

Bhikkhu Colour Dyeing Manual

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Quick Start

If you want to dye cotton or silk by hand, you only need to read these chapters:

1.2 METHODS FOR CELLULOSE FIBRES AND SILK → A few introductory lines.

1.3 Equipment → The hardware you need.

1.4 Chemicals → The required chemicals.

1.5 Usage of the spreadsheet → The spreadsheet which does all the calculations for you.

1.6 Manual-dyeing steps → The actual step-by-step dyeing procedure.

All other chapters either add detail information and problem solving or describe other methods.

1.1 Introduction

This manual describes different procedures to dye cotton, silk, polyester and other types of material to a colour which we use for our robes and cloth requisites in the Thai Forrest Tradition.

1.1.1 Cellulose fibres (cotton, linen, viscose, etc.) and silk

All subsequent chapters, except chapter 1.9, describe different methods to dye cellulose fibres and silk.

As the volume of this manual could be discouraging if one only wants to “quickly dye something”, it is good to point out that once you know how the process works and have the equipment at hand, a dyeing run can take **around 2h** (with preparation but without washing), depending on the amount of cloth. There is also a quick version for dyeing the **Kathina robe** with a dyeing time of **less than 30 min** (without the preparation time).

Many of the non-essential points have been moved to the appendix which can be skipped if you just want to follow the straight-forward way of manually dyeing something.

The main focus of this document is on hand-dyeing, but there is also a section for using the **washing machine** in chapter 1.8 *Machine-dyeing steps*, but be aware that the results are not as good as from hand dyeing.

Using Procion MX dye has the following **advantages**:

- It gives **brighter colours** than all-purpose dyes.
- It is a fibre reactive dye, which means, that the dye forms a chemical bond with the fabric and **can't be washed out**. The only colour loss you'll get is through bleaching in the sun and bleaching agents in laundry detergents.
- The colours can be **reproduced**, if the settings stay the same.
- With the provided spreadsheet, you can easily **adjust the colours** to your needs.
- **Specific mixtures** are available for cotton and for silk, whereby with all-purpose dyes like Dylon, you can get funny results on silk.
- It is **non-toxic** and relatively easy to handle.

1.1.2 Polyester

Chapter 1.9 describes a method to dye polyester with **iDye Poly from Jacquard**.

1.2 METHODS FOR CELLULOSE FIBRES AND SILK

In the following chapters you will find different methods for hand dyeing, a quick version to dye a Kathina robe and a machine dyeing procedure.

Cellulose fibres includes for example cotton, linen and viscose.

Silk is a protein fibre, but it is a special case and can be dyed by the method for cellulose fibres **or** by the method for protein fibres, we use the former way as it is much easier.

→ **Throughout this document**, the sections which are to be used for cellulose fibres only are marked with the tag **[Cellulose Fibres]**, the ones for silk only with **[Silk]**.

There are different ways to dye cotton, silk or wool with Procion MX dye.

A description for dyeing **protein fibres** like wool is currently not planned. It is more difficult as you need to keep the dye-bath on a stove near a simmer during the procedure.

Cotton is a cellulose fibres which requires soda ash (sodium carbonate) as a fixative for the dye, wool is a protein fibres which requires acid (usually vinegar) as a fixative.

If you want to dye something important like a robe and haven't used Procion MX dye at all, it can be **highly recommended** to make a **test dye run** at first.

As dyeing only a very small piece of cloth might not lead to a realistic test result it is better to dye e.g. a bathing cloth, some bedding or a towel. If you are going to do that it would further be useful to add a piece of the same material which is going to be used for the robe in order to see what to expect and maybe to adjust the colour if you are not happy.

1.3 Equipment

This is a list of the equipment you'll need for the manual dyeing procedure.

➔ Please note, that it doesn't make sense to give you the actual size of the required containers, as this depends on the required amounts of the ingredients as calculated with the spreadsheet for a specific amount of cloth.

E.g., if you want to dye a tee shirt which weighs **120gr**, you need a dyeing pot which can hold 3l of water, but if you want to dye a Jiworn which weighs **800gr** the pot need to hold **20l**. So you need to play a little bit in order to find the right material for the job.

1.3.1 Various equipment

- **Rubber gloves.** Mainly used to stir the cloth during the dyeing process.
- **Fine scale** for the dye.

There is no way around getting a fine scale which can weigh fractions of a gram.

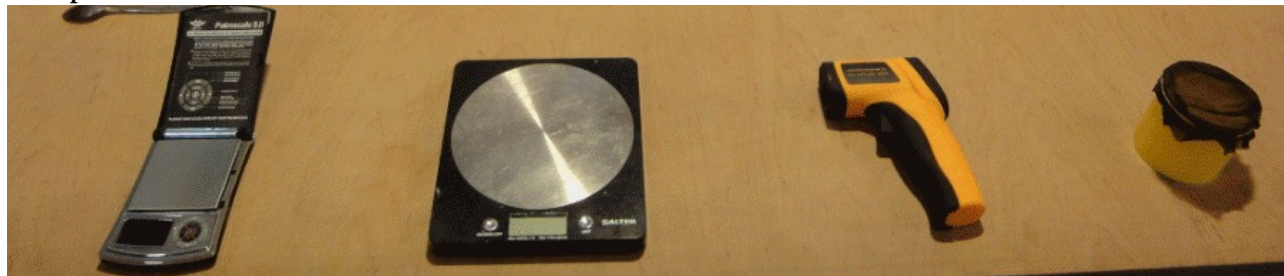
One aspect is, that you can't just use a measuring spoon instead of a scale as one volume of e.g. orange dye powder has a different weight than the same volume of yellow.

Another aspect is that if you dye e.g. 500gr of cloth a difference of e.g. 0.25gr of blue dye powder would mean a deviation of over 0.5% in the mixture which would lead to a considerable change in colour. This must not be a problem but prevents you from reproducing a certain colour.

It is useful to have a scale which updates the display quickly, so you can see faster how much you've added. I've used the product Palmscale 8.0 which is very accurate and inexpensive. Take care to get the 300gr version which weighs in 1/100 gr steps, the 800gr version does only 1/10 gr steps.

- **Kitchen scale** for cloth, salt, soda ash (sodium carbonate) and water softener (sodium hexametaphosphate).
- **Thermometer.**
- **Clock or timer.**
- Very fine **water strainer** or similar to strain the dye.
If your netting is not fine enough, try using a double layer.
- (Optional) **Apron.**
- (Optional) **Rag**, to clean up the dye splashes during the dyeing.

Example



From left: Fine scale, kitchen scale, infra red thermometer (can only be recommended), water strainer

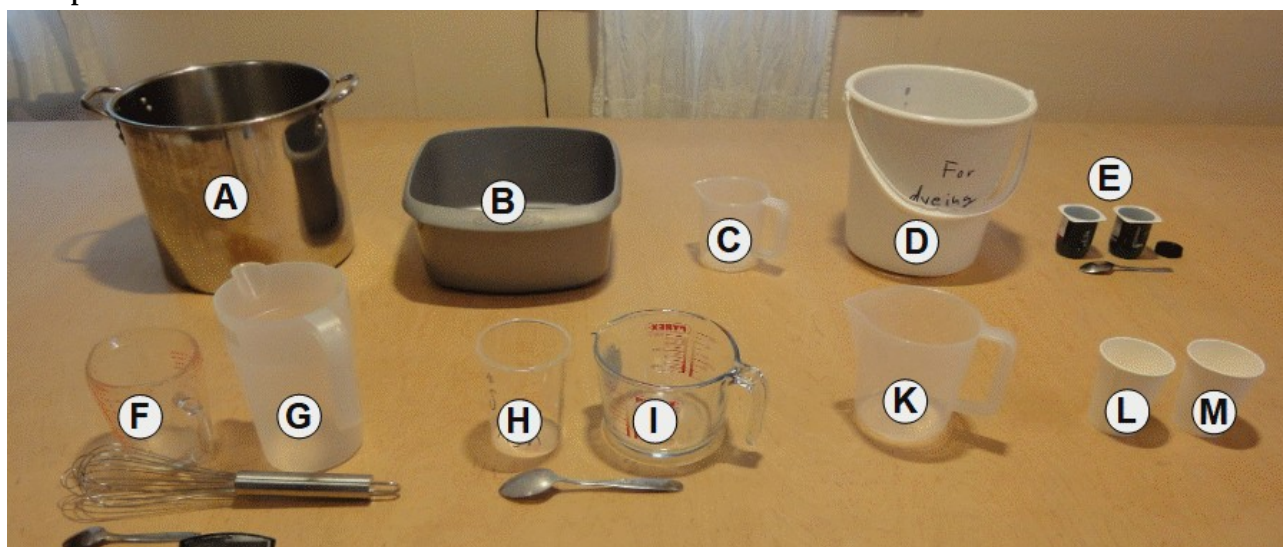
1.3.2 Containers and stirrers

Especially when you start with this kind of dyeing procedure it can be challenging to find the right container once are in the middle of doing it. Therefore, chapter 1.10.7 *Container labels* provides **labels which can be printed out** and stuck to some of them.

The letters behind the names are an aid to find specific entries quicker.

- **Dyeing pot (A)** (once the chemicals are dissolved in the dyeing pot, we also refer to it as “**dye-bath**”).
In order to keep the fabric well submerged it would be good if the pot is not too flat in relation to the amount of water used.
- **Temporary container (B)** to hold the cloth when taking it out of the dye-bath between the dyeing steps.
- **Scooping jug (C)** to scoop water out of the dye-bath.
- **Water measuring container (D)**. You can use a **cleaning bucket with litre scale** for larger quantities. If you only have an ordinary kitchen measuring jug that is also OK, but it can take some time to measure e.g. 20l of water.
- 3 x **Dye weighing containers (E)** which fit on the fine scale to weigh the **dye powder** + a **tea spoon** to scoop the dye powder out of the storage container.
It is useful to have different weighing containers for each colour to prevent contamination between them.
- 2 containers to pre-dissolve the **dye** + a **spoon** to mash the dye-powder + a **whisk** to dissolve the dye.
1st Dye container (F). Should not be too large in relation to the amount of dye powder.
2nd Dye container (G). Should be bigger than the 1st one to allow stirring of the dissolved dye with a whisk.
- [*Cellulose Fibres*] 2 containers to measure and pre-dissolve the soda ash (sodium carbonate) + a **spoon** to stir it.
1st Soda ash container (H). Should fit on the fine or kitchen scale and holds the measured powder.
2nd Soda ash container (I). Used to dissolve it in water.
- or -
- [*Silk*] **Vinegar container (J)**. Needs to have a **ml scale** in order to measure the required volume of vinegar.
- **Salt container (K)**. Should fit on the fine or kitchen scale.
- 2 containers to hold the **water softener (sodium hexametaphosphate)** which fit on the fine or kitchen scale.
1st Water softener container (L). Used for the dye-bath.
2nd Water softener container (M). Used for rinsing step.

Example



1.4 Chemicals

These are some general information about the used chemicals.

→ Always close the lids of the chemicals tightly as they can build lumps when they get humid or go off.

- **Procion MX dye**

The dye powder **goes off** over time, especially if it comes in contact with air, or is stored in a warm or humid place. Over time it loses its strength, whereby different colours lose their strength differently quick – this may result in a shift of the overall colour. So it's best, if you **a)** get only as much as you plan to use over a certain period, and **b)** store it in a dry and cool place (e.g. in a fridge).

After **one year** of storage a noticeable weakening of the colour depth has been seen. If that happens, you can either dye the cloth a second time, maybe with Medium or Light Shade, or use more dye powder straight away e.g. by combining the amounts given for Full and Light Shade in one dye run.

In that regard, it would probably be false economy if you have some dye powder left and after a year or so use it together with some newly ordered dye. Better to get rid of the old material and only use one set of yellow, orange and blue together which have been delivered at the same date.

The above statement **doesn't apply for silk**, as in that case the dyeing is based on a different chemical reaction than for cellulose fibres and you can use the dye powder for as long as you want.

- **[Cellulose Fibres] Soda ash (sodium carbonate)**

Is the fixative for cellulose fibres.

- **[Silk] 5% white, distilled vinegar**

Is the fixative for silk.

- **Salt**

The salt should be non-iodized, but if it is, this shouldn't be a problem.

"aids in the dyeing process by helping to drive the dye onto the fibre, out of solution, so that it is in the right place for any bonding to the fibre to occur."

- **Water softener (sodium hexametaphosphate)**

→ If you have soft water, you can ignore all the sections in this document which refer to "Water softener (sodium hexametaphosphate)".

For dyeing, we use the chemical **sodium hexametaphosphate**.

Use only a pure chemical and not something like water softener tabs for the washing machine, as they can interfere with the dyeing.

Without water softener you'll probably **get dull colours** and a visible, fine **layer of scum** on the cloth after dyeing.

The hardness of water is classified in the UK as "Soft", "Moderately Hard", "Hard" and "Very Hard". Currently, no advice can be given for moderately Hard water, maybe you could use half the amount of water softener.

- **Washing-up liquid**

Helps the dye to penetrate the fabric better and prevents dye particles of swimming on top of the water surface when dissolving it. Is also recommended to pre-wash cellulose fibre cloth.

1.4.1 Sourcing the dye

This manual describes the use of Procion MX dyes of two different dye suppliers, **Dharma Trading** and **Jacquard**.

Initially, all test and adjustments have been made with **Jacquard dye** but later a move to **Dharma Trading dye** has been made, because it is **more efficient** (e.g. amount of dye powder for 500 gr cloth with Dharma Trading: 46 gr, with Jacquard: 82.8 gr) and **cheaper**.

The dye mixtures used in the spreadsheet are different for both dye suppliers and also lead to different colours. This means, that if you move from one supplier to the other, you will get different results. It should also be pointed out, that the Dharma Trading mixtures have been better tested.



Please note, that a different kind of blue dye is required for cellulose fibres and silk.

1.4.1.1 Dharma Trading dye

The dye has to be ordered in the US: <https://www.dharmatrading.com/>

For the UK: Ordering in the US is actually not complicated as the customs clearance is being made by the parcel service and they either send you a card with the price to be paid before delivering it or an invoice after delivery (at least, this has been our experience).

If, for example, you would order these quantities:

PR1 Lemon Yellow: 1x **1lb** (453 gr)

PR6 Deep Orange : 1x **1lb** (453 gr)

PR22 Cobalt Blue: 2x **2oz** (56.5 gr) – Total 113 gr

you can dye ca. **10.3 Kg of cloth** to a full shade based on a mixture of 47.5% yellow, 45% orange and 7.5% blue.

You will also need **PR26: Sky Blue** if you want to dye silk.

Dye codes for your order

These are the product names of the dyes taken from their website. If you find similar names make sure, that the Procion MX codes like “MX-8G” are the same ones as given below in bold. For example, they had some special editions like “PRST18 : Lemon Yellow (PR1)” compared to “PR1 : Lemon Yellow - Yellow 86, MX-8G (Primary)” - in which case we would need the latter one.

PR1 : Lemon Yellow - Yellow 86, **MX-8G**

PR6 : Deep Orange - Orange 4, **MX-2R**

[Cellulose Fibres] PR22 : Cobalt Blue - Blue 109, **MX-2G**

[Silk] PR26 : Sky Blue - Blue 4, **MX-R**

1.4.1.2 Jacquard dye

The advantage of Jacquard dye is the better availability outside the US. Therefore, if you want to make a few tests before ordering Dharma Trading dye it might be easier to get a few cans of Jacquard dye in a local shop.

Dye codes for your order

These are the product names of the dyes taken from their website. If you find similar names make sure, that the Procion MX codes like “MX-8G” are the same ones as given below in bold. Jacquard doesn’t show the codes directly on the product page, but rather in a linked document.

Anyway, there should be no need to look for the Procion MX codes, as the product names are precise enough.

004 Lemon Yellow (**MX-8G**)

020 Brilliant Orange (**MX-2R**)

[Cellulose Fibres] 076 Cobalt Blue (**MX-2G**)

[Silk] 072 Medium Blue (**MX-R**)

1.5 Usage of the spreadsheet

Part of this manual is the Libre Office spreadsheet *Dyeing Manual.ods* (*Dyeing Manual – Excel.xlsx* for MS Excel) which calculates the required ingredients based on the dry weight of the cloth you want to dye. Make sure, that *Dyeing Manual.ods* / *Dyeing Manual – Excel.xlsx* is of the same version as *Dyeing Manual.pdf* by comparing the version number given in the spreadsheet named “Cover” with the number given on the last page of this document here.

The following paragraphs describe the sections of each spreadsheet.

If there are differences for certain fabric / dye combinations, they are described under a individual sub-heading.

1 – Set colour

The colours are set in percentage of **yellow, orange and blue** dye (**green** instead of yellow and blue for polyester) which have to be mixed together.

In this section you could adjust the colour if wanted, see chapter 1.10.4 *Adjusting the colour* on how to do that.

When the colours were designed, the goal was to get a **deep and saturated colour tone**, comparable to commercially dyed materials (silk doesn't take the dye that well and yields a lighter shade).

If the colour you get looks rather **weak or faded** and the dyeing procedure was done correctly, the most probable cause lies in a **type of cloth** which doesn't take the dye well or that your **dye is old**. After one year of storage a noticeable weakening of the colour depth could be seen – the best is not to order too much dye and to store it in a fridge.

You can find more information regarding the dyeing result

- for cotton in chapter 1.10.2 *Notes on cotton*,
- for silk in section 3 below,
- for polyester in chapter 1.9 *METHOD FOR POLYESTER*.

If you are not satisfied with the depth of the colour you've got, you can dye the cloth a second time.

It is good to know that if you would dry the cloth directly after dyeing it you wouldn't see the final colour as Procion MX dye needs very hot water to be rinsed out completely, for more on that see the introduction to *Section 3 - Rinsing* in chapter 1.6 *Manual-dyeing steps*.

Changing the colour of an already dyed cloth

By omitting dye colours from the dye mixture, you can change the existing colour of a cloth.

If you want the cloth to look **more red**, use only the given orange and yellow dye parts (only orange for polyester).
If you want **less red**, use only the blue dye (green for polyester).

Which of the shades - Full, Medium or Light – fits best has to be guessed.



Again, please be aware that you need a different kind of blue dye for cellulose fibres and silk.

Sheet “Cellulose fibres - Dharma Trading”

The default setting is 47.5% yellow, 45% orange and 7.5% blue.

If you want a lighter colour with a similar colour tone, you could try 53% yellow, 40% orange and 7% blue.

As it is impossible to know in advance how your dyed cloth will look it is recommended to use at first the default settings and then decide if you want to change it.

2 – Set fabric weight

You need to weigh the fabric while it is **dry**.

3 – Required ingredients

See chapter 1.4 *Chemicals* for the discussion of the used chemicals.

Generally, the columns **Full**, **Medium** and **Light Shade** give different amounts of the required ingredients to dye the cloth with a different depth by using **the same colour**.

Sheets “Cellulose fibres - Dharma Trading” and “Cellulose fibres - Jacquard”

- **Full Shade:** Use for white cloth.
- **Medium Shade:** Use to re-dye an already dyed cloth.
Should be sufficient for things like T-Shirts or thermal underwear while saving the chemicals.
- **Light Shade:** Re-dye an already dyed cloth.

Sheets “Silk – Dharma Trading” and “Silk – Jacquard”

- **Full Shade:** Use for white cloth **and** to re-dye an already dyed cloth.
- **Medium Shade:** Re-dye an already dyed cloth.

Generally, silk doesn't take the dye as good as cotton, therefore, it is highly recommended to dye white silk 2 times with Full Shade.

See also chapter 1.10.3 *Notes on silk*.

Sheet “Polyester”

- **Full Shade +:** Use for white material.
The Full Shade + setting uses a lot of dye and has been provided with the idea, that even material which doesn't take the dye well gets a good colour depth. For things like white fleece the Full Shade (without “+”) should also give a good result and saves 50% dye.
- **Full Shade:** Use for white material, see remark above.
- **Medium Shade:** A possible use is if you dyed something with Medium Shade but want to dye it a second time to get a deeper colour.

See also chapter 1.9 *METHOD FOR POLYESTER*.

Printing suggestion

The following chapter has been placed on it's own pages, so that you can print them out separately, laminate them, and use them as a reference while e.g. working at the sink.

If you print double-sided, they fit on 4 cards.

1.6 Manual-dyeing steps

Keep to the given sequence, as there are usually reasons for it.

Section 1 - Preparation

These steps can be done some time before the actual dyeing


Step 1 - Pre wash cloth in the washing machine

"Perfume, whiteners and brighteners in household detergents and soaps can totally change the dye color."

As special laundry detergents without these additives can be quite expensive, you can use ordinary **washing up liquid** for cellulose fibres and **hair shampoo** for silk. If you are using the latter, make sure that it doesn't contain additives like conditioner, baby-shampoo would be a good choice.

Washing up liquid creates a lot of foam, so don't take too much.

If you wash the cloth some time before the actual dyeing, make sure to soak the cloth again for **at least for 15 min** in warm water before putting it into the dye-bath, this helps getting a more even colour.

 **Make sure you don't wash your cloth with ordinary laundry detergent before dyeing it !**

Step 2 - Measure auxiliary chemicals

Measure the required weight (given in gr) or volume (given in ml) of each chemical as given in the spreadsheet and place them into the provided containers listed in chapter 1.3.2 *Containers and stirrers*.

- **Salt** into the **Salt container (K)**.
- **Water softener (sodium hexametaphosphate)** for the dye-bath into the **1st Water softener container (L)**.
- Again, **the same amount** of Water softener for rinsing into the **2nd Water softener container (M)**.
- **[Cellulose Fibres] Soda ash (sodium carbonate)** into **1st Soda ash container (H)**.
- or -
- **[Silk] Vinegar** into the **Vinegar container (J)**.

Step 3 - Weigh the dye



1. **Weigh** the required amounts of yellow, orange and blue dye, as given in the spreadsheet, by using the 3 **Dye weighing containers (E)** and ...



2. ... place them together into the **1st Dye container (F)**.
Especially with the blue dye, take care to weigh the powder as exact as possible.



3. Stir the dye powder well, so that it gives an even mixture.

Section 2 - Dyeing

Now, the actual dyeing begins and the following steps should be done without interruption

Step 1 – Prepare water with the right temperature

Keep the dye-bath always at a temperature between **35°C – 45°C**.

Start with a temperature of **45°C** and increase the temperature once it falls **below 40°C**.

1. Pre-warm the **Dyeing pot (A)** with some hot water and pour it out again.
2. Measure the required volume of water using the **Water measuring container (D)**, usually a water bucket with litre scale, and pour it into **Dyeing pot (A)**.

As a suggestion, here are two easy methods to increase the temperature:

Method 1: Place the dyeing pot in a sink, put the plug into the drain, and fill the sink with hot water once the temperature falls. You might need to repeat this from time to time, especially if you are dyeing small quantities.

Method 2: Put the dyeing pot safely on two pieces of wood and place a blow heater in front of it. The hot air should be able to flow under the pot, between the wood pieces. (This has been tested only with small amounts of liquid).

Note on the total dyeing time

If the temperature can't be kept high enough, it might be useful to extend the total dyeing time by 10 to 15 minutes in order to get the most out of your dye.

Why ?

If the temperature is too low, the dyeing takes longer and you have to increase the dyeing-time in order to account for that, if it is too high, you loose dye which binds with the water itself instead of to the cloth.

Step 2 - Add the first auxiliary chemicals to the water

1. Add the **water softener (sodium hexametaphosphate)** from the **1st Water softener container (L)** to the **Dyeing pot (A)**. Pour it in slowly while continually stirring.
 2. Add a tiny drop of washing up liquid.
- Do not add the salt yet!

[Cellulose Fibres]

Step 3 - Dissolve soda ash (sodium carbonate) → It doesn't go into the dyeing pot yet !



Keep the Soda ash away from the dye-bath and your cloth.

It only has to be added once you are 15 minutes into the dyeing process.

If you get drops of it earlier on your cloth, you might get permanent spots there.

1. At first, we only add the water.

Scoop water out of the **Dyeing pot (A)** into the **2nd Soda ash container (I)**, the amount should be just enough to dissolve the powder conveniently.



2. Then, we add the soda ash (sodium carbonate).

Pour the soda ash powder from the **1st Soda ash container (H)** slowly into the **2nd Soda ash container (I)** while continually stirring it.

Step 4 - Dissolve the dye

The procedure to dissolve the dye powder might look a bit too much, but if you don't dissolve all the little dye lumps carefully, especially the blue, **you easily get spots on your cloth** (which did happen in the past).

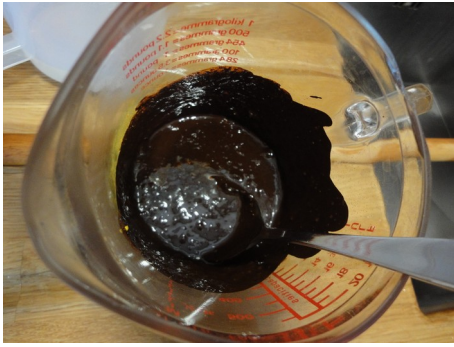
Take the water you need for the following steps out of the **Dyeing pot (A)**.



1. Add a few drops of water using the **Scooping jug (C)** to the dye powder in the **1st Dye container (F)** while squashing and stirring it with a spoon until the dye becomes a **creamy paste**, the consistency we aim at could be compared to soft tooth paste.

→ It is very difficult to describe how much water you have to add in the beginning because the point when the mixture becomes too liquid happens rather suddenly. So **add a bit, stir it, and after a few seconds add more**. If the solution becomes too liquid, it makes it more difficult to "catch" the remaining lumps with the spoon.

2. Try to mash up as many of the dye lumps as possible.



3. Once the mixture has the consistency of a creamy paste, **add** step by step **more water** while mashing up remaining dye lumps.



4. **Continue** adding water and mashing up the dye, **until you have a water-like liquid** with only a few lumps left.
5. **Stir well for a while**, like you would do to dissolve sugar in a cup of coffee.



6. Pour the dissolved dye through the strainer into the **2nd Dye container(G)**.



7. Use a spoon to squeeze remaining dye lumps through the strainer.

8. Pour some more water from the **Dyeing pot (A)** into the **1st Dye container (F)** to rinse out the remaining dye and pour again through the strainer into the **2nd Dye container (G)** - repeat, until most of the dye has been washed out from the 1st Dye container (F) and the strainer.

➔ When taking water out of the dye-bath use only the **Scooping jug (C)** - which should be free of any dye – to avoid getting dye lumps into the dye bath.



9. Now,
- **stir** the dye solution in the **2nd Dye container(G)** for a minute or so with the whisk,
 - **wait** a minute and
 - **stir** again.

10. Clean the strainer carefully under the tap, as we'll need it again.

Step 5 - Add salt to the water

1. Pour the salt from the **Salt container (K)** into the **Dyeing pot (A)**.
 - Stir while adding the salt, but it is not important to dissolve it all right now.

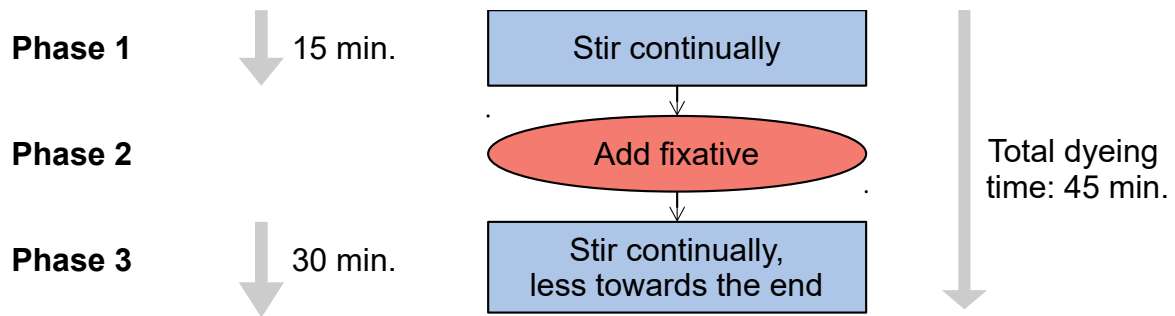
Step 6 – Add dye to the water



1. Pour the dissolved dye from the **2nd Dye container (G)** into the **Dyeing pot (A)** through the strainer (which is not shown in the picture). This time, don't try to squeeze remaining dye lumps through the mesh with a spoon, just set it aside after use.
 - Again, it can happen very easily to get **dark spots** on the cloth from undissolved blue dye, which is why we use the strainer once more.
 - **Stir while adding** the dye and continue doing so until all the salt from the previous step has been completely dissolved.

Step 7 – Soak cloth in dye-bath

The actual dyeing can be divided into 3 phases:



From the previous steps, we now have the ready to use dye-bath available in **Dyeing pot (A)**.

Phase 1

🕒 Start timer

1. Take cloth out of the **Temporary Container (B)** and submerge completely in **Dyeing pot (A)** using the gloves.
2. For **15 minutes**, move the cloth **continually** around with the gloves.
 - From time to time re-arrange the cloth, move what sits at the bottom to the top.

Why ?

If you have creases sitting on the same place for a long time, you will get an uneven shade there.

Phase 2

🕒 After 15 minutes



3. Move the fabric temporarily from **Dyeing pot (A)** into the **Temporary container (B)** **before** adding the fixative soda ash for [Cellulose Fibres], or vinegar for [Silk].
4. Pour the fixative from the **2nd Soda ash container (I)** [Cellulose Fibres] - or - the **Vinegar container (J)** [Silk] into the **Dyeing pot (A)** and stir well.
5. Put cloth back into the **Dyeing pot (A)**.

Phase 3

🕒 This phase lasts 30 minutes

6. Move the cloth **continually** around with the gloves.
 - If you want, you can move the cloth less during **the last 15 minutes**, maybe **every 2 minutes**. (This is, because after a total dyeing time of around 30 min. most of the dye has been used up.)
 - From time to time re-arrange the cloth, move what sits at the bottom to the top.

🕒 After 45 minutes

7. Take cloth out of the dye-bath into the **Temporary container (B)**.
8. Pour used up dye-bath from the **Dyeing pot (A)** into the sink. (There is not much dye left in the bath so it doesn't make sense to "re-use" the rest.)
9. Proceed to the section 3 for rinsing.

Section 3 - Rinsing

The actual dyeing is done, now the cloth has to be rinsed

General note

The dye which remains after the dyeing in the cloth needs very hot water in order to be washed out completely.

Tests have shown, that if you wash the cloth with only **60C** after dyeing it, it **takes several washes** for the remaining dye to be removed. That is generally no problem, but you should know that the cloth gets noticeable lighter over the next few washes and probably more red.

The **best way** is, if you are able to wash the fabric with **90C**. After that, the colour should remain more or less the same. So you have to decide, if your dyed material can take 90C or if 60C or less is safer.

This also means that the colour you see directly after the dyeing is not the final colour, you will see the end product only after most of the remaining dye has been rinsed out.

This note is mostly relevant for Step 4 below.

Step 1 – Cold / hot rinse

1. Fill the **Dyeing pot (A)** with **cold water**, put the cloth back in, and wash the excess dye out for a while.
2. Repeat this **2 times** with very **hot water**, as hot as the fabric can take.
Don't make your self the trouble to boil water on the stove, just take it from the hot water tap.

Step 2 – Soap soak

1. Take cloth out and put it into the **Temporary container (B)**.
2. Fill the **Dyeing pot (A)** with hot water, roughly **the same the amount of water** you used for dyeing.
3. Add the **water softener** from the **2nd Water softener container (L)** to the **Dyeing pot (A)**.
Pour it in slowly while continually stirring.
4. Add some **washing-up liquid**, but not too much as it creates a lot of foam.
5. **Put cloth back** into the pot, move it a bit around and then let it **soak for 5 – 10 minutes** while keeping it completely submerged.

Step 3 - Rinse again

1. Rinse again in very **hot water**, as hot as the fabric can take.
2. Repeat this step until the water becomes nearly clear.

Step 4 – Final wash

Wash the cloth directly after Step 3 in the **machine** with the **maximal temperature** suitable for that cloth type, **90C if possible**.

Use **washing up liquid** for cellulose fibres and **hair shampoo** for silk. The idea behind not using ordinary laundry detergent in this step is, that if you are not happy with the depth of the colour and you want to dye your things a second time, you don't have to worry about chemicals in the detergent which could interfere with a 2nd dye run.

If available, add washing soda and water softener (sodium hexametaphosphate or any water softener tabs for washing machines, sometimes called “lime scale prevention tabs”).

For more on that, see chapter 1.10.5 *Water hardness and laundry*.

1.7 Kathina-speed-dyeing steps

This description presumes that you have done the manual dyeing procedure in chapter 1.6 at least once and have an understanding of how it works, as here is only a **description of the changes** which need to be made to the procedure.

The central idea is, that **a)** we use very hot water in order to get the dye to bind quicker to the cloth and **b)** to put the fixative into the dye-bath straight away at the beginning.

1. As you probably don't know the **weight of the robe** in advance, you can weigh an existing one, generously round up and put that value into the spreadsheet (we've once used 500gr and got a very nice result).
2. DO THE FOLLOWING BEFORE THE ROBE IS FINISHED (in order to save time)
Prepare steps from **Section 1 / Step 2** (in chapter 1.6) up to and including **Section 2 / Step 2**, but with these changes:
 - > Use **60C hot water** for the dye-bath in Section 2 / Step 1.
3. DO THE FOLLOWING AFTER THE ROBE HAS BEEN FINISHED
Continue with the steps from **Section 2 / Step 3** up to and including **Section 2 / Step 6**, but with these changes:
 - > Don't worry about soaking the cloth 15min as noted in Section 1 / Step 1, just move it around a few times in warm water so that all areas get wet.
 - > Under the **Steps 3 and 4** it is said to scoop some water out of the dyeing pot to dissolve the soda ash and the dye powder, but we **don't do that here**, as it is now 60C hot and would bring certain disadvantages. Instead use **hand-warm water** from the tap.

*- Once we have finished **Section 2 / Step 6** we leave chapter 1.6 and continue with the description here -*

4. Pour the soda ash (sodium carbonate) into the dye-bath **straight away after adding the dissolved dye**, put the cloth in and **move cloth around intensely for 15 minutes**.
5. **Take cloth out**, rinse under the running tap for **a few minutes in cold** and then in **hot water** until the water looks clear enough. It doesn't have to be perfectly rinsed, but if you leave too much dye in the cloth, you might mess up your ironing board.
6. Spin dry.
7. Wrap the robe into a big bathing towel (like you would roll a bathing cloth together with a sabong) and twist the whole thing as hard as you can.
8. Dry with an iron, cover iron board with a cloth to prevent stains.
9. **Finished !**

And just to mention, this procedure can't be recommended for regular dyeing jobs as the cloth doesn't get dyed evenly enough and you waste dye which binds with the hot water.

1.8 Machine-dyeing steps

If you are new to using Procion MX dye, it might be necessary to read the chapters about hand-dyeing.

The described method has been taken from the Jacquard documentation for Procion MX dye, the measurements given below have been converted from the US units to metric units and rounded.

The method is **recommended for amounts of 1400gr – 2300gr cloth**.

One test has been made with this method which led to a slightly **uneven colouration** of the cloth (some subtle, dark shadows and fine crease-lines). The reason is probably, that you have to pour the soda ash (sodium carbonate) and the dye together into the machine at the same time, so that the dye will start to bind with the cloth straight away and doesn't have time to soak properly into the material.

Further, due to the spinning drum the cloth can get twisted and be prevented from moving freely. In these twisted areas the dye can't reach the fabric properly which leaves them lighter as other parts.

For underwear and similar, the method seems to be good enough, but **can't be recommended for robes**.

There are more sophisticated methods described in the internet which probably lead to better results, but machine

dyeing wasn't the focus of this manual and therefore hasn't been followed up (some of these procedures are actually so complicated, that one wonders, where the advantage over hand dyeing should be).

If you have some knowledge about how your washing machine works, you could tweak the given procedure by pouring the dissolved soda ash after 15 minutes via the detergent compartment into the drum, analogous to manual dyeing. But in that case, you should be sure, that the machine doesn't start draining shortly after adding it.

If you still want to go ahead, here is how.

1.8.1 Required chemicals

Dye powder	You need 2 x times the amount of dye as for the manual method. To get the correct calculation, you can multiply the dry weight by 2 and fill it into the spreadsheet as described in chapter 1.5 <i>Usage of the spreadsheet</i> .
Soda ash (sodium carbonate)	600gr – 800gr (for darker shades)
Salt	1700gr – 2200gr
Water softener (sodium hexametaphosphate)	You need 5 gr water softener per litre water. If you are lucky, the manual for your washing machine shows the number of litres it uses per program, if not, you could make an assumption, e.g. 50l.

1.8.2 Steps

1. **Pre wash** the cloth as described in chapter 1.6 *Manual-dyeing steps*, Section 1 / Step 1.
2. **Measure** the chemicals which are listed in the table above.
3. Fill one bucket with ca. **4l hand-warm water** and dissolve **salt, soda ash and water softener**. You can also use 2 buckets with 2l each, one for the salt and one for soda ash and water softener, but this doesn't really matter.
Only a small amount of the chemicals will dissolve, most of it sits at the bottom.
4. **Dissolve the dye in a separate container** as described in 1.6 *Manual-dyeing steps*, Section 2 / Step 4, except that you use hand-warm water from the tap.
5. Set the washing machine to a **program** which runs at **40C** and lasts **no less than 45min**. Longer shouldn't be a problem but doesn't give any advantage as most of the dye will be used up after 30min.
6. Put the dissolved chemicals from the bucket and the dye at the same time **together in the machine**.
7. **Add the cloth and start** the machine.
8. When the program is finished, **wash your dyed cloth** as hot as the cloth can take. It is good to add washing soda and water softener tabs (sodium hexametaphosphate or any water softener tabs for washing machines, sometimes called "lime scale prevention tabs") to clean the remaining dye out of the fabric as thorough as possible.
9. Remove the dyed pieces and start a short program without laundry to **rinse out the machine**.
You probably need to clean some remaining dye from the glass and rubber seal.



There are machines which start by draining any liquid which is in the drum.

Test out what your machine does, else you can lose all your dye straight away at the beginning.

1.9 METHOD FOR POLYESTER

This procedure is much more straight forward than the one for Procion MX dye, you only need to read this chapter and chapter 1.5 *Usage of the spreadsheet*.

The dye you need is called **iDyePoly** from the manufacturer Jacquard and is available in 14gr packs which contain the dye and the required, liquid colour intensifier or in 1lb (453gr) cans.

The colours you need are **Orange JID 1448**, and **Kelly Green JID 1460**.

If you want to dye any larger amounts the small packs become very expensive and impractical as you need a lot of dye powder so it is better to get the Orange in 1lb cans, for Kelly Green the 14gr packs should be enough as you need only 4.5% of it.

Regarding the smaller packs, don't trust the amounts printed on them, **always weigh the dye powder**. On one occasion, 17gr has been measured for the dye powder though it said 14gr on the packet and 13ml for the colour intensifier though it was said to contain 14ml.

There are generally 3 steps:

1. Enter the dry weight of your cloth into the spreadsheet named "Polyester".
2. Measure the required chemicals as shown in the spreadsheet.
Please note, that a small inaccuracy when measuring the green dye can have a big effect on the colour.
3. Follow the dyeing instructions of the manufacturer, but use the measured amounts instead of the whole packs.
The dyeing instructions is printed on the inside of the 14gr packs.

You need the following equipment to measure the chemicals:

- **Fine scale** for the dye.
See description for the fine scale in chapter 1.3.1 *Various equipment*.
- **2 weighing containers** which fit on the fine scale to weigh the dye powder + a tea spoon for the dye.
It is good, to use a different container for each colours.
- **Kitchen scale** for the cloth.
- Small measuring spoons or a small jug which enables you to roughly **measure in ml units**.
Be aware, that the colour intensifier is an oily substance, so if you use a large measuring jug you would loose a certain amount of liquid sticking to the walls.
- Appropriate containers to store the partially used dye powder and liquid colour intensifier.

Notes on the procedure

- Add a tiny drop of washing up liquid to the water after filling the pot, then the dye doesn't swim on the surface.
- A dyeing time of **45 minutes** has been enough with white fleece cloth. However, if you dye material which doesn't take the dye well or you have to use more water, e.g. because of the size of your pot, extend it to maybe **60 min**.
- The dye leaves a chemical smell on the fabric, so it might be useful to put the material straight after dyeing in a pot with clear, boiling water and boil it for a while (hasn't been tested yet).

Notes on polyester material

- Be aware, that **polyester textiles can shrink** in the same way as cotton does.
- It is quite unpredictable how good a specific material takes on the dye.
- If your material dyes too orange, you can give it another go with a little bit of green dye only.

Dyeing an orange fleece jacket

If you have an orange fleece jacket and want to give it a more "appropriate" colour, you could enter it's weight into the spreadsheet and dye it by following the procedure described here with the exception, that you **only add the amount of green dye** which is given there. This hasn't been tested yet but is a good guess.

1.10 Appendix

Contains additional information for the **cellulose fibres** and **silk method**.

1.10.1 Thanks and References

Thanks

I would like to express my gratitude to the Sangha members who helped me with reviewing this manual and by that way making it better understandable and useful for others.

Especially, I would like to thank Aj. Kongrit, Ven. Narindo, Ven. Anejo, Ven. Jinavaro, Sm. Dighadassi and Sm. Jalito.

References

The basic dyeing procedure has been taken from the instructions for Procion MX provided by the dye supplier Jacquard and been adapted for the use here.

Quite a lot of information has been incorporated from Dr. Paula E. Burch from her website <http://pburch.net>. If you should ever have any exotic questions about dyeing, chances are high that you'll find an answer there. Without her generously provided descriptions, FAQ's, tables, etc., there would be a few things missing here.

A few other helpful points have been cited from Dharma Trading Co. (<https://www.dharmatrading.com/>).

1.10.2 Notes on cotton

Your best starting point for dyeing cotton would be, if you are dyeing

- 100% cotton cloth,
- which is bleached (during the manufacturing process) and mercerised,
- before sewing it.

The more **non-cellulose fibres** the cloth contains (like polyester), the lighter the resulting colour will be. If you are dyeing underwear like long johns, you still get good results with only 60% cotton.

If you use cloth which is **not bleached and mercerised**, like some forms of natural cotton, the resulting colours won't be so bright and deep.

Even if you pre-wash the cloth with 90C before dyeing it, it can **shrink further during the dyeing process**.

See also chapter 1.10.6 *Sewing and dyeing robes*.

1.10.2.1 Starch

“Starch is a huge problem because it is so difficult to remove. Not even boiling will remove starch. Since starch contains the same glucose building blocks as the cellulose in cotton, it will be dyed just like the fiber; however, the dyed starch will then gradually bleed out with every washing, making it look as though your dye was not properly bound to the fiber in your fabric. The only answer to this problem is not to dye fabrics that have been sized with starch.” (<http://www.pburch.net>, Dr. Paula E. Burch)

1.10.3 Notes on silk

In order to **avoid shrinkage** in existing garments (which has happened), follow these points:

- Use a temperature of **maximal 30C**, which includes the rinsing at the end of the dyeing process.
- To make up for the lower temperature, dye for **60 minutes**.
- Be **very gentle** when moving the garment in the dye-bath, avoid excessive squeezing.
Only stir more intensely (for a minute ?) directly after putting it into the dye-bath and again after adding the vinegar.

1.10.4 Adjusting the colour

There are many factors which can have an effect on how the dyed cloth will actually look, a detailed description of these factors can be found on www.dharmatrading.com.

Some factors are: type of fabric, age of the dye, chemistry of your water, temperature, pre-washing.

For the case that you are unhappy with the colour you get after dyeing **cellulose fibres or silk**, here are some tips on how to tweak the dye mixture. **Polyester** is not included here, as this mixture uses only orange and green.

Generally can be said, that a change of **0.5% blue** for cellulose fibres or silk or **0.5% green** for polyester has a considerable effect – so be careful when changing these.

- Focus only on the amount of orange and blue dye in your considerations. Adjust the amount of yellow after changing orange or blue to get again a total of 100%.
- Orange dye: You get a noticeable difference when changing the amount by 5%.
- Blue dye: You get a noticeable difference already when changing the amount by 0.5%.
- If you want a **less red** colour, you can either
 - a) **decrease** the amount of orange
 - or -
 - b) **increase** the amount of blue (which leads to a darker colour than a).
- If you want a **more red** colour, you can either
 - a) **increase** the amount of orange (which leads to a darker colour than b),
 - or -
 - b) **decrease** the amount of blue.
- For a bigger change, you can apply the changes suggested under a) and b) both at the same time.

And to say it straight away: There is no fast-track way to see how the outcome of your change will be, you have to **go through the whole dyeing procedure** only then will you see the final result.

Further, if you want to dry the cloth **with an iron** to see the final colour, do so only after it has been thoroughly rinsed as you could get permanent changes in the colour if it still contains too much dye.

1.10.5 Water hardness and laundry

Here is a very detailed answer from Dr. Paula E. Burch to an email in 2017 why you should use water softener when there is **hard water** in your area:

"Do try to acquire some water softener. The calcium and magnesium ions in hard water otherwise can combine with soda ash to form an insoluble precipitate. In addition, some Procion dye molecules can form a dimer with calcium in between, creating a more difficult-to-wash-out compound. It is possible to think that you have washed out all of the unbound dye, using hard water, only to find that when a customer washes the item with softer water, more dye washes out, possibly transferring onto other garments. Such misplaced dye can be removed with hot water, since it has not reacted with the new locations, but it's better to avoid this occurrence."

These measurements could be taken to improve the washing result when you have hard water:

- Add water softener.
- Add washing soda.
- Increase the amount of laundry detergent, if you have no water softener.

For the dyeing procedure this is especially important for **pre-washing the cloth** before dyeing it, as residues of chemicals or fat can affect the colour or leave spotty areas.

1.10.6 Sewing and dyeing robes

One method when you want to sew your robes from white cloth and later dye it, is to a) pre-wash the cloth with 90C in order to shrink it, b) sew the robe and c) dye it.

The problem with that is that the dyeing + rinsing procedure at the end can lead to further shrinking. For a Jiworn, this can be several cm, usually in the width.

You can avoid these problems by following this procedure:

1. Measure and cut the robe material and include a buffer for the expected shrinkage.
Don't cut the strips for the border, rather prepare one big piece which will be cut later.
2. **Wash** cloth with **90C**.
3. Sew the robe without trimming it and without putting the border on.
(Take care, to close the seams at the fringes of the cloth properly.)
4. **Dye** the robe and the extra piece for the border.
5. **Wash** again with **90C**.
6. Trim the main piece, cut the border strip and sew the border on.

1.10.7 Container labels

Labels for some of the containers which can be printed out and stuck on.

Scooping jug (C)

Water measuring container (D)

1st Dye container (F)

2nd Dye container (G)

1st Soda ash container (H)

2nd Soda ash container (I)

Salt container (K)

1st Water softener container (L)

2nd Water softener container (M)

(v 1.3, 1 Dec. 2018, Dhammavicayo Bhikkhu)