

Effect Of Selected Bleaching Agents
And Reactive Dye On Cotton Fabrics

By

C. S. Sundari

A THESIS SUBMITTED TO THE AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND
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Certified as Bonafide Research Work.



Signature of the
Head of the Department



Signature of the Guide.

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Contents

LIST OF CONTENTS

CHAPTER		PAGE
	LIST OF CONTENTS	
	LIST OF TABLES	
	LIST OF PLATES	
	LIST OF FIGURES	
	LIST OF APPENDICES	
I.	INTRODUCTION	1
II.	REVIEW OF LITERATURE	4
	A. COTTON, ITS PROPERTIES AND USES	4
	B. BLEACHES AND THEIR CLASSIFICATION	6
	C. PROPERTIES OF BLEACHES	7
	D. DYES SUITABLE FOR COTTON FABRICS	9
	E. SELECTION OF REACTIVE DYE AND ITS APPLICATION	10
III.	EXPERIMENTAL PROCEDURE	13
	A. MARKET SURVEY	13
	B. HOUSEHOLD SURVEY	15
	C. BLEACHING THE FABRIC	17
	D. DYEING THE FABRIC	21

CHAPTER	PAGE
E.EVALUATION	22
1. VISUAL INSPECTION	23
2. LABORATORY TESTS	23
a.FABRIC THICKNESS	24
b.FABRIC WEIGHT	24
c.BURSTING STRENGTH	25
d.ABRASION RESISTANCE	25
e. WETTABILITY AND ABSORBENCY TESTS	
i. DROP TEST	26
ii. SINKING TEST	26
iii. CAPILLARY RISE TEST	27
f. COLOUR FASTNESS TESTS	
i. SUNLIGHT	27
ii. WET AND DRY CROCKING	28
iii. WET AND DRY PRESSING	29
iv. WASHING	29
IV. RESULTS AND DISCUSSIONS	30
V. SUMMARY AND CONCLUSION	65
BIBLIOGRAPHY	69
APPENDICES	

LIST OF TABLES

TABLE		PAGE
I	NOMENCLATURE OF THE SAMPLES	20
II	BLEACHING AGENTS AND THEIR COST	31
III	DEMAND FOR THE PRODUCT	31
IV	METHOD OF WASHING	32
V	PREFERENCE OF BLEACHING AGENTS	32
VI	FACTORS INFLUENCING PURCHASE OF BLEACHING AGENTS	34
VII	EVALUATION OF THE BLEACHED SAMPLES	36
VIII	EVALUATION OF THE DYED SAMPLES	38
IX	FABRIC THICKNESS AND FABRIC WEIGHT OF ORIGINAL, BLEACHED AND DYED SAMPLES	40
X	BURSTING STRENGTH AND ABRASION RESISTANCE OF ORIGINAL, BLEACHED AND DYED SAMPLES	47
XI	DROP TEST, SINKING TIME AND CAPILLARY RISE OF ORIGINAL, BLEACHED AND DYED SAMPLES	53
XII	EVALUATION OF THE COLOUR FASTNESS OF THE DYED SAMPLES	63

LIST OF PLATES

PLATE		PAGE
I	THICKNESS TESTER	24 a
II	CLOTH QUARDANT BALANCE	24 b
III	BURSTING STRENGTH TESTER	25 a
IV	ABRASION RESISTANCE TESTER	25 b
V	DROP ABSORBENCY TEST	26 a
VI	SINKING TIME	26 b
VII	CAPILLARY RISE	27 a
VIII	CROCKMETER	28 a

LIST OF FIGURES

FIGURE		PAGE
I	FABRIC THICKNESS	43
II	FABRIC WEIGHT	45
III	BURSTING STRENGTH	49
IV	ABRASION RESISTANCE	51
V	DROP TEST	57
VI	SINKING TEST	59
VII	CAPILLARY RISE TEST	61

LIST OF APPENDICES

APPENDIX		PAGE
I	INTERVIEW SCHEDULE TO ELICIT INFORMATION ON THE AVAILABILITY OF BLEACHING AGENTS IN SELECTED SHOPS OF COIMBATORE CITY	
II	AN INTERVIEW SCHEDULE TO ELICIT INFORMATION REGARDING PREFERENCES OF BLEACHING AGENTS AMONG SELECTED FAMILIES IN COIMBATORE CITY	
III	DETAILS OF THE SELECTED MATERIALS	
IV	THE BLEACHED SAMPLES	
V	DESIZING, BLEACHING, DYEING PROCEDURES	
VI	THE DYED SAMPLES	
VII	A. PROFORMA USED TO EVALUATE THE BLEACHED SAMPLES B. PROFORMA USED TO EVALUATE THE DYED SAMPLES	
VIII	DETAILS OF GREY SCALE RATING	

Introduction

I.INTRODUCTION

India is acknowledged as the birth place of cotton and the original home of the best and finest cotton fabrics produced in the world for thousands of year. Cotton is the backbone of the world textile trade and is one of the widely used major textile fibers possessing ideal properties than any other fibre. It has been of service to mankind for so long that its versatility is almost unlimited from utilitarian to high fashion and new uses constantly being discovered. This unique combination of properties has made cotton a standard for great masses of the people. The statement that “cotton is the king of fibres” still hold value inspite of the new discoveries of natural and man made fibers, Jerda (1992). Thus the people’s taste for cotton, the natural fibre has its own importance.

Comfort is the “outstanding” characteristics of cotton fabrics and are characterised by excellent launderability, high absorbency, good wearing qualities, colour fastness, pliability, heat resistance and easy dyeability. Cotton has great tensile strength and becomes stronger when wet, it therefore can be rubbed, twisted and boiled when washing without injury to the fabric, Corbman (1985).

A finish is defined as anything that is done to fibre, yarn or fabric, before or after weaving to change the appearance, feel and the performance. The finishing processes are required to make the materials attractive and also to improve their serviceability, Mullick (1997).

Cotton textiles are subjected to pretreatment such as desizing, bleaching with a view to attain maximum removal of impurities present on them. Removal of these impurities improves the absorbency and whiteness of the fabric and also enhances the accessibility and reactivity of cotton cellulose. Scouring and bleaching are the two

important pretreatments to obtain a well prepared fabric for dyeing, views Varghese et al., (1984).

Bleaching operation critically influence the qualities attained in subsequent stage of processing, such as dyeing and printing. The process employed should meet the requirements high degree of whiteness, good stability and absorbency, efficiency and ecologically acceptable technology ,Ashkenazi (1990).The efficiency of bleaching depends by thorough impregnation of fabric, uniform distribution of the liquor in the fabric, concentration and temperature of bleach liquor and the degree of aeration, views Mahale and Kulloli (1995).

In the early days, bleaches were almost entirely in liquid form, now they are available in both liquid and powdered form. Bleaching occupies an important place in the textile industry and hence it has to keep pace with continual urge for greater productivity as well as with the demand for improved standards arising from the introduction of new dyeing techniques and also with respect to absorbency and whiteness.

Colour has emerged as one of the most significant characteristics of textiles in recent years, says Annladbury (1985). The colour of a textile fabric is the first property, which is noticed and frequently is the first factor governing the fabric choice than pattern, structure, weight and fibre content. Colour and lustre are two associated phenomena which demand particular attention from the textile designers due to their prominent influence on the appearance of woven fabrics opines, Grosicki (1983). Dyes are an integral component which imparts colour to the fabric. They are soluble substances, which penetrate into the fibre and are fixed by chemical action ,says Sadov-et-al.,(1983)

The Reactive dyes are the latest discovery of synthetic dyes. The term Reactive

dye normally refers to a dye applicable to cotton because the technical importance of reactive dye is essentially for cotton and other cellulosic materials. Reactive dyes have very good colour fastness to laundering, crocking, rubbing off and they are resistant to gas fading. An entire spectrum of colours are available in this class of dyes and they can be used for dyeing and printing. The main factor behind the remarkable growth of reactive dyes has been their specific properties, which include versatility in application, high brilliancy of shades and all round fastness, opines Kamat and Prasad (1991).

Reactive dyes are applied to cotton by simple application techniques which do not required any oxidation, reduction process and hence the effluents cost by the presents of oxidation , reduction reagents are totally eliminated.

As there was no study on the effect of commercial bleaches on cotton fabrics the investigator made an attempt to compare these with the following objectives:

1. To find out the availability of bleaching agents in the market and their preferences by middle and high-income families.
2. To compare the effect of bleaching agents on selected cotton fabrics.
3. To assess the dye affinity of bleached cotton material.

Review of Literature

II. REVIEW OF LITERATURE

The literature pertaining to the study is viewed under the following headings:

- A. Cotton, its properties and uses
- B. Bleaches and their classification
- C. Properties of bleaches
- D. Dyes suitable for cotton fabrics
- E. Selection of reactive dye and its application.

A. Cotton , its properties and uses

Cotton is a white or yellow white vegetable fibre grown chiefly in the United States, Egypt, Peru and India. India is acknowledged as the birth place of cotton and the original home of best and finest cotton fabrics produced in the world for thousands of year.

Cotton is a fibre that grows from the surface of seeds in the pods or bolls of a bushy mallow plant, scientifically known as *Gossypium*, states William Scott (1985). Under microscope cotton fibre looks like a flat, twisted ribbon like structure with thick irregular ends. The length ranges from 1/8 to 1/2 inches and yarns made of shorter staple, are more apt to be linty and fuzzy, suggests Wingate(1984).

According to Moses(1994) cotton is one of the purest natural fibre made up of pure cellulose between 88 to 96 percent consisting of repeated anhydrous units found in polymeric cellulose chains, which are hydrogen bonded. The non cellulosic impurities include, naturally occurring organic compounds such as wax 0.4 to 1.0 percent, pectin's 0.7 to 1.2 percent and other colouring matter. After scouring, bleaching, dyeing the cellulose level increased to 99 percent.

According to Taylor (1985) cotton is the whitest and cleanest natural fibre and is strong due to the intrinsic structure of layer criss crossed, minute spiraled fibrils that compose the fibre cell. Mehta (1986) says cotton has remained the dominant raw material in our country, not only due to its easy, domestic availability but because of variety of other factors. The most important property in cotton is the moisture regain, which makes it comfortable to wear, especially in hot and humid climate. It can be laundered easily, for it withstands high temperature well and it does not scorch easily.

King (1985) profound that the chemical properties of cotton makes its vulnerable to acids, yet tolerant to mild alkalies. It is more susceptible to damage by strong mineral acids and by organic acids. Since alkalies do little damage to cotton it is possible to wash them with strong soaps and detergent solutions without fibre damage express Cowman and Jugerman (1980).

Joseph (1981) explains, fineness and maturity are two important properties, which influence the appearance and handle of cotton. Strong, durable, serviceable and also sheer, light weight, luxury type fabrics may also be made from cotton.

Khadi and Kulkarni (1996) opines cotton in the form of cloth satisfies one of the basic necessities of the human population. Achwal (1993) views the advantages of cotton as natural renewable resource compare to synthetic fibres, cultivation gives work to millions of people, biologically degradable and 97 percent of cotton seed material are useful. Fabrics of different constructions, weights, textures, and blends can be made from cotton fibres.

Cotton is the ruling fibre, still forms more than 80 percent of raw fibre used by world's Textiles Industry enumerates Sundarmurthy et-al.,(1994).Based on cotton textile industry the pyramid of the industrial sector of all the country has been built remarks Kothari(1992).

B. Bleaches and their classification

Bleaching process is essential for obtaining a good white colour. It involves the use of bleaching agents such as dilute hypochlorite solutions (Bleaching powder or Sodium Hypochlorite), H_2O_2 and sodium chloride, opines Mahale and Kulloli (1995).

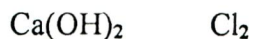
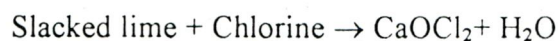
Bleaches contain Ultra Marine Blue, CMC (Carbo Methyl Cellulose Sodium) powder, fabric whitener, purified natural gum, wetting agents, emulsifiers and optical brightners. Generally mild bleaches include oxalic acid, hydrogen peroxide and commercial colour removers.

Bleaching agents are of two kinds

a. Oxidizing Bleaches: They have O_2 as chief component which is liberated and on contact with the stains forms a colourless compound. Sodium Hypochlorite, sodium perborate, hydrogen peroxide and potassium permanganate are oxidizing bleaches.

b. Reducing Bleaches: These remove O_2 from certain kinds of stains and so reduce them to a colourless compound. Sodium hydrosulphite is an example for reducing bleach.

Chlorine bleach is the inexpensive household bleach and disinfectant, sold under variety of trade names now comes in powder as well as liquid form. Bleaching powder contains 30-38 percent of available chlorine. In presence of acid it acts as an oxidizing agent. That is it releases O_2 and act as bleaching powder.



Chemical name of washing soda is Na_2CO_3 . It is manufactured by ammonia soda process.

C. Properties of Bleaches:

Fabrics, yarns and fibres are bleached either to make them white or to prepare them for dyeing or printing. Bleaching is carried out to impart superior and permanent whiteness to the textile material. Bleaches are designed to assist detergent to make the fabric look cleaner and brighter.

Mittal (1986) says bleaching is the cleaning of cotton cloth from three type of impurities namely natural, added, improcess impurities and the purpose is to make the fabric amenable for subsequent process of colouration and finishing. Bleaching, a chemical operation is relatively durable when the bleaching method is appropriate to the fibres involved.

According to Joseph (1984) commercial bleaching operation include

- A prewash to remove the desizing chemicals and the sizing.
- Saturation with the caustic wetting agents and emulsifiers to remove waxes, foreign matter and any discoloring materials present on the fibre.
- Time for these agents to react
- Washing to remove the caustic and other agent by using detergent.

Lyle (1977) views that oxidizing bleaches are generally safer for all washable fabrics. They cause the colouring matter to decompose and wash away. These are used in home and commercial laundry. When a fabric comes in contact with a bleaching agent for too long or in too high of concentration these convert cellulose into oxycellulose which is weaker than cellulose, and makes the fabric weakened, so when using bleach directions given on the package should be followed carefully.

Rai (1996) suggests, for all textile processing soft water is essential as the cations and anions present in the hard water have an adverse effect on the textile material. Bleaches should not be used in water containing iron, for it may cause rust spots or yellowing of the fabric.

The most common household bleach is chlorine, which comes in bottle under sundry trade names. It is an aqueous solution of sodium Hypochlorite, stabilized by the present of caustic soda. Caustic soda makes a peculiar physical modification on cotton fibre, swelling to a cylindrical form, slight increase in weight, tensile strength and also greater power of absorption toward dyestuffs opines Parikh and Sampath (1994).

Powdered chlorine bleach is more gentle in action. It releases bleaching ingredients more slowly as it dissolves and utilizes a group of chemicals known as "N-Chloro Compounds".

The consumers have become more quality conscious and the demand for safer and conventional bleaching agents based an chlorine will be passed out and all future bleaching operations will be based on H_2O_2 which is considered as ecofriendly (Venugopal, 1995).

D. Dyes suitable for cotton fabrics:

Dyes is the name given to the chemicals by which a comparatively permanent colour is imparted to certain bodies of which the most important are the textiles fibres defines Mathur and Agarwal (1980).

Dyeing is a very ancient art, it means of applying colours to fibres, yarns or fabrics. It also be called as finishing process and the art of colouring textiles in such manner that the colour may be fast or may not be ordinarily removed by washing, rubbing, sunlight and other to which the textiles are usually subjected. The chemical dyes are the discovery of comparatively recent times. Piece dyeing is the easiest and also the least expensive method for adding colour (Deulkar, 1988).

Peter et-al.,(1993) point out that the ability of the reactive dye to react chemically with cotton cellulosic is due to the presence of reactive group in the dyemolecule which reacts with the neurophillic groups in the anhydrous glucose units of cellulose. The ease with which cotton takes up dyes and other colouring matter is due to the polarity of its polymer system.

According to Marshall (1975) the factors which influence the dyeing behavior of reactive dyes are the affinity of the dye for cellulose, rate diffusion of the dye into cellulose and the chemical reactivity's of the reactive dyes.

The application of a reactive on to cotton required presence of an alkali(NaOH , Na_2CO_3 or a salt) in the dye bath which liberates alkali (NaHCO_3) on heating the dyeing liquor says Keonye and Olwande (1993)

Reactive dyes are anionic in solution and therefore to enhance the exhaustion, a high concentration of Electrolyte such as sodium chloride or sodium sulfate has to be added in to the dye bath. In the absence of adequate salt concentration reactive dye bath exhaustion is poor (Chevan and Chattopadhyay, 1998).

Reactive dyes are preferred to direct dye because they possess better colourfastness properties than direct dyes. Other advantages are increase in productivity, cost reduction, simplification of process, reduction in processing time, processing in Eco friendly and gives cleaner effluent because of neutral pH and lower amount of chemicals used in dyeing process, opines Bachi and Saha (1992) .

In many mills, consumption of reactive dye is 75 percent of the total colour consumption. Small-scale manufacturers have scored heavily over the large-scale manufacturers in this area because of low price and reasonably good quality, say Barve and Doshi (1985). Advantages of reactive colours over the other classes of dyes is viewed by Shah (1995) as,

*** Advantages Over Vats**

- Improved surface appearance and penetration
- Reduction and oxidation process are not involved
- Vats have no Turquoise blue, brilliant pink and magenta shades.

*** Advantages over Azoic**

- better rubbing fastness
- possibility of mild shades and wide range of shades are available

*** Advantages Over pigments**

- Better workability, better penetration and better rubbing fastness even at higher concentration.

*** General Advantages of Reactive Dyes**

- better brilliance of dyed goods
- all round good fastness for normal use
- universal application on pure cotton
- wider variety of mixed shades
- Ease of fixation, easily available at reasonable prices.

Experimental Procedure

III. EXPERIMENTAL PROCEDURE

The methodology adopted for the study consisted of the following aspects:

- A. Market Survey
- B. Household Survey
- C. Bleaching the fabric
 - 1. Selection of fabric, count and weave
 - 2. Desizing the fabric
 - 3. Selection of bleaching agent
 - 4. Procedure for bleaching the fabric
- D. Dyeing the fabric
 - 1. Selection of dye
 - 2. Procedure for dyeing the fabric
- E. Evaluation
 - 1. Visual Inspection
 - 2. Laboratory Tests
 - 3. Statistical Analysis.

A. Market Survey

A market survey to find out the availability of bleaching agents in the selected shops:-

A survey is a process of collecting data from existing population units with no particular control over factor that may affect the population characteristics of interest in the study.

A market survey was felt necessary to gather information regarding availability of the bleaching agents in the market. The survey included the following steps:-

1. Selection of area
2. Selection of shops
3. Selection of tool
4. Collection of data
5. Analysis of data

1. Selection of area

The area for shops selection were chosen on the basis of convenience sampling method. According to Gupta (1997), it refers to that fraction of the population being investigated which is selected neither by probability nor by judgement but by convenience. Hence the areas chosen for market survey were Gandhipuram, R.S. Puram and Townhall in Coimbatore city. Since most of the general stores were located in these areas.

2. Selection of shops

Fifty shops were selected for the market survey due to ease of approach by the investigator and co-operation extended by the shop keepers.

3. Selection of Tool

The tool selected for the study was interview schedule. An interview is one where number of questions or statements relating to the investigation is prepared and these questions are put to the selected group and their answers were recorded by the interviewer, states Chaudary (1991).

Interview schedule was formulated and a pilot survey was conducted by the investigator in ten shops to find out the availability of bleaching agents, details on purchase and sales promotion factors. The finalised schedule used for the market survey is presented in Appendix- I.

4. Collection of Data

The investigator approach the shop keepers at their convenient time and explained the purpose of the study and the necessary information was gathered by using the interview schedule.

5. Analysis Of Data

Sidhu (1984) states that the analysis of data means studying the tabulated values in order to determine inherent facts. Thus the information collected from the shopkeepers were analyzed and tabulated. This information served as the basis for framing the household schedule.

B. Household Survey

Household survey to collect information about the preferences of bleaching agents in the selected families:-

The survey included the following steps.

1. Selection of area
2. Selection of Samples
3. Selection of tool
4. Formulation of tool
5. Conducting the survey
6. Analysis of data

1.Selection of Area

The household survey was conducted in selected areas, on the basis of easy approach and co-operations rendered by the homemakers. Hence the areas chosen for household survey were Saibaba colony, Ramalingam Colony, Gandhipuram, Townhall and R.S. puram in coimbatore city.

2.Selection of Sample

A Sample is a subset of population units says Gupta (1997). Purposive sampling method was used for the selection of samples.

Purposive sampling denotes the method of selecting a number of group of units in such a way that the selected groups together yield as nearly as possible the same average or proportion as the totality with respect to those characteristics which are already matter of statistical knowledge, views Varma (1993). Based on purposive sampling 50 households ,25 of high income and 25 of low income were selected for the study.

3.Selection of tool

Kothari (1996) says "Collection of data through interview schedules is very useful in extensive enquiries and can lead to a fairly reliable results and it is the popularly used methods of collecting data in survey". For these reasons the interview method was selected as tool for conducting the survey.

4.Formulation of Tool

Singh and Sadhu (1992) view that surveys conducted by personal interviews have an advantage over surveys conducted by mailing the questionnaires, in that they yield a much better sample of the general population and schedules are of greater flexibility.

For the above mentioned reasons , an interview schedule was formulated to collect informations regarding the details of family background, expenditure pattern, mode of washing, details regarding bleaching agents used and purchase pattern. This was supplement with the investigators personal observations for ensuring reliability of data. The finalized schedule used for the household survey is presented in Appendix-II.

5. Conducting The Survey

For conducting the survey , the formulated interview schedule was used and the purpose of the study was explained to selected home makers individually. The required information was recorded simultaneously .

6. Analysis of Data

The data thus collected were consolidated and the result is presented under the chapter Results and Discussion .

C. Bleaching The fabric

1. Selection of fabric, count and weave

Fabric:

Fabric is a cloth that is woven, knitted, braided, netted, felted or pleated with any textiles fibre or is a bonded web. Literally the word fabric means “a structure“ Michael Ravinzky (1997).

Cotton fabric due to low cost, abundance of raw material, high strength, durability , thermal stability and easy dyeability is the most widely used textile material, Bhat et al.,(1995). Therefore the investigator selected hundred percent of the cotton material for the study.

Count :

According to Lyle (1997) fabric count is the number of ends and picks per square inch for woven fabrics. Cotton fabric of 96 x 48 count and 68 x 38 count were selected for this study based on their availability .

Weave :

Ponting (1982) views, that twill is the most satisfactory weave and been popular for men's suiting, ladies coats and uniform materials. Twill weave fabrics have good strength , appearance and tent to soil less quickly then plain weave fabrics. The distinct design in the form of diagonals is characteristic of twill weave, says Corbman (1985) and Saltzman (1983). Hence the investigator selected twill weave cotton material for the study . The details of the selected materials are given in Appendix-III

2.Desizing The Fabric

Datya and Vaidya(1984) point out that preparatory treatments are given to textiles to remove starch, oil as well as the natural impurities present on the fabric. The importants of desizing is pointed out by BTRA (1978), an effective sizing is important for weaving, efficient removal of the sizes from grey fabric is equally important for further wet process. The selected samples were desized following the procedures given in Appendix-IV.

Nomenclature of Samples

Eleven meters of desized materials from each count was taken for this study. One meter in each count (X, Y) was kept aside as original and one more meter (XD, YD) was left for dyeing purpose.

The remaining nine meters of X and Y were cut into three equal parts. They were treated with Ala and named as XA₁, XA₅, XA₁₀ and YA₁, YA₅, YA₁₀. Samples treated with Robin liquid were named as XR₁, XR₅, XR₁₀ and YR₁, YR₅, YR₁₀. Samples treated with commercial bleach were named as XCB₁, XCB₅, XCB₁₀ and YCB₁, YCB₅, YCB₁₀.

After bleaching treatment the samples were cut into two equal parts. One part of the sample in each count was dyed with Reactive dye. The nomenclature is Summarized below.

TABLE-I
NOMENCULATURE OF THE SAMPLES

Count	96X48		68X38	
Original	X	XD	Y	YD
Number Of Treatments With Ala				
1	XA ₁	XA ₁ D	YA ₁	YA ₁ D
5	XA ₅	XA ₅ D	YA ₅	YA ₅ D
10	XA ₁₀	XA ₁₀ D	YA ₁₀	YA ₁₀ D
Number Of Treatments With Robin Liquid				
1	XR ₁	XR ₁ D	YR ₁	YR ₁ D
5	XR ₅	XR ₅ D	YR ₅	YR ₅ D
10	XR ₁₀	XR ₁₀ D	YR ₁₀	YR ₁₀ D
Number Of Treatments With Commercial Bleach				
1	XCB ₁	XCB ₁ D	YCB ₁	YCB ₁ D
5	XCB ₅	XCB ₅ D	YCB ₅	YCB ₅ D
10	XCB ₁₀	XCB ₁₀ D	YCB ₁₀	YCB ₁₀ D

D-Dyed with reactive dye

A-Ala, R- Robin Liquid ,CB-Commercial Bleach

3.Selection of Bleaching Agent

Bleaching is a process of removing starches, oil substances, natural nitrogenous bodies, gums, mineral impurities and natural colouring matter, states Dantyagi (1996).

Bleaching of cotton fabrics are carried out to remove the inherent and added matter present in cotton and thereby improve the absorbency and whiteness of fabric, views Malaviya(1983).

According to the household survey Ala ,Robin liquid and commercial bleach were the agents widely used in majority of the household for bleaching cotton fabrics. The market survey revealed that Ala ,Robin Liquid, Commercial bleach were the fast moving bleaching agents in the market . Hence the investigator selected Ala ,Robin liquid and commercial bleach for bleaching cotton fabrics.

4.Procedure for Bleaching The Fabric

The procedures used for bleaching the selected samples were based on the instructions given by the manufacturers manual. The detailed procedure is given in Appendix-V. The bleached material are shown in Appendix-IV.

D. Dyeing The Fabric

1. Selection of Dye

According to Gogoi and Kalita (1996) a dye is generally an organic compound that is used to impart colour to the substrate. The type of dyestuff used for dyeing any particular fabric depends on the nature of the fabric and the fastness qualities required in the finished goods. Shenai (1983) says, the criteria

for dyestuff selection would include the shade, dyeing rate, degree of exhaustion and water solubility.

Reactive dyes are preferred for cellulosic fibre due to its ease of application , wide shade range, high brilliance and excellent wet fastness property, opines Shah and Patel (1999). Hence the investigator selected reactive dye for dyeing the fabric.

Colour:

The colour selected by the investigator was violet, because of its aesthetic value in Indian heritage, especially among the women folk and its technical advantage as to its fastness to prolonged wear and tear.

2.Procedure For Dyeing The Fabric

Dyeing is the art of imparting particular hues and tints to fabric by employing colouring matter, Michael Ravinzky(1997).The Samples were dyed with Reactive dye and the detailed procedure for reactive dyeing is given in Appendix-V. The dyed materials are shown in Appendix-VI.

E.Evaluation

The bleached and dyed samples were evaluated by the following ways.

1. Visual Inspection
2. Laboratory Tests
 - a. Fabric Thickness
 - b. Fabric Weight
 - c. Bursting Strength
 - d. Abrasion Resistance

e. Wettability and Absorbency Tests

- i. Drop Test
- ii. Sinking Test
- iii. Capillary Rise Test

f. Colour Fastness Tests

- i. Sunlight
- ii. Wet and Dry crocking
- iii. Wet and Dry pressing
- iv. Washing

1. Visual Inspection

In order to evaluate bleached and dyed samples, thirty judges comprising of staffs and students of, Textiles and Clothing and Family and Community Science Department, Avinashilingam Deemed University, Coimbatore were selected as they had enough knowledge on textiles. A rating scale was prepared as shown in Appendix-VII . The bleached and dyed samples were displayed for easy evaluation. The prepared rating scale was given to the selected judges and they were requested to evaluate the samples. The data were collected, consolidated and the result is presented under the chapter results and discussion.

2. Laboratory Tests

The original bleached and the dyed material were tested by taking the sample pieces from the same relative portions of all the materials for their respective laboratory tests.

a. Fabric Thickness

The thickness of a textile material is the distance between two parallel surfaces while exerting a specified pressure on the material ASTM Standards(1983).The Hungarian Thickness Tester(Plate -I) was used to determine the thickness of the original bleached and dyed materials . The thickness tester had a broad anvil, upon which a presser-foot is pressed by spring. The dial indicated the thickness of the material in thousands of an inch between the anvil and presser-foot. Each division on the dial read 0.01mm. The sample was placed on the anvil without tension or creases and the presser-foot was lowered onto the sample by releasing the raising level slowly and allowed it to rest upon the sample for two seconds at two kgs pressure. The dial reading was recorded . Ten readings were taken from different parts of the same original, bleached and dyed materials and mean values of each materials was calculated and recorded seperately.

b. Fabric Weight

Booth (1986) point out that the fabric weight is generally expressed in one of the three ways. Ounces per square yard, Ounces per linear yard, yard per pound for given widths.

The Eureka cloth quadrant balance (plate-II) was used to determine the fabric weight directly. It had graduated scale in ounces square yard. A template was used to cut the sample and the sample was suspended on the hook of the balance and the reading was recorded. The same procedure was repeated for the ten samples of the same material from the original bleached and dyed materials and the mean value was calculated and the fabric weight of each material was recorded seperately.

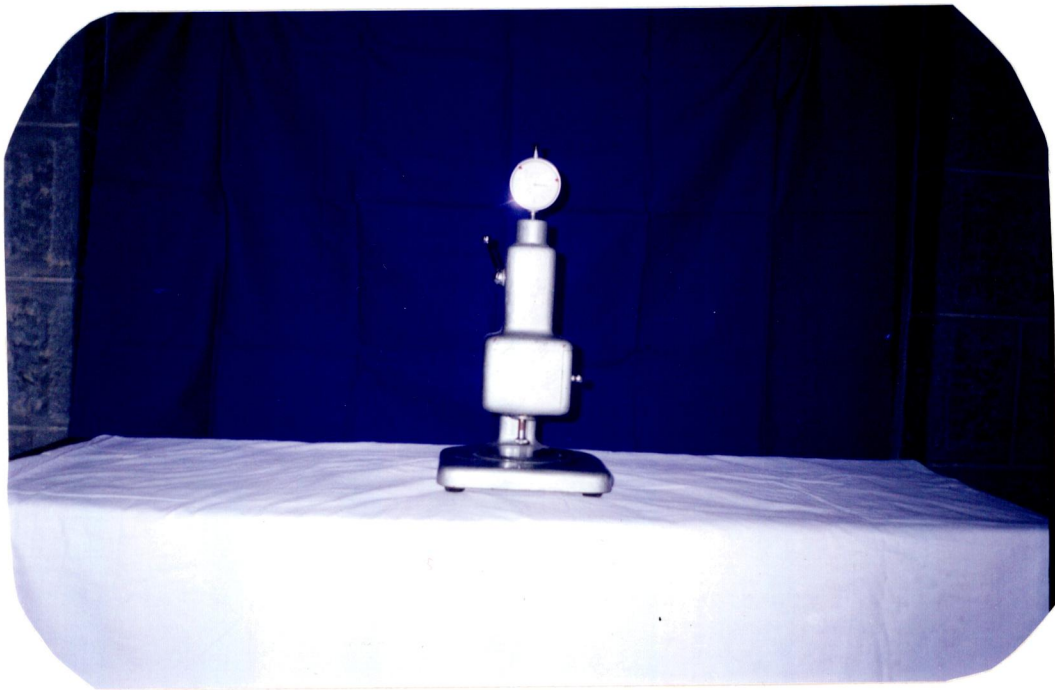


PLATE-I
THICKNESS TESTER



PLATE -II
CLOTH QUARDANT BALANCE

c. Bursting Strength

Skinkle(1972) expresses that bursting strength is the force applied to break a fabric when applied at right angles to the fabrics and uniformly distributed over a given area.

The Eureka bursting strength tester (Plate-III) was used to determine the bursting strength of the samples .It consisted of a device for holding the samples. The internal diameter of the clamp ring was 3 cm. The samples were cut with 10 cm X 10 cm. The material was clamped over a rubber diaphragm and hydrostatic pressure was applied until the sample was broken and the readings were recorded in lb/square inch. The same procedure was repeated for ten samples of original, bleached and dyed samples and the mean values was calculated and recorded seperately.

d. Abrasion Resistance

Abrasion Resistance is the ability of a fiber to withstand rubbing in use and care, this was conducted to find out the amount of rubbing, the fiber can withstand in its life, which in turn will show the resistance of the fabric to rubbing, points out Lyle (1982).

The Eureka Martindale Abrasion Resistance tester (Plate-IV) was used to determine the fabric resistance to friction. The silicon corborandum C-400 was used as abradant. The samples were cut from different part of the original, bleached and dyed materials by using the template. The initial weight of each sample was taken accurately in grams. The sample was mounted on the sample holder and a multi directional movement was given to rub against the abrasive paper. The appearance of the hole or the rupture of the sample determined the number of rubs abrading the

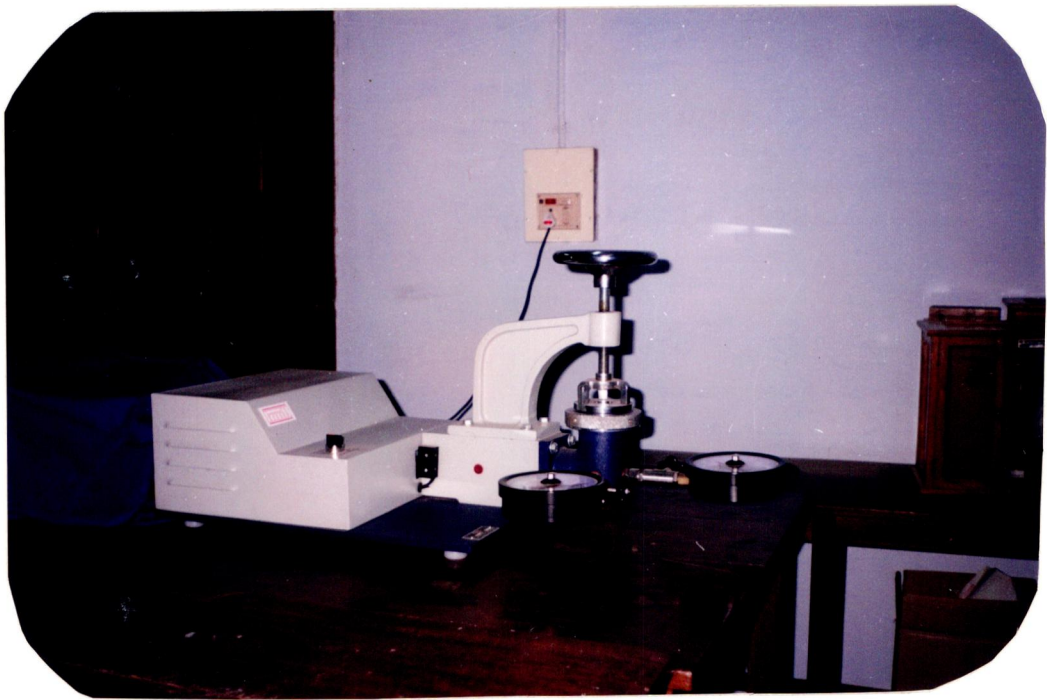


PLATE-III
BURSTING STRENGTH TESTER



PLATE-IV
ABRASION RESISTANCE TESTER

sample. Thirty rubs were found to be sufficient. Each sample was given thirty rubs. After abrasion, its final weight was taken accurately. The loss of weight of the sample was calculated. The same procedure was repeated for ten samples of original, bleached and dyed materials were calculated and mean value was recorded seperately.

e. Wettability and Absorbency Tests

i. Drop Test

According to Skinkle (1972), Wettability is the time taken in seconds for an drop of water to sink into fabric. Fabrics that take more than 200 seconds to absorb water are considered as unwettable.

A burette filled with distilled water was clamped in a stand (Plate-V),The sample was mounted in an embroidery frame. Height between the sample and burette nozzle was kept constant. The nozzle of the burette was opened to allow a drop of water to fall on the sample. The stopwatch was started simultaneously and it was stopped when the drop fully sank into the material. The time taken for this was noted. The same procedure was repeated for ten samples of the original, bleached and dyed material and mean value was calculated and recorded seperately.

ii. Sinking Test

Sinking Time is a single test, which helps to measure the wettability of a fabric Booth (1968). As suggested by Skinkle (1972) ten samples were cut into 5cmx5cm square from the original, bleached and dyed materials. A 1000ml of beaker was taken and filled with distilled water. The sample was dropped on the surface of the water from a standard height and the time required for the samples to sink was noted (Plate -VI) The stop watch was started when the fabric struck the surface of water and

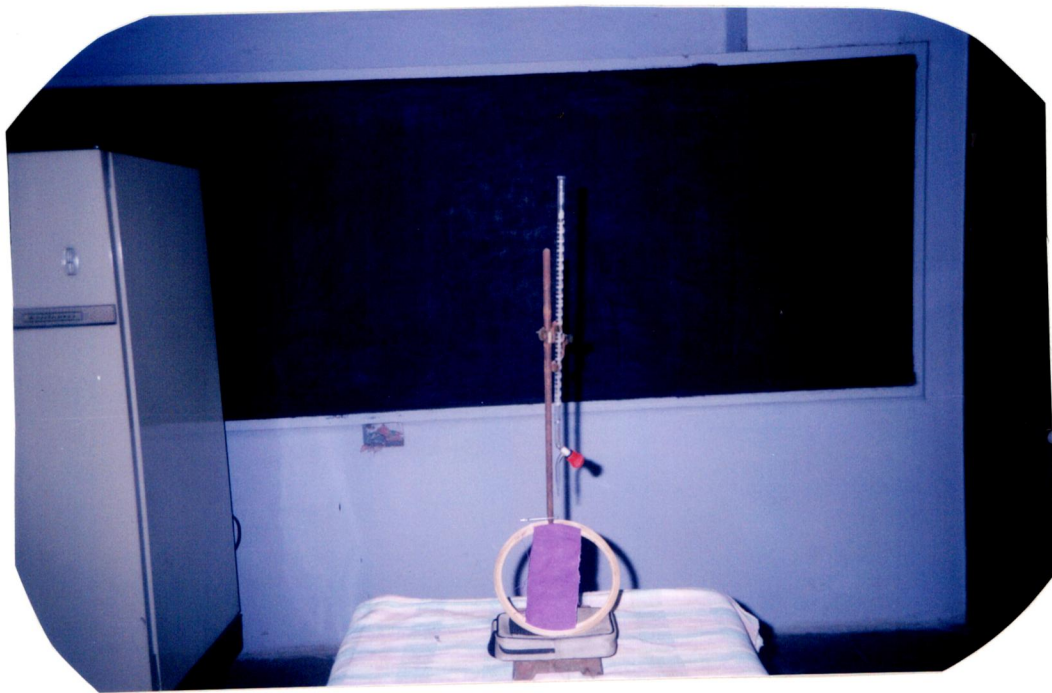


PLATE-V
DROP ABSORBENCY TEST



PLATE-VI
SINKING TIME

stopped when the last corner sank below the water surface. The time taken for this was noted. The same procedure was repeated for ten samples of the original, bleached and dyed materials and the mean value was recorded separately.

iii. Capillary Rise Test

Skinkle(1972) points out that the capillary travel method measures the rapidity of absorption. As suggested by him, ten samples were cut into 15cm length and 2.5 cm width from the original, bleached and dyed materials. One end of the sample strip was pasted with a glass rod and at the other end, 2 grams weight was attached to keep the sample straight. Both ends of the glass rod were placed on heavy wooden blocks. At the weighted ends, 2cm of the sample was allowed to immerse in a tray of distilled water as shown in(Plate-VII).. The rise of the water level in the strip was measured after 5 minutes. The same procedure was repeated for ten samples of original, bleached and dyed materials and the mean value was calculated and recorded separately.

f. Colour Fastness Test

Wingate (1970) opines that the colourfastness in textile materials is the ability of fabric to retain its original colour or to resist transfer of colour. The investigator followed the AATCC grey scales for the assessment of colour change, colour transfer and staining (Appendix-VII).

i. Sunlight

When a dyed fabric is exposed to sunlight during its use, the dye should not fade or change. It is a colour, that is, it should have light fastness, feels Venkataraman (1975).

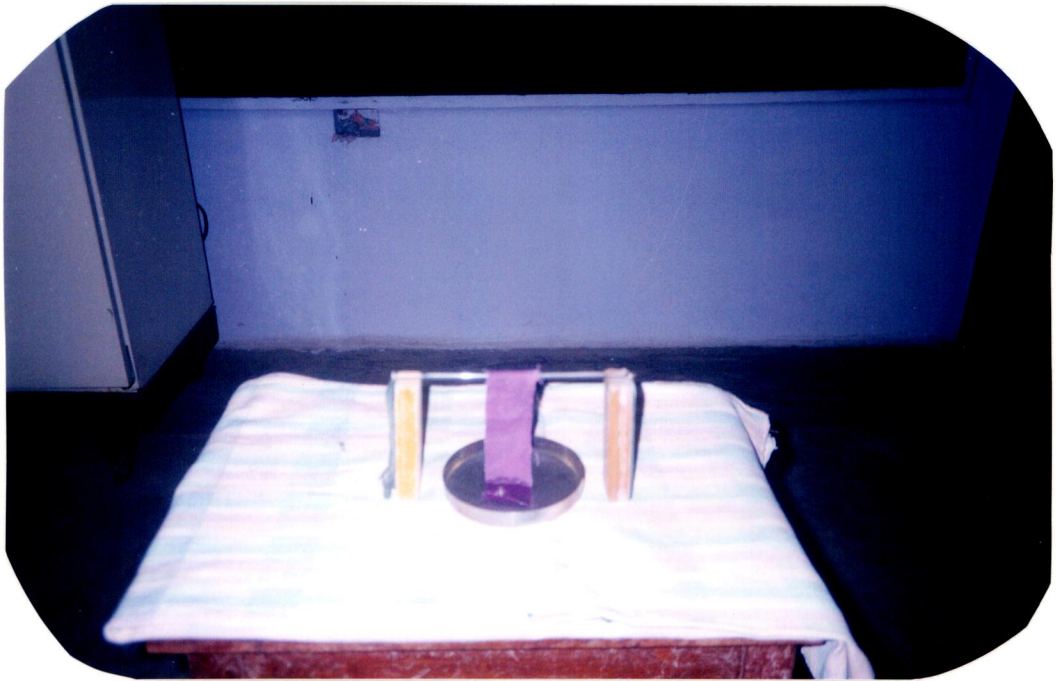


PLATE-VII
CAPILLARY RISE

A sample piece of dimension of 16 cm X 5cm was taken from each of the dyed materials. The samples were divided into 8 parts by marking at a distance of two inches in the larger side marked up to eight. Each sample was covered with black paper to prevent the samples from direct sun light. The first portion was exposed to direct sunlight for eight hours whereas the other seven parts were kept away from direct sunlight. For the successive seven days the other portions were exposed accordingly along with the first portion. As a result, the first portion got seven days exposure and the last portion got one-day exposure to sunlight. The changes in colour of the dyed samples were compared with the original an accordingly the specimens were rated with the grey scale.

ii. Dry And Wet Crocking

Sasmira Crockmeter (plate VIII) was used for ascertaining the fastness of dyed textiles to wet and dry crocking. It consisted of two metal blocks. The base block was stationary, while the upper block had an arrangement to move to and fro on the base by means of a rotating handle. There was a finger knob attached to the upper moveable block to hold the desized material with ring. The samples were cut into 20 cm X10 cm. The sample was fixed on the base block with longer side in the direction of rubbing. 5 cm X 5 cm dimension of white desized material was fixed on the finger knob of upper moveable block with the ring. The number of rubs to be given was standardized and fixed as fifty. Each sample was given fifty rubs. The white material was rubbed to and fro against the dyed samples along at a rack of 10 cm. The colour transferred from the dyed samples to the white material was assessed with AATCC

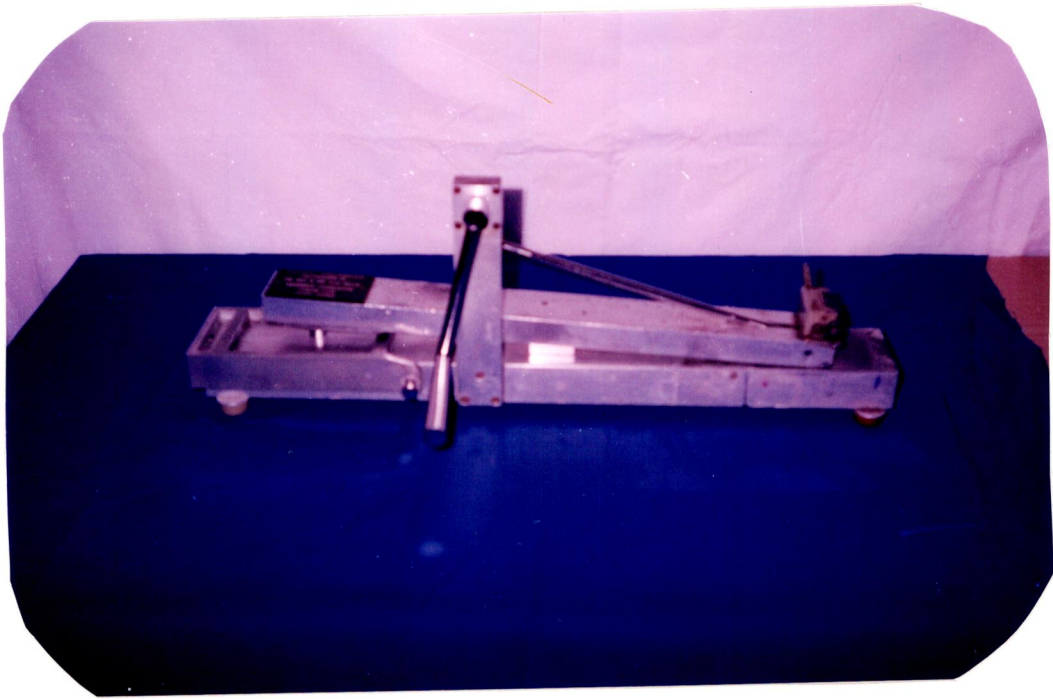


PLATE-VIII
CROCKMETER

grey scale and geometric scale for staining. The same procedure was repeated for all the samples of the dyed materials.

For wet crocking, the damp white material was used and the same procedure was followed.

iii. Dry And Wet Pressing

The national Bureau of standards suggested a test to determine colourfastness to dry and wet pressing. As suggested by Wingate (1988) dyed samples of 2"X4" size was sandwiched with a white material for both dry and wet pressing. Then, the dyed samples were pressed with a hot iron for fifteen seconds. The samples under dry and wet condition were assessed for colour change and staining using grey scale.

iv. Colour Fastness to Washing

Textile handbook (1966) states that all fabrics must withstand cleansing, colour fastness to washing and dry cleaning. The test samples of 3"X 3" were cut from the dyed materials. Each sample was sandwiched between the undyed cloth, which has been desized well.

Soap solution of about 5gms/litre was prepared. Each of the test samples was soaked in the soap solution separately for about 30 minutes. After that, the test samples were removed, rinsed in cold water thoroughly, squeezed and dried well.

Results And Discussion

IV. RESULTS AND DISCUSSIONS

The results of the study are discussed under the following headings:

- A. Market survey
- B. Household survey
- C. Visual Inspection
- D. Laboratory Tests

A. Market survey

The aspects included under the market survey are

1. Number of shops surveyed
2. Details about the bleaching agents
 - a. Details regarding the type of bleaching agents available and their cost.
 - b. Demand for the product
3.
 - a. Sales promotion methods adopted
 - b. Details on slackness in sales and heavy demand.

1. Number of shops surveyed

The numbers of shops surveyed were 50. Out of them 25 shops were selected from Gandhipuram and Townhall, 25 shops from R.S. Puram.

2. Details about the bleaching agents

- a. Details regarding type of bleaching agents available and their cost is given in

Table-II

Table-II**Bleaching Agents and their Cost**

S.No	Bleaching Agents	Percentage	Cost in Rs
1	Ala(500 ml)	100	24
2	Robin Liquid(500ml)	84	25
3	Robin cuffs and Collar(500ml)	24	32
4	Washing Soda (500 gms)	76	9-10
5	Bleaching powder(500 gms)	72	20-25

The above table reveals that Ala was available in all shops at the cost of Rs.24. About 84 percentage of the shops sold Robin Liquid at the cost of Rs.25. Nearly 76 percentage of shops sold washing soda at the cost ranging from Rs. 9 to 10, and 72 percentage of shops sold bleaching powder ranging from Rs 20 to 25.

Inference could be drawn from the table that Ala was available in almost all the shops, and Robin cuffs and collar was available only in few shops.

b.Demand for the product and the reasons are shown in Table-III

Table-III**Demand for the Product**

S.No	Fast Moving Items	Percentage
1	Ala	76
2	Robin Liquid	68
3	Robin Cuffs and Collar	4
4	Washing soda	64
5	Bleaching powder	72

Table-IV

Method of Washing

Method of washing	Percentage of families	
	Middle	High
Hand	52	36
Machine	28	52
Laundry	20	12

It is evident from the above table that in middle income 52 percent of families used hand washing and 52 percent of high-income families followed machine washing. All most all the families preferred soft water for washing clothes.

2.Details on purchase of bleaching agents

- a. Preference of bleaching agents by middle and high income families is given in Table-V

Table-V

Preferences of Bleaching Agents

Name of Bleaching Agents	Percentage of Families	
	Middle	High
Ala	60	68
Robin Liquid	40	38
Robin cuffs and Collar	-	4

From the above table, it is clear that in 76 percent of shops, the fast moving items was Ala and next is bleaching powder. In more than 60 percent of shops Robin Liquid and washing soda were considered as fast-moving item. The reasons stated by them were cheap.

3. a . Sales Promotion Methods Adopted

The survey reveals that out of fifty shops 42 percent of shops offered discount for their sales promotion. Whereas, only 16 percent of shops encourage sales by giving free gifts.

b. Details on slackness in sales and heavy demand.

The slackness in sales throughout the year was identified only in 10 percent of shops.

B. Household Survey

The findings of the household survey were assessed under the following headings.

- 1. Method of washing cotton fabrics and the type of water used
 - 2. Details on purchase of bleaching agents
 - a. Preferences of bleaching agents
 - b. Factors influencing the purchase of bleaching agents
1. Details regarding method of washing cotton fabrics and the type water used is discussed below

From table it is clear that irrespective of the income groups, more than 60 percent of families preferred Ala as the bleaching agent for washing clothes. Nearly 40 percent of middle and high-income families preferred Robin Liquid next to Ala.

b. The factors influencing purchase of bleaching agents are given in Table-VI

Table-VI

Factors Influencing Purchase of Bleaching Agents

S.No	Factors	Percentage Of Families	
		Middle	High
1	Cost	100	64
2	Durability	100	100
3	Effectiveness	88	80
4	Label Information	20	48
5	Brand	84	76
6	Advertisement	82	16
7	Availability	76	-

It is obvious from the table that, 100 percent of the middle income families showed cost and durability as the top most priority. Whereas, more than 80 percent of the families considered effectiveness brand and advertisement as the influencing factors. In high income, only durability was considered as top most factors by 100 percent of families when compared with the other factors.

C. Visual Inspection

The details of the panel ratings include general appearance, whiteness, texture, luster of the bleached materials and general appearance, evenness in dyeing , texture , luster of the dyed materials. These are given in Table-VII and Table-VIII respectively

TABLE-VII
Evaluation of the Bleached Samples

	Original		Bleached Samples																		
	X	Y	XA ₁	YA ₁	XA ₅	YA ₅	XA ₁₀	YA ₁₀	XR ₁	YR ₁	XR ₅	YR ₅	XR ₁₀	YR ₁₀	XCB ₁	YCB ₁	XCB ₅	YCB ₅	XCB ₁₀	YCB ₁₀	
General Appearance																					
Good(%)	24	22	20	16	34	32	85	78	20	14	34	32	88	76	22	28	38	36	86	78	
Fair (%)	64	68	76	64	66	68	15	22	76	64	66	68	12	24	78	72	62	64	14	22	
Poor(%)	12	20	4	20	-	-	-	-	4	22	-	-	-	-	-	-	-	-	-	-	
Whiteness																					
Bright(%)	20	8	28	18	30	26	92	90	20	16	26	24	90	98	58	52	64	60	98	94	
Fair(%)	68	80	72	70	70	64	8	10	80	70	74	60	10	2	42	48	36	40	2	6	
Dull(%)	12	12	-	12	-	10	-	-	-	14	-	16	-	-	-	-	-	-	-	-	
Texture																					
Soft(%)	32	18	28	20	22	26	44	56	24	18	24	28	43	40	36	32	30	28	88	86	
Medium(%)	68	70	72	72	78	74	56	44	76	70	76	72	57	60	64	68	70	72	12	14	
Coarse(%)	-	12	-	8	-	-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	
Lustre																					
High(%)	8	6	4	12	24	18	68	66	2	10	22	14	62	60	2	30	37	40	92	92	
Medium(%)	72	74	92	74	72	78	32	34	93	76	74	74	38	40	98	70	63	60	8	8	
low(%)	20	20	4	14	4	4	-	-	5	14	4	12	-	-	-	-	-	-	-	-	

X,Y -Original, A-Ala ,R-Robin Liquid ,CB-Commercial Bleach ,1,5,10 -Number Of treatments

From the above table, it was clear that samples XA_{10} , YA_{10} , XR_{10} , YR_{10} and XCB_{10} , YCB_{10} were rated as good by more than 85 percent of the judges. Samples XA_5 , YA_5 , XR_5 , YR_5 and XCB_5 , YCB_5 were rated as fair by more than 60 percent and good by more than 30 percent of the judges.

With respect to whiteness samples XA_{10} , YA_{10} , XR_{10} , YR_{10} and XCB_{10} , YCB_{10} were rated as bright by more than 90 percent of the judges.

As regards texture, samples XCB_{10} and YCB_{10} were rated as soft by more than 85 percent of the judges. Samples XA_5 , YA_5 , XR_5 , YR_5 and XCB_5 , YCB_5 were rated as medium by more than 70 percent and soft by more than 20 percent of the judges.

Considering the luster, samples XCB_{10} and YCB_{10} were rated as high by 92 Percent followed by XA_{10} , YA_{10} by more than 65 percent of the judges.

TABLE-VIII
Evaluation of the Dyed Samples

	Original		Dyed Samples																	
	XD	YD	XA ₁ D	YA ₁ D	XA ₅ D	YA ₅ D	XA ₁₀ D	YA ₁₀ D	XR ₁ D	YR ₁ D	XR ₅ D	YR ₅ D	XR ₁₀ D	YR ₁₀ D	XCB ₁ D	YCB ₁ D	XCB ₅ D	YCB ₅ D	XCB ₁₀ D	YCB ₁₀ D
General Appearance Good %	100	100	100	100	98	98	96	96	100	100	96	96	94	94	98	98	96	96	92	92
Fair %	-	-	-	-	2	2	4	4	-	-	4	4	6	6	2	2	4	4	8	8
Poor %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Evenness In Dyeing Good %	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Fair %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Poor %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Texture Soft %	38	18	30	26	34	32	68	66	30	20	38	32	66	68	32	45	41	42	88	88
Medium%	62	72	70	70	66	66	32	34	70	80	62	68	34	32	68	55	59	58	12	12
Coarse%	-	10	-	4	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Luster High %	18	9	25	20	24	15	26	25	28	30	26	20	24	30	20	20	26	24	40	35
Medium%	82	71	75	60	76	70	74	65	72	50	74	70	76	70	80	75	74	76	60	65
Low%	-	20	-	20	-	15	-	10	-	20	-	10	-	-	-	5	-	-	-	-

XD, YD-Dyed Original

From the above table it was clear that all of the samples were rated as good in general appearance by more than 90 percent of the judges.

As regarding evenness in dyeing all samples were rated as even by 100 percent of the judges.

With respect to the texture, samples XCB₁₀D and YCB₁₀D were rated as soft by 88 percent, and samples XA₁₀D, YA₁₀D, XR₁₀D, YR₁₀D were rated by more than 60 percent of the judges.

Considering the luster, samples except YA₁D, YA₁₀D, YR₁D, XCB₁₀D, YCB₁₀D all other samples were rated as medium by more than 70 percent of the judges.

D. Laboratory Tests

The test include the following aspects

1. Fabric Thickness
2. Fabric Weight
3. Bursting Strength
4. Abrasion Resistance
5. Wettability and Absorbency Tests
 - a. Drop Test
 - b. Sinking Test
 - c. Capillary Rise Test
 - d. Colour Fastness Tests
 - i. Sunlight
 - ii. Wet and dry crocking
 - iii. Wet and dry pressing
 - iv. Washing

1. Fabric Thickness

Thee fabric thickness of original , bleached and dyed samples is presented in Table-IX and Figure-I

TABLE-IX

Fabric Thickness and Fabric Weight of Original, Bleached and Dyed Samples

S.No	Samples	Fabric Thickness			Fabric Weight		
		Mean Value in mm	Gain or Loss over Original	% of gain or loss over original	Mean Value (oz/sq.yard)	Gain Loss or Over Original	% Of gain or loss over original
1	X	0.593	-	-	6.12	-	-
2	XA ₁	0.623	0.030	5.05	6.50	0.38	6.20
3	XA ₅	0.636	0.043	7.25	6.53	0.41	6.69
4	XA ₁₀	0.646	0.053	8.93	6.57	0.45	7.35
5	XR ₁	0.605	0.010	1.68	6.43	0.31	5.06
6	XR ₅	0.616	0.025	3.87	6.50	0.38	6.20
7	XR ₁₀	0.635	0.040	6.74	6.52	0.40	6.53
8	XCB ₁	0.603	0.010	1.68	6.50	0.41	6.68
9	XCB ₅	0.616	0.025	3.87	6.50	0.41	6.69
10	XCB ₁₀	0.630	0.037	6.23	6.60	0.48	7.84
11	Y	0.885	-	-	9.18	-	-
12	YA ₁	0.845	-0.033	-3.72	9.75	0.57	6.20
13	YA ₅	0.843	-0.043	-4.85	9.93	0.75	8.16
14	YA ₁₀	0.843	-0.043	-4.85	10.16	0.98	10.67
15	YR ₁	0.863	-0.023	-2.59	9.87	0.69	7.51
16	YR ₅	0.853	-0.033	-3.72	10.12	0.94	10.23
17	YR ₁₀	0.853	-0.035	-3.72	10.47	1.29	14.05

S.No	Samples	Fabric Thickness			Fabric Weight		
		Mean Value in mm	Gain or Loss over Original	% of gain or loss over original	Mean Value in (oz/sq.yard)	Gain Loss or Over Original	% Of gain or loss over original
18	YCB ₁	0.883	-0.003	-0.33	9.75	0.75	8.16
19	YCB ₅	0.873	-0.013	-1.46	10.12	0.94	10.23
20	YCB ₁₀	0.863	-0.023	-2.59	10.43	1.25	13.61
21	XD	0.596	-	-	6.50	-	-
22	XA ₁ D	0.633	0.012	2.01	6.60	0.10	1.53
23	XA ₅ D	0.640	0.044	7.38	6.66	0.16	2.46
24	XA ₁₀ D	0.650	0.057	9.56	6.75	0.25	3.84
25	XR ₁ D	0.613	0.017	2.85	6.59	0.09	1.38
26	XR ₅ D	0.623	0.027	4.53	6.62	0.12	1.84
27	XR ₁₀ D	0.636	0.013	2.18	6.62	0.12	1.84
28	XCB ₁ D	0.613	0.017	2.85	6.60	0.10	1.53
29	XCB ₅ D	0.623	0.027	4.53	6.71	0.21	3.23
30	XCB ₁₀ D	0.633	0.037	6.20	6.87	0.37	5.69
31	YD	0.906	-	-	10	-	-
32	YA ₁ D	0.860	-0.046	-5.07	10.25	0.25	2.50
33	YA ₅ D	0.845	-0.060	-6.62	10.43	0.43	4.30
34	YA ₁₀ D	0.843	-0.063	-6.95	10.93	0.93	9.30
35	YR ₁ D	0.883	-0.023	-2.53	10.25	0.25	2.50
36	YR ₅ D	0.873	-0.033	-3.64	10.50	0.50	5.00
37	XR ₁₀ D	0.856	-0.050	-5.51	10.75	0.75	7.50
38	YCB ₁ D	0.893	-0.013	-1.43	10.06	0.06	0.60
39	YCB ₅ D	0.883	-0.025	-2.53	10.62	0.62	6.20
40	YCB ₁₀ D	0.873	-0.033	-3.64	10.87	0.87	8.70

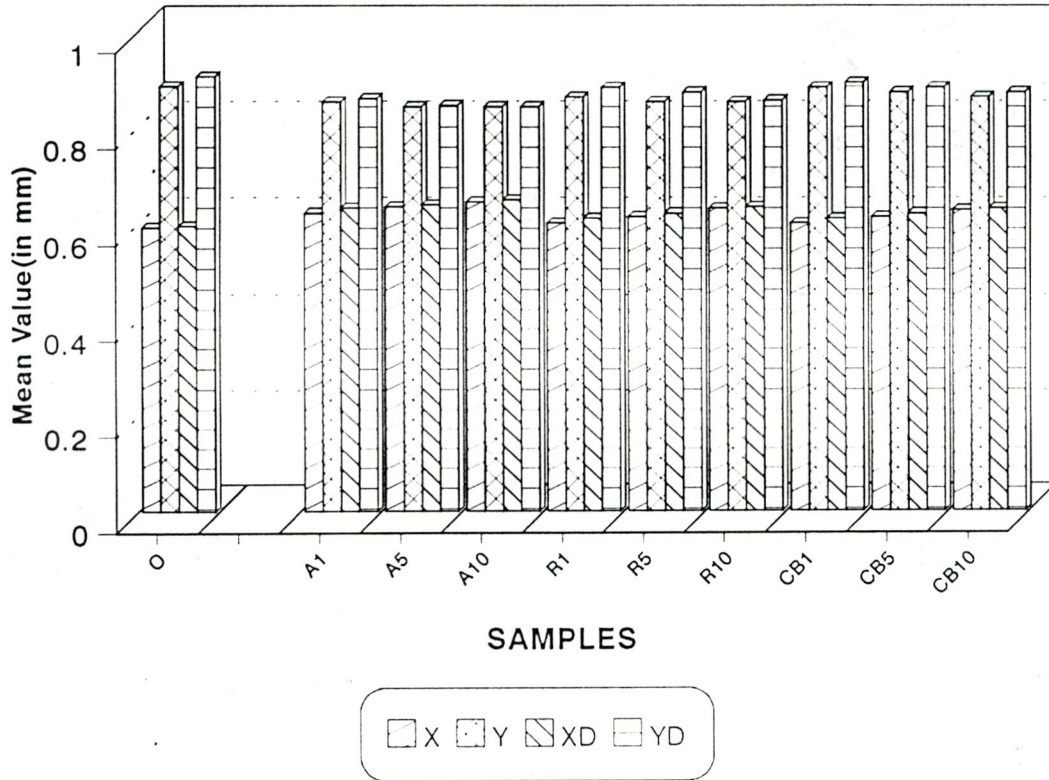
X,Y- Desized Original, XD,YD- Dyed Original, Ala ,R- Robin Liquid, CB-Commercial Bleach, 1,5,10- Number of treatments

Analysis of variance

Source Of Variation	Fabric Thickness				Fabric Weight			
	Sum of squares	DF	Means Square	F	Sum of squares	DF	Means Square	F
Main Effects								
Cloth	4360.901	3	1453.634	1913.267**	1391.026	3	463.675	119.503**
Liquid	22.454	2	11.227	14.777**	17.730	2	8.865	2.285
Wash	36.472	2	18.236	24.002**	703.249	2	351.625	90.624**
2-Way Interactions								
Cloth Liquid	401.220	6	66.870	88.014**	76.290	6	12.715	3.277**
Cloth Wash	316.576	6	52.763	69.446**	158.163	6	26.360	6.794**
Liquid Wash	1.589	4	.397	.523	24.989	4	6.247	1.610
3-Way Interactions								
Cloth Liquid Wash	14.505	12	1.209	1.591	59.146	12	4.929	1.270

** Significant at 1% level

FIGURE 1 FABRIC THICKNESS



X- ORIGINAL(96x48)
Y- ORIGINAL(68x38)
XD- DYED ORIGINAL(96x48)
YD- DYED ORIGINAL(68x38)
A- ALA
R- ROBIN LIQUID
CB- COMMERCIAL BLEACH
1,5,10-NUMBER OF TREATMENTS

Table-IX shows the thickness of the original, bleached and dyed samples. The greater the mean value the more is the thickness of the sample.

From Table-IX ,it was clearly evident that in X count ten times treated samples showed higher mean value than the original whereas in Y count ten times treated samples showed lower values than the original. There was not much difference found between thee treated and dyed samples in both counts.

On analyzing statistically ,the following facts are proved.

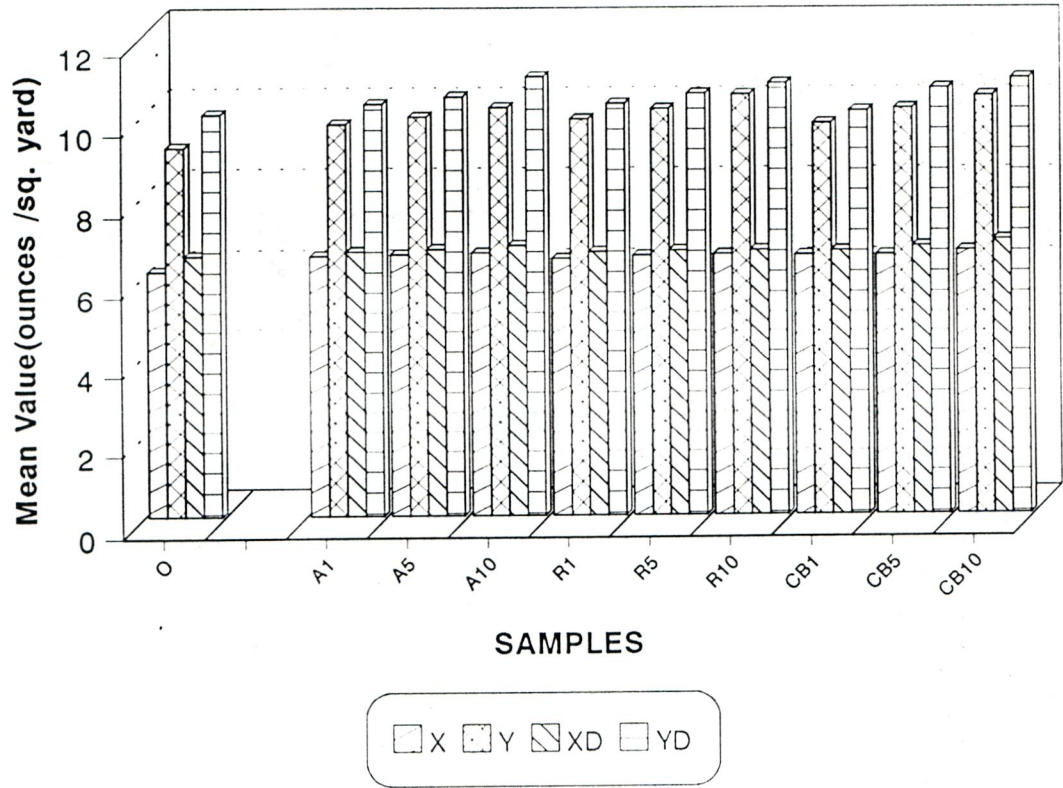
1. There was significant difference found within the counts, type of bleaches used and number of treatments given.
2. In two way interactions significant difference was found between the count with type belching agents used and also number of treatments given.
3. In three way interaction no significant difference was found between the counts, type of bleaching agents used and number of treatments given.

2.Fabric Weight

The fabric weight of original, bleached and dyed samples is presented in Table-IX and Figure-II

The Table-IX shows the weight of the original ,bleached and dyed samples. More the mean value, the more is the weight of the sample.From the above table it was clearly obvious that in both the counts all bleached and dyed samples showed higher mean values than the original. A maximum gain was

FIGURE 2 FABRIC WEIGHT



X- ORIGINAL(96x48),
Y- ORIGINAL(68x38)
XD- DYED ORIGINAL(96x48)
YD- DYED ORIGINAL(68x38)
A- ALA
R- ROBIN LIQUID
CB- COMMERCIAL BLEACH
1,5,10-NUMBER OF TREATMENTS

observed in ten times treated samples in both the counts when compared with the other samples.

The statistical analysis proved the following facts.

1. There was no significant difference between the type of bleaches used. But significant difference was found within the counts and number of treatments given.
2. In two way interaction significant was found between the counts with type of bleaches used and also number of treatments given.
3. In three-way interaction no significant difference was found between the count and also number of treatments given.

3. Bursting Strength

The bursting strength of original, bleached and dyed samples is presented in Table-X and Figure-III

TABLE-X

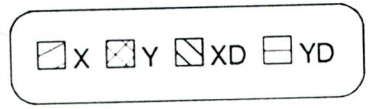
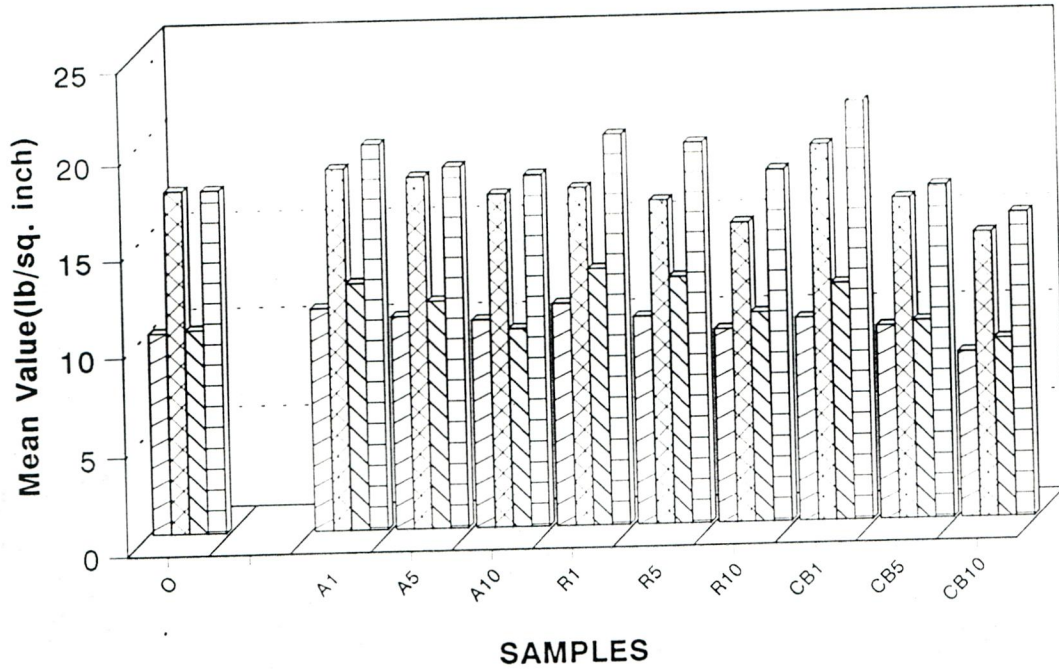
Bursting Strength and Abrasion Resistance of Original, Bleached and Dyed Samples

S.No	Samples	Bursting Strength			Abrasion Resistance		
		Mean Value in lb/sq.inch	Gain or Loss Over Original	% of gain or loss Over Original	Mean difference in gms	Gain or Loss over Original	% of gain of loss over original
1	X	10.12	-	-	0.015	-	-
2	XA ₁	11.25	1.13	11.16	0.017	0.002	13.33
3	XA ₅	10.75	0.63	6.22	0.19	0.004	26.66
4	XA ₁₀	10.50	0.38	3.75	0.021	0.006	40.00
5	XR ₁	11.25	1.13	11.16	0.016	0.001	6.66
6	XR ₅	10.50	0.38	3.75	0.017	0.002	13.33
7	XR ₁₀	9.75	-0.37	-3.65	0.020	0.005	33.33
8	XCB ₁	10.25	0.13	1.8	0.019	0.004	26.66
9	XCB ₅	9.75	-0.37	-3.65	0.018	0.003	20.00
10	XCB ₁₀	8.37	-1.75	-17.29	0.023	0.008	53.33
11	Y	17.50	-	-	0.005	-	-
12	YA ₁	18.50	1.00	5.71	0.007	0.002	40.00
13	YA ₅	18.00	0.50	2.85	0.009	0.004	80.00
14	YA ₁₀	17.00	-0.50	-2.85	0.010	0.005	100.00
15	YR ₁	17.25	-0.25	-1.42	0.006	0.001	20.00
16	YR ₅	16.50	-1.00	-5.71	0.008	0.003	60.00
17	YR ₁₀	15.25	-2.25	-12.85	0.01	0.005	100.00
18	YCB ₁	19.25	1.75	10.00	0.006	0.001	20.00
19	YCB ₅	16.37	-1.13	6.45	0.006	0.001	20.00

S.No	Samples	Bursting Strength			Abrasion Resistance		
		Mean Value in lb/sq.inch	Gain or Loss Over Original	% of gain or loss Over Original	Mean difference in gms	Gain or Loss over Original	% of gain of loss over original
20	YCB ₁₀	14.50	-3.00	-17.14	0.010	0.005	100.0
21	XD	10.25	-	-	0.011	-	-
22	XA ₁ D	12.50	2.25	21.95	0.014	0.003	27.27
23	XA ₅ D	11.50	1.25	12.19	0.016	0.005	45.45
24	XA ₁₀ D	10.00	-0.25	-2.43	0.018	0.007	63.63
25	XR ₁ D	13.00	2.25	21.95	0.015	0.004	36.36
26	XR ₅ D	12.50	2.25	21.95	0.015	0.004	36.36
27	XR ₁₀ D	10.57	0.32	3.12	0.017	0.006	54.54
28	XCB ₁ D	12.00	1.75	17.07	0.015	0.004	36.36
29	XCB ₅ D	10.00	-0.25	-2.43	0.016	0.005	45.45
30	XCB ₁₀ D	9.00	-1.25	-12.19	0.019	0.008	72.72
31	YD	17.50	-	-	0.004	-	-
32	YA ₁ D	19.75	2.25	12.87	0.005	0.001	25.00
33	YA ₅ D	18.50	1.00	5.71	0.007	0.003	75.00
34	YA ₁₀ D	18.00	0.50	2.85	0.008	0.004	100.00
35	YR ₁ D	20.00	2.50	14.28	0.005	0.001	25.00
36	YR ₅ D	19.50	2.00	11.42	0.007	0.003	75.00
37	XR ₁₀ D	18.00	0.50	2.85	0.008	0.004	100.00
38	YCB ₁ D	21.50	4.00	22.85	0.005	0.001	25.00
39	YCB ₅ D	17.00	-0.50	-2.85	0.005	0.001	25.00
40	YCB ₁₀ D	15.50	-2.00	-11.42	0.008	0.004	100.00

X,Y – Desized Original, XD,YD- Dyed Original, Ala ,R- Robin Liquid, CB-Commercial Bleach, 1,5,10- Number of treatments

**FIGURE 3
BURSTING STRENGTH**



X- ORIGINAL(96x48),
 Y- ORIGINAL(68x38)
 XD- DYED ORIGINAL(96x48)
 YD- DYED ORIGINAL(68x38)
 A- ALA
 R- ROBIN LIQUID
 CB- COMMERCIAL BLEACH
 1,5,10-NUMBER OF TREATMENTS

The above Table illustrates the bursting strength of the original, bleached and dyed samples. The higher the mean value, the greater is the strength of the samples. From the above table it is clear that in both counts all the ten times treated samples showed lower mean values than the original. Similarly lower mean values were found in dyed samples also when compared with other samples.

The statistical analysis proved the following facts.

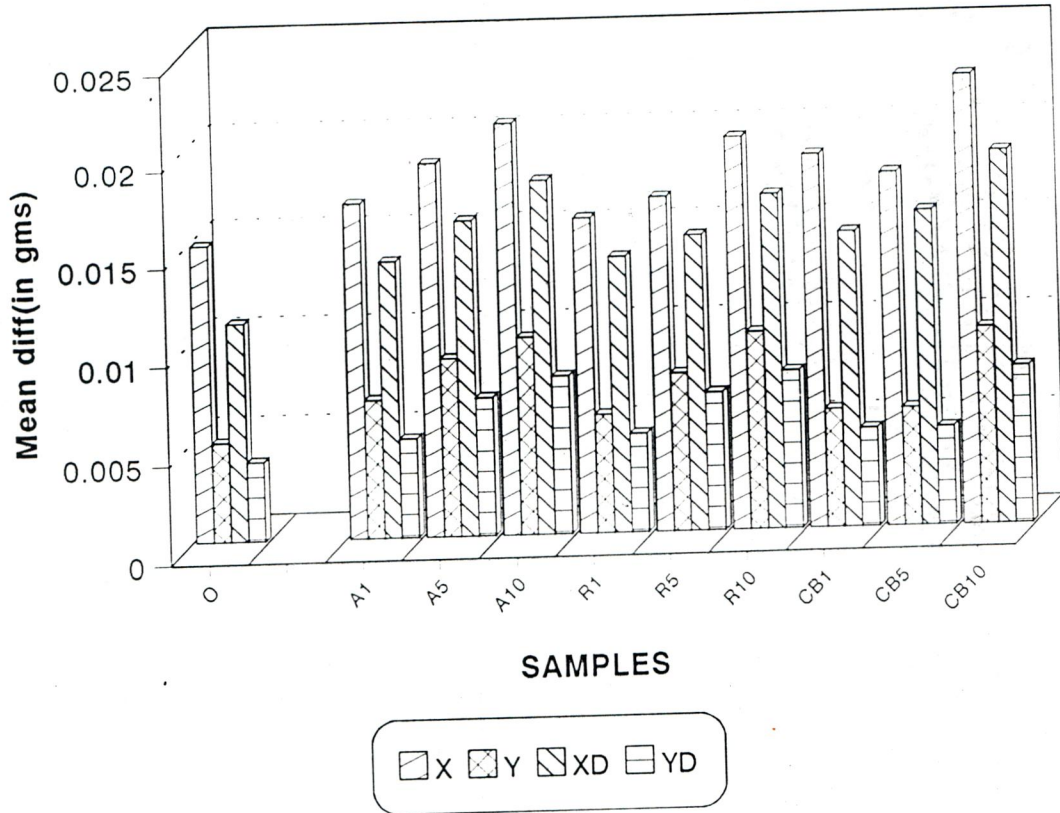
1. There was significant difference within the counts, type of bleaching agents used and number of treatments given.
2. In two-way interaction, significant difference was found between the counts with type of bleaching agents used and also with number of treatments given. Significant difference was found between the bleaching agents used with number of treatments given.
3. In three way interactions, significant difference was found between the count with type of bleaching agents used and with number of treatments given.

4. Abrasion Resistance

The Table-X determine the abrasion resistance of original, bleached and dyed samples . The greater the loss in weight the lesser is the resistance to friction.

From the above table it was clearly evident that in both counts all the ten times treated samples showed higher mean value than the original. Similarly dyed samples also showed higher mean values when compared with other samples.

**FIGURE 4
ABRASION RESISTANCE**



X- ORIGINAL (96x48),
 Y- ORIGINAL (68x38)
 XD- DYED ORIGINAL (96x48)
 YD- DYED ORIGINAL (68x38)
 A- ALA
 R- ROBIN LIQUID
 CB- COMMERCIAL BLEACH
 1,5,10-NUMBER OF TREATMENTS

The statistical analysis proved the following facts.

1. Significant difference was found between the counts and also between the number of treatments given. But between the bleaches no significant difference was found.
2. In 2-way interaction significant difference was found between the counts with type of bleaching agents used, between the counts with number of treatments and also bleaching agents with number of treatments given.
3. In 3-way interactions significant difference was found between the counts with bleaching agents used and also with number of treatments given .

5. Wetability and Absorbency Tests

a. Drop Test

The drop test of the originals, bleached and dyed samples is presented in Table-XI and Figure-V

TABLE-XI

Drop Test, Sinking Time and Capillary Rise of Original, Bleached and Dyed Samples

S.No	Samples	Drop Test			Sinking Time			Capillary Rise Test		
		Mean Value In Seconds	Gain Or Loss Over Original	% Of Gain Or Loss Over Original	Mean Value In Seconds	Gain Or Loss Over Original	% Of Gain Or Loss Over Original	Mean Value In cm	Gain Or Loss Over Original	% Of Gain Or Loss Over Original
1	X	0.750			5.625			6.45		
2	XA ₁	0.350	-0.400	-53.33	4.125	-1.500	-26.66	7.25	0.80	12.40
3	XA ₅	0.375	-0.375	-50.00	5.750	0.125	3.03	8.62	2.17	33.64
4	XA ₁₀	0.400	-0.350	-46.66	5.250	-0.375	-6.66	9.27	2.82	43.72
5	XR ₁	0.416	-0.334	-44.53	5.680	0.055	0.97	8.45	2.00	31.00
6	XR ₅	0.575	-0.175	-23.33	6.500	0.875	15.55	8.55	2.10	32.55
7	XR ₁₀	0.600	-0.150	-20.00	5.250	-0.375	-6.66	9.33	2.88	44.65
8	XCB ₁	0.600	-0.150	-20.00	6.625	1.00	17.77	7.50	1.05	16.27
9	XCB ₅	0.787	0.037	4.93	5.750	0.125	2.22	8.00	1.55	24.03
10	XCB ₁₀	0.800	0.050	6.66	7.000	1.375	24.44	8.65	2.20	34.10
11	Y	0.400			5.375			7.38		
12	YA ₁	0.366	-0.034	-8.50	5.125	-0.250	-4.65	6.52	-0.86	-11.65
13	YA ₅	0.475	0.075	18.75	5.001	-0.374	-6.95	7.83	0.45	6.09
14	YA ₁₀	0.508	0.108	27.00	5.125	-0.250	-4.65	9.54	2.07	28.04
15	YR ₁	0.437	0.037	9.25	3.312	-2.063	-38.38	7.63	0.25	3.38

S.No	Samples	Drop Test			Sinking Time			Capillary Rise Test		
		Mean Value In Seconds	Gain Or Loss Over Original	% Of Gain Or Loss Over Original	Mean Value In Seconds	Gain Or Loss Over Original	% Of Gain Or Loss Over Original	Mean Value In cms	Gain Or Loss Over Original	% Of Gain Or Loss Over Original
16	YR ₅	0.475	0.075	18.75	3.850	-1.525	-28.37	8.52	1.14	15.44
17	YR ₁₀	0.592	0.192	48.00	3.785	-1.590	-29.58	10.50	3.12	42.22
18	YCB ₁	0.600	0.200	50.00	4.125	-1.250	-23.25	6.27	-1.11	-15.04
19	YCB ₅	0.608	0.208	52.00	4.000	-1.375	-25.58	8.93	1.55	21.00
20	YCB ₁₀	0.725	0.325	81.25	4.250	-1.125	-20.93	7.64	0.26	3.52
21	XD	1.100			4.125			6.80		
22	XA ₁ D	0.550	-0.550	-50.00	2.750	-1.375	-33.33	6.00	-0.80	-11.76
23	XA ₅ D	0.787	-0.313	-28.45	3.680	-0.445	-10.78	9.12	2.32	34.11
24	XA ₁₀ D	0.925	-0.175	-15.90	3.125	-1.000	-24.24	8.70	1.90	27.94
25	XR ₁ D	0.600	-0.500	-45.45	4.250	0.125	3.03	7.35	0.55	8.08
26	XR ₅ D	0.787	-0.313	-28.45	5.750	1.625	39.39	8.30	1.50	22.05
27	XR ₁₀ D	0.950	-0.150	-13.63	4.000	-0.125	-3.03	9.35	2.55	37.50
28	XCB ₁ D	0.750	-0.350	-31.81	5.687	1.562	37.86	6.89	0.09	1.32
29	XCB ₅ D	1.050	-0.050	-4.54	4.062	-0.063	-1.52	6.12	-0.68	-10.00
30	XCB ₁₀ D	1.200	0.100	9.09	5.125	1.000	24.24	6.97	0.17	2.50
31	YD	0.762			2.375			7.62		
32	YA ₁ D	0.500	-0.262	-34.38	2.125	-0.250	-10.52	7.38	-0.24	-3.14
33	YA ₅ D	0.562	-0.200	-26.24	2.500	0.125	5.26	7.00	-0.62	-8.13
34	YA ₁₀ D	0.550	-0.122	-14.69	3.750	1.375	57.89	8.35	0.73	9.58

S.No	Samples	Drop Test			Sinking Test			Capillary Rise Test		
		Mean Value In Seconds	Gain Or Loss Over Original	% Of Gain Or Loss Over Original	Mean Value In Seconds	Gain Or Loss Over Original	% Of Gain Or Loss Over Original	Mean Value In cms	Gain Or Loss Over Original	% Of Gain Or Loss Over Original
35	YR ₁ D	0.575	-0.187	-24.54	3.150	0.775	32.63	7.57	-0.05	-0.60
36	YR ₅ D	0.600	-0.162	-21.25	2.750	0.375	15.78	7.92	0.30	3.93
37	XR ₁₀ D	0.775	0.013	1.70	3.000	0.625	26.31	8.52	0.90	11.81
38	YCB ₁ D	0.700	-0.062	-8.13	3.562	1.187	49.97	5.48	-2.14	-28.08
39	YCB ₅ D	0.800	0.038	4.98	4.125	1.750	73.68	6.52	-1.10	-14.43
40	YCB ₁₀ D	0.875	0.113	14.82	4.187	1.812	76.29	8.98	1.36	17.84

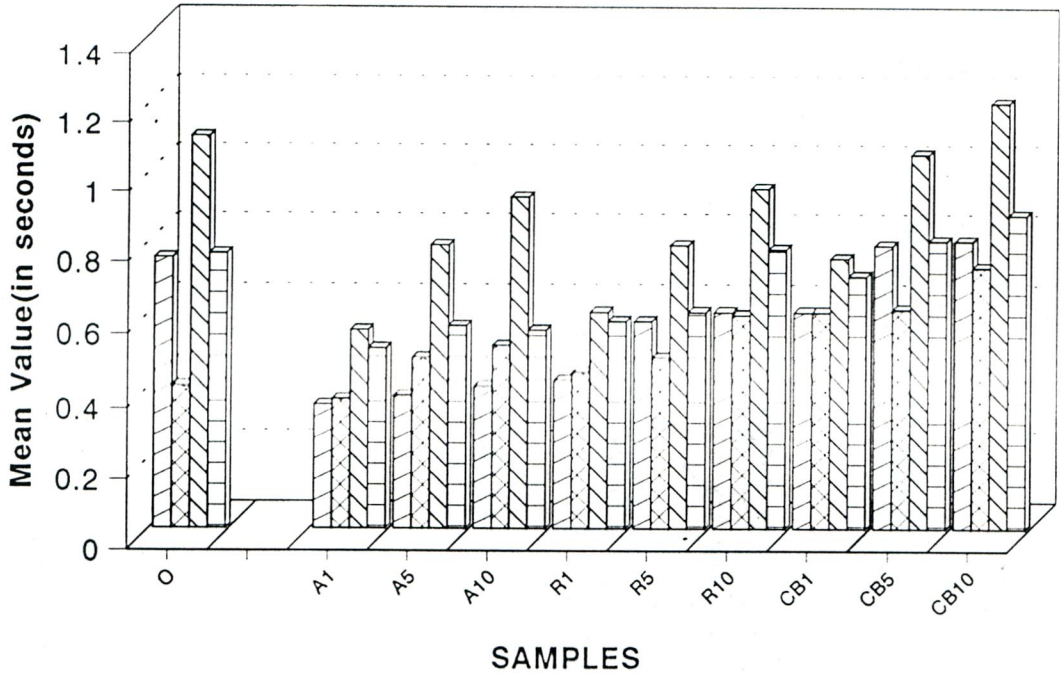
X,Y- Desized Original, XD,YD- Dyed Original, A-Ala, R- Robin Liquid, CB-Commercial Bleach, 1,5,10- Number of treatments

Analysis of Variance

Source of Variation	Drop Test				Sinking Time				Capillary Rise Test			
	Sum of Squares	DF	Mean Square	F	Sum of Squares	DF	Mean Square	F	Sum of Squares	DF	Mean Square	F
Main Effects												
Cloth	121242.727	3	40414.242	1050.459**	87821.943	3	29273.981	318.150**	35155.664	3	11718.555	1486.835**
Liquid	54508.091	2	27254.046	708.395**	23034.385	2	11517.192	125.169**	14404.759	2	7202.379	913.828**
Wash	26391.364	2	13195.632	342.985**	3146.994	2	1573.497	17.101**	17501.003	2	8750.501	1110.252**
2-Way Interactions												
Cloth Liquid	5124.203	6	854.034	22.198**	33373.792	6	5562.299	60.451**	2404.385	6	400.731	50.844**
Cloth Wash	3485.368	6	580.895	15.099**	7318.637	6	1219.773	13.257**	2751.920	6	458.653	58.193**
Liquid Wash	1451.540	4	362.885	9.432**	9708.337	4	2427.084	26.378**	3331.11	4	832.778	105.662**
3-Way Interactions												
Cloth Liquid Wash	2641.316	12	220.110	5.721**	18284.341	12	1523.695	16.560**	7374.281	12	614.523	77.970**

** – Significant at 1% level

FIGURE 5 DROP TEST



□ X □ Y ▨ XD □ YD

X- ORIGINAL(96x48),
Y- ORIGINAL(68x38)
XD- DYED ORIGINAL(96x48)
YD- DYED ORIGINAL(68x38)
A- ALA
R- ROBIN LIQUID
CB- COMMERCIAL BLEACH
1,5,10-NUMBER OF TREATMENTS

The above table shows the result of drop test of the samples original, bleached and dyed. The lower the mean value, the quicker is the absorbency of the samples. It was clearly evident that except samples treated with Commercial Bleach, all other showed a mean value lower than original in both counts. Similarly in dyed samples except commercial bleached samples, all showed lower mean value than original in both the counts.

The statistical analysis proved the following facts:

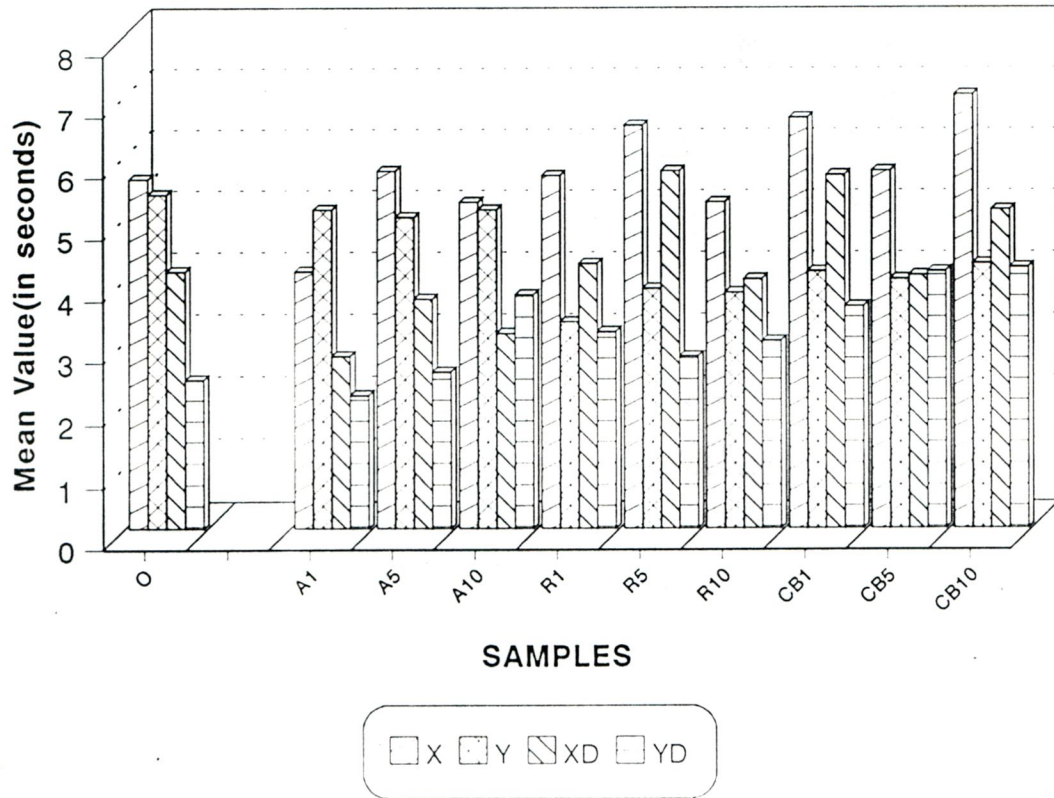
1. There was significant difference between the counts , between the bleaching agents used and also number of treatments given.
2. In two-way interactions the difference between the counts with type of bleaching agents used, and also with number of treatments was significant. Similarly, significant difference was found between the bleaching agents with number of treatments given.
3. In three-way interaction, significant difference was found between the counts with bleaching agents used and with number of treatments given.

b.Sinking Time

The sinking Time of the samples original, bleaced and dyed is presented in

Table- XI and Figure -VI

**FIGURE 6
SINKING TEST**



X- ORIGINAL (96x48).
 Y- ORIGINAL (68x38)
 XD- DYED ORIGINAL (96x48)
 YD- DYED ORIGINAL (68x38)
 A- ALA
 R- ROBIN LIQUID
 CB- COMMERCIAL BLEACH
 1,5,10-NUMBER OF TREATMENTS

The lesser the mean value, the more is the wettability of the sample. From the Table it was clearly evident that there was marked difference between bleached and dyed samples. In both counts, all the samples showed lesser mean values than the original.

On analyzing statistically, it proved the following facts:

1. There was significant difference between the counts, between the bleaching agents used and also number of treatments given.
2. In two-way interactions the difference between the counts with bleaching agents used and also with number of treatments was significant.
3. In three-way interaction, significant difference was found between the counts with bleaching agents and also with number of treatments given.

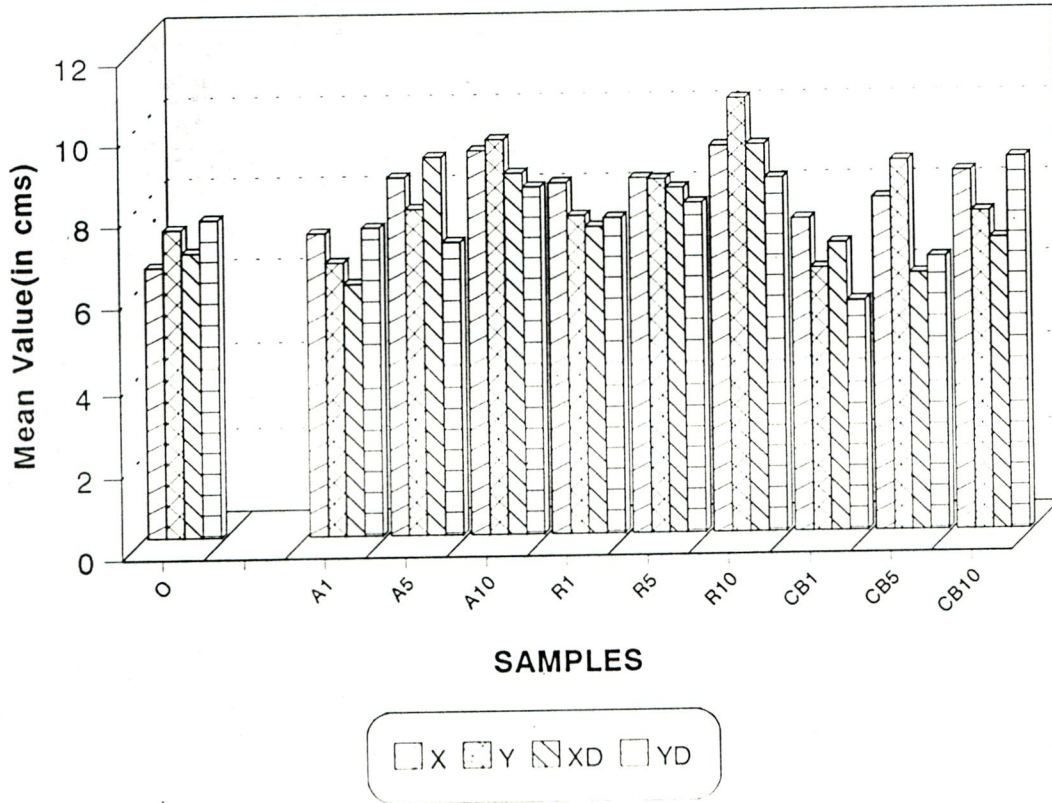
c. Capillary Rise Test :

The above Table and figure illustrates the capillary Rise of the originals, bleached and dyed samples. The higher the mean value, greater is the absorbency of the sample . Maximum gain in percentage was observed in ten times treated samples in both counts.

Statistical analysis proved the following facts.

1. There was significant difference between the counts, between the bleaching agents used and also number of treatments given.
2. In two-way interactions there was significant difference between the counts with bleaching agents used and also with the number of treatments. Similarly significant

**FIGURE 7
CAPILLARY RISE TEST**



X- ORIGINAL(96x48),
 Y- ORIGINAL(68x38)
 XD- DYED ORIGINAL(96x48)
 YD- DYED ORIGINAL(68x38)
 A- ALA
 R- ROBIN LIQUID
 CB- COMMERCIAL BLEACH
 1,5,10-NUMBER OF TREATMENTS

difference was found between the bleaching agents used with number of treatments given.

3. In three way interactions significant difference was found between the counts with bleaching agents used and also with number of treatments given.

d. Colour Fastness Tests

The details of the colour fastness tests of the dyed samples are given in Table-XII

TABLE-XII
Evaluation of the Colour Fastness of the Dyed Samples

	Dyed Samples																				
	XD	YD	XA ₁ D	YA ₁ D	XA ₃ D	YA ₃ D	XA ₁₀ D	YA ₁₀ D	XR ₁ D	YR ₁ D	XR ₅ D	YR ₅ D	XR ₁₀ D	YR ₁₀ D	XCB ₁ D	YCB ₁ D	XCB ₃ D	YCB ₃ D	XCB ₁₀ D	YCB ₁₀ D	
Colour Fastness to Sunlight																					
Colour Change	4	5	4	5	4	5	4	5	4	5	4	5	4	5	4	5	4	5	4	5	
Colour Fastness to washing																					
Colour Change	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	
Staining	2	3	2	3	3	3	3	3	2	3	3	3	3	3	4	4	4	4	4	4	
Colour Fastness To Crocking																					
Dry staining	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
Wet staining	2	4	2	3	2	3	2	3	2	3	2	3	2	3	2	4	2	4	2	4	

The above table shows that in sunlight test, Y count samples excelled well. X count samples revealed good colourfastness property.

In the washing test, all most all the samples in both the counts showed noticeable colour change and staining.

Regarding crocking, all the samples in both the counts exhibited excellent colour fastness in dry condition. Whereas in wet condition except Y count, all samples showed noticeable change in stain.

In the pressing test, almost all the samples showed good colourfastness in dry pressing. Whereas in wet pressing only Y count samples showed good colourfastness property.

Summary and Conclusion

V. SUMMARY AND CONCLUSION

Cotton is commercially a very valuable fibre. It's popularity stems from both its relative ease of production and its applicability to wide variety of textile products. The main reason for the remarkable popularity of present day importance is due to its good moisture absorption, wet and dry tensile strength and can withstands frequent laundering at high temperature.

In order to improve the appearance and bring out the distinctive characteristics fabrics are made to under go certain finishing process. Bleaching is employed to remove impurity and leaves it pure white.

Dyeing may also be called a finishing process, as it colours the fabric and so adds to it beauty. Cotton can be dyed with innumerable varieties of reactive dyes. An attempt has been made to compare with the following objectives .

- 1.To find out the availability of bleaching agents in the market and their preferences by the selected middle and high income families.
- 2.To compare the effect of bleaching agents on selected cotton fabrics .
3. To assess dye affinity of bleached cotton material.

The finding of the study was listed below:

A. Market survey :

A market survey was adopted to gather information on the availability of bleaching agents in the selected fifty shops in the different areas in and around

Coimbatore city. Interview method was adopted as the tool for collection of data. The schedule was finalized based on the pilot study conduct by the investigator in ten shops. The information collected from the shopkeepers were finalized and tabulated. Thus the information serve the basis for framing household schedule.

1. The survey revealed that out of fifty shop Ala, Robin Liquid, washing Soda and bleaching Powder were available in 100, 84 and 70 percentage of the shops respectively.

2. Among the various bleaching agents available Ala was considered as the fast moving item by 76 percentage followed by bleaching powder by 72 percentage of shops. Next to this robin liquid and washing soda were considered as the fast moving items by 68 and 64 percentages respectively.

B. House Hold Survey :

Household Survey was conducted to collect information about the preferences of bleaching agents by the selected 25 middle and 25 high-income families.

Regarding the method of washing 52 percent of middle income used hand washing and 52 percent of high income followed machine washing. Almost all the families preferred soft water for washing cloths.

1. Irrespective of the income, more than 60 percent of families preferred Ala as the bleaching agents for washing cloths. Nearly 40 percent middle and high-income families preferred Robin Liquid next to Ala.

2. More than 80 percent in both income groups were influenced by almost all the factors like cost, durability, effectiveness, brand and advertisement.

The study revealed that both income groups preferred Ala, Robin Liquid and commercial bleach for bleaching cotton fabrics. This may be due to easy availability, effectiveness, durability and cheap.

The investigator selected two counts of hundred percent cotton material. Eleven meters of desized material in each count was taken, one meter in each count was kept aside as original, and one meter for dyeing purpose. Remaining nine meters were treated with commercially available three main types of bleaches namely Ala, Robin Liquid and Commercial bleach for ten times respectively. 1, 5 and 10 times treated samples in three bleaches were cut into two equal parts. One part was dyed using reactive dye. The bleached and dyed samples were evaluated by Visual Inspection and Laboratory tests.

C. Visual Inspection :

Ten times treated samples with Ala, Robin Liquid and Commercial bleach were excelled others in the aspect of general appearance and bright whiteness. Next to this, ten times treated with commercial bleach were alone considered as soft and luster. Similarly, the dyed samples were also excelled well in general appearance as well as in evenness in dyeing.

C. Laboratory Tests

The statistical analysis proved that significant difference was found between the counts, type of bleaching agents used and number of treatments given in the case of fabric thickness and bursting strength.

Whereas no significant difference was found in fabric weight and abrasion resistance regarding the type of bleaching agents used.

In two way interactions, no significant difference was found between the bleaching agents used with number of treatments given regarding fabric thickness and weight, whereas significant difference was found between counts, type of bleaching agents used with number of treatments given in case of fabric thickness, weight, abrasion resistance and bursting strength.

In three way interaction significant difference was found between the counts with type of bleaching agents used with number of treatment given in case of abrasion and bursting strength whereas no significant difference was found in case of fabric thickness and rate .

Regarding the wettability and absorbency tests statistical analysis proved in both two way and three way interaction the significant difference was found between the counts, type of bleaching agents used and number of treatment given.

Regarding colourfastness tests, Y count showed better results than X count in sunlight and crocking test. In washing test both counts showed noticeable change. In pressing test Y count samples showed good colourfastness.

Appendices

APPENDIX -I

INTERVIEW SCHEDULE TO ELICIT INFORMATION ON THE AVAILABILITY OF BLEACHING AGENTS IN SELECTED SHOPS OF COIMBATORE CITY

I. General Information

1. Name of the interviewer :
2. Name of the interviewee :
3. Name of the shop:
4. Address :
5. When did you start the shop?

II. Availability of the bleaching agents

1. Mention the bleaching agents available in your shop

S. NO	Name of the bleaching agent	Number	Percentage
1	Ala		
2	Robin Liquid		
3	Robin cuffs and collar		
4	Washing Soda		
5	Bleaching powder		

2. List out the cost of bleaching agents

S. NO	Name of the bleaching agent	Cost in RS
1.	Ala(500ml)	
2.	Robin liquid(500ml)	
3	Robin cuffs and collar (500ml)	
4.	Washing soda(500gms)	
5.	Bleaching powder(500gms)	
6.	Others specify	

III. Purchasing pattern of bleaching agents

1. Mention about the place of purchase

S.No	Place of purchase	No	Percentage

2. How frequently do you purchase the bleaching items?

S.No	Frequency of purchase	No	Percentage
1	Once in 3 months		
2	Once in 6 months		
3	Annually		
4	As per need and requirement		

3. Mention about the mode of purchase of bleaching items

S.No	Mode of purchase	No	Percentage
1	Direct purchase a. Cash b. Credit		
2	Through Agent a. Cash b. Credit		

IV. Give details regarding the demand for bleaching items

V. Mention the sales promotion methods adopted

- a. Details on slackness in sales .

- b. Details about the measures taken to meet the demand.

- c. Do you adopt any measures to promote your regular sales.

APPENDIX-II

AN INTERVIEW SCHEDULE TO ELICIT INFORMATION REGARDING PREFERENCES OF BLEACHING AGENTS AMONG SELECTED FAMILIES IN COIMBATORE

I. General Information

1. Name of the interviewer :
2. Name of the interviewee :
3. Address :
4. Type of family : Joint Nuclear

5. Details on family background

S.No	Name of The Family Members	Age in Years	Education	Occupation	Income

II. Expenditure Pattern On Washing

1. How much do you spent for washing items/ month?

III. Method of Washing

1. What are the methods adopted for washing cotton fabrics?

S.No	Method of Washing	No	Percentage
1	Hand Wash		
2	Machine Wash		
3	Laundry		

2. Which type of water you prefer for washing clothes?

Soft Hard

IV. Details on Purchase of Bleaching Items

1. What type of bleaching agents do you prefer for cotton fabrics?

S.No	Bleaching Agents	No	Percentage
1	Ala		
2	Robin Liquid		
3	Robin Cuffs And collar		
4	Washing Soda		
5	Bleaching Powder		
6	Others Specify		

2. When do you purchase bleaching items?

i. Once in 3 months []

ii. Once in 6 months []

iii. Annually []

iv. As per need []

3. Where do you buy the bleaching items?

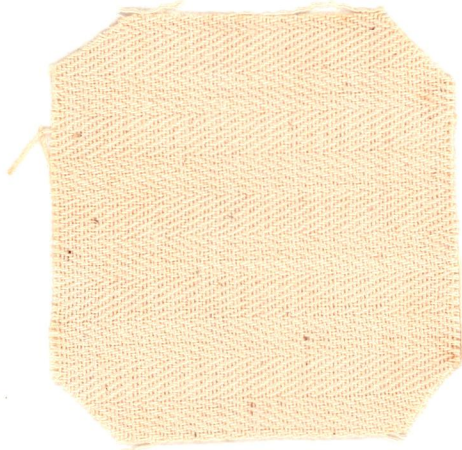
S.No	Place Of Purchase	Regularly	Occasionally	Rarely
1	Particular Shop			
2	Any Shop			
3	Hawker(Door to Door Vendor)			

4. Mention the factors influencing purchase of bleaching items

S.No	Factors	No	Percentage
1	Cost		
2	Durability		
3	Effectiveness		
4	Label Information		
5	Brand		
6	Advertisement		
7	Availability		

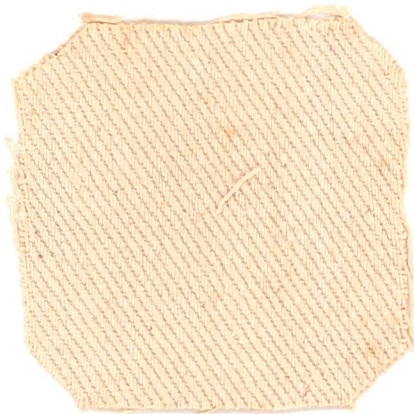
APPENDIX III

DETAILS OF THE SELECTED MATERIALS



100 PERCENT COTTON

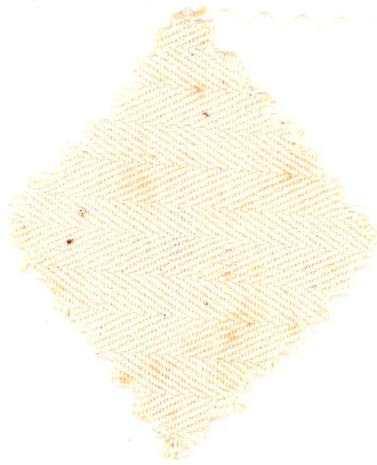
ENDS/INCH	- 96 WARP COUNT - 16 ^S
PICKS/INCH	- 48 WEFT COUNT - 12 ^S
WIDTH	- 160 CMS.
WEAVE	- TWILL WEAVE
COST	- RS. 48/METRE



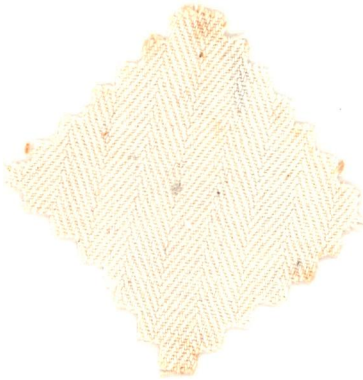
100 PERCENT COTTON

ENDS/INCH	- 68 WARP COUNT - 7 ^S
PICKS/INCH	- 38 WEFT COUNT - 7 ^S
WIDTH	- 129.5 CMS
WEAVE	- TWILL WEAVE
COST	- RS. 80/METRE

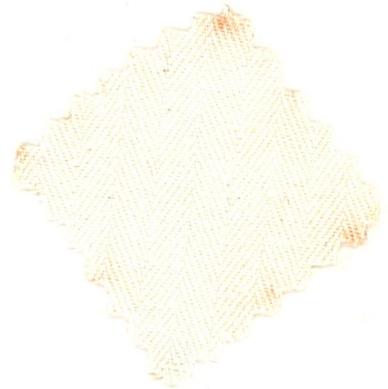
APPENDIX IV
THE BLEACHED SAMPLES



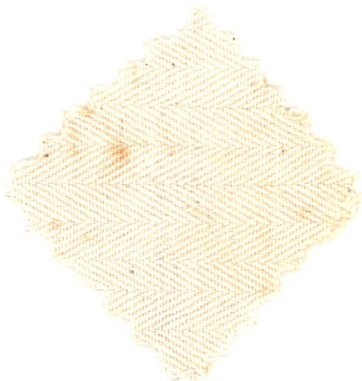
X



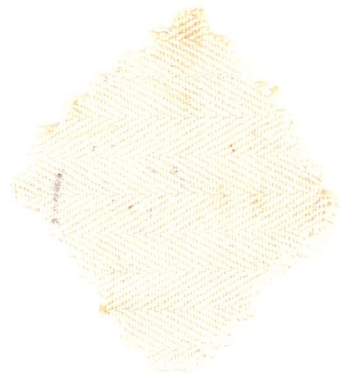
XA₁



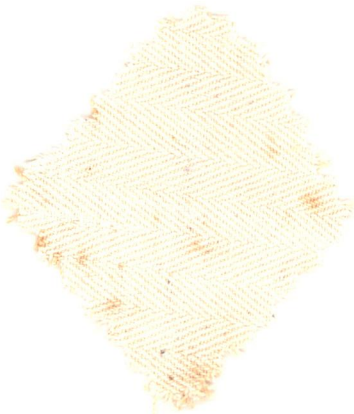
XA₁₀



XR₁



XR₁₀



XCB₁



XCB₁₀



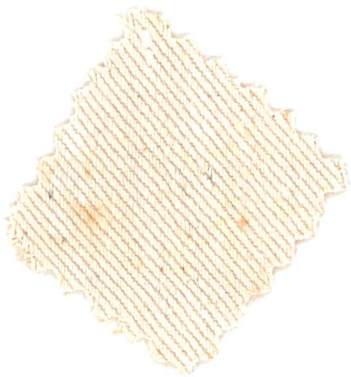
Y



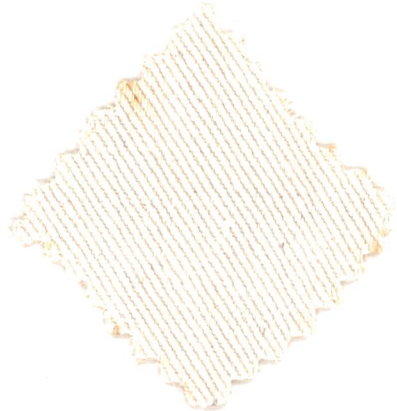
YA₁



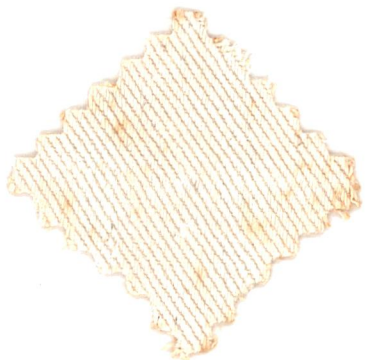
YA₁₀



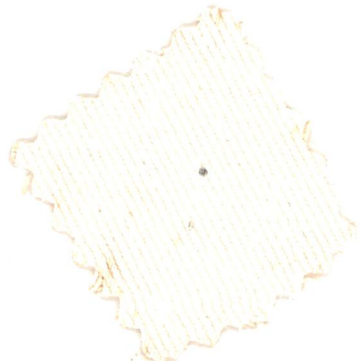
YR₁



YR₁₀



YCB₁



YCB₁₀

APPENDIX- V

Desizing Procedure

Ten litres of cold water was taken with 25 grams of soap powder. This was mixed thoroughly. The material was immersed in the water bath and boiling was continued for 35 to 40 minutes. Then the material was taken out, rinsed in cold water for several times thoroughly and dried well.

Bleaching Procedure

Ala

Ala	-	20cc
Cold water	-	4 liters
Time	-	30 minutes
Temperature	-	room temperature

Procedure

Four liters of cold water was taken in a plastic bucket. 20cc of Ala was added and mixed thoroughly. The material was immersed in Ala bath for 30 minutes, and then washed with soap water. Rinsed out thoroughly in cold water for several times to ensure thorough cleaning. The material was dried well.

Robin Liquid

Robin Liquid Bleach	-	20cc
Cold water	-	4 liters
Time	-	30 minutes
Temperature	-	room temperature

Procedure

Four liters of cold water was taken in a plastic bucket. 20CC of Robin liquid bleach was added and mixed thoroughly. The material was immersed in Robin liquid bath for 30 minutes and then washed with soap water. Rinsed out thoroughly in cold water for several times to ensure thorough cleaning. The material was dried well.

Commercial Bleach

Washing Soda	-	25 gms
Bleaching Powder	-	25 gms
Cold Water	-	4 liters
Time	-	30 minutes
Temperature	-	room Temperature

Procedure

Four liters of cold water was taken in a plastic bucket . 25 gms of washing soda was added and mixed thoroughly. 25 gms of bleaching powder was taken in a piece of cloth and tied well. This was dipped in washing soda bath and stirred well. The material was then immersed for 30 minutes and lifted out, washed with soap water. Rinsed out thoroughly in cold water for several times to ensure thorough cleaning. The material was dried well.

Note : Procedure given by manufacturers instruction manual

Dyeing

Requirements for Reactive dyeing

Material Liquor ratio	-	1:15
Dye Powder	-	10gms/litre
Water	-	750cc
Sodium chloride	-	20gms/litre
Sodium bicarbonate	-	10gms/ litre
Temperature	-	70°-80°c

All the above was taken based on the weight of the material.

Procedure

The reactive dye powder was dissolved in water and allowed to boil upto 80°c. The sample to be dyed was wetted out excess water was removed, shaken well to remove creases and then put in the dye solution. It was allowed to boil for about 10 minutes. Later it was raised to facilitate the addition of sodium bicarbonate. The solution was stirred well and the sample was put back, boiling was continued for 10 minutes, with constant turning of the material. Finally, the sample was rinsed well in 3 changes of soft water and dried.

APPENDIX VI
THE DYED SAMPLES



XD



YD



XA₁D



XA₁₀D



YA₁D



YA₁₀D



XR₁D



XR₁₀D



YR₁D



YR₁₀D



XCB₁D



XCB₁₀D



YCB₁D



YCB₁₀D

APPENDIX-VII (B)

PROFORMA USED TO EVALUATE THE DYED SAMPLES

	Dyed Samples																				
	XD	YD	XA ₁ D	YA ₁ D	XA ₃ D	YA ₃ D	XA ₁₀ D	YA ₁₀ D	XR ₁ D	YR ₁ D	XR ₃ D	YR ₃ D	XR ₁₀ D	YR ₁₀ D	YCB ₁ D	YCB ₃ D	XCB ₃ D	YCB ₃ D	XC ₁₀ D	YCB ₁₀ D	
General appearance																					
Good																					
Fair																					
Poor																					
Evenness in Dyeing																					
Good																					
Fair																					
Poor																					
Texture																					
Soft																					
Medium																					
Coarse																					
Luster																					
High																					
Medium																					
Low																					

X, Y-Desized Original, XD, YD-Dyed Original, A-Ala, R-Robin Liquid, CB-Commercial Bleach .1,5,10-Number of treatments

APPENDIX-VIII

DETAILS OF GREY SCALE RATING

The dyed samples were rated using the AATCC Grey scale to measure the extent of colour change and staining. The Grey scale ratings envisaged the following standards of colour fastness to reactive dye applied to selected cotton fabrics.

Number of rating	Inference regarding colour change
5	No change
4	Slightly changed
3	Noticeably changed
2	Considerably changed
1	Much Changed

Inference regarding staining

5	No staining
4	Slightly stained
3	Noticeably changed
2	Considerably stained
1	Much stained

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