Dyestuffs of al-Andalus

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Being very much a work still in progress…

Summary

This project explores the dyestuffs which would have been available for use by commercial dyers in al-Andalus. The list of dyestuffs was identified using both surviving artifacts as well as text sources. Experiments were then conducted using dyes which are readily available to modern craft dyers to see what colors each dye produced on different fibers and how hard it was to achieve specific colors using natural dyes.

Time Period

10th - 15th Century

Location

Al-Andalus, Spain

Background

I undertook this project for several reasons. First and foremost, I wanted to get a feel for the kinds of colors which could have been produced by the commercial and home dyeing industry in al-Andalus, which in turn would help me choose more authentic colors for garb. This decision meant that New World dyes, such as cochineal, logwood, and fustic, among others, were out of scope, and have only been included in this study for comparison purposes.

Several different sources provide us with evidence regarding the dyes available in al-Andalus. First and foremost, a number of extant textiles discovered in Spain have undergone chemical analysis to determine the dyes used. Unfortunately the sample is quite small and some of the textiles did not originate in Spain, but were imported as finished cloth from Persia, Egypt, Italy, and elsewhere. To supplement our knowledge of Andalusian dyes, we must turn to text sources, of which several genres are particularly useful: *hisba* (market regulations) manuals which may mention fraudulent dyeing practices; trade documents identifying the movement of dyestuffs into and out of a region; and agricultural treatises, which can identify those native Andalusian plants which might have been used as dyes (although "might have" and "were" are different indeed!). One final source includes histories or poems which mention colors of fabrics (for instance green silk, or black linen) because they indicate what was possible, even if they do not identify the dyestuff.

I chose to experiment on skeins of yarn to minimize the scale in terms of the amount of equipment needed, space required for storage, and cost for supplies until I mastered the basic techniques of natural dyeing. Additionally, I was able to acquire skeins in all four of the major natural fibers of the period (silk, linen, cotton and wool) so I could explore how the fibers took dyes differently. (Although none of the surviving cotton textiles appear to have been dyed.) Skeins also had the added bonus of giving me raw material for narrow wares or embroidery once they were dyed!

A handful of dyestuffs jumped out as obvious candidates for this project. Madder, weld, indigo, and woad were prominent in the commercial dyeing industry in al-Andalus, as well as elsewhere in the medieval world. Likewise, the choice of mordants was easy; tannin and alum were the only mordants found among the extant Spanish textiles (Cabrera Lafuente, 399), with the sole exception of one silk mordanted with copper sulfate (*Vestiduras Pontificales*). The absence of other metal salts – iron, copper, tin, etc – may have been due to the relatively small

sample size, but either way, tannin and alum seemed like a safe bet for this project! (Although in some of the dye experiments other mordants were used when trying to attain a specific color.)

General Dyeing Procedure

1. Truss skeins to minimize tangling
2. Scour skeins to remove any oils or dirt which may inhibit dye take up
3. Mordant fibers

A mordant bath of alum and cream of tartar was used for the protein fibers and a tannin mordant bath followed by two alum baths for the vegetable fibers (Dean, 40). On the swatches in the following pages, "Alum-1" indicates the fibers were mordanted in a combination of cream of tartar and alum; "Alum-2" is straight alum.

1. Prepare dyebath, following the general guidelines listed below. Since in every case I was working with a very small dry weight of goods (WOG), I did not worry too much about the weight of dyestuffs. Distilled water was always used, different chemicals in tap water (for instance, high calcium content) could have unintended consequences.
    a. Bark and root dyes were soaked in water overnight, then ground in the soaking water. Then they may be simmered in distilled water immediately, or soaked longer, depending on the dye and the effects desired. The dyestuff was sometimes strained out, and sometimes left in a stocking after the fibers were added.
    b. Flowers were gently simmered then strained out
    c. Bugs were ground to a fine dust, simmered, then strained out
    d. Extracts were mixed with hot water
    e. Indigo and woad were processed with a lye-hydrosulfite vat.
2. In most cases, the fibers were added to the dyebath after it had cooled to around 185F, since the fibers were usually dyed in the same bath and silk is sensitive to heat. The dyebath continued until the desired color was reached.
3. If a modifier was used, it was added to the dyebath at this point, after the skeins had soaked up a good amount of the original dye.
4. The skeins were removed from the dyebath, rinsed in distilled water to remove excess dye, and air dried for at least a day.
5. If an overdye was used, the steps were repeated (without 1 & 2 above).

Lacking any dyeing recipes specific to al-Andalus, I turned to modern dyeing treatises, specifically Liles and Dean. As my techniques improve and I get more consistent results, I hope to try some recipes from medieval dyebooks.

Reds

Lac

The dyestuff from lac is a resin secreted by the scale insect, c*occum lacca*, which also is the main ingredient for shellac. Lac was imported from India, though some considered it an inferior dye to the native bug, kermes (Serjeant, 172). The lac dye is very potent and produced a very dark color on wool; it is also pH sensitive, so an alkaline rinse will shift the color from red to purple. Originally the only lac I could find to purchase was an extract, but recently I acquired "stick lac" which is the resinous form. Now I need to figure out how to extract the dye!

Kermes

Kermes is a scale insect which grows on oak trees in the Mediterranean region. Because it is now an endangered species, kermes is no longer available to the craft dyer, so I have included a sample of cochineal instead. Cochineal (*dactylopius coccus*) was imported from the New World and quickly replaced the use of kermes. The earliest sample of cochineal comes from the sixteenth century (Cabrera Lafuente, 414), dating it just outside the scope of this study.

Madder

Rubia Tinctorum was one of the most prevalent dyes of medieval Europe, and al-Andalus was no exception (Cabrera Lafuente, 403). To extract the dye, the madder was soaked overnight to soften the roots. It was then ground, and soaked in water for an additional thirty days. The liquid and roots were then simmered for an hour, and the liquid poured off. Fresh water was added to the roots and simmered for an hour two more times. The mordanted fiber is then gently heated in the dyebath. High temperatures shift the color towards brown, which I suspect happened in my several attempts at dyeing with madder. I even tried a cold bath, where the fiber is left in the dyebath at room temperature for several days (Dean, 50). I did not try either chalk or bran, both of which can change the color of the dye. Madder could also be combined with weld to produce shades of orange (Cabrera Lafuente, 403). While I did not try that particular approach, I did get orange by using an acid modifier on a silk skein dyed with madder.

Reds

Brazilwood

Brazilwood (*Caesalpinia sappan*) was in use as a dye in the Mediterranean as early as the 11th century; while Cabrera Lafuente posits an Italian origin for extant medieval textiles discovered in Spain, this conclusion does not consider the text evidence for the prominence of brazilwood in the Andalusian dyeing industry (Remie-Constable, 157). Brazilwood has a reputation for not being lightfast, and even market regulations say dyers must not use it because it fades (Serjeant, 207). Additionally, brazilwood changes colors dramatically depending on the pH of the dyebath (Dean, 78). In extant textiles, brazilwood always appears combined with other dyes, such as madder or weld (Cabrera Lafuente, 410).

Other Reds

Three other red dyes which I have not tried yet include:

- orchil, a lichen which produces shades ranging from pink to purple (Cabrera Lafuente, 412
- alkanet root, which gives a purplish hue (García Sánchez, 443), and
- safflower (García Sánchez, 436).

All three are fugitive, meaning that the color will fade when exposed repeatedly to direct sun. Safflower will produce a pink dye as well as yellow, and although I haven't found evidence for safflower pink in Moorish Spain, it simply seemed like too much fun not to try (Dean, 53).

Yellows

Weld

The weld dyestuff is the leaves and flowers of *Reseda luteola*. Of the surviving textiles studied by Cabrera Lafuente, weld represented the widest variety of dates (fourth through fourteenth centuries), and textiles (linen, silk, and wool) (401). I was disappointed by the shades of yellow I achieved with weld; the color seemed fairly muddy to me. Dean identifies a cold bath technique as more likely to result in clear yellows whereas hot baths produce mustard shades (50).

Saffron

I was initially skeptical of García Sánchez's claim that saffron (*Crocus sativus*) was used as a fabric dye in al-Andalus (434-435). While its use as a food-coloring agent was well established, there was no evidence for its use in the dyeing industry aside from a vague reference to 'saffron-dyed robes' (which may have described the color rather than the actual dye used). Additionally, no surviving textiles used saffron (Cabrera Lafuente, 402). However, I finally found a reference to Valencian dyers famed for their saffron dyeing (Serjeant, 175), so I decided to try it myself. I was surprised to see that on the silk at least, the color is blazing orange rather than yellow!

Other Yellows

Other yellow dyestuffs which may have been used in medieval Spain include

- buckthorn (aka Avignon berry) (Cabrera Lafuente, 402)
- barberry (García Sánchez, 450), and
- safflower, which was mentioned previously in reference to pink (García Sánchez, 436).

Black oak bark, turmeric, and even onion skins can give yellow dyes as well. There are also two dyes which are hard to distinguish in the sources, smoke tree or fustet (Cabrera Lafuente, 402), which may have produced a color similar to the New World dye called fustic. A sample of fustic is provided for comparison.

Blues

Woad & Indigo

Woad (*Isatis tinctoria*) grew natively in Spain, but was generally thought to be inferior to imported indigo (*Indigofera tinctoria*) (Bolens, 1010). Each have been identified in chemical analyses of extant textiles, because while both have indigotin as their primary coloring agent, woad has also has indirubin, an indigotin precursor (*Vestiduras*, 238, 269).

Because of the unique process for producing blues with woad and indigo, mordants are not needed to create strong, lightfast colors. In fact, market regulations from the 13th century prohibited dyeing linen and cotton any color but light blue since other colors would eventually fade (Serjeant, 207).

Woad and indigo use a similar dyeing procedure, since they both contain the same dyestuff, indigotin. Of the three possible vat methods, I chose to use the lye-hydrosulfite vat, even though it is not period (Liles); the materials were easy to acquire, and it didn't require urine! (I did try a fermentation vat with the woad, but it never "sharpened" and it smelled too horrible to continue since I live in a townhouse.)

Greens

Many shades of green can be accomplished by overdyeing different yellows with woad or indigo. A sample indicating the strength of the indigo is shown too. Future experiments will focus on whether better results are achieved through dyeing first with yellow, or with blue.

Weld with Indigo

Weld was often the yellow of choice to create shades of green (Cabrera Lafuente, 402).

Weld with Tannins

Some of the olive shades of green were produced with weld and tannins. The chemical analysis show gallic acid, sometimes with ellagic acid, indicating gallotannins were the original tannin source. I have not yet tried this combination.

Barberry with Indigo

Barberry overdyed with indigo was not listed as a source for green in extant textiles, but I couldn't resist when I found directions for achieving turquoise (Dean, 75). The recipe requires using barberry bark dye on copper-mordanted fibers, and then overdyeing the resulting color with indigo. I did not get turquoise, but the shades of green really were quite lovely.

Browns/Blacks

A common belief among re-enactors is that black is a hard color to achieve with natural dyes. While we don't know what dyestuff was used, we do know that dyers in North Africa could produce black, so the technique was probably available to Andalusian dyers as well (Serjeant, 184). I tried two dyestuffs which might give black to see just how black of a color I could get. In fact, strong blacks and browns can be achieved when a dyestuff high in tannin is exposed to iron.

Pomegranate

I conducted my first experiment with pomegranate rinds. While pomegranates have not been identified as a dye in use by commercial Andalusian dyers, it was readily available and produces a fine dye due to the high tannin content of the rind. For my samples, the skeins were only scoured first, and not mordanted. After being simmered in a strong dyebath, they were put into an iron modifier bath, and they appeared to turn black within 15 minutes. Once they had been washed thoroughly, however, the color was an undisputable brown. If the skeins had been mordanted with alum before dyeing, they may have turned out black, like I was looking for.

Walnut Husk

Unripe walnut husks will produce a greenish-brown dye, but once the walnuts ripen and fall from the tree, the dyebath produced makes a much deeper color. Once the skeins were simmered for an hour in a strong solution of walnut husk, a brief simmer in iron liquor produced a lovely shade of black on the protein fibers, and a very dark brown on the cellulose fibers. Unfortunately, as with pomegranates, no evidence has turned up for dyeing with walnut husks.

Browns/Blacks

Oak Galls

Oak galls are another tannin-rich source can produce black when combined with iron. One surviving black textile had gallic acid and ellagic acid as the only coloring agents. Oak galls contain both phytochemicals, as well as gallotannic acid. However the chemical analysis did not mention iron, so I plan to try two samples, one with and one without.

Overdyed Blacks

The last sample was originally dyed light brown using unripe walnut husks and an iron modifier. The skein was then overdyed with woad, since mixing brown and dark blue seemed a decent way to make black. It seemed to work quite nicely!

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