Karbonizirane žitarice iz udbinske Gradine te pregled nalaza o uzgoju usjeva u srednjem i novom vijeku u Hrvatskoj

Šoštarić, Renata; Kolak, Tatjana

UDK 902
ISSN 1330-0644
Vol. 40/2
ZAGREB, 2023.

PRILOZI

Instituta za arheologiju u Zagrebu

Pril. Inst. arheol. Zagrebu
Str./Pages 1–186, Zagreb, 2023.

PRILOZI INSTITUTA ZA ARHEOLOGIJU
U ZAGREBU, 40/2/2023
STR./PAGES 1–186, ZAGREB, 2023.

Izdavač/Publisher
INSTITUT ZA ARHEOLOGIJU
INSTITUTE OF ARCHAEOLOGY

Adresa uredništva/
Address of the editor's office
Institut za arheologiju/Institute of archaeology
HR–10000 Zagreb, Jurjevska ulica 15
Hrvatska/Croatia
Telefon/Phone ++385/(0)1 61 50 250
Fax ++385(0)1 60 55 806
e-mail: urednistvo.prilozi@iarh.hr
http://www.iarh.hr

Glavni i odgovorni urednik/Editor in chief
Marko DIZDAR

Tehnički urednici/Technical editors
Marko DIZDAR
Katarina BOTIĆ

Prijevod na engleski/English translation
Tomislav BILIĆ, Sara ESSERT, Makso HERMAN, Tamara LEVAK POTREBICA, Marko MARAS

Prijevod na hrvatski / Croatian translation
Danijel DŽINO

Lektura/Language editor
Marko DIZDAR (hrvatski jezik/Croatian)
Marko MARAS (engleski jezik/English)

Korektura/Proofreads
Katarina BOTIĆ

Grafičko oblikovanje/Graphic design
Umjetnička organizacija OAZA

Računalni slog/Layout
Hrvoje JAMBREK

Tisak/Printed by
Sveučilišna tiskara d.o.o., Zagreb

Naklada/Issued
400 primjeraka/400 copies

Prilozi Instituta za arheologiju u Zagrebu indeksirani su u/
Prilozi Instituta za arheologiju u Zagrebu are indexed by:
DYABOLA – Sachkatalog der Bibliothek – Römisch-Germanische Kommission des Deutschen Archaeologischen Instituts, Frankfurt a. Main
Clarivate Analytics services – Web of Science Core Collection
CNRS/INIST – Centre National de la Recherche Scientifi que/L'Institut de l'Information Scientifi que et Technique, Vandoeuvre-lès-Nancy
EBSCO – Information servises, Ipswich
ERIH PLUS – European Reference Index for the Humanities and Social Sciences, Norwegian Directorate for Higher Education and Skills, Bergen
SciVerse Scopus – Elsevier, Amsterdam

E-izdanja. Publikacija je dostupna u digitalnom obliku i otvorenom pristupu na
https://hrcak.srce.hr/prilozi-iaz
E-edition. The publication is available in digital and open access form at
https://hrcak.srce.hr/prilozi-iaz?lang=en

DOI 10.33254

SADRŽAJ
CONTENTS

KARBONIZIRANE ŽITARICE IZ UDBINSKE GRADINE TE PREGLED NALAZA O UZGOJU USJEVA U SREDNJEM I NOVOM VIJEKU U HRVATSKOJ

CARBONIZED CEREALS FROM THE UDBINA – GRADINA SITE AND THE OVERVIEW OF EVIDENCE OF CROP CULTIVATION IN THE MEDIEVAL AND POST-MEDIEVAL PERIODS IN CROATIA

Izvorni znanstveni rad / srednjovjekovna i novovjekovna arheologija
Original scientific paper / Medieval and early modern archaeology
UDK UDC 903.28(497.5 Udbina)''653/654''
Primljeno / Received: 20. 6. 2023. Prihvaćeno / Accepted: 6. 10. 2023.
doi.org/10.33254/piaz.40.2.5

RENATA ŠOŠTARIĆ
Sveučilište u Zagrebu
Prirodoslovno-matematički fakultet
Biološki odsjek
Marulićev trg 20/2
HR–10000 Zagreb
renata.sostaric@biol.pmf.unizg.hr

TATJANA KOLAK
Muzej Like Gospić
Dr. Franje Tuđmana 3
HR–53000 Gospić
tatjana.kolak@muzejlike.hr
tkolak.mlg@gmail.com

Udbina – Gradina je jedini lokalitet iz razdoblja kasnog srednjeg (15. stoljeće) – novog vijeka (16. – 17. stoljeće) s većom količinom arheobotaničkih ostataka do sada analiziran na području Hrvatske. Na lokalitetu je nađena veća količina krupnozrnih žitarica u čijem sastavu je najdominantnija nepljevičasta pšenica (*Triticum aestivum* grupa) te manja količina korovnih primjesa. Napravljen je pregled karpoloških rezultata do sada istraženih i objavljenih srednjo- i novovjekovnih lokaliteta na području Hrvatske te usporedba s novoistraženim lokalitetom udbinske Gradine.

KLJUČNE RIJEČI: arheobotanika, srednji vijek, novi vijek, strategija uzgoja usjeva, Hrvatska

Udbina – Gradina is the only site from the Late Middle Ages (15th century) to the Post-Medieval Period (16th–17th century) with a considerable amount of archaeobotanical remains analysed so far in Croatia. A significant quantity of large-grain cereals was found onsite, the most dominant of which was free-threshing wheat (*Triticum aestivum* group), as well as a smaller quantity of weed admixtures. We present an overview of the carpological results of the thus far researched and published medieval and post-medieval sites in Croatia and provide a comparison with the newly researched site of Udbina – Gradina.

KEY WORDS: archaeobotany, Middle Ages, Post-Medieval Period, crop cultivation strategy, Croatia

UVOD

Krbavsko polje i Udbina

Krbavsko polje je najveća ravna poljska površina na prosječnoj visini od 724 m, u središnjem, gorskom dijelu Hrvatske, omeđena planinskim masivom Plješivice na istoku i nešto nižim lancem Ličkog sredogorja na zapadu. Središnje naselje kojem gravitiraju sva mjesta mikroregije jest Udbina, pozicionirana na prosječnoj visini 830 m n.v., na lingulastoj brdovitoj istaci plješivičkog gorja na istočnom rubu polja (sl. 1).

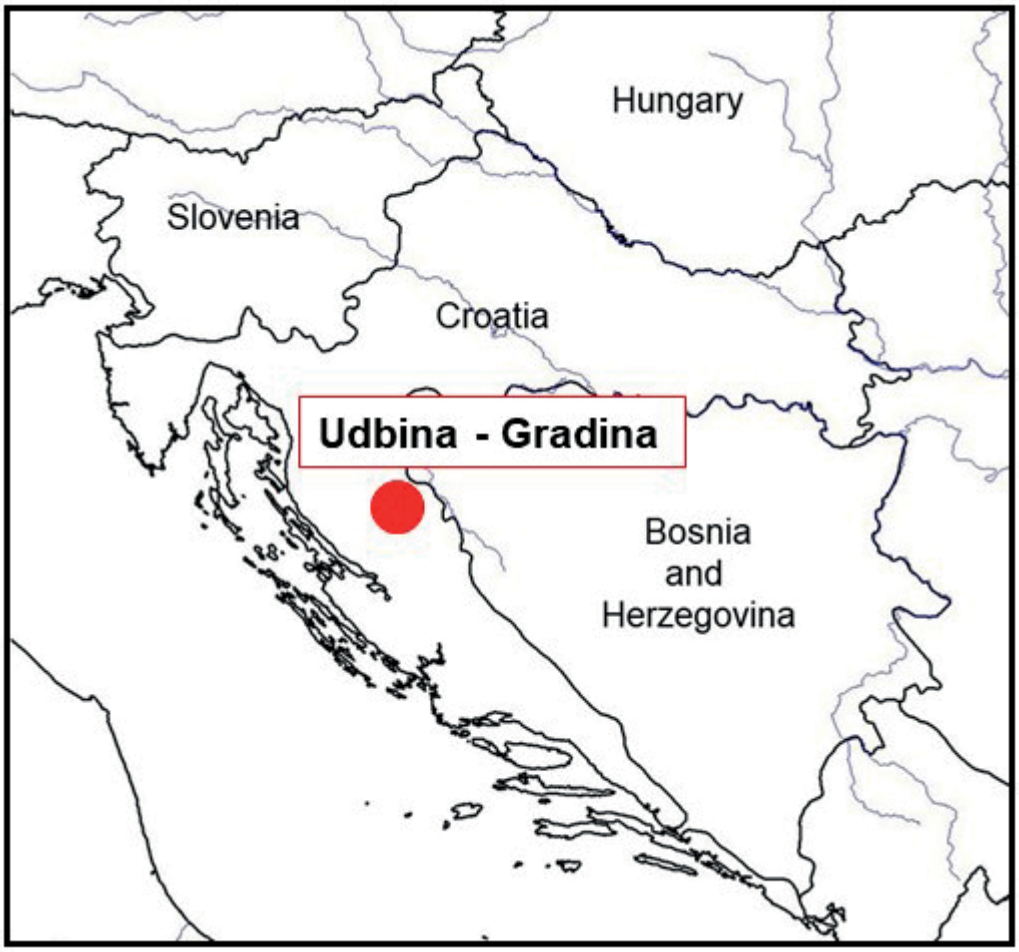
Ova dominantna točka, koja kontrolira gotovo cjelokupni prostor Krbavskog polja, a time i pravce komunikacije na transverzalama sjever – jug, odnosno istok – zapad, naseljena je kontinuirano od prapovijesti. Najviša točka samog brijega je stjenoviti položaj na sjevernoj strani, prepoznatljiv pod današnjim nazivom Gradina na koti 849 m n.v. (sl. 2: A) i donedavno s tek jedva vidljivim arhitektonskim ostacima srednjovjekovnog starog grada Udbine.

INTRODUCTION

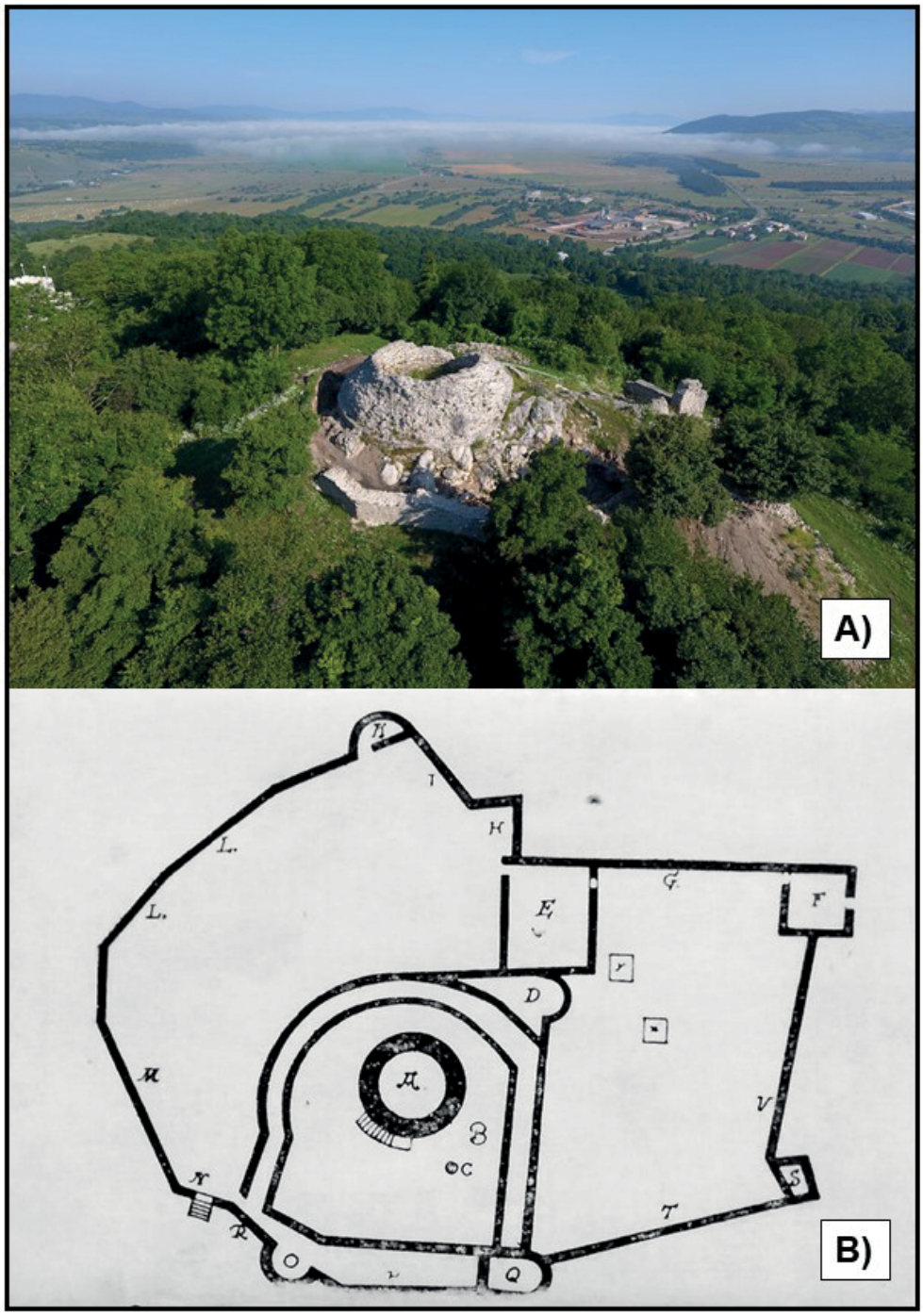
Krbavsko polje and Udbina

The Krbavsko polje is the largest karst field in the central, mountainous part of Croatia, placed at an average height of 724 m. It is surrounded by the Plješivica massif in the east and a slightly lower chain of Lika hills in the west. The central inhabited location to which all others in the microregion gravitate is Udbina, positioned at an average height of 830 m a.s.l., on the hilly spur of Plješivica Mountain on the eastern edge of the field (Fig. 1).

This dominant point, which overlooks almost the entire area of Krbavsko polje, and thus also all communication routes running north-south and east-west, has been inhabited continuously since prehistoric times. The highest point of the hill itself is a rocky position on the northern side, known today under the name Gradina, at an altitude of 849 m a.s.l. (Fig. 2: A), and until recently, with only barely visible architectural remains of the medieval town of Udbina.



Sl. 1 — Geografski položaj lokaliteta Udbina – Gradina (izradila: R. Šoštarić)
Fig. 1 — Geographical location of the Udbina – Gradina site (made by: R. Šoštarić)



Sl. 2 — A Pogled na udbinsku Gradinu (snimio: DJI, A. Kovačević); B plan Gradine I. F. Hollsteina iz 1740. godine (Szabo 1920: 206, sl. 226, original u bečkom Ratnom arhivu, sign. G Ia 55)
Fig. 2 — A view of Udbina – Gradina (photo by: DJI, A. Kovačević); B plan of Gradina by I. F. Hollstein from 1740 (Szabo 1920: 206, Fig. 226, original in the War Archives in Vienna, sign. G Ia 55).

Razlog za gradnju na sjevernoj, klimatološki nepovoljnijoj strani brda (izloženost hladnim vjetrovima i padalinama, manji broj sunčanih sati), uvjetovala su dva izvora pitke vode, Slanica i Točak, koja i danas opskrbljuju stanovništvo u razdobljima suše.

The reason for building on the northern, climatologically less favourable, side of the hill (exposure to cold winds and precipitation, fewer hours of sunshine) were two sources of drinking water, Slanica and Točak, which still supply the population in periods of drought.

U dosadašnjoj literaturi, Udbina se spominjala u kontekstu slučajnog nalaza japodskog nakita (Mirosavljević 1957: 5 i dalje), datiranog u starije željezno doba (Ha B – Ha D) (Ljubić 1876: 30–31, 34–35, 40, 42, 44–45, 48, 50, 55; 1889: 68–69, 169, 175; Drechsler-Bižić 1968: 42–43) te sekundarno korištenih rimskih urni i carskog novca (Patsch 1990: 41–43, 47). Srednjovjekovno razdoblje odnosilo se na uspon i jačanje krbavskih knezova Kurjakovića i s njima u svezi, izgradnju brojnih utvrda i kaštela (Kruhek 1997: 100–107; Kruhek, Horvat 2009: 253–262), sakralnih objekata i arhitekture (Horvat 1959: 1–2; 1963: 26; 1975: 131–132; Kruhek, Horvat 1988: 189–206; Horvat 1997: 157–160; 2003: 73–80) te uspostavu Krbavske biskupije u 12. st. i podizanje Stolnice sv. Jakova (Bogović 1988: 42–46 i dalje; 2010: 9–13), kao i njezinog istraživanja (Jurić 2004: 20 i dalje; 2008: 167–168).[1]

Najstariji, za sada nam poznati spomen imena Udbine zapisan je glagoljskim slovima na hrptu latinske isprave iz 1364., pisane za pavlinski samostan Bl. Dj. Marije: *To e list pod Turan na Udvini reda sga Pavla Remete*. Zemlje i sela koja tom ispravom dobivaju pavlini nalaze se također *...in districtu Vduina...* (Dočkal 1953: *s.p.*). Isprava je pisana u nekom tornju koji se nalazi na Udbini, u kojem bi lako mogli prepoznati kulu kao začetak novog naselja kojeg podiže rod krbavskih knezova Kurjakovića, suverenih gospodara župom Krbavom.

Pod kraj 15. i u prvoj trećini 16. stoljeća, s većim ili manjim intenzitetom, ali kontinuirano, odvijaju se osmanlijski ratni i pljačkaški pohodi s bosanskog prostora. U konačnici to rezultira padom Udbine, koju nakon 1527. Osmanlije popravljaju i dodatno utvrđuju te formiraju svoje upravno sjedište za idućih 150 godina. U vrijeme Vojne krajine, Udbina ima važnost tek stotinjak godina (1689. – 1791.) kada se granica pomiče dalje na istok. Od tada je prostor udbinske Gradine prepušten devastaciji i propadanju, i korišten tek kao mjerna kota ili bunker, odnosno osmatračnica u II. svjetskom ratu.

1 Arheološko istraživanje sv. Jakova provodi Arheološki muzej Zadar u suradnji s Muzejom Like Gospić, a započelo je 2000. pod vodstvom dr. sc. Radomira Jurića te danas pod vodstvom dr. sc. Jakova Vučića.

In the literature to date, Udbina has been mentioned only with regard to an accidental find of Iapydes jewellery (Mirosavljević 1957: 5, etc.) dating back to the Early Iron Age (HaB – HaD) (Ljubić 1876: 30–31, 34–35, 40, 42, 44–45, 48, 50, 55; 1889: 68–69, 169, 175; Drechsler-Bižić 1968: 42–43) and secondary Roman urns and imperial coins (Patsch 1990: 41–43, 47). The medieval period of the area was marked by the rise of the Kurjaković princes of Krbava and the related construction of numerous forts and castles (Kruhek 1997: 100–107; Kruhek, Horvat 2009: 253–262), sacral buildings and architecture (Horvat 1959: 1–2; 1963: 26; 1975: 131–132; Kruhek, Horvat 1988: 189–206; Horvat 1997: 157–160; 2003: 73–80), as well as the establishment of the Krbava diocese in the 12th century and the Krbava St. Jakov Cathedral (Bogović 1988: 42–46, etc.; 2010: 9–13) and the related research (Jurić 2004: 20, etc.; 2008: 167–168).[1]

The oldest known mention of the name Udbina was inscribed in Glagolitic script on the spine of the document written in Latin from 1364, written for the Pauline monastery of the Blessed Virgin Mary: *To e list pod Turan na Udvini reda sga Pavla Remet*. The lands and villages that were given to the Paulines by that document were also *in districtu Vduina* (in Udbina) (Dočkal 1953: *s.p.*). The document was written in a tower located in Udbina, in which one could easily recognize the tower as the initiation of a new settlement built by the Kurjaković princes of Krbava, the sovereign lords of the Krbava Parish.

At the end of the 15th century and in the first third of the 16th century, with greater or lesser intensity but continuously, Ottoman wars and raids coming from Bosnia persisted. Ultimately, this resulted in the fall of Udbina, which after 1527 the Ottomans reconstructed and additionally fortified and formed administrative headquarters for the following 150 years. At the time of the Military Frontier, Udbina was only important for about a hundred years (1689–1791), when the Frontier moved further east. Since then, the area of Udbina's Gradina has been left to devastation and decay, and was only used as a reference point or bunker and briefly as an observation post in World War II.

1 Archaeological research of the St. Jakov Cathedral is conducted by the Zadar Archaeological Museum in collaboration with the Lika Museum-Gospić and was initiated in 2000 under the guidance of Radomir Jurić, PhD, today headed by Jakov Vučić, PhD.

Gradina

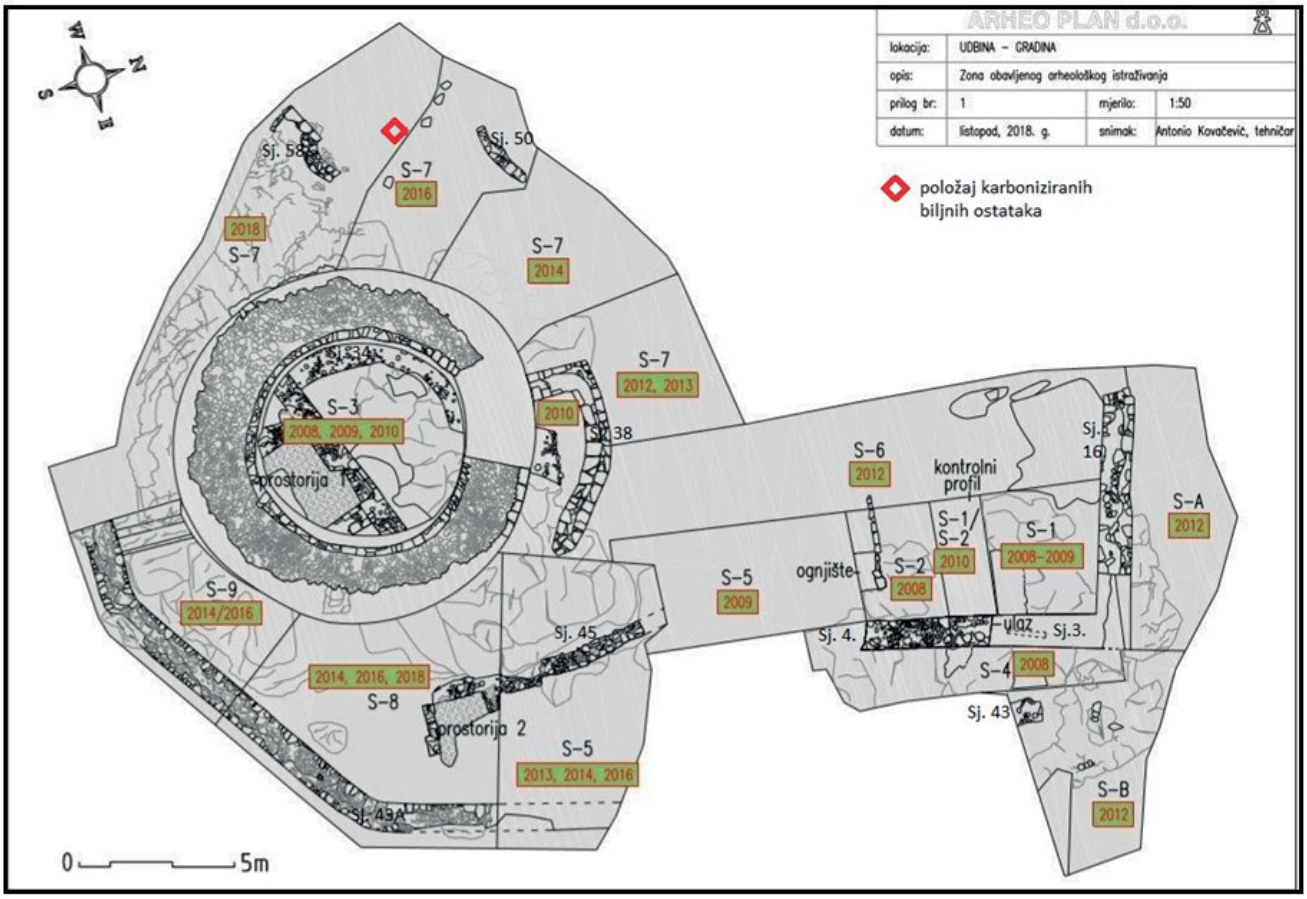
Arheološki lokalitet Gradina se sastoji od dva geomorfološki različita prostora – gornji dio s ostacima kružne kule, podjednako u obrambenoj i stambenoj funkciji, što čini prvotnu, stariju jezgru grada, a karakterizira ga izrazita strmina padine sa svih strana zaštićena zidanim bedemom. Donji dio kao prostor podgrađa, kojeg vjerojatno nastanjuju stanovnici ranije *civitas* Krbave, zaštićen je također donjim obrambenim zidom i u svojim današnjim gabaritima ukazuje na brojne preinake od srednjeg vijeka do današnjih dana. Ta situacija je uočljiva i na planovima iz 18. stoljeća (sl. 2: B) (1740. i 1790.) gdje je jasno označen glavni ulaz na jugozapadu.

Arheološko istraživanje pokrenuo je Muzej Like Gospić 2008., a započeto je iskopavanjem gornjeg segmenta lokaliteta (sl. 3). Tijekom prvih sezona u sondi 3 otkriveni su ostaci dviju nepravilno kružnih kula i istražena je njihova unutrašnjost. Mlađa kula, podignuta je dijelom

Gradina

The Gradina archaeological site consists of two geomorphologically different areas – the upper part comprises the remains of a circular tower, used both for defence and residential purposes, which forms the original, older core of the town and is characterized by a pronounced steep slope protected on all sides by a stone embankment. The lower part was below the tower and was probably inhabited by the inhabitants of the former Krbava *civitas*. It was also protected by the lower defensive wall and in its present dimensions indicates numerous alterations made from the Middle Ages to present day. This is also visible on construction plans from the 18th century (Fig. 2: B) (1740 and 1790), where the main entrance in the southwest is clearly marked.

Archaeological research was initiated by the Lika Museum Gospić in 2008 and began with the excavation of the upper segment (Fig. 3). During the first seasons in sector S-3, the remains of two irregularly circular towers were discovered



Sl. 3 — Udbina – Gradina, zona istraživanja 2008. – 2018 (izradio: A. Kovačević, ArheoPlan d.o.o.)
Fig. 3 — Udbina – Gradina, research zone 2008–2018 (made by: A. Kovačević, ArheoPlan Ltd)

na prirodnoj stijeni, a dijelom na temeljima, vjerojatno onog *turnja* iz isprave 14. stoljeća, vidljivih tek mjestimice ispod temeljne stope mlađeg objekta. Također je kružnog oblika s očuvanom podrumskom prostorijom (prostorija 1), zaglađenom žbukanom podnicom i pragom ulaza s utorom za nosivi stup jednokrilnih vrata, otvaranih prema unutra.

Ostaci vanjskog lica su minorni, uglavnom je riječ o zidnom plaštu, odnosno ispuni zida, a i očuvana visina zida ne dozvoljava determinaciju, je li kula bila cilindrična ili stožasta (temelji i ostaci zida prizemlja su nepravilno kružni, no to ne znači da su na katnoj razini bili jednakog oblikovanja). Starija historiografija navodi da je „na tri kata" s ulazom na prvom katu, okrenutom sjeveru. Za to potvrdu nalazimo u masivnom podzidu sa sjeverne strane s kojeg se vjerojatno pružala drvena stubišna konstrukcija koja je u slučaju opasnosti moglo lako biti uklonjena.

Nutarnji promjer kule iznosi 6,86 m, odnosno 7,37 m, dok debljina zida iznosi u prosjeku 2,40 m. Nutarnje lice zida i očuvani dijelovi vanjskog lica u potpunosti su građeni od klesanaca, dok je unutrašnjost zapunjena neobrađenim većim ili manjim kamenjem, uz obilno prisustvo veziva. S obzirom na iznimno veliku količinu rasute žbuke u podnožju kule, za pretpostaviti je da je kula u cijelosti bila presvučena debljim slojem žbuke. U svrhu provjetravanja unutrašnjosti kule, a ujedno se to pokazalo i kod bedema, između kule i podgrađa, u zidu su ostavljani pravilni kružni ventilacijski otvori, većinom promjera 10 cm.

Graditelji su vješto koristili prirodnu liticu na kojoj je kula podignuta, pa su pojedini dijelovi kamena živca obrađivani i ukorporirani kao dio temelja ili obrambenih zidova. Prirodne pukotine su zapunjavane kompaktnom žbukom i masnom zemljom crvenicom (ilovačom) miješanom s lomljenom ciglom, dok su na mekom terenu temelji proširivani nanošenjem obilnog sloja žbuke.

Iskopavanjem uz unutarnje lice sjevernog perimetralnog zida i spoj s istočnim unutarnjim bedemom, uz vidljiv današnji, uvjetno nazvan ulaz u gornji dio grada, otkriven je ostatak žbukane podnice nad kojim se nalazio koncentrirani sloj gorenja i ostaci drvenih masivnih greda. S obzirom da je nivo poda niži za jedan metar od današnjeg praga, pripadao bi objektu izravno povezanom uz unutarnji, istočni bedem, dok je drvena građa slu-

and their interior was explored. The more recent tower was built partly on natural rock and partly on the foundations of probably the tower (*turanj*) from the 14th century document. These foundations are visible only at several places below the new foundations of the more recent structure. This newer tower is also circular in shape with a preserved basement room (room 1), a smooth plastered floor and an entrance threshold with a slot for the support column of a single-wing door that opens inwardly.

The remains of the former exterior appearance of the building are negligible, mainly wall cladding is visible, and the preserved height of the wall does not allow for a determination of whether the tower was cylindrical or conical (the foundations and remains of the ground floor wall are irregularly circular, but this does not mean that they were of the same shape on the upper floor level). Older historiography states that it had "three floors" with an entrance on the first floor, which faced north. We can find evidence of this in the massive sub-wall on the north side, from which probably extended a wooden staircase structure that could be easily removed in case of danger.

The inner diameter of the tower is 6.86 m and 7.37 m, respectively, while the thickness of the wall is on average 2.40 m. The inner face of the wall and the preserved parts of the outer face are completely built of cut stone, while the interior is filled with uncut larger or smaller stones with an abundant presence of binding material. Given the extremely large amount of loose plaster at the foot of the tower, it can be assumed that the tower was completely coated with a thick layer of plaster. In order to ventilate the interior of the tower, and this is also distinguishable in the embankment, circular ventilation openings, mainly 10 cm in diameter, were made in the wall between the tower and the substructure.

The builders skilfully used the natural cliff on which the tower was built, so some parts of the existing stone were cut and incorporated as part of the foundation or defensive walls. Natural cracks were filled with compact plaster and greasy red soil (loam) mixed with broken brick, while on soft ground the foundations were widened by applying an abundant layer of plaster.

Excavation along the inner side of the northern perimeter wall and the junction with the eastern inner embankment, along with today's so-called entrance to the upper part of the town, revealed remains of a plastered floor over which there was a concentrated layer of burnt wood and the re-

žila kao dio konstrukcije za natkrivanje ulaza ili vjerojatnije nekadašnjeg ophoda uz bedem. Postoji i vjerojatnost da je riječ o razdoblju izgradnje kule i obrambenog zida sredinom ili u drugoj polovici 14. stoljeća, na što upućuju rezultati analize određivanja starosti metodom raspadanja radioaktivnog izotopa ugljika.[2]

Prapovijesni sloj otkriven je zasad na dvije pozicije, uz unutarnje lice sjevernog perimetralnog zida u sondi 6 (sezona 2012.) te podno istočne litice na kojoj je podignuta kula i u kaverni koja se mogla otvoriti i prilikom građevinske aktivnosti u vrijeme Kurjakovića (sezona 2018.). Kulturni sloj nije intaktan, već je korišten za nivelaciju terena prilikom zidanja i u statičke svrhe (Kolak 2014: 426–428). S obzirom na brojne analogije pokretnih nalaza s ličkih japodskih gradinskih lokaliteta tijekom kasnog brončanog i starijeg željeznog doba, a osobito prema nalazu brončanog koplja, ovu fazu možemo datirati u HaB stupanj kasnog brončanog doba.[3]

Srednjovjekovna pokretna arheološka građa pripada širokom repertoaru nalaza što se pronalaze pri istraživanju hrvatskih istovremenih gradova. Količinski je najbrojnija skupina keramičkih nalaza u koju pripadaju i građevinski elementi peći, poput čašastih pećnjaka, svakodnevno grubo posuđe namijenjeno čuvanju i spremanju hrane, a rezultat je lokalne proizvodnje te skupocjeno stolno posuđe, uvoznog porijekla u kome prepoznajemo čvrste veze ličko-udbinskog prostora s italskim ili srednjoeuropskim proizvodnim i kulturnim centrima. Ovome treba pridodati i ansambl staklenih recipijenata za serviranje i konzumaciju tekućina. Metalni nalazi su također brojni i pripadaju širokom spektru građevinskih predmeta, zanatstva, konjaničke ili konjske opreme te svakako oružja, od vrhova strelica za samostrel do najstarijeg tipa vatrenog oružja, tzv. bedemske puške ili kukače i signalnih mužara. Svi nalazi jasno pozicioniraju Ud-

mains of massive wooden beams. As the floor's level is one meter lower than today's threshold, this means it probably belonged to a building directly connected to the inner, eastern embankment, while the wood served as part of a structure overarching the entrance or, more likely, the former path along the embankment. There is also the possibility that the floor originates from the mid or late 14th century, when the tower and defensive wall were built, as indicated by analysis using the radioactive carbon isotope decay method.[2]

A prehistoric layer has so far been discovered at two positions, along the inner side of the northern perimeter wall in sector S-6 (season 2012), and at the foot of the eastern cliff on which the tower was built as well as in the cavern, which could also have opened up during construction by the Kurjaković family (season 2018). The cultural layer was not intact, as it was used for levelling the terrain during construction and for loadbearing purposes (Kolak 2014: 426–428). Considering the numerous analogies with the portable findings from the Lika Iapydes hill sites that trace back to the Late Bronze and Early Iron Ages, and especially the bronze spear that was found, we can date this phase to the HaB stage of the Late Bronze Age.[3]

The medieval portable archaeological artifacts belong to a wide array of findings found during research into the Croatian towns of the same period. Quantitatively, the largest group includes ceramic finds that comprise stove structural elements, like cup-shaped stove tiles, everyday coarse dishes for storing and preparing food, all of which were manufactured locally, as well as expensive tableware of imported origin that reveals the strong ties of the Lika-Udbina area with Italian or central European manufacturing and cultural centres. In addition, many finds included a vast collection of glass receptacles for serving and consuming liquids. Metal finds were also numerous and covered a wide range of objects used in construction and crafts, equestrian equipment, and last but not least, weapons, from crossbow arrow tips to the oldest type of firearm, arquebuses with hook-like

2 Analiza ^{14}C tehnikom LSC na dva uzorka greda vršena je na Institutu Ruđer Bošković Zagreb, Laboratorij za mjerenje niskih aktivnosti 2009.; Z-4248: BP 585±50, 1300–1370 AD (48,0 %), 1380–1410 AD (20,2 %); Z-4249: BP 575±50, 1300–1360 AD (44,6 %), 1380–1420 AD (23,6 %).

3 Japodsko gradinsko naselje nalazilo se na sjevernoj i sjeverozapadnoj padini podno samog vrha, a prema sada dostupnoj slici, devastirano je srednjovjekovnom gradnjom. Širilo se i na donje terase, osobito između današnje 9. i 12. postaje Križnog puta. Nekropola ovih stanovnika nalazila se vjerojatno na položaju današnjeg udbinskog parka i dijelom je uništena izgradnjom spomen-kosturnice narodno-oslobodilačke borbe (NOB) 1955. godine.

2 Analysis by ^{14}C LSC technique on two samples was performed at the Ruđer Bošković Institute Laboratory for Low-level Radioactivities in 2009; Z-4248: BP 585±50, 1300–1370 AD (48.0%) / 1380–1410 AD (20.2%); Z-4249: BP 575±50, 1300–1360 AD (44.6%) / 1380–1420 AD (23.6%).

3 The Iapydes settlement was located on the northern and north-western slope beneath the very peak but has since been devastated during construction in the Middle Ages. It spread to the lower terraces, especially between today's 9th and 12th Stations of the Cross. The necropolis of these inhabitants was most likely located at the position of today's Udbina park and was partly damaged following the construction of the National Liberation Army memorial ossuary in 1955.

binu u srednjoeuropski kontekst gradova u drugoj polovici 15. i početkom 16. stoljeća, u dvojakoj funkciji, podjednako vojnog, obrambenog obilježja, ali i stambenog prostora kao reprezent moći velikaških obitelji, odnosno krbavskih Kurjakovića.

Podno kule, na cijeloj dosad istraženoj površini, evidentiran je paljevinski sloj (sl. 4: A) kojeg, zajedno s pronađenom pokretnom arheološkom građom, možemo povezati s vojnom aktivnošću u posljednjem desetljeću 15. i s početka 16. stoljeća (sl. 4). S obzirom na strminu padine, dio tog paljevinskog sloja je erodirao, dok je najveća koncentracija prisutna uz sami podzid kule. U zapadnom podnožju kule, u debljem paljevinskom sloju otkrivena je u sezoni istraživanja 2016. veća količina gara te nešto manja količina karboniziranih sjemenki[4] koje su bile vidljive u zapadnom iskopnom profilu (sl. 4: B). Datacija uzorka gara iz tog paljevinskog sloja koji je uključivao i karbonizirane sjemenke, nakon provedene ^{14}C analize, ukazala je na 1489. godinu.[5] Vrijeme je to koje možemo promatrati i kroz spomenute vojne pohode, ali i mogućnost da je u jednom trenutku došlo do nekontroliranog širenja vatre.

U sezoni 2018., nastavljeno je s istraživanjem u zapadnom dijelu sonde 7, odnosno uklanjanjem nekadašnjeg zapadnog iskopnog profila. I tada je pronađen ostatak[6] karboniziranih sjemenki koji su s manjom količinom pronađenom u 2016. (sl. 4: A–B), činili cjelinu. Sveukupno je riječ o manjoj količini sadržaja. S obzirom da je erozija zemljišta utjecala na količinu sačuvanog materijala, teško je na terenu bilo pretpostaviti je li se u začetku radilo o skladišnom prostoru za hranu, sanduku namijenjenom ishrani stoke, o žitaricama u transportnoj vreći ili tipu namjenske vreće za prihranu konja[7] – *zobnici* ili *zobnjači*. Uzorak je također upućen na analizu u svrhu datacije, ali i potvrde dobivenog prvotnog datuma na temelju pronađenog gara. Rezultati se prilično razlikuju jer je datum botaničkog uzorka[8]

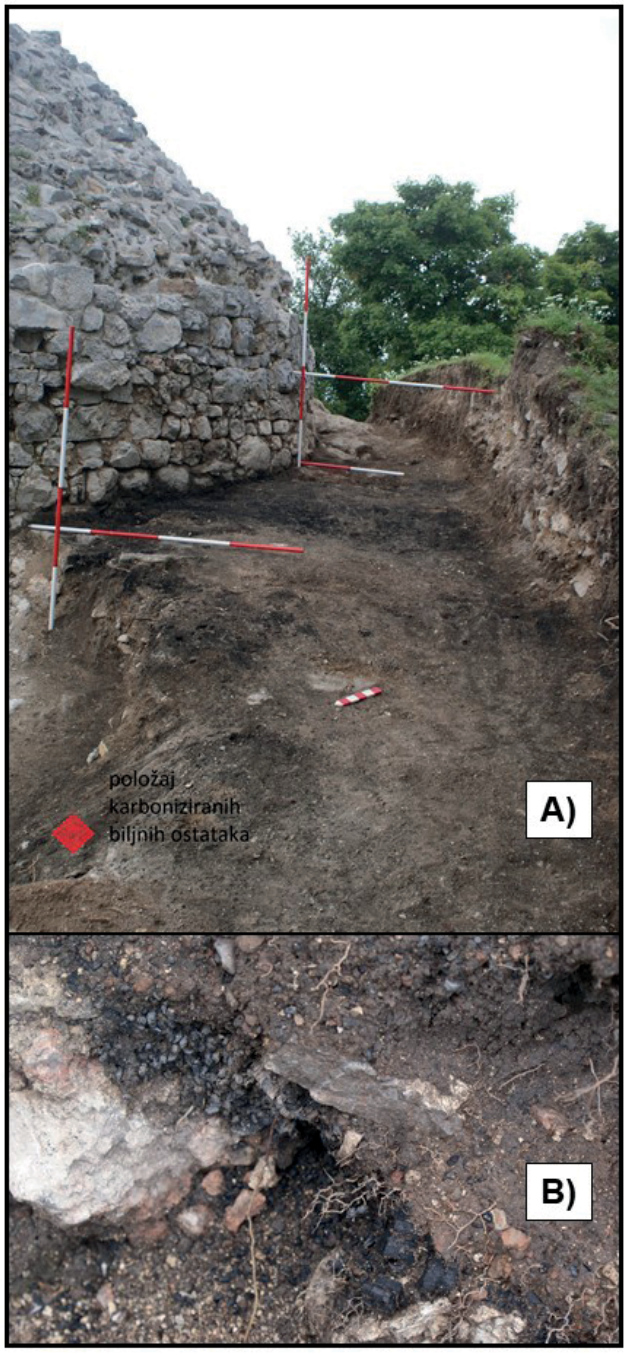
4 UDB-GR, UZ. 2/2016, S-7/Sj.8.,▼841,08.
5 Analiza ^{14}C, tehnikom LSC, na uzorku gara vršena je na Institutu Ruđer Bošković Zagreb, Laboratorij za mjerenje niskih aktivnosti 2016.; Z-6198: BP 410±50, 1434–1515 AD (57,7 %), 1559–1617 AD (10,5 %), med. Cal 1489 AD.
6 Ukupna težina iznosi 1602 g.
7 Prisustvo konja je posve očekivano, tim više što su pronađene i brojne cjelovite ili djelomično očuvane konjske potkove.
8 UDB-GR, Uz. 4/2018, S 7/Sj. 8, ▼841,15.

projection and signal rifles. All of these findings clearly position Udbina within the context of central European towns from the second half of the 15th and early 16th century that had both military and defensive significance, as well as importance as residential space through being representative of the power of noble families, in this case the Kurjaković family of Krbava.

At the bottom of the tower, on the entire area investigated so far, a layer of burnt material was detected (Fig. 4: A), which, together with the found portable archaeological material, can be linked to military activity in the last decade of the 15th century and early 16th century (Fig. 4). Considering the steepness of the slope, a part of this burnt layer had eroded, while the highest concentration was present along the sub-wall of the tower. At the western base of the tower, in the thicker burnt layer, a larger amount of charcoal and a somewhat smaller amount of carbonized seeds[4] were discovered in the 2016 research season, which was visible in the western excavation profile (Fig. 4: B). The dating of the charcoal sample from that burning layer which also included carbonized seeds, following ^{14}C analysis indicated the year 1489.[5] This was a time marked by many military campaigns, but there is also the possibility that at one point there was an uncontrolled spread of fire.

In the 2018 season, research continued in the western part of sector S-7, through the removal of the former western excavation profile. This was when the remaining[6] carbonized seeds were found, which together with the smaller amount found in 2016 (Fig. 4A–B), formed a single unit, which overall made up only a small amount of content. Given that soil erosion affected the amount of preserved material, it was difficult to speculate immediately whether this was initially a storage area for food, a crate intended for livestock feed, grain in a bag meant for transport or a sack intended for feeding horses.[7] The sample was also sent to ^{14}C analysis for dating and to confirm the original date obtained from the aforementioned charcoal. The results differed quite a bit, as the date of the 2018 botani-

4 UDB-GR, UZ. 2/2016, S 7/SU 8,▼841.08.
5 Analysis by ^{14}C LSC technique on the charcoal sample was performed at the Ruđer Bošković Institute Laboratory for Low-level Radioactivities in 2016; Z-6198: BP 410±50, 1434–1515 AD (57.7%); 1559–1617 AD (10.5%); med. Cal 1489 AD.
6 The total weight amounted to 1602 g.
7 The presence of horses was to be expected, even more so considering that many entirely or partially preserved horseshoes were found.



Sl. 4 — Udbina – Gradina: A paljevinski sloj u zapadnom podnožju kule, 2018. (snimila: T. Kolak); B karbonizirani biljni ostaci ***in situ***, detalj 2016. (snimila: T. Kolak)
Fig. 4 — Udbina – Gradina: A burnt layer at the western foot of the tower, 2018 (photo by: T. Kolak); B Carbonized plant remains *in situ*, detail from 2016 (photo by: T. Kolak)

iz 2018. mlađi za nešto više od dva stoljeća[9] i smješta žitarice u 16. – 17. stoljeće, tj. u novi vijek, što ukazuje da je Gradina bila u upotrebi dulje vremena nego što se prvotno mislilo.

9 Analiza ^{14}C, tehnikom AMS, na uzorku karboniziranih žitarica vršena je na Institutu Ruđer Bošković Zagreb, Laboratorij za mjerenje niskih aktivnosti 2018.; Z-6783: BP 250±50; vjerojatnost za 62,8 %: cal AD 1523–1573 (17,8 %), cal AD 1630–1679 (28,2 %), cal AD 1764–1801 (16,4 %), 1939–... cal AD (5,8 %); vjerojatnost za 95,4%: cal AD 1485–1691 (62,6 %), cal AD 1729–1811 (24,8 %), cal AD 1924–...(8,1 %). Vrlo sličan rezultat potvrdio je i Isotoptech Zrt. laboratorij u Debrecenu, Mađarska, (BP 325±21, cal AD 1492–1640), također na uzorku karboniziranih žitarica.

cal sample[8] was a little more than two centuries[9] more recent, placing the cereal in the 16th–17th century, i.e., the Post-Medieval Period, which indicates that Gradina was in use for much longer than thought originally.

MATERIAL AND METHODS

The carbonized plant remains collected in 2016 in the western part of sector S-7, layer 8, were analysed; sampling date 18 Jul 2016. The sample contained pure carbonized plant remains, without any addition of sediment, so there was no need for additional sample processing in terms of sieving, washing, etc.

RESULTS AND DISCUSSION

Udbina-Gradina

All of the extracted plant remains were carbonized. In total, more than 450 plant remains were identified (Tab. 1). A part of the fruits and seeds remained fused during the carbonization process, which made it impossible to precisely count all of the remains found, so their quantity was defined in accordance with their state of preservation (marks > and * in Tab. 1).

The findings predominantly contained different types of large-grain cereals (94.68%), while only a small part was made up of weeds (2.88%) and other (2.44%) admixtures (Fig. 5). Small-grain cereals, such as millet, were not found. As part of the cereal grains remained fused during carbonization, their quantity was approximated. In the dominant group of large-grain cereals, the most numerous was free-threshing wheat (*Triti-*

8 UDB-GR, Uz. 4/2018, S-7/SU 8, ▼841.15.
9 Analysis by ^{14}C AMS technique on the sample of carbonized grains was performed at the Ruđer Bošković Institute Laboratory for Low-level Radioactivities in 2018: BP 250±50, Z-6783, probability for 68.2%: 1523–1573 AD (17.8%); 1630–1679 AD (28.2%); 1764–1801 AD (16.4%); 1939–... AD (5.8%); probability cal AD 95.4%: 1485–1691 (62.6%), cal AD 1729–1811 (24.8%), cal AD 1924–...(8.1%). A very similar result was obtained from the Isotoptech Zrt. Laboratory in Debrecen, Hungary, (BP 325±21, cal AD 1492–1640), also on the sample of carbonized grains.

MATERIJAL I METODE

Analizirani su karbonizirani biljni ostaci sakupljeni 2016. godine u zapadnom dijelu sonde 7, iz sloja 8, datum uzorkovanja 18.07.2016. Uzorak je sadržavao čiste karbonizirane biljne ostatke, bez primjese sedimenta, pa nije bilo potrebe za dodatnom obradom uzoraka u smislu prosijavanja, ispiranja kroz sita i sl.

REZULTATI I RASPRAVA

Udbina – Gradina

Svi izdvojeni biljni ostaci bili su karbonizirani. Ukupno je identificirano više od 450 biljnih ostataka (tab. 1). Dio plodova i sjemenki ostao je slijepljen tijekom procesa karbonizacije, zbog čega nije bilo moguće precizno izbrojati sve nađene ostatke pa je njihova količina definirana u skladu sa stanjem očuvanosti (oznake > i * u tab. 1).

U nalazima potpuno dominiraju različite vrste krupnozrnih žitarica (94,68 %) dok samo manji dio čine korovne (2,88 %) i ostale (2,44 %) primjese (sl. 5). Sitnozrne žitarice, poput prosa, nisu pronađene. Kako je dio žitaričnih zrna tijekom karbonizacije ostao slijepljen, njihova je količina približno definirana. U dominantnoj skupini krupnozrnih žitarica najbrojnija je nepljevičasta pšenica (*Triticum aestivum* grupa, sl. 6: A), koja čini više od 30,12 % udjela i to bez kategorije slijepljenih zrna s drugim tipovima žitarica. Zatim slijedi raž (*Secale cereale*, sl. 6: B) s više od 15,96 % udjela, također bez kategorije slijepljenih zrna s drugim tipovima žitarica. Relativno veliki udio u nalazima ima i kategorija krupnozrnih žitarica (*Cerealia*), čiji se ostaci zbog loše očuvanosti i fragmentiranosti nisu mogli preciznije determinirati, a čine udio veći od 23,95 % nalaza (tab. 1; sl. 6: C). U uzorku nije bilo ostataka drugih skupina jestivih biljaka, poput mahunarki, voća, uljarica i sl.

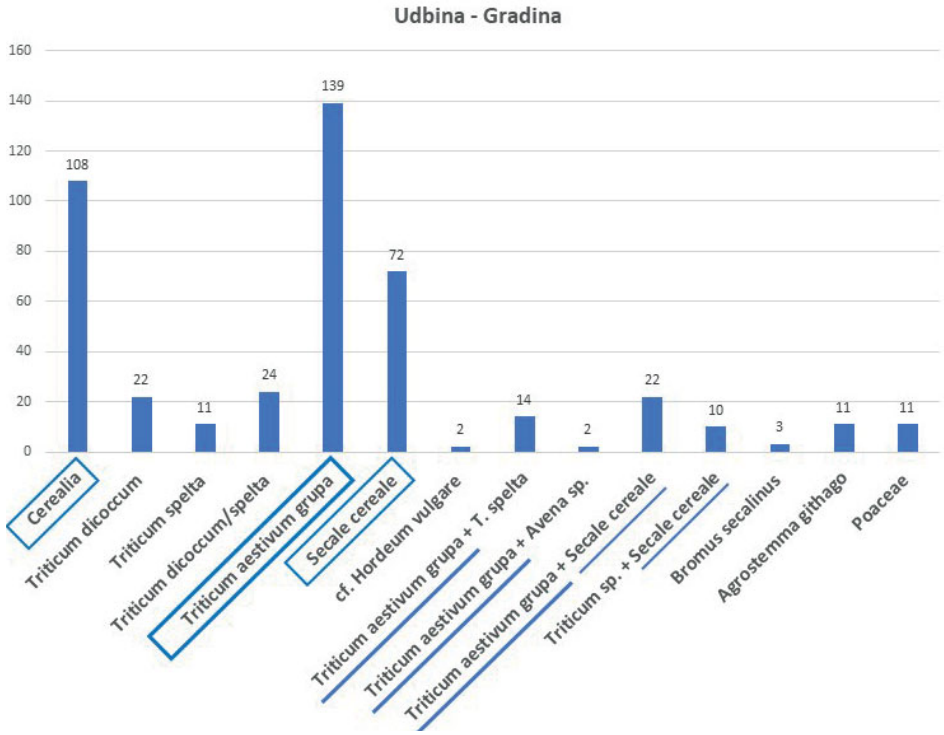
U uzorcima nisu nađeni ostaci pljeva, koji bi omogućili ili barem olakšali determinaciju nepljevičastih tipova pšenice (tetraploida *Triticum turgidum* subsp. *durum* i *Triticum turgidum* subsp. *turgidum* te heksaploida *Triticum aestivum* subsp. *aestivum* i *Triticum aestivum* subsp. *compactum*). Iako postoji veliki potencijal geometrijsko-morfometrijske analize u determinaciji nepljevičastih pšenica (Roushannafas, McKerracher 2023), takva identifikacija je još uvijek veliki izazov, naročito ako su *cum aestivum* group, Fig. 6: A), which made up a share of more than 30.12%, not counting the category of grains fused with other types of cereals. The second most numerous was rye (*Secale cereale*, Fig. 6: B) with more than 15.96% share, also not counting grains fused with other types of cereals. The category of large-grain cereals (*Cerealia*) also had a relatively large share of over 23.95%, but its remains could not be determined more precisely due to poor preservation and fragmentation (Tab. 1; Fig. 6: C). The sample contained no other remnants of edible plants, such as legumes, fruits, oilseeds, etc.

No chaff remains were found in the samples, which would enable or at least facilitate the determination of free-threshing wheat (tetraploid *Triticum turgidum* subsp. *durum* and *Triticum turgidum* subsp. *turgidum*, and hexaploid *Triticum aestivum* subsp. *aestivum* and *Triticum aestivum* subsp. *compactum*). Although there is a great potential of geometric-morphometric analysis in the determination of free-threshing wheats (Roushannafas, McKerracher 2023), such identification is still a big challenge, especially if the carbonized grains are poorly preserved, damaged or joined together. This is why this category of wheat is named as *Triticum aestivum* group.

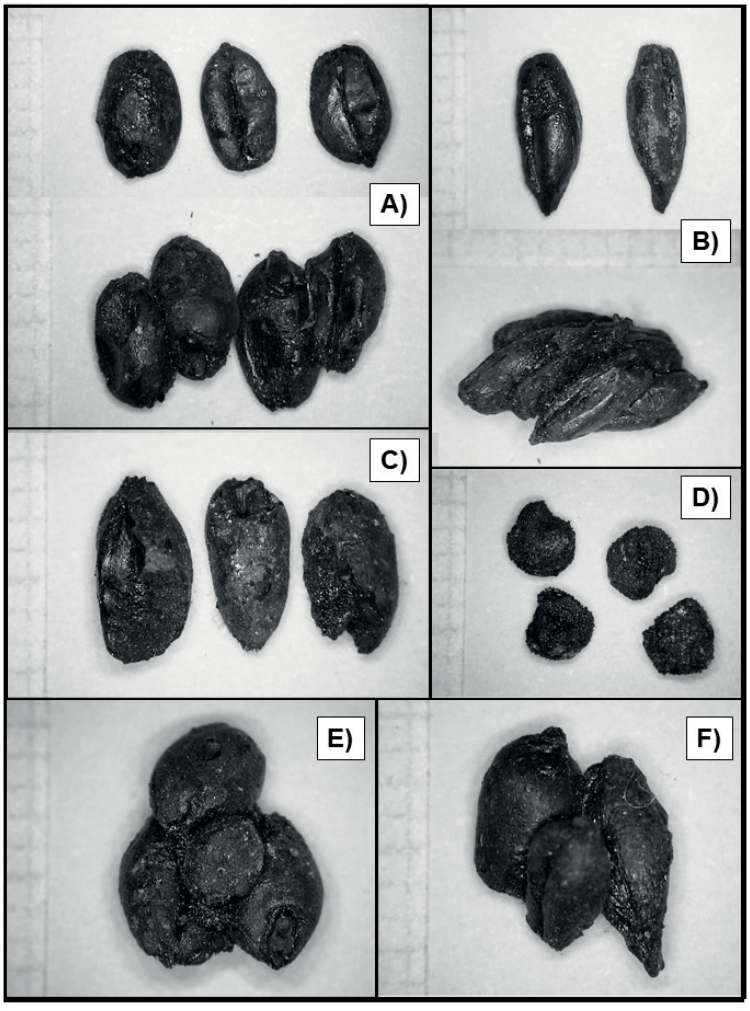
The burnt layer from which the plant remains originated was probably formed as a result of military activity in the Udbina area in the last decade of the 15th and the beginning of the 16th century. The dating of the analysed plant remains, which places them in the 16th–17th century, leads one to conclude that Gradina was used even longer, but probably less intensively and only occasionally. The composition of the plant remains, dominated by wheat and rye, indicates that they were intended for human consumption. The diet of horses that were of crucial importance in military activities, if cereals are used, is based primarily on oats (*Avena* sp.) and wheat bran, and then barley (*Hordeum vulgare*), while wheat is used much less often and in very limited quantities (Ivanković 2004; Medved 2020; Šerman 2001). Both oats and barley were found only in traces, so it is not likely that the grains came from any kind of receptacle for feeding horses; it is more likely that they came from the remains of a smaller storage area in Gradina or, for instance, a sack used for transport. Although grains could have been transported

SVOJTA / TAXA:	BILJNI OSTATAK / PLANT REMAIN:	BROJ BILJ. OSTATAKA / NUMBER OF PL. REMAINS:	Σ BILJ. OSTATAKA / Σ PL. REMAINS:	Σ
Triticum dicoccum (dvozrni pir, dvozrna pšenica / emmer wheat)	pšeno (zrno) / grain	15	**15**	**22**
Triticum dicoccum	slijepljena po 2 zrna + po 3 zrna / 2 grains + 3 grains fused together	2 + 1	**7**	
Triticum spelta (pravi pir / spelt wheat)	pšeno / grain	11	**11**	**11**
Triticum dicoccum/spelta	pšeno / grain	22	**22**	**24**
Triticum dicoccum/spelta	slijepljena po 2 zrna / 2 grains fused together	1	**2**	
***Triticum aestivum* grupa / group** (nepljevičasta pšenica / free-threshing wheat)	pšeno / grain	84	**84**	**> 139***
Triticum aestivum grupa / group	slijepljena 2 zrna / 2 grains fused together	17	**34**	
Triticum aestivum grupa / group	slijepljena 3 zrna / 3 grains fused together	4	**12**	
Triticum aestivum grupa / group	slijepljeno više od 3 zrna / more than 3 grains fused together	2	**> 6**	
Secale cereale (raž / rye)	pšeno / grain	64	**64**	**> 72**
Secale cereale	slijepljena 2 i više zrna / 2 or more grains fused together	4	**> 8**	
cf. *Hordeum vulgare* (ječam / barley)	pšeno / grain	2	**2**	**2**
Cerealia (krupnozrne žitarice / large grain cereals)	pšeno i fragment pšena / grain and grain fragment	86	**86**	**> 108**
Cerealia	slijepljena 2 i više zrna / 2 or more grains fused together	11	**> 22**	
Triticum aestivum* grupa / group + *T. spelta	slijepljena 2 i više zrna / 2 or more grains fused together	7	**> 14**	**> 14**
***Triticum aestivum* grupa / group + *Avena* sp.** (pšenica + zob / wheat + oat)	slijepljena zrna (1+1) / grains fused together (1+1)	1	**2**	**2**
Triticum aestivum* grupa / group + *Secale cereale (pšenica + raž / wheat + rye)	slijepljena 2 i više zrna / 2 or more grains fused together	11	**> 22**	**> 22**
Triticum aestivum* grupa / group + *Agrostemma githago (pšenica + kukolj /wheat + corncockle)	slijepljena 3 zrna pšenice i 1 sjemenka kukolja / 3 wheat grains and 1 corncockle seed fused together	1	**3+1**	*
Triticum* sp. + *Secale cereale (pšenica + raž / wheat + rye)	slijepljena 2 i više zrna / 2 or more grains fused together	5	**> 10**	**> 10**
Bromus secalinus (ražasti ovsik / rye brome)	pšeno / grain	3	**3**	**3**
Agrostemma githago (kukolj / corncockle)	sjemenka + fragm. sjemenke / seed + seed fragment	9 + 1	**10**	**11***
Poaceae (trava / grass)	pšeno / grain	11	**11**	**11**
Σ				**> 451**

Tab. 1 — Udbina – Gradina, pregled karboniziranih arheobotaničkih nalaza (izradila: R. Šoštarić)
Tab. 1 — Udbina – Gradina, overview of the carbonized archaeobotanical findings (made by: R. Šoštarić)



Sl. 5 — Udbina – Gradina, grafički prikaz vrste i količine nalaza karboniziranih biljnih ostataka (izradila: R. Šoštarić)
Fig. 5 — Udbina – Gradina, a graphic representation of the type and quantity of carbonized plant remains found (made by: R. Šoštarić)



Sl. 6 — Karbonizirani biljni ostaci nađeni na lokalitetu Udbina – Gradina: A *Triticum aestivum* grupa (nepljevičasta pšenica, pojedinačna i slijepljena zrna); B *Secale cereale* (raž, pojedinačna i slijepljena zrna); C *Cerealia* (žitarice); D *Agrostemma githago* (kukolj, sjemenke); E jedna sjemenka kukolja na vrhu tri slijepljena zrna pšenice; F jedno zrno raži slijepljeno s dva zrna nepljevičaste pšenice (snimila: R. Šoštarić)
Fig. 6 — Carbonized plant remains found at the Udbina – Gradina site: A *Triticum aestivum* group (free-threshing wheat, single and fused grains); B *Secale cereale* (rye, single and fused grains); C *Cerealia* (cereals); D *Agrostemma githago* (corncockle, seeds); E one corncockle seed on top of three fused wheat grains; F one grain of rye fused with two grains of free-threshing wheat (photo by: R. Šoštarić)

karbonizirana zrna slabije očuvana, oštećena ili slijepljena. Zbog toga je ova kategorija pšenice imenovana kao *Triticum aestivum* grupa.

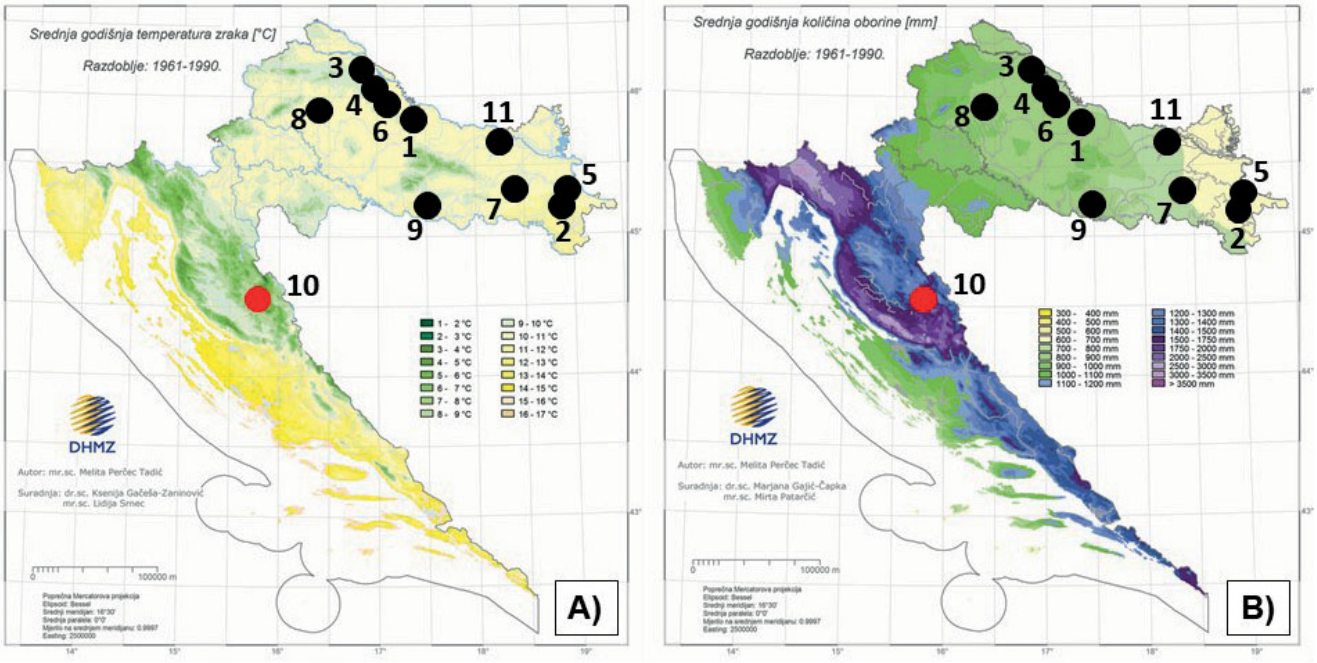
Paljevinski sloj iz kojeg potječu biljni ostaci povezuje se s vojnom aktivnosti udbinskog područja u posljednjem desetljeću 15. i s početka 16. stoljeća. Datacija analiziranih biljnih ostataka, koja ih smješta u 16. – 17. stoljeće, produžuje vrijeme korištenja Gradine, vjerojatno manje intenzivno i tek povremeno. Sastav biljnih ostataka, u kojem dominiraju pšenica i raž, upućuju na namjenu za ljudsku prehranu. Prehrana konja koji su u vojnim aktivnostima imali presudnu važnost, ako se koriste žitarice, temelji se prvenstveno na zobi (*Avena* sp.) i pšeničnim posijama, pa onda ječmu (*Hordeum vulgare*), dok se pšenica puno rjeđe i u vrlo ograničenim količinama koristi u prehrani konja (Ivanković 2004; Medved 2020; Šerman 2001). I zob i ječam nađeni su tek u tragovima, tako da nije vjerojatno da žitarice potječu iz *zobnjače* ili drugog „pakiranja" za prehranu konja, već je vjerojatnije da predstavljaju ostatke manjeg skladišnog prostora u Gradini ili žitarice transportirane u vreći. Iako su žitarice mogle biti transportirane iz drugih područja, vjerojatnije je da su uzgajane lokalno. Gradina ima dobar obrambeni položaj, pa je moguće da se dio usjeva pohranjivao u gradska skladišta kao mjera opreza i osiguranja u slučaju opasnosti i napada na naselja u nižim područjima.

Lika, pa time i istraživani lokalitet, pripada gorskom području Hrvatske, koje se reljefno i klimatski bitno razlikuje od panonskog prostora u kojem su koncentrirani do sada istraženi srednjovjekovni i novovjekovni lokaliteti. Gorska bila i grebeni pružaju se između zatvorenih poljskih ravnica s nižim pobrđem, a otprilike 70 % površine nalazi se između 500 i 700 m n.v. Srednje godišnje temperature zraka su niže od panonskog prostora i mogu značajnije varirati, ovisno o prodorima toplog ili hladnog zraka s obalnog ili kontinentalnog područja. Srednja godišnja količina oborina znatno je veća od vrijednosti u panonskom prostoru, ali zbog snažnog maritimnog utjecaja pokazuje oscilacije tijekom godine, pa najveća količina oborina pada uglavnom u jesen, zatim u proljeće, a ljeta mogu biti dosta suha (Šegota 1975) (sl. 7). Takva struktura najviše pogoduje razvoju stočarstva, ali plodne krške doline, poput, u ovom slučaju, Krbavskog polja, omogućavaju i uzgoj različitih usjeva.

from other areas, they were more likely grown locally. The Gradina town had a good defensive position, so it is possible that part of the crops was stored in the town warehouses as a precaution in case of danger and attacks on settlements in lower areas.

Lika, and thus the investigated site, belongs to the mountainous area of Croatia, which is significantly different in relief and climate from the Pannonian area, where the medieval and post-medieval sites that have been investigated so far are concentrated. Mountain ridges extend between closed karst fields with lower slopes, and approximately 70% of the area is located between 500 and 700 m a.s.l. Average annual air temperatures are lower than the Pannonian area and can vary significantly, depending on the arrival of warm or cold air from the coastal or continental area. The average annual amount of precipitation is significantly higher than the value in the Pannonian area, but due to the strong maritime influence it shows oscillations during the year, so the highest amount of precipitation falls mainly in autumn, then in spring, and summers can be quite dry (Šegota 1975) (Fig. 7). Such a structure is most favorable for the development of cattle breeding, but fertile valleys, such as, in this case, karst field of Krbavsko polje, also enable the cultivation of various crops.

Free-threshing tetraploids (*Triticum durum* and *T. turgidum*) are better adapted to warmer and drier areas of the Mediterranean (Zohary et al. 2012: 40), because they tolerate drought better, and are sensitive to low temperatures and high-water levels in the soil or floods (Roushannafas, McKerracher 2023: 6). Although free-threshing tetraploids (*Triticum durum*/*turgidum*) are better adapted to warm and dry regions, research has shown that they can also thrive in a continental climate, which is markedly colder and moister (Kirleis, Fischer 2014). Reed et al. (2022) also determined findings of free-threshing wheat from the Slavonia region as *Triticum aestivum/durum*. Nevertheless, when basic climate parameters are compared (Fig. 7), the area of Udbina's Gradina is located in a zone with a harsher continental climate than any site in Slavonia, so bread wheat (*T. aestivum*) was most likely grown in the Udbina area. The dry period with noticeably less precipitation is most often summer, namely the month of August (Šegota 1975), which should not endanger winter crops.



Sl. 7 — Geografski položaj uspoređivanih srednjovjekovnih i novovjekovnih lokaliteta na podlogama karata s osnovnim klimatskim parametrima: A srednja godišnja temperatura zraka (°C) za Hrvatsku za razdoblje 1961. – 1990.; B srednja godišnja količina oborine (mm) za Hrvatsku za razdoblje 1961. – 1990. Popis lokaliteta i literaturnih izvora nalazi se u tab. 3 (izradila: R. Šoštarić; prilagođeno prema Zaninović 2008: 34; Gajić-Čapka et al. 2008: 52)
Fig. 7 — Geographical location of the medieval and post-medieval sites from the comparison on maps with basic climate parameters: A average annual air temperature (°C) for Croatia for the period 1961–1990; B average annual precipitation (mm) for Croatia for the period 1961–1990. List of sites and literature sources in Tab. 3 (made by: R. Šoštarić; adapted from Zaninović 2008: 34; Gajić-Čapka et al. 2008: 52).

Nepljevičasti tetraploidi (*Triticum durum* i *T. turgidum*) bolje su prilagođeni toplijim i sušim područjima Sredozemlja (Zohary et al. 2012: 40) jer bolje podnose sušu, a osjetljivi su na niske temperature i visoku razinu vode u tlu ili poplave (Roushannafas, McKerracher 2023: 6). Istraživanja su pokazala da mogu uspijevati i u uvjetima kontinentalne klime koja je zamjetno hladnija i vlažnija (Kirleis, Fischer 2014), pa tako i Reed et al. (2022) nalaze nepljevičaste pšenice iz područja Slavonije definiraju kao *Triticum aestivum/durum*. Ipak, kada se usporede osnovni klimatski parametri (sl. 7), područje udbinske Gradine nalazi se u zoni hladnije i vlažnije kontinentalne klime od slavonskih lokaliteta, pa je na udbinskom području najvjerojatnije uzgajana krušna pšenica (*T. aestivum*). Sušno razdoblje sa zamjetno manje oborina najčešće je ljeto i to mjesec kolovoz (Šegota 1975), što ne bi trebalo ugroziti ozime usjeve.

Osim nepljevičaste pšenice, pronađeni su ostaci dvozrnog i pravog pira (*Triticum dicoccum* i *T. spelta*), u nekoliko slučajeva međusobno slijepljeni (tab. 1) što pokazuje da su bili u zajedničkoj smjesi. Vjerojatno je ciljana

Apart from free-threshing wheat, the remains of emmer wheat and spelt wheat (*Triticum dicoccum* and *T. spelta*) were found, in several cases fused (Tab. 1), which shows that they were in a common mixture of cereals. It is likely that the target crop was primarily free-threshing wheat (*T. aestivum* group) and that non-free-threshing mixtures were tolerated both in the fields and in the diet.

Rye (*Secale cereale*) made up a large part of the findings, in quite a number of cases also fused with wheat (Tab. 1; Fig. 6: F), which suggests that a mixture of wheat and rye was used for the preparation of bread and other food. Rye makes quite heavy, dark bread, because it contains less gluten than bread wheat, which makes white, lighter and more desirable bread. For this reason, a mixture of wheat and rye flour was often used, which gave lighter and brighter bread than pure rye flour (Van der Veen 2022).

Unlike wheat, which can be quite sensitive to low temperatures and drought and have truly low yields, rye is much more resistant, so it was often grown in colder areas of Europe (Gyulai 2014). Rye tolerates drought well, thanks to its deep roots, and poor and acidic soils, so it is a

kultura prvenstveno bila nepljevičasta pšenica (*T. aestivum* grupa), a pljevičaste primjese su se tolerirale i na poljima i u prehrani.

Veliki udio u nalazima čini raž (*Secale cereale*), mjestimično također slijepljena s pšenicom, i to u podosta slučajeva (tab. 1; sl. 6: F), što sugerira da se za pripremu kruha i drugih jela koristila mješavina pšenice i raži. Od raži se dobiva dosta težak, tamni kruh jer sadrži manje glutena od krušne pšenice od koje se dobiva bijeli, laganiji i poželjniji kruh. Zbog toga se često koristila mješavina pšeničnog i raženog brašna koja je davala laganiji i svjetliji kruh od čistog raženog brašna (Van der Veen 2022).

Za razliku od pšenice koja može biti dosta osjetljiva na niske temperature i sušu te podbaciti urodom, raž je puno otpornija, pa se često uzgajala u hladnim područjima Europe (Gyulai 2014). Raž dobro podnosi sušu, zahvaljujući dubokom korijenju, te siromašna i kisela tla, pa je puno pouzdaniji usjev od krušne pšenice (Van der Veen 2022). Vrsta tla također određuje vrstu kulture, pa se pšenica uzgajala na kvalitetnijim podlogama lesa i ilovače, dok su ječam, zob i raž dobro uspijevali i na pjeskovitim tlima (Bakels 2005). Neki autori sugeriraju da su pšenica i raž uzgajane zajedno u mješavini („maslin“) jer su konkurirajući jedna drugoj nadrastale korov, a u slučaju loše sezone, barem bi otporna raž osigurala kakvu-takvu žetvu (Pretty 1990; Reed et al. 2022). S obzirom na prirodne karakteristike šireg područja Udbine i Gradine (Krbavsko polje), postojali su uvjeti za uzgoj svih nađenih žitarica, pa se najvjerojatnije radi o lokalnoj proizvodnji. Na temelju arheobotaničkih nalaza nije moguće procijeniti jesu li se pšenica i raž uzgajale u mješavini ili odvojeno, pa naknadno miješale. Ipak, s obzirom na duge i hladne zime, proljetne i jesenske kiše, relativno suha ljeta, plodne, ali poplavne doline, te nešto plića tla na izdignutim položajima izvan dohvata proljetnih poplava, koji karakteriziraju istraživano područje, sasvim je moguće da se u uzgoju koristila mješavina različitih kultura. U ovom slučaju, kako sugeriraju nalazi – poželjne, ali osjetljive krušne pšenice i kulinarski manje cijenjene, ali otporne raži.

Iako su korovne pratilice očekivana primjesa žitarica, iznenađuje relativno veliki udio sjemenki kukolja (*Agrostemma githago*) s obzirom na količinu zrnja (tab. 1; sl. 6: D, E), a i u usporedbi s drugim lokalitetima na kojima je nađen pojedinačni primjerak (Hlebine – Dedanovice, tab. 2). Sjemenke kukolja su otrovne, kao i cijela

much more reliable crop than bread wheat (Van der Veen 2022). The type of soil also determined the type of culture, so wheat was grown on the more desirable loess and loam soils, while barley, oats and rye also thrived on sandy soils (Bakels 2005). Some authors suggest that wheat and rye were grown together in the mixture ('maslin') because through their competition they eradicated weeds, and in the event of a bad season, the sturdy rye would ensure at least some sort of harvest (Pretty 1990; Reed et al. 2022). Considering the natural characteristics of the wider area of Udbina and Gradina (Krbavsko polje), there were conditions for growing all of the cereals that were found, so they were most likely produced locally. Based on archaeobotanical findings alone, it is not possible to assess whether wheat and rye were grown together or separately and then mixed. Nevertheless, considering the long and cold winters, spring and autumn rains, relatively dry summers, fertile but flooded karst fields, and somewhat shallower soils on elevated positions beyond the reach of spring floods, which characterize the researched area, it is quite possible that a mixture of different cultures ('maslin') was used for the cultivation. In this case, as the findings suggest – desirable but sensitive bread wheat and culinary less appreciated but less demanding to grow rye.

Although weeds are an expected "companion" to cereals, the relatively large share of corncockle seeds (*Agrostemma githago*) was surprising considering the quantity of grains (Tab. 1; Fig. 6: D, E), as well as considering comparisons with other sites where only a single specimen was found (Hlebine – Dedanovice, Tab. 2). Corncockle seeds are poisonous, as is the entire plant. It is believed that an amount of 3 to 5 g of corncockle seeds is poisonous, which is why special care was taken to separate the seeds from the grain. The seeds are also poisonous to domestic animals, primarily horses, pigs and calves (Hegi 1912: 273–275; Roth et al. 2008: 104–105). The lack of chaff and the presence of large-seeded weeds, such as corncockle, can be an indication that it is probably a partially processed, refined grain, i.e. grain after husking, winnowing and sieving from which the chaff and mostly small-seeded weeds have been removed, but it is still necessary to manually refine the grain as large-seeded weeds would be removed. This, on the one hand, can explain the relatively large remaining share of

	Virovitica Kiškorija Jug	Vinkovci	Torčec	Hlebine – D danovice	Nuštar	Virje – Volarski breg	Virje – Sušine	Virje – Sušine	Torčec	Torčec – Gradić	Hlebine – Velike Hlebine	Jurjevac – Stara Vodenica	Pajtenica – Velike Livade	Tomašanci – Palača	Vrbovec	Torčec – Gradić	Vrbovec	Rašaška	Bijela Stijena	Virje – Sušine	Udbina – Gradina
	Ran SV	Ran SV	Ran SV	Ran SV	Ran SV	Ran SV	Ran SV	Raz SV	Raz SV	Raz SV	Raz SV	Raz SV	Raz SV	Raz SV	Raz SV	Kas SV	Kas SV	Kas SV	Kas SV – NV	NV	Kas SV – NV
krupnozrne žitarice (i fragmenti) / large grain cereals (and grain fragm):																					
Cerealia cf. *Cerealia*	76		2	9	120				17		1	37	37	29	443		42	180			> 108
Avena sp., *A.* cf. *sativa*												4	4		192		21				1
Hordeum vulgare cf. *H. vulgare*		1			1				1						5	2		1			2
Triticum aestivum group cf. *T. aestivum* group	21			3	2				2			8	12	11	787		111	97			> 139
Triticum aestivum group / *T. dicoccum*																		13			
Triticum monococcum																		4			
Triticum monococcum / T. dicoccum					1																
Triticum dicoccum *T.* cf. *dicoccum*									2			1	1					15			7
Triticum dicoccum / T. spelta																					24
Triticum spelta	2		1						10					1	42	1	14	4			
Triticum sp., cf. *Triticum* sp.	2	1	1						4			10		3	149		107	25			
Secale cereale cf. *S. cereale*	1				1							2	2	3				79			72
Agrostemma githago				1																	10
sitnozrne žitarice (i fragmenti) / small grain cereals (and grain fragm):																					
Panicum miliaceum cf. *Panicum miliaceum*	3		1	55	13		1	2	20				8		13		2	433		1	
Panicum/Setaria sp.				29		2			7												
Setaria italica *S.* cf. *italica*			2	12	2		2	1										2			
Setaria sp.			7						8								4				
Sorhum bicolor															1						

Tab. 2 — Komparativna tablica različitih srednjovjekovnih lokaliteta na području Hrvatske s nalazima krupnozrnih i sitnozrnih žitarica. Popis lokaliteta i literaturnih izvora nalazi se u tab. 3 (izradila: R. Šoštarić)

Tab. 2 — Comparison table of different medieval sites in Croatia with findings of large-grain and small-grain cereals. A list of abbreviations, sites and literary sources can be found in Tab, 3 (made by; R. Šoštarić)

biljka. Smatra se da je količina 3–5 g sjemenki otrovna, zbog čega se posvećivala posebna pažnja odvajanju sjemenki od zrnja žita kako bi se izbjeglo trovanje hranom. Sjemenke su otrovne i za domaće životinje, prije svega konje, svinje i telad (Hegi 1912: 273–275; Roth et al. 2008: 104–105). Nedostatak pljeva i prisutnost krupnosjemenog korova, poput kukolja, može biti pokazatelj da se vjerojatno radi o djelomično procesuiranim, pročišćenim žitaricama, tj. žitu nakon ljuštenja, vijanja i prosijavanja kojem su uklonjene pljeve i uglavnom sitnosjemeni korovi, no još je potrebno ručno pročistiti žito kako bi se uklonili krupnosjemeni korovi. To, s jedne strane, može objasniti relativno veliki preostali udio kukolja (*Agrostemma githago*) i plodova divljih trava (*Poaceae*) (tab. 1), a s druge strane, ide u prilog tvrdnji da se radi o žitu namijenjenom ljudskoj prehrani, a ne životinjama.

Iznenađuje izostanak sitnosjemenih žitarica, poput prosa (*Panicum miliaceum*), u nalazima iz Udbine – ljetnog usjeva, koji se često koristio kao rezervna varijanta u slučaju da podbaci primarni usjev, ali i kao nezahtjevna žitarica koja dobro uspijeva i na plićim i siromašnijim tlima. Kao što je već spomenuto, Liku karakteriziraju dulje i oštrije zime od onih u panonskom području, a krška polja, poput Krbavskog, često poplave u proljeće nakon otapanja snijega, što može biti pogubno za zahtjevnije usjeve poput pšenice. Veća količina prosa nađena je na antičkom lokalitetu Lički Ribnik (Reed et al 2019), a analiza izotopa u ljudskim kostima nađenim južno od Ličkog Ribnika potvrđuje značajnu količinu C4-biljaka u ljudskoj prehrani i/ili stočnoj hrani tijekom željeznog doba, antike i ranog srednjeg vijeka (Lightfoot et al. 2012; Reed et al. 2019), što pokazuje da se ta žitarica uzgajala i u Lici.

Pregled dosadašnjih istraživanja i usporedba srednjovjekovnih lokaliteta

Udbina – Gradina je jedini lokalitet u Hrvatskoj iz razdoblja kraja kasnog srednjeg (15. stoljeće) – novog vijeka (16. – 17. stoljeće) sa značajnijom količinom arheobotaničkih ostataka. Prema dostupnoj objavljenoj literaturi, poznata su još dva lokaliteta: Bijela stijena (14. – 17. stoljeće; Reed et al. 2022) i Virje – Sušine (kraj 16. – početak 17. stoljeća; Šoštarić, Vilović 2021), s tek pojedinačnim nalazima. Na lokalitetu Bijela Stijena nema žitarica, a na lokalitetu Virje – Sušine tek jedan nalaz prosa (*Panicum miliaceum*, corncockle (*Agrostemma githago*) and the fruits of wild grasses (*Poaceae*) (Tab. 1), and on the other hand, supports the claim that it is grain intended for human consumption, not animals.

The absence of small-seeded cereals, such as millet (*Panicum miliaceum*), in the finds from Udbina is surprising – a summer crop, which was often used as a reserve variant in case the primary crop failed, but also as an undemanding cereal that thrives well on shallower and poorer soils. As already mentioned, Lika is characterized by longer and harsher winters than those in the Pannonian area, and karst fields, such as Krbavsko polje, often flood in the spring after the snow melts, which can be disastrous for more demanding crops such as wheat. A larger amount of millet was found at the Roman site of Lički Ribnik (Reed et al. 2019), and stable carbon and nitrogen isotope analysis of human bones found south of Lički Ribnik confirms a significant amount of C4-plants in human diet and/or animal feed during the Iron Age, Roman Times and Early Middle Age (Lightfoot et al. 2012; Reed et al. 2019), which shows that this cereal was also grown in Lika.

An overview of previous research and comparison of medieval sites

Udbina-Gradina is the only site in Croatia from the end of the late Middle Ages (15th century) to the Post-Medieval Period (16th–17th centuries) with a significant amount of archaeobotanical remains. According to the available literature, two other sites exist: Bijela stijena (14th–17th centuries; Reed et al. 2022) and Virje – Sušine (end of the 16th to the beginning of the 17th century; Šoštarić, Vilović 2021), with only sporadic findings. There were no cereals found at the Bijela Stijena site and only one millet (*Panicum miliaceum*, Tab. 3) finding was documented at Virje – Sušine. Therefore, a comparison of our cereal findings with those from other medieval sites in Croatia was made (Tab. 3; Fig. 7), which also represents a general overview of the thus far published sites with carpological and archaeobotanical findings (Croatia, Middle Age and Post-Medieval Period). It should also be noted that Udbina – Gradina is the only site located in the mountainous regions of Croatia, which means that it was climatically and, throughout most of history, politically separated from the other sites, all of which are mainly located in the lowland and Pannonian regions of

tab. 3). Stoga je napravljena usporedba nalaza žitarica s drugim srednjovjekovnim lokalitetima na području Hrvatske (tab. 3; sl. 7), koja ujedno predstavlja i pregled do sada objavljenih lokaliteta s karpološkim arheobotaničkim nalazima (Hrvatska, srednji i novi vijek). Treba također istaknuti da je udbinska Gradina jedini lokalitet iz područja gorske Hrvatske, dakle klimatski i u prošlosti politički odvojen od ostalih lokaliteta koji su svi smješteni u uglavnom nizinskom i panonskom području Hrvatske (sl. 7). Lokaliteti koji su korišteni u analizi grupirani su u pojedine faze srednjeg vijeka prema slijedećoj vremenskoj skali: rani srednji vijek (Ran SV): (5. –) 7. – 10. stoljeće; razvijeni srednji vijek (Raz SV): 11. – 13. stoljeće; kasni srednji vijek (Kas SV): (13. –) 14. – 15. stoljeće (– 16. stoljeće); novi vijek (NV): kraj 16 st. – 17. stoljeće.

Prema istraživanju uzgoja različitih usjeva u ranom srednjem vijeku na području Nizozemske i Francuske, Bakels (2005) je zaključila da politika, odnosno promjene vlasti i teritorijalnog područja imaju minorni utjecaj na uzgoj usjeva. Vjerojatnije je da u tom smislu klimatske prilike i tradicija imaju veći značaj. S druge strane, Britanija pokazuje drugačiji obrazac: unatoč pogoršanju klime između 536. i 660. godine (Malo antičko ledeno doba) krušna pšenica (*Triticum aestivum*) postaje glavni usjev u ranom srednjem vijeku, iako bi klimatski – prikladniji izbor bio puno otporniji pir (*Triticum spelta*) (Van der Veen 2022). Usporedba različitih srednjovjekovnih lokaliteta s područja Hrvatske u kategoriji uzgoja žitarica (tab. 3–4) pokazala je da je na većini njih najbrojnija pšenica i to nepljevičasta pšenica (*Triticum aestivum* grupa) koja je očito favorizirana, dok su dvozrni i pravi pir prisutni u daleko manjim količinama, pa ih možemo smatrati toleriranim primjesama, kao i jednozrni pir koji se pojavljuje vrlo rijetko.

Na lokalitetima Hlebine – Dedanovice, Torčec i Rašaška najbrojnije je zastupljeno proso koje je sigurno imalo važnu ulogu kroz različite faze srednjeg vijeka jer se u različitim udjelima pojavljuje i na drugim lokalitetima. Djelomično je to vjerojatno vezano za tradiciju, a djelomično, možda i važnije, za činjenicu da proso ima kratak vegetacijski period i prilagodljiv je na različite podloge, pa može poslužiti kao zamjenski usjev kada podbaci urod pšenice ili drugih poželjnijih žitarica. Kao što je spomenuto, na udbinskoj Gradini nisu pronađeni ostaci prosa niti bilo koje druge sitnozrne žitarice. Kako je Gradina jedini lokalitet izvan „panonskog Croatia (Fig. 7). The sites that were used in our analysis are grouped into individual phases of the Middle Ages according to the following time scale: Early Middle Ages (Ran SV): (5th–) 7th–10th century; High Middle Ages (Raz SV): 11th–13th century; Late Middle Ages (Kas SV): (13th–) 14th–15th century (–16th century); Post-Medieval Period (NV): end of 16th–17th century.

According to research on the cultivation of various crops in the Early Middle Ages in the Netherlands and France, Bakels (2005) concluded that politics, i.e. changes in government and territory, had a minor impact on crop cultivation. It is more likely that climatic conditions and tradition had greater significance. Britain, on the other hand, shows a different pattern: despite the deterioration of the climate between 536 and 660 AD (the Late Antique Little Ice Age), bread wheat (*Triticum aestivum*) becomes the main crop in the Early Middle Ages, even though the climatically – more suitable choice would have been the much hardier spelt wheat (*Triticum spelta*) (Van der Veen 2022). A comparison of different medieval sites from Croatia in terms of grain cultivation (Tabs. 3–4) showed that the majority were dominated by free-threshing wheat (*Triticum aestivum* group), which was clearly favoured, while emmer and spelt wheat were present in much smaller quantities, which is why we can deem them as being tolerated, as was einkorn, which appeared very rarely.

At the Hlebine – Dedanovice, Torčec and Rašaška sites, millet (*Panicum miliaceum*) was the most abundant and it must have had an important role throughout the different phases of the Middle Ages, because it appears in varying proportions at other sites as well. This was likely in part due to tradition, and partly, even more importantly, due to the fact that millet has a short growing season and is adaptable to different substrates, which is why it can serve as a fallback crop when wheat or other more desirable cereals fail. As mentioned, no remains of millet or any other kind of small-grain cereal were found at Gradina. As Gradina is the only site outside the "Pannonian circle", one hesitates to speculate whether the tradition in Post-Medieval Period was different and the more resistant rye was valued more than the "last minute" millet, or whether it was merely a matter of a successful year for preferred cereals. For such conclusions, new research will need to be conducted

LOKALITET / SITE: (TIP LOKALITETA / TYPE OF SITE):	OZNAKA NA KARTI (sl. 7) / MARK ON THE MAP (Fig. 7):	RAZDOBLJE / PERIOD:	LITERATURA / LITERATURE:
Virovitica Kiškorija Jug (naselje / settlement)	1	rani srednji vijek / Early Middle Ages (Ran SV)	Šoštarić 2015
Vinkovci (grobovi / graves)	2	rani srednji vijek / Early Middle Ages (Ran SV)	Sekelj Ivančan, Tkalčec 2006: 200–201
Torčec (naselje / settlement)	3	rani srednji vijek / Early Middle Ages (Ran SV) razvijeni srednji vijek / High Middle Ages (Raz SV) kasni srednji vijek / Late Middle Ages (Kas SV)	Šoštarić, Šegota 2010a
Hlebine – Dedanovice (naselje i talioničke radionice / settlement and smelting workshops)	4	rani srednji vijek / Early Middle Ages (Ran SV)	Šoštarić, Vilović 2021
Nuštar (grobovi / graves)	5	rani srednji vijek / Early Middle Ages (Ran SV)	Rapan Papeša et al. 2015
Virje – Volarski breg (talioničke radionice / smelting workshops)	6	rani srednji vijek / Early Middle Ages (Ran SV)	Šoštarić, Vilović 2021
Virje – Sušine (talioničke radionice / smelting workshops)	6	rani srednji vijek / Early Middle Ages (Ran SV) razvijeni srednji vijek / High Middle Ages (Raz SV) novi vijek / Post-Medieval Period (NV)	
Torčec – Gradić (naselje / settlement)	3	razvijeni srednji vijek / High Middle Ages (Raz SV) kasni srednji vijek / Late Middle Ages (Kas SV)	Šoštarić 2004
Hlebine – Velike Hlebine (talioničke radionice / smelting workshops)	4	razvijeni srednji vijek / High Middle Ages (Raz SV)	Šoštarić, Vilović 2021
Jurjevac – Stara Vodenica (naselje / settlement)	7	razvijeni srednji vijek / High Middle Ages (Raz SV)	Reed et al. 2022
Pajtenica – Velike Livade (naselje / settlement)	7	razvijeni srednji vijek / High Middle Ages (Raz SV)	
Tomašanci – Palača (naselje / settlement)	7	razvijeni srednji vijek / High Middle Ages (Raz SV)	
Vrbovec (naselje / settlement)	8	razvijeni srednji vijek / High Middle Ages (Raz SV) kasni srednji vijek / Late Middle Ages (Kas SV)	Šoštarić, Šegota 2010b
Rašaška (utvrda / fort)	9	kasni srednji vijek / Late Middle Ages (Kas SV)	Reed et al. 2022
Bijela Stijena (utvrda / fort)	9	kasni srednji vijek – novi vijek / Late Middle Ages - Post-Medieval Period (Kas SV-NV)	
Udbina – Gradina (naselje i utvrda / settlement and fort)	10	kasni srednji - novi vijek / Late Middle Ages - Post-Medieval Period (Kas SV-NV)	
(Donji Miholjac – Đanovci) (naselje / settlement)	11	(rani i kasni srednji vijek / Early and Late Middle Ages)	Reed et al. 2022
(Đakovo – Franjevac) (naselje / settlement)	7	(razvijeni - kasni srednji vijek / High - Late Middle Ages)	
(Ivandvor – Šuma Gaj) (naselje / settlement)	7	(rani - kasni srednji vijek / Early - Late Middle Ages)	
(Ivanovci Gorjanski – Palanka) (naselje / settlement)	7	(razvijeni-kasni srednji vijek)	

Tab. 3 — Popis lokaliteta i literaturnih izvora korištenih za komparativni prikaz karpološkoh arheobotaničkih nalaza (tab. 2) i geografskog položaja analiziranih lokaliteta (sl. 7). Višeslojni lokaliteti kojima se nije mogla definirati preciznija faza srednjeg vijeka prikazani su na preglednim kartama (sl. 7), ali nisu uključeni u preglednu tablicu (tab. 2), a u ovoj tablici stavljeni su u zagradu (izradila: R. Šoštarić)

Tab. 3 — List of sites and literature sources used for the comparison of carpological archaeobotanical findings (Tab. 2) and the geographical locations of the analysed sites (Fig. 7). Multi-layered sites for which a more precise phase of the Middle Ages could not be defined are shown on the maps (Fig. 7), but have not been included in the table (Tab. 2). Such sites are listed here in brackets (made by: R. Šoštarić)

kruga", nezahvalno je procjenjivati je li se radilo o drugačijoj tradiciji u novom vijeku u kojoj se više cijenila otporna raž nego „last minute" proso, ili o godini dobrog uroda preferiranih žitarica. Za takve zaključke biti će potrebno provesti nova istraživanja i prikupiti rezultate s različitih lokaliteta izvan panonske Hrvatske.

Na lokalitetima Rašaška, Ivanovci Gorjanski – Palanka i Udbina – Gradina te eventualno i Donji Miholjac, značajan udio u nalazima čini raž, koja na ostalim lokalitetima ili nije zastupljena ili tek malim brojem. To se može objasniti primjerom iz Mađarske u kojoj je raž u ranijim fazama srednjeg vijeka bila tolerirana na poljima drugih žitarica, a kao samostalna kultura postaje značajna i česta tek u kasnom srednjem vijeku (Gyulai 2014). Vrlo sličan obrazac se može vidjeti i u Hrvatskoj.

U ovom pregledu treba spomenuti i zob koja se smatra sekundarnim usjevom i koja se u Europi u većim udjelima pojavljuje u post antičkim razdobljima (Zohary et al. 2012: 66–69). U Hrvatskoj se uglavnom pojavljuje na lokalitetima razvijenog srednjeg vijeka (tab. 2), s izuzetkom višeslojnog lokaliteta Donji Miholjac (Reed et al. 2022) čiji nalazi uključuju slojeve iz ranog i kasnog srednjeg vijeka.

Općenito se može reći da se tijekom srednjeg vijeka u uzgoju žitarica u Hrvatskoj primjenjivala strategija raznolikosti usjeva, slično kao što su to prepoznali Castiglioni i Rottoli (2013) za područje sjeverne Italije. Temeljila se prvenstveno na zimskim – krupnozrnim i zahtjevnijim, te ljetnim – sitnozrnim i manje zahtjevnim usjevima. To je vjerojatno bila univerzalna strategija u većini Europe koja je osiguravala dvije žetve godišnje, ako je to bilo potrebno. U sjevernoj Italiji (Castiglioni, Rottoli 2013) i u Hrvatskoj favorizirana je nepljevičasta pšenica, s razlikom da je u Italiji na brojnim lokalitetima u velikim količinama prisutan i ječam, što nije slučaj u Hrvatskoj. Sličnost sjeverne Italije i Hrvatske je i u tome da je najčešći „rezervni" usjev – proso. Zanimljivo je da se u Italiji od sitnozrnih usjeva najrjeđe uzgajao sirak (*Sorghum bicolor*), dok je u Hrvatskoj zabilježen samo jedan nalaz u Vrbovcu (Šoštarić, Šegota 2010b).

Iako se lokalitet Udbina – Gradina nalazi u geografski, klimatski i povijesno drugačijem području od ostalih analiziranih srednjovjekovnih/novovjekovnih lokaliteta, jedino značajnije odstupanje u strategiji uzgoja usjeva je izostanak sitnozrnih, ljetnih žitarica. Je li to slučajnost ili karakteristična razlika, pokazati će buduća istraživanja novih i brojnijih lokaliteta.

and results collected from different sites outside Pannonian Croatia.

At the Rašaška, Ivanovci Gorjanski – Palanka and Udbina – Gradina, and possibly Donji Miholjac sites, a significant share of the findings was taken up by rye, which was either absent or present only in small numbers at other sites. This could be explained by the example of Hungary, where rye was tolerated in fields where other cereals were cultivated in the earlier stages of the Middle Ages and became significant and common as an independent crop only in the Late Middle Ages (Gyulai 2014). A very similar pattern is evident in Croatia.

In this overview, we should also mention oat, which is considered a secondary crop and which appeared in Europe in larger proportions in post-antique periods (Zohary et al. 2012: 66–69). In Croatia, oat mainly appeared at sites from the High Middle Ages (Tab. 2), with the exception of the multi-layered site of Donji Miholjac (Reed et al. 2022), whose findings include layers from the Early and Late Middle Ages.

In general, it can be ascertained that during the Middle Ages, a strategy of crop diversity was applied in the cultivation of cereals in Croatia, similarly to conclusions by Castiglioni and Rottoli (2013) for the area of northern Italy. It was based primarily on winter (large-grain and more demanding) and summer (small-grain and less demanding) crops. This was probably a universal strategy in most of Europe that ensured two harvests a year, if necessary. In northern Italy (Castiglioni, Rottoli 2013) and in Croatia, free-threshing wheat was favoured, the difference being that barley was also present in large quantities in many Italian sites, which was not the case in Croatia. Another similarity between northern Italy and Croatia lies in the fact that the most common "reserve" crop was millet. It is interesting that in Italy sorghum (*Sorghum bicolor*) was the most rarely cultivated of the small-grain crops, whereas in Croatia only one finding of sorghum was recorded, at Vrbovec (Šoštarić, Šegota 2010b).

Although the Udbina – Gradina site is located in a geographically, climatically and historically different area from the other medieval/post-medieval sites analysed, the only significant deviation in its crop cultivation strategy was the absence of small-grain, summer cereals. Future investigations into new sites will reveal whether this is a coincidence or a characteristic difference.

Vjerujemo da će nastavak istraživanja, osobito podgrađa, omogućiti nove spoznaje o srednjovjekovnom i novovjekovnom svakodnevnom načinu života, a arheobotaničke i arheozoološke analize doprinositi saznanju o prehrambenim navikama tadašnjih stanovnika.

ZAKLJUČAK

Lokalitet Udbina – Gradina nalazi se u središnjem, gorskom dijelu Hrvatske i jedini je lokalitet iz razdoblja kasnog srednjeg (15. stoljeće) – novog vijeka (16. – 17. stoljeće) s većom količinom arheobotaničkih nalaza do sada analiziranih na području Hrvatske. Datacija pronađenih žitarica pokazala je da su mlađe od paljevinskog sloja podno kule koji se može povezati s vojnom aktivnošću u posljednjem desetljeću 15. i početkom 16. stoljeća. Žitarice pripadaju razdoblju 16. – 17. stoljeća (novi vijek) što znači da je udbinska Gradina bila u upotrebi dulje vremena nego se prvotno mislilo.

Na lokalitetu je nađena veća količina krupnozrnih žitarica, mjestimično međusobno slijepljenih zrna, u čijem sastavu je najdominantnija nepljevičasta pšenica (*Triticum aestivum* grupa), te manja količina korovnih primjesa. Veliki udio u nalazima čini raž (*Secale cereale*), u podosta slučajeva slijepljena s pšenicom, što sugerira da se za pripremu kruha i drugih jela koristila mješavina pšenice i raži. Sa žitaricama je pronađena i neočekivano velika količina otrovnih sjemenki kukolja (*Agrostemma githago*) pa je moguće da su sjemenke kukolja, zajedno s ostalim nađenim primjesama, pokazatelj djelomično pročišćenog materijala koji je bio pohranjen u skladište u Gradini.

Usporedba Gradine s ostalim srednjovjekovnim i novovjekovnim lokalitetima na području Hrvatske pokazuje da se u uzgoju žitarica u Hrvatskoj primjenjivala strategija raznolikosti usjeva, koja se temeljila prvenstveno na zimskim – krupnozrnim i zahtjevnijim, te ljetnim – sitnozrnim i manje zahtjevnim usjevima. U Hrvatskoj je, prema dosadašnjim nalazima, bila favorizirana nepljevičasta pšenica, a najčešći „rezervni" usjev bio je proso. U nalazima Gradine nedostaju sitnosjemene žitarice i to je jedino značajnije odstupanje u strategiji uzgoja usjeva, ali u ovoj fazi istraživanja nije moguće zaključiti je li ovo odstupanje vezano uz geografski, klimatski i povijesno drugačije područje u kojem se nalazi Gradina u odnosu na ostale lokalitete.

We believe that the continuation of research, especially into the lower settlements, will bring new knowledge about the medieval and post-medieval lifestyle, and that archaeobotanical and archaeozoological analyses will contribute to our understanding of the dietary habits of the inhabitants of the time.

CONCLUSION

The Udbina – Gradina site is located in the central, mountainous part of Croatia and is the only site from the Late Middle Ages (15th century) – Post-Medieval Period (16th–17th century) with a significant amount of archaeobotanical findings analysed so far in Croatia. The dating of the cereals found showed that they were younger than the burnt layer at the foot of the tower, which can be associated with military activity in the last decade of the 15th and the beginning of the 16th century. The cereals belonged to the 16th–17th century (Post-Medieval Period), which means that Gradina was in use much longer than originally thought.

A great quantity of large-grain cereals, some joined together, was found at the site and the most dominant was free-threshing wheat (*Triticum aestivum* group), with a smaller quantity of weed admixtures. A big share of the findings was taken up by rye (*Secale cereale*), often fused with wheat, which suggests that a mixture of wheat and rye was used to prepare bread and other dishes. An unexpectedly large number of poisonous corncockle seeds (*Agrostemma githago*) was also found with the cereals, so it is possible that the corncockle seeds, together with the other admixtures found, were partially purified material stored in the Gradina warehouse.

Our comparison of Gradina with other medieval and post-medieval sites in Croatia showed that a strategy of crop diversity was applied in grain cultivation, based primarily on winter (large-grain and more demanding) and summer (small-grain and less demanding) crops. In Croatia, according to the findings so far, free-threshing wheat was favoured and the most common "reserve" crop was millet. Small-grain cereals were not found at Gradina and this was the only significant deviation in the usual strategy of growing crops, but at this stage of the research it is not possible to deduce whether this deviation had to do with the fact that Gradina is situated in a geographically, climatically and historically different area than all of the other sites.

Prijevod Translation **MAKSO HERMAN**
Lektura Proofreading **MARKO MARAS**

INTERNETSKI IZVOR WEB SOURCE

Medved, I. 2020, *Ishrana konja*, Agroportal.hr, objavljeno 16.10.2020., https://www.agroportal.hr/konjogojstvo/2277 (pristupljeno 12.06.2023.)

LITERATURA BIBLIOGRAPHY

Bakels, C. C. 2005, Crops produced in the southern Netherlands and northern France during the early medieval period: a comparison, *Vegetation History and Archaeobotany*, Vol. 14(4), 394–399. https://doi.org/10.1007/s00334-005-0067-x

Bogović, M. 1988, Pomicanje sjedišta Krbavske biskupije od Mateja Marute do Šimuna Kožičića Benje (pregled povijesti Krbavske ili modruške biskupije), in: *Krbavska biskupija u srednjem vijeku*, Bogović M. (ed.), Visoka bogoslovna škola u Rijeci, Kršćanska sadašnjost, Rijeka – Zagreb, 41–82.

Bogović, M. 2010, *Modruška ili Krbavska biskupija*, Gospićko-senjska biskupija, Gospić.

Castiglioni, E., Rottoli, M. 2013, Broomcorn millet, foxtail millet and sorghum in North Italian Early Medieval sites, *Post Classical Archaeologies*, Vol. 3, 131–144.

Dočkal, K. 1953, Dva zaboravljena ličko-krbavska pavlinska samostana. Samostan Blažene Djevice Marije na brijegu Turan kod Udbine, Arhiv Hrvatske akademije znanosti i umjetnosti, rkp. XVI-29a 4/1, Zagreb.

Drechsler-Bižić, R. 1968, Japodske kape i oglavlja, *Vjesnik Arheološkog muzeja u Zagrebu*, 3.s. Vol. 3, 29–52.

Gajić-Čapka, M., Cindrić, K., Mihajlović, D. 2008, Oborina / Precipitation, in: *Klimatski atlas Hrvatske / Climate atlas of Croatia 1961 – 1990, 1971 – 2000.*, Zaninović K. (ed.), Državni hidrometeorološki zavod, Zagreb, 43–59.

Gyulai, F. 2014, Archaeobotanical overview of rye (*Secale cereale L.*) in the Carpathian-basin I. from the beginning until the roman age, *Columella – Journal of Agricultural and Environmental Sciences*, Vol. 1(2), 25–35. https://doi.org/10.18380/SZIE.COLUM.2014.1.2.25

Hegi, G. 1912, *Illustrierte Flora von Mittel-Europa III*, Pichler's Witwe und Sohn, Wien.

Horvat, A. 1959, O spomenicima u Krbavi, *Bulletin Instituta za likovne umjetnosti Jugoslavenske akademije znanosti i umjetnosti*, Vol. VII(1), 1–5.

Horvat, A. 1963, Prilog rasprostiranju stećaka u Liki i Baniji, *Prilozi povijesti umjetnosti u Dalmaciji*, Vol. 15, 26–35.

Horvat, A. 1975, O srednjovjekovnoj sakralnoj umjetnosti Like, in: *Arheološka problematika Like*, znanstveni skup, Otočac, 22-24. IX 1974., Marović I., Rapanić Ž. (ed.), Izdanja hrvatskog arheološkog društva 1, Hrvatsko arheološko društvo, Split, 127–141.

Horvat, Z. 1997, Katedrala sv. Jakova u Krbavi kraj Udbine, in: *Krbavska bitka i njezine posljedice*, Znanstveni skup, Novi Vinodolski 22.-24. listopada 1993., Pavličević D. (ed.), Hrvatska matica iseljenika, Zavod za hrvatsku povijest Filozofskog fakulteta u Zagrebu, Zagreb, 151–162.

Horvat, Z. 2003, *Srednjovjekovne katedralne crkve Krbavsko-modruške biskupije*, Hrvatski institut za povijest, Državni arhiv u Gospiću, Zagreb – Gospić.

Ivanković, A. 2004, *Konjogojstvo*, Hrvatsko agronomsko društvo, Zagreb.

Jurić, R. 2004, Arheološka istraživanja u Udbini (1996. – 2003.), *Riječki teološki časopis*, Vol. 23(1), 19–33.

Jurić, R. 2008, Arheološka istraživanja u Udbini (1996. – 2006.), in: *Arheološka istraživanja u Lici i Arheologija pećina i krša*, Znanstveni skup i kolokvij, Gospić 16.-19. listopada 2007., Kolak T. (ed.), Izdanja Hrvatskog arheološkog društva 23, Hrvatsko arheološko društvo, Muzej Like Gospić, Zagreb – Gospić, 165–182.

Kolak, T. 2014, Arheološka istraživanja Starog grada Udbine (2008.-2012.), in: *Ascendere historiam. Zbornik u čast Milana Kruheka*, Karbić M., Kekez H., Novak A., Horvat Z. (eds.), Hrvatski institut za povijest, Zagreb, 425–445.

Kirleis, W., Fischer, E. 2014, Neolithic cultivation of tetraploid free threshing wheat in Denmark and Northern Germany: implications for crop diversity and societal dynamics of the Funnel Beaker Culture, *Vegetation History and Archaeobotany*, Vol. 23(1), 81–96. https://doi.org/10.1007/s00334-014-0440-8

Kruhek, M. 1997, Topografija krbavske spomeničke baštine, in: *Krbavska bitka i njezine posljedice*, Znanstveni skup, Novi Vinodolski 22.-24. listopada 1993., Pavličević D. (ed.), Hrvatska matica iseljenika, Zavod za hrvatsku povijest Filozofskog fakulteta u Zagrebu, Zagreb, 99–129.

Kruhek, M., Horvat, Z. 1988, Sakralna arhitektura Krbave i Like – na području krbavsko-modruške biskupije, in: *Krbavska biskupija u srednjem vijeku*, Bogović M. (ed.), Visoka bogoslovna škola u Rijeci, Kršćanska sadašnjost, Rijeka – Zagreb, 187–233.

Kruhek, M., Horvat, Z. 2009, Srednjovjekovne hrvatske župe Lika i Krbava (stari gradovi Krbave), in: *Identitet Like: korijeni i razvitak I*, Holjevac Ž. (ed.), Institut društvenih znanosti Ivo Pilar, Područni centar Gospić, Zagreb – Gospić, 239–292.

Lightfoot, E., Šlaus, M., O´Connell, T. C. 2012, Changing cultures, changing cuisines: cultural transitions and dietary change in Iron Age, Roman and Early Medieval Croatia, *American Journal of Physical Anthropology*, Vol. 148(4), 543–556. https://doi.org/10.1002/ajpa.22070

Ljubić, Š. 1876, Popis predmeta iz predhistoričke dobe u Narodnom zemaljskom muzeju u Zagrebu, *Viestnik Hrvatskoga arkeologičkoga družtva*, Vol. II, 1–58.

Ljubić, Š. 1889, Sbirka predhistorička, in: Š. Ljubić, *Popis arkeologičkog odjela Narodnog muzeja u Zagrebu*, Odsjek 1, svezak 1. Egipatska sbirka – Prehistorička sbirka, Tiskarski i litografski zavod C. Albrechta, Zagreb, 26–187.

Mirosavljević, V. 1957, Ilirski grob iz Udbine. Prilog materijalnoj kulturi Japoda, *Opvscvla archaeologica*, Vol. 2, 5–18.

Patsch, K. 1990, *Lika u rimsko doba*, Biblioteka «Ličke župe», Gospić (pretisak u prijevodu Z. Derossi: *Die Lika in die römischer Zeit*, Schriften der Balkancommission, Antiquarische Abteilung I, Alfred Hölder, Wien, 1900.).

Pretty, J. N. 1990, Sustainable Agriculture in the Middle Ages: The English Manor, *The Agricultural History Review*, Vol. 38(1), 1–19.

Rapan Papeša, A., Kenéz, Á., Pető, Á. 2015, Arheobotanička analiza uzoraka iz kasnoavarodobnih grobova iz Nuštra (istočna Hrvatska) / The archaeobotanical assessment of grave samples from the Avar Age cemetery of Nuštar (Eastern Croatia), *Prilozi Instituta za arheologiju u Zagrebu*, Vol. 32, 261–288.

Roushannafas, T., McKerracher, M. 2023, Diversity of Free-Threshing Wheat in Early Medieval England Supported by Geometric Morphometric Analysis of Grains, *Environmental Archaeology*, online first. https://doi.org/10.1080/14614103.2023.2223406

Reed, K., Ožanić Roguljić, I., Radović, S., Kolak, T. 2019, Daily Food Consumption in a Rural Roman Villa: Excavations at Lički Ribnik, Croatia, *Interdisciplinaria Archaeologica: Natural Sciences in Archaeology*, Vol. X(I), 53–63. http://dx.doi.org/10.24916/iansa.2019.1.4

Reed, K., Smuk, A., Tkalčec, T., Balen, J., Mihaljević, M. 2022, Food and agriculture in Slavonia, during the Late Middle Ages: the archaeobotanical evidence, *Vegetation History and Archaeobotany*, Vol. 31(4), 347–361. https://doi.org/10.1007/s00334-021-00857-8

Roth, L., Daunderer, M., Kormann, K. 2008, *Giftpflanzen. Pflanzengifte* (5. Aufl.). Nikol Verlagsgesellschaft mbH & Co. KG, Hamburg.

Sekelj Ivančan, T., Tkalčec, T. 2006, Slavensko paljevinsko groblje na položaju Duga ulica 99 u Vinkovcima / Slawisches Brandgräberfeld am Standort Duga ulica 99 in Vinkovci, *Prililozi Instituta za arheologiju u Zagrebu*, Vol. 23, 141–212.

Szabo, Gj. 1920, *Sredovječni gradovi u Hrvatskoj i Slavoniji*, Matica hrvatska, Zagreb.

Šegota, T. 1975, Klimatske osobine Like i Gorskog kotara, in: *Geografija SR Hrvatske. 4: Gorska Hrvatska*, Cvitanović A. (ed.), Školska knjiga, Zagreb, 11–16.

Šerman, V. 2001, Hranidba službenih konja, *Krmiva*, Vol. 43(2), 99–108.

Šoštarić, R. 2004, Arheobotanička analiza uzoraka s lokaliteta Torčec – Gradić / (Archaeobotanical analysis of findings from Torčec-Gradić archaeological site), *Podravina*, Vol. 3(6), 107–115.

Šoštarić, R. 2015, Biljni ostaci iz antičkog i srednjevjekovnog naselja na lokalitetu Virovitica Kiškorija Jug, in: K. Jelničić Vučković, *Rimsko selo u provinciji Gornjoj Panoniji: Virovitica Kiškorija Jug*, Monografije Instituta za arheologiju 7, Institut za arheologiju, Zagreb, 311–326.

Šoštarić, R., Šegota, V. 2010a, Analiza biljnih ostataka sa srednjevjekovnog lokaliteta Torčec kraj Koprivnice, in: T. Sekelj Ivančan, *Podravina u ranom srednjem vijeku. Rezultati arheoloških istraživanja ranosrednjovjekovnih nalazišta u Torčecu*, Monografije Instituta za arheologiju 2, Institut za arheologiju, Zagreb, 373–388.

Šoštarić, R., Šegota, V. 2010b, Analiza biljnih ostataka iz srednjovjekovnog burga Vrbovca u Klenovcu Humskome, in: T. Tkalčec, *Burg Vrbovec u Klenovcu Humskome. Deset sezona arheoloških istraživanja*, Muzeji Hrvatskog zagorja, Institut za arheologiju, Zagreb, 248–254.

Šoštarić, R., Vilović, T. 2021, Plant Macro-Remains and Traces of Leaves from Virje and Hlebine, in: *Interdisciplinary research into Iron Metallurgy along the Drava River in Croatia – The TransFER project*, Sekelj Ivančan T., Karavidović T. (eds.), Archaeopress Publishing Ltd., Oxford, 212–226.

Van der Veen, M. 2022, All Change on the Land? Wheat and the Roman to Early Medieval Transition in England, *Medieval Archaeology*, Vol. 66(2), 304–342. https://doi.org/10.1080/00766097.2022.2129753

Zaninović, K. 2008, Temperatura zraka / Air temperature, in: *Klimatski atlas Hrvatske / Climate atlas of Croatia 1961 – 1990, 1971 – 2000.*, Zaninović K. (ed.), Državni hidrometeorološki zavod, Zagreb. 27–41.

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* (4. ed.), Oxford University Press, Oxford. https://doi.org/10.1093/acprof:osobl/9780199549061.001.0001