EXTRACTION AND APPLICATION OF NATURAL DACES FOR SILK AND COTTON

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Overview

Natural dyes can be derived from:

- Plants
- Minerals
- Insects
- Shellfish

Varieties of plants are extracted the color in Cambodia. Gum from Lac is a common natural dye material which has been using since the past generation.

Sources of natural dye colors from plants:

- Roots
- Leaves
- Flowers
- Barks
- Fruit skins
- Nutshells
Characteristics of natural dyes

– eco-friendly
– harmless
– non-toxic

Hue or shade of the color is dependent on:

- Soil
- weather conditions
- Time of year the plants is harvested
- Age of plant
Traditional natural dyeing practices

- No pretreatment of the materials to be dyed
- No proper determination of material composition
- No mordant use
- No specific liquor ratio
- No time consideration in extraction and dyeing
- No thorough rinsing to remove excess dyes
Effects of poor natural dyeing practices

- Poor colorfastness
- Low breaking strength
- Differences in shades
- Uneven dyeing
- Poor quality of end products
Natural dyeing parameters

- Dyeing time
- Temperature
- Liquor ratio
- pH
- Dyeing method
- Mordant and dye concentration (lightness and darkness of the dye)
- Mordanting process
  - Materials to be dyed is completely wet and entirely submerged in the dyeing solution to attain even dying
  - All dyed materials must be rushed thoroughly prior to dyeing to prevent bleeding and staining
Good Practice on Natural Dyes

Standardized and upgraded natural dye extraction and textile application processes

- more efficient and faster methods of extraction and dyeing than traditional method
- increase dye yield
- improved colorfastness
- shade reproducibility
- increased productivity
Factors affecting dye yield productivity

Size of dye parts

The smaller the cut or size of the plants used, the better the color yield produced due to the larger surface area that is exposed which allows better solvent water penetration of the dye parts.

Liquor ratio (LR)

LR ratio of the materials to be dyed to the volume to the volume of water to be used for the dye extraction.

The volume is maintained by adding hot water to the dye extract to compensate the water loss.

Extraction method

Time for dye extraction

PH

Temperature
Pretreatment Process

Degumming of silk – to remove sericin to achieve better dye ability, colorfastness properties and dye affinity

Time: 45-90mm
Temperature: Boiling
Liquor Ration 1:30
15% grated dish washing soap
5% soda ash
2% sodium hydrosulfite

Washed 6 times in water at gradual lowering of temperature.
Soak in 2 g/L acetic acid solution for 15 min
Washed thoroughly with tap water
Air dried
Flow Process of Degumming Silk Fabric

1. Silk yarn or fabric
2. Dish washing Soap Sodium hydrosulfite Soda Ash
3. Degumming at the boil
   45mm-90mm.
   Temperature 100 °C
4. Drain
5. Stir the mixture thoroughly
6. 70 °C
7. Water. LR 1:30
8. Wash 6x at gradual Temperature
Mordanting

Mordant – metallic substance that creates a chemical affinity between the substrate and the dyestuffs and fix the coloring matter on the materials permanently.

- better absorption of dyes
- improved colorfastness properties
- enhanced color shades

Mordants

- Copper sulfate
- Ferrous sulfate
- Alum
Mordanting Process

Silk /cotton

Alum or Copper sulphate

Temperature for silk: 70 °C
Temperature for cotton: 100 °C
Duration of Mordanting: 30mm

Stir the mixture thoroughly

Drain

Silk yarn or Fabric is ready to dye

70 °C
Temperature

Water. LR 1:30
INTRODUCTION OF NATURAL DYE MATERIAL
Natural dye yielding plant: Coconut

Scientific name: Cocos nucifera L.

Local name: ឈុង Coconut (English)

Description: The husk is outside of the shell

Plant part used: Husk of young coconut

Colors produced: Maroon, yellowish brown, brown and pinkish brown
Natural dye yielding plant: Annato

Scientific name: Bixa orellana L.

Local name: ឈីឈី បីស្កាលី Annatto (English)

Description: The flower are white or pinkish capsules and somewhat rounded, reddish brown, about 4 cm and covered with red pulp

Plant part used: Seeds

Colors produce: Light orange, brownish orange and yellow orange
Natural dye yield plant: Banana

Scientific name: Musa sapientum L.

Local name: ᵗⁿᵉᵉ  Banana(English)

Description: Locally grow around in the village, leave are used for packaging, fruit for eating.

Plant part used: Leave

Colors produced: Light gray, beige
Natural dye yield plant: Indian almond
Scientific name: Terminalia catappa L.
Local name: Indian almond (English)
Description: 6-18 cm, spirally arranged, smooth, shining and tapering below the narrow and subcordate base (show picture)
Plant part used: Leaves
Colors produced: Black and gray
Natural dye yield Insect: Lac

Scientific name: Laccifer Lacca Kerr.

Local name: តុំស្រាប់ Lac(English)

Description: We can find the place where farmer growing lac Insects in Kratie Province. These insects live in a specific tree

Plant part used: gum

Colors produced: Red, pink and purple
Natural dye yield plant: Prohut

Scientific name: Garcinia Villerciana

Local name: រូបោត

Description: Small tree growing in mountainous areas

Plant part used: bark

Colors produced: Yellow, moss green and Olive
DYE EXTRACTION PROCESS
Dye Extraction Process

Extraction of natural dyes from plant parts (bark, leaves, seeds, flowers) is the process of harnessing the pigment from the dye source. This is usually done by boiling of barks, woods, seeds and/or rhizomes while, fermentation and maceration are efficient for leaves and flowers, respectively. Prior thereto, plant parts are chopped/cut into smaller sizes for more effective dye extraction as characterized by higher color intensity of the extract.
The process of dyeing and extraction of Annato

1. Weigh the mordanted materials to be dyed.
2. Heat appropriate volume of water needed using a liquor ratio of 1:30.
3. Weigh exact amount of annatto seeds based on the weight of the material to be dyed and determined dye concentration.
4. Prepare soda ash and add to the measured water in step 2. Note: Use 1 gram of soda ash for 1 liter of water.
5. Boil the annatto seeds in the alkaline water for 1 hour, maintaining the volume of the solution.
6. Filter and set aside for dyeing.
7. Heat the filtered extract to boil an optimum temperature required for the material to be dyed. 70 °C for silk and 100 °C for cotton.
8. Immerse the mordanted material in the annatto dye extract and dye the material for 30 mm for silk and 60 mm for cotton. Bring the temperature to boil.
9. Remove the dyed material from the solution and wash with anionic detergent (e.g. Cleanmate).
10. Spin, dry and hang
The process of dyeing and extraction of Bark/fruits/leave

1. Weigh the mordanted materials to be dyed.
2. Heat appropriate volume of water needed using a liquor ratio of 1:30.
3. Weigh exact amount of barks/fruits/leave based on the weight of the material to be dyed and determined dye concentration.
4. Boil the barks/fruits/leave in water for 1 hour, maintaining the volume of the solution.
5. Filter and set aside for dyeing.
6. Heat the filtered extract to boil an optimum temperature required for the material to be dyed 70 °C for silk and 100 °C for cotton.
7. Immerse the mordanted material in the dye solution and dye the material for 30mm for silk and 60mm for cotton. Bring the temperature to boil. Heat the filtered extract to boil an optimum temperature required for the material to be dyed 70 °C for silk and 100 °C for cotton.
8. Immerse the mordanted material in the dye extract. Bring the temperature to boil.
9. Dye the material for 30mm for silk and 60mm for cotton.
10. Remove the dyed material from the solution and wash with anionic detergent (e.g. Cleanmate).
11. Spin, dry and hang

Note: We have to harvest the leave a day before using, store the leave in the normal room for a night to reduce the moisture.
The process of dyeing and extraction of Lac

1. Weigh the mordanted materials to be dyed and set aside for dyeing.
2. Grind Lac into power then weigh the amount of grinded lac base on the weight of the material to be dyed and determined dye concentration.
3. Heat appropriate volume of water needed using a liquor ratio of 1:30.
4. Boil the lac in water for 1 hour, maintaining the volume of the solution.
5. Filter and set aside for dyeing.
6. Heat the filtered extract to boil an optimum temperature required for the material to be dyed 70 °C for silk and 100 °C for cotton
7. Immerse the mordanted material in the dye solution and dye the material for 30mm for silk and 60mm for cotton. Bring the temperature to boil. Heat the filtered extract to boil an optimum temperature required for the material to be dyed 70 °C for silk and 100 °C for cotton
8. Immerse the mordanted material in the dye extract. Bring the temperature to boil.
9. Dye the material for 30mm for silk and 60mm for cotton.
10. Remove the dyed material from the solution and wash with anionic detergent (e.g. Cleanmate).
11. Spin, dry and ha
The process of making rusty solution

1. Using 30 litters of water for 10kg of rusty iron. Put the water into clay jar
2. Immerse rusty iron into the clay jar
3. Slice 3 kilograms of lemons and add to the clay jar
4. Add 3 kilograms of sugar palm into the jar
5. Cover the jar and keep it for 5 days before using solution.
Sample of dye information sheet

Date: 

Raw material: 

Weight: 

Liquoration: 

Dye material: 

Formula

-------------------------------%
-------------------------------%
-------------------------------%
-------------------------------%

Modanting

Alum: ..................................................g/l

Copper sulfate: .......................................g/l

Rusty solution: .....................................l/l