



Faculty of Engineering
Department of Textile Engineering

Project (Thesis) on

**STUDIES ON THE CHANGES OF TWILL AND DENIM
GARMENTS AFTER DYEING AND WASHING
PROCESS.**

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A thesis submitted in partial fulfillment of the requirements for the degree of **Bachelor of
Science in Textile Engineering**

LETTER OF APPROVAL

This project report prepared by **Md. Ashikur Rahman Apple (ID: 161-23-4604)** and **Md. Nadim Mahmud (ID: 161-23-4578)**, is approved in Partial Fulfillment of the Requirement for the Degree of **BACHELOR OF SCIENCE IN TEXTILE ENGINEERING**. The said students have completed their project work under my supervision.

During the research period I found them sincere, hardworking and enthusiastic.

A rectangular stamp containing a handwritten signature in blue ink. The signature is partially obscured by a horizontal line drawn across it.

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DEDICATION

*This thesis report is dedicated to our
beloved parents and honorable
supervisor*

Abstract

Raw denim garments obtained after finishing is impossible to wear before dyeing and washing because of rigidity and stiffness of finished denim. Finished denim garments is also looking dull before dyeing and washing. Twill garments also looking dull and impossible to wear before dyeing and washing. So that the denim and twill garments have to wash properly for its great performance. Denim wash actually not change garments physical property but also change aesthetic property of denim garments. This project is done for comparing the physical properties like rubbing fastness, weight, length wise shrinkage, width wise shrinkage, PH, tearing strength, tensile strength, gsm. We saw a twill garments for 4 pcs before wash this weight was 2.900kg and after different dyeing and washing it goes to 3.100kg. And gsm before wash was 8.78 oz/yd² and after wash it changes to 8.84 oz/yd². This garments length wise shrinkage percentage after wash 2.70% and width wise shrinkage percentage 8.00%. PH need 6-8 but here PH was 6.78. Rubbing fastness for dry have 4-5 and wet have 3-4. And some body measurement change after garments dyeing and washing waist was before wash 31.5 and after wash 29.5. This all data collected from laboratory and quality control section of Standard Group Ltd. After comparing those changes of garments we can comments about reasons of change garments property. Enzyme, bleach, towel, stone, acid wash is the main reason for changing those property.

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CHAPTER 01

INTRODUCTION

CHAPTER 01

INTRODUCTION

Denim is a popular cotton twill textile fabric in which weft yarn which have under two or more warp yarn and have diagonal line effects that's which differentiate plain weave cotton and it is very much hard and it is also very stiff[1,2].

Popularity of washing and dyeing of garments in global market is increasing very fast. To complete the requirement of buyer need a large number of washing factory is growing in Bangladesh. New technology is changes the garments aesthetics property, size, looking, comfortable, design and many different fashionable garments and naturally used on denim goods and another garments to make glassy by treatment of many wash like desizing, bleaching, enzyme dyeing and finishing. Desizing of denim garments removes impurities and dust from garments to good wash.[3-5].

Tis treatment use commonly for finishing goods get better hand feel and good to wear. Washing is the heart of denim garments that why before wear we must have to wash denim garments.[6,7].

Denim is now a days very much active of usage. For increase of usage it making by using different unique technique and get them required color. Blue denim garments is most popular in global market so it is much valuable. Also development of textile industry and Apparel industry, requirement is more comfortable and authentic look to wear denim garments[8].

The modification of denim garments structure use many wash effect then get water resistance, air permeability, thermal comfort. Customers choose their garments as him or her need. Comfort is the most important property for increase value.[9,10].

1.1 Objective of the study

To know about the changes of twill and denim fabric after dyeing and washing.

To know the GSM of fabric after dyeing and washing.

To know the EPI, PPI of fabric after dyeing and washing.

To know the Shrinkage% of fabric after dyeing and washing.

To know the Crimp% of fabric after dyeing and washing.

To analyze the look of garments after dyeing and washing.

To compare the changes of garments after dyeing and washing.

To develop a report go through this findings of the study.

CHAPTER 2

LITERATURE REVIEW

CHAPTER 2

LITERATURE REVIEW

2.1 Denim wash and Dye:

Garments washing and dyeing is most popular in the textile sector or industry. Impurities, dust, dirt and any harmful particles is removed by garments washing [11].

Different technique creates different requirements of style and fashionable products. Naturally denim wash is done after stitching garments. According to consumers need, and buyer ask to make wash. Physical changes is mainly depends on fabrics types [12].

Without denim present market is not profitable to any industry. Before denim dyeing and washing first have to do dry wash. Where firstly have to brush where p.p spray have to give, then pocket side have to grinding and end seam of pant have to grinding for smoothy garments. Destroy machine create a fashion on garments by laser to look fashionable [13].

Inseam of pocket staple somewhere for aesthetic look. Then upper part of denim pant cross walk looking it take on a heat pipe then spray potassium permanganate for permanent wrinkle. This washing process have many critical change of physical property of denim garments [14].

Enzyme wash, rinse wash, bleach wash, potassium permanganate wash, acid wash, stone wash, towel wash, stone-enzyme wash. Among these wash are dye wash strategy for shade match the required garments.

Dyeing is the heart of any garments. Dyeing is necessary for garments to get different color, look and many things. In Standard group we seen six dyeing mainly wants their buyer for customer need. They are pigment dyeing, reactive dyeing, direct dyeing, asudal dyeing, near wash dyeing, double dyeing etc.

2.1.1 The Changes after Different denim wash and dye:

Denim wash gives us many new look of garments like more fashionable, attractive color and good to wear. Day by day it going more valuable for consumer satisfaction. This can make which numerous feel to be get one kind and pre- trouble look after wash.

Article of clothing goods using denim can experience such lot number of procedure to get permanent fading impact.

2.2 Types of garmentswashing:

- Normal wash
- Bleach wash
- Stone wash
- Acid wash
- Enzyme wash
- Caustic wash
- Super whitewash
- Wash and overdyeing

2.2.1 Normal wash:

Normal wash used for size material remove, dirt and oil also remove from all garments and garments hand fell get soft.



Fig 2.1: Normal wash

2.2.2 Bleachwash:

Bleach wash required for fabrics produced whiten by bleaching action. Garments are dyed with direct dye or reactive dyeing. There used bleach wash for fading thegarments.



Fig 2.2: Bleachwash

2.2.3 Stonewash:

It use mainly denim garments and jeans to get required color. Fading is done irregularly in the garments by stone wash. Garments become more comfort by done stone wash during wash. Nowadays stone wash must require for denim and jeans garments for customer requirement and it done garments fading and soft feel. Soda ash and powder assistant is use for stone wash.



Fig 2.3: Stone wash

2.2.4 Acidwash:

Heavy jeans and denim garments are washed by acid wash. Penumic stone are used during acid wash. Irregular spotty effect can produce by acid wash in garments.by penumic stone produced by volcanic explosion. This type of stones floats on water.

The penumic stones to be used during acid wash for treatment in following cam soln.

Recipe:

Water 100L

P.P: 1.2 kg

Phosphoric acid: 300 ml

The solution was stritted in a stainless steel bowl.

The penumic stones were soak in the stock solution for 2-3 min. Then the stone were dried for 60-90 min.



Fig 1: Acid Washed Denim Garments

Fig 2.4: Acid wash

2.2.5 Enzymewash:

Indigo dyed warp yarn are sized with starch together with soluble PVA to remove this size material enzyme wash is used. For giving soft effect and to give the denim garments a stone wash look, with the better wash blue and white contrast on the surface. Soda ash, assistant, powder enzyme and liquid enzyme are used the wash.



Fig 2.5: Enzyme wash

2.2.6 Caustic wash:

High density alkali medium is used in caustic wash which remove the protruding fiber from the fabrics surface and also fading the color of garments. Caustic is a chemical with corrosive nature, or strong cleaning power for oil spot remove. In this process all the dirt will clean by caustic wash from garments.



Fig 2.6: Caustic wash

2.2.7 Super whitewash:

During bleach wash and stone wash OBA is used in final rinsing to make the white threads in the fabrics whiter to create strong color between blue and white on the surface of garments.



Fig 2.7: Super white wash

2.2.8 Garments wash and garments overdyeing:

Garments wash and over dyeing mainly done on the garments after stone wash or acid wash. Direct dye or reactive dye use for over dyeing, if direct dyeing used for over dyeing there in last color fixing agents must need direct dyeing, then staining of other garments during cleaning can be avoided.



Fig 2.8: Over dye wash

2.3 Machineries used in garments washing industry:

- ❖ Garments washmachine.
- ❖ Hydro Extractormachine.
- ❖ Drying machine(tumbledryer)
- ❖ Boiler
- ❖ Sample washingmachine
- ❖ stand blasting unit forsand
- ❖ blast washing machine
- ❖ spraymachine
- ❖ whickeringmachine
- ❖ Grindingmachine.
- ❖ Heat chamber for making crease ongarments.

CHAPTER - 3

EXPERIMENTAL DETAILS

CHAPTER 3

EXPERIMENTAL DETAILS

3.1 Materials

For this research we took two denim (style 4871, 4936) and three twill fabric samples (style 3955, 6721, 3954). Specification of these samples are mentioned below.

3.2 Process:

3.2.1 Recipe

According to buyer requirement, the recipe of these five samples are given below:

3.2.1.1 Style: 3955(Twillfabric)

Recipe Type: (Reactive + Pigment +Enzyme)

Color: Tour Khaki

1ststep: De-sizing

Materialwt... 200pcs/100kg
LiquorRatio=1:7.5... 750Liter
Temperature 60°c
DenimcolRGN750gm
Wettingagent... 1500ml
Time... 10min
Rinse... wash 2 times for 2min in coldwater.

2ndstep: Reactive dyeing

LiquorRatio=1:7..... 700 Liter
MIP700gm in cold water for5min
Nova.Yellow-EC2R..... 311.53gm (temp 50°c for5min)
Nova.Red-EC3GL..... 76.30gm (temp 50°c for5min).
Nova.Blue-SGL 128.55gm (temp 50°c for5min).
Glaubersalt 30kg (temp 50°to 60°c for10min).
SodaAsh... 10kg (temp 60°c for20min).
TotalTime..... 40min.
CheckandRinse...wash 2 times for 2min in coldwater.

3rdstep: Neutralization

LiquorRatio=1:7..... 700Litre.
Aceticacid... 350ml.
Temperature 50°c.
Time... 5min.
Rinse...wash 2 times for 2min in coldwater.

4thstep: Soaping

LiquorRatio=1:7..... 700Litre
Detergent-PCLF..... 700ml
Temperature 60°c.
Time... 10min
Rinse...wash 2 times for 2min in coldwater.

5thstep: Catanizer

LiquorRatio=1:7..... 700Litre
SodaAsh... 300gm
Prefix-K.....3500ml
Temperature 50°c.
Time... 20min.
PH...8.5
Rinse...wash 2 times for 2min in coldwater.

6thstep: Hot wash

LiquorRatio..... As required.

Temperature 80°c.

Time..... 5min.

7thstep: Pigment dyeing

LiquorRatio=1:7..... 700Litre

Beza, Yellow-RR..... 144.84gm (10min in coldwater)

Beza, Red-HBB.....54gm (temp 50°c for 10min)

Beza, Blue-BBN...36gm (temp 60°c for 5min)

Totaltime..... 25min

CheckandRinse...wash 1times for 5min in coldwater.

8thstep: Binder

LiquorRatio=1:7..... 700Litre.

Binder(707-B)... 1400ml.

Temperature 40°c.

Time..... 5min.

Rinse...wash 2 times for 2min in coldwater.

9thstep: Enzyme

LiquorRatio=1:6..... 600Litre.

Valumax..... 600ml.

Neopolish(8000L)... 100ml.

Temperature 40°c.

Time..... 10min

Rinse...wash 2 times for 2min in coldwater.

10thstep: Softening

LiquorRatio=1:6..... 600Litre.
 Softener-(UNP)..... 20Litre(mix)
 Silicon..... 500ml.
 Temperature 40°c.
 Time..... 5min
 PH..... 5.5

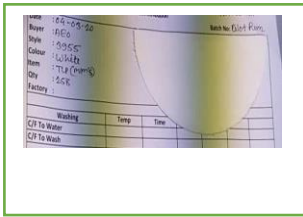


Fig 3.1:Before dyeing



Fig 3.1: After dyeing

3.2.1.2 Style: 6721(Twillfabric)

Recipe Type: (Reactive + Pigment +Enzyme)

Color: WashedBlack

1ststep: De-sizing

Materialwt..... 150pcs (100kg)
 LiquorRatio=1:6.10..... 500Liter
 Temperature 80°c
 DenimcolRGN 500gm
 Wettingagent..... 1000ml
 Time..... 10min
 Rinse..... wash 1 times for 2min in coldwater.

2ndstep: Reactive dyeing

LiquorRatio=1:5.40..... 700 Liter
MIP450gm in cold water for 5min
Nova.Yellow-EC2R..... 168.20gm (temp 50°c for5min)
Nova.Red-EC3GL..... 402.70gm (temp 50°c for5min).
Nova.Blue-SGL1178.00gm (temp 50°c for5min).
Nova.BlackG..... 1272.00gm (temp 50°c for5min).
Glaubersalt 24kg (temp 50°to 60°c for10min).
SodaAsh... 8kg (temp 60°c for20min).
TotalTime..... 40min.
CheckandRinse...wash 2 times for 2min in coldwater.

3rdStep: Soaping/Cleaning

LiquorRatio=1:6.10..... 500Liter.
Detergent-PCLF..... 500ml
Temperature50°c.
Time... 5min
Rinse...wash 1 times for 2min in coldwater.

4thStep: Catanizer

LiquorRatio=1:5.40..... 700Liter.
SodaAsh...450gm (In cold water for5min).
Prefix-K..... 2200ml (60°c for15min).
PH...8.5
Rinse...wash 1 times for 2min in coldwater.

5thStep: Hot wash

LiquorRatio..... As required.
Temperature 80°c.
Time... 5min.

6thstep: Pigment dyeing

LiquorRatio=1:5.40..... 450Liter.
ImperionYellow-KR... 8.74gm (10min in coldwater).
ImperionRed-KGC..... 36.74gm (temp 50°c for10min).
ImperionBlue-KB490.80gm (temp 50°c for10min).
ImperionBlackKFBB 1194.00gm (60°c for 10min).
Total time..... 30min
CheckandRinse... wash 1times for 2min in coldwater.

7thstep: Binder

LiquorRatio=1:6.10..... 500Liter.
BinderNK..... 1000ml.
Temperature40°c.
Time..... 10min.
Rinse..... wash 1times for 2min in coldwater.



Hydro + Dryer + Enzyme



8thStep: Enzyme

LiquorRatio=1:4.88..... 400Liter.
Stone... 3Balti.
RecopplusB..... 200ml.
Neopolish(8000L)..... 100ml.
Temperature50°c.
Time..... 15-20min
Rinse..... wash 2 times for 2min in coldwater.

9thstep: Soaping/Cleaning

LiquorRatio=1:5.40..... 450Liter.
 DetergentPCLF450ml.
 Temperature 50°c.
 Time..... 5min
 Rinse.....Wash 2 times for 2min in coldwater.

10thStep: Softening

Liquorratio=1:5.40..... 450liter.
Temperature..... 40°c.
 Softener-(UNP)..... 15litermix.
 Silicon.....450ml.
 Time..... 5min.
 PHmaintain.....6.0

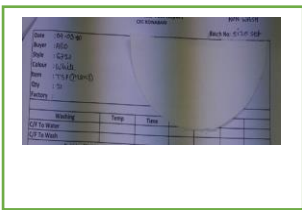


Fig 3.2:Before Dyeing



Fig 3.2: AfterDyeing

3.2.1.3 Style: 3954(Twillfabric)

Recipe Type: (Reactive + Pigment + Enzyme)

Color: Bold Black.

1ststep: De-sizing

Materialwt..... 210pcs/100kg
 LiquorRatio=1:7.5..... 750Liter
 Temperature 60°c
 DenimcolRGN 750gm
 Wettingagent..... 1500ml
 Time..... 10min
 Rinse..... wash 2 times for 2min in coldwater.

2ndstep: Reactive dyeing

LiquorRatio=1:7..... 700 Liter
MIP700ml in cold water for5min
Nova.Yellow-FN2R..... 800.00gm (temp 50°c for5min)
Nova.Red-FN3GL..... 693.00gm (temp 50°c for5min).
Nova.Blue-SGL847.00gm (temp 50°c for5min).
Nova.BlackG..... 3072.00gm (temp 50°c for5min).
Glaubersalt 30kg (temp 50°to 60°c for10min).
SodaAsh..... 10kg (temp 60°c for20min).
TotalTime..... 40min.
CheckandRinse... wash 2 times for 2min in coldwater.

3rdstep: Neutralization

LiquorRatio=1:7..... 700Litre.
Aceticacid... ..350ml.
Temperature50°c.
Time... ..5min.
Rinse... ..wash 2 times for 2min in coldwater.

4thstep: Soaping

LiquorRatio=1:7..... 700Litre
Detergent-PCLF..... 700ml
Temperature60°c.
Time... ..10min
Rinse... ..wash 2 times for 2min in coldwater.

5thstep: Catanizer

LiquorRatio=1:7..... 700Litre
SodaAsh..... 300gm
Prefix-K.....3500ml
Temperature 50°c.
Time..... 20min.
PH.....8.5
Rinse.....wash 2 times for 2min in coldwater.

6thstep: Hot wash

LiquorRatio..... As required.
Temperature 80°c.
Time..... 5min.

7thstep: Pigment dyeing

LiquorRatio=1:7..... 700Litre
Beza, Yellow-RR..... 215.00gm (10min in coldwater)
Beza, Red-KGC..... 153.00gm (temp 50°c for10min)
Beza, Blue-BBN.....616.00gm (temp 60°c for5min)
Beza, BlackDW..... 880.00gm (temp 60°c for5min)
Totaltime..... 25min
CheckandRinse.....wash 1times for 5min in coldwater.

8thstep: Binder

LiquorRatio=1:7..... 700Litre.
Binder(707-B)..... 1400ml.
Temperature 40°c.
Time.....5-10min.
Rinse.....wash 2 times for 2min in coldwater.

9thstep: Enzyme

LiquorRatio=1:6..... 600Litre.
 Valumax..... 600ml.
 Neopolish(8000L)..... 100ml.
 Temperature40°c.
 Time.....5-10min
 Rinse.....wash 2 times for 2min in coldwater.

10thstep: Softening

LiquorRatio=1:6..... 600Litre.
 Softener-(UNP)..... 20Litre(mix)
 Silicon.....500ml.
 Temperature40°c.
 Time..... 5min
 PH.....5.5

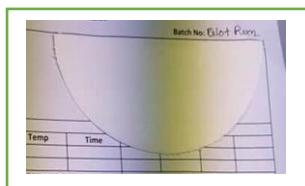


Fig 3.3:Before Dyeing

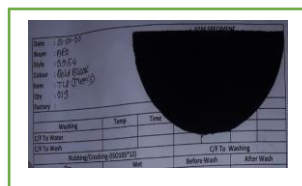


Fig 3.3: After Dyeing

3.2.1.4 Style: 4871(Denimfabric)

Recipe Type: (Enzyme+ towel+ tint)

Color: DarkWash

1ststep: Enzyme

Materialwt..... 150pcs(120kg)
 Liquorratio=1:4.17..... 500liter.
 Rinse.....wash 1 time for 3min in coldwater.
 Neopolish-8000L500ml
 Antistain..... 1000ml
 Temperature50°c.
 Time.....8-10min.
 Rinse.....wash 2 times for 3min in coldwater.

2ndstep: Potash + Neutralize

Liquorratio=1:5.83..... 700liter (Forpotas).
PPbleach..... 10ml (In cold water for3min)
Liquorratio=1:5..... 600liter (Forneutralize)
Metabysulphate..... 1500 ml (In cold water for5min)
Rinse.....Wash 2 times for 3min in coldwater.

3rdstep: Neutralize

Liquorratio=1:5..... 600 liter.
AceticAcid.....300ml (In coldwater).
Time..... 3min.
Rinse.....Wash 2 times for 3min in cold water.

4thStep: Tint

Liquorratio=1:4.17..... 500liter.
Yellow2RL..... 25.00gm.
ScarletBL2.30gm.
D/BlueGL..... 7.30gm.
SolarBlackNF..... 5.00gm.
GlauberSalt.....10kg.↓
Temperature50°c.
Time..... 8-10min.
Rinse.....Wash 2 times for 2min in coldwater.



Hydro + Dryer + P.P Spray (As required)



5thStep: Neutralize

LiquorRatio=1:5..... 600Liter.
MetabySulphate1500ml.
Antistain..... 500ml.
Temperature Cold.
Time..... 5min.
Rinse.....Wash 2 times for 3min in coldwater.

6thStep: PH control

Liquorratio=1:5..... 600Liter.
Temperature Cold.
SoftenerLKC..... 100ml.
PHcontrol..... 100ml
Time.....8-10min.
PHcontrol..... 6.0



Fig 3.4: After Washing

3.2.1.5 Style: 4936(Denimfabric)

Recipe Type: (Enzyme wash)

Color: Black

1stStep: Enzyme

Materialwt..... 150pcs(100kg).
Rinse.....Wash 1 time for 2min in coldwater.
Liquorratio=1:5..... 500Liter.
NeopolishNS-4000..... 300ml
Temperature Cold.
Time..... 32min.
Rinse.....Wash 1 time for 3min in coldwater.

2ndStep: Softening

Liquorratio=1:4..... 400Liter.
SoftenerLKC..... 600ml.
Silicon oil..... 500ml.
Temperature Cold.
Time..... 1min.
PHmaintain.....7.50
Rinse.....Wash 1 time for 2min in coldwater.

3rdStep: PH control

Liquorratio=1:4..... 400Liter.
Temperature Cold.
Sodaash... 1400gm
Time... 3min run 2min off, 3minrun.
PHmaintain... 7.50

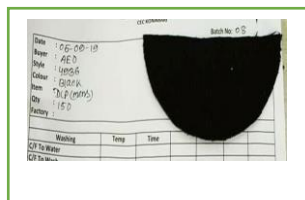


Fig 3.5: After Washing

3.2.2. Determination of body measurement:

The change of body parts measurement before and after washing was measured by measuring tape in inch. In this experiment, we measured the main parts of body measurement on length and width wise of the samples.

3.2.3 Determination of shrinkage% test:

Shrinkage percentage was calculated by using this formula:

$$\text{Shrinkage}\% = (B-A)/A \times 100$$

Where, B= Dimension after treatment

A= OriginalDimension

There are two types of shrinkage occurs during washing,

- 1) Length wise
- 2) Widthwise

The shrinkage percentage of different fabric were measured by using marker and template. Firstly template is put on the sample fabric with the size of (50cm x 50cm) and marking the sample with unchangeable marker before wash. Now examined the marking line after wash and we can find length and width wise shrinkage of the fabric.

3.2.4 Determination of crimp%:

The crimp percentage was calculated by this formula:

$$\text{Crimp\%} = (\text{Uncrimped length} - \text{Crimp length}) / \text{Crimp length} \times 100$$

There are two way of crimp percentage occur in fabric after dyeing and washing. They are-

- 1) Warp way
- 2) Weft way

The crimps percentage of the fabric was obtained by using measuring scale in cm. First we cut the fabric in size of (5cm x 5cm). Then we took the yarn of warp and weft way and measure their crimp and uncrimped length with the help of measuring scale. After that we use the formula to find the crimp percentage of the fabric.

3.2.5 Determination of EPI and PPI:

In this experiment we have determined the EPI and PPI of the fabric by using counting glass and needle. First we have to take a sample with the size of (5cmx5cm) and measure its EPI and PPI before and after dyeing and washing.

3.2.6 Determination of GSM:

GSM means gram per square meter. In this experiment the sample was cut from the fabric with GSM cutter and weight the sample by digital balance to calculate the weight of fabric in oz/yd².

3.2.7 Determination of color fastness to rubbing:

Rubbing color fastness refers to the ability to sustain original color of dyed fabrics when rubbing. The apparatus Crockmeter is used for this experiment. The color fastness to rubbing of fabric is determined by wet and dry state after dyeing and washing.

Table no 3.1: Color fastness to rubbing test:

Sample No.	Sample Style	Sample Name	Dry	Wet
01	3955	Twill Fabric	4-5	3-4
02	6721	Twill Fabric	4.0	2.0
03	3954	Twill Fabric	3-4	2.0
04	4871	Denim Fabric	3.0	1-2
05	4936	Denim Fabric	4.0	1-2

This table shows the color fastness to rubbing of different samples after dyeing and washing. These fastness ratings are normally evaluated by the grey scale. According to grey scale rating, the dry state color fastness of twill fabric is average to excellent and the wet state color fastness is poor to better. In denim fabric, the dry state color fastness is average to better and the wet state color fastness is poor.

3.2.8 Determination ofPH:

In this experiment the sample is cut into small pieces with the weight of 10g. Then boiled 250ml distilled water for 10mins, immerse the sample with glass flask and boiled for an additional 10mins. Finally when the water is in room temperature then we measured the PH value with the help of PH meter.

Table no 3.2: PH test (ISO 3071-2005):

Sample No.	Sample Style	Sample Name	Actual PH
01	3955	Twill Fabric	6.78
02	6721	Twill Fabric	6.85
03	3954	Twill Fabric	6.80
04	4871	Denim Fabric	6.63
05	4936	Denim Fabric	7.40

This table shows the PH value of the samples after dyeing and washing. Through observation, the actual PH value of twill fabric is acidic and the actual PH value of denim fabric is also acidic for sample no. 04 and slightly alkaline for sample no. 05.

CHAPTER 4

DISCUSSION OF RESULTS

CHAPTER 4

DISCUSSION OF RESULTS

4.1 Changes of body measurement after dyeing and washing:

Table no 4.1:

Sample no.	Sample style	Sample name	Body parts	Before dye and wash	After dye and wash	Change percentage	Average change
01	3955	Twill Fabric	Waist	31 ½”	29 ½”	-6.78%	
			Hip	39 5/8”	36 5/8”	-8.19%	
			Front rise	10 7/8”	10 1/2”	-3.57%	-6.48%
			Back rise	14 7/8”	14 1/2”	-2.59%	
			Thigh	24 5/8”	21 1/5”	-16.16%	
			Inseam	32”	31 ½”	-1.59%	

The above table shows the change of garments body parts measurement before and after washing. We can show that the measurement is reduced after dyeing and washing due to shrinkage. According to the table, the average shrinkage percentage is -6.48.

Table no 4.2:

Sample no.	Sample style	Sample name	Body parts	Before dye and wash	After dye and wash	Change percentage	Average change
02	6721	Twill Fabric	Waist	32 1/5"	29"	-11.03%	
			Hip	42 1/2"	40"	-6.25%	
			Front rise	12 1/8"	11 1/2"	-5.43%	-6.77%
			Back rise	16 3/8"	15 5/8"	-4.8%	
			Thigh	27 1/5"	25 3/4"	-5.63%	
			Inseam	21 1/2"	20"	-7.5%	

The above table shows the change of garments body parts measurement before and after washing. We can show that the measurement is reduced after dyeing and washing due to shrinkage. According to the table, the average shrinkage percentage is -6.77.

Table no 4.3.:

Sample no.	Sample style	Sample name	Body parts	Before dye and wash	After dye and wash	Change percentage	Average change
03	3954	Twill Fabric	Waist	35 1/2"	33 1/2"	-5.97%	
			Hip	42 1/4"	39 7/8"	-5.97%	
			Front rise	11 1/2"	10 7/8"	-5.75%	-6.00%
			Back rise	15 3/4"	15"	-5.00%	
			Thigh	25 3/8"	23 3/8"	-8.56%	
			Inseam	33	31 1/2"	-4.76%	

The above table shows the change of garments body parts measurement before and after washing. We can show that the measurement is reduced after dyeing and washing due to shrinkage. According to the table, the average shrinkage percentage is -6.00.

Table no 4.4:

Sample no.	Sample style	Sample name	Body parts	Before dye and wash	After dye and wash	Change percentage	Average change
04	4871	Denim Fabric	Waist	31 7/8"	29"	-9.91%	
			Hip	37 3/4"	32 1/2"	-16.15%	
			Front rise	9 3/4"	9 1/4"	-5.41%	-10.51%
			Back rise	14 3/4"	14 1/4"	-3.51%	
			Thigh	26 7/8"	21 1/4"	-26.47%	
			Inseam	32	31 1/2"	-1.59%	

The above table shows the change of garments body parts measurement before and after washing. We can show that the measurement is reduced after dyeing and washing due to shrinkage. According to the table, the average shrinkage percentage is -10.51.

Table no 4.5:

Sample no.	Sample style	Sample name	Body parts	Before dye and wash	After dye and wash	Change percentage	Average change
05	4936	Denim Fabric	Waist	31 7/8"	30 1/4"	-5.37%	
			Hip	40 3/4"	37 1/4"	-9.40%	
			Front rise	9 6/8"	9 3/8"	-4.00%	-6.04%
			Back rise	14 5/8"	14"	-4.46%	
			Thigh	24 5/8"	22 1/4"	-10.67%	
			Inseam	32 1/2"	31 6/8"	-2.36%	

The above table shows the change of garments body parts measurement before and after washing. We can show that the measurement is reduced after dyeing and washing due to shrinkage. According to the table, the average shrinkage percentage is -6.04.

4.2 Changes of weight of differentsamples:

Table no 4.6: GSM test:

Sample No.	Sample Style	Sample Name	Before dyeing & washing	After dyeing & washing	Weight Gain %
01	3955	Twill Fabric	8.78 oz/yd ²	8.84 oz/yd ²	(+) 0.68%
02	6721	Twill Fabric	7.57 oz/yd ²	8.25 oz/yd ²	(+) 8.98%
03	3954	Twill Fabric	8.48 oz/yd ²	8.57 oz/yd ²	(+) 1.06%
04	4871	Denim Fabric	9.93 oz/yd ²	11.67 oz/yd ²	(+) 17.52%
05	4936	Denim Fabric	10.53 oz/yd ²	12.75 oz/yd ²	(+) 21.08%

The table shows the GSM of different samples before and after dyeing and washing. The weight has increased after dyeing and washing in all samples. The highest and lowest percentage of weight gained per Yd² in twill fabric are obtained for sample no. 02 and 01. In denim fabric, the highest percentage of weight gained per Yd² is obtained for sample no. 05.

4.3 Shrinkage% of differentsamples:

Table no 4.7: Shrinkage test:

Sample No.	Sample Style	Sample Name	Length wise		Shrinkage Percentage	Width wise		Shrinkage percentage
			Before scouring & bleaching	After scouring & bleaching		Before scouring & bleaching	After scouring & bleaching	
01	3955	Twill Fabric	10 7/8"	10 1/2"	+3.57%	31 1/2"	29 1/2"	+6.78%
02	6721	Twill Fabric	12 1/8"	12 1/2"	+5.43%	32 1/5"	29"	+11.03%
03	3954	Twill Fabric	11 1/2"	10 7/8"	+5.75%	35 1/2"	33 1/2"	+5.97%
04	4871	Denim Fabric	9 3/4"	9 1/4"	+5.41%	31 7/8"	29"	+9.91%
05	4936	Denim Fabric	9 6/8"	9 3/8"	+4.00%	31 7/8"	30 1/4"	+5.37%

The table shows the shrinkage percentage occurred for the sample after scouring and bleaching. Generally length and width wise shrinkage was occurred on the fabric and after washing the length and width of the fabric is reduced. In twill fabric, the highest percentage of **length wise shrinkage** is obtained for **sample 03** and the lowest is obtained for **sample 01**. The highest percentage of **width wise shrinkage** is obtained for **sample no. 02** and the lowest percentage is obtained for **sample 03**. The average percentage of length and width wise shrinkage is +4.92% and +7.93%. In denim fabric, the highest percentage of **length wise shrinkage** is obtained for **sample 05** and the lowest is obtained for sample 04. The highest percentage of **width wise shrinkage** is obtained for **sample 04** and the lowest is obtained for sample 05.

4.4 Crimp% of different samples after dyeing and washing:

Table no 4.8: Crimp% test:

Sample No.	Sample Style.	Sample Name	Warp way after dyeing & washing			Weft way after dyeing & washing		
			Crimp length (cm)	Uncrimped length (cm)	Crimp Percentage	Crimp length (cm)	Uncrimped length (cm)	Crimp Percentage
01	3955	Twill Fabric	5	5.4	8%	5	6.1	22%
02	6721	Twill Fabric	5	5.6	12%	5	6.3	26%
03	3954	Twill Fabric	5	5.5	10%	5	6.2	24%
04	4871	Denim Fabric	5	6	20%	5	7.5	50%
05	4936	Denim Fabric	5	6.1	22%	5	7.6	52%

The table shows the crimp percentage occurred for the sample after dyeing and washing. Generally warp and weft way crimp was occurred on the fabric after dyeing and washing. In twill fabric, the highest crimp percentage of **warp and weft way** is obtained for **sample 02** and the lowest is obtained for **sample 01**. In denim fabric, the highest crimp percentage of **warp and weft way** is obtained for **sample 05** and the lowest is obtained for sample 04.

4.5 Changes of average EPI ad PPI increase% of the samples:

Table no 4.9: Change in EPI:

Sample No.	Sample Style	Sample Name	EPI B/W	EPI A/W	Increase%
01	3955	Twill Fabric	103	110	6.80%
02	6721	Twill Fabric	106	113	6.60%
03	3954	Twill Fabric	105	112	6.67%
04	4871	Denim Fabric	67	78	16.42%
05	4936	Denim Fabric	64	75	17.18%

Table no 4.10: Change in PPI:

Sample No.	Sample Style	Sample Name	PPI B/W	PPI A/W	Increase%
01	3955	Twill Fabric	62	72	16.13%
02	6721	Twill Fabric	66	74	12.12%
03	3954	Twill Fabric	64	73	14.06%
04	4871	Denim Fabric	42	49	16.67%
05	4936	Denim Fabric	42	48	14.29%

The table shows the EPI and PPI of the sample which was increased after dyeing and washing. In twill fabric, the highest percentage of **EPI and PPI increase** is obtained for **sample 01 with the value of 6.80% and 16.13%**. The lowest percentage of EPI and PPI increase is obtained for **sample 02** with the value of 6.60% and 12.12%. In denim fabric, the highest percentage of EPI and PPI increase is obtained for **sample 04** and the lowest is obtained for sample05.

CHAPTER 5

CONCLUSION

CONCLUSION

By doing this project, we learned about different washing & dyeing process done in denim and twill garments. We also learned about physical changes like EPI, PPI, Shrinkage%, Crimp%, GSM etc which occurred on denim and twill fabrics. After completing the survey, we have come to following conclusions.

- ❖ The weight gain% of denim fabric is higher than twill fabric. The highest weight gain% of twill fabric is 8.98% and the highest weight gain% of denim fabric is 21.08%.
- ❖ The width wise shrinkage percentage on both fabric is higher than the length wise shrinkage percentage. Due to higher EPI of fabric, the width wise shrinkage percentage of fabric is always higher than the length wise shrinkage percentage.
- ❖ The weft crimp percentage is higher than the warp crimp percentage after dyeing and washing. The highest crimp% occurred in enzyme washing on denim fabric with the value of 22% crimp in warp and 52% crimp in weft. The lowest is occurred in (reactive+ pigment+ enzyme) on twill fabric with the value of average 10% crimp in warp and 24% crimp in weft.
- ❖ Denim fabric has higher EPI increase percentage than twill fabric. The highest EPI increase% occurred in enzyme washing with the value of 17.18%. The lowest is occurred in (reactive+ pigment+ enzyme) with the value of average 6.69%.
- ❖ Denim fabric has higher PPI increase percentage than twill fabric. The highest PPI increase% occurred in (enzyme+ towel+ tint) washing with the value of 16.67%. The lowest is occurred in (reactive+ pigment+ enzyme) washing with the value of average 14.10%.

Finally we can say that thesis is very informative for us. We are very thankful for this project (thesis) to make us clear and effective ideas on garments washing and dyeing.

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