

Teri Dyes

DYEING COTTON

Linen, Tencel, and Rayon and other cellulosic fibres

By Murray Mackay

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COTTON DYEING

Cotton is one of a number of cellulose fibres (plant fibres) which include linen, tencel and the synthetic fibre, rayon. These fibres can all be dyed using the same dyeing methods. The major difference between cotton and wool dyeing is the dyeing conditions. Alkaline (or caustic) conditions are used for fixing cotton dyes, whereas acid conditions are used for fixing the dye to wool.

Fibre reactive dyes are generally used for cotton dyeing. Although these are not the only dyes available for cotton, they are the most versatile for craft dyeing. They combine excellent wash and light fast properties with the ability to be used for both hot and cold dyeing techniques.

Hot Dyeing

There are some significant differences between the hot dyeing methods for wool and cotton. These are highlighted below

It is also essential to use a salt when hot dyeing cotton. The two most commonly

	WOOL	COTTON
Starting Temperature	Warm	60°C
Final Temperature	100°C	60°C
Fixing Agent	Acetic Acid	Soda Ash

used salts are Glaubers Salt (Sodium Sulphate) and Common Salt (Sodium Chloride). Your dye supplier will advise which is the best to use with your dyes. The function of the salt is to improve the levelness of the dyeing. The salt assists the mobility of the dye through the fabric helping to ensure that the dye molecules fix evenly throughout the fabric. The amount of salt required is directly proportional to the amount of dye used, therefore dark colours require more salt than light colours.

Once the dye has been given enough time to become evenly distributed through the fibre (usually ½ hour) the fixing agent is added. Soda Ash (Sodium Carbonate) is most commonly used but other suitable agents are Washing Soda (contains Soda Ash) and Baking Soda (Sodium Bicarbonate). Dyeing time after the addition of the Soda Ash ranges from ½ hour for light colours to 1 hour for dark colours. Your dye supplier can supply detailed procedures.

When dyeing cotton, the dye liquor does not become clear at the end of dyeing. Thorough washing after dyeing is necessary to ensure that all unfixed dye is removed from the fabric or fibre. The general procedure is to use a cold wash to remove the salt and Soda Ash and then to wash with hot water and detergent to remove the unfixed dye. The fibre is then given a cold wash to remove the detergent. For very dark colours more than one hot wash may be required.

Different types and qualities of cotton will take up different amounts of dye. Thus you need to select your fabric carefully if very dark colours are required. Rayon in particular will give very strong vibrant colours.

Hot dyeing can be done in a variety of vessels. Stainless steel pots, bath tubs, preservers, washing machines and plastic bags can all be used. Do not use aluminium pots for cotton dyeing as the soda ash slowly dissolves the aluminium.

Cold Dyeing

In cold dyeing a special mixture of chemicals is used to assist the dyeing process. The mixture promoted by Teri Dyes (which we call **Base Solution**, but is also known as chemical water) contains the following:

UREA - One of the effects of heat in hot dyeing is that it swells the cotton fibre so that the dye molecules can enter into the fibre more quickly. Since heat is not available in cold dyeing to swell the fibre, another method is required to do this to allow easier penetration of the dye into the fibre. UREA is used in the solution to achieve this.

LEONIL KSC – this chemical has been developed especially for cold dyeing. It assists in wetting of the fibre, helps penetration of the dye into the fibre and improves the evenness of the dyed cotton. (*Previously Irgapadol P was used*).

SODA ASH – as in hot dyeing, Soda Ash is used to promote the fixing of the dye.

Cold Dyeing Techniques

There are two main methods of carrying out cold dyeing.

The first is to soak the fabric in the base solution until it is wet through. The excess solution is then gently squeezed out until the fabric is just damp (the excess can be retained for reuse). The dye solution can then be applied by a variety of techniques to the damp fabric, or alternatively the fabric can be allowed to dry first. The application techniques include brushing, pouring and spraying. This technique is particularly useful when multi coloured effects or patterns are required.

The second technique is to add the dye to the base solution and apply directly to the fabric. This is used particularly when a single colour is required or when really dark colours are required. The dye can be applied by any of the above methods or by soaking the fabric in the solution. **Once the dye is added to the base solution it must be used the same day.** It does not keep in the same way the individual dye and base solutions do.

Fixation Methods

Once the dye has been applied the fabric is wrapped in plastic and can then be fixed using any of the techniques described below.

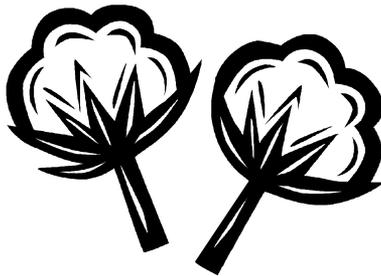
The normal fixation method for cold dyeing is to leave the dyed fabric at normal temperatures for a few days until the dye is fixed. It is recommended that black plastic be used for this as it absorbs more heat.

A word of warning however. The package should be turned at intervals as the dye liquid will slowly concentrate on the bottom leading to dark and light patches of colour.

There are other methods that can be used. These include microwave fixation and steaming. In these methods extra heat is supplied by the microwave or the steam to speed the fixation process to a matter of minutes in the case of microwaving or an hour or so in the case of steaming.

Actual times depend on the depth of colour required and the amount of fabric being used. When microwaving the time required also varies with the power rating of the microwave.

More detailed descriptions of the application and fixing methods can be obtained from your dye supplier.



HOT DYEING METHOD

FOR FABRICS USING DRIMARENE OR PROCION DYES

Pre- scour fabric with Imerol XND or other suitable detergent. Clean fabric is important. Any size remaining on new fabric will reduce dye uptake.

For 100 gm of fabric (Adjust measures to suit for different quantities of fabric)

- 1) To **2 litres** of water at **60°C** ADD well dissolved dyestuff, then **WET CLEAN FABRIC**
- 2) Stir gently for **10 minutes**
- 3) ADD Glaubers Salts. This can be added as a solid (see table below for quantity)
- 4) Stir gently for **30 minutes**
- 5) ADD Soda Ash (pre-dissolved in warm water) in **3 portions 5 minutes apart**
- 6) Stir gently for **30 minutes** for pale shades or **45-60 minutes** for dark shades
 - For Green and Turquoise dyes maximum yield is obtained by raising the temperature to **80°C** after the Soda Ash addition
- 7) 1st Rinse - **Cold**
- 8) 2nd Rinse **hot** with **1 ml/litre** Imerol XND or other suitable detergent
- 9) 3rd Rinse - **Cold**
- 10) For deep shades repeat **steps 8 and 9** to ensure maximum fastness. (During the hot rinses you will note dye bleed. This is normal and important, because if not removed now it will come off in the wash).

Easy Measures - Dye, 1/4 teaspoon = pale; heaped teaspoon = deep shade
- Glaubers Salt, heaped teaspoon = 20 grams
- Soda Ash, heaped teaspoon = 15 grams

Dye Bath Requirements - based on **100 grams** of fabric.

SHADE	PALE	MEDIUM	DEEP
WATER	2 litres	2 litres	2 litres
DYE	0.5 - 1.0 gm	1 - 3 gm	3 gm +
GLAUBERS SALT	20-80 gm	80-120 gm	120-160 gm
SODA ASH	2 gm	3 - 8 gm	8 - 10 gm

COLD DYEING METHOD

FOR USE WITH DRIMARENE & PROCION REACTIVE DYES ON COTTON, LINEN, TENCEL, RAYON (AND ALL CELLULOSE FIBRES)

Method 1

- 1) Dissolve 1 teaspoon dye powder in 500 mls of hot water to make a dye solution. This will store for several months.
- 2) Soak the fibre or fabric in the ready to use base solution (see page 7), and then drain off or squeeze out the excess which you can then re-use. If using Base Solution Concentrate dilute it with an **equal** quantity of water,
- 3) Prepare a work area by laying out a sheet of plastic large enough to hold the fibre being dyed, and still give plenty of room to fold the edges over later. Lay old absorbent material on the plastic to take up surplus dye. Place your fabric on this.
- 4) Paint, air brush or pour on the dye onto the fabric as required to get the desired effect. There are many innovative ways to express your creativity at this stage.
- 5) Remove absorbent material, fold the edges of the plastic over the fabric to prevent the colours running together. Roll the plastic end over end and secure the outer ends to prevent the fibre drying out

Method 2 (for use with Base Solution Concentrate)

Dilute the Base Solution Concentrate with an equal quantity of dye solution. For medium colours use the dye mix made up as in Method 1. For darker or lighter colours make the dye mix stronger or weaker as required, before adding it to the Base Solution Concentrate.

Continue with steps 3), 4), and 5) from method 1.

A thickener can be added if required - use Selley's Wallpaper Paste (the type recommended for school or craft use) or an alginate type, and apply the thickened mixture to the fibre/fabric by whatever means is appropriate.

Method 3

- 1) Soak the fabric in the ready to use base solution and allow it to dry
- 2) Continue with 3), 4), and 5 from Method 1.

Fixation of the Dye

Steam - 30 – 60 minutes

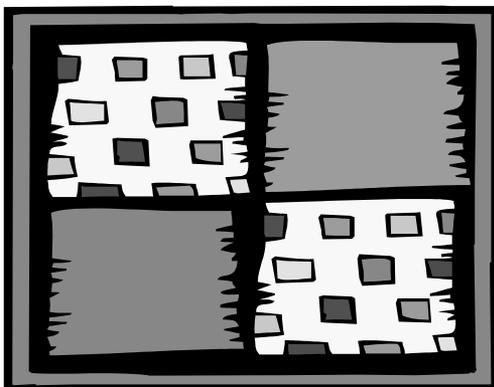
Cold Batch - keep in the plastic for 48/72 hours at room temperature, (or in a warm place such as a cylinder cupboard, glasshouse etc)

Microwave - Excellent for small articles or sample colour development. Cover with microwave plastic to prevent drying.

NB: place a small container of water in the microwave. Microwave on a medium high setting for about 1 minute. Repeat this a number of times, taking care that the material does not become dry.

After fixing rinse cold, followed by a warm wash with 1ml of Imerol XND per 1 litre of water to remove any unfixed dye.

Give a final cold wash.



COTTON BASE SOLUTION

FOR COLD DYEING WITH DRIMARENE OR PROCION DYES

Preparation of 1 litre of Base Solution – (Ready to use)

- 1) Weigh out 100 gms (10 tablespoons) Urea and dissolve in 500 ml warm water with stirring
- 2) Weigh out 50 gm (4 teaspoons) Soda Ash and add to 500 ml warm water with stirring
- 3) Add Soda Ash solution to Urea solution
- 4) Add 5 ml Leonil K-SC (optional)

The solution will keep well and is ready for use as is.

It can be made as a concentrate by using half the amount of water. Before use add an equal quantity of water or dye solution. (See methods 1 & 2 on page 6).

DYEING THREADS

FOR USE WITH DRIMARENE REACTIVE DYES ON COTTON, LINEN, RAYON ETC USING BASE SOLUTION

The Base Solution contains all the necessary chemicals to ensure that the dye will fix to the threads when microwaved. You can purchase this or make your own as you require it. The procedure for making your own is given on Page 7.

Dyeing Procedure

- 1) Dilute the **Cotton Base Solution Concentrate** with an **equal** quantity of water, or use your own solution. (see page 7). Use a small quantity of this to paste the dye powder to a smooth slurry and then dilute the dyes to working strength with more of the solution. Once mixed the dyes start reacting, so this solution must be used within 2 hours to get maximum colour development.
- 2) Soak the hanks of thread in warm water. Squeeze out the excess water and lay the threads on a paper towel
- 3) To dye the threads with a combination of colours, use a brush or dropper bottle to apply the dye. (or any other method that suits your purpose)
- 4) Roll the threads in a paper towel and seal with a sheet of plastic (gladwrap or microwave plastic is suitable)
- 5) Microwave for 2 minutes on 3/4 power to fix the dye. You will probably need to adjust this to suit your own microwave and the quantity of thread you are dyeing. A number of short heating bursts on a medium setting is safer than one long one on a high setting.

NB for safety, always have a cup of water in the microwave.

Alternatively the wrapped threads can be left in a warm place for 24-48 hours before washing off.

- 6) After fixing, wash the threads thoroughly to remove any unfixed dye. Start with cold water and increase the temperature to hot. It may take some time to wash all the excess dye out, particularly for darker colours.

PLASTIC BAG DYEING

FOR USE WITH DRIMARENE OR PROCION DYES

Method

For dyeing one fat quarter of cotton fabric (50 cm x 50cm). Quantities can be adjusted for larger or smaller pieces of fabric. You will need zip-topped plastic bags or screw top jars to dye in.

- 1) Prewash the fabric to remove any size Rinse and leave fabric damp.
- 2) Prepare each zip-topped plastic bag or screw topped jar by placing the following in each one
1 tablespoon Glaubers Salt
¾ cup near boiling water
- 3) Place **one fat quarter** of damp fabric in each plastic bag or jar.
- 4) Place each bag or jar in a plastic ice cream container or similar sized container.
- 5) **Dissolve dye (see below for suggested quantity) for each bag in about 1 cup of hot water** and add to plastic bag or jar, and then seal the top. Swirl the dye around a little before standing the bag or jar back in its container. The more you swirl the dye the more even will be the colour of the dyed fabric.
- 6) Leave the dye solution to stand for at least **½ an hour**
- 7) Dissolve **½ teaspoon of Soda Ash in ¼ cup of hot water** for each plastic bag or jar. Open each bag or jar and add the Soda Ash solution. Reseal the bag or jar, swirl the fabric around again and leave to cure for a minimum of one hour.
- 8) Remove the fabric from the bags and rinse thoroughly in cold water until the water is clear.
- 9) Wash the fabrics with warm water and detergent.
- 10) Rinse again in cold water.
- 11) If dye is still coming out of the fabric repeat steps 9 & 10 until the wash is clear.

Dye Quantities 1/8 teaspoon for pale shades, ½ teaspoon for dark shades.

USING A WASHING MACHINE WITH DRIMARENE

If the fabric is new, pre-wash to remove any size. Any size remaining on new fabric will reduce dye uptake. If you are changing the colour of used fabrics please ensure that the fabric is clean before dyeing. Clean fabric is important.

1. Place the dry fabric in the washing machine and then fill to the desired level with hot* water at least 60 degrees, 70 is better and agitate 30 seconds, to ensure all the fabric is thoroughly wet.
2. Remove all the fabric from the machine (using eg a wooden spoon as the water is hot) and store temporarily (eg in a large bowl)
3. Slowly add the required amount (see table) of **dye powder** to the washing machine while the machine is agitating. Agitate for a few minutes to ensure the dye is dissolved.
4. Re-add the **Pre-Wet Fabric** along with any water from the temporary bowl.
5. Agitate for a few minutes (**but don't let it drain!**)
6. Add the required amount (see table) of **Glaubers Salts**. This can be added as a solid while agitating. (The Glaubers Salts, anhydrous sodium sulphate, is used to develop the colour to its full shade)
7. Stand for **30 minutes** agitating for a few minutes every 5-10 minutes. This is necessary to ensure the fabric dyes evenly.
8. Dissolve the required amount (see table) of **Soda Ash** in warm water in a jug or basin. Soda Ash (sodium carbonate) is *caustic* (similar to washing soda) – *use gloves* when preparing it.
9. Over a period of 2-3 minutes, dribble the dissolved Soda Ash into to the washing machine. The Soda Ash is used to fix the dye to the fabric... if getting an even colour is important, then the slower the Soda Ash is added the better, as it will “go to work” on the first bit of fabric it finds.
10. Stand for **30 minutes** for pale shades or **45-60 minutes** for dark shades, agitating for a few minutes every 5-10 minutes. There will still be colour in the water at the end of this time. When dyeing cotton, the water does not become clear.
11. 1st Rinse – **Cold** (this can often easily be done by progressing the wash cycle.)
12. 2nd Rinse **hot** (not warm) with **detergent** - start a new hot wash cycle.
13. 3rd Rinse – **Cold**
14. When dyeing deep shades (like black) repeat **steps 12 and 13** to ensure maximum fastness. (During the hot rinses you will note dye bleed. This is normal and important, because if not removed now it will come off in the wash).

COLOUR DEPTH

	PER KILO DRY FABRIC		
	Dye (g)	Glaubers (g)	Soda (g)
Pastels: e.g. pinks and weak reds, weak yellows, baby blues	5-10	200-800	20
Medium: e.g. most reds, greens, yellows, turquoise, blues	10-30	800-1200	30-80
Dark: e.g. Navy, Black, Brown	30+	1200-1600	80-100

Every care has been taken with the above recommendations; however they must be tested and adapted to suit your own requirements and dyeing conditions.

** If you are dependant on the temperature of your hot water cylinder for the temperature of you wash cycle, you may wish to adjust this upwards the night before doing dyeing, if it can easily and safely be done by you, but take care in the shower! Don't forget to put it back down, afterwards.*

MICROWAVE DYEING

Using a microwave for dyeing is a convenient way of speeding up the dyeing process for relatively small amounts of fibre. It is primarily a rapid source of heat, which cuts down dyeing time considerably. It can be used for most methods of dyeing, provided certain precautions are taken.

Dyeing Equipment

The vessels used for microwave dyeing must be glass, plastic, or ceramic. On no account should metal containers of any other piece of metal equipment be placed in the microwave.

Safety Precautions

Always place a separate container of water in the microwave to ensure that the atmosphere does not dry out. Microwaves work by interacting with the water molecules to produce heat. If your cotton dries out the microwaves will work directly on the cotton and char it.

You will need to discover the best settings for your own microwave. The power ratings and available heat settings of microwaves vary so much that it is impossible to give more than general guidelines for times and settings.

Cold Dyeing

For cold dyeing you can fix the dye with the microwave instead of standing in a warm place or steaming. Preparation is exactly the same, with the dyed cotton being wrapped in plastic in the conventional manner. Place the prepared bundle in the microwave on the turntable, or in a plastic container and heat in short bursts.

Be very careful not over to over heat as the cotton can dry out and char. Also the plastic in which the cotton is wrapped can swell up and be burst by the steam which is generated.

Enjoy your microwave dyeing. It can add a new dimension to your armoury of dyeing techniques.

DISSOLVING DYES

Powders

Paste the required amount of powder with a little cold water to form a smooth slurry. Add hot water to make up the required amount of dye solution.

Granules

Add a quantity of cold water (about $\frac{1}{4}$ of the total quantity of water required) to the granules with stirring. Make up to the required volume with hot water. Note that many can be dissolved readily by just pouring hot water over them with vigorous stirring.

Stock Solutions

Stock solutions can be made up containing one level teaspoon of dye powder or granules per 500 mls of water. This is equivalent to about 10 grams of dye per litre of solution. These solutions should be kept in a cool cupboard. Under these conditions they will keep for up to six months for most dyes and for longer periods for some.

DEPTH OF COLOUR	Grams of dye per 100 grams fabric	Metres dyed per 25 grams dye	Metres dyed per 50 grams dye	Metres dyed per 100 grams dye	Metres dyed per 200 grams dye
PALE	0.1 – 0.5	185 – 40	370 – 80	740 – 160	1480 – 320
LIGHT	0.5 – 1.5	40 – 13	80 – 26	160 – 52	320 – 104
MEDIUM	1.5 – 4.0	13 – 5	26 – 10	52 – 20	104 – 40
DARK	4.0 – 6.0	5 – 3	10 – 6	20 – 12	40 – 24