

Dyeing of wool and other natural fibres with natural dyes

Introduction

Chemical dyes are not that old. The first ones were introduced in the 1850s, and they were not really in general use for some time after that. Anything much more than 120 years old must have been dyed with plants. Plants are still used in many traditional areas - and indigo, the blue dye still used in jeans, is chemically the same as the dye extracted from woad or the indigo plant, which has been the best blue available for centuries.

Natural dyes are very old - presumably when people found that something changed the colour of white fibres, they would automatically use it to augment the colours available from different colours of sheep. Dyeing as a craft gradually developed as people found out what worked.

Dyeing was (and still is) a skilled process, as you need to know what plants to use to get the best colours for the least effort, and which dyes were permanent and did not fade or wash out. Historically dye works were located on the edge of towns, as, like tanning, dyeing can be a very smelly process.

Colours

You can get all the colours of the rainbow from plants - however, some colours are much easier to get than others. A large number of plants will give yellow. In fact, when people want to identify where old textiles come from they quite often use the yellow dye, as this will be characteristic of the local plants. Reds and blues are more difficult - this is probably why purple was the imperial colour! Blue is generally obtained from indigo-containing plants (indigo from India, or woad, which grows in cooler countries), or from logwood (the heartwood of a particular tropical tree). Red can be produced from madder, a root which grows in temperate climates, or from cochineal (beetles which grow on cactus in Mexico) or from brazilwood (the heartwood of another tropical tree). To get the intermediate colours, two dyes can be combined, or the yarn can be dyed with one colour and then the other. Historically Imperial purple was extracted from shellfish in the Mediterranean - but modern dyers haven't worked out how!

Fibres

Protein (animal) fibres are the easiest to dye with plants - wool, mohair and other things such as alpaca. Silk takes some dyes quite well, as it's also a protein fibre. Cotton, linen and viscose are more difficult to dye with natural dyes. Nylon is chemically similar to wool, so often dyes OK - but acrylic and polyester are very unlikely to dye with plants.

Process

To make the dye fix to the wool, it is usually necessary to boil the wool first with a "mordant". This is a chemical which attaches itself to the fibre; the dye then sticks to the chemical. The dye can either be extracted into solution, and the wool then added, or the pre-mordanted wool can be put in a pan with the dyestuff and water, and boiled up together. After dyeing, the wool needs thorough rinsing, and then hot washing in soap or detergent solution to remove any dye which has not attached to the fibre.

Indigo is a "vat" dye, which needs a different process. The blue dye is insoluble in water. To get it to dissolve, you add ammonia (to make the solution alkaline) and a reducing agent (sodium dithionite, "spectralite" or colour run remover). This is then left so that the chemical reacts with the indigo, to produce a yellow-green solution. The yarn is first rinsed in water with a small amount of ammonia added, then squeezed out and added carefully to the vat (trying not to add too much air). When the yarn is removed from the vat and shaken in the air, the oxygen in the air oxidises the yellow back to blue indigo.

How to do natural dyeing

1. **Prepare:** Use natural fibres. Protein (animal) fibres are best - yarn, fleece or fabric.

For yarn, wind skeins, and tie in a minimum of 3 places with figure of eight ties (this stops the skeins from tangling). Fleece can be dyed in a net bag or old stocking. Weigh the yarn/fleece/fabric before wetting, to calculate how much mordant and dyestuff is necessary. Wash, or at least wet out the fibre thoroughly in water with soap or detergent.

2. **Mordant:** This is a chemical which you add to help the dyestuff stick to fibre. It is necessary for most natural dyes.

Because of the toxicity of other possible mordants, I generally use (7%) alum with (8%) cream of tartar as a pre-mordant. To do this, for each 100 g fibre, use 7 g alum (potassium aluminium sulfate, available from some chemists), with 8 g cream of tartar (used in baking). Dissolve these in warm water, then add enough cool water for the yarn/fleece to move a bit in the solution, and put in the wetted yarn. Bring it to the simmer with the mordant, keep it at about simmering point for an hour, and then let it cool in the solution. The next day, rinse the skeins, to remove any un-attached mordant, and then keep the yarn damp ready to dye.

(As an alternative I sometimes add copper sulfate to a dyebath and use unmordanted wool (adding vinegar to dyebath makes this mordant more effective and therefore the remains are less poisonous), or add iron (e.g. rust) which "saddens" the dye, turning yellows to olive-green. You can also use chromium or tin compounds, which give different colours, and are sometimes more light-fast (i.e. don't fade so quickly). However the resulting dyebaths are more difficult to dispose of (because they're much more poisonous.)

For mordanting cotton and linen I use alum-tannin-alum, in a three-day process, as this gives much better colours. However, it is also much more complicated, so I've not included the details here.

Substantive dyes: Some dyes don't need mordants: examples are indigo and woad, walnut and yew (on any fibres), some lichens on wool, and madder, cutch and many of the dye woods on cotton. These are called substantive dyes.

3. **Dye:** Either simmer the yarn with the dyestuff, or extract the dye first, strain off and simmer the yarn in the resulting dyebath.

Quantities - with fresh plant material usually try about 100% (i.e. same weight of dyestuff and yarn), with dried dyes, and imported/bought dyestuffs, you usually need less. Pale colours may be less fast (i.e. fade quicker).

I generally leave the dyestuff in with the yarn, as it is more informative when doing demonstrations, even though it can give a more patchy result. I usually bring the dyestuff and yarn, with enough water so the yarn can move a bit, slowly up to simmer, simmer for about %hr (or until it's the right colour), then allow it to cool for a bit in the dyebath. DON'T put wool straight from a boiling dyebath into cold water, allow it to cool first (or you end up making felt).

4. **Rinse** thoroughly, (and label and allow to dry if at a demonstration). Then wash in warm soapy water, and rinse again until no more dye come out, label and allow to dry. The dye should now be fast to washing. I keep samples in a book when I wind up the skeins into a ball, to record what I've done.

Books: For more information I would recommend Gil Dalby's Natural Dyes - fast or fugitive, and Jenny Dean's The Craft of Natural Dyeing - both give a good introduction