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PLANT REMAINS FROM THE LATE NEOLITHIC SETTLEMENT OF POLGÁR-BOSNYÁKDOMB

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Abstract. Charred plant remains were recovered at the Polgár-Bosnyákdomb site dated to the Middle Neolithic period (the Tisza–Herpály–Csőszhalom culture), corresponding to the first half of the Vth millenium BC. Among cultivated plants found as dispersed within the archaeological features and in daub pieces, remains of emmer wheat *Triticum dicoccon* were the most frequent. Also, leguminous plants were used as demonstrated by seeds of lentil *Lens culinaris*. Among wild herbaceous plants, taxa of field and ruderal habitats prevailed (*Chenopodium* type *album*, *Galium spurium*, *Polygnum mite* and *Bromus* sp.) as well as those coming from dry grasslands (*Stipa* sp.). The analysis of charcoal remains showed that mostly wood belonging to *Quercus* sp., *Ulmus* sp. and *Cornus* sp. were collected as firewood from the proximity of the settlement, mainly from oak-dominated wooded steppes developed on the elevated surfaces and floodplain forests from the seasonally flooded alluvium. The most frequently found plant remains (*Cornus* sp. wood and *Stipa* sp. awns) were dated with the means of radiocarbon analysis and the chronology showed their use at the end of the settlement, toward the middle of the Vth millenium BC.

Keywords: archaeobotany, anthracology, Neolithic, Great Hungarian Plain, Hungary

INTRODUCTION

Macroscopic plant remains that are retrieved from the archaeological sites inform about plant resources used by people in the past and about the environment near prehistoric settlements. The macro-remains of cultivated and wild plants found in the Neolithic sites are especially significant for the history of local flora and crop husbandry (e.g. Pearsall 2000; Lityńska-Zając, Wasylikowa 2005). Present study is based on plant remains that were collected at the Polgár-Bosnyákdomb site dated to the Middle Neolithic period, which developed in the first half of the Vth millenium BC. The settlement represents tell-like sites of the Tisza–Herpály–Csőszhalom culture. It was located in the proximity of the former branch of the Tisza River (Fig. 1; for the information of the research history, chronology and the archaeological context

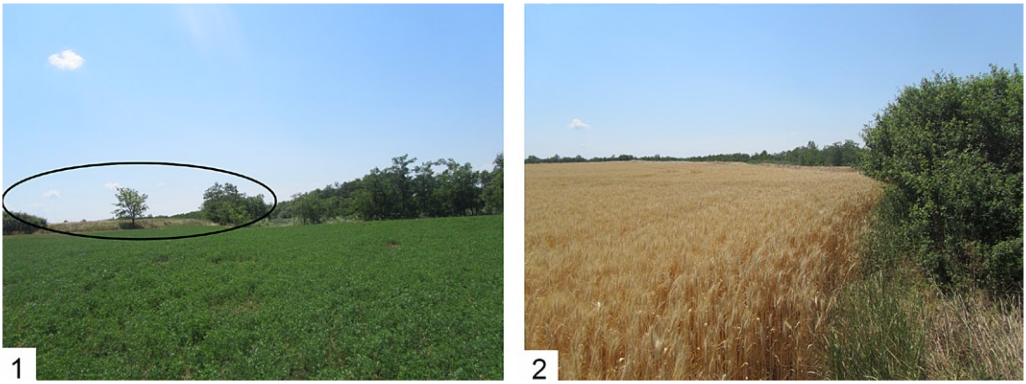

Fig. 1. 1. Location of the tell-like settlement of Polgár-Bosnyákdomb. 2. Present-day crop fields covered the area of the settlement

see: Raczky, Anders 2016). The site is situated in the north-eastern part of the Great Hungarian Plain, in the Middle Tisza Floodplain. This area is called "Polgár-Island" due to the presence of the loess-covered lag-surface elevated above the alluvium of the Tisza river and developed at the end of the Pleistocene (*ca*. 15,000 BP) (Sümegi et al. 2005; Sümegi et al. 2013). The region is characterized by a moderately continental climate with an average annual temperature of 9.5–11°C. The average annual precipitation is between 500 and 600 mm (Pécsi, Sárfalvi 1964; Pécsi et al. 1989). The presence of at least one month of drought is characteristic for this area. The main zonal vegetation is steppe forest dominated by different oak species (Zólyomi, Fekete 1994; Donița et al. 2003; Bölöni et al. 2008; Molnár et al. 2012), while the riparian forests appear along the valley of the Tisza river. The latter includes willow-poplar alluvial forests and oak-ash-elm forests (Bölöni et al. 2008).

MATERIALS AND METHODS

The macroscopic plant material came from three kinds of samples collected during the archaeological excavations: (1) soil samples, (2) manually gathered samples in places of a visible accumulation of charred plant remains, and (3) daub fragments. Soil samples were recovered from various layers of a ditch that surrounded the tell-like settlement. They came from the northern section of the ditch (feature 4, Trench I) and the southern one (feature 63, Trench VIII) (Tab. 1, 2) (See also: Raczky, Anders 2016, Fig. 1, 2). A total of 248 litres of sediments were floated and water-sieved with the help of meshes with diameters of 0.5 and 1.0 mm in the laboratory of the W. Szafer Institute of Botany of the Polish Academy of Sciences (IB PAN). Afterwards, fruits, seeds and charcoals were sorted. Manually collected samples came from occupation layers found in Trench V, from two post-holes (features 1 and 57) and from 18 pits (Tab. 3). Samples of daub were studied from two sections of the ditch (features 4 and 63) (Tab. 1).

Table 1. The results of the analysis of macroscopic plant remains from Polgár-Bosnyákdomb. Explanations: ch – charred, i – imprint; * dried fragments in daub pieces

Polgár-Bosnyákdomb	Ditches				
Taxa name	State of preservation	Kind of remains	4	63	Total
Triticum dicoccon	ch	caryopsis		1	1
Triticum dicoccon	ch	glume	6	3	9
Triticum dicoccon	ch	spikelet	8	5	13
Triticum dicoccon	i	caryopsis		10	12
Triticum dicoccon	i	spikelet		1	1
Triticum dicoccon	i	spikelet fork		7*	7
Triticum cf. *spelta*	ch	glume		1	1
Triticum sp.	ch	caryopsis		1	1
Cerealia indet.	ch	caryopsis	25	79	104
Cerealia indet.	i	chaff	+	3	3
Lens culinaris	ch	seed	1	1	2
Chenopdium album	ch	seed		3	3
Chenopodium t. *album*	ch	seed	7	15	22
Chenopodium hybridum	ch	seed	2		2
Chenopodium urbicum	ch	seed	1		1
Fallopia convolvulus	ch	fruit		1	1
Galium spurium	ch	fruit	2	3	5
Melandrium album	ch	seed		1	1
Polygonum mite	ch	fruit	2	2	4
Bromus sp.	ch	caryopsis	1	1	2
Galium sp.	ch	fruit		1	1
Polygonum sp.	ch	fruit		1	1
Rumex sp.	ch	fruit		1	1
Stipa sp.	ch	aws	17	59	76
Caryophyllaceae indet.	ch	seed		3	3
Poacea indet.	ch	caryopsis		2	2
Poacea indet.	ch	chaff	1		1
undet.	ch	?	4	5	9
Total			**77**	**210**	**287**

Remains of fruits and seeds as well as their imprints in daub were identified on the basis of their morphological characteristics with the help of a stereomicroscope with 2.5 to 40× magnifications. Identified specimens were compared with present-day reference collections available at the Archaeobotanical Laboratory of the Institute of Archaeology and Ethnology of the Polish Academy of Sciences and the Department of Palaeobotany of the IB PAS. For botanical analyses the specialized literature was also consulted (e.g. Kowal 1953; Dörter 1968; Kowal, Rudnicka-Sternowa 1969;

Table 2. The results of the analysis of charcoal remains from the ditch system from Polgár-Bosnyákdomb

Polgár-Bosnyákdomb	Southern part (63), Trench VIII						Northern part (4), Trench I	
Layers (cm)	120–150	140–160	160–180	180–200	N	%	N	%
Cornus sp.	6		2	1	9	2.1	7	4.7
Fraxinus sp.		1		1	2	0.5	1	0.7
Prunus sp.							1	0.7
Quercus sp.	129	84	90	49	352	83.4	127	84.7
Ulmus sp.	9	6	10	3	28	6.6	8	5.3
Salix sp.							1	0.7
Salix sp./*Populus* sp.		1			1	0.2		
Maloideae	1	1	1		3	0.7		
Angiospermae	12	7	7	1	27	6.4	5	3.3
Sum of fragments	**157**	**100**	**110**	**55**	**422**	**100**	**150**	**100**
Minimum number of taxa	**4**	**5**	**4**	**4**	**6**		**6**	

Kulpa 1974; Rymkiewicz 1979; Falkowski 1982; Cappers et al. 2006; Cappers et al. 2009). Charcoals were identified by using a reflected light microscope with magnifications of 100, 200 and 500×. Scanning electron microscope, available at the Laboratory of Field Emission Scanning Electron Microscopy and Microanalysis of the Institute of Geological Sciences at the Jagiellonian University in Kraków, was employed for making micrographs. Each charcoal fragment was broken along the three anatomical sections of wood, namely transverse, longitudinal radial and longitudinal tangential (Fig. 2) to observe characteristics of wood anatomy. Taxonomical identifications were made with the help of the modern wood collection (IB PAS) and the specialized literature (e.g. Schweingruber 1982, 1990). Plant remains were dated with radiocarbon analysis using the technique of accelerator mass spectrometry (AMS) at the Poznań Radiocarbon Laboratory. Calibration was made based on OxCal v4.2.4 (Bronk Ramsey 2013) and IntCal13 atmospheric curve (Reimer et al. 2013).

Each charcoal fragment, irrespective of its size, is an observation and quantification unit (Badal 1992; Chabal 1988, 1997). The results are presented as fragment's counts of the taxa identified in the charcoal assemblages (Chabal 1988). The percentages are given only in the case of floated samples because manually-collected samples may produce an over-representation of identified taxa. The rank of identification (species, genera, family, etc.) may vary as it depends on the size, the anatomical characteristics of the wood, and the state of preservation of the charcoal fragments (Schweingruber 1982). However, the taxonomical identification of charcoals was only possible to the genus level as all possible species within a particular genus are not differentiated on the basis of wood anatomy. Moreover, the calculation of the number of taxa (Minimum number of taxa) in samples/layers does not include fragments identified to a higher rank (e.g. angiospermae)

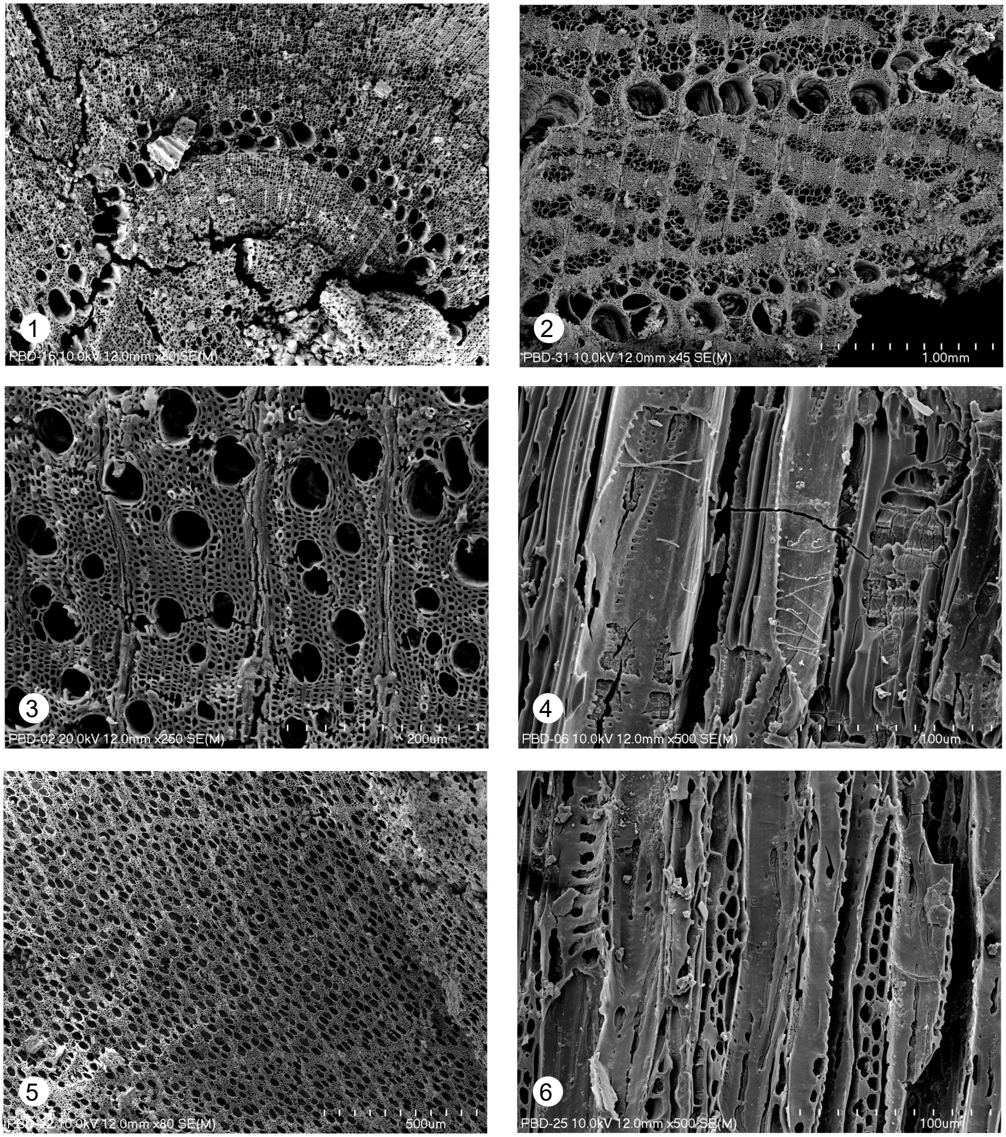

Fig. 2. The most frequent taxa found among the charcoals from the archaeological sites at Polgár-Bosnyákdomb: 1 – *Quercus* sp., transverse section (T.S.), scale bar: 500 μm, 2 – *Ulmus* sp., T.S., scale bar: 1.00 mm, 3 – *Cornus* sp., T.S., scale bar: 500 μm, 4 – *Cornus* sp., longitudinal radial section, scale bar: 100 μm, 5 – Maloideae T.S., scale bar: 500 μm, 6 – Maloideae longitudinal tangential section, scale bar: 100 μm. Micrographs: M. Moskal-del Hoyo

nor those that can be repeated, for example, if *Salix* sp. appears, a taxon identified as *Salix* sp. or *Populus* sp. is not counted for taxonomic diversity.

All the remains of cultivated plants were preserved as charred. Cereal grains were mostly crushed and had traces of mechanical damages visible on the surface. Some of the grains were swollen as a result of combustion. These specimens were included

Table 3. The results of the analysis of charcoal remains from the archaeological features from Polgár-Bosnyákdomb

Polgár-Bosnyákdomb	Late Neolithic																
Feature type	Layers	Post-holes		Pits													
Trench	V		VII	V												VII	VIII
Feature number		**1**	**57**	**22**	**24**	**25**	**22**	**24**	**31**	**32**	**33**	**36**	**37**	**46**	**50**	**53**	**55**	**75**
Stratigraphic layer		**289**	**508**	**418**	**420**	**421**	**418**	**420**	**450**	**451**	**452**	**455**	**456**	**465**	**481, 482**	**480**	**503, 506, 507**	**935**
Acer sp.	1									2						3		
Cornus sp.	3		6									3	1		1		5	
Corylus sp.	1																	
Quercus sp.	140	30	6	14	29	7	14	29		9	8	61	35	4	6	46	39	13
Quercus sp. type *cerris*	1																	
Ulmus sp.	57			4			4			1		26	4				6	
Salix sp.									4			1				7		
Salix sp./*Populus* sp.	6			1			1		1			6				1		
Populus sp.												1						
Maloideae												2				1		
Angiospermae	1			1	1		1	1								2		
Sum of fragments	**210**	**30**	**12**	**20**	**30**	**7**	**20**	**30**	**5**	**12**	**8**	**100**	**40**	**4**	**7**	**60**	**50**	**13**
Minimum number of taxa	**7**	**1**	**1**	**3**	**1**	**1**	**3**	**1**	**1**	**3**	**1**	**6**	**3**	**1**	**2**	**5**	**3**	**1**

Table 4. The results of the analysis of macroscopic uncharred plant remains from Polgár-Bosnyákdomb. Material is likely a modern contamination

Polgár-Bosnyákdomb		Ditch		
Taxa name	Kind of remains	4	63	Total
Chenopodium t. *album*	seed	5	12	191
Chenopodium rubrum	seed			1
Echinochloa crus-galli	spikelet			1
Fallopia convolvulus	fruit			1
Gypsophilla muralis	seed		37	37
Lamium album	fruit			1
Mentha cf. *aquatica*	seed			2
Polycneum arvense	seed		1	1
Polygonum aviculare	fruit		42	42
Polygonum cf. *calcatum*	fruit	1		1
Solanum nigrum	seed		1	1
Stachys recta	fruit		1	3
Thlaspi arvense	seed			1
Amaranthus sp.	seed			2
Potentilla sp.	fruit	1		1
Brasicaceae indet.	seed	2		2
Total		**9**	**94**	**288**

in undetermined *Cerealia* group (Tab. 1). Among wild herbaceous plants specimens preserved as charred and uncharred appeared (Tab. 1, 4). The former are usually considered contemporaneous with the archaeological features, but the latter are generally interpreted as modern contamination when they come from dry archaeological sites located above the groundwater level (Lityńska-Zając, Wasylikowa 2005). However, in the case of several seeds of goosefoot *Chenopodium album* it was very difficult to determine their state of preservation. Uncharred plant remains are presented (Tab. 4), but they are not included in a discussion on the Late Neolithic plant assemblage. Remains of wood were found as charcoals.

Daub fragments were generally well burned and very hard. On their surfaces, visible imprints of isolated plants were observed. After breaking, fragments of daub contained inside also evidences of plant additives, preserved as plant imprints and uncharred (dried) chaff fragments. In several fragments, an accumulation of cereal chaff was noted, which could not be counted. In these cases, in Table 1 they are marked with "+".

RESULTS

From the settlement of Polgár-Bosnyákdomb, remains of charred cultivated plants and their imprints occurred only in both parts of the ditch (features 4 and 63). The same was observed in the case of wild herbaceous plants. This is probably due to the recovery method of the samples. Altogether cultivated and wild herbaceous plants represented 19 taxa, including 10 taxa identified to the level of species, 6 to the genus level and 3 to broader taxonomical groups (Tab. 1). Among cultivated plants, remains of unspecified cereals were the most frequent. Cereals were represented mostly by caryopses and chaff remains of emmer wheat *Triticum dicoccon*. One glume fragment could represent spelt wheat *T.* cf. *spelta*. Leguminous plants appeared as two seeds of lentil *Lens culinaris*. Among wild herbaceous plants fragments of awns of *Stipa* sp. and seeds of *Chenopodium* type *album* were the most commonly found. Fruits of *Galium spurium* and *Polygnum mite* as well as caryopses of *Bromus* sp. were noted in both sections of the ditch. In daub fragments, imprints of caryopses and spikelet fragments of *Triticum dicoccon* were documented. Also, chaff remains of unidentified grasses appeared.

In charcoal assemblage, 11 taxa belonging to broad-leaved trees were found, which were identified to genera (*Acer*, *Cornus*, *Corylus*, *Fraxinus*, *Quercus*, *Quercus* type *cerris*, *Populus*, *Salix*, *Prunus* and *Ulmus*) and to subfamily Maloideae (Tab. 2, 3). Also, some charcoal fragments were identified as *Salix* sp. or *Populus* sp. since small fragments of these genera or those that are not well preserved cannot be easily differentiated based on wood anatomy (Schweingruber 1982, 132, 133, 154–158).

Among the charcoals, eight taxa were found in two sections of the ditch (floated samples). In the southern part of the ditch (feature 63), they appeared in different layers and depths, in which between four and five taxa were documented (Tab. 2). The remains of *Quercus* sp. and *Ulmus* sp. appeared in all layers. These taxa were also the most numerous as they reached 83.3% and 6.6 %, respectively. *Cornus* sp. (2.1%) and Maloideae (0.7%) occurred in three layers, while other taxa like *Fraxinus* sp. and *Salix* sp. or *Populus* sp. were less frequent (Tab. 2). In the northern part of the ditch (feature 4) six taxa were found in two samples collected from one layer. *Quercus* sp. was dominant (84.7%), followed by *Ulmus* sp. (5.3%) and *Cornus* sp. (4.7%). These taxa appeared in both samples. The remaining taxa (*Fraxinus* sp., *Prunus* sp. and *Salix* sp.) appeared as singular fragments (Tab. 2).

In hand-picked samples, a total of 10 taxa appeared (Tab. 3). The highest number of taxa was documented in the assemblage (20 samples) coming from the occupation layers located in Trench V. The remains of *Quercus* sp. and *Ulmus* sp. were predominant and those taxa were also ubiquitous as the former appeared in 16 samples and the latter in 8 of them. Other taxa were found sporadically. Two samples came from the post-holes (Tab. 3). In both of them remains of *Quercus* sp. appeared, but also fragments of *Cornus* sp. were found in one post-hole (number 57). Also, charcoal fragments came from 15 pits and *Quercus* sp. was the most frequen. Also, *Ulmus* sp. and *Salix* sp. or a taxon identified as *Salix* sp. or *Populus* sp. were ubiquitous as they appeared in six and five pits, respectively. *Cornus* sp. was documented in four pits, whereas *Acer* sp. and Maloideae occurred in two of them. The diversity of taxa in pits ranged from 1 to 6. This is partly connected with the number of fragments found as the highest number of taxa appeared in pit 36 from which 100 charcoal fragments were analysed. The taxonomic diversity may be also related with the recovery method. Usually the hand-collection of charcoals favours the selection of large fragments, and those in turn may result in over-representation of identified taxa due to their fragmentation.

Two taxa were chosen for radiocarbon dating. Among wood, one fragment of *Cornus* charcoal was selected, because it represents one of the most frequently found taxa of the Neolithic assemblage. *Cornus* charcoal might have come from a shrub or a small tree, which was not as long-lived as other ubiquitous trees such as oak and elm. This selection may help to avoid the so-called "old-wood problem" (Schiffer 1986; Moskal-Del Hoyo, Kozłowski 2009). A small fragment of the awn of *Stipa* sp. was selected to confirm a presence of this xerothermic plant in the Vth millennium BC in the Great Hungarian Plain, and indirectly to date the ditch. *Cornus* sp. was found in feature 36 and the dating result was 5695 ±35 BP, which after calibration might correspond to a period of 4553–4464 BC (68.2% probability). *Stipa* sp. came from the ditch (feature 63), from its stratigraphic layer 885. The date was 5700 ±40 BP, representing a period between 4583 BC and 4486 BC (68.2% probability). Both dating results show the same chronological horizon.

DISCUSSION

The remains of cultivated plants from Polgár-Bosnyákdomb evidenced a use of emmer wheat and lentil in the first half of the Vth millennium BC. In other contemporaneous sites from the area of Polgár a larger spectrum of crops was documented. In Polgár-Csőszhalom, an important tell settlement of the area and in Polgár-Csőszhalom-dűlő, an adjacent horizontal settlement, among cereal remains einkorn wheat *Triticum monoccocum*, broad wheat *T. aestivum* and spelt wheat *T. spelta* were also documented. The remains of hulled and naked barley *Hordeum vulgare* were the most numerous. Also, other cereal species like common millet *Panicum miliaceum* and rye *Secale cereale* were found within features dated to the Late Neolithic. Leguminous plants were represented by lentil, pea *Pisum sativum* and sporadically found grass pea *Lathyrus sativus* (Fairbairn 1992, 1993; Gyulai 2013). All of these species were also documented in the archaeological site at Polgár-Ferenci-hát dated to the Middle Neolithic (the second half of the VIth millennium BC) (Gyulai 2013). Emmer wheat, barley and lentil appeared at the Middle Neolithic site of Polgár-Piócási-dűlő (Nagy et al. 2014). However, taking into a consideration the history of cultivated plants in Europe (Zohary et al. 2012), a chronological verification of some of the species most typical for younger periods, like common millet, spelt and rye, should be done by a radiocarbon analysis. However, rye probably belonged to weeds in the Neolithic, according to Behre (1992).

The limited spectrum of crops in Polgár-Bosnyákdomb may be probably related to the recovery method as only sediments of the ditch system were sampled for the flotation. Nevertheless, given the volume of sediment that was floated, the number of specimens found is not very high. The filling of the ditch likely represented cultural layers as macroscopic plant remains were associated with fragments of pottery and chipped stones, uncharred animal bones and mollusc remnants. The radiocarbon datings of different materials of human, animal and plant origin, including remains of *Stipa* sp., from the southern part of the ditch (63) showed similar results. This may indicate that the ditch was covered with sediments coming from one occupation layer, representing one chronological horizon (Raczky, Anders 2016).

Among herbaceous plants, seeds of white goosefoot *Chenopodium* type *album* were the most frequent (Tab. 1). White goosefoot is a ruderal plant, which nowadays typically grows in the floodplain vegetation in the area (Magyari et al. 2012). *Chenopodium* type *album* was also the most common wild herbaceous plants found in the Middle and Late Neolithic sites from the Polgár region (Gyulai 2013). According to Gyulai (2013), its ubiquity in the past could indicate that white goosefoot might have formed part of a former diet, as a cereal replacement. Two other species of *Chenopodium* were also documented: *Ch. hybridum* and *Ch. urbicum*. All of the wild herbaceous plants, with the exception of *Stipa* sp., currently are field (*Fallopia convolvulus, Galium spurium, Bromus* sp.) and ruderal plants (*Melandrium album* and probably *Polygonum mite*, which also occurred in segetal and natural habitats), and may be associated with anthropogenic vegetation (Lityńska-Zając 2005). *Rumex* sp. probably represents typical plants for meadows. The remains of feather grass *Stipa* sp. appeared only in form of awn fragments (Tab. 1). Caryopses of this grass were also documented in Polgár-Csőszhalom tell (Fairbairn 1992, 1993) and Polgár-Csőszhalom-dűlő (Lityńska-Zając unpublished). Different species of this genus present in the Great Hungarian Plain usually grow on dry soils in steppe vegetation. This plant might have been also gathered by people for different purposes (Bieniek 2002; Bieniek, Pokorný 2005).

The reconstruction of former woodland vegetation is possible if based on the charcoal assemblages coming from the domestic fuelwood, thus being the result of long-term firewood collection (Chabal 1988, 1997; Asouti, Austin 2005). Such an assumption can be made when there is a diversity of the taxa. The presence of firewood may be suggested if in the charcoal assemblage remains of branchwood and twigs are found, which is the case of the charcoals from Polgár-Bosnyákdomb (Fig. 2: 1). The charcoals from the ditch could be representative for local forests that were growing in the vicinity of the settlement.

The remains of *Quercus* sp. dominated in all types of archaeological features (Tab. 2, 3). This may indicate that *Quercus* trees were abundant in the area of the settlement. This assemblage is also characterised by a high frequency of *Ulmus* sp. and *Cornus* sp., suggesting their growing in abundance. Fruit trees of the Rosaceae family, such as *Prunus* sp. and Maloideae, as well as *Salix* sp. or *Populus* sp. and ash *Fraxinus* sp. were rather sporadically found, but they grew in local woodland. On the other hand, the quantification of the charcoals coming from the pits and occupation layers can be biased due to hand-collection of the samples. However, similar observations can be made: *Quercus* is ubiquitous, *Ulmus* is the second widespread taxon, while other taxa such as *Cornus* sp., *Salix* sp. or *Populus* sp., *Acer* sp. and Maloideae appeared in different features.

Similar taxonomic composition and the predominance of *Quercus*, followed by *Ulmus* and *Cornus*, in the charcoal assemblages were documented in other archaeological sites from the area of Polgár dated to the Middle (Polgár-Piócási-dűlő and Polgár-

Ferenci-hát) and the Late Neolithic (Polgár-Csőszhalom and Polgár-Csőszhalom-dűlő) periods (Moskal-Del Hoyo 2013; Badal et al. 2016). This may suggest that *Quercus*, *Ulmus* and *Cornus* were growing near the settlement and their wood was available for a firewood collection. Unfortunately, all of these taxa are only identified to the genus level and based on the anatomical characteristic it is not possible to identify their species. In the case of *Quercus*, the great majority of the charcoal fragments belonged to deciduous oak of the subgenus *Quercus,* and only one charcoal represented the subgenus *Cerris* (Schweingruber 1990). In the Great Hungarian Plain, the first group is represented by *Q. robur*, *Q. petraea* and *Q. pubescens*, whereas the second one by *Q. cerris.* Among *Ulmus*, *U. minor* and *U. laevis* currently typically grow in the region. Two species of *Cornus* are present: Cornelian cherry *C. mas* and common dogwood *C. sanguinea* (Doniţa et al. 2003; Bölöni et al. 2008; Molnár et al. 2012). All of these trees and/or shrubs may develop in two main natural vegetation types of the region: oak-dominated wooded steppe and floodplain forest (Molnár et al. 2012). A relatively low number of taxa that are more typical for the riverine vegetation, like *Fraxinus* sp., *Salix* sp. and *Populus* sp., may suggest that wood was mostly collected from loess-mantled areas of wooded steppe and from higher floodplains (Moskal-del Hoyo et al. 2013).

From the area located north of Polgár, two pollen records were analysed. The results revealed the existence of two main vegetation types: *Quercus* wooded steppes on the elevated surfaces and *Quercus*-*Corylus*-*Fraxinus* forests in the seasonally flooded alluvium (Magyari et al. 2010, 2012). The palynological data from the Great Hungarian Plain have showed that during the Atlantic period wooded steppe dominated in this region (Magyari et al. 2010). Such open forest communities are characterized by a broken canopy and this allows a good development of heliophilous trees, such as *Cornus mas* and different species of *Prunus* and Maloideae subfamily, growing in shrub layers or in the forest limits (Doniţa et al. 2003).

CONCLUSIONS

The macroscopic plant remains from Polgár-Bosnyákdomb indicated that different plant communities developed near this settlement during the Middle Neolithic period. The existence of cultivated fields can be evidenced by the presence of emmer wheat and lentil. Also, this might be inferred based on wild plant remains of segetal communities. The crop fields were probably located in the vicinity of the site on fertile soils present in the area. Other remains of wild herbaceous plants showed that close to the settlement ruderal communities and patches of open vegetation were present. The remains of charcoals revealed that wood was gathered from woodlands growing near the settlement, especially from oak forests developed on loess soils, and from floodplain forests of the area of the former branch of the Tisza River. The location of the settlement within the area of diverse habitats, with fertile soils for cultivation and permanent access to water supply, offered excellent environments for different subsistence strategies.

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