

BOTANICAL DYE
STUDY NOTES

MADDER

rubia tinctorum



LANCASTER
& CORNISH



COPYRIGHT

© 2023 Sian Cornish (trading as Lancaster & Cornish). All rights reserved.

No part of this book may be reproduced or distributed in any form without prior written permission from the author, with the exception of non-commercial uses permitted by copyright law.



STUDY NOTES MADDER

WELCOME

A warm welcome from me, Sian Cornish.

I am a textile artist combining traditional natural dye processes, shibori techniques and contemporary artistic practice to create beautiful textiles that reflect the seasons and landscapes of my studio and home of Cornwall in south west England.

I use colour and pattern to express my connection to the natural world, creating enigmatic markings to reflect tidal ebb and flow, waves, landforms or perhaps the shape of a petal, modifying processes through the introduction of unique foraged and found items including branches, seaweed, shells and leaves. The colour palette produced from plant matter echoes the flora and fauna I observe in the environment. I aim to translate the feeling of the land, sensing deeper geological and meteorological forces, or the more gentle pastoral scenes, into the textiles I create.

Sustainability is a key part of my work, whether working to reduce resource use, minimising harm to the environment, or enhancing wellbeing through a deeper connection between ourselves and the world around us.

I work from my studio and dye garden in Lostwithiel, Cornwall and teach the art and science of natural dyes at craft centres and locations around Cornwall and the UK.

I invite you to join me on this joyful and exploratory journey into the world of natural dyes.

INTRODUCTION

There is something very satisfying and soulful about producing colour from nature.

From mark making to dress making, colour plays an important part in all of our lives. Humans are hard-wired to preserve colour and historically this was achieved using natural dyes, minerals and earth pigments. Scientific evidence confirms the presence of natural reds and oranges in Egyptian tombs dating back to 2600BC and, further back in time, archaeological evidence suggests over 10,000 years of plant dyeing in human history. Perhaps the ability to preserve traces of landscape and plants creates a feeling of permanence, an artistic impression recording a part of everyday life, nature and earth.

Madder (*rubia tinctorum*), holds a rich significance in the world of natural dyes. Historically, Madder has been prized for its vibrant red hues, most notably the famous "Turkey Red." This deep and fast red dye was a symbol of wealth and luxury in the 18th and 19th centuries, particularly in textile production. Turkey Red was achieved by a complex and time-consuming process that involved multiple dye baths and special techniques, making it one of the most coveted colors of its time.



HOW TO USE THE STUDY NOTES

These Madder Study Notes are intended for anyone, from the complete novice through to more seasoned artists and craftspeople interested in developing their practice and creating colour in a way that feels instinctive and life-affirming.

In previous Study Notes (Kitchen, Garden) I explored how colour can start in the heart of the home, using tannin rich dyes such as tea to produce satisfying results, and then in Garden how using fresh, dried and flower extracts can yield a bounty of sunshine colours, from a vibrant *Coreopsis* orange to Marigold yellows. This Note series takes a deeper dive in to one particular dye plant, Madder. I explore its history and cultural significance, as well as exploring the range and depths of colours achieved with this one plant. We will also take a look at other recipes used to yield pink colours, including Lac and Sorghum.

Reading List

- "Madder Red: A History of Luxury and Trade" by Robert Chenciner - This scholarly book delves into the history of madder as a luxury dye and its role in trade.
- "Natural Dyes" by Dominique Cardon - This book is a comprehensive reference on natural dyes and includes information on madder.
- "Madder Dyeing in the Colorful World of Kashmir" by Eva-Maria Dill - This scholarly article discusses madder dyeing techniques in the context of Kashmir's textile traditions.
- "Medicinal and Aromatic Plants of the Middle-East" by Zohara Yaniv and Nativ Dudai - This book covers various aspects of madder, including its use as a dye and its medicinal properties.
- "The Dyer's Garden: From Plant to Pot, Growing Dyes for Natural Fibers" by Rita Buchanan - This book explores growing plants for natural dyeing, including madder.

HEALTH & SAFETY

Please read the safety information before starting

Keep separate utensils and pans used for dyeing only.

Store all dyes, mordants and modifiers in clearly marked storage containers, in a dry place out of reach from children and animals.

Work in a well ventilated area and avoid inhaling vapour from the dye pot.

Do not eat, drink or smoke whilst working with dyestuff.

Protect your skin, clothes and the dyeing area, handle all chemicals with care, and use gloves and aprons as necessary.

Do not consume the dye liquids and keep them separate from food.

Avoid skin contact and accidental ingestion and inhalation.

Use appropriate gloves when handling hot saucepans.

Large saucepans full of liquid are heavy and it is safer to let the liquid cool down before handling them.

Dispose of used dyes responsibly.



WHAT YOU NEED

EQUIPMENT & MATERIALS

Natural textiles (cotton, linen, silk, hemp). Old/vintage fabric that has been used and washed.

Plastic, stainless steel or glass pots for mixing

Stainless steel or non-reactive pan(s)

Stovetop for heating water

Sieve / Steamer and string or elastic bands (for optional bundle dyeing experiments)

Separate stainless steel spoons / utensils for stirring dye baths and removing dyed items

PLANTS

You can work with fresh, dried or plant extracts

Madder

Lac

Sorghum

MORDANTS

Alum (Potassium aluminium sulphate)

Iron (Ferrous sulphate)

MODIFIERS

Soda Ash

Calcium Carbonate

PREPARATION

SCOURING:

Prepare your textile, whether silk, cotton, hemp or linen for natural dying by washing in a pH neutral detergent (dish detergents are often good as they don't produce an excess of lather, and so reducing water use and rinsing).

MORDANTING:

Prepare your textile, whether silk, cotton, hemp or linen for natural dying by mordanting according to the recipes in your Natural Dye Journal Foundation course: <https://community.lancasterandcornish.co.uk/lesson/an-introduction-to-mordants>

CARE & A NOTE ON COLOUR AND LIGHTFASTNESS

Natural colour can last for centuries, but some may be more fleeting, and we call these 'fugitive' dyes, including many berries and red cabbage. In this guide we have included dyes that have good light and colourfastness properties, when used in with a mordant. It should be noted that both of these properties (lightfastness and colourfastness) varies from dye to dye, and depends on external factors such as the conditions of storage.

Treat with care and colour will last longer. Gentle washing, and natural drying will increase longevity. However we encourage you to enjoy and use your dyed textiles if you want to, embrace slow-crafting, and re-infuse the item with love and colour as colours fade and seasons change.



USEFUL TERMS

*WEIGHT OF FIBRE (WOF)

A convenient way of measuring the amount of dye and mordant used, expressed as a percentage of the dry weight of fibre.

Weight of Fibre x % = Weight of Dyestuff

Weight of Fibre x % = Weight of Mordant

Example:

To dye a medium shade of orange with *Coreopsis tinctoria*, use 20% WOF

So, to dye 100 grams of silk, we would need 20 grams of dye stuff.

Weight of Fibre (WOF) 100 grams x 20 %= 20 grams

100 x 20 %

100 grams (WOF) x 0.2 = 20 grams (Dyestuff)

MORDANT

From the French verb 'mordre – to bite', mordants are metallic salts (including aluminium, iron and copper) that help the bonding of the dyestuff pigments to the fibre. Fibres are typically soaked in a solution of these metal salts, using various chemical combinations depending on the nature of the textile (protein or cellulose).

MODIFIER

Modifiers may be substances that alter the acidity or alkalinity (pH) of the dye bath. These can be acids, e.g. white vinegar, lemon juice, citric acid, or alkalis e.g. soda ash or wood ash water. They can also be solutions of iron or copper can also be used as modifiers as well as mordants. A small quantity of the modifier is added either to a pot of water or to some of the used dye bath.

DYE BATH

A container filled with dye used for the purposes of dyeing textiles.

PROTEIN FIBRES

Fibres from animals, such as silk and wool.

CELLULOSE FIBRES

Fibres from plants, including cotton, linen (flax), hemp and jute.

TANNIN

Natural chemicals produced by plants and contained in various concentrations within dyestuffs such as tea and coffee, also used as part of the mordant process for cellulose fibres. Can be colourless or impart their own colour.

FUGITIVE DYE

Fugitive 'dyes' do not last and the colour fades away due to external factors such as sunlight, heat and humidity.

SUBSTANSIVE DYE

A dye in which dye molecules are attracted by physical forces at the molecular level to the textile, requiring no mordant to bind.

MADDER (*rubia tinctorum*)



Madder is a perennial herbaceous plant with small yellow flowers.

It thrives in various climatic zones, including temperate regions and prefers well-drained, alkaline soils and can be cultivated in these conditions.

The pigment used in dyeing comes from the roots of the Madder plant. These roots contain compounds called alizarin and purpurin, which are responsible for the red and orange hues obtained from Madder.

SIMPLE DYE-BATH RECIPES

STEPS

Weigh

Weigh your DRY fibre/fabric and make a note (in grams)

Scour

Ensure they are clean by washing with a pH neutral detergent in warm to hot water.

Mordant

Follow the steps in your Natural Dye Journal Foundation course:

<https://community.lancasterandcornish.co.uk/lesson/an-introduction-to-mordants>

For Madder, use Potassium Aluminium Sulphate (Alum) at 15% WOF for protein fibres. For cellulose, first mordant with tannin at 8% WOF, then use aluminum acetate at 8%.

Dye - use with Madder

1. Weigh your dye (if using extract to around 35% Weight Of Fibre (see useful terms).
2. Make a paste with the extract powder with warm tap water in a glass or non-reactive jar.
 - a. If using fresh or dried madder roots, simply add to the dye pan in the next step.
 - b. Add the paste or dye material to dye pot and cover with warm or hot water. Bring up to about a medium heat 60°C (140°F) (if adding roots, hold this temperature for an hour or so to release the colour).
 - c. Wet and wring out the fabrics you want to add to the dye bath.
 - d. Add fibres and continue cooking for another hour OR cover and turn heat off, keep fibres in until desired colour achieved. Occasionally stir and turn the fibres for an even result and ensure the fibres have enough room to move around in the dye pot.
 - e. Remove fabric from the dye bath, squeeze out any excess dye and rinse in cold water until water runs clear.
 - f. Re-use the dye-bath to avoid waste (store in an airtight container with lid, labelled, for a week or two). Keep away from children and animals.

NOTE: Alizarin is the primary dye molecule found in the madder tinctorum roots, and to maintain the reds, do not let the dye bath go above above 72°C (160°F). Higher temperatures may result in more brown results as the other pigment chemicals are released.

MADDER (*rubia tinctorium*)

To extract the dye, the roots are typically harvested, cleaned, and then crushed or ground into a fine powder. This powder is then processed through a series of fermentation and dyeing steps to release and fix the color. Variations in color can be achieved through different processing techniques and mordants. For example, oranges and pinks can be achieved by modifying the dye bath conditions or using different mordants, while the classic deep reds are the result of the alizarin compound.

Madder's versatility in producing a range of colors makes it a valuable and sought-after natural dye in sustainable textile practices.



TURKEY RED

Turkey Red was a highly prized and sought-after color, particularly in the 18th and 19th centuries. Renowned for its deep, fast, and vibrant red hue and was used for a wide range of textile applications, primarily in Europe.

Historical Use:

1. Textiles and Clothing:

Turkey Red was predominantly used in the textile industry for dyeing fabrics. It was favored for producing red textiles, including clothing, upholstery, and accessories. It was particularly popular for high-quality garments, including military uniforms, ceremonial robes, and luxury clothing for the upper classes.

2. Carpets and Textile Art:

The rich, intense red of Turkey Red dye made it a favored choice for Oriental and Persian carpet production. The color's vividness and colorfastness made it a valuable component in creating intricate patterns and designs in textiles and rugs.

3. Flags and Banners:

Turkey Red was also used in the creation of flags and banners for various nations and military forces. Its ability to withstand exposure to sunlight and harsh weather conditions made it an ideal choice for these purposes.

4. Home Furnishings:

The dye was used to create beautiful red upholstery fabrics and draperies for homes, adding a touch of opulence to interior decor during the 18th and 19th centuries.

5. Traditional Costumes:

In some cultures, Turkey Red was used to dye traditional clothing and costumes. For example, it was used in Scottish tartan fabrics for kilts and plaids.

The name "Turkey Red" is somewhat misleading, as the dyeing technique associated with it did not originate in Turkey. It was originally developed and perfected in India, where it was known as "Kemben," "Rouge d'Adrinople," or "Adrinople Red." However, it gained the name "Turkey Red" as it became popular in Europe due to its trade through the Ottoman Empire.

Turkey Red dyeing was a complex and labor-intensive process that involved multiple dye baths and special techniques to achieve its distinctive colorfastness and vibrancy. The dyeing process was eventually adopted in Europe, particularly in countries like Scotland and France, where textile industries flourished.

MADDER

WEIGHT OF FIBRE (WOF): _____

FIBRE OR MATERIAL TYPE: _____

DYE MATTER: _____

PLANT NOTES: _____

MORDANT: _____

WEIGHT OF MORDANT: _____ AT _____ % WOF

WEIGHT OF DYE MATTER: _____ AT _____ % WOF

VOLUME OF WATER USED: _____

DYE BATH NOTES: _____

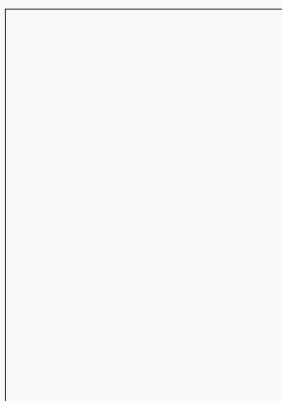
PH: _____

TEMPERATURE: _____

LENGTH OF IMMERSION TIME: _____

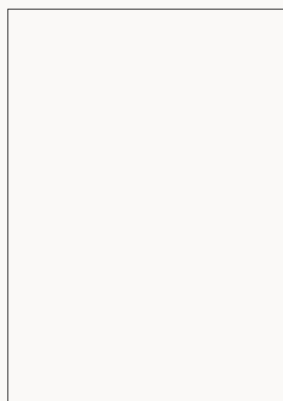
OBSERVATIONS:

SWATCH 1:



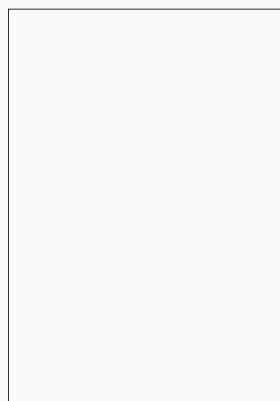
/ /

SWATCH 2:



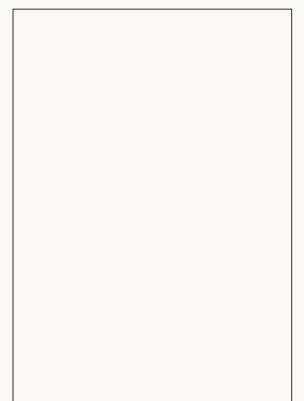
/ /

SWATCH 3:



/ /

SWATCH 4



/ /

MADDER

WEIGHT OF FIBRE (WOF): _____

FIBRE OR MATERIAL TYPE: _____

DYE MATTER: _____

PLANT NOTES: _____

MORDANT: _____

WEIGHT OF MORDANT: _____ AT _____ % WOF

WEIGHT OF DYE MATTER: _____ AT _____ % WOF

VOLUME OF WATER USED: _____

DYE BATH NOTES: _____

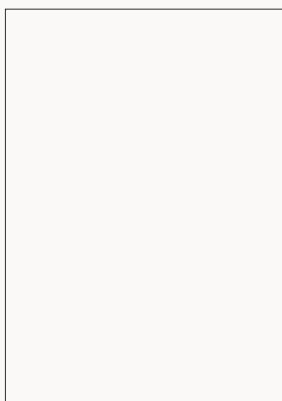
PH: _____

TEMPERATURE: _____

LENGTH OF IMMERSION TIME: _____

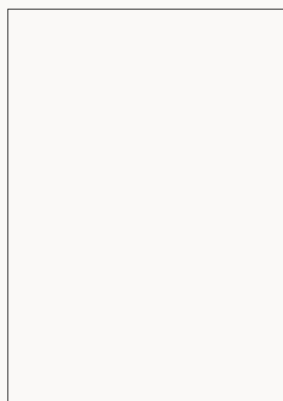
OBSERVATIONS:

SWATCH 1:



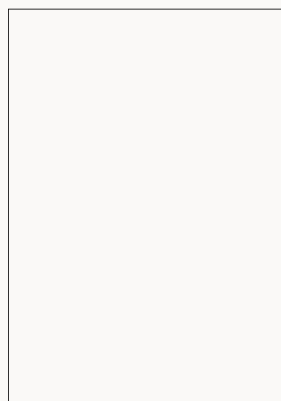
/ /

SWATCH 2:



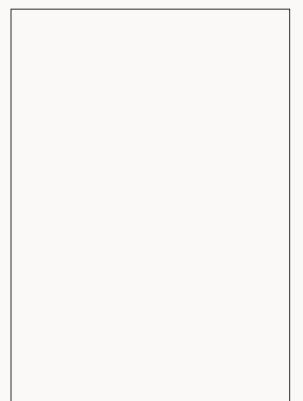
/ /

SWATCH 3:



/ /

SWATCH 4



/ /

MADDER

WEIGHT OF FIBRE (WOF): _____

FIBRE OR MATERIAL TYPE: _____

DYE MATTER: _____

PLANT NOTES: _____

MORDANT: _____

WEIGHT OF MORDANT: _____ AT _____ % WOF

WEIGHT OF DYE MATTER: _____ AT _____ % WOF

VOLUME OF WATER USED: _____

DYE BATH NOTES: _____

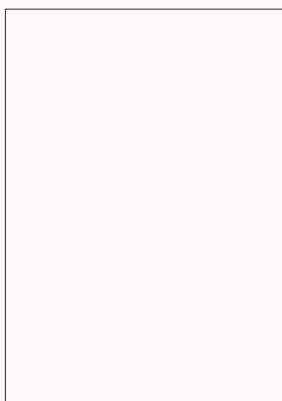
PH: _____

TEMPERATURE: _____

LENGTH OF IMMERSION TIME: _____

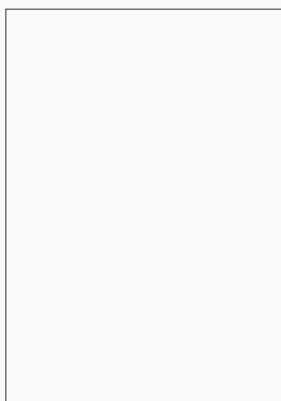
OBSERVATIONS:

SWATCH 1:



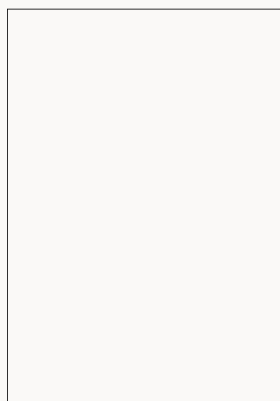
/ /

SWATCH 2:



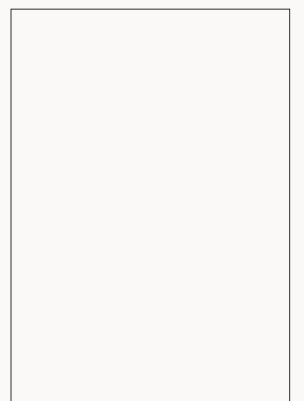
/ /

SWATCH 3:



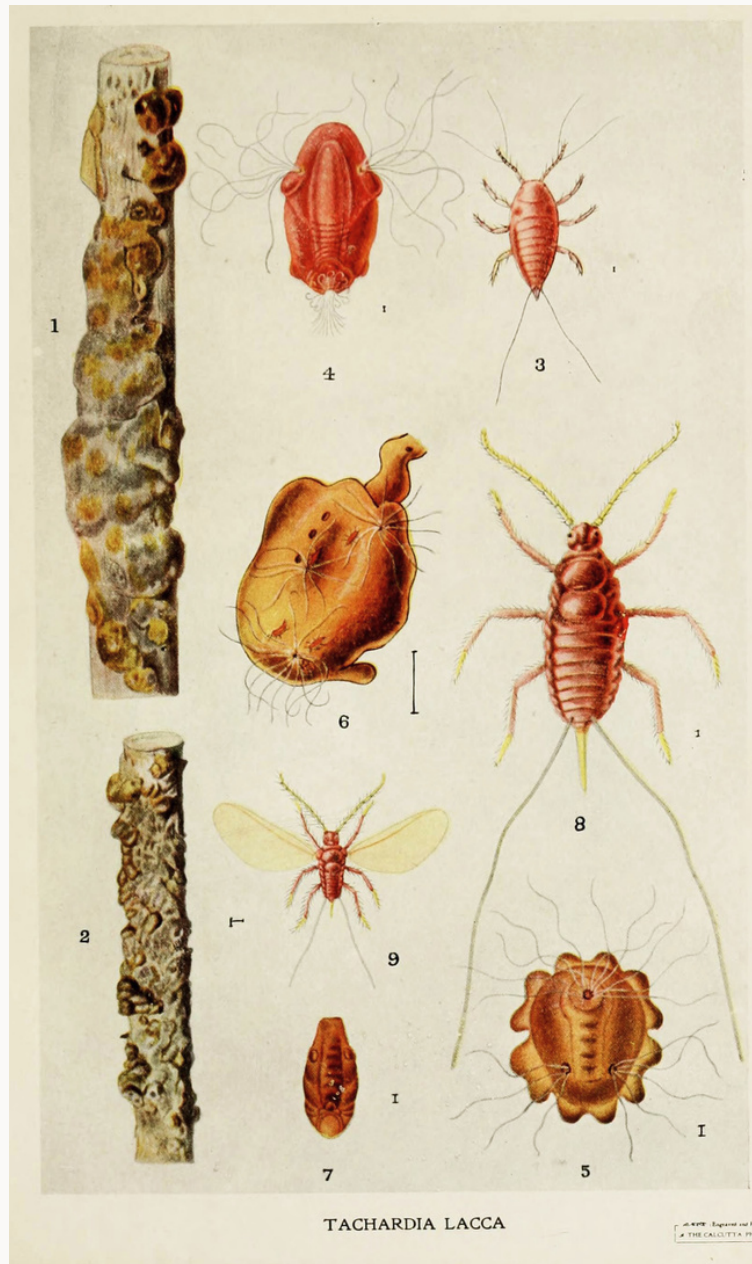
/ /

SWATCH 4



/ /

LAC (*Kerria lacca*)



Lac, also known as sticklac, is a natural dye derived from the resinous secretions of the tiny insect *Laccifer lacca*, primarily found in regions of Southeast Asia and India.

These insects feed on certain host trees, such as the cultivated host, *Kerria lacca*. The resinous secretions, known as lac resin, are harvested by scraping them from the branches and twigs where the insects attach themselves. Once collected, the resin can be processed into various forms, including shellac, used in woodworking and varnishes, or it can be used as a natural dye.

LAC (*kerria lacca*)

Lac dye is very colour and light fast, yielding a wonderful array of colours from deep burgundy reds to purples. The colourant is similar to cochineal but colours achieved are warmer, softer, and more muted.

We suggest using at 10-15% WOF.

Dissolve the extract in water and simmer with fibre for around an hour (or turn the heat off and cover). As ever, remove from the dye bath when the desired colour is achieved, remembering that the fibres will dry a lighter shade to when they are wet. The fabric can be left overnight for deeper, richer colours.

Much like Madder, lac is very sensitive to acidity and alkalinity (pH) and the addition of acidic cream of tartar (at 5% WOF) is recommended. Add an alkali such as soda ash will shift the colour towards more purple end of the spectrum, and iron (just use a pinch of ferrous sulfate will move towards black.

Example Recipes:

Red Dye using Cream of Tartar

1. Scour and mordant fibres
2. Weigh your dye (if using extract to around 15% Weight Of Fibre (see useful terms).
3. Make a paste with the extract powder with warm tap water in a glass or non-reactive jar with warm/hot water.
4. Add the paste or dye material to dye pot and cover with warm or hot water.
5. Dissolve a teaspoon of cream of tartar in a jar with some hot water and add to the dye bath.
6. Heat gently (ensure the lac is fully dissolved), or for the no-heat method first fill the dye bath with very hot water, then cover at this stage with no heat).
7. Wet and wring out the fabrics you want to add to the dye bath.
8. Remove fabric from the dye bath when you have achieved the desired shade, squeeze out any excess dye and rinse in cold water until water runs clear.
9. Re-use the dye-bath to avoid waste (store in an airtight container with lid, labelled, for a week or two). Keep away from children and animals.

Black Dye with Lac using iron

- As above, but mordant the fibres using a weak ferrous sulfate solution (2% WOF) prior to dyeing.

NB: Remember to use gloves when handling ferrous sulfate (iron mordant)

Ideas

Using two separate dye baths, experiment with batches of fabric mordanted using iron, and separately with alum. Modify colours during or afterwards using cream of tartar.

LAC

WEIGHT OF FIBRE (WOF): _____

FIBRE OR MATERIAL TYPE: _____

DYE MATTER: _____

PLANT NOTES: _____

MORDANT: _____

WEIGHT OF MORDANT: _____ AT _____ % WOF

WEIGHT OF DYE MATTER: _____ AT _____ % WOF

VOLUME OF WATER USED: _____

DYE BATH NOTES: _____

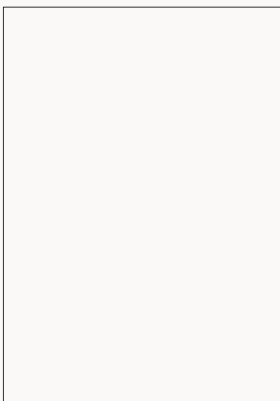
PH: _____

TEMPERATURE: _____

LENGTH OF IMMERSION TIME: _____

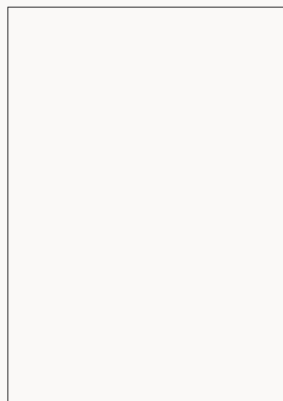
OBSERVATIONS:

SWATCH 1:



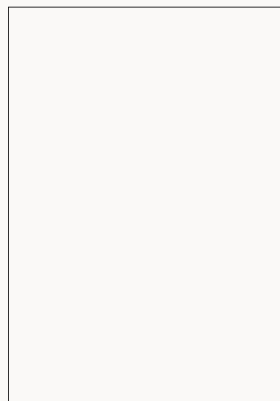
/ /

SWATCH 2:



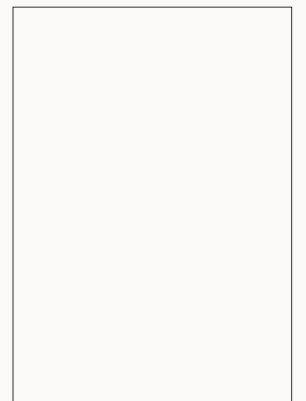
/ /

SWATCH 3:



/ /

SWATCH 4



/ /

LAC

WEIGHT OF FIBRE (WOF): _____

FIBRE OR MATERIAL TYPE: _____

DYE MATTER: _____

PLANT NOTES: _____

MORDANT: _____

WEIGHT OF MORDANT: _____ AT _____ % WOF

WEIGHT OF DYE MATTER: _____ AT _____ % WOF

VOLUME OF WATER USED: _____

DYE BATH NOTES: _____

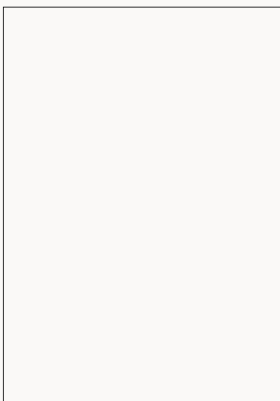
PH: _____

TEMPERATURE: _____

LENGTH OF IMMERSION TIME: _____

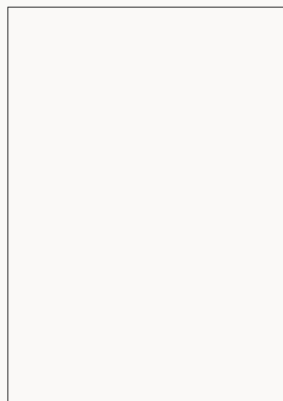
OBSERVATIONS:

SWATCH 1:



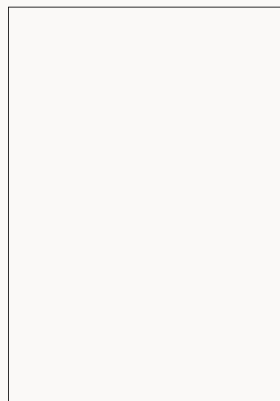
/ /

SWATCH 2:



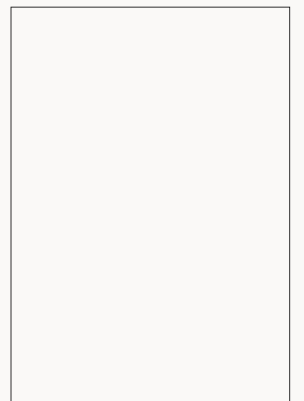
/ /

SWATCH 3:



/ /

SWATCH 4:



/ /

SORGHUM (*sorghum colorans*)



Sorghum is a versatile and drought-resistant cereal grain plant that belongs to the grass family, Poaceae. It is cultivated for its seeds, which are used for various purposes, including human consumption, animal feed, and industrial applications.

Plants typically grow to a height ranging from 1 to 4 meters, depending on the variety and growing conditions, with hollow sturdy stems. Leaves are long and narrow, resembling blades of grass, and are arranged alternately along the stems.

The flowering part of the sorghum plant consists of terminal panicles, which are clusters of tiny flowers. These flowers can vary in color from white and yellow to shades of red and purple, depending on the variety.

SORGHUM

Sorghum, a cereal grain primarily cultivated for food and animal fodder, also holds a unique place in the world of natural dyes. While it's not as commonly associated with dyeing as other plants, sorghum has been used for centuries in various cultures to create natural dyes.

One of the notable features of sorghum is its wide range of varieties, each with distinct colors. These varieties produce grains that can range from white and cream to deep red and burgundy, making them valuable for creating different shades of natural dyes. In regions where sorghum is a staple crop, such as parts of Africa and Asia, people have harnessed its dyeing potential to create textiles in traditional crafts.

To use sorghum as a natural dye, the grains are typically ground into a fine powder. The dye bath is prepared by simmering the powdered sorghum with water, and often mordants like alum or iron are used to enhance colorfastness and achieve specific shades. Fabrics or yarns are immersed in this dye bath and simmered until they absorb the desired color. The resulting hues can range from soft pinks and reds to earthy browns and deep purples, depending on the variety of sorghum used and the specific dyeing techniques applied.

While sorghum may not be as widely recognized in the natural dye world as other plants like indigo or madder, it offers a unique and sustainable option for dyers looking to create a diverse palette of colors. Its use as a natural dye showcases the ingenuity of traditional craftspeople who have harnessed the potential of this versatile grain for centuries, adding depth and variety to the world of natural textile dyes.

Ideas

Use the extract with an alum mordant at varying WOF (from 5% to 30%) to achieve pale pinks to deeper oranges.

SORGHUM

WEIGHT OF FIBRE (WOF): _____

FIBRE OR MATERIAL TYPE: _____

DYE MATTER: _____

PLANT NOTES: _____

MORDANT: _____

WEIGHT OF MORDANT: _____ AT _____ % WOF

WEIGHT OF DYE MATTER: _____ AT _____ % WOF

VOLUME OF WATER USED: _____

DYE BATH NOTES: _____

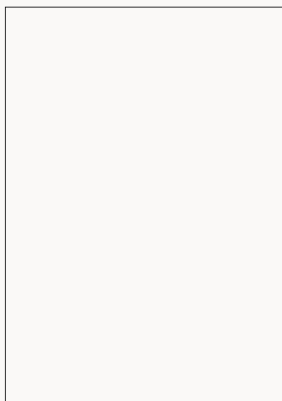
PH: _____

TEMPERATURE: _____

LENGTH OF IMMERSION TIME: _____

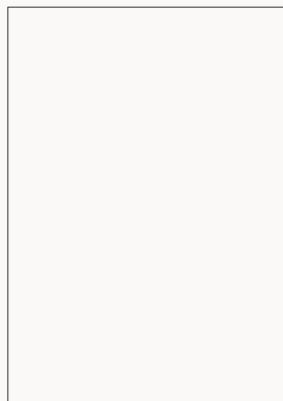
OBSERVATIONS:

SWATCH 1:



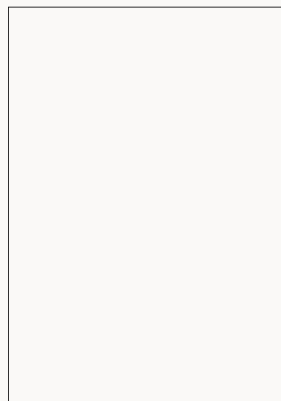
/ /

SWATCH 2:



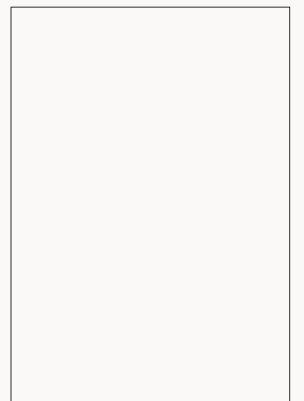
/ /

SWATCH 3:



/ /

SWATCH 4:



/ /

SORGHUM

WEIGHT OF FIBRE (WOF): _____

FIBRE OR MATERIAL TYPE: _____

DYE MATTER: _____

PLANT NOTES: _____

MORDANT: _____

WEIGHT OF MORDANT: _____ AT _____ % WOF

WEIGHT OF DYE MATTER: _____ AT _____ % WOF

VOLUME OF WATER USED: _____

DYE BATH NOTES: _____

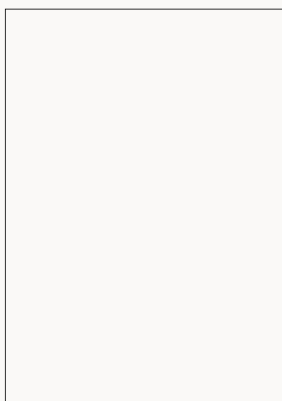
PH: _____

TEMPERATURE: _____

LENGTH OF IMMERSION TIME: _____

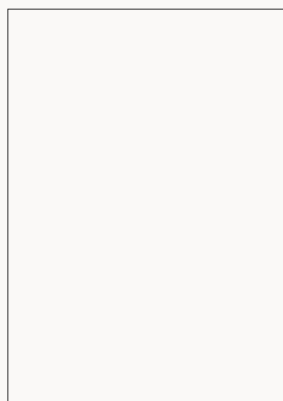
OBSERVATIONS:

SWATCH 1:



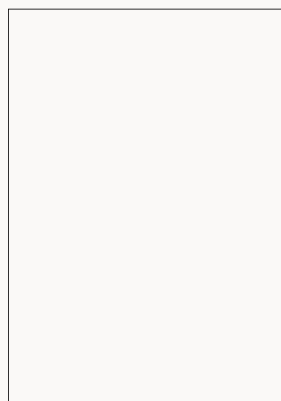
/ /

SWATCH 2:



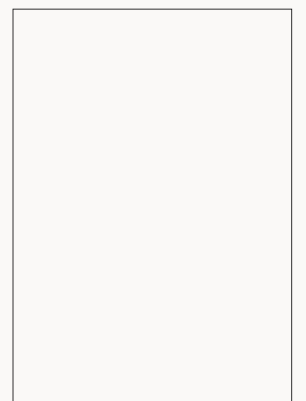
/ /

SWATCH 3:



/ /

SWATCH 4



/ /

SORGHUM

WEIGHT OF FIBRE (WOF): _____

FIBRE OR MATERIAL TYPE: _____

DYE MATTER: _____

PLANT NOTES: _____

MORDANT: _____

WEIGHT OF MORDANT: _____ AT _____ % WOF

WEIGHT OF DYE MATTER: _____ AT _____ % WOF

VOLUME OF WATER USED: _____

DYE BATH NOTES: _____

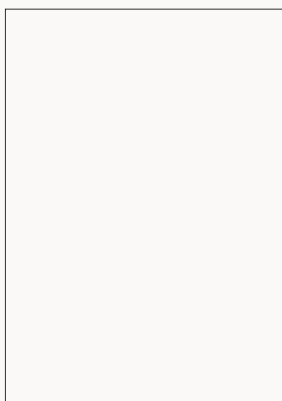
PH: _____

TEMPERATURE: _____

LENGTH OF IMMERSION TIME: _____

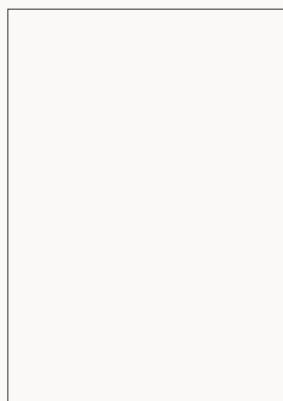
OBSERVATIONS:

SWATCH 1:



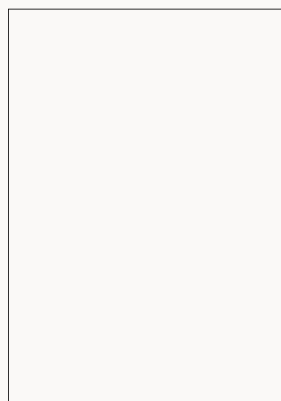
/ /

SWATCH 2:



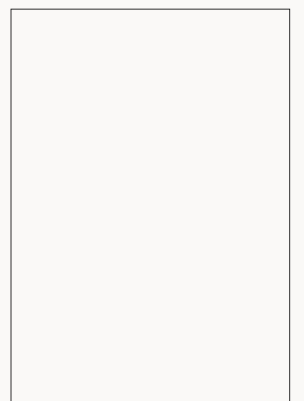
/ /

SWATCH 3:



/ /

SWATCH 4:



/ /

FURTHER NOTES



FURTHER NOTES



FURTHER NOTES



FURTHER NOTES



FURTHER NOTES



FURTHER NOTES



FURTHER EXPLORATION

We really hope that you have enjoyed experimenting with Madder in these Notes. If you want to explore kitchen ingredients, you will like the Kitchen Study Notes, and don't forget the Garden Study Notes for floral inspiration.

For further pink, red and orange exploration, we suggest:

Brazilwood

Cochineal

EXPLORE ✧ EXPERIMENT ✧ ENJOY

*
* *

LANCASTER
& CORNISH

BOTANICAL DYES
FOR STORIES AND CONSCIENCE