Some Finnish Archeological Twill Weaves from the 11th to the 15th Century

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Introduction

Fibre analysis is a new phenomenon in Finnish archaeological textile research. The first research ever was executed on medieval textiles excavated from the oldest Finnish town, Turku[1]. Archaeologically it is the best researched town, in the wet soils of which organic material is preserved remarkably well. In this article, Finnish archaeological textiles are briefly touched upon by comparing fibres from textiles in a late Iron Age female grave and some from medieval textiles (fig. 1).

The earliest textile fragments found in the old town centre of Turku are dated to the 13th century. Urban textile finds of that date are very rare; abundant textiles begin to appear in the middle of the 14th century with the medieval urban excavation of Åbo Akademi main building site in 1998. However, textiles from Late Iron Age female graves are the focus of this article. They are from the 11th and 12th century burial ground in Kirkkomäki situated 1,5 kilometres from Turku town centre towards the river[2]. The oldest Finnish prehistoric textile fragments (very few) are dated to the Roman period. Due to the practice of cremation at that time, textiles are largely absent. However, according to traditional custom the dead were buried with their best attire, weapons, utensils and tools. After the arrival of Christianity and a new practice of burying the deceased in a communal church yard, the furnishing of burials with grave goods were abandoned.

Iron Age textiles are only known from grave contexts. A few dwelling sites from that period yield some textile tool finds. Research on textile production from prehistoric times to the Middle Ages depends on textiles from graves and urban contexts. However, the smallest a basic textileunit, the fibre, is the same in all clothing and textiles, no matter what date they are.

Research Methods

Altogether 78 samples were studied: 48 samples originate from grave 27 in Kirkkomäki and 21 samples from a medieval urban context. A modern reference group comprised 9 wool samples. All the grave 27 finds originate from textiles identified as garments. Medieval urban textile finds consist of one interpreted as a piece of dress, one textile find with an unidentified function and what are interpreted as medieval raw wool finds.

Binding, yarn twist and cloth density were identified and measured using the naked eye and a binocular microscope (x20). Cloth appearance was also defined. Colour of textiles was surveyed with a transmitted-light microscope and some samples were sent for absorption spectrophotometry to York Textile Research Centre. Specimen sampling for the Iron Age and for the medieval textiles was conducted a bit differently in the light of the different cloth producing methods. It was necessary to make three yarn samples from one spot on the cloth because Kirkkomäki textiles have S-plied warp and z-spun weft yarn, i.e. two samples from warp and one sample from weft. Medieval urban textiles had combinations of z/z and z/s in warp and weft, so only two specimens for each sample were required from various sampling areas on the cloth.

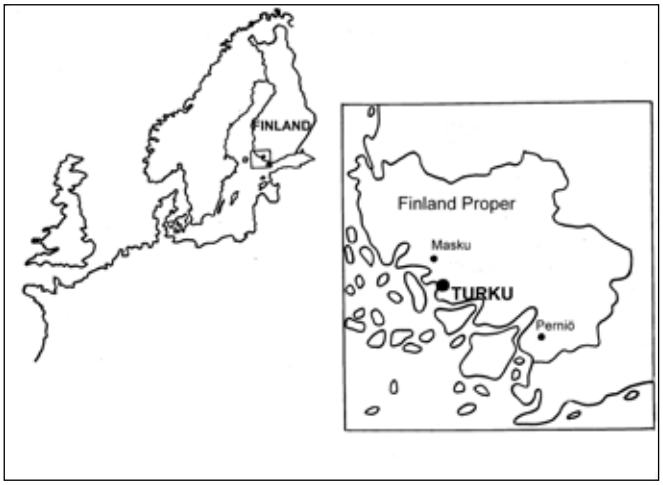

Fig. 1. Map of SW Finland.

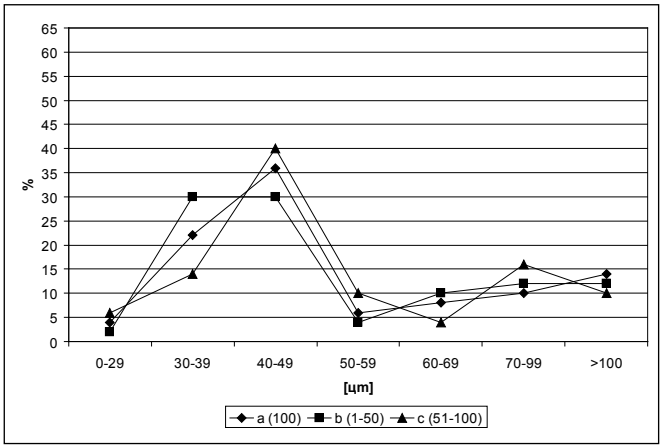

Fig. 2. Fibre curves on experimental measurements.

Fibres were examined as whole mounts at x250 magnification with a micrometer fitted onto the microscope. Fibre measurements were conducted by counting the diameters of 100 single wool fibres in each sample. This was done to warp and weft yarns of medieval textile specimens. This method is similar to Michael Ryder's (2000: 4) method of conducting the fibre analysis. Apart from fibre diameter counting, identification of fibre characteristics was based on scale structures, medullation and observation of fibre roots and tips[3].

Measurements of 50 single wool fibres were taken from warp and weft yarns of the Late Iron Age samples. Measuring procedure was the same but the number of fibres was not. Experiment was done with one medieval textile TE5081. Three different methods were used to compare the results. In sample A, 100 fibres were counted; in sample B the first 50 fibres and sample C the last 50 fibres. Statistically the results varied little and it seemed that this deviation does not affect significantly the results of fibre typing (fig. 2).

Three present day primitive Finnish sheep breeds were selected for the reference group; Åland sheep (Fi *ahvenanmaanlammas*), Grey Finn sheep (Fi *Kainuun harmas*) and Finnish landrace sheep (Fi *suomenlammas*). The mostly white Finnish landrace breed is about 1000 years old and it was generated from various local and earlier sheep populations; its genetic origins are very international, but sheep are related still to each other[4].

The 11th Century Textiles from Graves

Grave 27

The female grave 27 from the Kirkkomäki cemetery was chosen for its abundant textile finds. It was excavated in 1991. The burial ground comprises 43 excavated graves dated to the 11th and 12th centuries. Grave 27 is the richest female grave in the cemetery. The deceased was buried in a broad wooden coffin, probably originally used as a chest. Deer skin was placed on the bottom and moss laid underneath the deceased's head[5]. The following garments were identified: an undergarment, a dress, two aprons, a garment lying on top of the aprons (probably a dress), two shawls, leg bindings, mittens in *nålebinding* and a headdress (fig. 3). A textile fragment in loose weave (underclothing?), various braids and tablet-woven bands had no fibre analysis. Almost all the cloths and bands were dyed[6]. The best preserved textiles were situated at the junction of lower legs and waist, because of the heavy bronze spiral ornamentation of apron-I (tab. 1).

The coins suspended on the necklace date the grave after 1042 AD[7]. Also, a few C14-datings were taken. So, the deceased was buried at the second part of the 11th century, but the coffin, some of the artefacts and the textiles date from the earlier part of the same century[8]. Apron-I has heavily ornamented bronze spirals and it resembles more clearly Finnish Viking Age aprons. The shawls with rich spiral decoration came into fashion at the end of the 11th century[9].

Cloth	Weave	Warp direction	Thread count	Spin direction	Thread diameter mm	Colorant	Remarks
		in the grave	warp/weft	warp/weft	warp/weft	detected	
Iron Age	(grave 27)						
Apron I	2/2 twill	↑	9/8-9	S/z	0.75-1.25/0.75-1.25	blue	starting & finishing border, tubular selv.
Apron II	2/2 twill	↑	10/9	S/z	0.9-1.0/1.0-1.3	blue	starting & finishing border, tubular selv.
Dress I	2/2 twill	→	10/8	S/z	0.8-1.25/0.9-1.25	indigotin*	seam, tubular selv., patt tablet-woven braid
Dress II	2/2 twill	-	8/8-9	S/z	1.0-1.25/0.5-1.5	red-brown tannins*	seam, tubular selv., patt tablet-woven braid
Shawl I	2/2 twill	↑	10/9	S/z	1.1/1.3	blue	tubular selvedge, decorative border
Shawl II	2/2 twill	↑	16/10	S/z	0.9-1.4/0.9-1.6	indig.+red-bro. tan.*	tub. selv., dec. border, patt. tablet-w. braid
Headdress	2/2 broken twill	→	12/9	S/z	-	blue	tubular selvedge, warp yarn lattice
Legbindings	2/2 broken twill	→	13/11	S/z	-	indigotin*	tubular selvedge
Medieval							
TMM 20764:1427	2/2 twill	-	-	z/s	-	-	fragment
TMM 21816:5081	2/2 twill	-	10/10	z/z	0.75-1.0/1-1.25	white	shoulder piece of a dress?

*Table 1. The textiles from grave 27 and the medieval reference group. (*Walton Rogers 2001a: 2)*

Dress I and II

A narrow piece of apron-II hem and a larger fragment of folded dress-I were preserved underneath the broad spiral ornamentation of apron-I (fig. 4). The felted cloth was woven in 2/2 twill with a 16 yarn tubular tablet-woven selvedge in tabby. A 8 mm wide patterned tablet-woven band was sewn onto the edge of the hem, typical for Finnish Iron Age mantle-dresses[10]. Small pieces of dress-I were found at the waist, usually felted. When the cloth was examined with an optical microscope, blue dye was detected only on felted cloth areas. According to the dye analyses, the cloth was dyed with indigotin i.e. woad[11]. Associated with the brooches, only very fragmentary pieces of cloth were preserved, and it could not be deduced what kind of cloth was attached to them.

2/2 twill cloth was found on top of the spiral decorations of apron-I and grave artefacts. It is coarser than dress-I cloth and hence it has been named dress-II. It had also similar features to dress-I; felted cloth, a seam in weft direction and a tubular tablet-woven band on the edge with narrow patterned band sewn on. The dark pigmentation of the wool was enhanced with red-brown dye[12]. Most likely, it was an extra garment – dress-II was put on to cover the deceased.

Apron I and II

The deceased had two aprons of which the uppermost, a lavishly decorated garment is called apron-I (fig. 5) and the modestly decorated garment underneath is called apron-II. The cloth is a blue 2/2 twill with a tubular tablet woven band on both edges. Apron-II has an almost similar density in warp and weft to dress-I. However, it is easy to separate the garments because the warpruns crosswise in the dress and lengthwise in the apron. Both aprons are about 51x74 cm in size and they have diagonal-plaited bands for tying them up.

Shawl I and II

The deceased was covered with two large-size spirally-ornamented shawls. Shawl length is about 160 cm without the fringes. Both shawls are in 2/2 twill weave. Shawl-II has the thinnest and densest warp yarn of the textiles in the grave. A narrow patterned tablet-woven band was sewn onto its selvedge. Microscopically both shawls seemed to be dyed blue. Shawl-II was examined chromatographically and it was dyed with an indigotin-based dye, but also with red-brown tannins[13].

Headdress

Narrow strips of cloth selvedges where bronze rings were tightly pressed side by side, were found placed on the deceased's head. The blue cloth was made in broken twill weave. This kind of headdress was distinctive for the Turku region during the 11th and 12th centuries[14]. It was reconstructed by researcher Leena Tomanterä (fig. 6). The ends of rectangular piece of cloth, size ca 15 x 60 cm, were narrowed during the weaving because the weft yarns were pulled tighter. The cloth was folded in half and the ends were united together with a tablet-woven band whose weft yarns were the ends of cloth warp yarns. The yarns were plaited tightly as described by Purhonen *et al.*[15]. The nape piece formed a decorative detail. The other selvedge impressed with bronze rings framed the face and the other edge lay on top of the head. At the back of the head, ends of the other selvedge were pressed together with bronze rings. Perhaps birch bark gave the headdress a stiff shape. The type of broken 2/2 twill and bronze rings bring it closer to the Liv hair bands[16]. Broken 2/2 twill is also a dominant feature in headcoverings found in the Zalachtovie cemetery in north-western Russia which was populated by Finnic people at that time[17].

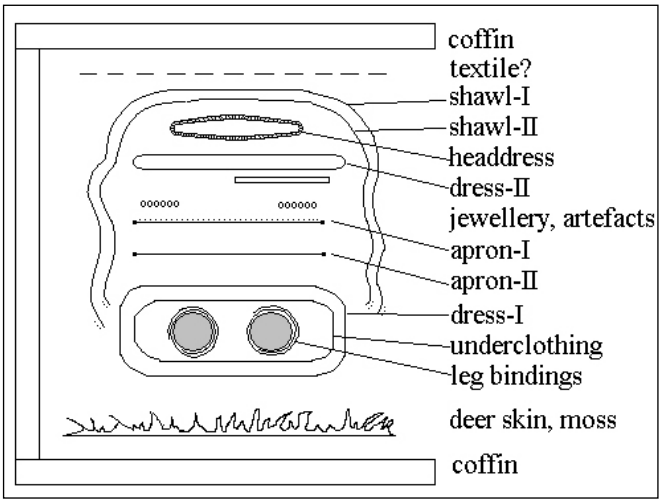

Fig. 3. Cross section of the grave 27.

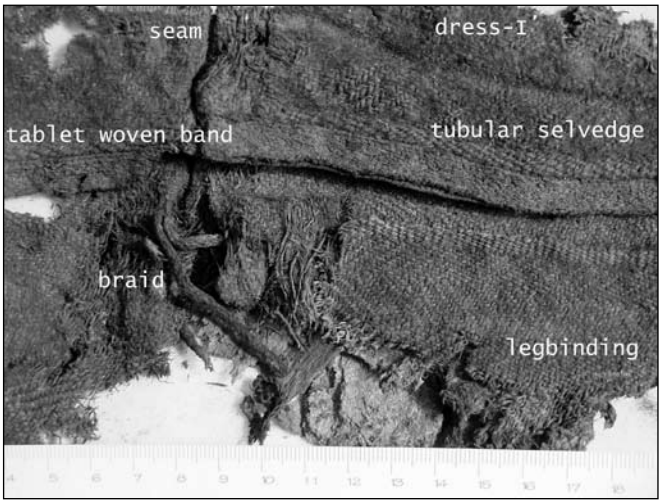

Fig. 4. Dress-I and leg bindings in the grave 27.

Leg bindings

Underneath the aprons and the dress hem, leg bindings were found: narrow cloth strips woven in broken 2/2 twill (fig. 4). Densely woven blue cloth bands were wrapped around both lower legs and tied up with red woollen braids. These are the only red dyed pieces of garments found in grave 27; most probably they were dyed with dyers' madder (*Rubia tinctorum* L.)[18]. A tubular tablet-woven selvedge was woven on both edges but unfortunately the width of the leg binding is not fully preserved. Possibly, it may have been wider than the 9 cm that is now left. Leg bindings woven in broken 2/2 twill and having the width of ca 10 cm, are known e.g. from the Liv graves in Latvia[19]. In the Finnic Zalachtovie cemetery, leg bindings are up to 16 cm in width[20]. Leg bindings are exceptional among the Finnish archaeological textile finds.

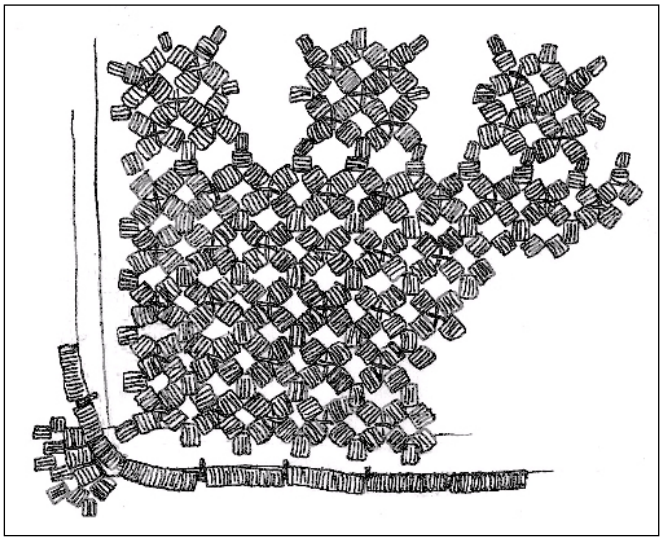

Fig. 5a. Upper corner of apron-I in the grave 27.

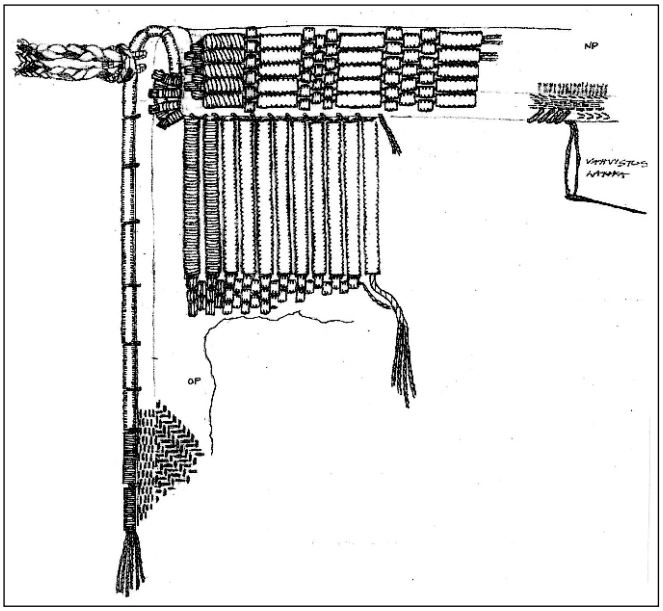

Fig. 5b. Lower corner of apron-I in the grave 27.

Late Iron Age and Medieval Fibre Material

Fleece

Hairy types of fleece were detected in over 50 % of samples and the other half was hairy medium among the Late Iron Age textiles. 75 % of medieval samples from textiles and raw wools were hairy and 25 % of them hairy medium. Surprisingly enough, generalised mediumwas absent totally in both period groups. An interesting feature is that medium fleeces were represented by 6 %, all of them in the Late Iron Age. If this result isevaluated by Ryder's standards[21], it means that imported wool would have been mixed with our local wools before spinning. But comparing the results e.g. with lamb's wool in the modern reference group, this finer type is more comprehensible.

Yarn fibre content in warp and weft varied beween hairy and hairy medium types, except in dress-I, dress-II and shawl-I where there was medium type in one of the warp yarns. It seems that during the Late Iron Age, they used all the wool and not just one type of wool for yarn. There was no great difference between warp and weft yarns; very coarse fibres were used for spinning thin yarns of warp and when plied together they were as thick as in weft yarn. Wool was collected by plucking and shearing, but use of dead wool was surprising. Root ends present in the fibres of one yarn system of apron-I and II, dress-I and II and leg bindings made up nearly 50 % and over. There existed also very short fibres of 20 µm length with tip and root. This was interpreted as wool of dead lambs that was scraped off the skin and then mixed with longer hairy or hairy medium types of fleece before spinning. This type of yarn due to its short fibre content was very fragile and brittle compared with the yarn made of longer fibres.

Pigmentation

69 specimens were taken into account when natural pigmentation was studied. Pigmentation pattern was recorded by counting fibres with pigmentation[22]. White was most common in both of the Iron Age (40 %) and medieval (52 %) fleeces. Skimlet fleece (that is a mixture of white, grey and black fibres) had the ratio of 24 % in medieval material and 33 % in the Late Iron Age yarns. Brown fleeces were identifiable in 27 % of Iron Age fleeces and 24 % in medieval fleeces. Altogether the natural fleece colours follow the history of sheep fleece evolution. White fleeces, due to selective breeding, became more common during the Iron Age[23]. The trend seems to be also true of the Finnish

Late Iron Age and medieval wool types; white dominates, grey skimlets are the rule for the late Iron Age fleeces and brown or black fleece types are rarest in the fibre material. Grey skimlet fleeces are found especially in primitive sheep breeds in Northern Europe and the Balkans. Furthermore, white was a more convenient base, if the textiles were to be dyed.

Continuing Traditions and Changing Textile Crafts

During prehistoric times, wool was plucked by hand according to its natural growth cycle, and all raw wool was used very carefully. As indicated by the textiles found in grave 27, the skill of the spinners was considerable, producing the same type of yarn out of very different types of wool fibre. By plying the single yarns, a stronger warp yarn was achieved for the warp-weighted loom. The most common weave was 2/2 twill, but also 2/2 broken twill was used in special garments like headcoverings and leg bindings. A typical cloth woven on a warp-weighted loom has warp yarn concentrations, because the absence of a reed that caused variability and higher densities in the textile itself. Also, typical of these cloths is a tubular tablet-woven selvedge. Most of the grave 27 textiles were dyed in blue which originated from woad (*Isatis tinctoria* L.). It could have been grown in Finland but most probably it was imported from Central Europe[24].

Our presumption was that wool was sheared more often and not plucked several times a year in medieval times. But medieval yarn samples indicate something different. We found more fibre roots and tips than ever. It appeared to be that the method of fibre analysis had been wrong. It is not only a matter of measuring fibre diameters but looking for fibre ends during the measuring. This opened a whole new way of interpreting fibres. Indications the wool was scraped from dead sheep were apparent and this method was used during the Middle Ages and in the Late Iron Age. It seems that plucking and shearing of sheep continued in a rather similar way in both periods.

Fig. 6 and 7. South-western Finnish headdress reconstructed by Leena Tomanterä.

There was no change in woolharvesting, except that sheep shearing or plucking happened more often due to the commercial nature of textile production in medieval times in Turku. Textile tool finds from the Åbo Akademi excavation indicated that a new type of loom, a horizontal pulley loom was introduced[25]. Along with the horizontal loom a different method of spinning

yarn appeared; warp yarns were rarely plied. It is supposed that the horizontal loom was used only by professional weavers. It had effects on cloth production; for cloth densities were standardised, cloth width stabilised to one meter and simple selvedges became more common. Tabby was introduced to greater degree, but 2/2 twill weaves held their superior position. There are hints among Turku finds that upright looms were employed for household weaving contemporaneously with horizontal looms. As a consequence, the tradition of weaving 2/2 twill cloth continued despite the change in looms. In medieval Turku, textiles were dyed mostly with madder, especially with imported dyers' madder (*Rubia tinctorum* L.). Furthermore, and mostly due to the Hanseatic trade, cloth imports grew considerably[26].

In spite of the changes in textile production, there was continuity in the usage of raw wool, in the way of collecting it and the preference for white, but also grey skimlet, wool. During the Late Iron Age and medieval times sheep were most probably related to the Finnish landrace sheep breeds of which the white ones were most in demand. In ancient and medieval times, they used several types of wool for the same garment, not just one type. But it is very hard to determine the cause of the fleece changes in yarn; were they caused by natural growth or artificially induced by human intervention?

Bibliography

Appleyard 1978 – Harry Miltrop Appleyard, Guide to Identification of Animal Fibres (Leeds 1978).

Ciglis/Zirne/Žeiere 2001 – Jānis Ciglis, Sandra Zirne, Irita Žeiere, Lībieši senatne. The Livs in Antiquity (Rīga 2001).

Khvoschchinckaia 1992 – Natalia Khvoschchinckaia, New Finds of Medieval Textiles in the North of Novgorod Land. In: Lise Bender Jørgensen, Elisabeth Munksgaard (eds.), Archaeological Textiles in Northern Europe, Report from the 4th NESAT Symposium 1.-5. May 1990 in Copenhagen (Copenhagen 1992) 128–133.

Kirjavainen 2002 – Heini Kirjavainen, Medieval Archaeological Textiles in Turku. In: Guido Helmig, Barbara Scholkmann, Mathias Untermann (eds.) Centre, Region, Periphery. – Medieval Europe Basel 2002. 3rd International Conference of Medieval and Later Archaeology 2 (Hertingen 2002) 346–351.

Kirjavainen 2006 – Heini Kirjavainen, Medieval Textile Tools: Cloth Production Tools at the Åbo Akademi Site in Turku, Finland. Archaeological Textiles Newsletter 42, 2006, 2–6.

Lehtosalo-Hilander, 1982 – Pirkko-Liisa Lehtosalo-Hilander, Luistari II. The Artefacts. Suomen Muinaismuistoyhdistyksen Aikakauskirja 82/2 (Helsinki 1982).

Lehtosalo-Hilander, 1984 – Pirkko-Liisa Lehtosalo-Hilander, Ancient Finnish Costumes (Helsinki 1984).

Peets 1998 – Jüri Peets, Indigovärvist Läänemere piirkonnas ja Eestis muinas- ja keskajal. Muinasaja Teadus 5/2, 1998, 291–307.

Purhonen et al. 1984 – Paula Purhonen, Leena Söyrinki-Harmo, Leena Tomanterä, Marianne Aav, Sirkka-Liisa Masala, Maija Johansson, Ken kantaa Kalevalaa: A pageant of ancient Finnish dress, 1835 Kalevala 1985, Exhibition catalogue. Finnish National Board of Antiquities and Historical Monuments/Kalevala (Koru Oy 1984).

Riikonen 1999 – Jaana Riikonen, St. Katherine's Church Hill – Late Iron Age Burial Ground. Exhibition catalogue (Turku 1999).

Ryder 1990 – Michael Ryder, The Natural Pigmentation of Animal Fibres. Textile History 21/2, 135–148.

Ryder 2000 – Ryder Michael, Issues in Conserving Archaeological Textiles, Archaeological Textiles Newsletter 31, 2000, 2–7.

Talvio 2002 – Tuukka Talvio, Coins and Coin Finds in Finland AD 800–1200. Iskos 12, Suomen Muinaismuistoyhdistys (Helsinki 2002).

Tapio/Kantanen 2000 – Miikka Tapio, Juha Kantanen, Mitä perinnöllinen muuntelu kertoo suomenlampaan historiasta? Lammas ja vuohi 3, 2000, 21–24.

Tapio/Kantanen 2001 – Miikka Tapio, Juha Kantanen, Itämeren saarilla vanhoja lammasrotuja. Lammas ja vuohi 4, 2001, 37–39.

Vahter 1952 – Tyyni Vahter, Varsinaissuomalainen kaarihuntu. Corolla archaeologica in honorem C. A. Nordman (Helsinki 1952) 151–158.

Walton Rogers 2001a – Penelope Walton Rogers, Report on tests for dye in textiles from grave 27 at St Katherine's Church Hill, Finland. Textile Research in Archaeology (unpublished York 2001a).

Walton Rogers 2004 – Penelope Walton Rogers, Fibres and Dyes in Norse Textiles. In: Else Østergård, Woven into the Earth (Aarhus 2004) 79–92.

Zariņa 1988 – Anna Zariņa, Lībiešu apģērbs 10.–13. gs (Rīga 1988).

References

[1] Kirjavainen 2002, 346.
[2] Riikonen 1999.
[3] e.g. Appleyard 1978, 26, 107–108.
[4] Tapio/Kantanen 2000, 22–23; 2001, 38–39.
[5] Riikonen 1999.
[6] Walton Rogers 2001a, 2
[7] Talvio 2002, 175.
[8] The Viking Age is dated in Finland 800–1025/1050 AD and the final period of prehistory is called the Crusader Period until ca 1200 AD.
[9] Lehtosalo-Hilander 1982, 160; 1984, 55.
[10] Lehtosalo-Hilander 1984, 51; Purhonen *et al*. 1984, 44.
[11] Walton Rogers 2001a, 2.
[12] Walton Rogers 2001a, 2.
[13] Walton Rogers 2001a, 2.
[14] Vahter 1952, 152.
[15] Purhonen et al. 1984, 38, 43.
[16] Zariņa 1988, 25. att.; Ciglis/Zirne/Zeiere 2001, 24.
[17] Khvoschchinckaia 1992, 130.
[18] Walton Rogers 2001a, 2-3.
[19] Zariņa 1988, 102, VI tab. 6; Ciglis et al. 2001, 25.
[20] Khvoschchinckaia 1992, 130.
[21] Ryder 2000.
[22] see Walton Rogers 2004, 89.
[23] Ryder 1990, 139, 143.
[24] Peets 1998, 297–299.
[25] Kirjavainen 2006, 5.
[26] Kirjavainen 2002, 350