IV

EXPERIMENTAL PROCEDURE

The procedure has been described under the following sub-sections:

1. Designs and their analysis.
2. Procedure for preparation of illustration.
3. Procedure for the application of transfer printing as an experimental technique.

1. Designs and their analysis.

Designs presented in this work were obtained in two ways- (a) designs were collected from sources like magazines, books, weeklys and were modified to make them simple, (b) designs were prepared using single element of design like dots, or line or area to produce various effects in printing, e.g. dots would give the effect of tie and dye work, line could create depth in a design, very tiny dots when used would give a speckled effect, and area/broken area to get effect of depth.

The harmonious effect of the different elements of design like dot, line, shape, space and texture has been given with each design as well as its analysis.

2. Procedure for preparation of illustration.

a. Preparation of blocks for printing, stamp pad and the printing surface.

b. Preparation of printing paste.

c. Printing of illustrative samples on paper, fabrics.

a. Preparation of blocks for printing and the printing surface: (Linoleum, dotted rubber and U-foam were used):

Thick plywood blocks of the required size (according to the design) were cut. The linoleum or U-foam was fixed onto the block with an adhesive (fevicol- it is cheap and gives a good adhesion). The selected design was transferred on the printing surface with a carbon paper. The block was then cut according to the design. For the dotted rubber the design was drawn on the rubber and was cut with scissors. It was then fixed onto the block as mentioned above.

Surface modification of linoleum: First the linoleum blocks with design were prepared as above. To get even printing with linoleum blocks, the linoleum surface was flocked with cellulose powder. The flocking powder was put in a strainer and was spread out evenly on a small plate of glass. On the linoleum block adhesive (fevicol) was spread out evenly and the block was inverted on the glass plate containing the flocking powder and kept under one kg weight. After about two hours the weight was removed and the block was allowed to dry for about an hour. After which the excess of flock was removed by stamping or shaking on a piece of a fabric. The modified linoleum block was ready for use.

The stamp-pad: A plywood board of size 9" x 6" was taken. It was covered with some cotton batting. Over this

a piece of cotton fabric was placed and it was firmly fixed onto the board with an adhesive (fevicol). This was used as a base pad for inking the blocks. On this pad a plastic sheet was placed and on it a loosely woven jute fabric was kept. On the jute fabric four layers of muslin cloth were placed. The printing paste was poured onto this and spread out evenly. The blocks were inked.

Printing surface: The surface (on which the samples to be printed are placed) has to be resilient to get effective printing. A wooden piece of 30 cm x 40 cm was taken. On this one woollen felt piece and one piece of knitted material were fixed with adhesive. On this, two layers of muslin were kept. This was used as a printing pad for the samples to be printed. Trials were done by printing on dummy pieces of fabric to check the resiliency.

b. Preparation of printing paste

The dye paste was prepared as per recipe given below. This recipe was similar to the recipe used for screen printing given on page 47 , but to make it suitable for block printing the consistency was reduced by decreasing the concentration of sodium aliginate.

The disperse dyes used were:

a. Vernasol violet 6R*.

b. Resolin blue I-FBL*.

c. Resolin red I-FB*.

*Supplied by Colour-Chem Limited, Ravindra Annexe, Dinshaw Vachha Road, 194, Churchgate Reclamation, Bombay 400 020.

Recipe for the paste:

Disperse dye solution 10% (Ethyl alcohol:water 1:1)	...	20 ml
Polyvinyl acetate	...	40 gms
Sodium alginate 2.5%	...	25 gms
Water	...	15 ml
	Total	100 gms

c. Printing of illustrative samples on paper, fabric.

Samples were prepared by direct printing on paper and fabric with the blocks prepared. The additional paper sample was used for transfer printing.

The samples to be printed were kept on the printing surface, and were stamped with the blocks. For the linoleum and dotted rubber blocks impact was used while for U-foam blocks compression was used. Fabric samples of direct block printing were made on cotton cambric.

Transfer printed samples were made on 67:33 polyester: cotton fabrics finished with acrylic emulsion. The procedure for transfer printing is described in the next sub-section.

3. Procedure for the application of transfer printing as an experimental technique.

a. Materials used.

b. Determination of preliminary data of fabric.

c. Preparation and application of finish.

d. Preparation of printing paste and printing screen.

e. Printing the paper.

f. Transfer printing on fabric, and evaluation of samples.

g. Assessment of the samples for washing fastness.

a. Materials used:

Paper used: Drawing paper commonly used was used. Trials were first taken with different papers like gelatin paper, tracing paper, absorbant paper, abond paper and drawing paper. In gelatin paper and tracing paper curling of paper caused difficulty so it was not selected. When absorbant paper was used the dye was being wasted as it was absorbed more so that was not selected. With bond paper, slight unevenness of the printed portion was noticed due to its graze, so that was also not selected. Drawing paper was found to be suitable so it was selected for work from these different points, namely that above difficulties were not faced.

Dyes used: From the available disperse dyes, three dyes, one having low, other having medium and the third with high sublimation fastness were used for this study.

		Sublimation fastness*	
		180°C	210°C
i.	Vernasol violet 6R**	2-3	1
ii.	Resolin blue I-FBL**	3	2
iii.	Navilene scarlet RR***	4-5	3

*As given in the shade-cards of the manufacturers.

**Supplied by colour-Chem Limited, Bombay 400 020.

***Supplied by Indian Dyestuff Industries Limited, Mafatlal Centre, Nariman Point, Bombay 400 001.

Finishes used

Three finishes were used in this study: (1) Acrylic Emulsion-Ahuracryl TX 50*, (2) Polyvinyl Acetate - Texchem PVSOL EM** (3) Polyvinyl Alcohol - Ahuralan NVFA*. The characteristics of these finishes as given by the manufacturers are given below.

Acrylic Emulsion (Ahuracryl TX 50):*

General characteristics	:	Ahuracryl TX 50 is an acrylic based emulsion. It yields a soft pliable and transparent film which has good wash fastness.
Colour	:	Milky white.
Solubility	:	In cold or warm water.
Active matter content	:	50 percent.
pH	:	5.5

Polyvinyl acetate (Texchem PVSOL EM):**

General characteristics	:	Texchem PVSOL EM is an synthetic resin emulsion. It gives a "semi-permanent" smooth, pliable, finish.
Colour	:	Milky white.
Solubility	:	In cold or warm water.
Solid content	:	50 ± 2 percent.
pH	:	4.5 to 5.5

*Manufactured by Ahura Chemical Products Pvt. Ltd., 84-Sion Road, Sion East, Bombay 400 022.

**Manufactured by Texchem, 132, Dr. Annie Besant Road, Bombay 400 018.

Polyvinyl alcohol (Ahuralan NVFA)*:

General characteristics	:	Ahuralan NVFA is used in textiles for sizing and finishing and it gives a clear film.
Colour	:	Clear water white.
Solid content	:	15 percent.
pH	:	6 to 8.

Fabrics used:

Four white fabrics commercially available were used for transfer printing. These were (1) cotton cambric, (2) 67:33 polyester:cotton, (3) 50:50 polyester:cotton and (4) 100 percent polyester. Fabrics were scoured in a solution containing 2 gms per litre of soap and 2 grams per litre of soda ash at 80°C for one hour, using material to liquor ratio 1:30.

b. Determination of preliminary data of fabrics used.

i. Determination of fabric count (16a): The number of ends and picks per centimeter were determined using the Alfred Suter counter. Average of five readings were records as fabric count.

ii. Determination of the weight per unit area of the fabric (16b): Five specimens of 5 cm x 5 cm were cut at random from the fabrics. The specimens were conditioned over a saturated common salt solution at room temperature, in a dessicator. Each conditioned specimen was weighed seperately,

on an analytical balance. An average of five readings was obtained and the weight per unit area in grams per square meter was calculated using the formula:

weight in gm/sq. m: $\frac{W \times 100 \times 100}{5 \times 5}$

where 'w' is the average weight in grams of the specimens.

iii. Determination of thickness of fabrics (16c): Compressometer was used to determine the thickness of the fabric. One specimen at a time was placed on the anvil without any folds and tension. The pressure foot was lowered upon the specimen by rotating the knob until upper dial read 5 (equal to 0.1 lb per square inch pressure) and the reading was recorded from the lower dial. The pressure was then increased until the upper dial read 40 (equal to 1 lb per square inch pressure), and the lower dial reading was recorded again. The difference between the two readings gave the thickness of the fabric in inch (x 0.001). The average of five readings was taken as the fabric thickness. This was converted to centimeters and reported to the nearest 0.001 cm.

c. Application of the finish.

The three finishes were used as follows

i.	Acrylic emulsion or Polyvinyl acetate or Polyvinyl alcohol	:	5 ml
ii.	Water	:	95 ml
	Total		100 ml

d. Preparation of printing paste and printing screen.

Two types of printing pastes were used for this study, the variation being in the use of synthetic polymer emulsion. One type of paste was without any synthetic polymer emulsion.

For the second type of paste three different pastes were prepared each paste having one synthetic polymer emulsion.

In the preparation of paste for transfer printing, sodium alginate is recommended (27) as a thickner, so it was used.

Recipe for the paste (without any synthetic polymer emulsion:

Sodium alginate 5%	:	60 gms
Disperse dye solution 10% (Ethyl alcohol:water 1:1)	:	20 ml
Water	:	20 ml
		100 gms

Recipe for paste containing synthetic polymer emulsion:

Acrylic emulsion or Polyvinyl acetate or Polyvinyl alcohol	:	40 gms
Sodium alginate 5%	:	25 gms
Disperse dye solution 10% (Ethyl alcohol:water 1:1)	:	20 ml
Water	:	15 ml
		100 gms

The water in the second paste recipe was reduced to obtain the same consistency as the first paste.

In the second recipe, when acrylic emulsion was used, the amount of water was reduced to 5 ml and the amount of sodium alginate was increased to 35 gms to get suitable consistency.

Preparation of screen

A wooden frame of 9" x 10" was prepared. Polyester fabric available for screen preparation was used as screen fabric. The fabric was stretched and nailed onto the wooden frame. The design area i.e. two strips 1" x 4" was marked onto the screen. This area was covered with a gum tape. The remaining portion was painted using shellac solution. The screen was kept for drying. The gum tape was then removed by moistening with water. The screen was ready for use.

e. Printing the paper

The paper to be printed was placed on the printing pad. The screen was placed on this paper. The printing paste was poured onto the screen and with the help of a squeeze the paste was passed from one end to the other end of the screen and back. The pattern produced was allowed to dry at room temperature and then used.

f. Transfer printing on fabric.

The apparatus used for transfer printing is shown in diagram. Transfer printing was done on a hot plate-a, to

which an energy regulator-b was attached to control the temperature. For mounting the samples a perforated padded aluminium lid-c was used.

The hot plate assembly

As shown in diagram (6) the hot plate had a diameter of 8 inch. An even layer of sand was spread on the surface. An aluminium lid of 8 inch diameter was kept inverted onto the hot plate.

The energy regulator

The energy regulator was attached to the hot plate so that the temperature on the hot plate could be controlled. It had energy marking from 0 to 100. The temperature was regulated and maintained at 200°C by keeping the energy regulator between 40 and 50, and checking the temperature by temperature indicating crayons.

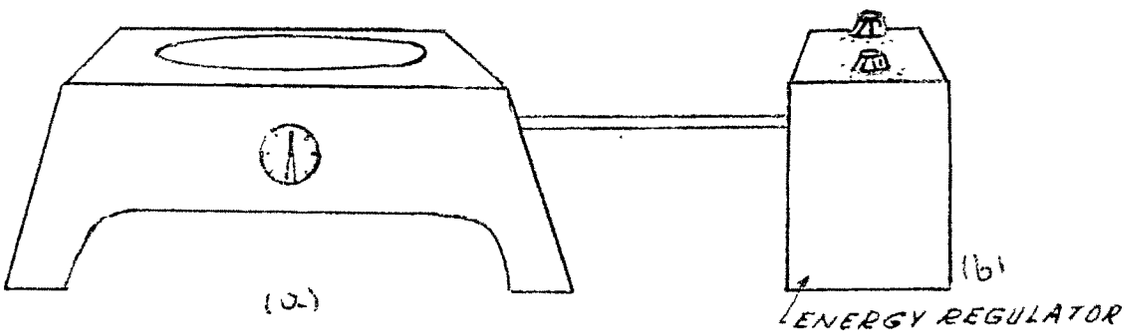
The perforated lid

A perforated lid of 8 inch diameter was used. The lid was padded with jute and cotton cloth.

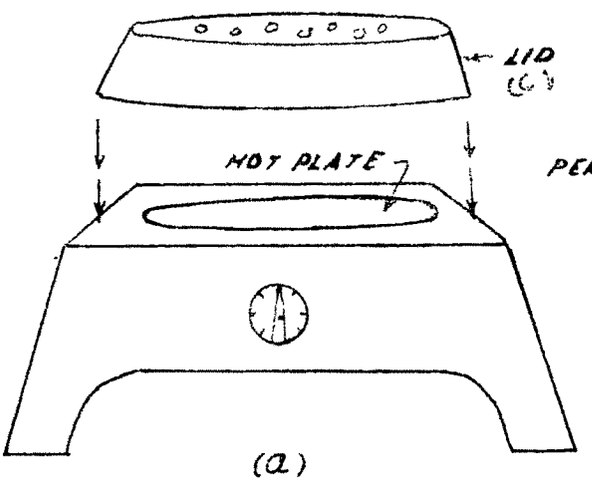
Actual transfer printing

The sample to be printed was mounted on this lid. The fabric sample was placed on the center of the padded lid and on top of it the printed paper was placed. It was fixed on two sides with gum tape.

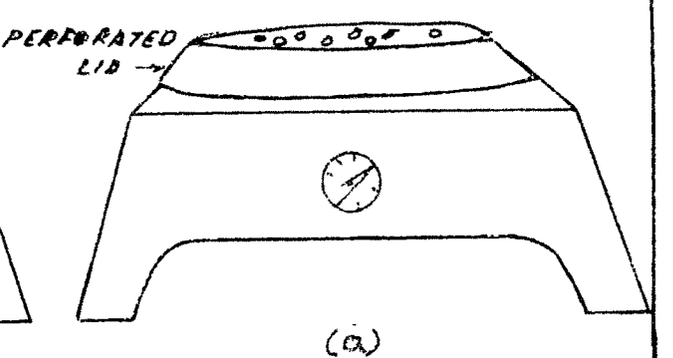
THE HOT PLATE ASSEMBLY



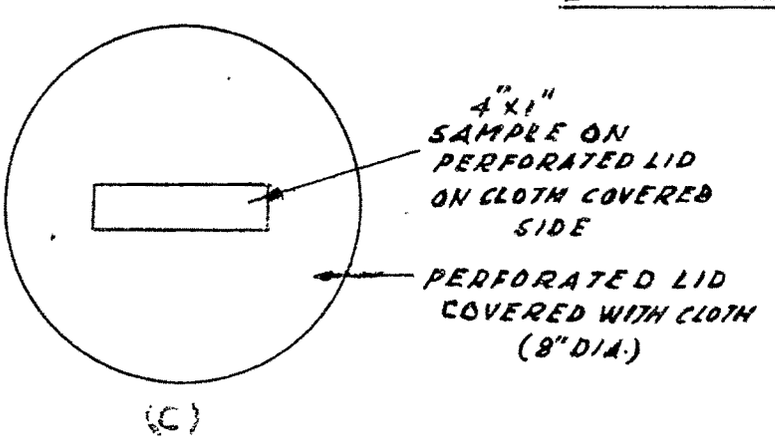
HOT PLATE WITH ENERGY REGULATOR



POSITION OF PERFORATED LID ON HOT PLATE



POSITION OF PERFORATED LID PLACED ON HOT PLATE



PERFORATED LID AND SAMPLE

When the temperature reached to 200°C on the hot plate and maintained by the energy regulator, the perforated lid along with the sample was inverted onto the hot plate and a weight of two kg was placed on the lid and kept for 2 minutes for transfer printing. The lid was lifted and the sample was removed from the lid.

Preparation of standards

To obtaining relative transfer printing number of the transfer printed samples, standard were prepared.

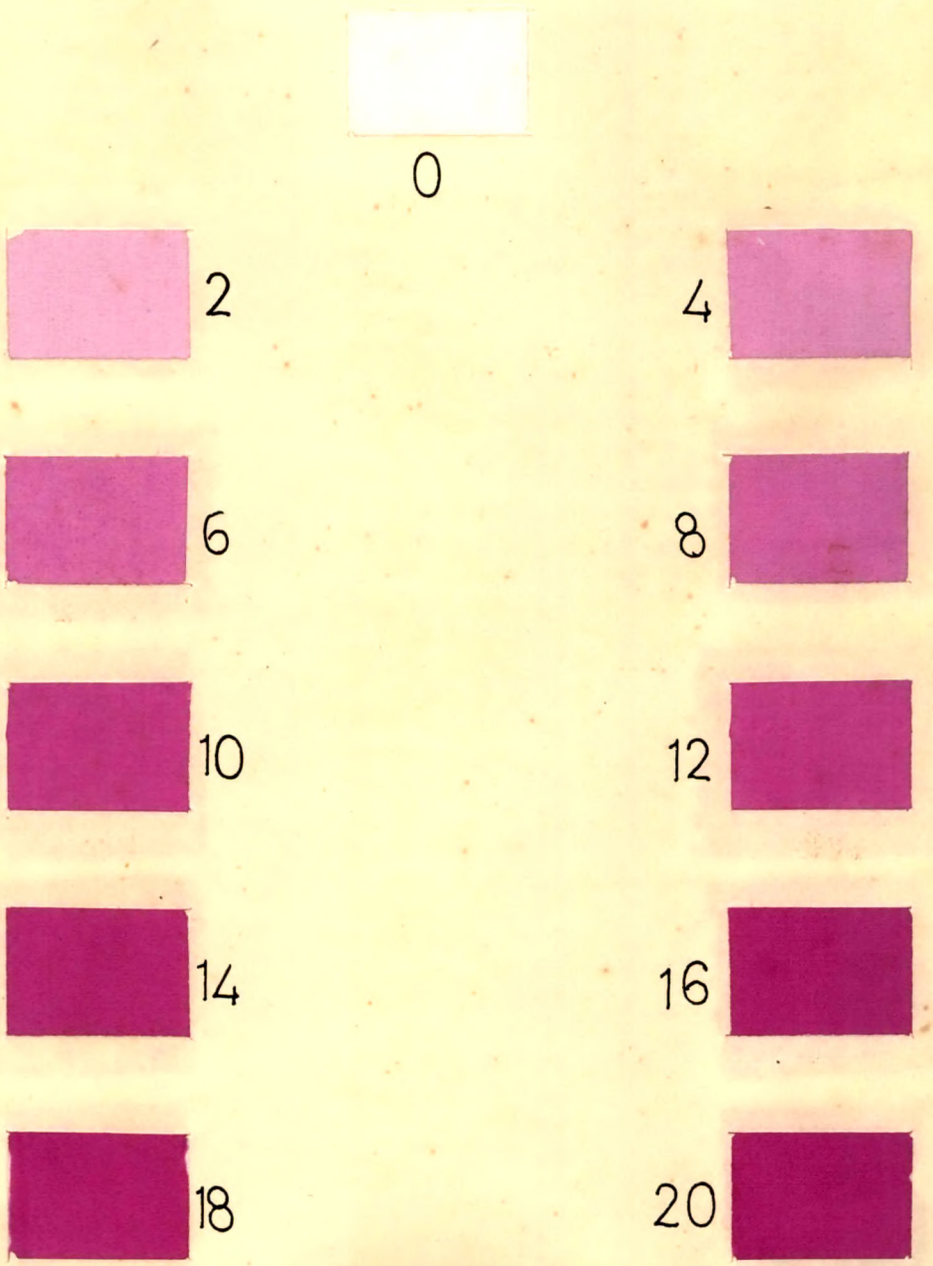
Standards were prepared on paper and were then transfer printed onto 100% polyester fabrics using dye pastes having varying concentrations of the disperse dye solution 2%, 4%, 6%, 8%, 10%. Higher standards of 12%, 14%, 16%, 18% and 20% were also prepared. Standards above 20% were not prepared as they were not needed.

Recipe for the printing paste used:

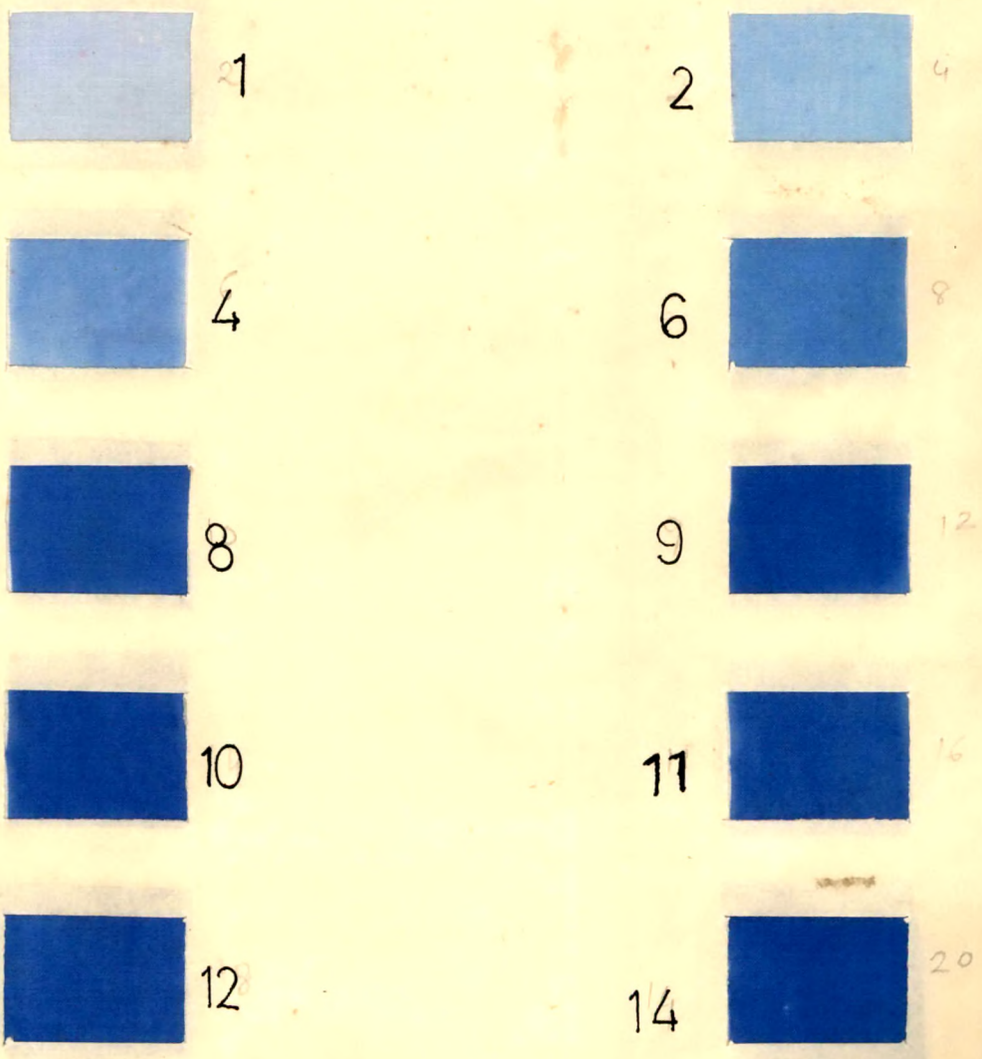
Disperse dye solution (2% or 4% or 6% or 8% or 10%) (Ethyl alcohol:water 1:1)	:	6 ml
Sodium alginate 5%	:	17 gms
Water	:	7 ml
		30 gms

For standards higher than 10% and upto 20% the same recipe as mentioned above was used, only the concentration of the disperse dye solution was changed as required.

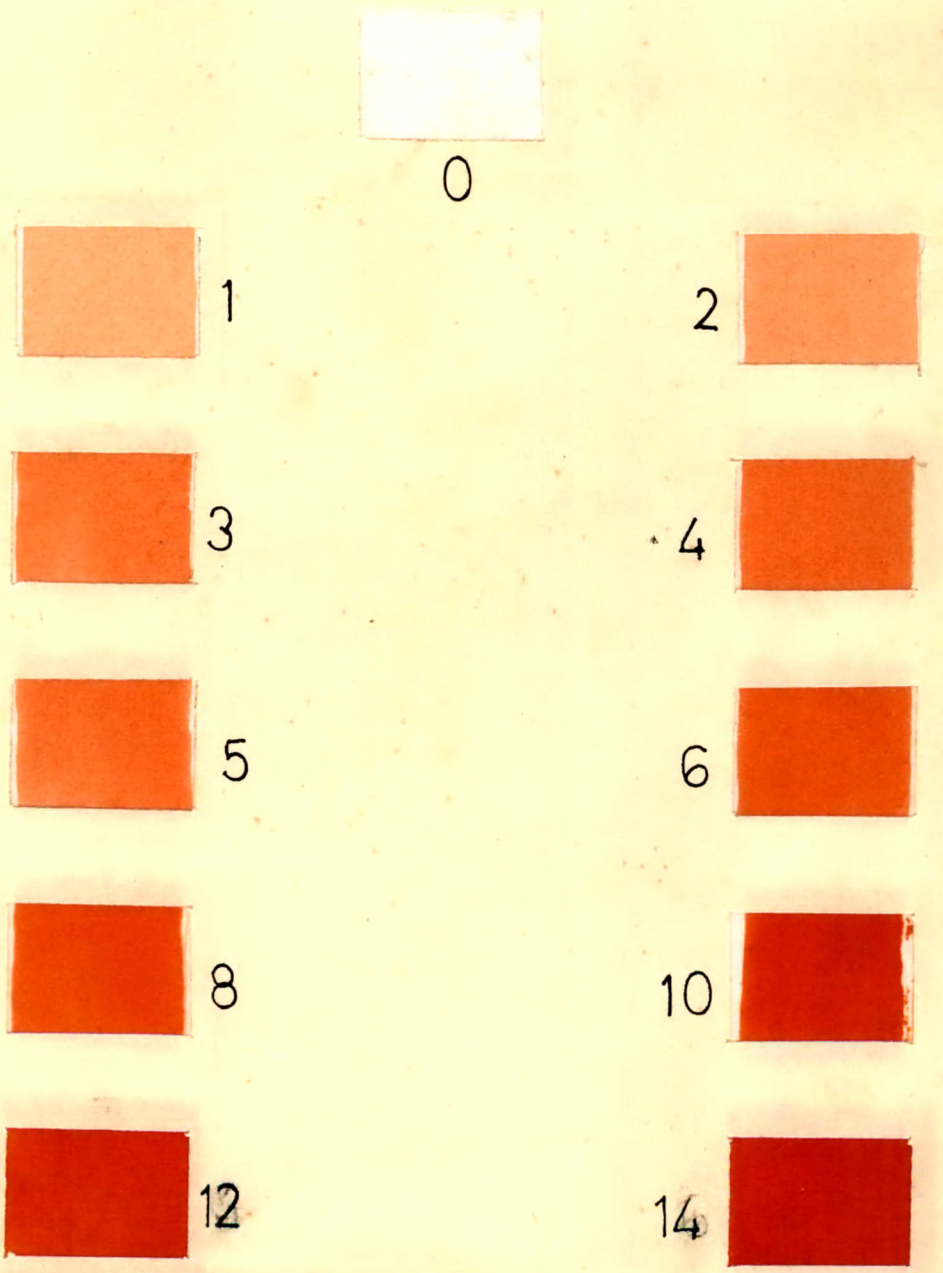
STANDARDS SHOWING
THE RELATIVE TRANSFER PRINTING NUMBERS OF DYE I



STANDARDS SHOWING
THE RELATIVE TRANSFER PRINTING NUMBERS OF DYE II



STANDARDS SHOWING
THE RELATIVE TRANSFER PRINTING NUMBERS OF DYE III



In dye I the relative transfer printing numbers given to the standards prepared were according to the concentration of the dye solution used i.e. No. 2 was given to the standards prepared by using 2% dye solution and so on.

In Dye II and Dye III the standards were prepared as per the procedure mentioned but the relative transfer printing numbers given to these standards were not according to the concentration of the dye solution but those corresponding to the depth of the dye in the standards of Dye I. This was done to obtain equivalent relative transfer printing number for the samples of the three dyes used.

Assessment for the washing fastness of the samples:

The transfer printed samples were tested for their washing fastness, by AATCC Test method for colour fastness 61-1968 Test No.IA. (2). The samples were put in a glass jar containing soap solution of 5 gms/litre at room temperature, for 45 minutes. The samples were dried and evaluated against the standards prepared.

Statistical analysis of the data

The statistical analysis of the data was done by calculating the F values and comparing them.