The Materials and Techniques Used in the Colouring and Preventive Protection of Mediaeval Islamic Paper

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Book Manufacturing:

• Paper Making
• **Paper Colouring**
• Paper Starching
• Ink Making & Writing
• Decoration & Painting
• Bookbinding
Colouring Paper During Islamic Mediaeval Era:

Based on historical & investigational studies:

Natural Colour of Paper:

- Cream to dark cream and either grey or off-white.
- No record of colour being added to the pulp.
- Wheat starch added mainly as filler – increase paper’s whiteness.

Undyed and dyed papers (225mm × 155mm), Mamluk, 15th century A.D., Oriental Institute (Bosch & Peherbridge, 1981)
Colouring Paper During Islamic Mediaeval Era:

• Based on Historical Sources:

• Reasons of Colouring Paper:
  1- Artistic Appeal
  2- Healthy Reason
  3- Symbolic Significance
  4- X X X X X X X X
Motivation:

Can Colour Protect?

Diagram shows the physical structure of book and the location of endpaper

Dyed endpaper pasted at the front and back cover of a manuscript book, 13th – 16th century, Egypt
Motivation:

Can Colour Protect?

Dyed endpapers at the back cover of manuscript book (1755 AD / 1169 AH), Cairo, Egypt

Coloured inside cover of mediaeval Moroccan book manuscript, Giza, Egypt
Aims:

• To identify the materials and techniques of colouring Islamic paper during the mediaeval era.

• To establish whether or not that some of these materials were selected for their biocidal properties as well as their colour.

• If bookbinders were knowledgeable of these properties.

• To explore empirically effectiveness as biocidal agents.
Method:

An interdisciplinary methodology is used:

• Gathering information from original and primary historic sources that include paper dyeing recipes.

• Collecting and analysis archaeological samples.

• Testing the biocidal properties of the founded dyes.
Historical Sources of Paper Dyeing:

1-Persian Source: (Simi Nishapuri’s text)

- Author: Simi Nishapuri
- Title: (A Disquisition on Paper, Colors, Inks, and Pens)
- Finished by (1433 AD)
- In Kitabkhana-i, Tehran
- 15th century Technical Information
- It gives 15 Recipes of paper dyeing

(Porter, Y. 1985; Thackston, W. M. 1990)
Materials & Recipes:

It gives 15 Recipes for 10 Materials:

• Saffron
• Henna
• Mulberry Juice
• Anemone Flowers
• Indigo
• Lac
• Sappanwood
• Safflower
• Cinnabar
• Verdigris
Historical Sources of Paper Dyeing:

2-Arabic Sources:
A- (al-Safti’s text):

- Unknown Author
- Title: (An essay on making inks and other materials)
- A copy back to (1851 AD)
- In National Archive of Egypt
- 13\textsuperscript{th} – 15\textsuperscript{th} century Technical Information
- It gives 15 Recipes for dyeing paper
Materials & Recipes:

It gives 15 Recipes for 14 Materials:

• Henna
• Myrtle
• Weld
• Turmeric
• White Straw
• Garlic Peels
• Green Fenugreek
• Red Onion Skins
• Lac
• Sappanwood
• Rings of Pomegranate
• Safflower
• Cinnabar
• Verdigris
Historical Sources of Paper Dyeing:

2-Arabic Sources:

B- (Ibn Badis’ Text):

• Author: Ibn Badis
• Title: (Staff of the Scribes and Implements of the Discerning)
• An unpublished 18th century copy of a 11th century manuscript
• In Al-Azhar Uni. Library in Cairo
• 11th century Technical Information
• It gives various recipes for 6 materials (lac, saffron, sappanwood, verdigris, cinnabar, and an unidentifiable plant source which had a blue colour)
Examples of the Recipes:

• Henna:

“Half pound of sieved Hejazi Henna is mixed into hot or cold water. When the henna becomes dough like, [then,] it is put in a container of copper and [again] twelve pounds water from a well is poured over it. The henna is, then, covered and left overnight. [Later on], it is filtered with a thin piece of cloth without stirring it [the coloured water ]”
Historical Sources of Paper Dyeing:

Examples of the Recipes:

- **Weld:**

  “Yellow lemon dye of *weld* is prepared by taking one pound of seasonal (newly-collected) weld, washed and put in a container of copper with one ounce of wild *Natron*. Then, twenty-four pounds of water of the well is poured over it and kept overnight. [Later on,] it is boiled until it is completely diffused into the water. [Once] heating is stopped, it is filtered, precipitated and then it used for dyeing [the paper], it gives a vegetable-like colour [to the paper]”.
Empirical studies:

Dyed endpaper pasted at the front and back cover of a manuscript book, 13th – 16th century, Egypt

(A Book of Questions on Medicine) Mamluk period (1250-1517 AD), Cairo, Egypt
Empirical studies:

1- Analysis of Historical Samples:

• (HPLC-ESI-MS) has been used.
• An established method was used to investigate the existence of yellow flavonoids. (Perry, Brown et al. 2011)
• Luteolin & apigenin were identified.
• the identity of dye (Reseda luteola) was established.
Empirical studies:

2- Microbial Study:

- Agar Diffusion Assay
- Turmeric, Weld, Safflower and Saffron tested against *Bacillus subtilis*, *Micrococcus luteus* and *Bacillus cereus*
- Measure the Clear zones of inhibition
- The dyes solutions showed different levels of antimicrobial activity against the bacteria; however, turmeric exhibited higher antimicrobial activity than the other dyes
Results:

1-From Original Manuscripts:

• The process of colouring paper can be traced back to the first half of the 11\textsuperscript{th} century AD.

• Fifteen historical recipes used dyeing paper during the Islamic-medieval period in Egypt.

• All materials were soaked, boiled, filtered, precipitated then the resultant coloured water used as dyeing bath.

• Each material has its boiling and soaking time and it is different from the other materials.
Results:

1-From Original Manuscripts:

• The recipes prove that processing took place after the formation of sheets of paper.

• Paper sheets were dipped directly into a dye bath, then drying.

• The process of dying had been done by the scribes or the bookbinders not the papermakers.

• Dyeing paper was a direct method, without adding any mordant.
Results:

2- From Empirical Studies:

• Weld was identified in three historical samples.

• The microbial study supports the concept that these dyes have some useful biocidal properties.

• The research suggests that some yellow dyes, but not all, could have been deliberately applied in the Islamic-medieval period to the endpapers of books to protect them from bio-deterioration.
Thank You