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Colours in medieval seal bags versus archaeological textiles from Swedish cities

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Abstract

There are a large number of wool fragments from various medieval Swedish archaeological city excavations. The original colour of the fragments cannot be interpreted, as the fabrics lost their colour in the soil. While dye analysis could indicate which pigment is used, this method cannot give an exact, nuanced response. In the Swedish National Archives collections, there are a number of medieval documents with associated seals. In order to protect the wax seals, a textile bag was often included on important documents to ensure the seals remained intact. Due to the associated documents, these materials can be linked to an exact date. The bags were sheltered from direct sunlight, and therefore have maintained a closer colour to the original fabrics than the archaeological material. By studying these two different collections, it is possible to better understand the original colours of the archaeological material, and present a palette of the latter 14th century's most common fabric qualities and colours in wool and linen.

Keywords: seal bags, natural colourants, medieval textiles

13.1. Introduction

In the 1960s and 1970s, many Swedish city centres were modernized. These urban areas frequently have medieval roots, and yielded a vast amount of archaeological material, including large quantities of textiles. Today, these textiles are more or less brown in colour, since their pigments have degraded in the soil. In order to investigate the original colours of medieval textiles, a pigment analysis can be carried out, and in combination with written sources and extant medieval textiles preserved above ground, it is possible to gain an idea of the medieval colour palette. Seal bags, including those held in the collections of the National Archives of Sweden, serve as a frequently disregarded source in this context.

The National Archives have in their care several medieval documents with seals. In order to protect the seals, which are made of wax, fabric was stitched into textile bags when the individual documents were drawn up. Since the documents are precisely dated, it is possible to date the seal bags as well. The

bags have been kept away from direct sunlight, and retain more of their original colours than what is represented in the archaeological material.

By comparing seal bags to archaeological sources, it is possible to gain a more nuanced picture of which colours were common in medieval garment fabrics. In this first attempt, we have focused on material from the second half of the 14th century

13.2. Archaeological textile material from medieval Swedish towns

What does medieval Swedish archaeological textile material look like? The conditions for preservation favour protein fibres, and the majority of the finds are wool. There are a great many finds; enough to draw general conclusions about the overall nature of the material. Our study uses the urban archaeological finds held in the collections of the Swedish History Museum as its starting point.

The types of material can be categorized into four major groups:

1. Loose wool – often felted, likely used as stuffing or insulation, for example between logs in a building.
2. Packing textile – thick tabby fabrics, where warp and weft both consist of a thick two-ply yarn. These fabrics were likely used as packing material.
3. String, cords, ribbons, and yarn.
4. Woven or nålbound fabrics – various fabric qualities, predominantly tabby, 2/1 twill, and 2/2 twill, used for garments and furnishings.

This chapter is mainly concerned with the textiles in Group 4. The textiles found in the cultural layers likely have three different deposition backgrounds. First, there are items that have been lost, such as misplaced mittens or garments. This category constitutes a very small portion of the finds. Second, there are materials discarded from crafting, such as offcuts from tailoring, etc. These finds are small pieces of fabric used in garments that were newly produced at the time, and again make up a small portion of the material. The third category makes up the majority of the finds, and consists of worn-out or repurposed textiles, which have seen a final cycle of use as rags before being finally discarded. These finds display clear signs of wear, and sometimes evidence of previous functions, such as hems.

The textiles also present a wide range of qualities, from the finest linen to more heavy-duty materials, suitable for use as blankets or similar fabrics. The bindings are predominantly tabby, 2/2 twill, and 2/1 twill, the latter of which is the primary weaving technique. Apart from the previously mentioned finds, there are also a smaller number of striped fabrics; these are most frequently weft-faced rep in tabby. Where striped fabrics are woven as 2/1 twill, stripes were made by excluding every third warp thread from the binding sequence, which makes the remaining threads form a sparsely woven tabby, yielding weft stripes. In addition, there are a few patterned fabrics woven in 2/1 lozenge twill.

With very few exceptions, the fabrics feature high-twist, Z-spun warp threads. The weft is often S-spun, with less twist, and is very frequently thicker than the warp. Fabrics that are more balanced in warp and weft generally tend to consist of more similar-looking warp and weft yarns.

The textiles display a wide range of qualities. In this case there are more factors than the mere thread count in play, and the visual impression of the fabric matters a great deal. Other parameters must also be taken into account, such as what kind of wool the thread was spun from, the spinning method, a woollen or worsted output, varying degrees of twist, and finishing treatments such as

nap raising and fulling. Without detailing every single specification, fabrics can still be divided into distinctive visual groups, which can in turn be tied to particular qualities and functions. This renders the large archaeological material a bit more lucid, and patterns emerge for parameters relating to production techniques and desired fabric qualities. The visual grouping is based on the work presented in Hammarlund et al. (2008).

The groups featured in Hammarlund et al. (2008) are based on analyses of textiles from Lödöse (Sweden), Turku (Finland), and Tønsberg (Norway); cities whose textile finds are very similar to the Swedish cities of Söderköping, Nyköping, Uppsala, and Enköping, on which this article is based. Hammarlund et al. 2008 have thus far identified a total of twelve different groups. The group designated as Group 8 in their work, packing textiles, has been exempted from our summary, as it cannot be considered to include garment textiles.

Today, textile fragments found in Swedish urban archaeological material are brown, ranging from a light to a very dark shade. Some plainly display pigmented fibres, and it is therefore likely that the wool itself is dark grey or dark brown in colour. The lightest fragments may very well have originally been white, while the deep brown ones were probably woven from a homogeneously pigmented wool at the outset. Dye pigments are poorly preserved in the soil. In cases where colour can still be distinguished, it almost always presents as various shades of red. In a few striped fragments, stripes are visibly made up of several colours which now appear as various shades of brown, sometimes with a tinge of other colours.

13.3. Colours and pigments

In 2020, the Lödöse Museum had some twenty archaeological samples taken and submitted for dye analysis (vanden Berghe and Coudray 2020). Altogether 29 textile fragments were analyzed, ten of which displayed signs of dye pigments (Table 1).

Pigment analyses reveal which active dye has been used, but do not indicate the intensity or nuance of the colour produced. This means that analysis results generally provide a framework detailing which pigments were applied, while still being too inaccurate to provide a concrete palette of colours used.

Table 1. Dyes detected in the textiles from Lödöse Museum.

Luteolin	Found in dyer's weed, also known as weld
Indigotin	Found in woad, and indigo
Alizarin, combined with purpurin	Found in dyer's madder
Kermesic acid	Found in the kermes insect
Tannin	Found in oak gall and bark

13.4. Colours in extant material preserved above ground

Sweden has large collections of medieval church textiles. As these have been preserved above ground, they still display several different colours, in multiple shades. Wool and silk fabrics are generally found in solid colours, while medieval silk embroideries tend to use several shades of the same colour to create variation and produce shadowing effects. Apart from these, there is a smaller group of embroideries, made with wool yarn on a linen ground fabric. This latter group is potentially more representative when it comes to the colours of wool fabrics. Preserved wool embroideries often include a smaller number of colours, with fewer shades respectively.

The long-legged cross stitch embroidery from Fogdö church (SHM:23128 FID:96334) is a notable exception, displaying an impressive range of colours and shades – eleven in total: yellow, red, pink,

orange, light blue, dark blue, green, beige, and brown, with undyed wool yarn for both white and brown.

The brick stitch embroidery from Ärentuna church is another example with a rich palette of colours: ten in total, including undyed white and brown natural shades of the wool, in addition to both light and dark shades of red, blue and green, with pink and yellow as additional colours.

One important group of medieval embroideries are the twelve preserved gilt-leather embroideries. (Neijman and Sundström 2021: 32–53). These are constructed from large pieces of dyed wool cloth. The majority of the larger pieces used are tabby, while fabrics used for details include 2/2 and 2/1 twills. The colours are deep, featuring mostly red, dark blue, and green. One of these embroideries, the Ilsbo coverlet (HM:4104), includes fabric pieces with the additional colours of light blue and light green. The Skokloster 1 embroidery (SHM:24690 FID:96344) also includes two different purple fabrics. A closer inspection reveals that the thread in these purple fabrics is spun from fibres dyed blue and red respectively, after which they have been blended together and spun. One of the purple fabric pieces has red as its base with a small amount of blue fibres, while the other piece includes a larger number of blue fibres. These purple fabrics are highly unusual items among the preserved material. Creating a colour through fibre blending is an interesting method, which is entirely invisible in the archaeological material. Additionally, the Skokloster 1 embroidery includes a wine-coloured fabric which has likely been overdyed with two different pigments, a blue one followed by a red (Neijman and Sundström 2022).

In *Kläderna och människan i medeltidens Sverige och Norge* (Clothes and human in medieval Sweden and Norway), Andersson (2006: 191–193) presents an overview of colour representation in garments, based on sources in Swedish and Norwegian wills and testaments. She reports that from 1340–1389, there are 100 items of clothing described in the wills as having a particular colour. The colours are represented in the following percentages: 30% blue, 24% red, 15% green, 16% brown, 9% white, 4% black, and 2% grey

It is not possible to establish whether the brown, black, and grey are in fact dyed textiles, or whether these fabrics retain only the natural wool pigments. Likewise, we must also consider whether medieval Swedish vocabulary for the concept of “colour” is detailed enough to allow the detection of different shades within the same colour. The words used could potentially refer to entire colour groups. No words are used in the medieval sources to distinguish particular shades or nuances, such as “light” or “dark”, and the only mixed/nonprimary colour mentioned is green.

While the pigments known to have been in use at the time provide us with clear-cut colour groups, a great variety of shades and colours can be achieved depending on mordanting, the material of the dye pot used, the amounts of pigment used, whether the dye bath is a main or partially exhausted one, and what finishing processes (if any) were used after dyeing. In combination with overdyeing using additional pigments, the colour palette could be further expanded.

Through practical dye experiments with the more common medieval plant dye pigments, we have gained a more in-depth understanding of the shades that can be achieved using these pigments. Madder, for example, can yield a variety of shades, from bright wine-coloured ones to pale apricot tones. How this has been used in the Middle Ages is, however, unclear.

13.5. Seal bags

The National Archives of Sweden, Stockholm, include a great many medieval manuscripts in their collections. The documents bear the seals of their respective writers to guarantee document authenticity, which was considered valid only if the seals remained attached and intact. For this reason, the seals have been stitched into textile bags for protection. These bags are generally made of linen

or wool. The documents have been carefully stored, safe from direct sunlight and pests, meaning the seal bags still retain their original colours. As the National Archives have digitized a large portion of the manuscripts in their collections and present the material via the SDHK database, it is possible to distinguish manuscripts that still have their seal bags attached. We chose to examine seal bags preserved from the years 1360–1397 (Table 2) in order to compare their colours with those mentioned in the wills examined by Andersson (2006).

The manuscripts examined may bear a single, attached seal, but frequently have at least three, and in some instances as many as eight seals. Some of the seals no longer retain their seal bags, which have subsequently been lost. This is due to the fact that each seal bag has at some point been cut open or had seams unpicked, to establish ownership of the respective seals (Figure 1). As a result, the majority of the preserved documents with seals attached no longer have their seal bags. We analyzed seal bags connected to 39 individual documents; of these, 48 bags are made from linen or hemp fabric, and 32 bags are made from wool fabric. The seals range in size from about 2.0 cm in diameter to about 10 cm in diameter. The largest seals are those belonging to bishops and monasteries, and frequently come in vesica piscis shape – vertical, pointed ovals.

The bags' fabric includes linen, hemp, and wool. The linen and hemp fabrics are unbleached, white, blue, or light red. A striking detail about the wool fabrics of the bags is that they, unlike the archaeological textile finds, come in very bold, dyed colours; they present a most informative source material, as they are precisely dated and can be connected to individual people. By our analysis of the fabric of the bags and the compilation of the qualities of these fabrics, we can compare them to archaeological finds from the same time period.

The fabric qualities of the seal bags correspond to the fabrics used for gilt-leather embroideries (Neijman and Sundström 2021: 37), as well as the archaeological fabrics of Hammarlund Groups 3 and 4 (Hammarlund et al. 2008). The seal bag fabrics are visually and technically similar both to one another and to the fabrics described by Hammarlund et al. (2008). This means they appear visually similar, and have the same thread count, twist angle, twist direction, and finishing. The fabrics are tabby or 2/1 twill – 2/2 twills are absent in the material examined – and are more or less all fullled.

All bags except one were stitched together with 2-ply linen thread. The linen thread is unbleached, white, or (in a few cases) dyed blue. In one case, silk thread was used; this rarer material was used in a bag from a monastic context (SDHK:11472). Bags may vary in their construction, and even the seams on different seal bags connected to the same document may vary in execution. Some bags are made from one piece of fabric folded down the middle, while others have been assembled from two separate pieces, either sewn with some variation of French seams, or whipstitched together from the outside. Most bags utilize the same materials on both sides, although a few have front and back

Table 2. Examined seal bags from the years 1360–1397 in the National Archives of Sweden.

SDHK-nr:7810	SDHKnr:10803	SDHKnr:11083	SDHKnr:11328	SDHKnr:11486
SDHK-nr:9798	SDHKnr:10855	SDHKnr:11107	SDHKnr:11335	SDHKnr:11502
SDHKnr:10405	SDHKnr:10858	SDHKnr:11110	SDHKnr:11367	SDHKnr:11540
SDHKnr:10586	SDHKnr:10877	SDHKnr:11125	SDHKnr:11423	SDHKnr:11543
SDHKnr:10587	SDHKnr:10891	SDHKnr:11171	SDHKnr:11444	SDHKnr:11560
SDHKnr:10592	SDHKnr:10936	SDHKnr:11209	SDHKnr:11455	SDHKnr:11631
SDHKnr:10593	SDHKnr:10964	SDHKnr:11221	SDHKnr:11461	SDHKnr:11639
SDHKnr:10658	SDHKnr:11020	SDHKnr:11306	SDHKnr:11464	SDHKnr:11670
SDHKnr:10722	SDHKnr:11032	SDHKnr:11307	SDHKnr:11470	SDHKnr:11731
SDHKnr:10726	SDHKnr:11069	SDHKnr:11317	SDHKnr:11472	SDHKnr:11765
SDHKnr:10732				



Figure 1. A document with altogether four seals and their opened bags (SDHK 10936). (Photograph: M. Neijman)

pieces crafted from different colours. Some of the bags display evidence of reuse, such as seams from previous use, while others have been grafted to create a piece of fabric large enough to cover the seal. On document SDHK:10658, there is one mixed-material bag, with a red wool lining and a shell fabric of white linen.

The documents include deeds of gifts, wills, agreements, and other types of letters. The documents bearing many seals often have adherent seal bags in many different fabrics placed around the individual seals, indicating that it is the owners of the respective seals provided the fabric for the occasion of the drawing-up of the manuscript in question.

13.6. Bag colours

The majority of the wool bags analyzed are a deep, dark blue. Many of these are tinged in other colours, such as red, green, or purple. It is unclear whether the bags were originally dyed with different pigments, or if the underlying shade is a result of overdyeing a faded fabric, with the dark blue hue as a form of touching-up. In order to achieve such a dark blue, it is easiest to work with already pigmented wool, such as brown.

The red bags are bright in colour, with the kind of intensity achieved with a madder dye bath prepared with equal amounts of pigment and material to be dyed. Both the blue and red seal bag colours correspond well to the colours found in medieval gilt-leather embroideries (Neijman and Sundström 2021: 37). Yellow fabrics, too, are represented among the seal bags. These colours are bright, and impressively untouched by age. The same is true for the green fabric used around the seal SDHK:11455.

Five bags include fabrics of particular interest, as they consist of blended fibres in the same way as the fabrics of the Skokloster 1 gilt-leather embroidery (Neijman and Sundström 2021: 39). From a distance, these fabrics appear purple by virtue of optical illusion. A closer investigation plainly reveals that red and blue fibres were mixed together in varying amounts to provide the material for spinning a thread. The five examples present different blends; one fabric is predominantly blue with a tinge of red, two are blended from approximately equal amounts of the respective colours, and two are mainly red with a smaller portion of blue fibres. In one case, it is evident that there is one red, previously spun thread, which has been incorporated into the compound-colour thread. This might indicate that

the compound-colour thread was spun from recycled fibres obtained from a red, unravelled fabric. Document SDHK:11069 features just such a fabric, which belonged to either the Seneschal of the Realm or the lawman of the province of Östergötland.

13.7. Who provided the fabric?

It is plain when looking at the documents bearing multiple seals that different fabrics were used to make the individual seal bags. In some instances each bag was made from a different fabric, while in other cases a few of the bags are made from the same fabric, while all the others vary. Document SDHK:11540 bears the signatures of five different individuals who also added their seals to the manuscript; the first three seals have bags made from different fabrics, while the last two have bags made from the same material. These last two also use the same type of green wax in their seals, and the bearers appear to be related, as they share the same surname. Document SDHK:11444 has three seals with the bags still attached, two of which are made of red wool, with one made of dark blue linen. Official documents display more uniformity, as seal bags attached to them are frequently all made from the same fabric, and stitched together in the same manner. A plausible theory is that the individuals sealing the documents were themselves responsible for providing the materials required to make their signature

13.8. Conclusion

There is no doubt that materials were plant dyed in the Middle Ages; the seal bags add a confirmation of that knowledge. Even this limited study provides valuable insights regarding the saturation, hues, and surface structures of the wool fabrics. The red colour of the seal bags examined was a very much expected feature, as it is comparable to those present in the archaeological material. The yellow and green were expected, but the confirmation of their use is valuable. The blue was a bit surprising as it was so dark, and some colours appear to be compounds; blue shades this dark are rarely represented in art dating from the same age as the fabrics. The seal bags feature very few and very bold colours. We expected to find a wider range represented for the respective colours, such as pale reds and blues. Another surprise was the complete absence of undyed wool fabrics among the bags. However, the colours of the bags are close matches in both shade and quantity represented to the colours mentioned in the wills and testaments of the time. Here, too, blue and red occur most frequently. What is missing among the seal bags are the colours brown, white, black, and grey. These could be achieved with natural pigments, that is, undyed wool. It is also possible that some of the dark blue fabrics of the seal bags could correspond to black. The colours of the bags can also be found in extant gilt-leather embroideries (Neijman and Sundström 2021: 38–39).

What we find most interesting are the mixed-fibre fabrics, of which we now have several examples. This is something that is completely invisible in the archaeological material. The colour blending is the result of a deliberate process seeking to achieve a purple colour. These fabrics are found in the upper strata of society, and were likely coveted items. It is interesting to see that recycling was a matter of course within fabric production, and that all social groups were open to more frugal processes.

The documents included in this study all represent people of economic means, while the fabrics found in urban archaeology are more anonymous. In the archaeological material, there are fabrics of even finer qualities than those used to make the seal bags, meaning that high-status textiles are also represented archaeologically. Materials from these finds also display greater variety in their quality, and

originate from a longer period of time than the seal bags we have examined. As seal bags dating from the 13th and 15th centuries are also known, it is likely that additional fabrics with qualities similar to those in the archaeological finds can be identified among these. The bags that we examined are remarkably similar to one another regarding weaving techniques and thicknesses, and their equivalents can be found in the archaeological material referred to as Groups 3 and 4 by Hammarlund et al. (2008). It is easy to assume that these fabrics were chosen since they provide a measure of padding, and a cover to protect the seals from impact damage. However, this is contested by the fact that a great many seal bags dating from the 13th and 15th centuries are made from a thin linen or hemp tabby, which does not provide the same cushioning. The question is whether there was a generally accepted idea about what kind of fabric was suitable and functional in seal bags, or whether the choice of fabric has been determined entirely by the materials available to the individuals contributing their seals. Among the bags examined, there is a single example which utilized two different fabrics to encase the seal. The lining of this bag is a red wool fabric, while the shell is a white linen or hemp fabric.

Only a handful of documents survive today, and few retain their seals. Fewer still also have their seal bags intact. Of course, these results require further examination, and thus far the material included in the study is too small to draw any definite conclusions. Still, we consider the material a valuable one, and we are convinced that further study of the seal bag material can add more nuance to the medieval colour palette.

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