Complex Weavers'

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Medieval Textiles

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Madder Dyeing

By Nancy M. McKenna

Madder (Rubia tinctorum) is easy to grow; a perennial to zone 4 and not too particular as to soils. For best color, a calcium rich soil is preferred, but adding bone meal, egg shells, or lime to the soil at planting time takes care of that. It is a weedy looking plant that grows in full sun to about two feet tall with whorls of green leaves and small pale flowers. It can be started from seed, cuttings, or by taking a stem, bending it to the ground and placing a handful of soil atop it. Wherever the stem is buried, roots will form. For ease of harvesting this plant is best grown in containers or raised beds in soft loam or sandy soil. I use a steel garbage can that has holes punched in the bottom.

It is the roots that you want. After about two years of growing, the roots will be pencil diameter and have a red interior. They can extend as far as three feet into the ground. After harvesting, dry the roots, and grind them into a fine powder using a coffee or spice grinder or a mortise and pestle. Grind small amounts at a time and do not let the madder powder to become heated. If the grinding is being done inside, a dust mask is advisable to keep the powder out of your lungs, as it may be irritating although it is not a toxic substance.

The dye substance that madder produces is alizerine (dihydroscyanthraquinone). This dyestuff is the first duplicated by chemistry for use in dying calico fabrics and is also known as Red Lake. Alizerine can be purchased in this chemical form to produce clear reds easily, however, like any other pure chemical dye it will not harmonize with other natural colors as easily as dye from madder roots. Madder, like many natural dyestuffs contains dyes besides alizerine – most notably yellow. Alizerine becomes available in the dyebath at about 120 degrees farenheit, but as you raise the temperature to or above 180 degrees alizerine will cease to affix itself to the material in the dyebath and the yellow dyestuff becomes the predominant dye.

Madder was the first dyestuff duplicated because it is lightfast and washfast. Color reproduction can be achieved with careful measurement and by using powder from the same grind as previous dyebaths, but just as commercially dyed yarns have dyelots to allow the matching of skeins, it is always advisable to dye enough yarn for a particular project in one dyebath. If the color is not deep enough, the yarn may be remordanted and redyed. Using madder root is no more time consuming than using synthetic dyes since both usually require mordanting as well as time in a dyebath. Using alum and cream of tartar for mordanting, and madder root for the dyebath, however, allows you the option of disposing of the remaining mordant and dyebath in your compost pile.

In using natural dyes, time is the most important element. There are no substitutes. All the recipes and procedures I have read or discussed with other dyers have insisted that mordanting must take no less than three days. Some sources specify immersing the fiber in the mordant for at least 30 days not exceeding 40 degrees Celsius (104 degrees Fahrenheit). Liles mentions in his madder section, "If the material turns out to be a pale color or unevenly dyed the chances are good that the material was not adequately mordanted."

I tried several methods; each method is outlined below. All the sources I consulted used J & R Bronson's mordant for wool:

Mordant:
Per pound of wool:
3 oz. Alum (potassium Alum Sulfate)
1 oz Cream of Tartar (potassium bitartrate)
5 gallons of soft water

Sample 1 (after Bronson):
As Bronson specifically mentions using a copper pan for mordanting, I placed a 2" copper pipe cutoff in one of the mordanting baths. After simmering ½ hour I poured the yarn and mordant into a colander and let sit till cool enough to handle. I squeezed the water out and rinsed well. On to the dyebath…

Sample 2:
Bring mordant bath to a simmer, add wool. Let simmer for ½ hour then pour wool and mordant into a glass jar and let sit on the counter (in my house this is at 68 degrees Fahrenheit) for 48 hrs. Drain & rinse. Proceed to dye bath.

Sample 3:
Bring mordant to a simmer, add wool. Pour immediately into jar and let sit on the counter for 14 days. Drain & rinse. Proceed to dye bath

Dyebath:
Per pound of wool:
8 oz ground madder root
½ oz slaked lime (Calcium Hydroxide)

Sample 1: Quick Bronson Variant:
Chop dried madder root into ¼" pieces. Use mortar and pestle as long as patience allows to reduce the size further, add water and grind to make a coarse paste Add to hot tap water in pot – about 120 degrees. pH is at 4. The water becomes an opaque brick red, and a white plastic spoon is not visible below the surface when placed in the bath. Add the wool. Immediately the water goes to a clear straw color and the wool takes on a raspberry color. Slowly bring the heat up to 180 degrees.

After 10 minutes, the water was at 130 degrees Fahrenheit, still clear yellow and still a pH of 4. Yarn same color.

After ½ hour the water was at 150 degrees Fahrenheit, wool is the color of ripe strawberries, water is still clear yellow.

At the two-hour mark, wool is darker, water is still yellow & clear and I quickly brought the water to a boil and then turned off the stove. I lifted the yarn out of the dyebath and into a waiting container. The dyebath becomes orange. I then added enough lime to bring the pH to 7. The water becomes a brilliant opaque red. The wool is dumped back into the dyebath, stirred, and brought to a boil again. The heat is turned off and the yarn allowed to sit for 10 minutes. It is then drained and rinsed well. About 2 hours start to finish.

Sample 2: same as sample 1, but temperature kept between 120 and 180 degrees Fahrenheit throughout.

Sample 3: Same as sample 2. The time mordanting meant that the color achieved by 2 hrs in the dye bath occurred within 15 minutes of initial immersion in the dye bath and by keeping the wool in the dye bath the same amount of time as previous samples a deep purple red was achieved.

Other observations: if the dye bath is brought up to neutral or alkaline before the wool has been in the dye bath for awhile, the wool does not take up the color, at best you get pale pinks. If the lime is added before the wool has taken up color, the wool will not take up the color well, resulting in weak pinks or reds. If the lime is added at the end of the dyeing, a chemical reaction takes place and the color of the wool becomes deeper. I have not checked colorfastness between yarns that have and have not been treated with lime as all recipes I have found call for lime to be added. Mordanting time is critical, as well as time in the dye bath. The more time in the mordant, the less time one can spend over the dye bath, which would probably limit felting of the yarn.

Notes for sample "iron mordant"

The wool used for this sample is the medium grade worsted spun used for the other samples. All singles were running c. 3600 yards/lb. About 1/4 pound (1000 yards) of yarn was spun for this dye batch, measurements were not as exact as for other dyebaths. The hypothesis was that using an iron mordant would result in purple hues rather than red hues. This was borne out by the dyebath results. I will be experimenting with iron more in the future to see the range of colors I can achieve in conjunction with madder.

Note: Iron is more toxic than many other mordants. Getting even a small amount more into one's system than one needs can prove fatal: most fatalities in over-dose of vitamin tablets is due to iron poisoning. Please be extremely careful in handling the iron mordant. After use, however, it is safe to add to compost or the garden. The acidity and the iron affect acid loving plants positively in my experience.

Mordant:
about 1 inch of 000 steel wool was pulled off the rollog of steel wool, held over a flame to burn off the manufacturing oils, and dropped into 2 cups of vinegar mixed with 4 cups of water. After 1 week, all the wool had been dissolved into solution. Add more water to allow mordant to cover the wool if necessary.

After washing in dish detergent, the above wool singles yarn was placed into the mordant, at room temperature (approx. 78 degrees) for 24 hours.

1/4 oz of madder was mixed with sufficient water to cover the wool (for comparison, if the original recipe were followed, approx. 2 oz of madder would have been used), brought to 100 degrees Fahrenheit and the wool added. The dyebath was brought to 150 degrees Fahrenheit and kept there for no more than an hour. This was to keep the yellow/orange component of madder from affecting the dyebath. Because of the relatively small amount of madder used, and the short mordant time and time in the dyebath, I believe that the sample is one of the lightest shades that can be produced with an iron mordant.

Sources of further information:

Liles, J.N. The art and craft of natural dyeing : traditional recipes for modern use . Knoxville : University of Tennessee Press, ©1990

Bronson, J & R. The Domestic Manufacturer's Assistant, and Family Directory, in the Arts of Weaving and Dyeing, Utica, NY 1817 - reprinted by Dover press in 1977 under the name Early American Weaving and Dyeing.

D. E. Rougemont, A field guide to the crops of Britain and Europe, © 1989 Collins London.

Goodwin, J. A Dyer's Manual. © 1981 Pelham

Dean, Jenny. The Resourceful Natural Dyer Part One: Mordants, The Journal for Weavers, Spinners, & Dyers. Issue 198, June 2001 pp.24-25

The materials for mordanting and dyeing may be carried by your local weaving shop, pharmacist, or through suppliers such as:

Hill Creek Fiber Studio
7001 Hillcreek Road
Columbia, MO 65203
573-874-2233
http://www.hillcreekfiberstudio.com/

Maiwa (Ottowa, Canada)
#6 - 1666 Johnston Street, Granville Island
Vancouver, BC V6H 3S2
Phone (604) 669-3939
http://www.maiwa.com/Maiwacat14.html

Dharma Trading
PO Box 150916
San Rafael, CA 94915
(800) 542-5227 (USA and Canada)
(415) 456-7657 (Elsewhere)
http://www.dharmatrading.com/index.html

Conversion Factors
you may need these when making dyebaths:

you have	mult. by	to get
grams	0.0527	ounces
ounces	28.349	grams
fluid ounces	29.573	milliliters (cc)
Milliliters (cc)	0.0338	fluid ounces
liters	0.2641	U. S. liquid gallons
gallons	3.7854	liters

Temperature:
Farenheit = 9/5 (celcius + 32)
Celcius = 5/9 (farenheit - 32)
Celcius = kelvin - 273.15

from Beyer, William H., PhD. CRC Standard Mathematical Tables, 27th Edition, 1986, CRC Press, Inc. Boca Raton, FL