All the shades of madder,

or at least a healthy few of them.

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Following up on my dye work for Queen's Prize Tourney in Nov 2015, I decided to actually do the 'more experimentation' with madder that I mentioned in that documentation. This is entirely a collection of samples and playing around, seeing what colours I could coax out of the bag of madder that I had. I decided to work (almost) exclusively in wool this time, for convenience and price point.

Madder is Rubia tinctorum, an evergreen perennial that grows to about a metre tall with small pale yellow flowers. The dye is concentrated in the roots and the sources are fairly mixed on when the roots should be harvested for best colour, ranging from two to five years, or longer. (Wikipedia: madder, n.d.) The madder that I'm using was a gift from a friend and I have no clue where she got it from.

A few basic choices were made for consistency sake. All of the wool used is a commercial spun 2 ply fingering weight wool in a natural colour. All of the dye baths were at 78C, as that is the temperature of my dye crockpot on low. While I didn't get a lot of difference between temperatures in my QPT experiments, I wanted to hold the temperature consistent. Unless otherwise specified, all of the wool was pre-mordanted with alum at 10% wof. Each dyebath started out with 10g of powdered madder.

There were a number of different things I wanted to explore in this set of samples. There was discussion at QPT about how madder changed between the first dye liquor off the dyestuff, to the second and the third. I wished to compare how my tap water, generally considered to be quite hard, differed from distilled water. I also looked at altering the pH of the dyebath from fairly neutral to both quite acidic and basic and a brief look at different mordants.

Looking at period madder recipes in 'A Profitable Book' (1586 / 1605) (A Profitable Booke, 1586) it directs to take 2 pounds of wool treated with 10 ounces of alum and to use 'branne water'. Earlier in the text it indicates that one makes this water by using wheat bran in water. Maiwa's natural dye instructions note that wheat bran can be modernly substituted with calcium carbonate. (Natural Dyes) The period recipe then adds 'unsleakt lime' and 'common ashes' to the madder and wool. Unslaked lime is calcium oxide, also known as quicklime or bunt lime made by burning limestone or seashells. (Wikipedia reference). Common ashes mixed with water would have produced a weak lye solution, bringing the solution more basic, at a guess.

I mordanted my wool with a 10% weight of fibre solution of alum, and 5% wof of cream of tartar. Reading the period recipe, assuming that their ounce is the same as a modern ounce, 10 ounces for two pounds of wool is 30% wof. Possibly their alum was less concentrated than the modern alum that I'm using, possibly they just used a really high percentage, possibly ounces aren't always ounces. I used the same batch of alum mordanted wool throughout (save for the dye baths looking at other mordants.)

The first set of dyebaths that I did were to compare local tap water to distilled water. I dissolved 10g of madder in a crockpot of water, either tap or distilled and let simmer for about an hour. I then strained off the dye liquor, reserving the dyestuff. The dye liquor was reserved to dye with, and the dyestuff was used to produce another batch of dye liquor. I got three iterations of dye liquor with tap water (Figure 1), and when I did it with distilled water, got two and three iterations

Figure 1 Tap water dye liquors

respectively. The colours from the tap water progressed as expected, from darkest to lightest with each iteration, as the dyebaths appeared to get more exhausted. The colours in the distilled water, however, barely shifted from one iteration to the next, only very slight differences between them. In Figure 2, the top row is the tap water, and the next two rows are distilled water. I was surprised enough to do it twice, and then further surprised when those were

Figure 2 Tap and distilled water dye results

different between them. Madder has a bit of a reputation of being finicky, and it was proving to be well deserved.
I next explored different mordants, choosing to look at copper, iron and alum. The alum was already premordanted, and I decided to premordant both the copper and iron. While I normal mordant those at much lower concentrations, due to attempting to mordant a single skein of

Figure 3 Alum, Copper and Iron pre-mordanted wool

wool (about 2 g of fibre), they got mordanted at about 10% also. All three were left to dry before dyeing, and went into the dyebath together. Figure 3 shows the three skeins pre-mordanted,

Figure 4 Iron, copper and alum mordants

alum, copper and iron L-R. Figure 4 shows them post dyebath, with iron on the top left, copper on the top right and alum in the second row.

The last set of samples that I did examined the colours produced when adjusting the pH of the dyebath. I prepared a standard dyebath (10g of madder in distilled water) and then split it into four approximately even containers. I used a water bath to hold all four jars at a consistent 78C as illustrated in Figure 5. Jar 1 was the control jar, nothing was done to the dye liquor in that jar and it had a pH of 6.2. Jar 2 was treated with citric acid to achieve a pH of 2.6. Jar 3 was treated with sodium carbonate to achieve a pH of 10.2 and finally jar 4 was treated with household ammonia to a pH of 10.0. I neglected to get a photograph of all four dye baths together, but the acidic jar immediately had a great deal of precipitate fall out of solution, making for quite a thick sediment layer on the bottom and a quite light and clear orange coloured liquid on top. The two basic solutions changed to a darker purple colour, although I could see no sediment form in

either. Figure 6 shows the skeins produced from these dyebaths, with the control on the top left,

Figure 5 Example hot water bath

the citric acid on the top right, the sodium carbonate on the bottom left and the ammonia on the bottom right.

Figure 6 Colour variation based on pH

I enjoyed working with a wide variety of variables in looking at what colours can be coaxed out of madder. I have plans to explore the period recipes to experiment with those additives and see how the impure variations of the chemicals and mordants affect the results.

Bibliography

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