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CONSERVATION OF A GAUZE TEXTILE FROM THE TULUNID PERIOD IN EGYPTIAN TEXTILE MUSEUM, CAIRO

Enas A. AMIN*

Conservation Department, Faculty of Fine Arts, Minia University, El asisy street, Shalaby, Minia, Egypt

Abstract

The article is about the documentation and conservation of an Islamic textile piece from the Tulunid period. The object was made of gauze textile. The main challenges of previous conservation at the excavation site where the poor condition of the object that the piece was glued on a free acid paper and it caused dryness of the fibers. SEM microscopy was used in the identification of textile fibers; x-ray analysis was performed to identify mordant, FTIR analysis to identify dyes in dyed samples. The main conservation treatments removed the piece far from acid free paper, surface cleaning and supporting the fabrics of the object on blue linen support fabrics using stitches.

Keywords*: Gauze; Stitches; Conservation; Treatments; Supporting*

Introduction

The unique form of textiles makes them the perfect material to assess culture change [1]. For that we study the textile structures such as gauze textiles. Like other loom-made fabrics, gauzes have warp and weft elements; but a special constructional feature distinguishes fabrics of gauze weave [2], which is characterized by crossed warps [3], that the warp threads are paired and twisted loosely around each other, spirally, throughout their length in such a way that one or more wefts can be passed through the loose bends which they combine in forming [2]. Wefts are omitted at regular intervals, leaving rows of openwork [4]. But the twisting process is one of uniting by winding one thread around another; it identifies twining techniques. In gauze weaving, threads are deflected from a parallel position to cross and recross [2, 5], but at no time do they twist or spiral completely around one another. All explanations of the gauze weave give emphasis to its additional characteristics [2]:

- Variation in the number of threads crossing: one crossing one, two crossing two, one crossing three, one crossing four, etc.
- Variation in the number of picks grouped together and in the manner in which they are grouped together by the crossing threads.
- Variation in the yarns-thicknesses, colors, woven together.
- Variation by the introduction of extra materials [6].

The decorative effect achieved on gauze textiles by the supplementary wefts being added during the weaving process [7]. Figures in gauze can be created by combining different types of ground-end crossings or even by combining gauze with other weave constructions [8]. The

* Corresponding author: Enas.Mohamed_17@yahoo.com

chain stitch is one of the embroidery stitches which using in the embroidery. This type of weave is described as gauze is as thin and elastic quality, as well as lightness [9-10].

This study is a case history which illustrates the gauze textiles, and demonstrates the importance of understanding the properties of these textiles when formulating conservation strategies for this object. The paper aims to deal with a complex object by investigation and analysis of fibers and dyes, in orderto establish the state of damage, as to be able to make a strategic plan for conserving a historical gauze textile in the Egyptian Textile Museum in Cairo [11-16]. This case study will be a guide for the conservators who seek to investigate structure study, conserve, and display the historical gauze textile.

Methodology

Description of the object under study

The object was documented using the basic guidelines of the cataloguing of archaeological textiles. The dimensions, weave techniques and thread of textiles were documented [17]. The Tulunid object was stored in the Egyptian Textile Museum under inventory no. T595. It dated to 8–9 AD century/2–3 AH The object is made of silk, and is 20cm long by 19cm wide (Fig. 1). It is consisting in an uncompleted square inside it an embroidered roundel. The roundel contains different types of decorative motifs such as plants and geometric figures. In the two corners of the object found decorations made up of plants figures and modified bird. The structure of the object is gauze textile (Fig. 2a). The decorations were embroidered by using colors linen threads with the chain stitch (Fig. 2b). The object contains different colors such as red, black, green, yellow.

Fig. 1. The Tulunid object in Egyptian Textile Museum

Fig. 2. Gauze textile: a – structure; b – decoration embroidered by the chain stitch

A visual inspection showed the object to have many kinds of damage (Fig. 3), such as missing embroidery threads (Fig. 4a), irregular holes (Fig. 4b), missing parts of the object (Fig. 4c), writing with ink (Fig. 4d and e), and its fibers are very stiff and too weak mainly due to poor and unsuitable storage, because the piece has been adhered on acid free paper with adhesive material (Fig. 4f) at the excavation site.

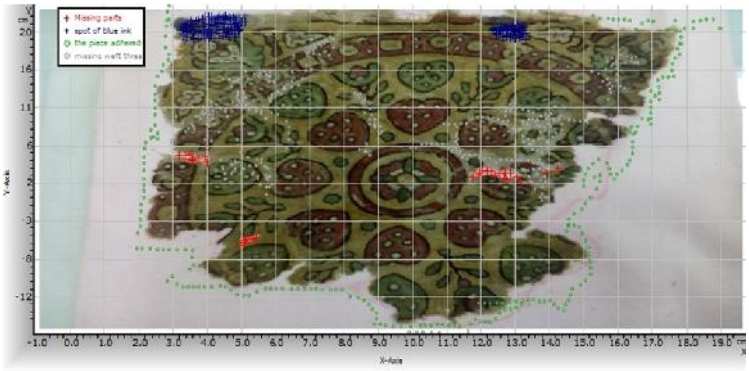

Fig. 3. The types of deterioration on the object

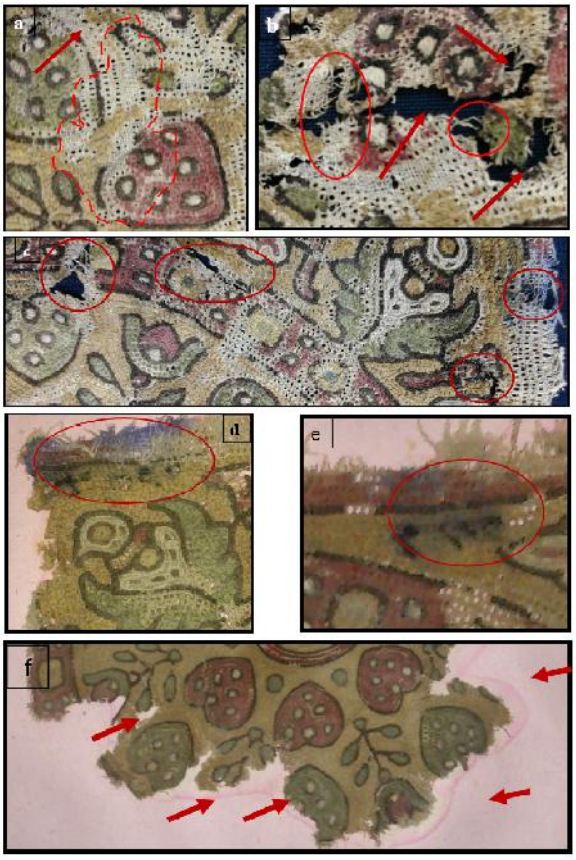

Fig. 4. The textile samples:
a - missing embroidery threads; b - irregular holes;
c - missing parts of the object; d and e - writing with ink;
f - the piece has been adhered on acid free paper

Testing and analysis

Morphological study

Samples were taken from the textile for SEM testing. The smallest sample was taken from the loose threads, which were available from different parts, to investigate the morphology of the surface of the fabric to show the quality of the fibers, as well as the damage aspects on these fibers. SEM photos of examining textile are illustrated in (Fig. 5a and b). Showing the silk threads that were identified from different parts of the object ground but all the yarns of different colors are linen. The most common changes in morphology of the fibers were surface damage, scratches, large slights, holes, broken with transverse cracking of fibers, longitudinal splitting, the fragile ends (Fig. 5c and d) and the acid free paper onto which the object was pasted with the adhesive was appear (Fig. 5e and f).

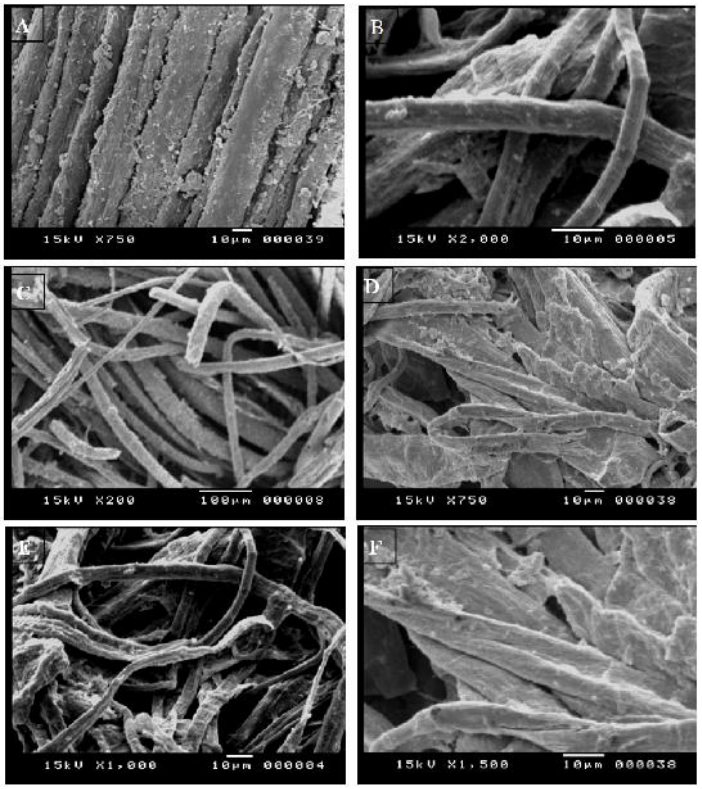

Fig. 5. SEM images of the textile samples**:**
A. The figure shows SEM images, one can see that the ground fibers are silk;
B. The yarns from different colors are linen;
C. and D. The fibers are extremely damaged, broken and fractures
with longitudinal splitting characterized and the fragile ends;
E. and F. The acid free paper which the object pasted on it with the adhesive was appear

Fourier Transform infrared spectral analysis (FTIR)

FTIR analysis of solid phase samples can be typically performed using two different methodologies. The first, more traditional and widely used approach, FTIR–KBr. FTIR analysis has been performed by transmission techniques, in which the infrared energy is passed directly through the compound being studied. The powder sample can be milled with potassium bromide (KBr) to form a very fine powder. This powder is then compressed into a thin pellet which can be analyzed. In this method the sample is diluted with KBr (IR grade) so that the

concentration of the sample is 1%. Fabrics were measured by (Smart Performer ATR) unit accessory with Zinc Selenide crystal. ATR accessories require minimal setup and are easy to clean. Samples are placed directly onto the crystal surface itself. Single - bounce crystal modules tend to be the most versatile, since most are supplied with a pressure device and are appropriate for a variety of organic liquids and powders [18]. The small samples of different colors were taken and investigated them. Then, all the dyes which give these colors were brought and investigated them. After that, the original samples were compared with new dyes to find the following: (Red color is adder dye, Yellow color is Turmeric dye, Green color is a mixture between Indigo and Turmeric dye, Brown color is Indian cutch) as shown in (Fig. 6). Furthermore, the analysis was shown the kind of mordant is (Alum) as shown in (Fig. 7).

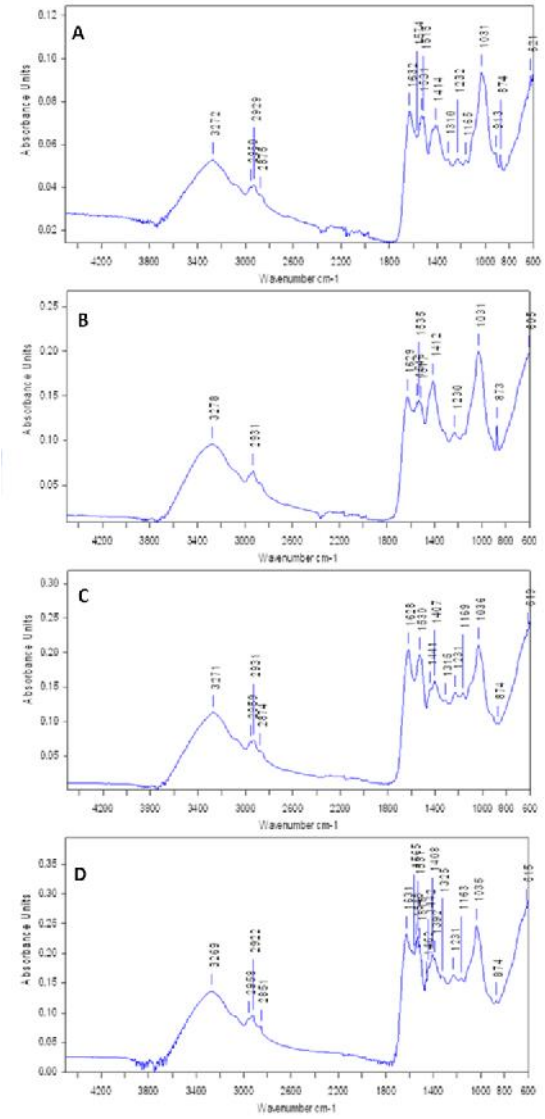

Fig. 6. FTIR Spectra: A. Textile dyed with Madder dye, B. Turmeric dye, C. Mixture between Indigo and Turmeric dye, D. Indian cutch dye

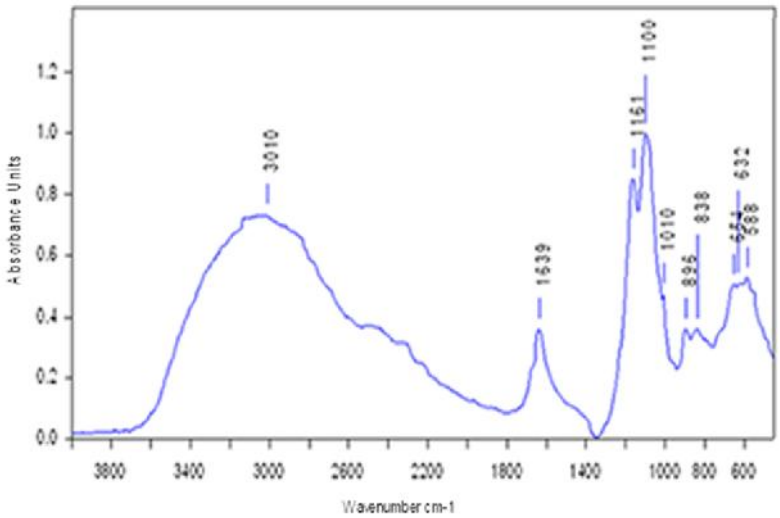

Fig. 7. Spectra of textile mordent with (Alum)

UV analysis

In our case Perkin Elmer Lambda 900 was performed**;** UV results proved that the type of adhesive which the piece has been pasted with it on acid free paper at the excavation site was analyzed, Where the resin material was extracted of processor paper and analyzed, the result that the UV spectrum of that material converges with the UV spectrum of sugary substance likely that Arabic gum (Fig. 8)**.**

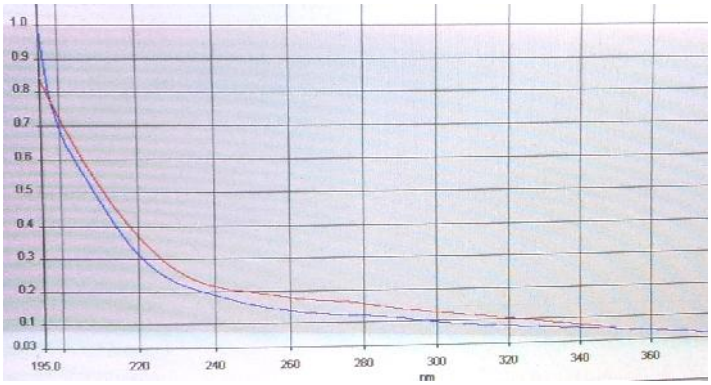

Fig. 8. UV analysis shows that the adhesive is Arabic gum

Conservation Procedures

Testing the stability of dyes

The aim of conservation cleaning is to remove any harmful soils, which may be disfiguring or causing physical or chemical damage to a textile. Selection of the appropriate cleaning method depends on the nature of the soil present, and on the materials, structure, and condition of the textile. Stability of dyes always is carried out first to determine the response of the textile dyes to cleaning and to identify the most suitable procedure [19-22]. To test the stability of the natural dyes to wet cleaning, the object showed severe dryness. A piece of cotton

wrapped round a wooden stick was immersed in the cleaning solutions and placed in contact with the colorful parts of the embroiderers. Each color was individually tested. It was found that all the dyes were stable and did not bleed with the wet cleaning solution.

Wetting process

Due to the severe dry conditions of the piece, which lead to the difficulty of holding it, wetting processes were conducted using water and ethyl alcohol by using a piece of cotton wrapped round a wooden stick, which was immersed into the cleaning solutions and used to wet the object's edges (Fig. 9).

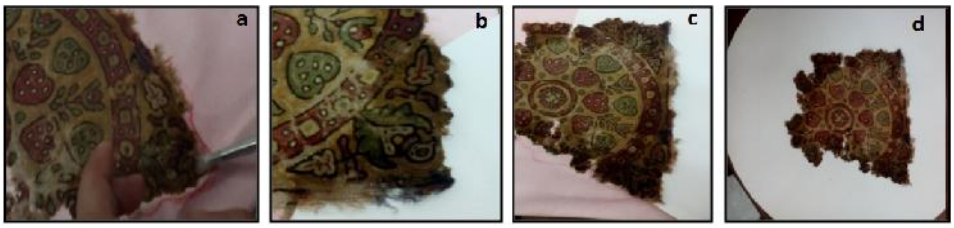

Fig. 9. The wetting process

This process has been repeated over different periods of times in an attempt to restore some flexibility to these pieces. This process is simple and successful to a great extent, and it also helps to detach the piece from the acid-free paper, to put it on a blotting paper preparing to support it on a textile support. As well as its participant to free from the glue because it is not a viable approach. Past experiments with adhesives have produced results that can be described as disastrous because of the heterogeneity of the materials and because the glue adds an undesirable thickness to the textile in the areas of consolidation [23]. After removing the object far from the free acid paper, we found a part of the paper very adhered with the object from the behind (Fig. 10a) for that we used the warm water to remove it. The path temperature was 40ºC in order to increase the effectiveness of cleaning (Fig. 10b).

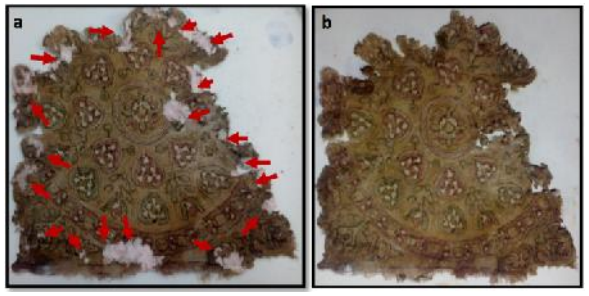

Fig. 10. The ancient textile object:
a. A parts of paper very adhered with the object from the behind,
b. The object after cleaning the adhered paper

Dry cleaning

In general, dry cleaning solvents such as alcohols will attack the ink at room temperatures. Solvent cleaning is based, substantially, on the same phenomena of washing, that is to solubilize, emulsify and catty away the foreign substances from the textile, but without triggering chemical reactions with the fibers and swelling them [24].

Thus, ethyl alcohol was used for the soiling ink parts by using a piece of cotton to help remove spots after 5 minutes. The result is effective until we stopped it to protect the fibers and we can note the pictures after use, which shows the extent of the alcohol efficiency to remove a big part of undesired remnants of ink as shown in (Fig. 11). This process is not only considered a dry cleaning, but also a sterilization of pieces from the fungi [18].

Fig. 11. The dry cleaning process

The final support process

Preparation of wooden frame and textile support

The most effective support of a weak textile is to line it with a suitable fabric. Mounting the object on a new support fabric will give additional stabilization. This step includes laying the object on a suitable mounting fabric for exhibition purposes [25]. A new blue linen textile was used (1/1 Plain Weave). The linen support fabric was prepared and washed to remove chemical residues and prevent shrinkage at a later time due to humidity changes. The new linen fabric was ironed to remove creases. The textile size is 40×40cm to tighten it on the wooden frame which was chosen with good quality of wood with size (30×30cm). The textile was pulled on a wooden frame by using pins with the province to keep its warps and wefts on a right direction.

Temporarily fixing

The piece was temporarily fixed on the textile support by using needle work, precisely using a thin needle with red cotton yarn. The piece was put on the textile support with taking into account putting the piece correctly in the middle. At the beginning, the piece was fixed by working longitudinal, straight and parallel lines and each line length 5cm and far from the next line to it a distance of about 5cm, first start the work on the lines of the first row and after completing it comes second row, so that mediates the distance between the first lines row, then comes the third row as the first alternately until fixed was completed we also fixed the weak places of the piece, as shown in Figure 12.

Permanent supporting

After completion of the object treatment and temporary fix, tacking stitches were used with a very fine needle and fine silk thread to fix the object into the linen support. At the beginning of the final stage, the edges of the object all around and the edges of the missing parts were attached by sewing with a small stitch technique (blanket stitch) and afterwards vulnerable parts were attached by small stitches (Couching stitches). Similarly, sized stitches were used to attach the body of the object with the support textile (Fig. 13).

Fig. 12. The temporary fixing

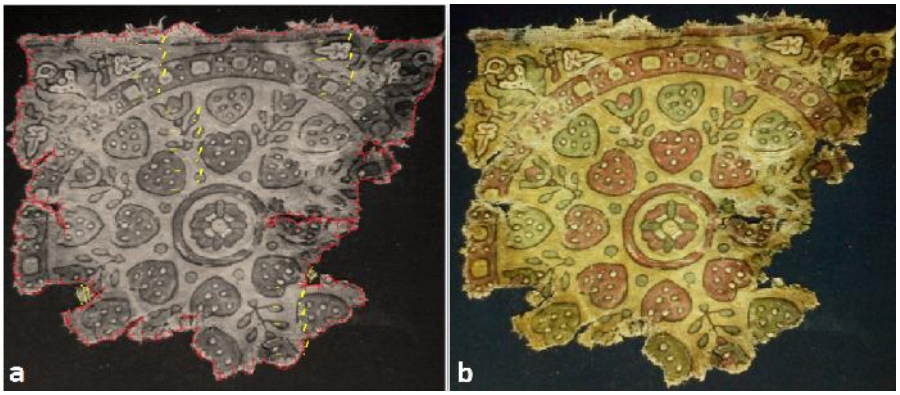

Fig. 13. The permanent supporting: a – stitches applied, b – final stage

Fig. 14. Preparing for the museum display

Preparing for the museum display

After completing the cleaning process and fixing the object, it could be displayed in a suitable manner according to the museum requirements. The foam frame is used because of its good characteristics against the moisture and biological deterioration, in addition to its lightness and facile movability. This procedure was carried out in the following three steps. The 1st step, a piece of foam has been cut with size 30×30cm leaving about 5cm from each side. The 2nd one, a piece was taken far from the wooden frame and put in the middle of the foam frame. The 3rd step, the edges of the textile support has been adhered from behind with polyvinyl acetate. Finally, two sheets of foam have been cut with sizes 4×30cm, and two sheets have been cut with sizes 4×22cm to paste it with polyvinyl acetate on the clear textile support from behind as shown in Figure 14. The object in the final stage is shown in Figure 13b.

Conclusion

Thorough documentation, material research and conservation were used in this research. The gauze technique was discovered during documentation. The practical conservation was carried out to make the piece structurally stable and visually more presentable. The main challenges were the poor condition of adhering the object on acid free paper with glue. The support made and gives the current shape of the object. After conservation and the custom display the entire piece is more integral and aesthetically pleasant.

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