

Dressing Situla people: prehistoric textile remains from the Dolenjski muzej Novo mesto

Oblačila ljudi s situl: ostanki prazgodovinskih tkanin iz Dolenjskega muzeja v Novem mestu

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Izvleček

Prispevek obravnava ostanke železnodobnih tkanin iz 8. do 4. st. pr. n. št., ki jih hrani Dolenjski muzej v Novem mestu, z namenom prepoznati njihove surovine, tehnologije, funkcijo in družbeni pomen ter jih umestiti v širši evropski kontekst. Primarno identificirano tekstilno tkanje je volneni keper, ki je značilen za halštatsko kulturo in italško tekstilno tradicijo. Analiza kakovosti volne kaže na lokalno surovino z različnimi metodami obdelave. V strukturnih značilnostih tekstila so ugotovljene določene diahronne spremembe, ki lahko kažejo na vplive iz drugih regij.

Ključne besede: Slovenija; Dolenjska; železna doba; tekstil; identifikacija vlaken; kakovost volne; identiteta

Abstract

This contribution examines the Iron Age textiles (8th–4th century BCE) kept at the Dolenjski muzej in Novo mesto, Slovenia, with the aim of identifying their raw materials, technologies, functions and social significance and situating them in a wider European context. The primary textile weave identified is a wool twill, which is typical for the Hallstatt culture and Italic textile traditions. Wool quality analysis indicates a local raw material with different processing methods. Certain diachronic changes are identified in textile structural characteristics, which may be indicative of influences from other regions.

Keywords: Slovenia; Dolenjska; Iron Age; textiles; fibre identification; wool quality; identity

Textiles are a product whose design and use are subject to cultural patterning; as such, they can be used to establish the identity of an individual or a group with respect to other individuals or groups. Worn or displayed in an emblematic way, textiles can denote variations in age, sex, rank, status, ethnicity, or group affiliation, thereby creating and reinforcing cultural and social borders. However, despite their universally recognised value as fun-

damental carriers of individual and group identity, textiles have rarely been used as archaeological indicators of cultural identity in Iron Age Central Europe – a lacuna ostensibly resulting from the generally unfavourable conditions for organic material preservation in the region.

While organic preservation is relatively rare in the Central European regions, mineralised textile traces are not unusual, thanks to the frequent

deposition of metal grave goods in burials during the Iron Age. Such mineralised formations are created when metal (copper or iron) corrosion products form casts in or around fibres, thereby retaining their external morphology and size almost unaltered (Chen et al. 1998). Even when minute, these traces can provide a considerable amount of information about a textile's raw material, structure, pattern, and function. These data enable reconstructing the stages of the *chaîne opératoire* (Grömer 2016, Fig. 15) behind the conscious choices intended to culminate in a specific outcome: textiles that are then used in the construction of particular identities and, hence, cultural boundaries, during different chronological periods. In other words, they enable us to define textile cultures (Gleba 2017a).

This contribution presents the first analysis of the Iron Age textiles of the Dolenjska cultural group currently conserved at the Dolenjska Museum in Novo mesto, Slovenia.

MATERIAL AND CONTEXT DESCRIPTION

The textiles derive from burials of several cemeteries of the Dolenjska cultural group, one of the most important Iron Age cultural groups, which is a part of the Eastern Hallstatt Circle, located in south-eastern Slovenia (Fig. 1). The region is hilly and was densely populated with a series of fortified hilltop settlements and extensive barrow cemeteries (Teržan 2021). A single barrow could contain multiple graves and likely represented a family or a clan burial site. Earlier burials followed the preceding cremation rite, but inhumations soon predominated.

Ivanec

The prehistoric barrow cemetery Ivanec in Družinska vas belongs to a wider framework of the archaeological site of Vinji vrh, also known as 'the Šmarjeta'. The burial site consisted of 44 barrows, ranging from 6 to 20 m in diameter. Several were excavated between 1879 and 2006, and some were destroyed. The excavated archaeological artefacts are kept at the Naturhistorisches Museum Wien in Vienna, in Narodni muzej Slovenije in Ljubljana, and in the Dolenjski muzej Novo mesto in Novo mesto. Barrow 30 (also known as 'Kopina') was oval in plan, 22 × 16 m in size, flattened by ploughing, but still measured 1.5 m in height. When it was excavated in 1990, it contained 10 male and female

graves (6 inhumations and 4 cremations) dating from Ha C2 to Ha D2 (Guštin, Križ 2007). The analysed sample was found in Grave 30/4.

Medvedjek

The earthen burial mound 1, circular in plan, measuring 28 m in diameter and 2.5 m in height, was erected on the scrubby base of a small elevation. Adjacent to it was a small Noric-Pannonian barrow with a shaft entrance from the 1st century BCE. It was excavated in 1980 and 1981 and contained 42 poorly preserved inhumation graves with typical Ha D1 and Ha D2 grave goods and occasional osteological remains. Into the upraised barrow, as well as into the intermediate space between the two mounds, a further 6 cremation Late Iron Age graves and 17 Roman period graves were cut (Dular 2021, Cat. No. 110). The analysed samples were found in Grave 1/1.

Novo mesto (Kandija, Kapiteljska njiva, Mestne njive) The town of Novo mesto lies in the central Dolenjska region, where the river Krka takes a large meander in its middle (Fig. 1), thus creating a peninsula that was controlled by a fortified prehistoric hillfort at its narrowest point. Many burial sites were found nearby, the largest being Kapiteljska njiva, Mestne njive, and Kandija, also known as Znančeve njive.

Kandija

The cemetery comprised at least five barrows from the Early Iron Age and a Late Iron Age flat cemetery. They were first excavated in 1939 (Gabrovec 1960) and 1941 (Gabrovec 1968), then in the period from 1967 to 1970 (Knez 1986). Over a hundred Early Iron Age inhumation graves and over sixty Late Iron Age cremation graves were found. The barrows contained five extremely rich princely graves. Among the finds the finest are bronze cuirass, tripod, strainer, helmets, and situlae from the Early Iron Age. The analysed sample was found in Grave III/1.

Kapiteljska njiva

Kapiteljska njiva is a domed hill, located between the Novo mesto town core and the district of Bršljin, north of the historical traffic route that led into Novo mesto from the west, across the Marof hill. Today it is mostly fields and grasslands, with some terraces on the slopes that show no indication that they cover one of the largest prehistoric burial grounds in Central Europe. Until the beginning

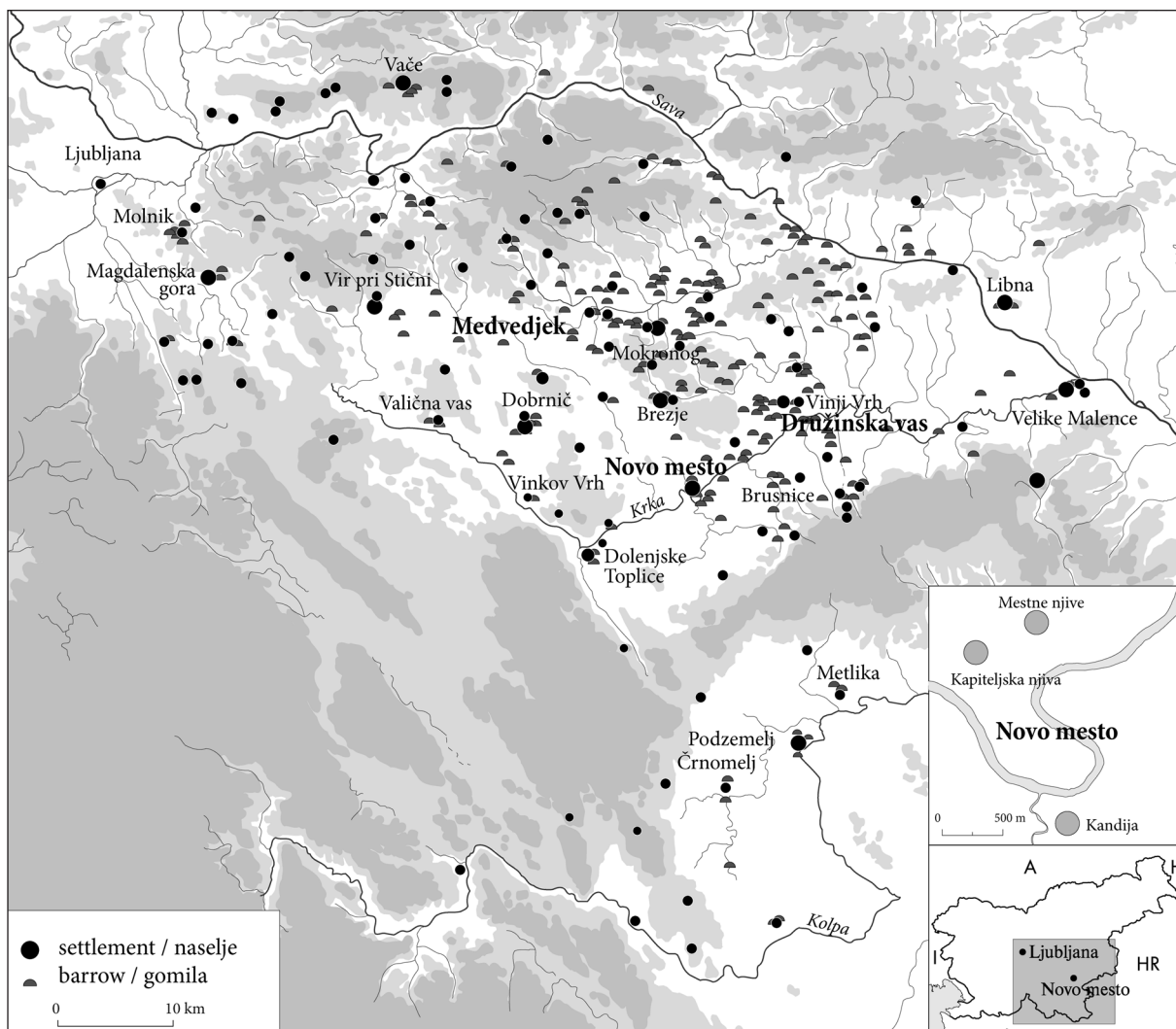


Fig. 1: Early Iron Age settlement in Dolenjska.
Sl. 1: Starejšeželeznodobna poselitev Dolenjske.

of the 20th century, the imposing Early Iron Age barrows were clearly visible over the entire area. Later, the mounds were flattened due to intensified ploughing; today, they are no longer discernible.

At the end of the 19th century, Professor Rudolf Hoernes from Graz and Jernej Pečnik, a well-known excavator for the museum in Vienna, started to dig into the still well-visible mounds. They excavated two Early Iron Age barrows and some Late Iron Age graves. Intensive archaeological excavations have been conducted since 1986, at first under the direction of Tone Knez and later Borut Križ, both archaeologists and curators of the Dolenjski muzej.

By the end of 2018, 338 Late Bronze Age cremation graves in urns, 69 Early Iron Age barrows with 1162 inhumation graves spanning from Podzemelj phase to the end of Negova phase (extra two barrows dug in the 19th century), 711 flat cremation

graves from the Middle La Tène period, and a single Early Medieval grave had been excavated (Križ 2019). The analysed samples were found in Graves LXVI/2, XIV/51, LXIX/1, VI/9, XIV/7 and XXVII/4.

Mestne njive

The cemetery of Mestne njive is located on a conical hill to the north of the medieval town centre and close to Kapiteljska njiva. The first graves were excavated on the site in 1954 by Vinko Šribar. Excavations were continued by Tone Knez and Borut Križ. A total of 560 Late Bronze Age cremation graves and three inhumation graves from the Early Iron Age have been excavated at the site to date (Križ, Jereb 2014). The analysed sample was found in Grave 329.

METHODOLOGY

The vast majority of Iron Age textiles in Slovenia survive in a mineralised state on iron or bronze artefacts included as grave goods in graves. Sometimes referred to as 'pseudomorphs', mineralised textiles are created when a combination of chemical and physical conditions within a burial lead to the replacement of their organic components with inorganic ones, resulting in a positive or negative cast of the fabric and preserving its physical features, down to the fibre morphology, allowing both structural textile analysis and fibre identification.

Textile structural analysis

The purpose of structural textile analysis is to determine the culturally and chronologically relevant characteristics of the examined fabrics. The textile analysis includes the determination of structural parameters such as weave type (tabby, twill) and thread count per cm (which is indicative of textile quality); thread twist (z – clockwise; s – counter-clockwise, i – no discernible twist, * – spliced), diameter and angle; presence of edges and any other characteristic elements, such as pattern, sewing, etc. (Fig. 2, 3) (Emery 1966).

The structural examination of textile fragments was carried out using autopic observation and digital microphotographs taken utilising a portable Dino-Lite digital microscope AM7115MZT at different magnifications (20×, 50×, 230×). At least 10 thread diameter and angle measurements were taken whenever the size of the preserved textile fragment allowed. Most fragments were too small to allow more than 1–2 thread counts.

Fibre identification and wool quality analysis

The purpose of the fibre analysis is to identify first whether the fibres used to produce the textile yarns were of plant or animal origin and, if the fibres are sufficiently well preserved, to identify the species. Fibre characterisation furthermore helps to understand fibre processing and microscopic thread structure, enabling differentiation of different thread production methods, such as draft spinning and splicing. Fibre identification is essential to underpin the connections between

technology and raw material and understanding wild and cultivated resource management.

Fibre identification is usually carried out using microscopy and is based on comparison of the archaeological samples with a known reference. In mineralised textiles, fibres can be preserved either as negative casts (most common in contact with iron) or positive casts (more prevalent with bronze), although neither is exclusive. Since the samples are no longer transparent, the preferred method is Scanning Electron Microscopy, which enables the acquisition of a detailed sample surface image that allows the observation and identification of morphological characteristics of the fibre.

Analyses of wool fibre quality are used to determine the fleece type of prehistoric sheep, enabling comparisons with fleeces from modern sheep, particularly the so-called primitive or 'unimproved' sheep breeds, and leading to conclusions about ancient breeds (overview in Skals et al. 2018). A fleece consists of the outer coat containing coarse kemp (over 100 microns in diameter) and hair (over 60 microns in diameter), and the much finer underwool. Assessment of fibre quality is based on a technique used in the modern textile industry and consists of a diameter measurement of 100 fibres per thread or staple, and statistical analyses resulting in a distribution histogram.

Fibre identification and analysis were carried out at the Department of Chemistry, University of Padua, using Coxem EM-30AX Plus Scanning Electron Microscope (SEM) in order to acquire more detailed surface information for fibre identification. The following instrumental settings were used: analytical condition mode at 20.00 kV accelerating voltage and working distance of 10–13 mm. The samples were not coated. The fibre diameters were measured using ImageJ software from SEMicrographs obtained at 300× magnification. Statistical processing of the fibre diameter data was carried out in Microsoft Excel.

CHRONOLOGY

The analysed material spans the period from the 8th to the 4th century BCE. In the area of the Eastern Hallstatt Circle, there is a noticeable cultural shift that began during the second half of the 6th century BCE. The following period lasts until the establishment of fully developed La Tène communities in this area in the first half of the 3rd century BCE. It is marked by the transforma-

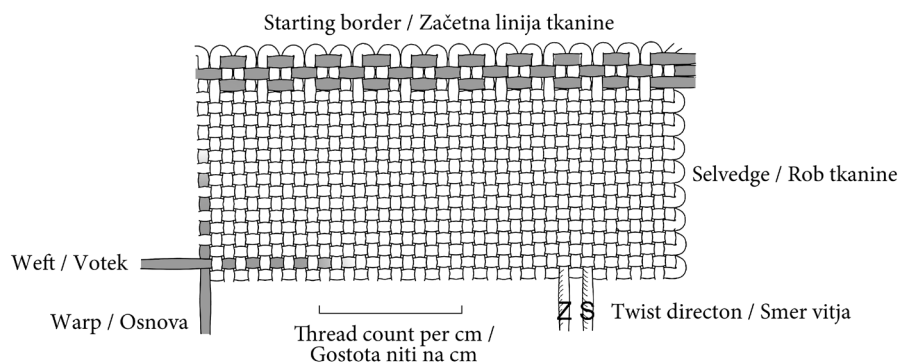
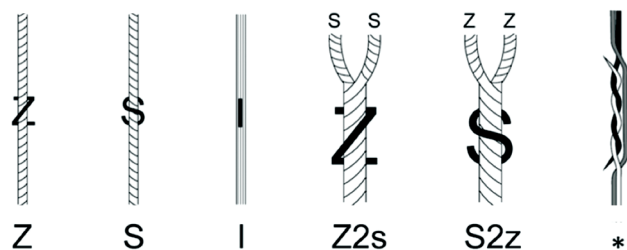


Fig. 2: Technical details of a textile.

Sl. 2: Shematski prikaz tkanine in poimenovanje njenih osnovnih gradnikov.

Thread twist direction / Smer sukanja niti



Z clockwise / v smeri urinega kazalca

S counterclockwise / v nasprotni smeri urinega kazalca

I no discernible twist / ni opaznega zasuka

* Splicing / spajanje/podaljševanje

Thread diameter / Premer niti (mm)



Weave / Tkanje

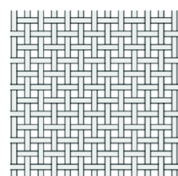
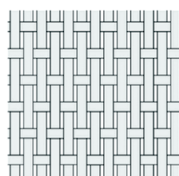
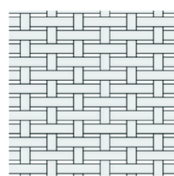
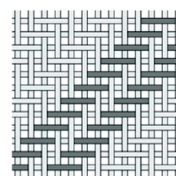
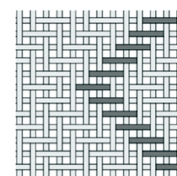
Plain Weave or tabby /
platnena vezava ali platnoWrap-faced tabby /
platno z osnovo na vrhuWelf-faced tabby /
platno z votkom na vrhu2/2 diagonal twill /
2/2 diagonalni keper2/2 diamond twill /
2/2 diamantni keper

Fig. 3: Structural parameters recorded during textile analysis.

Sl. 3: Strukturni parametri tkanine, zabeleženi med analizo.

tion of the Hallstatt communities in new forms that significantly differ in different parts of the Carpathian Basin and Eastern Alpine area, largely depending on exposure to Scythian raids and La Tène influences, as well as regional cultural dynamics on the borders of the Hallstatt world. In this complex world of change, textiles can be seen as one of important identity markers in Iron Age communities.

Results

Textile traces were identified on 11 artefacts in 10 burials from 5 cemeteries, resulting in 12 fabrics (Fig. 4, 5). In one case, two textiles were found on the same artefact (Fig. 5: 7,8), while another two artefacts from the same burial had traces of different fabrics (Fig. 5: 10,11). The identification of the type of weave and its technical characteristics



Fig. 4: Artefacts with textile traces from Novo mesto, Družinska vas and Medvedjek, examined in this study.

Sl. 4: Predmeti s sledovi tkanin iz Novega mesta, Družinske vasi in z Medvedjeka, raziskani v projektu.

1 – Kapiteljska njiva, LXVI/2; **2** – Mestne njive, G 329; **3** – Kapiteljska njiva, XIV/51; **4** – Kapiteljska njiva, LXIX/1; **5** – Ivanec pri Družinski vasi, 30/4; **6** – Kapiteljska njiva, VI/9; **7** – Medvedjek, 1/1; **8** – Kapiteljska njiva, XIV/7; **9** – Kapiteljska njiva, XXVII/4; **10** – Kandija, III/1

is often tentative due to poor visibility of the artefact's surface. A summary of the textile structural data is provided in *Table 1*.

None of the fragments preserves selvedge, borders, sewing, or other structural elements that enable identifying warp and weft (hence defined as System 1 and System 2); therefore, the following discussion concerns the type of weave and thread characteristics of both thread systems.

Textile weave

Two types of weave were identified in the analysed material: tabby or plain weave and twill. A tabby is one the earliest loom-woven structures as it is the simplest textile binding attainable with two thread systems on a loom, with passive warp and active weft threads alternating one over one in each direction. Tabbies in the recorded material

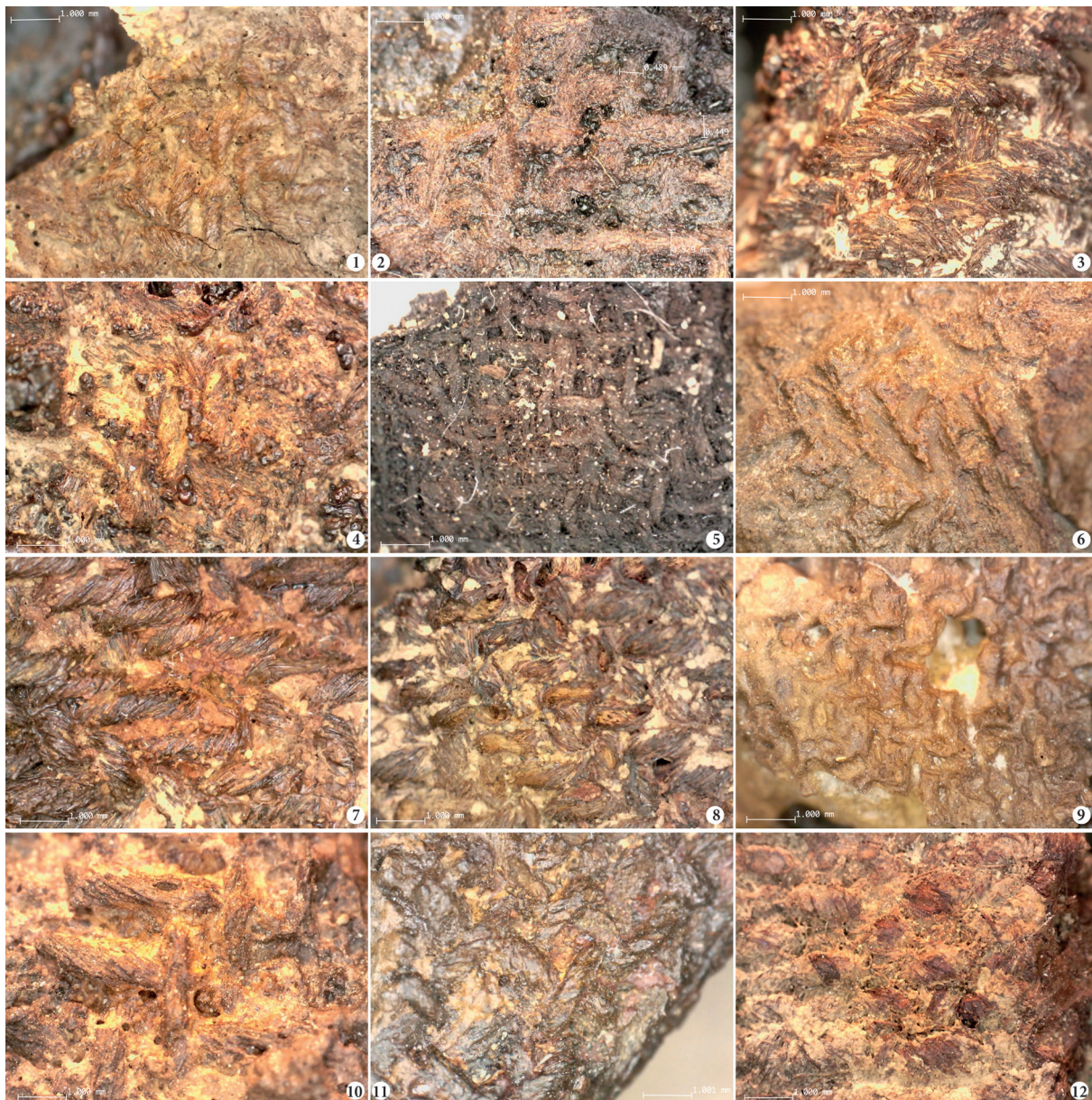


Fig. 5: Micrographs of textile traces from Novo mesto, Družinska vas and Medvedjek.

Sl. 5: Fotografije ostankov analiziranih tkanin iz Novega mesta, Družinske vasi in z Medvedjeka, posnete s SEM.

1 – Kapiteljska njiva, LXVI/2; 2 – Mestne njive, G 329; 3 – Kapiteljska njiva, XIV/51; 4 – Kapiteljska njiva, LXIX/1; 5 – Ivanec pri Družinski vasi, 30/4; 6 – Kapiteljska njiva, VI/9; 7 – Medvedjek 1/1 (coarse / grobo); 8 – Medvedjek 1/1 (fine / fino); 9 – Kapiteljska njiva, XIV/7; 10 – Kapiteljska njiva, XXVII/4 (axe / sekira); 11 – Kapiteljska njiva, XXVII/4 (spearhead / sulična ost); 12 – Kandija, III/1

can be divided into balanced and dominant varieties. Balanced tabbies have approximately equal numbers of threads per unit of length in warp and weft. Weft-dominant tabbies have more wefts than warp threads per unit of length, while warp-dominant tabbies have more warps than wefts per unit of length. In a twill, the horizontal weft threads pass over and under vertical warps in a regular staggered pattern (in a 2/2 twill case every two threads in each

system), each row being stepped to one side of the row above, creating a diagonal effect.

Two textiles (a spear in Grave XXVII/4 from Kapiteljska njiva; Fig. 5: 11 and a bronze fibula in Grave III/1 from Kandija; Fig. 5: 12) were identified as tabbies, probably weft-dominant, although no selvages or borders survive to help with identification of warp and weft. Their quality is similar, with 7–9/10–13 threads per cm. Both examples

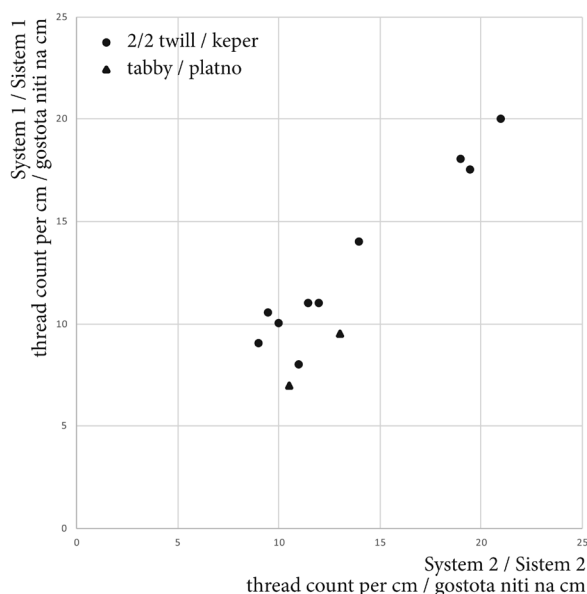


Fig. 6: Scatter plot of thread counts of textiles from Novo mesto, Družinska vas and Medvedjek.

Sl. 6: Gostota niti pri analiziranih tkaninah iz Novega mesta, Družinske vasi in z Medvedjeka.

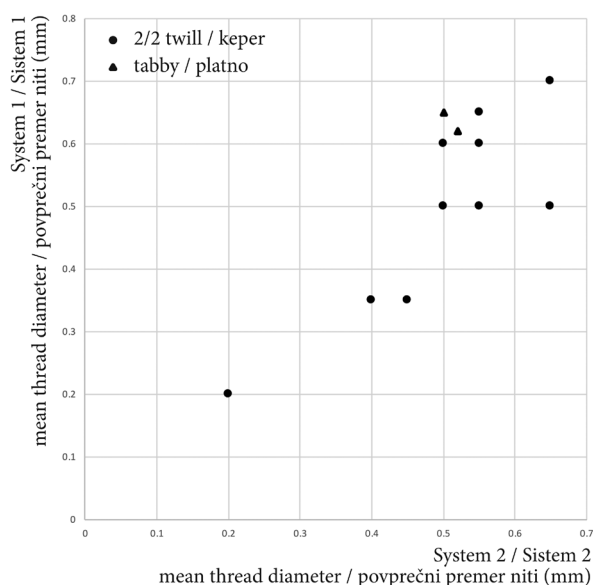


Fig. 7: Scatter plot of mean thread diameters of textiles from Novo mesto, Družinska vas and Medvedjek.

Sl. 7: Povprečni premeri niti pri analiziranih tkaninah iz Novega mesta, Družinske vasi in z Medvedjeka.

date to the end of the chronological period covered by the finds examined here, that is the shift to the La Tène period.

The remaining ten textiles were identified as 2/2 twills, with one case possibly a chevron variant (fibula from Grave LXVI/2 from Kapiteljska njiva; Fig. 5: 1), in which the direction of twill diagonals changes at regular intervals creating a pattern. It is possible that other textiles were originally more complex twill variants, but the fragments are too small to allow their definitive identification. All textiles are relatively balanced and their quality ranges from 8–10 to 20–22 threads per cm, although they mostly group at the coarser or the finer end of the range (Fig. 6). Both coarse and fine twills span the entire chronological spectrum examined here.

A cord and a thread are also documented on a fibula from Kapiteljska njiva (Grave XIV/51; Fig. 5: 3). They appear to have been used for the repair of the closing mechanism.

Yarn structure

Two types of thread structure were identified in the analysed material: single and plied (*Tab. 1*). The cord and tabby textile are plied: the cord on the boat fibula from Kapiteljska njiva XIV/51 is S2z, while the tabby on the iron spearhead from Kapiteljska njiva XXVII/4 (Fig. 5: 11) appears to

be Z2-ply, although the twist direction of the single thread is not discernible.

In all other cases, a single yarn was used; however, there is a variation in the twist direction, which may be chronologically significant. Textiles from the earlier 8th–6th centuries BCE contexts are either z/z, or spin- or shadow patterned in one or both directions, that is woven with alternating groups of z- and s-twisted yarn alternating in one or both systems. In most cases, the preservation does not enable the definitive count of the pattern but groups, but in fibula from Grave LXVI/2 at Kapiteljska njiva (Fig. 5: 1), 4s,4z alternation is noted in one system and 6s,6z in the other. Textiles from the later 5th–4th century BCE contexts do not appear to have spin patterns, and four out of six are s/s.

Thread diameters range from 0.2 to 0.8 mm (Fig. 7), with the thread from fibula in Grave XIV/51 at Kapiteljska njiva reaching 1 mm (Fig. 5: 1; 6). Both tabbies and twills have threads clustering around 0.5–0.7 mm, with only the twill from the ring from Grave XIV/7 at Kapiteljska njiva (Fig. 5: 9) having much finer threads of 0.2 mm.

Fibre identification

Sampling for fibre identification and analysis was possible in the case of 10 textiles, while for the remaining two (Kapiteljska njiva, Grave XIV/7 and

Site, Grave, Fig. / Najdišče, grob, sl.	Date / Datacija	Burial / Pokop	Sex / Spol	Artefact / Predmet	Weave / Tkanje	System 1 thread count / gostota niti 1	System 2 thread count / gostota niti 2	System 1 twist vitje 1	System 2 twist vitje 2	System 1 diameter / premer 1	System 2 diameter / premer 2
Kapiteljska njiva LXVI/2 (4: 1; 5: 1)	8 th c. BCE / 8. st. pr. n. št.	I	F	Vače type 5a bronze and iron fibula / bro- nasta in železna vaška fibula (tip 5a)	2/2 twill (chevron?) / keper (ševron?)	16–18	18–20	4s, 4z	6s, 6z	0.3–0.4	0.3–0.5
Mestne njive G 329 (4: 2; 5: 2)	8 th c. BCE / 8. st. pr. n. št.	C	F?	Vače type 5a bronze and iron fibula / bro- nasta in železna vaška fibula (tip 5a)	2/2 twill / keper	10	8–10	s	s,z	0.5	0.5–0.6
Kapiteljska njiva XIV/51 (4:3; 5: 3)	7 th c. BCE / 7. st. pr. n. št.	I	F	Bronze boat fibula / bronasta čolničasta fibula	2/2 twill / keper	8	10–12	z	z	0.6	0.5–0.6
					cord / vrvica	S2z				0.8 (0.4)	
					thread / nit	z				0.8–1	
Kapiteljska njiva LXIX/1 (4: 4; 5: 4)	7 th c. BCE / 7. st. pr. n. št.	I	F	Iron and bronze two- looped bow fibula / železna in bronasta dvozankasta narebrena ločna fibula	2/2 twill / keper	11	11	s,z	s,z	0.4–0.6	0.6–0.7
Ivanec 30/4 (4: 5; 5: 5)	Mid-6 th c. BCE / sr. 6. st. pr. n. št.	I	F	a piece of textile / košček tkanine	2/2 twill / keper	16–18	18–20	z	4z, 2s, 2z	0.3–0.4	0.3–0.4
Kapiteljska njiva VI/9 (4: 6; 5: 6)	5 th c. BCE? / 5. st. pr. n. št.	I	M	Iron and bronze belt hook / železen in bronast pasni jeziček	2/2 twill / keper	10	10	s	s	0.4–0.6	0.4–0.6
Medvedjek 1/1 (4: 7; 5: 7, 8)	5 th c. BCE / 5. st. pr. n. št.	I	M?	Iron belt plate / železna pasna plošča	2/2 twill / keper	10	12	s	s	0.5–0.8	0.4–0.7
					2/2 twill / keper	14	14	s	s	0.4–0.8	0.4–0.6
Kapiteljska njiva XIV/7 (4: 8; 5: 9)	Late 5 th –early 4 th c. BCE / pozno 5.–zač. 4. st. pr. n. št.	I	M	Iron ringlet / železen obroček	2/2 twill / keper	20	20–22	s	s	0.2	0.2
Kapiteljska njiva XXVII/4 (4: 9; 5: 10, 11)	Late 5 th –early 4 th c. BCE / pozno 5.–zač. 4. st. pr. n. št.	I	M	Iron axe / železna sekira	2/2 twill / keper	9	9	z	z	0.6–0.8	0.6–0.7
				Iron spearhead / železna sulična ost	tabby / plattena vezava	7	10	Z2?	Z2?	0.6–0.7	0.5
Kandija III/1 (4: 10; 5: 12)	Late 5 th – early 4 th c. BCE / pozno 5.– zač. 4. st. pr. n. št.	I	F	Bronze crossbow fibula with reverted foot / bronasta samostrelna fibula z nazaj zavito nogo	tabby / plattena vezava	9	13	z	z	0.5–0.7	0.5–0.6

Tab. 1: Summary of textile technical data from Novo mesto, Družinska vas and Medvedjek. Abbreviations: I – inhumation; C – cremation; F – female; M – male.

Tab. 1: Povzetek tehničnih podatkov o analiziranih tkaninah iz Novega mesta, Družinske vasi in z Medvedjeka. Okrajšave: I – skeletni pokop, C – žgani pokop, F – ženska, M – moški.

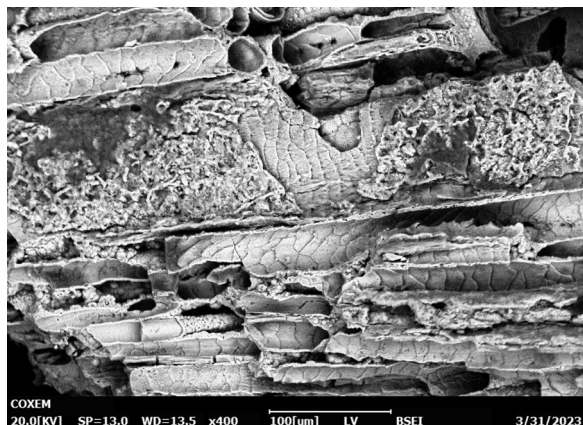


Fig. 8: SEMicrograph of Grave XIV/51 from Kapiteljska njiva showing negative fibre casts with cuticular scale impressions; opposing direction of scales in adjacent casts indicates fibre processing.

Sl. 8: Tkanina iz groba XIV/51 na Kapiteljski njivi z negativnimi odlitki vlaken z odtisi kutikularnih lusk; nasprotna smer lusk v sosednjih odlitkih kaže na obdelavo vlaken. Posneto s SEM.

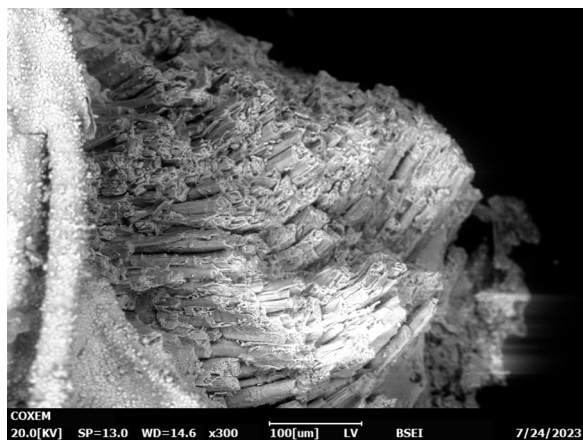


Fig. 9: SEMicrograph of Grave III/1 from Kandija showing fibres with polygonal cross sections and nodes or dislocations.

Sl. 9: Tkanina iz groba III/1 iz Kandije. Vidna so vlakna s polygonalnimi preseki in vozli ali dislokacijami. Posneto s SEM.

Mestne njive, G 329) it would have compromised the integrity of the artefact. Fibre casts were more or less well preserved, mostly as negative casts. In all cases except one, the raw material is of animal origin, sheep wool, as indicated by the characteristic cuticular scales (Fig. 8) and fibre quality analysis. The tabby from the fibula in Grave III/1 from Kandija (Fig. 5: 12) is instead made of plant bast fibre, possibly flax, as indicated by the polygonal cross sections of the fibres, the presence of nodes or dislocations (Fig. 9) and the average diameter of 15 micron (the range of 19 measured fibres is 10–19 micron).

Wool quality analysis

Wool fibre quality analysis was possible in the case of seven samples. In all cases, the analysis reflects the entire textile since it was not possible to investigate warp and weft separately. Apart from two samples, in all other cases, more than 100 fibre diameters were measured. The results are summarised in Table 2 and the histograms are presented in Figure 10. No significant differences are observed between chronologically earlier and later samples.

The wool quality appears rather homogeneous between the samples. The average mode is 18 microns, the median 19.7 microns, the mean diameter is 22.5 microns and the overall range is 9–49 micron with only a few outliers above 50 micron and none above 88 micron. The histograms are all positively skewed. While this falls within Generalised Medium fleece type in Ryder's classification (Ryder 1969), different samples range between Categories A and CD in Rast-Eicher's system (Rast-Eicher 2008). The results indicate a similar raw fleece in all cases but variable selection and processing of the raw material. Wool quality does not necessarily translate into textile quality, as demonstrated by the two textiles present on the belt plate from Medvedjek (Fig. 5: 7,8): here, the coarser twill is made with better-processed wool than the finer twill.

Wool processing (likely combing) is furthermore indicated by the opposing direction of scales in adjacent fibres in several samples (Fig. 8).

Contextual/functional analysis

In six cases out of twelve, textile traces are present on fibulae, all of which were recovered from female burials and five of these are dated to the 8th–7th centuries BCE (Fig. 4, Tab. 1). In all likelihood, they are to be identified with the clothing of the deceased that was held together by the fibula. In all early specimens, textile traces are present on the iron pins of the fibulae, indicating that the latter were used to arrange and hold the garments on the bodies of the deceased. In the case of the fibula from Grave XIV/51 at Kapiteljska njiva (Fig. 5: 3), the pin clearly pierces the fabric. On the same artefact, cord and thread seem to have been used for repairing it: they are tied around the head of the fibula several times and then secured with multiple simple knots. In the case of the later

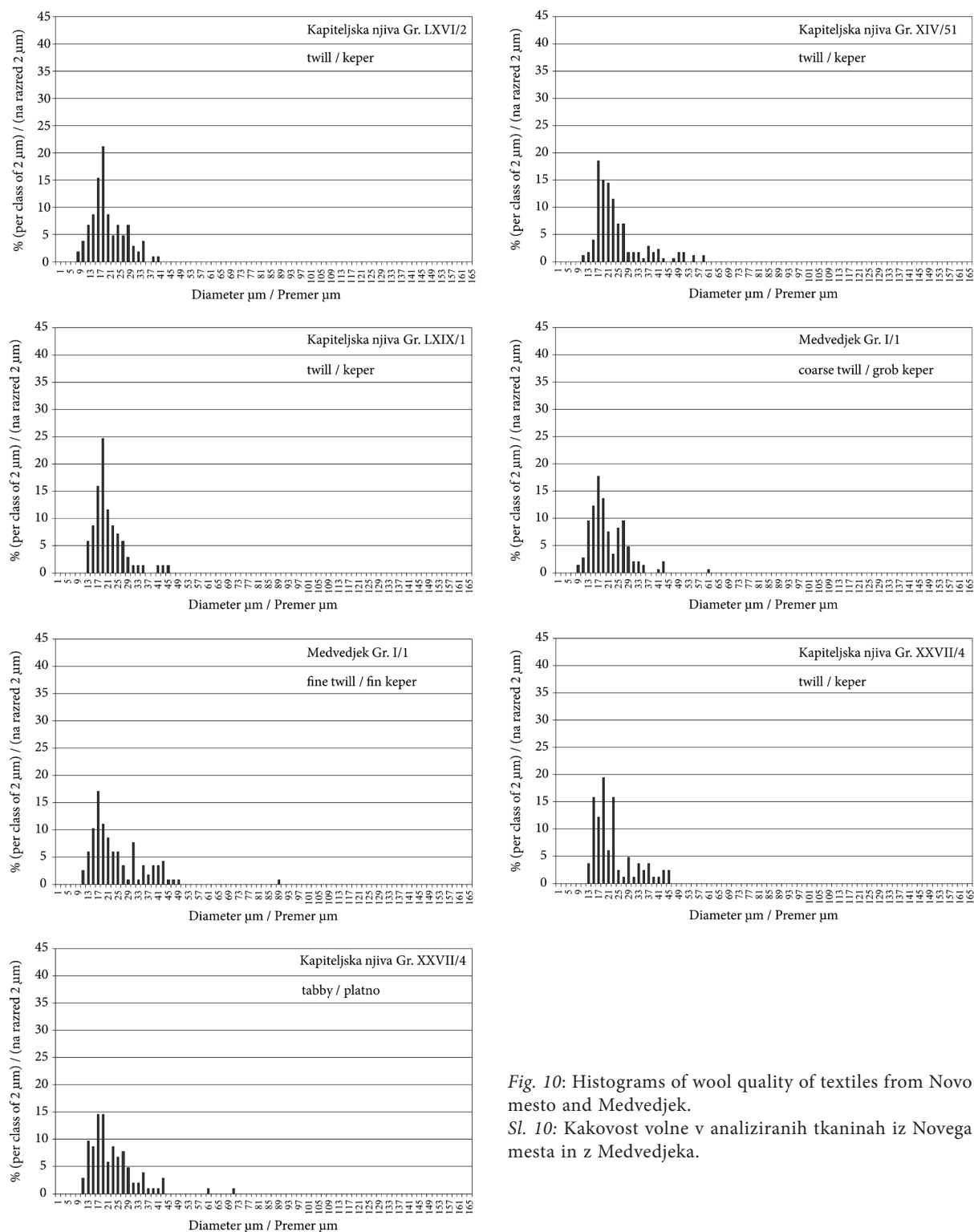


Fig. 10: Histograms of wool quality of textiles from Novo mesto and Medvedjek.

Sl. 10: Kakovost volne v analiziranih tkaninah iz Novega mesta in z Medvedjeka.

fibula from Kandija (Fig. 4: 10), textile traces are present on its external surface.

The remaining traces are associated with male burials. The belt plate from Medvedjek preserved a coarser twill on one side and a finer twill on the other (Fig. 5: 7,8), indicating at least two differ-

ent fabrics constituted the dress in this case, with the finer twill being on the interior of the plaque, that is closer to the body, if it was placed in the grave in the same position on the body as it would have been worn in when the owner was alive. The other four fabrics (found on the axe, spearhead,

Sample / Vzorec	Date / Datacija	No. fibres / Št. vlaken	Median / Mediana	Mode / Modus	Mean / Povprečje	SD / Standardni odklon	Range / Variacijski razmik	Rel. variab. ** / Relativna variabilnost **	Skewness of distrib. *** / simetrija porazdelitve ***	Ryder class. / Rayderjeva razvrstitev	Rast-Eicher class. / Rast-Eicherjeva razvrstitev
Kapiteljska njiva LXVI/2 twill / keper	8 th c. BCE / 8. st. pr. n. št.	105	19.3	19	20.9	6.67	8–41	0.32	0.72	GM	A
Kapiteljska njiva XIV/51 twill / keper	7 th c. BCE / 7. st. pr. n. št.	173	21.2	17	24.3	9.69	11–59	0.4	0.96	GM	AB
Kapiteljska njiva LXXIX/1 twill / keper	7 th c. BCE / 7. st. pr. n. št.	69	18.9	19	21.3	6.7	12–45	0.31	1.07	GM	A
Medvedjek 1/1 coarse twill / grobi keper	5 th c. BCE / 5. st. pr. n. št.	146	18.8	17	20.8	7.72	9–43, 61*	0.37	0.78	GM	A
Medvedjek 1/1 fine twill / fini keper	5 th c. BCE / 5. st. pr. n. št.	117	20.2	17	24.5	11.34	11–49, 88*	0.46	1.14	HM–GM	CD
Kapiteljska njiva XXVII/4 tabby / platno	Late 5 th –early 4 th c. BCE / pozno 5.–zač. 4. st. pr. n. št.	103	19.8	18	22.9	9.88	10–43, 61*, 71*	0.43	0.94	GM	A
Kapiteljska njiva XXVII/4 twill / keper	Late 5 th –early 4 th c. BCE / pozno 5.–zač. 4. st. pr. n. št.	82	19.9	19	22.8	8.22	12–46	0.36	1.06	GM	A

* Diameter outside the main range (outliers) / Skrajne vrednosti.

** Relative variability (coefficient of variation) = standard deviation/mean /
Relativna variabilnost (koeficient variacije) = standardni odklon/povprečje.

*** Skewness of distribution (Pearson's coefficient of skewness) = $3 \times (\text{mean} - \text{median}) / \text{standard deviation}$ /
Asimetrija porazdelitve (Pearsonov koeficient asimetrije) = $3 \times (\text{povprečje} - \text{mediana}) / \text{standardni odklon}$.

Tab. 2: Wool fibre quality of the textiles from Novo mesto and Medvedjek.

Tab. 2: Podatki o kakovosti volnenih vlaken pri analiziranih tkaninah iz Novega mesta in z Medvedjeka.

ringlet, and belt hook) are present on artefacts that constituted grave goods. They may have come in contact with these artefacts accidentally or were used to wrap them intentionally.

DISCUSSION

Wool twills constitute the most prevalent weave among the newly analysed textiles from the Dolenjska Iron Age sites of Slovenia. Only two tabbies are present, and both are among the chronologically latest finds examined. The threads are finely and regularly spun, with threads as fine as 0.2 mm in one case. In terms of weave quality, counted in threads per cm, the twills are quite balanced, with

both thread systems having more or less the same thread counts, which range between 8 and 22 threads/cm. Several of the twills display a spin or shadow pattern. They are comparable in quality to twill textiles from other Slovenian Iron Age sites, such as Vače and Magdalenska gora (Bender Jørgensen 2005, 143–145, Fig. 7; Lau 2022). The general uniformity of wool fibre quality suggests that all of these textiles were made from similar wool of likely local origin.

All the textile remains examined, with Kandija being the sole exception, are made of wool, which, given the current results of research into the Early Iron Age settlement in Dolenjska, is not surprising, since flax grains (*Linum usitatissimum*) were found only at Cvinger above Dolenjske Toplice

(Culiberg, Šercelj 1995, 170; Dular, Tecco Hvala 2012, Fig. 119), while the share of sheep and goat among farmed animals is almost 25% at all sites (Dular, Tecco Hvala 2012, Fig. 120).

We have a good overview of textiles found in graves of the Hallstatt Culture: from Germany, we know of outstanding items deriving from aristocratic graves like Eberdingen-Hochdorf (Bank-Burgess 2012), Swiss and Austrian finds were also published in recent years (Rast-Eicher 2008; Grömer 2012). Additionally, there are catalogues of grave finds from the Eastern Hallstatt Culture (Bender Jørgensen 2005, 140–145). That allows us to understand which textile types and qualities were used in Central Europe during the Iron Age and how the finds from the Dolenjska region fit into this picture. Textile finds from continental Italy have been extensively investigated in recent years and point to the same textile culture (Gleba 2017a; 2017b).

Generally, there are distinct differences between the twills in the East and the West of the Hallstatt Culture (Bender Jørgensen 2005, Fig. 1; Grömer 2012; Grömer et al. 2013). In the West, especially Southern Germany and Switzerland, fine twills were usually woven with plied yarn in one thread system (usually warp) and single yarn in the other. In the East (e.g., Eastern Austria, Hungary, and western Slovenia) and in Italy, a textile type with single yarn, twill and spin pattern is the most characteristic. As such, the twills from the Dolenjska region are typical examples of the textile craft in the Eastern Hallstatt Circle and fit well in the broader, twill-based textile culture of Central Europe and Italy. The two later tabbies are likely weft-dominant and have 7–9/10–13 threads/cm. They compare well with La Tène period textiles from Austria and Slovakia (Grömer 2012; Belanova Štolcova 2012).

Material culture and burial customs suggest that, starting in the second half of the 6th century BCE, local communities of Dolenjska and especially Novo mesto are subjected to a wide variety of external

influences while keeping and emphasising continuity of settlement and burial ground. Textiles analysed in this paper suggest a similar trend. The later part of the Early Iron Age, compared to previous classic Hallstatt features, shows a change in the twist direction and apparent lack of spin pattern. Both textiles identified as tabbies, also belong to this period. However, at the same time, wool quality appears rather homogeneous. It means that raw material was probably the same or similar, but its selection and processing were different up to the level of weaving. Some of these choices were certainly made to fit the intended purpose of the textile (belt, outer or inner garment, etc.), but others may carry a chronological value. Textiles from Novo mesto fit the model in which a strong and resilient local community transforms to adapt to influences from other regions, one of them being new textile production techniques. They resist profound and abrupt changes that affected the rest of the Eastern Hallstatt Circle coming from the east and at the same time adopt influences coming from the west where La Tène Culture is growing into new cultural and 'industrial' standard for craftspeople in Central Europe and beyond.

Acknowledgments

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MG – concept, textile and fibre analysis, comparative data from Croatia, Bosnia and Italy; KG – textile analysis, comparative data from Slovenia and Austria; BK and PS – contextual data; HP – contextual and chronological analysis.

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Oblačila ljudi s situl: ostanki prazgodovinskih tkanin iz Dolenjskega muzeja v Novem mestu

Povzetek

Preučevanje tkanin iz starejše železne dobe je usmerjeno na izjemne predmete iz bogatih grobov z najdišč v Nemčiji, kot je Eberdingen – Hochdorf (Banck-Burgess 2012), po letu 2000 pa so bile objavljene tudi švicarske in avstrijske najdbe (Rast-Eicher 2008; Grömer 2012). Prav tako so na voljo katalogi grobnih najdb iz vzhodne halštatske kulture (Bender Jørgensen 2005, 140–145) in objave o najdbah tkanin iz celinske Italije (Gleba 2017a; 2017b), ki imajo enako tekstilno strukturo kot tukaj predstavljene najdbe z dolenskih najdišč. S temi objavami se zaokroža védenje o vrstah in kakovosti tkanin, ki so jih izdelovali in uporabljali na območju srednje Evrope v železni dobi.

Gradivo

V raziskavo so zajeti predmeti z ohranjenimi ostanki tkanin iz posameznih grobov s Kapitelske njive, Mestnih njiv in iz Kandije v Novem mestu ter gomile 30 z Ivanca pri Družinski vasi in gomile 1 na Medvedjeku (*sl. 1; 4; 5; tab. 1*), ki jih hrani Dolenjski muzej v Novem mestu.

Metodologija

Večina železnodobnih tkanin v Sloveniji se je ohranila kot mineraliziran ostanek na železnih ali bronastih predmetih v grobovih. Mineralizacija tekstila v grobu se zgodi zaradi kombinacije kemičnih in fizikalnih procesov, ki povzročijo zamenjavo organskih komponent z anorganskimi. Tako se ohranijo pozitiven ali negativen odtis tkanine in njene fizikalne lastnosti, na podlagi česar je mogoče izvesti tako strukturno analizo tekstila kot identifikacijo vlaken.

Strukturna analiza tkanin

Namen strukturne analize tekstila je določiti kulturno in kronološko relevantne značilnosti analiziranih tkanin. Analiza vključuje določanje strukturnih parametrov, kot so vrsta tkalske vezave (platno, keper), gostota niti (pokazatelj kakovosti tekstila), smer sukanja niti (z – v smeri urnega ka-

zalca, s – v nasprotni smeri urnega kazalca, i – ni opaznega sukanja, * – spajanje oz. podaljševanje), premer niti in druge posebnosti, denimo robovi, vzorci, šivi ipd. (*sl. 2, 3*) (Emery 1966).

Analiza vlaken in kakovosti volne

Z analizo vlaken, uporabljenih za izdelavo tekstilne preje, smo želeli ugotoviti, ali so bila rastlinskega ali živalskega izvora, ob morebitni dobri ohranjenosti pa tudi določiti uporabljeno rastlinsko ali živalsko vrsto. Opredelitev vlaken pomaga razumeti njihovo obdelavo in mikroskopsko strukturo niti, to pa omogoča razlikovanje med različnimi metodami izdelave niti, kot sta sukanje in podaljševanje niti.

Identifikacija vlaken se običajno izvaja z mikroskopiranjem in temelji na primerjavi arheoloških vzorcev z znano referenco. Pri mineraliziranih tkaninah se vlakna lahko ohranijo kot negativni (najpogosteje v stiku z železom) ali pozitivni odtisi (bolj razširjeno pri bronu).

Analize kakovosti volnenih vlaken se uporabljajo za določanje tipa runa prazgodovinskih ovc, kar omogoča primerjavo s sodobnimi ovcami, zlasti tako imenovanimi primitivnimi ali neizboljšanimi pasmami, in vodi do spoznanj o starodavnih pasmah (pregled v Skals et al. 2018). Runo je sestavljeno iz zunanje resaste dlake (premer več kot 100 mikronov) in nadlanke (premer več kot 60 mikronov) ter mnogo finejše podlanke. Ocena kakovosti vlaken temelji na tehniki iz sodobne tekstilne industrije – ta je sestavljena iz merjenja premera 100 vlaken na nit in statističnih analiz, katerih rezultat je porazdelitveni histogram.

Kronologija

Analizirano gradivo sega v čas od začetka starejše do začetka mlajše železne dobe (8.–4. st. pr. n. št.). V zapletenem svetu sprememb lahko tekstilije obravnavamo kot enega od pomembnih označevalcev identitete tedanjih skupnosti.

Rezultati

Raziskovali smo ostanke tkanin na 11 predmetih iz desetih grobov s petih najdišč (*tab. 1, sl. 4, 5*). Posebnost je košček tkanine (*sl. 5: 5*) iz groba 30/4 v Družinski vasi, ki ni bil sprijet s kovinskim predmetom, kot je sicer običajno. V enem primeru (Medvedjek) sta bili na istem predmetu najdeni dve tkanini (*sl. 5: 7,8*), v drugem primeru (grob XXVII/4 s Kapitelske njive) pa so bili na predmetih iz istih grobov sledovi različnih tkanin (*sl. 5: 10,11; tab. 1*).

Na niti enem fragmentu se niso ohranili robovi, šivi ali drugi strukturni elementi, ki bi omogočili določitev smeri osnovnih niti ali smeri votka (opredeljena kot nitni sistem 1 in nitni sistem 2), zato se razprava nanaša na vrsto tkalske vezave in lastnosti niti obeh sistemov.

Tekstilno tkanje

Na analiziranih ostankih smo prepoznali dve vrsti vezave, platno (*tabby*, platno) in keprovo (*twill*, keper). Platnena vezava je ena najzgodnejših struktur, tkanih na statvah. Gre za najpreprostejšo tekstilno vezavo, ki jo je mogoče doseči z dvema sistemoma niti na statvah, s pasivno osnovno in aktivno votkovno nitjo, ki se izmenično križata. Platneno vezavo lahko v raziskanem gradivu razdelimo na uravnoteženo in prevladujočo različico. Uravnotežena ima približno enako število osnovnih in votkovnih niti na enoto dolžine. Različice s prevladujočim votkom imajo več votkovnih kot osnovnih niti na enoto dolžine, pri različicah s prevladujočo osnovo pa je razmerje obrnjeno. Pri keprovi vezavi potekajo vodoravne votkovne niti čez navpične osnovne niti in pod njimi v pravilnem zamaknjenem vzorcu (pri kepru 2/2 vsaki dve niti v obeh sistemih), pri čemer je vsaka vrsta zamaknjena za eno nit, kar ustvarja diagonalni videz.

Dve tkanini (na sulični osti iz groba XXVII/4 s Kapitelske njive, *sl. 5: 11*, in na bronasti fibuli iz groba III/1 iz Kandije, *sl. 5: 12*) sta bili prepoznani kot platno, verjetno s prevladujočim votkom, čeprav se robovi, ki bi nam pomagali prepoznati osnovo in votek, niso ohranili. Njihova kakovost je podobna. Gostota niti v nitnem sistemu 1 je na tkanini s Kapitelske njive 7 niti na cm in na tkanini iz Kandije 9 niti na cm, gostota v sistemu 2 pa na prvi 10 niti na cm in na drugi 13 niti na cm. Oba ostanka tkanine segata v latensko obdobje.

Preostalih deset tekstilij je bilo prepoznanih kot keper 2/2, pri eni gre verjetno za ševron (fibula iz groba LXVI/2 s Kapitelske njive, *sl. 5: 1*). Pri tem se

smer diagonalnega kepra spreminja v enakomernih intervalih in ustvarja vzorec (*sl. 5: 4*). Morda je šlo pri drugih tekstilnih izdelkih prvotno za bolj zapletene različice kepra, a so ohranjeni koščki premajhni, da bi omogočili dokončno identifikacijo. Vse tkanine so podobne kakovosti. Gostota tkanja se giblje od 8–10 do 20–22 niti na cm, čeprav se večinoma združujejo na bolj grobem ali finejšem razponu (*sl. 6*). Tako grobi kot fini kepri zajemajo celoten kronološki spekter, ki ga tukaj preučujemo.

Vrvica in nit sta dokumentirani tudi na fibuli iz groba XIV/51 s Kapitelske njive (*sl. 5: 3*). Zdi se, da sta bili uporabljeni za popravilo zapiralnega mehanizma.

Struktura preje

V analiziranem gradivu sta prepoznani dve vrsti preje: enojna in sukana iz več niti (*Tab. 1*). Vrvica in niti platna na čolničasti fibuli (Kapitelska njiva XIV/51) so sukane, vrvica je S2z, medtem ko je platnena vezava na železni sulični osti iz groba XXVII/4 s Kapitelske njive (*sl. 5: 11*) Z2, pri čemer smeri sukanja enojne niti ni mogoče določiti.

V vseh drugih primerih je bila uporabljena enojna preja, vendar je zaznati razliko v smeri sukanja, kar je lahko kronološko pomembno.

Premeri niti segajo od 0,2 do 0,7 mm, pri tkanini na fibuli iz groba XIV/51 s Kapitelske njive pa premer niti doseže 1 mm (*sl. 5: 1; 6*). Tako niti platnene kot tudi keprove vezave imajo premer med 0,5 in 0,7 mm, le niti kepra na obročku iz groba XIV/7 s Kapitelske njive (*sl. 5: 9*) so veliko bolj fine (0,2 mm).

Analiza vlaken

Vzorčenje za analizo vlaken je bilo mogoče izvesti pri 10 tkaninah, pri preostalih dveh pa bi ogrozilo predmet. Odtisi vlaken so bili bolj ali manj dobro ohranjeni, večinoma kot negativni. Pri vseh primerih razen pri enem je surovina ovčja volna, na kar kažejo značilne kutikularne luske (*sl. 8*) in analiza kakovosti vlaken. Platno na fibuli iz groba III/1 iz Kandije (*sl. 5: 12*) je izdelano iz rastlinskih vlaken, morda lanu (*sl. 9*), njihov povprečni premer je 15 mikronov (razpon 19 izmerjenih vlaken je 10–19 mikronov).

Analiza kakovosti volne

Kakovost volnenih vlaken je bilo mogoče analizirati pri sedmih vzorcih. V vseh primerih odraža celotno tkanino, saj osnovnih in votkovnih niti ni bilo mogoče raziskati ločeno. Razen pri dveh vzorcih je bilo v vseh preostalih primerih izmerjenih

več kot 100 premerov vlaken (*tab. 2; sl. 10*). Med kronološko zgodnejšimi in poznejšimi vzorci ni opaziti občutnejših razlik. Histogrami vseh vzorcev so pozitivno asimetrični.

Kakovost volne se med vzorci zdi precej homogena (povprečni modus znaša 18 mikronov, mediana 19,7 mikrona, srednji premer je 22,5 mikrona, celoten razpon 9–49 mikronov z le nekaj odstopanji nad 50 mikronov in nobenim nad 88 mikronov). Vsi histogrami so pozitivno asimetrični. Rezultati kažejo na podobno surovo runo v vseh primerih, vendar spremenljivo izbiro in predelavo surovine. Kakovost volne ne pomeni nujno kakovosti tkanine, kar dokazujeta tkanini na pasni sponi z Medvedjeka (bolj grob keper je izdelan iz bolj obdelane volne; *sl. 5: 7,8*).

Na predelavo volne (verjetno česanje) kaže tudi nasprotna smer lusk v sosednjih vlaknih pri več vzorcih (*sl. 7*).

Kontekstualna in funkcionalna analiza

V šestih primerih od dvanajstih so sledi tkanin ohranjene na fibulah (vse iz ženskih grobov, pet jih je iz 8.–6. st. pr. n. št.). Sledi smo našli na železnih iglah fibul, kar kaže, da so te služile za spenjanje oblačil. Pri fibuli iz groba XIV/51 s Kapiteljske njive (*sl. 5: 3*) igla nedvomno prebada blago. Zdi se, da sta bili na istem predmetu vrstica in nit uporabljeni za popravilo (večkrat sta zavezani okoli glave fibule in nato pritrjeni z več preprostimi vozli). Pri poznejši fibuli iz Kandije (*sl. 4: 10*) so sledovi tkanine na njeni površini.

Preostali primeri so povezani z moškimi pokopi. Na pasni sponi z Medvedjeka (*sl. 5: 7,8*) se je na eni strani ohranil bolj grob, na drugi strani pa bolj fin keper, kar kaže na vsaj dve različni tkanini, pri čemer je bolj fin keper na notranji strani spone, tj. ob telesu. Preostale štiri tkanine so bile najdene na predmetih, ki so bili pokojniku pridani v grob. Morda so prišle v stik s predmeti po naključju ali pa so bili ti vanje zaviti.

Sklep

Na splošno so keper in njegove različice med najpogostejšimi vrstami vezave, vendar se kažejo očitne razlike med vzhodno in zahodno halštatsko kulturo (Bender Jørgensen 2005; Grömer 2012; Grömer et al. 2013). Na zahodu, zlasti v južni Nemčiji in Švici, so bili fini kepri običajno tkani iz sukane preje v enem sistemu (običajno osnova) in enojne preje v drugem. Na vzhodu, npr. v vzhodni

Avstriji, na Madžarskem in v zahodni Sloveniji, pa je značilnejša uporaba keprove tkanine z enojno prejo in tehnike izmenično uporabljenih niti z različno smerjo sukanja. V tej luči so tkanine, najdene v zadnjih desetletjih v skeletnih grobovih v velikih zemljenih gomilah na Dolenjskem, odličen primer tekstilne umetnosti vzhodne halštatske kulture, izstopajo pa po svoji kakovosti.

Vsi ostanki tkanin, z izjemo tistega iz Kandije, so volneni, kar ob trenutnih rezultatih raziskav starejše železnodobne poselitve na Dolenjskem niti ne preseneča, saj so zrna lanu doslej našli le na Cvingerju nad Dolenjskimi Toplicami (Culiberg, Šercelj 1995, 170; Dular, Tecco Hvala 2012, sl. 119), medtem ko je delež drobnice med rejnimi živalmi na vseh analiziranih najdišč skoraj 25-odstoten (Dular, Tecco Hvala 2012, sl. 120).

Nekateri opisani primerki spadajo med najkakovostnejše doslej znane tkanine iz starejše železne dobe v srednji Evropi. Niti so fino in enakomerno predene, v enem primeru debele le 0,2 mm. Po kakovosti tkanja, šteto v nitih na cm, so razmerna enakomerno tkane, oba sistema niti imata bolj ali manj enako število niti, to je 8–22 niti na cm. Več keprov prikazuje vzorec vrtenja ali sence.

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MG – zasnova, analiza tekstila in vlaken, primerjalni podatki iz Hrvaške, Bosne in Italije; KG – analiza tekstila, primerjalni podatki iz Slovenije in Avstrije; BK in PS – kontekstualni podatki; HP – kontekstualna in kronološka analiza.

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