

---

## ON THE CHALCOLITHIC PLANT ECONOMY OF THE HÂRȘOVA-TELL SETTLEMENT (ROMANIA): RECENT ARCHAEOBOTANICAL RESULTS

---

ROMAN HOVSEPYAN,  
RAMON BUXÓ CAPDEVILA,  
DRAGOMIR-NICOLAE POPOVICI †

---

### ABSTRACT:

Numerous remains of cultivated plants were recovered from the Boian culture, Gumelnița culture and Cernavoda culture archaeological sediments of Hârșova-Tell, situated on the right bank of Danube River. The archaeological stratigraphy here represents the Copper Age evolution in this region (Boian, Hamangia, Gumelnița and Cernavoda I Cultures, 5<sup>th</sup> - 4<sup>th</sup> millennia BC). The recent archaeobotanical findings are evidence that agriculture was an important direction of the agrarian economy of the local Chalcolithic populations. The charred and in some cases mineralized archaeocarpological material which was recovered and investigated attests to the cultivation of several cereals and pulses: einkorn (*Triticum monococcum*), emmer (*T. dicoccum*), bread wheat (*T. aestivum*), spelt wheat (*T. aestivum* ssp. *spelta*), Timopheev's wheat (*Triticum timopheevii*), naked barley (*Hordeum vulgare* var. *nudum*), lentil (*Lens culinaris*), bitter vetch (*Vicia ervilia*), and common pea (*Pisum sativum*). This assemblage of cultivated cereals and pulses, where hulled wheats, particularly einkorn, and naked barley prevail, is common for the Chalcolithic period of South-Eastern Europe. The abundance of pulses is notable, as the cultivation of pulses drops somewhat in this period in the Near East and the Caucasus. In addition to the cultivation of cereals and pulses, viticulture (or use of wild grape) was practiced. Edible fruits, nuts and seeds (maybe herbs as well?) also were gathered and consumed.

### REZUMAT: DESPRE ECONOMIA VEGETALĂ CALCOLITICĂ ÎN AȘEZAREA DE TIP *TELL* DE LA HÂRȘOVA (ROMÂNIA): REZULTATE ARHEOBOTANICE RECENTE

Numeroase resturi de plante cultivate au fost recuperate din sedimentele arheologice aparținând culturilor Boian, Gumelnița și Cernavodă de la Hârșova-tell, situat pe malul drept al fluviului Dunărea. Stratigrafia arheologică de aici reprezintă evoluția Epocii cuprului din această regiune (culturile Boian, Hamangia, Gumelnița și Cernavodă I, mileniile V - IV BC). Descoperirile arheobotanice recente sunt dovada faptului că agricultura a fost o direcție importantă a economiei agrare a populației calcolitice locale. Materialul arheocarpologic ars și, în unele cazuri, mineralizat, care a fost recuperat și investigat, atestă cultivarea câtorva cereale și leguminoase: alac (*Triticum monococcum*), emmer cultivat (*T. dicoccum*), grâu comun (*T. aestivum*), alac spelt (*T. aestivum* ssp. *spelta*), grâu Timopheev (*Triticum timopheevii*), orz nud (*Hordeum vulgare* var. *nudum*), linte (*Lens culinaris*), mazărice (*Vicia ervilia*) și mazăre comună (*Pisum sativum*). Această asociere de cereale și leguminoase cultivate, în care predomină grâul decorticat, în special alacul, și orzul nud, este comună pentru perioada calcolitică din sud-estul Europei. O abundență constantă a legumelor este notabilă, deoarece cultivarea leguminoaselor scade într-o oarecare măsură, în această perioadă, în Orientul Apropiat și în Caucaz. Pe lângă cultivarea cerealelor și a legumelor, a fost practică viticultura (sau utilizarea strugurilor sălbatici). Fructele, nucile și semințele comestibile (poate și ierburile?), de asemenea, au fost colectate și consumate.

**KEYWORDS:** archaeobotany, Romania, Boian, Gumelnița, Cernavodă, Chalcolithic, einkorn.

**CUVINTE CHEIE:** arheobotanică, România, Boian, Gumelnița, Cernavodă, Calcolitic, alac.

---

## Introduction

The archaeological site of Hârșova-Tell is in the south-eastern part of the Hârșova city, on the right bank of Danube River in SE Romania (N 44°40'53.02", E 27°57'15.50", 12 m a.s.l.). It is the largest tell currently investigated in Romania. The preserved size of the *tell* is ca. 200 x 60 m at its base (Fig. 1, 2). The southern parts of the *tell* were partly destroyed by the river. The rest of the site was affected by the Roman, medieval/Ottoman and modern human activities. Now the site is covered near entirely by buildings and private yards. The archaeological stratigraphy of the site has more than 12 m thickness in its central part. The Copper Age is the most representative period for the human occupation of the site and it consists of the Boian (the first half of the 5<sup>th</sup> millennium B.C.), Gumelnița (the second half of the 5<sup>th</sup> millennium B.C.) and Cernavodă I cultures (beginning of 4<sup>th</sup> millennium B.C.). The surrounding landscape of the site is also strongly affected by human activity; nowadays, the natural vegetation of the riverbank where the site is situated is represented by steppe, where wild grasses (Poaceae) predominate. Meanwhile, the opposite bank, which is somewhat protected from human activity by the river, is covered by riparian forests, where poplar and willow are predominating.

Archaeological excavations at the Hârșova-Tell site started in 1961, conducted by D. Galbenu<sup>1</sup>, and continued to the present day with some interruptions. The first excavations (a test trench in the central part of the *tell*) evinced the existence of archaeological remains attributed to the last three phases of the Boian cultural evolution and two of the three stages of the Gumelnița culture's evolution (Gumelnița A1 and A2). Starting in 1993, the excavation (ca. 400 m<sup>2</sup>) strategy changed (director of excavations was Dr. Dragomir-Nicolae Popovici<sup>2</sup>) to permit a better understanding of the evolution of this exceptional site with a very complicated stratigraphy. It allowed the testing of the informational content of different types of the discovered stratigraphic units (inside or outside dwellings and occupations (marked as US), refuse from different fire contexts, etc.), allowing the elaboration of a specific sampling strategy appropriate for every discipline involved in the multidisciplinary research. The space of the settlement has been organized with buildings of the same dimensions built one after another and having passageways between, which demonstrates the presence of a highly organized community<sup>3</sup>.



Figure 1. Location of Hârșova-Tell on the map of Romania.

<sup>1</sup> Galbenu 1962.

<sup>2</sup> Popovici et al. 1998-2000, 2001, 2014.

<sup>3</sup> Popovici et al. 2001, 2014.

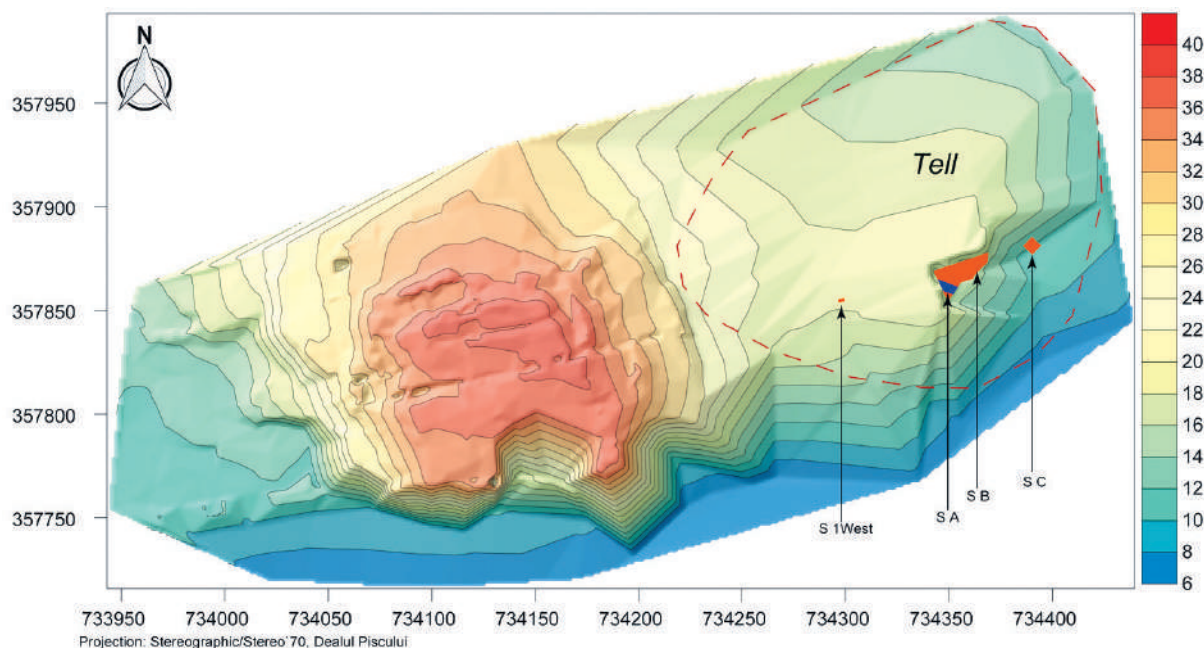


Figure 2. Excavation plan of the archaeological site of Hârșova-Tell (by Mihai Florea).

Starting from 2013, a small surface excavation (ca. 60 m<sup>2</sup>) was conducted in the central-eastern part of the *tell* and three test trenches were dedicated to the Boian occupational sequences (ca. 3.4 m in its total stratigraphical extent) in the lower part of the *tell*, which is, as of now, the most complete for the evolution of the Boian culture in that part of Romania (Fig. 2 - SC). Archaeological structures like dwellings, hearths, and waste throwing areas were uncovered and investigated offering important information about the character of the Boian habitation sequences and palaeoeconomy in that area of the tell. Our current study aimed to reveal information about agriculture and plant-gathering practices of the Boian, Gumelnița, and Cernavodă I culture communities of the settlement and thus complete our understanding of these communities' economies.

## Methods

Material from the recent years and some samples remained from the previous excavations were studied. The studies were performed on the plant carpological remains preserved in the archaeological sediments. The Boian, Gumelnița, and Cernavodă I cultural layers of the Hârșova-Tell site were investigated. The plant remains were recovered using standard flotation and wet-sieving techniques, sometimes by the co-application of both methods. Here we would like to mention the importance of the co-application of the flotation and wet-sieving methods, because, for example in the case of bitter vetch (from stratigraphical unit 30045; Fig. 4:19), the seeds were not floating at all, but settled down and were recovered only by the wet-sieving. The identification of the recovered material was done using the corresponding references<sup>4</sup>. During the investigations in the recent years, 1460 units of carpological material were recovered from the Boian culture layers of the site as a result of 19 processed samples with 330 liters of total volume (Tab. 1). Alongside the regular dispersed archaeobotanical material, large hoards of cultivated plants (with thousands of seeds) also recovered from the Gumelnița culture sediments and studied (Tab. 2). Archaeobotanical material from the Cernavodă I culture is the fewest but gives valuable information about this occupational phase of the site (Tab. 3).

<sup>4</sup> Zohary et al. 2012; Jacomet 2006.

Table 1. Archaeocarpological material from the Boian culture layers of Hârșova-Tell (excavations of 2013 and 2016, Zone SC/pP, Sector 20).

Stratigraphical unit (US)			20170	20246	20247	20646	20863	
Habitation Structure (SL)				-		109	-	
Complex (C)				2065		-	-	
Sediments volume (liter)			333.0	92.5	188.0	46.0	3.0	
Concentration of all carpological material (unit/liter)			4.4	2.7	2.5	3.6	5.7	
Concentration of cultivated plants' carpological material (unit/liter)			4.3	2.6	2.4	3.5	4.7	
Plant taxon	Organ	Preservation	1476	253	471	166	572	17
Triticeae gen. spp.	grains fragm.	charred	392	98	156	82	49	7
Triticeae gen. spp.	internodes	-	1	-	1	-	-	-
Wheat-Barley proportion		(everything)	84.8%	26.2%	87.0%	76.0%	100%	14.3%
		(only grains)	82.3%	24.4%	77.0%	64.7%	100%	16.7%
cf. <i>Triticum</i> spp.	grains	charred	21	4	15	2	-	-
<i>Triticum</i> spp.	-	-	90	13	61	11	5	-
<i>Triticum aestivum/turgidum</i>	-	-	1	-	-	-	1	-
<i>Triticum</i> cf. <i>aestivum</i> ssp. <i>spelta</i>	-	-	3	1	2	-	-	-
<i>Triticum aestivum</i> ssp. <i>spelta</i>	-	-	2	-	-	2	-	-
<i>Triticum</i> cf. <i>dicoccum</i>	-	-	67	2	9	1	55	-
<i>Triticum dicoccum</i>	-	-	100	2	4	-	94	-
<i>Triticum monococcum/ dicoccum/ timopheevii</i>	-	-	241	3	18	11	209	-
<i>Triticum timopheevii/dicoccum</i>	-	-	22	-	2	-	20	-
<i>Triticum monococcum/timopheevii</i>	-	-	70	2	13	3	52	-
<i>Triticum monococcum</i>	-	-	32	2	-	2	27	1
<i>Triticum</i> cf. <i>timopheevii</i>	-	-	26	1	-	1	24	-
<i>Triticum timopheevii</i>	-	-	25	-	-	-	25	-
<i>Triticum</i> cf. <i>dicoccum</i>	spikelet bases	charred	9	-	7	2	-	-
<i>Triticum dicoccum</i>	-	-	2	-	1	1	-	-
<i>Triticum monococcum/ timopheevii/ dicoccum</i>	-	-	49	3	34	12	-	-
<i>Triticum timopheevii/dicoccum</i>	-	-	2	-	2	-	-	-
<i>Triticum monococcum/timopheevii</i>	-	-	28	-	25	3	-	-
<i>Triticum</i> cf. <i>monococcum</i>	-	-	8	-	8	-	-	-
<i>Triticum monococcum</i>	-	-	23	-	19	3	1	-
<i>Triticum</i> cf. <i>timopheevii</i>	-	-	15	-	12	3	-	-
<i>Triticum timopheevii*</i>	-	-	15	-	15	-	-	-
Barley-Wheat proportion		(only grains)	17.7%	75.6%	23.0%	35.3%	0%	83.3%
cf. <i>Hordeum vulgare</i>	grains	charred	40	17	16	6	-	1
<i>Hordeum vulgare*</i>	-	-	84	52	20	12	-	-
<i>Hordeum vulgare</i> cf. var. <i>nudum</i>	-	-	6	6	-	-	-	-
<i>Hordeum vulgare</i> var. <i>nudum*</i>	-	-	9	8	1	-	-	2
	triplet middle grains	-	10	10	-	-	-	-
<i>Hordeum vulgare</i> ssp. <i>vulgare</i> convar. <i>coeleste*</i>	triplet right grains	-	2	-	-	-	-	2
<i>Hordeum vulgare</i>	internodes	-	1	-	-	-	-	1
Pulses-Cereals proportion		(only seeds & grains)	2.4%	7.3%	2.6%	2.9%	0%	0%
Fabaceae: <i>Viciae</i> gen. sp. (cult.)	seeds	charred	9	2	5	2	-	-
<i>Viciae</i> : cf. <i>Pisum</i> sp.	-	-	7	5	1	1	-	-
<i>Pisum sativum</i>	-	-	1	1	-	-	-	-
<i>Viciae</i> : cf. <i>Vicia</i> sp.	-	-	2	2	-	-	-	-
<i>Viciae</i> : cf. <i>Vicia ervilia*</i>	-	-	5	3	2	-	-	-
<i>Viciae</i> : cf. <i>Lens</i> sp.	-	-	3	2	1	-	-	-
<i>Lens culinaris*</i>	-	-	4	3	-	1	-	-
Wild edible fruits, berries, large seeds			0.5%	1.2%	0.9%	0.7%	0%	0%
<i>Trapa natans*</i>	nut fragments	charred	6	3	2	1	-	-
<i>Cornus mas*</i>	nutstones	charred	1	-	1	-	-	-
Weeds and wild herbs			3.2%	3.2%	5.2%	2.8%	1.8%	17.6%
<i>Buglossoides arvensis</i> (= <i>Lithospermum arvense</i> )	nutlet	biomineralized	1	-	-	-	-	1
<i>Lithospermum purpureoaceruleum*</i>	nutlet	biomineralized	1	1	-	-	-	-
<i>Hordeum</i> sp. (wild/weed)*	grains	charred	2	1	-	-	1	-
<i>Asperugo procumbens*</i>	erems	biomineralized	1	-	-	-	1	-
cf. <i>Lamiaceae</i> gen. sp.*	nutlets	biomineralized	1	-	-	-	1	-
cf. <i>Cyperaceae</i> gen. sp.*	nutlets	charred	3	1	2	-	-	-
<i>Amaranthaceae/Chenopodiaceae</i> gen.spp.	seeds	charred	2	-	-	-	2	-
cf. <i>Chenopodium</i> sp.	seeds	mineralized	1	-	1	-	-	-
		charred	2	-	2	-	-	-
<i>Chenopodium</i> sp. *		charred	6	-	5	1	-	-
Unidentified species	seeds	charred	23	5	8	3	5	2

Notes: Sediment samples from US 20170 and US 20247 were taken from ash lenses. Seed material present in ash lenses of US 20247 apparently spread also into overlying US 20246.

\* - New for the Boian culture of Hârșova-Tell.

Table 2. Archaeocarpological material from the Gumelnița culture sediments of Hârșova -Tell.

Grouped under contexts →			Domestic waste	Destruction deposits	Occupational deposits	Post holes	Oven	Pit-fireplace	Other
Stratigraphical unit (US) →			1296, 1316, 1450, 2423, 2462, 2545, 2669, 2704, 2772, 2773, 3520, 3546, 3547, 4013	1196, 3653, 3656, 3706	1520+1521, 1523, 3676, 3750, 4162	1361, 1369, 1371, 1375, 1411, 1420, 1434, 1477, 2077, 2079, 2356, 2367, 2373, 2389, 2401, 2667, 2670	1156	1319	1008, 2422, 2698, 2497, 4109, 9329, 11953, 9077, 11041, 11062
<b>Sediment volume (liter) →</b>		<b>2033.9</b>	<b>547.0</b>	<b>432.6</b>	<b>616.7</b>	<b>39.3</b>	<b>5</b>	<b>80.5</b>	<b>313</b>
Concentration of carpological material in sediment (unit/liter) →		<i>1.77</i>	<i>0.12</i>	<i>3.30</i>	<i>1.24</i>	<i>0.64</i>	<i>237.40</i>	<i>0.86</i>	<i>0.17</i>
<b>Plant taxa ↓</b>									
<b>Cultivated plants ↓</b>		<b>3592</b>	<b>65</b>	<b>1428</b>	<b>763</b>	<b>25</b>	<b>1187</b>	<b>69</b>	<b>54</b>
	Cereals Pulses proportion →	<b>98.7%</b>	81.0%	99.9%	99.8%	91.7%	98.8%	100%	76.3%
	grains fragm.	<b>10</b>	1	-	-	6	-	-	3
	grains	<b>55.7%</b>	72.0%	87.0%	95.2%	50.0%	4.9%	100%	53.8%
	grains	<b>1</b>	-	-	-	-	-	-	1
	-	<b>15</b>	11	1	2	-	-	-	1
	-	<b>23</b>	17	-	1	2	1	1	1
	-	<b>114</b>	6	2	24	5	3	68	6
	spikelet bases	<b>2</b>	1	-	-	-	1	-	-
	-	<b>2</b>	-	-	-	-	-	-	2
	-	<b>1</b>	-	-	-	-	-	-	1
	-	<b>740</b>	1	449	240	1	47	+	2
	glumes	<b>3</b>	-	-	-	-	3	-	-
	-	<b>755</b>	-	529	224	-	2	-	-
	Barley Wheat proportion	<b>44.3%</b>	28.0%	13.0%	4.8%	50.0%	95.1%	0%	46.2%
	grains fragm.	<b>94</b>	-	94	-	-	-	-	-
	grains	<b>113</b>	14	51	23	8	15	-	2
	rachis segments	<b>1098</b>	-	-	-	-	1098	-	-
	grains	<b>10</b>	-	1	2	-	-	-	7
	-	<b>3</b>	-	-	-	-	-	-	3

Pulses/Cereals proportion		1.3%	19.0%	0.1%	0.2%	8.3%	1.2%	0%	23.7%
<i>Lens sp.</i>	seeds	1	1	-	-	-	-	-	-
<i>Lens culinaris</i>	-	22	5	1	1	2	11	-	2
cf. <i>Pisum sp.</i>	-	1	-	-	-	-	-	-	1
<i>Pisum sativum</i>	-	8	1	-	-	-	3	-	4
<i>Vicia ervilia</i>	-	7	5	-	-	-	-	-	2
<b>Possibly gathered fruits, berries, seeds</b>									
<i>Vitis vinifera</i>	pips, biomineralized	11	-	-	-	-	-	-	11
<i>Celtis sp.</i>	nutstones, biomineralized	2	-	-	-	-	-	-	2
<i>Prunus sp.</i>	nutstones, charred	4	-	-	3	-	-	-	1
<b>Weeds</b>									
<b>Poaceae</b>									
Poaceae gen. spp.		64	-	38	25	-	-	-	1
<i>Avena sp.</i>		2	1	-	1	-	-	-	-
<i>Lolium sp.</i>		2	-	1	-	-	-	-	-
Paniceae gen. sp.		43	-	34	9	-	-	-	-
<i>Setaria sp.</i>		6	-	4	2	-	-	-	-
<i>Setaria viridis</i>		37	-	19	18	-	-	-	-
<b>Fabaceae</b>									
Fabaceae gen. spp.		5	-	-	5	-	-	-	-
<i>Medicago sp.</i>		7	-	2	5	-	-	-	-
<i>Medicago sativa</i>		1	-	1	-	-	-	-	-
<i>Medicago cf. lupulina</i>		4	-	3	1	-	-	-	-
cf. <i>Melilotus sp.</i>		8	-	8	-	-	-	-	-
<i>Melilotus sp.</i>		30	-	12	18	-	-	-	-
<i>Melilotus officinalis/albus</i>		103	-	39	64	-	-	-	-
<i>Melilotus albus</i>		13	-	10	3	-	-	-	-
<i>Melilotus/Trifolium sp.</i>		4	-	-	4	-	-	-	-
<i>Trifolium sp.</i>		7	-	4	3	-	-	-	-
<i>Vicia sp.</i>		1	-	-	1	-	-	-	-

<b>Polygonaceae</b>										
Polygonaceae gen. spp.										
	4	-		3	1	-	-	-	-	-
<i>Polygonum sp.</i>	1	-		1	-	-	-	-	-	-
<i>Polygonum aviculare</i>	3	-		2	1	-	-	-	-	-
<i>Polygonum convolvulus</i>	1	-		-	-	-	-	1	-	-
<i>Polygonum cf. lapathifolium</i>	3	-		3	-	-	-	-	-	-
<i>Polygonum persicaria</i>	1	-		1	-	-	-	-	-	-
<i>Rumex sp.</i>	2	-		2	-	-	-	-	-	-
cf <i>Koenigia sp.</i>	1	-		-	1	-	-	-	-	-
<b>Cyperaceae</b>										
Cyperaceae gen. spp.	4	-		4	-	-	-	-	-	-
<i>Carex sp.</i>	6	-		6	-	-	-	-	-	-
<i>Schoenoplectus cf. tabernaemontani</i>	1	-		1	-	-	-	-	-	-
<b>Chenopodiaceae</b>										
Chenopodiaceae gen. spp.	17	-		12	5	-	-	-	-	-
<i>Chenopodium sp.</i>	2	-		2	-	-	-	-	-	-
<i>Chenopodium album</i>	38	-		12	26	-	-	-	-	-
<i>Chenopodium cf. murale</i>	5	-		1	4	-	-	-	-	-
<i>Atriplex sp.</i>	2	-		1	-	-	-	1	-	-
<b>Malvaceae</b>										
<i>Malva sp.</i>	14	-		11	3	-	-	-	-	-
<b>Caryophyllaceae</b>										
cf. Caryophyllaceae gen. spp.	13	-		13	-	-	-	-	-	-
<i>Saponaria sp.</i>	5	-		5	-	-	-	-	-	-
<b>Lamiaceae</b>										
<i>Ajuga sp.</i>	1	-		-	-	-	-	1	-	-
<i>Teucrium sp.</i>	5	-		4	1	-	-	-	-	-
<b>Asteraceae</b>										
Cichorioideae gen. sp.	1	-		-	-	-	-	-	-	1
										seeds, mineralized
<b>Rosaceae</b>										
Rosaceae gen. sp.	8	-		2	6	-	-	-	-	-
Unidentified	2	1		-	-	-	1	-	-	-
Unidentifiable	75	-		39	36	-	-	-	-	-

Notes: Remains of cultivated plants are charred.

Table 3. Archaeocarpological material from the Cernavodă I culture layers of Hârșova-Tell.

Stratigraphical units (US)		3501, 3502, 3507, 3510, 3511, 3513, 3516, 3517, 3518, 3551	1709/1740, 3500, 3508	3533, 3535	3543	3503	
Context		<b>Total</b>	domestic waste	destruction layer	fireplace	pit fill	post hole
Volume of proceeded sediments (liter)		<b>1157.9</b>	378.2	56.7	16.0	705.0	2.0
Concentration of carpological material in sediments (unit/liter)	All plants	<b>0.19</b>	0.34	0.25	0.25	0.09	2.00
	Cultivated plants	<b>0.17</b>	0.32	0.25	0.13	0.09	2.00
Triticeae gen. sp.	grains fragments	<b>7</b>	6	-	1	-	-
<i>Hordeum vulgare</i>	grains	<b>27</b>	10	-	-	17	-
<i>Triticum aestivum/durum</i>	grains	<b>122</b>	90	3	-	26	3
<i>Triticum dicoccum</i>	grains	<b>10</b>	5	2	-	3	-
	spikelet base	<b>1</b>	-	1	-	-	-
<i>Triticum monococcum</i>	grains	<b>20</b>	8	5	1	5	1
	spikelet bases	<b>3</b>	-	3	-	-	-
<i>Lens culinaris</i>	seeds	<b>10</b>	1	-	-	9	-
Paniceae gen. spp. (wild)	grains	<b>6</b>	3	-	1	2	-
Unidentified	-	<b>3</b>	2	-	-	1	-

## Results

The majority of the archaeocarpological findings from the processed sediments coming from all the above-mentioned three cultures belonged to cultivated plants (Tab. 1-4).

### *The Boian culture archaeobotanical findings*

The following cultivated plants were recorded from the Boian culture sediments (listed according to the number of findings): einkorn (*Triticum monococcum*, Fig. 4: 1-6), emmer (*Triticum dicoccum*, Fig. 4: 7-12), naked barley (*Hordeum vulgare* var. *nudum*, Fig. 4: 14-18), spelt wheat (*Triticum aestivum* ssp. *spelta*, Fig. 4: 13), lentil (*Lens culinaris*, Fig. 4: 21), bitter vetch (*Vicia ervilia*; Fig. 4: 19) and pea (*Pisum sativum*, Fig. 4: 20). Along with the regular einkorn (*Triticum monococcum*), Timopheev's wheat (*Triticum timopheevii*) is present as well (Fig. 4:4). There are also poorly preserved specimens and specimens with intermediate morphological and anatomical features, the taxonomical attribution of which it was not possible to identify up to a certain taxonomic level; those remains are comparably large and in all probability belong to the above-mentioned cultivated plants (Triticeae gen. spp., Viciae gen. sp., etc; Tab. 1). Remarkably, all comparably well-preserved and identifiable wheat (*Triticum*) groups recovered belong to hulled varieties. On the contrary, there are no results attesting to the presence of hulled varieties of barley in the studied sediments, while naked grains are numerous. Such a situation is not unusual as einkorn is one of the most frequent cultigens of Neolithic-Chalcolithic Europe<sup>5</sup>. The proportions of wheat and barley are 85.2% to 14.8% in the studied Boian culture sediments, and, if future findings will not change these proportions, it may attest to the secondary role of barley for the Boian population of Hârșova. It worth mentioning, that the proportions of the cereals do vary from sample to sample quite intensely. The barley grains were completely absent in some samples, while in others the wheat grains are absent or the proportions are very polarized. This is indirect evidence that these cereals were cultivated separately by the Boian culture communities of Hârșova.

The essential part of the cereal grains (more than 550) recovered from the Boian cultural sediments of the Hârșova-Tell settlement comes from the surface of a clay floor of a secondary structure built next to a dwelling (US 20646, SL 109; sector 20 of zone SC/PP; Tab. 1, Fig. 2). The grains were concentrated in the southwestern corner of the room (squares D3 and C3D3; e.g. Fig. 4: 1-4, 7-12). Both grains and other remains of the spikelets were recovered. Many of the recovered emmer grains were still attached in the way as they were in the spikelets. These

<sup>5</sup> Zohary et al. 2012.



attest that unprocessed yield was stored and maybe also processed in this structure. The floor (US 20646) from where the grains were found was the last floor of this structure, after which the dwelling was destroyed by fire<sup>6</sup>.

The other three locations investigated (US 20246, US 20170 and US 20247) were ashy lenses in one complex, which represents a domestic waste area between dwellings. This complex indicates domestic activities with a lot of charcoal, bones, shells, fragments of ceramics, etc. US 20170 and US 20247 were situated at the same level, but without connection and US 20246 was formed after these two (stratigraphically it is a later formation; Fig. 2 - SB).

The recovered cultivated pulses quantitatively predominate over the cereals (the average value is 2.1%), but in some samples their quantity is critical (20% and more; Tab. 1).

Wild and weedy plant taxa recorded for the Boian culture layers of Hârşova-Tell include water caltrop (*Trapa natans*; Fig. 4: 11), cornelian cherry (*Cornus mas*; Fig. 4: 10), purple gromwell (*Lithospermum purpurocaeruleum*; Fig. 4: 12), a wild species of barley (*Hordeum* sp.), madwort (*Asperugo procumbens*), species of Lamiaceae family and Cyperaceae family (probably *Scirpus* type), goosefoots (*Chenopodium* sp.) (Tab. 1). It was not possible to identify even the family attribution of the recovered seeds in some cases, because of their poor preservation (Tab. 1).

The fragmented and charred nuts of *Trapa natans* and the nutstones of *Cornus mas* found at the site may suggest that these plants were utilized: the seeds of *Trapa* enclosed in the nuts and flesh (the exocarp and mesocarp) of the *Cornus* fruits are edible. A biomineralized nutlet (erem) of *Lithospermum purpurocaeruleum* found within the site is not complete, but, even in that state, it is visible that the apex and the bottom of the nutlet were trimmed to prepare a bead (Fig. 4: 12). Findings of *Lithospermum* nutlets in this processed state are not new: it is already known that nutlets of *Lithospermum purpurocaeruleum* have been used for the preparation of beads in the prehistoric times of Romania (Cucuteni and Gumelniţa cultures)<sup>7</sup>. The other wild plants recorded are common weeds (*Hordeum* sp., *Asperugo procumbens*, cf. Lamiaceae, *Chenopodium* sp.) or hydrophile plants, which attest to the presence of wetlands (cf. Cyperaceae gen. sp., as well as the *Trapa*). In general, the quantities of wild/weedy plants are low and the dataset consists more generally of cultivated plants.

### The Gumelniţa culture archaeobotanical findings

The assemblage of cultivated plants recorded for the Gumelniţa cultural contexts of Hârşova-Tell generally repeats that associated with the Boian culture (Tab. 1, 2). The few observed differences are probably incidental and caused by the differences in the sampling and/or volumes of the processed sediments. The proportion values of pulses (the same taxa recorded for both cultures) in cultivated plants, i.e. cereals and pulses, is between 1-2% for both, the Boian and Gumelniţa cultures materials (Tab. 1, 2, 4). The proportion of wheat and barley is almost equal for the studied Gumelniţa culture material (55.7% and 44.3%, Tab. 2, 4). Few hulled barley grains present here, while they are not recorded yet for the Boian culture layers. As in the case of the Boian culture samples, the einkorn prevails in the Gumelniţa culture material, too. Other plants identified include edible fruits (*Prunus*, *Vitis* and *Celtis*) and wild and weedy plants (species of *Ajuga*, *Avena*, *Setaria*, *Lolium*, Paniceae tribe and other Poaceae, *Atriplex*, *Polygonum*, *Rumex*, *Chenopodium*, species of Rosaceae, *Saponaria*, *Scirpus*, *Carex* and other Cyperaceae, *Teucrium*, *Medicago*, *Melilotus*, *Trifolium*, *Vicia*).

There are some contexts excavated in Hârşova-Tell, where large concentrations of cultivated plants were recovered. For example, in sequencing stratigraphic units 30034 and 30036 of Test trench 1 W (excavated in 2014; Fig. 2 – S1 West, Fig. 5, Fig. 3a) several ten thousands grains of charred naked barley (*Hordeum vulgare* var. *nudum*) were uncovered on the floor of dwelling no. 302. These two stratigraphical units represent lenses with grains in massive quantities, which were situated on the same floor very close next to each other (~10 cm), but without a visible relation on the stratigraphic profile. They probably are from the same hoard. Meanwhile, nothing was recovered from the sediments of the overlying (US 30003, 30009, 30012, 30023, 30024) and the underlying stratigraphic units (US 30047), which supports the supposition that the above-mentioned barley accumulations come from one archaeological context and represents a single event (Fig. 3). The bulk of these barley grains in both samples (US 30034 and US30036), which were less distorted from charring, are triplet middle grains, attesting that the hoard mostly or perhaps entirely comes from two-rowed naked barley (Fig. 4: 14, 16, 18). Interestingly, stratigraphical units US 30009, 30012, 30023, 30024, which were situated over this barley hoard, belong to one hearth structure (an oven; C 3002; US 30003 and US 30047 are two different situations, but both represent space between dwellings, common space where people used to throw the domestic waste), but did not contain any carpological material at all but charcoal (Fig. 3b). This is good evidence that the oven was not used to prepare vegetal food when the above-mentioned layers were formed. It may have been used to prepare only animal food during that period, or to heat the dwelling or for other unidentified purposes.

In the same manner, a concentration of bitter vetch (*Vicia ervilia*) seeds (around 3460 seeds counted) was recovered from a floor (US 30045) of a non-burnt dwelling (SL 304, Test trench 1 W excavated in 2014; Fig. 2 – S1 West, Fig.

<sup>6</sup> Popovici 2010.

<sup>7</sup> Cârciumar 1996; Marinescu-Bîlcu, Cârciumar 1992.

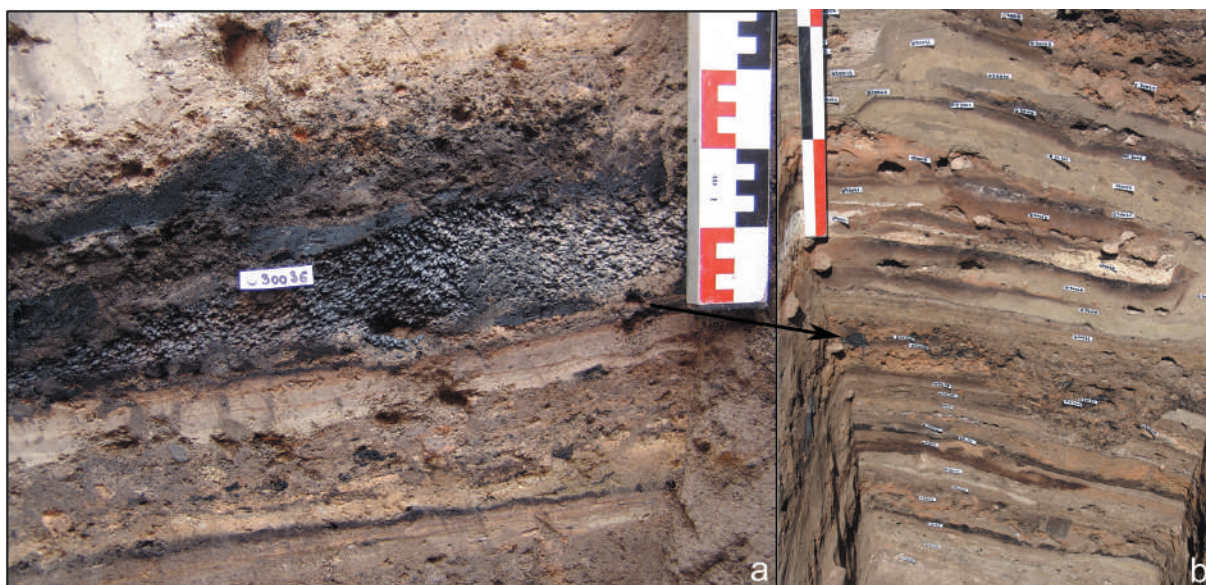


Figure 3. Hoard of charred barley grains in dwelling N302 of Hârșova-Tell and its stratigraphical position on the east profile of test trench I West (excavation of 2014; by D.-N. Popovici).

3b, Fig. 4: 19). Another little hoard of pulses, though more poorly preserved and comprising more than 100 charred seeds probably from pea (cf. *Pisum* sp.), was uncovered from a destruction layer of a burnt building (square D5 of stratigraphic unit 9329 in SL 19 of Sector 7 Zone SB, exc. of 2002; Fig. 2 - SB). The examination of the content of vessel N2 (assemblage 3) from the same layer revealed thousands of charred grains of emmer. Possibly these seeds were put in the fire intentionally as an offering. Another large concentration of cultivated plants' remnants was recorded for oven US 1156 (Tab. 2): 92% of 1,188 findings from this oven were barley triplet bases that with other remnants of the threshing waste were probably used as fuel.

Sometimes accumulations of weeds, presumably collected by insects, also can be encountered at excavations, e.g. the concentration of more than one thousand biomineralized nutlets of field gromwell (*Buglossoides arvensis*; location of findings: L12 (d), □K4, SB, exc. in 1991; Fig. 2 - SB).

### *The Cernavodă I culture archaeobotanical findings*

Mostly remains of cultivated plants were found from the samples belonging to the Cernavodă I culture. They repeat the taxa recorded for the Boian and Gumelnița cultures (from the most common to less): naked wheat (*Triticum aestivum/ durum*), barley (*Hordeum vulgare*), einkorn (*Triticum monococcum*), emmer (*T. dicoccum*), and lentil (*Lens culinaris*). In addition, some seeds of plants from the Paniceae subfamily were recovered (probably wild species; Tab. 3).

### **Discussion**

There are similar findings from the previous archaeobotanical investigations of Hârșova-Tell. The first archaeobotanical investigations at the settlement of Hârșova-Tell were carried out by Marin Cârțumaru, who studied the Boian culture material from archaeological campaigns in 1961 and 1988, and the Cernavodă I culture material from the campaign of 1986. The following cultivated plants were identified by him for the Boian culture: *Triticum monococcum*, *T. dicoccum*, *T. aestivum* ssp. *spelta*, *T. cf. aestivum*, *Pisum sativum*; and for the Cernavodă I culture: *Quercus* sp.<sup>8</sup>

Felicia Monah worked on archaeobotanical materials from the excavations of 1998 and the earlier years (but after 1995)<sup>9</sup> as well as on some samples from the excavations of 2000<sup>10</sup>. The following taxa of cultivated plants were recorded by her for the Gumelnița culture (Complex 521): *Triticum aestivum*, *T. monococcum*, *T. dicoccum*, *Hordeum vulgare*, *Secale cereale*, *Vicia ervilia*, *Lens culinaris*, *Pisum sativum*, *Vicia* sp., *Vitis vinifera*, plus some wild plants: *Vitis sylvestris*, *Trapa natans*, *Chenopodium album*, *Sambucus nigra*, *Echium* sp., *Crambe tatarica*.<sup>11</sup>

<sup>8</sup> Cârțumaru 1996.

<sup>9</sup> Monah 2000.

<sup>10</sup> Monah 2007a.

<sup>11</sup> Monah 2000.



Figure 4. Archaeobotanical findings from the Boian culture and Gumelnița culture contexts of the Hârșova-Tell archaeological site (by R. Hovsepyan). 1-4 – charred grains of einkorn, 2-3 – single grained einkorn (*Triticum monococcum*), 4 – Timopheev’s wheat (*Triticum timopheevii*), 5 – spikelet base of einkorn, 6 – spikelet base of Timopheev’s wheat, 7-12 – charred grains of emmer (*Triticum dicoccum*), 8-10 – grains from the same spikelets, which stayed attached after glumes of spikelets were gone, 13 – charred grain of spelta wheat (*Triticum aestivum* ssp. *spelta*), 14-18 – charred grains of naked barley (*Hordeum vulgare* var. *nudum*), 19 – charred seeds of bitter vetch (*Vicia ervilia*), 20 – charred seed of common pea (*Pisum sativum*), 21 – charred seed of lentil (*Lens culinaris*), 22 – charred part of water caltrop (*Trapa natans*) nut, 23 – charred nutstone of cornelian cherry (*Cornus mas*), 24 – biomineralized nutlet of *Lithospermum purpureocaeruleum* graven on the top and in the bottom to make a bead. Cultural belonging: 1-13, 15, 17, 20-24 – Boian (exc. 2013), 14, 16, 18-19 – Gumelnița (exc. 2014) (Location of specimens: 1-4 – SC/pP, St. 20, US 20646, SL 109, D3; 5-6 – SC pP, St. 20, US 20246, C 2065, B3; 7-12 – SC/pP, St. 20, US 20646, SL 109, C3-D3; 13 – SC/pP, St. 20, US 20247, C 2065, C1; 14, 16, 18 – S 1 V, US 30036; 15, 17, 20-22, 24 – SC/pP, St. 20, US 20170, C 2065, D1; 19 – S 1 V, US 30045; 23 – SC/pP, St. 20, US 20246, C 2065, A1).



Figure 5. Charred grain mass of naked barley (*Hordeum vulgare* var. *nudum*) from the Hârșova-Tell settlement (Gumelnița culture; exc. 2014, S 1 V, US 30036; by R. Hovsepyan).

Although none of the cultivated plants, wild plants, or weeds recently recovered in Hârșova-Tell are new for the Chalcolithic or Neolithic period of Romania<sup>12</sup>, there are some new records of cultivated plants for the Boian cultural occupation of this settlement: naked barley (*Hordeum vulgare* var. *nudum*), bitter vetch (*Vicia ervilia*), lentil (*Lens culinaris*) and Timopheev's wheat (*Triticum timopheevii*) (see Table 1 for the details, the new records are marked with “\*”). The hackberry (*Celtis* sp.) and an essential part of the weedy species are new records for the Gumelnița cultural occupations of the Hârșova-Tell settlement (Tab. 2, the new records are marked with “\*”).

The proportions of the major food and economic groups of our findings are presented in Tab. 4. Although these values do not mandatorily express the exact situation for all investigated communities for every moment of their lives, they may give some preliminary images for their agriculture and vegetal food. No samples with large concentrations of a single plant species, such as grain hoards and threshing waste, were involved in the calculations of Tab. 4. The almost total predominance of a single species crop in the recovered seed hoards may serve an indication that the crop had been harvested carefully avoiding weeds and/or it had been cleaned (e.g. sieved) after the harvest.

Apparently, cultivated cereals had primary importance as a vegetal food and in the agriculture at the settlement; the portions of the cereals are between 95-99% for all three cultures, and the pulses are consequently less than 5%. The proportions of the cultivated cereals, wheats and barley, are very similar for all the investigated cultures, ca. wheat 85-89% and barley 11-15%. The portions of the edible fruits and seeds gathered from the wild are less than 1% for the Boian and Gumelnița culture samples (Tab. 4).

The systematic and continuous archaeobotanical investigations of the Hârșova-Tell site enrich our knowledge about the Chalcolithic plant economy, agriculture, vegetal diet and household of the site and thus will contribute to the study of the prehistory of the Romanian plain.

<sup>12</sup> Cărciumaru 1996, 2000; Monah 2000, 2005, 2007b; Schier, Drașovean 2004; etc.

**Table 4.** Proportions of the main food and economic groups of plants according to carpological material recovered from the Hârşova-Tell site and combined by cultural attribution.

Culture		Boian	Gumelniţa*	Cernavodă I
<i>Sediment volume (liter)</i>		573	2,029	1,158
<i>Findings of carpological material (units)</i>		1,475	2,447	209
<i>Concentration of carpological material (units/liter)</i>	<i>All</i>	2.8	1.2	0.2
	<i>Cultivated plants</i>	2.5	0.9	0.2
Cultivated plants / All =		96.1%	75.2%	95.7%
Cereals / Cultivated plants =		98.4%	98.6%	95.0%
Wheat / (Wheat+Barley) =		84.9%	88.6%	85.2%
Barley / (Wheat+Barley) =		15.1%	11.4%	14.8%
Pulses / Cultivated plants =		1.6%	1.4%	5.0%
Gathered** plants / All =		0.4%	0.7%	0%
Weeds / All =		3.5%	24.8%	4.3%

\* - No samples with large concentrations of single plant species are counted in this table (also the concentration of more than one thousand spikelet bases from oven US1156 shown in Tab. 2).

\*\* - Edible fruits and seeds that possibly were gathered for food.

## Conclusions

Populations of the Chalcolithic Boian, Gumelniţa and Cernavodă I cultures at Hârşova have been practicing agriculture mostly based on the cultivation of cereals and partly on pulses. As elsewhere in the Chalcolithic period SE Europe, the main cultivated plants were einkorn, emmer, bread wheat (spelt and free-threshing varieties), Timopheev's wheat, bitter vetch, small-seeded lentil and pea. Possibly viticulture was practiced as well (at least for the Gumelniţa culture). The gathering of edible fruits, berries and nuts (grape, water caltrop, cornelian cherry, hackberry and plum) was one of the ways to supplement the populations' vegetal food for all the above-mentioned cultures.

## Acknowledgements

This study has been done under the framework of the research program IDEI (PN-II-ID-PCE-2011-3-0982): Landscape and human co-evolution patterns in the wetland area of Balta Ialomiţei", Romania and "Programme de coopération archéologique franco-roumain". The authors express their gratitude to the excavating archaeologists I. Cernău and C. Cernea for proper sampling of the studied sediments.

The Cernavodă I sediment samples and a part of the Gumelniţa samples were studied by R. Buxó (excavations of 1993-1995), while the Boian samples and another part of the Gumelniţa samples were studied by R. Hovsepyan (materials from the excavations started from 2008 to the present and some samples from the earlier excavations were processed mostly by R.H. in the archaeological base of Popina Borduşani, and partly by local workers in the archaeological base of Hârşova-Tell).

## REFERENCES

- Cârciumaru 1996 Cârciumaru, M., *Paleoetnobotanica, Studii în preistoria și protoistoria României (Istoria agriculturii din România) [Palaeoethnobotany, Researches in the prehistory and the protohistory of Romania (History of agriculture in Romania)]*, Iași, Helios, 1996.
- Cârciumaru 2000 Cârciumaru, M.. Neolithic palaeoethnobotany of Romania, *Cercetări Arheologice*, 11(2), 2000, 577-581.
- Galbenu 1962 Galbenu, D., Așezarea neolitică de la Hârșova, *Studii și cercetări de istorie veche*, 12(2), 1962, 285-304.
- Jacomet 2006 Jacomet, S., *Identification of cereal remains from archaeological sites*, 2nd ed., Basel: Basel University. (Accessed December 30, 2015) [https://ipna.unibas.ch/archbot/pdf/Cereal\\_Id\\_Manual\\_engl.pdf](https://ipna.unibas.ch/archbot/pdf/Cereal_Id_Manual_engl.pdf), 2006.
- Marinescu-Bîlcu, Cârciumaru 1992 Marinescu-Bîlcu, S., Cârciumaru, M., Colliers de Lithospermum purpureo-coeruleum et de „perles” de cerf dans le contexte Central et Sud-Est Européen, *Prehistoire Europeenne*, 2, 1992, 70-88.
- Monah 2000 Monah, F., Rapport préliminaire sur les macrorestes végétales du Complexe ménagère 521 – le tell néolithique Hârșova (départ. de Constanța), *Cercetări Arheologice*, 11(1), 2000, 66-74.
- Monah 2005 Monah, F., Analiza macroresturilor vegetale din stațiunile calcolitice de la Luncavița și Isaccea, *Arheologia Moldovei*, 28, 2005, 357-362.
- Monah 2007a Monah, F., Nouvelles déterminations archéobotaniques pour la Roumanie, *Arheologia Moldovei*, 30, 2007, 333-342.
- Monah 2007b Monah, F., The spread of cultivated plants in the region between Carpathians and Dniester, 6th/4th millennia BC, in S. Colledge S., Conolly J. (eds.), *The origin and spread of domestic plants in Southwest Asia and Europe*, Walnut Creek, Ca, Left Coast Press, 2007, 111-125.
- Popovici 2010 Popovici, D.N.. Copper Age traditions North of the Danube River. In *The Lost World of Old Europe. The Danube Valley, 5000-3500 BC*: 90-111, New York, P.U.P., 2010.
- Popovici et al. 2000 Popovici, D., Randoin, B., Rialland, Y., Voinea, V., Vlad, F., Bem, C., Haită, G., Les recherches archéologiques du tell de Hârșova (départ. de Constanța), 1997-1998, *Cercetări Arheologice*, 11(1), 2000, 13-124.
- Popovici et al. 2001 Popovici, D., Randoin, B., Rialland, Y., Le tell néolithique et chalcolithique d’Hârșova (Roumanie), in Guilaine J. (ed.), *Communautés villageoises du Proche-Orient à l’Atlantique (8000-2000 avant notre ère)*, Paris, Éditions Errance, 2001, 119–152.
- Popovici et al. 2014 Popovici, D.N., Randoin, B., Cernău, I., Cernea, C., Ilie, A., Haită, C., Bălășescu, A., Radu, V., Mărgărit, M., Nițu, L. and Hovsepian, R., Programul de colaborare româno-francez de la Hârșova-tell, jud. Constanța. Campania 2013. *Cercetări Arheologice* 21, 2014, 25-54.
- Schier, Drașovean 2004 Schier, W., Drașovean, F., Vorbericht über die rumänisch-deutschen Prospektionen und Ausgrabungen in der befestigten Tellsiedlung von Uivar, jud. Timiș, Rumänien (1998-2002), *Praehistorische Zeitschrift*, 79, 2004, 145-230.
- Zohary et al. 2012 Zohary, D., Hopf, M., Weiss, E., *Domestication of Plants in the Old World*, 4<sup>th</sup> edition, New York, Oxford University Press, 2012.

## LISTA ILUSTRAȚIILOR

Figura 1. Localizarea sitului Hârșova-tell pe harta României.

Figura 2. Planul săpăturilor din situl arheologic Hârșova-tell (autor Mihai Florea).

Figura 3. Grupare de resturi de orz carbonizat în locuința SL 302 de la Hârșova-tell și poziția ei stratigrafică pe profilul estic al Sondajului I vest (săpături 2014; autor D.N. Popovici).

Figura 4. Descoperiri arheobotanice din contexte ale culturii Boian și culturii Gumelnița din situl arheologic Hârșova-Tell (autor R. Hovsepyan). 1-4 – grăunțe carbonizate de alac, 2-3 – alac cu un singur bob (*Triticum monococcum*), 4 – grâul lui Timopheev (*Triticum timopheevii*), 5 – bază de spiculețe de alac, 6 – bază de spiculeț de grâu Timofeev, 7-12 – grăunțe carbonizate de emmer (*Triticum dicoccum*), 8-10 – grăunțe din aceleași spiculețe, care rămân atașate după ce glumele de spiculețe au căzut, 13 – grăunțe carbonizate de grâu spelta (*Triticum aestivum* ssp. *spelta*), 14-18 – grăunțe carbonizate de orz nud (*Hordeum vulgare* var. *nudum*), 19 – semințe carbonizate de mazărice (*Vicia ervilia*), 20 – sămânță carbonizată de mazăre comună (*Pisum sativum*), 21 – sămânță carbonizată de linte (*Lens culinaris*), 22 – parte carbonizată din sămânță de colțul-babei de apă (*Trapa natans*), 23 – sămânță carbonizată de corn (*Cornus mas*), 24 – sămânță biomineralizată de *Lithospermum purpurocaeruleum* cioplită în partea de sus și în partea de jos pentru a face o mărgea.

Atribuire culturală: 1-13, 15, 17, 20-24 – Boian (săp. 2013), 14, 16, 18-19 – Gumelnița (săp. 2014). Localizarea eșantioanelor: 1-4 – SC/pP, St. 20, US 20646, SL 109, D3; 5-6 – SC/pP, St. 20, US 20246, C 2065, B3; 7-12 – SC/pP, St. 20, US 20646, SL 109, C3-D3; 13 – SC/pP, St. 20, US 20247, C 2065, C 1; 14, 16, 18 – S I V, US 30036; 15, 17, 20-22, 24 – SC/pP, St. 20, US 20170, C 2065, D 1; 19 – S I V, US 30045; 23 – SC/pP, St. 20, US 20246, C 2065, A 1).

Figura 5. Masă de grăunțe carbonizate de orz nud (*Hordeum vulgare* var. *nudum*) din așezarea Hârșova-tell (cultura Gumelnița; săp. 2014, S I V, US 30036; autor R. Hovsepyan).

Tabelul 1. Materialul arheocarpologic din nivelurile culturii Boian de la Hârșova-tell (campaniile de săpături 2013 și 2016, Zona SC/pP, Sector 20).

Tabelul 2. Materialul arheocarpologic din nivelurile culturii Gumelnița de la Hârșova-tell.

Tabelul 3. Materialul arheocarpologic din nivelurile culturii Cernavodă de la Hârșova-tell.

Tabelul 4. Raportul principalelor grupe de plante utilizate ca hrană și economice, conform materialului carpologic recuperat din situl Hârșova-tell, combinate cu atribuirea culturală.

ROMAN HOVSEPYAN,  
Institute of Archaeology and Ethnography NAS, Yerevan, Armenia,  
roman.hovsepyan@gmail.com

RAMON BUXÓ CAPDEVILA,  
Museu d'Arqueologia de Catalunya – Girona, Spain,  
rbuxo@gencat.cat

DRAGOMIR-NICOLAE POPOVICI †