

Tradition and transition: the technology and usage of plant-fibre textiles in Estonian rural areas in the 11th–17th centuries

Riina Rammo

ABSTRACT

Numerous plant-fibre textiles are found from the 11th century onwards together with the spread of inhumation burials in Estonia. I analysed altogether 129 samples from 39 sites from the 11th century until the 18th century AD. The overview of the finds during this period gives a possibility to trace the technical development of plant-fibre fabrics and changes in their utilisation and value. It seems that there are almost no changes in the production and usage of these textiles in the course of the Late Iron Age and the Middle Ages. Plant-fibre textiles are all similar to each other and less frequent than the finds of woolen textiles. One reason for this is that the vegetal fibres preserve poorly in acidy Estonian soil; in addition different values of fabrics and their role as part of burial dress should be taken into consideration – the use of linen was different from that of wool. The situation changed at the end of the Middle Ages along with transformation of burial customs – including burial dress and ornaments – when the percentage of linen finds in comparison with those of wool grew remarkably. At the same time the production of these textiles transformed remarkably. This change obviously indicates the technical innovations related to the broader social transformations.

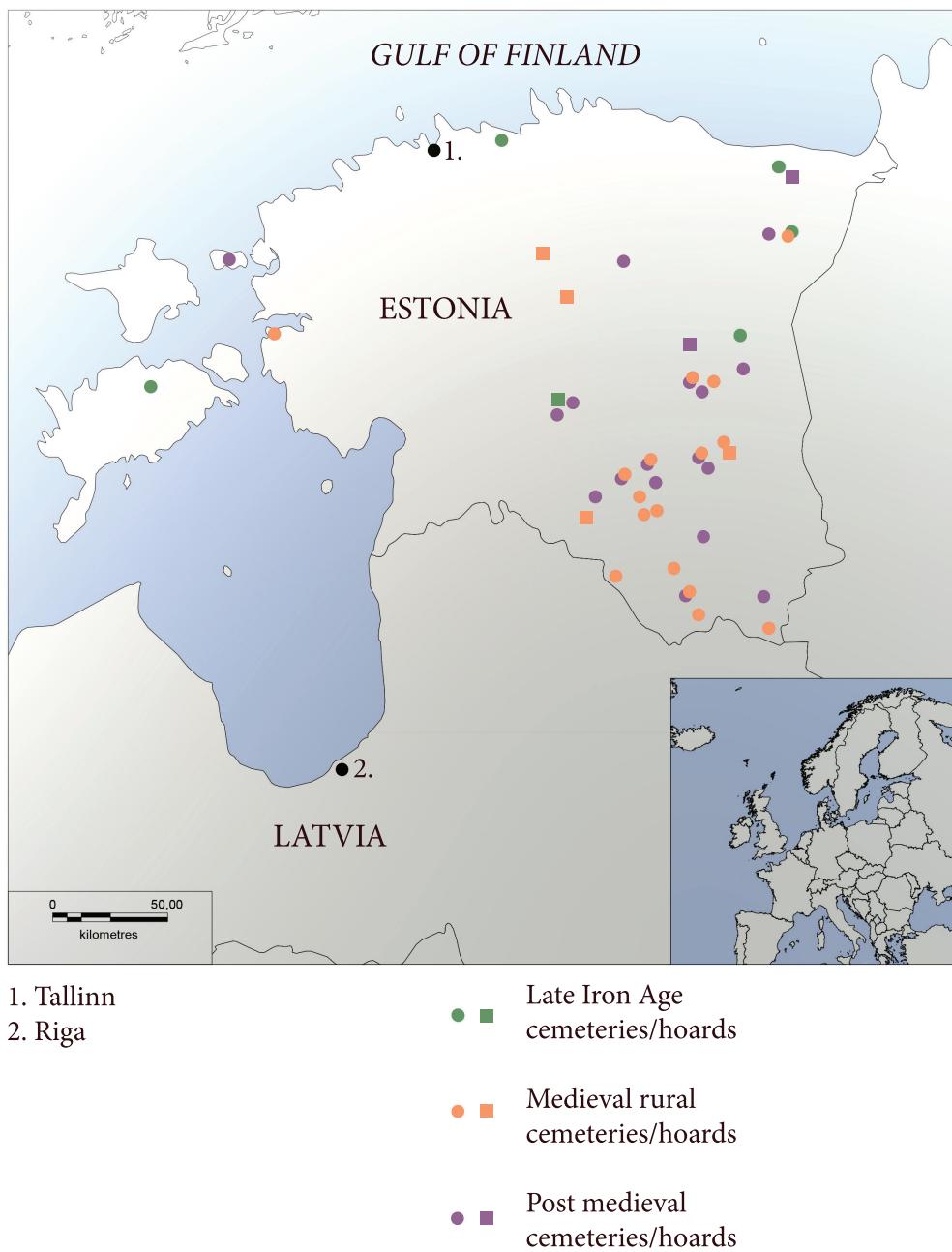
Keywords: plant-fibre textiles, weaving, looms

1. Introduction

The main aim of this article is to collate evidence for the history of the use of plant-fibre textiles found in Estonian rural areas from the 11th until the 18th centuries AD; i.e., across the long period comprising Late Iron Age, Medieval, and Post-Medieval Periods in the Estonian context. The use of plant-fibre fabrics is constant throughout this period, unlike that of wool, which changes from time to time. Almost all plant fibre fragments are tabbies made of z-spun yarns. The main point of discussion will be the traditions and changes during the long history of plant-fibre textiles in this period. Can a more detailed survey of these small scraps prove the continuity or is there a break in the pattern? What impact did new technical skills and tools, such as the looms that hypothetically were introduced in the course of this period, have on these textiles?

As said above, the survey encompasses a long span of time. The choice of time limits is based on the dates of the preserved finds. The first trace of using fibres of plant origin dates back to the Mesolithic era (9000–4900 BC in the Estonian context): this find is a fragment of fishing-net made of lime (*Tilia cordata*) bass (Indreko 1931; AI 2779). The earliest recorded evidence of the use of flax (*Linum usitatissimum*) for textiles in Estonia has been dated to the end of the 5th century AD. Two tiny fragments were discovered from a hoard of silver ornaments and following examination by microscope, they were identified as flax (Moora 1925, 113; AI 2489: 13). Unfortunately, these fragments have been lost.

Only since the 11th century did the finds of textiles, including the plant-fibre ones, become more abundant in Estonian contexts. One reason for this is the wider spread of inhumation burials replacing cremations in different Estonian areas at this time. The 18th-century finds are the youngest examples found in Estonian archaeological contexts. All the finds I am dealing with are from inhumation burials and hoards where the textiles have been in contact with metal objects (such as ornaments, tools etc.) and their conservative salts. The majority of the finds concentrate on the southern part of Estonia due to the more favourable conditions for preservation of organic materials (see Map 8).



Map 8. Placenames mentioned in the article of Rammo. Illustration: K. Vajanto.

Although archaeological textile finds have been extensively studied in Estonia, the researchers have so far concentrated more on the topics related with textiles of sheep wool (Peets 1987; 1992; 1993) and clothing (Laul 1990; Laul & Valk 2007, 49–68). The plant-fibre textiles that often preserve badly in comparison with wool and silk have received remarkably less attention (however, see Peets 1992, 92–97; Laul 2004). Recently, the textile finds of vegetable origin, so far more-or-less neglected by researchers, have attracted the attention of researchers in neighbouring countries as well (Žeiere 2010; Riikonen 2011).

2. Finds and methods

For the study, all known archaeological plant-fibre textile fragments in Estonian archaeological collections were examined. Altogether 212 finds of vegetal fibre from 44 sites were recorded. For further analyses, 129 fragments from 39 sites were selected (Appendix, Map 8) excluding extremely degraded pieces, imprints in the corrosion products around metal objects and single yarns.

The selected textiles were studied with a stereomicroscope and fibres of finds by a transmitted light microscope (magnification up to 400 \times). All samples had to be clearly classified as plant fibres. It is quite easy to distinguish the fibres of vegetal origin from, for example, animal hairs and silk, but much harder to differentiate between different species of various fibre plants using only a transmitted light microscope. The reasons for this are the degradation and the small size of fragments, which have survived (especially those from the Late Iron Age). Because of this I will use hereafter the term ‘plant-fibre’ and will not draw conclusions about the utilisation of various species (e.g. hemp and nettle).

For grouping analysed fragments I used traditional methods and documented the dimensions, weave, spin direction, thread count, and thickness of the threads (Walton & Eastwood 1983). For an easier comparison of the density of different fragments in the following text I applied the method described by Jaana Riikonen (2011, 216–217; cf. also Hägg 1984, 260, Tab. 1–27). The comparative unit for the overall density of fabrics is the ‘sum of thread density’, which means adding up the number of the warp and weft threads counted per one cm². According to this index figure the finds were divided into three groups: very fine (sum of thread density is at least 30), fine (20–29), and coarse (under 20). These divisions do not take into consideration the other variables characterising different fabric types, e.g. visual appearance, placement of thread systems, and diameter of threads. In order to compare the relational density of different warp and weft systems to each other in a single fragment the ratio was calculated. In practice, this means that the denser yarn system is divided by the looser



Fig. 1. Textile from Vaidavere hoard (Appendix, no. 121). Photo: R. Rammo.

one. In the catalogue the denser thread system is always recorded first, but regrettably it is not possible to clearly distinguish warp and weft in most cases.

In order to study chronological trends, the textile records were divided into three large chronological groups (Appendix) according to their dating. The current periodisation in Estonia (Mäesalu & Valk 2006, 127; Russow et al. 2006, 159) was used as the basis of this division:

1. the Late Iron Age (AD 800–c. 1225), i.e., the last phase of the Estonian Prehistory ending with the German-Danish conquest and violent Christianisation
2. the Middle Ages (i.e. the period after the Christianisation lasting until the Livonian War in 1558–1583) at the end to the 16th century
3. Post-Medieval Period since the beginning of the 17th century until the 18th century

In spite of the fact that the number of finds is relatively low, especially concerning the wide time span, I still believe it is worth looking at the whole assembly as an integral whole. The finds analysed cover the entire period and a rather wide geographical area (Appendix, Map 8), but the tiny scraps do not reveal much information if treated as single cases.

3. Analysis

The dimension of the fragments is relatively small, at approximately c. 6 cm². The biggest piece is exceptional, at 600 x 395 millimetres (Fig. 1; Appendix, no. 121). All fragments analysed were woven from z-spun yarn with the diameter varying between 0.2 and 1.2 millimetres. With one exception (Appendix, no. 13, Fig. 7) all finds are uncoloured and probably bleached. Roughly half of them are of fine quality. The fragment with the highest quality in the study is the coloured fabric from the Lõhavere hoard dated to the beginning of the 13th century with the ‘sum of thread density’ of 44 (Appendix, no. 13) and the coarsest from the village cemetery at Vaadu with 8 (Appendix, no. 120). The majority of the fragments (94%) are tabbies. Within this large tabby group two fabric-subtypes can be distinguished (Walton Rogers 2007, 67–68).

The first subtype is the tabby with repp character (Fig. 2), i.e., one of the systems is remarkably denser (the ratio is 1.6: 1 on average). This is the largest fabric-type, representing 64% of all analysed textiles. The fragments of true tabby repp (i.e. the ratio between warp and weft is at least 2: 1) belong to this subgroup as well. Two simple selvages and six remains of shirt slits preserved indicate that these fabrics were at least partly warp-faced, i.e., the warp system is denser than weft. Usually the threads of the looser system are slightly thicker as well. The textiles occur in different qualities with



Fig. 2. Textile from Kihme hoard with drawn-threads work (Appendix, no. 41). Photo: J. Ratas.

thread-counts ranging from 6 to 26 in warp and 4 to 16 per centimetre in weft; in most cases the quality falls between 9 and 15 threads per centimetre in one system.

The second subtype of plain weave is balanced tabby binding (Fig. 1), i.e., warp and weft have approximately equal numbers of threads per centimetre. This group represents 30% of all analysed fragments. The range of thread-counts for balanced tabby is from 4 per centimetre to 24 per centimetre and on average (14 in warp and 13 in weft) they are finer than the tabbies with repp character.

In addition to the tabbies described above the remaining 6% of fragments represent other weave types or have distinctive features. As examples different diagonal twill weaves, rosette twill, panama, drawn-threads work (Fig. 2) and red plied yarns (Fig. 3) in the weft system can be named.

To conclude the temporal analyses, it can be pointed out that until the end of the 16th century the fabrics found in rural areas are more-or-less similar. All but four medieval finds (Appendix, nos. 25, 41, 70, 78) are simple tabbies. The vast majority of these Late Iron Age and medieval tabbies are clearly defined as having repp character (85% repp: 15% balanced). By the beginning of the 17th century relatively sudden changes occur. First, the balanced tabby group ratio (67%) becomes significantly higher than that of tabbies with repp character (33%). Secondly, various weaves and decorations (red yarns) occur more frequently, although they are still rare (8 pieces) in comparison with simple tabby types (39). On average, the textiles become continuously coarser and in two cases fragments made obviously of tow have been preserved (Appendix, nos. 86, 109, 122).

4. Usage of plant fibre textiles

The probable function of only 85 finds from the burials could be analysed. The choice of finds was dependent on the availability of sufficient information regarding their location in the grave. I also do not consider the fragments from hoards here, because it is usually impossible to say whether the textiles were used for wrapping the objects or if they originate from fine clothing items like headbands (Kiudsoo & Ratas 2005) deposited together with valuable items. Plant-fibre thread was widely used for sewing and thick cords for holding together heavy spirals of copper alloy in ornaments

as well (e.g. AI 4116: 122, 173; AI 5366: XC: 5, CXV: 11). The latter finds were not analysed here as the main focus is on the woven textiles. One exceptional tiny fragment from the Late Iron Age has been interpreted as the pennon of a spear (Creutz 2003, 120; 196–197; from the Raatvere cemetery). Nevertheless, the precise use of these fragmented fabrics can be determined only in very rare cases and I can only point out some general trends on the basis of their find context.



Fig. 3. Fragment with red stripes on the brooch from Peetri Uueveski (Appendix, no. 107). Photo: A. Haak.

4.1 Shirts

Throughout the whole period the most numerous finds are those that are connected with a particular item of dress, for example, a shirt (Žeiere 2010, 42; Riikonen 2011, 210–214; Laul 2004). Occasionally, the remains of plant fibre textiles connected with shirts have been preserved under the metal ornaments or accessories. For example, in the 11th-century grave at Raatvere plant-fibre fragments were found inside the bracelets (Appendix,



Fig. 4. "Back apron" made of tiny metal spirals with the remains of a probable shirt (Appendix, no. 83). Photo: R. Rammo.

nos. 21–22). Medieval fragments of plant-fibre textiles have been preserved on the ornaments made of tiny spiral tubes of copper alloy (Fig. 4; Appendix, nos. 49, 51, 53–55, 83) and worn by women on the bottom hanging from waist called 'back apron' (Laul 1981; Riikonen 2005, 55, Fig. 14).

The most fragments in this group of shirt textile remains were found beneath brooches on the chest area of the buried person. Usually the fragments are tiny, but in six cases with brooches even the slits of shirtfronts have been found (Appendix, nos. 23, 37, 81, 86, 113, 127; Fig. 5). The probable warp threads (more densely placed) are running along the shirt, the edges have been folded down twice (the seam is 4–12 millimetres in width) and sewn with plied thread of plant-fibre in coarse over sewing stitches.

4.2 Shroud or scarf?

In many cases the fragments of plant-fibre cloth have been found on top of ornaments, e.g. on brooches, chains and belt buckles. The first traces are already from the Late Iron Age. For example, in graves at the Kukruse cemetery (Appendix, nos. 7–8) remains of plant fibre textile have been preserved in several places on the metal parts of the knife sheath, on plaques mounted on the leather belt, on the buckle, and on the breast chain. In five cases where shirt slits have been preserved under the brooches, the remains that clearly are from another plant-fibre fabric have been identified on top of the same ornament (Appendix, nos. 23–24, 36–37, 72–73, 80–81, 107–108).

It is not known whether a cloth was put over the body as a cover, the body was wrapped in a cloth or in some kind of clothing, such as a scarf, 'linen shawl', or upper garment (Peets 1992, 92; Žeiere 2010, 43; Riikonen 2011, 214–216). I believe that all these suggested explanations are plausible. The remains belonging to this group represent different qualities from very fine to coarse, including tow and weaves. For example, the linen fragments on the



Fig. 5. Slits of the shirtfront (Appendix, no. 113). Photo by R. Rammo.

bracelets found from the medieval Siksälä graveyard (Appendix, nos. 62 and 68) can be interpreted as belonging to a narrow linen scarf worn on the shoulders and decorated with tiny beads and tin plaques (Laul & Valk 2007, 57–58).

The folksongs collected at the end of the 19th century often mention, as part of the burial dress, a linen shirt and linen scarf or ‘shawl’ (*lina, linik, palakas, pallapool, kaal, uig, hame*), which could also be used in the wedding ceremony (Kama 2012; Voolmaa 1984, 75–77; Värv 1998, 389). The practice to bury women in their wedding clothes was widespread (Valk 2001, 75). Special weaves and decorations, such as red stripes and rosette twill (see Appendix, nos. 99, 110, 124; Fig. 3), were common to these ceremonial clothing items (Voolmaa 1984, 76–77).

4.3 Headdresses

Plant-fibre scarves were also probably worn as head gear, but the actual finds are few. For instance, a tiny fragment of a probable head-dress has been unearthed with spiral decoration in Kukruse (Appendix, no. 6). Three finds from Post-Medieval Period can be related with linings of bonnets and caps (Appendix, nos. 93, 116, 128).

4.4 Covers for grave goods and bags

The usage of vegetal fabrics for covering grave goods can be explicitly suggested (Žeiere 2010, 43; Riikonen 2011, 209–210). Occasionally metal grave goods, not related to the clothing of the dead person, have been found with remains of plant-fibre fabric. Valuable objects were placed into a textile bag or wrapped into a cloth. The Late Iron Age finds and two medieval assemblages are related with the ornaments placed separately into a grave (Appendix, nos. 3–5, 40, 84; Rammo 2006; Fig. 6). Medieval and post-medieval finds are often related to coins placed into a grave with the dead person. The coins were possibly put in a bag of plant-fibre textile. In two cases the remains of a leather purse containing coins with fine balanced textile fragments (e.g. from lining) have been preserved (Appendix, nos. 100, 110).

Over half of the fragments connected with the covering of ornaments or coins throughout the entire long period are of balanced tabby type of fine or medium quality. In the context of Late Iron Age and Middle Ages this constitutes a remarkable part of the balanced tabby finds (Appendix). Balanced tabby fragments have often been found from the hoards. Other fragments, mentioned before and connected with the clothing, e.g. shirts, probable covers of the body, scarves and upper garments, were mostly tabbies with repp character, at least until the 17th century.

It seems quite clear that repp tabbies and balanced tabbies as fabrics have different properties and they were used and valued differently. The Late Iron Age hoard from Lõhavere hill fort (Laul 1992)

with fine jewellery, weighing scales, handicraft implements and various textiles, among them imported ones (e.g. brocaded bands) can be named as an example of the special value of balanced tabbies. In addition to ordinary repp fabrics of plant fibres it contained fragments of fine balanced tabbies. What is more remarkable is that this very fine fabric (Fig. 7; Appendix, no. 13, three fragments) was coloured blue with woad (*Isatis tinctoria*; Peets 1992, 92). These fine textiles from Lõhavere suggest how high status cloth would have looked like at the end of the Iron Age.



Fig. 6. Fragment found with grave goods placed near head (Appendix, no. 4). Photo: R. Rammo.

My suggestion is that the fine balanced weaves, which are so different from the clothing items in contemporaneous graves, can be regarded as luxuries and imports similarly to other precious textiles from Lõhavere assemblage. This view about the value of fine balanced tabbies fits well together with the results of Finnish researcher Jaana Riikonen (2006, 373–374; 2011, 219; Hägg 1984, 210).

5. Tradition and Transition

Looking for continuity and/or discontinuity in the course of the history of the plant-fibre textiles found in Estonia I can point out two notable results. First, it seems that there is no remarkable change in the production and usage of linen fabrics during the transition from the Late Iron Age to the Medieval Period. This transition, i.e., the German and Danish conquest and Christianisation at the beginning of the 13th century caused the integration of Estonia into the political, social, and religious structures of western Europe. These political changes are visible in archaeology in the establishment of towns, abandonment of many prehistoric cemeteries and changes in burial customs, alterations in artefact forms and fashions during the 13th century (Russow *et al.* 2006, 159).

In spite of these rapid transformations it seems that as far as rural domestic culture was concerned, everyday life continued as before based on the old traditions. Although the textile finds are not numerous, I presume that the standard plant-fibre textiles in medieval times clearly were plain weave with repp character similar to the Late Iron Age fabrics. When these tabbies are compared with those found in the contemporaneous Estonian towns and in neighbouring areas, the difference is striking. The linen fragments from the 14th-century layer in Tartu, a medieval Hanseatic town in modern-day Estonia, are all well balanced plain weaves (Rammo 2009, cover photo) similar to the finds from other European towns (e.g. Crowfoot *et al.* 2006, 80; Tidow 1992, 247). At the same time it is interesting to note that in Latvia the number of tabbies with repp character also gradually decreased from the 10th century and imbalanced tabbies have not been found at all from the Liv burials of the 11th–13th century (Žeiere 2010, 41). It is interesting to consider these changes in the context of the spread of new tools, e.g. different loom types in the Estonian areas. One could suggest that the continuity in the rural textile types indicate the persistence of the Late Iron Age technology as well.

Until the beginning of the 13th century vertical looms with warp weights were most likely used (Rammo 2006, 368), as is suggested by the characteristics of the textile finds (double warps, tubular selvages and weave types). This loom type had warp hanging down from the upper beam of

a loom frame and it was tensioned with loom weights. As the finds of tools and textiles indicate, in the Middle Ages the innovations in textile production, including a more elaborated foot-operated horizontal loom type, arrived quickly from western Europe to the newly founded Hanseatic towns in Livonia and other neighbouring areas (Cardon 1999, 400–401; Zariņa 1992, 178–186; Rammo 2012, 137–139). This is why Estonian researchers have been looking for early evidence for horizontal looms in villages. On the basis of weave types and probable cloth width of some single finds it has been suggested that the change took place as early as the 13th or 14th centuries (Peets 1992, 62; Laul & Valk 2007, 56). However, the results of the present study do not indicate any changes in



Fig. 7. Dyed fragments from hoard of Lõhavere (Appendix, no. 13).
Photo: J. Ratas.

plant-fibre textile production at that time. If we look carefully at all finds available, nothing supports any change in the ways of making fabrics. For example, a costume made of sheep wool found at the Parisselja bog and dated to the late Middle Ages (15–16th centuries; ERM 19506; Tallgren 1923) has obviously been woven on a warp-weighted vertical loom as indicated by the tubular selvages, 2/2 diagonal and 2/2 herringbone twill weaves, and z-spun combed wool.

Was this a deliberate choice in order to maintain the tradition, as there was no need to adopt new skills, or just the lack of contacts? I believe that the weaving of cloth in medieval villages was most probably a domestic handicraft mainly carried out by women at home and the textile culture well established in the Late Iron Age extended with little change until the 17th century, at least in some areas. It is interesting to note that in the medieval period flax was widely spread throughout medieval Livonia. It was one of the occasionally taxed articles for peasants, and the processed fibres and seeds were some of the most important exports (Ligi 1992, 224; Põltsam-Jürjo *et al.* 2012, 186). Hence, the lack of contacts related with flax cultivating and processing was probably not the reason for the persistent tradition in linen weaving.

My second point is to highlight the remarkable break that clearly occurred by the 17th century. As mentioned before, it was marked by the dominance of balanced tabbies and a greater variety of weaves. This relatively sudden and visible change in weave types can be explained by the transformation of the technological process. Therefore, does this transformation in weaves in the early 17th century mark the final habituation of technological innovations in textile crafts, namely the horizontal loom, in villages? Using foot-operated treadle-loom, where the warp is tensioned horizontally and the reed helps to control the warp yarns more correctly, certainly affected and changed the placement of threads in weave.

It seems that this change coincides with the occurrence of new types of ornaments in graves (Valk 2001, 111). I believe that these transformations detectable in grave finds not only show the new trends in funerary clothing or fashion, but also may indicate wider changes in the Estonian society. The roots for these changes are definitely present in the 16th century with the Reformation, the devastating Livonian War (1558–1583), and the establishment of new political and economic systems that caused breaks in the mental and social sphere. The 17th century was a more peaceful period under the new rule of the Kingdom of Sweden. This was probably also the period when the developments in education, closer contacts between the villagers and urban and manor craftsmen, and greater openness of society resulted in the spread of new knowledge and ideas.

6. Summary

Archaeologists often give special attention to the drastic changes in material culture. I believe that when studying technologies or practices, in addition to transformations, it is equally important to recognise the permanence of tradition and the slowness of transition. Keeping this idea in mind, the present study attempted to trace the history of the production and usage of plant-fibre textiles. The results proved that the majority of the examined textiles are seemingly uniform and are in accordance with the widely spread qualities of plant-fibre textiles. Typical characters are z-spun yarns, tabby weave and usage of plant-fibre textiles in making shirts, shrouds and coverings of precious items. The closer examination revealed essential differences between tabbies with repp character and those of balanced weave. From the 11th century until the 17th century, the first type clearly dominates, but after the 17th century the balanced weave became more abundant. Both tradition and transition can be explained through similar factors – the technological and economic ones are probably the most obvious, but also social and cultural circumstances played a role. The main emphasis in this article is on technology, more precisely on the introduction of looms. The inferences are wide-reaching and need critical checking using different sources, e.g. other types of textiles and ethnological parallels.

Acknowledgements

This research was supported by the European Union through the European Regional Development Fund (Centre of Excellence CECT).

References

- Cardon, D. 1999. *La Draperie au Moyen Âge: Essor d'une grande industrie européenne*. Paris: CNRS Éditions.
- Creutz, K. 2003. Tension and tradition: a study of late Iron Age spearheads around the Baltic Sea. Stockholm: Stockholm Universitetet.
- Crowfoot, E., F. Pritchard & K. Staniland 2006. Textiles and clothing, c.1150–c.1450. *Medieval finds from excavations in London*, 4 (2nd edition). Woodbridge: The Boydell Press.
- Hägg, I. 1984. *Die Textilfunde aus dem Hafen von Haithabu mit Beiträgen von Gertrud Grenander Nyberg und Helmut Schweppe*. Berichte über die Ausgrabungen in Haithabu 20. Neumünster.
- Indreko, R. 1931. "Kiviaja võrgujäänuste leid Narvas." *Eesti Rahva Muuseumi aastaraamat VII*: 48–67.
- Kama, P. 2012. *Arheoloogiline vaatepunkt matuseetemalistele regilaulutüüpidele*. Master's thesis, University of Tartu (unpublished manuscript in Archives of Archaeology, University of Tartu).
- Kiudsoo, M. & Ratas, J. 2005. "Viljandimaa varauusaegsed peaheted." *Viljandi Muuseumi aastaraamat* 2004: 112–122.
- Laul, S. 1981. "Tagapöll muinaseesti naise rõivastuses." In *Eesti ajaloo probleeme*, edited by E. Tarvel, 76–88. Tallinn: Eest NSV Teaduste Akadeemia.
- Laul, S. 1990. "Einige gemeinsame Züge in den vorgeschichtlichen Trachten der Ostseefinnen." In *Finnougric Studies in Archaeology, Anthropology and Ethnography, Estonian papers presented at the Sixth International Finno-Ugric Congress (Syktyvkar, 24-30 July, 1985)*, edited by A. Viires, 29–43. Tallinn: Estonian Academy of Sciences.
- Laul, S. 1992. *Aruanne Lõhavere peitleiu (ehte- ja käsitöövaka) leidmisest ja lahtivõtmisest*. (Unpublished report in Archaeological archives, Institute of History, Tallinn University.)
- Laul, S. 2004. "Muinasaja lõpu ja varakeskaegsed särgileiud Siksälä kalmistust." In *Setumaa kogumik, 2. Uurimusi Setumaa arheoloogiast, geografiast, rahvakultuurist ja ajaloost*, edited by M. Piho, 223–229. Tallinn: Ajaloo Instituut.
- Laul, S. and H. Valk 2007. *Siksälä. A Community at the Frontiers. Iron Age and Medieval*. Tallinn, Tartu: Universities of Tallinn and Tartu.
- Ligi, H. 1992. "Talupoegade koormised." In *Eesti talurahva ajalugu, I kd*, edited by J. Kahk, 220–233. Tallinn: Eesti Teaduste Akadeemia Ajaloo Instituut.
- Moora, H. 1925. "Hõbeaare Pilstverest." *Eesti Rahva Muuseumi aastaraamat I*: 110–117.
- Mäesalu, A. & H. Valk 2006. "Research into the Late Iron Age." In *Archaeological Research in Estonia 1865–2005, Estonian Archaeology 1*, edited by V. Lang & M. Laneman, 127–158. Tartu: Tartu University Press.
- Peets, J. 1987. "Totenhandschuhe im Bestattungsbrauch der Esten und anderer Ostseefinnen." *Fennoscandia archaeologica IV*: 105–116.
- Peets, J. 1992. *Eesti arheoloogilised tekstiilid kalmetest ja peitleidudest III–XVI saj*. (Materjal, töövahendid, tehnoloogia). Master's dissertation, University of Tartu (unpublished).
- Peets, J. 1993. Tekstiilileide Ida- ja Kirde-Eesti muinas- ja keskaegsetelt kalmetelt. In *Vadjapärased kalmed Eestis 9.–16. sajandil. Muinasaja teadus 2*, edited by V. Lang, 215–233. Tallinn: Ajaloo Instituut.
- Põltsam-Jürjö, I., Selart, A. & Leimus, I. 2012. "Maamajandus ja külarahvas." In *Eesti ajalugu II*, edited by A. Selart, 185–202. Tartu.
- Rammo, R. 2006. "Eesti arheoloogilistest põlleleidudest." In *Etnos ja kultuur: uurimusi Silvia Laulu auks. Muinasaja teadus 18*, edited by H. Valk, 249–265. Tartu, Tallinn: Tartu Ülikooli arheoloogia õppetool.
- Rammo, R. 2009. *Kangas hansalinnas*. Tartu Linnamuuseumi näitusekataloog. Tartu.
- Rammo, R. 2012. "Fragments of clothing from medieval Tartu (Estonia). Archaeological sources." In *Medieval Urban Textiles. Muinasaja teadus 22*, edited by R. Rammo and A. Haak, 121–142. Tartu: Tartu Ülikooli ajaloo ja arheoloogia Instituudi.
- Riikonen, J. 2005. "Iron Age Aprons from Southwestern Finland and other Cloths and Pendants worn on the

- Waist". In *Rituals and Relations. Studies on the Society and Material Culture of the Baltic Finns*. Edited by S. Mäntylä, 31–72. Annales Academiae Scientiarum Fennicae. Humaniora, 336.
- Riikonen, J. 2006. "Mahtimiesten jäljillä – tiennäytäjinä tekstiilit." In *Etnos ja kultuur: uurimus Silvia Laulu auks. Muinasaja teadus 18*. edited by H. Valk. 367–387. Tartu, Tallinn: Tartu Ülikooli arheoloogia õppetool.
- Riikonen, J. 2011. "White linen – cloth of luxury?" In *Times, Things & Places. 36 essays for Jussi-Pekka Taavitsainen*, edited by J. Harjula, M. Helamaa, and J. Haarala, 198–221. Masku: J.-P. Taavitsainen Festschrift Committee.
- Russow, E., H. Valk, A. Haak, A. Pärn and A. Mäesalu 2006. "Medieval archaeology of the European context: towns, churches, monasteries and castles." In *Archaeological Research in Estonia 1865–2005. Estonian Archaeology, I*, edited by V. Lang and M. Laneman, 159–192. Tartu: Tartu University Press.
- Tallgren, A.M. 1923. "Esihistoriallinen puku Viron Pärnumaalta." *Suomen Museo XXX*, 3–11.
- Tidow, K. 1992. "Die spätmittelalterlichen und frühneuzeitlichen Wollgewebe und andere Textilfunde aus Lübeck." In *Untersuchungen zur Bau- und Kulturgeschichte Lübecks. Mit einem vergleichenden Beitrag zu Greifswald*, edited by G.P. Fehring, 237–271. Lübecker Schriften zur Archäologie und Kulturgeschichte Bd. 22.
- Valk, H. 2001. *Rural Cemeteries of Southern Estonia 1225–1800 AD*. Visby, Tartu: Gotland University College.
- Voolmaa, A. 1984. "Õlakatted ehk ülevisked Eesti naiste röivastuses". In *Etnograafiamuuseumi aastaraamat XXXV*, 70–79.
- Värv, E. 1998. "Riietumine ja rahvaröivad." In *Eesti rahvakultuur*, edited by A. Viires and E. Vunder, 367–396. Tallinn: Eesti Entsüklopeediakirjastus.
- Walton, P. and G. Eastwood, 1983. *A brief guide to the cataloguing of archaeological textiles*. York: Institute of Archaeology Publications.
- Walton Rogers, P. 2007. *Cloth and Clothing in Early Anglo-Saxon England AD 450–700*. CBA Research Report 145. York: Council for British Archaeology.
- Zariņa, A. 1992. "Frühe Funde von Trittwebstühlen in Lettland." In *Archaeological textiles in Northern Europe, Report from the 4th NESAT Symposium, Tidens Tand 5*, edited by L. Bender Jørgensen and E. Munksgaard, 178–186. Copenhagen: NESAT 4.
- Žeiere, I. 2010. "Types of linen fabric recovered archaeologically in Latvia and their utilisation." In *Fasciculi Archaeologiae Historiae XXIII*, edited by J. Maik, 39–46. Łódź: Institute of Archaeology and Ethnology of Polish Academy of Sciences and Polish Academy of Sciences Łódź Branch.

Appendix. Catalogue of analysed finds.

Abbreviations

G - grave; H - hoard

R - tabby with repp character; B - balanced tabby

Sum - sum of thread density

AI – Archaeological collections of the Institute of History of Tallinn University

ERM – Collections of the Estonian National Museum in Tartu

TÜ – Archaeological collections of the Institute of history and archaeology of the University of Tartu

TmM – Collections of former Museum of Tartumaa county, deposited at the University of Tartu

PaKM – Collections of Järvamaa Museum

Late Iron Age (ca. 800–1225 AD)

No.	Find place	Catalogue number	G/H	R/B	Threads/cm ²		Sum	Context	Interpretation	Remarks
					1	2				
1	Jõuga	AI 5100: 406	G	R	14	11	25	on knife; near hip	-	-
2	Kaberla	AI 4116: 123	G	R	16	8	24	on knife sheath; waist	shroud	-
3	Kaberla	AI 4116: 139	G	B	14	14	28	pendants; grave goods near shoulder	covering	-
4	Kaberla	AI 4116: 155	G	R	20	10	30	metal ornaments; grave goods near skull	covering	-

5	Karja	AI 4115: 78	G	B	8	8	16	beneath knife sheath; leg area	covering	-
6	Kukruse	TÜ 1777: XLIV: 3235	G	R	18	12	30	on spiral tubes of copper alloy; head	headdress	-
7	Kukruse	TÜ 1777: VI	G	R	17	13	30	on knife sheath and buckle; waist	shroud	-
8	Kukruse	TÜ 1777: I	G	R	20	12	32	on chains; chest	shroud	-
9	Lõhavere	AI 4133: 2274: 5/5	H	R	11	7	18	scales, jewellery	-	-
10	Lõhavere	AI 4133: 2274: 19/6	H	R	26	14	40	scales, jewellery	-	-
11	Lõhavere	AI 4133: 2274: 19/7	H	R	17	12	29	scales, jewellery	-	-
12	Lõhavere	AI 4133: 2274: 19/8a	H	R	14	10	24	scales, jewellery	-	-
13	Lõhavere	AI 4133: 2274: 19/8b	H	B	22	22	44	scales, jewellery	-	-
14	Lõhavere	AI 4133: 2274: 22	H	R	20	12	32	scales, jewellery	-	-
15	Lõhavere	AI 4133: 2274: 48	H	R	16	10	26	scales, jewellery	-	-
16	Lõhavere	AI 4133: 2274: 48/2	H	B	12	11	23	scales, jewellery	-	-
17	Lõhavere	AI 4133: 2274: 52	H	R	18	12	30	scales, jewellery	-	-
18	Lõhavere	AI 4133: 2274: 63/2	H	R	14	11	25	scales, jewellery	-	-
19	Lõhavere	AI 4133: 2274: 64/5	H	R	16	8	24	scales, jewellery	-	-
20	Lõhavere	AI 4133: 2274: 65	H	R	24	16	40	scales, jewellery	-	-
21	Raatvere	AI 5259: VI: 45	G	R	20	17	37	inside bracelet; wrist	shirt	-
22	Raatvere	AI 5259: XV: 148	G	R	17	13	30	inside bracelet; wrist	shirt	-

Medieval Period (ca. 1225–1558) and the end of the 16th century

No.	Find place	Catalogue number	G/H	R/B	Threads/cm ²		Sum	Context	Interpretation	Remarks
23	Ervu	TÜ 2: 92a	G	R	7	4	11	beneath brooch; chest	shirt	slits of shirtfronts
24	Ervu	TÜ 2: 92b	G	R	9	6	15	on brooch; chest	shroud	-
25	Jõuga	AI 4008: K IX: 72a	G	-	10	8	18	beneath pendant; chest	shirt	twill
26	Jõuga	AI 4008: K IX: 72b	G	R	14	10	24	on wood fragment	-	-
27	Jõuga	AI 4008: XXII: 165	G	R	15	10	25	on bells of necklace; chest	shroud	-
28	Jõuga	AI 5100: 541	G	B	10	10	20	on brooch; chest	shroud	-
29	Jõuga	AI 5100: 542	G	B	11	10	21	on iron knife	-	-
30	Helme	ERM A 418: 13	H	R	12	6	18	jewellery	-	-
31	Kobratu	AI 3357: 338a	G	B	22	20	42	on coin	-	-
32	Kobratu	AI 3357: 338b	G	R	15	12	27	on coin	-	-
33	Kõrgepalu	AI 4086: 11	G	R	18	9	27	on coin; in grave	covering	-
34	Kõrgepalu	AI 4119: 15a	G	R	6	5	11	on brooch	-	-
35	Kõrgepalu	AI 4119: 15b	G	R	16	8	24	on brooch	-	-
36	Kõrgepalu	AI 4119: 37a	G	R	14	7	21	on brooch; chest	shroud	-
37	Kõrgepalu	AI 4119: 37b	G	R	18	10	28	beneath brooch; chest	shirt	slits of shirtfronts
38	Kõrgepalu	AI 4119: 43	G	R	18	7	25	on brooch; chest	shroud	-
39	Kõrgepalu	AI 4119: 104	G	R	14	10	24	on iron knife; near hip	shirt	-
40	Kõrgepalu	AI 4119: 135	G	R	14	6	20	on brooch; near skull	covering	-
41	Kihme	PaKM 2056	H	R	15	7	22	jewellery	-	drawn-threads work
42	Makita	Vm A 37: 4	G	R	14	7	21	beneath brooch	shirt	-
43	Makita	Vm A 37: 209	G	R	13	7	20	on brooch; chest	shroud	-
44	Makita	Vm A 39: 152m	G	R	13	5	18	beneath coin pendant	shirt	-
45	Makita	Vm A 39: 160a	G	R	12	8	20	on knife; near ribs	-	-
46	Mälet-järve	TmM A 155: 10	G	R	10	7	17	on coin; on ribs	covering	-
47	Mälet-järve	TmM A 155: 65	G	B	16	16	32	coins; near pelvis	covering	-
48	Niklusmägi	TÜ 2171: 669	G	R	14	8	22	on brooch; chest metal accessory	shroud	-
49	Otepää Piiri	AI 2652: 15	G	R	15	10	25	(backapron); beneath pelvis	shirt	-
50	Otepää Piiri	AI 2676: 4	G	R	14	8	22	beneath brooch; chest	shirt	-
51	Otepää Piiri	AI 2676: 22	G	R	15	12	27	metal accessory (backapron); beneath knees	shirt	-

52	Otepää Piiri	AI 2676: 28	G	R	10	6	16	on finger-ring; chest metal accessory	shirt	-
53	Otepää Piiri	AI 3680: 12	G	R	19	12	31	(backapron); beneath of pelvis	shirt	-
54	Otepää Piiri	AI 3680: 20	G	R	16	12	28	metal accessory (backapron); beneath of knee	shirt	-
55	Otepää	AI 4127: 58	G	R	20	10	30	metal accessory (backapron); beneath of pelvis	shirt	-
56	Puru	AI 7072	H	B	18	18	36	jewellery	-	-
57	Salevere	AI 5042: 5	G	R	14	9	23	coin	-	-
58	Sargvere	TÜ 1957: 10	H	R	15	6	21	jewellery	-	-
59	Siksali	AI 5101: XL: 2	G	R	20	15	35	on knife; near leg	-	-
60	Siksali	AI 5101: XCIII: 2	G	R	13	10	23	beneath brooch; chest	shirt	-
61	Siksali	AI 5101: CXLIII: 10	G	R	16	8	24	beneath woollen coat	shirt	-
62	Siksali	AI 5101: CLXXV: 3b	G	R	21	10	31	on bracelet; wrist	scarf	-
63	Siksali	AI 5101: CLXXXVII: 32a	G	R	14	9	23	on woollen cloth	shirt	-
64	Siksali	AI 5101: CLXXXVII: 32b	G	R	20	10	30	on woollen cloth	-	-
65	Siksali	AI 5101: CXCII: 1	G	R	18	14	32	together with glass beads; chest	shirt	-
66	Siksali	AI 5101: CCXI: 3c	G	R	18	13	31	on plaques of belt; waist	shroud	-
67	Siksali	AI 5101: CCXXIV: 6	G	R	11	6	17	on plaques of belt; waist	shroud	-
68	Siksali	AI 5101: CCXLIV	G	B	16	15	31	on bracelets; wrist	scarf	-
69	Siksali	AI 5101: unknown: 2	G	R	14	8	22	on plaques of belt; waist	shroud	-
70	Siksali	AI 5101: IV: 15	G	-	16	13	29	on knife; beneath skeleton	-	panama
71	Vaabina	AI 5354: 120	G	R	19	7	26	beneath brooch; chest	shirt	-
72	Vaabina	AI 5354: 61a	G	B	8	7	15	on brooch; chest	shroud	-
73	Vaabina	AI 5354: 61b	G	R	14	11	25	beneath brooch; chest	shirt	-
74	Vana- Kuuste	TmM A 153: 35	G	R	13	5	18	beneath brooch; chest	shirt	-
75	Vana- Kuuste	TmM A 153: 66	G	R	13	10	23	on brooch; chest	shroud	-
76	Vana- Kuuste	TmM A 153: 83	G	R	10	6	16	on brooch; chest	shroud	-
77	Vana- Kuuste	TmM A 153: 94	G	R	22	10	32	needle; on hip	-	-
78	Vana- Kuuste	TmM A 153: 129	G	-	20	13	33	on coin; in grave	covering	rosette twill
79	Vana- Kuuste	TmM A 153: 140	G	R	20	14	34	coin	-	-
80	Vana- Kuuste	TmM A 153: 142a	G	R	11	5	16	on brooch; chest	shroud	-
81	Vana- Kuuste	TmM A 153: 142b	G	R	10	4	14	beneath brooch; chest	shirt	slits of shirtfronts
82	Vellavere	TÜ 1: 35	G	R	10	6	16	iron knife; near tigh	shirt	-
83	Virunuka	AI 4342: 9	G	R	14	4	18	metal accessory (backapron); beneath of pelvis	shirt	-
84	Välgi	AI 4209: 18	G	B	12	10	22	metal jewellery; grave goods near skull	covering	-
85	Võnnu	ERM A 462: 73	H	R	9	5	14	jewellery	-	

Post-Medieval Period since the beginning of the 17th century

No.	Find place	Catalogue number	G/H	R/B	Threads/cm ²	Sum	Context	Interpretation	Remarks
86	Ervu	TÜ 2: 74	G	R	11	8	19	beneath brooch	shirt
87	Ervu	TÜ 2: 76	G	B	12	10	22	on coin; near left elbow	covering
88	Ervu	TÜ 2: 125	G	B	12	10	22	beneath brooch	shirt
89	Ervu	TÜ 2: 136b	G	B	8	8	16	on brooch; chest	shroud
90	Ervu	TÜ 2: 154	G	B	14	14	28	on coin; chest	-
91	Ervu	TÜ 2: 168	G	B	14	12	26	beneath brooch; chest	shirt
92	Ervu	TÜ 2: 172a	G	R	11	8	19	on coin; feet	covering
93	Iisaku	AI 4134: 9	G	B	21	20	41	on hair; woollen cap	lining of cap
94	Iisaku	AI 4134: 26	G	R	14	8	22	on coin; near shoulder	covering
95	Iisaku	AI 4134: 58	G	R	14	8	22	on coin; beneath skeleton	-
96	Kanepi	TÜ 1250: 45	G	R	14	8	22	on coin; grave	covering
97	Kanepi	TÜ 1250: 64	G	B	14	13	27	on coin; grave	covering
98	Kaubi	TÜ 700: 86a	G	R	12	7	19	beneath brooch	shirt
99	Kaubi	TÜ 700: 86b	G	R	10	7	17	on brooch	shroud
100	Kobratu	AI 3357: 128	G	B	18	16	34	on coins with leather; chest	covering
101	Kobratu	AI 3357: 188	G	B	12	10	22	on coin; grave	covering
102	Kobratu	AI 3357: 190	G	B	6	6	12	on coin; leg area	-
103	Kobratu	AI 3357: 190	G	-	10	9	19	on coin; leg area	-
104	Körgepalu	AI 4086: 17	G	R	12	6	18	beneath brooch; chest	shirt
105	Lahepera	AI 4978	G	B	8	8	16	iron item	-
106	Meremäe	AI 4341: 8	G	B	14	14	28	metal item	-
107	Peetri Uueveski	VM aj 416: E 1182a	G	R	14	12	26	on brooch	shroud
108	Peetri Uueveski	VM aj 416: E 1182b	G	B	6	6	12	beneath brooch	shirt
109	Peetri Uueveski	AI 6878: B: 6b_a	G	B	7	6	13	on coin with skin; chest	-
110	Peetri Uueveski	AI 6878: B: 6b_b	G	B	18	18	36	on coin with skin; chest	covering
111	Roiu	TmM A 156: 39	G	B	12	10	22	on coin	-
112	Roiu	TmM A 156: 40	G	B	12	12	24	on coin	-
113	Roiu	TmM A 156: 56	G	R	17	12	29	between skin layer and brooch	shirt
114	Rõngu	AI 4137: 16	G	B	15	13	28	on both sides of coin; grave	covering
115	Rõngu	AI 4137: 42	G	B	22	20	42	on coin; grave	-
116	Rõngu	AI 4137: 62	G	-	15	14	29	on silk cloth; head	headress
117	Rõngu	AI 4137: 79	G	R	14	8	22	on coin; grave	covering
118	Tääksi	AI 5776: 123	G	B	12	11	23	buckle	-
119	Tääksi	AI 5776: CLIII: 3	G	B	14	13	27	on coin; grave	covering
120	Vaadu	AI 4293: 23	G	B	4	4	8	on coin; near feet	covering
121	Vaidavere	TÜ	H	B	6	6	12	coins	-
122	Vana-Kuuste	TmM A 153: 25c	G	-	16	17	33	on brooch; chest	shroud
123	Vana-Kuuste	TmM A 153: 25a	G	-	9	6	15	near brooch	-
124	Vellavere	TÜ 1: 10	G	-	12	10	22	beneath brooch; chest	shirt
125	Vellavere	TÜ 1: 22	G	B	9	7	16	iron knife; near tigh	shirt
126	Vellavere	TÜ 1: 29	G	B	8	7	15	on brooch; chest	shroud
127	Vormsi	AI 4296: 114	G	R	24	16	40	beneath brooch	shirt
128	Vormsi	AI 4296: 157	G	R	18	14	32	remains of bonnet; head	headress
129	Äksi Pupastvere	AI 3470: 1–3	G	B	12	12	24	around brooch needle	shirt