Assessing the Performance of Selected Blouse Materials

By

B. Anitha

A THESIS SUBMITTED TO THE AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND HIGHER EDUCATION FOR WOMEN (DEEMED UNIVERSITY) COIMBATORE-641 043, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN TEXTILES AND CLOTHING

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CERTIFIED AS BONAFIDE RESEARCH WORK

Signature of the Head of the Department	Signature of the Dean of the Faculty	Signature of the Guide
G. Krishna Bai 6/5/93		Anusamani 6.5.93.

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Introduction

I INTRODUCTION

"Costly thy habit as thy purse can buy,
But not express'd in fancy ; rich, not gaudy,
For the apparel oft proclaims the man",

Views Shakespeare, [Copeland, 1992]

Fabric has alway been used as a medium to convey messages about one's status, religious beliefs, age, financial position and political persuation feels Holland (1985). In our Society, clothing is used for reasons of modesty, since it provides a psychological and physical barrier between us and the outside world.

The basis of clothing are fibres, which can be animal vegetable or man-made. Clothes made earlier than the middle of the nineteenth century were almost certainly considered from natural fibres. There are many ways in fabric formation, of which weaving is the most common. In weaving, fibres are spun into yarn and woven on a loom to make a fabric. With the progress of the industry, fabric manufacturers have evolved, intricate and complex methods to produce a variety of quality and effect in textiles. Fabrics are made of various combinations of mixed fibres of different kinds of yarns and different weaves.

The structural design of a textile fabric is largely dictated by its end use application and is restricted within predetermined limits of functional performance. In the case of fabrics intended for industrial applications, such characteristics can be unambiguouslydefined in objective terms such as weight,

thickness, density and mechanical properties. The factors that collectively determine functional behaviour can be adequately controlled by selection of raw materials and the method of yarn and fabric production. On the otherland, in the case of apparel and household fabrics, subjective factors such as drape, handle, wrinkle recovery, crease resistance, pilling, texture and softness also come into play.

Each day, new fabrics appear in the market when they are added to the thousands already available, it becomes increasingly difficult to decide what to buy or to be sure that the choice is good. The only way to achieve this ability is through knowledge awareness of physical, chemical, microbiological properties of fibres, their behaviour and proper maintainence techniques.

Today's dress include formal, semiformal, sport, casual and work clothing. One can look smart even on a small budget if one's clothes have been carefully chosen, well co-ordinated and if worn in the most comfortable and flattering way. Thus the art of intermingling, swapping, mixing and matching is worth cultivating, especially by those who need a large wardrobe. Baliga (1992) expresses ladies matching sense to have reached its peaks with the use of blouses and tops with multi-coloured threads and pieces of mirrors for a number of saris and dresses.

According to 'The Random House Dictionary Of The English Language', (1989) blouse is a light weight, loose fitting

garment for women and children, covering the body from the neck or shoulders more or less to the waist line, with or without a collar and sleeve, worn inside or outside a skirt or slacks. Webster Universal Dictionary, (1970) defines blouse as a loose outer garment, kind of shirt worn by women on upper part of the body.

Fashion changes day to day and now, blouses are given much emphasis due to the increased interest created by them. Almost all women prefer to wear sari with a good blouse. Due to this, there are too many varieties in the market. Thus it is difficult to choose out of the whole lot. Hence in this study, an attempt has been made

1. To find out the availability and sale of blouse materials.

2. To carry out the laundering procedure on selected blouse materials to judge their performance.

Review of Literature

II REVIEW OF LITERATURE

The literature for the study are reviewed under the following headings.

A. Importance of clothing

B. Qualities of fabric

C. Materials suitable for blouses

   1. Fibres

   2. Blends

   3. Mixtures

D. Care of blouse materials

   1. Washing

   2. Starching

   3. Drying

   4. Ironing

A. Importance of clothing :

Clothing is a basic necessity expresses Gulrajani (1980). Clothing is an expression of the person, reflecting his personality, way of living, way of thinking, and especially pride in self or family. Clothing is a reflection of one's taste, one's life and one's values feel Chambers and Moultan (1961).

According to Kaur-et-al (1988) properly washed and ironed garments give a feeling of self confidence, security and sense of well being to the wearer. Baliga (1990) expresses that dressing up well is an essential part of pleasant personality. Polland-et-al (1964), feel that carefully selected clothes can make even the plainest girl attractive.

Besides being good to look at, becoming and in keeping with ones life, successful clothes meet the additional standards of health, comfort and economy say Goldstein and Goldstein (1954).

Messenger (1983) points out that clothes reflect the times of fashion. Status of prestige may be more easily displayed by the selection of clothing than any other way state Lyle and Brinkley (1983). Clothing often helps to communicate the mood of a person views The World Book Encyclopaedia (1989).

B. Qualities of Fabric :

1. Comfort :

Health and comfort are quite as important in dress as the aesthetic requirements. According to a national consumer study by opinion research corporation, the consumers first concern is comfort state Goldstein and Goldstein (1966). Fashion dictates are no longer shaping consumer choice remark Prisco and Moore (1986).

2. Quality :

The term quality conveys the idea of attractive and pleasing appearance, as well as serviceability and consistency in large scale production. It is dependent upon, the objective quality of the merchandise which is related to 'fitness for purpose' of which performance, material specification , safety and fit amongst other things are essential ingredients. The subjective quality of the merchandise which relates to such factors as style, design, colour, fabric and material aesthetics, standards of make and finish and

comfort amongst others feels Levy (1983).

3. Hand :

According to Alexander (1977), hand is the way a fabric feels to the touch and the way it hangs or falls into folds.

4. Beauty :

In reference to textiles, beauty usually incorporates colour, appealing design, interesting texture and pleasing hand. The consumer trend today is for beauty of a classical, enduring quality express Prisco and Moore (1986).

5. Decoration :

Conciously or unconciously, people are at first interested in clothes and ornaments as devices for enhancing the attractiveness of the body, but gradually they develop an interest in clothes for their own sake feel Latze and Hostetter (1968).

C. Materials suitable for blouses :

1. Fibres :

Due to scientific developments, we find newer varieties of fibres in the market. By blending and mixing the fibres, many more varieties are introduced with better qualities. This makes the consumers choice very difficult. Fibres which are in common use includes cotton, linen, silk, and polyester.

Cotton the 'King of fibres' as pointed by Shenai (1980) is common and most popular fibre for apparel fabrics. It has good tensile strength, durability and resistance to severe treatment in normal use. Corbman (1985) says that cotton has a good affinity for dyes.

According to Wickens (1982), linen threads have a beautiful quality. Subtle colour changes can be introduced by using different shades of linen, or by making warp of one shade and weft of another. Linen withstands high temperature, boiling, rubbing, alkalies and a very hot iron feels Holland (1985).

For thousands of years, silk the only natural filament fibre has reigned as the 'Queen of fibres'. Silk combines high strength and flexibility with good moisture absorbtion, softness and warmth, excellent wearability and a luxurious appearance views cook (1984).

Polyester is a medium weight fibre with very good durability and elasticity. With its excellent resistence, it is the best wash and wear fabric views Pizzuto (1980). The strength and abrasion resistance of polysters are quite high state Hollen-et-al (1979).

2. Blends :

Blending is a process by which staple fibres of different characteristics are combined and spun into a yarn, so that the good qualities are emphasized and poor qualities are minimized says white (1978). when different types of fibres are blended, the properties of these fibres are also combined, though modified, in the blended yarn views Corbman (1985).

Blends can be developed to provide the consumer with special performance qualities or to meet predetermined end-use requirements, feels Joseph (1984).

The blends which are common in use for apparel and other purposes include cotton and linen, cotton and polyester, wool and cotton, wool and polyester, wool and nylon, wool and viscose staple. The most popular blend used, is a combination of polyester and cotton state Modi and Garde (1975).

3. Mixtures :

A mixture is a combination of yarns of different colour and fibre content. A mixture often has one fibre in the warp and another in the weft. Mixtures of fancy yarns in woven and knitted fabrics produce attractive and novel effects, states Ladbury (1979).

According to Stout (1970) mixture fabrics are those made up of two or more different kinds of yarns, each of which is composed of only one kind of fibre or of different fibre.

C. Care of blouse materials :

1. Washing :

"Any cleansing operation done in water or water containing detergents, alkalies or builders is washing", defines Fair childs dictionary of textiles (1985).

The aim in washing is to cleanse thoroughly, but at the sametime, to avoid discolouring or shortening the life of fabrics, to maintain whiteness of white articles and to preserve the colour of coloured articles feels Lancaster (1956). According to Gupta-et-al (1989), washing is carried out after sorting, mending and stain removing. The usual temperature of water is 100° - 120° F say Henney and Byett (1959) Let the garment soak for 10 or 20 minutes point out Lyle and Brinkley (1983).

The care and durability of fabrics depend on the type of detergent used and the way they are laundered expresses Vatsala (1986).

Detergent is a substance that cleans soiled surfaces. Soap is a type of detergent. But the word detergent usually refers only to synthetic detergents, which have a chemical make up than soap The world Book Encyclopaedia (1989). Laundry soaps are available in the form of bar, cake, chips and powder while detergent in the form of cake, powder while detergent in the form of cake, powder and liquid opines Girwalker (1988).

According to Mills (1970), there are two types of water hardness namely temperory and permanent. If hard water is used for washing, the soap forms a scum or a sticky deposit on the surface of the water. Thus, soft water is better for washing.

Deulkar (1988), remarks that pressure can be applied in four ways to remove the dust, namely application of friction, application of light pressure, application of principle of suction and use of washing machines.

2. Starching :

Ajgaonkar-et-al (1982), points out that starches are white or near white fine powders. starch is a carbohydrate. Different sources of starches are rice, wheat, maize, grains, palm stems, potatoes, sweet potatoes and arrow root. Commercial starches are also available in the market expresses Ray (1985).

According to the Encyclopaedia of textiles (1972) and Ehrenkranz and Inman (1973), addition of starches to cellulosic fabrics add weight, fine hand, crispness and body to the cloth. starches help to keep fabrics cleaner, as dirts tend to slide off the smooth finish produced by starching.

According to Dantyagi (1983), there are two kinds of starch namely boiling water starch and cold water starch.

3. Dyring :

Equipment for open-air drying should be provided whenever possible, because this method of drying completes the washing process with natural bleaching, essentially hygienic and cost nothing states Lancaster (1962). Coloured cotton and silks should be dried in a shady place unlike white cotton garments feels Mullick (1981).

Driers are now available in the market which aids in quick drying of the clothes. All driers, irrespective of heating methods used are equipped with a suction fan, to provide the movement of fresh, clean air through the clothing during the drying process, explains Anderson (1976).

4. Ironing

Iroing is necessary for finishing the laundered clothes, says Mullick (1981). Barnhart and Barnhart (1982), 'The Random house dictionary of the English language' (1987) define ironing as the act or process of smoothing or pressing clothes and linens with a heated iron.

The purpose of iron is to smooth out creases produced during wear and washing opines Ling (1975).

Gupta -et- al (1989) remark that, several types of iron are available in the market such as dry iron; steam and dry iron, and spray-steam and dry iron.

American Home Economics Association (1960) remarks that proper temperature is the most important consideration in hand ironing. In gerernal, cotton and linen can be ironed with a hot iron (400° to 500° F) but a medium hot iron (300° - 375° F) is better for rayon, and jerseys says Wingate (1970).

Testing before iroing is utmost importance. Always test on a scrap of fabric large enough so that half of it can be pressed while the other half is left as purchased as a standard for comparison expresses Bane (1973).

The iron must be cleaned and its surface well polished. Materials requiring glossy surface, should be ironed on the right side says Deulkar (1988) Zarapkar and Zarapkar (1993) tells 'press on the wrongside of a garment to avoid shining or iron marking on the right side'. Any fabric such as rayon which shines or iron-marks easily should be sujected to light pressure and through a dry cloth.

Experimental Procedure

III EXPERIMENTAL PROCEDURE

The procedure for the study includes the following steps.

A. Market Survey

B. Conducting the experiment

C. Evaluation

A. Market survey :

A market survey was conducted to findout details about the availability of blouse materials. The shops in Townhall, Gandhipuram and R.S.Puram areas of Coimbatore City were selected for the study. The Shopkeepers were approached personally and interviewed. The interview schedule is presented in Appendix I. The collected data was consolidated and presented under the chapter IV, Results and discussion.

B. Conducting the experiment :

1. Selection of material :

Consolidation proved that Premier mill cotton materials have the maximum sales of 80 per cent. Hence the investigator selected 'Premier mill cotton materials', namely 'Poplin', 'Cambric' and 'Two by Two' for the study. (Appendix II).

2. Selection of colour :

Reds are becoming new basics. Next fall, the colours in the range are those of fruits, autumn leaves and refined pastels expresses Peclers (1993)

Dantyagi (1983), points out that red colour indicates joy, happiness, life, truth, virtue and sincerity. Hence red colour was selected for the study.

3. Nomeclature of samples:

Based on the market survey conducted, four metres of red colour Preimer mill cotton material was selected in each variety- 'Poplin' 'Cambric' and Two by Two'. The samples were named as given in the Table I.

Table I

Nomenclature of samples

S.No.	Name of the sample	Original sample	Processed samples		
			Washed samples	Washed & ironed samples	Washed, starched & ironed samples
1.	Poplin	P	P_1	P_2	P_3
2	Cambric	C	C_1	C_2	C_3
3	Two by Two	T	T_1	T_2	T_3

4. Laundering Procedure :

Based upon the pilot study, 0.25 per cent surf solution was prepared. The surf solution was stirred well until the foam raised two inches above the solution level. The study conducted by Shobha (1988) revealed that 62 per cent of the families followed kneading and squeezing method for washing coloured cottons. Thus all the samples were soaked in the surf solution for five minutes and washed well by kneading and squeezing method. The samples were dried in shade.

According to the working information service (-), readymade starch powders are easily available and can be used as per the instructions on the packet. Thus, commercially available starch was chosen for the study. Based upon a pilot study, the investigater prepared 0.15 per cent starch solution for one metre of material. The samples P_3, C_3, T_3 were soaked in the starch solution for 10 minutes, squeezed and dried in shade.

"Fabrics are best pressed when they are slightly damp, or with steam, as wrinkles are removed more easily", expresses Tortora (1982). Needham and Strong (1970) says that, 'iron on wrongside, anything on which you do not want a shining surface'.

Considering the above factors, the samples P_2, C_2, T_2, P3, C_3, and T_3 were ironed at 400°F on the wrong side of the fabric.

All the laundering procedures were repeated thirty times, for each sample.

C. Evaluation :

The samples were evaluated using

1. Laboratory tests
2. Statistical analysis

1. Laboratory tests :

The following laboratory tests were conducted for all the samples.

a. Abrasion resistance
b. Breaking strength and elongation
c. Crease recovery
d. Drapability
e. Fabric stiffness
f. Fabric thickness
g. Fabric Weight
h. Colour fastness

a. Abrasion resistance :

According to Lyle (1976), abrasion is defined as, "the wearing away of any part of a material by rubbing against another surface".

"Eureka Martindale type Abrasion resistance tester", (Plate I) was used for the study.

PLATE I

ABRASION RESISTANCE TESTER

A specimen of 38mm diameter was cut from a sample and weighed. The reading was noted down and the specimen was fixed on the holder. Care was taken to place the specimen right at the centre of the holder. The C-400 abradant paper was fastened to the table beneath such that the specimen mounted on the holder rub uniformly against abradant surface. It was found that 20 rubs were sufficient to abrade the specimen. So the specimen was given 20 rubs.

The loss in weight of the specimen after the 20 rubs estimated the wear of the sample. Nine more specimens were cut from the same sample and tested in the same manner. The mean value was calculated and recorded. The same procedure was followed for all the other samples.

b. Breaking strength and Elongation :

According to ASTM standards (1983), "tensile strength is the maximum resistance of material to deformation in a tensile test carried to rupture, that is, the breaking load, or force per unit cross sectional area of the unstrained specimen". It is the strength shown by a specimen subjected to tension as distinct from tension, compression or sheer.

Indian Standards Institution (1982) remarks elongation as, "the length of a stretched specimen at breaking load and its initial

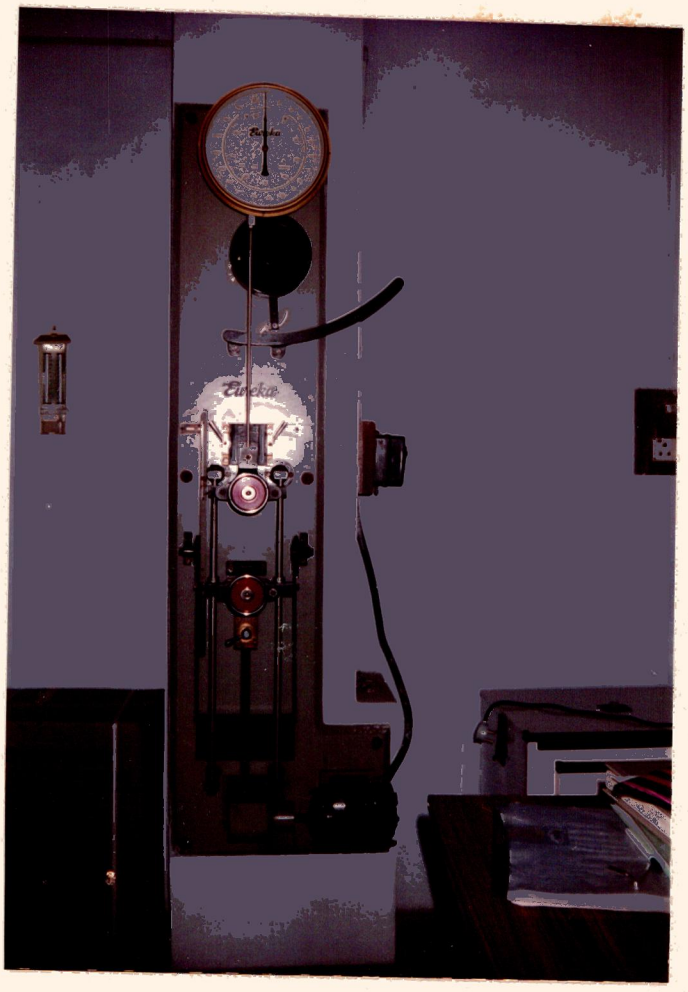


PLATE II

EUREKA BREAKING STRENGTH TESTER

length, usually expressed as a percentage of the latter, under a given load".

'The Eureka Pendulum type tensile strength tester' (Plate II) was used to determine the breaking strength and elongation of the samples. As sepcified by Sundaram (1979), a specimen was cut from a sample, with its width 14mm more than the required width and the threads were ravelled out from both sides of the strip equally to reduce the width of the specimen, excluding fringes to the required length. The specimen was gripped between two clamps and the machine was operated. When the specimen broke, values of breaking load and elongation of the same were read from the dial and the scale respectively. Ten readings were noted and the mean strength and elongation were calculated for both warp and weft directions.

The same procedure was followed for all the other samples.

C. Crease recovery :

"Crease recovery angle is the angle formed between the two limbs of a strip of fabric previously folded under prescribed conditions, at a specified time after removal of the creasing load", remarks British Standard Institution (1974).

'Eureka crease recovery tester'(Plate III) was used for the study.A wrinkle free rectangular specimen was cut from the sample

PLATE III

CREASE RECOVERY ANGLE TESTER

both in warp and weft directions using a template. The cut specimen was folded into half and compressed under load of two kilograms for two minutes and was allowed to recover for two minutes. At the end of the recovery period, the crease recovery angle was measured and recorded. Nine more specimens were tested from the same sample following the same procedure. The mean value was calculated and recorded.

All the other samples were subjected to the same procedure and tested.

d. Drapability :

According to Kori (1992), "drape is the ratio of the draped area of the fabric to full area of the fabric, when freely hung with a central support to the fabric."

According to the British Standard Institutions (1974), "the fabric drape is the extent to which a fabric will deform when it is allowed to hang in its own weight". And the drape co-efficient is the percentage of the total area of the annular ring of fabric, obtained by projecting shadow of the draped specimen.

'The Eureka drape tester' (Plate IV) was used to determine the drapability of the test specimens. The template of 24cm diameter was selected for the samples under test. The sample free from creases was placed on a flat horizontal surface and by means of the template, the outline was traced and the centre was

PLATE IV

EUREKA DRAPEMETER

marked and cut. Three annular ring of paper with same template was cut and weighed seperately.

The cut specimen was placed on the horizontal disc of the apparatus and the upper lid was closed. A paper was placed over the lid of the apparatus. The light was switched on and the periphery of the shadow on the paper ring was drawn, cut and was discarded. The weight of the residual portion of the paper ring was determined. The procedure was repeated with two other fresh papers.

The drape co-efficient was calculated as follows :

$$\text{Drape co-efficient} = \frac{M_2}{M_1} \times 100$$

M_1 - Initial weight of the paper

M_2 - Weight of the paper after cutting

Mean drape co-efficient was found out. The same procedure was carried out for all the other samples.

e. Fabric stiffness:

Fabric stiffness is determined by finding out the bending length. According to ASTM (1983) bending length is defined as, "a measure of the interaction between fabric weight and fabric stiffness

PLATE V

SHIRLEY STIFFNESS TESTER

as shwon by the way in which a fabric bends under its own weight".

'Eureka stiffness tester' (Plate V) was used to find out the bending length. Using the template given, a specimen was cut in the warp direction from the sample. It was then placed on the platform with the scale on top of it. The scale was holded in horizontal plane and the sample was slided slowly until the two inclined line coincided. The sliding was stopped and the overhang length was read from the scale and recorded. A specimen cut in the weft direction was subjected to the same procedure. Likewise ten specimens were tested from the same sample and their mean values were calculated.

All the other samples were tested in the same manner for both warp and weft direction.

f. Fabric thickness :

According to ASTM standards 1989, "fabric thickness in textiles is the distance between the upper and lower surfaces of material, measured under a specified pressure.

The "Hungarian thickness tester" (Plate VI) was used to determine the thickness of the material. The specimen free from creases was placed over the anvil of the thickness tester. The presser-foot was pressed by a spring and allowed to rest over the material for two seconds, at two kilograms pressure. The dial

PLATE VI

HUNGARIAN THICKNESS TESTER

reading was recorded. The thickness of the sample was found at ten different places.

All the samples were subjected to the same procedure and their mean thickness were calculated and recorded.

g. Fabric Weight :

According to ASTM standards (1981) fabric weight is "mass per unit area expressed in ounces per square yard or universally as linear yards per pound".

The fabric weight was determined using 'cloth quadrant balance' (Plate VII) which had a graduated scale in ounces per square yard.

A specimen was cut using the template given. The cut specimen was hung in the hook provided and the reading was recorded. Ten readings were taken from the same sample at different places and their mean values were calculated and recorded.

All the test samples were subjected to the same procedure.

h. Colourfastness tests :

Colour fastness means "the resistance of the colour of textiles to the different agencies to which textiles may be exposed during manufacture and the subsequent use", says Indian Standards Institution, (1982).

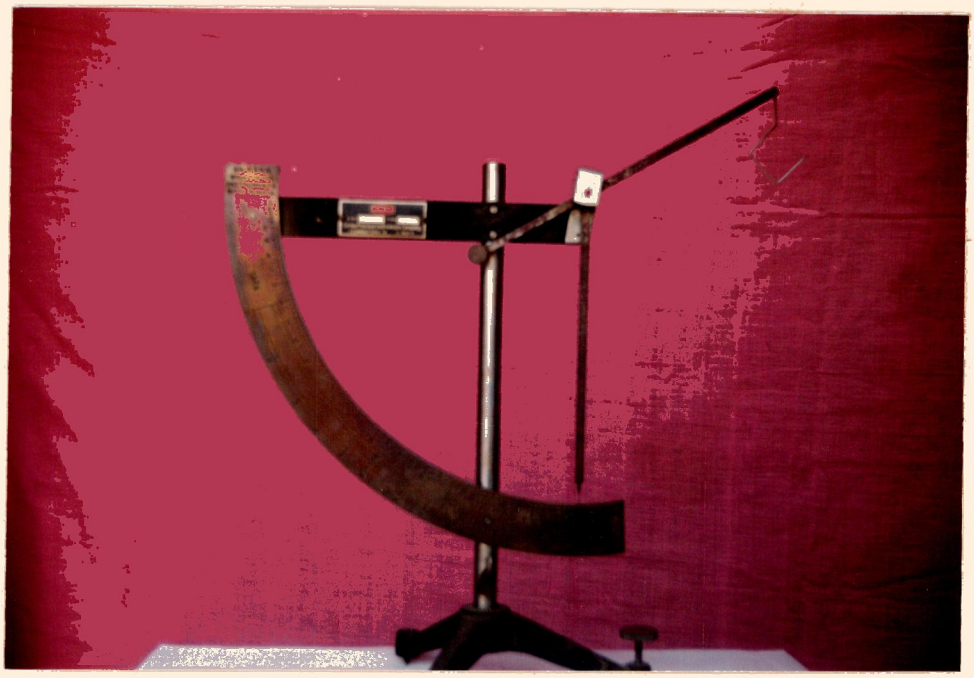


PLATE VII

EUREKA CLOTH QUADRANT BALANCE

The following colour fastness tests were conducted to determine the colour fastness of the materials;

i) Colour fastness to sunlight

ii) Colour fastness to crocking

iii) Colour fastness to pressing

iv) Colour fastness to perspiration

i) Colour fastness to Sunlight :

A specimen of dimension 21cm x 4 cm was cut from each sample. The specimen was covered with a black chart paper, which was divided into eight equal parts. On the first day the first part of the sample was exposed to sunlight from 9 A.M. to 4 P.M. On the second day the second part of the sample alongwith the first part was exposed to the sunlight. Likewise on each day, one part was increased. This was continued for seven days. The eighth part was kept as such without exposing as a original sample. Evaluation was done by comparing the exposed samples with the original. All samples were tested in the same manner.

ii) Colour fastness to crocking (Dry and Wet) :

According to ASTM standards (1981), "crocking is a transfer of colour from the surface of a coloured fabric to an adjacent area of the same fabric or to another surface principally by rubbing action". 'Sasmira Crockmeter' (Plate VIII) was used to determined the colour fastness to crocking.

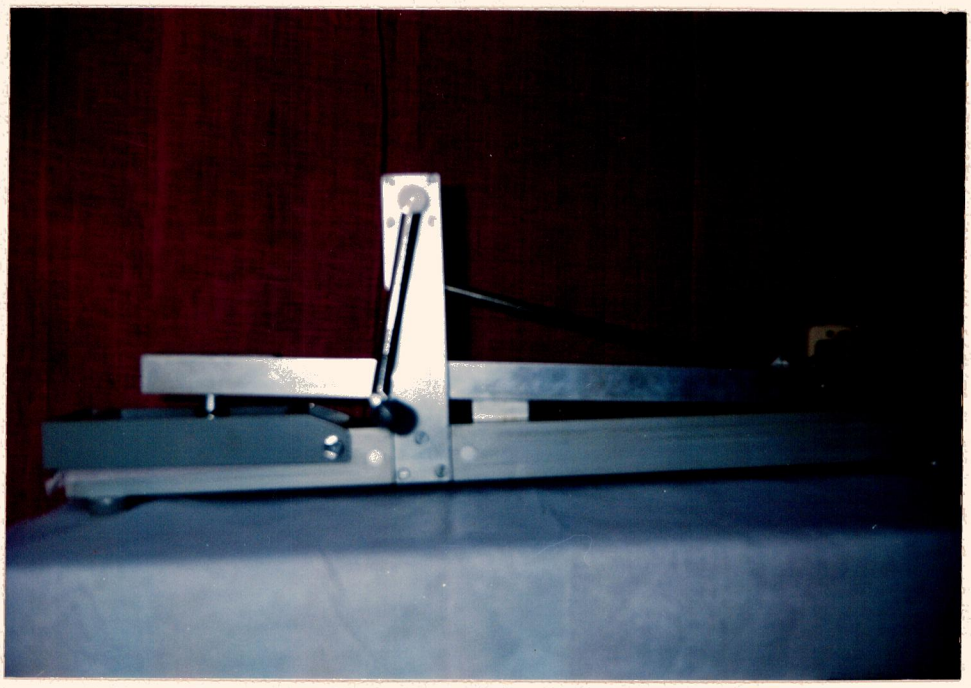


PLATE VIII

SASMIRA CROCKMETER

Two specimens of 5.1 cms x 5 cms size were cut from undyed white cotton cloth. This was medium in weight and free from sizing. One sample was mounted over the end of the finger which projects downwards from the weighted sliding arm, with the weave oblique to the direction of rubbing. Two test specimens of 14 cms x 5 cms were cut from each sample and one was mounted on the flat base. The undyed cotton cloth was rubbed to and fro, in a straight line along a track of 10 cm long on the specimen, ten times, in ten seconds with a downward force of 900 gms on the finger. Both the test sample and undyed cloth were removed.

To estimate the wet crocking, undyed cotton cloth was soaked in distilled water and the excess water was squeezed out. This fabric was mounted on the crockmeter . Following with same procedure, all the samples were tested, and the ratings were assigned with the help of Geometric Grey Scale (Appendix III).

iii) Colour fastness to pressing :

Two pieces of 14 cm x 4 cm size of undyed cotton cloth were taken. Another two pieces of dimension 10 cm x 4 cm were cut from all the samples. Each sample was placed on one piece of dry undyed cotton cloth on a smooth horizontal surface. Heated iron was placed over it and left for 15 seconds.

Another piece of each sample was soaked in distilled water and squeezed. It was placed on another dry piece of undyed

It was placed on another dry piece of undyed cotton cloth and heated iron was placed over it and left for 15 seconds. The samples were allowed to dry.

The staining in the undyed cotton cloth were evaluated with the help of Geometric Grey Scale and the ratings were assigned seperately.

iv. Colour fastness to Perspiration :

"The action of perspiration is an excellent nutrient medium for all kinds of bacteria and attack the test fibres in both acid and alkaline," remarks Hall (1975).

'Sasmira Perspirometer' (Plate IX) was used for the study. As suggested by Sundaram (1979) two test samples of 5Cmx4Cm size were cut from all the samples and placed between two pieces of undyed cotton cloth each having a size of 5Cms x 5Cms. The two common 5Cms sides were sewn to form a composite specimen.

The acidic test liquor was prepared by dissolving 2.65gms sodium chloride and 0.75g urea per litre, the pH was adjusted to 5.6 by the addition of acetic acid. The alkaine test liquor

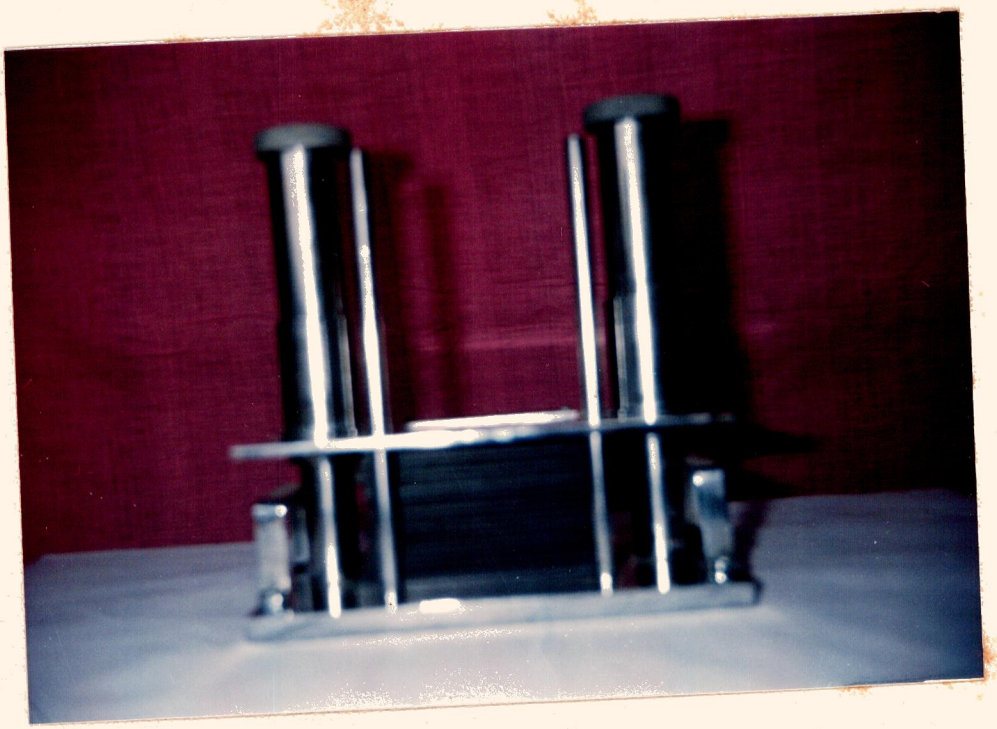


PLATE IX

SASMIRA PERSPIROMETER

consisted of a solution of 3gms sodium chloride per litre, the pH was adjusted to 7.2 by the addition of Sodium bicarbonate.

The samples were thoroughly wetted in the acidic liquor (the material liquor ratio was 1:50) and allowed to remain in the liquor for 30 minutes at room temperature. The liquor was poured off and the specimen were placed between 2 glass plates under a load of 4.5 kgs. The apparatus was placed in an air oven for four hours at 37°±2°C.

At the end of that period, the specimens were removed, the samples were seperated from the two pieces of undyed cloth and dried out apart in air at room temperature. Similarly, all the samples were treated in alkaline liquor.

The tested samples were evaluated with the help of and the ratings were assigned.

2. Statistical Analysis :

The result of the laboratory tests were analysed statistically using Students t - distribution.

According to Elhance (1984), t - distribution has a number of applications, (i) t - test for significance of single mean, population variance being unknown (ii) t-test for significance of the difference between two sample means, the population variance being equal but unknown (iii) t - test for significance of an observed correlation coefficient.

The formula used for t-test was

$$t = \frac{\bar{d}\ \sqrt{n}}{s}$$

A model of the statistical analysis is given in the Appendix IV.

IV RESULTS AND DISCUSSION

The findings of the study are discussed under the following headings.

A. Market Survey

B. Laboratory tests

A. Market Survey :

The market survey results are discussed under the headings given below :

1. Sale of blouse materials as expressed by the shopkeepers.
2. Availability of designed and embroided blouse materials.
3. Cost of blouse materials.

1. Sale of blouse materials as expressed by the Shopkeepers.

From the survey conducted, it is understood that 80 per cent of shopkeepers feel that Premier mill cotton materials namely Poplin, Cambric and Two by Two had the maximum sales. Similarly, 65 per cent of Shopkeepers expressed Aravind cotton material rank next in the sales. All varieties of Khatau and Madura fabric blouse materials were sold effectively by more than 50 per cent of the shopkeepers. All other blouse materials showed only minimum sales.

2. Availability of designed and embroidered blouse materials :

The survey conducted revealed that 35 per cent of the shops sold woven and printed designed blouse materials. The common designs available were floral, geometrical, stripes and dots. Apart from these designs, traditional motifs like mango, peacocks were also available.

Mirror work and embroidered blouse bits in all colours were available in 40 per cent of the shops. The embroidery work ranged from simple running stitch to chain, satin and other complicated stitches. Kutch work and applique work were found on many blouse bits. Depending upon prices the embroidery work vaired.

3. Cost of blouse materials :

The cost of the poplin material ranged from Rs.18.50/- to Rs.23.00/- The price range of cambric was from Rs.22/- to Rs.33/-. For the two by two material, the price range was from Rs.28/- to Rs.49/- The prices of cotton/polyester and polyester fabrics ranged from Rs.32/- to Rs.51 and Rs.28 to Rs.46 respectively.

B. Laboratory Tests :

Results of the laboratory tests are discussed under the following headings.

1. Abrasion resistance
2. Breaking strength (warpand weft direction)
3. Crease recovery angle (warp and weft direction)
4. Drapability
5. Elongation (warp and weft direction)
6. Fabric stiffness (warp and weft direction)
7. Fabric thickness
8. Fabric weight
9. Colour fastness tests

1. ABRASION RESISTANCE

Abrasion resistance of the samples are presented in Table II.

TABLE II

Abrasion Resistance

S.No.	Samples	Mean Weight Loss in mgms	Loss or gain over original	%Loss or gain over original
1	P	4.06		
2.	P_1	1.25	2.81	82.5
3.	P_2	0.61	3.45	84.5
4.	P_3	0.57	3.49	85.76
5.	C	3.69		
6	C_1	9.54	-5.85	-158.52
7.	C_2	8.1	-4.41	-119.51
8.	C_3	0.69	3	81.3
9.	T	6.1		
10.	T_1	3.47	2.63	43.11
11	T_2	1.12	4.98	81.63
12	T_3	0.7	5.7	93.44

From Table II and Figure I it is evident that the weight loss due to abrasion was more in original samples namely P = 4.06, C = 3.69 and T = 6.1 per cent than in other samples. The weight loss due to abrasion was the least in starched samples in all categories.

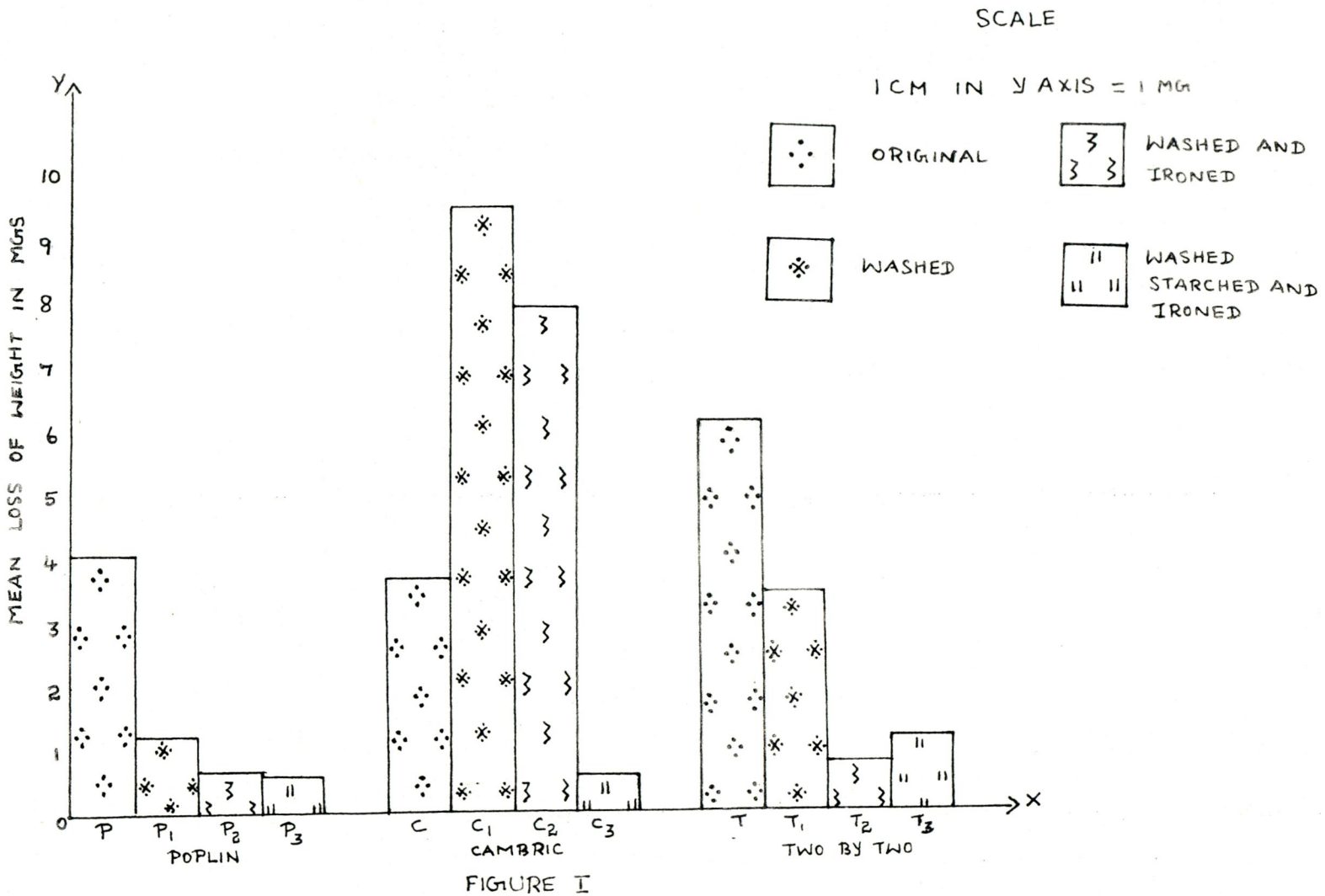


FIGURE I

ABRASION RESISTANCE

From this, it can be concluded that starching increases abrasion resistance.

2.(a) BREAKING STRENGTH - WARP

Breaking strength in warp direction of the samples are presented in Table III.

TABLE III

Breaking strength - WARP

No.	Samples	Mean Strength in Kgs	Loss or gain over original	% Loss or gain over original	Samples compared	't' value
1	P	20				
2	P_1	14.16	5.84	29.2	P vs P_1	1.623
3	P_2	10.91	9.09	45.45	P vs P_2	2.912
4	P_3	21	-1	-5	P vs P_3	1.153
5	C	17.83				
6	C_1	15.6	2.23	12.50	C vs C_1	-2.972
7	C_2	12.5	5.33	29.89	C vs C_2	0.352
8	C_3	20	-2.17	-12.17	C vs C_3	1.849
9.	T	21.16				
10	T_1	14.41	6.75	31.89	T vs T_1	0.676
11	T_2	13.25	7.91	37.38	T vs T_2	0.685
12	T_3	19.25	1.91	9.02	T vs T_3	0.809

From Table III and Figure II, it is evident that starching has

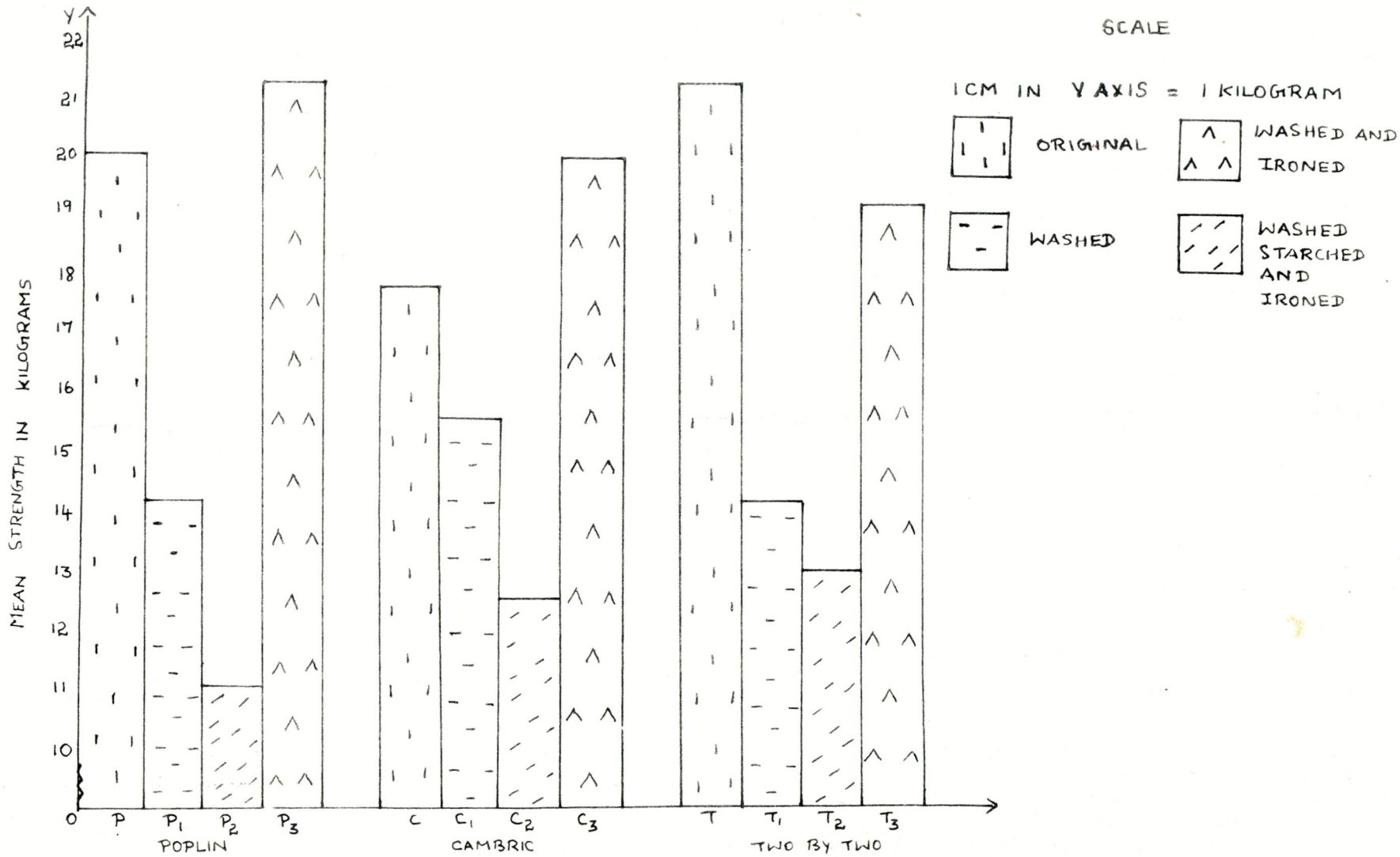


FIGURE II

BREAKING STRENGTH [WARP DIRECTION]

increased the breaking strength in samples P_3 and C_3. The breaking strength of other samples, was found to be decreased.

Statistical data revealed the fact that there is no significant difference at 5 per cent and 1 per cent levels.

2.(b). BREAKING STRENGTH - WEFT

Breaking strength of the samples along weft direction are given in Table IV.

TABLE IV

Breaking Strength - Weft

No.	Sampies	Mean Strength in Kgs	Loss or gain over original	%Loss or gain over original	Samples compared	't' value
1	P	13.33				
2	P_1	9	4.33	32.48	P vs P_1	1.31
3.	P_2	10.08	3.25	24.38	P vs P_2	- 3.129
4	P_3	14.33	-1	-7.50	P vs P_3	2.21
5	C	11.18				
6	C_1	10.5	0.68	6.08	C vs C_1	-1.77
7	C_2	7.5	3.68	32.91	C vs C_2	-0.870
8	C_3	13.16	-1.98	-17.71	C vs C_3	0.669
9	T	12				
10	T_1	10	2	16.66	T vs T_1	-3.778
11	T_2	9.25	2.75	22.91	T vs T_2	-5.75*
12	T_3	14.16	-2.16	-21.75	T vs T_3	1.053

Note : Significant at 5% level.

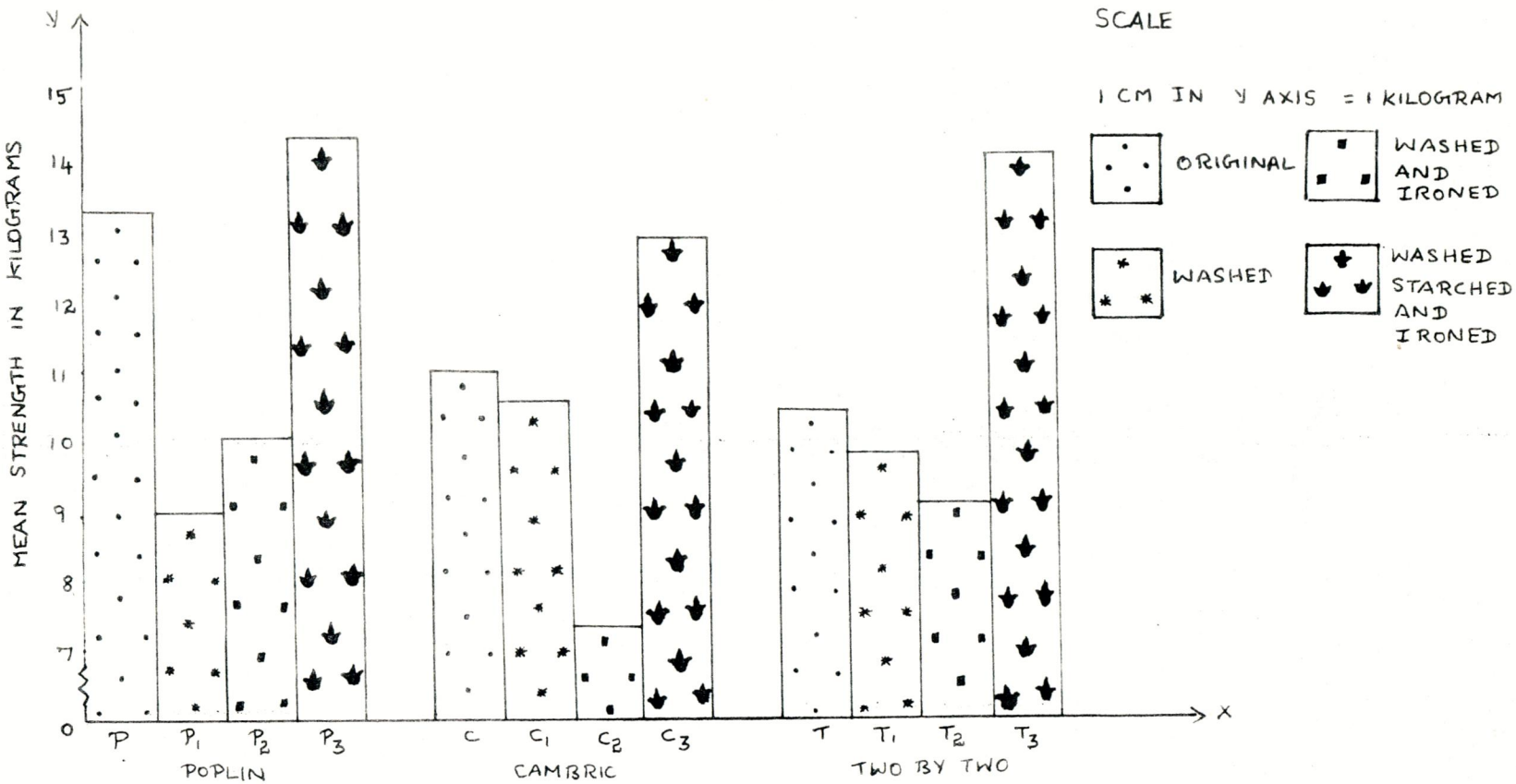


FIGURE III

BREAKING STRENGTH [WEFT DIRECTION]

From Table IV and Figure III, it is clear that starching has increased the strength in P_3, C_3 and T_3; where as a decrease in strength was observed in all the samples.

Significant difference at 5 per cent level was found between samples T and T_2.

3 a. CREASE RECOVERY ANGLE - WARP :

Crease recovery angle along warp direction is presented in Table V.

TABLE V

Crease recovery - warp

S.No.	Samples	Mean recovery angle (in degrees)	Loss or gain over original	Percentage loss or gain over original
1	P	67.2		
2	P_1	75.6	-8.4	-0.125
3	P_2	67.2	0	0
4	P_3	45.4	21.8	32.44
5	C	93.4		
6	C_1	78.8	14.6	15.63
7	C_2	82	11.4	12.20
8	C_3	52.8	40.6	43.46
9	T	85.8		
10	T_1	84.4	1.4	1.63
11	T_2	76	9.8	11.42
12	T_3	60.2	25.6	29.83

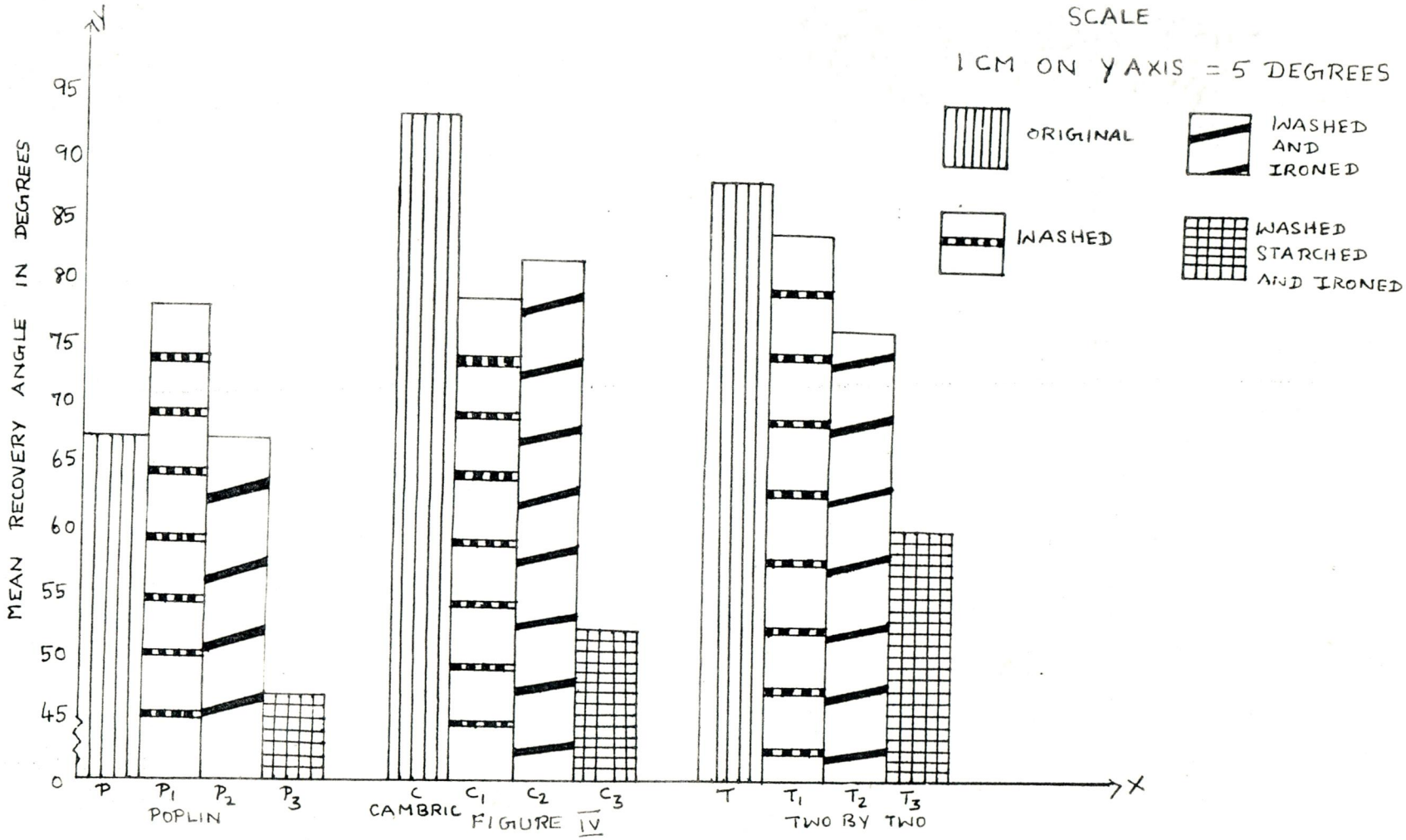


FIGURE IV

CREASE RECOVERY ANGLE [WARP DIRECTION]

From Table V and Figure IV, it is evident that loss was observed in all the samples except P_1 and P_2. A maximum decrease in angle of 32.44, 43.46 and 29.83 per cent were showed by the starched samples P_3, C_3 and T_3 respectively.

From this, it can be concluded that all the laundering processes decrease the crease recovery, while starching decreases the same to a greater extent. Washing increases the recovery angle in Poplin samples.

3 (b) CREASE RECOVERY ANGLE - WEFT :

Crease recovery angle of the samples are given in Table VI.

TABLE VI

Crease recovery - weft

S.No	Samples	Mean Recovery angle (in degrees)	Loss or Gain over original	Percentage Loss or gain over original
1	P	56.6		
2	P_1	69.0	-12.4	-21.9
3	P_2	60.4	-3.8	-6.7
4	P_3	56	0.6	1.06
5	C	83.2		
6	C_1	60.4	22.8	27.4
7	C_2	78.6	4.6	5.52
8	C_3	49.2	34	40.86
9	T	83		
10	T_1	83.4	-0.4	-0.48
11	T_2	88	-5	-6.02
12	T_3	54.8	28.2	33.97

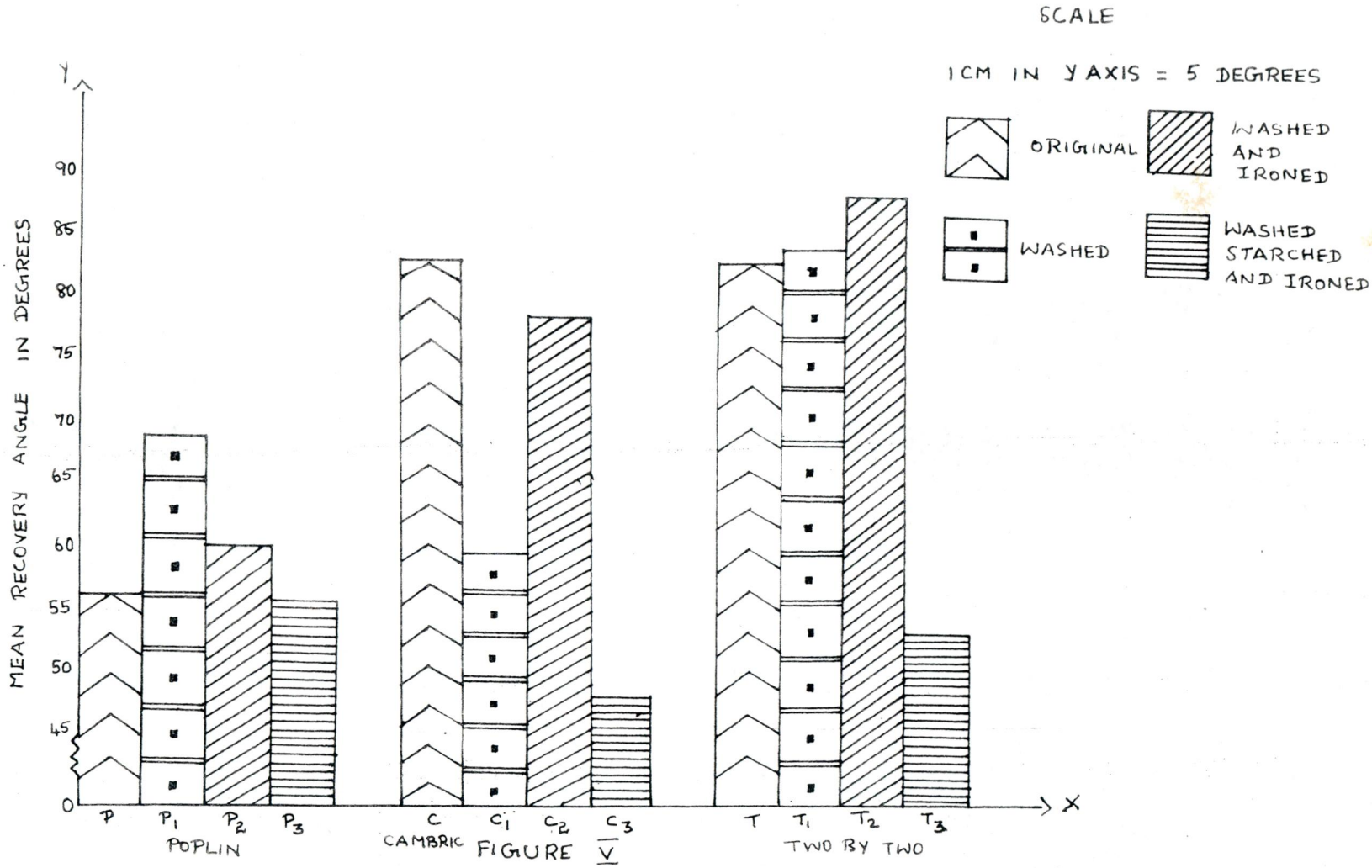


FIGURE V

CREASE RECOVERY ANGLE [WEFT DIRECTION]

From the Table VI and Figure V, it is obvious that there is gain in the recovery angle in P_1, P_2,C_1 and C_2 samples when compared with their originals. All the other samples showed a loss in the recovery angle. The loss observed was maximum in the starched samples.

From the above results, it can be concluded that there is more loss in recovery angle in the starched samples.

4. DRAPABILITY

The drape co-efficient of the samples are presented in the Table VII.

TABLE VII

Drape co-efficient

S.No	Samples	Drape co-efficient
1	P	22.7
2	P_1	34.58
3	P_2	32.61
4	P_3	16.68
5	C	26.51
6	C_1	31.57
7	C_2	31.92
8	C_3	9.06
9	T	38.59
10	T_1	38.96
11	T_2	39.61
12	T_3	16.60

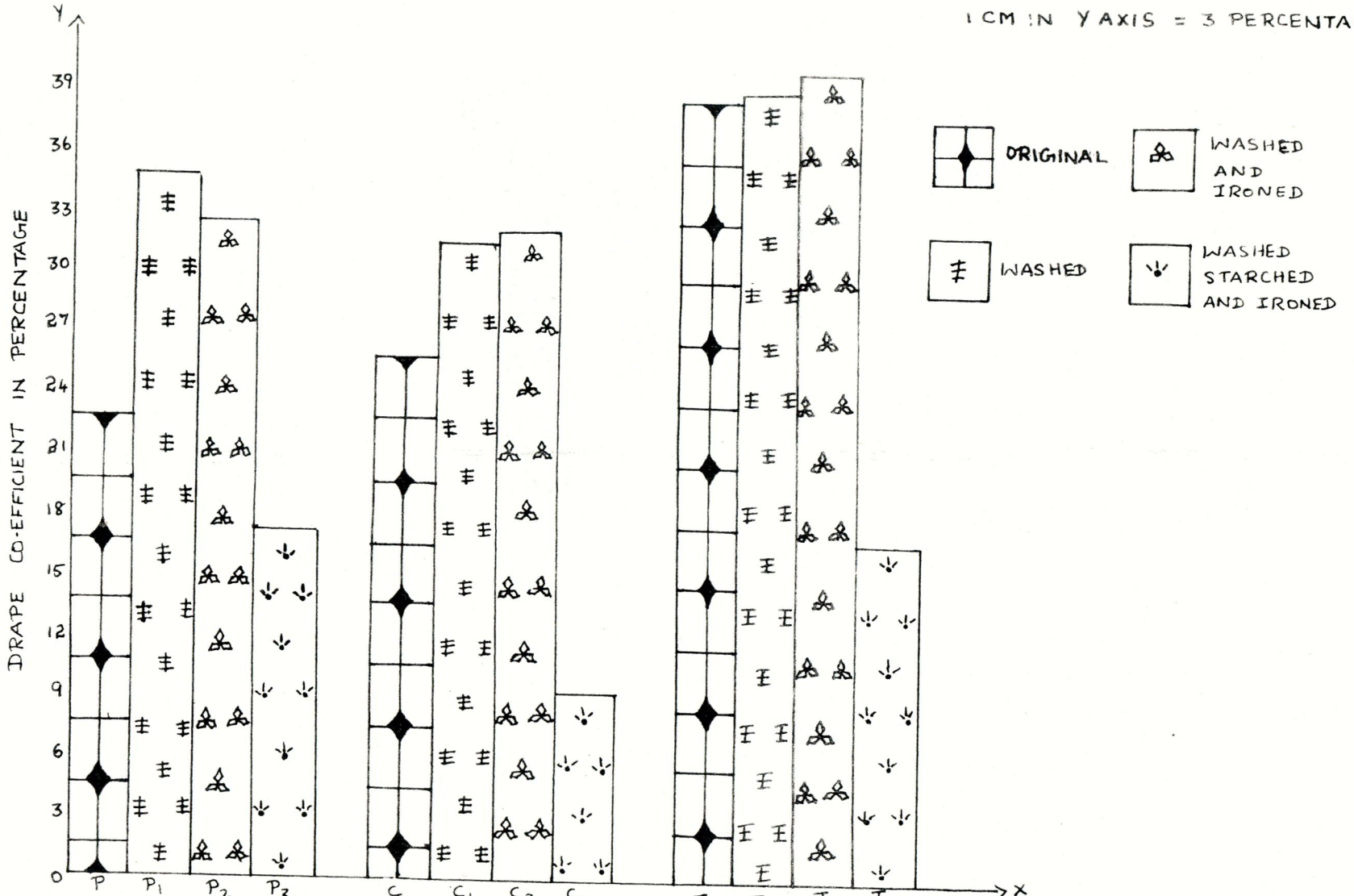


FIGURE VI

DRAPABILITY

From Table VII and Figure VI, it is clear that the drape co-efficient has increased in all the samples except P_3, C_3 and T_3.

Thus it is obvious that washing and ironing increases the drapability while starching decreases the same irrespective of the type of material.

5.a. ELONGATION - WARP

The elongation of the samples along warp direction are given in Table VIII.

TABLE VIII

Elongation Warp

S.No.	Samples	Mean Value in cms.	Loss or gain over original	% Loss or gain over original
1	P	1.37		
2	P_1	1.64	-0.27	-19.70
3	P_2	1.52	-0.15	-10.94
4	P_3	1.16	0.21	15.32
5	C	0.82		
6	C_1	0.71	0.11	13.41
7	C_2	0.71	0.11	13.41
8	C_3	0.54	0.28	34.14
9	T	1.07		
10	T_1	1.81	-0.74	-69.15
11	T_2	1.37	-0.30	-28.03
12	T_3	0.92	0.15	14.01

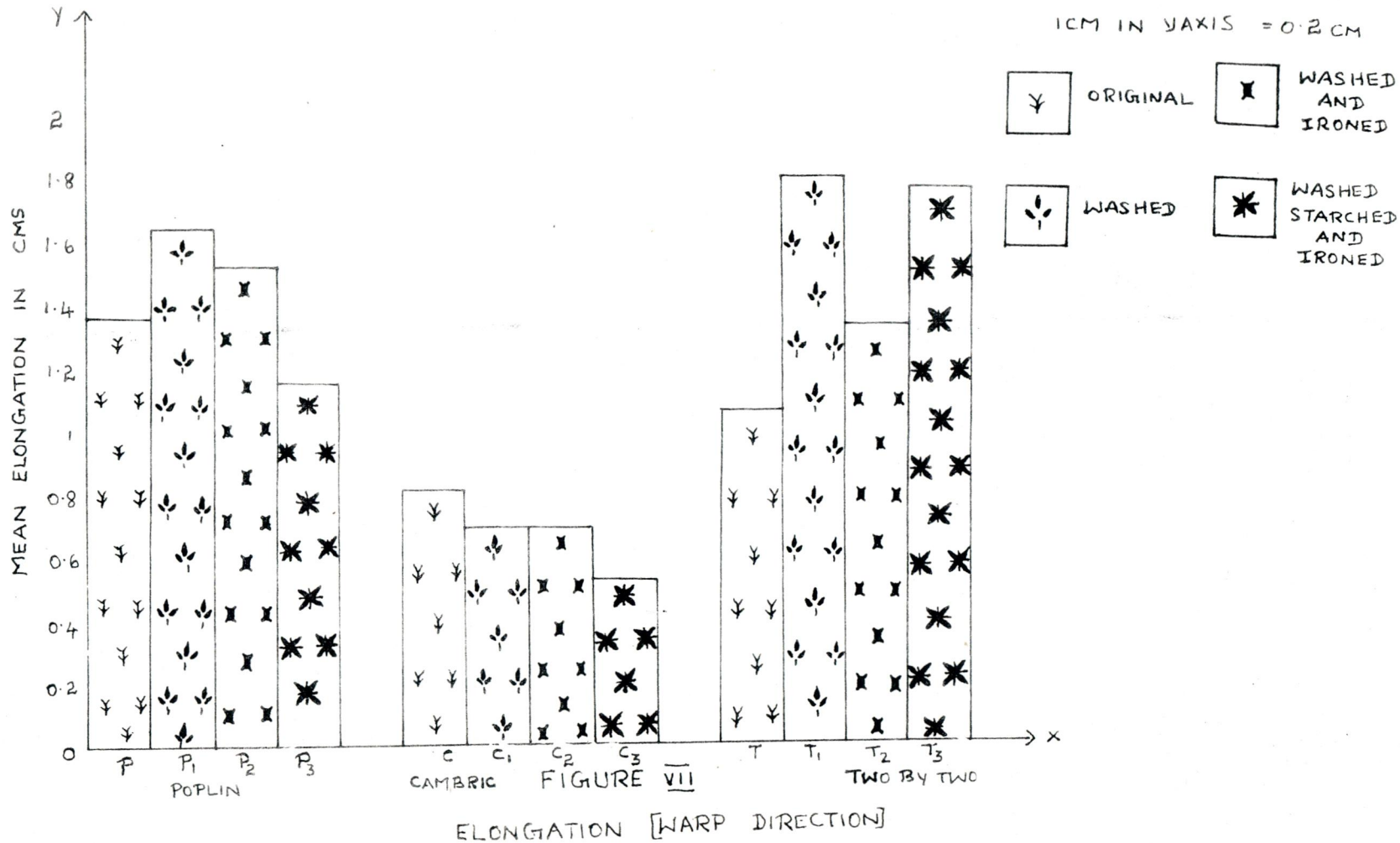

SCALE
1CM IN YAXIS = 0·2 CM
ORIGINAL
WASHED AND IRONED
WASHED
WASHED STARCHED AND IRONED
Y
X
MEAN ELONGATION IN CMS
0
0·2
0·4
0·6
0·8
1
1·2
1·4
1·6
1·8
2
P
P1
P2
P3
POPLIN
C
C1
C2
C3
CAMBRIC
T
T1
T2
T3
TWO BY TWO
ELONGATION [WARP DIRECTION]

FIGURE VII

From Table VIII and Figure VII, it is clear that there is an increase in elongation in samples P_1, T_1 and T_2; whereas the other samples were found to be decreased in elongation when compared to their originals. A maximum decrease of 15.32, 34.14, 14.01 were found in the starched samples P_3, C_3 and T_3 respectively.

Thus it can be concluded that starching decreases the elongation of all the samples.

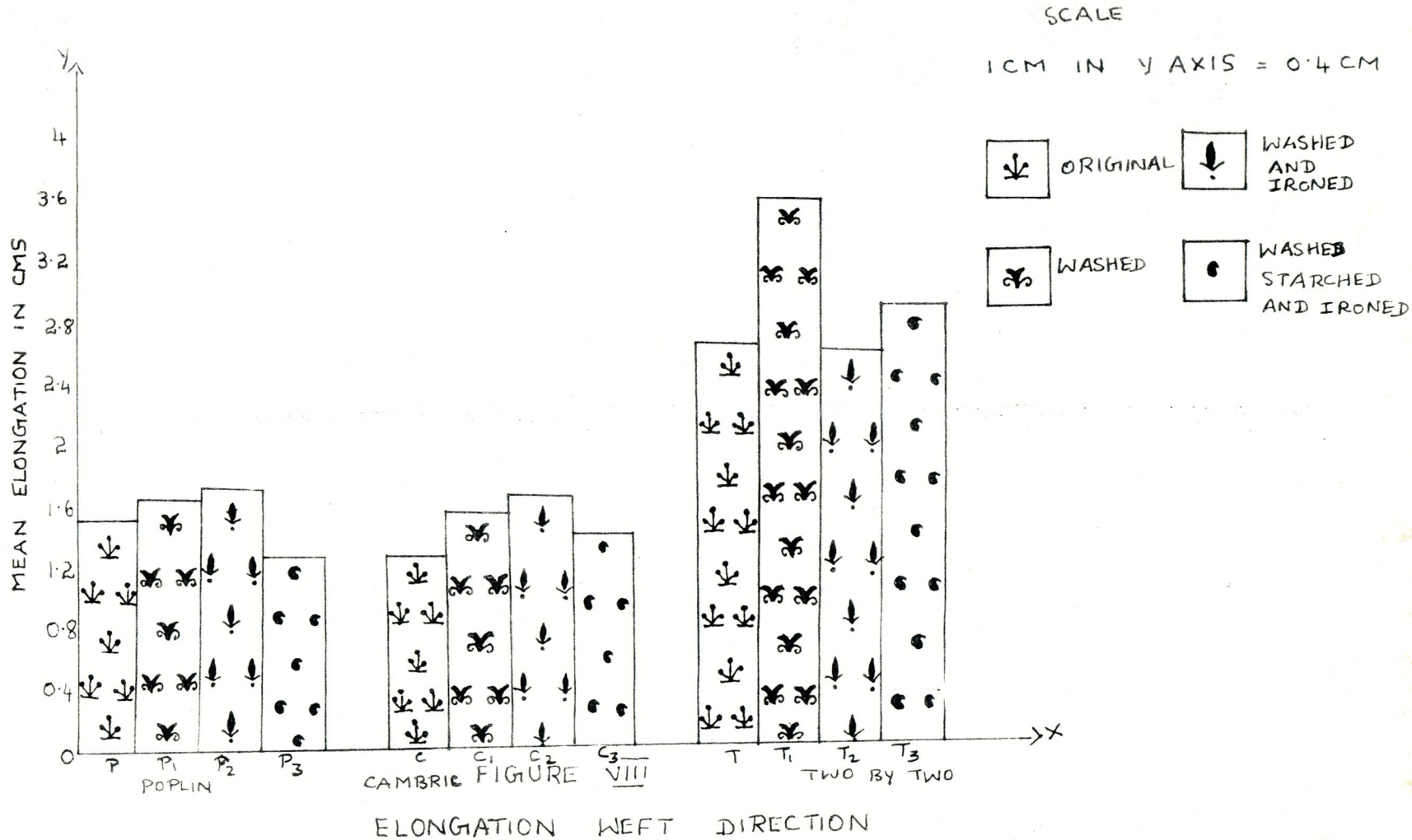
5.b. ELONGATION - WEFT

The elongation of the samples along weft direction are presented TableIX.

TABLE IX

Elongation - Weft

S.No.	Samples	Mean Value in cms	Loss or Gain over original	Percentage Loss or gain over original
1	P	1.57		
2	P_1	1.68	-0.11	-7.00
3	P_2	1.77	-0.20	-12.73
4	P_3	1.35	0.22	14.0
5	C	1.37		
6	C_1	1.65	-0.28	-20.43
7	C_2	1.76	-0.39	-28.46
8	C_3	1.52	-0.15	-10.94
9	T	2.71		
10	T_1	3.61	-0.45	-16.60
11	T_2	2.70	0.01	0.36
12	T_3	2.95	-0.24	-8.85


SCALE
1 CM IN Y AXIS = 0·4 CM
ORIGINAL
WASHED AND IRONED
WASHED
WASHED STARCHED AND IRONED
MEAN ELONGATION IN CMS
Y
X
0
0·4
0·8
1·2
1·6
2
2·4
2·8
3·2
3·6
4
P
P1
P2
P3
POPLIN
C
C1
C2
C3
CAMBRIC FIGURE VIII
T
T1
T2
T3
TWO BY TWO
ELONGATION WEFT DIRECTION

From Table IX and Figure VIII, it is evident that samples P_1, P_2, C_1, C_2, T_1 and T_3 showed an increased elongation whereas samples T_2, P_3 and C_3 showed decreased elongation.

6. a. **FABRIC STIFFNESS - WARP:**

Fabric stiffness of the samples along warp direction are presented in Table X.

TABLE X

Fabric Stiffness - Warp

No.	Samples.	Mean value in Cms	Loss or gain over original	% Loss or gain over original	Samples compared	't' value
1	P	1.76				
2.	P_1	1.58	0.18	10.22	P vs P_1	-1.755
3.	P_2	1.61	0.15	8.52	P vs P_2	-2.039
4	P_3	3.05	-1.29	-73.29	P vs P_3	-1.368
5	C	2.23				
6	C_1	1.69	0.54	24.21	C vs C_1	-9.200**
7	C_2	1.74	0.49	21.97	C vs C_2	-7.592**
8	C_3	2.80	-0.57	-25.56	C vs C_3	2.843*
9	T	1.40				
10	T_1	1.30	0.10	7.14	T vs T_1	0.117
11	T_2	1.39	0.01	0.71	T vs T_2	0.670
12	T_3	2.30	-0.90	-64.28	T vs T_3	12.720**

Note : * - Significant at 5 percent level

** - Significant at both 5 percent and 1 percent levels

Table X and Figure IX. reveals that there is gain in stiffness in all the starched samples namely P_3, C_3 and T_3. Statistical analysis proved that significant differnece exist between $C-C_1$, $C-C_2$, $C-C_3$ and $T-T_3$.

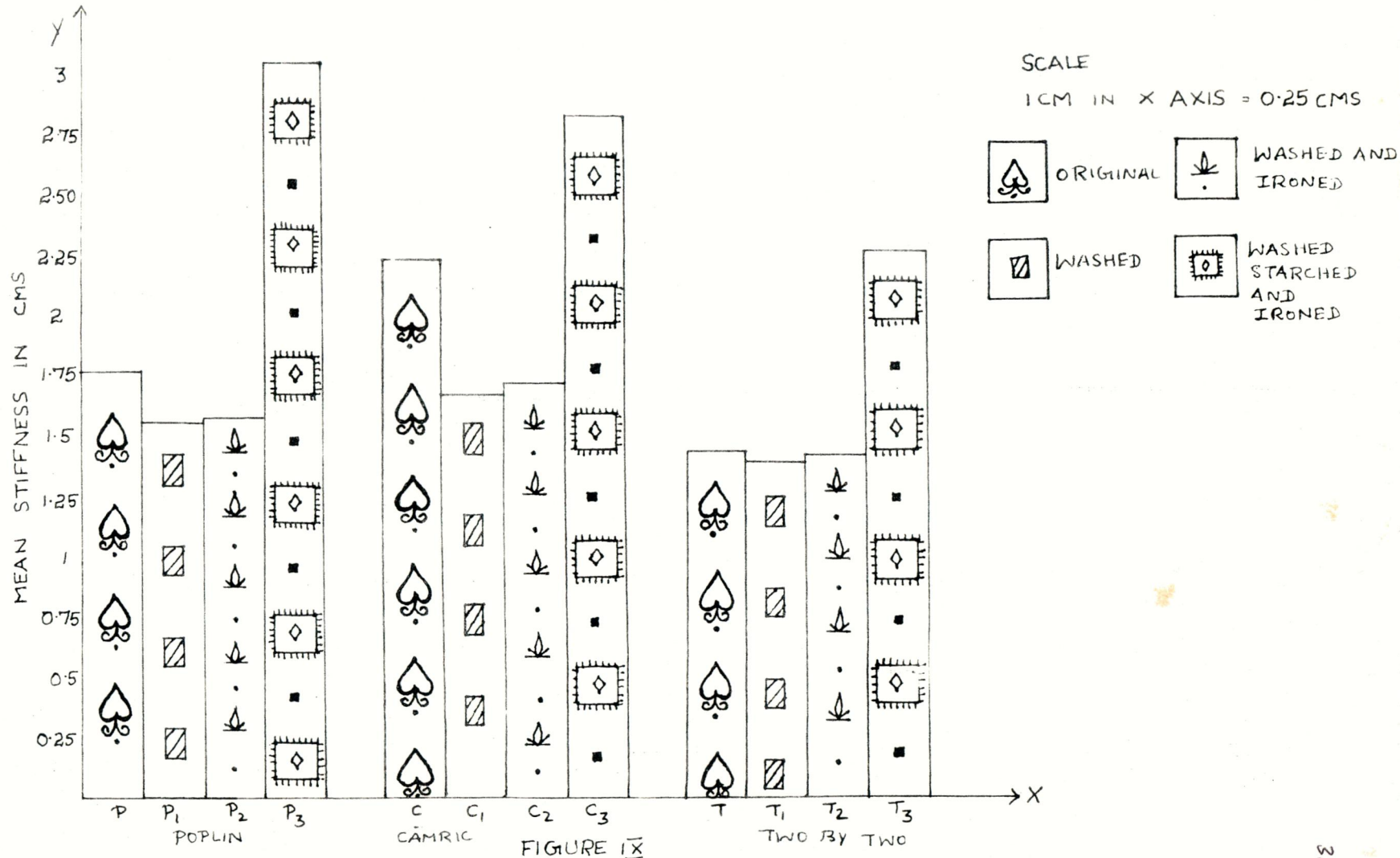


FIGURE $1\overline{X}$

FABRIC STIFFNESS WARP DIRECTION

From the results, it can be concluded that starching increases the stiffness of the samples to a greater extent while washing and ironing increases the same to some extent.

6. b. **FABRIC STIFFNESS -WEFT:**

Fabric stiffness of the samples along weft direction are presented in Table XI.

TABLE - XI

Fabric Stiffness - Weft

No.	Samples	Mean Value in Cms.	Loss or gain over original±	% Loss or gain over original	Samples compared	't' Value
1.	P	1.36				
2.	P_1	1.30	0.06	4.41	P Vs P_1	-3.46*
3.	P_2	1.28	0.08	5.88	P Vs P_2	0.844
4.	P_3	2.45	-1.09	-80.14	P Vs P_3	5.792**
5.	C	1.52				
6.	C_1	1.18	0.34	22.36	C Vs C_1	3.830
7.	C_2	1.20	0.32	21.05	C Vs C_2	-0.320
8.	C_3	2.16	-0.64	-42.10	C Vs C_3	8.830
9.	T	1.03				
10.	T_1	0.93	0.10	9.70	T Vs T_1	-1.73
11.	T_2	0.99	0.04	3.88	T Vs T_2	2.809
12.	T_3	2.00	-0.97	-94.17	T Vs T_3	10.187**

Note : * Significant at 5 percent level

** Significant at both 5 percent and 1 percent levels.

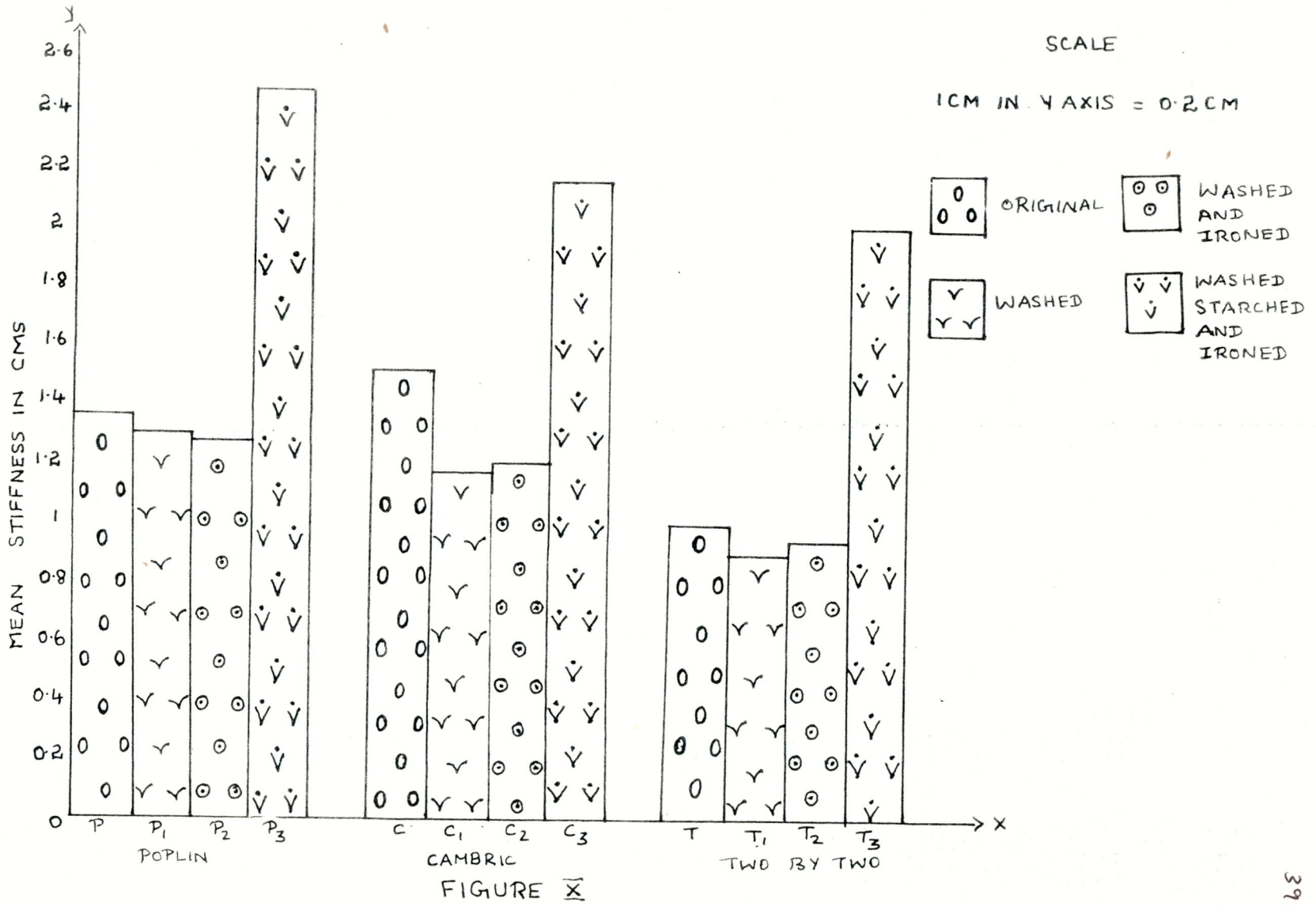


FIGURE $\overline{X}$

FABRIC STIFFNESS WEFT DIRECTION

From Table XI and Figure X, it is obvious that there is decrease in stiffness in all the samples except P_3, C_3 and T_3.

Statistical analysis done proved that there is a significant difference between samples P-P_3, C-C_3 and T -T_3 at 5 percent and 1 percent level. When sample P_1 compared with sample P, the difference was found to be significant at 5 percent level.

7. FABRIC THICKNESS

Fabric thickness of the samples are given in Table XII

TABLE XII

Fabric Thickness

No.	Samples	Mean fabric thickness (mm)	Loss or gain over original	% Loss or gain over original	Samples compared	't' value
1	P	0.166				
2	P_1	0.238	-0.072	-43.37	P vs P_1	25.99**
3	P_2	0.227	-0.061	-36.74	P vs P_2	16.33**
4	P_3	0.278	-0.112	-67.46	P vs P_3	19.87**
5	C	0.147				
6	C_1	0.149	-0.002	-1.36	C vs C_1	0.82
7	C_2	0.148	-0.001	-0.68	C vs C_2	-1.395
8	C_3	0.161	-0.013	-8.84	C vs C_3	7.378**
9	T	0.176				
10	T_1	0.189	-0.013	-7.38	T vs T_1	7.378**
11	T_2	0.184	-0.008	-4.54	T vs T_2	3.365**
12	T_3	0.211	-0.035	-19.88	T vs T_3	11.857**

Note : ** - Significant at both 5 percent and 1 percent levels

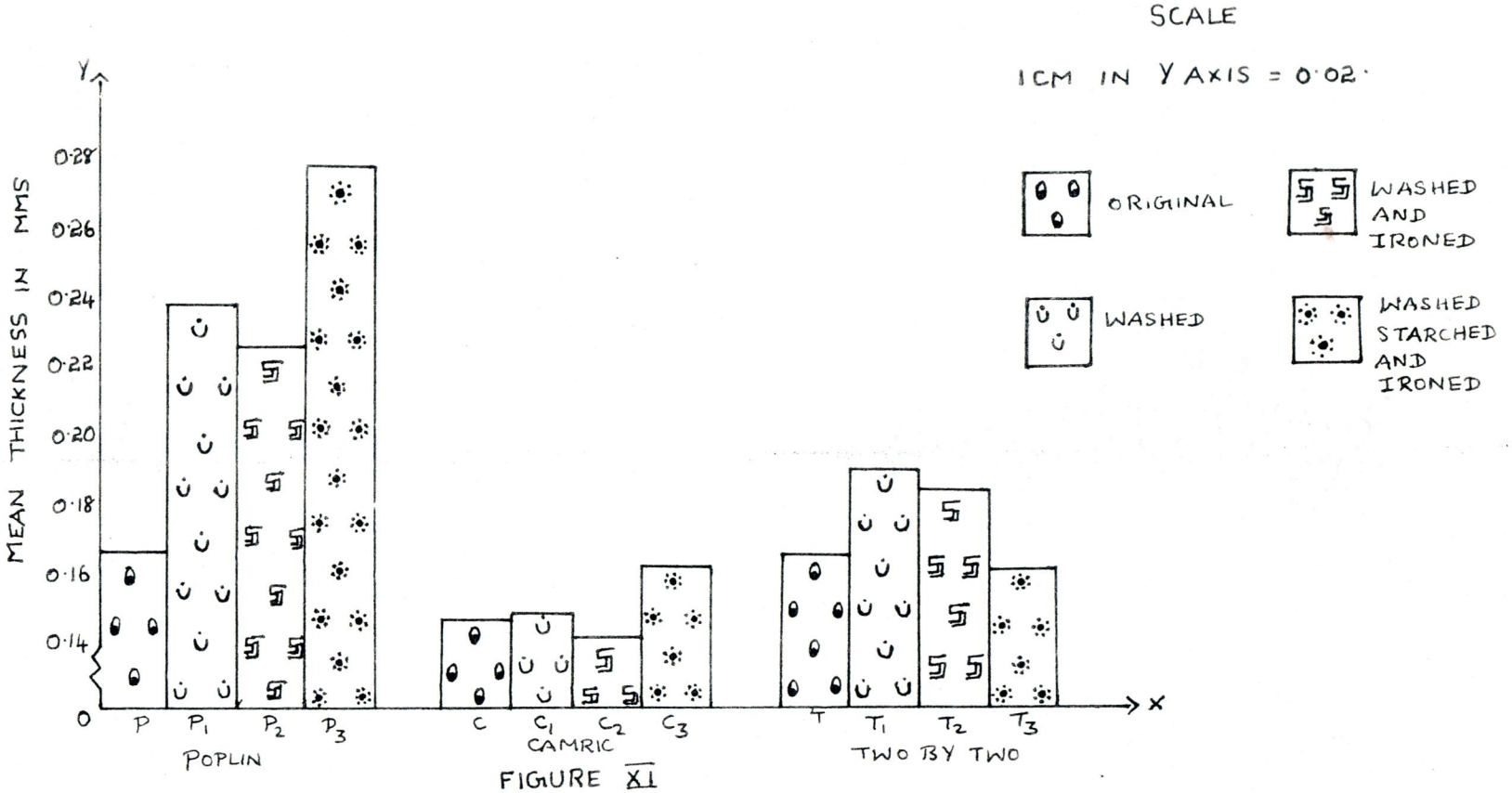


FIGURE XI

FABRIC THICKNESS

From Table XII and Figure XI, it is clear that there is increase in thickness in all the samples when compared to their original. It is also evident that maximum increase was observed in the starched samples.

Statistical analysis proves that the samples P_1, P_2, P_3, C_3, T_1, T_2 and T_3 have significant difference at both five per cent and one per cent levels.

From the above results, it can be concluded that all the laundering processes namely washing, ironing and starching increases the thickness. starching process increases the thickness to a greater extent than washing and ironing.

8. FABRIC WEIGHT

Fabric weight of the samples are given in Table XIII.

TABLE XIII

Fabric Weight

S.No.	Samples	Mean Fabric Weight in OZ/SQ.yard	Loss or gain over original	Percentage loss or gain over original
1	P	3.28		
2	P_1	3.21	0.07	2.13
3	P_2	3.22	0.06	1.82
4	P_3	3.16	0.12	3.65
5	C	2.44		
6	C_1	2.30	0.14	5.73
7	C_2	2.37	0.07	2.86
8	C_3	2.38	0.06	2.45
9	T	2.84		
10	T_1	2.96	-0.12	-4.22
11	T_2	2.88	-0.04	-1.40
12	T_3	3.76	-0.92	-32.39

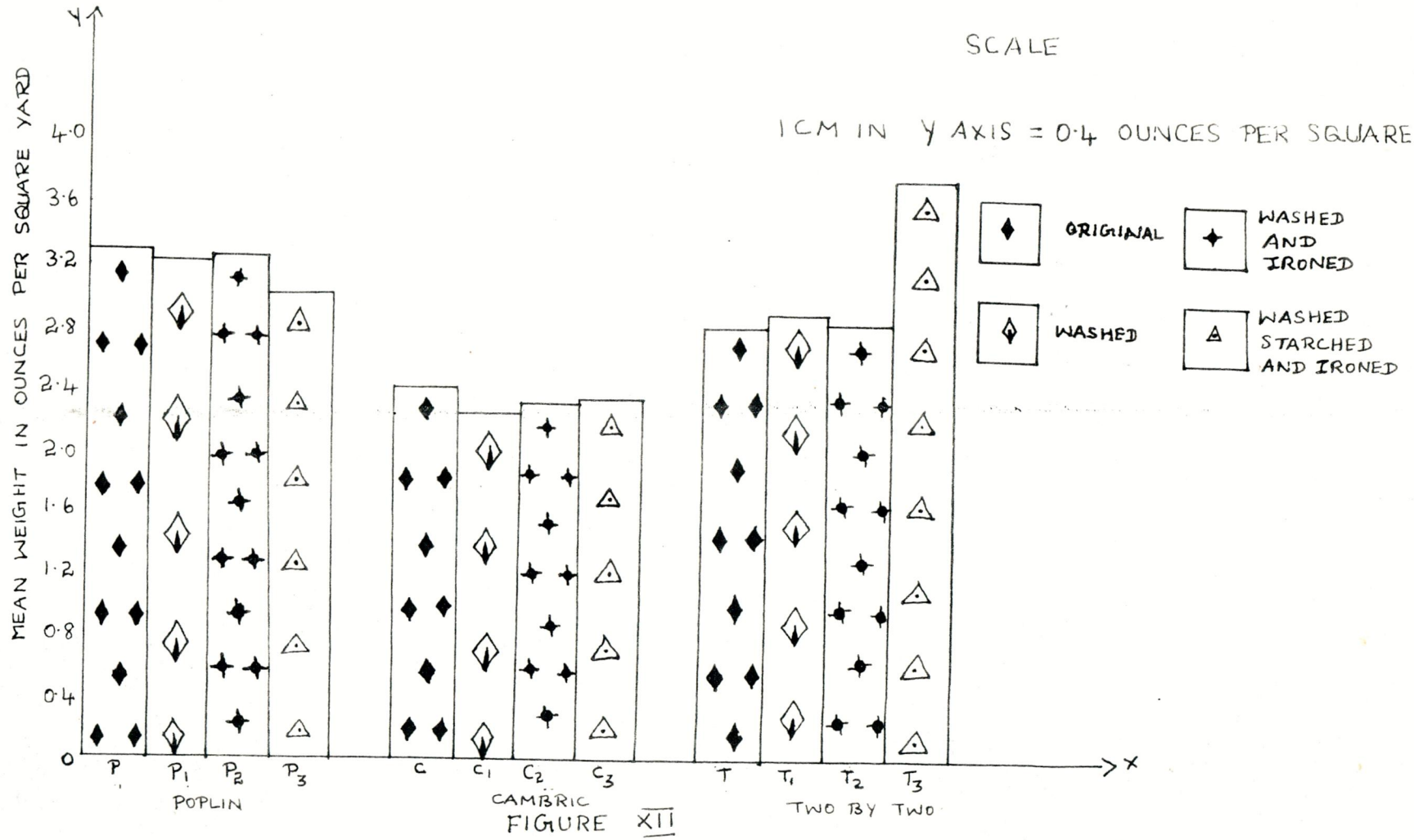


FIGURE XII

FABRIC WEIGHT

Table XIII and Figure XII reveal the fact that all the laundering processes decreases the weight in Poplin and Cambric samples, and increases the weight in Two by Two samples.

9. COLOUR FASTNESS TESTS :

Colour fastness tests are presented under the following headings.

a. Colour fastness to sunlight

b. Colour fastness to dry and wet crocking

c. Colour fastness to dry and wet pressing

d. Colour fastness to acid and alkali perspiration.

a. Colour fastness to Sunlight :

All the samples were highly colour fast to sunlight.

b. Colour fastness to dry and wet crocking.

Colour fastness to dry and wet crocking are presented in Table XIV.

TABLE XIV

Colour fastness to dry and wet crocking

S.No.	Sample	Grading obtained (Staining)	
		Dry	Wet
1	P	4	2
2	P_1	4/5	2
3	P_2	4/5	2
4	P_3	4/5	2
5	C	4	3
6	C_1	4/5	3
7	C_2	4/5	4
8	C_3	4/5	4
9	T	4/5	3
10	T_1	4/5	3
11	T_2	4/5	3
12	T_3	5	4

From the Table XIV, it is obvious that all the samples are highly colourfast to dry crocking. In the case of wet crocking all the Poplin samples showed a "Poor" colour fastness and Cambric and two by two samples showed a "moderate" colour fastness.

C COLOUR FASTNESS TO DRY AND WET PRESSING :

Colour fastness to dry and wet pressing are presented in Table XV.

TABLE XV

Colour fastness to dry and wet pressing

S.No.	Samples	Grading obtained	
		Dry	Wet
1	P	4/5	4/5
2	P_1	4/5	4/5
3	P_2	4/5	4/5
4	P_3	4/5	4/5
6	C	5	4/5
6	C_1	5	4/5
7	C_2	5	4/5
8	C_3	5	5
9	T	5	5
10	T_1	5	4/5
11	T_2	5	4/5
12	T_3	5	4/5

From Table XV it is clear that all the samples are highly colourfast to both dry and wet pressing, since all the samples were graded 4/5 and 5.

d. COLOUR FASTNESS TO ACID AND ALKALI PERSPIRATION :

Colour fastness to acid and alkali perspiration are presented in the Table XVI.

TABLE XVI

Colour fastness to Acid and Alkali perspiration

S.No.	Samples	Grading obtained (Staining)	
		Acid perspiration	Alkali perspiration
1	P	3/4	3
2	P_1	4/5	4/5
3	P_2	4/5	4/5
4	P_3	4	4/5
5	C	4	4/5
6	C_1	4/5	4/5
7	C_2	4/5	4/5
8	C_3	4/5	5
9	T	4/5	5
10	T_1	4/5	5
§11	T_2	4/5	5
12	T_3	4/5	5

From Table XVI it is evident that all samples were graded as 4, 4/5 and 5 except P. This indicates that all the samples were 'Good' to acid and alkali perspiration. Sample P was graded 3/4 and 3 for acid and alkali perspiration respectively thus proving to be 'fair' to colour fastness to perspiration.

Summary and Conclusion

V SUMMARY AND CONCLUSION

'Apparel maketh a man - apparel proclaims a person', it is often said. The early man felt the need for clothing as protection but today clothing also helps them in expressing their own personalities. Today, the number of fibres available to the people of the world have varied through history with the geographical area, state of culture, degree of poverty, technological developments, possibilities of trade, type of organisation, governing structure which may stimulate or limit innovation.

Fashion changes day by day and in ladies garments, blouses are given much emphasis due to increased interest created by them. Baliga (1992) expresses ladies matching sense to have reached its peaks with the use of blouses and tops with multicoloured threads and pieces of mirrors for a number of saris and dresses. Today almost all women prefer to wear sari with a good blouse. Thus the market is flooded with too many varieties, of blouse materials. Thus it is difficult to choose the best blouse material.

Hence in this study an attempt has been made

1 to find out the availability and sale of blouse materials
2. to carry out laundering procedure on selected blouse materials to judge their performance

Based on the market survey, premier mill cotton - poplin, cambric and two by two materials were selected for the study

Each of the selected materials were washed, washed and ironed, washed, starched and ironed. The washing was carried out with surf by kneading and squeezing method. Ironing was done at 400°F. The starching procedure was carried out using 0.15 percentage of starch solution. The three procedures were repeated 30 times and the samples were subjected to various laboratory tests.

The findings of the study are summarized below :

1. Survey revealed that Premier mill cotton blouse materials namely Poplin, Cambric and Two by Two were sold in 80 per cent of the shops.
2 Embroidery blouse bits of all colours were available in 40 per cent of the shops.
3. Woven and printed designed blouse bits were also sold in 35 per cent of the shops visited. The designs were floral, geometrical stripes and dots.
4. The cost of the poplin material was cheap where as the cost was higher in the case of blended materials.
5. Irrespective of the material, starching has increased abrasion resistance.
6. Starching has increased the strength of all the samples in the weft direction.
7. Starching has increased the strength of the cambric and poplin materials in the warp direction.
8. The crease recovery angle has increased for washed Poplin in warp direction.
9. The crease recovery angle in the weft direction was found to be increased in washed and ironed samples.

10. Washing and ironing has increased the drape quality of the samples.
11. Elongation was found to be increased in warp direction for Poplin and Two by Two samples after washing and ironing.
12. An increase in elongation was observed in washed Poplin, Cambric and Two by Two samples along weft direction.
13. Increase in stiffness was found to be greater in starched sample than in washed and ironed samples.
14. A moderate increase in stiffness in weft direction was observed in washed and ironed samples. The increase in stiffness was greater, in the case of starched samples than washed and ironed samples.
16. The various laundering processes increased the thickness of all samples.
16. The weight of Two by Two samples were found to be increased by the various laundering processes.
17. All the samples were colourfast to sunlight
18. With dry crocking all the samples showed a 'Good' colourfastness.
19. As regards wet crocking, all the Poplin samples showed poor colourfastness. Cambric and Two by Two samples showed a moderate colourfastness.
20. All the samples were colourfast to dry and wet pressing.
21. The Poplin samples were alone rated fair for acid and alkali perspiration.

From the above results it could be concluded that,

1. Starching increased the strength, stiffness, weight and thickness of all samples.
2. Washing increased the crease recovery and elongation of all samples.
3. Washing and ironing increased the drapability of all samples.
4. Wet crocking decreased the colour of all samples.
5. Perspiration decreased the colour of poplin samples.

Recommendations :

1. Similar study can be undertaken in 100 percent polyester and Cotton/Polyester blended materials.
2. The same study can be conducted by varying the washing methods.
3. Follow-up studies on comparison between detergents can be conducted.

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Appendices

APPENDIX I

Interview schedule to elicit information regarding the blouse materials.

1. Name and Address of the Shop

2. Blouse materials available in the shop and details of the mills producing blouse materials.

S.No.	Mills	Cotton			Polyester		Nylon/ Cotton	Any other
		Poplin	Cambirc	Two by Two	Cotton	100% Polyester		
i)	Khatau							
ii)	Madura							
iii)	Premier							
iv)	Mafatlal							
v)	Aravind							
vi)	C.C.M							
vii)	Lakshmi							
viii)	U maid							
ix)	Entyce							
x)	Binny							
xi)	S.Kumar							
xii)	Bombay dyeing							

4. Whether designed blouses are available in your shop?

Yes / / No / /

5. If yes, what are the designs available ?

S.No.	Designs	Woven	Printed
1.	Stripes		
2.	Floral		
3.	Geometrical		
4.	Dots		
5.	Any other		

6. Which material have the maximum sale?

Designed material / / Plain material / /

7. Whether embroidery blouse materials are available in your shop?

Yes / / No / /

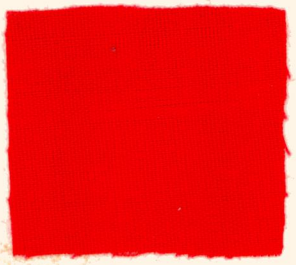
8. If yes, mention the varieties available.

9. List out the price of the materials

S.No.	Material	Price
1.	Poplin	
2.	Cambric	
3.	Two by Two	
4.	100% polyester	
5.	Cotton/Polyester	
6.	Others	

APPENDIX II

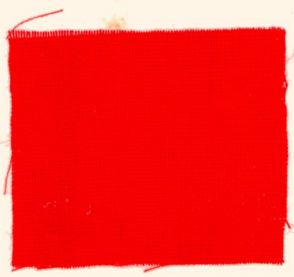
DETAILS OF MATERIAL



POPLIN

100% COTTON

PREMIER MILLS LTD



CAMBRIC

100% COTTON

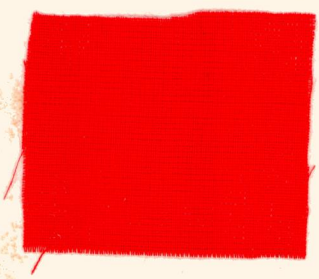
AARATI

DYED SUPERIOR VOILE

SPUN X SPUN SUPERFINE

MERCERISED FAST TO NORMAL WASH

PREMIER MILLS LTD



TWO X TWO

100% COTTON

RUBY

SPUN X SPUN FULL VOILE

FAST TO NORMAL WASH

PREMIER MILLS LTD

APPENDIX III

GREY SCALE USED TO EVALUATE THE SAMPLES

The materials were rated using 'AATCC' grey scale to measure the extent of staining.

Nomenclature	Used for staining
5	No Staining (Excellent)
4	Slightly stained (Good)
3	Noticeably stained (Fair)
2	Considerably stained (Poor)
1	Much changed (very poor)

APPENDIX IV

METHOD USED FOR STATISTICAL ANALYSIS

Statistics is a tool of all sciences and indispensable to research and intelligent judgement and has become a recognized discipline in its own weight. There is hardly any field where statistical tools are not applicable.

Students t - Distribution.

The students t - distribution is to find out whether there is any significant difference between the samples compared. The 't' value was found out using the following formula.

$$t = \frac{\bar{d}\sqrt{n}}{S}$$

Where as $S = \sqrt{\frac{\Sigma(d-\bar{d})^2}{n-1}}$ Standard deviation of the differences

d = the mean of the differences

For example, the table for the fabric thickness test of sample P - P_1 and the calculation of its components are given in the next page.

S.No.	P_1	P	P_1-P	$d-\bar{d}$	$(d-\bar{d})^2$
1	0.24	0.17	0.07	0	0
2	0.24	0.17	0.07	0	0
3	0.24	0.16	0.08	0.01	0.0001
4	0.23	0.16	0.07	0	0
5	0.24	0.16	0.08	0.01	0.0001
6	0.23	0.17	0.06	-0.01	0.0001
7	0.24	0.17	0.07	0	0
8	0.24	0.16	0.08	0.01	0.0001
9	0.23	0.16	0.07	0	0
10	0.25	0.16	0.09	0.02	0.0004

$$\bar{d} = \frac{0.74}{10} = 0.074$$

$$\Sigma (d-\bar{d})^2 = 0.0008$$

$$S = \sqrt{\frac{\Sigma (d-\bar{d})^2}{n-1}} = \sqrt{\frac{0.0008}{9}} = 0.009$$

$$t = \frac{\bar{d}\sqrt{n}}{S} = \frac{0.074 \times 3.162}{0.0009} = 25.99$$

$$t = 25.99$$

't' value

Observed	expected	
	5%	1%
25.99	2.262	3.250

The observed 't' value is greater than the expected value at 5 percent and 1 percent level. Thus, the difference is significant at 5 percent and 1 percent level.