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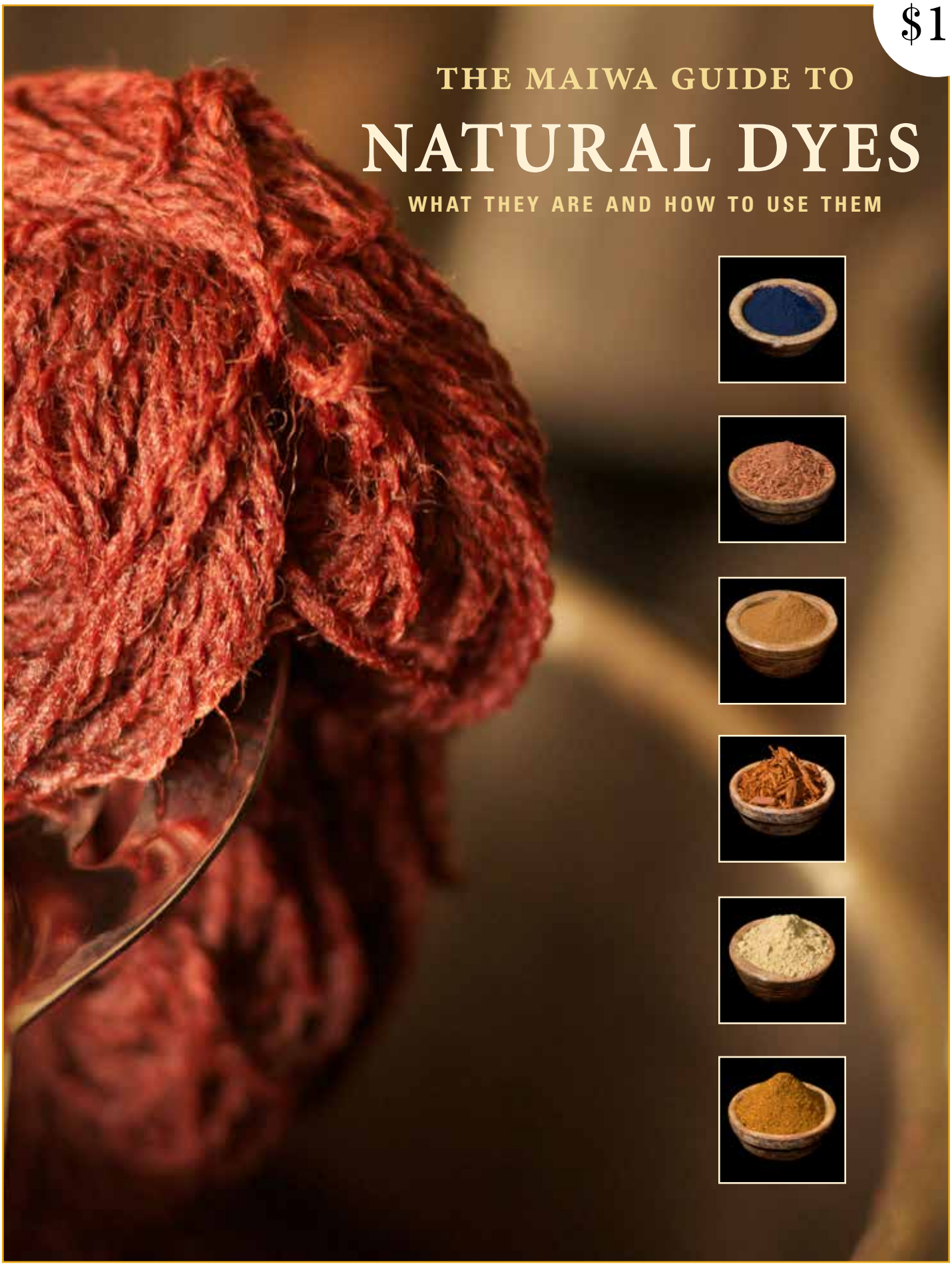
THE MAIWA GUIDE TO

NATURAL DYES

WHAT THEY ARE AND HOW TO USE THEM



NATURAL DYES

WHAT THEY ARE AND HOW TO USE THEM

Artisans have added colour to cloth for thousands of years. It is only recently (the first artificial dye was invented in 1857) that the textile industry has turned to synthetic dyes. Today, many craftspeople are rediscovering the joy of achieving colour through the use of renewable, non-toxic, natural sources.

Natural dyes are inviting and satisfying to use. Most are familiar substances that will spark creative ideas and widen your view of the world. Try experimenting. Colour can be coaxed from many different sources. Once the cloth or fibre is prepared for dyeing it will soak up the colour, yielding a range of results from deep jewel-like tones to dusky heathers and pastels. Variations are easily achieved by manipulating dyestuff, quantity, or procedure.

The instructions below will take you through the application of the "classic" dyes: those dyes that artisans and guilds have used for centuries. You will also learn everything you need to experiment with garden dyes or wild harvesting. If you can measure ingredients and boil water you can dye with natural dyes.

Maiwa is constantly researching natural dye use and we are confident that a full palette can be achieved through the use of safe, time honoured techniques and recipes.

SOME NOTES BEFORE BEGINNING...

- Learning to use natural dyes is like cooking with colour. And just like cooking, it takes practice and care. Don't rush the process. Attention to detail will give results you are proud to call your own.
- Always use clean non-reactive vessels: stainless steel, unchipped enamel, glass, or plastic. Iron or copper vessels can also be used but the metal will react with the dyebath. Iron will dull or "sadden" colours. Copper will tend to brighten them.
- Dyeing evenly is much more difficult with piece goods than with yarns. It is also much easier to dye protein fibres (wool, silk) than cellulose fibres (cotton, linen). For best results the beginner is well advised to start with wool or silk yarns.
- Dry all fibres out of direct sunlight.
- Even expert dyers will never start a large project or one involving expensive materials without first running test samples.
- Read all instructions before beginning.
- Mixing dyes or mordants and overdyeing can result in that one desired shade. Experimentation pays off and adds an element of creativity to your dyeing. Keep records.
- All dyes are sensitive to water quality. In almost all cases soft water is preferable for washing, scouring, mordanting and dyeing. Rainwater or distilled water can also be used.
- Natural dyes are not recommended for synthetic fabrics or fibres.

For the dyer, nothing matches the excitement of the first dip in the dyebath.

TESTING THE WATERS

The acidity or alkalinity of the water used for natural dyeing (both in the mordant bath and the dye bath) will affect the colour. Soft water is best for practically all natural dyes with the exception of madder, weld, logwood and brazilwood. These dyes develop better in hard water (containing calcium and magnesium salts). Most natural dyers consider rainwater best (although in places it may be more contaminated than tap water), river water next best, and well or tap water the last choice as it often contains the largest amount of contaminants.

For dyes that prefer hard water, calcium carbonate can be added in the form of finely ground chalk, or an antacid (Tum's, Rolaid) tablet. Also soda ash, household ammonia, or wood ash water can be added to push the pH up.

If local hard water needs to be made acidic, add vinegar, lemon juice or a few crystals of citric acid. Water that contains iron is difficult to use for natural dyeing as it will not be possible to achieve clear, pure colours. In this case colours will be "saddened" that is, muted and darker.

pH neutral (pH7) water should be used for rinsing and washing naturally dyed fibres and fabrics, otherwise there may be unwanted colour changes. A set of pH strips is a good way to test the water.

ABOUT FIBRES AND CLOTH

For the dyer, the fibre world is divided into two types: animal (protein) fibres such as wool, hair, and silk; and plant (cellulose) fibres such as cotton, linen, and hemp. As mentioned earlier, yarns are the easiest to dye. Woven materials require care to get even coverage. A suitably large dyepot is very important. Tightness of weave is also a consideration. Garments are the trickiest to dye. Watch out for synthetic stitching (it will not take on colour) and areas of wear or perspiration as they will dye unevenly. When using wools, care is required to avoid felting.

MEASURES, RECORDS, WOF

All measures in dyeing are based on the weight of material to be dyed. This is known as the Weight Of Fibre (WOF). WOF gives a convenient way to state how much dyestuff is needed for a given shade, regardless of whether the dyer wants to colour a few yarns or several metres of fabric. The weight of dyestuff is expressed as a percentage of WOF.

for example:

To dye a medium-red with madder, we would use 50% WOF.

Hence, if we had a pound of cotton (450 g) we would need a half-pound (225 g) of madder.

Weight of Fibre x % = Weight of Dyestuff
(imperial) 1lb x .5 = .5lb (8 oz)
(metric) 450g x .5 = 225 g

Alternatively, cochineal only requires 6% WOF for a medium shade. Hence, to dye the same amount of fibre we would need:

(imperial) 1lb x .06 = .06lb (1 oz)
(metric) 450g x .06 = 27 g

Yarns, fibres, and fabrics are always weighed dry before washing.

Keeping notes of the weight of fibre and how much dyestuff was used will help plan future projects - clipping a sample of dyed yarn beside the notes makes for a wonderful record.

SCOURING

Both yarns and fabrics need to be scoured before dyeing

Soured items dye more evenly, the dye penetrates better, and dyed colours are more lightfast and washfast.

Note: Fabrics sold as "ready for dyeing" may not need scouring.

indigo dyed cloth - unscoured on the left, scoured on the right.

SUPPLIES:

Soda ash & Synthrapol (for cotton)
Orvus paste soap (for silk & wool)

SCOURING COTTON AND OTHER CELLULOSE FIBRES:

1) Fill a large pot so that yarns or fabric is covered and not crowded.
2) Add 1 tsp Synthrapol (5 ml) and 4 tsps. soda ash (20 g) for each pound (450 g) of cotton.
3) Simmer for approximately 1 hour. Cotton is full of wax, pectic substances, and oil, all of which must be removed. The resulting wash water will be yellow brown. Bleached white cotton yarns and fabrics may not need as long.

SCOURING SILK AND WOOL:

1) Use a large vessel and fill with enough water so that the yarn or fabric is well covered and not crowded.
2) Add 1 tsp (5 ml) orvus paste soap for each 450g of fibre.
3) Add yarn, fleece or piece goods and heat gently (60° C, 140° F) for approximately 1 hour. Turn gently but do not agitate
4) Allow fibre to cool down slowly and then rinse in warm water.

MORDANTS

Colourfast dyeing usually requires a mordant. Mordants are metalic salts that facilitate the bonding of the dyestuff to the fibre. Cellulose fibres also require a tannin in order to bond well. Both metalic salts and tannins are classified as mordants.

Some natural dye recipes still call for the use of heavy metal mordants such as chrome and tin. Historically these were introduced during the industrial revolution and we do not recommend them. Heavy metal mordants are toxic, presenting real challenges for safe use and disposal. moreover most colours obtained through the use of heavy metals may be obtained through overdyeing or variations in the dye procedure. For those who wish to obtain a mordant from plants, Symplocos is a tropical bio-accumulator of alum.

Mordant procedures for protein and cellulose fibres are not interchangeable.

ALUM

Potassium aluminum sulfate is the mordant most frequently used by dyers for protein (animal) and cellulose (plant) fibres and fabrics. It improves light and washfastness of all natural dyes and keeps colours clear. It is inexpensive and safe to use (see our safety notes). This form of alum is refined from bauxite, the raw state of aluminum ore, and is free from the impurities (such as iron) some other alums may contain.

ALUM ACETATE

Aluminum acetate is often used as the preferred alum mordant for cellulose fibres and fabrics. It is refined from bauxite with acetic acid used as a purifying agent. For this reason some dyes develop to a richer shade on cellulose when mordated with alum acetate. Alum acetate is the recommended mordant when considering printing with natural dyes. It is more expensive and sometimes hard to find.

Use at 5-8% WOF.

HOMEMADE ALUM ACETATE

The dyer may make aluminum acetate from sodium acetate and potassium aluminum sulfate. Depending on the availability of these materials in your area, this can be cost effective.

To make enough aluminum acetate to mordant 1 kilo of fabric, combine in 3 litres of hot tap water:

150 g sodium acetate or calcium acetate
150 g potassium aluminum sulfate

This can be added to your mordant bath (see next section).

TANNIN

Tannic acid is used to assist the mordants of cellulose fibres and fabrics. Alum does not bond with cellulose fibres as well as it does with protein fibres. However, tannin bonds well with cellulose. and once treated with tannin, alum will combine with the tannin-fibre complex. Many dyestuffs contain tannin (black oak, pomegranate, cutch, fustic, etc) and do not need an additional tannin.

Tannins can be clear or they can add colour to the fibre, and this is an important consideration when selecting a tannin. The two most popular tannins in the Maiwa studio are oak gall and myrobalan.

- Clear Tannins: “Gallic” - Gallnut, Tara, some Sumacs
- Yellow Tannins: “Ellegic” – Myrobalan, Pomegranate, Black Oak, Fustic
- Red-Brown Tannins: “Catechic” – Cutch, Quebracho, Tea leaves, and some Sumacs.

GALLNUT (OAK GALL)

Gallnuts are a rich source of clear tannin. A gallnut is produced by oak trees as a defense against parasitic wasps who deposit their eggs in small punctures they make on young branches. The tree excretes a tannin-rich substance that hardens and forms a gallnut. These are collected and ground to be used in dyeing. Use at 6-8% WOF.

oak galls

MYROBALAN

This dyestuff consists of ground nuts of the *Terminalia chebula* tree which grows in Nepal, India, Sri Lanka, Burma, Thailand, Indochina and south China. Myrobalan is both a tannin and a dye and is an important tannin for cotton in India and Southeast Asia due to the light warm colour it imparts to the cloth. The colour works well for overdyeing. Myrobalan is also the perfect colour to lay down under a single indigo dip to obtain a light teal. When used as a tannin myrobalan requires 15-20% WOF. If used to create a soft butter yellow colour, 20-30% WOF is needed.

CREAM OF TARTAR

Cream of tartar (potassium bitartrate) is a salt of tartaric acid. It is commonly obtained as a sediment produced in the wine-making process. Cream of tartar is an optional addition to the dyebath to soften wool, brighten shades, and point the colour of some dyes (it will move the fuschia of cochineal to a pure red). Cream of tartar works best with animal or protein fibres and is seldom used with plant or cellulose fibres. Use at 5-6% WOF.

IRON (FERROUS SULFATE)

Iron is an optional mordant which will increase the fastness of any colour. It is far from neutral, however, and makes other dyes darker and richer (but it will also "sadden" bright colours). It is most often used with cellulose fibres like cotton, linen, rayon and hemp and should be used with care on protein fibres as it can make them slightly hard or brittle. If used in the mordant process colour shifts are more distinct than if added while dyeing.

Iron should be used at 2-4% WOF. More than that could damage the fibre.

When printing with natural dyes we recommend changing ferrous sulfate to ferrous acetate to avoid bleeding and ferrous transfer (the migration of iron).

HOMEMADE FERROUS ACETATE

5 g ferrous sulfate
100 ml vinegar
3 g lime (calcium hydroxide)

Combine the above ingredients in a plastic container and stir well. If thickening is required, weigh the amount of ferrous acetate you wish to thicken and add 1% of guar gum.

Ferrous acetate needs to be fixed to the cloth. We use chalk (calcium carbonate) 50g in 5 litres of warm water. Once your ferrous acetate is fully dry dip it into this solution. This solution may be kept and reused again and again. Generally you may refresh with 50 g of chalk after each 10 kg of fabric.

HOW TO:

MORDANT WOOL, SILK OR OTHER PROTEIN FIBRES

STANDARD MORDANT RECIPE

1) Weigh the fibre dry, then scour.
2) Measure alum at 15% WOF
3) Measure cream of tartar at 6% WOF (optional, see cream of tartar above).
4) Dissolve both the alum and the cream of tartar in very hot water in a non-reactive container.
5) Add the dissolved chemicals to the dye kettle with enough warm water 45° C (110° F) to cover the fibre when it is added - usually a 30:1 ration of water to fibre. Stir well.
6) Add the scoured, wet fibre. Over 30-45 minutes bring the temperature up to 90° C (195°F) Just under simmer for wool and 85°C (185°F) for silk. Hold for one hour, gently turning the fibre regularly.
7) Let cool in the bath for 20 minutes.
8) Remove the fibre from the mordant bath. Allow to hang evenly over a non-reactive rod (stainless steel, plastic) until it stops dripping. Rotate the yarn or fabric frequently so the alum is evenly distributed.
9) Store the yarn or cloth in a damp white cloth for 24-48 hours. Keep it damp during this entire period.
10) Once completely dry mordanted yarns and fabrics may be stored indefinately.

HOW TO:

MORDANT COTTON OR OTHER CELLULOSE FIBRES

Note: For more effective mordanting on fibres such as linen we use a combination of two mordants of alum. For example we will mordant once with alum at 15% WOF and then again with a fresh mordant bath of alum at 10% WOF. Or we will do a tannin/alum/alum mordant to achieve slightly richer colours.

1) Weigh the fibre dry, then scour.
2) Choose your tannin and mordant (see individual dyes for recommendations). Tannin must always be done first. Each bath must be completed before starting the next one.

TANNIN

1) Measure tannin to the recommended WOF for the tannin you are using. Dissolve in hot water. Add to kettle. Fill the kettle with enough water to fully cover the fibre when added.
2) Add scoured, wet fibre.
3) Heat to 87 - 93°C (190 - 200°F) hold for 45 minutes.
4) At this point the fibre may be rinsed and mordanted with alum, or left to steep for 8-24 hours before rinsing (steeping will give deeper colours).

ALUM

Aluminum Potassium Sulfate

1) Measure alum at 15% WOF. Dissolve in hot water. Add to kettle. Fill the kettle with enough water to fully cover the fibre when added.
2) Add wet fibre (already treated with tannin).
3) Heat to 87 - 93°C (190 - 200°F) hold for 45 minutes.
4) At this point the fibre may be **a)** rinsed and remordanted, **b)**rinsed and dyed, or **c)** left to steep for 8-24 hours before rinsing (steeping will give deeper colours).

ALUMINUM ACETATE

For this mordant you do not "cook" the fibre. You begin with very hot tap water 38 - 50°C (100 - 120 °F) but do not maintain heat. For this reason a plastic container may be used for mordanting.

1) Measure aluminum acetate at 8% WOF, dissolve in hot water, add to mordanting kettle. Or use your homemade aluminum acetate. Top up the kettle with enough hot tap water **38 - 50°C (100 - 120 °F)** to fully cover the fibre when added.
2) Add wet fibre (already mordanted with tannin).
3) Let fibre sit for 1 - 2 hours stirring from time to time. Keep the kettle covered so that it retains its heat.
4) Remove fibre and hang to dry.
5) Chalk* (fix) the fibre. Dissolve 50 g of chalk (calcium carbonate) in 5 litres of warm water. Dip fibre into this solution. Fully wet the fibre, wring out and proceed to dyeing. If using wheat bran, mix 100 g of wheat bran in 5 litres of warm water, fully wet the fibre, wring out and proceed to dyeing. These solutions may be maintained over time and occasionally refreshed (after every 10 kg of fibre).

*Aluminum acetate must be fixed to the fibre prior to dyeing. In some cultures this is known as "dunging" as cow dung is used. Dung is high in phosphates, but you may also use wheat bran or calcium carbonate (our preferred choice).

IRON (OPTIONAL)

1) Measure iron at 2% WOF. Dissolve in hot water. Add to kettle. Fill the kettle with enough water to fully cover the fibre when added.
2) Add wet, mordanted fibre
3) Heat to 71 - 77°C (160 - 170°F) hold for 30 minutes.
4) Rinse well. Remember always thoroughly scrub a pot that has been used to iron mordant or it will sadden the next dye bath.

Note: cellulose fibres can be fully dried and stored before dyeing. Fibres do not need to be remordanted between dyes. Once a fibre has been mordanted it can be dyed and then overdyed without any further mordanting.

DYEING

Before beginning, keep in mind that dyes are not like paints: dyes combine with fibres to give character and personality, depth and texture. They do not produce a uniform, even, shade. It is these variations that give an added dimension and excitement to natural dyes. Like fine wines that change with the years to reflect the weather of the seasons, the conditions of the soil, and the tastes of the vintner; dyes will give slightly different shade each time they are used. They will alter when you change the dyeing conditions, mordants, colour pointers (such as cream of tartar and iron) and over dye. Experiment and play with this potential (keeping notes will help). Recipes for dyes are listed with each dyestuff.

ABOUT EXTRACTS

The dye colourant always needs to be extracted from host material (usually a root, bark or leaf). Usually this extraction happens in the dyebath, but sometimes (as with indigo, cutch etc.) it is an entirely separate process.

We sell natural dyes as both raw materials and extracts. Extracts are very concentrated and so smaller amounts are needed. We also carry a special line of extracts.

As a general philosophy we always recommend working with dyes in their raw form. Working with raw materials increases your knowledge and gives you control over both process and colour.

ALKANET – *Alkanna tinctoria* or dyer's alkanet is a very attractive purple colourant that is found in the roots of plants belonging to the borage family. It grows uncultivated throughout central Europe and extends to central Asia and North Africa. The extracted pigment is often used in cosmetics, soaps and pigments. The violet colourant from alkanet is not soluble in water. Before a dyebath is made the alkanet root must be soaked in a solution of alcohol and hot water – colourless rubbing alcohol or methylated spirits can be used (some dyers who do not like the smell of either of these solvents use vodka!). The colours produced on mordanted fabric and yarns are shades of grey, lavender and purple when used at 75-100% WOF. The colours achieved are beautiful but have moderate light fastness.

Mordanting: use alum mordant at 15% WOF for protein fibres. For cellulose mordant with tannin at 8% WOF and then alum at 15%, or alum acetate at 8%.

Dyeing: Use dried alkanet at approximately 75-100% WOF for rich colours. First, soak the alkanet in alcohol (or methylated spirits) for several days to extract the colour. When the liquid has developed a strong colour, add enough water for the fibres to move freely in the solution. Add the mordanted fibres and heat this dyebath up gently - but no higher than 60°C (140°F) - until all the colour has been taken up. Adding iron to the dyebath at 2% WOF creates a range of greys and grey-violets.

DYERS CHAMOMILE – *Anthemis tinctoria* is part of the daisy family. It grows throughout North America, Europe and throughout the Himalaya region. It is often used in Turkish carpets for warm, strong yellows and is mixed with madder for tangerine colours. Chamomile is best on protein fibres with an alum mordant. It requires 50-100% WOF for medium to strong yellows.

Mordanting: use alum mordant at 15% WOF for protein fibres. For cellulose mordant with tannin at 8% WOF and then alum at 15%, or alum acetate at 8%.

Dyeing: Use dried chamomile at approximately 50-100% WOF for medium to strong warm yellows. First soak the chamomile in hot water for an hour. Add fibre and slowly bring the temperature up to about 82°C (180°F). Hold at temperature for about an hour. Adding madder to the dyebath gives some of the most beautiful tangerine colours.

COCHINEAL – is the most important of the insect dyes. The females of *Dactylopius coccus* colonize the prickly pear (nopal) cactus native to Mexico, Central and South America and the Canary Islands. Peru is currently the primary export country, shipping out over 4000 metric tons annually. This dye is found mostly in food, drugs and cosmetics. Cochineal has excellent light and washfastness and produces a powerful range of fuchsias, reds and purples. The colour changes with the mordants used and pH of the dyebath.

Although expensive, it is very concentrated. The bugs have a high dye content (carminic acid) and go a long way. You will need only 3-8% WOF for a medium depth of shade.

Mordanting: use alum mordant at 15% WOF for protein fibres. For cellulose mordant with tannin at 8% WOF and then alum at 15%, or alum acetate at 8%. If cream of tartar at 6% WOF is added to the alum mordanting bath or the dyebath, the colour achieved will be more towards Christmas red. With the addition of iron at 2-4% WOF to either the mordanting bath or the dye bath the colour will shift towards purple.

Dyeing: The colourant is first extracted from the dried insects. Gently grind the insects in a blender or use a mortar and pestle to crush them to a fine powder. Put this powder into a saucepan and cover with three inches of water. Boil for 30 minutes. Strain the liquid and set aside. Place the cochineal pulp back in the saucepan and again cover with water and boil for 30 minutes. Add this decanting to the first decanting. Repeat 2 more times. Some dyers will then keep the remaining pulp in a jar of water for several weeks and use in subsequent dyebaths.

The combined decantings are used to make a dyebath. Cochineal is sensitive to acids and bases. The cochineal rich red can be shifted to orange with the addition of an acid (vinegar) and to a deep fuschia with the addition of an alkaline (soda ash). This sensitivity means the soaps used to pre or post wash your fibres must have a neutral pH.

CUTCH EXTRACT – This powder is an extract prepared from steeping the wood of the *Acacia catechu* tree in hot water until a syrupy liquid immerges. This is dried and then ground into powder. It is common to most parts of India, Burma, Indonesia and Peru. Indian cutch is by far the most beautiful. It is a good source of colourfast shades of brown - cinnamon, nutmeg, and clove. Cutch extract contains tannin as well as the dye compound catechu. It is easily soluble in water. Cutch has excellent light and washfast properties. It requires 20-50% WOF to dye a medium depth of shade.

Mordanting: use alum mordant at 15% WOF for both protein and cellulose fibres (there is enough tannin in cutch so mordanting with tannin is not required).

Dyeing: completely dissolve the powdered cutch (sometimes cutch will come a little chunky) in boiling water and add it to dyebath.

Deeper colours can be achieved by first soaking the cutch extract in a weak mixture of caustic soda. Add 1 tsp lye or sodium hydroxide to 4 litres (1 gallon) of water. Soak for 1 hour. Then add more water and neutralize with acetic acid or vinegar to pH7. Add this neutral solution to the dyebath. Fibres are then added and the dyebath is kept at a low simmer for at least two hours. Cutch does not easily exhaust and dyebaths can be used multiple times for lighter shades. The alum mordant yields toffee browns. The addition of iron at 2-4% WOF yields chocolate browns, while a soda ash rinse will redden the cutch colour. The addition of 2% WOF hydrogen peroxide during the final 15 minutes of dyeing will darken cutch considerably. Allowing the fibre to cool down and sit in the dyebath overnight will give the darkest shades.

EASTERN BRAZILWOOD (SAPPANWOOD) – is from the heartwood of trees of the genus *Caesalpinia*. Originally an old-world dye, the country of Brazil was named after this dyeplant. Historically harvested (then overharvested) from the species *Cæsalpinia echinata* found on Brazilian coastlines. Sappanwood *Cæsalpinia punctata* is found throughout east Asia and is sometimes known as Eastern Brazilwood. Our brazilwood comes from Sappanwood. This wood is high in tannin and a colourant known as Brazilian. It will produce lovely warm reds when dyed at a 20% WOF and deep crimson reds when dyed at 50-100%. The dyebath can be used multiple times for lighter colours and the wood chips can be dried for future use. Startling variations can be achieved (bright orange to blue red) when the pH level of the dye bath is manipulated. Fabrics dyed with brazilwood are fast to washing but somewhat fugitive to light.

For Eastern Brazilwood extract use at 4-10%.

Mordanting: use alum mordant at 15% WOF for protein fibres. For cellulose mordant with tannin at 8% WOF and then alum at 15%, or alum acetate at 8%.

Dyeing: Brazilwood develops best in slightly hard water. Adding finely ground chalk (or a Tum's tablet – 1 to each 4 liters of water) brightens the brazilwood colour, especially if there is no lime in the local water. This dye takes time to be extracted - simmer the wood chips for 1-3 hours and leave to cool overnight or longer (some dyers leave for days). Add fibre to bath and the first dyebath will produce a deep crimson red and the next dye bath can be used to achieve beautiful shades of pink and coral. Change the pH level to an acid to get an orange red or use an alkaline (like soda ash) to get blue-red to brilliant purple.

Adding fustic extract will yield rich warm reds and iron will turn the fabric to a mulberry wine colour. A dip in indigo will produce purples.

EUPATORIUM – This dyestuff comes from a genus of flowering plants in the aster family. *Ageratina adenophora* is known by many common names, including eupatory, sticky snakeroot, and crofton weed. *Eupatorium adenophorum* is a synonym. There are many species of the genus Eupatorium that contain colourants; interestingly, the 1882 bulletin of the Royal Gardens, Kew, records two species known as Paraguay indigo. Eupatorium gives soft egg-yolk yellows that range into oranges. When used with an iron mordant it can be used for an earthy moss greens, when overdyed with indigo it provides a satisfying range of yellow to blue greens.

Mordanting: use alum mordant at 15% WOF for protein fibres. For cellulose mordant with tannin at 8% WOF and then alum at 15%, or alum acetate at 8%.

Dyeing: For ground leaves use 50% WOF for a medium depth of shade. For the extract use 10% WOF. Eupatorium yields warm yellows to ochres. The addition of an iron mordant gives lovely moss greens.

FUSTIC EXTRACT – An extract prepared from the heartwood of a tree from the Mulberry family, *Chlorophora tinctoria*. Fustic produces a range of colours from daffodil yellow to deep gold to orange. Fustic makes a good underdye with indigo to make forest greens and teals. While fustic is available in wood chips, its most common form is in a liquid concentrate. The extract is highly concentrated and ready to be added directly to the dye bath. Fustic has a high light and washfastness although exposure to strong sunlight may cause them to become darker.

Mordanting: use alum mordant at 15% WOF for protein fibres and cellulose fibres (there is enough tannin in fustic so that mordanting with tannin is not required).

Dyeing: Fustic liquid extract can be added to the dyebath directly at between 4-6% WOF for a medium depth of shade. Keep the dyebath temperature at about 85°C (185°F) for wool and cotton and 77°C (170°F) for silk. At a higher temperatures the colour will turn to a dull brown yellow. With the addition of iron at 2-4% WOF fustic yields beau-

tiful sage greens. By dyeing in a copper pot or adding clean copper pennies to the dyebath clear yellows will emerge. When combined with madder or cochineal, fustic will give true reds, when mixed with logwood purple, fustic will give rich olive greens.

HENNA – the leaves are harvested from the shrub *Lawsonia inermis*. Henna produces a brown colour tending toward a red-orange on protien fibres. The dye comes from leaves that are dried and ground into a powder. Henna bonds well with protein, hence is used to dye skin (mendhi), hair, fingernails, leather, silk and wool. On cellulose fibres henna yields light yellow greens.

Mordanting: use alum mordant at 15% WOF for protein fibres. For cellulose mordant with tannin at 8% WOF and then alum at 15%, or alum acetate at 8%.

Dyeing: when using ground henna at 20-50% WOF on mordanted fibres, rich browns are achieved on protein fibres and "latte" like colours to soft greens on cellulose fibres. There is no need to make an extract, just add the powder directly to the dyebath. Simmer the fibres in the dyebath until the desired colour is obtained – approximately 1-2 hours. Iron at 2-4% can slightly deepen and enrichen the brown colour. Altering the pH of the henna dyebath does not alter the colour.

INDIGO (NATURAL) – natural indigo powder is an extract prepared from *Indigofera tinctoria* which is cultivated for this purpose. Indigo is the legendary source of colourfast blues and its ability to produce a wide range of shades has made it the most successful dye plant ever known. Indigo grows all over the world but flourishes best in hot, sunny, humid areas. Indigo can give clear blues that range from the tint of a pale sky to a deep navy that is almost black. Our indigo comes from a farm in south India and is very strong (approx 50% indigotin). It reduces beautifully in an indigo vat. See Maiwa Indigo Data Sheet for complete instructions.

KAMALA – Kamala – is a powdery substance obtained from the fruit of *Mallotus philippinensis*, a small evergreen that is also known as the monkey-face tree (because monkeys are said to rub their faces in the fruit). Kamala is found throughout tropical India. Kamala dye is very similar in behavior and colour to annatto. Kamala dyes golden yellows to tangerines with moderate lightfastness on cotton. Lightly deeper shades are obtained on protein fibres. When iron is added deep moss green is obtained. Over or under dyed with indigo produces forest greens.

Mordanting: use alum mordant at 15% WOF for protein fibres. For cellulose mordant with tannin at 8% WOF and then alum at 15%, or alum acetate at 8%.

Dyeing: Kamala is not very soluble in water, so it is necessary to extract the colourant before dyeing. To extract with alcohol, soak the powder with twice its volume of isopropyl or ethyl alcohol. Let stand for 2 hours stirring occasionally. Add the alcohol/kamala mixture to the dyebath.

To extract with soda ash, mix the Kamala powder with half of its weight of soda ash in twice its volume of water. Let stand stirring occasionally. Add the entire mixture to the dyebath. After dyeing rinse first with a vinegar solution and then thoroughly with water. Kamala dyes a beautiful orange yellow on silk and wool. It dyes lighter yellow shades on cotton.

LAC EXTRACT – a red dye extract from the scale insect *Kerria lacca* which is found throughout India, south east Asia, Nepal, Burma, Bhutan and south China. It is found both in the wild and cultivated. The female lac insects invade host trees (mainly fig and acacia) and the insect secretes a resin that contains the red dye. When harvested, the resin is taken off the branches and is known as stick lac. The resin is also used to make shellac. The dye must be extracted from the resin before it can be used to colour cloth.
Lac extract yields crimsons to burgundy reds to deep purples. The colourant is similar to cochineal but colours achieved are warmer, softer, and more muted. The lac dye has high light and washfastness on silk and wool. 5-8% dye to WOF is all that is needed for a medium depth of shade.

Mordanting: use alum mordant at 15% WOF for protein fibres. For cellulose mordant with tannin at 8% WOF and then alum at 15%, or alum acetate at 8% – but note that lac extract has reduced light and washfastness on cellulose fibres.

Dyeing: Use at 10-15% WOF. Dissolve extract in water and simmer with fibre for 45 minutes, leaving overnight for richest colours. This dye is very sensitive to change in pH and develops to its fullest colour potential with the addition of cream of tartar at 6% WOF. The addition of an alkali like soda ash will yield plum purples and the addition of iron will give blackened purples.

LOGWOOD – is the heartwood of the logwood tree, *Haematoxylon campechianum*. It yields deep, rich, red purples to orchid blues and has been prized as a dyestuff since the 16th century. The logwood tree grows in Mexico, Central America, Dominican Republic, Venezuela, Brazil, the Guyannas, Madagascar, and India. Mixed with iron, logwood gives good blacks – a colour difficult to achieve with natural dyes. Logwood has good washfastness but moderate lightfastness – a bit of iron improves the lightfastness dramatically. Logwood chips will give a medium depth of shade at 10-15% WOF.

For many years we sold Logwood extract - it has become increasingly rare. If using the extract, it is very easily dissolved and can be used directly in the dyebath at 0.5-1% WOF for a medium shade.

Mordanting: use alum mordant at 15% WOF for protein fibres. For cellulose mordant with tannin at 8% WOF and then alum at 15%, or alum acetate at 8%.

Dyeing: For chips - pour enough boiling water over the logwood chips to make a dyebath and soak overnight. Pour off this liquid and use for the first (and strongest) dyebath. Simmer fibres for about one hour, keeping temperature of dyebath between 77-83ºC (170-180ºF). If a darker colour is required leave fibres in dyebath overnight. The logwood chips can be soaked again and the liquid used for lighter shades.
Logwood develops best in slightly hard water. Adding finely ground chalk (or a Tum's tablet) brightens the logwood colour, especially if there is no lime in the local water. Cream of tartar can be added (at approximately 6% WOF) to push logwood to a purple-navy, adding osage or fustic gives grey-greens, cochineal gives purples, coffee bean browns are obtained by adding cutch, navy can be had with a dip in indigo, greys to blacks are made with the addition of iron.

MADDER – *Rubia tinctorium, Rubia cordifolia*, and *Morinda citrifolia.* Madder is one of the oldest dyestuffs known. It is most frequently used to produce turkey reds, mulberry, orange-red, terracotta, and in combination with other dyes and dyeing procedures can yield crimson, purple, rust, browns, and near black. The primary dye component is alizarin, which is found in the roots of several plants and trees. Madder is cultivated and grows wild throughout India, south east Asia, Turkey, Europe, south China, parts of Africa, Australia and Japan. Madder is a complex dyestuff containing over 20 individual chemical substances. Alizarin is the most important of these because it gives the famous warm Turkey red colour. Also present in this wonderful plant is munjistin, purpurin, and a multitude of yellows and browns. Madder is dyed at 35-100% WOF for a medium depth of shade.

Mordanting: use alum mordant at 15% WOF for protein fibres. For cellulose mordant with tannin at 8% WOF and then alum at 15%, or alum acetate at 8%. For dark brick reds use alum acetate (instead of the normal mordanting alum which is potassium aluminum sulfate).

Dyeing: Madder develops to its deepest and richest reds in hard water – water containing calcium and magnesium salts is ideal. If the water is soft add calcium carbonate (a single Tum's tablet to 4 litres of water works well). Add dye material to dye pot and cover with water. Bring up to about 60ºC (140ºF) and hold for an hour. Add fibres and continue cooking for another 1-2 hours. For clear reds do not let the temperature go above 72ºC (160ºF). At higher temperatures the browns of the madder plant come out and dull the colour. The madder dyebath can be reused two or three times for lighter shades

Because of the different dye components present in the madder plant, the dyer can coax many colours out and onto the cloth by manipulating the mordanting process, the pH, the temperature, and the dye process. There are hundreds of madder recipes used historically that are intriguing to try including one from Turkey which brings out the purpurin from madder and gives a purple.

Madder, in combination with cochineal yields a true red, with iron yields garnet, bright orange with alum and cream of tartar, brick red with alum mordant and a higher heat, the addition of acetic acid or vinegar plus iron will push the colour to a rich brownish-purple.

MARIGOLD - This dyestuff consists of dried and ground flower heads of the *Tagetes* species. It yields rich vibrant yellows, green-yellows and oranges with 20 -30% dried marigold to WOF. Marigold is cultivated all over the world for its decorative flowers, for religious festivals and for its colourant. Marigold has a moderate light and washfastness.

Mordanting: use alum mordant at 15% WOF for protein fibres. For cellulose mordant with tannin at 8% WOF and then alum at 15%, or alum acetate at 8%.

Dyeing: add the dried flowers to the dye pot, cover with water and simmer for half and hour to extract the colour. Strain the dye liquid and add to dye pot. Add fibres and simmer until the desired shade is achieved. With the addition of iron at 2% WOF warm olives can be made.

MYROBALAN - This dyestuff consists of ground nuts of the *Terminalia chebula* tree. This tree grows in Nepal, India, Sri Lanka, Burma, Thailand, Indochina and south China. It may be classed as both a mordant and a dye, giving a light buttery yellow when applied. It is an important tannin based mordant for cotton in India and southeast Asia due to the light warm colour it imparts to the cloth. Myrobalan is a good foundation for overdyeing. It is also the perfect colour to lay down under a single indigo dip for teal. When used as a tannin mordant myrobalan requires 15-20% WOF. If using to create a soft butter yellow use 20-30% WOF.

Mordanting: use alum mordant at 15% WOF for protein fibres and cellulose fibres (there is enough tannin in the myrobalan so that mordanting with tannin is not required).

Dyeing: Add myrobalan powder to the dye or mordant bath, bring bath up to 55°C (130°F) and then add fibre. Continue heating bath to a high simmer (approximately 83°C (180°F)) hold for one hour. Adding iron (2-4% WOF) to the bath will produce soft lichen greens to deep grey-greens.

OSAGE ORANGE - consists of the shredded wood of the tree *Maclura pomifera*. Osage contains a yellow dye similar to fustic and black oak and yields clear, true yellows to soft yellow greens that have a high light and washfastness. It yields good depth of shade at 20-30% WOF. Osage grows throughout the south and central United States. The tree was originally planted to help with wind erosion, the wood was used to build fences and was hard enough for wagon wheels. Osage has overgrown many areas and is being cut down for firewood. Our supplier rescues these logs and chips them for us or soaks them in water and through a solar process extracts the liquid concentrate.

Mordanting: use alum mordant at 15% WOF for protein fibres. For cellulose mordant with tannin at 8% WOF and then alum at 15%, or alum acetate at 8%.

Dyeing: when using the osage sawdust, soak it in water for a few hours or overnight. When soaking is complete, bring this bath up to simmer and cook for an hour. Strain off the dye liquid and use for the dyepot. Add the fibre and simmer for about 45-60 minutes. Dyeing in a copper dyepot or adding a few clean copper pennies to the dyebath will brighten the yellow. Adding 2-4% iron to the dyebath will produce olive greens. Over or Under dyeing with indigo yields bright emerald and leaf greens.

Osage Extract: when using the extract simply add the liquid directly to the dyebath, add the fibre and simmer for about 45-60 minutes. Use at 2-5% WOF for a medium depth of shade Dyeing in a copper dyepot or adding a few clean copper pennies to the dyebath will brighten the yellow. Adding iron at 2-4% WOF will produce medium olive greens. Overdyeing in indigo yields bright emerald and leaf greens.

POMEGRANATE - An extract or a powder from the rinds of pomegranates *Punica granatum*, this dyestuff is high in tannin and improves the light and washfastness of any dye with which it is mixed. In India and south east Asia it is used as both a dye and a mordant. Pomegranate yields soft yellows to green-yellows when used at 5-8% WOF for the extract (15 - 20% WOF for the powder) for a medium depth of shade. When combined with iron, pomegranate yields yummy warm cement greys and deep moss greens. It is often mixed with the more fugitive turmeric dye to brighten the yellow and make it lightfast.

Mordanting: use alum mordant at 15% WOF for protein fibres and cellulose fibres (there is enough tannin in the pomegranate so mordanting with tannin is not required).

Dyeing: for either the powder or the extract, add to hot water, ensure it is thoroughly mixed and then add the fibre. Simmer for about 1 hour. If a darker colour is required leave in dyebath overnight.

SAFFLOWER – *Carthamus tinctorious*, is an annual thistle. This plant is most known for the oil that can be derived from it's seeds, however, the petals are a most magical dyestuff. Yellows, surprisingly sharp pinks, orange-reds, and corals can be extracted from safflower. Soaking petals in water at room temperature gives a yellow which can be collected and used to dye any modanted natural fibre. Repeated soaking will exhaust the yellow at which point pinks may be obtained by "turning the bath" (drastically changing the pH to alkaline and then back to slightly acidic).

Mordanting: use alum mordant at 15% WOF for protein fibres. For cellulose mordant with tannin at 8% WOF and then alum at 15%, or alum acetate at 8%.

Dyeing yellow: Use 100-200% WOF – Put the safflower in cold water for a minimum of one hour. Use a pillow slip or make a bag of closely woven cloth that can fit the inside a large pot. Strain the safflower through this bag and gently squeeze. Set the liquid aside for dying. Repeat the procedure twice more, each time starting with fresh water and saving the yellow water.

Combine the water from the first three soakings in a dye kettle. Add mordanted fibre (protein or cellulose) and simmer with the extracted yellow dye for 45 minutes. Note: this is the only time heat is applied.

Dyeing pink (cellulose only): Start as above with 100-200% WOF – Repeat the soaking of safflower until the water has very little yellow. This may take an additional four or five soakings. Each time start with fresh water. You may discard the waste water after soaking.

After the final soaking, thoroughly squeeze the bag containing the safflower to eliminate as much water as possible. Drape this bag in a large pot and add 4 to 5 litres of water which you have turned to pH 11 through the addition of soda ash. (Use a pH meter or pH papers). Be careful as a pH above 11 will ruin the dye. After a minimum of one hour remove the bag and gently squeeze. Keep this now reddish water and turn it slightly acidic (pH 6) by adding an acid such as white vinegar. Now add your cellulose fibres (these do not need to be mordanted) to the bright red liquid and leave overnight. Note: There is no heating in the procedure to get pink.

Silk fibres may absorb a second yellow dye that has been extracted into the acidic solution, giving an orange or coral. Wool will not dye.

SEQUOIA – *sequoia sempervirens*, Sequoia comes from Californian Coastal Redwoods. The dyestuff occurs in minute quantities in the seed cones, and only reaches useable quantities as a by-product of seed collection and reforestation programs. Sequoia yields rich purple browns when dyed at 15% WOF. Shades achieved are beautiful but with moderate lightfastness.

Mordanting: use alum mordant at 15% WOF for protein fibres. For cellulose mordant with tannin at 8% WOF and then alum at 15%, or alum acetate at 8%.

Dyeing: the dyestuff may be added directly to the dyebath. Add dye material to dye pot and cover with water. Bring up to about 60°C (140°F) and hold for an hour. Add fibres and continue cooking for another 1-2 hours.

WALNUT – Walnut (Eastern Black Walnut) *Juglans nigra*. This dyestuff is obtained from the bark of the tree and also from the green husks of the fruit. Domonique Cardon has called walnuts "great living laboratories of dye production." Walnut is a substantive dye and can be used without a mordant. It can be used alone to produce warm deep taupes or to give extra depth in combination with other dyes. Historically it has been used with madder (both rubia cordifolia and rubia tinctoria) to produce mahogonies. Walnut responds well to overdyeing with iron producing rich grey/browns. Dye at 30-50% WOF.

WELD - *Reseda Luteola* is also known as Dyers Weld, Dyers Rocket, and Dyers Mignonette. It produces an excellent light and washfast yellow and is a strong clear yellow to combine with indigo for emerald and leaf greens. Traditionally cultivated throughout Europe as a yellow dyeplant it still flourishes on embankments or beside railways and roads. Weld gives strong intense yellows whcih are clear and bright. The strength of these colours makes weld a good choice for overdyeing with indigo to obtain teals and greens. can be dyed at 30-50% WOF for a medium depth of shade.

Mordanting: use alum mordant at 15% WOF for protein fibres. For cellulose mordant with tannin at 8% WOF and then alum at 15%, or alum acetate at 8%.

Dyeing: pour boiling water over the plant material and allow to stand overnight. Add more water and bring the pot to a simmer but not more than 160 F as too high a temperature will dull the yellow. Strain off the dye liquor into the dyebath. The plant material can be reuses two or three times for light shades. Add the fibre to the dyebath and simmer below 160 F for about one hour.
Weld develops best in slightly hard water. Adding finely ground chalk (or a Tum's tablet – 1 to each 4 litres of water) brightens the weld colour, especially if there is no lime in the local water.

WOAD - is the common name of *Isatis tinctoria.* In Medieval Europe it was the only source of blue dye for textiles. The leaves of the woad plant contain the same dye as Indian Indigo *Indigofera tinctoria,* although in a weaker concentration. This makes colouring with woad a much more subtle and delicate art. The same recipes that are used for indigo may be used for woad. The shades obtained from woad are slightly different from indigo and call to mind the areas where it was most popular - the south of France.

Our woad comes from France, from the famous woad project of Bleu de Lectoure.

NATURAL DYE EXTRACTS

CONCENTRATED AND EASY TO USE

BUCKTHORN species are native to the Middle East, and Mediterranean. Also known as Persian berries since the warm yellow colour comes from the unripe berries. Use cream of tartar along with mordants. **Dyeing**: Use extract on mordanted fibre at 2-6% WOF.

CHESTNUT trees grow in many parts of the world and contain a great source of tannin. They dye a warm brown colour. This dye is also well known for it's ability to dye silk black with the addition of logwood and an iron mordant. **Dyeing**: Use extract on mordanted fibre at 5-10% WOF.

COCHINEAL is a parasitic insect that lives on the nopal cactus native to Central and South America. This dye has excellent light and washfastness and produces a powerful range of fuchsias, reds and purples mainly depending on mordents used and the dyes sensitivity to pH. **Dyeing**: Use extract on mordanted fibre at 0.5 - 2 % WOF.

EUPATORIUM – This dyestuff comes from a genus of flowering plants in the aster family. Ageratina adenophora is known by many common names, including eupatory, sticky snakeroot, and crofton weed. Eupatorium adenophorum is a synonym. **Dyeing**: Use extract 10-15% WOF.

GOLDEN ROD is a wild flower found in North America and Europe where it continues to be a well known source of yellow. **Dyeing**: Use extract at 7-10% WOF.

LAC is a scale insect of Southeast Asia that contains a colourant similar to cochineal but colours achieved are warmer, softer, and more muted. The lac dye has high light and washfastness on silk and wool. **Dyeing:** Dissolve extract at 10-15% WOF and simmer mordanted fibre for 45 minutes, leaving overnight for richest colours. This dye is very sensitive to change in pH.

LOGWOOD is a bushy, thorny tree grown in Mexico, Central and South America and parts of Africa. The purple dye is concentrated in the heartwood of the tree. **Dyeing**: For a medium to dark colour use extract at only 0.5-1 % WOF on mordanted fibre. Dye at temperatures no higher than 180 F and for no longer then 60 min or the colour will lack clarity and luminosity.

MADDER Madder is one of the oldest dyestuffs. It is most frequently used to produce turkey reds, mulberry and in combination with other dyes can yield crimson, purple, rust and browns. The primary dye component is called alizarin, which is found in the roots of the plant. **Dyeing**: Use madder extract at 3-8% WOF. Do not allow the dye bath to go above 180°F as this brings out the brown colour also found in madder.

QUEBRACHO dye comes from a tree native to South America, which is very high in tannins. The dye can vary in colours from coral, warm red brown, yellow or green depending on the species. **Dyeing**: Use extract on mordanted fibre at 5-10% WOF. To deepen the quebracho colours add an alkali or iron mordant.

WALNUT is obtained from the bark of the tree and also from the green husks of the fruit. Domonique Cardon has called walnuts "great living laboratories of dye production." Walnut is a substantive dye and can be used without a mordant. It can be used alone or to give extra depth in combination with other dyes. Historically it has been used with madder (both rubia cordifolia and rubia tinctoria). Walnut responds well to overdyeing with iron producing rich grey/browns. **Dyeing**: Use extract at 20-30% WOF.

WELD or Dyer's Weld has been used as a dyeplant for many centuries in the Mediterranean, Europe and North Africa. It has been a long time favourite yellow due to its intense colour which has excellent lightfastness. **Dyeing**: Use extract on previously mordanted fibre at 4-6% WOF.

SOME NATURAL DYE REFERENCES

Natural Dyes: Sources, Tradition, Technology and Science
By Dominique Cardon

Koekboya: Natural Dyes and Textiles:
A Colour Journey from Turkey to India and Beyond
By Harald Böhmer withCharllotte Kwon (of Maiwa)

Indigo
by Jenny Balfour-Paul

Wild Colour
by Jenny Dean

Colours from Nature
by Jenny Dean

A Handbook of Indigo Dyeing
by Vivien Prideaux

MAIWA DYE INFO SHEETS

Indigo & Woad
A blue "how to." All about vats, preparation, dyeing and disposal.

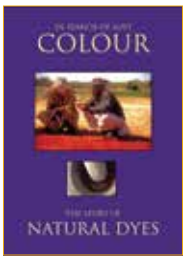
Free online: maiwa.com

The Organic Vat
Co-authored with Michel Garcia, this info sheet presents a number of options for reducing agents from fruit to other dyes such as henna.

Free online: maiwa.com

maiwa.com
EVERYTHING FOR THE FIBRE ARTS

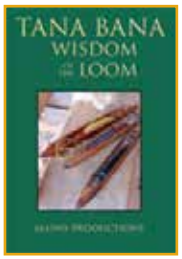
MAIWA DOCUMENTARIES



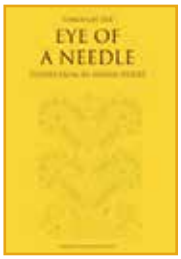
In Search of Lost Colour, travels the world to document the growing, harvesting, extraction and use of natural dyes. From the Bogolanfini mudprinting of Mali to the madder-root of Turkey, from the cochineal insect to the rare shellfish purple, this documentary provides a look at some of the most exotic colours in existence.

In many areas the use of natural dyes is perilously close to extinction - and yet traditional techniques and cultures often use processes which are environmentally sound and economically beneficial. Join us for an unforgettable exploration into the history of colour and its use. 90 minutes

Indigo: A World of Blue shot on location in southern India, Sindh, Pakistan; the Vientiane District of Laos; the island of Sumba, Indonesia; Yogyakarta, Indonesia, village Dhamadka, India; and Suleymanköy, Turkey, Featuring renowned indigo scholar Jenny Balfour-Paul speaking about indigo history, traditions, superstitions and lore. 60 min.



Tana Bana is our second feature-length documentary film on craft. Here you will find works of great beauty and skill, ingenious variations, and delicate figures. Shot in rural locations in Africa, Laos, Indonesia, India, and Pakistan, this documentary takes you to the world of looms, weaves, and artisans. 60 min.



Through the Eye of a Needle: is the story of a unique group of craftswomen. Follow their journey as they return to creating the world-class embroidery that made their ancestors famous. The incredible stories of the women from the KMVS co-operative are recorded here through video, song, laughter, and stitch. 30 min.

Maiwa documentaries on DVD: $21.95 cdn. each. Trailers available online: www.maiwa.com