaign (2016), which was conducted inside the Teleac fortification and supported by the LOEWE project, part of a three-year project developed between 2016 and 2018. The focus of our archaeobotanical investigation were macro remains from archaeological contexts. Analysis of macro remains recovered from archaeological deposits in Teleac helped to reconstruct the plant species cultivated by the Late Bronze Age inhabitants.

The Teleac hillfort is situated on Grușeț Hill, north of the village. The western slopes of the hill (part of the Secașelor Plateau) descend towards the Mureș floodplain and a dead channel of the river that delimits the settlement in this direction (**Fig. 1**).[1] In this region prevails a variety of soils, such as brown soils, podzols, pseudorendzinas, eroded soils, regosols and alluvial soils. The potential natural vegetation is believed to have consisted of forests, which have been cut in order to create areas for grazing and crop cultivation (**Fig. 2**). It is also important to emphasize the importance of alluvial soils sited below in the nearby floodplain of the Mureș River, which are an excellent soil for agriculture.[2] The proximity of fertile soils certainly also played a role in the selection of the site.

From earliest times onwards the human habitat was influenced and controlled by the climate. Mankind was able to establish himself only in those areas where climatic conditions were approachable for his activities and needs, or conditions which through invention he was able to modify. Climatic and environmental conditions fluctuated, so that the inhabitants will have suffered bad years for crop production along with good ones, as has always been the case. The extent to which human groups buffered themselves against such effects is a cultural matter; there is some evidence that during the Late Bronze Age, for instance, specific strategies were adopted for this precise purpose.[3]

Evidence generally shows that plants played an important role in the subsistence of Late Bronze Age communities, which in turn were very much influenced by the availability and abundance of plant resources as well as climatic conditions. The evolution of human communities has been greatly influenced by the potential sources for life sustenance that are accessible in the area in which they live.

1 Ciugudean *et al.* 2017, 144-146.

2 Vasiliev *et al.* 1991, 13.

3 Harding 2010, 20.

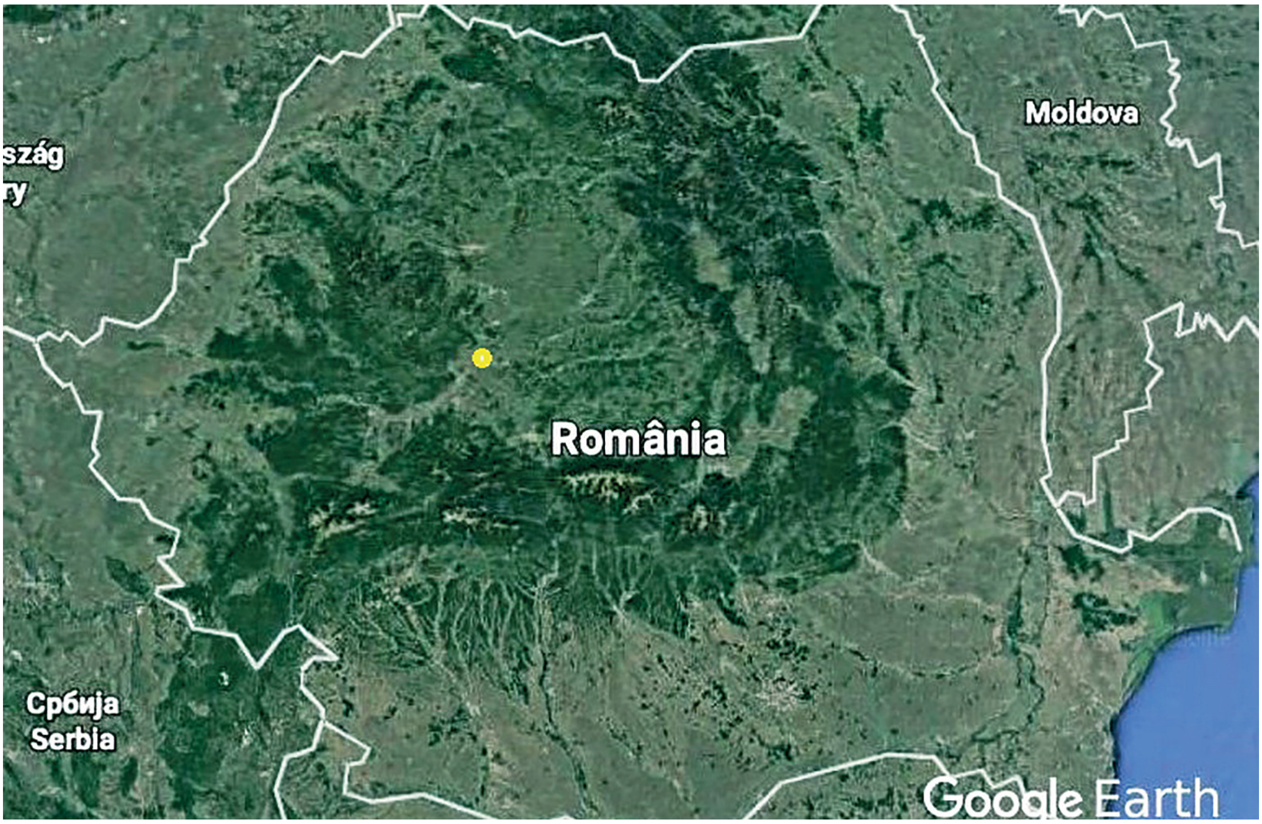

Fig. 1 Location of the site of Teleac in Romania (map based on Google Earth)

The Bronze Age is assigned to the climatic period called the Subboreal, which is between the Atlantic and the Subatlantic periods. In general, this was a warm and dry period, in contrast to the warm wet Atlantic and the cool wet Subatlantic. Nevertheless, such a mild general statement conceals a mass of small variations, both spatial and temporal. A pollen diagram shows that within the broader picture obtained by traditional pollen analysis there is a similar detailed set of fluctuations happening in the pollen record, which as a proxy climate indicator reflects changes in air temperature, precipitation and so on.[4]

According to palynological analyses for the Romanian intra Carpathian Basin, there seems to have been a cooling of the climate in the second half of the 2nd millennium BC, during which a colder and more humid, but balanced climate was established. The cooler and humid climate favoured the wide spread of beech forests that formed an area of their own by pushing the spruce forests into a more concentrated level. The beech expansion was also accompanied by *Abies sp*., a species that shares the same environmental conditions. The climate, although colder, favoured the planting of cereal species and legumes that were adapted to environmental conditions. The cultivated fields were extended by deforestation, according to palynological analyses, which reveal the presence of ruderal species that usually accompany human settlements and cultivated plots. The flora specific to the intra Carpathian Basin for the targeted segment was made up of species of trees and shrubs represented by *Juniperus, Fraxinus, Betula, Quercus, Ulmus, Salix, Tilia, Corylus, Fagus, Abies, Juglans, Alnus, Picea, Hedera, Viscum, Sambucus, Vitis* and *Pinus*.[5] Grassland herbs and ruderal species were also present, for example Poaceae, Cerealia, *Secale* sp., *Plantago lanceolata*, *Artemisia* etc. Other plants that populated the intra Carpathian Basin belonged to the taxa Rosaceae, Ericaceae, *Rumex*, Ranunculaceae, Rubiaceae, Urticaceae, *Cannabis* type, *Polygonum* sp., Caryophyllaceae, Fabaceae, Brassicaceae, Cyperaceae, Valerianaceae and Liliaceae.[6] The species listed above were present in greater or lesser proportion within the palynological samples.

From specific bibliography we learn that throughout the Bronze Age the main grain crops exploited were wheats and barleys. In many areas

4 Harding 2010, 19.

5 Tanțău *et al*. 2006, 55; Bodnariuc *et al*. 2002, 1480.

6 Tanțău *et al*. 2006, 56.

Fig. 2 View of the landscape (photo by B. Ciută)

these were supplemented by pulses, peas and beans, and by other edible plants that were gathered wild rather than cultivated. A wide range of fruits and berries was also exploited, as evidenced by a number of well-preserved wet sites. At certain times other grains were also important, and oil plants usually played a role as well.[7]

Archaeobotanical data

During the excavation season of 2016 at the Teleac site, the bulk and feature soil samples were collected from archaeological contexts, which were revealed in two excavated trenches: T1 and T2. From Trench 1 sixteen bags were sampled (**Fig. 3**), and from Trench 2 seven bags were sampled (**Fig. 4**). In sum 23 samples were collected, each sample consisting of 40 litres of soil (four buckets of 10 litres). Whole soil samples were sorted with the help of a water flotation device (made according to the Ankara model design), using mesh sizes of 3.15 mm, 2 mm, 1 mm and 0.5 mm (**Fig. 5**). All in all, during the entire season approximately 920 litres of soil were processed with the flotation device. Almost all samples contained charred macro remains. The samples were sorted under a magnifying lamp. The species were identified using a binocular microscope and a reference seed collection.[8]

A total of 355 charred seeds representing cereals, vegetables and ruderal plants was recovered from the samples. In the following are details about the list of discovered species. In general, 68 seeds could be identified as cereals. We could determine the seeds only to this general category, because the external aspect of these seeds had deteriorated through their context deposition. It is important to mention that most of the charred seeds belonging to the cereals category were recovered from the samples collected above and inside the oven discovered in Trench 1 (**Figs. 6**-**7**).

The predominant cereal species in the samples was *Panicum miliaceum* (broomcorn/domestic millet) with 51 seeds, followed by *Triticum monococcum* (einkorn) with 27 seeds and *Triticum*

[7] Harding 2010, 143.

[8] We also used the on-line available *Digital Atlas of Economic Plants in Archaeology.* The nomenclature used in this report is based on Zohary/Hopf (1988).

Fig. 3 View towards Trench 1 (photo by B. Ciută)

Fig. 4 View of Trench 2 (photo by B. Ciută)

spelta (spelt wheat) with 14 seeds. Also revealed were *Triticum dicoccum* (emmer) with 9 seeds and *Secale* sp. (rye) with 7 seeds (**Fig. 8; Tab. 1**).

Triticum monococcum: In the past einkorn cultivation was more extensive. This wheat was one of the founder grain crops. However, since the Bronze Age its importance declined gradually, very likely because of the competition from free-threshing wheats. Einkorn is a small plant, rarely more than 70 cm high, with a relatively low yield, yet it can survive on poor soils where other types fail. The fine yellow flour is nutritious, but gives bread of poor rising quality. Thus, einkorn was consumed primarily as porridge or as cooked whole grains.[9] Although it is a relic crop, einkorn wheat is still present in the Romanian flora, being cultivated mainly in mountain areas in Transylvania, mostly in the Apuseni Mountains.[10]

Triticum dicoccum: From the very beginnings of agriculture in the Near East emmer was the principal wheat of established farming settlements. Although remains of cultivated barley and cultivated einkorn also occur quite regularly in these contexts, quantitatively emmer prevails. Emmer was widely grown in Chalcolithic and Bronze Age times, although in the Late Bronze Age, like einkorn, it was generally replaced by free-threshing wheats.[11]

Triticum spelta: This is a species very frequently found in the sites belonging to this period, because it was predominantly cultivated by Late Bronze Age inhabitants. Spelt was widely disseminated from its Near East origin during the Bronze Age (4000–1000 BC) throughout the Balkans, Europe and Transcaucasia. It belongs to the category of hulled wheat.[12]

Panicum miliaceum: The small seeds belonging to broomcorn millet were found in every Late Bronze Age context in Teleac. According to specific literature[13] domestic millet became predominant in Europe only in the Late Bronze Age, being a latecomer to the cereals category. Common millet ranks among the hardiest cereals. It is a warm-season plant, which stands up well to intense heat, poor soils and severe droughts. Moreover and very important, it completes its life cycle

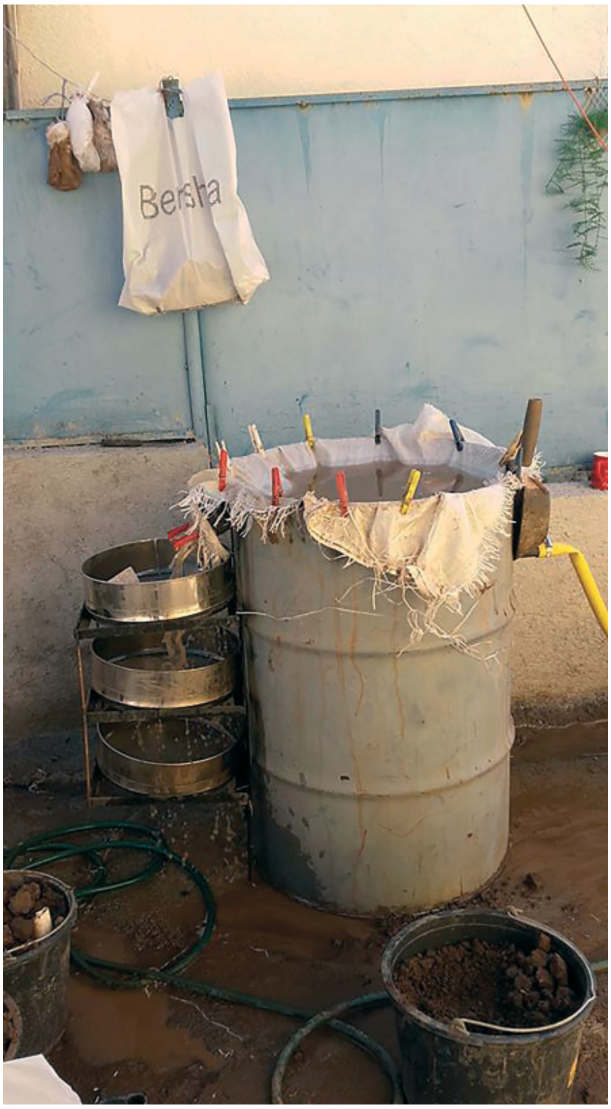

Fig. 5 Flotation barrel used in the selection process (photo by B. Ciută)

within a very short time (60–90 days), succeeding in areas with short rainy seasons.[14] Broomcorn millet was used for making porridge in past times. In Bulgaria in recent times a fermented drink called *boza* is made from millet; a similar beverage could have been made in prehistoric times, too.[15]

In this context mention should be made of the archaeobotanical results from older research on the Teleac fortification. During this work species belonging to *Hordeum vulgare* and *Triticum durum* were sampled that had been recovered from a ritual pit located under a house (house no. 5).[16] Further, a sample containing charred seeds from a ritual pit discovered at the site of Șimleul

9 Zohary/Hopf 1988, 28.
10 Săvulescu *et al.* 1957, 76.
11 Zohary/Hopf 1988, 42.
12 Renfrew 1973, 57.
13 Renfrew 1973, 99.
14 Zohary/Hopf 1988, 76.
15 Renfrew 1973, 101.
16 Vasiliev *et al.* 1991, 131.

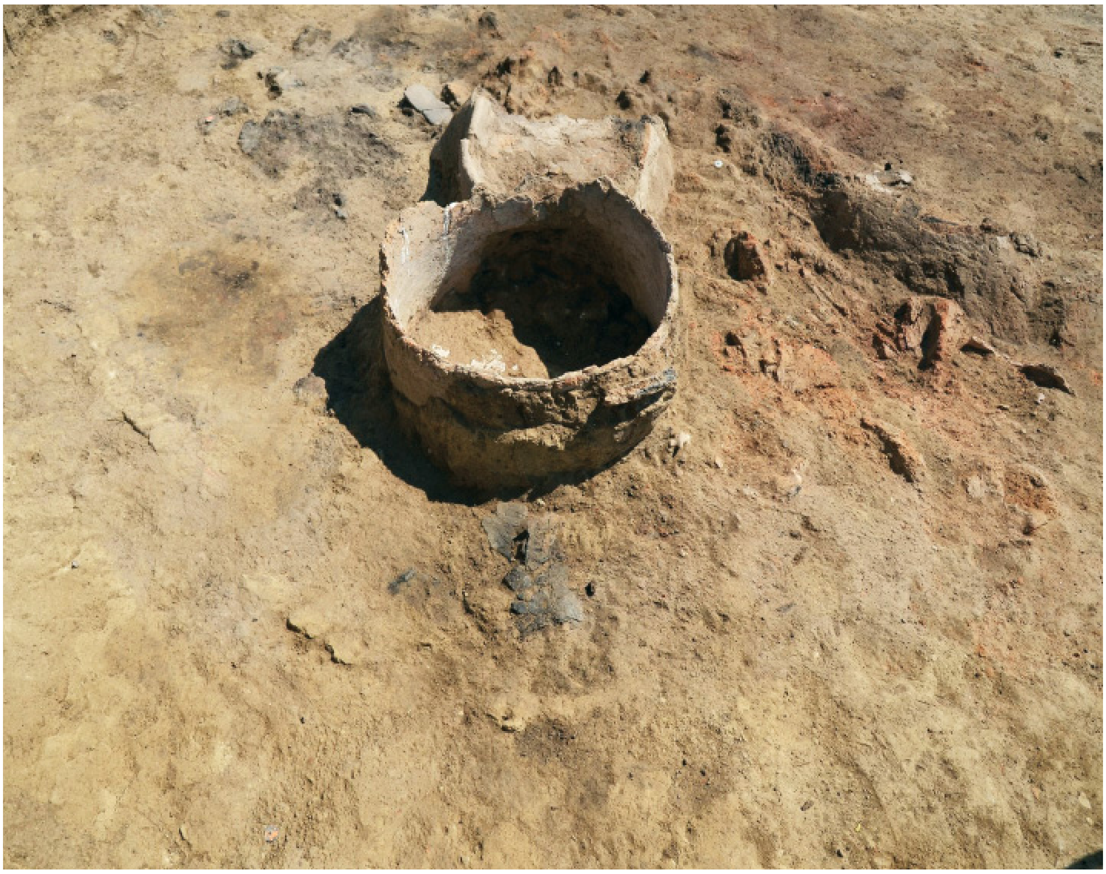

Fig. 6 Oven in Trench 1 (photo by R. Burlacu)

Fig. 7 Charred seeds recovered from inside the oven (photo by B. Ciută)

Archaeobotanical analysis for Teleac site Late Bronze Age									Abreviations sp.= unknown specie; cf.= probably; example T1-1= Trench1, sample 1; T2-1= Trench 2, sample 1										
Sample origin																			
Sample description	**T1-5**	**T1-6**	**T1-7**	**T1-8**	**T1-9**	**T1-10**	**T1-11**	**T1-12**	**T1-13**	**T1-14**	**T1-15**	**T1-16**	**T2-1**	**T2-2**	**T2-3**	**T2-4**	**T2-5**	**T2-6**	**T2-7**
Sample dimension in liters	40 liters	40 liters	40 liters	40 liters	40 liters	40 liters	40 liters	40 liters	40 liters	40 liters	40 liters	40 liters	40 liters		40 liters		40 liters		40 liters
No. of charred macroremains/fragm	**3**	**13**	**17**	**3**	**42**	**8**	**152**	**50**	**4**	**7**	**3**	**19**	**6**	**5**	**4**	**6**	**6**	**0**	**5**
Cerealia (seeds or fragm.)	1	1+3	4	1	27		58	29+2			3	5	2	1	1	1	4		4+1
Triticum sp.									1								1		
Triticum monococcum					3	4	15	3		1			1						
Triticum dicoccum						1		8											
Triticum spelta	1						8	1	1			3							
Secale cereale							7	6											
Panicum miliaceum	1	9	10		9		8		1	1		6	1	1	1		1		
Avena sp.							1	1											
Leguminosae (seeds or fragm.)						1		1				2							
Vicia faba						2						2							
Pisum sativum				1+1					1	1									
Fruits																			
Cornus mas (stone)														1					
Sambucus nigra													1						
Ruderal species																			
Rumex sp./Rumex acetossella			1				2					1							
Chenopodium album										1			1			4			
Chenopodium hybridum		1												1	2				
Galium aparine			2		3		51			1									
Polygonum sp.														1		1			
Bromus secalinus							2												
Raphanus raphanistrum				1															

Tab. 1 Plant species found at Teleac (graphic by B. Ciută)

Silvaniei-Observator, dated to the Late Bronze Age. Identified in the sample with a weight of 0,538 g were species of *Triticum monococcum* and *Triticum dicoccum.*[17]

Vegetables discovered in the Teleac site are represented by pulses, such as *Vicia faba* (horse bean) with 4 seeds and *Pisum sativum* (green pea) with 3 seeds, and 4 cotyledons of the *Fabaceae* family (**Fig. 8; Tab. 1**). Ruderal plants are represented by *Rumex acetosella* (common sorrel), *Galium aparine* (cleavers) and *Chenopodium album/hybridum* (fat hen). These species are found very frequently in human settlements, a common companion of inhabited areas.

Einkorn, emmer, as well as spelt are hulled (syn. glume) wheats, in which robust glumes surround the grain. To separate the grain from the glumes, additional steps in processing are necessary: parching by fire, pounding in mortars, repetitive winnowing and sieving. In contrast, ("modern") bread and macaroni wheats are free-threshing, which means that the grain falls out of the glumes already during threshing.[18] The advantage of hulled wheats is that the robust glumes protect the grain more efficiently against pests in the fields (birds and rodents); glumes safeguard the grain against insects and fungal attacks during storage, thus making hulled wheat more vigorous than free-threshing wheats.[19]

Pulses started their role as a companion to wheat very early in the agricultural history of the Old World. By rotation or mixing of legume crops with cereals the cultivator was able to maintain higher levels of soil fertility. Rather than using up nitrogen, pulses add to the soil. Another virtue is that the seeds of pulses are exceptionally rich in storage proteins, while cereals are rich in starch. Thus, they complement each other as food elements and contribute to a balanced human diet. Each agricultural civilization developed not only its staple cereals, but also its characteristic companion legumes.

To grow and ripen well, all the cereals require certain climate and soil types. For instance, wheat does not thrive well on loose sandy or peaty soils nor on wet clay soils. It provides the best yields on firm clay loams that are well drained. Wheat exhausts the land more than any other crop. It tends to lodge when growing on rich, damp bottom

17 Ciută/Bejinariu 2012, 158.

18 Hajnalova/Dreslerova 2010, 170.

19 Nesbit/Samuel 1996, 54.

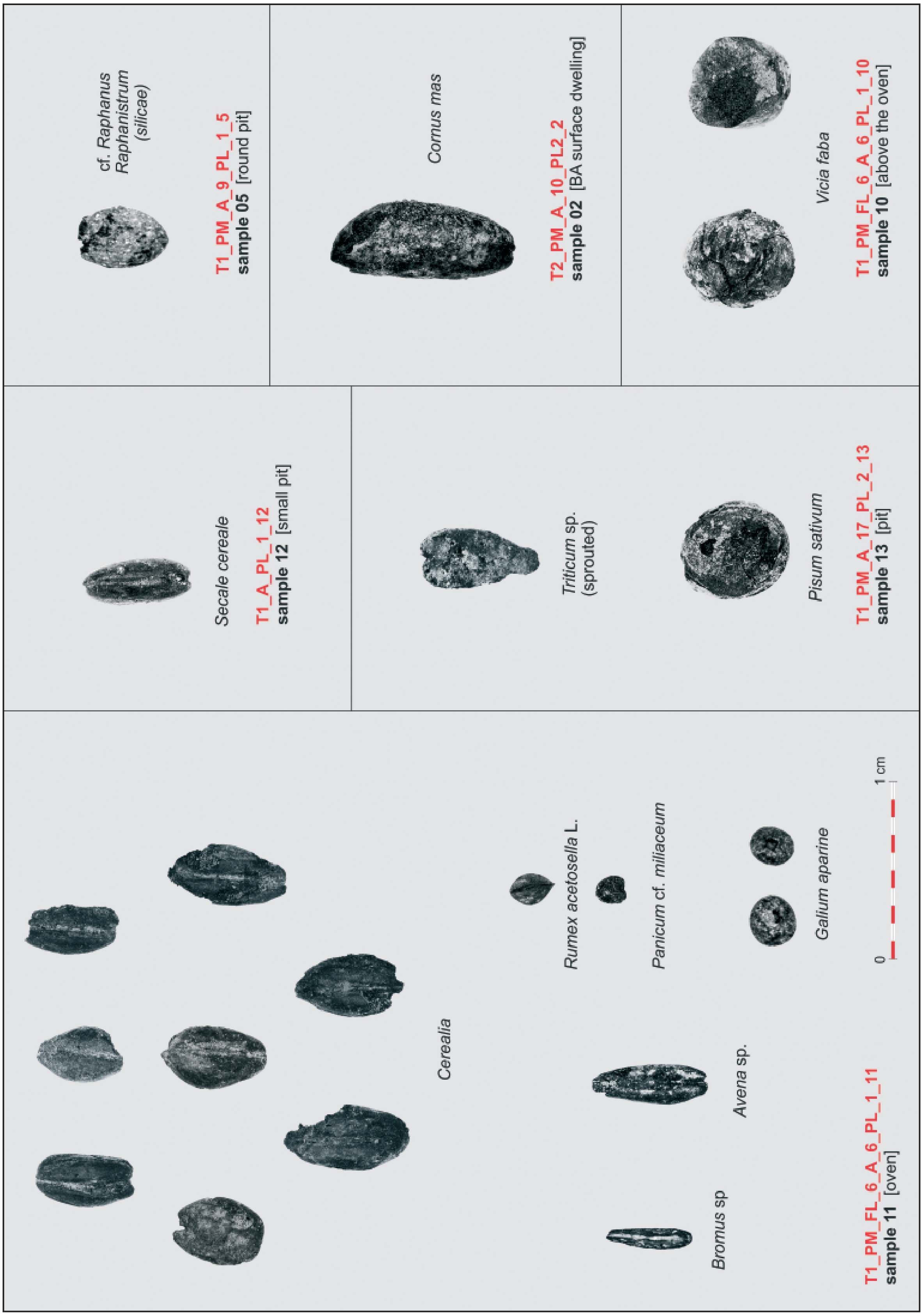

Fig. 8 Plate showing the plant species recovered from the Teleac site (photo by B. Ciută)

land.[20] Wheat grains were of importance in the diet of prehistoric communities. After threshing and grinding the grains into a coarse meal, they were utilized either to make gruel or porridge or baked into bread. Wheat flour can be of two types, either *strong* or *weak*. Strong flour is caused by the high gluten content in the grain, which gives it elasticity so that it can be baked into light porous loaves. When the grain is grown under conditions of low rainfall, on rich soil, with a hot, dry and sunny ripening period, strong flour is produced. Weak flours, by contrast, tend to produce compact, hard loaves. They are frequently found in areas with high rainfall and soil moisture, and cool, cloudy weather during the ripening period.[21] We exemplify these environments, because – as we have demonstrated – during the Late Bronze Age the climate fluctuated so that the crops were of either type. In this case we can assume that the cultivated species were adapted to the climate. Also, we presume that the cultivated fields were somewhere outside of the settlement, either in the south-eastern part or in the western part, in the floodplain of the Mureș River.

Discussion

The Bronze Age witnessed important social and economic changes, as attested by the establishment of large, stable and fortified settlements with trenches and walls of earth, and by specialised growth of the agricultural economy (livestock and cultivation of plants). New tools made of more robust materials, including the bronze plough and sickles, played an important role in the agricultural process during the Middle and Late Bronze Age.[22]

As it turns out Bronze Age communities adapted to the climate by cultivating species suitable for their environmental conditions. Cereals, legumes and dried fruits must have been stored for winter consumption. The form of storage for cereals (whole spikelets or free grains) is not yet securely known. Studies have shown that storage of grains as whole spikelets provide better protection against fungi and insects, and that the absence of spikelet bases in the seed samples can be linked to their collection and flotation techniques.[23] On the other hand, it is considered that storage was not essential only for the winter season alone. Assumptions are that the production surplus was inherent as a safety measure in the areas where the annual harvest could fluctuate significantly.[24] This surplus could have important implications when used as trade good to acquire other products.

An overview of the entire Bronze Age, our focus in the space above, shows that during this period the communities were engaged predominantly in agriculture, preserving their habits from the area of their origin. The results of specific analyses show that peasant farming was the mainstay of Bronze Age life. Further, results of archaeobotanical research revealed an important characteristic of the Bronze Age: the purity of cultivated crops. Most of the analysed samples contained cereal samples with very few impurities. Does this reality signify a start in the specialization of everyday activities? Or, respectively, does it signify that communities were mainly occupied with only the cultivation of plants and dedicated themselves exclusively to these skills? We may state as a first general conclusion that the analysed plant remains from Teleac hillfort are representative for the Late Bronze Age, similar to other sites in Europe. It will remain for future archaeological campaigns and archaeobotanical results to complete the picture of plant species included in the diet of inhabitants of the Teleac fortification.

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[20] Renfrew 1973, 66.
[21] Renfrew 1973, 67.
[22] Vulpe *et al.* 2001, 238.
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[24] Halstead 1989, 68.

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