Neposredno datiranje botaničkih uzoraka u arheološkom kontekstu - biljni ostaci s prapovijesnog lokaliteta Kaptol-Gradci kod Požege (Hrvatska)

Direct Dating of Botanical Samples in an Archaeological Context – Plant Remains from the Prehistoric Site of Kaptol-Gradci near Požega (Croatia)

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RENATA ŠOŠTARIĆ
Sveučilište u Zagrebu
Prirodoslovno–matematički fakultet
Biološki odsjek
BOTANIČKI ZAVOD S BOTANIČKIM VRTOM
Marulićev trg 20/2
HR – 10000 Zagreb
renata@botanic.hr

HRVOJE POTREBICA
Sveučilište u Zagrebu
Filozofski fakultet
Odsjek za arheologiju
I. Lučića 3
HR – 10000 Zagreb
hpotrebi@ffzg.hr

ANDREJA BRIGIĆ
Sveučilište u Zagrebu
Prirodoslovno–matematički fakultet
Biološki odsjek
ZOOLOGIJSKI ZAVOD
Rooseveltov trg 6, HR–10000 Zagreb
andrejab@biol.pmf.hr

Arheološka nalazišta u blizini mjesta Kaptol kod Požege predstavljaju jedan od najznačajnijih kompleksa halštatske kulture u ovom dijelu Europe. Tijekom 2001. i 2002. god. istraživan je tumul 1, smješten na istočnom rubu nekropole lokaliteta Kaptol-Gradci. Tumul je bio pravilnog oblika s prosječnom visinom od 1,5 m i promjerom 12-14 m i predstavlja zatvorenu grobnu cjelinu u čijoj se sredini nalazila komora suhozidne konstrukcije, približnih dimenzija 4,5 x 4 m i prosječne visine oko 1,25 m, koja je vjerojatno bila vanjska obloga drvenog sanduka, odnosno komore u kojoj je pokojnik bio pokopan. Čini se da je komora bila konceptualno podijeljena u dva dijela, a u njezinoj unutrašnjosti je nađena nakupina pepela s kostima pokojnika, te brojni prilozi. Analiza metalnih nalaza i brojnih keramičkih ostataka datira ovaj tumul u razdoblje Ha C1, odnosno u prvu polovicu 7. st. pr. Kr., a datiranje radioaktivnim ugljikom u doba 810.-420. god. pr. Kr.

Uz ostale nalaze, u sjeverozapadnom kutu grobne komore pronađena je mala, na nekoliko mjesta napuknuta, keramička zdjelica ispunjena sjemenkama, koja po svojim značajkama također pripada halštatskom razdoblju. Prva pretpostavka bila je da je posrijedi grobni prilog, no zbunjivao je sastav biljnih ostataka – radilo se o sitnim sjemenkama isključivo samoniklih biljaka (Euphorbia cyparissias/ dulcis i Euphorbia sp. – 36%; Vicia/Lathyrus tip 1 i 2 – 29%; Trifolium tip 1 i 2 – 17%; Geranium dissectum – 12%; Viola sp. – 1%; Carex sp., Scirpus sp. i dr. – 5%). Još je neobičnija bila činjenica da je znatni dio sjemenki, koje bi trebale biti stare oko 2700 godina – proklijao. AMS-datacija neproklijalih sjemenki pokazala je starost manju od 50 godina, što znači da se radi o recentnoj kontaminaciji. Kako se radi o zatvorenom grobnom kompleksu i nema materijalnih dokaza da je posudica naknadno unesena u nekom od mlađih povijesnih razdoblja, odbačen je ljudski faktor. Zbog činjenice da su biljni ostaci gotovo isključivo vezani za halštatsku keramičku posudicu, u prvi mah se odbacivala mogućnost da je posrijedi nakupina životinjskog podrijetla. Ipak, daljnjom analizom utvrđeno je kako se najvjerojatnije radi o ostacima mravinjaka – napuknuta halštatska zdjelica poslužila je mravima kao sklonište, slično kamenu, pukotini stijena i dr., i dobar zaklon za njihovo skladište sjemenki.

Ključne riječi: tumul, grobni prilozi, biljni ostaci, mravi sjemenari, halštat,Kaptol-Gradci, Hrvatska

The archaeological sites near the village of Kaptol near Požega are among the most important complexes of the Hallstatt culture in this part of Europe. Tumulus 1, situated at the eastern edge of the necropolis of the Kaptol-Gradci site was excavated during 2001 and 2002. The tumulus was of regular shape with an average height of 1,5 and a diameter of 12-14 m. It is a closed grave assemblage with a drywall grave chamber in the centre, measuring approximately 4,5 x 4 m and 1,25 m high on average. The chamber was probably an outer casing of the wooden coffin, i.e. a chamber in which the deceased was buried. It seems that the chamber was conceptually divided into two parts. A heap of ash with the bones of the deceased as well as numerous grave goods were found in its interior. The analysis of the metal finds and numerous ceramic remains dates this tumulus to the Ha C1 period, that is, the first half of the 7th century B.C., while the radiocarbon dates yielded an age between 810-420 B.C.

In addition to other finds, a small ceramic vessel filled with seeds was found in the northwestern corner of the grave chamber. It was cracked in several places and by virtue of its features it also belongs to the Hallstatt period. The first assumption was that it formed part of grave goods, but the composition of plant remains was puzzling – these consisted of small seeds of exclusively wild plants (Euphorbia cyparissias/dulcis and Euphorbia sp. – 36%; Vicia/Lathyrus type 1 and 2 – 29%; Trifolium type 1 and 2 – 17%; Geranium dissectum – 12%; Viola sp. – 1%; Carex sp., Scirpus sp. etc. – 5%). An altogether more unusual fact was that a considerable part of the seeds, which are supposedly 2700 years old – germinated. The AMS-dating of ungerminated seeds showed an age of less than 50 years, which means that this was a recent contamination. As this is a closed grave complex without any material evidence that the vessel was introduced later during subsequent historical periods, the human factor has been discarded. As the plant remains are almost exclusively connected with the Hallstatt ceramic vessel, at first the possibility was rejected that the heap was produced by animal action. However, further analysis established that in all likelihood these were the remains of a subterranean ant nest – the cracked Hallstatt vessel was used by ants as a shelter, similar to a stone, a crack in the rock etc., and a good cover for their store of seeds.

Key words: tumulus, grave goods, plant remains, harvester ants, Hallstatt, Kaptol-Gradci, Croatia

UVOD

Nalazišta u blizini mjesta Kaptol kod Požege (sl. 1) predstavljaju jedan od najznačajnijih kompleksa halštatske kulture u ovom dijelu Europe. Nekropola na položaju Čemernica istraživana je u razdoblju od 1965. do 1971. god., a posljednji ciklus sustavnih istraživanja koji uz ovo obuhvaća i nalazišta na lokalitetu Gradci, počeo je 2001. god. i kontinuirano se odvija svake sezone, uključivši i 2007. god.

U ovom će radu biti predstavljeni rezultati arheobotaničkih analiza vezanih za arheološko istraživanje lokaliteta Kaptol-Gradci (45°26´N, 17°43´E, sl. 1) 2001. i 2002. god., a odnose se na tumul 1 koji je smješten na istočnom rubu nekropole što se smjestila u neposrednoj blizini utvrđenog naselja na obroncima Papuka, nadmorske visine između 400 i 450 m.

Istraženi tumul bio je pravilnog oblika s prosječnom visinom od 1,5 m i promjerom koji zbog pada terena varira između 12 i 14 m. U sredini tumula nalazila se komora suhozidne konstrukcije izgrađena na terenu koji je niveliran lomljenjem izdanaka prirodne stjenovite podloge – gnajsa. Suhozidna konstrukcija bila je približnih dimenzija 4,5 x 4 m u najširem donjem dijelu i prosječne visine oko 1,25 m. Čini se da je komora bila konceptualno podijeljena u dva dijela. U južnom dijelu suhozidne konstrukcije, zid je bio kalcificiran u toj mjeri da je razdvajanje kamenja pri razgradnji iziskivalo velike napore. U tom dijelu komora je bila ispunjena slojevima gara, vjerojatno s pogrebne lomače i dijelovima namjerno lomljenih keramičkih posuda. Važno je napomenuti da unatoč velikom broju pronađenih posuda u ovom dijelu komore, svakoj je nedostajao barem jedan dio. Za razliku od takve situacije, u sjevernom dijelu komore nije uočena

INTRODUCTION

The sites in the vicinity of the village of Kaptol near Požega (Fig. 1) make up one of the most important complexes of the Hallstatt culture in this part of Europe. The necropolis at the position of Čemernica was excavated between 1965 and 1971, and the latest cycle of systematic excavations, which in addition to this one comprises also the positions at the site of Gradci has started in 2001 and continued every year, including 2007.

This paper will present the results of archaeobotanical analyses connected with the archaeological excavation of the Kaptol-Gradci site (45°26´N, 17°43´E, Fig. 1) in 2001 and 2002, and they refer to tumulus 1, situated at the eastern edge of the necropolis, which lies in the immediate vicinity of the fortified settlement on the slopes of the Papuk mountain, between 400 and 450 m above sea level.

The excavated tumulus had a regular shape with an average height of 1,5 m and a diameter that varies between 12 and 14 m due to the inclination of the terrain. A drywall chamber built on soil leveled by the breakage of the outcrops of natural rocky substrate – gneiss – stood in the centre of the tumulus. The drywall structure measured approximately 4,5 x 4 m in the widest lower part, and it was around 1,25 m high on average. It seems that the chamber was conceptually divided in two parts. The wall in the southern part of the drywall structure was calcified to such extent that the separation of stones during the deconstruction required great effort. This part of the chamber was filled with layers of charcoal, probably from the fu-

Sl. 1 Geografski položaj lokaliteta Kaptol-Gradci
Fig. 1 The geographic position of the site Kaptol-Gradci

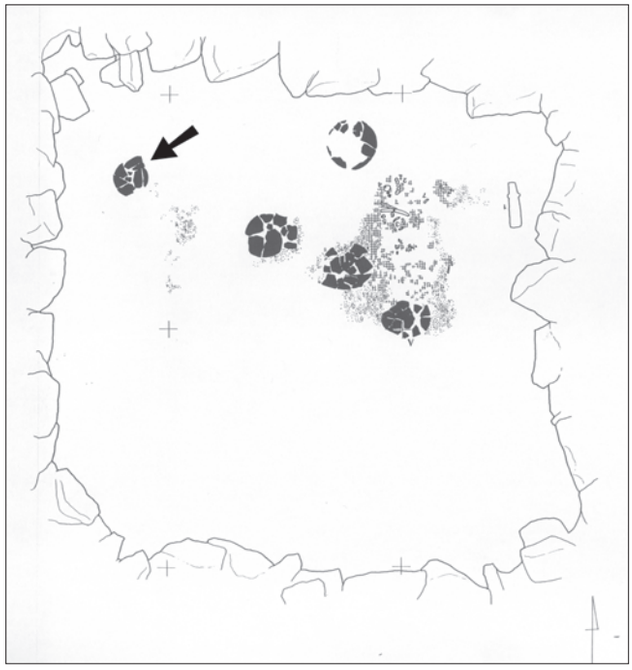
keramika u gornjim slojevima, a na dnu je pronađena cjelina koju možemo smatrati grobom (sl. 2). U sjeveroistočnom dijelu pronađeno je nekoliko većih komada kamena koji su vjerojatno upali kroz drveni pokrov komore, a između njih su pronađene tri plitke zdjele. Ispod jednog većeg kamena u sjeveroistočnom kutu, na malom uzvišenju od prirodne kamene podloge, pronađena je velika nakupina pepela izmiješanog s kostima, za koje je antropološkom analizom utvrđeno da su pripadale pokojniku. Uz taj veliki kamen, u samom kutu komore pronađena je željezna sjekira s ručicama, dok je ispod kamena u nakupini pepela i kostiju pronađena brončana fibula sa zadebljanjima na narebrenom luku i dva prstenasta privjeska od brončane žice, željezni nožić i dva keramička pršljenka. U sjeverozapadnom kutu komore, pronađena je samo jedna mala zdjelica ispunjena sjemenjem (sl. 3) (Potrebica 2002).

neral pyre, and with pieces of deliberately broken ceramic vessels. It is important to mention that in spite of a large number of discovered vessels in this part of the chamber, each lacked at least one piece. In contrast to this situation, there was no perceived pottery in the upper layers in the northern part of the chamber, while an assemblage that can be considered a burial was discovered at the bottom (Fig. 2). Several larger pieces of stone that probably fell in through the wooden cover of the chamber were found in the northeastern part, and three shallow bowls were found among them. A large heap of ash mixed with bones was found beneath a larger stone in the northeastern corner, on a small elevation of natural bedrock. The anthropological analysis determined that the bones belonged to the deceased person. An iron trunion axe was found adjacent

Istraživanjem drugih grobnih humaka na istom nalazištu utvrdili smo da je suhozidna konstrukcija vjerojatno bila vanjska obloga drvenog sanduka, odnosno komore u kojoj je pokojnik bio pokopan, a čije tragove zbog propadljivosti materijala rijetko možemo neposredno utvrditi. U ovom slučaju je vidljivo da se kamena obloga komore u potpunosti oslanjala na nešto što je očuvalo središnji prostor koji je po propadanju drvene komore zasula zemlja iz nasipa samog tumula. Utvrđen je relativno velik broj posuda (oko 21), što je velik broj kad se usporedi s ostalim grobnim cjelinama na ovom lokalitetu, ukoliko izuzmemo kneževski tumul 6. Međutim, većina tih posuda je namjerno fragmentirana i nabacana bez nekog vidljivog reda te se čini da su u komoru prilagani samo veći ili manji dijelovi posuda. Ovoj cjelini je za sada, kako dimenzijama, tako i unutrašnjom organizacijom najsličniji tumul 7 na istoj nekropoli. Iako pljačku ne možemo u potpunosti isključiti, kao razlog za takvu situaciju drugi elementi ju čine manje vjerojatnom. Prapovijesni pljačkaški prodori u unutrašnjost tumula uglavnom dolaze sa strane i jasno su uočljivi na nekoliko sličnih kamenih obloga na ovoj nekropoli, što u primjeru tumula 1 nije slučaj. Također, pljačkaše, bez obzira je li riječ o prapovijesti, antici, srednjem vijeku ili modernom dobu, nikada ne zanima keramika koja u slučaju pljačke ostaje razbacana na mjestu prodora, što je isto bilo dokumentirano u nekoliko sličnih slučajeva na ovoj nekropoli. Međutim, u nasipu tumula 1 pronađen je tek jedan ulomak keramike! Osim toga, taj ulomak nije se mogao povezati niti s jednom posudom pronađenom unutar komore, a kojima, s druge strane, katkad nedostaje i do jedna trećina. Veoma slična struktura tumula 7 ukazuje kako je prije riječ o specifičnom grobnom ritualu, negoli o naknadnom poremećaju grobne cjeline (Potrebica 2006, 61-64). Ostaci keramike, pa i mala izdvojena zdjelica ispunjena sjemenjem, svojim se obilježjima u potpunosti uklapaju u lokalnu proizvodnju, na što ukazuje i vrlo često premazivanje površina posuda grafitom.

Svi nalazi upućuju na zaključak kako riječ o cjelini koja pripada među najstarije do sada pronađene na obje nekropole oko Kaptola. Ovaj tumul se prema materijalu (metalnim nalazima i keramičkim oblicima) datira u razdoblje Ha C1 odnosno u prvu polovicu 7. st. pr. Kr., dok je većina dosadašnjih nalaza pripadala razdobljima Ha C2 i Ha D1, odnosno drugoj polovici 7. i prvoj polovici 6. st. pr. Kr. Zbog dobivanja okvirne apsolutno kronološke slike izvršeno je i uzorkovanje materijala za datiranje radioaktivnim ugljikom koje je dalo rezultat 810.-420. god. pr. Kr.

Spomenuto je da je tijekom iskopavanja, u sjeverozapadnom kutu nekropole, pronađena jedna mala zdjelica ispunjena sjemenjem (sl. 3), koja po svojim obilježjima pripada halštatskom razdoblju. Kako je pukla na nekoliko mjesta zbog pritiska nasipa tumula, za arheobotaničku analizu uzorkovani su sadržaj zdjelice, te zemlja oko posudice i gar ispod nje. Paralelno s tim uzeti su i uzorci nasipa tumula iz različitih dijelova komore. Ukupna volumna količina analiziranih uzoraka iz cijele komore iznosi 58 litara, od kojih je 8 litara izuzeto ispod, oko ili iz same zdjelice. Uzorci su proce-

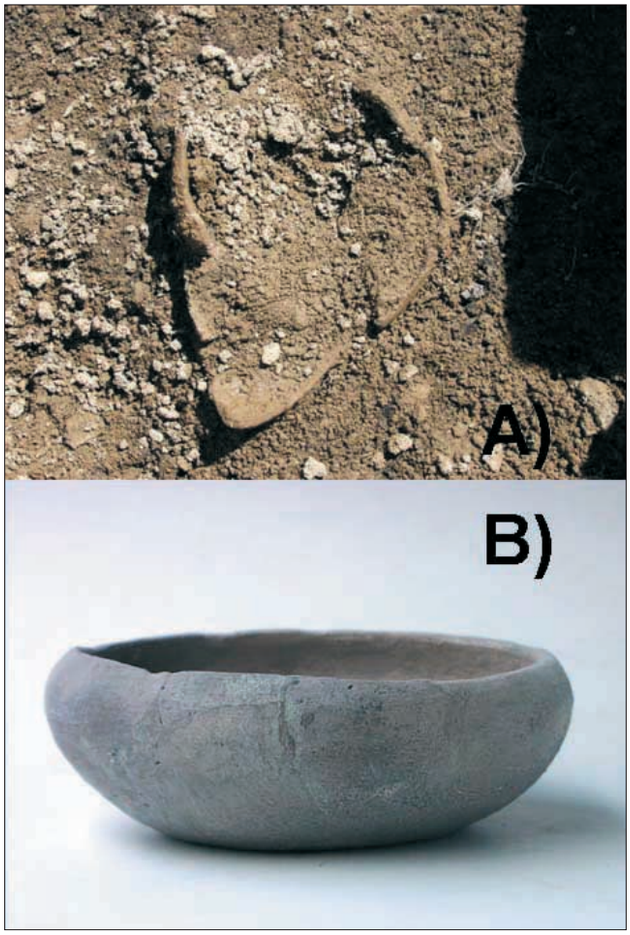


Sl. 2 Tlocrt komore s označenim položajem zdjelice sa sjemenkama

Fig. 2 The ground plan of the chamber with the marked position of the small bowl with seeds

to that large stone, in the very corner of the chamber, while a bronze fibula with several disks on the ribbed bow and two annular pendants of bronze wire, a small iron knife and two ceramic spindle-whorls were found in the heap of ash and bones beneath the stone. A small bowl filled with seeds was the only object discovered in the northeastern corner of the chamber (Fig. 3) (Potrebica 2002).

The excavation of the other grave barrows on the same site helped us determine that the drywall structure was probably the outer casing of the wooden coffin, i.e. the chamber in which the deceased person was buried, and whose traces can rarely be directly ascertained owing to the perishable nature of the material. In this case it was apparent that the stone casing of the chamber entirely leaned on something that preserved the central space which was filled by the soil from the fill of the tumulus after the wooden chamber had decayed. A relatively large number of vessels (around 21) were documented, which is quite a high number when compared to the remaining grave assemblages on this site, with the exception of princely tumulus 6. However, a good part of those vessels were deliberately broken and scattered about with no apparent order and it seems that only larger or smaller parts of vessels were deposited into the chamber. In terms of dimensions as well as interior organization tumulus 7 in the same necropolis is at present the most similar assemblage to this one. Although we cannot entirely rule out looting there are other elements that make it a less probable cause for such a situation. Prehistoric looting incursions into the interior of tumuli mostly come from the side and are clearly



Sl. 3 Fotografija zdjelice sa sjemenkama: A) *in situ*, B) nakon rekonstrukcije

Fig. 3 A photograph of the small bowl with seeds: A) in situ, B) after reconstruction

sirani na uobičajeni način za ispiranje preko sita, a korištena su sita veličine oka mreže 2.5, 1 i 0.3 mm.

REZULTATI I RASPRAVA

Od 12 uzoraka uzetih na različitim mjestima u komori tumula 1 (uzorak 1- komora; □ B-3; ∇ 10,52-10,58; 28. 04. 2002; gar ispod zdjele 2 i keramike pored / uz. 2 - komora; □ B-4; ∇ 10,49; 28. 04. 2002; sadržaj zdjele 4 / uz. 3 - komora; □ B-4; ∇ 10,54; 28. 04. 2002; kod zdjele 4 / uz. 4 -komora; □ B-4; ∇ 10,49; 28. 04. 2002; gar ispod zdjele 4 / uz. 5 - komora; □ B-3; ∇ 10,55; 28. 04. 2002 / uz. 6 - komora; □ B-3; ∇ 10,87-10,74; 26. 04. 2002 / uz. 7 - komora; □ C-2; ∇ 11,19-11,09; 25. 04. 2002 / uz. 8 - komora; □ C-3, B-3; ∇ 10,49; 27. 04. 2002. + K / uz. 9 - komora; □ C-3; ∇ 10,66; 26. 04. 2002 / uz. 10 - komora; □ C-3; ∇ 11,15; 25. 04. 2002 / uz. 11 - komora; □ C-4; ∇ 10,55; 26.04.2002 / uz. 12 - komora; □ B-2/3; ∇ 10,64; 28. 04. 2002; laka frakcija - spaljene kosti), samo ih je šest sadržavalo ostatke sjemenki i plodova (Tab. 1).

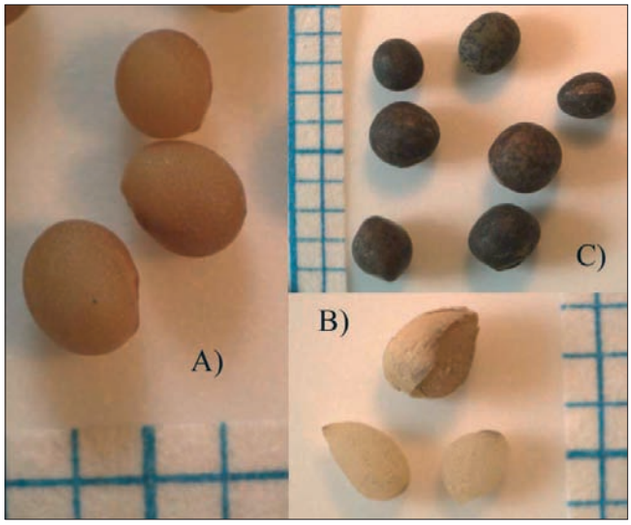
Izdvojeno je ukupno 1026 nekarboniziranih i neproklijanih biljnih ostataka, očuvanih u odličnom stanju, a njih 98,8% potječe iz keramičke zdjelice i njezine neposredne blizine. Budući da je zdjelica pukla na nekoliko mjesta, pretpostavljeno je da su nalazi oko i ispod posudice dio rasuta sadržaja zdjelice, što potvrđuje i gotovo identični sastav. perceptible in several similar stone casings in this necropolis, which is not the case with tumulus 1. Moreover, the looters, irrespective of the period – prehistory, antiquity, the Middle Ages or the Modern Age, are never interested in pottery. In the case of looting, usually left scattered on the spot of incursion which was also documented in several similar cases in this necropolis. However, the fill of tumulus 1 yielded merely one fragment of pottery! Furthermore, that fragment could not be connected to any vessel found within the chamber, even though they sometimes lack up to a third of their mass. The highly similar structure of tumulus 7 indicates that this is sooner a case of a specific burial ritual than of a subsequent disturbance of the grave assemblage (Potrebica 2006, 61-64). The features of the pottery remains, including the separate small bowl filled with seeds, entirely match the local production, which is also indicated by the fact that the surfaces of vessels are frequently coated with graphite.

All the finds point to the conclusion that this assemblage is among the oldest ones found so far on both necropolises around Kaptol. Based on the material (the metal finds and the ceramic forms), this tumulus is dated to the Ha C1 period, that is, the first half of the 7th cent. B.C., whereas the majority of the finds discovered until now belonged to the Ha C2 and Ha D1 periods, i.e. the second half of the 7th cent. B.C. and the first half of the 6th cent. B.C. In order to obtain a general picture regarding absolute chronology the material was sampled for radiocarbon dating, which yielded the age of 810-420 B.C.

It has already been mentioned that a small bowl filled with seeds (Fig. 3) was discovered during the excavations in the northwestern corner of the chamber. As it cracked in several places due to the pressure of the tumulus fill, the contents of the small bowl, the soil surrounding it and the charcoal below it were sampled for archaeobotanical analysis. In parallel with this we also sampled the fill of the tumulus from various parts of the chamber. The total volume of the analyzed samples from the entire chamber was 58 litres, of which 8 litres were taken from below, around or within the bowl itself. The samples were processed in the usual manner for Wet - sieving, using 2.5, 1 and 0.3 mm mesh sizes.

THE RESULTS AND DISCUSSION

Only six out of 12 samples taken at various spots within the chamber of tumulus 1 contained the remains of seeds and fruits (Pl. 1): sample 1 - chamber; □ B-3; ∇ 10,52-10,58; 28/04/2002; charcoal beneath bowl 2 and adjacent pottery / sam. 2 - chamber; □ B-4; ∇ 10,49; 28/04/2002; contents of bowl 4 / sam. 3 - chamber; □ B-4; ∇ 10,54; 28/04/2002; next to bowl 4 / sam. 4 -chamber; □ B-4; ∇ 10,49; 28/04/2002; charcoal beneath bowl 4 / sam. 5 - chamber; □ B-3; ∇ 10,55; 28/04/2002 / sam. 6 - chamber; □ B-3; ∇ 10,87-10,74; 26/04/2002 / sam. 7 - chamber; □ C-2; ∇ 11,19-11,09; 25/04/2002 / sam. 8 - chamber; □ C-3, B-3; ∇



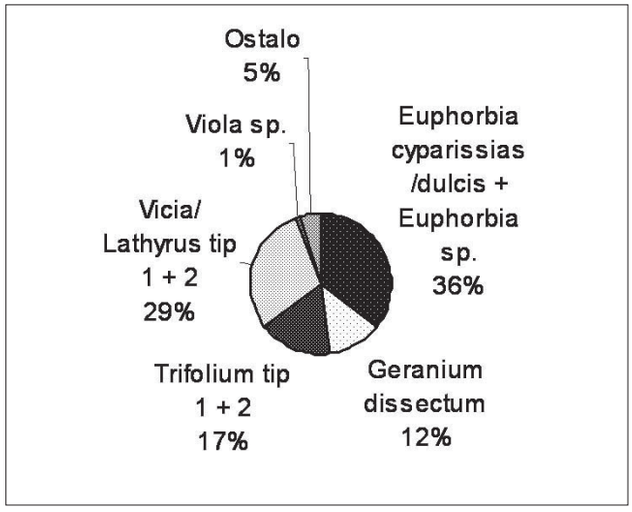
Sl. 4 Neki od biljnih ostataka nađenih u halštatskoj keramičkoj posudici: A) *Trifolium* sp. tip 1, B) – *Viola* sp. i C) *Vicia/Lathyrus* sp. tip 2

Fig. 4 Some of the plant remains found in the Hallstatt ceramic vessel: A) Trifolium sp. Type 1, B) – Viola sp. and C) Vicia/Lathyrus sp. type 2

Uzorci iz ostalih dijelova komore ili nisu sadržavali biljne ostatke ili su tek pojedinačni i drukčijeg sastava (Tab. 1) i pretpostavlja se da su u grobnu komoru dospjeli slučajno.

Budući da su nalazi biljnih ostataka (sl. 4) prvenstveno vezani za keramičku zdjelicu, koja svojim obilježjima pripada halštatskom razdoblju, prva pretpostavka je bila da su posudica i njezin sadržaj dio grobnih priloga. Sadržaj zdjelice u najvećem postotku (36%) čine sjemenke mlječike (*Euphorbia cyparissias/dulcis* i *Euphorbia* sp.), sjemenke mahunarki (*Vicia/Lathyrus* tip 1 i 2 – 29%, te *Trifolium* tip 1 i 2 – 17%) i sjemenke iglice (*Geranium dissectum* – 12%), dok su puno manjim udjelom zastupljeni ostaci ljubice (*Viola* sp. – 1%) i ostalih (*Carex* sp., *Scirpus* sp. i dr. – 5%), pa je moguće da su ti manje-više pojedinačni nalazi slučajna primjesa (sl. 5).

Sadržaj zdjelice prilično je iznenadio, budući da se radi o sitnim sjemenkama isključivo samoniklih biljaka i teško je pretpostaviti koji je smisao ovakva grobnog priloga. Još je veće iznenađenje bila činjenica da znatni dio sjemenki, koje bi trebale biti stare oko 2700 godina – proklijao. Materijal je uzorkovan na samom lokalitetu 28. travnja 2002., tako što su sadržaj zdjelice i uzorci sedimenta iz komore stavljeni u plastične vrećice i kartonsku kutiju u kojoj su 9. svibnja 2002. dostavljeni na analizu. Već tada, pri preuzimanju uzoraka, bilo je vidljivo da je znatni dio biljnog materijala počeo klijati (sl. 6A). Uzorci su ostavljeni još tjedan dana, a zatim su klijanci izdvojeni i posađeni u cvjetni lonac, dok je ostatak uzoraka ispran i izdvojen je preostali biljni materijal. S vremenom su se klijanci razvili u napredne biljčice, s time da su dominirali *Vicia* i *Geranium* (sl. 6B). Sve biljke koje su proklijale, razvile su zdrave i snažne stabljike i listove, ali u prvoj vegetacijskoj sezoni nijedna nije procvala. Tek je jedan primjerak iglice (*Geranium*) preživio do sljedeće sezone u kojoj je bujno cvao i stvarao plodove, te na kraju vegetacijske sezone i on nestao.



Sl. 5 Udio pojedinih biljnih svojti nađenih u i oko halštatske keramičke zdjelice

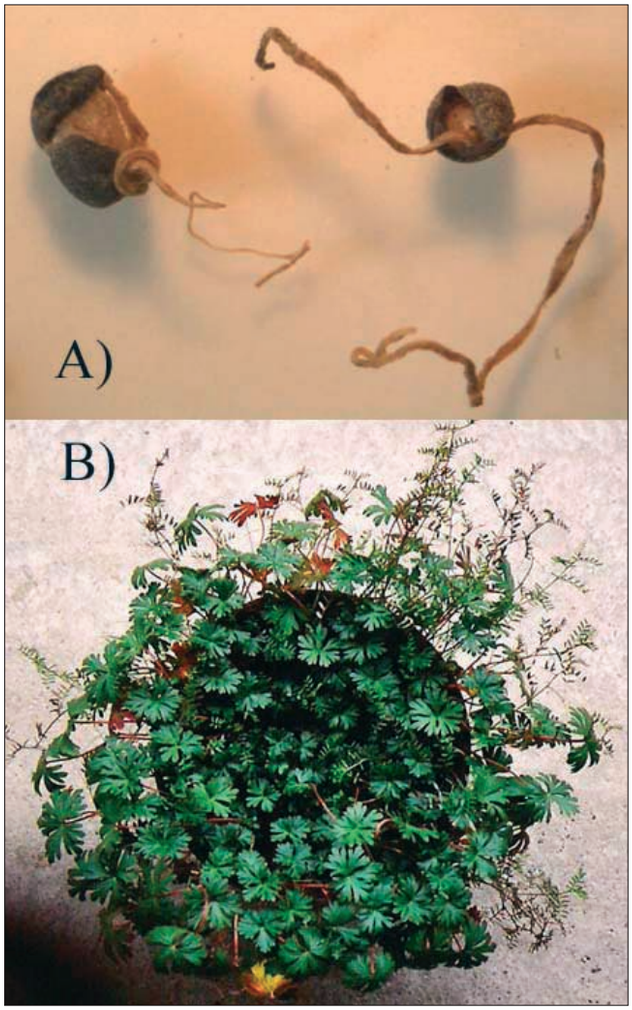
Fig. 5 Proportion of individual plant taxa found in and around the Hallstatt ceramic bowl

10,49; 27/04/2002. + K / sam. 9 - chamber; □ C-3; ∇ 10,66; 26/04/2002 / sam. 10 - chamber; □ C-3; ∇ 11,15; 25/04/2002 / sam. 11 - chamber; □ C-4; ∇ 10,55; 26/04/2002 / sam. 12 - chamber; □ B-2/3; ∇ 10,64; 28/04/2002; light fraction – burnt bones).

A total of 1026 non-carbonized and ungerminated plant remains were separated, excellently preserved, and 98,8% of those come from the small ceramic vessel and the space immediately around it. Considering that the small bowl cracked in several places, it was assumed that the finds around and below the bowl formed part of the scattered contents of the bowl, which is corroborated by the almost identical composition. The samples from the other parts of the chamber either did not contain plant remains or they were only individual and of a different composition (Pl. 1) and it is assumed that they arrived in the grave chamber by accident.

Considering that the finds of plant remains (Fig. 4) are primarily connected with the small ceramic bowl, whose features place it in the Hallstatt period, the first assumption was that the small bowl and its contents form part of the grave goods. The contents of the small bowl revealed that the most represented taxa are *Euphorbia cyparissias/dulcis* and *Euphorbia* sp., whose seeds make up 36% of the bowl. It is followed by seeds of pulses (*Vicia/Lathyrus* type 1 and 2 – 29%, and *Trifolium* type 1 and 2 – 17%) and Geranium dissectum - 12% while the remains of violet (*Viola* sp. – 1%) and other species (*Carex* sp., *Scirpus* sp. etc. – 5%) are present in a much smaller percentage, so it is possible that these more or less individual finds are accidental inclusions (Fig. 5).

The contents of the bowl came as quite a surprise, given that these were small seeds of exclusively wild plants and it is difficult to grasp the meaning of a grave good of this kind. An even greater surprise was the fact that a consider-



Sl. 6 Faze klijanja sjemenki nađenih u halštatskoj keramičkoj posudici: A) proklijale sjemenke, B) mlade biljke

Fig. 6 Phases of the germination of the seeds found in the Hallstatt ceramic bowl: A) germinated seeds, B) young plants

Iako se još uvijek istražuje i špekulira o tome koliko dugo sjemenke mogu zadržati klijavost i u kakvim uvjetima (usp. npr. Lerman, Cigliano 1971; Basu 1995, 2-3; Baskin, Baskin 1998, 145-149), mogućnost da to razdoblje bude 2700 godina činila se nevjerojatnom, pa je dio neproklijanih sjemenki poslan na AMS-dataciju u Beta Analytic laboratorij (Miami, Florida). U tom laboratoriju analiziran je uzorak drvenog ugljena pronađen neposredno uz pliticu, a rezultat je nedvojbeno potvrdio pripadnost ove cjeline razdoblju halštata. Međutim, analiza sjemenki je pokazala starost ispod 50 godina, što je značilo da se radi o recentnoj kontaminaciji.

Međutim, ni višekratno ponovljenim analizama tumula 1 i njegova kompleksa, arheolozi nisu mogli pojasniti na koji bi način halštatska posudica s biljnim materijalom mogla naknadno dospjeti u unutrašnjost odnosno komoru tumula, budući da je cjelina bila zatvorena iznimno tvrdim slojem kalcifikata, a na kamenoj jezgri koja zatvara komoru, kao ni u unutrašnjosti komore, nije bilo nikakvih tragova otvaranja cjeline. Čak i da pretpostavimo mogućnost pljačke u nekome od povijesnih razdoblja, to ne bi razjasnilo misterij proklijalih sjemenki. Definitivno se radi o kontaminaciji novijeg datuma, ali ljudski čimbenik se morao odbaciti, jer za to nema nikakve materijalne potvrde.

able part of the seeds, which were supposed to be around 2700 years old, has germinated. The material was sampled on the site itself on 28th April 2002 by placing the contents of the bowl and the sediment samples from the chamber into plastic bags and a cardboard box, in which they were delivered for analysis on 9th May 2002. Already then, at the takeover of the samples, it was obvious that a good part of the plant material started germinating (Fig. 6A). The samples were left standing for another week and then the sprouts were separated and planted into a flower pot, while the remainder of the samples were wet - sieved and the remaining plant material separated. The sprouts eventually developed into thriving plants, with *Vicia* and *Geranium* dominating (Fig. 6B). All the plants that germinated developed healthy and strong stems and leaves, but not a single one blossomed in the first vegetational season. Only one specimen of *Geranium* survived until the next season, in which it bloomed lavishly and yielded fruits, but it also waned at the end of the vegetational season.

Although the research and conjecture on how long and in what conditions seeds can preserve their ability to germinate is still ongoing, the possibility that this might amount to 2700 years appeared implausible (comp. e.g. Lerman, Cigliano 1971; Basu 1995, 2-3; Baskin, Baskin 1998, 145-149), so a part of the ungerminated seeds were sent for AMS-dating to the Beta Analytic Laboratory (Miami, Florida). This laboratory carried out an analysis of a charcoal sample discovered adjacent to the small bowl, and the result confirmed beyond doubt that this assemblage belonged to the Hallstatt period. However, the analysis of the seeds showed that they were less than 50 years old, which meant that a recent contamination was at play.

However, even after multiple analyses of tumulus 1 and its complex, the archaeologists were still unable to explain how it could happen that a Hallstatt vessel with plant material could at a later point in time arrive in the interior, more precisely the chamber of the tumulus, considering that the assemblage was sealed by an exceptionally hard layer of calcified matter and that the stone core that covered the chamber, same as the interior of the chamber, showed no signs whatsoever of having been opened. Even if we allow for the possibility of looting during one of the historical periods, this would not clarify the mystery of the germinated seeds. This is definitely a contamination of a recent date, but we were forced to reject the possibility of human action, because there was no material evidence of any sort.

Because the plant remains are almost exclusively connected with the Hallstatt ceramic vessel, at first we discarded the possibility that the heap was produced by animal action. However, animals are largely of opportunistic nature, and the find of a mouse nest in the interior of an ancient Greek bronze statue (Šoštarić et al. 2007) shows that they can choose fairly bizarre places for their dwellings, so this possibility was also taken into consideration. Even though no animal traces were noticed in the interior

Zbog činjenice da su biljni ostaci gotovo isključivo vezani za halštatsku keramičku posudicu, u prvi mah se odbacivala mogućnost da se radi o nakupini životinjskog podrijetla. No životinje su dobrim dijelom oportunisti, a nalaz mišjega gnijezda u unutrašnjosti starogrčkog brončanog kipa (Šoštarić et al. 2007) pokazuje da mogu odabrati prilično bizarna mjesta za svoje nastambe, pa je razmotrena i ta mogućnost. lako u unutrašnjosti tumula 1 nisu uočeni tragovi životinja, u dijelu kasnije otvaranih grobnih kompleksa nađeni su ostaci starijih i novijih gnijezda glodavaca koja su jasno vidljiva i prepoznatljiva, a prilikom iskopavanja u stratigrafiji su uočljivi i tuneli kojima su se glodavci služili. Također, u nekoliko slučajeva susreli smo se i s aktivnim mravinjacima u unutrašnjosti tumula.

Usporede li se biljni nalazi iz mišjega gnijezda starogrčkog brončanog kipa (Šoštarić et al. 2007) i iz halštatske posudice tumula 1, uočljiva je razlika u sastavu, koja je i očekivana, budući da nalazi potječu iz različitih klimatskih zona, ali i u tipu biljnog materijala. U „grčkom" mišjem gnijezdu nađeni su ostaci kukaca, te vrlo raznovrsni biljni materijal, čija veličina je varirala od nekoliko milimetara do nekoliko centimetara, a uključivala je sjemenke, plodove, fragmente klasova žitarica, glavice sa zrelim roškama, mahunarke s ostacima sjemenki i mahuna, ostatke sočnih plodova i dr. Halštatska posudica sadržavala je isključivo biljni materijal, nikakvi ostaci kukaca, zuba, dlaka i sl. nisu nađeni, a ostaci sjemenki su vrlo sitni, uglavnom 1-2 milimetra, tek poneka sjemenka mahunarki (*Vicia/Lathyrus* tipovi) prelazi 2 mm, i vrlo čisti, bez tragova mahuna, tobolaca i sl. „omotača". Osim toga, 54% neproklijanih sjemenki iz posudice u prirodi se rasprostranjuje ili se može rasprostranjivati putem mrava (prema Düll, Kutzelnigg 1986), što ne isključuje mogućnost da je i ostatak nalaza bio dio mravlje „smočnice". Postoje i druge vrste kukaca koje pohranjuju pričuve hrane u podzemne prostore, kao npr. pojedini rodovi i vrste inače tipično predatorske porodice trčaka (*Carabidae*). U odraslom i ličinačkom obliku trčci su edafski organizmi, koji provode život na površini tla ili u različitim slojevima tla te su najvećim dijelom života vezani uz tlo (Thiele 1977; Trautner, Geigenmüller 1987). Većinom su predatori, ali pojedini rodovi su u potpunosti fitofagni (npr. *Zabrus*). „Prava" spermofagija (sjemenke kao izvor hrane) značajna je za pojedine rodove tribusa Amarini, Zabrini i Harpalini. Zanimljivo je da ličinke trčaka, koji se hrane sjemenkama, skladište sjemenke češće negoli odrasli oblici (Brandmayr 1990). Ličinke rodova *Harpalus* i *Ophonus* spremaju manje količine sjemenki u vertikalne rovove, dok je kod odraslih oblika spremanje hrane za buduće potomke zabilježeno isključivo za skupinu Ditomini tribusa Harpalini (Brandmayr 1990). Ipak, s obzirom na brojnost i veličinu pohranjenih sjemenki najvjerojatnije se radi o mravima, koji skladište sjemenke u mravinjacima (rodovi *Messor, Monomorium* i *Pheidole*) (Gullan, Cranstone 2005; Matoničkin 1991; Wootton 1993). Mravi sjemenari tvore uglavnom velike kolonije i grade kompleksne mravinjake. Sjemenke pohranjuju u suhe „podzemne sobe", na različitim dubinama. Dubina mravinjaka je različita, te kod nekih vrsta može iznositi svega nekoliko centimetara, dok kod nekih pustinjskih mrava može prelaziti i dvanaest metara, a oblik

of tumulus 1, the remains of readily visible and recognizable old and recent rodent nests were found in a part of the subsequently opened burial complexes, and during the excavations the tunnels used by the rodents were also visible in the stratigraphy. Likewise, in several instances we encountered active anthills in the interior of the tumuli.

The comparison of the plant remains from the mouse nest in the ancient Greek bronze statue (Šoštarić et al. 2007) and those from the Hallstatt bowl in tumulus 1 reveals a difference in the contents – which is expected considering that the finds come from different climatic zones – but also in the type of plant material. The "Greek" mouse nest yielded remains of insects and quite diverse plant material, whose size varied from a couple of milimetres to several centimetres and included seeds, fruits, spike segments, capitula with ripe achenes, pulses with remains of seeds and pods, remains of juicy fruits etc. The Hallstatt vessel contained exclusively plant material, with no remains of insects, teeth, hair etc., and the seed remains were very small, 1-2 milimetres in general, with only an occasional pulse seed (*Vicia/Lathyrus* types) surpassing 2 mm, and very clean, without traces of pods, capsules and similar "seed-cases". In addition to this, 54% of the ungerminated seeds from the vessel are dispersed or can be dispersed by ant action (after Düll, Kutzelnigg 1986), which does not exclude the possibility that the remaining finds also formed part of the ant "larder". There are also other insect species that store seeds reserves into underground spaces, e.g. certain genera and species of the otherwise typical predatory family of ground beetles (*Carabidae*). In their adult and larval form ground beetles are edaphic organisms that spend their life on the surface of soil or in various soil layers, and they are connected with soil for the most part of their life (Thiele 1977; Trautner, Geigenmüller 1987). They are mostly predators, but certain genera are entirely phytophagous (e.g. *Zabrus*). The "true" spermophagy (seeds as a source of food) is important for certain genera of the Amarini, Zabrini and Harpalini tribes. It is interesting that ground beetle larvae, which feed on seeds, store seeds more frequently than the adult forms (Brandmayr 1990). The larvae of the *Harpalus* and *Ophonus* genera store smaller quantities of seeds into vertical shafts, while for adult forms the storing of food for future offspring is documented only in the case of the Ditomini group of the Harpalini tribe (Brandmayr 1990). Still, considering the large number and the size of the stored seeds, they probably arrived there through the action of ants, who store seeds in subterranean nests (genera *Messor, Monomorium* i *Pheidole*) (Gullan, Cranstone 2005; Matoničkin 1991; Wootton 1993). Harvester ants generally form large colonies and build complex subterranean nests. They store seeds in dry "underground granaries" at different depths. Anthills vary in depth – in the case of certain species they can amount to only a few centimetres, while in the case of certain desert ants they can exceed twelve metres. The form depends on the physical, chemical and hydrological properties of soil (Schlick-Steiner et al. 2005;

ovisi o fizikalnim, kemijskim i hidrološkim karakteristikama tla (Schlick-Steiner et al. 2005; Tschinkel 2004).

Izbor napuknute halštatske keramičke posudice kao mjesta za spremanje pričuva hrane, možda se u prvi mah čini vrlo neobičnim, ali zapravo i nije. Mravi je doživljavaju kao sklonište, slično kamenu, pukotinama stijena i sl., te ukoliko su mikroklimatski uvjeti odgovarali tj. ukoliko je bio minimaliziran utjecaj vlage, moguće je bilo skladištenje sjemenki u posudicu koja je istodobno bila i dobar zaklon za vrijedne namirnice.

Da sjemenke nađene u halštatskoj zdjelici nisu proklijale, teško da bi bilo tko dovodio u pitanje njihovu starost i ulogu grobnog priloga, bez obzira i na neočekivano dobru očuvanost biljnog materijala. Ovaj primjer pokazuje kako je važno biti vrlo oprezan u interpretaciji nalaza, te da bi direktna datacija organskog materijala trebala biti standard, pa i u slučajevima kada se kontekst njihova nalaza čini neupitan.

Tschinkel 2004). The selection of a cracked Hallstatt ceramic vessel as the place for storing food reserves may appear quite unusual at first but in fact it is not. The ants experience it as a shelter, similar to a stone, cracks in a rock etc., and if the microclimatic conditions were suitable, i.e. if the impact of humidity were minimized, it would be possible to store seeds in the vessel, which was at the same time a good cover for valuable victuals.

Had the seeds found in the Hallstatt bowl not germinated, hardly anybody would put their age and the role of grave goods in doubt, irrespective of the surprisingly well preserved state of the plant material. This example demonstrates how important it is to be careful in the interpretation of finds, and that the direct dating of organic material should be the standard, even in the cases when the context of their discovery appears indisputable.

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SVOJTA:/BROJ UZORKA: *TAXON:/NO. OF SAMPLES***:**	**2**	**3**	**4**	**6**	**9**	**12**	**Σ**
Alchemilla vulgaris s.l.		1					1
Carex sp.	2						2
Euphorbia cyparissias/dulcis	19	69	1				89
Euphorbia sp.	153	101	19				273
Geranium dissectum	39	83	5				127
Polycnemum arvense					2	1	3
Prunella vulgaris						1	1
Scirpus sp.		1					1
Trifolium sp. Tip/Type 1	21	139	6				166
Trifolium sp. Tip/Type 2		8					8
Vicia/Lathyrus sp. Tip/Type 1	6	31	2				39
Vicia/Lathyrus sp. Tip/Type 2	87	155	20				262
Viola sp.	3	6	1				10
INDET.	2	34		6		2	44
Σ	332	628	54	6	2	4	1026

Tab. 1 Popis biljnih svojti nađenih u uzorcima iz komore tumula 1
Pl. 1 The list of plant taxa found in the samples from the chamber of tumulus 1