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UDK: 903.5(497.5Ražanac)"637"
582:902
Izvorni znanstveni članak / Original scientific paper
Primljen / Received: 29.6.2019.
Prihvaćen / Accepted: 22.8.2019.

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TRAGOVI NAJRANIJE UPOTREBE VINOVE LOZE NA ŠIREM NINSKOM PODRUČJU? *VITIS VINIFERA* – ANALIZA BIOARHEOLOŠKIH UZORAKA S LOKALITETA MALA GLAVICA – MATAKOV BRIG (RAŽANAC)[1]

U stručnoj literaturi ustalilo se mišljenje o upotrebi vinove loze na širem ninskom području (zapadni dio Ravnih kotara) od ranog brončanog doba, i to u kontekstu pogrebnih rituala. Kao temelj za takvu interpretaciju iskorišteni su rezultati arheoloških istraživanja lokaliteta Mala glavica – Matakov brig kod Podvršja u Općini Ražanac, provedenih 1986. – 1987. g. pod vodstvom Šime Batovića i Sineve Kukoč. Radi se prvenstveno o uzorcima sjemenja vinove loze (*Vitis vinifera*), pronađenim u (naizgled) intaktnom sloju gomile, pa se zaključuje da potječu iz arheološkog konteksta grobnog humka iz ranog brončanog doba. Da bi se potvrdila pretpostavljena starost i ustanovila vrsta sjemena, u okviru proučavanja tematike iz gospodarske prošlosti šireg ninskog područja, 2017. – 2018. g. provedene su arheobotanička i radiokarbonska analiza uzoraka. Radiokarbonskom analizom ustanovljeno je da uzorci sjemena datiraju u šezdesete godine 20. st., najvjerojatnije u razdoblje 1966. – 1968. g. (Beta – 489417, 95.4 % 1966-1967 cal AD). U skladu s takvom datacijom logičan je zaključak da uzorci ne potječu iz originalnog konteksta grobnog humka. Stoga se i njihov nalaz ne bi trebao interpretirati u okviru pogrebnih rituala brončanog doba kako se dosad ustalilo u literaturi. Takva se (re)interpretacija stavlja u širi kontekst dosadašnjih spoznaja i dokaza najranije upotrebe vinove loze na širem području Ravnih kotara u zaleđu Nina i Zadra.

Ključne riječi: Nin, Ražanac, tumul brončanog doba, sjeme *Vitis vinifera*, arheobotanički uzorci, arheobotanička analiza, radiokarbonska analiza, kultivacija vinove loze

TRACES OF THE EARLIEST USE OF GRAPEVINE IN THE WIDER NIN REGION? *VITIS VINIFERA* – ANALYSIS OF BIOARCHAEOLOGICAL SAMPLES FROM THE SITE OF MALA GLAVICA – MATAKOV BRIG (RAŽANAC)[1]

Use of grapevine in the wider Nin region (western part of Ravni kotari) from the Early Bronze Age has been assumed in the context of funerary rituals in the professional literature. This interpretation was based on the results of the archaeological excavations at the site of Mala glavica – Matakov brig near Podvršje in the Ražanac Municipality conducted in 1986-1987 led by Šime Batović and Sineva Kukoč. These are primarily samples of grapevine seeds (*Vitis vinifera*), recovered from (seemingly) intact layer of the mound so it was concluded that they originated from the archaeological context of the Early Bronze Age burial mound. Archaeobotanical and radiocarbon analyses of the samples were carried out in 2017-2018 in order to confirm the assumed age and determine the kind of seeds within the study of economic past of the wider Nin region. Radiocarbon analysis dated the seed samples to the 1960s, most likely 1966-1968 (Beta – 489417, 95.4 % 1966-1967 cal AD). In accordance with such dating logical conclusion is that the samples do not belong to the original context of the burial mound. Therefore, their finding should not be interpreted in the context of funerary rituals of the Bronze Age as previously suggested in the scholarly literature. Such (re)interpretation is put into wider context of previous insights and evidence of the earliest use of grapevine in the wider area of Ravni kotari in the hinterland of Nin and Zadar.

Key words: Nin, Ražanac, Bronze Age tumulus, *Vitis vinifera* seeds, archaeobotanical samples, archaeobotanical analysis, radiocarbon analysis, grapevine cultivation

1 Rad posvećujemo prerano preminulom kolegi Mati Radoviću – vrsnom poznavatelju i istraživaču prošlosti šireg ninskog područja. Za vrijeme svojeg rada u Muzeju ninskih starina prvopotpisanoj autorici ovog rada mnogo je puta pomagao u istraživanjima: od pruženog uvida u dokumentaciju i podatke o brojnim nalazima i nalazištima do poticajnog pristupa za istraživanja kroz brojne rasprave koje su za cilj uvijek imale nove spoznaje o prošlosti ninskog područja.

1 We would like to dedicate this paper to our prematurely deceased colleague Mate Radović – a researcher and an expert in the past of the wider Nin region. During his work in the Museum of Nin Antiquities he helped one of the authors (M. Dubolnić Glavan) on a number of occasions in research: from ensuring access to excavation documentation and providing information on many finds and sites to inspiring approach to research through many discussions that were always focused on new insights about the past of the Nin region.

1. UVOD

U okviru proučavanja tematike iz gospodarske prošlosti šireg ninskog područja u radu se tematiziraju i (re)interpretiraju rezultati istraživanja provedeni osamdesetih godina 20. st. na prostoru Općine Ražanac. Naime, u stručnoj se literaturi kao općeprihvaćeno ustalilo mišljenje o upotrebi vinove loze od ranog brončanog doba, i to u kontekstu pogrebnih rituala.[2] Kao temelj za takvu interpretaciju poslužili su rezultati arheoloških istraživanja sa sjajnim otkrićima na temelju kojih je značajnim dijelom i definirano naše poznavanje ranog brončanog doba na prostoru sjeverne Dalmacije. Radi se o arheološkim istraživanjima lokaliteta Mala glavica – Matakov brig kod Podvršja u Općini Ražanac, provedenim 1986. – 1987. g. Istraživanja su vodili Šime Batović i Sineva Kukoč, djelatnici Odsjeka za arheologiju Filozofskog fakulteta u Zadru, Sveučilišta u Splitu (danas Odjel za arheologiju Sveučilišta u Zadru) te Arheološkog muzeja u Zadru. S tih istraživanja potječu arheobotanički uzorci, odnosno tri hrpice sjemena vinove loze (*Vitis vinifera*), pronađene u (naizgled) intaktnom sloju grobnog humka iz ranog brončanog doba. Prema tome zaključuje se da potječu iz arheološkog konteksta, tj. da su u zemlju dospjele u vrijeme gradnje humka.[3]

U okviru proučavanja tematike iz gospodarske prošlosti šireg ninskog područja, da bi se potvrdila pretpostavljena starost i ustanovila vrsta sjemena, provedena je arheobotanička i radiokarbonska analiza uzoraka. Cilj istraživanja bio je ustanoviti starost uzoraka, odnosno radi li se o kultiviranim ili divljim sortama vinove loze, što bi moglo utjecati na dosadašnje spoznaje o povijesti njezina uzgoja na spomenutom području. U periodu 2017. – 2018. g. analizu spomenutih uzoraka provodi Hrvatska akademija znanosti i umjetnosti, Zavod za povijesne znanosti u Zadru, u okviru stručnog projekta „Najraniji tragovi uzgoja vinove loze na širem ninskom području: *Vitis vinifera* – analiza bioarheoloških uzoraka" pod vodstvom dr. sc. Martine Dubolnić Glavan.[4] Rad na projektu rezultirao je izradom stručne studije o provedenim istraživanjima.[5]

2. ARHEOLOŠKA ISKOPAVANJA GROBNOG HUMKA MALA GLAVICA – MATAKOV BRIG 1986. – 1987., TIJEK ISTRAŽIVANJA I METODOLOGIJA RADA

Grobni humak u narodu zvan *Mala glavca* nalazi se u Zadarskoj županiji, na prostoru Općine Ražanac, na udaljenosti oko 11,5 km sjeveroistočno od Nina i oko 18 km sjeveroistočno od Zadra. Smješten je s istočne strane zaseoka

1. INTRODUCTION

Within the study of themes dealing with the economic past of the wider Nin area the paper analyzes and (re)interprets the results of research conducted in the 1980s in the area of the Ražanac Municipality. Namely, use of grapevine in the wider Nin region (western part of Ravni kotari) from the Early Bronze Age has been assumed in the professional literature, in the context of funerary rituals.[2] Such interpretations were based on the results of the archaeological excavations with outstanding findings that significantly contributed to our understanding of the Early Bronze Age in the northern Dalmatia region. These were the archaeological excavations at the site of Mala glavica – Matakov brig near Podvršje in the Ražanac Municipality conducted in 1986-1987 by Šime Batović and Sineva Kukoč, from the Department of Archaeology of the Faculty of Philosophy in Zadar, of the University of Split (presently Department of Archaeology of the University of Zadar) and Archaeological Museum in Zadar. These excavations yielded archaeobotanical samples, actually three piles of grape seeds (*Vitis vinifera*), recovered from (seemingly) intact layer of the Early Bronze Age burial mound. Therefore, it was concluded that they originated from the archaeological context, and that they ended up in soil when the mound was built.[3]

Archaeobotanical and radiocarbon analyses of the samples were conducted within the study of economic past of the wider Nin region in order to confirm the assumed age and determine the kind of seeds. The aim of the research was to determine the age of the samples, and if they were cultivars or wild grapevine species, which could in turn influence previous conceptions about the history of its cultivation in the mentioned region. From 2017 to 2018 the analysis of the mentioned samples was conducted by the Croatian Academy of Sciences and Arts, Institute for Historical Sciences in Zadar, within the professional project "The earliest traces of grapevine cultivation in the wider Nin region *Vitis vinifera* – analysis of bioarchaeological samples" led by Martina Dubolnić Glavan, PhD.[4] Work on the project resulted in a professional study on research conducted.[5]

2. ARCHAEOLOGICAL EXCAVATIONS OF BURIAL MOUND MALA GLAVICA – MATAKOV BRIG 1986 – 1987, THE COURSE OF RESEARCH AND WORK METHODOLOGY

Burial mound known locally as *Mala glavca* is located in the Zadar County, in the area of the Ražanac Municipality, about 11.5km northeast of Nin and about 18km northeast of Zadar. It is situated on the eastern side of the Mataci hamlet

2 Š. Batović, S. Kukoč 1986, 40–41; 1988, 57–58; S. Kukoč 2009, 52–55.
3 Š. Batović, S. Kukoč 1986, 40–41; 1988, 14, 42; S. Kukoč 2009.
4 Projekt je ostvaren financijskom potporom tvrtke Kraljevski vinogradi d.o.o. Ovom prilikom zahvaljujemo suradnicima iz Kraljevskih vinograda d.o.o., gosp. Milenku Rajiću i Ani Novosel, na poticaju za istraživanje i rad na spomenutoj temi.
5 M. Dubolnić Glavan 2018, 1–34.

2 Š. Batović, S. Kukoč 1986, 40–41; 1988, 57–58; S. Kukoč 2009, 52–55.
3 Š. Batović, S. Kukoč 1986, 40–41; 1988, 14, 42; S. Kukoč 2009.
4 The project was realized owing to financial support of the company Kraljevski vinogradi d. o. o. We would like to thank our associates from Kraljevski vinogradi d. o. o., Mr. Milenko Rajić and Mrs. Ana Novosel, for inciting the research and study of the mentioned subject.
5 M. Dubolnić Glavan 2018, 1–34.

Karta 1. Položaj tumula Mala glavica kod Podvršja u Općini Ražanac
Map 1. Position of the tumulus of Mala glavica near Podvršje in the Ražanac Municipality

izradili / made by: **R. Maršić, M. Dubolnić Glavan**

Mataci (predio Gajine – Matakov brig), u blizini sela Podvršje, na cca 100 m nadmorske visine (karta 1).[6] Lokalitet se nalazi na sjeverozapadnom rubu grebena Ljubačka kosa koji se pruža u dužini od oko 15 km na potezu od Posedarja do Ljupča. Taj prirodni greben izuzetno je bogat raznovrsnim arheološkim nalazištima zbog čega je i stekao epitet „jednog od najzanimljivijih i najbogatijih arheoloških predjela u sjevernoj Dalmaciji".[7]

Prethodnim terenskim pregledom ustanovljeno je da je humak otprije bio djelomično oštećen uslijed odnošenja kamenja za gradnju obližnjih suhozida. S površine je prikupljeno više raznovrsnih artefakata zbog čega se lokalitet činio pogodnim za provođenje iskopavanja.[8] Arheološka iskopavanja tumula Mala glavica provedena su tijekom dviju kampanja 1986. – 1987. g. (u periodu od 14. svibnja do 6. lipnja 1986. te od 27. travnja do 28. svibnja 1987. g.) u okviru praktičnog terenskog rada studenata arheologije Filozofskog fakulteta u Zadru (danas Odjel za arheologiju Sveučilišta u Zadru). Rezultati arheološkog istraživanja objavljeni su u nekoliko radova[9] među kojima

(area Gajine – Matakov brig), in the vicinity of the village of Podvršje, at ca. 100masl (Map 1).[6] The site is located on the northwestern edge of the Ljubačka kosa ridge that spreads in the length of 15km from Posedarje to Ljubač. This natural ridge abounds in archaeological sites which is why it was given the epithet of "one of the richest and most interesting archaeological regions in northern Dalmatia".[7]

In the previous field survey it had been discovered that the mound was partially damaged due to removing stones to build nearby drystone walls. Several various artifacts had been collected from the surface suggesting that the site might be suitable for archaeological excavations[8] which were eventually conducted in two campaigns in 1986-1987 (from May 14 to June 6, 1986 and from April 27 to May 28, 1987) within the field practice of the archaeology students of the Faculty of Philosophy in Zadar (presently the Department of Archaeology of the University of Zadar). The results of the archaeological excavations were published in several reports,[9] with the most comprehensive presentation of the course of excavations and research methodology, analysis

6 Š. Batović, S. Kukoč 1986, 38–39; 1987, 61–62; 1988, 9.
7 Š. Batović 1983, 30–31; Š. Batović, S. Kukoč 1986, 39; 1987, 61–62; 1988, 5–7.
8 Š. Batović, S. Kukoč 1986, 39; 1987, 61–62.
9 Š. Batović, S. Kukoč 1986, 38–41; 1987, 61–63; 1988a, 26–29.

6 Š. Batović, S. Kukoč 1986, 38–39; 1987, 61–62; 1988, 9.
7 Š. Batović 1983, 30–31; Š. Batović, S. Kukoč 1986, 39; 1987, 61–62; 1988, 5–7.
8 Š. Batović, S. Kukoč 1986, 39; 1987, 61–62.
9 Š. Batović, S. Kukoč 1986, 38–41; 1987, 61–63; 1988a, 26–29.

Slika 1. Tumul Mala glavica, tlocrt sloja kamenoga nasipa prije skidanja kontrolnih profila
Figure 1. Tumulus of Mala glavica, ground plan of the stone fill layer prior to removing balks

prema / after: **Š. Batović, S. Kukoč 1988, T. XIX**

je najcjelovitiji prikaz tijeka i metodologije istraživanja, s obradom pronađene građe i dokumentacije, publiciran u članku Š. Batović i S. Kukoč, *Grobni humak iz ranoga brončanog doba u Podvršju*.[10]

of collected finds and documentation, published in the paper by Š. Batović, S. Kukoč entitled *Grobni humak iz ranoga brončanog doba u Podvršju* (*An Early Bronze Age burial mound from Podvršje*).[10]

10 Š. Batović, S. Kukoč 1988, 5–64.

10 Š. Batović, S. Kukoč 1988, 5–64.

Prije početka istraživanja humak je bio kružnog oblika, promjera 15 x 14 m, visine 0,7 m, građen od zemlje i kamenja. Istražen je metodom podjele na kvadrante prema stranama svijeta. S pomoću prekriženih pravaca u smjeru sjever-jug, istok-zapad podijeljen je na četiri kvadranta, a po sredini su ostavljeni križni kontrolni profili širine 50 cm (sl. 1). Istraživanje je provedeno stratigrafski, dakle uz praćenje slojeva u pojedinim kvadrantima koji su pritom tehnički i fotografski dokumentirani.[11] Takvom metodologijom dobivena je horizontalna i vertikalna stratigrafija humka (sl. 1–2), odnosno ustanovljen je način gradnje tumula, odnos pojedinih slojeva i ostataka materijalne kulture. Unatoč prvotnoj oštećenosti humka, većim dijelom ustanovljen je i prostorni raspored kulturnih ostataka: građevnih faza, artefakata, grobova i drugih vrsta nalaza poput gareži i nalaza hrpica sjemena (sl. 3).[12]

Prikupljeni podatci omogućili su rekonstrukciju nastanka i izgleda humka koji je u glavnini sagrađen nasipavanjem dvaju slojeva: nasipa čiste crvenice u donjem sloju i nasipa zemlje i kamenja u gornjem sloju. Na zdravici je prvo izgrađen kružni obzid od naslaganog kamenja u suhozidu čiji je promjer iznosio približno 10 – 11 m. Prostor unutar kruga zatim je ispunjen zemljom crvenicom (debljine 20 – 30 cm) kao podlogom za grobove u koje su polagani pokojnici. Ostatci spaljenih skeleta prekriveni su zemljom i kamenjem, pa je prvotna visina tumula iznosila 1,5 – 2 m. Dokumentirana su četiri oštećena groba te više ljudskih kostiju razbacanih po humku. Jedan grob sadržavao je grobnu arhitekturu u tzv. škrinji izrađenoj od neobrađenog kamenja. Grobovi su većinom bili bez priloga, a u samo jednom grobu pronađen je zub psa.[13]

Izvan grobova, pronađena je iznimno velika količina raznovrsne građe razasute po čitavoj površini tumula. U gornjem sloju zemlje i kamenja prikupljeno je 4300 ulomaka keramike. Spomenuti keramički ulomci bili su disperzirani po čitavu humku, a potječu od stotinjak raznovrsnih keramičkih posuda (zdjela, vrčeva i većih posuda) za koje se drži da su namjerno razbijane kao dio pogrebnih rituala.[14] Pronađena je također i velika količina artefakata od kamena poput kremenih noževa, strugala, jedne strelice, pravokutnog privjeska ili štitnika, odsječenih poluvalutaka, pločica od brusa, jedne kugle te drugih nedefiniranih kamenih predmeta. Mogu se istaknuti i nalazi hrpica ugljena, ptičjih kosti te sjemena vinove loze (*Vitis vinifera*) koji se također interpretiraju u okviru pogrebnih rituala (sl. 3).[15]

Before the onset of the excavations the mound was circular in form, with diameter of 15 x 14m, and height of 0,7m, built of stone and earth. It was excavated by using the method of division in quadrants aligned to the cardinal points. It was divided into four quadrants by two intersecting lines in opposite directions (NS, EW). Balks 50 cm wide were left in the middle (Fig. 1). The excavations was carried out stratigraphically, monitoring the layers in the quadrants that were documented technically and photographically in the process.[11] Such methodology provided horizontal and vertical stratigraphy of the mound (Figs. 1–2), and manner of construction was determined as well as the relations between the layers and the material culture remains. Despite the original damage on the tumulus, spatial distribution of cultural remains was defined: building phases, artifacts, graves and other categories of finds such as soot and finds of seed piles (Fig. 3).[12]

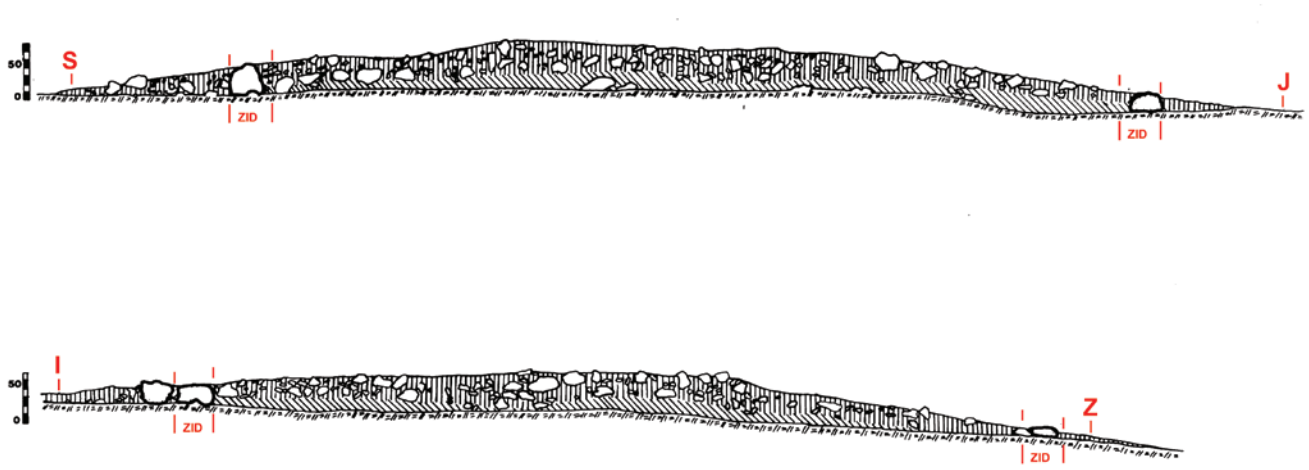
Collected data enabled reconstruction of formation and appearance of the mound that was basically built by depositing two layers: pure *terra rossa* in the lower layer and filling of earth and stones in the upper layer. Circular enclosing wall made of arranged stones in drystone wall technique was built first, on the bedrock, wih diameter of ca. 10-11m. The area inside the circle was then filled with *terra rossa* (thicknes 20-30 cm) as a basis for graves in which the deceased persons were laid. Remains of cremated skeletons were covered with earth and stones, so that the original height of the tumulus was 1.5-2m. Four damaged graves were documented and several human bones scattered on the mound. One grave contained a cist made of undressed stones. Graves were mostly without grave goods, save one in which a canine tooth was found.[13]

An exceptionally large amount of various artifacts was found outside the graves, scattered on the entire surface of the tumulus. Four thousand and three hundred pottery sherds were recovered from the upper layer of soil and rocks. Mentioned pottery sherds were dispersed across the mound, and they belonged to about a hundred different vessels (bowls, jugs and larger vessels) that are believed to have been broken intentionally as a part of funerary rituals.[14] Artifacts made of stone were also quite abundant such as flint knives, scrapers, one arrow, rectangular pendant or guard, split pebbles, grindstone plaque, ball, and other undefined stone objects. We should also mention finds of piles of soot, bird bones and grapevine seeds (*Vitis vinifera*) which are also interpreted within the context of funerary rituals (Fig. 3).[15]

Owing to abundance of recovered finds, the tumulus of Podvršje offered the most complete image of the Cetina

11 Š. Batović, S. Kukoč 1988, 10–11.
12 Š. Batović, S. Kukoč 1988, 12–36.
13 Š. Batović, S. Kukoč 1986, 39–40; 1987, 62; 1988, 13–17.
14 Š. Batović, S. Kukoč 1986, 40; 1988, 43.
15 Š. Batović, S. Kukoč 1986, 39–41; 1988, 43, 57–58.

11 Š. Batović, S. Kukoč 1988, 10–11.
12 Š. Batović, S. Kukoč 1988, 12–36.
13 Š. Batović, S. Kukoč 1986, 39–40; 1987, 62; 1988, 13–17.
14 Š. Batović, S. Kukoč 1986, 40; 1988, 43.
15 Š. Batović, S. Kukoč 1986, 39–41; 1988, 43, 57–58.



Slika 2. Tumul Mala glavica, presjeci humka u pravcu sjever-jug i istok-zapad
Figure 2. Tumulus of Mala glavica, cross-sections of the mound, NS and EW

prema / after: **Š. Batović, S. Kukoč 1988, T. XX**

Prema bogatstvu pronađene građe, tumul iz Podvršja pružio je znanstvenicima do tada najpotpuniju sliku o cetinskoj kulturi na prostoru sjeverne Dalmacije. Drži se da su u tumulu pokapani članovi pojedinih obitelji ili roda. Nalazi brojnih keramičkih posuda te kamenih i koštanih privjesaka i strelice upućuju na zaključak da je u tumulu bio pokopan barem jedan pokojnik istaknutog društvenog položaja.[16] Tipološka svojstva pronađene materijalne građe te način gradnje upućuju na dataciju tumula u rano brončano doba (period 1900. – 1600. g. pr. Kr.), preciznije u njegov kasni dio, odnosno u 3. stupanj cetinske kulture.[17]

3. KONTEKST PRONALASKA SJEMENA VINOVE LOZE (*VITIS VINIFERA*) I NJEGOVA INTERPRETACIJA

Prilikom istraživanja grobnog humka Mala glavica u sjeveroistočnom kvadrantu, na dubini od oko 50 cm, pronađene su tri hrpice sjemenki grožđa (*Vitis vinifera*). Kontekst pronalazaka sjemena vinove loze iscrpno je opisan u navedenom radu u kojem su objavljeni cjeloviti podatci o istraživanju tumula: „Osobito je interesantan nalaz grožđanog sjemena posred sjeveroistočnog kvadranta, na 2,50 – 2,55 m od sredine humka i toliko od obzida, pa 1,55 – 1,65 m od pravca sjever – jug, na dubini oko 50 cm od površine humka, ili na dubini 15 – 25 cm u donjem nasipu crvenice. Sjemenke su bile u tri hrpice, oko desetak centimetara udaljene jedna od druge, odnosno dvije su bile na 25 cm dubine, a treća iznad jedne od njih na dubini 15 cm u crvenici. Svaka od njih bila je u rastresitoj finoj smeđoj zemlji, nastaloj vjerojatno truljenjem ploda unutar crvenice. Nije bilo moguće ustanoviti

16 Š. Batović, S. Kukoč 1988, 57.
17 Š. Batović, S. Kukoč 1986, 40–41; 1987, 63; 1988, 55–58.

culture in the northern Dalmatia region. It is believed that members of certain families or kin were buried in the tumulus. Finds of a number of ceramic vessels, stone and bone pendants and an arrow suggest that at least one member of the social elite was buried in the tumulus.[16] Typological characteristics of recovered artifacts and manner of construction suggest dating of the tumulus to the Early Bronze Age (1900-1600 BC), more precisely to its late part, or the third stage of the Cetina culture.[17]

3. CONTEXT OF THE DISCOVERY OD GRAPEVINE SEEDS (*VITIS VINIFERA*) AND ITS INTERPRETATION

During the excavation of the burial mound Mala glavica three piles of grapevine seeds (*Vitis vinifera*) were found in northeastern quadrant, at a depth of 50cm. The context of discovery of the grapevine seeds was described extensively in the mentioned paper in which complete information on the research of the tumulus was published: "There was a particularly interesting finding of grapevine seeds in the middle of the northeastern quadrant, at 2.50-2.55m from the middle of the mound and at the same distance from the enclosure wall, 1.55-1.65m from direction north – south, at a depth of 50cm from the surface of the mound, or at a depth of 15-25cm in the lower filling of *tera rossa*. Seeds were grouped in three piles, at a mutual distance of about ten centimeters. Two of them were at a depth of 25cm, and the third one above them at a depth of 15cm in *terra rossa*. They were all in fine loose brown soil, resulting probably from rotting of the fruit in *terra rossa*. It was impossible to determine any traces of subsequent bringing

16 Š. Batović, S. Kukoč 1988, 57.
17 Š. Batović, S. Kukoč 1986, 40–41; 1987, 63; 1988, 55–58.

bilo kakve tragove naknadnom nanošenju toga sjemena (mravi ili neke druge životinje), jer u crvenici nije bilo nikakvih rupa, kanalića ili prekida, već se upravo iznad toga sjemenja nalazio vrlo tvrd sloj crvenice s valutcima. Čini se po svemu da je to sjemenje pronađeno u prvotnom položaju iz vremena gradnje humka."[18] Dakle, iz spomenutog se može zaključiti da je sjeme vinove loze pronađeno u intaktnom sloju, odnosno da potječe iz arheološkog konteksta grobnog humka čiji kulturni slojevi datiraju u rano brončano doba (sl. 3).

Na temelju rezultata iskopavanja interpretiraju se brojni nalazi iz tumula, prvenstveno kulturni slojevi, građevne faze i grobovi, a zatim i brojni artefakti i druge vrste nalaza poput gareži i hrpica sjemena. Kako je postterenska arheobotanička analiza A. Šercelja tada pokazala da se radi o kultiviranoj vrsti vinove loze, zaključuje se kako je to do tada jedini nalaz sjemenki grožđa u cetinskoj kulturi i najraniji trag upotrebe vinove loze kod nas![19]

Nalazi sjemena i ugljena, kao i tragovi loženja vatre dokumentirani u slojevima grobnog humka, tumače se kao tragovi posmrtnih obreda izvršeni u vrijeme njegove gradnje, pri čemu se nalazi sjemena interpretiraju kao tragovi žrtvenih obreda ili hrane ostavljane pokojniku za prekogrobni život. Iako se brojni elementi pogrebnog rituala dokumentirani istraživanjem humka uklapaju u sliku ranog brončanog doba, nalaz sjemena promatra se kao novina i posebnost na ovim prostorima.[20] Analogije za stavljanje sjemena u grobne humke autori nalaze na lokalitetu Rašnovac – Troglavce u Grbama nedaleko od Nina gdje je pronađena veća količina karboniziranog sjemena,[21] no kako spomenuti arheobotanički nalazi do danas nisu objavljeni, nije poznato o kojoj je vrsti sjemena riječ te kolika je njegova starost.

Od vremena provođenja iskopavanja i objave rezultata istraživanja spomenuti su zaključci još uvijek relevantni. Drži se da je humak iz Podvršja i danas najpogodniji za analizu cetinskog funerarnog kulta sa spaljivanjem pokojnika u sjevernoj Dalmaciji te kulta mrtvih općenito u ranoj bronci na ovom prostoru. Njegova struktura (formalno-graditeljska i religijska) objedinjuje više važnih elemenata svojstvenih humcima cetinske kulture, poput gradnje obzida, nasipanja zemlje, spaljivanja pokojnika te, među ostalim, i prilaganja sjemenja (divlje loze), paljenja vatri u prostoru humka, razbijanja (žrtvovanja) keramičkog posuđa itd.[22]

of these seeds (ants or some other animals) as there were no holes in *terra rossa*, channels or breaks, just the opposite – very hard layer of terra rossa with pebbles was over the seeds. It seems that these seeds were found in an original position from the time when the mound was built."[18] Therefore, it could be safe to conclude that grapevine seeds were found in an intact layer, i.e. that they originate from an archaeological context of a burial mound whose cultural layers date to the Early Bronze Age (Fig. 3).

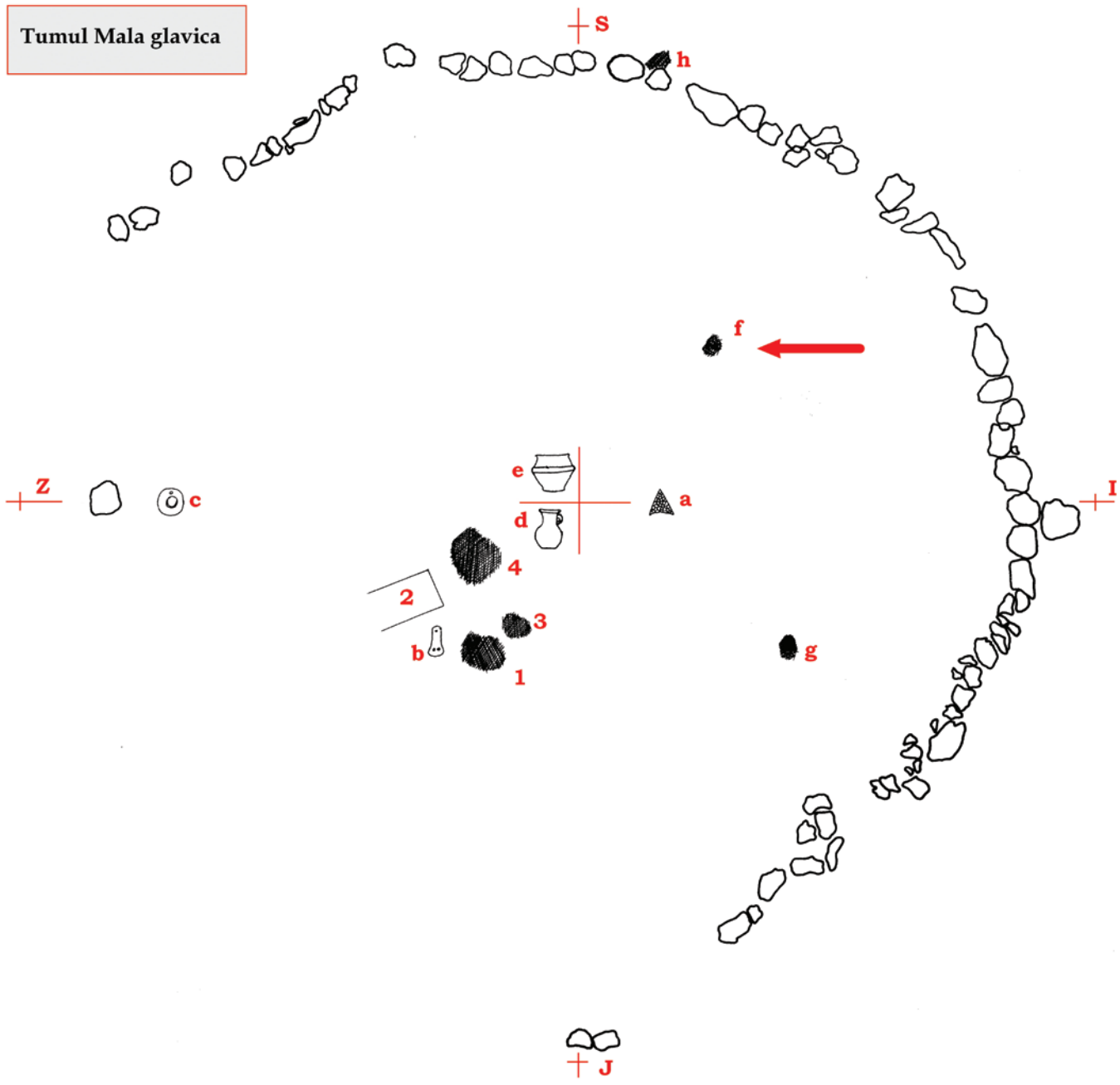
Based on the excavation results a number of findings from the tumulus were interpreted, primarily the cultural layers, building phases and graves, and then also numerous artifacts and other kinds of finds such as soot and piles of seeds. Since post-excavation archaeobotanical analysis by A. Šercelj indicated that it was cultivated grapevine, it was concluded that it was the only find of grapevine seeds in the Cetina culture and the earliest trace of using grapevine in our region![19]

Finds of seeds and soot, as well as traces of fire making documented in the layers of the burial mound, are interpreted as traces of funerary rituals performed at the time when it was built, while traces of seeds are understood as traces of sacrificial rituals or food left for the deceased person in the afterlife. Although a number of elements of the funerary ritual documented in the mound excavation correspond to the image of the Early Bronze Age, the finding of seeds is observed as something new and special in these regions.[20] Analogies for placing seeds in burial mounds can be found at the site of Rašnovac – Troglavce in Grbe near Nin where a substantial amount of carbonized seeds was found,[21] but since mentioned archaeobotanical finds have not been published yet, the type of seeds and its age remains unknown.

Mentioned conclusions have been relevant since the excavations were carried out and the results published. It is still believed that the mound from Podvršje is the most suitable example for the analysis of the funerary cult in the Cetina culture with cremation of the deceased in northern Dalmatia and the cult of the dead in general in the Early Bronze Age in this area. Its structure (in terms of construction and religion) unifies several important elements characteristic of the Cetina culture mounds such as building enclosure walls, filling with earth, cremating the deceased, and, among other things, offering seeds (of wild grapevine), making fires in the mound area, breaking (sacrificing) pottery etc.[22]

18 Š. Batović, S. Kukoč 1988, 14.
19 Š. Batović, S. Kukoč 1988, 42.
20 Š. Batović, S. Kukoč 1988, 14, 42–43, 58.
21 Š. Batović 1984, 15–17; 1986, 21–24; Š. Batović, S. Kukoč 1988, 14–15, 42–43.
22 S. Kukoč 2009, 54–55.

18 Š. Batović, S. Kukoč 1988, 14.
19 Š. Batović, S. Kukoč 1988, 42.
20 Š. Batović, S. Kukoč 1988, 14, 42–43, 58.
21 Š. Batović 1984, 15–17; 1986, 21–24; Š. Batović, S. Kukoč 1988, 14–15, 42–43.
22 S. Kukoč 2009, 54–55.



Slika 3. Tumul Mala glavica, tlocrt istraženog obzida humka s označenim položajem važnijih nalaza. Crvena strelica označava položaj pronalaska hrpica sjemena vinove loze

Figure 3. Tumulus of Mala glavica, ground plan of the excavated enclosing wall of the mound with marked positions of more important finds. Red arrow marks the findspot of the piles of grapevine seeds

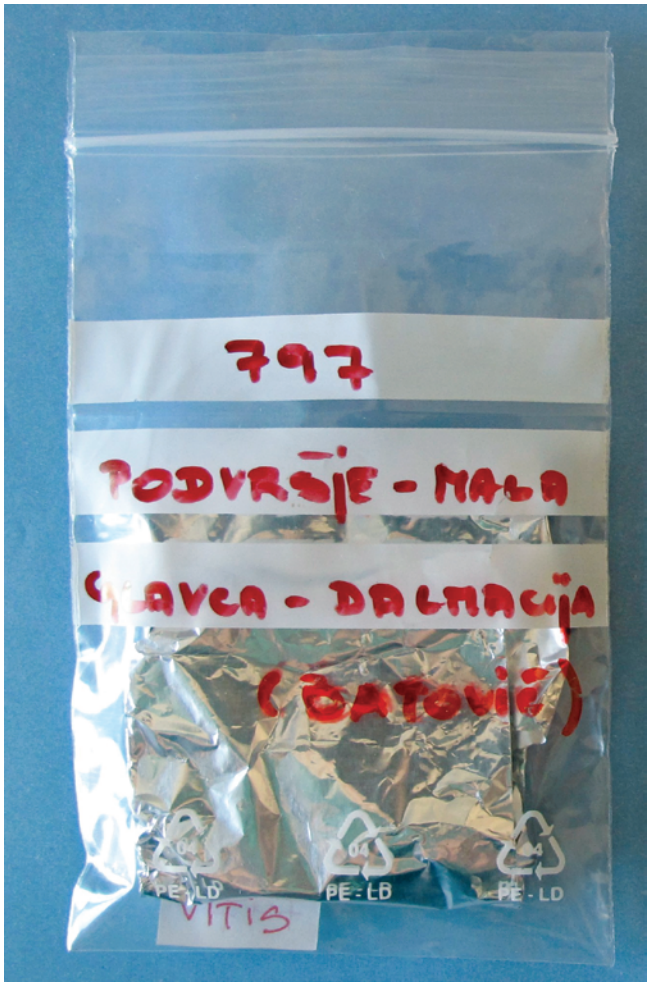
izradila / made by: **M. Dubolnić Glavan; prema** / after: **Š. Batović, S. Kukoč 1988, T. XXI**

4. SMJEŠTAJ ARHEOBOTANIČKIH UZORAKA

Po završetku spomenutih iskopavanja sav prikupljeni arheološki materijal predan je na pohranu u Arheološki muzej Zadar, gdje se i danas nalazi, dok se dokumentacija s istraživanja tek šturo sačuvala.[23] Tijekom 1987. g. voditelj istraživanja poslao je uzorke sjemena vinove loze na analizu poznatom paleobotaničaru u Ljubljanu, akademiku Alojzu Šercelju (Slovenska akademija znanosti in umetnosti, Biološki inštitut Jovana Hađija).[24] Nakon provedene analize uzorci sjemena nisu vraćeni u Hrvatsku, već su pohranjeni u SAZU-u u Ljubljani. Uzorak je sadržavao 200 dobro očuvanih sjemenki grožđa koje su od 1987. godine bile pohranjene u Biološkom inštitutu Jovana Hađija u Ljubljani, SAZU, u Zbirci bioloških uzoraka pokojnog akademika Šercelja.[25] U tom je periodu uzorak oznake „br. 797. Podvršje – Mala Glavca – Dalmacija (Batović)" bio adekvatno pohranjen (sl. 4–5).[26]

4. LOCATION OF THE ARCHAEOBOTANICAL SAMPLES

At the end of the mentioned excavations all collected archaeological material was handed over to the Archaeological Museum in Zadar for safekeeping, where it remains to this day, while research documentation was only scantily preserved.[23] In 1987 the research leader sent samples of grapevine to analysis to a famous paleobotanist in Ljubljana, academician Alojz Šercelj (Slovenian Academy of Sciences and Arts (SAZU), Institute of Biology Jovan Hadži).[24] After the analysis was finished the samples were not returned to Croatia but they were kept in SAZU in Ljubljana. The sample contained 200 well preserved grapevine seeds that have been housed in the Institute of Biology Jovan Hadži in Ljubljana, SAZU, in the collection of biological samples of the late academician Šercelj.[25] In that period sample designated "no. 797. Podvršje – Mala Glavca – Dalmacija (Batović)" was adequately stored (Figs. 4–5).[26]



Slike 4–5. Uzorak 797 Podvršje – Mala glavica pohranjen u Biološkom institutu Jovan Hadži (SAZU) u Ljubljani
Figures 4–5. Sample 797 Podvršje – Mala glavica stored in the Institute of Biology Jovan Hadži (SAZU) in Ljubljana

foto / photo by: **M. Dubolnić Glavan**

23 U fototeci Arheološkog muzeja Zadar nalazi se dvadesetak fotografija humka prilikom iskopavanja, dok ostaloj dokumentaciji (dnevnici i tehnička dokumentacija) nije poznat smještaj.
24 Š. Batović, S. Kukoč 1988, 14.
25 M. Dubolnić Glavan 2018, 15.
26 Prema podatcima koje nam je pružila kolegica Metka Culiberg uzorci su cijelo vrijeme bili pohranjeni u ormarima posebne sabirne sobe te nije moguće da su bili izloženi kontaminacijama.

23 In the photographic archives of the Archaelogical Museum Zadar are some twenty photos of the mound during the excavations while the location of the rest of the documentation (field journals and technical documentation) is unknown.
24 Š. Batović, S. Kukoč 1988, 14.
25 M. Dubolnić Glavan 2018, 15.
26 Colleague Metka Culiberg claims that the samples were constantly kept in the cabinets in a special depository room where they could not have been contaminated.

Arheobotanički materijal vraćen je 2016. godine u Hrvatsku u Zavod za povijesne znanosti HAZU-a u Zadru posredstvom djelatnika Instituta SAZU-a, dr. sc. Branka Vreša i dr. sc. Metke Culiberg.[27] Tijekom 2017. g. uzorci su predani na pohranu u Arheološki muzej u Zadru, gdje se nalazi i ostala građa sa spomenutih istraživanja.[28]

5. REZULTATI ARHEOBOTANIČKIH ANALIZA UZORAKA SJEMENA VINOVE LOZE 1988. I 2017. – 2018. G.

Za identifikaciju sjemena vinove loze iz arheoloških slojeva te za distinkciju divljih (*Vitis vinifera ssp. sylvestris*) od kultiviranih sorti (*Vitis vinifera ssp. vinifera*) općenito se koriste analize morfoloških karakteristika uzoraka. No dosadašnja istraživanja pokazala su kako su morfološke analize uzoraka problematične te je za postizanje optimalnih rezultata uputno koristiti se različitim biometrijskim analizama i usporedbama.[29]

Spomenuta tvrdnja ogleda se i u rezultatima analiza sjemena pronađenog istraživanjem tumula Mala glavica. Arheobotaničke analize provedene su u dva navrata, no s različitim rezultatima. Kao što je već navedeno, po završetku istraživanja 1988. g. uzorak br. 797, oznake Podvršje – Mala Glavca – Dalmacija (Batović), analizirao je akademik Alojz Šercelj (SAZU) i ustanovio da se sastoji od cca 200 sjemenki (Prilog 1). Sjemenke nisu karbonizirane, ali imaju čvrstu sjemenu ovojnicu zahvaljujući kojoj su ostale sačuvane u odličnom stanju. Iako se sjemenke razlikuju po veličini i obliku, zaključuje se da su sve istog tipa. Prema morfološkim karakteristikama sjemena (peteljka i halaza) riječ je o kultiviranoj vrsti, odnosno običnoj vinovoj lozi (*Vitis vinifera*), dok bi se dio uzoraka teoretski mogao pripisati i divljim sortama (*Vitis vinifera ssp. sylvestris*), što je malo vjerojatno.[30]

U periodu 2017. – 2018. g. spomenute uzorke analizirala je izv. prof. dr. sc. Renata Šoštarić s Prirodoslovno-matematičkog fakulteta (Biološki odsjek Botaničkog zavoda) Sveučilišta u Zagrebu. Na temelju morfologije sjemena i razlikovnih osobina[31] R. Šoštarić je ustanovila kako najveći dio biološkog materijala (91 uzorak sjemena) čini sjeme divlje vinove loze (*Vitis vinifera* susp. *sylvestris*), dok je tek manji broj uzoraka (32 sjemenke) determiniran kao *Vitis vinifera* cf. susp. *vinifera* (najvjerojatnije kultivirani oblik vinove loze). Preostale 83 sjemenke nemaju jasne karakteristike po kojima bi se sa sigurnošću mogle odvojiti kao divlji ili kultivirani tip vinove loze (determinirane su kao

Archaeobotanical material was brought back in 2016 to Croatia to the Institute of Historical Sciences of HAZU in Zadar through mediation of the employees of the Institute SAZU, Branko Vreš, PhD and Metka Culiberg, PhD.[27] In 2017 the samples were given to the Archaeological Museum in Zadar to be stored there with the rest of the finds from the excavations.[28]

5. RESULTS OF THE ARCHAEOBOTANICAL ANALYSES OF THE SAMPLES OF GRAPEVINE SEEDS IN 1988 AND 2017 – 2018

Analyses of morphological characteristics of the samples are usually used in identification of grapevine seeds from archaeological layers and for differentiation between wild (*Vitis vinifera ssp. sylvestris*) and cultivated species (*Vitis vinifera ssp. vinifera*). However previous research has indicated that morphological analyses of samples might be problematic and it is advisable to use various biometric analyses and comparisons to obtain optimal results. [29]

The mentioned claim is reflected in the results of the analyses of seeds found in Mala glavica tumulus. Archaeobotanical analyses were conducted on two occasions but with different results. As already mentioned after the excavations had been finished in 1988 sample no.797, with designation Podvršje – Mala Glavca – Dalmacija (Batović), was analyzed by the academician Alojz Šercelj (SAZU) who determined that it consisted of ca. 200 seeds (Appendix 1). The seeds were not carbonized, but they had a firm seed shell that preserved them in excellent condition. Although they differ in shape and size, it was concluded that they were all of the same type. Morphological characteristics of the seeds (petiole and chalaza) indicate that it is cultivated species, common grapevine (*Vitis vinifera*), while a part of the sample could be ascribed to wild species (*Vitis vinifera ssp. sylvestris*), which is unlikely.[30]

In the period from 2017 to 2018 mentioned samples were analyzed by Renata Šoštarić, PhD, associate professor from the Faculty of Science (Department of Biology of the Division of Botany) of the University of Zagreb. On the basis of seed morphology and distinctive traits[31] R. Šoštarić determined that most of biological material (91 seed samples) consisted of wild grapevine seeds (*Vitis vinifera* susp. *sylvestris*), while only smaller number of samples (32 seeds) were determined as *Vitis vinifera* cf. susp. *vinifera* (most probably cultivated sort of grapevine). The remaining 83 seeds exhibit no clear characteristics to determine them as wild

27 Ovom prilikom zahvaljujemo djelatnicima Instituta Slovenske akademije znanosti i umjetnosti dr. sc. Branku Vrešu i dr. sc. Metki Culiberg na pomoći prilikom povrata uzoraka u Hrvatsku. Zahvalu na pomoći prilikom analiziranja građe također dugujemo i kolegi izv. prof. dr. sc. Dariju Vujeviću, djelatniku Odjela za arheologiju Sveučilišta u Zadru.
28 M. Dubolnić Glavan 2018, 15, 19.
29 T. Korenčić *et al.* 2007, 261–264.
30 M. Dubolnić Glavan 2018, 19.
31 Prema J. M. Renfrew 1973, 128.

27 We would like to express our gratitude to the scholars from the Institute of the Slovenian Academy of Sciences and Arts Branko Vreš, PhD, and Metka Culiberg, PhD, for their help in returning the samples to Croatia. We would also like to thank Dario Vujević, PhD, asociate professor from the Department of Archaeology of the University of Zadar for his help in the analysis of the material.
28 M. Dubolnić Glavan 2018, 15, 19.
29 T. Korenčić *et al.* 2007, 261–264.
30 M. Dubolnić Glavan 2018, 19.
31 After J. M. Renfrew 1973, 128.

Vitis vinifera s. l.). Međutim, ta se determinacija treba uzeti s rezervom zato što je u praksi razlikovanje divlje i kultivirane vinove loze na temelju sjemenki vrlo teško. Iako Renfrew jasno razlikuje i odvaja te dvije skupine vinove loze,[32] i sama ističe kako su sjemenke vrlo varijabilne oblikom i veličinom. Na to je već ranije ukazivala Zaprjagaeva,[33] a takvo mišljenje prihvaćaju i moderni autori.[34] Predmet je rasprave i područje rasprostranjenosti divlje vinove loze, koja je prema Zohary i suradnicima široko rasprostranjena na području Sredozemlja i u toplijim kontinentalnim područjima, ali dio areala divlje vinove loze nesumnjivo pripada feralnim, tj. podivljalim oblicima koji su se razvili iz kultivirane vinove loze.[35] Osim toga, divlji i kultivirani oblici mogu uspješno hibridizirati što dodatno povećava raznolikost te otežava identifikaciju na temelju sjemenki i interpretaciju dobivenih rezultata. Što se tiče Hrvatske i recentne rasprostranjenosti divljeg oblika vinove loze (*Vitis vinifera* subsp. *sylvestris*), prema bazi *Flora Croatica Database*, prisutna je na različitim lokalitetima u obalnom i kontinentalnom području.[36] Divlja loza primarno se rasprostranjuje pticama, no može se rasprostranjivati i različitim vrstama sisavaca i gmazova, uključujući i domaće životinje poput ovaca i koza.[37] Ostatci sjemenki vinove loze u arheološkom kontekstu pronađeni su na brojnim prapovijesnim lokalitetima diljem Europe i jugoistočne Azije[38] jer su se plodovi divlje loze sakupljali u prirodi i koristili prije početka uzgoja. Iako su bobe divlje loze sitne i prilično kisele, mogle su se koristiti za spravljanje alkoholnih pića. Stoga pronalazak sjemenki vinove loze u prapovijesnom kontekstu na području Nina ne bi bio neočekivan, no, nažalost, u ovom je slučaju recentna kontaminacija. S obzirom na sve navedeno te na činjenicu da se radi o području koje se intenzivno koristilo i naseljavalo od prapovijesnih vremena, vjerojatno je u grobnom kontekstu pronađena mješavina feralnih i kultiviranih sjemenki vinove loze koja je u grobni kontekst dospjela zahvaljujući divljim ili domaćim životinjama lokalnog područja.

6. REZULTATI RADIOKARBONSKE ANALIZE 2018. G.

S obzirom na činjenicu da se uzorak sastoji od većeg broja dobro očuvanog sjemenja, za analizu je odabrano sedam sjemenki ukupne težine 70 – 90 mg, koje su prijašnjom arheobotaničkom analizom određene kao *Vitis vinifera* s. l. te *Vitis vinifera* cf. *ssp. vinifera*. Tijekom 2018. g. uzorak sjemena vinove loze poslan je na radiokarbonsku analizu u londonski ured laboratorija Beta Analytic Inc. (Beta Analytic

32 J. M. Renfrew 1973, 128.
33 V. I. Zaprjagaeva 1964, 695.
34 D. Zohary, M. Hopf, E. Weiss 2012, 123.
35 D. Zohary, M. Hopf, E. Weiss 2012, 121–122.
36 T. Nikolić 2015.
37 V. Badler 2008, 2283.
38 D. Zohary, M. Hopf, E. Weiss 2012, 124–126.

or cultivated sorts of grapevine (determined as *Vitis vinifera* s. l.). However this should be taken with caution as it is very difficult in practice to distinguish between the wild and cultivated grapevine on the base of seeds. Although Renfrew clearly distinguishes and separates these two groups of grapevine,[32] she states herself that these seeds are quite variable in form and size. This was emphasized earlier by Zaprjagaeva,[33] and such opinion is accepted by other contemporary authors.[34] Area of distribution of wild grapevine is another subject of discussions. According to Zohary and associates it is widely distributed in the Mediterranean region and in warmer continental area, but some of it definitely belongs to feral or wild forms that developed from cultivated grapevine.[35] Furthermore wild and cultivated sorts can be successfully hybridized which additionally increases diversity and aggravates identification on the basis of seeds and interpretation of acquired results. As for the recent distribution of the wild sort of grapevine in Croatia (*Vitis vinifera* subsp. *sylvestris*), according to *Flora Croatica Database* it is present in various localities in the coastal and continental area.[36] Wild grapevine is primarily dispersed by birds, but various mammals and reptiles can also disperse them, including domestic animals such as sheep or goats.[37] Remains of grapevine seeds in archaeological contexts have been found at a number of prehistoric sites across Europe and southeastern Asia[38] since wild grapevine fruit was gathered in nature and used before cultivation. Although wild grapevine berries are small and quite sour, they could have been used for making alcoholic beverages. Therefore discovery of gapevine seeds in prehistoric context in the Nin region would not be surprising but unfortunately in this case it is a recent contamination. Having in mind all the aforementioned and the fact that this area was intensively used and occupied from prehistory, probaby mixture of feral and cultivated grapevine seeds that was found in grave context ended up there owing to local wild or domestic animals.

6. RESULTS OF THE RADIOCARBON ANALYSIS FROM 2018

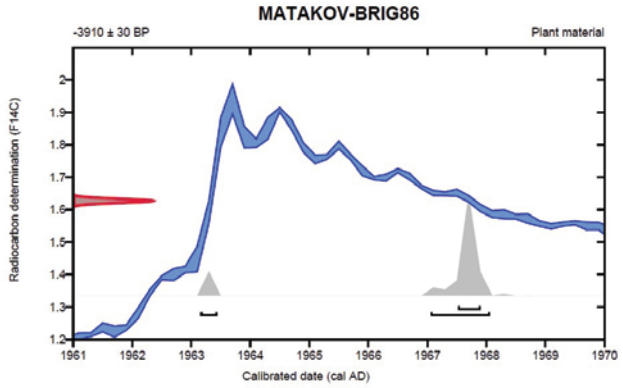
Since the sample contained a considerable number of well preserved seeds, seven examples weighing 70-90mg were selected for the analysis that had already been determined as *Vitis vinifera s. l.* and *Vitis vinifera* cf. *ssp. vinifera* in the previous archaeobotanical analysis. In 2018 the sample of grapevine seeds was sent to radiocarbon analysis to the London office of the laboratory Beta Analytic Limited, London BioScience Innovation Centre. Sample Beta – 487002,

32 J. M. Renfrew 1973, 128.
33 V. I. Zaprjagaeva 1964, 695.
34 D. Zohary *et al.* 2012, 123.
35 D. Zohary *et al.* 2012, 121–122.
36 T. Nikolić 2015.
37 V. Badler 2008, 2283.
38 D. Zohary *et al.* 2012, 124–126.

Limited, London BioScience Innovation Centre). Uzorak Beta – 487002, pod kodom MATAKOV-BRIG86, analiziran je u matičnom laboratoriju u Miamiju, Sjedinjene Američke Države, metodom Standard AMS (*Accelerator Mass Spectrometry*).

Rezultati analize pokazali su 95 % vjerojatnosti da je analizirano sjeme modernog datuma te da datira u 1967. – 1968. godinu (-18 – -19 godina prije vremena kada su pronađene) (Cal results of 83.2 % 1967-1968 cal AD and 12.2 % 1963 cal AD) što je vidljivo iz priložene kalibracijske krivulje (sl. 6; Prilog 3).

Da je nedvojbeno riječ o modernom uzorku, potvrđuje zabilježeni postotak modernog ugljika (162.70 +/- 0.61 pMC). Rezultat 162.7 pMC (*Percent Modern Carbon*) upućuje na prisutnost ugljika bombe koje je proizvelo termonuklearno oružje testirano u periodu od sredine 1950-ih do sredine 1960-ih godina (vidi krivulju *Bomb Carbon Curve*) (Prilog 2; Prilog 3)



Slika 6. Kalibrirani datum za uzorak 487002 MATAKOV-BRIG86 (cal AD)

Figure 6. Calibrated date for sample 487002 MATAKOV-BRIG86 (cal AD)

izvor / source: **Beta Analytic Inc.**

U laboratoriju gdje je vršena analiza ne postoji ništa što posjeduje ^{14}C aktivnost preko OXII ^{14}C modernog standarda (ca 134.06 pMC), pa nije moguće da se vrijednost postotka modernog ugljika (pMC) podigla zbog analitičke pogreške ili pogrešnog izračuna. Također, koliko nam je trenutačno poznato, ne postoji ništa na terenu, ili nakon prikupljanja i pohrane, što je moglo kontaminirati uzorak na postotak + 60 pMC, osim ako u nekom trenutku uzorak nije bio direktno izložen „označenom ili obogaćenom ^{14}C" koji je proizveden u reaktoru i/ili za medicinsku primjenu.

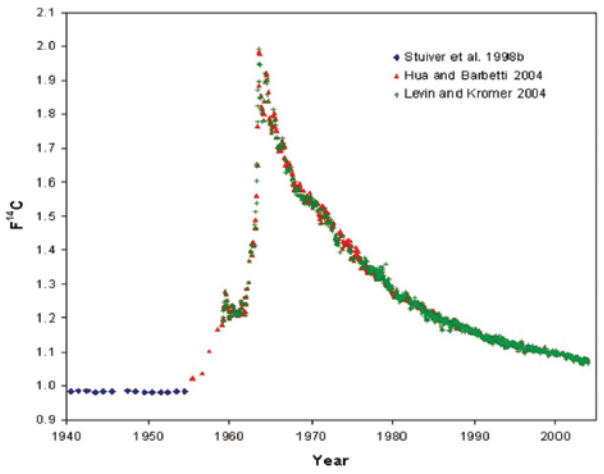
Zbog takvog (neočekivanog) rezultata, Laboratorij Beta Analytic Inc. poduzeo je dodatne provjere da bi se otklonila mogućnost kontaminacije uzoraka u laboratoriju prilikom analize. Provjeren je čitav postupak analize te nije ustanovljena nikakva logistička ili analitička pogreška.

marked MATAKOV-BRIG86, and it was analyzed in the parent laboratory in Miami, USA, by using the method Standard AMS (*Accelerator Mass Spectrometry*).

Results of the analysis have shown with 95 % probability that the analyzed seeds were recent, dating to 1967 -1968 (-18 – -19 years before the time when they were found) (Cal results of 83.2 % 1967-1968 cal AD and 12.2 % 1963 cal AD) as evident from attached calibration curve (Fig. 6) (Appendix 3).

Percentage of modern carbon (162.70 +/- 0.61 pMC) proves that it is definitely a modern sample. The result 162.7 pMC (*Percent Modern Carbon*) suggests presence of carbon of a bomb produced by thermonuclear weapons tested in the period from mid-1950s to mid-1960s (see curve *Bomb Carbon Curve*) (Appendix 2; Appendix 3)

In the laboratory where the analysis was carried out, there was nothing with ^{14}C activity over OXII ^{14}C of modern standard (ca 134.06 pMC), so it is not possible that the value of percentage of modern carbon (pMC) was higher due to a mistake in the analysis or incorrect calculation. Furthermore, to the best of our knowledge, there is nothing at the site or after gathering and depositing the sample that could have contaminated it to the percentage of + 60 pMC, except if the sample had not been exposed to "marked and enriched ^{14}C" produced in the reactor and/or for medical use.



Slika 7. Atmosferska koncentracija $^{14}CO_2$ izražena u F^{14}C (*Bomb Carbon Curve*)

Figure 7. Atmospheric concentration of $^{14}CO_2$ expressed in F^{14}C (*Bomb Carbon Curve*)

izvor / source: **Beta Analytic Inc.**

Because of such (unexpected) result Beta Analytic Inc. Laboratory undertook some additional verifications in order to eliminate any possibility of contamination of samples during the analysis. Entire procedure of analysis was checked and there were no logistic or analytical mistakes.

Za kontrolu kvalitete izvršeni su dodatni testovi br. Beta – 489417 čiji je rezultat (163.72 +/- 0.61 pMC) statistički identičan prvotnom (162.7 +/- 0.61 pMC). S obzirom na činjenicu da su ponovljena testiranja pružila identičan rezultat, starost uzorka određena je u period nakon 1950-ih, a na temelju kalibracija u period od 1963. g. ili, najvjerojatnije, između 1966. i 1968. g. (Beta – 489417, 95.4 % 1966-1967 cal AD). Stoga se s većom sigurnošću može zaključiti da je riječ o recentnom uzorku koji je dospio u područje prikupljanja.

7. (RE)INTERPRETACIJA NALAZA SJEMENA VINOVE LOZE IZ TUMULA MALA GLAVICA – MATAKOV BRIG U PODVRŠJU

Na temelju rezultata provedene ^{14}C analize te dodatnog testiranja vidljivo je da uzorci vinove loze pronađeni prilikom istraživanja tumula Mala glavica datiraju u moderan period. Takav je rezultat mogao nastati zbog kontaminacije ako su prilikom pohrane ili neke od provedenih analiza uzorci bili izloženi artificijelnom ^{14}C i na taj način kontaminirani modernim ugljikom. Za takvo što postoji mala vjerojatnost s obzirom na poznate podatke o vremenu i načinu pronalaska arheobotaničkih uzoraka te njihove pohrane i analize od 1986. do 2018. godine.

Prema tome, analizirane sjemenke datiraju u šezdesete godine 20. st. te su evidentno u sloj tumula dospjele naknadno, što nije uočeno prilikom arheoloških istraživanja. Ako je recentno deponiranje sjemena grožđa i ostavilo nekakve tragove u stratigrafiji, oni su promakli istraživačima prilikom iskopavanja. Možda nije bez značaja činjenica da je tumul prije samog početka istraživanja bio devastiran te da su uzorci pronađeni u skupnom kontekstu (u odnosu na difuzni raspored sjemena) što bi svakako više upućivalo na mogućnost da je materijal zoogenog podrijetla, tj. da su ga u područje prikupljanja donijele životinje (možda kao zalihu hrane). O kojoj se vrsti životinja radi, teško je pretpostaviti s obzirom na to da nisu ostali nikakvi tragovi u stratigrafiji. No svakako je uputno upozoriti na takve situacije prilikom arheoloških iskopavanja koje kod nas, ali i šire, nisu jedini slučaj.[39]

Kao analogiju možemo spomenuti rezultate arheoloških iskopavanja provedenih 2001. – 2002. g. u okviru nekropole halštadskog doba lokaliteta Kaptol – Gradci.[40] Prilikom istraživanja intaktne grobne cjeline tumula 1 (prva polovina 7. st. pr. Kr.), uz pokojnika je kao grobni prilog pronađena keramička posudica ispunjena sjemenjem. Dakle, sjeme je pronađeno kao skupni nalaz unutar posudice, pri čemu se u prvi mah činilo da je najvjerojatnije riječ o

Quality was controlled with additional tests no. Beta – 489417 whose result (163.72 +/- 0.61 pMC) was statistically identical to the original one (162.7 +/- 0.61 pMC). Since repeated testings provided identical results, age of the sample was dated to the period after the 1950s, and on the basis of calibrations to the period of 1963, or most likely between 1966 and 1968 (Beta – 489417, 95.4 % 1966-1967 cal AD). Therefore we can conclude with increased certainty that this was a recent sample that accidentally ended up at the site.

7. (RE)INTERPRETATION OF THE GRAPEVINE FINDS FROM THE TUMULUS OF MALA GLAVICA – MATAKOV BRIG IN PODVRŠJE

On the basis of the results of the ^{14}C analysis and additional tests it is evident that the samples of grapevine seeds recovered in the excavations of the tumulus of Mala glavica are dated to the modern period. Such result could have been obtained due to contamination if the samples were exposed to artificial ^{14}C during their storage or in some of the analyses performed and contaminated with modern carbon in that way. This is unlikely considering the data on the time and manner of recovery of the archaeobotanical samples and their storage and analysis from 1986 to 2018.

Analyzed seeds date to the 1960s and they evidently ended up in the tumulus layer subsequently, which had not been noticed during the archaeological research. Even if the recent deposit of grapevine seeds did leave a trace in the stratigraphy, it went unnoticed during the excavation. Perhaps it is worth mentioning that the tumulus was devastated before the very beginning of the excavations and that samples were found in a group context (in relation to diffuse distribution of seeds) which would definitely suggest a possibility that the material was of zoogenic origin i.e. that it was brought by the animals to the site (possibly as a food supply). It is difficult to assume what kind of animals they might have been since there are no traces in stratigraphy. It is definitely advisable to pay attention to these situations in the archaeological excavations as they are not the only case in the country and abroad.[39]

As an analogy we can mention the results of the archaeological excavations conducted in 2001-2002 on a necropolis of the Hallstatt period at the site of Kaptol – Gradci.[40] A small ceramic vessel filled with seeds was found in the intact grave unit of tumulus 1 (first half of the 7th cent.) next to the deceased person as grave goods. Seeds were found as a group find inside a vessel, and at first it seemed that it probably belonged to grave goods.[41] Archaeobotanical analysis indicated

39 Na moguće zoogeno podrijetlo uzoraka upozorila nas je i kolegica dr. sc. Metka Culiberg s podatkom da je u posljednje vrijeme ustanovljeno više takvih slučajeva nalaza recentnog sjemena vinove loze na brončanodobnim i željeznodobnim nalazištima na području Prekomurja.

40 R. Šoštarić *et al.* 2007, 80.

39 Our colleague Metka Culiberg, PhD, suggested possible zoogenic origin of the samples since several cases of finding recent grapevine seeds have been recorded lately at the Bronze Age and Iron Age sites in the Prekomurje region.

40 R. Šoštarić *et al.* 2007, 80.

41 R. Šoštarić *et al.* 2007, 82–83.

grobnom prilogu.[41] Arheobotanička analiza pokazala je da je riječ o sjemenju raznih autohtonih biljnih vrsta, no čak i prije no što su uzorci sjemena stigli na ^{14}C analizu, nekoliko ih je proklijalo! AMS datacijom neproklijalih sjemenki utvrđeno je da uzorci nisu stariji od 50 godina, prema čemu se zaključuje da je riječ o recentnoj kontaminaciji. S obzirom na činjenicu da uzorci potječu iz zatvorenog grobnog kompleksa, kao uzrok kontaminacije odbačen je ljudski faktor te je gotovo sigurno riječ o nakupini životinjskog podrijetla.[42]

Prema tome, vidljivo je da bi u slučaju botaničkih nalaza u arheološkim strukturama i slojevima istraživač trebao biti iznimno oprezan prilikom donošenja zaključaka o starosti i kontekstu nalaza. Zadnju riječ kod interpretacije arheobotaničkih nalaza trebaju imati rezultati radiokarbonskih i drugih analiza.

Prema ranije navedenom možemo ustanoviti kako su uzorci vinove loze pronađeni istraživanjem tumula Mala glavica – Matakov brig u Podvršju modernog postanka. U skladu s takvom datacijom logičan je zaključak da uzorci ne potječu iz originalnog konteksta grobnog humka datiranog u rano brončano doba, pa njihov nalaz ne bi trebalo interpretirati u okviru pogrebnih rituala cetinske kulture. Stoga bi tvrdnje o polaganju i prosipanju sjemena u humak u okviru pogrebnog rituala ranog brončanog doba trebalo odbaciti.

8. ZAKLJUČNO O POČETCIMA UPOTREBE VINOVE LOZE NA ŠIREM NINSKOM PODRUČJU

Provedene analize arheobotaničkih uzoraka pokazale su neočekivan, no svakako vrijedan rezultat koji je nužno publicirati kako bi se izbjegle zabune, odnosno interpretacije koje su u stručnoj literaturi duže vrijeme zastupljene kao relevantne, a potječu iz doba kada (barem u okviru hrvatskih standarda) nije bilo mogućnosti za provedbu starosnih analiza. U današnje su vrijeme radiokarbonska i druge analize, kao i multidisciplinarni tim stručnjaka (među kojima su zastupljeni i biolozi botaničari), prilikom arheoloških iskopavanja postali standard bez kojeg ozbiljnija analiza nalazišta više gotovo i nije moguća. U kontekstu reinterpretacije nalaza ovdje se možemo osvrnuti na dokaze upotrebe vinove loze na širem ninskom području.

Moderna vegetacija ninskog područja nastala je kao rezultat prirodnog i antropogenog utjecaja na okoliš. Zastupljene vrste tala čine taj kraj izuzetno pogodnim za poljoprivrednu proizvodnju, pa je agrarna orijentacija jedan od glavnih čimbenika naseljenosti i gospodarskog razvoja.[43] Ravničarski teren ima vrlo dobre predispozicije

that these were seeds of different autochtonous plants but even before the samples of seeds reached the ^{14}C analysis, several of them sprouted! AMS dating of the remaining (ungerminated) seeds showed that the samples were not older than 50 years meaning that it was a recent contamination. Since the samples were found in a closed funerary complex, human factor was eliminated as a cause of contamination and it is almost certain that it was a result of zoogenic activity.[42]

Therefore, it is obvious that a researcher should be exceptionally cautious in case of botanical finds in archaeological structures and layers when making conclusions about the age and context of the find. Results of the radiocarbon and other analyses should be crucial in interpretation of archaeobotanical finds.

From all the aforementioned we can conclude that grapevine samples found in the excavations of the tumulus of Mala glavica – Matakov brig in Podvršje are of modern origin. In accordance with such dating logical conclusion is that the samples do not belong to the original context of the burial mound dated to the Early Bronze Age so their finding should not be interpreted within funerary rituals of the Cetina culture. Statements about placing and scattering seeds on the mound as a part of an Early Bronze Age funerary ritual should be abandoned.

8. CONCLUDING REMARKS ON THE BEGINNINGS OF THE USE OF GRAPEVINE IN THE WIDER NIN REGION

Analyses of the archaeobotanical samples gave an unexpected but valuable result that needs to be published so as to avoid confusions or interpretations that have been present in the professional literature for a while and regarded as relevant, originating from the period when age analyses were not possible (at least within the Croatian standards). Presently radiocarbon and other analyses as well as a multidisciplinary team of experts (including biologists-botanists) have become a necessary standard in the analysis of archaeological excavations. In the context of reinterpretation of finds we can pay attention to evidence on use of grapevine in the wider Nin region.

Modern vegetation of the Nin region has been formed as a result of natural and anthropogenous influence on the environment. Soil types in this area are exceptionally suitable for agriculture so that agrarian orientation is one of the main factors of settling and economic development.[43] Lowland terrain has good predispositions for winegrowing but this aspect of the economic past of the Nin region has been poorly explored and almost unknown in the professional literature.[44]

41 R. Šoštarić *et al.* 2007, 82–83.
42 R. Šoštarić *et al.* 2007, 84–87.
43 M. Kurtagić, B. Pušić 1956, 43–95; D. Magaš 1995, 34–35, M. Dubolnić Glavan 2015, 380–387.

42 R. Šoštarić *et al.* 2007, 84–87.
43 M. Kurtagić, B. Pušić 1956, 43–95; D. Magaš 1995, 34–35, M. Dubolnić Glavan 2015, 380–387.
44 M. Dubolnić Glavan 2015, 451–456.

za uzgoj vinove loze, no taj je aspekt gospodarske prošlosti ninskog područja loše istražen i u stručnoj je literaturi praktički nepoznat.[44]

Na prostoru Hrvatske paleovegetacijske studije općenito su rijetko rađene, stoga su tim značajniji rezultati istraživanja provedeni osamdesetih godina 20. st. na širem zadarskom području u okviru projekta „Neotermalna Dalmacija"[45] te recentnih istraživanja na lokalitetima Crno vrilo kod Poljica Briga[46] i uvala Dražnik u Zatonu kod Nina.[47]

Palinološka istraživanja i analize uzoraka peludi iz slojeva Bokanjačkog blata upućuju na početak antropogenog djelovanja na vegetacijski pokrivač u neolitiku, pogotovo tijekom eneolitika i brončanog doba, i to vezano za indikatore ispaše, tj. stočarsku privredu. Ljudsko djelovanje intenziviralo se tijekom rimskog i srednjovjekovnog perioda[48] što se iskazuje kultivacijom biljaka i rastom peludnih krivulja pojedinih vrsta (poput *Juglans*, *Castanea*, *Olea* i *Vitis*). Drži se da su vinova loza i maslina na ovom području autohtone vrste te su poznate i prije perioda rimske dominacije (peludne krivulje tih vrsta protežu se i u period prije Rima, ali smanjenog intenziteta).[49] Iako nije moguće sa sigurnošću odrediti kada su najranije kultivirane, one se općenito vežu za kulturne utjecaje pristigle posredstvom Rima.[50]

Veze istočne jadranske obale s ostalim Sredozemljem višestruko su potvrđene tijekom neolitika što pojedini autori, poput M. Zaninovića, tumače time da je naša zemlja bila dio drevne „vinske civilizacije" te uopće ne dovode u sumnju upotrebu i proizvodnju vina još od neolitičkog perioda.[51]

Žive trgovačke i kulturne veze između jadranskih obala te s proizvodnim centrima Grčke dobro su dokumentirane i tijekom čitava željeznog doba, najranije od 9./8. st. pr. Kr., o čemu svjedoče brojni primjerci uvoznog posuđa (daunijska, crvenofiguralna, crno premazana, Gnathia, reljefna keramika i dr.) među kojima je u znatnoj količini i ono koje se koristilo za posluživanje i konzumaciju vina.[52]

Teško je povjerovati da Liburni, kao vješti pomorci i u neko doba praktički gospodari Jadrana, nisu od Grka preuzeli i kultivirali biljku čijim su proizvodima tako često trgovali. Stoga je vrlo vjerojatno da je najraniji utjecaj poljoprivrede tijekom željeznog doba stigao s područja Grčke ili italskog poluotoka posredstvom trgovine, posebno stoga što spomenute biljke (voće, sjeme) nije teško transportirati i uzgojiti.[53]

Paleovegetational studies have been rarely carried out in Croatia which is why the results of the research performed in the 1980s in the wider Zadar region within the project Neothermal Dalmatia[45] are even more valuable as well as recent research at the sites Crno vrilo near Poljica Brig[46] and Dražnik cove in Zaton near Nin.[47]

Palynological research and analyses of the samples of pollen from the layers of Bokanjačko blato suggest the beginning of the anthropogenous activity on the vegetation cover in the Neolithic, and in particular during the Eneolithic and the Bronze Age, associated with the pasture indicators i.e. livestock raising. Human activity was intensified during the Roman and medieval period[48] which is expressed in cultivation of plants and growth of pollen curves of certain species (such as *Juglans*, *Castanea*, *Olea* and *Vitis*). It is believed that grapevine and olive were autochtonous plants in this region and that they had been known prior to the period of Roman domination (pollen curves of these species spread to pre-Roman period but with reduced intensity).[49] Although it is impossible to determine with certainty when they were earliest cultivated, they are usually associated with the cultural influences mediated by Rome.[50]

Relations of the eastern Adriatic coast with the rest of the Adriatic have been evidenced repeatedly in the Neolithic which is interpreted by certain authors such as M. Zaninović as our country being a part of the ancient "wine civilization" and they do not question use and production of wine back from the Neolithic period.[51]

Lively trade and cultural relations between the Adriatic coasts and with the production centers in Greece are well documented during the entire Iron Age, from the 9th/8th cent. BC at the earliest which is reflected in a number of examples of imported ware (Daunian, red figural, black slip, Gnathia, relief pottery etc.) including the types used for serving and consuming wine.[52]

It is hard to believe that the Liburnians as skillful seamen and once practically masters of the Adriatic would not accept from the Greeks and cultivate a plant with whose products they often traded. Therefore it is very likely that the earliest influence of agriculture in the Iron Age came from the Greek region or Italian peninsula through mediation of trade, in particular because mentioned plants (fruits, seeds) are not difficult to transport.[53]

44 M. Dubolnić Glavan 2015, 451–456.
45 J. Chapman *et al.,* 1996, 33–35.
46 R. Šoštarić 2009, 49–51.
47 R. Šoštarić 2005, 385–387; S. Gluščević *et al.* 2006, 147–161.
48 E. Grüger 1996, 33–35.
49 E. Grüger 1996, 33–35.
50 E. Grüger 1996, 35; S. Nye 1996, 240–242; R. Šoštarić 2005, 385–387; S. Gluščević *et al.* 2006.
51 M. Zaninović 2007, 27–30.
52 Š. Batović 1987, 374–375, 386–387; L. Šešelj, F. Silvestrelli 2013, 282–392; M. Čelhar, I. Borzić 2016, 72–83, 88.
53 R. Šoštarić 2005, 386.

45 J. Chapman *et al.,* 1996, 33–35.
46 R. Šoštarić 2009, 49–51.
47 R. Šoštarić 2005, 385–387; S. Gluščević *et al.* 2006, 147–161.
48 E. Grüger 1996, 33–35.
49 E. Grüger 1996, 33–35.
50 E. Grüger 1996, 35; S. Nye 1996, 240–242; R. Šoštarić 2005, 385–387; S. Gluščević *et al.* 2006.
51 M. Zaninović 2007, 27–30.
52 Š. Batović 1987, 374–375, 386–387; L. Šešelj, F. Silvestrelli 2013, 282–392; M. Čelhar, I. Borzić 2016, 72–83, 88.
53 R. Šoštarić 2005, 386.

Na takav bi zaključak, barem što se tiče šireg ninskog područja, upućivala i brojnost autohtonih božanstava plodnosti i vegetacije zabilježenih u sinkretizirajućoj formi kultnih zajednica s rimskim božanstvima (*Anzotica* i *Priapus*, *Iovi Sabasio Iico*, *Silvanus*). Takva religijska slika tijekom prvih stoljeća rimske dominacije tumači se jakim autohtonim tradicijama i prežitcima željeznodobnih vjerovanja iz vremena liburnske samostalnosti.[54] Brojnost nalaza povezanih s kultom Dioniza/Bakha, starog grčkog božanstva plodnosti, vegetacije, vina i vinogradarstva, također ukazuje na značaj te poljoprivredne kulture i religijska strujanja na prostoru municipija *Aenona*.[55]

Dakle, iako postoje snažne indicije da je vinova loza na ovom prostoru kultivirana tijekom željeznog doba, a možda i ranije, nedostaje konkretnih nalaza koji bi potvrdili takvu dataciju. Velika je šteta što nisu analizirani uzorci pougljenjenog sjemena pronađeni 1983. g. prilikom zaštitnih iskopavanja u tri devastirana zemljana grobna humka na polju Rašnovac, na položaju Troglavce kod Grba nedaleko od Nina.[56] Prema tipologiji pronađenih keramičkih predmeta istraživani humci datiraju se u kasno(?) brončano doba, dok se nalaz veće količine karboniziranog sjemena (nedefinirane biljne vrste) tumači kao obredno posipanje sjemenja pri gradnji humka.[57] Činjenica da je pronađeno sjeme karbonizirano te disperzirano po nižim slojevima humaka svakako je zanimljiva, no prilike za analize pružit će možda neka buduća revizijska istraživanja.[58]

Osim rezultata analiza polena iz slojeva Bokanjačkog blata, na rimski period kao vrijeme intenzivnog uzgoja vinove loze na ovom prostoru upućuje prvenstveno brojnost botaničkih nalaza iz arheoloških slojeva antičke luke u uvali Dražnik u Zatonu kod Nina. Provedenim analizama ustanovljen je izuzetno velik broj makrofosila raznih mediteranskih biljaka među kojima su i brojni uzorci kultivirane vinove loze (sjeme, grančice, suhe bobice).[59] Nalazi iz antičke luke upućuju na zaključak da je vinova loza ne samo uzgajana na ovom području već se njome i trgovalo.[60]

Dakle, za sada možemo zaključiti da je na ninskom području vinova loza najranije kultivirana u rimskom periodu, sve dok se ne pojavi neki novi sretan nalaz kao konkretan dokaz za tvrdnju da je na ovom području ona kultivirana i ranije.

The same conclusion, at least for the wider Nin region, is suggested by the multitude of autochtonous deities of fertility and vegetation recorded in the syncretized form of cult unions with Roman deities (*Anzotica* and *Priapus*, *Iovi Sabasio Iico*, *Silvanus*). Such religious image in the first centuries of the Roman domination is interpreted by strong autochtonous traditions and survivals of the Iron Age beliefs from the period of Liburnian independence.[54] The number of finds associated with the cult of Dionysus/Bacchus, ancient Greek deity of fertility, vegetation, wine and winemaking also indicates the importance of this field crop and religious beliefs in the area of the municipium *Aenona*.[55]

Although there are strong indications that grapevine was cultivated in the Iron Age, and perhaps even earlier, there is no specific evidence that might confirm such dating. It is a pity that analyses were not performed on samples of carbonized seeds found in 1983 in the rescue excavations in three devastated earth burial mounds in the field Rašnovac, on the position of Troglavce near Grbe in the vicinity of Nin.[56] On the basis of typology of recovered ceramic objects the excavated mounds are dated to the Late (?) Bronze Age while the finding of a large amount of carbonized seeds (of an undefined plant species) is interpreted as ritual spreading of seeds when the mound was made.[57] The fact that the recovered seeds were carbonized and dispersed in lower layers of the mound is definitely interesting, but only future revised research might offer an opportunity for analyses.[58]

Except for the results of the pollen analysis from the layers of Bokanjačko blato, Roman period as the time of intensive winegrowing in this region is indicated by multitude of botanic finds from archaeological layers of an ancient harbour in Dražnik cove in Zaton near Nin. An exceptionally big number of macrofossils of various Mediterranean plants, including a number of samples of cultivated grapevine (seeds, branches, dry berries) were recognized in the analyses.[59] Finds from the ancient harbour point to the conclusion that grapevine was not only grown in this region but also traded with.[60]

For now we can conclude that the earliest cultivation of grapevine in the Nin region happened in the Roman period, until some new fortunate find comes along as a specific evidence which might confirm that it was cultivated even earlier in this region.

54 M. Suić 1969, 73–78; M. Dubolnić Glavan 2015, 288–314, 454–455.
55 M. Dubolnić Glavan 2015, 314–322.
56 Š. Batović 1984, 15–15; 1986, 23–24.
57 Š. Batović 1986, 24; Š. Batović, S. Kukoč 1988, 42; S. Kukoč 2009, 55.
58 U Arheološkom muzeju Zadar nalaze se tri kutije s nalazima pronađenim zaštitnim iskopavanjima humaka među kojima i vrećice s uzorcima zemlje iz humaka. Fotodokumentacija s istraživanja pohranjena je u Dokumentacijskom odjelu Arheološkog muzeja Zadar. Nije poznato gdje se nalazi terenska dokumentacija s istraživanja. Na podatcima zahvaljujemo djelatnicima Arheološkog muzeja Zadar, višoj kustosici Nataliji Čondić te dokumentaristima Robertu Maršiću i Ivanu Čondiću.
59 S. Gluščević *et al.* 2006, 155–157.
60 R. Šoštarić 2005, 386.

54 M. Suić 1969, 73–78; M. Dubolnić Glavan 2015, 288–314, 454–455.
55 M. Dubolnić Glavan 2015, 314–322.
56 Š. Batović 1984, 15–15; 1986, 23–24.
57 Š. Batović 1986, 24; Š. Batović, S. Kukoč 1988, 42; S. Kukoč 2009, 55.
58 In the Archaeological Museum Zadar there are three boxes with finds discovered in rescue excavations of the mounds including bags with samples of soil from the mounds. Photo-documentation from the excavations is kept in the Documentation Department of the Archaeological Museum in Zadar while whereabouts of the excavation documentation are unknown. We would like to thank the staff of the Archaeological Museum in Zadar - Natalija Čondić, senior curator, and Robert Maršić and Ivan Čondić, documentarists for the information provided.
59 S. Gluščević *et al.* 2006, 155–157.
60 R. Šoštarić 2005, 386.

318

Pop. 14

797

Šime Batović

P o d v r š j e - Matakov brig

sjemenke

Lab. 21. 797

U uzorku izdvojili smo ca 200 sjemenki , sve istog tipa,ali vrlo različite po obliku i veličini. Nisu pougljenisane i unatoč tog odlično su očuvane. To je zbog toga, što je sjemenska ljuska odrvenela i nije se deformirala, već su sjemenke zadržale originalni oblik.

To so kruškasto o rnuto jajčastog oblika, sa produženom suženom bazom u nekaki peteljak različite dužine. Ledja strana je ispupčena i sa dvije duboke brazde, a trbušna strana nosi ovalnu ili okruglu halazu. Peteljka i halaza odlučujuče su karakteristike za distinkciju različitih vrsta (N.J Kac, S.V.Kac, M.G.Kipiani; Bertsch). Prema literaturi tu bi trebalo biti i kultiviranihhi divljih vrsta, što je malo vjerovatno.

Tako ostaje obična vinova loza (Vitis vinifera) kao jedini takson, mada bi mogla biti i V. vinifera ssp silvestris, divlja loza, koja raste uz rijeke i šumske pristranke.

Analize:
dr. Alojz Šercelj

2. 7. 1988

Prilog 1. Rezultati arheobotaničke analize sjemena vinove loze iz tumula Mala glavica provedene 1988. g. prema dr. sc. A. Šercelju (SAZU)

Appendix 1. Results of the archaeobotanical analysis of the grapevine seeds from the tumulus of Mala glavica conducted in 1988 after A. Šercelj, PhD (SAZU)

Beta Analytic
RADIOCARBON DATING

Beta Analytic Inc
4985 SW 74 Court
Miami, Florida 33155
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beta@radiocarbon.com

Mr. Darden Hood
President

Mr. Ronald Hatfield
Mr. Christopher Patrick
Deputy Directors

ISO/IEC 2005:17025-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

Martina Dubolnic Glavan — Report Date: February 19, 2018

Archaeologist Historian — Material Received: February 05, 2018

Laboratory Number	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes Calendar Calibrated Results: 95.4 % Probability High Probability Density Range Method (HPD)	
Beta - 487002	**MATAKOV-BRIG86**	**162.70 +/- 0.61 pMC**	IRMS δ13C: -23.4 o/oo

(83.2%) 1967 - 1968 cal AD (-18 - -19 cal BP)
(12.2%) 1963 cal AD (-14 cal BP)

Submitter Material: Seeds
Pretreatment: (plant material) acid/alkali/acid
Analyzed Material: Plant material
Analysis Service: AMS-Standard delivery
Conventional Radiocarbon Age: -3910 +/- 30 BP
Fraction Modern Carbon: 1.6270 +/- 0.0061
D14C: 627.01 +/- 6.08 o/oo
Δ14C: 613.88 +/- 6.08 o/oo(1950:2017)
Raw pMC: (without d13C correction): 163.24 +/- 0.61 pMC
Calibration: BetaCal3.21: HPD method: INTCAL13 + NHZ1

Prilog 2. Rezultati radiokarbonske analize sjemena vinove loze iz tumula Mala glavica provedene 2018. g. u laboratoriju Beta Analytic Inc. (Beta Analytic Limited, London BioScience Innovation Centre)
Appendix 2. Results of the radiocarbon analysis of the grapevine seeds from the tumulus of Mala glavica conducted in 2018 in the laboratory Beta Analytic Inc. (Beta Analytic Limited, London BioScience Innovation Centre)

BetaCal 3.9

Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL13 + NHZ1)

(Variables: d13C = -23.4 o/oo)

Laboratory number **Beta-487002**

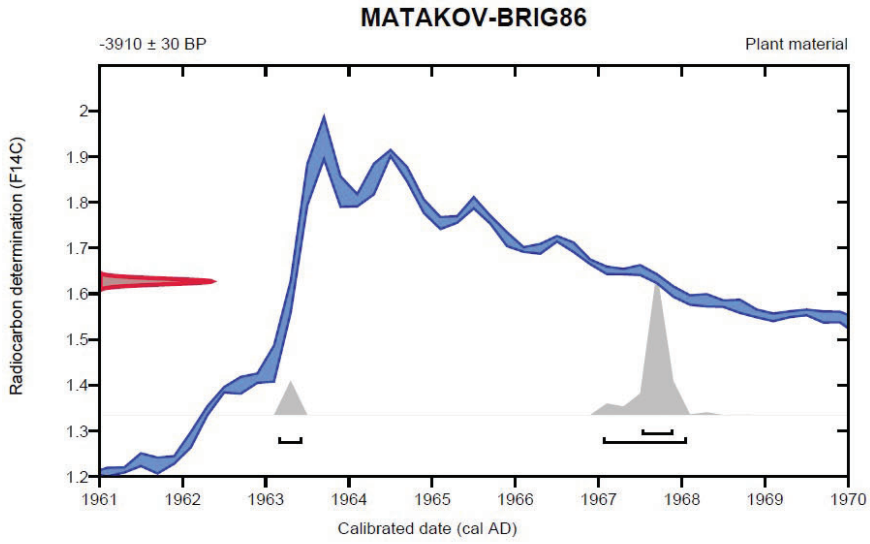
Percent modern carbon **162.70 +/- 0.61 pMC**

95.4% probability

(83.2%)	1967 - 1968 cal AD	(-18 - -19 cal BP)
(12.2%)	1963 cal AD	(-14 cal BP)

68.2% probability

(68.2%)	1967 cal AD	(-18 cal BP)



Database used

INTCAL13 + NHZ1

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References to Database INTCAL13 + NHZ1

Hua, et.al.,2013, Radiocarbon, 55(4). Reimer, et.al., 2013, Radiocarbon55(4).

Beta Analytic Radiocarbon Dating Laboratory

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Prilog 3. Kalibracija rezultata radiokarbonske analize arheobotaničkih uzoraka iz tumula Mala glavica provedene 2018. g. u laboratoriju Beta Analytic Inc. (Beta Analytic Limited, London BioScience Innovation Centre)

Appendix 3. Calibration of radiocarbon analysis of archaeobotanical samples from the tumulus of Mala glavica conducted in 2018 in the laboratory Beta Analytic Inc. (Beta Analytic Limited, London BioScience Innovation Centre)

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