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## TEXTILE-IMPRESSED POTTERY REVISITED: ITS USEFULNESS FOR STUDYING BRONZE AGE TEXTILE CRAFT IN ESTONIA

### ABSTRACT

Although textile craft is a socially complex and economically significant phenomenon, little is known about textile techniques in the Bronze Age of the eastern shore of the Baltic Sea, including Estonia. No textile or cloth remains dated to the Bronze Age, *i.e.* between 1800 and 500 BC in the Estonian context, have been found so far. Only indirect evidence such as possible textile tools and impressions on pottery can be used in the study of textile-making. The aim of the present study is to review

the available evidence regarding Bronze Age pottery with patterns commonly described as made with textiles, and to systematise it. As a result, it is suggested that the evidence based on these impressions is even more limited than thought so far. Few finds clearly indicate the use of textiles. Regular patterns consisting of variously-shaped concavities on the vessels' walls may have been made also with other items, for example by rolling fir cones over the surface of a freshly-modelled pot.

### STRESZCZENIE

#### ODCISKI TEKSTYLIIÓW NA CERAMICE ZREWIDOWANE.

#### O PRZYDATNOŚCI ODCISKÓW W STUDIACH NAD RZEMIOSŁEM WŁÓKIENNICZYM W ESTONII W EPOCE BRĄZU

Chociaż produkcja włókiennicza miała istotne znaczenie społeczne i ekonomiczne, niewiele wiadomo o samych technikach włókienniczych w epoce brązu na wschodnim wybrzeżu Morza Bałtyckiego, między innymi w Estonii. Do naszych czasów nie przetrwały żadne wyroby włókiennicze z Estonii datowane na epokę brązu, czyli na okres 1800–500 p.n.e. W badaniach nad włókiennictwem mogą być zatem wykorzystane jedynie źródła pośrednie, takie jak pozostałości narzędzi włókienniczych i odciski wyrobów tekstylnych na ceramice. Celem artykułu jest przegląd oraz usystematy-

zowanie informacji dotyczących ceramiki z epoki brązu odciskanej wzorami określanymi powszechnie jako odciski tekstyliów. Wyniki analizy pokazują, że odciski tekstylne na ceramice występują rzadziej niż sugerowano do tej pory i tylko nieliczne wzory powstały z użyciem wyrobów włókienniczych. Regularne, powtarzające się wzory utworzone przez różnego rodzaju wgłębienia na powierzchni naczyń, mogły powstawać z użyciem bardzo różnych materiałów, na przykład poprzez toczenie szyszek jodły po ściankach świeżo wymodelowanego naczynia.

**Keywords:** textile impressions on ceramics, textile ceramics, Bronze Age, textile technology, East Baltic

### 1. Introduction

No textile remains dated to the Bronze Age (1800–500 BC) have been found so far in Estonia, and textile tools of the period are also rare in archaeological collections. Most numerous finds that could be related to textile-making are bone needles (Lang 2007: 139). No

other tools (*e.g.* spindle whorls) dated undoubtedly to the Bronze Age have been found (Vedru 1999: 109; Lang 2007: 137). So far, it has been claimed that the imprints on the ceramic vessels are the main evidence for textile production in the Neolithic and Bronze Age in present-day Estonia. The starting point for the study was to collect more information about textile techniques.

Therefore, the main emphasis was put on a more in-depth analysis of the textile impressions on vessels in order to acquire information about textile types used. In the course of the study, the focus shifted as it became clear that the regular patterns labelled as textile impressions were in fact not always made this way. Moreover, ‘textile ceramics’ as a phenomenon is not uniform and various different pattern groups can be distinguished. Were the imprints really made with textiles, *i.e.* products of fibrous raw material? How to distinguish between different patterns? How much can we still detect on the basis of these imprints about the textiles used?

The custom of finishing the surface of a pot with textile impressions has been a widespread phenomenon both in time and space (*e.g.* Drooker 2000; Özdemir 2007; Alipour *et al.* 2011; Mazäre 2011; Doumani, Frachetti 2012; Schaefer in this volume). Regular patterns resembling textile impressions were also common on Neolithic and Bronze Age pottery in the vast area of the north-eastern European forest zone (*e.g.* Lavento 2001: 20–43; Lang 2007: 128). Since the end of the Neolithic (*c.* 2700 cal BC), various pottery types have been thought to be related to this surface finishing tradition also in Estonia (Kriiska *et al.* 2005: 5; Lang 2007: 126–136). As the so-called textile impressions were used on various ceramic types and together with other treatments (striating, smoothing, and cord impressions), I define this custom as one of the possible finishing treatments of ceramics and do not use the term ‘textile ceramics’ (Lang 2007: 126). The custom disappeared in northern and western Estonia during the middle of the Pre-Roman Iron Age but prevailed in south-eastern Estonia until the advent of the Migration Period approximately in 500 AD (Lang 2007: 126).

Researchers have paid little attention to the textile impressions as a possible source of knowledge about textile technology in Estonia. However, it has been a focus of two previous studies by Silvia Laul and Jüri Peets (Laul 1966; Kriiska *et al.* 2005: 18–25, respectively). Both assume that the textiles used to make these impressions were made primarily from plant fibres and the main technique was plain weave, often with repp character. Also *nålebinding* technique was mentioned (Kriiska *et al.* 2015: 24). For the present study, especially enlightening were the experiments that had been carried out on the basis of similar potsherds found in Latvia and the Volga-Oka region (D’yakovo culture) (Dumpe 2006; Lopatina 2015, respectively).

## 2. Finds

For the present study 170 sherds with impressions were analysed; 12 of them were too vague to allow for a further study and were left out (Tab. 1). As the Bronze

Age was in focus, the study was based on the sherds from three settlements dated to the period: Asva (Fig. 1.1), Ridala (Fig. 1.2), and Iru (Fig. 1.3). The majority of the analysed finds come from Asva; a selection from other sites allows for a comparison and pointing out general trends. The finds are roughly dated to the beginning of the 1<sup>st</sup> millennium BC, *i.e.* the Late Bronze Age in the Estonian context (Sperling 2014: 219). According to Valter Lang, the sites listed above belong to a group called ‘enclosed settlements’ (or ‘fortified settlements’), because all these sites were separated from the rest of the landscape by natural or modest man-made fortifications (Lang 2007: 55). It has been suggested that the inhabitants of the sites occupied themselves with, among other activities, importing, reprocessing, and distributing metal (Lang 2007: 71).

‘Textile impressions’ occur on coarse ware, mainly pots, modest in terms of quality and meant for storage and food preparation (Lang 2007: 126; Sperling 2014: 217). The vessels were presumably modelled, as previously, by using the coiling technique (Kriiska *et al.* 2005; Lang 2007: 126; Sperling 2014: 199–205). ‘Textile-impressed’ ware was not very common; for example, less than 5% of the whole ceramic assemblages in Asva and Ridala were finished in this technique (Sperling 2014: 216). The ‘textile impressions’ were used together with other finishing methods, such as smoothing or striating (Lang 2007: 126). Mainly the exterior surfaces were covered with impressions, but occasionally bottom parts with a textile pattern occurred as well. Imprints would sometimes cover the entire walls of the pots, although more often they would reach as far up as the carina or the neck. The upper parts of the pots were frequently decorated with a row of circular pits or an impression of a cord.

## 3. Methodology

One of the main aims was to detect how and with what tools the patterns were made, and, therefore, the methodological focus was on a close study of selected samples. After a preliminary study and description of the patterns and their components, 158 sherds were divided into six typological groups (Tab. 1). After that, 32 samples were chosen for making casts and thorough microscopic studies (Tab. 2). Casts were made with the help of a modelling clay ‘Sculpey Original’ that was easy to use, so that the casts were detailed enough to enable an in-depth study. Moreover, after firing the casts, it was possible to preserve them for further research. However, a serious negative side-effect was contamination of the original sherds and, occasionally, oily stains on the surface.

A stereomicroscope (Nikon SMZ 1000) with up to 80× magnification was used. The main aim of the

Tab. 1. Distribution and types of impressions. Type 1 – tabby textile; type 2 – putative cord patterns; type 3 – round, oval, or rhomboid pits; type 4 – wavy diagonal rows; type 5 – sharp notches; type 6 – wedge-shaped grooves.

Site	No. of sherds	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6
<b>Asva</b>	136	3% (4)	16% (22)	36% (49)	32% (44)	11% (15)	2% (2)
<b>Ridala</b>	10	0	0	100% (10)	0	0	0
<b>Iru</b>	12	8.3% (1)	0	75% (9)	8.3% (1)	0	8.3% (1)
<b>Total</b>	158	3% (5)	14% (22)	43% (68)	28% (45)	10% (15)	2% (3)



Fig. 1. Location of the settlement sites mentioned in the text: 1 – Asva, 2 – Ridala, 3 – Iru (drawing by R. Rammo).

microscopy of the original finds was to describe particular elements of the regular patterns – shape and bottom of the concavities – to find traces of fibrous structures left by the presumed use of yarn. Another task was to detect two different yarn systems indicating possible weaving or braiding. Secondly, the casts were studied as well, and the results were examined side by side with the original finds. It is important to compare positive casts with original negative impressions to exclude possible errors caused, for example, by two different finishing treatments following each other. For example, the surface was sometimes striated after making the ‘textile pattern’ causing false impression of two alternating yarn systems on the cast.

#### 4. Identified impression types

The phenomenon referred to by other researchers under a broad term ‘textile impressions’ actually incorporates various types of patterns on pottery. A common trait in describing them all is a certain regularity: systematically placed, small concavities of various shapes, such as narrow and steep slots or round, oval, and rhomboid pits. In the course of the present analyses, it became clear that it is rather hard to relate these patterns to particular textile structures. While comparing with examples showing clear and easily-identifiable textile impressions known from other cultures (*e.g.* Alipour *et al.* 2011; Mazāre 2011; Doumani, Frachetti 2012), doubts arose whether textiles

Tab. 2. The catalogue of finds chosen for making casts and microscopic study.  
AI – Tallinn University, Archaeological Research Collection

Site	Cat. no.	Width 1 (mm)	Width 2 (mm)	Thickness (mm)	Type in the text
Asva	AI 3307: 172	48	40	11	2
Asva	AI 3307: 221	33	26	11	2
Asva	AI 3307: 318	61	38	12	2
Asva	AI 3307: 319	61	56	14	3
Asva	AI 3307: 319	40	35	10	2
Iru	AI 3428: 493	82	65	9	6
Iru	AI 3428: 630	30	26	8	3
Iru	AI 3428: 829	48	33	8	3
Iru	AI 3428: 1199	107	93	15	1
Iru	AI 3428: 1223	63	44	10	3
Iru	AI 3428: 1223	30	26	9	5
Iru	AI 3428: 1272	68	56	10	4
Asva	AI 3658: 328	44	36	10	3
Asva	AI 3658: 461	75	75	9	4
Asva	AI 3658: 561	60	51	14	3
Asva	AI 3658: 661	38	37	9	2
Asva	AI 3658: 670	44	33	11	3
Asva	AI 3799: 262	53	50	8	4
Asva	AI 3799: 378	40	35	12	3
Asva	AI 4012: 300	28	27	9	5
Asva	AI 4012: 317	33	27	8	4
Asva	AI 4012: 325	36	26	7	6
Asva	AI 4012: 347	47	45	10	4
Asva	AI 4012: 350	45	30	8	3
Asva	AI 4012: 356	65	52	8	5
Ridala	AI 4261: 20	42	35	10	3
Asva	AI 4366: 105	34	32	6	3
Asva	AI 4366: 312	92	67	13	3
Asva	AI 4366: 527	125	104	10	4
Asva	AI 4366: 557	144	120	20	1
Asva	AI 4366: 1512	79	65	13	3
Asva	AI 4366: 1789	70	62	12	3

were used to make these patterns. Not all patterns were made with textiles – actually only a few imprints were undoubtedly produced this way.

It seems that in the case of the Estonian samples, the pattern itself was not of a great importance because often the surfaces covered with impressions were carelessly smoothed or striated afterwards; occasionally, the imprints have even been entirely removed (*e.g.* Sperling 2014: 221). The main aim was probably to achieve a particular finishing of the pots' walls. It has been suggested that complex imprinting helped to weld clay surface together and to reduce irregularities (*e.g.* Holmes 1901: 400–401). The fact that the bottoms and the walls have been treated in different ways (see below) indirectly supports the functional purpose of the finishing against its purely aesthetic meaning.

A microscopic examination of the traces on the vessels' walls did not unambiguously prove that impressions were made by simply pressing a piece of textile against still pliable clay. Judging from the overall scratches on the surfaces, repetitions of the structures, and the runs of different pattern patches that occasionally change directions, it seems that the patterns resulted rather from rolling an item resembling a roulette over the surfaces of the modelled pots. This assumption has been confirmed by experiments made by various researchers (*e.g.* Dumpe 2006; Lopatina 2015).

#### 4.1. Tabby textiles (type 1)

Only one of the analysed impressions was definitely made with a woven fabric. The sample has clearly two basic sets of threads – warp and weft – and it represents a textile woven in the tabby weave (Fig. 2). Four more finds (AI 3428: 1199; AI 3658: 250, 718f; AI 3994: 601) bear traces that could have been made with a tabby tex-

tile, but the imprints are not clear enough to allow for a final conclusion. It is noteworthy that all imprints indicating tabbies are preserved on the bottoms of the vessels. Therefore, it is plausible that during the shaping process the bases of the pots were placed on surfaces covered with woven cloths or plaited mats. The weave of the first and the clearest of the said impressions seems to be well balanced with a count of approximately six threads per cm in both systems. The twist direction is z in the former and s in the latter system. The estimated thread diameter ranges between 1.0 and 1.4 mm. The other four textile imprints indicate a similar textile type: *c.* 3–5 threads per cm and a yarn diameter of between 0.7 and 1.8 mm. It seems that most common was the z-spun yarn in the first and s-spun yarn in the second system. However, it is rather difficult to prove that only single yarns were used; the yarns could have been also plied. Tabby textile fragments with similar technical characteristics have been found, for example, in contemporaneous sites in Scandinavia (*e.g.* Franzén *et al.* 2012: 353; Mannering *et al.* 2012: 97).

#### 4.2. Putative cord patterns (type 2)

Another type of impressions (14%), which was found only on the outer surfaces of the vessels' walls, consists of relatively narrow furrows that often have remarkably steep walls and sharp ends (Fig. 3). The furrows are in rows that are often clearly separated from each other. The ends of the furrows are more or less overlapping. The bottoms of the furrows sometimes bear a pattern of diagonal lines indicating the possible twist direction of a spun thread, although sometimes it is missing and instead the bottom is even or covered with mottled relief. The casts made from those sherds show rows which may at least partly belong to loosely

Fig. 2. Tabby imprint on the bottom of a coarse-grained vessel from Asva (AI 4366: 557) (photo by J. Ratas).  
The microscopic photographs of the imprint and the cast (8×) (photos by R. Rammo).





Fig. 3. Imprint of a pattern consisting of narrow furrows, possibly made with double-twisted cords (Asva, AI 3307: 172) or eaten fir cone carinas (photo by J. Ratas). The microscopic photographs of the imprint and the cast (8×) (photos by R. Rammo).

twisted two-ply cords. Baiba Dumpe (2006) has suggested on the basis of similar Latvian finds that the cord was wound around a stick and rolled over the surface of a pot. Another explanation for making these patterns is offered by Olga Lopatina (2005), whose experiments showed that fir cones, chewed by rodents or squirrels so that only carinas without seeds and scales are left, rolled over the clay can produce very similar traces.

#### 4.3. Regular pattern of round, oval, or rhomboid cavities (type 3)

The most common pattern (43%) on the vessels' walls were close-set diagonal rows of round, oval, or slightly rhomboid shallow pits (Fig. 4). The diameter of these concavities was *c.* 2–4 mm. Another common trait was that the pits were deeper and steeper on one side and, therefore, sometimes the pit was more similar

to a crescent. Usually, the pattern was very regular and concavities were placed densely. Nevertheless, sometimes the pits were organised in diagonal rows slightly apart from each other. No traces of a second yarn system (*e.g.* warp or weft) indicating twined or woven textile have been recorded.

The bottoms of these pits were mostly very smooth and without a fibrous pattern characteristic for spun yarns. Obviously, it is not a question of preservation, such as abrasion or wearing off. At least in one case, on the same sherd as pits, a single fine groove ran around the rim, and judging from the well-preserved diagonal lines on its bottom it had been clearly made with a single s-spun yarn.

At the present stage of research, no final conclusions can be made regarding the tools used to make such patterns. The most widespread interpretation is that the finishing treatment involved using a textile item either in the



Fig. 4. Imprint consisting of oval pits with even bottoms (Asva, AI 4366: 1789) (photo by J. Ratas). The microscopic photographs of the imprint and the cast (8×) (photos by R. Rammo).

twining technique or tabby weave of a repp character, in which one system is dominant and covers the other entirely (e.g. Laul 1966; Kriiska *et al.* 2005: 9–11). The second possibility could be rolling the cord over the pot surface (Dumpe 2006). Lastly, the possibility that similar impressions were not made with textiles but with some kind of stamps has also been suggested (e.g. Carpelan 1970).

Considering the possibility that these imprints were made with textile items, the smooth bottoms of the pits need explanation. It is possible that the raw material was not a fibrous spun thread but rather something wide and smooth. Therefore, also interpretations other than textiles should be considered in further studies and experiments. Once again, fir cones can be mentioned as a possible solution, only this time whole and fresh specimens. However, fir cones' scales admittedly bear a characteristic pattern which is not visible on the studied items.

#### 4.4. Other types of impressions on the vessels' walls

Out of 45 cases (28%; type 4), a single element of the wavy diagonal row had an arched shape which to some extent resembled traces made by fingernails. Another characteristic of these elements were double grooves (Fig. 5; see also Lopatina 2015: 166). Similar imprints on sherds have been interpreted as left by a textile made with the *nålebinding* technique (Kriiska *et al.* 2005: 20, Fig. 20; Sperling 2014: 218, Fig. 87). Lopatina convincingly showed that a very similar pattern could be produced with fir cones, whose scales and seeds had been partly removed (Lopatina 2015: Fig. 2; cf. Kriiska *et al.* 2005: Fig. 12).

Fifteen sherds were covered with a fine net of notches and grooves (type 5; Fig. 6). A common trait were two

parallel furrows that ended with a crossing notch. It is possible that these imprints were made with so far unidentified textile items because the grooves and notches can be interpreted as two different textile systems. However, probably it is possible to produce this kind of pattern also with items not made of textiles (cf. Lopatina 2015). Three specimens of 158 sherds (type 6; AI 3428: 493; AI 4012: 299, 325) had regular patterns of sparsely placed wedge-shaped grooves with steep walls and even bottoms that most likely had nothing to do with textiles.

## 5. Conclusions

The results of this preliminary study show that, contrary to a common scholarly assumption, only few impressions can undoubtedly be considered as made with textiles. Thus, the studied impressions on clay do not reveal much about textile techniques used in the Bronze Age. However, some conclusions can be pointed out. The few imprints actually made with tabby textiles, cords, and yarn are still almost the only and crucial evidence of cloth-making in the Bronze Age settlement sites of the region. The textile imprints do not allow for ascertaining what kinds of raw materials were used in textile production. Mostly, it has been suggested that these textiles were made of plant fibres such as tree bast or nettle, although wool cannot be totally excluded either (Kriiska *et al.* 2005: 24). It is clear that both *s*- and *z*-spun yarns were known, and plied cords were obviously produced as well. As the spindle whorls were not common until the Iron Age in Estonia, it is impossible to deduce how the yarns and cords were made. Obviously, it is possible to spin with a whorl of a perishable material or use a simple stick instead. Nevertheless, the relatively finely



Fig. 5. Imprint of type 4  
(Iru, 3428: 1272)  
(photo by J. Ratas).

The microscopic photographs  
of the imprint and the cast (8×)  
(photos by R. Rammo).

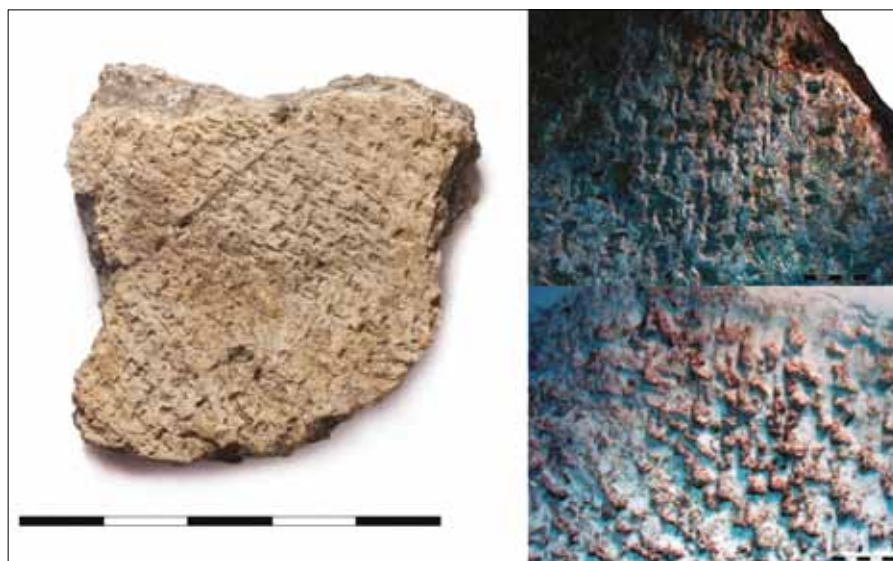


Fig. 6. Imprint of type 5 (Asva, AI 4012: 356) (photo by J. Ratas). The microscopic photographs of the imprint and the cast (8×) (photos by R. Rammo).

balanced tabby proves that looms and weaving were known, although considering the knowledge about textile production in the neighbouring areas, for example in Scandinavia (e.g. Franzén *et al.* 2012: 353; Mannering *et al.* 2012: 97), there was no reason to doubt it even earlier. Numerous bone needles may indicate that various netting and twining techniques were used as well, but such textiles were not used in ceramic production.

It seems that the aim of making the impressed patterns was mainly functional. Distinct impressions on the bottoms and the walls indicate different steps in pottery production. A tabby cloth or mat was used for covering the surface on which the vessel's bottom was formed, probably to prevent the clay from sticking. The finishing of the surfaces of vessels' walls with concavi-

ties might have been used to make clay more durable. Nevertheless, if one assumed that imitating textile structures with other tools was indeed the intention of ancient potters, a symbolic meaning of these imitations cannot be excluded either.

### Acknowledgements

I am grateful to Jaana Ratas for endless discussions and excellent photographs. This work was supported by Aalto University Nanon microscopy Center, the Estonian Research Council grant PUTJD661 and by institutional research funding IUT20-7 of the Estonian Ministry of Education and Research.

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