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## Textile impressions on Trypillia culture pottery

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### Abstract

Due to the limited number of materials associated with textile production from the Neolithic and Eneolithic, especially with regards to Eastern Europe, the indirect remains from these processes present an important and valuable source of information. One source of information are textile impressions visible on pottery fragments. The aim of this chapter is to present the current state of research on textile imprints on Trypillia culture pottery, as well as discuss the results of microscopic analyses of new textile traces identified on ceramic vessels from the Trypillia culture site Verteba Cave (ca. 3951–2620 cal BC) in western Ukraine. As such, this chapter is intended as an introduction to further research on the still only partially recognized textile crafting of the Eneolithic Trypillia communities. This research identified three basic categories of textile-related products: pottery with intentional cord imprints, impressions of various types of non-woven textiles, and impressions from woven fabrics of varying thicknesses and densities. This study also highlights the issues concerning the use of textiles in the technological process of pottery manufacturing.

Keywords: textile impressions, pottery, Trypillia culture, textile production, early textiles

### 1.1. Introduction

Textile manufacturing is currently one of the least recognized production fields among Eneolithic Trypillia culture communities from the territory of contemporary Ukraine. Due to the almost complete lack of textile finds – single fragments of plied plant fibre yarns are known – the study of past fibre technologies in this archaeological context can only be traced on the basis of indirect evidence (Biloysko 2018; Burdo et al. 2010: 133). Apart from clay implements such as spindle whorls and loom weights, a significant and unique collection of associated finds related to textile production include textile impressions preserved on pottery. However, since the research of Trypillian material culture is dominated by the study of ceramics, this category of textile traces has not been comprehensively investigated so far.

Textile imprints identified on ceramic vessels were formed during intentional or unintentional contact between a textile product and a clay surface, and then hardened during the firing process. The idea behind using textiles in pottery making can be interpreted in two ways: for decorative purposes, resulting in the so-called ‘cord’ ornament or during the technological process, for example as textile

wrappings, materials used during the shaping as a simple type of rotary tool, as a support for drying, transporting unfinished products or for finishing the surfaces (Doumani and Frchetti 2012; Drooker 2000: 59–68; Grömer and Kern 2010: 3136–3145; Rammo 2017: 111–119; Skrzyniecka 2020: 231–258).

This chapter aims to present the current state of research on textile impressions on Trypillia culture ceramics, as well as to discuss the results of microscopic analysis of a new set of imprints identified on Late Trypillia pottery from Vertebea cave, western Ukraine. The study focuses on the technological analysis of the structural features of impressed products in order to determine the type and quality of the textiles used. The research presented here is a part of a doctoral thesis, which generally focused on identifying and assessing the stage of technological advancement of textile production in Trypillia culture.

## 1.2. State of the research

Studies of textile imprints on Trypillia culture ceramic fragments published since the end of the 1940s indicate that different types of products were used in the pottery making process (Kordysh 1951: 98–112; Novitskaya 1948: 44–61; 1960: 33–35). These papers present research results from several late Trypillia culture sites, such as Stina, Petreny, Bernashivka, Yaltushkiv, Chechelnyk, Bilyi Kamin, and Biały Potok (Kosakivskiy 1998: 41–43; 2001: 17–19; Kosakivskiy et al. 1998: 29–40; Makarevich 1960: 23–32; Sikorski 2017: 365–389).

The analyzed imprints, most of which are classified as ‘technical’ textile traces, are almost exclusively located on the bottom of the vessels and are interpreted as remnants of materials used to support and shape the pots, or as a textile pad to set the vessel on to dry prior to firing (Kordysh 1951: 98–99; Kosakivskiy 2004: 92–95). Raw material identification is based solely on textile impressions, and therefore may pose difficulties. However it is presumed that the most common impressions were the result of plant fibres such as hemp, as possible seed imprints were discovered on the clay floor of Trypillian dwellings (Kordysh 1951: 112). The use of wool may also be possible, although there is no direct evidence of using animal fibres in Trypillia culture (Burdo 2004: 532).

As part of this research, four basic imprinted textile categories have been registered so far. The first and the most numerous category includes impressions made with the close twining technique, using two active threads; this is described in literature as kilim technique or rep weave. Textiles belonging to this type were made of coarse 0.8 to 1.9 mm thick yarns, using either right- or left-ply threads, with a thread count ranging from one to eight threads per cm (Kosakivskiy et al. 1998: 29–40; Kosakivskiy 1998: 41–43; 2001: 17–19).

The second group consists of impressions of textiles made in simple tabby, in balanced and weft- or warp-faced weave. The structural features of textiles in this category are characterized by great diversity in terms of fabric density and yarn diameters. The thread counts range from three to twelve threads per cm, and identified yarn imprints ranged from coarse yarns ca. 1.9 mm thick, to rather fine materials ca. 0.5 mm thick. Two textile impressions, from the sites of Stina and Yaltushkiv, are interpreted as made using patterned textiles, woven by alternating twining and tabby weave. No starting borders or selvages have been identified so far (Biloysko 2018; Kosakivskiy et al. 1998: 29–40; Novitskaya 1960: 33–35; Sikorski 2017: 365–389).

The third category are impressions of non-woven textiles made with netting or needle looping techniques. There are two variants of this type of product, with the first possibly made using simple needle looping and the second using twisted looping or needle netting techniques, which according to the information from literature could be made with the use of different tools (Kosakivskiy et al. 1998:

36–39; Novitskaya 1948: 45–57). It is also worth noting that similar impressions are found on the bottoms of vessels originating from the Cucuteni culture, in the western part of the Cucuteni-Trypillia cultural complex, and are generally interpreted as made using nålbinding technique (Marian and Bigbaev 2008; Mazare 2011; Petrescu-Dimbovița and Văleanu 2004: Fig. 289–291).

The last group includes imprints of different kinds of plaitings and basketry products. While coiled material stitched in a spiral and twined represent the dominant technique in this category, different types of techniques such as the afore-mentioned needle netting or looping around a core are also considered possible (Biloysko 2018; Kosakivskyi et al. 1998: 29–40; Sikorski 2017: 365–389).

### 1.3. Vertebea Cave

The Vertebea Cave site is located near Bilcze Złote village, which lies on the eastern bank of the Seret river, in the Ternopil province of the Volhynian-Podolian Upland in western Ukraine (Figure 1). The site, considered to be a place dedicated to ritual practices, is located in a gypsum cave and constitutes a part of an expansive Miocene gypsum karst (Kadrow 2013: 23–28; Ledogar et al. 2018). Excavations in Vertebea Cave have been conducted intermittently since the end of the 19th century and resumed in the second half of the 1990s. Materials obtained during the fieldwork are housed at the Archaeological Museum in Kraków, Poland, and the Regional Museum in Borschiv, Ukraine. The collection of artefacts from the site and the neighbouring settlement are considered one of the largest assemblages of Cucuteni-Trypillia complex materials documented so far (Kadrow et al. 2003; Nikitin et al. 2010; Ledogar et al. 2018). In addition to a large amount of human skeletal remains in association with faunal bones, the collection also includes thousands of potsherds, whole vessels, numerous examples of anthropo- and zoomorphic figurines, flint, bone, antler, and stone objects, as well as textile implements – spindle whorls and loom weights (Nikitin et al. 2010: 9–18; Ledogar et al. 2018: 1–6).

Three chronological horizons fall into the habitation period of Vertebea Cave, during which the succession of at least three local groups took place: the Shipentsy, Koshilivtsy, and Kasperivtsy groups (started from the end of CI stage and ended during the CII stage of the Trypillia culture). According to radiocarbon dating, the site was inhabited by the Trypillia communities from the beginning of the 4th millennium BC to the first centuries of the 3rd millennium BC (Kadrow et al. 2003: 119–123; Nikitin et al. 2010; Ledogar et al. 2018: 141–158).

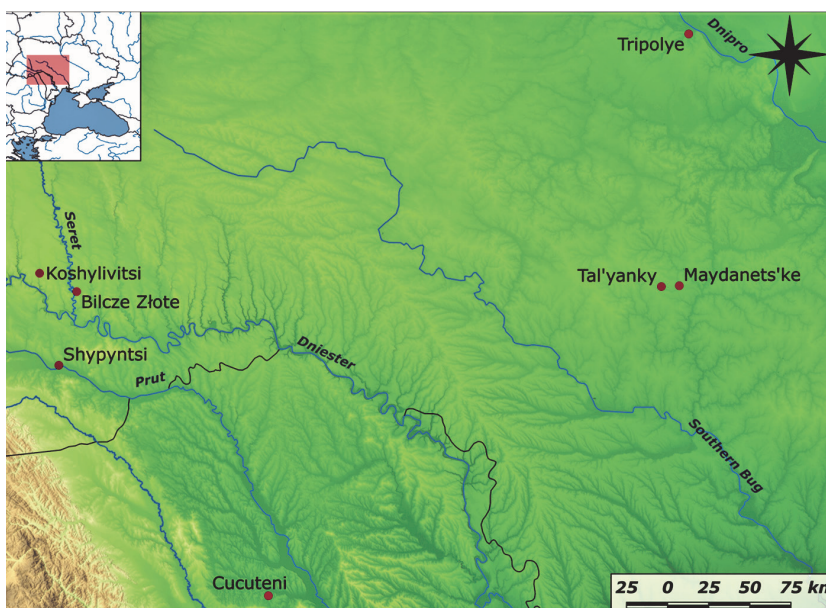


Figure 1. Location of Bilcze Złote. (Map: R. Skrzyniecki)

## 1.4. Materials and Methods

Thirty-one new samples with impressions of woven and non-woven textiles were identified and selected from the entire collection of Vertebe Cave ceramics materials. As indicated in previous studies, the analyzed imprints reveal traces of using ‘technical textiles’ during the pottery manufacturing process. In 30 cases, textile negatives were visible on the outer walls of the vessels’ bottoms, with some fragments intentionally covered with an additional layer of clay. The only exception was an imprint of the fabric which was registered inside the vessel wall, presumably created to better adhere and bond individual elements to create the pot (Figure 2; Skrzyniecka 2020: 248–249).

In addition, the so-called cord ornament on the Trypillia ceramics was also studied. For this purpose, microscopic analysis of 104 ceramics fragments with the previously mentioned types of decorative motifs was also performed (cf. Burdo et al. 2010: 122–134; Koško et al. 2010: 13–48).

The research followed standard analysis procedures for archaeological textiles and textile impressions, including a visual examination and microscopic measurements of discernible structural features of textiles such as twisting direction of yarns (reversed image), width measurements, twist angle, and thread count per cm (Grömer and Kern 2010: 3136–3145; Gleba 2017: 1206–1207). The microscopic investigation was carried out using a Keyence VHX-6000 digital microscope, with up to 100× magnification in the Laboratory of Microscopic Analysis and Archaeometry at the Faculty of Archaeology, University of Adam Mickiewicz, Poznań. Observations were complemented using high-resolution photography with side lighting and altering contrast settings in order to highlight the individual technological features of imprinted textiles. In addition, positive casts of self-hardening sculpting clay were also made on selected samples, and served as reference material during structural analysis and identification of the textile techniques.

In the case of textiles made in tabby weave, a characteristic over-and-under thread interlacing is observed. The weft- or warp-faced variant has one yarn structure which is covered by the greater density of the opposing one. However, similar, ‘dense’ imprints can also be obtained using twined textiles of twisted, paired yarns. Non-woven textiles, including looped structures, are much more difficult to identify. The checkerboard-like patterns in this case are not visible, and the imprint appears to be looser. Additionally, clear fibrous structure in the yarn imprint may indicate the use of plant-based raw materials (Grömer and Kern 2010: 3140–3144).

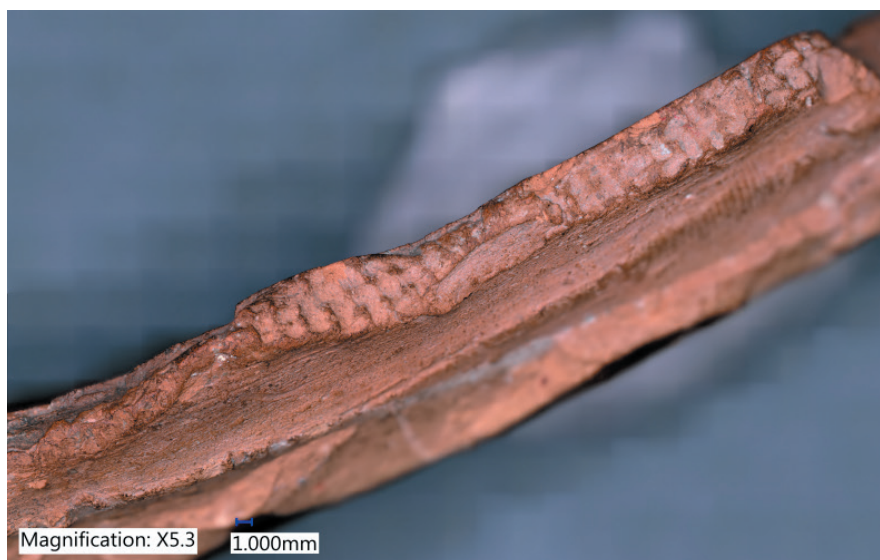


Figure 2. Tabby woven textile impression inside the wall of a ceramic fragment. (Image: W. Skrzyniecka)

Due to various types of deformation and shrinkage after impressing textile products onto wet clay and the firing process, all structural measurements from imprinted textiles constitute an approximate value. Experimental studies have confirmed that the reliability of information obtained during analysis also depends on the pottery fragments' state of preservation, as well as the type, admixture, quality, and moisture level of the clay used for making the vessels (Grömer and Kern 2010: 3136–3145; Ulanowska 2020: 414–415).

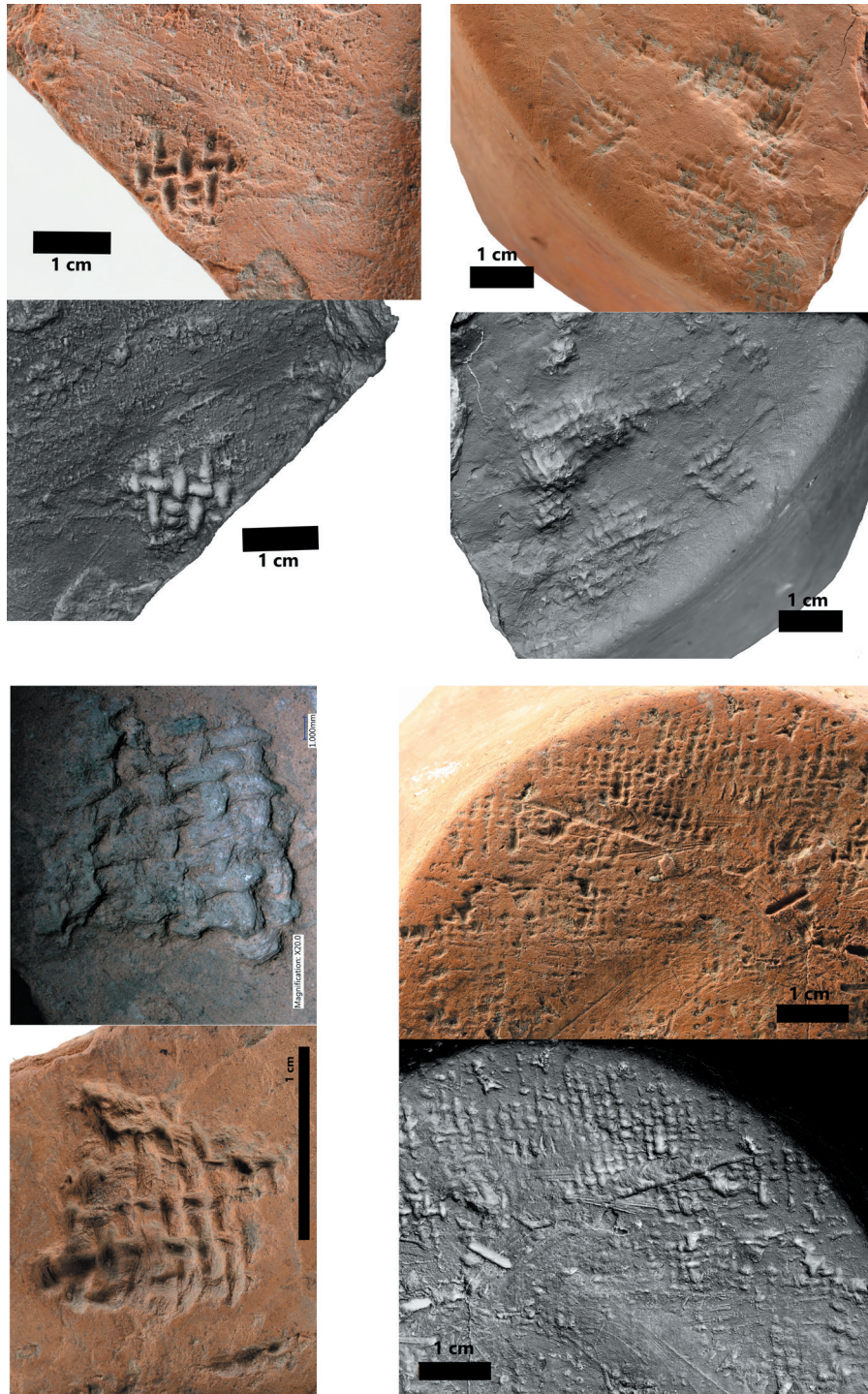


Figure 3. Textile impressions of balanced tabby weave. (Images: P. Silska and W. Skrzyniecka)

## 1.5. Results and Discussion

Twenty-five pottery fragments reveal traces of imprinted textiles woven using the earliest form of weaving – a tabby weave. In this impression category, there is a great variety in terms of fabric density and yarn diameters. There are examples of balanced (Figure 3) and weft- or warp-faced tabbies (Figure 4), with thread counts ranging from three to twelve threads per cm. Yarns were usually S-plied (visible as mirrored Z-plied in the imprint) however due to the state of preservation, the twist direction could not be identified in each of the analyzed samples and threads systems. In addition, no discernible twist in single-thread elements was identified, which may suggest thread production utilizing splicing instead of draft-spinning.

The diameter of the coarsest yarns was about 2.0 mm, while the finest ones measured approximately 0.5 mm thick, with an average of 0.8 mm thick. One exception was a slightly visible negative of cloth registered on the bottom of a small vessel, possibly made in fine, loose tabby with 0.2 mm thread diameter and 7–8 threads per cm. No starting borders or selvages have been identified, which makes it impossible to clearly distinguish the weft and warp systems. It is also worth mentioning that traces of missing and loose threads were also observed on the imprints, which may indicate the use of partially damaged and reused clothes in the pottery making process.

Six registered impressions can be included in the category of non-woven and basketry products (Figure 5). There are textile impressions resembling partly stretched horizontal rows of cord-like

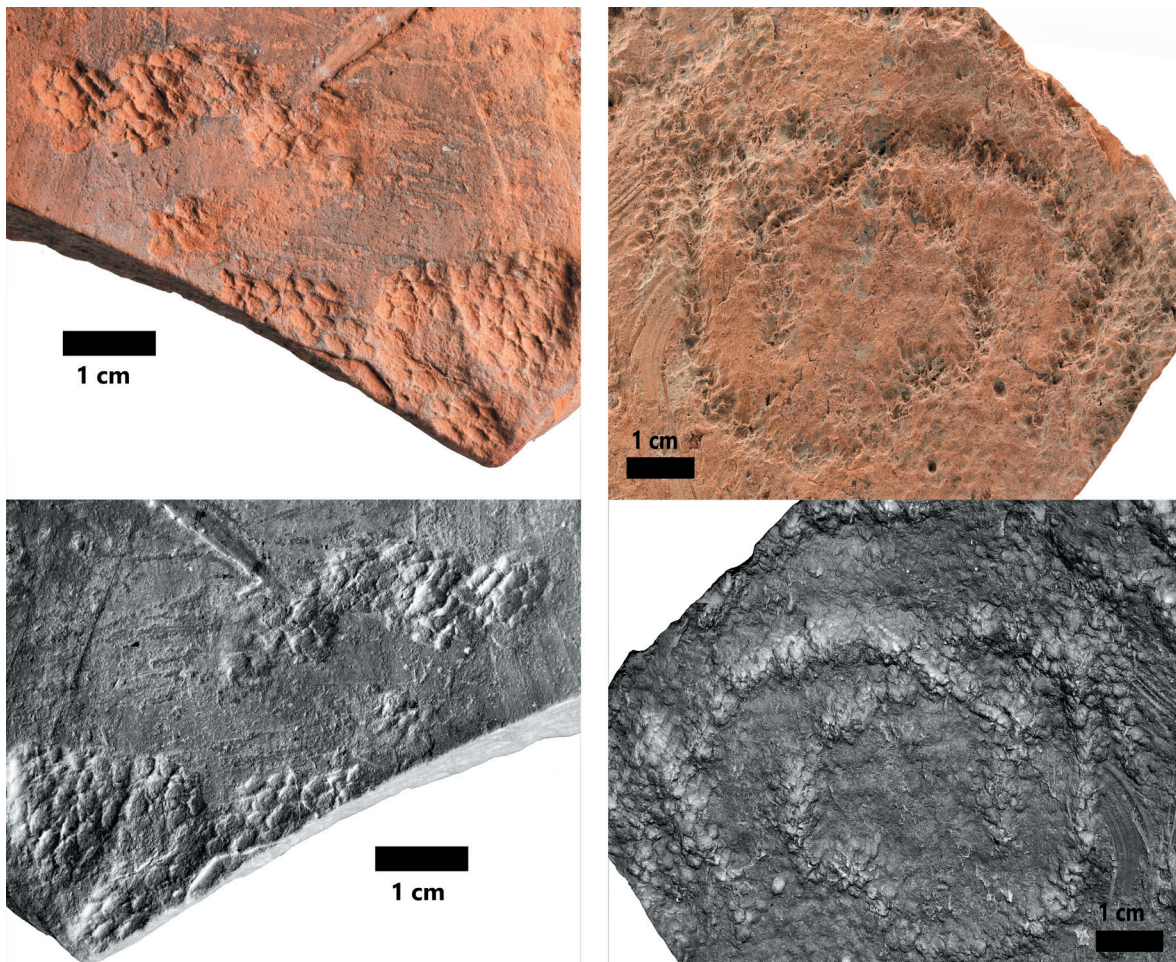


Figure 4. Textile impressions of warp or weft-faced tabby weave. (Images: P. Silska and W. Skrzyniecka)

imprints with dense structure. These products were possibly made with twining or simple needle loping techniques, with the use of S-plyed threads approximately 2–2.5 mm in diameter (Skrzyniecka 2020: 245). There are also examples of matting or basketry products made with a coiling technique. However, it must be noted that different non-woven textile techniques could potentially leave similar looking patterns on the vessel surfaces, and these methods are quite difficult to identify based solely on an imprint.

The results of cord impression analysis indicate that most of the twisted cord imprints, which are observed exclusively on Late Trypillia pottery, were created with precision and distributed evenly with the use of fine and tightly plyed cords. Imprints mostly derive from Z-plyed cord, which causes a mirrored S-plyed impression, regular in depth (Figure 6). The imprints range in width from 1.1 to 2.0 mm thick, and the twist count is between 4–6 twists per cm, with a twist angle of ca. 30–50°. There are also some coarser, irregularly twisted examples, with 2–3 twists per cm which measure more than 2.0 mm (3.2 mm) thick, with a twist angle measuring 20–40°. Visible, sharp, and clear fibre edges suggest that the products were most likely made of plant-based raw materials.

## 1.6. Conclusions

Utilizing microscopic analysis of Trypillia textile impressions on ceramics from Verteba Cave, these results expand our knowledge of the still barely-recognized textile production in this archaeological context. The identified diversity of textile techniques and technological features, both in terms of thread count and yarn diameters, indicates a need for products with a wide range of properties, as well as gives insight into the manufacturing skills of Trypillian communities. This study, taken into

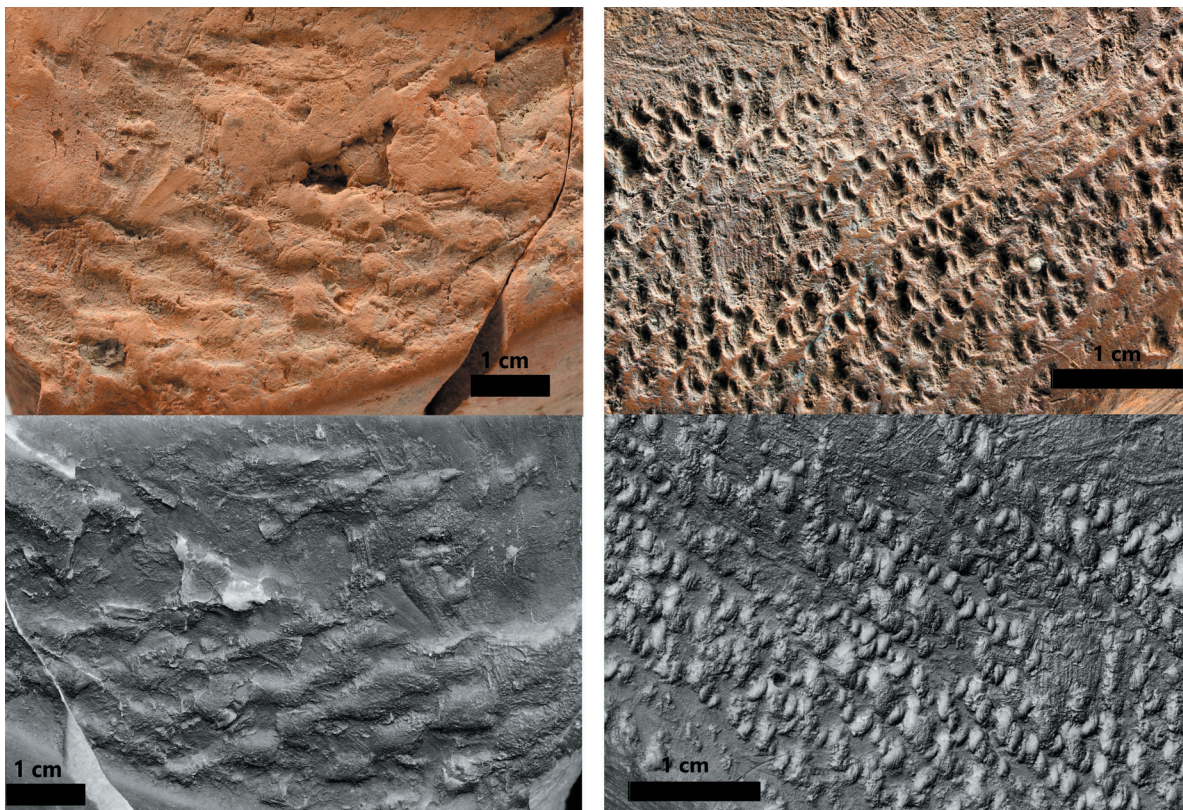


Figure 5. Impressions of non-woven textile products. (Images: P. Silska and W. Skrzyniecka)

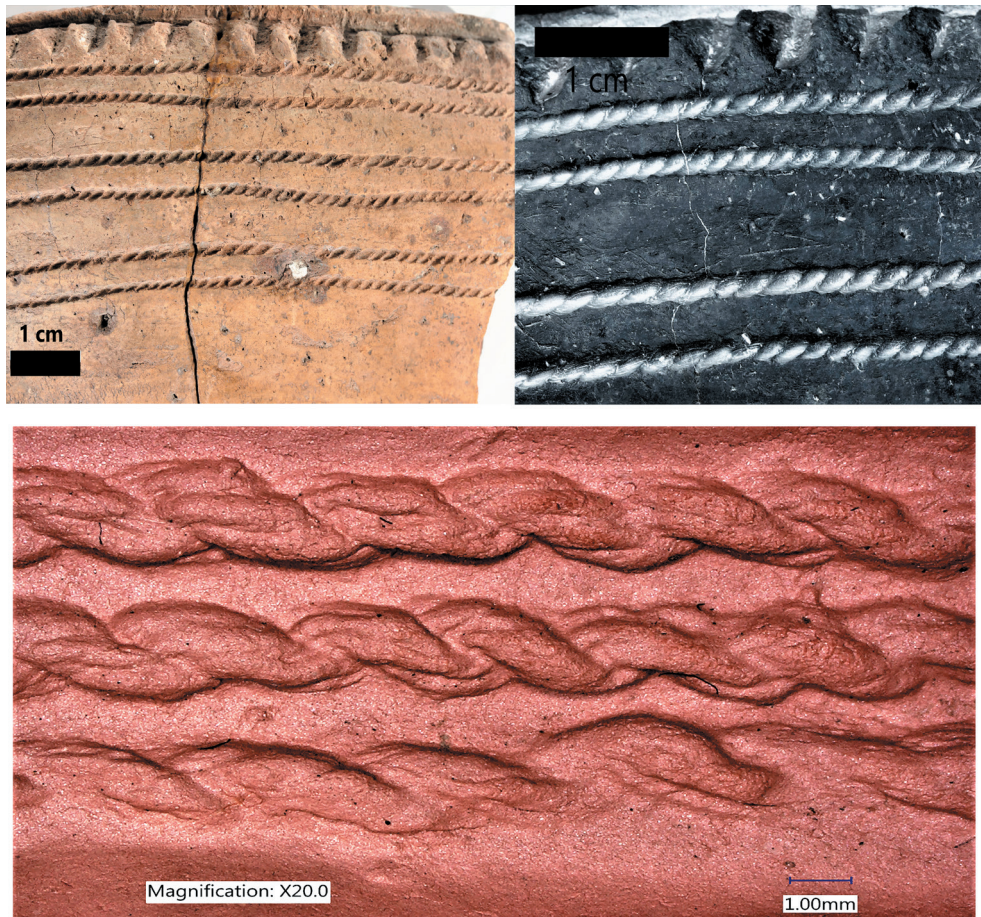


Figure 6. Cord impressions on pottery. Microscopic photography and positive cast. (Images: P. Silska and W. Skrzyniecka)

consideration with the associated loom weigh finds, indirectly confirms the production of loom-woven textiles in the 4th millennium BC in the territory of Eastern Europe. Moreover, the relatively high frequency of impressions shows that textiles, including woven fabrics, were important elements of the technological process associated with pottery making and thus commonly available and used by the Eneolithic populations of Trypillia culture (Chmielewski 2009: 226–233; Skrzyniecka 2020: 252–253). The amount of materials with textile imprints is continuously growing. The extended data pool will become sufficient for quantitative and qualitative identification of possible developmental stages of Trypillian textile production, and for new research focused on the comparative analysis of materials from the discussed zone and other textile finds from European Neolithic and Eneolithic contexts.

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