Threads Crossing the Warp
MODULE 4
Natural thread dying techniques

ΙΔΡΥΜΑ ΚΡΑΤΙΚΩΝ ΥΠΟΤΡΟΦΙΩΝ
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Dyeing:
what a dyer should know

The natural dye practice

„The natural dye practice involves chemistry, alchemy and a deep understanding of variations that a plant can have, depending on the soil where it is grown, the amount of rain it received, and how this affects the colors. To understand the depth of this practice, it can take a lifetime."

Porfirio Gutierrez http://porfiriogutierrez.com/artwork/creative-process/natural-dyes/


https://porfiriogutierrez.com/artwork/creative-process/

We involve

- practice, personal skills, patience and knowledge.
- natural raw materials - Plants, insects, natural fibers, water, mordants that nature provide in form of metallic salts or plants.
- Fire and water.

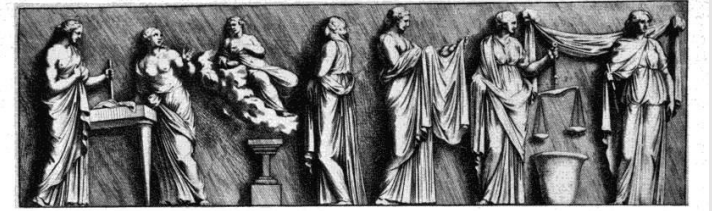

Michel Pastoureau – Black: the History of an color – 2018/
Der Schwarzfarber 1568 – in Hans Sachs Beschreibung aller Staende – Frankurt am Main 1568





A brief history of color

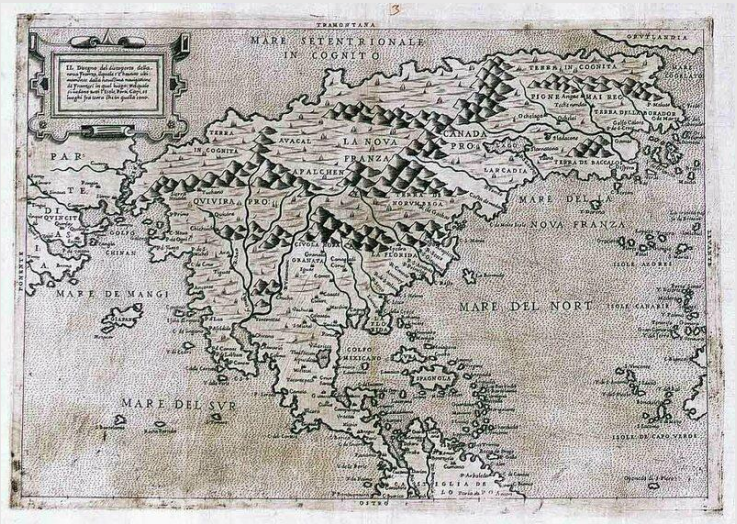
- It is not known exactly when human kind discovered and developed the possibility of coloring textile fibers.
- It is assumed that:
  - their coloring was an accidental process,
  - staining the materials with colored fruits.
- After years of practice people managed to obtain different color schemes based on:
  - fine observation of the environment
  - through the exploitation of the biological resources: plants, lichens and animals,
  - through the study of their physical-chemical traits.
- The written sources and the archeological discoveries certify the fact that the dyeing of fibers was well known and widely used in the Antiquity.
  - The two manuscripts found in the tombs in Thebes, Egypt during the 3rd century AD - The manuscripts present dyeing recipes found in other texts – 2nd century BC.
  - The chemical investigations made on textile fragments found in the Roman sites in Egypt in the 3rd century, correlated with the deciphered inscriptions on ceramic fragments from the same tombs attest the knowledge concerning the processing of complex colors such as indigo and Tyrian purple.
- In Europe, during the Middle Ages, the new territorial discoveries and commercial routes granted:
  - access to new biological sources,
  - thus expanding the color scheme used and
  - expanding the methods used to apply the dye.
- It is well known that until the emergence of synthetic dyes (created in the laboratory), the natural dyes had a major impact in the people's economy and culture.



Relievo from Forum Nervae in Rome. Engraving from Bartoli: Admiranda Romanorum antiquitatum, Rome 1693. Goddesses as makers of woollen cloth are engaged in dyeing, preparing and weighing textiles under the supervision of Athene, the inventor of the craft.

http://www.elizabethancostume.net/cibas/ciba9/ciba915.jpg

https://news.artnet.com/art-world/scientists-analyze-columbus-map-308121 world map - approximately 1491



Forlani's map of North America from 1566.
https://www.atlasobscura.com/articles/mapmaking-cartography-ocean-water-sixteenth-century-europe

- *J. H. Hofenk de Graaff – The Colourful Past Origins, Chemistry and Identification of Natural Dyestuffs 2004.*
- Cardon Dominique - Natural Dyes, Our Global Heritage Of Colours - Textile Society of America Symposium Proceedings Textile Society of America 2010 - https://digitalcommons.unl.edu/tsaconf/12Case study: recent identifications of true purple and red insect dyes in archaeological textiles from Roman Egypt p3

Colors, dye, natural dye

Colors – the quality of an object or substance with respect to light reflected by the object, usually determined visually by measurement of hue, saturation, and brightness of the reflected light; saturation or chroma; hue. https://www.dictionary.com/browse/colors

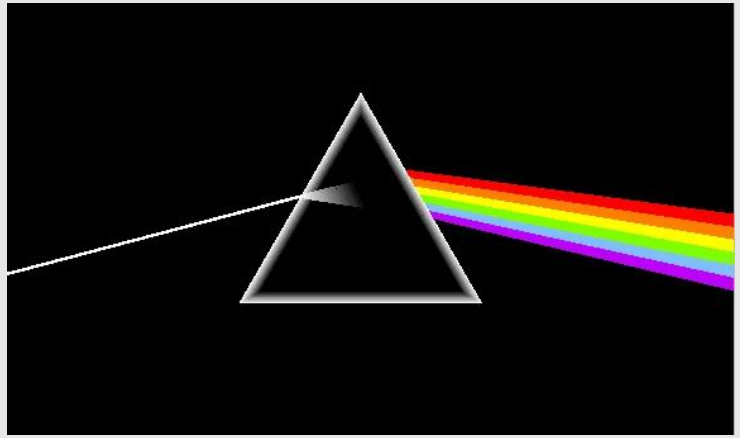
Dye – a liquid containing coloring matter, for imparting a particular hue to cloth, paper, etc. https://www.dictionary.com/browse/dye

Dyed – to become colored or absorb color when treated with a dye

Natural Dye – Organic sources provided by nature with tinctorial proprieties:

- Tinctorial - that contains dyeing substances; (about substances) it is obtained from plants and is used to dye textile products or leathers - from Fr. Tinctorial. *https://dexonline.ro/definitie/tinctorial*

- Until the **1850s** all dyes were obtained from natural sources, most commonly from vegetables, such as plants, trees, and lichens, with a few from insects. https://www.britannica.com/technology/natural-dye



https://math.wikia.org/ro/wiki/Dispersia_luminii?file=Dispersion-prism-coolpinkfloyd.jpg

We dye with:

natural dye from natural sources:

- **Plants** – roots, leaves, flowers, branches, bark, fruits
  - We use: dry plants, fresh plants
  - most known plants:
    - woad, indigo – blue;
    - weld, saffron, pomegranate, fustic - Old (*Maclura tinctoria, known as old fustic and dyer's mulberry*) and New (*Cotinus coggygria*) – yellow ;
    - madder, henna, brazilwood – red,
    - walnut, oak – brown
    - etc.
- **Lichens and fungus** – common name - Weeds
  - Most known
    - Litmus (*Lecanora tartarea* și *Roccella tinctorum*) red, violet, blue
    - Orchil (Roccella tinctoria) purple
    - Echinodontium tinctorium - red
    - etc.
- **Animals and insects**
  - Animals – Mollusca and shellfish – purple
    - Mollusca secretion
  - Most known Bolinus brandaris - Murex brandaris – purple Tyrian purple
  - Insects – mostly reds and variants
    - Dried insects
    - Most known:
      - Kermes - (Kermes vermilio),
      - Cochinel (Dactylopius coccus)
      - lacdye (Kerria lacca).
      - etc.
- **Dye extract – powdery extract from raw materials**
  - use 10% of WOF
- **Preferable with raw materials – fresh or dried organic maters**

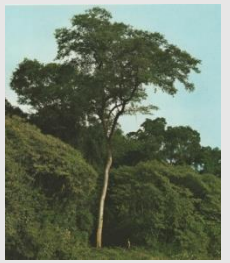

https://en.wikipedia.org/wiki/Isatis_tinctoria


https://en.wikipedia.org/wiki/Indigofera


https://en.wikipedia.org/wiki/Reseda_luteola

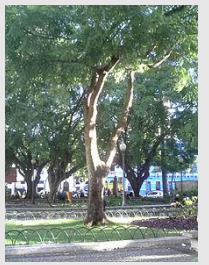

https://en.wikipedia.org/wiki/Saffron


https://en.wikipedia.org/wiki/Pomegranate


http://tropical.theferns.info/viewtropical.php?id=Maclura+tinctoria


https://en.wikipedia.org/wiki/Rubia_tinctorum


https://en.wikipedia.org/wiki/Lawsonia_inermis


https://en.wikipedia.org/wiki/Paubrasilia


https://en.wikipedia.org/wiki/Walnut


https://en.wikipedia.org/wiki/Oak


https://en.wikipedia.org/wiki/Roccella_tinctoria


https://en.wikipedia.org/wiki/Echinodontium_tinctorium


https://en.wikipedia.org/wiki/Bolinus_brandaris


https://en.wikipedia.org/wiki/Kermes_(insect)


https://en.wikipedia.org/wiki/Dactylopius#Cochineal_dye


https://en.wikipedia.org/wiki/Kerria_lacca

Methods of dyeing

- **<u>Direct dyes (or substantive dye) (few plants)</u>**

a direct bond between fibers and the colored water. The color has the property to fix in fibers in time – no mordant is involved

- ***We need***
  - *the fabric + water + plant ex. turmeric, sumac, gals, etc. (tannins) + heat.*
- ***We do:***
  - *Simmer/boil the textile fabric in the colored water (colored by the plant) how long it is necessary*
- **<u>Mordant dye (or adjective dyes) – most natural dyes</u>**

a metallic salt is involved (mordant) to fix the colors in the fiber

- ***We need:***
  - *Metallic salt – alum, iron, cooper, tin etc.*
  - *Metallic salt + fabric + natural sources (ex: plants, roots, insects) + water + heat.*
- ***We do:***
  - *Treat the fabric with a metallic salt*
    - *The treatment can be done*
      - *before dye – pre mordanting*
      - *during dye – simulant mordanting*
      - *after dye – post mordanting*

https://tdsblog.com/dye-off-natural-vs-synthetic/

Methods of dyeing

- **<u>Vat dye</u>**

Indigo, purple (ingotin and mollusks).

Dyes that are not soluble in water.

The fibers don’t have to be treated with metallic salt.

- ***We need***
  - *a vat and three elements to create the all process*
  - *The natural sources (indigo, purple), an alkaline element and redox element (mineral, chemical or organic – fermentation with organic materials)*
    - *Alkaline element – soda ash, wood ash, hydroxide ash etc.*
    - *Redox element – organic vat fructose (sugar from fruits) ripe fruits like banana, oranges, lemons; mineral vat Ferrous Sulfate, chemical vat – Sodium Dithionite,*
  - *alkaline solution + indigo + redox element + fabric + water + constant heat – in the end oxygen exposer*
- ***We do:***
  - *Make the alkaline redox solution, add the damp fabric and maintain the vat at the constant temperature for an amount of time, expose the fiber to oxygen and let them become blue. For a deep color, immerse the fibers again and repeat the exposure to the air. Repeat the process as long as you consider in order to achieve a dark blue. In the end neutralize the fiber with a solution of water and vinegar.*

Mordants

Natural

Sumac

Sumac alum

Sumac Iron

Sumac Copper,

Sumac Tin

Sumac: Alum, Iron, Copper, Tin

Mordants

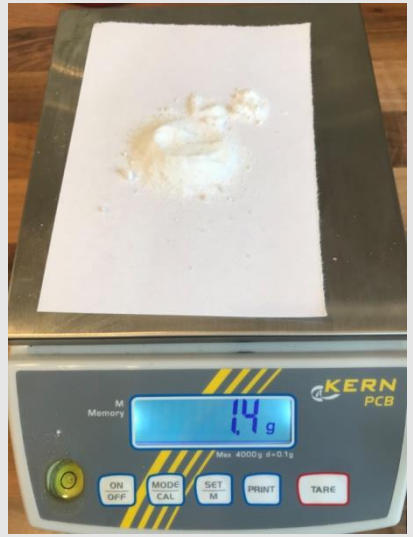
- **Mordant** – a substance used in dyeing to fix the coloring matter, especially a metallic compound, as an oxide or hydroxide, that combines with the organic dye and forms an insoluble colored compound or lake in the fiber. https://www.dictionary.com/browse/mordant
- **Mordanting** – the process that create a good connection between the fibers and dye https://www.thefreedictionary.com/mordanting
- **Term "Mordant"** – comes from the French word "mordre"- that means to bite
- **Type of mordant:**
  - Soluble Metallic salts used from the beginnings of dying
    - alum, iron, cooper,
    - Premodern time tin
    - Modern time chrome (very toxic)
  - Natural mordants (bio-accumulation plants) sometimes called "binders"

https://crosswarp.hua.gr
Natural dyes

Bio-accumulators plant - sumac

Mordants

- **Their use** - Will make a permanent bond between the fiber and the color
- **Quantity**
  - Mordant quantities will be given by the dry weight of fabrics WOF
  - We will work with percentage ratio of the weight of fabrics (WOF) that we want to dye – 1 – 20%
- **Application Methods**
- It is a thermic, aqueous treatment with metallic salts or bio-accumulators plant, on the textile fibers in order for them (fibers) to accept and create a permanent bond with the color
  - Pre mordanting – before dyeing
  - During dye mordanting – During dyeing – mordant is added during dye bath
  - Post mordanting – after dyeing – the mordant is added at the end of dye bath or separately (usually iron, copper)
- **After mordanting of the fibers/ fabrics/ threads**
  - Rinse them well in warm water.
  - Remove excess of water
  - Dye them/ keep them in freezer/ dry them and keep them in labeled plastic bags in dark places.



Alum

„the sunny mordant" the oldest known mordant mentioned in manuscripts since 2000 BC

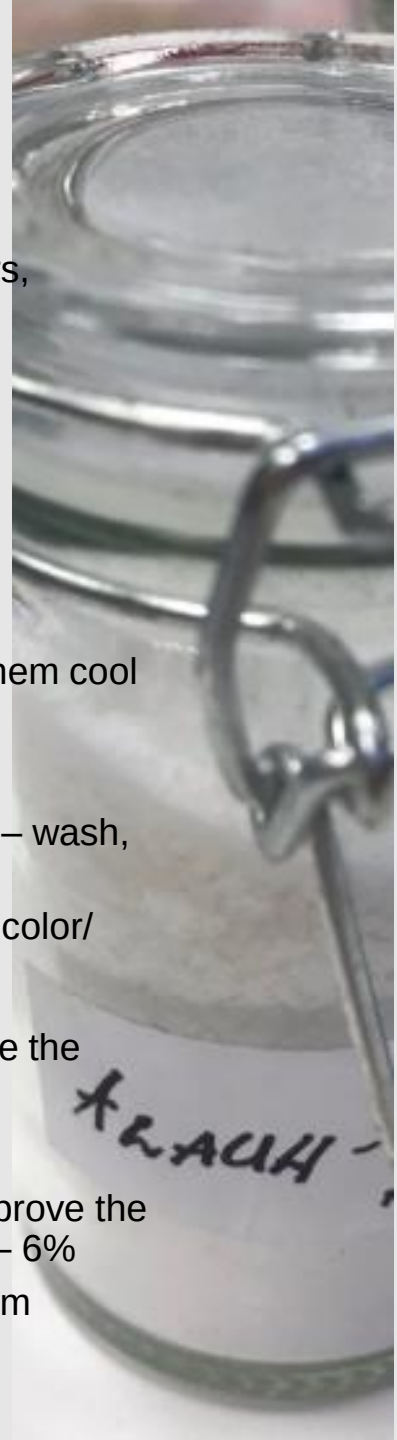
General characteristics

- **Chemical formula**: $KAl(SO_4)_2 \times 12H_2O$
- **Form:** crystal stone or white powder - if it is grated
- **Color:** white – transparent white
- **Toxicity:** slightly irritating – use a mask when you grind it
- **Storage:** labeled plastic bags, jars with lids in well ventilated spaces
- *You can find ALUM in: bio store as a deodorant, in grocery stores in the Mexican food section or in the cosmetic section (deodorant) or in shops specialized in dyes*

For dyeing:

- **We Use** – powder (dissolved in warm water)
- **Mordanting:** natural fibers – protein and cellulosic fibers (with help of additives)
- **When we used:** preferable in pre mordanting
- **Quantity** 10 – 20% from the weight of dry textile fibers (WOF)
  - **protein fibers** (silk and wool) –
    - Silk alum, 7 - 20% WOF
    - Wool - alum + cream tartar (cream of tartar)
  - **cellulosic fibers** – 10% - 15% WOF
    - alum + Soda ash 2 – 6% (sodium carbonate)
    - Myrobalan 5% + alum 15%

- **Method of use**:
  - Dissolve the powder in water
  - Put the damp fibers in the solution
    - careful – the solution must cover all your fibers,
    - let room for the fibers to move in the bath
- **Temperature to use**
  - Cold/warm – silk
  - Simmer not more than 50degrees C– wool
  - Boiling point – cellulosic fiber
- **Application Time**
  - one hour (simmer/boiling) to 8 hour – you may let them cool to room temperature in solution
- **Result:**
  - Strong, permanent bond between fibers and colors – wash, light, use .
  - will keep the original color of the dye/ slightly warm color/
- **Caution:**
  - Excess used - a higher precent of alum will damage the fibers – it will become sticky
- **Note:**
  - For wool you may use Cream of Tartar (COF) to improve the quality of mordant and to protect the wool fibers: 3 – 6%
  - For cellulosic fiber you have to add soda ash (natrum carbonate) 2%
  - Or use aluminum acetate



Aluminum Acetate

(non historic mordant)

a salt used in pharmacy for treating skin rash – it is used for cellulosic fibers

General characteristics

- **Chemical formula**: $Al(CH_3CO_2)_3$
- **Form:** powder
- **Color:** white
- **Toxicity:** irritating
- **Storage:** labeled plastic bags, jars with lids in cold well ventilated spaces
- *You can find Aluminum Acetate in pharmacy as solution or dedicated shop for dye*

For dyeing:

- **We Use** – powder (dissolved in worm water)
- **Mordanting:** natural fibers – silk and cellulosic fibers
- **When we used:** preferable in pre mordanting
- **Quantity** from the weight of dry textile fibers (WOF)
  - 5 - 8%
  - **cellulosic fibers** – 5 - 8%
  - Dissolve the powder in water
  - Put the damp fibers in the solution
  - Simmer or boil solution
    - Tannin + alum acetate + fixing in chalk 10% or wheat bran 100g/5L
    - careful – the solution must cover all your fibers,
    - let room for the fibers to move in the bath
- **Temperature to use**
  - Boiling point – cellulosic fiber
- **Application Time**
- one hour (simmer/boiling) to 8 hour – you may let them cool to room temperature in solution
- **Result:**
  - Strong, permanent bond between fibers and colors – wash, light, use .
  - will keep the original color of the dye/ slightly warm color/
- **Caution:**
  - Do not ingest, do not inhale dust
  - Use mask and gloves

https://www.indiamart.com/proddetail/aluminium-acetate-8010993788.html

Copper

Copper Sulphate, Verdigris, Blue Vitriol, Blue Copperas, Bluestone Vitriol of Cyprus/Roman vitriol – it was mentioned as a mordant in old document like "Graecus Holmienisis Papirus" – 300 Before Christ.

General characteristics:

- **Chemical formula**: $CuSO_4 \times 5\ H_2O$
- **Form:** crystal stone or small granules
- **Color:** blue
- **Toxicity:** irritating
- **Storage:** labeled plastic bags, jars with lids in cold well ventilated spaces
- *You can find COPPER in: stores for agriculture, as a product that kills bacteria, algae, roots, plants, snails, and fungi, or in shops specialized in dyes*

For dyeing:

- **We Use** – small granules (dissolved in warm water)
- **Mordanting:** natural fibers – protein and cellulosic fibers
- **When we used:** preferable in post mordanting – it is most often used as a color modifier
- **Quantity** from the weight of dry textile fibers (WOF) 2 – 5%

- **Method of use**:
  - Before dyeing/After dyeing
    - Dissolve the powder in water
    - Put the damp fibers in the solution
      - careful – the solution must cover all your fibers,
      - let room for the fibers to move in the bath
- **Temperature to use**
  - Simmer/boiled water
- **Application Time**
  - Before dying
    - one hour (simmer/boiling) to 8 hour – you may let them cool to room temperature in solution
    - For a fast process simmer for 1 -2 hours.
  - Post mordanting – ½ hours in hot water.
- **Result:**
  - Strong, permanent bond between fibers and colors – wash, light, use
  - A greenish blue tone from the original color.
- **Caution:**
  - Do not ingest, do not inhale dust
  - Use mask and gloves

Iron

it is widely used since first century BC.
Ferrous Sulphate, green vitriol, green, copperas, the sad mordant

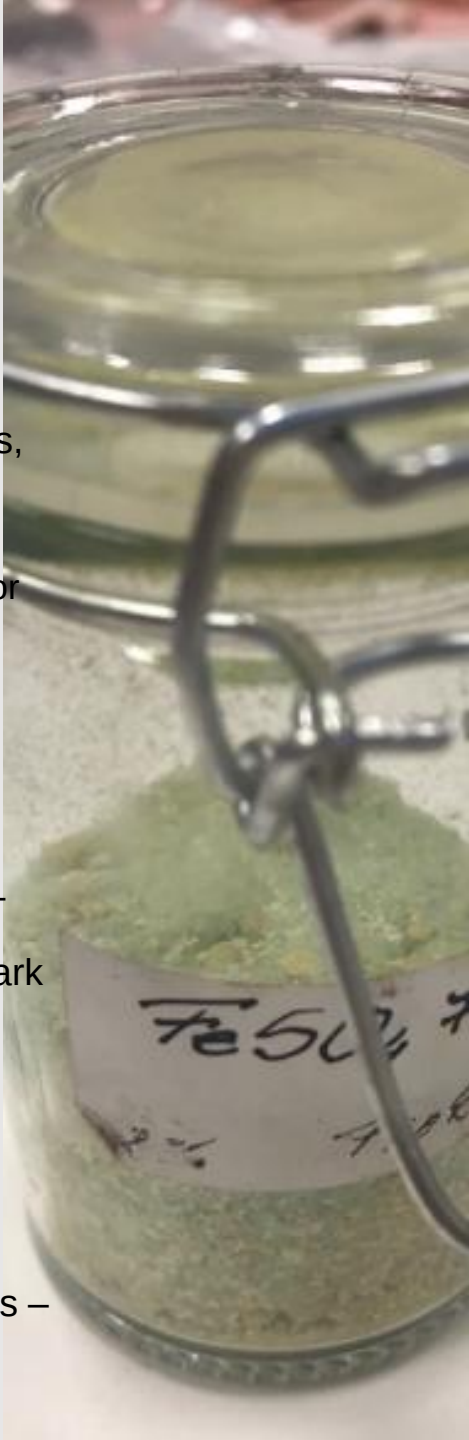
General characteristics

- **Chemical formula**: $FeSO_4 \times 7H_2O$
- **Form:** crystalized salt, granules, powder
- **Color:** green salt
- **Toxicity:** it is used in pharmaceutical industry
- **Storage:** labeled plastic bags, jars with lids in cold well ventilated spaces
- *You can find IRON in: stores for agriculture as a fertilizer or moss*

For dyeing:

- **We Use** – small granules powder (dissolved in warm water)
- **Mordanting:** natural fibers – protein and cellulosic fibers
- **When we used:** preferable in post mordanting
- **Quantity** from the weight of dry textile fibers (WOF)
  - 1% - 8% WOF – less is better
  - Protein fibers wool/ silk
  - Wool
    - Iron + cream tartar (cream of tartar will soften the fiber)
  - Cellulosic fiber
    - Iron (ferrous sulphate)
    - **Ferrous acetate** + Calcium Carbonate 10%

- **Method of use**:
  - Dissolve the iron in hot water
  - Put the damp fibers in the solution
    - careful – the solution must cover all your fibers,
    - let room for the fibers to move in the bath
- **Temperature to use**
  - Gently raise the temperature of stock solution – boiled for an hour
- **Application Time**
  - one hour (simmer/boiling) pre – mordanting
  - During dye – the last 15 minutes
  - Post mordanting — ½ hours
- **Result:**
  - Strong, permanent bond between fibers and colors – wash, light, use.
  - Color modifier –in the base color will be change in dark and brown colors
- **Caution:**
  - Do not ingest, do not inhale dust
  - Use mask and gloves
- **Note:**
  - Dissolve well – otherwise your color will not be even
  - A higher precent of iron will damage the protein fibers – the fibers it will became brittle
  - Iron is corrosive – Wash well your pots and spoons



Tin

it is a mordant used from XVII century
Stannous chloride, tin crystals, tin salts, muriate of tin, in London it was known as Color Kufflerianus" or „Bow scarlet", in Paris „ecarlate de Holland"
nowadays it is one of the most used mordant for protein fibers

General characteristics

- **Chemical formula**: $SnCl_2$
- **Form:** powder
- **Color:** White powder
- **Toxicity:** high
- **Storage:** labeled plastic bags, jars with lids in cold well ventilated spaces
- *You can find Tin: as a product for laboratory (identification of gold), on eBay and Amazon, or in shops specialized in dyes*

For dyeing:

- **We Use** – powder (dissolved in warm water)
- **Mordanting:** natural fibers – protein (best) and cellulosic fibers
- **When we use:** pre mordanting postmordanting
- **Quantity** from the weight of dry textile fibers (WOF)
  - 2 – 4% WOF
  - the pH of dye solution
- **Method of use**:
  - Dissolve the powder in water
  - Put the damp fibers in the solution –
    - careful – the solution must cover all your fibers,
    - let room for the fibers to move in the bath
- **Temperature to use**
  - Slightly rise the water temperature and simmer below the boiling point 90C
- **Application Time** maintain one hour from the simmer point
- **Result:**
  - Strong, permanent bond between fibers and colors – wash, light, use.
  - It will work as a color modifier – will brighten the color
- **Caution:**
  - Excess used - a higher precent of tin will damage the fibers – it will become brittle
  - Do not ingest, do not inhale dust
  - Use mask and gloves

Chrome *not a historical mordant.*

It was widely used in 19 century
It is a very toxic mordant - for people and environment
Orange stone, Potassium Dichromate, Bichromate of Potash

General characteristics

- **Chemical formula**: $Cr_2K_2O_7$
- **Form:** crystal stone, granulated crystal
- **Color:** orange
- **Toxicity:** extremely toxic
- **Storage:** labeled plastic bags, jars with lids in cold well ventilated spaces
- *You can find Chrome in specific suppliers for chemistry industry. It is a restricted produce by the law.*

For dyeing:

- **We Use** – powder (dissolved in warm water)
- **Mordanting:** natural fibers – (best on) protein and cellulosic fibers
- **When we use:** pre mordanting post mordanting
- **Quantity** 2 -4% from the weight of dry textile fibers (WOF)
- **Method of use**:
  - Dissolve the powder in water
  - Put the damp fibers in the solution
  - careful – the solution must cover all your fibers,
  - let room for the fibers to move in the bath
- **Temperature to use**
  - Simmer the stock solution
- **Application Time** shimmer one hour, boiled ¾ hour
- **Result:**
  - Strong, permanent bond between fibers and colors – wash, light, use .
  - will bright the color
- **Caution:**
  - Extremely toxic for people and environment
  - Do not use if it is not necessary
  - Do not ingest, do not inhale dust
  - Use mask and gloves

https://ro.wikipedia.org/wiki/Dicromat_de_potasiu#/media/Fi%C8%99ier:Potassium-dichromate-sample.jpg

Organic mordants from plants

Tannins – work best on cellulosic fibers – 10 - 15%

- Staghorn Sumac *Rhus typhina*
- Oak galls - *Quercus species*,
- Myrobalan *Terminalia catappa* - leaves;
- Pomegranate *Punica granatum* – fruit peel
- Tea – *Camellia sinensis* – leaves


https://en.wikipedia.org/wiki/Rhus_typhina


https://en.wikipedia.org/wiki/Terminalia_catappa


https://en.wikipedia.org/wiki/Camellia_sinensis

Alum

- Symplocos - *Symplocos* - 15 – 50%
- Clubmoss - *Lycopodium selago*,
- Common clubmoss - *Lycopodium clavatum*,
- Juniper - *Juniperus spp*
  - ashes resulting from burning the green needles
- Camellia - *Camellia sinensis* leaves

- Hydrangea - *Hydrangeaceae family* - leaves –
  - only if the flowers are blue (pink doesn't have alum)
- Heuchera - *family Saxifrag*aceae - roots
- Soy milk


https://blog.ellistextiles.com/2019/05/02/symplocos-a-plant-mordant/#:~:text=Symplocos%20is%20a%20plant%20species,available%20aluminum%20from%20the%20ground.


https://en.wikipedia.org/wiki/Lycopodiopsida


https://en.wikipedia.org/wiki/Juniper


https://en.wikipedia.org/wiki/Hydrangea


https://en.wikipedia.org/wiki/Heuchera


https://en.wikipedia.org/wiki/Soy_milk

Oxalic Acid – works best on silk and wool

- Rhubarb - *Rheum species* – leaves (caution it is poison)
  - works on animal fibers best
- Wood sorrels Oxalis *Oxalidaceae family* - leaves
- Sorrel - *Rumex acetosa* leaves


https://en.wikipedia.org/wiki/Rhubarb


https://en.wikipedia.org/wiki/Oxalis


https://en.wikipedia.org/wiki/Sorrel

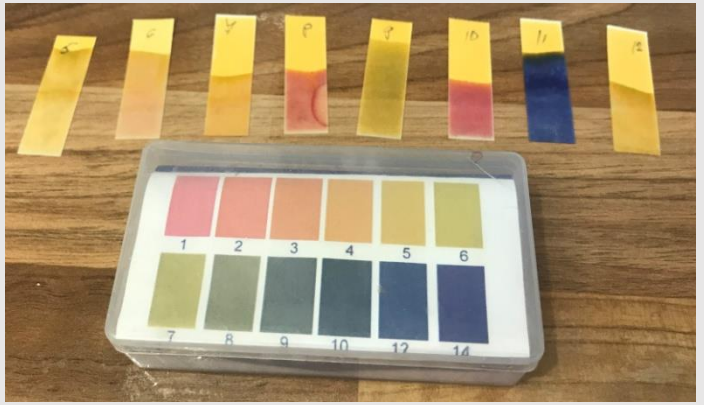
Mordanting assistant and Color modifier

Mordanting assistant

A chemical used with textile dye mordants to cause decomposition of the mordant and uniform deposition on the fibers
https://encyclopedia2.thefreedictionary.com/mordanting+assistant

will work together in mordanting the fibers for efficacity of the mordants and for enhancing the colors

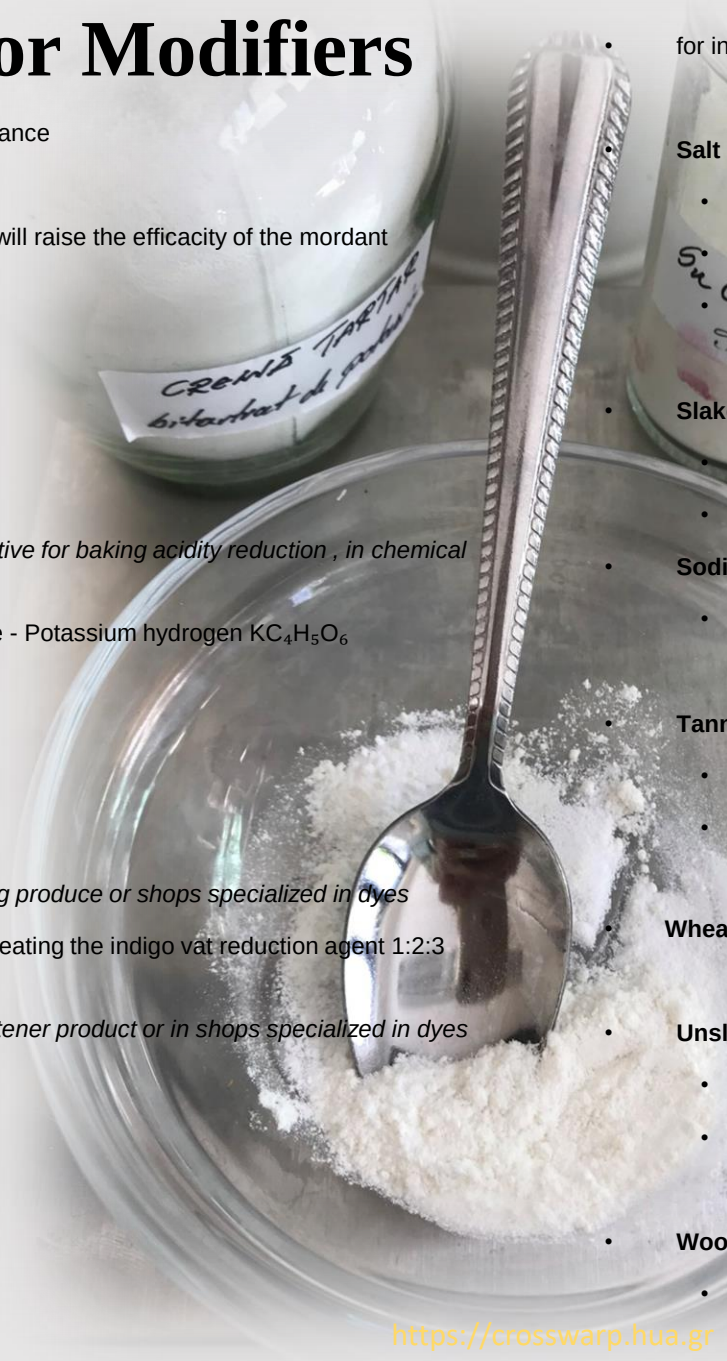
The most used assistant – cream of tartar



Color modifiers are substance that are use in the dye process to widen the color range (shifting color)

- Different mordants are used as color modifiers:
  - Iron will darken the color
  - Copper will greenish the color
  - Tin will brighten the color
- **Color modifier -** will work in connection with the pH of the color solution based on the pH of the plant
- changing the pH will result in a wide variation of colors
  - Lemon juice, cream tartar (cream of tartar) vinegar, etc. will lower the pH
    - Those are used to dilute and neutralized the basic solution
    - They will do a permanent change in the dyed color
  - Baking soda, limestone, slaked lime, soda ash, hardwood ash will raise the pH
    - Those are used to dilute and neutralized the acid solution
    - They will do a permanent change in the dyed color

Assistants and color Modifiers



- **Acetic acid** – vinegar (4 – 6% acetic acid) weak acid substance
  - used to neutralize the indigo dye,
  - in combination with Copper will enhance the color, will raise the efficacity of the mordant
  - for lowering the pH solution
    - *You may find it in grocery stores*
- **Chalk**, limestone; $CaCO_3$ Calcium Carbonate
  - raises the water's pH
  - raise the pH of the dye solution
    - *You can find it in grocery stores as an additive for baking acidity reduction , in chemical shops , shops specialized in dyes*
- **Cream of tartar**, potassium tartarate Rochelle salt, wine stone - Potassium hydrogen $KC_4H_5O_6$
  - Sometimes used as a mordant
  - together with alum in mordanting the wool.
  - Together with Tin
  - Will soften the wool
    - *You can find it in grocery stores as a baking produce or shops specialized in dyes*
- **Fructose** – sugar of the fruits – 6gpL light blue it used for creating the indigo vat reduction agent 1:2:3 ratio indigo vat
    - *You can find it in grocery stores – a sweetener product or in shops specialized in dyes*
- **Lemon**, lime, Citric Acid C6H8O7
  - Lowers the pH
  - Helps the mordant to fix the color
  - Sometimes it can bleach the color on fabric
    - *You can find it in grocery stores*
- **Soda Ash** /washing soda - Sodium Carbonate Na_2CO_3
  - used for mordanting cellulosic fibers together with alum
  - for indigo vat – alkalinity of the vat
    - *You can find it in grocery stores – in the detergent area or in shops specialized in dyes*
- **Salt Sodium** chloride ClNa
  - Enhances the color
  - It will help to fix the color
  - It is used in indigo vat
    - *You can find it in grocery stores or in shops specialized in dyes*
- **Slaked lime** Calcium hydroxide $Ca(OH)_2$ - (slightly alkaline)
  - Raises slightly the pH
  - For indigo vat – alkalinity of the vat (together with fructose will make the 1:2:3 ratio indigo vat)
- **Sodium dithionite** Na2S2O4
  - Reduction agent for a fast indigo vat indigo : soda ash: dithionite
    - *You can find it in shops specialized in dyes or in Chemistry shops- a redox product*
- **Tannic acid -** Gallotannin, Tannimum, Quercitannin, Oak bark tannin - C76H52O46
  - Sometimes used as a mordant
  - together with alum in mordanting cellulosic fibers.
    - *You can find it in shops specialized in dyes or in Chemistry shops-*
- **Wheat bran** – will help to fix the mordant on cellulosic fibers
    - *You can find it in grocery stores where the flour is, or in shops specialized in dyes*
- **Unslaked lime**/ caustic calcium - Calcium oxide CaO – alkaline
  - Raises the pH
  - For indigo vat – alkalinity of the vat
    - *You can find it in pharmacy, in gardening shops or in shops specialized in dyes*
- **Wood bleach**/Crab Acid - Oxalic acid $C_2H_2O_4$
  - used with Tin for raising the efficacity of the mordant
    - *You can find it in shops specialized in dyes or in Chemistry shops– as a chemical product to prevent bleed ng or rust*

Knowing - pH

- **Definition** pH – quantitative measure of the acidity or basicity of aqueous or other liquid solutions. The term, widely used in chemistry, biology, and agronomy, translates the values of the concentration of the hydrogen ion—which ordinarily ranges between about 1 and 10−14 gram-equivalents per liter —into numbers between 0 and 14. In pure water, which is neutral (neither acidic nor alkaline), the concentration of the hydrogen ion is 10−7 gram-equivalents per liter, which corresponds to a pH of 7. A solution with a pH less than 7 is considered acidic; a solution with a pH greater than 7 is considered basic, or alkaline. Source - https://www.britannica.com/science/pH
- Some natural sources are **sensitive to the pH** level and the final color will be a result of your decisions to raise or lower the pH of your stock solution .
- **modifying the pH** of dye solution (with modifiers and assistants – shifting colors)
  - you can obtain a range of different colors / shades on the textile fibers.
- Split the dye stock solution in two pots
  - add lemon juice (acidic pH) in one
  - wood ash (basic pH) in the other you
  - RESULT we will have different colors/shades even the original solution it is from the same sources
- The textile fibers/threads/fabrics etc. **have a pH** level as well – starting from that point the response will be different.
  - Protein materials appreciate a slightly acidic pH environment
  - Cellulosic materials appreciates slightly basic pH environment.
- *Careful!! A too high or too low pH in stock solution may cause a permanent degradation on fibers, lick:*
  - brittle, rigidity, lake of luster, complete decay of fiber
- The pH level can be measured with:
  - pH meter
  - by the indicator paper (with the colored and numbered paper)
  - Turmeric can give you the alkalinity of the stock solution – in basic environment yellow will become orange
- You can read the scale measurement from 1 (the most acidic pH) – 6 slightly acidic 7 neutral 8 basic – 14 the most basic /alkaline

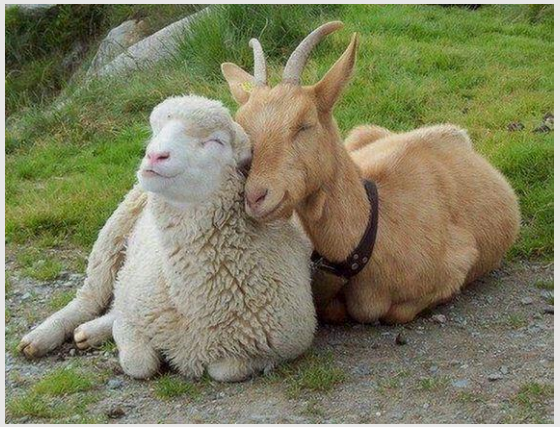
Modifying the pH of dye solution
Sumac

What we dye?

- ***Fibers, Threads, Fabrics, Cloth – with light color***
- **Material sources:**
  - organic nature – found in nature and processed by humans
- **Why them?**
  - they have a good response and affinity for receiving and maintaining the dyes with the help of mordants.
- **Category:**
  - Animals Fiber – protein fibers - hair and secretion of worms
  - Vegetal fibers – cellulosic fiber – plants, trees

https://www.theunusualpear.com/products/300g-bundle-of-natural-yarns

Raw Materials used to dye:



https://globalanimalpartnership.org/about/news/post/how-can-you-tell-the-difference-between-sheep-and-goats/

https://www.thoughtco.com/silkworms-bombyx-domestication-170667

https://www.britannica.com/topic/cotton-fibre-and-plant

https://fibershed.org/2019/12/12/bast-fiber-updates-flax/

https://www.hempgrower.com/article/hemp-fiber-industry-nihc-panxchange-textiles-2020-trends/

Protein Fibers,

animal fibers

- **Wool** – the hair from sheep, goat, rabbit. etc.
  - widely used by humans in the history of man
  - Fibers, threads, felts, fabrics with different texture and fineness.
  - very good response in the dye bath
- **Silk** – from silkworm *Bombyx Mori*
  - *Highly appreciated by the humans, being a noble material*
  - Fibers, threads, fabrics with different texture and fineness.
  - excellent response in the dye bath

Cellulosic Fibers,

vegetal fibers

- Cotton – *Gossypium*
- Linen – Flax - *Linum usitatissimum*
- Hemp - *Cannabis sativa*
- Banana, jute, ramie, nettle etc.
- Are extracted from plants.
  - Wildly used
  - Fibers, threads, fabrics with different texture and fineness.
  - The response is not so good for dyeing. You need to do a different treatment in order to accept the color.

Color and Types of textile materials

- **Type of materials:**

- Unspun fibers
- Spined Threads
- Felts
- Textile Fabrics
- Cloth (hard to obtain an even dye)

- **Color:**

- Undyed,
- Natural color of the fibers,
- White color,
- Light dyed fiber.

https://www.onlineclothingstudy.com/2020/08/handloom-fabric-manufacturing-process.html

https://www.motherearthnews.com/diy/home/basic-alum-mordant-recipe-ze0z1312zbla

https://thesensiblefay.com/blog/2020/fabrics-101-why-natural-fiber-clothing-matters-and-how-to-care-for-natural-fabrics-part-1

We need for dye:

Facility and tools

- Facility – space to move, to try, to see
- Equipment – having and using proper equipment
- Natural fabrics/threads – that will be dyed
- Mordants – to bond and fix the color on fabric
- Additives and modifiers – to help the mordant and widen the color spectrum
- Raw materials - natural sources of colors for dye plants, insects

https://crosswarp.hua.gr
Natural dyes

Personal skills and good mood

- Hands – Work with hands
- Eyes appreciation
- Smell – we will need a good nose to detect the funny smell
- Enthusiasm – Good will to try, every try is a step forward
- Good spirit – try and try again, Try and error
- Patience - it is a complex and long activity; don't give up!
- Curiosity – let's see why and how

Facilities

- **Big room / outdoor space**
  - well ventilated
- Big **windows** for light
- **Electric supply**
- **Water supply** - Running water
  - to wash, to prepare the liquor, to rinse
- **Heat source**
  - hob or stove
  - to simmer, to boil: water, mordant solution, dye solution
- **Working surface**
  - Big Tables, Countertop etc.

Dyer Equipment

- **Pots with lids** - stainless steel pots, enameled pots
  - scour, mordanting, dye, post-mordanting, rinsing etc. big enough to fit all the fabrics you want to wash – clean pots, without spots. Metal, copper aluminum pots will change the final color
- **Bucket** – plastic buckets, enameled buckets
  - to scour, wash, etc.
- **Measuring pots** - Glass pots, plastic recipients
  - to measure the liquor ratio
- **Spoons and tongs** - stainless steel, wood spoons,
  - to stir the liquor
- **Chopper** – for cut roots etc.
- **Coffee grinder**/ pestle and mortar
  - to grind: insects, roots and branches
- **Grater** - Stainless steel
  - To scrap stone (alum)
- **Colander** - Stainless steel, plastic
  - to strain the solution
- **Funnel** - Stainless steel, plastic
  - to transfer the solution from a pot to a bottle
- **Metric Scale** /kitchen scale/ laboratory balance
  - Stainless Steel LED Digital Scale
  - to measure the fabrics, dyestuff, mordants,

- **Thermometer/kitchen thermometer** – to measure the temperature of the water dyestuff solution.
- **Clock** – to measure the time for the mordanting, dyeing
- **Digital camera or phone** for keeping records
- **Scissors** - Stainless steel
  - To cut the fabric
- **Clothes dryer** – for drying the goods
- **Washing machine** – for washing big cotton fabrics
- **Colored Synthetic threads** (see if the color doesn't bleed)
  - To mark different type of skein (same dye but different mordant)
- **Jars with lids** – to prepare the solution and liquor, storing materials
- **Zipp bags** – for storing materials
- **Labels** – for keeping records on bags and jars
- **Notebook** – for keeping records of dye process.
- **Protective cloth** – mask, surgical gloves, overall.
- **pH strips** – to measure the pH level
- **Tape line** – to measure the length of threads/fabric

Preparing our stuff:

- **We need:**
  - Notebook – Journal note – to keep record
  - The equipment (previously presented)
  - Textile materials (threads, fabrics etc. - previously presented)
  - Water
  - Dyestuff - Natural sources for dyeing – plants, insects (previously presented)
  - Mordants if it is necessary (previously presented)
  - Additives and modifiers (previously presented)

- **How we dye – steps to fallow**
  - Preparing the fabrics
    - Test your fabrics
    - Measure and weight the fabric
    - Score fabric
  - Pre mordanting fabric
  - Natural dye
    - Quantity
    - Extract of color matter from the natural source
    - Filtering the solution
  - Dye bath
  - Post mordanting if it is necessary
    - Color modifier it is necessary
  - Washing textile fabric
  - Dry textile fabric

Dyer’s Journal

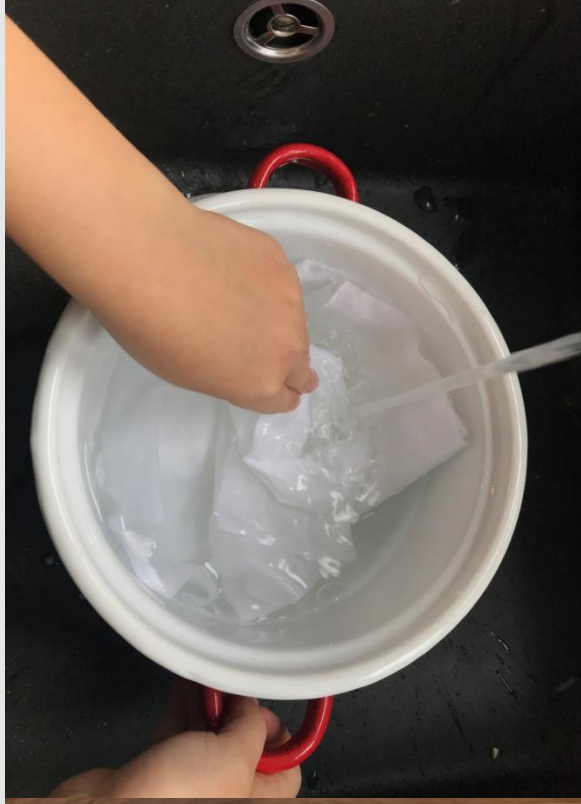
Keep records of what you are doing in order to be able to repeat the color after time.

We will note:

- **dye bath number** (first, second, third) – after the first bath you may use the bath to repeat the process with the same amount of fabric as the first bath
- **The name of recipe** / number of recipes
- **Natural source** – the name of plant
  - If it is a root, leave, flower etc.
  - if it is dry or fresh
  - If the recipes contains more then one dye – mention all the dye and the proportion
  - Weight
  - Proportion of thee quantity of plant with textile
- **Material for dye**
  - Natural material – vegetal hemp, linen, etc./ protein silk wool
  - Type of material – un spun, threads, fabric felts etc.
  - Raw color white, grey, light brown, brown etc.
  - Weight of materials (WOF)
- **Mordant** – if it is the case
  - Percent of mordant from WOF
  - Quantity
  - Mordanting
  - Type of mordanting – before, during, after
- **assistants** – if it is the case
  - Percent of mordant from WOF
  - Quantity
- **color modifier** – if it is the case
  - Percent of mordant from WOF
  - Quantity
- **Time of cooking**
- samples from dyed fabrics

Water - General characteristics

- **Chemical formula:** H_2O
- **Form:** liquid
- **Color:** transparent
- **Smell:** no smell
- **Toxicity:** no toxicity
- **pH** = 7 (near to 7)
- **Water pH**
  - Near 7
  - Measure your pH water - if it is slightly basic/alkaline or acidic – will change the final color
  - If it is a hard water (above 7) – you may lower the pH adding cream of tartar
  - If it is acidic you can add a bit of chalk
- **We need water for:**
  - Preparing fabrics
    - Wash fabrics
    - Scour fabrics
    - Moist fabrics
    - Mordanting fabrics
  - Preparing stock solution
    - Cook (Simmer/Boil) the plant to obtain the colored stock solution
  - Final fabric rinsing
- Quality of water
  - soft, clean fresh.
- **Type of water:**
  - tap water, rain water, distillate water.
    - Hard/mineral water will change the final color
- **Quantity** – water always has to cover the materials that we are working with.
  - The fabric – wash, mordanting dyeing.
  - The plant – for extracting the color
  - In dyeing – fabrics have to have enough room to move around in water for an even color
  - Do not use too much water – that will create a less intense color



Preparing the fibers

- Test the fibers
  - We need natural materials - Check out your fibers and threads.
  - There is a simple test that you can do to be sure that it is really a natural
  - **Burn test**

- **How we do it?**

We need:

- A safe place to work – above the sink, or above an aluminum foil – to be safe if something will drop.
- Textile fiber
  - A small piece from your threads
  - If you have fabric – you have to take out a small piece of weft and warp
- Scissors – for cutting the thread
- Matches or lighter – for burning the threads
- Tweezer
- Safe hand
- Good Smell and attention

We do:

- Cut the thread or extract a small thread from weft and warp that will be your burn sample
- Take the sample with the tweezer
- Keep it firmly
- Burn the end of your sample using matches or lighter
- See how it is burning
- Stop the burning to see how your thread it is looking and feel the smell

Careful!!! Don't burn yourself!

Burn test result

Fiber's nature	Burning/flame	Smoke	After burning				Conclusions
			Smell	Residue *The end of the thread after burning*	Color of residue	If you press the residue	
Protein Wool/ silk	Slow Small flame	Black	Of burned hair	Shrinks in to a small bead	Grayish - black ash powder	Easily crushed between your fingers	Protein fibers Can be dyed
Cellulosic fibers flax, hemp, cotton	Rapidly Vivid flame	Whitish	Burned paper	The residue is a fine, feathery ash	gray ash	Fine ash	Cellulosic fibers Can be dyed
Synthetic fibers	Slow	Black	Burned plastic Sweet or vinegar smell	melted Plastic beads	Black	Hard bead	Synthetic fibers Can`t be dyed or the result will not be satisfactory

Prepare the textile fibers, yarn, fabrics

In order to work well and easy we have to wind the threads in skeins
Fabric can have different type of fabric protein and cellulosic – be careful with mordanting process
Winding skeins – from natural textile threads
One skeins has to have the same type of threads – protein or cellulosic fiber (it is easier)

We need:

- Natural textile threads
- Tapeline to measure the threads
- **For winding the threads:**
  - a hard cardboard – different lengths - depends on how big you want the skeins to be.

  or
  - Spinners
  - Schacht Warping Pegs








Schacht Warping Pegs spinners - https://www.schachtspindle.com/product/warping-pegs/ https://woolery.com/schacht-horizontal-warping-mill.html https://woolery.com/ashford-niddy-noddy.html?refSrc=53216&nosto=nosto-page-product2

Winding of textile

We need:

- **Fabrics**
- if you want to dye the same color on a large piece of fabric you can leave it at it is
- Small pieces – useful for learning
    - Cut them in pieces of the same length

We do:

- **Winding the yarns**
- In order to have a even color you have to transform your yarn ball in skeins.
- For learning how to dye it is better to have small skeins
- It is up to you how long they it will be.

Make a skein

- Take your threads – ex. Cotton
- Take your cardboard (can be a small piece of cardboard, book, or the back of the chair, a special system like Spinners, needy-noddy, Schacht Warping Pegs
- Secure the end of the yarn (with your finger)
- Spin it around the cardboard
- Repeat until you decide that is enough – you can measure the length of your threads or you can note it down the numbers of rotations.
- the two loose ends of the yarn will be tied up together (calculate to leave some loose ends to secure the skein) – you will have a ring now
- In order to secure the ring - the loose ends will be passed over and through the edge skein (they will form a ring).
- Knot the ends again not to tight on the skein (if it is to tight the color will not be even all over)
- **In order to secure the skein we may use different yarns – in this way we can label the skeins with different mordants recipes. (note your identification scheme)**
- *To prevent entanglement*
    - *If the skein is too large (to many yarns) split the yarn in two or four groups*
    - *Tide up loosely (not too tight) each group with another yarn. You can use a vegetal or synthetic yarn preferable white (if the yarn is colored, be sure that the color will not bleed – boil it a bit in water if it doesn't leave marks on paper it is good to use)*
    - *You can tight the skein with the **"8"** method*
        - *split the skein in two*
        - *Take one yarn and pass through the two groups. Secure the ends. Spin around one end on to one group and pass again between the two groups. Do the same with the other end on the other group. Tie them up in the middle*.



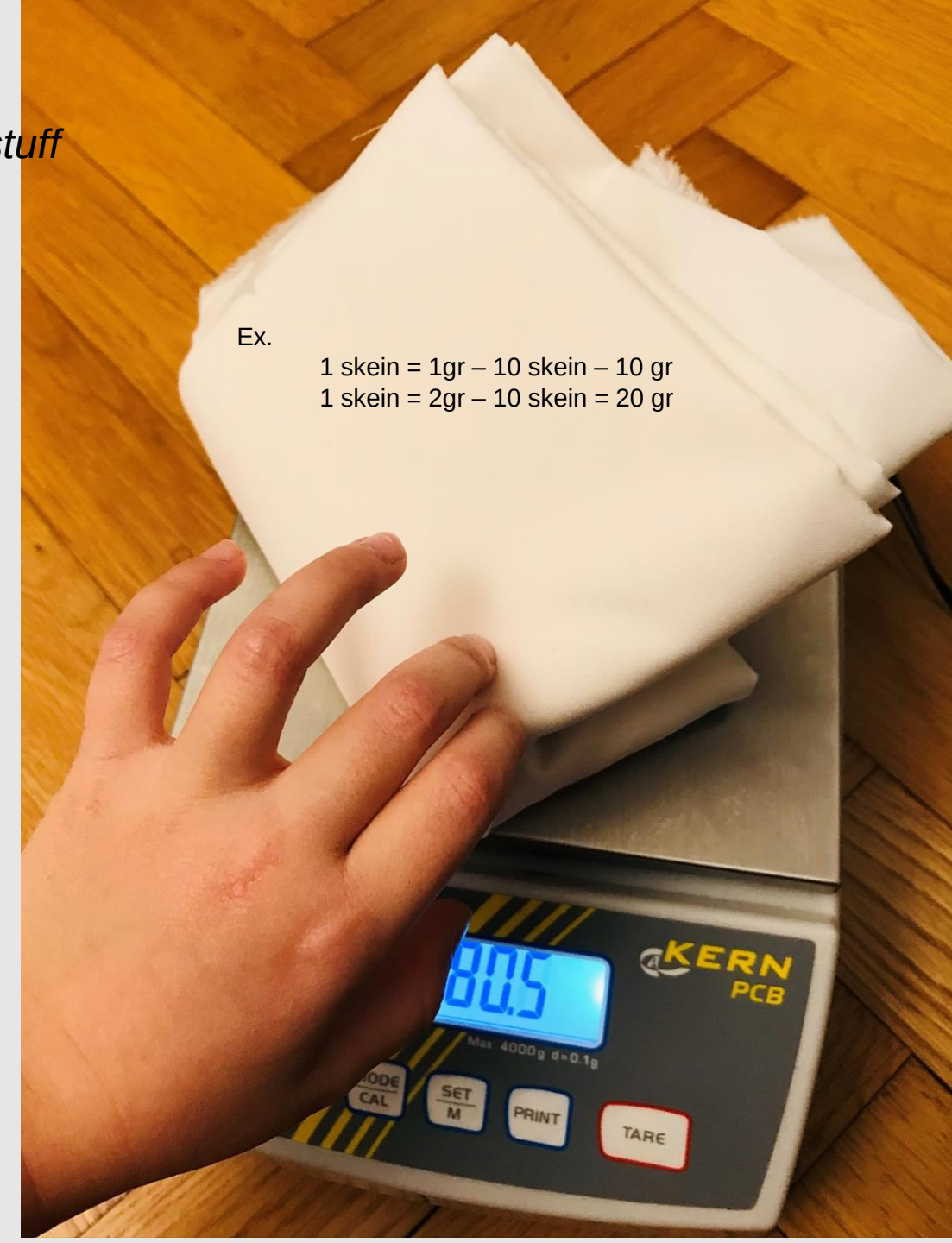




Weight of fabric

will give you the quantity of mordant, additives, color modifier dyestuff

- **Everything that we want to dye has to be properly measured**
- **Wight of fabric it is very important**
  - The weight of fabric - WOF – will give you:
    - the quantity of mordant
      - sometimes you may have more mordant than you want to dye, and have already treated fibers for the future
    - dye plant/biological source that we will need to dye.
- The weight of fabric it will be **always** measured dry
  - written down to remember.
  - If the fabric it is like 48g you may consider 50g
- ***We need***
  - *For measure weight the fabrics or skeins*
  - *Scale weights to measure*
  - *Notebook – to write down*
  - *Pen - to write down*
  - *Foto camera to record the steps*
- **We have to know**
  - the weight of one skein or piece of fabric and
  - the weight of all the quantity fabric or yarns that we want to dye
- Use more then one sample when you start to dye
  - It is easier
  - It is environmentally safer
  - You can create more recipes by using different mordants or by adding in the end colors modifiers



Scour fibers

Wash and Scour the fabric

in order to remove fat and finishing substances
Do not use hand soap – it contains glycerin, perfume and color – all this can do a film on fiber which will not allow the color to adhere into the fibers

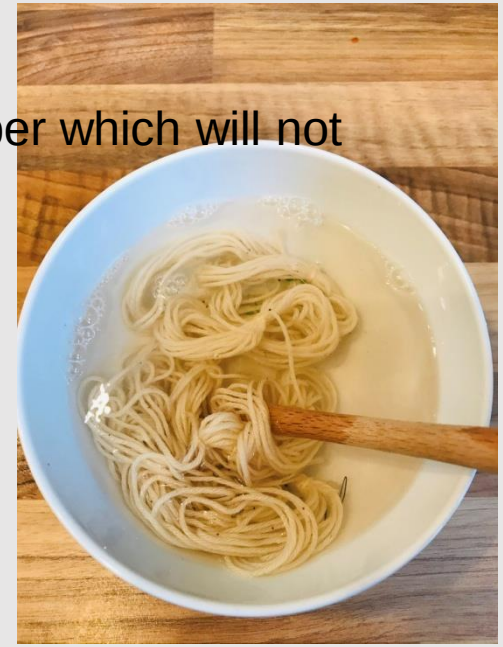
We need:

- Scale weights – to measure the fabric's weight
- Measuring pots to make the ratio solution
- Textile skeins or fabric materials
- Thermometer
- Pots
- Washing machine (large cellulosic fabrics)
- Stove
- Detergents
- Water

- Detergents: preferable pH neutral
  - Orvos
  - Synthrapol
  - Dishwasher (cellulosic fibers, silk)
  - Natural soap – Radix Saponaria (all kind of fabric)
  - Soda ash

We do:

- Large pot +Water + detergent + skeins + Heat .



Scour fibers - how we do it:

Wool

- Warm enough water to cover the fabric, gentle movement
- *Careful! If the water is too hot the wool will shrink and will felt*
- Soak wool in warm water for at least one hour (overnight is better)
  - Move gentle from time to time
  - Change the water if it is too dirty
- Score – In a big pot add:
  - warm water 40ºC
  - 1 ml/1l detergent
  - Mix the solution
  - Add the damp wool
- Maintain the same temperature in your pot for at least half an hour
  - Move gentle from time to time
- Rinse them well in slightly warm water
- Take out the excess of water
- Use them (damp) for mordanting
- Or store them
  - in freezer (damp) *or*
  - Dry them
  - Maintain them in an labeled package

Silk

- Soak silk in warm water for at least one hour (overnight is better)
- Score – In a big pot add:
  - hot water 90ºC
  - 25 – 30% WOF detergent
  - Mix the solution
  - Add the damp silk
- Maintain the same temperature in your pot for at least one hour
  - Move gentle from time to time
- Rinse them well in slightly warm water
- Take out the excess of water
- Use them (damp) for mordanting
- Or store them
  - in freezer (damp) *or*
  - Dry them
  - Maintain in an labeled packet
- *Note – to remove the sericin film from the fiber you have to boiled (the silk) in an alkaline solution*

Cellulosic fibers

- Enough hot water to cover the fabric, gentle movement
- Soak wool in hot water and boil them for at least one hour (if it is possible let them cool overnight)
  - Move gentle from time to time
  - Change the water if it is to dirty
- Score – In a big pot add:
  - hot water
  - 20% detergent and 6% soda ash Na_2CO_3 (D. Cardon)
  - Mix the solution
- Add the damp fibers
- Boil and maintain the same temperature in the pot for at least two hours
  - Move gentle from time to time
- You may use washing machine 90ºC
- Rinse them well in slightly warm water
- Take out the excess of water
- Use them (damp) for mordanting
- Or store them
  - in freezer (damp) *or*
  - Dry them
  - Maintain them in an labeled packet

Mordanting fibers
the “adjective” dyes and color modifiers

Mordanting fibers – “the adjective” dyes and color modifiers

- **It is a thermic, aqueous treatment with metallic salts or bio-accumulators plant, on the textile fibers in order for them (fibers) to accept and create a permanent bond with the color**

  - **Pre mordanting** – before dyeing - the most used method for the efficacity and economy of resource (we can do a large quantity, store and use later)
  - **Simulant mordanting** – During dyeing – mordant is added during dye bath – the dye bath **can’t** be use again after that
  - **Post mordanting** – after dyeing – the mordant is added at the end of dye bath or separately – if it is separately then the dye bath can be reuse

Note

we may use different mordants for the same yarns/fabrics (ex tin as pre-mordanting treatment and iron at the end as a color modifier + color modifier like citric acid)

- it will result a wide range of color

- ***Good to know before we start:***
- **What we use**
  - Mordants - Metallic salt - Aluminum, Iron, Copper, Tin
  - Hot water
  - Assistants – If it is the case
- **What we mordanting**
  - Natural fabrics – In damp state
- **When we mordanting**
  - After weight (dry) and score the fabrics
  - After dyeing if it is a post mordanting treatment
- **Quantity**
  - Give it by mordanting Recipes
  - Percentage from the weight of fabric
  - Ex. 20% alum it means 20g for 100gr of fibers

Mordanting fibers – “the adjective” dyes and color modifiers

Calculate the mordant and color modifiers necessary example

The mordant, modifiers and additives are a percentage of the weight of dry materials

Ex. – Mordant no more then 20% (alum), assistent 15% cream of tartare, color modifier 1%
That means – 100 gr wool + 20gr mordant + 15gr cream of tartare + 1gr color modifier

100g WOG – dry fabric x 100% = 100g of (dry) plant
1gWOF x 100% = 1g of dry plant

If we need 20% Mordant
Example:
100g WOF…….20g mordant $\frac{50x20}{100} = 10$ *or*
50gWOF……..X g mordant = 10g mordant

(50 X 20):100 = 10
For 50gWOF we need 10g mordant
10 g represent 20% mordant from 50g of materials

Time

Depends on type of mordants
Alum as long as possible, for iron less it is better (it will destroy the protein fibers)

After mordanting treatment

- Rinse well your yarns and fabrics
- Use in damp state for dyeing (you can use skein with different mordants in the same pot – if that you have to label the skein to recognize afterwards)
- Keep them in damp state in the freezer in labeled plastic bags
- Dry them and keep in labeled plastic bags




Mordanting fibers

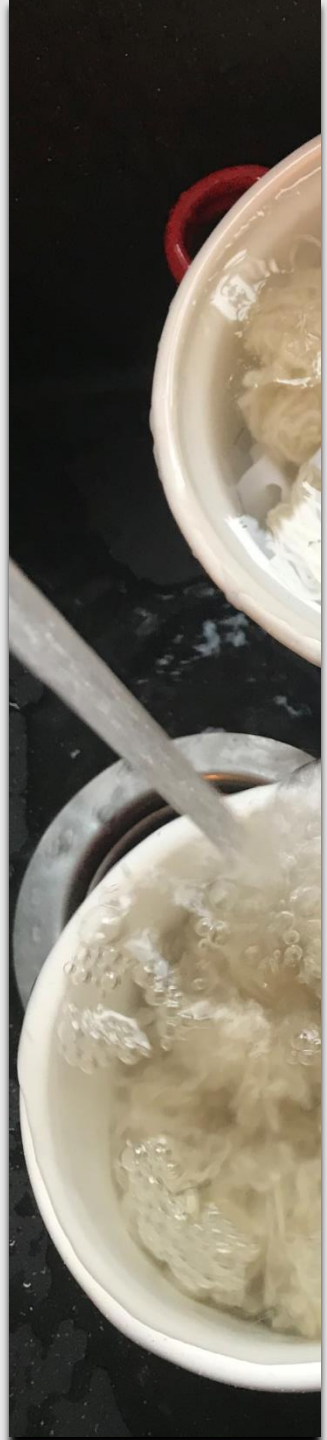
We need

Mordanting recipes
Hot water to dissolve the mordant, for aqua treatment, to rinse
Mordant – metallic salt
Additives if it is the case to- enhance the property of mordants
Textile fabrics and yarns scored, weight it, wind it
Stove for simmer boiling
Small pots for dissolving the salt
Big pot Pots with lids
Measuring pots - Glass pots, plastic recipients to measure the liquor ratio
Spoons and tongs - stainless steel, wood spoons, to stir the liquor
Grater - Stainless steel To scrap stone (alum) if it is necessary
Metric Scale /kitchen scale/ laboratory balance to measure the mordants,
Thermometer/kitchen thermometer – to measure the temperature of the water dyestuff solution.
Clock – to measure the time for the mordanting, dyeing
Digital camera or phone for keeping records
Clothes dryer – for drying the goods
Colored Synthetic threads (see if the color doesn't bleed)
To mark different type of skein (same dye but different mordant)
Zipp bags – for storing materials
Labels – for keeping records on bags and jars
Notebook – for keeping records of dye process.
Protective cloth – mask, surgical gloves, overall.

Note:
Wash your pots and tools very well
- **remains can ruin your color next time**
- **Were protection cloth**

Before dyeing
We do:

- Prepare your fabrics and yarns:
  - weight the fabric (dry),
  - score,
  - Pre-wet (for at least half on hour)
- Weight the mordant (metallic salt) percentage from textile fabric
- Dissolve the mordant – metallic salt – in hot water – stir well.
- Put the resulting solution in big pot on to the stove
  - Add water enough to cover all the fibers
  - Let room for the fibers to move easily.
  - Warm the solution up to 40ºC
- Add the damp fibers in the pot
  - Simmer 90ºC for wool and silk
  - Boiled for cellulosic fiber
- Time – based on the recipes
  - If it is alum – 2 hours
    - We can do a cold mordanting
    - We may keep it overnight
  - If it is copper, iron or tin pre mordanting – one/2 hour, post-mordanting no mor then half un hour
    - A minimum exposure is best - iron will damage the fibers
- Take out the fabric/threads and rinse well in warm water
  - Label your skein – by tiding a color yarn to identify your mordant
  - Use in damp state for dyeing (you can use skein with different mordants in the same pot – if that you have to label the skein to recognize afterwards)
  - Keep them in damp state in the freezer in labeled plastic bags
  - Dry them and keep in in labeled plastic bags



At the same time with dyeing

mordant is added during dye bath
the dye bath can't be used again after that

We do:

- Weight the mordant (metallic salt) percentage from textile fabric
- Dissolve the mordant – metallic salt – in hot water – stir well.
- Add the resulting solution in dye bath
  Stir gently
- In the end – take out the fibers
- Rinse well
- Dry them

Post mordanting – after dyeing

- the mordant is added at the end of dye bath – the last 20 minutes

or

- separately in a different pot – if it is separately then the dye bath can be reused

We do:

- Dissolve the mordant in hot water
- Add enough water to cover all your yarns and fabric
- Add in your pot the warm freshly dyed textile materials - gentle squeezed.
  Do not rinse them
- Let them rest for a while
  - if it is iron - no more then half an our is needed(protein fibers)
- Take them out
- Rinse well
- Dry them

Color modifier

Best to try with:

Wood ash (alkaline) and lemon juice (wick acid)

- separately (in a different jar/pot/ backet)
  - Dissolve the color modifier in hot water
  - Add enough water to cover all your yarns and fabric
  - Add in your pot the warm freshly dyed textile materials - gentle squeezed.
    Do not rinse them
  - Let them rest for a while
    - if it is alkaline solution no more then half an hour (protein fibers)
  - Take them out
  - Rinse well
  - Dry them

Mordant	Percent	Assistant	fibers		color modifier	
			protein	Cellulosic	acid	base
Alum $KAl(SO_4)_2x\ 12H2O$	10 – 20%	cream of tartar $KC_4H_5O_6$ only with wool Soda ash Na_2CO_3 2- 6% Tannins / Myrobalan 5% only with cellulosic	Wool – x + crem of tartar X +cream of tartar + 2% soda ash	x 15% + soda ash 6% x 15% + myrobalan 5% Tannin first + 5% X	Citric acid	Wood ash
Alum Acetate	5 - 8%	Tannin chalk	-	X	Citric acid	Wood ash
Cooper $CuSO_4$	2 – 5%	Vinegar (acetic acid) 5% Tannins	X	X X	Citric acid	Wood ash
Iron $FeSO_4$ Ferrous acetate $Fe(CH_3CO_2)_2$	2%	Chalk (Calcium Carbonate $CaCO_3$)	X X	X X + Calcium Carbonate ($CaCO_3$) 10%	Citric acid	Wood ash
Tin $SnCl_2$	2 - 4%	cream of tartar Oxalic acid	X Best on protein As pre mordanting – we may use cold water	X	Citric acid	Wood ash
Chrome $Cr_2K_2O_7$ Highly toxic – do **NOT use unless it is necessary**	2 – 4 %		Best on wool	X	Citric acid	Wood ash

Mordanting fibers – Dry them and keep in in labeled plastic bags

Natural sources – dye stock solution

- **Natural sources**
  - Plants and twigs, roots, bark and conifers, fruits, flowers, insects
  - Dried or fresh (if it is fresh you have to use a larger quantity then dry)

- **Quantity – how much natural source we use?**

For deeper color we have to use more natural sources like over 200%.

  - *It is a percentage from Weight of textile fabric*
  - *Ex. No more then 25% Cochineal, 50% Madder, 100% Cosmos, 400% and so on.*
  - *Ex. 10g of onion skin – 10g fabric - 100% natural sources from the fabric*

- **How we extract the color matter from plants**
  - In most of the cases in a thermic aqua treatment
    - Let the plant sit in the water for a period of time.
    - Simmer after that

Preparing the natural sources for extraction of dye stuff

We need:

- Natural sources
  - Plants and twigs, roots, bark and conifers, fruits, flowers, insects
- Warm water
- Vinegar (if it is the case)
- Scale
- Pots or Bucket – plastic buckets, enameled buckets
- Coffee grinder/ pestle and mortar/Grater to grind: insects, roots and branches
- Spoons and tongs - stainless steel, wood spoons,
- Big table and protection for table
- Chopper
- Stove
- *Time*
- *Patience*
- *Notebook – record everything*

- **How we do it**
  - Grind the natural sources
  - Put the natural source separately in large pots
  - Put warm water on top – enough to cover everything
  - Let them rest for a while – more time is better – note everything, quantity, time etc.
    - Plants and twigs, roots, bark and conifers – at least few hours
    - fruits – smash them – leave for at least few hours – we may add a two glass of vinegar or lemon juice/5 liters (D. Cardon)
    - flowers, insects – we may use directly
  - Put the pot on fire
    - If the level of water is getting lower you may add more - enough to cover the plants (not more than that)

  Simmer for at least two hours
    - Stir gently from time to time
  - Strain the resulting solution
  - Now you have the stock solution or the bath dye ready to dye






Dyeing treatment – Dye bath

Dyeing treatment – Dye bath

Dye bath solution is the colored water resulting after maceration and/or boiling of the natural sources

We may use

- *strained solution – the result will be a even color*
- *With the plant in it – the result will be uneven color*

- The dye bath can be reused until exhausting the color
- We may repeat the dyeing process in the same bath several time – each time the color will be less intense.
- Note on your journal the number of dye bath
  - 1 the first bath – ex white wool fibers/add dyed samples
  - 2 second bath – ex. white wool fibers/add dyed samples
  - For keeping records of what color will produce the second bath
    - use the same quantity of fabrics as we used in the first place for the original dye bath.
    - use the same natural fiber as before
    - Add water if it is necessary - just to cover your yarns

Dyeing

We need:

- Dye bath
- Damp Textile fabric
  - weighted
  - scored,
  - treated (if it is a pre mordant dye method)
- Big pot
- Spoons
- Stove
- Thermometer
- Clock

damp fabric + dye bath solution.

Note

Do not boil Rubia Tinctorium – it will change in color from reddish to brown color

Direct dye

No mordant is involve – we may use the dye bath wit untreated fabric

Mordant dye (adjective dyes) – it is involved a metallic salt (mordant) to fix the colors in fiber

We need:

- *pre - mordanting damp fabric + dye bath solution.*

  or
- *damp fabric + dye bath solution + add in the end % mordant*

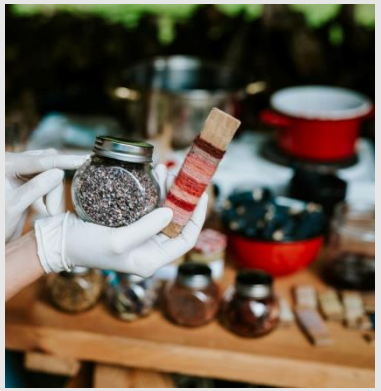
  or
- *damp fabric + dye bath solution + add in the end % mordant + %color modifier*

We do:

- *Warm the dye bath*
- *Add the scoured damp textile fabric in the colored water*
- *Simmer everything together for at least two hours– longer time is better*
  - *stir gently from time to time*
  - *aerate them from time to time*
- *We may achieve good result in cold solution but we have to let the fibers for a long period of time (days)*
- *Let cool the solution and the fabric*
- *Take out the fabric/threads and rinse them well in warm water*







Rinse

- **We need**
  - Current warm water
  - Dyed fabric (damp state)
  - Bucket for rinsing
  - Detergents
- **We do:**
  - Remove the fibers from the dye bath
  - Squeeze them gently
  - Put them in the bucket filled with warm water
  - Rinse them well in current water
  - Wash them with a light detergent
  - Rinse them well in current water until the water is clean

Dry

- **We need**
  - Damp fabric (dyed)
  - Clothes dryer
  - Dark, well ventilated place
- **We do:**
  - Squeeze them gently
  - Put them on the clothes dryer
  - Dry them in a shadow place mark your fabric with colored threads to keep records of your recipes or you method of dyeing
- **Note:**

The color will be lighter than when wet

Indigo - Vat dye

Indigo - Vat dye

- **Blue** - Indigoferas, Isatis, Persicaria – tinctoria, etc.
- The most **known** Natural sources:
  - Indigofera Tinctoria – America, Asia, Africa
  - Woad – European source for blue
- **How we use indigo**:
  - Fresh leaves – salt technique (mix fresh leaves with salt, add your fabric and keep mixing by hand for a while – expose to the air)
  - Dry pigment – extract from leaves – organic vat, chemical vat etc. – transform the insoluble indigo pigment in a soluble one by using a complex procedure called Vat dye.
- **Indigo quantity**:
  - 1 – 10 g/l
  - 1g for light tone – 10 for dark tone
  - The rest of ingredients are calculate from the quantity of indigo we use
- **Indigo vat principle**
  - Water (hot in the first place, maintain up to 50°C) + Alkaline element + Redox element + indigo
- **pH vat** – 9.5 – 10pH for wool, higher for cellulosic
  - Alkaline medium (pH 9 – 10), we need an alkaline medium to prepper the vat (this alkaline environmental has to be maintain during the all proses)
    - wood ash, washing soda/soda ash (Na_2CO_3), slake lime (calcium hydroxide $Ca(OH_2)$, or caustic soda / lye (Sodium hydroxide NaOH – verry powerful, use careful)

Removing agent - redox element (to remove oxygen from water), constant warm temperature of vat.

- Fructose (can be ripe fruits, honey etc. (do not industrial sugar), organic materials – will do a the fermentation process (remove the oxygen from water) **Organic vat**
  - Quick vat 1-2-3 vat – sugar from fruits
  - Slow vat – fermentation with organic materials over time
- Sodium dithionite (Sodium hydrosulfite), Thiourea dioxide, Iron, Zinc **Chemical vat**
  - You may find the last two with the name of **mineral vat**
  - The iron vat it is suitable only for cellulosic fiber because of the higher pH level of vat

For indigo is not necessary to do the mordant treatment on your fibers

For obtain color like black, mov or green you have to over dyeing:

For better result it is advisable to dye indigo first and mordant dye after (including treatment of mordanting fibers) - J. Boutrup C. Eliss

For black – red ex. madder or brown ex. oak

Mov – red ex. cochineal

Green – yellow ex. Weld

For dyeing with indigo

We need:

- Stove
- Kitchen scale
- Pot with lid
- Bucket
  - *to resist at 50ºC*
  - *big enough for all your fibers*
  - *Fill the bucket or the pot ¾ from its capacity.*
- Spoons – inox or wood
- Jars – for prepper the solutions
- Clock – to measure time
- Thermometer – to measure the temperature stock solution
- pH paper – to measure the pH
- clothes dryer
- Protection cloth
- well ventilate space

- Water – warm up to 50ºC
- Fabric (clean, scored, no mordansate, damp state) cellulosic or proteic.
- Indigo powder g/l
- Alkaline element g/l
- Redox element g/l
- Vinegar 5% - for neutralize the alkaline solution

1:2:3 vat or Quick vat - Marcel Garcia recipe

3 elements involved

- 1 indigo powder – one part
  - ex 1 g
- 2 Calcium hydroxide $Ca(OH_2)$ - alkaline element – two parts from indigo quantity
  - ex. If indigo is 1g we need 2g $Ca(OH_2)$
- 3 Fructose – redox element – tree parts from indigo,
  - ex. If indigo is 1g we need 3g fructose

- *If we do a 10l vat we will calculate*
  - *1g indigo x 10l water – 10g of indigo*
  - *if we have 10g indigo - 20g of Calcium hydroxide, 30g of Fructose*
- *If we do a 10l vat of a medium dark shade we will calculate*
  - *7g indigo x 10l water = 70g of indigo*
  - *if we have 70g indigo x 2 parts = 140g of Calcium hydroxide,*
  - *If we have 70g indigo x 3parts = 210g of Fructose*

Chemical vat
easy to work and to learn

- You can't achieve deeper tones
- The redox element it is a chemical substance – use them carefully

We involve:

- Indigo powder
- Alkaline element soda ash (Na_2CO_3) or Sodium Hydroxide (NaOH)
- Redox element Sodium dithionite (Sodium hydrosulfite $Na_2S_2O_4$) or Thiourea dioxide $CH_4N_2O_2S$

- *For ex 3g/l for a light shade of blue*
  - *3g of indigo*
  - *3g of Sodium carbonate*
  - *3g of Sodium Dithionite Na_2S_2O*
  - *For a vat about 10l – 3g indigo x 10l water = 30g indigo*

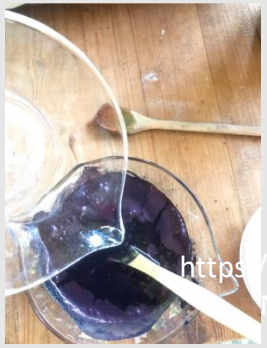
- **Note –** be careful:
  - Sodium Hydroxide it is very dangerous chemical – can cause burns of your skin level

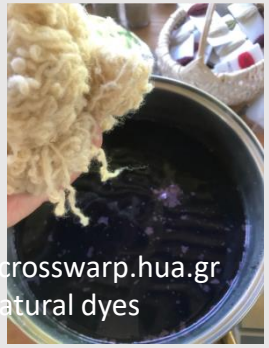
We do:
Quick vat – organic vat

- Simmer the measured water – the quantity of water that you need.
- Measure all your ingredients
- Put them in resistant jars or small recipients (mark your jars)
- Dissolve your ingredients (in there's jars) with hot water (from your simmered water)
- Put your dissolved ingredients in a big bucket/pot (filled with the hot water from your pot ¾ from the)
- Stir well with circular movement – be careful not to add oxygen to your vat keep your spoon down wen you stir.
- Wait for 30 minutes
- Stir again
- Put the lid on top of your bucket
- Let it cool slowly to 40 - 50ºC
- Your solution it is ready to use when your stock solution it will have a yellowish brown color, a metallic layer on the surface and bubble. (remove the bubble) your solution has to have a 9.5 – 10 pH measure with pH paper .

  It can take from few hours to 2 days

  If it is still blue add more redox element





We do:
Chemical vat

- Simmer the measured water – the quantity of water that you need.
- Measure all your ingredients.
- Split in two the redox ingredient.
- Hydrated dissolve your indigo powder – put warm water on top and mix well.
- Hydrated dissolve your soda ash (Sodium Carbonate Na_2CO_3) – put warm water on top and mix well.
- Mix the two of theme together – it will result a metallic cooper surface.
- Put the ingredients in the vat water. – large bucket filed ¾ from its volume - with simmered water - 50ºC
- Move gently.
- Sprinkle the Sodium Dithionite (an sulphury odor will be release)
- Put the lid on top and maintain for about 20 minutes in warm environment about 40 – 50ºC (do not exceed that temperature).
- Your solution it is ready to use when your stock solution it will have a yellowish brown color
  - your solution has to have a 8 – 9.5 pH - measure with pH paper.
  - If it is still blue add more redox element.
  - If the pH it is to high lower down by adding warm water

Dye your fabric in your already made vat

- Dip your damp fibers in to the pot (slowly)
  - stir gently for the color to adhere to the fibers for 20 minutes
  - be sure that your fibers are completely covered with dye solution
- Take them out slowly from the vat
- Expose them completely to the air.
- In the beginning the yarns will be yellowish green
- Put them in cold water to remove the unfixed color from fibers
- Take them out - gently squeeze the excess of water
- Expose them completely to air.
  - They will become blue
- For a deeper color repeat the immersion and the procedure for several time
- Be careful not to add oxygen in your dye vat when you immerse your fibers

In the end

- Rinse well the yarns
- Neutralize your dyed yarns in an acidic solution (to remove excess of alkaline remains)
  - 5% vinegar in water
- Rinse again
- Wash them with a gentle detergent
- Squeeze excess water
- Dry them
  - in well ventilated place
  - The fabrics and yarns must be completely open, unfolded
  - Complete by exposing to air.





Time

Time it is crucial - Respect your recipes

- Prepper your fabrics minimum 30 minutes – depends on what you want to dye
- Score – 1 – 4 hours
- Mordanting/post-mordanting – from few minutes if it is post-mordanting up to one day
- Prepper your natural source – from one hour to tree days ore even more
- Dye bath – from one ½ hour to couple of days (in warm solution)
- Rinse – 20 minutes
- Dry – up to 24 hours

http://pictures.4ever.eu/technology/historic-clocks-207325

Suggestions for you to start:

you may find those natural dye in raw form in grocery shops and specialized dye suppliers

- **Vat dye**

Indigo – blue (indigo vat)

- **Direct dye**

Turmeric – yellow a direct dye – non mordanting dye

- **Mordant dye: (mordant Alum, Iron, Copper, Tin)**

Red and yellow onion skins – a range of color – from yellow to dark brown.

Tagets/marigold – a range of yellow

Madder – a range of color – orange, red, brown.

Avocado skin – a range of delicate pink green brown.

Cochineal – a range of red violet

Marigold,

Madder.

Cochineal

Turmeric

indigo

recipies based on Ina Vanden Berghe class described by Irina Petroviciu in „Establishment of common reference materials” în raportul COST G8 Non-destructive analysis and testing of Museum Objects

note: the color that you see are a bite lighter then the real one

Pink, red, violet	Yellow, orange, green – brown	Greenish, Violet, Blue,	Light brown, brown, grey
• Cochineal - *Dactylopius coccus – 25%* • Madder – *Rubia Tinctorium 50%* • bilberry, wimberry, whortleberry – *Vaccinium myrtillus* berries (not a real dye stuff) 100% • Sumac fruit- *Rhus typh*ina 300%	• Turmeric - *Curcuma longa* • Targetes Marigolds – *Targetes erecta and patula 500%* • Yellow Onion – *Allium cepa – 100%* • Red Onion *Allium cepa – 100%* • Alder buckthorn, Glossy buckthorn, Breaking buckthorn – *Rhamnus frangula* • Common Buckthorn, Purging Buckthorn – *Rhamnus cathartica – 500%* • Beetroot – *Beta vulgaris* (not a real dye stuff) 100%	Indigo - *Indigofera tinctoria* Red Cabbage – *Brassica oleracea – 200%* Common Privet – *Ligustrum vulgare -* Nettle - *Urtica dioica - 100%*	Horse chestnut – *Aesculus hippocastanum 100%* Walnut – Juglans regia *100%* Sumac leaves – *Rhus typhina 100%* Avocado - *Persea americana* pink reddish light brown 100%

Recipes - number identification R						
R 1 - Without mordant	**R 2**	**R 3 pre mordanting**	**R 4 pre mordanting**	**R 5 Post mordanting**	**R 6 Post mordanting**	**R7 Post mordanting**
Protein/vegetables	**Vegetables**	**Protein**	**Vegetables**	**Protein/vegetables**	**Protein/vegetables**	**Protein/vegetables**
Without mordant	Sumac	Alum $KAl(SO_2)_2x12H_2O$) 20% + Cream of tartar 10% + soda ash (Na_2CO_3) 2%	Alum $KAl(SO_2)_2x12H_2O$) 20% + soda ash (Na_2CO_3) 6%	Iron $FeSO_4x7H_2O$ 3% + cream of tartar 6%	Copper 5% $CuSO_4x5H_2O$	Tin $SNCl_2$ 3% + 3% cream of tartar 3%

Combine recipes – pre mordanting + post mordanting; post mordanting + color modifier acid/alkaline;				
R 3:5, R3:5, R3:6 **Pre - mordanting + color modifier**	**R 4:5, R4:5, R4:6** **Pre - mordanting + color modifier**	**R 5:10, R5:11** **Post mordanting + color modifier**	**R 6:10, R6:11** **Post mordanting + color modifier**	**R 7:10, R7:11** **Post mordanting + color modifier**
Protein	**Vegetables**	**Protein/vegetables**	**Protein/vegetables**	**Protein/vegetables**
Alum 20% + cream of tartar 10% + soda ash 2% ***Dye*** 3% $FeSO_4x7H_2O$ + 6% cream of tartar	Alum 20% + soda ash 6% ***Dye*** Iron 3% + cream of tartar 6%	***R 5:10*** $FeSO_4x7H_2O$ 3% + cream of tartar 6% + Citric Acid	***R 6:10*** Copper 5% + color modifier Citric Acid	***R 7:10*** Tin 3%+ cream of tartar 3% + color modifier Citric Acid
Alum 20% + cream of tartar 10% + soda ash 2% ***Dye*** Copper 5%	Alum 20%+ soda ash 6% ***Dye*** Copper 5%	***R5:11*** $FeSO_4x7H_2O$ 3% + 6% cream of tartar + color modifier Wood ash	Copper 5%+ color modifier Wood ash	Tin 3% + cream of tartar 3% + color modifier Wood ash
Alum 20% + cream of tartar 10% + soda ash 2% ***Dye*** Tin 3% + cream of tartar 3%	***Dye*** Tin 3% + cream of tartar 3%			

Recipes with no mordant - treated with color modifier				
R8	R9	R10	R11	R 12 ocazional
Protein/vegetables	**Protein/vegetables**	**Protein/vegetables**	**Protein/vegetables**	**Protein/vegetables**
Vinegar (acid)	Salt (alkaline)	Citric (acid)	Wood ash (alkaline)	Sour cabbage liquid (acid)

Alder buckthorn, Glossy buckthorn, Breaking buckthorn – Rhamnus frangula – bark

100%, crumbeled, half a day in warm water, dye bath simmered for 2 hours, first bath

No color No mordant, alum

No color, No mordant, alum Iron iron+ citric iron wood ash Copper Copper citric Copper wood ash Tin Tin citric tTn wood ash

Vinegar Salt Citric Acid Wood ash

Apple branches - Malus domestica

100%, 3 days in warm water, boiled for 2 hours, dye bath simmered for 2 hours

first bath

No color No mordant, alum

No color, No mordant, alum Iron iron+ citric iron wood ash Copper Copper citric Copper wood ash Tin Tin citric tin wood ash

Vinegar Salt Citric Acid Wood ash Sauer cabbage liquid

Avocado - *Persea americana* - skins

100%, simmered for 2 hours, dye bath 2 hours first bath

No color, No mordant, alum

No color, No mordant, alum | Iron | iron+ citric | iron wood ash | Copper | Copper citric | Copper wood ash | Tin | Tin citric | tin wood ash

Vinegar | Salt | Citric Acid | Wood ash | Sauer cabbage liquid

Beetroot – Beta vulgaris (not a real dye stuff) 100%,
fresh cut in small pieces
simmered in water for 1 hour, dye bath – simmered for 2 hours, first bath

No color No mordant, alum

No color, No mordant, alum Iron iron+ citric iron wood ash Copper Copper citric Copper wood ash Tin Tin citric tin wood ash

Vinegar Salt Citric Acid Wood ash Sauer cabbage liquid

Bilberry, wimberry, whortleberry – *Vaccinium myrtillus* berries (not a real dye stuff) fresh fruits

100%, smashed, simmered for 2 hours, dye bath simmered for 2 hours, first bath

No color , No mordant, alum

No color, No mordant, alum Iron Copper Tin Vinegar Salt Citric Acid Wood ash

Cochineal - Dactylopius coccus dry insects

25%, grinded, simmered for 2 hours, dye bath 2 hours first bath

No color No mordant, sumac, alum

No color, No mordant, sumac alum Iron Copper Tin Vinegar Salt Citric Acid Wood ash

Common Buckthorn, Purging Buckthorn – Rhamnus cathartica – 500%

100%, crushed, simmered for 2 hours, squeezed, dye bath 2 hours, first bath

No color No mordant, alum

No color, No mordant, alum Iron iron+ citric iron wood ash Copper Copper citric Copper wood ash Tin Tin citric tin wood ash

Vinegar Salt Citric Acid Wood ash Sauer cabbage liquid

Cornflower or bachelor's button Centaurea cyanus, - dried flowers

100%, simmered for 2 hours, dye bath 2 hours

first bath

No color , No mordant, alum

No color, No mordant, alum Iron iron+ citric iron wood ash Copper Copper citric Copper wood ash Tin Tin citric tin wood ash

Vinegar Salt Citric Acid Wood ash Sauer cabbage liquid

Horse chestnut – Aesculus hippocastanum

leaves and skins

100%, simmered for 2 hours, dye bath 2 hours

first bath

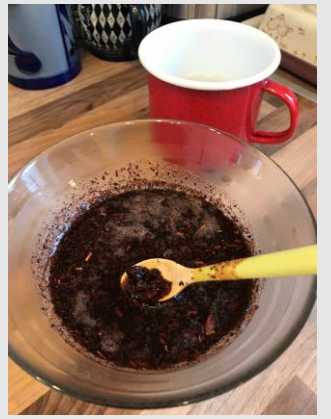
No color , No mordant, alum

No color, No mordant, alum Iron iron+ citric iron wood ash Copper Copper citric Copper wood ash Tin Tin citric Tin wood ash

Vinegar Salt Citric Acid Wood ash

Madder – *Rubia Tinctorium - roots*

50%, 2 hors in warm water, 2 hours in simmered water, dye bath - 2 hours simmered in water, and left overnight.
first bath



No color No mordant, sumac alum

No color, No mordant, sumac alum Iron Copper Tin Vinegar Salt

Nettle - *Urtica dioica – dried leaves*

100%, simmered in water, dye bath – simmered for 2 hours first bath

No color No mordant, alum

No color, No mordant, alum Iron iron+ citric iron wood ash Copper Copper citric Copper wood ash Tin Tin citric Tin wood ash

Vinegar Salt Citric Acid Wood ash Sauer cabbage liquid

Red Onion – Allium cepa dried skins

100%, 2 hours in warm water, simmered for 2 hours, dye bath 2 hours first bath

No color No mordant, alum

No color, No mordant, alum Iron iron+ citric iron wood ash Copper Copper citric Copper wood ash Tin Tin citric tin wood ash

Vinegar Salt Citric Acid Wood ash Sauer cabbage liquid

Targetes Marigolds – Targetes erecta and patula

500%, fresh flowers
simmered for 2 hours, dye bath 2 hours
first bath

No color No mordant, alum

No color, No mordant, alum Iron iron+ citric iron wood ash Copper Copper citric Copper wood ash Tin Tin citric Tin wood ash

Vinegar Salt Citric Acid Wood ash

Red cabbage – Brassica oleracea L– not a real dye
cut in small pieces
100%, simmered in water, dye bath – simmered for 2 hours
first bath

No color No mordant, alum

No color, No mordant, alum Iron iron+ citric iron wood ash Copper Copper citric Copper wood ash Tin Tin citric Tin wood ash

Vinegar Salt Citric Acid Wood ash Sauer cabbage liquid

Sumac fruit - *Rhus typh*ina 300%

in warm water for 3 hours, simmered in water, dye bath - shimmer 2 hours

first bath

No color No mordant, alum

No color, | No mordant, | alum | Iron | iron+ citric | iron wood ash | Copper | Copper citric | Copper wood ash | Tin | Tin citric | tin wood ash

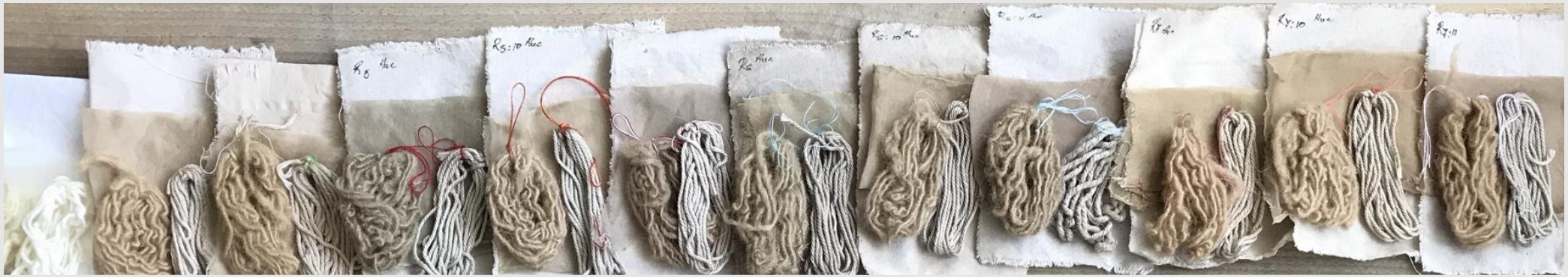
Vinegar | Salt | Citric Acid | Wood ash

Walnut – Juglans regia dried skins and leaves

100%, 2 hours in warm water, 2 hours in simmered water, dye bath - 2 hours, first bath

no mordant needed - mordant and color modifiers were used for shifting the color

No color No mordant, alum



No color, No mordant, alum Iron iron+ citric iron wood ash Copper Copper citric Copper wood ash Tin Tin citric Tin wood ash

Vinegar Salt Citric Acid Wood ash

Yellow Onion – Allium cepa dried skins

100%, 2 hours in warm water, simmered for 2 hours, dye bath 2 hours first bath

No color , No mordant, alum

No color, No mordant, alum Iron iron+ citric iron wood ash Copper Copper citric Copper wood ash Tin Tin citric tin wood ash

Vinegar Salt Citric Acid Wood ash Sauer cabbage liquid

Direct dye - Turmeric - *Curcuma longa - roots*

100%, simmered in water, dye bath – simmered for 2 hours

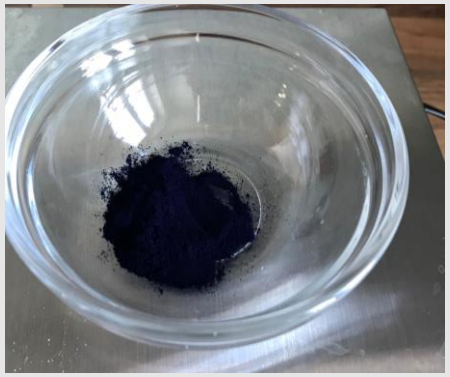
first bath

No color

No mordant

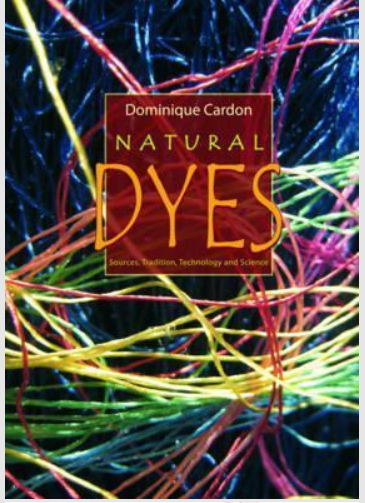
Indigo - *Indigofera tinctoria vat dye - 6g indigo/l*

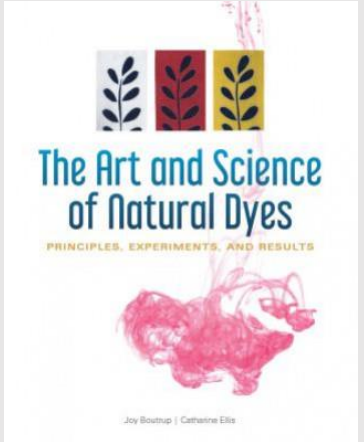
No color

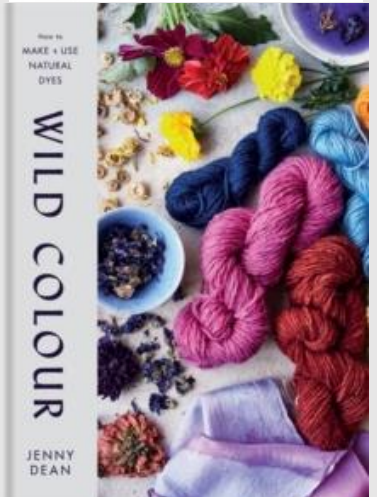


Good to know

- Try to find out good useful information about the plant that you are using for dye
  - Not all plants are stable in time
  - Fruits like blueberry and other berries are good for learning but they are not real dyestuff
  - Cabbage and beetroot are in the same category
  - Test your color light fast – you may dye a small sample and expose half of the dyed fabric in light. Monitor it for a couple of weeks. See the result
- For a better information about the plant I suggest you look in the comprehensive and extensive book of Dominique Cardon “Natural dyes sources, tradition, technology, science.” Boutrup Joy, Ellis Catharine - “ Art and Science of Natural Dyes” https://www.ellistextiles.com/resources/, and Jenny Dean book “Wild Colour” and site https://www.jennydean.co.uk/ and the rest of the books and website and facebook working group listed in references.
- Patience, Keep practice, Enjoy and Learn each time something







Online Specialized dye suppliers *Few suggestions*

- https://www.griffindyeworks.com/product-category/dyeing/
- http://www.wildcolours.co.uk/html/natural_dyes.html
- https://botanicalcolors.com/product-category/natural-dyes/
- https://maiwa.com/collections/natural-dyes
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- https://www.suzannedekel.com/natural-dyes
- Many more

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Thank you all