

“Granaries” of Early Iron Age Kalakača, northern Serbia and the issue of archaeobotanical taphonomy

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ABSTRACT

Archaeological excavations of the Early Iron Age site of Kalakača in northern Serbia revealed the presence of numerous pit-features and traces of several possible above-ground structures. A number of pits were interpreted as storage features. Moreover, the charred plant remains in some of them were taken as an evidence of the function of the pits as crop stores/granaries. Archaeobotanical analysis confirmed the presence of a range of crops in the pits; however, the circumstances in which the charred crop remains were found strongly suggest that there is no direct connection between the plant material and the pit-features. No traces of *in situ* burning were detected in the excavated pits, demonstrating that the charring of plants happened outside. The use of charred plant remains as evidence for the storage of crops in the Kalakača pits can thus be dismissed. The plant material was perhaps charred within the surface structures. The analysis of the type of plant parts re-deposited in the pits reveals the presence of crop products – chiefly millet grain (most likely semi-cleaned) and some barley grain; and crop processing by-products – wheat and barley chaff. Millet grain may have originated from millet stores; cereal chaff may have arrived in the pits as daub temper or as crop processing residue discarded in fire.

KEYWORDS

Early Iron Age, Vojvodina, Kalakača, pit-features, storage, charred plant remains, taphonomy, millet

Introduction

The archaeological site of Kalakača in the southern Pannonian plain comprises a number of semi- and fully-subterranean structures dug into high loess terraces on the right bank of the Danube. Based on the pottery typology, it was dated to the early phase of the Iron Age in south-eastern Europe (approximately 1000-800 BC – Medović 1988, fig. 324, 427–428). Over 200 pit-features have so far been excavated. A large amount of pottery and animal bone, some stone and bone implements and few metal objects were recovered from the pits during several seasons of development-led archaeological excavations conducted in different sections of the site. Further, great quantities of fragments of burnt wattle-and-daub walls were recovered from the pit fills, testifying to the existence of above-ground structures; however, remains of only five possible wattle-and-daub houses or huts have been securely identified. Drawing upon the architectural and artefactual evidence, there are various opinions on the potential purpose(s) of the pits, including interpretations as houses, ‘basements’, storage pits, clay-borrow pits, rubbish pits, workshops (Medović 1988; Jevtić 2006; 2011). Traces of a defensive ditch, and possibly also earthen wall supporting the bank of the ditch, were identified in the eastern section of the site; to the north, the site is delimited by the Danube and to the west by a deep natural gully. It was suggested that the location of the site on an elevated terrain rising some 60 m above the



Fig. 1. Location of different excavation areas at Kalakača and two nearby villages (map base: GoogleEarth Image © 2015 CNES/Astrium; after Jevtić 2011, fig. 32a)

Обр. 1. Разположение на разкопаните площи в Калакача и две съседни села (основа на картата: GoogleEarth Image © 2015 CNES/Astrium; по Jevtić 2011, fig. 32a)

surrounding flat area and the Danube would have given it a prominent position and a defensive advantage (Medović 1988; Jevtić 2006; 2011).

It is the dominant and protected position in the landscape coupled with the nature of the preserved features – specifically, the very few detected surface structures as opposed to the large number of pits potentially used for food storage – that have led recent researchers of Kalakača to re-consider the nature of the site's use (Jevtić 2006; 2011). Some hypotheses were put forward, such as that Kalakača may have served as a seasonal “farmers’ collection centre” where harvested crops were stored and from there redistributed (to, presumably, nearby contemporary settlements). This was seen as a plausible explanation for the presence of a large number of (storage) pits and the abundance of very large ceramic (storage) vessels discovered within the pits; support for the idea was also found in the location of the site on a dry, well-drained, high Danube terrace (Jevtić 2011, 37; M. Jevtić, pers. comm. 2011). Another suggestion was that the site may have been used by a group of (transhumant) pastoralists who, over some time, kept their animal products in the pits that must have offered good storage conditions as they would have been dry and the temperature inside would have been fairly constant (M. Jevtić, pers. comm. 2011).

As was emphasised in the available reports on Kalakača, top cultural layers of the site, which could have included above-ground architectural elements and other remains, have almost entirely been lost due to modern road works and intensive agricultural activity in the

area, as well as soil erosion and landslides. Thus the apparent absence of surface structures could simply be a result of the lack of their preservation in the investigated area (Medović 1988, 9, 18). It should be noted that a large section of the site has not been excavated; this has inspired another hypothesis that proposed a functional differentiation within the settlement at Kalakača: the exposed area may have represented a "food storage zone" whereas the "residential area" may lie in the unexcavated section of the site (Jevtić 2006, 9; 2011, 30).

The already completed archaeobotanical work for Kalakača included the recovery of plant remains and their identification and quantification (Medović 1988, 348-349; Filipović 2011), and investigations into the quantitative representation of different crop and wild taxa as well as a comparison of the crop assemblage from Kalakača with the crop record from other Early Iron Age sites in Serbia (Filipović in press). The main goal of the present paper is to contribute to the discussion on the possible uses of Kalakača pits by exploring the origin of the charred plant remains and the circumstances of their deposition. This is attempted through a combined study of, on one hand, the archaeological context of the charred plant material and, on the other, of its taphonomy. The results challenge conclusions offered so far for the purpose of the pits and emphasise the need to, prior to any interpretations, understand the processes/activities that produced and shaped the archaeobotanical assemblage and that led to its incorporation in the archaeological features.

The archaeology of Kalakača

Kalakača is a single-layered site located on a large slope descending from the eastern side of the Fruška Gora Mountain onto the right bank of the Danube, in an area between the modern villages of Beška and Krčedin in Vojvodina, northern Serbia (fig. 1). It has a prominent position as it overlooks the confluence of the Tisa and the Begej rivers to the east and parts of the southern Pannonian plain to the north, east and south. The bank of the Danube is here dissected by gullies and ravines which separate numerous small loess terraces that rise to varying altitudes. Archaeological excavations established that the site of Kalakača extends over three adjacent loess terraces slanting gradually towards the Danube; the highest of these flat areas lies at around 140 m altitude. In three separate series of rescue archaeological investigations, targeting different parts of the site, the evidence of prehistoric occupation/use was discovered over an area of more than 7000 m² which is about 60 % of the estimated total area of the site (Medović 1988, 18; Jevtić 2006, 8).

In preparation for a major regional highway construction, the first excavations (directed by Predrag Medović) took place between 1971 and 1974, were large-scale and encompassed an area of c. 4800 m² of the site on one of the higher-elevation loess plateaus. Several decades later, in seasons 2003-04, new development-led excavations at Kalakača (directed by Miloš Jevtić) were conducted in the area of about 2100 m², to some extent overlapping with the previously investigated part of the site. In parallel, the work was carried out in another section of the site which is labelled Kalakača-Gasovod (in 2004) and, some time later (in 2007), at the location designated as Beška (Kalakača) – Most (fig. 1). In these cases also, the location, scale and pace of excavations (directed by Miroslav Lazić and Dragan Anđelić) were dictated by the regional infrastructure development projects that funded the work (Jevtić 2011, 31).

As noted, using the characteristics of pottery and some of the metal objects, the site was relatively dated to the beginning or the 'early phase' of the Early Iron Age (1100/1000-800 BC) in this region and attributed to the Bosut group in the regional culture-historical sequence. Additionally, in the Kalakača-Gasovod area, concentrations or scattered finds of potsherds were



Fig. 2. Map showing some of the 'Kalakača-type settlements' in northern Serbia

Обр. 2. Карта на неколку селишта тип 'Калакача' в северна Сърбия

discovered showing elements associated with the Late Copper Age traditions (Kostolac and Vučedol cultures); sporadic finds of Kostolac culture-type pottery were also noted in the 1970's and were considered colluvial debris. At the Beška-Most location, fragments of Neolithic, Copper Age and medieval pottery were encountered, as well as a group of vessels characteristic of the Early Bronze Age of the region (Medović 1988, 15, 428; Jevtić 2011, 31, 36).

The features and archaeological finds registered at Kalakača are characteristic of a number of other settlements in the region that are (partially) coeval with Kalakača. These were thus labelled 'Kalakača-type settlements' and, among others, include the sites Gradina-on-Bosut, Feudvar and Asfaltna Baza-Zemun (Medović 1988, fig. 1; 1994, 46-48; Vranić 1994; Petrović 2010). Some of these sites also occupied high ground and were protected by ditches and perhaps embankments, whilst others were located in open space in the lowlands (fig. 2). They seem to have formed a network of hill-forts and (dependent) settlements distributed along big rivers (the Danube, the Sava and the Tisa) and their tributaries (e.g. the Bosut river).

It appears that the uppermost layers of the cultural deposit at Kalakača were almost completely swept away by erosion and modern-day use of the area for agricultural purposes (Medović 1988, 9, 14, 18). In places where the top levels were more-or-less preserved, remains of surface structures/houses were detected (five in total) as well as upper portions ('mouths') of the pits. Potential evidence of above-ground structures includes concentrations of burnt wattle-and-daub material, traces of a hard-packed earthen floor (seemingly rectangular in shape), and some oven and hearth remains. One of the potential houses (Structure 142) was surrounded by several pits; together they may have represented an economic unit composed of a residential structure and sub-surface space used for storage

and other purposes (Medović 1988, 19, 31-33, 310, fig. 20, 281).

In total, 240 subterranean structures were recorded in all excavation areas and seasons. They are located few metres apart and are of different sizes and depths: circular or sub-circular in ground-plan; oval, rectangular, triangular or irregularly-shaped in the vertical cross-section. The excavators recognised four to five main types of these features according to the similarities in their shape and size and, in some instances, composition of their infill. The proposed groups of structures are briefly described below using combined observations from the previous and most recently published archaeological accounts (Medović 1988; Jevtić 2006; 2011).

(1) Most numerous are the large, conical pits, some with very narrow top and small mouth compared to the spacious lower part (bell-shaped or pear-shaped). This form is seen as probably facilitating protection of the pit contents from bad weather and other unwanted influences (and the small opening would have been easier to cover/conceal). These dugouts are probably the largest at the site; they are up to 2 m deep and their base is about 1.8-2.8 m in diameter. Few of the pits in this group are jar-shaped. The walls of the structures are well-polished. Three different types of pit base were noted: flat; moderately convex in the central part (where the 'hump' is 20-50 cm high); flat with a hole in the centre possibly remaining from a stake or a post supporting the roof and/or representing a climbing pole. There were few examples of 8-shaped pit where two round pits (one bigger than the other) were connected via a narrow opening (*e.g.* Structures 4, 21/22 and 67 – Medović 1988, 44, 77-81, 175-178).

The fill of these pits included small or large amounts of potsherds, considerable quantity of animal bone, ash, stone, and daub fragments in few cases. The finds were usually encountered in the lower part of the fill, right above the pit base. Pottery fragments generally belong to very large vessels (pithoi and amphorae, up to 70 cm in height) and they were concentrated mostly in the centre of the pits or were, in some cases, lined along the edge of the base, near the pit walls. Pits in this group were interpreted as representing crop stores in the form of underground silos/granaries where grain and perhaps also other food were deposited in large vessels (pithoi, amphorae and similar ceramic containers).

(2) Initially included in group 1 (Medović 1988, 342) and later differentiated as a separate type is a limited number of cylinder-shaped, relatively deep (0.8-1.2 m) pits of about 1.5 m in diameter. They contained large quantities of fragmented pottery, while a few of them were filled with a mass of house rubble in the form of daub fragments, some bearing impressions of the wattle (made of thin branches and stakes) or traces of thick clay slip that is sometimes painted white or decorated with grooves. They were understood as waste-disposal pits (Jevtić 2011, fig. 39).

(3) Around 30 small, shallow, cylinder- or funnel-shaped pits, up to 45 cm in depth and 1-2 m in diameter were found. Some of them were devoid of archaeological material and it was proposed that they may have been used as mixing pits for preparation of house daub. Large amounts of potsherds (mostly of large vessels) were found in others and sometimes also animal bone and fragments of burnt daub; these may have been rubbish pits (Jevtić 2006, fig. 7; 2011, fig. 57).

(4) A small number (*c.* 10) of round, oval or irregularly shaped, relatively large (2-4 m in diameter), shallow pits were registered mostly near the perimeter of the excavated part of the settlement. Their walls and bases are rough, *i.e.* not hardened and/or smoothed as in most of the other features. They were interpreted as possible soil borrow-pits or workshops. There are traces of *in situ* burning in some of them in the form of scorched/singed

Structure number	8	55	72	112	121	131
Brief description	cylinder-shaped pit, 30 cm deep and 2.3 m in diameter	semi-subterranean feature, roughly circular, c. 1 m deep, 3.7 m in diameter	round semi-subterranean feature, 50 cm deep, 2.3 m in diameter	conical, 75 cm deep, 2.1 to 2.5 m in diameter	oval, 50 cm deep, 3.3 m in diameter, built over earlier pit	conical, 70 cm deep, 1.7 to 2.4 m in diameter; lots of burnt daub
Structure group	(3 or 5)	(4)	(3 or 5)	1	(4)	(1)
CROPS						
<i>Triticum monococcum</i> – einkorn	27	22	40	10	350	
<i>Triticum aestivum</i> – bread/(free-threshing) wheat					2	
<i>Hordeum vulgare</i> – barley	245	20	12	497	30	
<i>Panicum miliaceum</i> – common millet	2	18	27		295	„a lot“
<i>Lens culinaris</i> – lentil			4		4	
WILD/WEED FLORA						
<i>Agrostemma githago</i>					4	
<i>Bromus mollis/secalinus</i>					20	
<i>Chenopodium album</i>		16	11		3	
<i>Polygonum aviculare</i>		1			1	

Table 1. Results of the archaeobotanical analysis of Kalakača pits conducted by van Zeist (Medović 1988, 348-349)

Табл. 1. Резултати от археоботаничния анализ на материал от ями в Калакача, направен от van Zeist (Medović 1988, 348-349)

parts of wall and floor and, in one case, remains of a hearth. The fill of these pits contained diverse materials including fragments of pottery, ash, bone, burnt daub, some bone and stone tools.

(5) In addition to the variety of semi- or fully recessed dugouts, several relatively shallow round or oval features were discovered that could represent bases of structures constructed above ground and used as shelters for humans and/or animals. These so-called “huts” are of circular shape, between 3.3 m and 4.3 m in diameter and ‘sunken’ in loess to the depth of between 15 cm and 50 cm. Almost all of them have a c. 50 cm wide hole in the centre likely remaining from the timber used as central roof supporter. The floor and the walls of the pits were hard packed, made of stuffed clay and finely smoothed. Small and large pieces of pottery vessels and burnt daub, animal bone and ash lenses were present in some of the pits, as well as occasional finds of stone objects such as fragmented grinding stones, clay loom-weights and worked bone. In one case a small clay oven was discovered adjacent to a hut base (Structures 155, 157 – Medović 1988, 339-340).

Whereas the intended purpose of the pits most probably varied between (and within) these groups, the infill of different features and feature-types is very similar in its composition. It is, in most cases, very heterogeneous; the excavators agree that it represents household rubbish deposited in pits perhaps after they went out of the initial use. Among the recovered material, pottery represents the most ubiquitous find across all investigated areas of the site; complete vessels or fragments were found in almost every pit. The assem-

blage is dominated by large pots, pithoi and bowls followed by beakers, amphorae and cups (Medović 1988, 382, table 2). Few other objects made of clay include loom-weights, spindle-whorls and several figurines depicting animals. Worked stone implements have also been identified and they include grinding slabs and grinders (hand stones), sharpening stones, axes, stone moulds for casting metal, and some stone ornaments. The very limited bone tool assemblage includes awls, possible hafts for tools/weapons and elements of horse tack (bit shanks). A small number of metal finds were discovered, mostly made of bronze; for instance – bronze earrings and needles, a bracelet, an ornamental clasp (fibula), a ring, a hook and an amulet (Medović 1988, 416; Jevtić 2006, 14).

Probably the second most frequent find at Kalakača are animal bones. Over 2500 bones were identified to species; remains of domestic animals largely prevail. Cattle is the best represented taxon (42%), whilst the remains of pig, horse and sheep/goat are much less abundant (24%, 18% and 11% respectively); dog bones occur in a small proportion (5%). Most of the remains of wild fauna belong to red deer, after which come remains of wild boar and aurochs. Few bones of hare and roe deer were also found. All remains were collected by hand; although sieving was not employed, some fish bones were recovered and fish scales were noted in several of the features. Molluscs (in the form of freshwater shells and snails) were observed in the soil but not collected (Medović 1988, 350-380).

In addition to the pit-features, a shallow ditch (canal) located in the southern section of the site was also registered. The canal is 80 cm deep, 13.5 m long and not more than 1.5 m wide. It is aligned north-south and seems to have been connected to a cylindrical pit at its southern end. Its function is unknown. Two juvenile skeletal burials were encountered in the fill of the canal, which was otherwise filled with small quantity of pottery sherds, some animal bone and stones. Other than these burials, fragments of human bone were only seldom found in the pit fills (Medović 1988, 215).

Besides their highly diverse physical form and configuration, another peculiar aspect of the Kalakača pits is that most of them contained large amounts of (burnt) daub made of dirt tempered with vegetal material (*e.g.* cereal chaff). Over 1000 kg of large daub fragments, excluding the mass finds of this material in some of the pits, were retrieved bearing imprints of posts, beams, thin branches and reeds (Medović 1988, 31-32, 300). They indicate the presence of structures for the construction of which wattle-and-daub material was used, possibly for walls of above-ground huts (presumably erected above shallow pits – see group 5 above) and/or houses. No evidence, however, of possible holes remaining from upright timbers holding the wattle has been detected along the edge of the pits or anywhere in the excavated area, but this may again be a result of the destruction of the surface layers through erosion, etc. Another suggested possibility is that, for the wall construction, beams were placed horizontally (Medović 1988, 33, 347). Many of the daub fragments are polished and some show traces of plastering with whitish-beige clay; the clay slip is sometimes decorated with grooves or mouldings in the shape of spiral ribbons. These may represent wall remains. There were also daub pieces probably coming from fire installations (hearths) and possibly fragments of earthen tables (Jevtić 2006, 8-9).

Archaeological context of the plant remains and the implications for archaeobotanical taphonomy

In almost all of the excavated pits, as well as the small north-south canal and the defensive ditch, ash and/or charred material were regularly present, often mixed with other

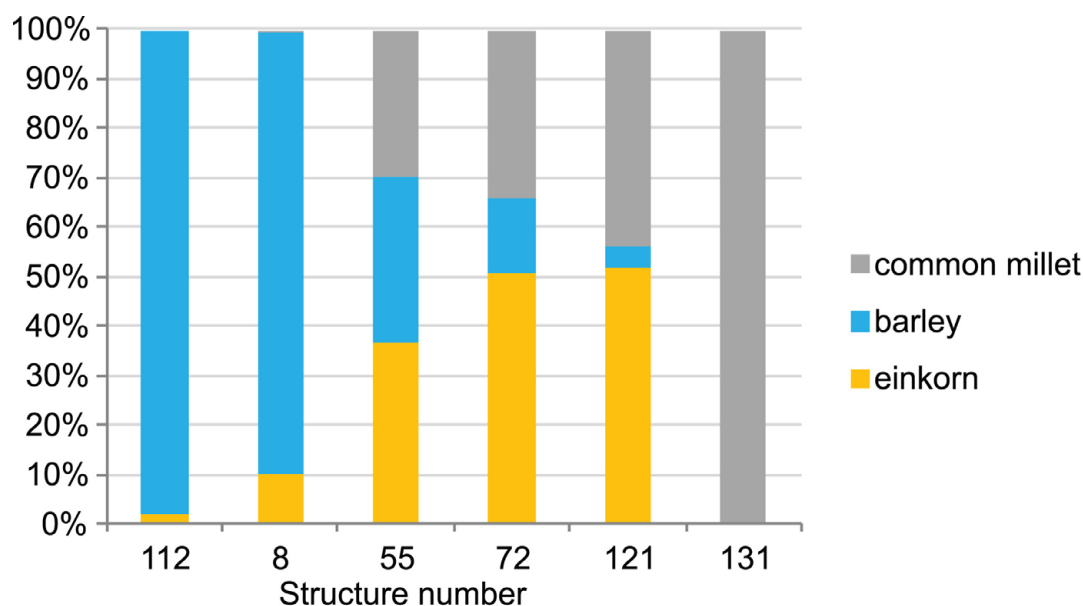


Fig. 3. Relative proportions of the main crop types in the dataset analysed by van Zeist
 Обр. 3. Относително разпространение на основните типове културни растения, анализирани от van Zeist

frequent components of the fill (pottery, animal bone, fragments of daub, loose soil, etc.). In some cases, concentrations of ash/charred remains were detected, visible as lenses within the fill or as distinct layers across the pit (usually at the base), up to 5 cm thick (e.g. Structure 25 – Medović 1988, 85). In one of the features, charred wood fragments were found accumulated in a small pile at the base (Structure 13 – Medović 1988, 65). From six features excavated in 1971-74 charred material was hand collected; Willem van Zeist conducted the analysis and identified the remains of several domesticated crops and few potential arable weeds (Medović 1988, 348-349; see table 1). Archaeobotanical sampling and flotation were employed in the excavations 2003-04, and plant material from the total of 11 analysed features also showed presence of a range of crop and wild taxa (Filipović 2011, in press). The discovery of crop remains in the pit fills re-enforced earlier impression about the storage purpose of the features, in particular the large, conical/bell-shaped pits (Group 1) already earmarked as silos/granaries based on their shape, size and careful construction as well as the finds of large vessels inside.

In order to become charred, plant parts need to be exposed to high temperatures (of 250°C or more – Pearsall 2015, 41-42). At Kalakača, this could have happened within the structures, in which case charred remains could potentially indicate storage of plants. However, in the available descriptions of the excavated features, a possibility of within-pit burning was inferred only in several cases, where traces of fire were recognised on walls and/or floors (e.g. in Structures 14 and 62 – Medović 1988, 66, 169) though these marks may have also derived from dumping of cinders and hot ashes into the pits (e.g. structure 10 – Medović 1988, 56). In few instances, *in situ* remains of fire installations were recognised (e.g. floor of a hearth in Structure 74 – Medović 1988, 192). The almost complete absence of fire and burning inside the excavated pits (with only few possible exceptions) strongly suggests that the discovered plant remains were not charred within the subterranean spaces. This means that they were deposited already charred, and that charring happened at a location or locations outside of the investigated structures. Thus, based on the current knowledge,

and contrary to the previous conclusions (Medović 1988, 348; Jevtić 2011, 36), charred plant remains from Kalakača cannot invariably represent evidence of the use of the pits as granaries. In other words, the charred material found in the pit fills has its origin elsewhere.

Plant material may have been charred in places where burning of daub (and wattle) took place and may, together with the daub, have been relocated into the pits. The high amounts of burnt daub encountered in the pits indicate large-scale burning or (frequent) small-scale fires that destroyed wattle-and-daub buildings. It is not clear whether other materials present in the pit fills were also burnt. Medović notes few instances of animal bones showing traces of burning (Structure 42, 61 and 152 – Medović 1988, 120, 166, 333), concentrations of pottery sherds deformed due to the exposure to high temperatures (Structure 51 – Medović 1988, 165), and a find of burnt stone (Structure 125 – Medović 1988, 275). Whether this implies that in all other cases these (and other) materials were not burnt could not be deduced from the published data. From the recent excavations at Kalakača, several ceramic vessels with evidence of secondary burning were reported (Peković 2006, 34, 36, 41, 44, 48; Jevtić 2011, 48-61). The evaluation of possible contextual connection between these pots (and other burnt material) and charred plant remains would shed some light on the 'life' of these finds prior to burning and (re-)deposition.

Indeed, multidisciplinary approach is the only valid route towards testing and establishing the possible use of (semi-)subterranean features as agricultural storage pits, as clearly demonstrated by the investigations of similar structures (dating to the Iron Age) conducted in different parts of the world (*e.g.* Currid and Navon 1989; Fairbairn and Omura 2005; Tiverios *et al.* 2013). These studies recognise that (charred) archaeobotanical evidence *per se* is insufficient for defining the potential role of prehistoric pits as granaries (*cf.* Hristova *et al.* in press). They thus combine relevant observations from ethnography, experimental work, historical records, analysis of different archaeological materials (architectural remains, ceramics, faunal remains etc.) and comparison of similar features from different sites. In case of Kalakača, in addition to the presented archaeological information, consideration of the composition of the charred plant assemblage is another useful basis for assessing the purpose of the pit-features.

The purpose of the pits: insights from the study of archaeobotanical composition

Features excavated in 1971-74

There seem to be no direct relationship at Kalakača between the charred plant remains and the archaeological context from which they were recovered. This, nonetheless, does not exclude the possibility that the dug-out features were indeed used for storage, including storage of plant food. A different form of archaeobotanical evidence is, however, needed to establish this (for instance, plant microfossils such as starch and phytoliths). It is also possible that the charred remains derive from storage contexts, but located outside of the investigated pit-features.

What could help understand the taphonomy of plant remains at Kalakača, and to some extent the history of use of the pits, is a closer examination and comparison of the archaeobotanical content of the analysed features (*cf.* Fuller *et al.* 2014). Table 1 gives the results of the analysis that van Zeist conducted for six of the Kalakača structures. Fig. 3 shows the relative proportions of the identified crop types that were represented by 30 or more remains in the assemblage (for Structure 131, an arbitrary total of 500 for millet seeds was used in this calculation). Interestingly, three of the features contained large, relatively clean,

Structure	Structure group	<i>Triticum monococcum</i>		<i>Triticum dicoccum</i>		cf. 'New type' glume wheat	'New type' glume wheat	<i>Triticum aestivum/durum</i>		<i>Hordeum vulgare</i>		<i>Panicum miliaceum</i>	Pulses	<i>Linum usitatissimum</i>
		<i>einkorn</i>		<i>emmer</i>		'new type' glume wheat		free-threshing wheat		barley		common millet	pulses	flax/linseed
		grain	glume base	grain	glume base	grain	glume base	grain	rachis segment	grain	rachis segment	grain	seed	seed
1	(5)	4								3		4		
13	(1)	13	1		8			7		8		131	1	
18	(5)									5		1		
24a		1								2		13		
26	(2)	3							8	1			2	
32		4			40				8	7		73		
		7	24		12				4	11		25		
		10	58		120		224		64	11		56		
		32	96	16	224					8	32	192		
		8	224		64				32	16	8	64		
39	(2)	11		1	32		16		2	22	85	16		
		10			48					6		32		
47		11	5		48					6		27		2
		19	28	1		1			8	9	1	149		16
48	(1)	7								29		4419	3	235
		12			56					5		2401	10	
		15								23		282	2	79
		24	80		160		96		256	40		496		32
		24	48						32	16		256		
49			448				32		32	16		48	8	
		32	192		32				96	28		168	40	
54		9						1	5	330	1	3	3	
total		256	1204	18	844	1	368	8	547	602	127			
total		1460		862		369		555		729		8856	69	364

Table 2. Absolute counts for the crop types identified in the recently analysed Kalakača pits
Табл. 2. Абсолютен број на типовите културни растенија, идентифицирани в последния анализ на комплекса от Калакача

single-crop concentrations that may represent grain storages that, after being burnt, were directly and at once re-deposited in the pit. In the other three features, different crop types were combined in various proportions, with einkorn and millet as the most prominent. Structure 121 is also interesting because it contained traces of all crop and wild types identified at the site by van Zeist. The material found in this feature seems to have come from a mixed deposit in which there may have been a considerable input from charred einkorn and millet stores; the mixing could have also happened within the pit itself.

This reconstruction of the possible origin of plant material in the pits is, however, provisional since, in the report on van Zeist's archaeobotanical work at Kalakača, it was not

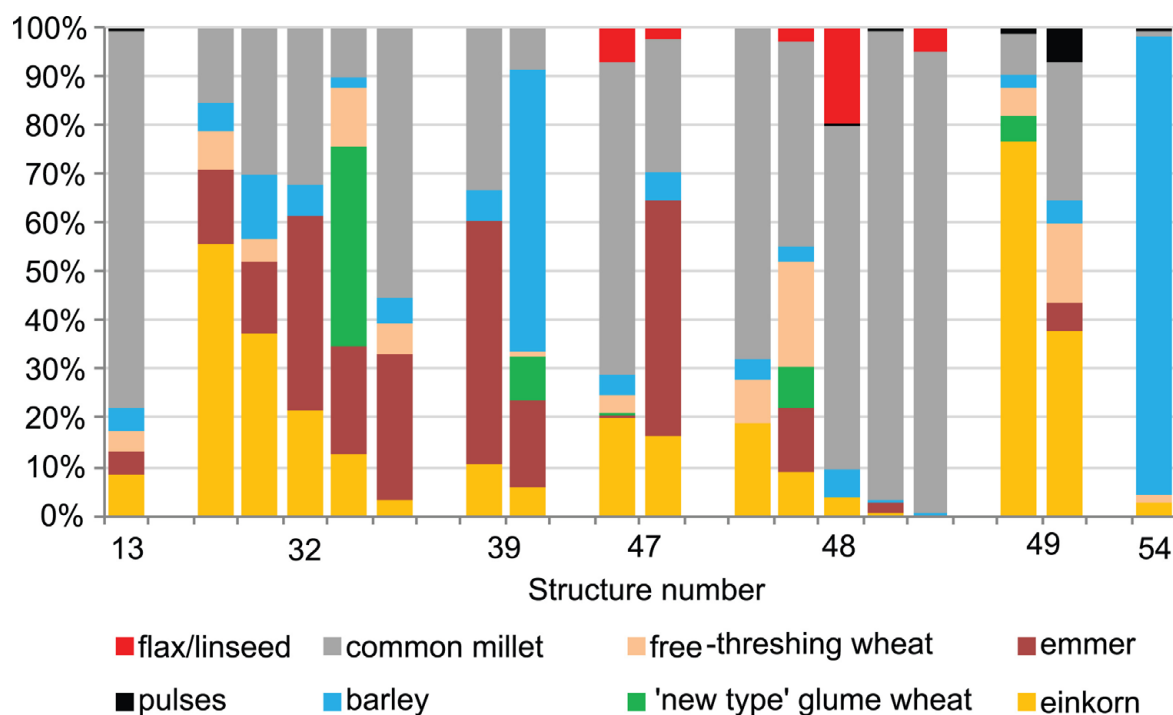


Fig. 4. Relative proportions of the crop types registered in the recently analysed assemblage from Kalakača

Обр. 4. Относително разпространение на основните типове културни растения, регистрирани в последния анализ на комплекса от Калакача

made clear if the item-counts for different crop types include only seed or chaff, or seed and chaff combined (Medović 1988, 348-349). Given that the material was hand-collected by the excavators, it is likely that what was immediately visible while digging, and attracted the attention of archaeologists, were concentrations of seeds or seeds and chaff. Even if very limited, this analysis signals that some of the deposits could have originated from storage contexts external to the pits.

It is perhaps worth looking at the pit type/group to which the archaeobotanically analysed features belong. Medović provided the classification for only one of the analysed pits (Structure 112 – group 1); thus, for the purpose of this paper, the rest of the structures were broadly grouped using the published descriptions of the features (table 1). Based on this, it looks like the 'rich' plant deposits and the different crop types were not confined to a particular pit-type.

Features excavated in 2003-04

The results of the archaeobotanical analysis of 11 recently excavated structures at Kalakača (Filipović 2011, in press) provide a further insight into the composition of crop record of the pit-features. Table 2 lists the identified crop taxa and the absolute counts for crop types and plant parts (excluding indeterminate categories such as *Triticum* sp. and glume wheat indeterminate). Fig. 4 illustrates the relative proportions of different crop types across the samples/structures. Four features contained fewer than 30 remains of the determinate crop categories, and were excluded (Structures 1, 18, 24a and 26). More than one flotation sample was taken from most of the analysed structures. According to the excavators, the samples should reflect separate depositional episodes within the same pit

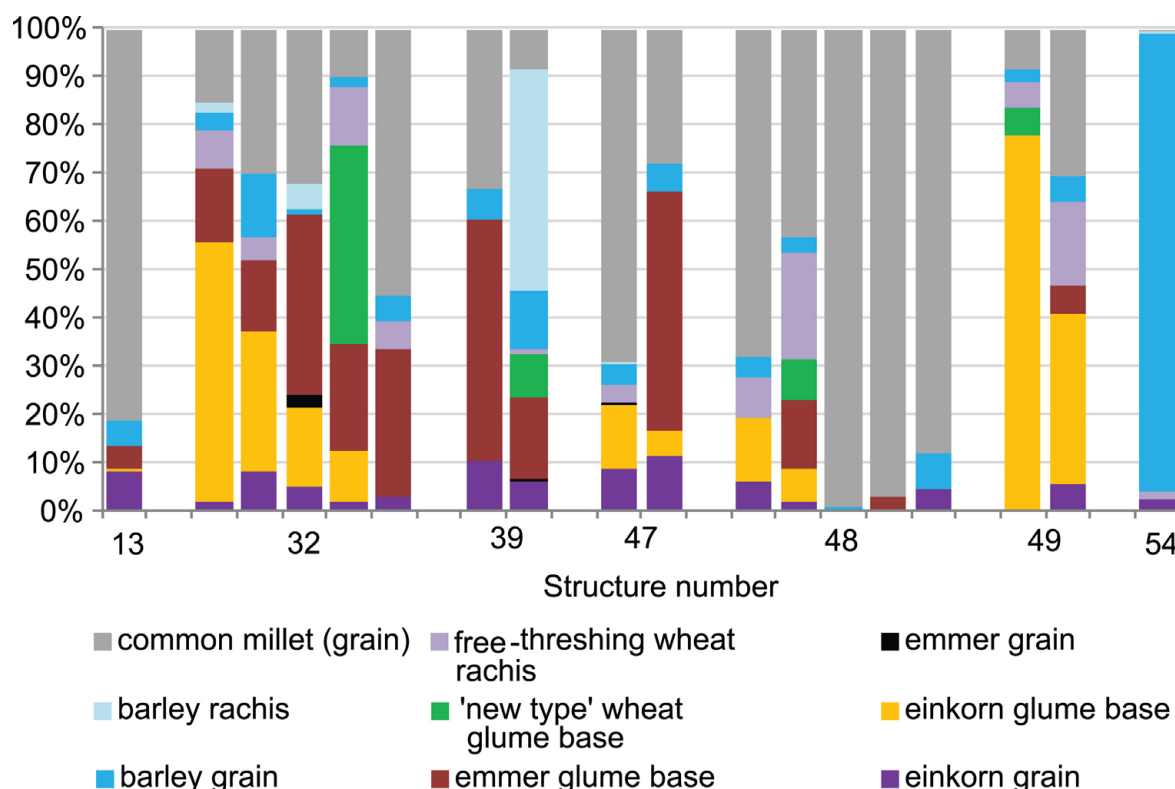


Fig. 5. Relative proportions of the plant parts of wheat, barley and common millet in the recently analysed assemblage from Kalakača

Обр. 5. Относително разпространение на растителни части от пшеница, ечемик и просо регистрирани в последния анализ на комплекса от Калакача

(M. Jevtić, pers. comm. 2011). Multiple samples from the same feature are therefore treated separately here, although, as shown in fig. 4, in some cases they look as if they could represent parts of the same deposit. For instance, in Structure 48 most samples seem more-or-less pure and are dominated by common millet. In the two samples from Structure 49 einkorn prevails. Three samples from Structure 32 appear mixed as they combine similar proportions of at least five different crop types, but mixing could have happened prior to the deposition. The pairs of samples from Structures 39 and 47 differ in their composition and reflect disposal of diverse crop material, perhaps as multiple episodes.

As in the case of structures analysed by van Zeist, the relatively pure crop concentrations in these pits may have derived directly from burnt crop stores. Consideration of the type of plant parts that constitute the Kalakača crop assemblage sheds more light on the processes that led to the formation of the crop record (*cf.* Dennell 1972; Hillman 1981; Jones 1990; Fuller *et al.* 2014). As it is clear from table 2, common millet, pulses and flax/linseed are represented by seeds. However, some of the millet grains were preserved in husk and a large number of others had fragments of charred lemma and palea adhering to the grain. This indicates that the grains entered the fire while still in husk. According to the ethnoarchaeological model of millet processing presented by Harvey and Fuller (2005, fig. 5), after the harvest millet grains would have been taken to storage in a semi-cleaned form, i.e. without being de-husked. Thus, the presence of virtually pure deposits of millet at Kalakača can be taken as one possible indicator of the derivation of the grain from crop stores – and the

semi-cleaned state of the grain as another. Finds of charred mouse pellets in some of the features (*e.g.* over 30 in Structure 48 – Filipović *in press*) may also point to the origin of millet from burnt store contexts.

Wheat and barley remains include both grain and chaff. Fig. 5 shows the relative proportions of plant parts of different wheat types and barley, and of millet. As listed in table 2, only one possible 'new type' glume wheat grain was discovered and fewer than 10 free-threshing wheat grains; they are not included in the graph. It is evident that the greatest portion of the wheat record is made up of chaff – glume wheat glume bases and free-threshing wheat chaff. Barley rachis is also present, in one case in a large proportion (Structure 39). The previously noted barley sample from Structure 54 is almost entirely composed of barley grain and points to a burnt barley concentration or barley store as the potential source of the material.

The majority of the samples contain a combination of the by-products of cleaning of two, in the crop processing sense, different groups of cereals – glume or hulled wheat (*einkorn*, *emmer* and 'new type' wheat) and free-threshing cereals (free-threshing wheat and barley) (Hillman 1981; 1984; 1985; Jones 1984; 1990). These two groups of cereals would, after harvest, have been processed separately (and perhaps each cereal type independently), but the different by-products could have become mixed when discarded into fire. They could, subsequently, have been deposited into the pits as residue from cleaning of fire installations or sweepings from floor around ovens and hearths etc. One other possibility is that they have been combined and used as temper for daub – the, apparently, widely used building material at Kalakača.

The details on the size and shape of the recently excavated Kalakača structures have not been made available; nonetheless, published photographs and illustrations and remarks in the reports enabled preliminary classification of several analysed features into specific groups (table 2). What is immediately clear is that Structures 1 and 18, described as "huts" and hence included in group 5 (based on Jevtić 2006, fig. 5; 2011, 38, fig. 35), contain much less charred material than other feature types. This could mean that huts in general were not used for the deposition of burnt plant (and other) material and that they may have been kept and/or left 'clean'.

Further archaeobotanical analysis and much more detailed archaeological data are needed for an investigation into possible patterning in the deposition of charred plant remains across different pit-types, and their relation to other materials found in the pit fills. Along with better contextualised archaeobotanical data, a comprehensive study of other pit contents would perhaps help characterise the potentially changing purpose of these features (*e.g.* from storage facilities to "a convenient repository for domestic waste" as suggested for Iron Age pits elsewhere – Thomas 1999, 64) and the nature of the deposition of cultural materials in them (*e.g.* ritual *vs.* everyday practice – cf. Garrow 2012), including the placement of burnt grain as, perhaps, a symbolic act (see *e.g.* Cunliffe 1992). To this end, the burning itself may have had a symbolic dimension – similarly to what was suggested for the (deliberate) burning of wattle-and-daub buildings of the southeast European Neolithic and Copper Age (Tringham 2005; 2013). For these periods also, the practice of the accumulation of materials, including house rubble, in pits is known in the Balkans, and it may have had ritual and/or social significance (Chapman 2000). The question remains open as to whether or not the burning of crops (perhaps stored in wattle-and-daub structures) at Kalakača was intentional, and symbolically laden or socially structured.

Conclusions

Extensive excavations of the Early Iron Age site of Kalakača in northern Serbia revealed the presence of numerous pit-features of various sizes and depths, as well as traces of several possible above-ground (wattle-and-daub) structures. Most of the pits were filled with large amounts of pottery and burnt daub, some animal bone and stone, ashes and, sporadically, concentrations of charred plant material. Based on the high quantity of fragments of very large ceramic vessels and their most likely use as storage containers, the pits, or the majority of them, were interpreted as structures used for storage (of food). In particular, the conical or bell/pear-shaped pits, which are the dominant type, were seen as certainly used for this purpose since fragments of large vessels were often found here lined up against the pit walls, indicating the 'original', 'safe' location of the pots – i.e. away from the small pit opening and thus protected from weather and other unwanted influences. The charred remains of crops in a small number of pits were taken as an evidence for the function of the features as crop stores.

Archaeobotanical analysis determined the presence of a range of crops in the pit fills, as well as wild-collected and possible weed taxa. Common millet, einkorn, emmer and barley are the dominant types in the Kalakača crop assemblage. Whereas it is conceivable that these (and other) crops could have been stored at the site, the consideration of the archaeological context of the charred crop remains indicates that the plant material found in the pits was burnt elsewhere. Namely, no traces of *in situ* burning were detected in the excavated pit-features, demonstrating that the charring of plants happened outside. Thus, the use of charred plant remains as evidence of the storage of crops in the Kalakača pits is dismissed. The plant material was perhaps charred within the wattle-and-daub surface structures. The significant presence of burnt daub in the excavated features perhaps indicates synchronous (re-)deposition in the pits of the burnt building and plant materials. The analysis of the type of plant parts disposed of in the pits reveals the presence of (a) crop products – chiefly millet grain (most likely semi-cleaned) and some barley grain, and (b) by-products of processing of wheat and barley, i.e. chaff. Millet grain may have originated from burnt millet stores; cereal chaff may have arrived in the pits as, for example, residue from fire installations, or as daub-tempering material.

The consideration of the taphonomy of charred plant remains and the evaluation of the available archaeological information for Early Iron Age Kalakača provided a new understanding of the potential origin of plant material recovered from the excavated structures. The results of this assessment emphasise the need to explore the relationship, or lack of one, between charred plant deposits and the context in which they are found before making any conclusions on the life- or use-history of both the plant remains and the context from which they derive.

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“Зърнохранилища” от РЖЕ обект Калакача в северна Сърбия и въпросът на археоботаничната тафономия

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(резюме)

През 70-те години на миналия и началото на този век бяха проведени широко мащабни разкопки, на РЖЕ обект Калакача в северна Сърбия (Войводина). Проучванията установиха наличието на многобройни вкопани съоръжения с различна големина и дълбочина, както и следи от няколко възможни наземни структури с колово-плетена конструкция. Повечето от ямите са запълнени с голямо количество керамика и горяла

мазилка, и по-малко животински кости и каменни атрефакти. Регистрирани са и спорадични концентрации от овъглен растителен материал. На базата на многото големи фрагменти, произхождащи от съдове-хранилища, голяма част от ямите са интерпретирани като структури за съхранение (на храна). Тази интерпретация се отнася по-специално за коничните или крушовидни ями, които са преобладаващи. За тяхното използване с такава цел свидетелстват фрагментите от големи съдове, които често се намират изправени до стените на ямите и индикиращ 'оригиналното' и 'сигурно' местоположение на съдовете – на известно разстояние от малкия отвор на ямата, което ги предпазва от климатични и други нежелани влияния. Останките от овъглени културни растения в някои от ямите дават основание тези структури да се интерпретират като склад за зърнени култури.

Археоботаничният анализ на запълнителя на ямите установи наличието на широк обхват културни, диви и плевелни растения. Комплексът зърнени култури в Калакача е доминиран от просо, ечемик, еднозърнеста и двузърнеста пшеница. Напълно е възможно тези (и други) реколти да са били съхранявани на този обект, но анализът на археологическия контекст показва, че материалът е бил изгарян извън ямите, тъй като в тях не са намерени *in situ* следи от горене. Следователно използването на овъглени растителни останки като доказателство за съхранение на реколти в Калакача не е възможно. Растителният материал вероятно е бил овъглен в наземните колово-плетени конструкции. Значителното присъствие на горяла мазилка в разкопаните структури показва вероятно синхронно (ре)депониране на горял строителен и растителен материал в ямите. Анализът на депонираните в ямите растителните останки установи присъствието на: а) реколти от зърнени култури – главно зърна от просо (най-вероятно полу-почистено) и ечемик и б) вторични продукти – слама и плява. Зърната от просо биха могли да идват от склад на зърно, докато плявата би могла да попадне в ямите заедно с останките от отоплителни съоръжения или като примес на строителна глина.

Археоботаничният анализ, заедно с внимателната оценка на тафономията на овъглените растителни останки и на наличната археологическа информация за РЖЕ в Калакача, дават възможност за ново разбиране на евентуалния произход на растителните останки, намирани в археологическите структури. Резултатите от тази комплексна оценка подчертават нуждата да се изследва връзката (или липсата на такава) между овъглените растителни останки и контекста, в който са намерени. Тези резултати са и много показателни относно интерпретативния потенциал на археоботаничните изследвания.