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**Conservation and Treatment of a Historic Indian Textile at the Faculty of Applied Arts' Museum, Giza, Egypt,
Moushera Ismaiel Hussien.**

Conservation Department, Faculty of Fine Arts, Minia University

Email address: imoushera@yahoo.com

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Abstract

In this paper, we discuss how deterioration aspects were found due to suffering from various degradation factors during the previous museum exhibition for the archaeological piece. One of the fabric pieces has been treated and As part of the Museum of the Faculty of Applied Arts under several 119/99, after it was found to be in a severe state of deterioration, which led to the frailty of its fibers and the erosion of many areas, and therefore this study aims at cleaning, strengthening, and stabilizing it., It is the application of knitting with a concept based on the use of threading that was used in the initial temporary exhibition, which is the use of the needle on the background of dyed Installing linen before restoration as a supporting method.

Keywords

Conservation, mordant, supporting, silk, textile.

1. Introduction

From ancient, till now textiles are a great part of our daily life. People have created textiles not only for warmth but also as a means of demonstrating social status and signifying personal individuality.

Aging of historical textiles can be concenter as the irreversible changes that occur slowly over time, and in the case of textiles result in the deterioration of mechanical, chemical, and optical properties (Harby E. Ahmed, etal-2020), Textiles in all forms

are an essential part of human civilization (Bergfjord.C, Mannering, etal-2012) , The paper aims to present the strategies for the conservation of historical textiles in Egypt. It shows new methods in the conservation of historic textiles, at least in Egypt. The paper aims at knowing the kinds of fibers and dyes, stains, dust, and different damages in this object through different ways of investigation. The paper reports the conservation treatment of the object such as cleaning, removing the old adhesive and old restorations, completing lost parts, fixing separate parts, and making a new display (Harby E. A, Yassin E. Z-2011)

Textiles are one of the most vulnerable art collections Due to the influence of various damage factors, it always needs display and storage methods that guarantee preservation and safe display, and then the methods of display and museum storage of antique textiles always represent a continuation of development in the necessary maintenance operations, so it is always the responsibility of the textile restoration specialist to constantly think in providing the best means methods of restoration, display and museum storage in proportion to the conditions of archaeological textiles, with the aim of protecting them as an important element of Preventive Conservation Archaeological textiles, like other organic materials, are subject to the influence of various damage factors present in the surrounding environment, such as heat, light, humidity, mechanical pressures, and for long periods of time, which leads to the occurrence of aging of the fibers and results in weakening and damage to these

textiles that appear in the form of wear and tear and the fabric may become stiffer and drier and consequently Fibers lose their elasticity and strength. Therefore, rapid intervention is necessary to treat fragile antique textiles and properly display them to preserve this cultural heritage from extinction (Maria Cybulska, etal-2007)

All textiles are damaged by light, insects, microorganisms, and air pollution which, alone or in combination, cause a great loss in tensile strength and elasticity (Salgo Merin Jacob, etal-2017)

The main environmental parameters influencing the collections conservations were identified as humidity, atmospheric pollution, noise and vibration, temperature, illumination. a) Relative humidity fluctuations produce changes in size and shape of the exhibits with associated stresses, change in the rate of deterioration because of chemical reactions, changes in biological deterioration sources. b) Atmospheric pollution can produce particulate deposition as well as chemical degradation (Giacomo Goli, etal-2017)

2. Materials and methods:

2.1. Sampling:

The applied study concerned the treatment and maintenance of an ancient piece, which was in a state of deterioration, erosion, and fragmentation. The study commenced with its registration, documentation, preservation, and diagnosis of the condition of the antique. Techniques used included a technical description of the motifs, technical analysis of the histological composition, and microscopic examination.

And to obtain sufficient data on the state of deterioration exposed to it, whether for the fibers or their natural dyes.

The treatment and maintenance stages included the temporary fixation process, then the permanent fixation of the artifact, and then preparing it for museum display. Then the study extracted a set of important results, which explained the state of deterioration, which can be used in the treatment and maintenance of some similar tissue pieces. The documentation steps were as follows:

The textile object dates to an Indian age (1945) and was shown in case no 9/119 which is preserved at the Faculty of Applied Arts, The Indian silky textile (fig.1), of the piece is approximately 130 X 110 cm, it is a piece of cloth woven from the silk. The piece is an almost square-shaped area divided according to the decorative design. It is bordered by a wide four sides. They have been added to the piece.



(Fig.1) The object dates to an Indian age,1945



(Fig.2) decorative patterns in the object

The weaving composition of the lining is a plain fabric that extends 1/1 regular in the direction of the weft and the wedge together with the difference in the thickness of the warp threads, the piece is fixed on a brown lining and fixed with sewing stitches with a white cotton thread with the saddle stitch and installed on a plain fabric 1/1 as shown in (fig.3)



(Fig.3) the lining of the object

2.2. Analytical techniques

2.2.1. Optical Examination:

Using USB Digital Microscope was used Magnification power from 20 X – 200 X - 1.3 MegaPixel (fig.5), and then Using Axio Cam ERC 5s were used with all microscopes stands from Carl Zeiss – in Faculty of fine arts -Minia university.

2.2.2. SEM:

Samples were collected from the background and decoration. The filaments were examined using a Scanning Electron Microscope (SEM) (FEI-QUMTA 200SEM) in Central Lab. For Microanalyses, Minia University, Egypt, to study the surface morphology as well as aspects of damage to these fibers.

2.2.3. FITR

The analysis was done in the Cairo Projects Sector, Ministry of Antiquities and the device is a Brooker

brand Model 70 vertex with a mid-infrared source, spectral, equipped with an ATR unit, to measure samples without preparation and damage to the sample Resolution 4. scan 16

2.2.4. Testing the stability of dyes

Dyes are intense coloring organic substances used to impart permanent colors to textile fabrics and sometimes to leather, wood, bone, ivory, and other materials. Not all colored organic substances are dyes. Only organic molecules of considerable complexity are useful as dyes. The color of dyes arises from the selective absorption of specific wavelengths of radiation within a visible spectrum. The absorbed radiation brings about electronic transitions within the dye molecule: the energy differences involved in these transitions are the color of the dye. Light reflected from or transmitted by the dye produces the eye effect of color, and the color perceived is complementary to that absorbed by the dye (Omar Abdel-Kareem-2012)

2.3. Results

2.3.1. Optical Examination results:

The initial examination of the piece showed that it was exposure to a severe state of deterioration that caused a set of changes, whether on the level of the existing fibers or pigments, which had a significant impact on the arrival of the state of deterioration to a level that can be judged to be a dangerous level of deterioration in addition to the method of storing it, and the occurrence of mechanical damage it is represented in cuts, holes, and erosions, as well as exposure to rupture and fragmentation in many areas.

In addition to the loss of other areas and detachment of other parts, in addition, to discoloration of fabrics and their dyeing. Where the colors used in the decorations were discoloration and fading, as well as the color of the background, with severe cases of erosion in the warp and weft threads, which were largely concentrated on the ground of the piece.



(Fig.4) some details of the deteriorated parts

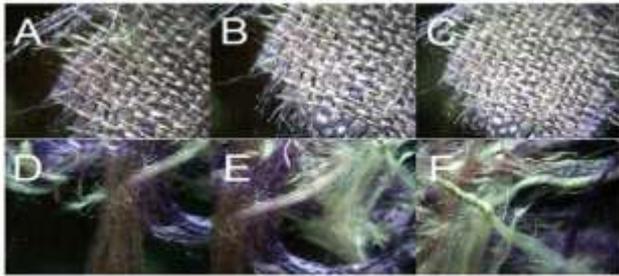
- A. part from the edges,**
- B. Missing part,**
- C. Missing weft,**
- D. Separated threads**
- E. holes**
- F. cutting**



(Fig.5) USB Digital Microscope was used.



(Fig.6) A,B,C,D features of deterioration under digital microscope , weakened fibers, and brittleness and other previous repairs

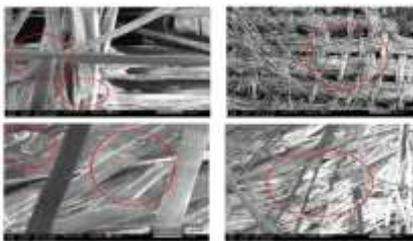


(Fig.7) different shapes of deterioration under Axio Cam ERc microscope

2.3.2.SEM results:

After using the scanning electron microscope (SEM) to examine the fibers of the textile piece to identify the type of fibers through the morphological examination of the fibers, where the examination showed that the fibers of the textile piece are silk fibers

The lining of the light blue color is made of cotton, and the examination revealed that the fibers were exposed to a severe case of dust accumulation between the textile fibers (fig.8)



(Fig.8) SEM filament screening images

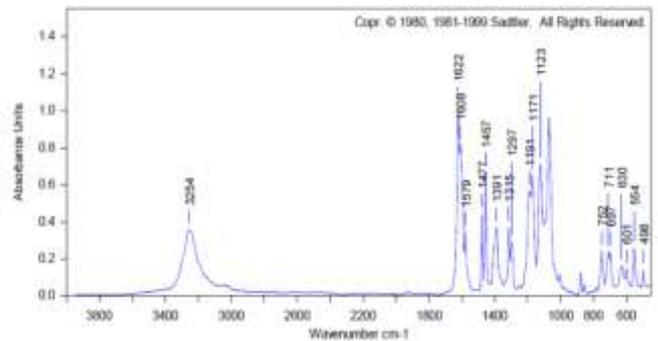
It shows that the weaving composition is plain 1/1 and the vegetal decoration using the technique of

extra weft and the lining fibers of the textile piece of silk

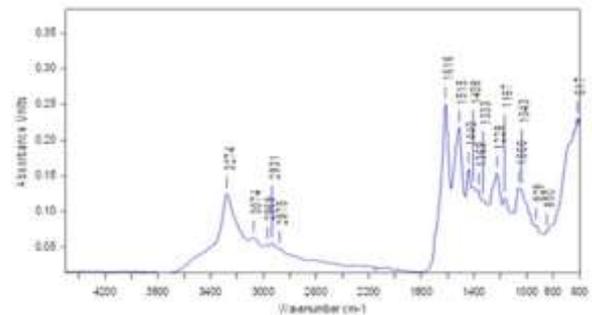
2.3.3. FTIR results:

The results showed that the red color (ground) is a madder dye, green (ornaments), indigo dye with turmeric, orange (underlay), saffron dye, brown (ornaments), black catechu dye.. (fig.9-11)

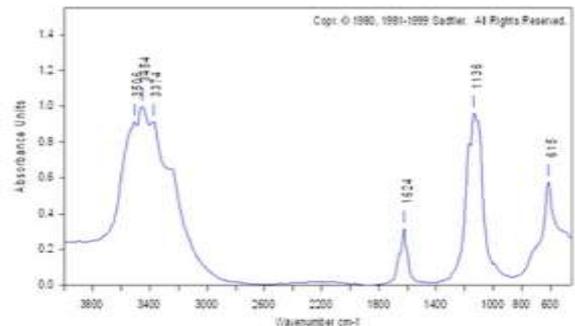
2.3.3.3. Decorations green color (indigo dye with turmeric)



(Fig.9) The identification of indigo with madder dye in decorations



(Fig.10) The identification of indigo with turmeric dye in decorations is demonstrated using an infrared analyzer.



(Fig.11) Mordant used Ferrous Sulfate is demonstrated using an infrared analyzer.

2.3.3.4. Mordant used Ferrous Sulfate

3.3.4. Testing the stability of dyes results:

The test was carried out first with distilled water, then with washing solution, and at all degree's chromaticity, where the test gave positive results, which confirms the lack of stability, and then it can be excluded washing process without any damage to the colors. (Fig.12)



(Fig.12) the stability of dyes in colored textile

4. Conservation and treatment

4.1. The mechanical Cleaning of the object

The conservation of textile includes the entire range of treatment and processing of the valuable items, without tampering directly with the item's structure and changing its shape. Restorations are combined with conservation of the methods and procedures which are applied directly, to return a textile item or material into satisfactory form, where its original shape and preserved aesthetic, historical, and sent physical integrity can be perceived. Conservation and restoration processing is often complex, and it involves certain risks for the item (Dragan Djordjević-2017)

4.2. Treatment procedure

4.2.1. Temporary fixing

The piece was put on the textile support considering putting the piece correctly in the middle, The piece was fixed by working

longitudinal, straight, and parallel lines and each line length was 5cm and away 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 the 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(fig.13), The sides of the fabric were saddled to protect them from disintegration and abrasion by using the Stitch Blanket Stitch due to its ability to trap those eroded ends, while the eroded areas were protected by a group of cross stitches, to protect them from further weakness and dislocation.



(Fig.13) The temporary fixing of the object

4.2.2. Permanent fixing

4.2.2.1. Dyeing and dye mordanting process for silk yarn and linen fabric

Mordanting Process of silk

1)1) Add potassium alum $KAl(SO_4)_2$ to the water and 5g was added to the dye bath 500ml of water and continued to heat the silk thread at 70 - 80 °C for 15 minutes, stirring and lifting the fibers once.

2)A rinse bath was performed using distilled water and neutral soap to remove excess dye not adherent to the fabric.

Turmeric dyes were used with its ginster dye on the green-yellowish color in addition to the use of silk in its natural color to restore the decorated parts in the white color and saffron to restore the remaining parts of the background of the orange piece and the black catechu dye to obtain the brown color found in the decorations and the dyeing was done as follows:

- 1) Add turmeric powder with zinester dye (5 gm) for each dye to the dye bath with 500 ml of water and heat slowly to 60 ° C for 30 minutes.
- 2) Add mordanted silk with heating about 60°C and stirring for 30 minutes.
- 3) The silk is lifted and rinsed well several times, then the fibers are dried well. (fig.14)



(Fig.14) .Dyeing and dye mordanting process for silk yarn

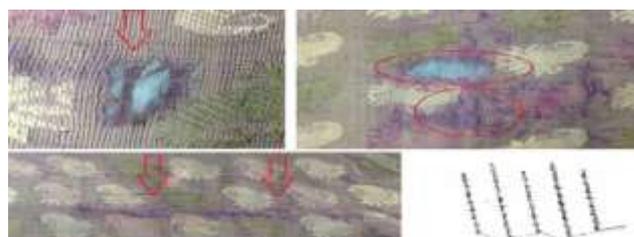
4.2.2.2. consolidation with needle

Stitching is probably the most widely used treatment method in textile conservation. It is a versatile technique that can be adapted for several purposes, such as different kinds of damage, retouching, and mounting. During a study to become a textile conservator, learning the basics of conservation stitches, it is taught that different materials or types of objects need different kinds of stitches, thread, and support fabric (Marie Schön., -2017), Textile conservator workers often use cloth braces to provide stiffening in weak areas of fabric and to provide an optical fill in missing areas. The most popular technique is the use of

dyed fabrics from one color but while simple pigmented support provides good reinforcement (Frances Lennard-2008) , 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) (fig.15), and vulnerable parts were attached by small stitches (Couching stitches) (Fig.16), Similarly, sized stitches were used to attach the body of the object with the support textile (Enas A. Amin, -2018)



(Fig.15) The piece edges are fixed with the blanket stitch.



(Fig.16) The piece edges are fixed with the couching stitch.

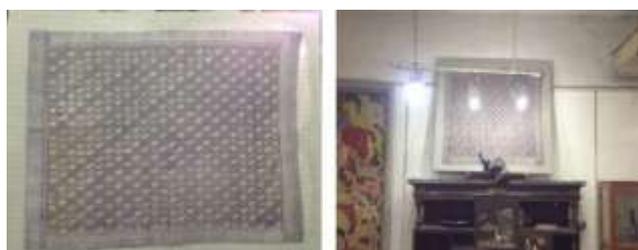
5. The recommendations for displaying in the museum

Causes of Deterioration: There are varieties of factors that contribute to the degradation of textiles. These factors include poor environment, pollution, inherent stability, and careless handling, in addition to inappropriate storage, display, and cleaning. Environment The chief cause for decay

in textiles is almost always the environment in which they are stored. Light, temperature, and humidity can all contribute to a textile's health or deterioration, depending on its intensity. Additionally, pests, chemicals, and pollutants may also cause damage to an antique fabric. Control of the museum environment is of prime importance for the good conservation of all museum articles(Vinita Koka-2018)

Rapidly fluctuating RH poses the greatest threat to organic materials. The goal guiding most collection management is to avoid a change in RH no greater than +/- 3% in one hour, +/-5% in 24 hours while sustaining a range of 40-65% RH. - If RH is controlled, temperature control is generally less crucial, However, Public areas are usually kept 17-19°C. For collections, a range of 15- 25°C is acceptable. - 50 lux is most often the given acceptable light level (20) -(Fig.18)

A new linen support fabric (The weave structure was plain 1/1) was prepared and washed to remove chemical residues and prevent shrinkage later due to humidity changes. The new linen fabric was ironed to remove creases. The fabric was stretched on a new wooden frame after cutting it with dimensions 140 × 120cm.



(Fig.17) The piece after treatment process and became ready for displaying at the museum.

6. Discussion:

These studies help to provide us with a good understanding of and useful information on how to choose background fabrics or dyes to use with them(Virendra Kumar Gupta,ob.cit -2019) , This applied study included the treatment and restoration of an archaeological piece of silk fabric to keep it from fragmentation and erosion and support it by working the needle against a linen fabric background as a safe and retrievable method by ensuring the use of wide stitches and as few as possible, while preparing the piece for museum display (Marie Schön.,ob.cit -2017), SEM, FTIR, And These analyzes showed a weakness in the structure of the archaeological fabric of the piece, and after performing the color sensitivity test, a decision was taken that the piece needed to be restored using a needle with the use of silk threads dyed with natural dyes close to the color of the piece with a background made of natural linen and dyed with natural dyes by the fabric combinations. The study confirmed that the technique of strengthening antique textiles using the method of weaving or needlework is one of the safe techniques to use, as long as the textile pieces themselves can withstand needlework, given that it is a retrieval restoration technique that can restore the textile piece when it is exposed to any future deterioration(Sandra C. Aho -20, Plus, things are suffering Particularly from fiber damage and corrosion On edges, ends and creases And creases especially at the corners and the dirt Spots , Basic control of museum environment plays an important role to maximize the life of textiles. It helps in preserving antique textiles and costumes for years

of use and enjoyment. In, Preparation of wooden frame and textile support, the most effective support of a weak textile is to line it with 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 (Omar Abdel-Kareem-2009) , Archeological textiles in the Museum of the Faculty of Applied Arts are exposed to many challenges such as oscillate relative humidity (RH), changing temperature, the effect of light, the effect of air pollution, nonstandard storage, and display methods. Choosing a good quality of silk fastening yarns dyed with colors close to the fabric, also had a good variety in the use of several knitting stitches that suit the conditions of each part of the fabric and the state of weakness and abrasion in the fabric, which helped it, in the end, to achieve the best possible result from treatment, support, and preparation for the display Appropriate museum, Archeological textiles in the Museum of the Faculty of Applied Arts are exposed to many challenges such as oscillate relative humidity (RH), changing temperature, the effect of light, the effect of air pollution, nonstandard storage, and display methods, In conclusion, we can say that this is a study that encourages the strengthening of textiles by using the needle, especially as it is a recovery method, and thus textiles are preserved and given chances of long-term survival.

7. Conclusions

Historical textile is exposed to many factors of damages due to use such as dust, blur color grades, weakness, loss of some parts, and change of pH value. Therefore, the historical textile requires to conservation process to eliminate the deterioration effects and protect the textile for the long term. Tests and analysisrward are used to identify textile materials and damage aspects. Initial support and test of color stability is an important step before the cleaning process. Mechanical cleaning process to remove the dirt and dust, as well as wet cleaning for disposal of impurities and dust, are important for carpet maintenance, the use of needle reinforcement and the use of silk threads and dyeing them with natural dyes close to the tones of the artifact may be necessary.

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