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

COMSt Conference

Hamburg, Germany

September 2016

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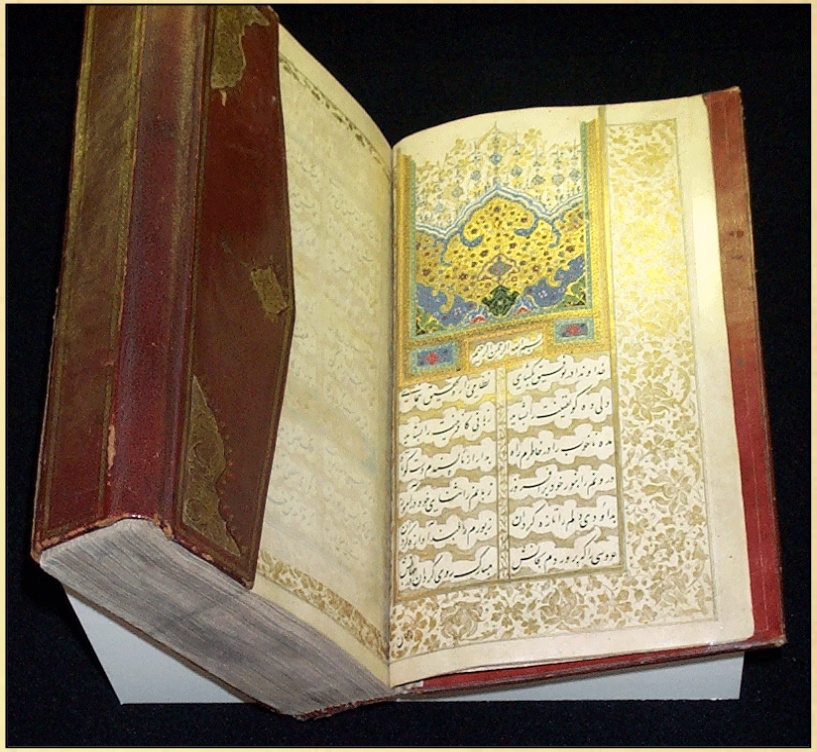
Book Manufacturing:

- 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

Motivation:

Can Colour Protect?

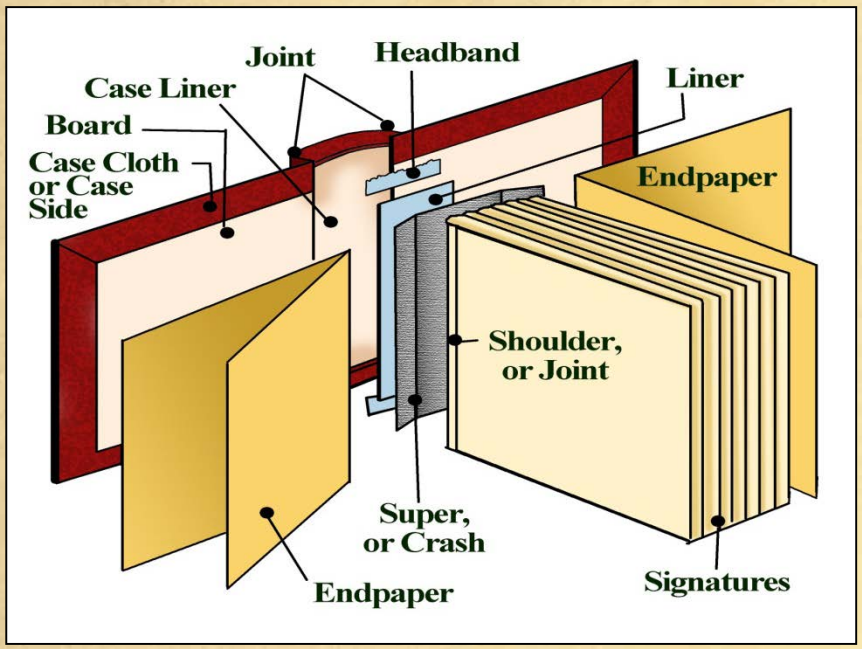


Diagram shows the physical structure of book and the location of endpaper

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:

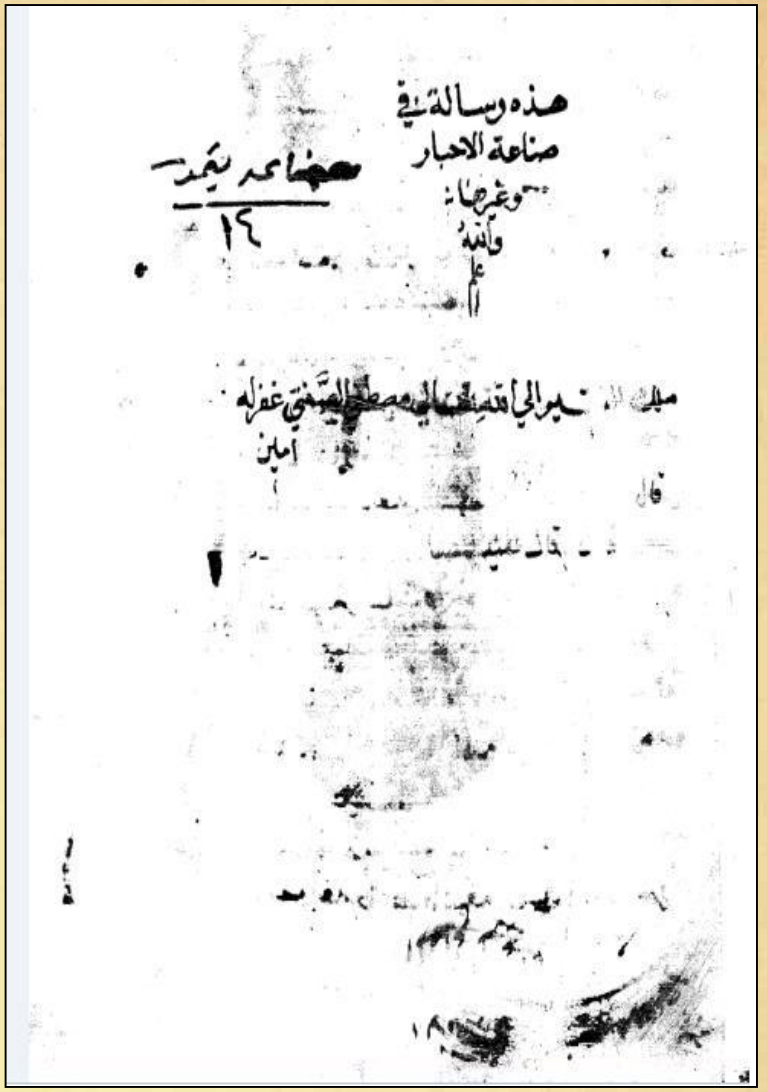
- Saffron
- Henna
- Mulberry Juice
- Anemone Flowers
- Indigo
- Lac
- Sappanwood
- Safflower
- Cinnabar
- Verdigris

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**
- **13th – 15th 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)**

Historical Sources of Paper Dyeing:

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]”.

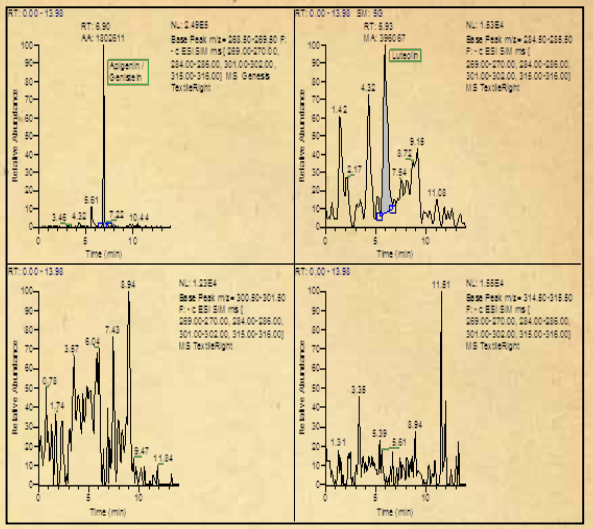
Empirical studies:

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:



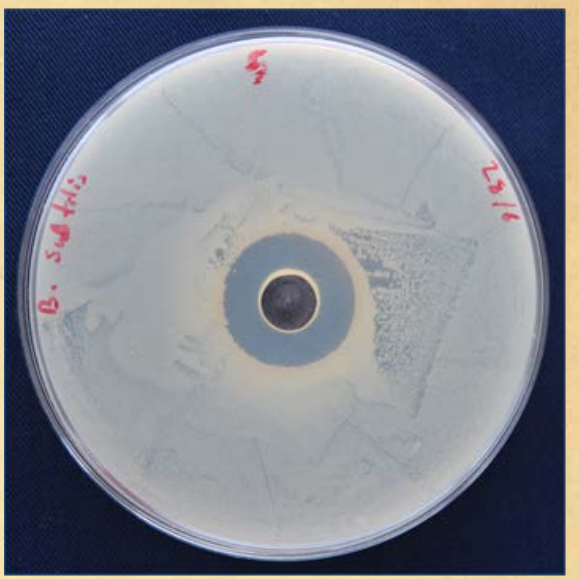
- (HPLC-ESI-MS) has been used.
- An established method was used to investigate the existence of yellow flavonoids.

  (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 11th 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