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10.6 ARHEOBOTANIČNE ANALIZE VZORCEV IZ GROBOV NA PEZDIRČEVI NJIVI V PODZEMLJU, IZKOPAVANJA V LETIH 2017–2022

10.6 ARCHAEOBOTANICAL ANALYSES FROM THE GRAVES AT PEZDIRČEVA NJIVA IN PODZEMELJ, EXCAVATIONS 2017–2022

Tjaša TOLAR

UVOD

V arheobotanično preiskavo smo prejeli 15 vzorcev iz posod iz sedmih grobov in 17 sedimentnih vzorcev, odvzetih iz polnil grobov. Poleg tega smo analizirali še 18 vzorcev oglja iz 13 grobov. Pri nekaterih gre za ostanke lesenih krst, drugi pa so bili izbrani predvsem za radiokarbonsko datiranje posameznih grobnih jam.

Dodatno smo analizirali še 40 vzorcev ostankov nezoglenelega lesa, ki so pripadali sekiram in sulicam iz 27 grobov, ter tri vzorce arheološkega lesa, ki so se ohranili kot sestavni del bronastih fibul. Vsi vzorci nezoglenelega lesa so bili vzorčeni med konserviranjem kovinskih predmetov, pri čemer ostanki lesa niso bili preparirani.

METODE DELA

Arheobotanični makroostanki (semena, plodovi, oglje in les) so bili pridobljeni z metodo mokrega sejanja sedimenta iz arheoloških plasti. Uporabljena so bila sita s premerom por do enega milimetra. Po sejanju so bile frakcije s sit posušene na zraku in v celoti pregledane.

Identifikacija semen oziroma plodov in oglja (*tab. 1*) je potekala v arheobotaničnem laboratoriju Inštituta za arheologijo ZRC SAZU z uporabo stereomikroskopa Leica z do 50-kratno povečavo in svetlobnega mikroskopa Nikon z do 600-kratno povečavo. Uporabljeni so bili lastna referenčna zbirka semen, plodov in oglja ter slikovni določevalni ključi, kot so Schweingruber (1990), Torelli (1991), Anderberg (1994), Cappers et al. (2006) in drugi.

Analiza delno že preperelega arheološkega lesa iz ročajev železnih sulic oziroma sekir in bronastih fibul je

INTRODUCTION

Our archaeobotanical examination included 15 samples from vessel of 7 graves and 17 sediment samples extracted from grave fills. A further 18 charcoal samples from 13 graves were also analysed. Some of these remains came from wooden coffins, while others were chosen predominantly for the purpose of radiocarbon dating individual grave pits.

We also analysed 40 additional samples of uncharred wooden axe and spear shafts from 27 graves and three samples of archaeological wood remains preserved as parts of bronze fibulae. All the samples of uncharred wood were collected in the course of conserving metal artefacts, and were themselves not chemically prepared.

METHODOLOGY

We obtained archaeobotanical macroremains (seeds, fruits, charcoal, wood) through wet sieving sediment from archaeological layers using sieves with mesh sizes down to 1 mm. Afterwards, the sieving fractions were air-dried and fully examined.

Seeds/fruits and charcoal (*Tab. 1*) were identified in the archaeobotanical laboratory of the Institute of Archaeology at the Research Centre of the Slovenian Academy of Sciences and Arts (ZRC SAZU) using a Leica stereomicroscope (up to 50x magnification) and a Nikon light microscope (up to 600x magnification). The specimens were compared using our in-house reference collection of seeds, fruits, and charcoal, as well as using illustrated identification keys like Schweingruber (1990),

Grobovi z AB ostanki v posodah / Graves with AB remains in the vessels	Grobovi z AB ostanki v zasutju grobnih jam / Graves with AB remains in the grave fills
1, 3, 4, 6, 7, 8, 9	28, 45, 49, 56, 58, 64, 71, 76*, 79, 82, 86, 95, 96, 101, 115, 130, 145

* Vzorca iz groba 76 ni mogoče povezati z določenim pokopom (76 ali 76a) / Sample from Grave 76 cannot be linked to a specific burial (76 or 76a).

Tab. 1: Seznam grobov z identificiranimi arheobotaničnimi (AB) ostanki.
Tab. 1: A list of graves with identified archaeobotanical (AB) remains.

Grob / Grave	Število vzorcev oglja / No. of charcoal samples	Ostanki krste / Coffin remains	Radiokarbonski datumi / Radicarbon dates
18a	1	x	
20	1		Poz-136380: 2190 ± 30 BP
21	1		Poz-136297: 2275 ± 30 BP
29	1		Poz-136305: 2800 ± 30 BP
30	1		Poz-136381: 2075 ± 30 BP
35	1		Poz-136382: 2680 ± 30 BP
55	1		Poz-137571: 2225 ± 30 BP
67	5	x	
69	1		
76*	3		Poz-136383: 2520 ± 30 BP
79	1		
84	2	x	
86	1		

* Vzorca iz groba 76 ni mogoče povezati z določenim pokopom (76 ali 76a) / Sample from Grave 76 cannot be linled to a specific burial (76 or 76a)

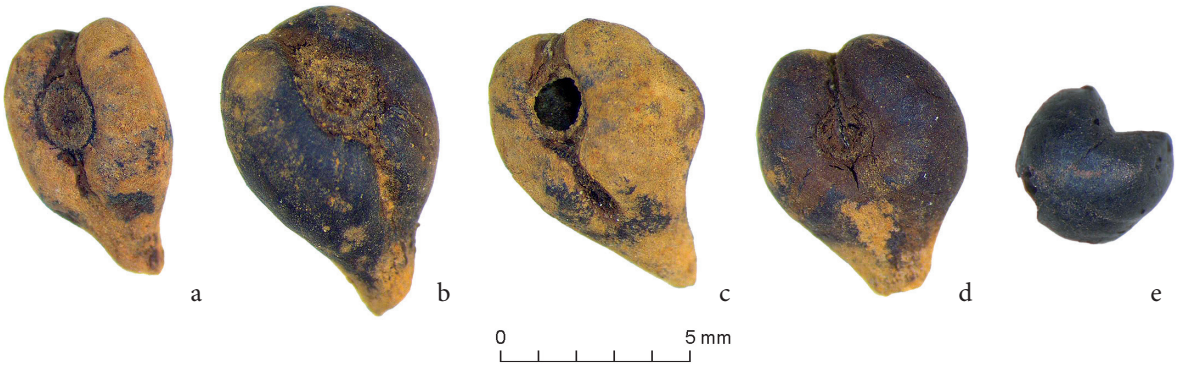
Tab. 2: Seznam grobov z analiziranim ogljem in radiokarbonskimi datacijami. Osenčene so datacije, ki odstopajo od pričakovanih.
Tab. 2: A List of graves with analysed charcoal and radiocarbon datings. The deviating datings are shaded.

bila prav tako izvedena v arheobotaničnem laboratoriju ZRC SAZU, in sicer z uporabo stereomikroskopa Leica z do 50-kratno povečavo ter lastne referenčne zbirke oglja, lesa in lesnoanatomskih preparatov. Pri nekaterih vrstah lesa njihova določitev ni popolnoma zanesljiva (glej *tab. 2*), zato pri identifikaciji navajamo "cf.", kar pomeni primerljivo določeni vrsti.

Ker gre pri vzorcih s Pezdirčeve njive za zelo redke ostanke ohranjenega nezoglenelega arheološkega lesa, je makroskopska identifikacija zaradi delne preperelosti izjemno težavna in pogosto nezanesljiva (npr. Tolar 2017). Zanesljivejša je mikroskopska analiza, za katero je potrebno krhek arheološki les najprej vklopiti v polietilen glikol (PEG) 1500 (prim. Zupančič et al. 2004, 285), nato pa z uporabo drsnega mikrotoma, na primer Leica SM 2000R, z mikrotomskim nožem odrezati rezine lesa debeline 20 mikrometrov v treh anatomskih ravninah: prečni, radialni in tangencialni (npr. Tolar et al. 2008, 51). Tako dobimo lesnoanatomske mikroskopske preparate, ki omogočajo vpogled v lesno strukturo pod večjo povečavo svetlobnega mikroskopa, tj. 400–600-kratno, pri čemer so vidni anatomski elementi, značilni za Torelli (1991), Anderberg (1994), Cappers et al. (2006) and others.

The partially degraded archaeological wood from the shafts of iron spears or axes and parts of bronze fibulae was likewise analysed at the ZRC SAZU archaeobotanical laboratory using the Leica stereomicroscope capable of up to 50x magnification and referenced against our in-house collection of charcoal, wood, and wood-anatomical samples. The less than entirely reliable individual identifications of certain wood species (see *Tab. 2*) are remarked as cf., meaning comparable to the ID species.

Since samples from Pezdirčeva njiva represent extremely rare instances of preserved uncharred wood, a partially degraded substance which is itself extremely problematic to identify macroscopically, their identification is often unreliable (e.g. Tolar 2017). For the more dependable microscopical analysis, the fragile archaeological wood remains would first need to be embedded in polyethylene glycol (PEG) 1500 (cf. Zupančič et al. 2004, 285), after which a sliding microtome blade, such as the Leica SM 2000R, would be used to cut sections of wood measuring 20 µm in the transversal, radial, and tangential



Sl. 1: Podzemelj, Pezdičeva njiva. Polzoglenele do nezoglenele pečke vinske trte iz grobov 1 (a), 9 (b), 45 (c) in 49 (d), ter zoglenelo zrno prosa iz groba 96 (e). (Foto: T. Tolar.)
Fig. 1: Podzemelj, Pezdičeva njiva. Semi- to uncharred grape pips from the Graves 1 (a), 9 (b), 45 (c), 49 (d), and charred millet grain from the Grave 96 (e). (Photo: T. Tolar.)

določeno lesno vrsto. Za analizo najdb s Pezdirčeve njive teh cenovno manj ugodnih in zamudnejših metod nismo uporabili.

REZULTATI

ANALIZA SEMEN OZIROMA PLODOV

Maloštevilna semena oziroma plodovi, ohranjeni v polnilih posod iz grobov, so se ohranili tako v zoglenelem kot tudi nezoglenem in polzoglenelem stanju (*tab. 3, sl. 1*). Nekateri so po videzu sodeč zelo verjetno recentni, torej kontaminirani s površja. Pri teh gre za pretežno ruderalno oziroma plevelno vegetacijo, kot so metlika (*Chenopodium album*), muhvič (*Setaria pumila*), dresen (*Polygonum* sp.) in košarnice (Asteraceae), ter eno seme oziroma plod belega gabra (*Carpinus betulus*). Od ostankov prehranskih rastlin so bili najdeni le polzogleneli pečki vinske trte (*Vitis vinifera*) v dveh grobovih (gr. 1 in 9) in zogleneli odlomek lešnika (*Corylus avellana*) v posodi iz groba 4 (*tab. 3*).

Tudi v vzorcih iz zasutij grobnih jam prevladujejo nezoglenela, po videzu recentna semena oziroma plodovi ruderalnih taksonov, na primer metlike, dresni in slakovca (*Fallopia convolvulus; tab. 3*). Poleg njih je bilo v šestih grobovih (gr. 45, 49, 56, 64, 115 in 130) najdenih tudi osem pečk vinske trte, ki so bile ohranjene v polzoglenelem do nezoglenelem stanju. Po obliki sodeč bi lahko pripadale bodisi gojeni bodisi divji podvrsti (torej *Vitis vinifera* ssp. *vinifera/sylvestris*; *sl. 1:* a–d). V vzorcu iz groba 96 je bilo dodatno najdeno tudi zoglenelo zrno prosa (*Panicum miliaceum*; *sl. 1:* e), kakršno je bilo odkrito že pri naselbinskih izkopavanjih na severnem vrhu Kučarja (Culiberg, Šercelj 1995, 198, tab. 1).

planes (e.g. Tolar et al. 2008, 51). The resulting anatomical wood slides (i.e. thiny sections of wood in all three anatomical planes) would have enabled the examination of the wood structure under the light microscope's greater magnification, i.e. 400–600x, rendering visible anatomical elements that are characteristic for certain wood species. Due to limited financial resources and time these methods were not used in the examination of the artefacts from Pezdirčeva njiva.

RESULTS

SEED/FRUIT ANALYSIS

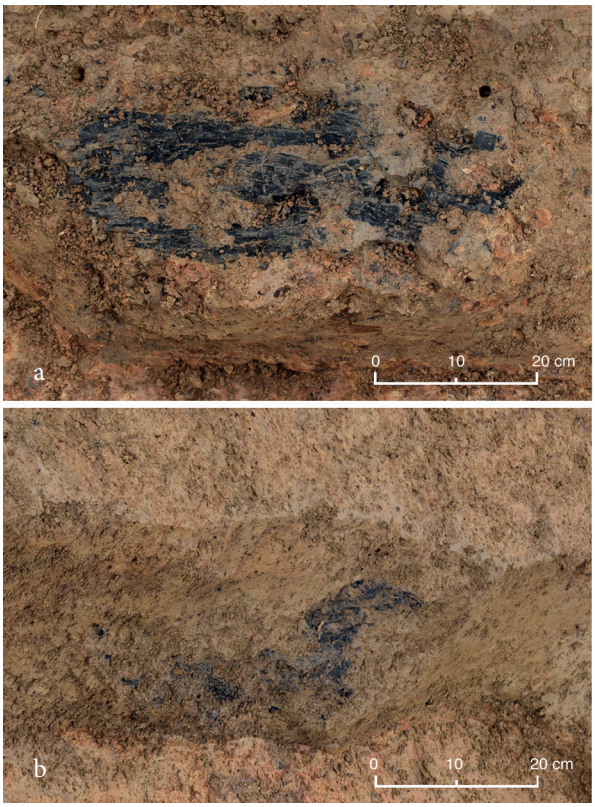
The scarce seeds/fruits remains preserved in the fills of the grave vessels were found either in charred, uncharred, or semi-charred condition (*Tab. 3, Fig. 1*). Going by appearance, some were most probably introduced recently, i.e. contaminants from the surface. These largely comprise ruderal/weedy vegetation, such as lamb's quarters (*Chenopodium album*), yellow foxtail (*Setaria pumila*), knotweed (*Polygonum* species), Asteraceae, and a single seed/fruit of hornbeam (*Carpinus betulus*). The only discovered remnants of edible plants were two semi-charred grape pips (*Vitis vinifera*), which were found in two separate graves (Graves 1 and 9), and a single shell fragment of hazelnut (*Corylus avellana*) from a vessel found in Grave 4 (*Tab. 3*).

The samples from the grave fills were also predominantly uncharred, containing visually seemingly recent seeds/fruits of ruderal taxa, e.g. lamb's quarters, knotweed, and black-bindweed (*Fallopia convolvulus; Tab. 3*). Aside from these, six Graves (gr. 45, 49, 56, 64, 115, 130) also yielded 8 grape pips in semi-charred and uncharred condition. Going by shape, these could have belonged

		Setaria pumila	*Panicum miliaceum*	*Corylus avellana*	*Vitis vinifera*	*Vitis vinifera*	*Vitis vin. cf sylvestris*	*Rubus* sp.	*Chenopodium album*	*Polygonum* sp.	*Fallopia convolvulus*	*Euphorbia* sp.	*Verbena officinalis*	*Silene alba*	*Carpinus betulus*	Asteraceae	drugo/other	NID	NID frg. seme
Grob/ Grave	**SE**	rec.?	C	frg. C	C	NC	NC/C	NC	NC	rec.	NC	rec.?	NC	C	rec.?	rec.?		rec.	C
1	**7**				1												C cop.		
3	**11**														1		CS		ZF
4	**13**			1					1								CS		
6	**17**								2								CS		
7	**19**	1															CS		
8	**21**															1			
9	**23**	1			1					1							CS		
	SV sum	2		1	1				3	1					0	1			
Grob/ Grave	**SE**									1									
45	**100**					1													
49	**108**						1												
56	**121**					1				x									
58	**125**								1	1									
64	**137**					3													
67	**143**												2	1					
71	**151**								1										
76	**231**								3										
79	**167**								1										
82	**175**									1									
86	**187**								3										
95	**193**								1										
96	**208**		1																1
101	**244**										1								
115	**272**					1													
130	**303**					1													
145	**336**																	1	
	SG sum		1			7	1		10	3	1		2	1				1	1

Legenda / Legend: SE – stratigrafska enota / stratigraphic unit; rec.– recentno / recent; C– zoglenelo / carbonised; NC– nezoglenelo / non-carbonised; CS– zoglenela snov / charred substance; C cop.– zoglenel koprolit malega sesalca / charred coprolite small mammal; NID– neidentificiran rastlinski ostanek /not indentified plant remain; ZF– zoglenel fragmentiran koščičast plod / charred fruit kernel frgment; SV sum– vsota ostankov v posodah / sum plant remains in vessel; SG sum– vsota ostankov v grobovih / sum of plant remains in graves

Tab. 3: Identifikacije semen in plodov iz grobov na Pezdirčevi njivi. Zgoraj: vzorci iz posod; spodaj: vzorci iz zasutij grobnih jam.
Tab. 3: Identifications of seeds/fruits from the graves at Pezdirčeva njiva site. Above: samples from the vessels; below: samples from the grave pits.



Sl. 2: Podzemelj, Pezdičeva njiva. Zogleneli ostanki krst v grobovih 67 (a) in 84 (b). (Foto: O. Kovač.)
Fig. 2: Podzemelj, Pezdičeva njiva. Charred coffin remains in the Graves 67 (a) and 84 (b). (Photo: O. Kovač.)

ANALIZA OGLJA IN ZOGLENELIH OSTANKOV LESENIH KRST

Od skupno 18 identifikacij oglja iz izbranih grobov (*tab. 2*) jih polovica (devet) pripada belemu gabru (*Carpinus betulus; tab. 4*), sledita hrast (*Quercus* sp.) s štirimi prepoznanimi primerki in jerebika (*Sorbus* sp.) z dvema. S posamično identifikacijo so bile ugotovljene še tri lesne vrste: breza (*Betula* sp.), jelša oziroma leska (*Alnus/Corylus*) in črni gaber (*Ostrya carpinifolia*).

Posebno pozornost smo namenili izsledkom analiz zoglenelih ostankov lesenih krst iz grobov 67 in 84 (*sl. 2*; *tab. 2*). Ker smo v dveh vzorcih iz groba 84 ugotovili dve različni vrsti oglja (beli gaber in hrast), smo izvedli dodatne analize na večjih kosih oglja iz obloge te grobne jame (*sl. 2*: b). Analiza je pokazala oglje belega gabra, enako kot tudi vseh pet vzorcev oglja iz groba 67 (*tab. 4*). Sklenemo lahko, da sta bili obe krsti, iz grobov 67 in 84, zelo verjetno izdelani iz lesa belega gabra. Ta lesna vrsta je pri analizi ostankov lesa iz prazgodovinske naselbine na Kučarju prepoznana le z enim koščkom med ostanki lesa verjetno za kurjavo, najdenimi v jami 2. Ugotovljeno je bilo, da je bil za gradbeni material pogosteje uporabljen les hrasta (Culiberg, Šercelj 1995, 195, tab. 1), iz katerega bi lahko bil izdelan pokrov krste v grobu 84.

to either cultivated or wild varieties (i.e *Vitis vinifera* ssp. *vinifera/sylvestris*; *Fig. 1:* a–d). The sample from Grave 96 was additionally found to contain a charred millet grain (*Panicum miliaceum*; *Fig. 1:* e), such as those previously discovered during the excavations of the settlement on the northern summit of Kučar (Culiberg, Šercelj 1995, 198, *Tab. 1*).

ANALYSIS OF CHARCOAL AND CHARRED REMAINS OF WOODEN COFFINS

Out of a total of 18 charcoal examinations from selected graves (*Tab. 2*), half were identified as hornbeam (*Carpinus betulus; Tab. 4*), followed in frequency by four identified instances of oak (*Quercus* sp.), and two instances of rowan (*Sorbus* sp.). A single examination yielded a further three species of wood: birch (*Betula* sp.), alder/hazel (*Alnus/Corylus*), and hop-hornbeam (*Ostrya carpinifolia*).

We paid special attention to the analysis results of the charred wooden coffin remains from Graves 67 and 84 (*Fig. 2*; *Tab. 2*). The two different types of charcoal (hornbeam and oak) identified in two samples from Grave 84 prompted additional analyses of the larger segments of charcoal from the lining of the same grave pit (*Fig. 2*: below). Analysis identified the charcoal as that of hornbeam, the same as all five samples from Grave 67 (*Tab. 4*). We may conclude to a high degree of probability that both coffins from Graves 67 and 84 were made from hornbeam wood. Analysis of wood remnants from the prehistoric Kučar settlement only turned up one fragment of this wood species, deposited among residual offcuts found in pit 2, most probably intended for firewood. It was determined that the more common construction wood was oak (Culiberg, Šercelj 1995, 195, Tab. 1), which may have also been used for the lid of the coffin in Grave 84.

ANALYSIS OF THE REMAINS OF WOODEN PARTS OF METAL FINDS

Conservators supplied us with 40 samples of dried disintegrating archaeological wood remains. It was collected during the conservation of 29 spearheads from 26 graves[1] and 12 samples of similarly preserved wood,

[1] Grave 39 (*Pl. 15: 1*), Grave 52 (*Pl. 21: C1*), Grave 54 (*Pl. 23: 1*), Grave 57 (*Pl. 22: D1*), Grave 60 (*Pl. 24: C1*), Grave 61 (*Pl. 25: 1*), Grave 65 (*Pl. 26: D1*), Grave 70 (*Pl. 28: 2*), Grave 71

			Betula sp.	*Alnus glutinosa/ Corylus avellana*	*Carpinus betulus*	cf. *Sorbus* sp.	*Quercus* sp.	cf. *Ostrya carpinifolia*	drugo/other
Grob / Grave	**SE / SU**	**Op. / Note**							
18	**233**	C14; CGr							?B, CS
20	**50**	C14; CGr					1		
21	**52**	C14; CGr				1			
29	**68**	C14	1						
30	**70**	C14		1					
35	**80**	C14			1				
55	**119**	C14; NID							
67	**143**	Co			7				?B
69	**147**	C14						1	
76	**161**	C14; VF			1		1		?B
79	**167**	C14				1			
84	**183**	C14; Co			2		3		
86	**187**	C14; VF			1				
105	**252**	?usnje / leather							CS
137	318	Co; NID							
113	268	?usnje / leather							CS

Legenda / Legend: B – bobovec / "beans" ore; CS – zoglenela snov / charred substance; C14 – datirano / dated; CGr – žgan grob / charred grave; NID – neidentificiran / non identified wood; Co – krsta / coffin; VF – polnilo posode / vessel fill

Tab. 4: Identifikacije oglja iz grobov na Pezdričevi njivi. Za C14 glej *tab. 2*.
Tab. 4: Charcoal identifications in the graves from Pezdirčeva njiva. For C14 see *Tab. 2*.

ANALIZA OSTANKOV LESENIH DELOV KOVINSKIH NAJDB

Od restavratorjev smo prejeli 40 vzorcev posušenega in razpadajočega arheološkega lesa, ki je bil vzorčen med konserviranjem 29 železnih suličnih osti iz 26 grobov[1] in 12 vzorcev podobno ohranjenega lesa, vzorčenega med konserviranjem 11 železnih sekir iz 11 grobov.[2] Pri 13 primerih vzorcev iz sulic in dveh

ANALYSIS OF THE REMAINS OF WOODEN PARTS OF METAL FINDS

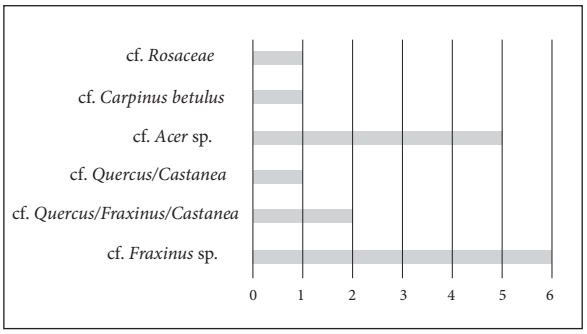
We received 40 samples of dried and decaying archaeological wood from conservators, which had been sampled during the conservation of 29 iron spear blades from 26 graves[1] and 12 samples of similarly preserved wood sampled during the conservation of 11 iron axes from 11 graves[2]. The wood of 13 spear samples and 2 axe samples was too poorly preserved for identification.

Analysis of the remaining samples demonstrated that spear shafts were often made of ash (*Fraxinus* sp.) and maple (*Acer* sp.; *Fig. 3*), and less frequently other species such as oak/chestnut (*Quercus* sp./*Castanea sativa*), hornbeam (*Carpinus betulus*), and members of the

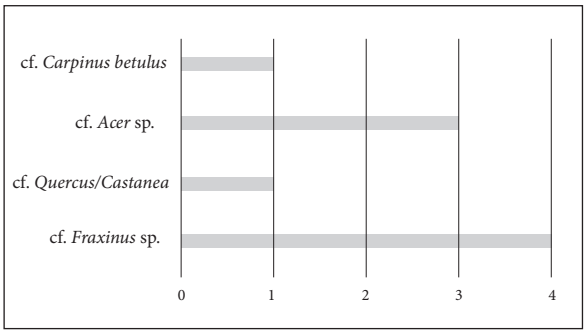
[1] Grob 39 (*t. 15: 1*), grob 52 (*t. 21: C1*), grob 54 (*t. 23: 1*), grob 57 (*t. 22: D1*), grob 60 (*t. 24: C1*), grob 61 (*t. 25: 1*), grob 65 (*t. 26: D1*), grob 70 (*t. 28: 2*), grob 71 (*t. 29: A1*), grob 72 (*t. 29: B1*), grob 74 (*t. 31: 1,2*), grob 75 (*t. 32: 1*), grob 79 (*t. 34: 1*), grob 81 (*t. 36: A1*), grob 83 (*t. 36: B1*), grob 91 (*t. 40: A1*), grob 96 (*t. 43: 1*), grob 97 (*t. 45: 1*), grob 100 (*t. 46: 3,4*), grob 110 (*t. 56: A1*), grob 124b (*t. 62: B4*), grob 146 (*t. 70: C1*), grob 154 (*t. 74: 1,2*), grob 158 (*t. 75: A1*), grob 167 (*t. 78: A1*), grob 172 (*t. 79: B1*) in sporadična najdba (*t. 83: 3*).

[2] Grob 39 (*t. 15: 3*), grob 54 (*t. 23: 2*), grob 61 (*t. 25: 2*), grob 72 (*t. 29: B2*), grob 75 (*t. 32: 3*), grob 83 (*t. 36: B2*), grob

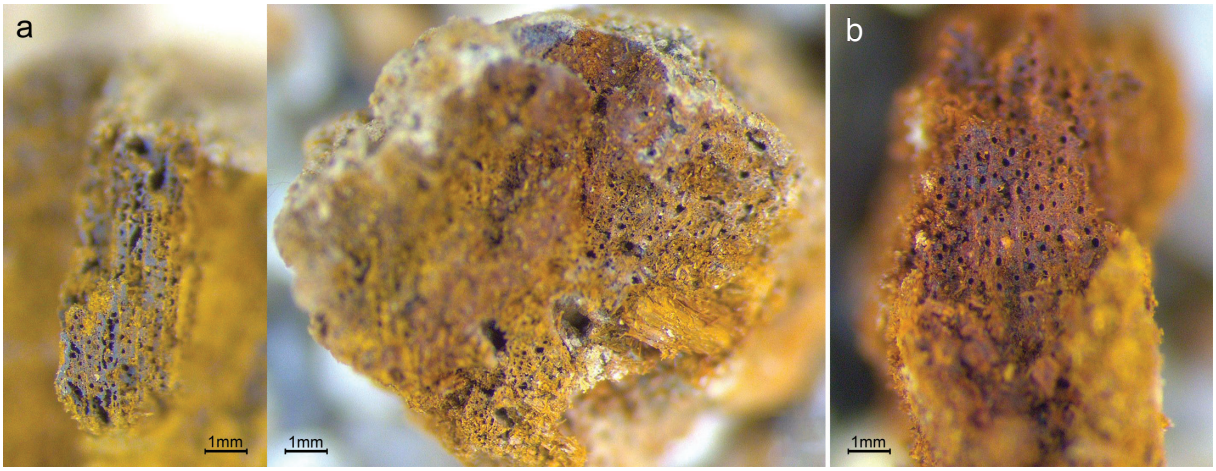
[1] Grave 39 (*Pl. 15: 3*), Grave 54 (*Pl. 23: 2*), Grave 61 (*Pl. 25: 2*), Grave 72 (*Pl. 29: B2*), Grave 75 (*Pl. 32: 3*), Grave 83 (*Pl. 36: B2*), Grave 96 (*Pl. 43: 2*), Grave 97 (*Pl. 45: 2*), Grave 100 (*Pl. 46: 2*), Grave 118 (*Pl. 59: B3*, and Grave 167: (*Pl. 78: A2*).



Sl. 3: Število identificiranih ostankov lesa držajev sulic od skupno 16 sulic iz petnajstih grobov.
Fig. 3: The number of identified spear wood remains out of a total of 16 spears from 15 graves.



Sl. 4: Število identificiranih ostankov lesa držajev sekir od skupno 9 vzorcev lesa iz devetih grobov.
Fig. 4: The number of identified remains of wooden axes from a total of 9 wood samples from 9 graves.



Sl. 5: Podzemelj, Pezdičeva njiva. a) Primer lesa javorja (*Acer* sp.; zgoraj PN 219) in/ali jesena (*Fraxinus* sp.; spodaj PN 237 in 252) iz sulic v grobovih 72, 79, 74 ter b) primer lesa javorja (PN 501) iz sekire v grobu 167. (Foto: T. Tolar.)
Fig. 5: Podzemelj, Pezdičeva njiva. a) Example of maple wood (*Acer* sp.; above PN 219) and/or ash (*Fraxinus* sp.; below PN 237 and 252) from spears in Graves 72, 79, 74 and b) example of maple wood (PN 501) from an axe in Grave 167. (Photo: T. Tolar.)

primerih vzorcev iz sekir je bil les preslabo ohranjen za identifikacijo.

Analize preostalih vzorcev so pokazale, da je bil za nasaditev suličnih osti pogosto uporabljen les jesena (*Fraxinus* sp.) in javorja (*Acer* sp.; *sl. 3*), redkeje pa les drugih vrst, denimo hrasta oziroma kostanja (*Quercus* sp. oziroma *Castanea sativa*) in belega gabra (*Carpinus betulus*) ter rožnic (Rosaceae). Identifikacije niso popolnoma zanesljive zaradi slabe ohranjenosti lesa.

Podobno kot pri sulicah tudi pri sekirah kaže (*sl. 4*), da so bili držaji pogosteje izdelani iz lesa jesena in/ali javorja (*sl. 5*), druge vrste (hrast oziroma kostanj in gaber) so bile uporabljene redkeje.

Pri konserviranju fibul iz grobov 46 in 87b (*t. 19: B1; 38: B2,B3*) so bili v njihovi peresovini odkriti

96 (*t. 43: 2*), grob 97 (*t. 45: 2*), grob 100 (*t. 46: 2*), grob 118 (*t. 59: B3*) in grob 167: (*t. 78: A2*).

rose family (Rosaceae). Due to its poor condition, wood identification is not entirely reliable.

Like spears, axes (*Fig. 4*) also appear to have frequently been fitted to ash and/or maple wood shafts (*Fig. 5*), other species (oak/chestnut, hornbeam) were used less frequently.

The conservation of fibulae from Graves 46 and 87b (*Pl. 19: B1; 38: B2, B3*) also turned up remains of three wooden twigs (*Fig. 6*) showing visible imprints of bronze wire. Analysis of wood anatomy determined that all three twigs were most probably derived from the same deciduous species with diffuse-porous wood, and that the twig from Grave 46 measuring up to 4 mm also came with a preserved pith. One of the specimens from Grave 87b exhibited clearly visible aggregate rays, which are characteristic of hazel (*Corylus avellana*), alder (*Alnus* sp.), and hornbeam. The remnants of the twigs from the

Sl. 6: Podzemelj, Pezdičeva njiva. Lesene vejice iz peresovin fibul v grobovih 46 (zgoraj) in 87b (spodaj). (Foto: D. Valoh.)
Fig. 6: Podzemelj, Pezdičeva njiva. Wooden twigs from feather fibulae in Graves 46 (above) and 87b (below). (Photo: D. Valoh.)

tudi ostanki treh lesenih vejic (*sl. 6*) z vidnimi odtisi bronaste žice. Analiza lesne anatomije je pokazala, da gre v vseh treh primerih za vejico iz najverjetneje iste listopadne drevesne vrste z difuzno poroznim lesom, pri čemer ima vejica iz groba 46 s premerom do štiri milimetre ohranjen tudi stržen. Pri enem od primerkov iz groba 87b so bili lepo vidni tudi agregirani trakovi, ki so značilni za les leske (*Corylus avellana*), jelše (*Alnus* sp.) in belega gabra. Zelo verjetno je, da ostanki vejic iz fibul pripadajo belemu gabru, vendar bi za zanesljivo prepoznavo morali izdelati lesnoanatomski preparat z mikrotomskim nožem (glej Metode dela).

fibulae were most probably made of hornbeam, though a more reliable identification would require anatomical wood slices prepared with a microtome blade (see the Methodology section).

DISCUSSION AND CONCLUSION

After having excluded visibly recent seeds/fruits naturally introduced to the archaeological samples in the upper excavated layers, the only remaining witnesses attesting to the vegetation and diet from the time of the prehistoric cemetery were scarce and charred or semi-charred remains: grape pips, a hazelnut shell shard, and a grain of millet. On one hand, these finds complement the carpological research from the contemporane-

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Če izvzamemo semena oziroma plodove recentnega rastja, ki so v plitvo izkopanih plasteh naravno zašli v arheološke vzorce, o rastlinstvu in prehrani iz obdobja, ko je bilo tu prazgodovinsko grobišče, pričajo le redki zogleneli in polzogleneli ostanki: grozdne pečke, odlomek lešnikove lupinice in zrno prosa. Ti po eni strani dopolnjujejo karpološke raziskave s sočasne naselbine na Kučarju (Culiberg, Šercelj 1995), po drugi pa vsaj nekoliko odstirajo vpogled v tedanje pogrebne rituale. Žal so tudi podatki s sočasnih grobišč na širšem območju zelo skopi. Najdbe semen in plodov so bile izjemno redke tudi na železnodobni nekropoli Most na Soči z več kot 6.000 izkopanimi grobovi, od koder Culibergova (2020, 243) poroča le o nekaj zrnih prosa (*Panicum miliaceum*). Poleg tega je bilo v le enem grobu z najdišča Molnik odkritih 21 zrn ovsa (*Avena sativa*) in en ostanek pleve dvozrne pšenice (*Triticum dicoccum*) (Tolar 2017, 207). Z železnodobne gomile na najdišču Trata – Filc v Škofji Loki so bili v petih vzorcih ugotovljeni trije fragmenti žit (Cerealia), pet zrn prosa, tri zrna boba (*Vicia faba*) in 11 fragmentov zrn stročnic (cf. *Vicia* spp.) (Tolar, Brezigar 2022, neobjavljeno; prim. Brezigar 2023). Z grobišča Park slovenske himne v Kranju smo v le treh grobovih prepoznali nekaj rastlinskih makroostankov: en odlomek najverjetneje boba v grobu 4, dve zrni ječmena (*Hordeum vulgare*) in dva fragmenta žitnih zrn v grobu 9 ter eno zrno rži (*Secale cereale*) v grobu 11 (Tolar 2024). S planega grobišča Lepa ravna pri Habakuku pod Poštelo so bila v polnilu sklede z uvihanim ustjem iz groba 24 najdena tri ječmenova in eno nedoločeno žitno zrno (Tolar, Vinazza 2021, neobjavljeno). Skromni podatki o najdbah semen oziroma plodov v železnodobnih grobovih niso nujno kazalnik, da posmrtno darovanje v obliki hrane pri tukajšnjih železnodobnih skupnostih ni bilo razširjeno, ampak so lahko trenutni rezultati posledica bodisi nezadostnega vzorčenja sedimenta za mokro sejanje in preteklih metod dela (Tolar et al. 2010; prim. Dular, Tecco Hvala 2018, 39) bodisi slabših razmer za ohranitev organskih ostankov v suhih tleh in plitvo pod površjem. Verjetno se rastlinski ostanki v (predvsem skeletnih) grobovih niso ohranili, ker niso prišli v stik z ognjem in torej niso zogleneli. Nedavno so bili namreč objavljeni obetavni prvi rezultati analiz rastlinskih makroostankov s halštatske nekropole z žganimi pokopi Kaptol – Gradca na Hrvaškem, ki kažejo na prevladujočo prisotnost žitnih zrn rodu *Triticum* v grobovih. Poleg teh so v dveh grobovih odkrili še manjše število semen oziroma plodov plevelnih taksonov in ostankov divjih sadežev oziroma oreškov (Šoštarić et al. 2016; 2017). Pogosto skromne najdbe tako s hrvaških kot tudi drugih evropskih železnodobnih grobišč avtorji razlagajo z neugodnim letnim časom in okoljem pokopa oziroma z razpoložljivostjo semen in plodov v naravi, pa tudi z možnostjo oziroma razpoložljivostjo takratnega

ous settlement at Kučar (Culiberg, Šercelj 1995), on the other, they at least partially pull back the curtain on the funerary rites of the time. Unfortunately, data from contemporaneous cemeteries in the wider area is likewise very scarce. Seed and fruit finds were also extremely rare at more than 6000 excavated graves of the Iron-Age Most na Soči necropolis, where Culiberg (2020, 243) reported no more than a few grains of millet (*Panicum miliaceum*). Furthermore, only one of the graves at the Molnik site yielded 21 grains of oat (*Avena sativa*), and a single remnant of emmer wheat (*Triticum dicoccum*) chaff (Tolar 2017, 207). Five samples from the Iron-Age mound at the Trata-Filc site in Škofja Loka listed 3 cereal fragments (*Cerealia*), 5 grains of millet, 3 broad been seeds (*Vicia faba*), and 11 legume grain fragments (cf. *Vicia* spp.) (Tolar, Brezigar 2022, unpub.; e.g. Brezigar 2023). From the cemetery at Park slovenske himne in Kranj, we were only able to identify scarce plant macroremains in three graves: a single fragment of what was probably broad bean in Grave 4, two grains of barley (*Hordeum vulgare*) and two cereal fragments in Grave 9, and a single grain of rye (*Secale cereale*) in Grave 11 (Tolar 2024). The Lepa ravna flat cemetery near Habakuk beneath Poštela turned up 3 barley grains and one undetermined cereal grain in the fill of a bowl with an inturned rim from Grave 24 (Tolar, Vinazza 2021, unpub.). Modest data about seed/fruit finds in Iron-Age graves does not necessarily indicate that posthumous food offerings were not widespread among local Iron-Age communities; present results could simply have arisen from insufficient sampling of sediments, from the shortcomings of past excavation methods (Tolar et al. 2010; cf. Dular, Tecco Hvala 2018, 39), or conditions unfavourable for the preservation of organic remains in dry soil close to the surface. Likely, plant remains were not preserved in the (mostly skeletal) graves because they never came in contact with fire, and therefore did not char. Recently published promising initial analysis results of plant macro-remains from the Hallstatt cremation necropolis Kaptol-Gradci in Croatia indicates a dominant presence of *Triticum* (wheat) grains in the graves. Aside from these, a small number of seeds/fruits from weedy taxa and remains of wild fruits/nuts were uncovered in two graves (Šoštarić et al. 2016; 2017). According to the authors, the frequent scarcity of such finds at Croatian as well as other Iron-Age cemeteries is the result of unfavourable seasonal weather and burial environments, unavailability of seeds/fruits in nature, the then poorly developed supply storing capacity along with, of course, low food durability (i.e. its preservability also until the present time). They base their interpretation on the fact that cereal remains at the Kaptol-Gradci site were discovered in extremely poor condition, which also resulted in the species remaining predominantly unspecified (Šoštarić et al. 2017).

shranjevanja zalog hrane in seveda njene trajnosti (tj. ohranitve, tudi do današnjih dni). Ostanki žit, odkriti na najdišču Kaptol – Gradca, so namreč zelo slabo ohranjeni, zato pogosto ostajajo tudi vrstno nespecificirani (Šoštarić et al. 2017).

Od skupno 18 analiziranih odlomkov oglja iz različnih grobov na najdišču Pezdirčeva njiva jih polovica (devet) pripada belemu gabru (*Carpinus betulus*). To vrsto lesa so najverjetneje uporabili tudi za izdelavo krst, saj je bila prepoznana v obeh primerih domnevnih ostankov krst s tega grobišča. Poleg belega gabra je bil v grobovih pogosto odkrit tudi hrast (*Quercus* sp.), ki sta ga Culibergova in Šercelj (1995) prepoznala kot najpogosteje uporabljeni gradbeni les na pripadajoči naselbini na severnem vrhu Kučarja nad Podzemljem. Z grobišča smo poleg belega gabra in hrasta ugotovili še zogleneli les jerebike, breze, jelše oziroma leske in črnega gabra, ki je bil morda uporabljen na grmadi. Podobno raznovrstno oglje je bilo denimo ugotovljeno tudi v železnodobnih grobovih z Molnika (Tolar 2017, 207–208), kjer zaradi slabše ohranjenosti oglja in prepere-losti v več primerih ni bilo mogoče natančno določiti lesne vrste, pa vendar so bili tudi na tem najdišču ostanki gabra, leske in jelše (*Carpinus*, *Corylus* in *Alnus*) poleg javorja (*Acer* sp.) in hrasta med pogostejšimi. Podobna raznolikost lesnih vrst, uporabljenih za kremacijo (18 taksonov), je bila ugotovljena tudi na železnodobnem grobišču Pucarjev rob na Mostu na Soči, kjer je analiza oglja iz 27 grobov pokazala prevlado uporabe bukovine (*Fagus sylvatica*) s 37-odstotnim deležem. Sledijo gaber (s 16 odstotki) ter hrast in jesen (*Fraxinus* sp.) (vsak z devetimi odstotki). Oglje javorja, vrbe (*Salix* sp.) in jelše (*Alnus* sp.) je zastopano z manjšim deležem (Culiberg 2020, 243–245). Podobno je bilo ugotovljeno tudi na sosednjem železnodobnem grobišču, na Repelcu na Mostu na Soči, kjer dobra polovica prepoznanega oglja pripada bukvi, sledijo gaber (17 odstotkov), jesen (13 odstotkov) in javor (devet odstotkov), medtem ko je pre-ostalih devet prepoznanih lesnih vrst prisotnih z nižjimi deleži (Culiberg 2020, 245–246). Izbiro lesnih vrst gre najverjetneje pripisati takratnim naravnim danostim na določenem območju in s tem najlažji dostopnosti lesa. Za sežiganje pokojnikov so zelo verjetno uporabili les iz bližnje okolice (tudi Culiberg 2020, 249).

Danes na območju Bele krajine uspevajo večino-ma tri vegetacijske gozdne združbe (po Marinček et al. 2006): 1. *Abio albe – Carpinetum betuli* (združba navad-nega gabra in bele jelke; drevesni sloj sestavljajo: hrast graden, smreka, jelka, beli gaber, javor, češnja; grmovni sloj pa: češmin, rdeči dren, leska, glog, trdoleska in dru-gi), 2. *Pteridio – Betuletum pendulae* (drugotna združba navadne breze in orlove praproti; drevesni sloj: breza, trepetlika; grmovni sloj: breza, beli gaber, krhlika, vrba) in ponekod v manjšem obsegu 3. različne združbe z buk-vijo (*Fagetum*). Vse tri, posebno pa združba navadnega gabra in bele jelke, obsegajo tudi (beli) gaber in hrast, ki

Of a total of 18 analysed charcoal fragments from Pezdirčeva njiva, half (9) were identified as hornbeam (*Carpinus betulus*). This wood species was most probably also used in coffin construction since it was identified in both instances of apparent coffin remnants from this cemetery. Besides hornbeam, the other recurrent wood species in the graves was oak (*Quercus* sp.), which Culiberg and Šercelj (1995) had acknowledged as the most frequently used construction wood at the associated nearby settlement on the northern summit of Kučar above Podzemelj. In addition to hornbeam and oak, the cemetery also yielded charred remains of rowan, birch, alder/hazel, and hop-hornbeam, all of which may have been used as funeral pyre firewood. A similarly diverse assortment of charcoal was identi-fied, for example, in the Iron-Age cemeteries of Molnik (Tolar 2017, 207–208), where the poor and dilapidated state of the charcoal inhibited a precise identification of wood species. Yet, along with maple (*Acer* sp.) and oak, hornbeam/hazel/alder (*Carpinus*/*Corylus*/*Alnus*) were among the most commonly identified wood species here as well. A similar diversity of wood species used for cremation (18 taxa) was also identified at the Pucarjev rob Iron-Age cemetery at Most na Soči, where analysis of charcoal from 27 graves demonstrated a prevalence of beech (*Fagus sylvatica*) at 37%, followed by hornbeam at 16%, then oak and ash (*Fraxinus* sp.) at 9% each. Maple, willow (*Salix* sp.), and alder (*Alnus* sp.) charcoal was pre-sent in smaller proportions. (Culiberg 2020, 243–245). A similar situation was observed at the neighbouring Iron-Age cemetery at Repelc in Most na Soči, where a good half of the identified charcoal was beech, followed by hornbeam (17%), ash (13%), and maple (9%), while a further nine other identified wood species were present to smaller degrees (Culiberg 2020, 245–246). The choice of wood species most likely came down to the natural conditions in a certain area at the time and thereby the most easily accessible wood. Wood for the purposes of cremation was more than likely sourced in the immedi-ate surroundings (also Culiberg 2020, 249).

Today, three principal forest communities prosper in the space of Bela krajina (according to Marinček et al. 2006): 1. *Abio albe – Carpinetum betuli* (hornbeam and silver fir community; the tree layer is composed of: sessile oak, spruce, fir, hornbeam, maple, cherry; the shrub layer comprises: barberry, dogwood, hazel, hawthorn, spindle, etc.), 2. *Pteridio – Betuletum pendulae* (secondary com-munity of silver birch and bracken; tree layer: birch, aspen; shrub layer: birch, hornbeam, buckthorn, willow), and in places to a smaller degree 3. Various beech communities (*Fagetum*). All three, but particularly the communities of European hornbeam and fir also include hornbeam and oak. The latter also often appeared among the identified samples of charcoal and coffin remnants at the Pezdirčeva njiva cemetery.

sta bila pogosto prepoznana med analiziranimi vzorci oglja in ostankov krst na grobišču Pezdirčeva njiva.

Zogleneli ostanki dveh lesenih krst v večini pripadajo gabrovemu lesu (*Carpinus betulus*). V enem primeru je bil ugotovljen tudi les hrasta (*Quercus* sp.), iz katerega bi lahko bil izdelan pokrov krste, lahko pa se je okoliško oglje vneslo v grob. Hrast je sicer pogosto ugotovljena vrsta lesa za izdelavo krst, čeprav so te najdbe izjemno redke (glej Huntley 2010, 38 in tam navedena literatura). To kažejo tudi ostanki krst iz grobov 72 in 73 v gomili 48 iz Stične, kjer je bil poleg hrasta ugotovljen še les smreke oziroma jelke (*Picea abies* oziroma *Abies alba*) (Gabrovec et al. 2006, 57–60). Poleg jesena in javorja smo hrast prepoznali tudi pri analizi domnevnih ostankov krst z železnodobnega grobišča na Molniku (Tolar 2017, 207). Proučevanje lesa železnodobnih krst je ključnega pomena za razumevanje pogrebnih praks in družbene dinamike. Takratni prebivalci so za krste uporabljali več vrst lesa, kažejo se regionalne razlike, ki odražajo lokalne vire, kulturne prakse in vplive (prim. Melton et al. 2016, Jones et al. 2023; Sharma et al. 2024; Jiang et al. 2021; etc.).

Pričujoča raziskava z najdišča Pezdirčeva njiva poleg krst in oglja v grobovih obsega tudi analizo običajno redkih, a s tega najdišča precej številnih ostankov nezoglenelega arheološkega lesa, pri katerih gre za ostanke držajev sulic in sekir. Izkazalo se je, da je pri skoraj 70 odstotkih vzorcev iz sulic in 78 odstotkih vzorcev iz sekir izbran les jesena (*Fraxinus* sp.) in/ali javorja (*Acer* sp.*; sl. 5*). Tudi z grobišča na Molniku je bil najden v kovinske predmete (šila, sekire) vtaknjen les, ki ga je bilo težje identificirati zaradi predhodnega restavratorskega posega. Kljub temu je bil tudi tam prepoznan les venčasto poroznega listavca (tj. hrast, jesen ali kostanj) pri dveh tulih sekir in les neznanega difuzno do polvenčasto poroznega listavca pri enem držaju šila (Tolar 2017, 205–206). Z železnodobnega najdišča Čadrg – Laze I Culibergova (2020, 251) poroča o identifikaciji lesa belega gabra (*Carpinus betulus*), ki naj bi bil uporabljen za izdelavo tulca sulične osti. Drugače kot pri drobcih oglja (tj. les za gorivo), ki ga zasledimo pri skoraj vseh grobnih kontekstih, gre pri držajih in drugih pomembnih lesenih predmetih gotovo za namensko izbiro lesa. O tem pričajo tudi na primer več tisoč let starejše in veliko bolje ohranjene lesene najdbe s kolišč na Ljubljanskem barju (datirane okoli 3300 pr. n. št.), kjer je prepoznana tako izbira lesa za gradnjo kot tudi za izdelavo orodij in orožij (Tolar, Zupančič 2009 in tam navedena literatura).

Most charred remains of the two uncovered wooden coffins were predominantly identified as hornbeam (*Carpinus betulus*). In one instance, oak wood (*Quercus* sp.) was also identified, which could have either been the coffin lid material, or the charcoal itself could have been introduced into the grave from the immediate surroundings. In the extremely rare instances of coffin finds, oak is generally identified as the most frequent coffin material (see Huntley 2010, 38 and references therein). Similarly, Graves 72 and 73 in Barrow 48 in Stična contained oak with the addition of spruce/fir (*Picea abies*/*Abies alba*) (Gabrovec et al. 2006, 57–60). Furthermore, in the course of analysing the presumed coffin remnants from the Iron-Age cemetery at Molnik, oak was also identified alongside ash and maple (Tolar 2017, 207). The study of Iron-Age coffin wood is key to our understanding of funerary practices and social dynamics. Multiple wood species could have been used for coffins; regional differences reflect local sources, cultural practices, and influences (e.g. Melton et al. 2016, Jones et al. 2023, Sharma et al. 2024, Jiang et al. 2021, etc.).

Aside from coffins and charcoal in graves, the present study at Pezdirčeva njiva also included the analysis of usually rare, but at this site relatively numerous archaeological wood remains of spear and axe shafts. Almost 70% of the spear and 78% of the axe shaft samples were found to have been made of ash (*Fraxinus* sp.) and/or maple (*Acer* sp.) wood (*Fig. 5*). The Molnik cemetery also yielded wood inserted into metal artefacts (awls, axes), though in this case, previous conservation treatments rendered wood identification more difficult. Nevertheless, two axe hafts were found to have been made of ring-porous deciduous hardwoods (i.e. oak/ash/chestnut) while an awl handle was made from the wood of an undetermined diffuse- to semi-ring-porous deciduous tree (Tolar 2017, 205–206). From Iron-Age Čadrg-Laze I site, Culiberg (2020, 251) reports that a socket for a spearhead was purportedly made from hornbeam (*Carpinus betulus*). Unlike charcoal fragments (i.e. firewood), which are encountered in nearly all grave contexts, the choice of wood for handles and other significant wooden artefacts reflects intent. This is attested, for example, by the several millennia older and better-preserved wooden finds from pile dwelling sites from the Ljubljansko barje (dated to c. 3300 BCE), where intentional wood selection was identified in building as well as weapon and tool manufacture (Tolar, Zupančič 2009 and references therein).

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