



TAD- 111 CREDIT 3 (2+1)

B.Sc. (Home Science)



TEXTILE SCIENCE AND FABRIC CARE PRACTICAL MANUAL

**DEPARTMENT OF TEXTILES & CLOTHING
COLLEGE OF HOME SCIENCE
C. S. AZAD UNIVERSITY OF AGRICULTURE & TECHNOLOGY, KANPUR-208002**

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PRINTED: JUNE, 2013

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PRICE: Rs.

Printed at: University Printing Press, CSAU&T, Kanpur-208002

PREFACE

Textile is one of the most demanding branches of Home Science. Every few years there are new names of synthetic fabrics, weaves and finishes. Now - a - days market is flooded with immense varieties of textile materials. It is difficult to judge the kind of fibre by the appearance alone. The durability of material depends on the kind of fibers, strength of the yarn, the type of the weave and the nature of the finishes used.

The study of textiles is, therefore, essential to differentiate between the different kind of fibers strong and weak yarns and between close and loose weaves. In order to take good care and retain the strength and serviceability of the material, knowledge of laundering is also essential.

This manual contains the practical aspects of textile fibers. Yarn identification, weaves and laundering of different fabrics, which is expected will be helpful to a student during practical classes.

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Class :

Semester & Year :

Course Title : **TEXTILE SCIENCE AND FABRIC CARE**

Course No. : **TAD-111**

Credit Hours : **3(2+1)**

Department : **TEXTILES AND CLOTHING**

College :

University :

Father's Name :

Address :

Instructor's Name :

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Experiment No. 1

Objectives: To identify the natural textile fibers

Materials required: Microscope, slides, cover glass, spirit lamp, test tube & chemicals such as HCL, H₂ SO₄, NaOH etc

Procedure:

(i) Visual Inspection: Visual inspection of a fabric for appearance and hand is always the first step in fabric identification. It is no longer possible to make an identification of the fiber content by the appearance and hand alone because man made fibers can be made to resemble like natural fibres.

Observations

Samples	Length	Body	Texture	Lustre
1. Cotton				
2. Jute				
3. Linen/Flax				

(ii) Burning test: Specimens of the fibers are observed under flame. One end of the fiber specimen is put directly into the flame to determine the burning characteristics of the fiber. After removal from the flame the fiber burning characteristics should be observed and the burning odour noted.

Observations

Samples	When approaching the flame	When in flame	After removal from flame	Odour	Ash
1.					
2.					
3.					

(iii) Microscopic test: Pull the yarn from the lengthwise direction of the sample into fibers and mount the fiber on a slide. Place a cover glass over the mount. Examine under low and high magnification. Repeat the test with yarn pulled from the crosswise direction of the fabric.

Experiment No. 2

Objective: To identify the protein fibers

Materials required: Microscope, slides, cover glass, spirit lamp, test tube & chemicals such as NaOH etc.

Procedure:

(i) Visual inspection: Visual inspection by hand or feel is useful because it is simple to perform and under certain circumstances, provide ready identification. To understand what is meant by feeling a fabric, place your finger on a sample of wool. The heat generated by the finger remains in the area because wool is a non conductor of heat resulting, wool fabric feels warm to the touch "If the finger is placed on a sample composed of the vegetable fibers such as cotton the heat of the finger passes of because such fibers are conductors of heat. These fabrics therefore "feel cool to the touch".

Observations:

Samples	Length	Body	Texture	Lustre
1. Wool				
2. Jute				

(ii) Burning test: To recognize the composition of the sample by the burning test the sample shall be showed slowly towards a small flame and the reactions to the heat carefully observed. After it is removed from the flame, the burning characteristics should be observed and the burning odour noted.

Observations:

Samples	When approaching the flame	When in flame	After removal from flame	Odour	Ash
1.					
2.					

(iii) Microscopic Test: Identification by microscope is a reliable test that can be used to distinguish the fibers. For this test mount the individual fiber on the slide and cover with cover glass Examine under the microscope with low and high magnification.

Experiment No. 3

Object: To identify the synthetic fibers

Materials required: Microscope, slides, cover glass, spirit lamp, test tube & chemicals such as HCL, H₂SO₄, Formic acid and metacresol etc.

Procedure:

(i) **Visual inspection:** Visual inspection for appearance and feel requires perception if it is to be of any value. Synthetic fabrics feel very smooth, light weight, elastic and quite resilient.

Observations

Samples	Length	Body	Texture	Lustre
1. Nylon				
2. Polyester				
3. Acrylic				
4. Rayon				

(ii) **Burning test:** One end of the sample should be put directly into the flame to determine its burning rate and characteristics. After it is removed from the flame, the burning characteristics and odour is observed. After the sample is cooled, the ash should be examined for characteristics such as form, hardness and color.

Observations:

Samples	When approaching the flame	When in flame	After removal from flame	Odour	Ash
1.					
2.					
3.					
4.					

(iii) **Microscopic test:** Under the microscope man made fibers are difficult to identify because some of them look alike and their appearance may be changed by variation in the manufacturing process. Cross sectional appearance of the fiber is helpful if more careful examination is desired.

Observations:

Samples	Microscopic appearance	
	Longitudinal view	Cross-sectional view
1.		
2.		
3.		
4.		

(iv) Solubility test: Solubility test is another means of identifying fibers. Synthetic fibres such as nylon is soluble in common solvent vis-a-vis formic acid, phenol and H₂SO₄ but insoluble in NaOH whereas polyester are soluble in Metacresol only.

Observations:

Solvent	Sample 1	Sample 2
1. 20% HCL		
2. 70% H ₂ SO ₄		
3. Formic acid		
4. Metacresol		

Conclusions:.....

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Experiment No. 4

Object: To identify different types of yarns

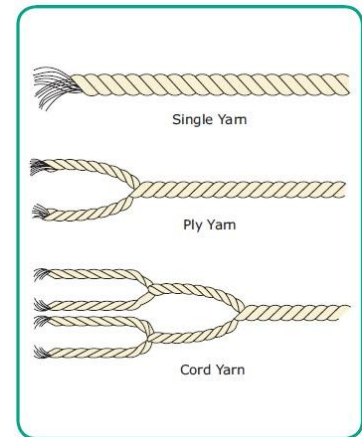
Introduction: Yarn is a generic name for an assembly of fibers that is laid or twisted together. Yarns are simple or novelty. The simple or novelty yarns are either spun or filament. Staple fibers are straightened and the process is known as carding where as long staple and filaments straightening process is called combing.

Simple yarn may be classified as:

(A) Single yarn: It is the product of first twisting operation that is performed by machine.

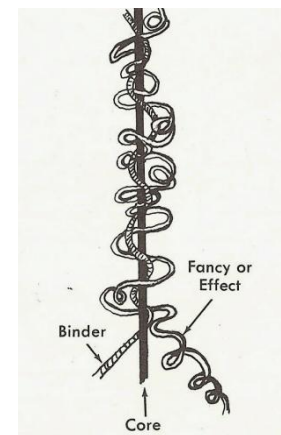
(B) Ply yarn: A ply yarn is made by second twisting operation which combines two or more single yarns. Each part of the yarn is called a ply.

(C) Cord yarn: A Cord is made by third twisting operation that twists ply yarns together. Some type of sewing thread and ropes belong to this group. Cords are seldom used in fabrics.



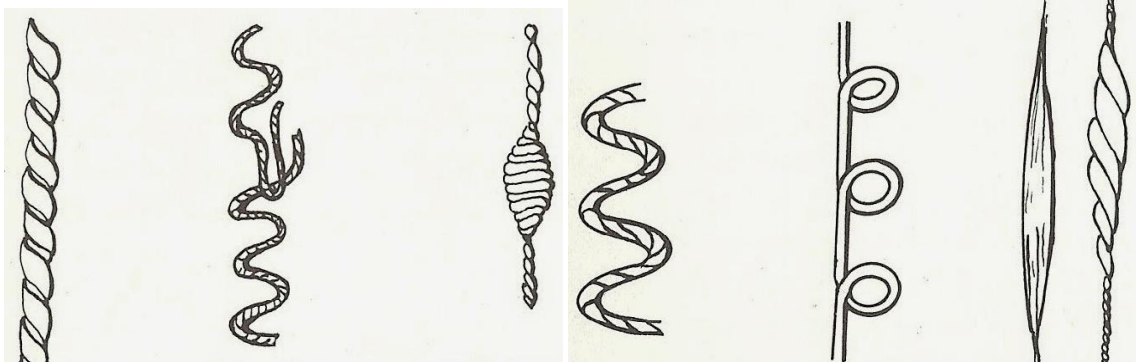
Novelty Yarn: Novelty yarn has 3 basic parts:

- Basic or foundation yarn
- Fancy or effect yarn which surrounds the foundation yarn
- Binder yarn, which binds the fancy yarn with foundation yarn



Novelty yarn

Types of Novelty Yarn



Spiral or corkscrew

Ratine

Knot or spot

Spike or snarl

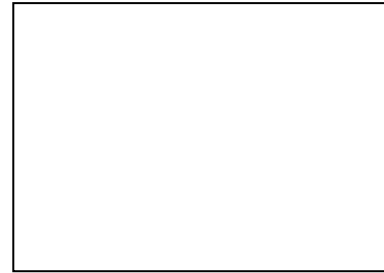
Loop

Slub

Observe and analyze the following samples:

I. Sample 1: Tick which observation is true for the given sample

- (i) It is a single / ply yarn
- (ii) It is a simple / novelty yarn
- (iii) It is a spun / filament yarn
- (iv) It is a carded / combed yarn



Observation and discussion:

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II. Sample 2: Tick which observation is true for the given sample

- (i) It is a novelty / simple yarn
- (ii) It is a filament / spun yarn
- (iii) It is a combed / carded yarn



Observation and discussion:

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III. Sample 3: Tick which observation is true for the given sample

Weft wise

- Single/ ply
- Spun/ filament
- Carded/ combed

Warp wise

- Single/ ply
- Filament/ spun
- Combed/ carded

Observation and discussion:

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IV. Sample 4: Tick which observation is true for sample No. 4

- (i) It is a single / ply / cord yarn
- (ii) It is a spun / filament yarn
- (iii) It is a carded yarn / combed

Observation and discussion:

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V. Sample 5: Tick which observation is true for sample No. 5

- (i) It is a single / crepe yarn
- (ii) It is a filament / spun yan
- (iii) It is a combed / carded yarn

Observation and discussion:

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Experiment No. 5

Object: To weave the samples of basic weave

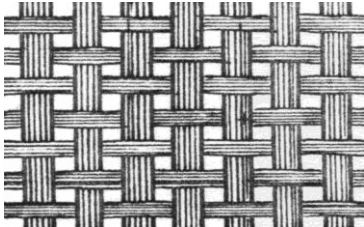
Materials required: Glazed papers of contrasting colors, gum, scissors, and stencil cutter

Introduction: Weaving is the process of interlacing two or more sets of yarns at right angles to each other. The yarns running in the lengthwise direction are called warp or ends & the yarns running in the crosswise direction are called the weft or filling. The three basic weaves are:

1. PLAIN WEAVE

It is the simplest of three basic weaves that can be woven on a simple loom. It is formed by yarns at right angles passing alternately over and under each other. Each warp yarn interlace with each filling yarn to form the maximum number of interlacing Plain weave fabrics have no right or wrong side unless they are printed or given a surface finish. Plain weave fabric tends to wrinkle more, ravel less and absorb less than other weaves.

Example: Organdie, linen, voile, cambric, chintz, gingham, buckram, gauze.



Plain weave



Plain weave variations:

(i) **Basket weave:** Two or more weft yarns pass alternately over and under two or more warp yarns. The resultant cloth is fairly loose in weave, allows slippage of yarns and shrinkage.



Basket weave



(ii) **Rib weave:** A rib effect is produced in either the warp direction or in the weft direction. The ribbed or corded fabrics are created by grouping a number of yarns together in one direction before they are crossed by the yarns from the opposite direction or by using larger yarn in one direction than in the other.

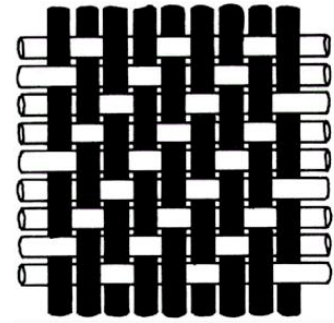


Rib Weave



2. TWILL WEAVE

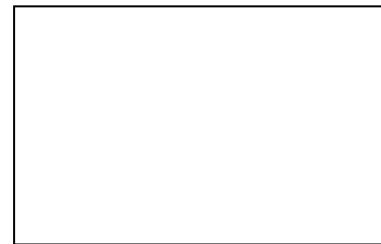
Twill weave is one in which each warp or filling yarn floats across two or more filling or warp yarns with a progression or interlacing by one to the right left to form a distinct diagonal line. A float is that portion of a yarn which crosses over two or more yarns from the opposite direction. Twill weave fabric has a right and a wrong side. The performance of twill weave may be increased by the use of long floats, combed yarns, ply yarns, hard twist yarns, twist of yarn opposite to the direction of twill line and by use of high thread count.



The direction of the twill weave usually goes from lower left to upper right in wool and wool like fabrics ie right hand twill and from lower right to upper left in cotton or cotton like fabrics - left hand twills . The degree of angle of the weave depends on the balance of the cloth. The greater the difference between the number of warp and filling yarns, the steeper the twill line will be. Examples: Cotton drill, Jean denim, gabardine.

Classifications of twill weave: Twill weave are classified on the basis of kind of yarn expressed on the surface of the fabric as:

(i) Warp faced twill: Have a predominance of warp yarns on the right side of the cloth



(ii) Weft faced twill: Have a predominance of filling yarn on the surface of the fabric



(iii) Herring bone: Fabrics have the twill line reversed at regular intervals to give the design that resembles the backbone of a fish.



(iv) Even sided twills: Fabrics have the same amount of warp and filling yarn exposed on both the sides of the fabric. They are sometimes called reversible twills because they look alike

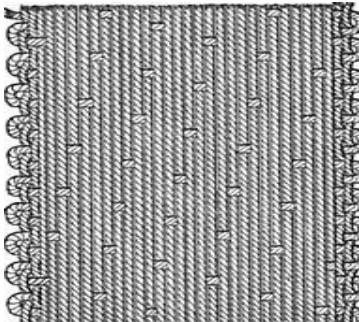


on both the sides although the direction of the twill line differs. Example: Serge, Surah, Flannel.

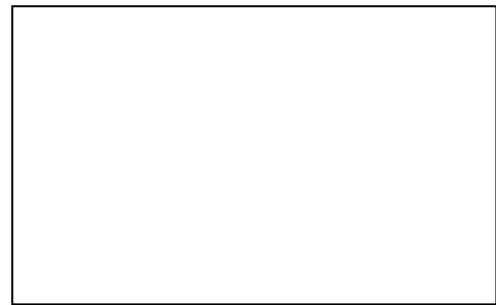
3. SATIN WEAVE

Introduction: In this each warp yarn float over filling yarns and interlaces with the fifth filling yarn, with a progression of interlacing by two to the right or the left. The basic fabric made with this weave is satin or sateen. These fabrics have right or wrong side. These are one of the most lustrous fabrics.

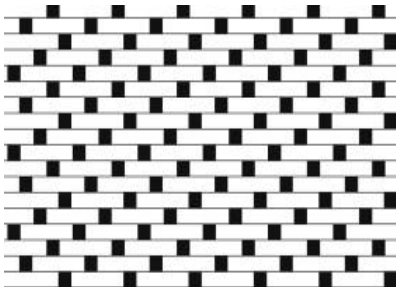
i. Warp faced satin weave: It is warp faced fabric because the warp yarns cover the surface of the fabric and warp count will be high. The long warp floats in this weave produce a smooth surface with a characteristic luster.



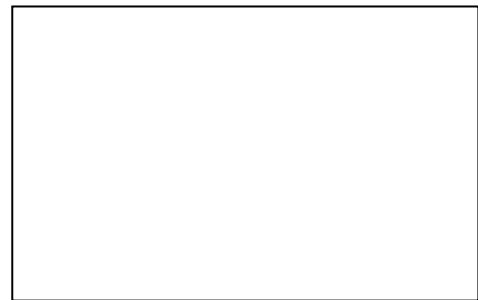
Warp faced satin weave



ii. Weft faced satin weave: It is the filling faced fabric because filling floats cover the surface of the fabric and filling count will be high. The floats in the sateen are generally shorter than those in the satin weave.



Weft faced satin weave



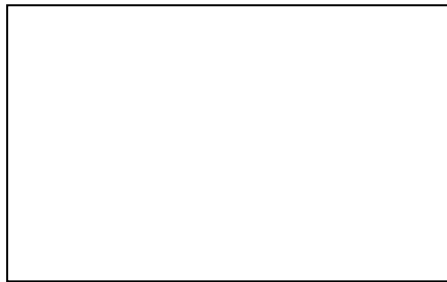
Experiment No. 6

Object: To check the thread count of a woven fabric

Materials required: Casement cloth of 3x3 " size, Pick glasses, pencil, ruler

Procedure: The closeness of weave is expressed as the thread count. Mark an inch square on the sample, with the help of pick glasses count the number of yarn in 1 inch of warp and 1 inch of filling. The thread count is often expressed in numerical count as 80x64 indicating that there are 80 warp yarns per inch by 64 filling yarns.

The thread count is the indication of the quality of fabric, higher the count, the better the quality of fabric. The higher count also means less potential shrinkage and less ravelling of seam edges.



Sample

Thread count = Warp x Weft

Balance: It is a ratio of warp yarns to filling yarns in a fabric. A well balanced fabric has approximately 1 warp yarn for every filling yarn or ratio of 1:1.

Balance = Warp: Weft

Experiment No. 7

Object: To remove common stains from different fabrics

Introduction: Stain is the spot or mark of discoloration left on fabric by contact and absorption of some foreign substance. Some stains are easily removed by ordinary method or reagent, but there are quite a few which need special treatment.

Materials required: Cotton, silk and synthetic fabrics of 5"x5", lime, salt, kerosene, glycerine, oxalic acid, KMnO_4 , H_2O_2 , acetic acid, acetone, sodium hydrosulphate, borax, bleaching powder, washing powder etc.

Procedure:

S. No.	Stains	Method of Removing the Stains	Samples	
			Before	After
1.	Turmeric	Prepare a paste of soap powder (detergent) and water. Apply this on the stain (both sides). Then wash with soap and water dry in sun. On silk fabrics, keep the stain with wrong side up and sponge with cold water on the stain.		
2.	Tea, Coffee, Cocoa	Soak in cold water for an hour or even longer. Then wash with soap and water. If still remains pouring boiling water through from a height of two feet.		
3.	Kajal	Soak in kerosene oil. Then wash with warm water.		
4.	Ice cream	Wash in cold water. Rub borax into stain or alcohol or spirit or kerosene oil for some time.		

5.	Grass	Soak the stain in alcohol or spirit or kerosene oil for some time. Then wash with cold water.		
6.	Beetle leaf	<ul style="list-style-type: none"> • Rub the stain with curd and lime, wash with detergent. • Rub with raw potato on the stain. Then wash with soap. 		
7.	Ink	<ul style="list-style-type: none"> • Soak the stain in lime juice and salt for some time. The pour water from a height. • Rub the stain with a cut tomato and salt and wash. • Soak in methylated sprit for some time then wash with soap and water. • Soak in cold water for an hour. Rub soap into the stain well. Then wash with soap and water. Rinse thoroughly and dry. 		
8.	Rust	<ul style="list-style-type: none"> • Rub salt and sour lime juice into the stain and let it dry. Then wash. • Spread the stain over the top of a vessel. Apply oxalic acid solution on the stain and immediately rinse in cold water. If stain still remains, then pour hot water over it and apply oxalic acid crystals on it. Wash after few minutes. 		

9.	Lipstick and grease	Rub dalda (solid) or Vaseline on both sides of the stain and rub until color is loosened. Then wash with hot water and soap and then dry in the sun. If necessary bleach with hydrogen peroxide, Rinse well.		
10.	Nail polish	Soak stain in acetone for 15 to 30 minutes, and then wash in detergent and water. Rinse well.		
11.	Blood	Soak in cold water for 1/2 an hour. Then rub stain in cold water and wash with soap. If still remain put a few drops of ammoniac on the stain and wash it with soap. Rinse well.		
12.	Milk	<ul style="list-style-type: none"> • If possible wash before it dries on the fabric. • Wash in cold water. Do not use any soap. 		
13.	Oil	<ul style="list-style-type: none"> • Wash in warm water and soap. Rinse thoroughly. • On silk, dab talcum powder or atta on the stain. Then brush off the powder. 		

Experiment No. 8

Object: To launder different fabrics

COTTON FABRIC:

Materials required: Tubs, basket, soap, washing powder, scrubber, mug, bleaching and stiffening agents etc.

Introduction: Cotton and linen are easy to clean and therefore, popular for clothing Cotton and linen are obtainable in many varieties and with different finished surfaces and color.

Procedure: The process used for laundering is governed by:

- (a) The texture of the fabric
- (b) The fastness of the color
- (c) The finish appropriate to it

(i) Care Required: In washing cotton and linen care must be taken-

- (a) To avoid the use of such methods and cleaning reagents as are likely to weaken the fabrics
- (b) To preserve the whiteness of the white and the color of the colored article
- (c) To clear, stiffen, finish and to freshen the appearance of the fabrics and make it look as new as possible, wash cotton separately

(ii) Steeping: Loose dirt is removed through pedesis by steeping stains soluble in water are removed and the starch of the previous laundering is softened.

Rules for steeping:

- (a) Use a clear tub that has no rust marks.
- (b) The tub bucket or basin should be sufficiently large to hold a sufficient quantity of water and the cloths.
- (c) Dirty clothes can be steeped overnight with washing soda added to water.
- (d) Salt and little disinfectant can be added to the water in which handkerchief are soaked.

(iii) Washing: The method for washing is determined by the texture of the fabric the type of article its color and type of dirt present in it. Method used in washing is application of hand friction or scrubbing.

Strong white articles, such as table linen, bed linen should be washed by application of light friction for washing the article on a scrubbing board.

(iv) Rinsing: After washing rinse clothes in several warm waters to remove all traces of soap from the fabric. Give a last rinse in cold water to restore the whiteness. Wring out the moisture.

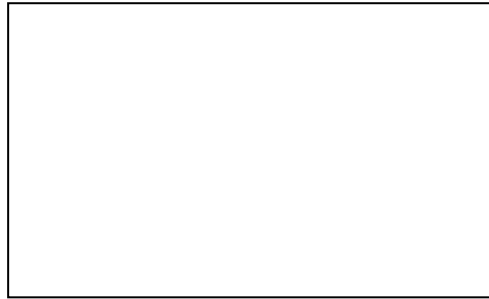
(v) Stiffening and blueing: Shake a bag of blue in the prepared starch to get the desired shade. All white clothes are blueed. All cottons and lines except bed linen and under garments are starched.

(vi) Removal of moisture: The article is folded and then passed through a mangle. For delicate article, rubber wringers are used as they neither spoil the texture of the fabrics or stretch nor tear the cloth.

(vii) Drying: Outdoor drying is best for all white articles as sunlight helps to bleach the cloth, quickens the drying, disinfects and freshens the cloth.

They should not be left out in sun too long but removed as soon as they are dry. Hot sun causes white cloth to become yellow.

(vi) Finishing: Cotton and linen are generally starched and, therefore, need a good finish. Most of these are finished by ironing except velveteen, which is steam - pressed. In order to get a good and even finish, the starched articles must be well dried before ironing .



Cotton sample

- (a) Ironing is always done along the selvedge of the garment from hem to neck.
- (b) Materials requiring a glossy surface should be ironed on the right side. ned on the wrong side over a flannel pad.
- (c) Materials must be ironed to complete dryness and give a finish.
- (d) Ironing has begun at the end of the farthest part of the garment so that the ironed parts can be slide away from the worker, bringing the portion to be ironed under the worker's hand.

SILK FABRIC

Materials required: Tubs, bucket, mug, ezee, silk garment etc.

Introduction: Silk is an insect fiber of delicate and fine texture which needs special care in laundering. In case of silk, strong alkalis, heat and friction are equally harmful.

Procedure:

(i) Preparation: Repair tears and opening in the seams, if any, before washing as these are likely to enlarge during the washing process.

(ii) Stain removal: Strong acids and alkalis and strong bleaching agents are harmful to silk. For old stains which are difficult to remove, use weak reagents, such as weak solutions of borax, or sodium perborate for colored silk, and Hydrogen peroxide with a few drop of ammonia for white silk. Grease spots are not removed in the processes of washing and so these too should be removed with a grease solvent before washing.

(iii) Soap and water: Silk material is of fine texture and is usually an expensive fabric; therefore a good neutral soap or detergent like ezee, genteel should be used.

(iv) Preparation of soap solution: Dissolve genteel or ezee in the lukewarm water. If water is hard, then add a teaspoon of borax or ammonia to soften it.

(v) Preparation of soap solution: Cleansing is done by kneading and squeezing or by suction washing. Rub lightly the most soiled parts with additional lather. Rinse the silk in two or three warm waters to remove the soiled soap from the fabric. Add a few drops of acetic acid or citric acid to the last rinse, which should be of cold water. It improves the sheen of the fabric.

(vi) Stiffening of silk: There is a natural gum in the silk fiber which is stiffened by the final cold rinse, giving a light stiffness to the article. If extra stiffen is necessary add gum water to the last rinse. Silk should be squeezed lightly by hand to remove the moisture.

(vii) Drying: Drying of silk should be done in the shady place. Small articles need no drying. Silk should not be dried completely but kept slightly damp for finishing.

(viii) Finishing: Special precaution must be taken in finishing the silk. A hot iron will scorch the silk, whilst a cold one will drag and crease the surface of the silk instead of giving it a smooth finish. The heat of iron should be tested on a piece of paper.



Silk sample

WOOL FABRIC

Materials required: Ezee or genteel (mild detergent), tubs, mug, wool sample etc.

Introduction: Wool is an animal fiber of delicate texture. It needs careful treatment of laundering because of the tendency of woollens to shrink or stretch in the process of washing.

Procedure

(i) Preparation: Woollen fabrics are of loose structure and so hold dust particles. Shake the article to remove the dust. To prevent the felting or spoiling of the shape of hand knitted garments, mark outline of an article before wetting it. After washing and removing the moisture, the garment should be placed on the paper and pulled back to its original shape guided by its outline. The garment should be allowed to dry flat on the paper. As only thus will it keep its shape.

(ii) Stain removal: All reagents must be used in solution. Weak acids are less harmful than weak alkalis. Use only Hydrogen peroxide or sodium perborate at a moderate temperature.

(iii) Preparation of water and soap: The water must be soft and just warm. If the water is hard, add a few drops of ammonia to the water for white woollens and borax for white as well as coloured woollens. Any neutral soap is good for woollens. A soap containing a grease solvent is useful for very soiled articles.

(iv) Method of Washing: Prepare a permanent lather with warm water and soap flakes. Wash small articles by kneading and squeezing, and the bulky ones by suction washing. Renew the soap solution if the dirt is not removed.

Rinse in several water for the through removal of the soap. For the removal of moisture the best method is warp the articles in a dry cloth or towel press between the hands if the article is small. Bulky suction washer or with a wooden roller.

(v) Drying: Dry the woollen in the shady, warm and dry place, woollen article should be put for drying as flat as possible. Large article which have to be hung should be hung up by their strongest point on clothes line or drying rack.

(vi) Finishing: The elasticity of woollen fiber is spoiled if excessive finishing is applied.



Woollen sample

Some Don'ts for woollen clothes

- (a) Never boil or twist
- (b) Never hang wool garments near heated radiators or in the hot sun, because heat dries up the wool fiber causing it to become brittle and break
- (c) Do not use washing soda

SYNTHETIC FABRICS

Materials required: Tubs, mug, detergents, synthetic fabric, such as nylon, polyesters, acetate etc.

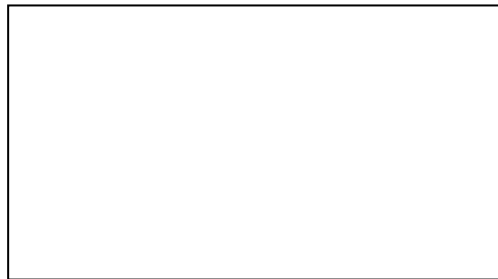
Introduction: Synthetic fabrics are easy to care fabrics. They are hydrophobic and thermoplastic. The smooth and soft surface of these fabrics resists dirt and grease and so remains fresh and cleaner for longer period.

Procedure

(i) Laundering: Check labels for instructions. These fabrics do not require any steeping unless they are extremely dirty and even then a small exposure to lukewarm water would suffice. Sheer, delicate and fine fabrics should be hand laundered to retain the freshness and smoothness of the fabrics. Rinse thoroughly with warm water to remove soap completely, otherwise the soap particles will dull the color.

Avoid putting needless wrinkles into the fabrics during the laundering process. Lightly squeeze out excess moisture, roll it into a bath towel, smooth out and allow drying. The fabric can also be hung drip wet, after the buttons have been fastened and collars and cuffs finger pressed.

(ii) Ironing: These synthetic fabrics and their blends should be ironed at low temperature setting white still damp with little or no pressure because they have a tendency to glaze and melt under heat and pressure.



Synthetic Fabric Sample

RAYON FABRIC

Materials required: Soap, tubs, mug, etc.

Procedure

(i) **Laundering:** In cleansing, only gently squeezing in war soapy water is necessary, and when the fabric is to be lifted out of the liquid support it with the hand and do not pull it out by catching hold of corners. The rinsing must be thorough. If further removal of water is necessary, place the article between two dry Turkish towels and again press the water out. In case of a printed fabric a piece of muslin inserted between the folds will prevent the marking off of the colours when they tend to bleed.

(ii) **Drying:** Hang to dry as soon as possible seeing that the weight of the garment is evenly distributed. It is good tip to suspend a dress by throwing it over the line at the waist. Garment that will stretch out to shape can be dried flat.

(iii) **Ironing & Finishing:** The label attached in the garments giving direction for finishing must be followed for obtaining correct result.

(a) As a general rule, rayon must be slightly and evenly damped before ironing.

(b) Always cool iron should be used because a hot iron can cause melting of the fabric within the split of a second.

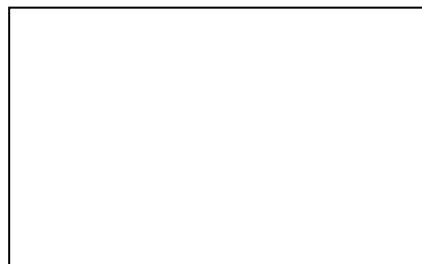
(c) Finish shiny fabrics like satins on the right side, dark rayon's and crepe fabrics on the wrong side, using a moderately hot iron .

(d) To ensure a uniform result, single material may have to be ironed first. It is unwise to iron over buttons and press fastners or on many thicknesses of these fabrics.

If the creases are not easily removed, it is because the material is too dry. This is remedied by rewetting or placing between two damp towels and not by sprinkling with water because this is liable to produce unevenness of luster or water marks particularly on dull finish fabrics like crepes.

Keep the iron moving and do not press heavily. Fold lightly without pressing in the folds. Glazed parts caused by hot iron can often be removed by wetting the whole article and exposing the glazed part to the steam of a kettle. If the material is white and the glazing so bad, that the garment is unbearable it may be dipped in soap solution, and treated as above. A steam electric iron is very useful for finishing rayon particularly crepe fabrics.

Dry cleaning of Rayon: Some garments by the very nature of their make - up are difficult to wash, eg. elaborate suits etc. So in these instances it is advisable to dry clean the garment.



Sample of rayon

In the cleaning of rayon non - inflammable solvents such as carbon tetrachloride are not advisable, as they sometimes extract the color from acetate.