LESSON 9  DYSES AND DYEING PROCESS

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9. **DYES AND THE DYEING PROCESS**

In the previous lesson we had learnt about the fabrics that are generally used for tie and dye work and the different methods used to tie them up for dyeing. These included: marbling, twisting & coiling, knotting, binding, stitching or sewing and tying objects, before dyeing.

In this lesson we will learn about dyes and the dyeing process.

### 9.0 Objectives

After going through this lesson you will:

- Gain an understanding about the dyes used for tie & dye.
- Understand various check points while doing tie & dye.
- Understand the process of dyeing in detail.

### 9.1 Introduction

The tie and dye process involves tying the fabric in different ways as described in Lesson 8 and then dyeing it with the aim of creating attractive, eye catching visual effects. Owing to bunching and binding, the actual sample which receives the dye is reduced in size and therefore needs less dye in proportion to its weight. This should be kept in view when preparing the dyebath.

As tie and dye is a resist dyeing process, the best dye is one that gives a powerful colour in a short time. The dye liquor must be strong enough to give dark colours in the design as the pale colours are produced in the folds of the fabric where the dye penetrates only partially. When more than one dyeing is done, it is usual to begin with the palest colour first and then dye the darkest colour last.

The fabric selected for tie and dye work should always be first washed in soapy water, as already pointed out in Lesson 8. It is not essential to wet out a sample before placing it in the dyebath as in ordinary dyeing it can be entered wet or dry.

As stated in Lesson 7 in the early days of tie and dye, natural dyes were used to create beautiful designs. However, with the advent of synthetic dyes, the advantages they offered led to their use in this unique craft also. A whole range of synthetic dyes described in lesson 2 of course no. 202 is available and the tie dye process can actually be carried out with basic, acid, direct, vat, disperse and reactive dyes.
dyes or with azoic colours. However, in practice, some of these dye systems are more in use than others and they will be described in this lesson. Also included would be a list of check points which allows the dye process to be carried out relatively more smoothly.

9.2 The Dyes and the Dyeing Process

9.2.1 The dyes used

The dyes which are extensively used for tie and dye work are reactive dyes, vat dyes, azoic colours (naphthols) and direct dyes. A very wide range of colours is available in each of these systems. Moreover a very comprehensive range of colours can be prepared by mixing four colours viz. yellow, blue, red and black. Some of the colours obtained by their combinations are given below:

Mixing of two colours

| Red     | Blue  | = | Orange |
| Red     | Yellow| = | Purple |
| Yellow  | Blue  | = | Green  |
| Purple  | Green | = | Grey   |
| Purple  | Orange| = | Brown  |
| Red     | Green | = | Brown  |
| Red     | Black | = | Maroon |

The process of dyeing using different dyes has been the subject matter of some earlier lessons. Here, the emphasis will be on the four dye systems specified above and typical recipes for tie and dye work.

9.2.2 Reactive dyes

Reactive dyes penetrate the material being dyed quite readily and are thus useful for dyeing bulky or closely bound samples particularly those bunched by the folding techniques. It is advisable to wet out smaller finely tied bundles or the resist will be lost. Sometimes after untying there seems to be no resist pattern left, but after rinsing and soaping at the boil, the loose dyestuff is washed away and the resist appear.

The fabric to be dyed should be well washed and made absorbent. Wash the fabric for 30 minutes in very hot water, in which 2 grams per litre of Lissapol D has been added. Alternately, soap powder or detergent may be added. Rinse the fabric thoroughly.

While the recipe will depend on which reactive dye is used (for this manufacturers' literature is available) a standard recipe is given below:

| Cold water reactive dye (strong) | : 5 grams |
| Common salt                     | : 60 grams |
| Caustic soda                    | : 20 grams |
| Water                           | : 1 litre  |
Dissolve the dye powder in half a litre of warm water and stir. In a separate container dissolve the salt and soda in half litre of hot water and stir. In a separate container dissolve the salt and soda in half a litre of hot water and stir.

When the fabric has been tied and is ready for dyeing, mix the two solutions together and stir. Place the sample in the dye liquor immediately moving it about constantly in the mixed solution with a wooden stick for the first 10 minutes and at intervals during the rest of the dyeing time, which for the standard recipe would be 1 hour.

In the hot-dyeing method, the above procedure is used with the dyeing been done at 70 degree Celsius.

After the dyeing has been completed, take out the sample and rinse it thoroughly until water clears. Then wash in boiling water to which a little Lissapol D, or detergent or soap has been added moving the sample about. Rinse, untie and rinse again. The ties can be opened when it is wet. Rinse again and iron while damp.

Before dyeing a second time, ensure that the sample is completely untied, rearranged and re-tied.

**9.2.3 Vat dyes**

These are very fast to light and washing and have been described in earlier lessons. An important point to note is that the recommended temperature of dyeing (usually 50ºC or thereabout) should never be exceeded and it is therefore advisable to always use a thermometer while dyeing. Also use of rubber gloves is recommended when handling the dyed sample.

As discussed in earlier lessons, the vat dyes are insoluble in water. They have first to be made soluble and this process is called “Vatting”. Thus dyeing with vat dyes involves two stages. These will now be briefly described.

To make approximately 2 litres of dye liquor, the following recipes may be used:

**Vatting:**
- 8 grams dye powder and ¼ litre soft water
- 4 grams caustic soda flakes or 10 cc caustic soda solution
- 4 grams sodium hydrosulphite

**Dyebath:**
- 1.5 litre soft water and 70 gms common salt
- 4 grams caustic soda flakes or 10 cc caustic soda solution
- 4 grams sodium hydrosulphite

**Vatting:** For making the dye soluble, i.e. for vatting, the dye powder is first pasted with a little amount of Turkey red oil in an enamel basin. Add ¼ litre of soft water and stir thoroughly. Place the basin in a sauce pan containing water and heat to 50ºC.

Put 100 cc (4 tablespoonful) of cold water in a jam jar, then add 8 grams of caustic soda flakes and stir until dissolved. Put half of this caustic soda solution into the vat (with the dye powder) and stir.
Next add 4 grams of hydrosulphite stirring very gently so that no air bubbles are formed. Maintain at 50ºC for 10 minutes stirring gently occasionally.

**Dyebath:** While the dye is vatting, put 1.5 litres of soft water into the dyebath. Add most of the remaining caustic soda solution and stir. Add 4 grams of hydrosulphite and stir gently, raising the temperature to 50ºC.

When the vat is ready it will have changed colour and be free from specks. Empty the basin containing the vat gently into the dyebath, bring the temperature upto 50ºC. Add salt and stir. Dye the sample from 1 to 10 minutes at 50ºC. It is possible to dye in a cold or lukewarm liquor, but most vat colours have the maximum affinity for the fabric when dyed at 50ºC.

If the dye bath shows any signs of changing back to its original colour, or specks are apparent add a little hydrosulphite and the remaining caustic soda solution. Leave for a few minutes, and then stir and resume dyeing.

When the dyeing is completed, remove the sample from the dyebath and squeeze. Do not rinse. Hang the sample up to oxidize for 20 minutes in an airy spot away from the sunlight.

Rinse thoroughly in cold water and then soak for 5 minutes in 3 litres of water to which has been added a few spots of 10% sulphuric acid and one tablespoonful of 30% acetic acid. Rinse well. Dry and untie. Boil the sample for 5 minutes in 2 litres of soft water and 25 grams of soap flakes.

Rinse and iron while damp. Repeat the process for each colour.

### 9.2.4 Azoic (Naphthol) colours

As described in earlier lessons, these are cold dyeing colours and very popular for brilliant red, maroon and navy blue colours. Their wash fastness is good but rubbing fastness is not so good. For colouring cotton, a two stage process is adopted. The first stage involves impregnation of the fabric sample with naphthol and the removal of excess liquor. The second stage relates to the development of colour with diazotized base or diazotized salt. The colour development takes place in-situ on the material by the coupling reaction between Naphthol and diazo component. After-treatment is essential for satisfactory fastness. It is an economically viable system for tie and dye and besides being cold dyeing it can dye materials in any form.

The naphthol can be pasted with industrial alcohol and warm water and then converted to Naphtholates adding caustic soda. The sample is impregnated with the solution of Naphthol and the excess solution is removed by squeezing the naphtholated sample. For cotton, this process can be carried out at room temperature but for viscose rayon a temperature of 80º-85º C is recommended.

The second stage involves the treatment of naphtholated material with diazotized base or diazotized salt. Since this has been described later in the lesson on batik (Lesson 11 of Unit 4) it will not be further described here.
9.2.5 Direct Dyes

Direct dyes are good all round dyes and are suitable for cotton, linen and viscose rayon. They can be dyed hot or cold.

- **Hot dyeing Method**

  Paste 15 grams dye powder with a little water. Add 2 to 4 litres of hot water according to depth of shade required. Add 90 grams of common salt and stir. Heat the solution gradually until almost boiling.

  Wet out the sample and dye at almost boil for 10 minutes to 1 hour stirring occasionally. A longer dyeing time gives a deeper colour. After taking out the sample, rinse well until water clears. Dry the sample.

  Before dyeing further colours, add more binding. When the final dyeing is completed, rinse thoroughly and after drying untie the sample. Rinse again and dry quickly. Iron while damp, covered with newspaper.

- **Cold dyeing (for medium shades only)**

  Paste 5 grams of dye powder with a little water. Add half a litre of hot water and add 30 to 45 grams of common salt. Bring the solution to boil and then let it cool. The cold dyeing procedure is similar to that for hot dyeing.

  Direct dyes can be superimposed on most dyes as a final layer of colour. A large sample with densely packed folds will need longer dyeing time – even more than 1 hour. Put it in the dyebath dry, add the salt at 15 minutes interval. If the dye becomes exhausted, add some freshly mixed colour to it.

  Due to low wash fastness, even after the fabric receives an after wash treatment, direct dyes do not meet the requirements set for cellulosic apparel finishing materials. Also due to German ban on certain azo dyes, many direct dyes based on azo structure are banned. For these two reasons direct dyes have been largely replaced by reactive dyes.

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**Self-check Questions**

Fill in the blanks

1. The dyes which are extensively used for tie and dye work are _______ dyes, ______ dyes, _______ colours (naphthols) and _______ dyes.

2. Direct dyes are good ___ _______ dyes and are suitable for ________, ________ and _________ ___________. They can be dyed _____ or ____.
9.3 Check Points

1. Cover all work surfaces and floors with plastic drop cloths. Work outside when possible.
2. Carry wet cloth over newspaper or a plate, in a plastic bag, or an aluminum pan to catch the dye drops.
3. Hang tie-dyes to dry outside over grass or place newspaper under them to catch drips.
4. Remove any spills or stains on the clothing with cleanser or household bleach.
5. Most dyes today are permanent. If they are not, add 2 extra tablespoons of salt to the dye bath, or 2 tablespoons of vinegar.
6. In the classroom, prepare colors in large containers and place them in a sink.
7. Tying in objects when binding fabric is fun and adds design interest. Pebbles, pop side sticks, coins and marbles can be tied into rubber bands to create patterns.
8. Have separate working areas for tying and dyeing work.
9. Work with patterns when tying knots, one person can hold the cloth, while the other ties.
10. Wash all materials before dyeing them to remove sizing. Old shirts are easy to work with. Natural fibers such as cotton and silk absorb dye and are colorfast.
11. Make sure all knots are tight, especially on thin material.
12. Fabrics look darker when they are wet. Plan to make the dye color a little stronger, as it will get light when the fabric dries. Dyeing time will depend on the color desired.
13. After an item has been tie-dyed, wash it separately with cold water and soap or have it dry cleaned.

After tie and dye is done, it is further embellished with zari, gota and stonework to make it look rich and royal. The latest trend used by designers these days is to mix and match and make garments or the final product look attractive.

Self-check Questions

3. Write any four check points which you should remember while doing tie & dye?

4. After tie & dye is done what other material can you use to further embellish the fabric?
9.4 Tie and Dye Today

Tie and Dye is a relatively easy process and in villages of India women and girls can be seen practicing this craft in their homes with pieces of malmal (fine muslin), handloom or silk cloth. This cloth is first bleached and then folded into two or four layers depending on the thickness of the cloth. A rangara or designer marks the layout of the pattern on the material using wooden blocks dipped in geru, a burnt sienna color mixed with water. The craftsmen then begin to tie the cloth, which is not to be dyed. The folds of the material within the small motif are lifted and tied together. The material with the first set of ties is dyed yellow. There is also a process, mostly followed in Rajasthan of dyeing parts of the material by hand - lipai technique. The material is again tied and dyed into red or green. If the border has to be darker, all the lighter parts are tied and covered with plastics foil and the edges are dyed with the required colors. Repeated tying and dyeing produces elaborate designs (Fig. 9.1).

![Fig. 9.1 Two different designs made using tie and dye technique](image)

9.5 Influence on the Life of People

When simply tied, Bandhani textiles are inexpensive and this is one of the cheapest ways for women of the poorer communities to dress in a colourful fashion. Bandhani Chunri is worn as a wedding scarf by the women of Gujarat. Men use it as a Turban for daily wear. Wedding sarees and shawls in auspicious colours have become increasingly popular and red, yellow and white colours are symbolic of joy and happiness.

9.6 Utility in Real Life

A fabric that has been tie-dyed can be used to make many attractive items, which have become popular in the international market also. Some of these are: lampshades, book covers, table covers, picture frames, window shades, gift-wraps, wall hanging, clothing and costumes. They can also be framed or mounted on cardboard. In addition shirts, skirts, scarves, jeans, ties, hats, bedspreads, dupattas, curtains and pillows can be given new life by using tie-dye.
9.7 Assignments

9.7.1 Class assignment
i) You will remember that you had tied four samples of fabric in the previous class, using different techniques of tying of fabric. Take these samples now and dye them according to the method you have learnt for dyeing of cloth, in this lesson.

9.7.2 Home assignment
i) The four samples that you had dyed may again be tied, for dyeing them later, to learn making tie and dye patterns in two colours.

9.8 Summing Up

In this lesson, we have learnt about the various dyes that are used for tie and dye, the dye formulations used and the method of dyeing.

9.9 Possible Answers to Self-check Questions

1. The dyes which are extensively used for tie and dye work are reactive dyes, vat dyes, azoic colours (naphthols) and direct dyes.

2. Direct dyes are good all round dyes and are suitable for cotton, linen and viscose rayon. They can be dyed hot or cold.

3. Some important points to be kept in mind while doing tie and dye are:
   - Cover all work surfaces and floors with plastic drop cloths. Work outside when possible.
   - Hang tie-dyes to dry outside over grass or place newspaper under them to catch drips.
   - Most dyes today are permanent. If they are not, add 2 extra tablespoons of salt to the dye bath, or 2 tablespoons of vinegar.
   - Remove any spills or stains on the clothing with cleanser or household bleach.

4. After tie and dye is done, it is further embellished with zari, gota and stonework to make it look rich and royal.
9.10 Terminal Questions

1. Which dyes are generally used for tie and dye?
2. What are the advantages of naphthol dyes?
3. What is the main disadvantage of direct dyes?
4. Describe how you will dye a tied fabric with a reactive dye?

9.11 References and Suggested Further Reading


9.12 Glossary

1. Wash fastness Permanency of a fabric dye or colour pigment against washing

2. Impregnation Saturation, spread all through

3. Auspicious Bringing good luck

4. Sienna Reddish, yellowish or brown pigment made from natural earth

5. Viscose rayon Synthetic fabric made from cellulose