Arheobotanička analiza uzoraka iz kasnoavarodobnih grobova iz Nuštra (istočna Hrvatska)

Rapan Papeša, Anita; Kenéz, Árpád; Pető, Ákos

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Hrvatska/*Croatia*
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Fax ++385(0)1 60 55 806
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ANITA RAPAN PAPEŠA
Gradski muzej Vinkovci
Trg bana Josipa Šokčevića 16
HR–32 100 Vinkovci
anita@muzejvk.hr

ÁRPÁD KENÉZ
Hungarian National Museum, National Heritage Protection Centre, Laboratory for Applied Research
Daróci út 3.
H–1113 Budapest
kenez.arpad@mnm–nok.gov.hu;
kenezarpad@gmail.com

ÁKOS PETŐ
Szent István University
Institute of Nature Conservation and Landscape Management, Department of Nature Conservation and Landscape Ecology
Páter Károly u. 1.
H–2100 Gödöllő
peto.akos@mkk.szie.hu; peetoako@gmail.com

Mikro- i makroarheobotaničke analize odabranih kasnoavarodobnih grobova s arheološkog nalazišta Nuštar provedene su kako bi se otkrila interakcija između pogrebnih običaja i biljaka kasnoavarodobnog (710.–810.) stanovništva u istočnoj Hrvatskoj (hrvatskom Podunavlju). Tijekom istraživanja iz grobova je prikupljeno 108 uzoraka tla i sedimenta; zbog velike količine zemlje uzorci su prikupljani s različitih dubina i položaja unutar zapuna. Osim toga, prikupljeno je i nešto malo manje od 100 cijelih posuda sa sadržajem. Dvadeset uzoraka iz zapuna grobova za makroarheobotaničke analize, kao i deset uzoraka zemlje iz posuda za mikroarheobotaničke analize izabrano je prema "razlikovnom ključu" (uzorci iz svih spolnih i dobnih skupina, te različitih tipova ukopa). Nijedan od uzoraka nije sadržavao velike količine sjemena ili ostataka plodova; općenito ih se sve može obilježiti kao loše arheobotaničke cjeline. Identificirani biljni makroostaci odnose se na šest različitih žitarica i tri različite vrste korova. Žitarice čine 67,31% ukupnog uzorka, korov čini 12,50%, a preostalih 15,38% hranu. Fitolitske analize pokazale su prisutnost fitolita povezanih sa žitaricama, ali većina uzoraka smatra se sterilnim. Na osnovi mikro- i makroarheobotaničkih istraživanja odabranih grobova kasnoavarodobnog groblja možemo pretpostaviti da upotreba biljaka u pogrebnim običajima na arheološkom nalazištu Nuštar nije igrala značajnu ulogu. U svjetlu prethodno proučavanih kasnoavarodobnih naselja i groblja u zemljopisnom okruženju (Karpatska kotlina i srednje Podunavlje) čini nam se da su u slučaju obrednog i grobnog konteksta proizvodi životinjskog podrijetla možda imali važniju ulogu.

Ključne riječi: avarsko razdoblje, Nuštar, rekonstrukcija pogrebnih običaja, makroarheobotaničke analize, analiza fitolita

Micro- and macro-archaeobotanical investigations were carried out on a selection of Late Avar graves from the archaeological site of Nuštar with the aim to reveal interactions between burial customs and plants of the Late Avar (710–810) population in Eastern Croatia (Croatian Danube region). During the excavation 108 soil and sediment samples were collected from the graves; due to the fact that there was a great amount of material, samples were collected from different depths and places in graves. Moreover, a little less than 100 whole vessel contents were recovered. Twenty sediment samples from grave-fill for macro-archaeobotanical study, as well as ten samples from vessels for micro-archaeobotanical study were chosen according to a "difference key" (samples from all gender and age and different burials). Overall the archaeobotanical assemblages were poor with none of the samples yielding high amounts of seed or fruit remains. Thus, only six different cereals and three different weed species were identified. Cereals form 67.31% of the entire assemblage, whilst weeds form 12.50% and food remains 15.38%. Phytolith analyses also show the presence of cereal related phytoliths, but most of the samples were considered sterile. Based on the micro- and macro-archaeobotanical investigations of selected graves from the Late Avar cemetery we may consider that the use of plants in burial customs at Nuštar did not play a significant role. In light of previous studies at Late Avar settlements and cemeteries in the surrounding geographical environment (Carpathian Basin, and Middle Danube valley) animal-derived products might have therefore had a more prominent role in ritual and burial contexts.

Keywords: Avar Age, Nuštar, reconstruction of burial customs, macro-archaeobotany, phytolith analysis

1. UVOD

1.1. Geografska i arheološka pozadina

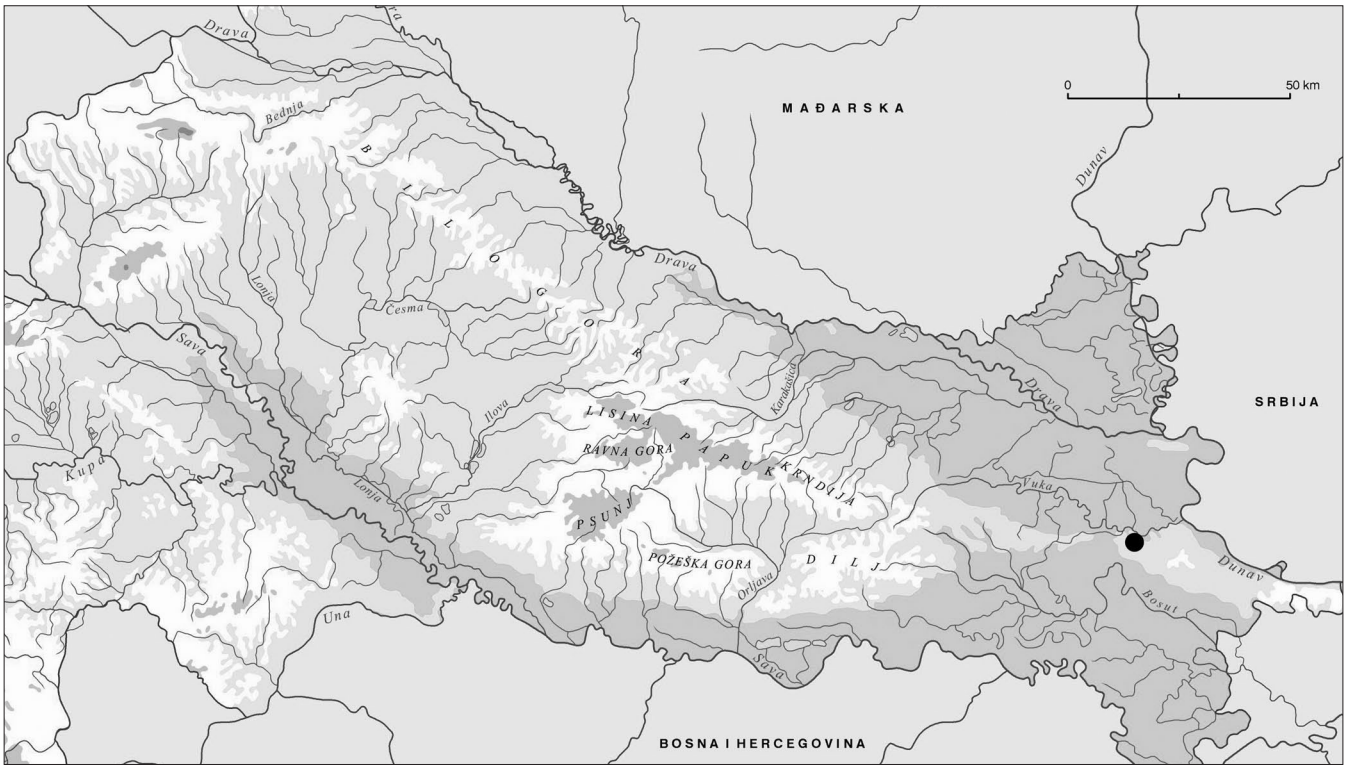
Naselje Nuštar (45° 019′ 53′′ N, 18° 050′ 46′′ E) nalazi se u istoimenoj općini u Vukovarsko-srijemskoj županiji u istočnoj Hrvatskoj (karta 1). Istočna Hrvatska nalazi se između niskih brežuljaka (Dilj, Papuk) na zapadu, rijeke Save na jugu, rijeke Drave na sjeveru i rijeke Dunav na istoku.[1] Stoga se ovo područje često naziva Međuriječje. Opisano područje obuhvaća oko 12 000 km^2, a prosječna nadmorska visina je između 80 i 100 m.

1. INTRODUCTION

1.1. Geographical and archaeological background

The settlement of Nuštar (45^{0}19′53′′N, 18^{0}50′46′′E) is situated in the municipality with the same name located in the Vukovar-Syrmia County in Eastern Croatia (Map 1). Eastern Croatia lies between low hills (Dilj, Papuk) to the west, river Sava to the south, river Drava to the north and river Danube to the east.[1] Therefore this region is often called Interamnium. The area described covers c. 12 000 km^2 and its average altitude is between 80–100 m.

Geographically the site is situated in the region of we-



Karta 1 Položaj Nuštra na karti Hrvatske (A. Rapan Papeša, 2014.)
Map 1 Position of Nuštar archaeological site (A. Rapan Papeša, 2014)

Zemljopisni položaj lokaliteta je u području zapadnog Srijema, u mikroregiji vinkovačko-vukovarskoga lesnog platoa hrvatske istočne nizine (LNH 2005: 533). Istočnohrvatska ravnica dio je velike međugorske potoline oblikovane između Karpata, Dinarida i Alpa, a prema kriterijima homogenosti, navedeno zemljopisno područje čini jedinstveni kompleks s prirodnim i susjednim panonskim jedinicama Vojvodinom i mađarskom Velikom nizinom (Magaš 1998: 187) – povijesnim prostorom avarskog kaganata. Na prostoru Istočnohrvatske ravnice prevladavaju akumulacijski procesi (akumulacije lesa i lesolikih sedimenata, te riječnih naplavina) i mala reljefna energija. Razlikujemo nizine (nastale fluvijalnim i fluvijalno-močvarnim nastankom), zaravni (eolski i sufozijski procesi) i brda (radijalna tektonika) (Bognar 1994: 25–28).

Zbog svoga položaja na raskrižju od sjevera prema jugu i istoka prema zapadu ovo je područje naseljeno u kontinuitetu od prapovijesti do danas. Tijekom avarskog razdoblja, a posebno u srednje i kasno avarsko doba, ovo je područje također bio naseljeno. Slučajni nalazi, naselja i groblja to dokazuju. Istraživači su dokazali nekoliko kategorija nalaza

stern Syrmia in the micro region of the Vinkovci-Vukovar loess plateau of the Croatian Eastern Plain (LNH 2005: 533). The Eastern Croatian Plain forms part of a large depression formed between the Carpathians, Dinarides and the Alps, and is homogenous with the neighbouring Vojvodina (Serbia) and the Great Hungarian Plain (Magaš 1998: 187), which was also part of the Avar Khaganate (kingdom). The Eastern Croatian Plain is characterised by accumulated loess, loess sediments and river alluvium and low energy relief from which lowlands (resulting fluvial and fluvial-wetland occurrence), plateau (aeolian processes) and hills (radial tectonics) can be distinguished (Bognar 1994: 25–28).

Because of its location on the crossing from the north to the south and from the east to the west this area has been inhabited in continuity from prehistory until today. During the Avar Age, especially within the Middle and Late Avar Age, stray finds, settlements and cemeteries prove their presence in the region. Evidence of finds from this period can be linked to either Slavs or Avars, or to both of them, but unfortunately, published sites are in the minority and

1 Uobičajeno se ovom području priključuje i Baranja, iako se nalazi izvan opisanih granica.

1 The Croatian part of Baranja is usually added to Eastern Croatia, although it lies outside of the described borders.

u tom razdoblju koje možemo povezati bilo sa Slavenima, bilo s Avarima, ili obojima. Nažalost, objavljeni su lokaliteti u manjini, ali postoji nekoliko dobrih osvrta. Dobra polazna točka je rad Ž. Tomičića o arheološkim nalazima iz ranoga srednjeg vijeka u Međuriječju (Tomičić 2000: 142–161), zatim dopuna K. Filipeca avarskim lokalitetima objavljenim u ADAM-u[2] (Filipec 2003: 132–135). Pregled arheoloških nalaza s gledišta povjesničara napravio je povjesničar H. Gračanin kao dio disertacije (Gračanin 2011: 119–145, katalog lokaliteta 285–342).

1.2. Društvo i ekonomija Avara na ovom prostoru

Zbog turbulentnog razdoblja seobe naroda i čestih oružanih sukoba koji su prethodili dolasku Avara ovaj prostor nije bio gusto naseljen. Prema nekim pretpostavkama gustoća naseljenosti po km^2 bila je između 5 i 30 osoba.[3] Unatoč tomu ovaj je prostor pružao nekoliko pogodnosti: (1) okoliš je nalikovao azijskim stepama iz kojih su doselili, (2) neposrednu blizinu Bizantskog Carstva i (3) ostatke infrastrukture (u prvom redu mrežu cesta) Rimskog Carstva (Bugarski 2008: 439).

Avari su se naselili duž rubnih područja Bizantskog Carstva, stoga je gospodarska i trgovinska veza između dviju populacija neupitna. Unatoč blizini Bizanta i njihove visoko razvijene kulturno-društvene organizacije, Avari su ostali daleko izvan sustava rimske civilizacije (Pohl 2003: 592). U ranijim razdobljima, prostor Bizantskog Carstva značio je neograničen izvor sredstava (tributom, ali i pljačkaškim upadima), dok se u kasnijim razdobljima sve više očituje kroz razmjenu kulturoloških ideja.

Područje južne Panonije bilo je gusto ispresijecano mrežom rimskih cesta,[4] upravo zbog svoga geografskog položaja – tranzitnog područja između istoka i zapada, sjevera i juga. Mreža rimskih cesta, a kako nam svjedoče i kasniji izvori, bila je krucijalna za razvoj ovog područja. Iako nemamo direktne dokaze, možemo pretpostaviti da su korištene i u avarskom razdoblju.

Stupanj istraženosti avarskog načina života u Hrvatskoj, nažalost, nije jako visok. Jedino djelomično istraženo srednjoavarodobno naselje u Starim Jankovcima nije još objavljeno.[5] Povremeno su tijekom istraživanja lokaliteta iz drugih razdoblja zabilježeni i objekti koji vjerojatno pripadaju ranosrednjovjekovnom razdoblju, npr. u Sotinu (Ložnjak Dizdar, Hutinec 2012: 9; 2013: 9; 2014: 11) ili Stružanima (Miklik-Lozuk 2012: 43–47; Lozuk 2012, u tisku). Ipak, možemo pretpostaviti da se ne razlikuju previše od života avarodobnih populacija u ostatku kaganata (npr. Srbija i Mađarska).

1.3. Pogrebni običaji Avara na ovom prostoru

U razdoblju prijelaza srednjeg na kasno avarsko doba na navedenom području uočavamo dva različita ritusa ukopavanja: spaljivanje ili kremaciju i pokopavanje ili inhumaciju. Riječ je o istodobnom egzistiranju dvaju različitih društveno-socijalnih oblika na istom području. Groblja s incineracijskim ritusom sahranjivanja na ovom području zasada su

2 Szentpéteri, J. (ed.), 2002, *Archäologische Denkmäler der Awarenzeit in Mitteleuropa*, Varia archeaologica Hungarica XIII, Budapest.

3 http://www.fordham.edu/halsall/source/pop-in-eur.asp (20.12.2014.).

4 Recentni pregled stanja istraženosti i mreže cesta vidi u: Gračanin 2010.

5 Materijal je na obradi kod dr. sc. K. Filipeca s Odsjeka za arheologiju Filozofskog fakulteta Sveučilišta u Zagrebu.

few good reviews exist. Of note, is work published by Ž. Tomičić on archaeological finds from the Early Middle Ages in Interamnia (Tomičić 2000: 142–161), a supplement to Avar sites published in ADAM[2] by K. Filipec (Filipec 2003: 132–135) and an overview of archaeological finds from an historian's point of view by H. Gračanin as a part of his PhD (Gračanin 2011: 119–145, catalogue of sites 285–342).

1.2 Avar society and economy in the study region

Due to the turbulent period of the Great Migration and frequent armed conflicts, which preceded the arrival of the Avars (582 AD) this area was not densely populated. Some suggest a population density per km^2 of between 5 and 30 individuals.[3] This area also provided several benefits: (1) the environment was similar to the Asian steppes from which they migrated, (2) the immediate vicinity of the Byzantine Empire and (3) the region contained remnants of infrastructure (primarily road network) from the preceding Roman Empire (Bugarski 2008: 439).

The Avars settled along the peripheral territories of the Byzantine Empire, therefore the economic trade links between the two populations are unquestionable. In spite of the closeness of the Byzantine Empire and their highly-developed cultural social organisation, the Avars remained out of Roman Civilization (Pohl 2003: 592). In earlier periods, the area of the Byzantine Empire meant an unlimited source of funds (tribute, but also plundering intrusions), while in subsequent periods evidence of contact can be seen with the increasingly evident exchange of cultural ideas.

The area of southern Pannonia was densely intersected by a network of Roman roads,[4] and because of its geographical position, it played the role of a transit area between east and west, north and south. The Roman road network is crucial for the development of this area, although we have no direct evidence that these roads were used during the Avar Age.

Unfortunately, research into the living habits of the Avars in Croatia is limited. Recently, excavations at Stari Jankovci have revealed part of a Middle Avar period village; however, this site is not yet published.[5] Occasional finds have also been recorded during the investigation of sites from other time periods e.g. in Sotin (Ložnjak Dizdar, Hutinec 2012: 9; 2013: 9; 2014: 11) or Stružani (Miklik-Lozuk 2012: 43–47; Lozuk 2012, in press). However, even with this limited information we can assume that they do not differ too much from the lifestyle of Avar period populations in the rest of the Khaganate (e.g. in Serbia and Hungary).

1.3 Avar burial practices in the study region

In the period of transition from the Middle to Late Avar Age in this area we see two different burial rites: cremation and inhumation, resulting from the simultaneous existence of two different social forms in the same area. So far, cemeteries with cremation rites have been explored at two

2 Szentpéteri, J. (ed.), 2002, *Archäologische Denkmäler der Awarenzeit in Mitteleuropa*, Varia archeaologica Hungarica XIII, Budapest.

3 http://www.fordham.edu/halsall/source/pop-in-eur.asp (20.12.2014.)

4 For a recent review of the state of research and road networks see: Gračanin 2010.

5 Finds are currently being evaluated by K. Filipec from the Archaeological Department, Faculty of Philosophy, University of Zagreb.

Lokalitet / Site	Datacija / Date	Tip raka / Grave pit	Položaj pokojnika / Position of the dead	Višestruki ukopi / Multiple burials	Ukopi konja / Burails with horse	Orijentacija / Orientation	Grobni nalazi / Grave finds	Prilozi / Food offering	Literatura / Bibliography
Stari Jankovci	07/4-08/4	Bez tragova grobne konstrukcije ili lijesa / Nor traces of grave constructions or coffins	Ispružen, na leđima / laid down in extended position	-	+	JI–SZ / SE-NW	+	+	Šmalcelj 1981a
Bijelo Brdo I	07-08	Grobovi su plošni, bez tragova ljesova / graves are flat, no traces of coffins	Ispružen, na leđima / laid down in extended position	-	+	I–Z / E-W	+	+	Ivaniček 1949; Vinski 1949
Privlaka	08-09/1	Rake su četvrtaste s više ili manje zaobljenim uglovima, bez tragova grobne konstrukcije / Grave pits are rectangular with more or less rounded corners, no traces of garve constructions	Ispružen, na leđima / laid down in extended position	+	+	SZ–JI / NW-SE	+	+	Šmalcelj 1973; 1976; 1981b
Otok	08/4-09/1	Četverokutna zaobljenih uglova / rectangular with ronded corners	Ispružen, na leđima / laid down in extended position	-	+	SZ–JI/NW-SE	+	+	Šmalcelj 2012
Brodski Drenovac	08/4-09/2	Rake su jednostavne, zemljane, te bez tragova bilo kakve grobne konstrukcije / grave pits are simple, no traces of grave construnction	Ispružen, na leđima / laid down in extended position	+	+	I–Z/E-W	+	+	Vinski-Gasparini, Ercegović 1958
Nuštar	08-09/1	Jednostavne ili s drvenim konstrukcijama / simple or with traces of wooden constructions	Ispružen, na leđima / laid down in extended position	+	+	Z–I/W-E	+	+	Rapan Papeša 2013

Tab. 1 Popis i opis lokaliteta s inhumacijskim ukopima
Tab. 1 List and description of sites with skeletal burials

istražena na smo dvije lokacije: Vinkovci – Duga ulica 99 (Sekelj Ivančan, Tkalčec 2006) i Belišće – Zagajci II (Filipec, Roksandić 2008: 19–21). Riječ je o slavenskim paljevinskim grobljima datiranima u prijelaz 7. na 8. stoljeće. Na ova dva lokaliteta uočavaju se razlike u samom ritusu pokopavanja, ali kako je uzorak relativno malen, a groblja (zbog različitih okolnosti) nisu u potpunosti istražena, do nekih budućih arheoloških istraživanja nećemo moći sa sigurnošću ustanoviti obrazac. Za razliku od prethodnih lokaliteta na ostalim istraživanim lokalitetima (tab. 1) prakticiran je isključivo inhumacijski ritus pokopavanja. Slične zaključke imamo i za pojedinačne grobne nalaze, za koje se najčešće navodi da potječu iz razorenih skeletnih grobova.

Rake na istraživanim lokalitetima su četvrtaste s više ili manje zaobljenim uglovima, te, osim u Nuštru, bez grobne konstrukcije, a rijetko su zabilježeni i tragova ljesova (čavli, okovi). Orijentacija ukopa na istraženim grobljima je raznolika, međutim možemo reći da prevladavaju ukopi orijentirani u smjeru sjeverozapad–jugoistok i istok–zapad.

Pokojnici su u rake sahranjivani u ispruženom položaju na leđima, s rukama pruženim uz tijelo. Zabilježena su i manja odstupanja od ovih normativa (npr. pokopi u zgrčenom položaju). Sporadično su dokumentirani i višestruki ukopi, a uglavnom je riječ o ukopima odrasle žene i djeteta, iako imamo slučajeva kombinacija svih dobnih i spolnih skupina. Ukopi konja i konjanika također su relativno česti – na svim istraživanim grobljima imamo barem jedan takav ukop. I konjanik i konj pokapani su sa svom svojom opremom, iako i ovdje uočavamo odstupanja od pravila. Grobni nalazi nam svjedoče da su pokojnici bili pokapani u odjeći, s predmetima koje su i koristili za života. Najčešće je riječ o nakitu, dijelovima pojasa i pojasnim garniturama, ali i oruđu (noževi, pršljenci, iglenice) i oružju (mačevi, strelice). Prilozi u istraženim grobovima vezuju se uz prilaganje hrane; tako nalazimo keramičke lonce, kosti životinja i ljuske jaja.

1.4. Poljoprivreda, proizvodnja i korištenje biljaka kod Avara na ovom prostoru

Tradicionalno avarsko gospodarstvo temelji se na nomadskom stočarstvu (Pohl 1997) koje je opstalo i kad su se, od 7. stoljeća, počela pojavljivati stalna naselja u avarskom kaganatu. Za vrijeme kasnoga avarskog doba počeo je međunarodno prepoznat optimum srednjovjekovne klime (MWP) (Cioccale 1999: 35–47; Villalba 1994: 183–197), koji je zabilježen u rasponu od oko sredine 8. stoljeća do oko sredine 13. stoljeća, a temperature su bile slične ili malo više nego danas. Utjecaj na gospodarski potencijal Europe, ali i ovog prostora, imalo je, nakon toga, i malo ledeno doba (LIA) (Bradley, Jones 1992: 649–665; Pfister 1992: 118–142). U avarskom razdoblju bilježimo i nekoliko hladnijih razdoblja (Mann et al. 2009: 1257). Klima je bila hladnija, a padaline oskudne (Vadas-Rácz 2012: 207). Posebno se naglašava da je suha klima rezultirala smanjivanjem prostora za ispašu avarske stoke u 8. stoljeću, a samim time i lagano odumiranje kasnoavarske države. Činjenicu da nekako istodobno Slaveni naseljavaju ove prostore objašnjava se drugim vrstama životinja koje uzgajaju, kao i činjenicom da se naseljavaju u (vodom bogatijim) močvarnim područjima (Vadas-Rácz 2012: 208–209). Prostor za razvoj poljoprivrede bio je neusporedivo manji nego je on danas, prije svega zbog velikih površina pod šumskim pokrovom; štoviše, povremeno po-

locations: Vinkovci – Duga ulica 99 (Sekelj Ivančan, Tkalčec 2006) and Belišće – Zagajci II (Filipec, Roksandić 2008: 19–21). Both are Slavic incineration graveyards dated to the turn of the 7th and 8th century. At these two sites differences in the burial rites are observed, but because of a relatively small sample and the fact that both cemeteries (because of different circumstances) have not been fully explored, we cannot determine patterns of burial rites with any certainty. Apart from these two cemeteries, all the other excavated sites (Tab. 1) point to the exclusive practice of inhumation burials. Similar conclusions have also been made for chance finds that, as it is most commonly stated, originate from destroyed skeletal graves.

Typically, grave pits are rectangular with more or less rounded corners, without grave construction, except in Nuštar, and traces of coffins (e.g. nails, hinges) are rarely recorded. Orientation of the graves vary, however, we can say that burials oriented in a northwest–southeast and east–west direction prevail.

The deceased were buried in the graves in an extended position on their back, with hands next to the body. Minor deviations from these norms are also recorded (e.g. burials in a contracted position) as well as multiple burials of different age and sex groups, although burials of an adult woman and a child dominated. The burials of horses and horsemen are also relatively common; all excavated cemeteries have at least one such burial. Both rider and horse were buried with all their equipment, although deviations from the rule can also be observed. Grave goods suggest that the deceased were buried in cloths, with objects that they used in life. Most grave goods belong to jewellery, belt and belt sets, tools (e.g. knives, spindle-whorls, needle-cases, flints) and weapons (e.g. swords, arrows). Traces of food offerings are also found in the form of pottery, animal bones and eggshells.

1.4 Avar agricultural production and plant exploitation in the study region

The traditional Avar economy was based on nomadic pastoral farming (Pohl 1997) that persisted when permanent settlements began to appear in the Avar Khaganate in the 7th cent. AD. The Late Avar Age saw the beginning of the globally recognisable Medieval Climate Optimum (MWP) (Cioccale 1999: 35–47; Villalba 1994: 183–197), which ranged from app. the mid 8th cent. to app. mid 13th cent. and saw temperatures similar to that of today if not slightly warmer. Afterwards, less favourable Little Ice Age (LIA) had an influence on the economic potential of Europe and of this region, too (Bradley, Jones 1992: 649–665; Pfister 1992: 118–142). During The Avar Age several colder periods were recorded (Mann et al. 2009: 1257). The climate was cooler and dryer (Vadas-Rácz 2012: 207). Particular emphasis is that the drying climate has resulted in the reduction of grazing areas, which significantly influenced the animal husbandry of the Avar populations already in the 8th cent., and thus slowly withering away the Late Avar Khaganate. The fact that somehow simultaneously Slavs settled in these areas is explained by different animal husbandry habits, and the fact that the Slav tribes settled in (water rich) wetlands (Vadas-Rácz 2012: 208–209). The area for the development of agriculture was less extended than it is today, primarily be-

plavljena područja i močvare dominirale su u riječnim dolinama.[6]

Bez sumnje, gospodarstvo kasnoavarskog razdoblja zasnivalo se na uzgoju stoke – dokaze za to nalazimo u grobnim prilozima – ali bez sumnje i na poljoprivredi i vrtlarstvu (Daim 2003: 486). Sustav obrade tla vjerojatno je bio ekstenzivan, odnosno nakon što se tlo iscrpi napušta se i traži se novo područje za obradu. Ovakav način obrade tla dodatno je smanjivao obradivu površinu koje je ionako bilo malo. No, sve ove pretpostavke zasada nije moguće dokazati jer nedostaju važni arheološki pokazatelji (u prvom redu istražena i objavljena naselja). U susjednim područjima Avari i Slaveni uzgajali su različite vrste žitarica, uključujući proso koji je bio jako popularan, ali i pšenicu, raž, ječam i dr. (Gyulai et al. 1992; Behre 1992). Izgradnja autocesta u Mađarskoj rezultirala je i istraživanjima nekoliko dijelova kasnoavarodobnih naselja. Pregledom arheobotaničkog materijala dokazan je i uzgoj i prerada žitarica među naseljenim kasnoavarodobnim populacijama (Pető, Herendi 2012; Pető et al. 2012; Herendi, Pető, u tisku). Iako rijetki, nalazi iz grobova potvrđuju nam bavljenje poljoprivredom u kasnoavarskom razdoblju. Nalazi srpova u grobovima svjedoče o socijalnom statusu pokojnika (poljoprivrednik). Takav primjer imamo u grobu 8 na lokalitetu Otok. Riječ je o grobu muškarca sa sljedećim grobnim nalazima: željezno kresivo, dvije željezne predmeta, željezni nož i željezni srp, te prilozima: lonac i životinjska kost (Šmalcelj 2013). Željezni srp položen je na koljena pokojnika, a riječ je o jednosječnom srpu s tragovima drveta na dršci (Rapan Papeša 2009: 150–151). Treba svakako spomenuti i neke druge teorije vezane uz prisutnost srpova u grobovima; uz teoriju da su srpovi oruđe koje predstavlja zanimanje pokojnika, neki ga znanstvenici tumače i kao oružje koje označava vojni status ili kao magijsko-ritualni simbol protiv vampira (usp. Slivenska 2004: 10).

2. NUŠTAR : ARHEOLOŠKA ANALIZA

Zaštitno arheološko istraživanje na kasnoavarodobnom groblju na poziciji Dvorac Khuen-Belasi u Nuštru izvršeno je od strane Gradskog muzeja Vinkovci tijekom rujna i listopada 2011. godine. Spoznaje o lokalitetu, koji nam je do tada bio nepoznat, dobili smo u siječnju iste godine (Rapan Papeša 2012: 4). Arheološki nadzor i probni rovovi napravljeni su na cijeloj površini predviđenoj za izgradnju (10 800 m^2), a prema njihovim rezultatima arheološko istraživanje obavljeno je samo u jugoistočnom dijelu iskopa (na površini od oko 2500 m^2). Na navedenom prostoru istražen je dio groblja, odnosno 10 uglavnom pravilnih ukopnih redova, unutar gabarita iskopa. Ukupno je imenovan 201 grob, a istraženo njih 196 (dva su najvećim dijelom izlazila izvan granica iskopa, a tri nisu bili grobovi). Prikupljeno je više od 1500 nalaza iz grobova, uglavnom dijelova odjeće, nakita i oruđa.

Zapune grobova ocrtavale su se kao više ili manje pravilni pravokutnici lagano zaobljenih uglova, a pojavljuju se u dvije nijanse, svjetlijoj i tamnijoj, te njihovim kombinacijama. Rake istraženih grobova imaju ravne okomite stranice, a izdvojena su tri glavna tipa s obzirom na dno. Česte su kombinacije i varijacije, tako da se ova tri glavna tipa raščlanjuju na osam podtipova i 31 varijantu (Rapan Papeša 2013, u tisku). Najveći broj raka u prosjeku je dug oko 2,25 m i širok

6 Za usporedbu možemo spomenuti baru Palača između Vinkovaca i Osijeka koja je regulirana tek krajem 19. stoljeća, upravo u svrhu povećanja poljoprivredno obradivih površina (usp. Živaković Kerže 2008).

cause of extended forest vegetation, as well as periodically flooded areas and wetlands that were also dominant in the river valleys.[6]

Economy of the Late Avar Age was based on cattle farming, which is largely evidenced from animal remains recovered from graves (Daim 2003: 486). Cultivation system was probably extensive; after leaving the ground exhausted that requested a new area for processing. This type of cultivation further reduced the arable land territories, which were small anyway. But all these assumptions are hard to prove, since it lacks important archaeological indicators (primarily researched and published settlements). From neighbouring regions Avar and Slav farmers cultivated many types of grain including millet, which was especially popular. Wheat, rye, and barley was also present in the economy of these populations (e.g. Gyulai et al. 1992; Behre 1992). The motorway constructions in Hungary resulted in the excavation of several Late Avar Age settlement parts. The examination of these provided archaeobotanical evidence for both crop husbandry and processing within the settled Late Avar populations (Pető and Herendi 2012; Pető et al. 2012; Herendi, Pető, in press). In Croatia, no archaeobotanical remains have currently been published on crop agriculture at this time and the only indirect evidence of plant husbandry are sickles recovered from graves. Such an example is a male grave (grave Nr. 8) at the site of Otok, where the following grave goods were identified: iron tinder, two iron buckles, iron knife and an iron sickle and food offerings: pot and animal bone (Šmalcelj 2013). The iron sickle, which had one cutting edge with traces of wood on the handle, was laid on the knees of the deceased (Rapan Papeša 2009: 150–151). In addition to the theory that sickles were working tools representing the deceased's profession, sickles from graves are interpreted by some scholars as weapons reflecting military status or as a magical, ritual symbol against bad spirits (cf. Slivenska 2004: 10).

2. NUŠTAR ARCHAEOLOGICAL SITE: AN ARCHAEOLOGICAL ANALYSIS

Rescue archaeological excavations of the Late Avar Age cemetery at Castle Khuen-Belasi in Nuštar was carried out by the Municipal Museum Vinkovci in September and October 2011. We received information about the site, which had previously been unknown, in January of the same year (Rapan Papeša 2012: 4). Archaeological supervision and trial trenches were made throughout the area predicted for the construction of a building (total area: 10 800 m^2), and according to those results archaeological excavation was carried out only in the south-eastern part of the building area (approximately 2500 m^2). In the aforementioned area, part of the cemetery, organized into 10 mainly regular burial rows, was excavated. A total of 201 graves were identified, and 196 of them explored (two for the most part went outside the limits of the excavation, and 3 were not graves). We collected more than 1500 artefacts from the graves, mainly parts of clothing, jewellery and tools.

The graves' backfill were more or less regular rectangles with slightly rounded corners and appeared in two shades,

6 For comparison, pond Palača between Vinkovci and Osijek could be mentioned. This waterbody was regulated by the end of the 19th cent., precisely in order to increase agricultural and arable land (cf. Živaković Kerže 2008).

oko 0,80 m. Dubina iskopa varira između 0,05 i 1,44 m. Svi ukopi orijentirani su u smjeru zapad–istok (glava na zapadu). Odstupanja prema sjeveru ili jugu kreću se od 2° do 15°.

Pokojnici su u rake sahranjivani u ispruženom položaju na leđima, s rukama pruženim uz tijelo. Iznimke su izuzetno rijetke. Za nekoliko ukopa možemo pretpostaviti da su pokojnici bili umotani u platno ili kožu. Na lokalitetu je zabilježena i sedam višestrukih ukopa. Ukopi konjanika s konjem zabilježeni su u dva groba. Iako su kosturi bili poremećeni po položaju lubanja i kostiju potkoljenica, možemo zaključiti da su i konjanik i konj bili isto orijentirani, a konji su položeni konjaniku s lijeva. Ovakav način pokapanja konjanika i konja vodi se kao Tip III prema klasifikaciji A. Kissa, a tipičan je za kasno avarsko doba (Kiss 1963: 153–154).

U nuštarskim grobovima imamo dokaze prilaganja hrane; uz keramičke posude, te okove drvenih vjedrica, tu su i kosti ptica i sisavaca. Prilog hrane u vidu keramičke posude zabilježen je u 141 grobu – u 134 groba po jedna posuda, a u sedam grobova po dvije posude (Rapan Papeša 2014, u tisku). Okovi drvenih vjedrica sa sigurnošću su nađeni u dva groba, a moguće je da će se nakon restauracije pojaviti još koji. Prilog u vidu jedne ili više životinjskih kostiju zabilježen je u 100 grobova. Najzastupljenija vrsta su goveda, slijede ptice i mali preživači, dok je pas prisutan u vrlo maloj mjeri, a svinja i punorožac samo s po jednim ulomkom (Premužić et al. 2014, u tisku). U samo jednom grobu (trojnom dječjem) kao prilog zabilježene su ljuske jaja (Premužić et al. 2013).

Grobni nalazi nađeni su u 175 grobova, a razlikujemo nekoliko kategorija grobnih nalaza: dijelove odjeće (pojasne garniture, predice, spojke), nakit (naušnice, prstenje, narukvice, ogrlice od staklenih perli, praporci), oruđe (noževi, pršljenci, iglenice, kremeni, kresiva), oružje (strelice). Svi prethodno opisani nalazi mogu se datirati kroz cijelo 8. i prva desetljeća 9. stoljeća.

3. MATERIJALI I METODE

3.1. Strategija uzorkovanja i uzorci

Tijekom zaštitnoga arheološkog iskopavanja kasnoavarodobnog groblja Nuštar prikupljeno je ukupno 108 uzoraka sedimenta iz grobova. Uzorci su prikupljani s različitih mjesta unutar grobova (npr. zapuna u cjelini, ispod određenih mjesta kostura: glave, prsa, zdjelice, nogu). Uzorci pokrivaju različite socijalne, dobne i spolne skupine. Uzorci su flotirani na lokalitetu tijekom istraživanja i potom spakirani u vrećice za buduće analize. Proces flotacije uključuje ispiranje zemlje u spremniku s vodom i prikupljanje sitnih ulomaka (frakcija) u dva sita i u mrežicu na dnu spremnika. Sita imaju mrežicu promjera 250–300 mikrona. Čest grobni prilog na groblju u Nuštru su posude (lonci). Sveukupno je prikupljeno 149 posuda (Rapan Papeša 2014, u tisku). Srećom, 78 ih je nađeno cijelo, zajedno sa sadržajem (zemljom) u njima.

Kako bismo učinili prvi korak u razumijevanju interakcije između ljudi i biljaka u avarskim grobovima, 30 uzoraka je izabrano i podvrgnuto arheobotaničkim analizama (sl. 1); 20 za makroarheobotaničke i 10 za mikroarheobotaničke analize. Izabrani su tako da se razlikuju koliko god je to moguće: pokušali smo dobiti podatke za djecu, žene i muškarce, za keramiku rađenu rukom, na sporom i brzom lončarskom kolu.

Ukupno trideset uzoraka podvrgnuto je arheobotaničkoj analizi. Karpološko ispitivanje provedeno je na dvadeset

lighter and darker, or a combination of both. The grave pits had straight vertical sides, and three main types, according to the bottom, were singled out; however, due to combinations and variations these three main types were divided into eight subtypes and 31 variants (Rapan Papeša, 2013, in press). The average length of the grave pits was about 2.25 m and the average width was about 0.80 m. The depths varied between 0.05 and 1.44 m. All burials were oriented in the east to west direction (head to the west), with deviations to the north or south ranging from 2^0 to 15^0.

The deceased were buried in the grave pit in extended position on the back, with hands next to the body. Exceptions were extremely rare. For several burials we can assume that the deceased were wrapped in cloth or leather. At the site seven multiple burials were recorded. The burials of a horseman with a horse were recorded in two graves. Although the skeletons were disturbed, by the position of the lower leg bones and skulls, we can conclude that both rider and horse were of a similar orientation, where the horses are placed to the left of the rider. This type of horsemen and horse burial are described as Type III according to the classification of A. Kiss, and is typical for the Late Avar Age (Kiss 1963: 153–154).

At Nuštar food offerings were found to be common; along with ceramic pots and metal hoops for wooden pails there are also bones of birds and mammals. Ceramic vessels were recorded in 141 graves; one vessel in 134 graves and two vessels in seven graves (Rapan Papeša 2014, in press). Wooden pail hoops were found in two graves and it is possible that after restoration some more may also be identified. Finds in the form of one or more animal bones are recorded in 100 graves. The most abundant species were cattle, followed by birds and small ruminants; dogs were only presented with very few finds, whilst one single pig and horn remain was also recovered (Premužić et al. 2014, in press). Eggshells were only recorded in one grave (triple child burial) (Premužić et al. 2013).

Grave goods were found in 175 graves, and there are several categories of grave finds: pieces of clothing (belt set, buckles, clasps), jewellery (earrings, rings, bracelets, necklaces of glass beads, bells), tools (knives, spindle whorls, needle cases, flint), weapons (arrows). All previously described finds can be dated throughout the 8th and the first decades of the 9th cent.

3. MATERIALS AND METHODS

3.1. The sampling strategy and the sample set

During the preventive archaeological excavation at the Late Avar Age cemetery of Nuštar altogether 108 anthropogenic sediment samples were collected from graves. The samples represent different locations within the graves (e.g. grave fill in general, under specific places of skeleton: head, chest, pelvis, legs). The sampling set covered different social, age and sex groups. The samples were floated at the site during the excavation and then bagged for further future analyses. The process of flotation includes washout of soil in a water tank and collecting tiny pieces (fractions) in 2 sieves and a net on the bottom of the tank. Sieves have a mesh size of 250–300 microns. Common grave good at the cemetery in Nuštar were vessels (e.g. pots). Altogether 149 vessels were collected (Rapan Papeša, 2014, in press). Fortunately, 78

Sl. 1 Plan groblja s ucrtanim grobovima za makroarheobotaničke i mikroaheobotaničke analize (A. Rapan Papeša, 2014.)
Fig. 1 The plan of the cemetery with marked graves for macro- and micro-archeobotanical analysis (A. Rapan Papeša, 2014)

uzoraka, dok je deset uzoraka odabrano za fitolitske analize. Sljedeća tablica daje sažetak o ispitanom materijalu (tab. 2).

3.2. Metode makroarheobotaničke analize

Svi uzorci – koji su prikupljeni za makroarheobotaničke

of them were recovered with its infill in them.

To make the first step towards the understanding of plant-human interaction in Avar graves thirty samples were chosen and subjected to archaeobotanical analyses (Fig. 1); twenty for macro-archeobotanical and ten for micro-arche-

Br. / Nr.	Oznaka uzorka / Sample code	Karpologija / Carpology	Fitološke analize / Phytolith analysis	Opis groba / Description of the grave	Mjesto uzorkovanja / Origin of the sample
1.	G-5 (U=43)	☑	Ø	Grob konjanika s konjem / grave of a horseman and a horse	Između kostura / in-between the two skeletons
2.	G-7 (U=5)	☑	Ø	Grob žene (?) / grave of a female (?)	Ispod lubanje i gornjeg dijela prsišta / below the skull and upper part of the chest
3.	G-8 (PN=42)	Ø	☑	Grob muškarca / grave of a male	Smeđa, rukom rađena posuda (lonac), smještena uz lijevo koljeno / brown, hand-made vessel (pot), located next to the left knee
4.	G-10 (U=30)	☑	Ø	Grob djeteta / grave of an infant	Ispod zdjelice / below the pelvis
5.	G-18 (U=16)	☑	Ø	Grob odrasle osobe / grave of an adult	Ispod zdjelice i prsnog koša / below the pelvis and the chest
6.	G-20 (U=22)	☑	Ø	Grob odrasle osobe / grave of an adult	Ispod zdjelice i prsnog koša / below the pelvis and the chest
7.	G-20 (PN=226)	Ø	☑		Tamnosiva posuda (lonac) rađena na kolu, smještena uz desno stopalo / dark gray, wheel-thrown vessel (pot) located next to the right foot
8.	G-25 (U=17)	☑	Ø	Grob muškarca / grave of a male	Ispod zdjelice i prsnog koša / below the pelvis and the chest
9.	G-29 (U=24)	☑	Ø	Grob muškarca / grave of a male	Oko nogu / leg area
10.	G-32 (U=23)	☑	Ø	Grob muškarca / grave of a male	Ispod lubanje / below the skull
11.	G-34 (U=36)	☑	Ø	Grob muškarca / grave of a male	Ispod zdjelice i oko nogu / below the pelvis and the leg
12.	G-37 (U=37)	☑	Ø	Grob muškarca / grave of a male	Ispod lubanje i oko nogu / below the skull and the leg area
13.	G-37 (PN=354)	Ø	☑		Smeđa, rukom rađena posuda (lonac) smještena uz lijevo stopalo / brown, hand-made vessel (pot) located below and next to the left foot
14.	G-44 (U=55)	☑	Ø	Grob tri djeteta / grave of three infants	Zapuna groba / grave infill
15.	G-53 (U=49)	☑	Ø	Grob odrasle osobe / grave of an adult	Ispod zdjelice i oko nogu / below the pelvis and the leg
16.	G-78 (U=66)	☑	Ø	Grob odrasle osobe / grave of an adult	Ispod lubanje / below the skull
17.	G-84 (PN=940)	Ø	☑	Grob žene / grave of a female	Tamnosiva posuda (lonac) rađena na kolu, smještena na području stopala / dark gray, wheel-thrown vessel (pot) located at the feet area
18.	G-101 (PN=821)	Ø	☑	Grob muškarca / grave of a male	Smeđa, rukom rađena posuda (lonac) smještena uz lijevo koljeno / brown, hand-made vessel (pot) located next to the left knee
19.	G-104 (U=75)	☑	Ø	Grob žene / grave of a female	Ispod prsnog koša i lubanje / below chest and skull
20.	G-108 (U=84)	☑	Ø	Grob žene (?) / grave of a female (?)	Zapuna groba / grave infill
21.	G-122 (U=85)	☑	Ø	Grob žene / grave of a female	Ispod prsnog koša i lubanje / below chest and skull
22.	G-124 (PN=1065)	Ø	☑	Grob djeteta / grave of an infant	Smeđecrvenkasta posuda (lonac) rađena na kolu, smještena uz stopala / brown and reddish, wheel-thrown vessel (pot) located at the feet

23.	G-126 (U=86)	☑	Ø	Grob muškarca / grave of a male	Ispod zdjelice / below the pelvis
24.	G-130 (U=87)	☑	Ø	Grob žene / grave of a female	Ispod prsnog koša i lubanje / below chest and skull
25.	G-141 (U=89)	☑	Ø	Grob adolescent / grave of an adolescent	Zapuna groba / grave infill
26.	G-142 (PN=1249)	Ø	☑	Grob odrasle osobe / grave of an adult	Posuda (lonac) od žute keramike, smještena uz lijevo stopalo / yellow, wheel-thrown vessel (pot) located at the left foot
27.	G-144 (PN=1393)	Ø	☑	Grob žene / grave of a female	Smeđecrvenkasta rukom rađena posuda (lonac) smještena uz lijevo stopalo / brown and reddish, hand-made vessel (pot) located at the left foot
28.	G-165 (PN=1244)	Ø	☑	Grob muškarca (?) / grave of a male (?)	Tamnosiva posuda (lonac) rađena na kolu, smještena uz stopala / dark gray, wheel-thrown vessel (pot) located at the feet
29.	G-182 (PN=1348)	Ø	☑	Grob muškarca / grave of a male	Smeđecrvenkasta rukom rađena posuda (šalica) smještena uz desno stopalo / brown and reddish, hand-made vessel (cup) located at the right foot
30.	G-201 (U=113)	☑	Ø	Grob djeteta / grave of a child	Zapuna groba / grave infill

Tab. 2 Popis i detalji o uzorcima podvrgnutim arheobotaničkim analizama
Tab. 2 List and details of samples submitted for archaeobotanical analyses

analize – obrađeni su na lokalitetu tijekom istraživanja od strane stručnih djelatnika Gradskog muzeja Vinkovci. Organski ostaci lakših i težih plutajućih uzoraka podijeljeni su u različite skupine s binokularnim stereomikroskopom povećanja 20x. Uzorci za makroarheobotanička ispitivanja, kao što su plodovi, sjemenke, komadići ugljena, fragmenti stabljika i lišća obitelji trava (*Gramineae*), bili su razdvojeni prije procesa identifikacije. Tijekom pripreme uzorka i identifikacije korišten je binokularni stereomikroskop Olympus SZX7 s pričvršćenim digitalnim fotoaparatom Olympus DP25 s povećanjem između 20x i 40x. Identifikacija biljnih ostataka učinjena je pomoću moderne referentne zbirke relevantnih taksona,[7] te pomoću djela Brecher (1960), Schermann (1966), Radics (1998) i Cappers et al. (2006). Korov i druge divlje biljke grupirane su prema činjeničnim parametrima postavljenim prema Borhidijevom relativnom ekološkom sustavu pokazatelja (Horváth et al. 1995). Osim toga, koristile su se spoznaje o divljim biljkama kako opisuju Brombacher i Jacomet (1997: 220–279) te Maier (2001). Nomenklatura znanstvenih biljnih imena sorti prati Van Zeist (1984: 8–16), sažeti u modernim grupiranjima kod Zohary et al. (2012), dok se nomenklatura divljih biljaka daje u skladu s Király (2009).

3.3. Metode mikroarheobotaničke analize

Vađenje fitolita obavljeno je prema standardnom protobotanical. They were chosen in a way that they differ as much as possible: we've tried to get data for children, female and male burials, for hand-made, slow and fast wheel made pottery.

Altogether thirty samples were subjected to archaeobotanical analysis. Carpological examination was undertaken on twenty samples; whilst ten samples were selected for phytolith analysis. The following table gives a summary on the material examined during the study (Tab. 2).

3.2. Macro-archaeobotanical analysis methods

All the samples – that were collected for macro-archaeobotanical analysis – were processed on-site by the excavation professional staff members of the Municipial Museum Vinkovci (Gradski Muzej Vinkovci). The organic components of both the light and heavy fraction of the floated samples were sorted into different groups with a binocular stereomicroscope at a magnification of 20x. The items for macro-archaeobotanical examination, such as fruits, seeds, charcoal pieces, stem and leaf fragments of the *Gramineae* family, were separated prior to the identification process. During the sample preparation and identification, an Olympus SZX7 binocular stereomicroscope with an attached Olympus DP25 digital camera was used at a magnification ranging from 20x to 40x. Identification of the plant remains was done by using a modern reference collection of relevant taxa,[7] and by using the works of Brecher (1960), Scher-

7 Korištena je zbirka sjemenki i voća Laboratory of Applied Research, Hungarian National Museum, National Heritage Protection Centre (Budapest, Hungary).

7 Seed and fruit reference collection of the Laboratory of Applied Research, Hungarian National Museum, National Heritage Protection

kolu u nekoliko koraka (Pearsall 2000; Piperno 1988). Količina sirovine za uzorak uzimana je ravnomjerno u količini od 5,00 g. Uništavanje organske tvari tla (SOM) postiže se dodatkom 33% vodikova peroksida (cc. H_2O_2) u uzorcima. Svi se uzorci griju na pješčanoj kupelji najmanje 1,5 h s cc. H_2O_2. Pijesak iz uzoraka se odstranjuje pomoću mokrog prosijavanja uzoraka kroz mreže od 250 µm. Ovom koraku uslijedilo je razdvajanje gline u cilindričnim čašama za koje smo iskoristili gravitaciju taloženja na osnovi Stokesova zakona. Uzorci su osušeni i 0,5 g je izmjereno u epruvetu za centrifugiranje. Flotacija teških tekućina ponovljena je dvaput, a 2 ml supernatanta je kod svake flotacije uklonjeno pomoću Pasteurove pipete. Teška tekućina pripravljena je pomoću natrijeva polivolframata (SPT) i namještena na specifičnu težinu 2,35 g/cm3. Prikupljeni ekstrakti čišćeni su više puta kako bi uklonili SPT. Ekstrakti su osušeni na pješčanoj kupelji i uskladišten u glicerin u označenim plastičnim mikroepruvetama.

Fitolitski ekstrakti stavljeni su na staklo za mikroskopiranje i brojeni pod svjetlosnim mikroskopom pod povećanjem od 100 do 400x. Cilj je bio da se izbroji najmanje 100 komada prepoznatljivih zrna fitolita; međutim, mnogi su uzorci sadržavali fitolite u vrlo niskim koncentracijama, dakle to se nije moglo poduzeti u slučaju svakog uzorka. Izdvojeni fitolitski morfotipovi opisani su i nazvani prema Međunarodnom kodeksu za fitolitske nomenklature (ICPN 1,0) (Madella et al. 2005: 253–260).

Tijekom istraživanja prioritet je stavljen na taksonomsku identifikaciju fitolita. Načela na kojima su izgrađeni klasifikacijski sustavi pokrivaju tri glavna pristupa. Taksonomski klasifikacijski sustavi sastavljeni su od dobro definiranih morfotipova koji su isključivo vezani uz biljne taksone (npr. Twiss et al. 1969: 109–115; Korstanje, Babot 2007: 41–72). Oni se prije svega koriste u arheobotaničkim istraživanjima kada je glavni cilj da se identificiraju biljke na određenoj razini taksonomskog. U tipološkoj klasifikaciji sustava, izravna veza između fitolitskog morfotipa i biljnih taksona jest sekundarna. Morfotipovi su opisani prema njihovoj morfologiji (oblik, veličina, tekstura i sl.), a njihova uloga u pružanju informacija temelji se na predmetima unutar kojih se nalaze i skup koji čine (npr. Bertoldi de Pomar 1971: 317–328; Power-Jones 1992: 15–35; Bowdery 1998; 1999; Golyeva 2001a; 2001b). Klasifikacijski sustavi izraženi pojmom 'takso-tipološki' obično kombiniraju načela dvaju navedenih pristupa kako bi se povećao ishod informacija (Blinnikov 2005: 71–98). Referentna zbirka relevantnih taksona i njihovih preparacija[8] korištena je za određivanje anatomskog podrijetla i/ili identificiranje fitolita.

4. REZULTATI

4.1. Rezultati makroarheobotaničke analize

Ukupno je dvadeset uzoraka podvrgnuto makroarheobotaničkoj (karpološkoj) analizi. Nijedan od uzoraka nije dao velike količine ostataka sjemena ili plodova; općenito se za sve uzorke može reći da čine loše arheobotaničke cjeline.

8 Pohranjeni u Laboratory of Applied Research, Hungarian National Museum, National Heritage Protection Centre (Budapest, Hungary) i u Herbarium of Debrecen University.

mann (1966), Radics (1998) and Cappers et al. (2006). Weeds and other wild plants were grouped according to the actualistic parameters set up by Borhidi's relative ecological indicator system (Horváth et al. 1995). In addition we used knowledge on wild plants as described by Brombacher and Jacomet (1997: 220–279) and Maier (2001). The nomenclature of scientific plant names of the cultivars follows van Zeist (1984: 8–16), and the modern grouping summarised by Zohary et al. (2012), whilst the nomenclature of wild plants is given according to Király (2009).

3.3. Micro-archaeobotanical analysis methods

Phytolith recovery followed the standard multi-step protocol (Pearsall 2000; Piperno 1988). The amount of raw soil used for the recovery was uniformly 5.00 g. Destruction of the soil organic matter (SOM) was accomplished by adding 33% hydrogen-peroxide (cc. H_2O_2) to the samples. All samples were heated on a sand bath for at least 1.5 h with cc. H_2O_2. The sand fraction of the samples was removed by wet sieving the samples through a 250 µm mesh. This step was followed by clay separation in cylindrical beakers for which we utilised gravity sedimentation based on Stokes' law. Samples were dried and 0.5 g was measured to a centrifuge tube. The heavy liquid flotation was repeated twice, and 2 ml of the supernatant removed after each flotation with a Pasteur pipette. Heavy liquid was prepared of sodium-polytungstate (SPT) and adjusted to a specific gravity of 2.35 g/cm^3. The recovered extracts were cleaned multiple times to remove SPT. The extracts were dried on sand bath and stored in glycerine in labelled plastic micro tubes.

Phytolith extracts were mounted to microscope slides and counted under light microscope at a magnification of 100–400x. The aim was to count at least 100 pcs of identifiable phytolith grains, however many of the samples contained phytoliths in extremely low concentration, therefore this could not have been undertaken in the case of each and every sample. Disarticulated phytolith morphotypes were described and named according to the International Code for Phytolith Nomenclature (ICPN 1.0) (Madella et al. 2005: 253–260).

During the study, taxonomic phytolith identification was given a priority. The principles that classification systems are built on cover three major approaches. Taxonomic classification systems are built up of well-defined morphotypes those are exclusively associated with a plant taxon (e.g. Twiss et al. 1969: 109–115; Korstanje, Babot 2007: 41–72). These are primarily utilised in archaeobotanical studies, when the main aim is to identify plants at a given taxonomic level. In the typological classification systems, the direct link between phytolith morphotype and plant taxa is secondary. Morphotypes are described according to their morphology (shape, size, textures etc.), and their role in providing information is based on the media they are located within and the assemblage they form (e.g. Bertoldi de Pomar 1971: 317–328; Power-Jones 1992: 15–35; Bowdery 1998; 1999; Golyeva 2001a; 2001b). Classification systems denominated with the term 'taxo-typological' usually combine the

Centre (Budapest, Hungary) was used.

				1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
				G-5	G-7	G-10	G-18	G-20	G-25	G-29	G-32	G-34	G-37	G-44	G-53	G-78	G-104	G-108	G-122	G-126	G130	G-141	G-201
				U=43	U=5	U=30	U=16	U=22	U=17	U=24	U=23	U=36	U=37	U=55	U=49	U=66	U=75	U=84	U=85	U=86	U=87	U=89	U=113
				♂	♀	juv.	ad.	ad.	♂	♂	♀	♂	♂	juv.	ad.	ad.	♀	♀	♂	♂	♀	juv.	juv.
Latinski/znastveni naziv / Latin/Scientific name	**Hrvatski naziv / English name**	**Vrsta ostataka / Type of remain**	**Σ**																				
Žitarice / Cereals																							
cf. cereal	Žitarice / cereal	Ulomak pšena / caryopsis fragment	**89**					5					3			5	33			36	5	2	
cf. cerealia/food	Žitarice/ hrana / cereal/food	Ulomak pšena / caryopsis fragment	**31**	4			9		1		2	14		1									
Hordeum vulgare L.	Ječam / barley	Ulomak pšena / caryopsis fragment	**1**																	1			
Panicum miliaceum L.	Proso / broomcorn millet	Pšeno / caryopsis	**13**														6			7			
cf. *Secale cereale* (L.)	Raž / rye	Ulomak pšena / caryopsis fragment	**1**																	1			
Setaria italica (L.) P. Beauv.	Klipasti muhar / foxtail millet	Pšeno / caryopsis	**2**														2						
Triticum cf. *aestivum* (L.) subsp. a*estivum*	Pšenica / bread wheat	Ulomak pšena / caryopsis fragment	**2**																	1	1		
Triticum monococcum (L.) subsp. *monococcum / Triticum turgidum* (L.) subsp. *dicoccum* (Schrank) Thell.	Pšenica/pir / einkorn/ emmer	Ulomak pšena / caryopsis fragment	**1**													1							
		Međuzbroj / sub-total:	**140**	**4**	**0**	**0**	**9**	**5**	**1**	**0**	**2**	**14**	**3**	1	0	6	41	0	0	46	6	2	0
		Broj taksona / number of taxa:	**6**																				
Korov / Weeds																							
Chenopodium album L.	Bijela loboda / white goosefoot	Plod / fruit	**11**														1			10			

Digitaria sanguinalis (L.) Scop	Ljubičasta svračica / hairy crabgrass	Pšeno / caryopsis	**6**														2			4			
Setaria viridis (L.) P. Beauv./*Setaria verticillata* (L.) P. Beauv.	Zeleni muhar/pršljenasti muhar / green foxtail / bristly foxtail	Ulomak pšena / caryopsis fragment	**9**																	9			
		Međuzbroj / sub-total:	**26**	**0**	**0**	**0**	**0**	**0**	**0**	0	0	0	0	0	0	0	3	0	0	23	0	0	0
		Broj taksona / number of taxa:	**3**																				
Neodredivi ostaci / Not classified remains																							
cf. *Bromus* sp.	Stoklasa / brome grass	Ulomak pšena / caryopsis fragment	1									1											
Indet.	Neodredivo / unidentified		9										6				1	1					1
		Međuzbroj / sub-total:	**10**	**0**	**0**	**0**	**0**	**0**	**0**	0	0	1	6	0	0	0	1	1	0	0	0	0	1
		Broj taksona / number of taxa:	**1**																				
Ostaci hrane / Food remains																							
Spaljeni ostaci hrane / charred food remain	Hrana nalik kaši / mush-like food		**32**			1				10			20										1
Ostali ostaci / Other remains																							
Koža? / leather?															X								
Ulomci ljušture mekušaca / mollusc shell fragment				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mali komadi kosti / small bone fragment				X			X	X		X	X	X	X	X		X	X	X					
Kost ljudskog prsta prekrivena bakrenom korozijom / human finger bone covered with copper corrosion									X					X									
Ljudska kost (nakovanj) / human bone (human anvil (*incus*))																					X		
Ljudski zub / human teeth																		X					X
Ugljen / charcoal (small and fragmented)				2X	2X	2X	2X	2X	X	3X	2X	2X	5X		2X	3X	3X	2X	X	3X	3X	3X	5X
Šljaka? / slag of metal?					X																		

Perla / pearl (from bone or glass)																	X	X			X		
Kora? / bark?																							X
Ulomak zuba glodavca / tooth fragment of small rodent																							X
Moderno sjemenje/plodovi / modern seeds/fruits						4X	4X	2X	5X	2X	X	X	X	2X	X	X	X		5X	5X	2X	4X	X
Komadići kosti prekriveni bakrenom korozijom / small bone fragments covered with copper corrosion						X																	
Zakovica / rivet (copper?)						X																	
Ljuska jajeta / shell of egg																	X						
Ostali neprepoznati organski ostaci / other unidentified organic remains						X																	
Neprepoznati ostaci prekriveni hrđom / unidentified remains covered in rust						X								X			X						
				4	0	1	9	5	1	10	2	15	29	1	0	6	45	1	0	69	6	2	2
		Sveukupno / subtotal:	208																				
		Broj taksona / number of taxa:	10																				

Tab. 3 Rezultati makroarheobotaničke (karpološke) analize
Tab. 3 Results of the macro-archaeobotanical (carpological) analyses

Bilješke: X – iznimno malo; 2X – nekoliko; 3X – prosječno; 4X – obilno; 5X – iznimno obilno
Notes: X – extremely few; 2X – few; 3X – average; 4X abundant; 5X – extremely abundant

Pet uzoraka iz analiziranih dvadeset smatra se sterilnima[9] jer se u njima ne može identificirati arheobotaničke ostatke. Preostalih petnaest uzoraka dalo je 208 komada arheobotaničkih ostataka (tab. 3). Među njima se moglo identificirati šest različitih žitarica i tri različite vrste korova, ali taksoni koji bi se odnosili na divlje vrste u prirodnom okruženju u mjestu nisu otkriveni. Velika većina ostataka zrna (kariopsa) žitarica i dalje se ne može podijeliti na rodove, niti na razini vrste; međutim, spaljeni ostaci hrane u uzorcima mogu se odnositi na žitarice. Svi identificirani arheobotanički ostaci su spaljeni.

U arheobotaničkom skupu analiziranih uzoraka dominiraju neidentificirani fragmenti žitarica i ostaci hrane spremljene od žitarica. Žitarice čine 67,31% ukupnog skupa, dok je korov zastupljen sa 12,50%, a hrana sa preostalih 15.38% (sl. 2). Prepoznate žitarice (T. 1) predstavljene su ostacima prosa (*Panicum miliaceum* L.), pšenice (*Triticum aestivum* (L.) subsp. *Aestivum*), klipastog muhara (*Setaria italica* (L.) P . Beauv.), raži (*Secale cereale* L.), ječma (*Hordeum vulgare* L.) i po kariopama ostaci koji pripadaju piru (*Triticum monococcum* (L.) subsp. *monococcum*) ili pšenici (*Triticum turgidum* (L.) subsp. *dicoccum* (Schrank) Thell.) (sl. 3; tab. 3). Korov je zastupljen vrstama koje su u potpunosti česte na oranicama i područjima pod ljudskim djelovanjem, kao što su ceste, naselja ili jarci.

Ukupno je otkriveno 26 komada arheobotaničkih ostataka, odnosno biljaka, što čini 12,50% cjelokupnog uzorka (sl. 2). Otkriveni su ostaci bijele lobode/obične lobode (*Chenopodium album* L.) (11 kom), zelene muhare (*Setaria viridis* (L.) PB. / *Verticillata* (L.) R. et Sch.) (9 kom) i ljubičaste svračice/svrakonje (*Digitaria Polygonum* (L.) Scop.) (6 kom) (sl. 2; tab. 3; T. 1). Ostaci taksona prirodnog okruženja nisu uopće nađeni. Ukupno je identificirano 32 komada ostataka pougljenjene hrane koji su dio neke vrste kaše pripremljene od žitarica (tab. 3; T. 1). Tekstura ovih ostataka vrlo je porozna, oni su ravni i njihova površina je sjajna, što bi moglo upućivati na korištenje (životinjske?) masti tijekom pripreme ove vrste hrane. Kategorija žitarica/ostaci hrane (tab. 3) jest uspostavljena jer je u nekim slučajevima teško razlikovati iznimno fragmentirane kariope žitarica i ostatke hrane. Nije bilo moguće odlučiti predstavljaju li sekundarnu fragmentaciju kariopa žitarica ili pak predstavljaju li korak u obradi žitarica. No, u nekim slučajevima može postojati preklapanje.[10]

4.1.1. Katalog arheobotaničkih rezultata

G-5: U uzorcima prikupljenim iz groba konjanika i konja ukupno su nađena četiri komada ostataka hrane. Ostali ostaci podrazumijevaju ljuske mekušaca, školjke i ulomke kostiju, kao i nekoliko komada drvenog ugljena.

G-7: Uzorak prikupljen iz groba žene(?) nije pokazao nikakve arheobotaničke ostatke, ostali ostaci upućuju na ljuske mekušaca i komade drvenog ugljena, kao i nekoliko čestica koje su najvjerojatnije ostaci troske.

G-10: Uzorak prikupljen ispod zdjelice djeteta sadržavao je jedan komad hrane (kašu?). Ostali ostaci upućuju na ljuske mekušaca, školjke, slabo sačuvanih komada drvenog ugljeprinciples of the two abovementioned approaches in order to maximize information outcome (Blinnikov 2005: 71–98). A reference collection of relevant taxa and their preparations[8] were used to specify the anatomical origin and/or to identify phytoliths.

4. RESULTS

4.1. Results of the macro-archaeobotanical analysis

Altogether twenty samples were subjected to macro-archaeobotanical (carpological) analysis. None of the samples yielded high amounts of seed or fruit remains; in general all of them can be characterised by poor archaeobotanical assemblages. Five samples from the analysed twenty were considered sterile,[9] because no carpological remains could be identified in them. The remaining fifteen samples yielded 208 pcs of carpological remains (Tab. 3). Among these, six different cereal and three different weed species were identified, but taxa that would refer to wild species of the natural environment of the site were not detected. The vast majority of the cereal caryopsis remains neither could be identified on genera nor on species level, however charred food remains found in the samples could have been related to cereals. All of the identified archaeobotanical remains showed charred preservation.

The archaeobotanical assemblage of the analysed samples is dominated by unidentifiable cereal fragments and food remains of cereal origin. Cereals form 67.31% of the entire assemblage, whilst weeds 12.50% and food remains 15.38% (Fig. 2). The identifiable cereals (Pl. 1) are represented by the remains of broomcorn millet (*Panicum miliaceum* L.), bread wheat (*Triticum* cf. *aestivum* (L.) subsp. *aestivum*), foxtail millet (*Setaria italica* (L.) P. Beauv.), rye (*Secale cereale* L.), barley (*Hordeum vulgare* L.) and by a caryopsis remain which either belongs to einkorn (*Triticum monococcum* (L.) subsp. *monococcum*) or to emmer (*Triticum turgidum* (L.) subsp. *dicoccum* (Schrank) Thell.) (Fig. 3; Tab. 3).

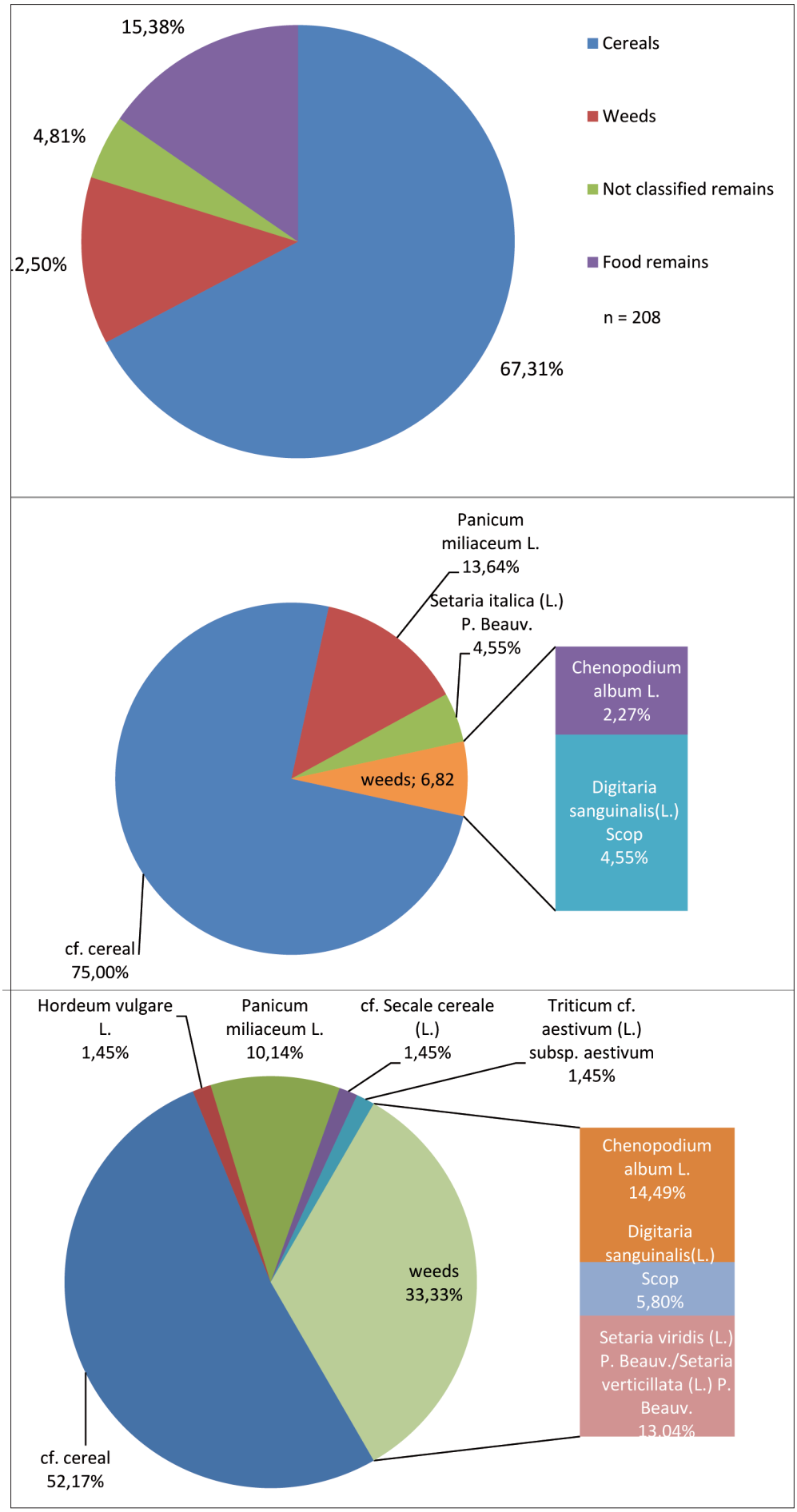
Altogether 26 pieces of archaeobotanical remains, respectively plants, were detected, which counts for the 12.50% of the entire assemblage (Fig. 2). Remains of white goosefoot (*Chenopodium album* L.) (11 pcs), green foxtail/bristly foxtail (*Setaria viridis* (L.) PB./*verticillata* (L.) R. et Sch.) (9 pcs) and hairy crabgrass (*Digitaria sanguinalis* (L.)Scop.) (6 pcs) were detected (Fig. 2; Tab. 3; Pl. 1). The weeds are represented by species that are common on plough-land, human-induced areas, such as roadsides, settlements or ditches. Remains of taxa of the natural environment were not found at all. Altogether 32 pieces of charred food remains identified as some kind of mush prepared of cereals were detected (Tab. 3; Pl. 1). The texture of these remains is highly porous, they are flat and their surface is shiny, which could point to the use of (animal?) fat during the preparation of these food types. The category of cerealia/food remain (Tab. 3) was set up, because in some of the cases it

9 Sterilni uzorci: G-7; G-53; G-122.

10 Npr. hrana nalik kaši.

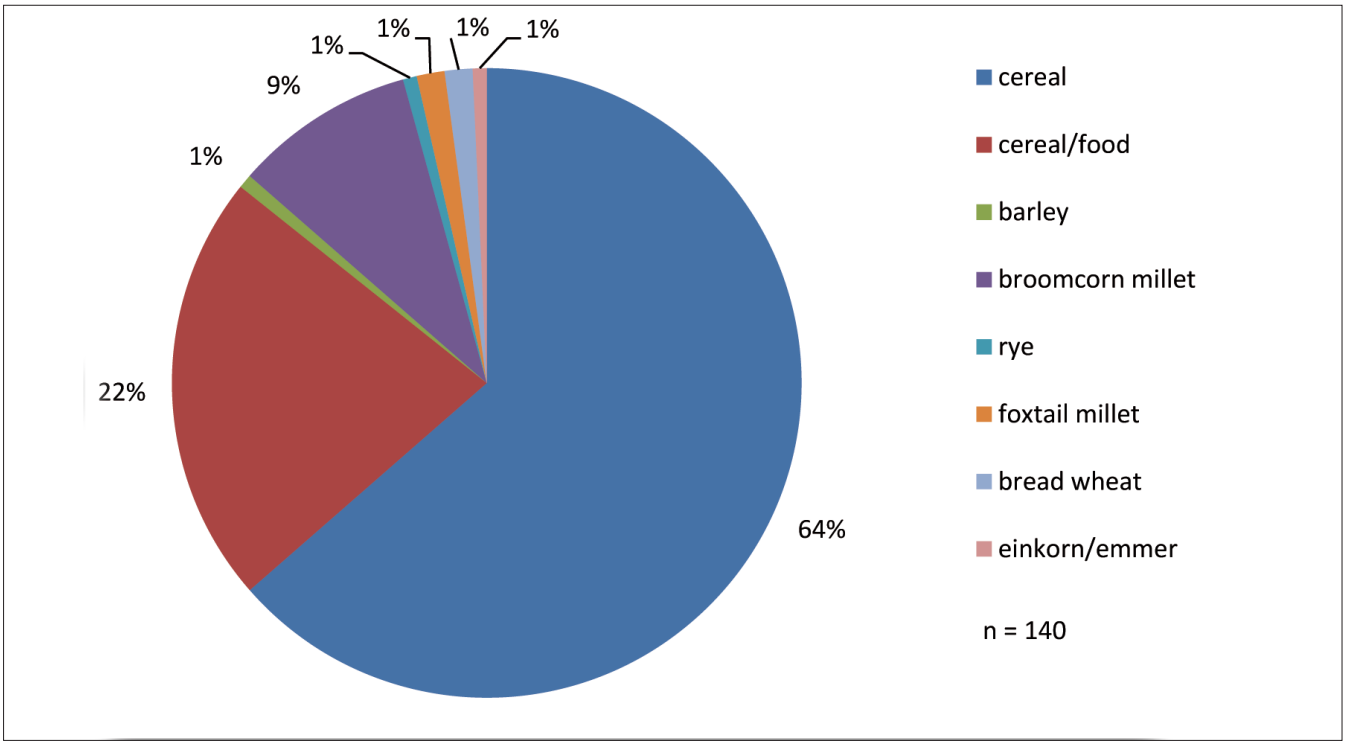
8 Stored at the Laboratory of Applied Research, Hungarian National Museum, National Heritage Protection Centre (Budapest, Hungary) and in the Herbarium of Debrecen University.

9 Sterile samples: G-7; G-53; G-122.



Sl. 2 Raspodjela različitih biljnih skupina u arheobotaničkom uzorku, G-104 i G-126)

Fig. 2 Distribution of the different plant groups within the archaeobotanical assemblage, G-104 and G-126



Sl. 3 Raspodjela žitarica i ostataka povezanih sa žitaricama
Fig. 3 Distribution of the cereals and the cereal related remains

na, velike količine modernih sjemenki/plodova, komade kostiju prekrivenih bakrenom korozijom, bakrenu zakovicu i nekoliko neidentificiranih ostataka obuhvaćenih hrđom.

G-18: Uzorci prikupljeni ispod zdjelice i prsnog koša odrasle osobe sadržavaju devet komada kariopa žitarica i ostataka hrane povezanih sa žitaricama. Ostali ostaci podrazumijevaju ljuske mekušaca i komade kostiju, nekoliko čestica ugljena, moderne sjemenke/plodove u velikim količinama.

G-20: Uzorci prikupljeni ispod zdjelice i prsnog koša odrasle osobe žitarica dali su pet komada fragmentiranih ostataka žitarica. Ostali ostaci upućuju na ljuske mekušaca i male komadiće kosti, kao i moderne sjemenke/plodove.

G-25: Uzorci prikupljeni ispod zdjelice i prsnog koša muškarca dali su jedan fragmentirani nalaz žitarica. Ostali ostaci upućuju na ljuske mekušaca i fragmente ljudske kosti prsta. Potonji je pokriven bakrenom korozijom. Moderne sjemenke/plodovi također su otkriveni u velikim količinama.

G-29: Uzorci prikupljeni ispod nogu muškarca sadržavali su deset komada ostataka hrane. Ostali ostaci upućuju na ljuske mekušaca i male komade kostiju, kao i komade drvenog ugljena u prosječnim količinama. Otkriveno je i nekoliko primjeraka suvremenih sjemenki/plodova.

G-32: Uzorci prikupljeni ispod lubanje ženske osobe sadržavaju dva komada žitarica/ostataka hrane. Ostali ostaci podrazumijevaju ljuske mekušaca i malih komada kostiju, kao i nekoliko čestica ugljena, dok su iznimno rijetko otkriveni primjerci suvremenih sjemenki/plodova.

G-34: Uzorci prikupljeni ispod zdjelice i nogu muškarca sadržavali su 14 komada žitarica/ostataka hrane, kao i slabo očuvane kariope trave vrste stoklasa ili ovsik (usp. *Bromus* sp.). Ostali ostaci podrazumijevaju ljuske mekušaca i male komade kostiju, kao i nekoliko čestica ugljena, dok su iznimno rijetko otkriveni primjerci suvremenih sjemenki/plo-

was difficult to distinguish between extremely fragmented cereal caryopsis and food remains. It was not possible to decide whether these represent secondary fragmentation of cereal caryopses or they represent a given step of cereal processing. However, an overlap may exist in some of the cases.[10]

4.1.1. Catalogue of the archaeobotanical results

G-5: In the sample collected from the grave of a horseman and his horse altogether 4 pcs of food remains were found. Other remains imply mollusc shell and bone fragments, as well as few charcoal pieces.

G-7: The sample collected from the grave of a female (?) did not yield any carpological remains; other remains imply mollusc shell and charcoal fragments, as well as a few particles, which are probably slag remains.

G-10: The sample collected from below the pelvis of an infant contained 1 pc of food remain (mush?). Other remains imply mollusc shells, poorly preserved charcoal fragments, high amounts of modern seeds/fruits, bone fragments covered with copper corrosion, a copper rivet and a few unidentified remains covered in rust.

G-18: The sample collected below the pelvis and the chest of an adult contained 9 pcs of poorly preserved and fragmented cereal caryopses and cereal related food remains. Other remains imply mollusc shell and small bone fragments, a few charcoal particles, modern seeds/fruits in high amounts.

G-20: The sample collected below the pelvis and the chest of an adult individual yielded 5 pcs of fragmented cereal remains. Other remains imply mollusc shell and small bone fragments, as well as modern seeds/fruits.

10 e.g. mush like foods or bulgur.

dova.

G-37: Uzorci prikupljeni ispod lubanje i nogu muškarca sadržavali su tri komada fragmenata žitarica i šest komada ostataka hrane. Ostali ostaci podrazumijevaju ljuske mekušaca i male komade kostiju, kao i iznimno velike količine ugljena, a vrlo malo primjeraka modernih sjemenki/plodova.

G-44: Uzorak prikupljen u zapuni groba tri djeteta. Samo jedan komad žitarica/ostataka hrane mogao je biti otkriven. Ostali ostaci podrazumijevaju oklop mekušaca i male komade kostiju. Otkrivene su ostaci ljudskog prsta prekrivenog bakrenom korozijom, kao i nekoliko primjeraka modernih sjemenki/plodova.

G-53: Uzorci prikupljeni ispod zdjelice i nogu odrasle osobe nisu dali ikakve arheobotaničke ostatke, stoga se smatraju sterilnim. Ostali ostaci podrazumijevaju kožne dijelove, mekušce i nekoliko ostataka ugljena, kao i iznimno malo primjeraka suvremenih sjemenki/plodova.

G-78: Uzorci prikupljeni ispod lubanje odrasle osobe sadržavali su fragmente pet komada kariopa žitarica i jedan komad kariopa koji može biti ili identificiraju kao *T. dicoccum* i *T. monococcum*. Ostali ostaci upućuju na ljuske mekušaca i mali komadići kosti, kao i prosječne količine ugljena i nekoliko primjeraka modernih sjemenki/plodova.

G-104: Uzorci prikupljeni ispod prsa i lubanje žene u ispitivanim uzorcima smatraju se za jedan od najbogatijih skupova. Uz prisutnost 33 komada fragmenata žitarica, moglo se identificirati šest komada prosa i dva komada kariopa klipastog muhara. Korovi su zastupljeni u ovom uzorku s bijelom lobodom i ljubičastom svračicom. Ostaci hrane uopće nisu otkriveni. Ostali ostaci upućuju na ljuske mekušaca i male komadiće kosti, kao i prosječnu količinu ugljena i iznimno malo primjeraka modernih sjemenki/plodova. Dokazali smo i prisutnost perli i ljuski jaja u ovom uzorku.

G-108: Ovaj uzorak potječe iz zapune groba; međutim, mora se naglasiti da je ovaj ukop sadržavao priloge žene, ali kosti nisu sačuvane. S arheobotaničkog stajališta uzorak je sterilan jer je samo jedan komad izrazito fragmentiranog biljnog ostatka mogao biti identificiran. Ostali ostaci podrazumijevaju oklop mekušaca i male komade kostiju, kao i ljudske zube, perle i ugljen u manjim količinama.

G-122: Prikupljeni uzorak ispod lubanje i grudi žene nije dao ikakve arheobotaničke ostatke, stoga se smatra sterilnim. Ostali ostaci podrazumijevaju ljuske mekušaca i vrlo malo ostataka ugljena, kao i moderne sjemenke/plodove u iznimno visokim količinama.

G-126: Ovaj uzorak potječe iz područja zdjelice muškarca i drži se za najrazličitiji uzorak u smislu i ostataka i vrsta. U uzorku prevladavaju nalazi žitarica, i to jako fragmentirane kariope žitarica (36 komada), kariope prosa (7 kom), ječma (1 kom), kao i raži (1 kom). Korov je zastupljen bijelom lobodom (10 komada), sjemenkama zelene muhare (9 kom) i ljubičaste svračice (4 kom). Ostali ostaci upućuju na ljušture mekušaca i ugljen u prosječnim količinama, kao i moderne sjemenke/plodove u iznimno visokim količinama.

G-130: Prikupljeni uzorak ispod lubanje i prsa žene dao je pet komada vrlo fragmentiranih i neidentificiranih kariopa žitarica i jedan komad kariopa pšenice. Ostali ostaci upu-

G-25: The sample collected below the pelvis and the chest of a male individual yielded a single fragmented cereal find. Other remains imply mollusc shell and human finger bone fragments. The latter is covered by copper corrosion. Modern seeds/fruits were also detected in high amounts.

G-29: The sample collected below the leg of a male individual contained 10 pcs of food remains. Other remains imply mollusc shell and small bone fragments, as well as charcoal fragment in average amount. Few specimens of modern seeds/fruits were also detected.

G-32: The sample collected below the skull of a female individual contained 2 pcs of cereal/food remains fragment. Other remains imply mollusc shell and small bone fragments, as well as few charcoal particles, whilst extremely few specimens of modern seeds/fruits were detected.

G-34: The sample collected below the pelvis and the leg of a male individual contained 14 pcs of cereal/food remain fragments, as well as poorly preserved caryopsis of a brome grass species (cf. *Bromus* sp.). Other remains imply mollusc shell and small bone fragments, as well as few charcoal particles, whilst extremely few specimens of modern seeds/fruits were detected.

G-37: The sample collected below the skull and the leg of a male individual contained 3 pcs of cereal fragments and 6 pcs of food remains. Other remains imply mollusc shell and small bone fragments, as well as extremely high amounts of charcoal, and extremely few modern seeds/fruits specimens.

G-44: The sample derives from the general infill of the grave of three infants. Only 1 pc of cereal/food remain could have been detected. Other remains imply mollusc shell and small bone fragments. Bone remains of human finger covered with copper corrosion, as well as few modern seeds/fruits specimens were also detected.

G-53: The sample collected below the pelvis and the leg of an adult individual did not yield any carpological remains, therefore it was considered sterile. Other remains imply possible leather fragments, mollusc and few charcoal remains, as well as extremely few modern seeds/fruits specimens.

G-78: The sample collected below the skull of an adult individual contained 5 pcs of cereal fragments and 1 pc of caryopsis, which can either be identified as einkorn or emmer. Other remains imply mollusc shell and small bone fragments, as well as average amounts of charcoal and extremely few modern seeds/fruits specimens.

G-104: The sample collected below the chest and skull of a female individual was considered as one of the richest samples in the examined assemblage. Besides the presence of 33 pcs of cereal fragments, 6 pcs of millet and 2 pcs of foxtail millet caryopsis could have been identified. The weeds are represented in this sample by the white goosefoot and the hairy crabgrass. Food remains were not detected at all. Other remains imply mollusc shell and small bone fragments, as well as average amount of charcoal and extremely few modern seeds/fruits specimens. We could prove the presence of both pearls and eggshells in this sample.

G-108: This sample derives from the general infill of the grave; however it must be noted that this feature only contained grave goods of a female individual, but no bones were preserved. From the carpological point of view the sample is sterile, since only 1 pc of extremely fragmented

ćuju na fragmente ljuske školjkaša, ostatak kosti nakovnja (*incus*) (!), prosječne količine ugljena, perle i manje količine modernih sjemenki/plodova.

G-141: Uzorak prikupljen u zapuni groba adolescenta. Ispitivanje uzorka rezultiralo je s dva komada vrlo fragmentiranih i slabo sačuvanih ostataka žitarica. Ostali ostaci upućuju na fragmente ljuske mekušaca, male čestice ugljena u prosječnim količinama, kao i manje količine modernih sjemenki/plodova.

G-201: Uzorak prikupljen u zapuni groba djeteta smatra se sterilnim jer nema arheobotaničkih ostataka. Ostali ostaci upućuju na fragmente ljuske mekušaca, ljudske zube, male čestice ugljena u iznimno visokim količinama, ostatke zubi glodavaca (vjerojatno moderna onečišćenja), vjerojatno fragment kore i moderne sjemenke/plodove u manjim količinama.

4.2. Rezultati mikroarheobotaničke analize

Ukupno je deset uzoraka podvrgnuto analizi fitolita (tab. 4). Unatoč višestrukom i ponovljenom skeniranju uzoraka, u većini njih uopće nisu nađeni fitoliti. U slučaju tih uzoraka (PN = 226; PN = 354; PN = 1348) ponovili smo analize dvaput kako bismo isključiti bilo koji tehnički kvar. Nažalost, ponavljanje analiza i skeniranje uzoraka nisu dali pozitivan rezultat. U svjetlu gore navedenog, većinu uzoraka smatra se sterilnom. Samo dva uzorka (PN = 1065; PN = 1393) sadržavala su čestice biljnih opala u većim količinama. Analiza uzorka PN = 1065 koji potječe iz smeđecrvenkaste posude rađene na sporom lončarskom kolu nađene u grobu djeteta, pokazala je trinaest različitih fitolitskih morfotipova (sl. 5). Općenito, u uzorku prevladava prisutnost epidermalnih dugih stanica koje su nespecifični, opći pokazatelji trave. Oni formiraju stabljiku, list, a dijelom i cvijet travnatih vrsta. Najveća učestalost izmjerena je za kružne SC morfotipove koji su epidermalne kratke stanice koje se proizvode u listovima, cvijetu i listićima trava (*Graminae*) i žitarica. Povrh toga, u uzorku su zastupljene i žitarice iznimno slabim signalima produljenih dendritskih LC morfotipova. Ove duguljaste stanice fitolitskog morfotipa proizvodi se u *glumes, paleas i lema* vrstama žitarica, dakle, njihova pojava izravna je veza prisutnosti žitarica u uzorku, međutim iznimno slaba. Sveukupna distribucija morfotipova u uzorku nije specifična; vjerojatnije predstavlja mješavinu onečišćenja okoliša i dijelom učinak izazvan ljudskim djelovanjem. Potonji se očituje u velikom broju kružnih SC i prisutnosti nekoliko duguljastih dendritskih LC morfotipova. Vrlo sličan uzorak može se uočiti u slučaju uzorka PN = 1393 (sl. 4), ali mora biti navedeno da je izravna poveznica sa morfotipovima žitarica, kao što su duguljasti dendritski LC, nije dio spektra. Osim dvaju gore navedenih uzoraka, jako izgrizen duguljasti dendritski LC morfotipovi, pokazatelji žitarica, pronađeni su u uzorku PN = 821 i PN = 1244. Pojava tih morfotipova upućuje na prisutnost ljuski žitarica u ispitivanim posudama, iako je njihov signal prilično slab.

4.3. Neke ključne identifikacije

Osim uzorka iz G-108 (U = 84), botanički ostaci klasificirani kao moderne i novije sjemenke pronađeni su u ispitivavegetal remain could have been identified. Other remains imply mollusc shell and small bone fragments, as well as human teeth, pearls and charcoal in fewer amounts.

G-122: The sample collected below the skull and the chest area of a female individual did not yield any carpological remains, therefore it is considered sterile. Other remains imply mollusc shell and extremely few charcoal remains, as well as modern seeds/fruits in extremely high amounts.

G-126: This sample derives from the pelvis area of a male individual and it is considered as the most diverse sample both in terms of remain types and species. The cereal assemblage of the sample is predominated by highly fragmented cereal caryopses (36 pcs). Caryopses of broomcorn millet (7 pcs), that of barley (1 pc), as well as of rye (1 pc) were detected. The weeds are represented by the white goosefoot (10 pcs), seeds of green foxtail/bristly foxtail (9 pcs) and hairy crabgrass (4 pcs). Other remains imply mollusc shell and charcoal remains in average amounts, as well as modern seeds/fruits in extremely high amounts.

G-130: The sample collected below the skull and the chest of a female individual yielded 5 pcs of highly fragmented unidentifiable cereal caryopses and 1 pc of bread wheat caryopsis. Other remains imply mollusc shell fragments, a human anvil (*incus*) remain (!), average amounts of charcoal, pearls and fewer amounts of modern seeds/fruits.

G-141: The sample derives from the general infill of the grave of an adolescent individual. The examination of the sample yielded 2 pcs of highly fragmented and poorly preserved cereal remains. Other remains imply mollusc shell fragments, small charcoal particles in average amounts, as well as fewer amounts of modern seeds/fruits.

G-201: The sample, which derives from the general infill of the grave of a child was considered sterile, since no carpological remains could have been detected. Other remains imply mollusc shell fragments, human teeth, small charcoal particles in extremely high amounts, teeth remains of rodents (probably modern contamination), a probable bark fragment and modern seeds/fruits in fewer amounts.

4.2. Results of the micro-archaeobotanical analysis

Altogether ten samples were subjected to phytolith analysis (Tab. 4). Despite the multiple and repetitive scanning of the samples, most of them did not yield phytoliths at all. In the case of these samples (PN = 226; PN = 354; PN = 1348) we have repeated the recovery two times to exclude any technical failure. Unfortunately the repetitive recovery and scanning of the samples did not yield positive results either. In the light of the aboven mentioned, most of the samples are considered sterile. Only two samples (PN = 1065; PN = 1393) yielded plant opal particles in higher amounts. The analysis of sample PN = 1065, which derives from a brown and reddish, wheel-thrown vessel recovered in the grave of an infant yielded thirteen different phytolith morphotypes (Fig. 5). In general the sample is predominated by the presence of epidermal long cells, which are non-specific, general grass indicators. They are formed in the stem, leaf and partly in the inflorescence of Gramineae species. The highest frequency was measured for the rondel SC morphotype, which is an epidermal short cell produced in the leaves, as well as in the inflorescence bracts of grasses (Gramineae) and also cereals. Moreover, the cereals are represented by the extremely weak signal of the

	Fitolitski morfotipovi / Phytolith morphotypes (ICPN 1.0 descriptors)																	
Oznaka uzorka / Sample code	rondel SC	saddle SC	bilobate SC	cuneiform psilate bulliform cell	paralellepipedal psilate bulliform cell	elongate smooth psilate LC	elongate sinuate LC	elongate polylobate psilate LC	elongate echinate LC	elongate dendritic LC	trapeziform elongate sinuate LC	trapeziform elongate polylobate smooth LC	lanceolate psilate T	lanceolate T (short type)	acicular psilate T	**ukupno / total (n)**	**ukupno / total (p)**	sponge spicule	diatom
G-8 (PN=42)	1	1		1		5			1				2	1		**12**	**7**	3	
G-20 (PN=226)																**0**	**0**		
G-37 (PN=354)				1												**1**	**1**		
G-84 (PN=940)																**0**	**0**		
G-101 (PN=821)	1		1			9	1		3	1(?)	6	1		2		**24**	**8**		
G-124 (PN=1065)	56	6	4		4	24	4	2	8	2	6	2	8	8		**134**	**13**		1
G-142 (PN=1249)			1		1	5			5							**12**	**4**	2	
G-144 (PN=1393)	48	4	14	4		18	2		2		2	2	4	6	2	**108**	**12**		
G-165 (PN=1244)	1			1	1	5				1(?)			2			**10**	**5**		
G-182 (PN=1348)	1					1										**2**	**2**		

Tab. 4 Rezultati fitoloških analiza
Tab. 4 Results of the phytolith analysis

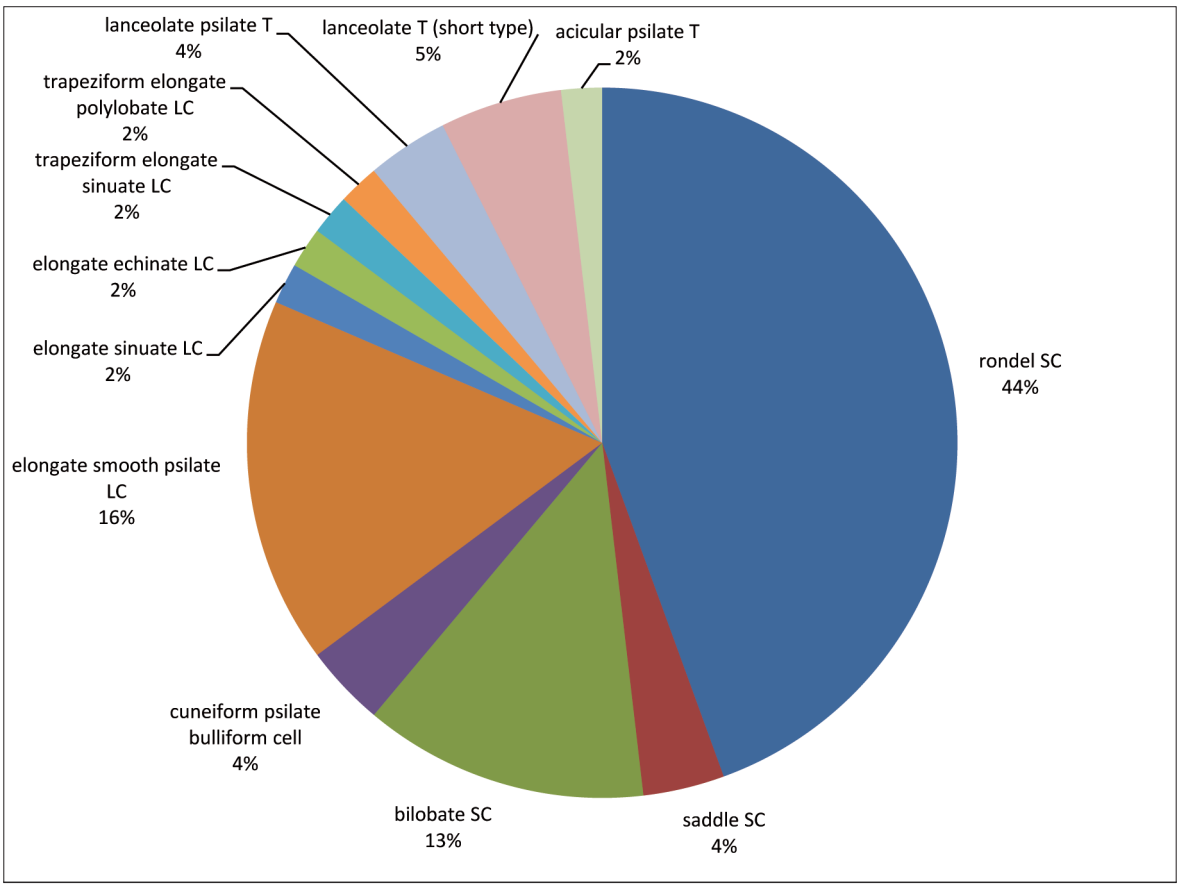
nim makroarheobotaničkim uzorcima. U nekim su slučajevima koncentrirani u uzorcima u većim količinama (tab. 3). Najbrojnija vrsta je abdovina/bazga (*Sambucus ebulus* L.), čije su koštunice u nekim od uzoraka pronađene u velikim količinama. Većina arheobotaničkog materijala pokazuje spaljene ostatke, dok se fragmenti i ostaci ovih koštunica čine modernim. Međutim, vrlo je teško izdvojiti mineralizirane tipove očuvanosti koji bi smjestili ove ostatke u arheobotaničku evidenciju. S botaničkog gledišta, može se zamisliti da su plodovi bazge korišteni kao lijekovi jer imaju značajan učinak na povraćanje te laksativni učinak (Shokrzadeh, Saeedi Saravi 2010: 95–103; Nejad et al. 2013: 284–289). Ipak, potrebno je istaknuti da su u većim količinama plodovi ove vrste otrovni i mogu čak dovesti do smrti. Navedene bi činjenice otvorile širok spektar arheobotaničkih i arheoloških tumačenja; međutim, ovom tumačenju mora se pristupiti s pozornošću jer očuvanost i raspodjela ostataka ne naglašava njihovo istodobno podrijetlo.

Nakon preciznijeg ispitivanja koštunica, na kraju smo zaključili da su one najvjerojatnije novo onečišćenje. U nekoliko grobova (G-29 (U = 24); G-44 (U = 55); G-53 (U = 49); G-122 (U = 85), G-201 (U = 113)) također su pronađene moderne sjemenke i plodovi drugih vrsta (njivski vijušac/povijajuća heljda/crno-slak – *Fallopia Convolvulus* L., oputina – *Polygonum aviculare* L., breza – *Betula* sp., bijela loboda – *Chenopodium album* L., štir/rumenika – *Amaranthus* sp.).

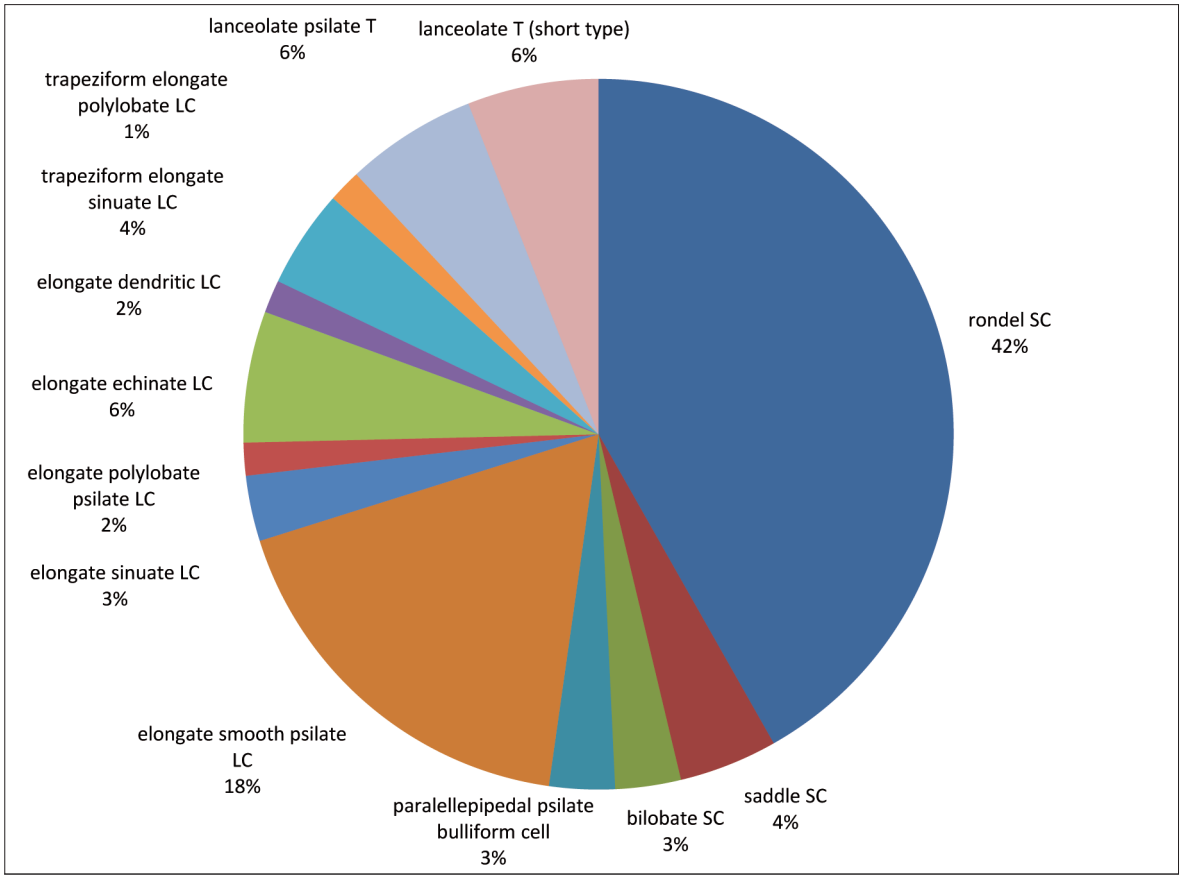
elongate dendritic LC morphotype in the sample. This long cell phytolith morphotype is produced in the glumes, paleas and lemmas of cereal species, therefore its appearance is a direct link to the presence of cereal remains, however an extremely weak one. In overall the samples morphotype distribution is not specific, it is likely that it represents a mixture of environmental background contamination and partly a human-induced effect. The latter is manifested in the high proportion of rondel SC and the presence of a few elongate dendritic LC morphotypes. A very similar pattern could have been observed in the case of sample PN = 1393 (Fig. 4), however it must be noted that directly cereal related morphotypes, such as the elongate dendritic LC, are not part of the spectra. Besides the two above mentioned samples, strongly corroded elongate dendritic LC morphotypes, so indicators of cereals, were found in sample PN = 821 and PN = 1244. The occurrence of these morphotypes point to the presence of cereal husks in the examined vessels, though their signal is pretty weak.

4.3. Some critical identifications

Except for sample G-108 (U = 84) botanical remains classified as modern or recent seeds were found in the examined macro-archaeobotanical samples. In some of the cases they concentrated in the samples in higher amounts (Tab. 3). The most abundant species was danewort (*Sambucus ebulus* L.), of which drupes were found in high amounts in some of the samples. The majority of the archaeobotanical



Sl. 4 Raspodjela morfotipova fitolita u uzorku G-144 (PN = 1393)
Fig. 4 Phytolith morphotype distribution of sample G-144 (PN = 1393)



Sl. 5 Raspodjela morfotipova fitolita u uzorku G-124 (PN = 1065)
Fig. 5 Phytolith morphotype distribution of sample G-124 (PN = 1065)

Ovi potonji ostaci svi su bez sumnje moderna kontaminacija uzoraka. Sjemenke, plodovi i koštunice klasificirane kao ostaci modernih biljaka pronađeni su svuda u grobovima, nisu bili koncentrirati na određenom mjestu. U slučaju da je bazga korištena kao lijek prije smrti pojedinca, ostaci koštunica trebali bi biti koncentrirani u želucu ili području zdjelice. Umjesto toga, nađeni su pod nogama i u mnogim slučajevima ispod glave, što, čini se, ne naglašava njihovu upotrebu u medicinske svrhe. Štoviše, ako su ušli u želudac i crijeva, proces probave trebao je olakšati proces uništenja ostataka. U tom slučaju, koštunice u tako dobrom stanju nisu mogle biti pronađene.

Još jedan fenomen koji daje uvid u problematiku koncentracija koštunice bazge jest navika gliste (npr. Lumbricina) da skuplja bazgu, zovu i drugo voće u tlu (Curry, Schmidt 2007: 463–477; Regnier et al. 2008: 1621–1629; Gyulai 2010). Poznato je da kišna glista prikuplja različite sjemenke zbog krmne svrhe i to bi moglo dovesti do povećane koncentracije sjemena u tlu. Na osnovi gore navedenih primjedbi i informacija smatramo koštunice bazge modernom kontaminacijom i stoga ih ne uključujemo u arheobotaničku evidenciju.

5. RASPRAVA

Svi uzorci prikupljeni na avarodobnom groblju u Nuštru proizlaze iz očitih antropogenih konteksta (grobova i posuda), dakle, ne može ih se priznati kao (čiste) okolišne pokazatelje; pa ipak, mogli bismo razmotriti neke od fitolitskih morfotipova i spektre morfotipova u uzorcima PN = 1065 i PN = 1393 kao neizravne okolišne pokazatelje. Nažalost, makroarheobotanički ostaci vrsta koje izravno pružaju ekološke informacije o suvremenom okruženju nisu otkrivene u ispitivanom uzorku.

Oba prethodno spomenuta fitolitska uzorka sadrže morfotipove koje se može procijeniti kroz različite pristupe klasifikaciji. Ako uzmemo u obzir ekološki klasifikacijski sustav Alexandre A. Golyeve (Golyeva 1997: 15–22; 2001b; 2007: 196–201), možemo doći do zaključka da uzorci predstavljaju okoliš u kojem dominira stepa. To je naglašeno i prisutnošću i dominacijom kružnih SC morfotipova. Rezultati proučavanja fitolita provedenih na tipičnim vrstama tla Mađarske (Pető 2010; 2013: 149–161) također mogu pružiti dodatne informacije o svojstvima okoliša u fitolitskim uzorcima. Možemo procijeniti ove uzorke temeljem sustavnog istraživanja provedenog na mađarskim profilima tla. Pokazano je da se omjer kružnih SC i izduljenih glatkih psilate LC morfotipova odnosi na razvoj tla tipa crnica i povijest vegetacije koja se može povezati s procesom oblikovanja stepa (Pető 2010; 2013: 149–161). Vrlo slab signal šumske vegetacije naznačen je prisutnošću kopljastog psilata T, kopljastog (kratkog tipa) T i trapezoidnoga izduženog višelatičastog LC morfotipa. Međutim, mora se uzeti u obzir da bi ti okolišni signali mogli biti rezultat svjesnoga ljudskog djelovanja, a u tom smislu iznimno visok postotak kružnih SC možda nije u potpunosti okolišni. Potonje se ogleda u pojavi izduženih dendritskih LC morfotipova koji se vezuju uz žitarice, u više uzoraka.

Pojava fitolita povezanih sa žitaricama u ispitivanim

material shows charred preservation, whilst these drupe fragments and remains seem to be modern. However, it is extremely difficult to sort out mineralised preservation types, which would place these remains in the archaeobotanical record. From the botanical point of view, it can be imagined that fruits of the danewort were used as medicines, since they have significant emetic and laxative effect (Shokrzadeh, Saeedi Saravi 2010: 95–103; Nejad et al. 2013: 284–289). Still, it must be noted that in bigger amounts the fruits of this species is toxic and may even lead to death. The aforementioned facts would open up broad archaeobotanical and archaeological interpretations; however this interpretation must be handled with care, since the preservation and distribution of the remains do not underline their contemporaneous origin.

After a more precise examination of the drupes we finally concluded that they are most likely to be recent contaminations. In a few graves (G-29 (U = 24); G-44 (U = 55); G-53 (U = 49); G-122 (U = 85), G-201 (U = 113)) modern seeds and fruits of other species were also found (black-bindweed – *Fallopia convolvulus* L.*,* common knotgrass – *Polygonum aviculare* L., birch – *Betula* sp., white goosefoot – *Chenopodium album* L., amaranth – *Amaranthus* sp.). These later remains are all undoubtedly modern contaminations in the samples. Seeds, fruits and drupes classified as modern vegetal remains were found all over the graves, they do not concentrate at any locations. In case the danewort was used as a medicine before the death of the individuals, the drupe remains should have been concentrated under the stomach or the pelvis area. Instead of this, these were found under the leg and in many cases under the head, which does not seem to underline its use as a medicine. Moreover, if they have entered the stomach and the intestines, the digestion process should have facilitated the destruction of the remains. In this case drupes in such good conditions could not have been found.

Another phenomenon that gives an insight to the problem of danewort drupe concentrations is the habit of earthworms (e.g. Lumbricina), which gather danewort, elder and other fruits in the soils (Curry, Schmidt 2007: 463–477; Regnier et al. 2008: 1621–1629; Gyulai 2010). It is known that *Lumbricus terrestris* collects different seeds due to foraging purposes and this might result in increased seed concentration in the soil. Based on the abovementioned observations and information we consider the danewort drupe presence as modern contamination and therefore did not include it in the archaeobotanical record.

5. DISCUSSION

All of the samples collected at the Avar Age cemetery of Nuštar derive from clearly anthropogenic contexts (graves and vessels), therefore they cannot be acknowledged as (pure) environmental indicators; still we might consider some of the phytolith morphotypes and the morphotype spectra of sample PN = 1065 and PN = 1393 as indirect indicators for the environment. Unfortunately macro-archaeobotanical remains of species that would directly provide ecological information on the contemporaneous environment were not detected in the examined assemblage.

Both of the aforementioned phytolith samples bear morphotypes, which can be assessed through different classification approaches. If we consider the ecological classi-

uzorcima otvara pitanje uzgoja i korištenje biljaka od populacije koja se ukopavala na groblju. Rijetki nalazi korova na lokalitetu odnose se na prisutnost oranice ili barem na kontaminirane zalihe žitarica. Zanimljivo je napomenuti da su sve tri vrste korova cvijet, koji se oprašuje i čije sjemenke sazrijevaju krajem ljeta i sredinom jeseni (*Digitaria sanguinalis* (L.) Scop.: srpanj–studeni, *Chenopodium album* (L.): lipanj–studeni, *Setaria viridis* (L.) PB./*verticillata* (L.) R. et Sch.: srpanj–rujan). Budući da su te vrste korova pronađene u grobovima G-104 i G-126, možemo pretpostaviti da se sahrana tih pojedinaca odvijala za vrijeme jeseni. Ove vrste dio su korova koji prati žitarice bez obzira na to tko – Avari ili netko drugi (?) – je žeo žitarice. Svakoj od vrsta koje su prepoznate kao korov dozrijevaju i jestive sjemenke koje mogu biti pohranjene, premda to nije moguće dokazati u slučaju ovog lokaliteta.

Prisutnost kako makro- tako i mikroarheobotaničkih ostataka žitarica, kako u grobovima tako i u posudama, otvara pitanja vezana uz žetvu žitarice i korištenje žitarica avarskog stanovništva u Nuštru i Avara kao kulturne jedinice razdoblja seobe naroda Karpatske kotline. Dugo vremena Avare u Karpatskoj kotlini smatralo se pastoralnim i mobilnim zajednicama. Zbog nedostatka sustavnih arheobotaničkih ispitivanja i većih iskopavanja naselja, kao i na osnovi rezultata arheozooloških analiza, strategija njihova opstanka definirana je prije svega kao ovisna o stočarstvu. Kako su arheobotaničke analize ranosrednjovjekovnih/vremena seobe naroda nalazišta u Hrvatskoj iznimno rijetke, možemo usporediti podatke iz Nuštra sa susjednim zemljama. Arheobotanička analiza paljevinskog groblja u Vinkovcima predstavlja otprilike 100 godina mlađi kontekst, no treba napomenuti da su na ovom lokalitetu identificirani ostaci ječma (*Hordeum* sp.) i pšenice (usp. *Triticum* sp.) (Šoštarić 2006: 200–201). Arheobotanička analiza napravljena je na nekoliko uzoraka na lokalitetu Torčec kod Koprivnice, nekih 200 km sjeverozapadno od Nuštra. Arheološka su istraživanja pokazala ostatke naselja koja su postojala od 6. do 14. stoljeća. Arheobotaničke analize slojeva datiranih od 6. do 9. stoljeća dokazale su postojanje *Chenopodium album, Panicum millaceum, Polygonum laphatifolium,* usp. *Prunus sp.,* cf. *Rosa sp., Abdovina, Setaria italica, Setaria sp., Triticum spelta* i *Triticum sp.* (Šoštarić 2010: 388, tab. 6). Ovi rezultati – u sastavu sorti i vrsta korova – pokazuju blagu sličnost s uzorcima iz Nuštra. Kompleksne mikro- i makroarheobotaničke analize nekoliko mađarskih lokaliteta (Pető, Herendi 2012: 431–459; Pető et al. 2012: 181–194; Kenéz, Pető, u tisku; Herendi, Pető, u tisku) otkrile su da je odnos avarskih populacija prema branju i skupljanju biljnih vrsta složeniji nego se prethodno mislilo. Iako nisu pronađeni značajniji nalazi žitarica, a time je teško nedvosmisleno naglasiti i procijeniti praksu žetve žitarica kod Avara, moglo bi se zaključiti da su posjedovali oranice i aktivno prakticirali žetvu žitarica. Primarna žitarica Avara bio je proso koji je pronađen u arheobotaničkom uzorku iz Nuštra. Proso se smatra tipičnom žitaricom mobilnih populacija koje prakticiraju polusjedilački način života (Gyulai 2001). Slično prosu, klipasti muhar također je otkriven u Nuštru. Ova je vrsta u Karpatskoj kotlini prisutna već u rimsko doba. Tijekom kasnijih faza avarskog

fication system of Alexandra A. Golyeva (Golyeva 1997: 15–22; 2001b; 2007: 196–201), we may get to the conclusion that the samples represent a steppe-dominated environment. This is underlined by the presence and dominance of the rondel SC morphotypes. The results of phytolith studies conducted on typical soil types of Hungary (Pető 2010; 2013: 149–161) may also provide additional information to the environmental signal of the phytolith assemblage. We might assess these samples based on the systematic study conducted on Hungarian soil profiles. It has been demonstrated that the ratio of rondel SC and the elongate smooth psilate LC morphotypes refer to chernozem type soil development and a vegetation history that can be linked to steppe formation processes (Pető 2010; 2013: 149–161). An extremely weak forest vegetation signal is indicated by the presence of the lanceolate psilate T, the lanceolate (short type) T and the trapeziform elongate polylobate LC morphotypes. However, it must be taken into account that these environmental signals might be inferred by conscious human activity and in this sense the extremely high rondel SC proportion might not entirely be environmental. The latter is reflected in the appearance of the cereal related elongate dendritic LC morphotypes in more samples.

The appearance of cereal related phytoliths in the examined samples opens up the question of plant cultivation and plant usage of the population that used the cemetery. The weeds may indicate the presence of lands being utilised for crop cultivation and their presence could suggest that the crops were not fully cleaned before they became charred. It is interesting to note that all three weed species flower, pollinate and ripen seeds during the end of the summer and middle of autumn (*Digitaria sanguinalis* (L.) Scop.: July–November; *Chenopodium album* (L.): June–November, *Setaria viridis* (L.) PB./*verticillata* (L.) R. et Sch.: July–September). Since the weed species were found in graves G-104 and G-126, it could be imagined that the burial of these individuals took place sometime during autumn. These species formed part of the weed flora that accompanied the cereals irrespectively of who – the Avars or somebody else (?) – harvest the cereals. Each of the species that are acknowledged as weeds ripen edible seeds, which could have been stored as well, though it is not possible to prove this in the case of this particular site.

The presence of both macro- and micro-archaeobotanical remains of cereals, both in the graves and in the vessels opens up questions related to cereal harvesting and cereal usage of the Avar population at Nuštar, and the Avars as a cultural unit of the Migration Period of the Carpathian Basin. For a long time the Avars of the Carpathian Basin were regarded as pastoral and mobile communities. Due to the lack of systematic archaeobotanical examinations and extended settlement excavations, as well as a bias towards archaeozoological analyses, their subsistence strategy was defined primarily as animal husbandry dependent. Since archaeobotanical studies of Early Medieval/Migration Period sites in Croatia are extremely rare we might compare data from Nuštar with neighbouring countries. Archaeobotanical analyses of a cremation graveyard in Vinkovci, Croatia, represents an app. 100 years younger context, however it should be noted that remains of barley and wheat (cf. *Triticum* sp.) were identified at this site (Šoštarić 2006: 200–201). The archaeobotanical analyses of samples dating from the

kaganata pojavljuju se i pšenica i ječam (Gyulai 2010). Ove vrste imaju dulje vrijeme rasta i zato što su prihvaćene kao neizravan pokazatelj stabilnijega sjedilačkog načina života. Obje navedene vrste pronađene su u arheobotaničkom uzorku iz Nuštra.

Nalaz žitarica u kontekstu naselja nije tako iznenađujući kao što bi bio u pogrebnim običajima. Analiza fitolita nekoliko avarskih grobova i sadržaj posuda ne može istaknuti uporabu biljnih materijala vezanih uz žitaricu u pogrebnim običajima (Krausz 2010). Svi pregledani sadržaji posuda i zapuna grobova na lokalitetu Tolna-Mözs–Fehérvízi-dűlő sterilni su iz botaničkog gledišta, što se odnosi na činjenicu da su tijekom pogrebnih običaja najvjerojatnije korišteni proizvodi povezani sa životinjama. Kao suprotnost tomu, avarski ratnik s bogatim arheobotaničkim prilogom – ostataka grožđa i sjemenki stavljenih na njegovu zdjelicu – otkriven je na arheološkom nalazištu Dunaszentgyörgy–Kaszástanya (Kenéz, Pető, u tisku). Međutim, ovaj sretni nalaz u ovom je trenutku prihvaćen kao pojedinačan fenomen, ali već sada upućuje na iznimno važnu ideju o uporabi biljaka/ratarstva kod avarske populacije. Rezultati arheobotaničke analize ovog posebnoga arheobotaničkog nalaza sugeriraju da se grožđe koje je pažljivo postavljeno na pojas avarskog ratnika i nađeno s desne strane njegove zdjelice sastoji od više vrsta i sorti grožđa. Ovaj zaključak naglašava ulogu grožđa u životu(?) i/ili struci(?) avarskog ratnika.

Kompleksne arheobotaničke analize lokaliteta u Nuštru pokazale su slične rezultate kakve imamo u Tolna-Mözs-Fehérvízi-dűlő (Krausz 2010). Najrazličitijih uzorci potječu iz groba žene (G-104) i muškarca (G-126). Obrađene žitarice, kao što su pougljenjeni ostaci hrane, u osnovi se javljaju u svim ispitivanim grobovima, dok su perle nađene samo u ženskim grobovima (G-104, G-108, G-130). Proso je otkriven i u ženskim i muškim grobovima (G-104, G-126). U slučaju ženskog groba sedam je komada pronađeno ispod lubanje, dok je kod muškarca šest komada nađeno ispod zdjelice. Uzorci koji proizlaze iz područja zdjelice nude mogućnost da se razmisli o potrošačkim navikama, no gotovo je nemoguće sa sigurnošću povezati sadržaj crijeva i arheobotaničke ostatke. Štoviše, slučajna raspodjela ostataka hrane povezanih sa žitaricama i fragmenti kariopa žitarica odnose se na činjenicu da su ti pougljeni botanički ostaci usput odlagani u grobovima. Prethodna istraživanja pokazala su postojanje različitih biljnih taksona u grobovima avarskog doba. Sjemenke poljskog slaka (*Convolvulus arvensis* L.), žira hrasta (*Quercus* sp.), sjemenke grožđa (*Vitis vinifera* L. subsp. *Vinifera*), sjemenke jabuka (*Malus sylvestris* L.) i općenito lješnjaci (*Corylus avellana* L.) pronađeni su u austrijskim (Scharrer-Liška, Thanheiser 2007: 26–31) i mađarskim grobljima (Kenéz, Pető, u tisku). Potonja četiri taksona uvijek se nalaze u muškim grobovima s oružjem, u kojima je također bio prisutan luk ili nož. Položaj sjemenki grožđa pronađenih u gore spomenutom grobu avarskog ratnika na arheološkom nalazištu Dunaszentgyörgy–Kaszás-tanya odnosi se na simboličko značenje biljnog materijala jer su ostaci sjemenki grožđa i ostaci nalik grožđicama smješteni na pojasu pored zdjelice pokojnika. To pretpostavlja uporabu konjaničke torbice u kojoj su te bobice grožđa bile pažljivo postavljene. U 6th to 9th cent. at the site of Torčec near Koprivnica (dated from 6th to 14th cent.), somewhat 200 km northwest of Nuštar, have also yielded evidence of *Chenopodium album*, *Panicum millaceum*, *Polygonum laphatifolium*, cf. *Prunus* sp., cf. *Rosa* sp., *Sambucus ebulus*, *Setaria italica*, *Setaria* sp., *Triticum spelta* and *Triticum* sp. (Šoštarić 2010: 388, Tab. 6). These results – in the composition of the cultivars and weed species – show a slight similarity with the finds of Nuštar. The complex micro- and macro-archaeobotanical analyses of a few Hungarian sites (Pető, Herendi 2012: 431–459; Pető et al. 2012: 181–194; Kenéz, Pető, in press; Herendi, Pető, in press) revealed that the relation of the Avar populations to harvested and gathered plant species is more complex than previously thought. Though significant cereal assemblage finds were not found, and therefore it is difficult to unambiguously underline and assess cereal harvesting practices of the Avars, it might be concluded that they were in possession of the knowledge and actively practiced cereal harvesting. The primary cereal of the Avars was broomcorn millet, which was also found in the archaeobotanical assemblage of Nuštar. Broomcorn millet is considered as the typical cereal of mobile populations that practice a semi-sedentary lifestyle (Gyulai 2001). Similar to broomcorn millet, foxtail millet was also detected at Nuštar and was already present in Roman times in the Carpathian Basin. During the later phases of the Avar Khaganate bread wheat and barley also occurred (Gyulai 2010). These species have a longer breeding season and are accepted as indirect indicators of a more stable sedentary lifestyle. Both of the aforementioned species were found in the archaeobotanical assemblage of Nuštar.

The recovery of cereal remains from settlement contexts is not as surprising as it would be from burial features. The phytolith analysis of a few Avar graves and vessel contents could not underline the usage of cereal related vegetal materials in the burial customs (Krausz 2010). All of the examined vessel contents and grave infillings of the Tolna-Mözs–Fehérvízi-dűlő were found to be sterile from the botanical point of view, which refers to the fact that most probably animal related products were used during the burial customs. As an opposition to that an Avar warrior with rich archaeobotanical grave goods – namely grape remains and seeds placed at its pelvis – were brough to light at Dunaszentgyörgy–Kaszás-tanya archaeological site (Kenéz, Pető, in press). However, this fortunate recovery is accepted at the moment as an individual phenomenon, but it already points to an extremely important notion between plant usage/husbandry of Avar populations. The results of the archaeobotanical analysis of this special archaeobotanical find suggest that the grape assemblage that was carefully placed on the belt of the Avar warrior and was recovered from the right side of its pelvis was composed of more grape species and varieties. This observation emphasizes the role of the grape within the life (?) and/or profession (?) of the Avar warrior.

The complex archaeobotanical analyses of the Nuštar site yielded similar results to what has been experienced at Tolna-Mözs–Fehérvízi-dűlő (Krausz 2010). The most diverse samples derive from the grave of a female (G-104) and a male (G-126) individual. Processed cereals, such as charred food remains basically occur in all of the examined graves, whilst pearls were only found in female graves (G-104, G-108, G-130). Broomcorn millet was detected both in female and

slučaju Nuštra sličan obrazac nije bio vidljiv jer su botanički ostaci prisutni na gotovo svim mjestima u grobovima, nisu koncentrirani na dobro definirane točke lubanje ili bilo koji drugi anatomski važan dio tijela.

Na osnovi prisutnosti taksona žitarica i fitolita koji se odnose na žitarice možemo zaključiti da je uzgoj biljaka bio prisutan u svakodnevnom životu avarskih stanovnika Nuštra, međutim čini se moguće da biljke ne igraju značajnu ulogu u pogrebnim običajima. Sadržaj ispitanih posuda – grobnih priloga – podržava ovu ideju. Ni u Tolna-Mözs–Fehévizí-dűlő ni u Nuštru nismo pronašli značajnije biljne ostatke u posudama. Organska kemijska mjerenja (FT-IR) provedena na naseobinskoj keramici pretpostavljaju da su u njima pohranjivani mliječni i drugi nebiljni proizvodi životinjskog podrijetla (neobjavljeni podaci). Po našem mišljenju, posude postavljene uz pokojnika vjerojatno su sadržavale životinjske proizvode koji povezuju pogrebne običaje Avara s njihovim izvornim, nesjedilačkim stočarskim uzgojem i pastoralnim životom.

U sažetku možemo zaključiti da što je više arheobotaničkih analiza učinjeno na avarskim lokalitetima, to složeniju sliku dobivamo. U kasnijim fazama avarskog kaganata moramo računati s polusjedilačkim načinom života koji uključuje više interakcije između ljudi i biljaka, kao i između ljudske populacija i krajobraznih resursa. Ranije provedena istraživanja pokazala su da različite avarske populacije u Karpatskoj kotlini prakticiraju kultivaciju biljaka, međutim njihova učinkovitost i agrotehnička razina nije poznata. Podaci pokazuju da avarske populacije koriste svoju okolinu i biljne resurse u svojim sredinama pored stočarstva koje se u kasnijim fazama polako okreće onim vrstama koje zahtijevaju stabilan, sjedilački način života (npr. uzgoj peradi i svinja). Ipak, uloga biljaka u pogrebnim običajima ne može se naglasiti, što nas tjera na mišljenje da u slučaju obreda i kontekstima pokopa glavnu ulogu igraju proizvodi dobiveni od životinja.[11]

Prijevod / Translation
Ákos Pető, Anita Rapan Papeša

Lektura / Proofreading
Kelly Reed, Sanjin Mihelić

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male graves (G-104, G-126). In case of the female individual grave 7 pcs were found below the skull, whilst in the male grave 6 pcs below the pelvis. Samples, which derive from the pelvis area offer the possibility to think of consumption habits, however it is almost impossible to securely link intestinal contents and archaeobotanical remains. Moreover, the random distribution of cereal related food remains and cereal caryopsis fragments refer to the fact that these charred botanical remains were incidentally deposited in the graves. Previous studies demonstrated the presence of different plant taxa in Avar Age graves. Field bindweed seeds (*Convolvulus arvensis* L.), oak acorns (*Quercus* spp.), grape pips (*Vitis vinifera* L. subsp. *vinifera*), crab apple seeds (*Malus sylvestris* L.) and common hazel nuts (*Corylus avellana* L.) were found in Austrian (Scharrer-Liška, Thanheiser 2007: 26–31) and Hungarian cemeteries (Kenéz, Pető, in press). The later four taxa were always found in armoured male graves, in which bow or knife was also present. The position of grape pips found in the grave of the abovementioned Avar warrior at Dunaszantgyörgy–Kaszás-tanya archaeological site refers to the symbolic meaning of the vegetal material since the grape pips and raisin-like remains were located at the belt next to the pelvis of the deceased. This supposes the use of a sabretache, in which these grape berries were carefully placed in. In the case of Nuštar similar patterning was not visible, since botanical remains were present at almost every location of the graves, they did not concentrate at a well-defined point of the skull or any other anatomically important part of the bodies.

Based on the presence of the cereal taxa and the phytoliths, which refer to cereals we might conclude that plant cultivation was present in the everyday life of the Avar population of Nuštar, however it also seems possible that plants did not play a significant role in the burial customs. The examined vessel – grave good – contents support this idea. Neither at Tolna-Mözs–Fehérvízi-dűlő, nor at Nuštar did we find significant plant depositions in the vessels. Organic chemical measurements (FT-IR) conducted on settlement ceramics suppose that diary and other non-vegetable animal products were stored in them (unpublished data). In our view, the vessels placed next to the deceased individuals probably contained animal related products, which link the burial customs of the Avars to their original, non-sedentary herding and pastoral lifestyle.

In summary we might conclude that the more archaeobotanical analyses is done on Avar sites, the more complex the picture gets. In the later phases of the Avar Khaganate we must count with a semi-sedentary lifestyle, which involves more the interaction between humans and plants, as well as between human populations and landscape resources. Previously conducted research showed that different Avar populations in the Carpathian Basin practiced plant cultivation, however their effectiveness and agro-technical level is not known. Data show that Avar populations used their environment and the vegetal resources in their surroundings beside animal husbandry, which in the later phases slowly-slowly turned to those species, which require stable, sedentary lifestyle (e.g. fowl and pig husbandry). Still, the role of plants in burial customs cannot be underlined, which makes us think that in case of ritual and burial contexts animal derived products play the main role.[11]

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LITERATURA / BIBLIOGRAPHY

Bertoldi de Pomar, H. 1971, Ensayo de clasificación morfológica de los silicofitolitos, *Ameghiniana*, Vol. 8, 317–328.

Blinnikov, M. S. 2005, Phytoliths in plants and soils of the interior Pacific Northwest, USA, *Review of Palaeobotany and Palynology*, Vol. 135, 71–98.

Bognar, A. 1994, Na vukovarskoj lesnoj zaravni / Auf der Vukovarer Tonsandsteinniederung / On the Loess Plains of Vukovar, in: *Vukovar, vjekovni hrvatski grad na Dunavu*, Karaman I. (ed.), Zagreb, 25–48.

Bowdery, D. 1998, *Phytolith analysis applied to Pleistocene-Holocene archaeological sites in the Australian Arid Zone*, British Archaeological Reports International Series 695, Oxford.

Behre, K. 1992, The history of rye cultivation in Europe, *Vegetatation History and Archaeobotany*, Vol. 1/3, 141–156.

Brecher, Gy. 1960, *A magismeret atlasza* [*The atlas of seed identification*], Mezőgazdasági Kiadó, Budapest.

Brombacher, C., Jacomet, S. 1997, Ackerbau, Sammelwirtschaft und Umwelt: Ergebnisse archäeobotanischer Untersuchungen, in: *Ökonomie und Ökologie neolitischer und bronzezeitlicher Ufersiedlungen am Zürichsee. Ergebniss der Ausgrabungen Mozartstrasse, Kanalisationssanierungen Seefeld*, Schibler J., Hüster-Plogmann H., Jacomet S., Brombacher C., Gross-Klee E., Rast-Eicher A. (eds.), AKAD/Pressehaus un Mythenschloss in Zürich, Monographien der Kantonsarchäeologie Zürich 20, Zürich–Egg, 220–279.

Bugarski, I. 2008, The Geomorphological Matrix as a Starting Point for Determining the Position of Avar-time Settlements in Pannonia: The Example of the Bačka Region, *Archäologisches Korrespondenzblatt*, Vol. 38/3, 437–455.

Cappers, R. T. J., Bekker, R. M., Jans, J. E. A. 2006, *Digitale Zadenatlas van Nederland / Digital Seed Atlas of the Netherlands*, Barkhuis, Groningen.

Cioccale, M. 1999, Climatic fluctuations in the central region of Argentina in the last 1000 years, *Quaternary International*, Vol. 62, 35–47.

Curry, J. P., Schmidt, O. 2007, The feeding ecology of earthworms – a review, *Pedobiologia*, Vol. 50, 463–477.

Daim, F. 2003, Avars and Avar Archaeology: An Introduction, in: *REGNA AND GENTES. The Relationship between Late Antique and Early Medieval Peoples and Kingdoms in the Transformation of the Roman World*, Goetz H.-W., Jarnut J., Pohl W. (eds.), Leiden–Boston, 463–570.

Filipec, K. 2003, Kasnoavarski ukrasni okov (falera) u obliku veprove glave iz Siska, *Godišnjak Gradskog muzeja Sisak*, Vol. III–IV, 117–146.

Filipec, K., Roksandić, D. 2008, Redni broj: 4 Lokalitet: Belišće – Zagajci II [Summary], *Hrvatski arheološki godišnjak*, Vol. 5, 19–21.

Golyeva, A. A. 1997, Content and distrubution of phytoliths in the main types of soils in Eastern Europe, in: *The state of–the–art of phytholits in soils and plants,* Pinilla A., Juan-Tresseras J., Machado M. J. (eds.), Monografías del Centro de ciencias medioambientales, CSCI (4), CSCI, Madrid, 15–22.

Golyeva, A. A. 2001a, Biomorphic analysis as a part of soil morphological investigations, *Catena*, Vol. 43, 217–230.

Golyeva, A. A. 2001b, *Phytoliths and their information role in natural and archeological objects*, Syktyvar Elista, Moscow.

Golyeva, A. A. 2007, Various pytolith types as bearers of different kinds of ecological information, in: *Plants, People and Places, Recent Studies in Phytolith Analysis*, Madella M., Zurro D. (eds.), Oxbow Books, Oakville, 196–201.

Gyulai, F., Hertelendi, E., Szabó, I. 1992, Plant remains from the early medieval lakeshore settlement Fonyód-Bélatelep (Lake Balaton, Hungary) with especial emphasis on the history of fruit cultivation in Pannonia, *Vegetation History and Archaeobotany*, Vol. 1, 177–184.

Gračanin, H. 2010, Rimske prometnice i komunikacije u kasnoantičkoj južnoj Panoniji, *Scrinia Slavonica*, Vol. 10, 9–68.

Gračanin, H. 2011, *Južna Panonija u kasnoj antici i ranom srednjovjekovlju (od konca 4. do konca 11. stoljeća)*, Zagreb.

Gyulai, F. 2001, *Archaeobotanika. A kultúrnövények története a Kárpát-medencében a régészeti-növénytani vizsgálatok alapján [Archaeobotany. The history of cultivated plants in the Carpathian Basin based on archaeobotanical examinations]*, Jószöveg Műhely Kiadó, Budapest.

Gyulai, F. 2010, *Archaeobotany in Hungary.Seed, Fruit, Food and Beverage Remains in the Carpathian Basin from the Neolithic to the Late Middle Ages*, Archaeolingua Main Series 21, Budapest, 479.

Herendi O., Pető, Á., u tisku, Avar kori településnyom Hódmezővásárhely–Kopáncs I., Olasz-tanya lelőhelyen (Csongrád megye): egy félig-földbemélyített épületobjektum régészeti és természettudományos értékelése [An Avar Age settlement part at Hódmezővásárhely–Kopáncs I., Olasz-tanya archaeological site (Csongrád county): archaeological and activity area analysis of a semi-subterranean feature], in: *Proceedings of the XXIVth Hungarian Research on the Migration Period* (u tisku).

Horváth, F., Dobolyi, K. Z., Morschhauser, T., Lőkös, L., Karas, L., Szerdahelyi, T. 1995, *FLÓRA Adatbázis 1.2. Taxon-lista és attribútum-állomány*, Flóra Munkacsoport, Magyar Tudományos Akadémia, Ökológiai és Botanikai Kutatóintézete és Magyar Természettudományi Múzeum Növénytár, Vácrátót–Budapest.

Ivaniček, F. 1949, Istraživanje nekropole ranog srednjeg vijeka u Bijelom Brdu, *Ljetopis Jugoslavenske akademije znanosti i umjetnosti*, Vol. 55, 111–144.

Kenéz, Á., Pető, Á., u tisku, Szőlőmaradványok egy avar fegyveres férfi sírjából Dunaszentgyörgy–Kaszás-tanya lelőhelyről (Tolna megye) [Grape remains from the grave of an avar warrior at Dunaszentgyörgy–Kaszás-tanya archaeological site (Tolna county, Hungary)], in: *Proceedings of the XXIVth Hungarian Research on the Migration Period* (u tisku).

Király, G. 2009, *Új Magyar füvészkönyv.Magyarország hajtásos növényei. Határozókulcsok* [*New Hungarian Herbal. The Vascular Plants of Hungary. Identification key*], Aggteleki Nemzeti Park Igazgatóság, Jósvafő.

Kiss, A. 1963, Az Avarkori Lovas-Temetkezés Szokásának Vizsgálata [Über das Brauchtum der awarenzeitlichen Reiterbestattungen], *Janus Pannonius Múzeum Évkönyve,* (1962), 153–162.

Korstanje, M. A., Babot, M. del P., 2007. Microfossils characterization from south Andean economic plants, in: *Plants, People and Places, Recent Studies in Phytolith Analysis*, Madella M., Zurro D. (eds.), Oxbow Books, Oakville, 41–72.

Krausz, E. 2010, *Ember és táj kapcsolata két avar kori lelőhely fitolitelemzésén keresztül* [*Relation of humans and landscape as seen through the phytolith data of two Avar Age sites*], BSc thesis, Szent István Egyetem, Mezőgazdaság- és Környezettudományi Kar, Környezet- és Tájgazdálkodási Intézet, Gödöllő.

LNH 2005 = *Leksikon naselja Hrvatske*, Feldbauer B. (ed.), sv. 2., Zagreb (*s. v.* Nuštar).

Ložnjak Dizdar, D., Hutinec, M. 2012, Sotin – arheološka istraživanja 2011. godine, *Annales Instituti Archaeologici*, Vol. VIII, 9–13.

Ložnjak Dizdar, D., Hutinec, M. 2013, Sotin – arheološka istraživanja 2012. godine, *Annales Instituti Archaeologici*, Vol. IX, 8–11.

Ložnjak Dizdar, D., Hutinec, M. 2014, Sotin – arheološka istraživanja 2013. Godine, *Annales Instituti Archaeologici*, Vol. X, 9–13.

Lozuk, J. 2012, Stružani – naselje iz 8.i 9. stoljeća / Stružani – a settlement of the 8th and 9th centuries, in: *Znanstveni skup Hrvatska arheologija i Aachenski mir 812.–2012.*, Zadar (u tisku).

Madella, M., Alexandre, A., Ball, T. 2005, International Code for Phytolith Nomenclature, *Annals of Botany*, Vol. 96, 253–260.

Magaš, D. 1998, *Osnove geografije Hrvatske*, skripta iz predmeta Regionalna geografija (Hrvatska) na Odsjeku za Geografiju Filozofskog fakulteta u Zadru, Zadar.

Maier, U. 2001, Aräeobotanische Untersuchungen in der neolitischen Ufersiedlung Hornstaad-Hörnle IA am Boden see, in: *Siedlungsarchäeologie im Alpenvorland VI. Botanische und pedologische Untersuchungen zur Ufersiedlung Hornstaad-Hörnle IA*, Maier U., Vogt R. (eds.), Forschungen und Berichte zur Vor- und Frühgeschichte in Baden-Württemberg 74, Stuttgart, 9–384.

Mann, M. E., Zhang, Z., Rutherford, S., Bradley, R. S., Hughes, M. K., Shindell, D., Ammann, C., Faluvegi, G., Ni, F. 2009, Global Signatures and Dynamical Origins of the Little Ice Age and Medieval Climate Anomlay, *Science*, Vol. 326, 1256–1260.

Miklik-Lozuk, L. 2012, *Stružani život naselja kroz stoljeća*, katalog izložbe, Slavonski Brod, [74–77].

Nejad, A. S. M., Kamkar, A., Gir, A., Pourmahmoudi, A. A. 2013, Ethnobotany and folk medicinal uses of major trees and shrubs in Northern Iran, *Journal of Medicinal Plants Research*, Vol. 7(7), 284–289.

Pearsall D. M. 2000, *Paleoethnobotany: a handbook of procedures*, Academic Press, London.

Pető, Á. 2010, *A Magyarországon előforduló meghatározó jelentőségű és gyakori talajtípusok fitolit profiljának katasztere* [*Phytolith profile cadastre of the most significant and abundant soil types of Hungary*], PhD thesis, Szent István University, Gödöllő.

Pető, Á. 2013, Studying modern soil profiles of different landscape zones in Hungary: An attempt to establish a soil-phytolith identification key, *Quaternary International*, Vol. 287, 149–161.

Pető, Á., Herendi, O. 2012, Fitolitkutatási adatok a Hódmezővásárhely-Kopáncs II. Lelőhely (Csongrád megye) környezeti rekonstrukciójához és archaeobotanikai elemzéséhez / Phytolith research data for the environmental reconstruction and archaeobotanical analysis of Hódmezővásárhely-Kopáncs II (Csongrád County) archaeological site, in: *Évkönyv és jelentés a Kulturális Örökségvédelmi Szakszolgálat 2009. évi feltárásairól / Yearbook and Review of Archaeological Investigations of Field Service for Cultural Heritage in 2009.*, Kvassay J. (ed.), Budapest, 431–459.

Pető, Á., Kenéz, Á., Herendi, O., Gyulai, F. 2012, A késő avar kor növényhasznosítási és tájgazdálkodási potenciáljának értékelése egy dél-alföldi telepen végzett mikro- és makro-archaeobotanikai vizsgálat tükrében [Assessment of potential plant exploitation and land use of the Late Avar period in the light of micro- and macroarchaeobotanical analyses of an archaeological site in Southeastern Hungary], in: *Környezet–Ember–Kultúra: Az alkalmazott természettudományok és a régészet párbeszéde – Environment–Human–Culture / Dialogue between applied sciences and archaeology*, Kreiter A., Pető Á., Tugya B. (eds.), Magyar Nemzeti Múzeum, Budapest, 181–194.

Pfister, Ch. 1992. Monthly temperature and precipitation in central Europe from 1525-1979: quantifying documentary evidence on weather and its effects, in: *Climate Science A.D. 1500*, Bradley R. S., Jones P. D. (eds.), Routledge, London, 118–142.

Piperno, D. R. 1988, *Phytolith analysis: an archaeological and geological perspective*, Academic Press, San Diego.

Pohl, W. 1997. The role of the steppe peoples in Eastern and Central Europe in the first millennium AD, in: *Origins of Central Europe*, Urbanczyk P. (ed.), Scientific Society of Polish Archaeologists, Warsaw, 65–78.

Pohl, W. 2003, A non-Roman Empire in Central Europe: The Avars, in: *REGNA AND GENTES The Relationship between Late Antique and Early Medieval Peoples and Kingdoms in the Transformation of the Roman World*, Goetz H.-W., Jarnut J., Pohl W. (eds.), Leiden–Boston, 571–595.

Power-Jones, A. 1992, Great expectations: a short historical review of European phytolith systematics, in: *Phytolith Systematics. Emerging Issues*, Rapp G. Jr., Mulholland S. C. (eds.), Plenum Press, New York, 15–35.

Premužić, Z., Rajić Šikanjić, P., Rapan Papeša, A. 2013, *Eggshells in a juvenile burial from avar cemetery in Croatia*, Pilsen, 2013.

Premužić, Z., Trbojević Vukičević, T., Rajić Šikanjić, P., Rapan Papeša, A. 2014, Životinjske kosti kao prilozi na avarodobnom groblju iz Nuštra, in: *Groblja i pogrebni običaji u srednjem i ranom novom vijeku na prostoru sjeverne Hrvatske, Zagreb (u tisku).*

Radics, L. 1998, *Gyommaghatározó* [*Identification key to weed seeds*], Mezőgazda Kiadó, Budapest.

Rapan Papeša, A. 2009, kataloške jedinice 494–498, in: *Slavonija, Baranja i Srijem, vrela europske civilizacije*, katalog izložbe, Biškupić B. (ed.), Zagreb, 150–151.

Rapan Papeša, A. 2012, *Prvi nalazi s avarskog groblja na položaju Nuštar / First Findings From the Avar Cemetery in Nuštar / Die ersten Funde des Awarenfriedhofs an der Fundstelle Nuštar*, katalog izložbe, Vinkovci.

Rapan Papeša, A. 2013, Novi tipovi raka u hrvatskoj ranosrednjovjekovnoj arheologiji, in: *Dani Stjepana Gunjače*, Split (u tisku).

Rapan Papeša, A. 2014, Prethodna razmišljanja o prilozima keramičkih lonaca i njihovom sadržaju u avarodobnim grobovima na lokalitetu Nuštar/Dvorac, in: *Groblja i pogrebni običaji u srednjem i ranom novom vijeku na prostoru sjeverne Hrvatske, Zagreb (u tisku).*

Regnier, E., Harrison, S. K., Liu, J., Scmoll, J. T., Edwards, C. A., Arancon, N., Holloman, C. 2008, Impact of an exotic earthworm on seed dispersal of an indigenous US weed, *Journal of Applied Ecology*, Vol. 45, 1621–1629.

Scharrer-Liška, G., Thanheiser, U. 2007, Außergewöhnliche archäobotanische Funde aus Grab 34 des awarischen Gräberfeldes von Frohsdorf, NÖ. Bestimmung und Interpretationsmöglichkeiten,*V IA VIAS*, Vol. 1, 26–31.

Schermann, Sz. 1966, *Magismeret I-II*. [*Seed identification I-II.*], Akadémiai Kiadó, Budapest.

Sekelj Ivančan, T., Tkalčec, T. 2006, Slavensko paljevinsko groblje na položaju Duga ulica 99 u Vinkovcima, *Prilozi Instituta za arheologiju u Zagrebu*, Vol. 23, 141–212.

Shokrzadeh, M., Saeedi Saravi, S.S. 2010,The chemistry, pharmacology and clinical properties of Sambucus ebulus. A review, *Journal of Medicinal Plants Research*, Vol. 4/2, 95–103.

Sliveska, Z. 2004, The Sickles in Graves during the Period of Early Middle Ages from the Territory of Slovakia, *Annales Universitatis Apulensis, Series Historica*, Vol. 8, 7–11.

Tomičić, Ž. 2000, Arheološka slika ranoga srednjeg vijeka na prostoru međurječja Drave, Dunava i Save, in: *Hrvati i Karolinzi I, Rasprave i vrela*, Milošević A. (ed.), Split, 142–161.

Twiss, P. C., Suess, E., Smith, R. M. 1969, Morphological classification of grass phytoliths, *Soil Science Society of America Proceedings*, Vol. 33, 109–115.

Šmalcelj, M. 1973, Privlaka – »Gole njive« (općina Vinkovci) – Nekropola VII–IX stoljeća: sistematska iskopavanja, *Arheološki* pregled, Vol. 15, 117–119, Tab. LXIX.

Šmalcelj, M. 1976, Privlaka – »Gole njive«, Vinkovci–Nekropola VIII–IX st., *Arheološki* pregled, Vol. 18, 127–128.

Šmalcelj, M. 1981a, Stari Jankovci – Gatina (općina Vinkovci) – avaroslavenska nekropola, *Arheološki pregled*, Vol. 22, 142–143, Tab. LXXXV.

Šmalcelj, M. 1981b, Privlaka – Gole njive (opć. Vinkovci) – avaroslavenska nekropola, *Arheološki pregled*, Vol. 22, 143–144, T. LXXXVI.

Šmalcelj, P. 2012, *Ranosrednjovjekovno groblje otok kod Vinkovaca*, graduation thesis, Zagreb.

Šoštarić, R. 2006, Ekskurs: arheobotaničke analize / Exkurs: Archäobotanische Analyse, in: Sekelj Ivančan, Tkalčec 2006: 200–201.

Šoštarić, R., Šegota, V. 2010, Analiza biljnih ostataka sa srednjovjekovnog lokaliteta Torčec kraj Koprivnice / The analyses of plant remains from the medieval site of Torčec near Koprivnica, in: Sekelj Ivančan, T. *Podravina u ranom srednjem vijeku*, MIA 2, Zagreb, 373–388.

Vadas, A., Rácz, L. 2012. Climatic Changes in the Carpathian Basin during the Middle Ages: The State of Research, *Global Environment*, Vol. 12, 199–227.

Van Zeist, W. A. 1984, List of names of wild and cultivated cereals. *Bulletin on Sumerian Agriculture*, Vol. 1, 8–16.

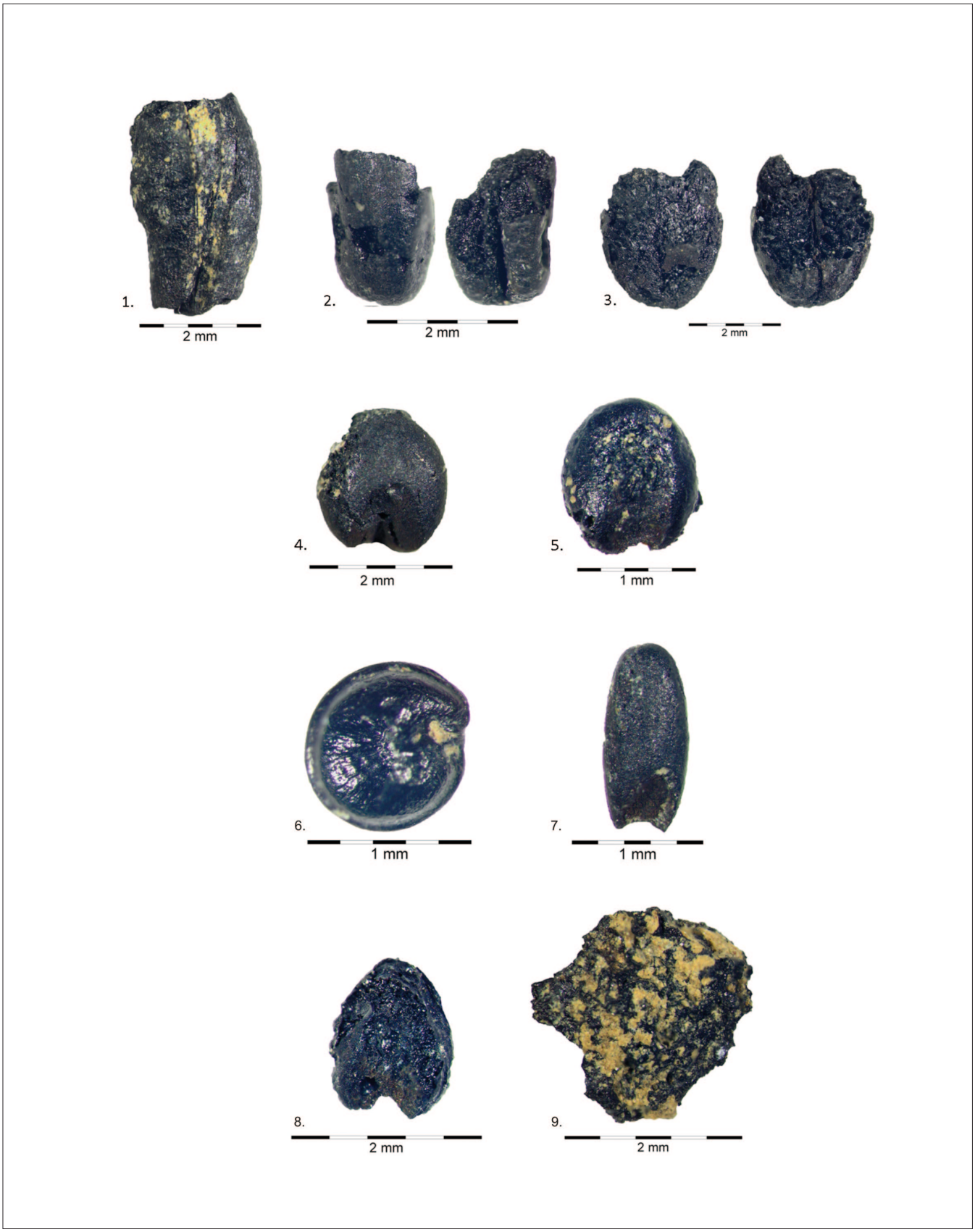
Villalba, R. 1994, Tree ring and glacial evidence for the medieval warm epoch and the Little Ice Age in Southern South America, *Climate Change*, Vol. 26, 183–197.

Vinski-Gasparini, K., Ercegović, S. 1958, Ranosrednjovjekovno groblje u Brodskom Drenovcu, *Vjesnik Arheološkog muzeja u Zagrebu*, 3. s. 1, 129–161, Plan 1–3, Tab. I–XXVII.

Vinski, Z. 1949, Prethodni izvještaj o arheološkim značajkama elemenata materijalne kulture nađenim pri iskapanju nekropole ranog srednjeg vijeka u Bijelom Brdu u siječnju 1948. g., *Ljetopis Jugoslavenske akademije znanosti i umjetnosti*, Vol. 55, 225–238.

Zohary, D., Hopf, M., Weiss, E. 2012, *Domestication of Plants in the Old World: The origin and spread of domesticated plants in Southwest Asia, Europe, and the Mediterranean Basin*, Fourth Edition, Oxford University Press, Oxford.

Živaković Kerže, Z. 2008, Ivan Nepomuk Spannbauer i njegovo značenje za odvodnju osječkoga kraja (Poseban osvrt na isušivanje močvare Palača), *Godišnjak Njemačke narodnosne zajednice – VDG Jahrbuch*, Vol. 15, 117–126.



T. 1 Ostaci žitarica iz Nuštra: 1. Hordeum vulgare L., 2. cf. Secale cereale L., 3. Triticum cf. aestivum (L.) subsp. aestivum, 4. Panicummiliaceum L., 5. Setariaitalica (L.) P. Beauv., 6. Chenopodium album L., 7. Digitaria sanguinalis (L.) Scop, 8. Setaria viridis (L.) P. Beauv./ Setaria verticillata (L.) P. Beauv., 9. Komadić hrane nalik kaši (A. Pető, 2014.)

Pl. 1 Cereal remains from Nuštar archaeological site. 1. Hordeum vulgare L., 2. cf. Secale cereale L., 3. Triticum cf. aestivum (L.) subsp. aestivum, 4. Panicummiliaceum L., 5. Setariaitalica (L.) P. Beauv., 6. Chenopodium album L., 7. Digitaria sanguinalis (L.) Scop, 8. Setaria viridis (L.) P. Beauv./Setaria verticillata (L.) P. Beauv., 9. small piece of mush-like food (A. Pető, 2014)