

## CHAPTER 3

## Research Methodology

3.1 Material

It is unmercerized cotton fabric (only bleached), having the weight of 175.1875 gm/sq.m; and the numbers of yarn used for plain weaving are : 34.07<sup>S</sup> warp yarn , 17.84<sup>S</sup> weft yarn.

3.2 Chemicals

The chemicals used in the research are :

Procion MX (Reactive) dyes of I.C.I.Co.,Ltd.

- Procion Yellow MX - 8G (8G)
- Procion Yellow MX - 3R (3R)
- Procion Orange MX - 2R (2R)
- Procion Red MX - 5B (5B)
- Procion Brown MX - 5BR (5BR)
- Procion Turquoise MX - G (TG)
- Procion Blue MX - 4GD (4GD)
- Procion Blue MX - G (G)
- Procion Blue MX - 7RX (7RX)

Sodium Chloride, Sodium Carbonate, and Lissapol ND (detergent).

3.3 Apparatus3.3.1 Dyeing Machine

It is the batch dyeing machine, as shown in Figure 3.1, and the numbers of designation are :-

- |                     |                                 |
|---------------------|---------------------------------|
| (1) DYEING TANK     | (8) SAFETY VALVE                |
| (2) DYEING POT      | (9) CONDUCT THERMOMETER         |
| (3) DYEING HOLDER   | (10) DISTANCE THERMOMETER       |
| (4) ELECTRIC HEATER | (11) AIR EXHAUST VALVE          |
| (5) SPEED REDUCER   | (12) COOLING WATER INLET VALVE  |
| (6) MOTOR           | (13) FEED WATER VALVE           |
| (7) PRESSURE GAUGE  | (14) DRAIN VALVE                |
|                     | (15) COMPRESSED AIR INLET VALVE |

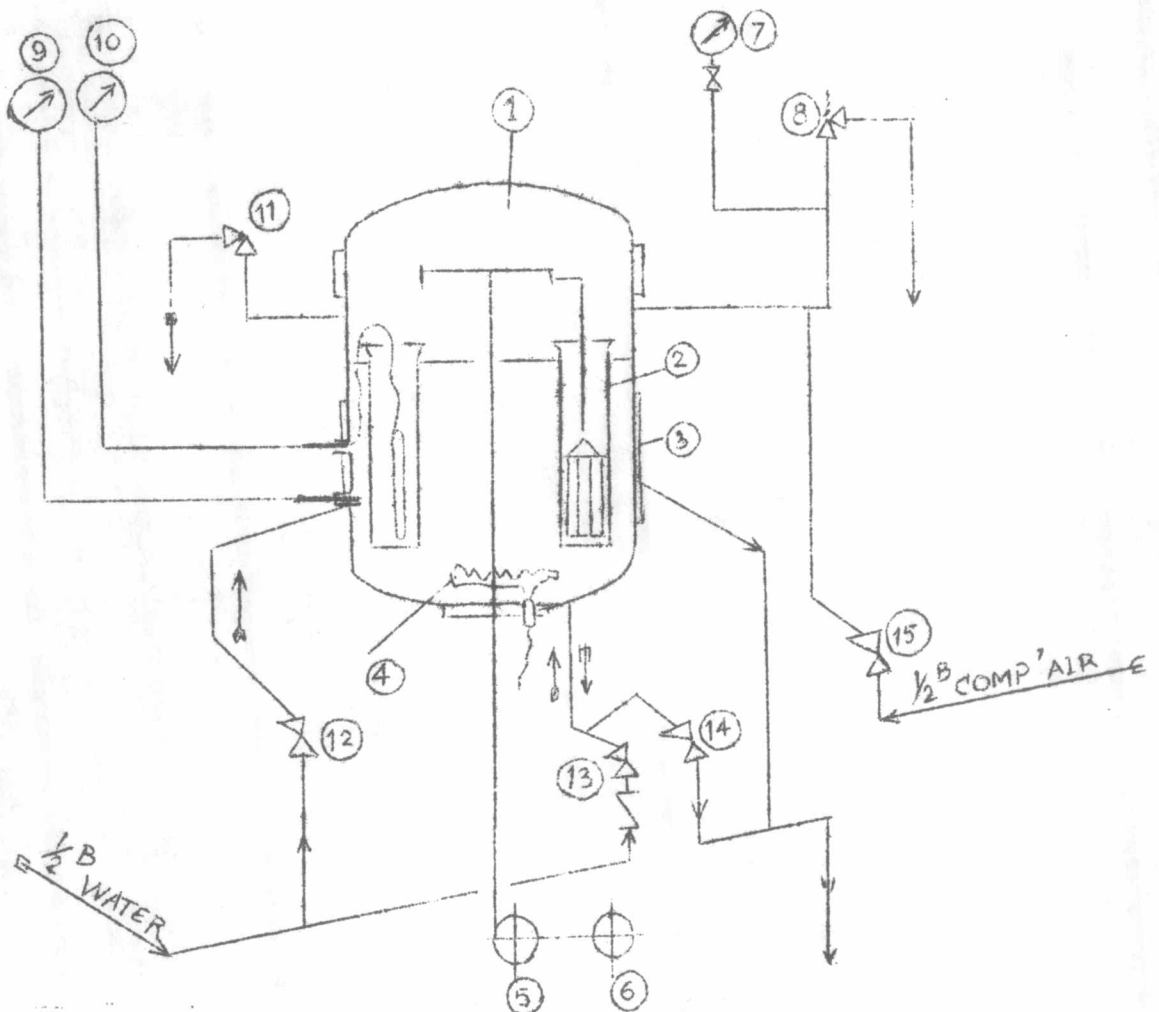


Fig. 3.1 Schematic of Colourpet dyeing machine.

### 3.3.2 Spectrophotometer

The spectrophotometer, as shown in Fig 3.2, is of the model MS 2000 manufactured by Macbeth Instrument Co, Ltd. It is used for reflectance measurements.

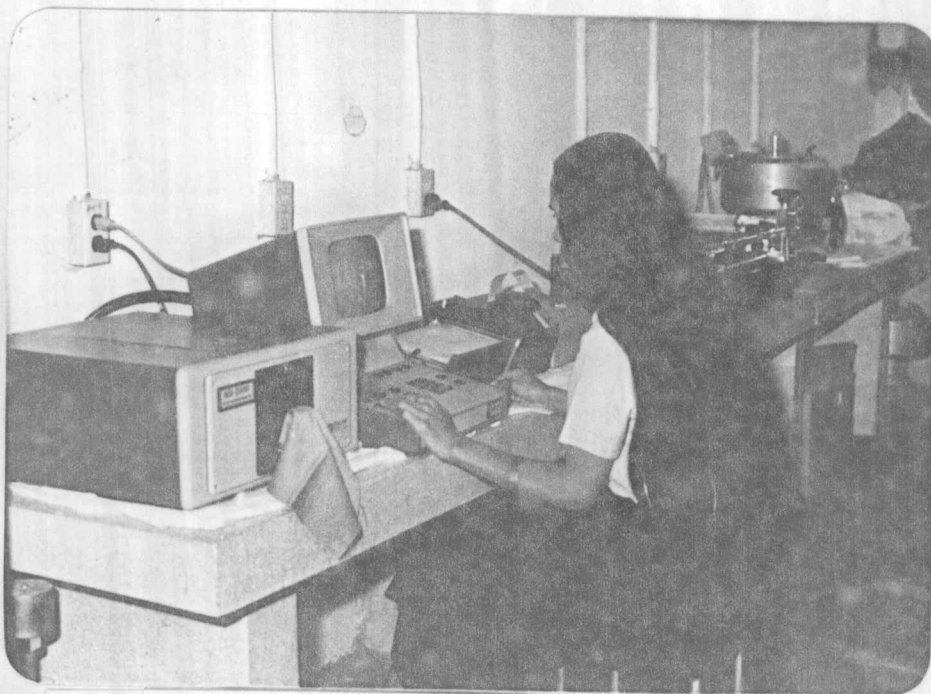


Figure 3.2 Macbeth MS 2000 Spectrophotometer

## 3.4 Procedures

### 3.4.1 Experimental scheme

In this research, the general exhaustion method for procion MX dyes was used, and its steps is as follows and is shown in Figure 2.24

3.3

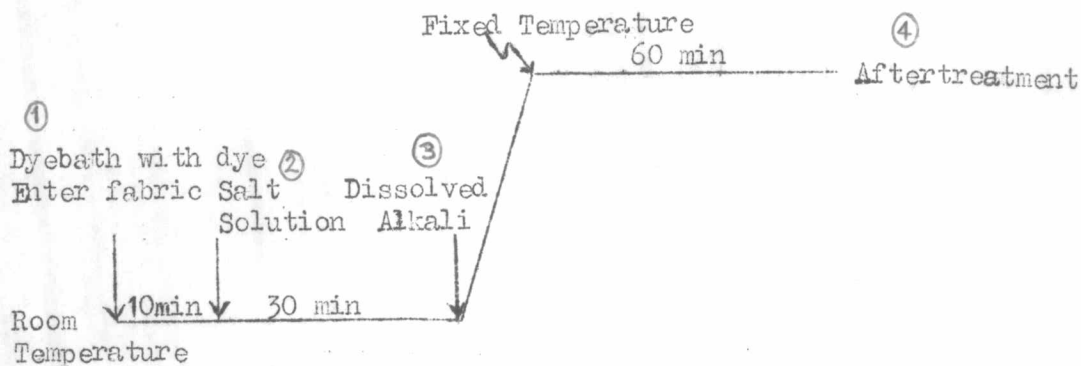


Fig. 3.3 Exhaustion Dyeing diagram.

- (1) Set dyebath with dye at room temperature. Enter fabric 5 gm each. Run 10 minutes. (Liquor ratio 50:1)
- (2) Add Salt solution (Sodium Chloride) 50 g/l. Run 30 min.
- (3) Add dissolved alkali (Sodium Carbonate) 8 g/l. Continue dyeing by raising to fixation temperature of each dyes for 60 min.
- (4) Aftertreatment with - rinse cold  
 - rinse warm 60°C, 4 minutes.  
 - soap at boil with Lissapol ND 5 minutes.  
 - rinse cold.

The sequence of operations in the matching of a sample with a given standard can be divided into the following steps:

- (1) Calibration dyeings of colorants.
- (2) Standard dyeings of color mixtures.
- (3) Reflectance measurement and storage of the standards and calibration dyeings.



Table 3.2 The concentration of dyes for standard dyeings (two color)

Dyes	%	ml	%	ml	%	ml	%	ml	%	ml	Stock Sol <sup>n</sup>
A	0.5	20	1.5	60	2	80	2.5	100	3.5	140	1.25 g/l
B	3.5	140	2.5	100	2	80	1.5	60	0.5	20	

Table 3.3 Pairs of Dyes, A and B

	A	B
1	3R	2R
2	3R	5B
3	3R	4GD
4	2R	4GD
5	4GD	5B
6	G	5B

	A	B
7	G	8G
8	G	3R
9	3R	8G
10	2R	5B
11	5B	7RX
12	7RX	TG
13	4GD	5BR
14	5BR	5B
15	TG	8G
16	5BR	3R

The concentration of any three color mixtures in standard dyeing was fixed as given in Table 3.4 . The three color mixtures used in this work are presented in Table 3.5.

In addition to dyes, all the dye-bath solutions in this work consisted of NaCl and  $\text{Na}_2\text{CO}_3$  in quantities as specified in Table 3.1

Table 3.4 The concentration of dyes for standard dyeings (three color)

Dyes	%	ml	%	ml	%	ml	%	ml	%	ml	Remarks
A	0.5	25	1.0	50	1.5	75	2.0	100	2.5	125	Stock Dye Sol <sup>n</sup> 1.0 g/l
B	1.0	50	2.5	125	1.0	50	1.5	75	0.5	25	
C	2.5	125	0.5	25	1.5	75	0.5	25	1.0	50	

Table 3.5 The three color mixture of dyes A,B and C

	A	B	C
1	2R	3R	4GD
2	2R	5B	4GD
3	G	4GD	3R
4	3R	8G	G
5	G	4GD	5B
6	TG	G	7RX
7	G	5B	7RX
8	8G	TG	G

### 3.6 Reflectance Measurement

For the reflectance measurements, the illuminant D - 65 and the FMC II formula buttons were used. Four - folds of measuring fabrics was used in every measurement to keep the fabric thickness constant.