

A Study on Frictional Properties of Denim Fabric

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Abstract: This Project is focused on frictional behavior between the denim fabric and human skin. To study on the frictional relation between human skin and fabric by using denim fabric. Analyzing the frictional properties of denim fabric. Count, ends per inch, picks per inch blend of the denim fabric is tested. The friction in the fabric reduced by giving enzyme finish to the fabric that is given to the cellulase and alovera. Chemicals are not used for finishing.

Keywords: Denim, Desizing, Scouring and Friction

1. Introduction

Denim many colors available in that fabric mostly we see indigo color [1]. The aim is to reduce the friction level in the fabric. The materials required are denim fabric, hcl, water bath, and thermometer. In scouring process material required are denim fabric, NAOH, TRO, water bath, thermometer. After this process natural finish Scouring and desi zing, alovera gel, padding machine. Finally enzyme finish scoured /desizing fabric, cellulase, beaker, water bath, and thermometer. Alovera is mainly used in textile to keep skin safe and it destroys the microbes. It protect our body from microbes. There are different types of washes stone wash, acid wash, bleach wash, enzyme wash. We must remove the green layer of alovera and take gel take the denim fabric and mix with that and keep for few hours. After the fabric is taken for padding process. After this we take the alovera and cellulase mixed if kept in the sunlight for few hours. Finally touch and check the fabric before and after softness. Finally we see the friction changes.

2. Materials and Methods

Table 1
Analysis of construction test method

Sample	Ends Per Inch	Picks Per Inch	Color
Sample 1	75	60	Light blue
Sample 2	94	87	Dark blue
Sample 3	74	57	Black
Sample 4	82	64	Indigo blue

Table 2
Analysis of yarn count

Sample	Warp count	Weft count	Color
Sample 1	26	27	Light blue
Sample 2	27	25	Dark blue
Sample 3	25	27	Black
Sample 4	26	24	Indigo blue

3. Methodology

1) Desizing

The material should be conditioned and the wait is measured to the two decimal point accuracy. The calculated amount of Hcl, are taken in a clean vat and stirred well. The sample should be wetted out before entering into the vat. Then the vat is placed in a water bath and the temperature is maintained at 60 deg for 1 hr [11]. The liquor should be agitated continuously with the help of glass rods till the end of the process in order to obtain uniform desizing. After 1 hr once the process gets completed, the liquor is drained and the after treatment is carried out.

2) Scouring

The material should be conditioned and the wait is measured to the two decimal point accuracy. Prepare the stock solution according to the required concentration as given the recipe [13]. The calculated amount of H₂O, TRO, NaOH, Na₂CO₃, are taken in a clean vat and stirred well. The sample should be wetted out before entering into the vat. Then the vat is placed in a water bath and the temperature is maintained at 90 deg for 1 hr. The liquor should be agitated continuously with the help of glass rods till the end of the process in order to obtain uniform scouring. After 1 hr once the process gets completed, the liquor is drained and the after treatment is carried out.

3) Extraction of alovera gel

We must remove the green layer of alovera and take gel take the denim fabric and mix with that and keep for few hours. After the fabric is taken for padding process. In padding alovera finishing separated each mixed fabric is comprised twice until the wetness of the fabric is well compressed [7]. After this we take the alovera mixed if kept in the sunlight for few hours. Finally touch and check the fabric before and after softness. Finally we see the friction changes.

4) Enzyme finish

The denim fabric is weight. The stock is prepared by taking calculated amount of cellulase. The sample is wetted out & squeezed then entered into the water bath and the temperature is maintained at 55 deg for 1 hr [3, [4]]. The liquor should be agitated continuously with the help of glass rods till the end of the process in order to obtain uniform enzyme finish. After 1 hr once the process gets completed. After the fabric is taken for padding process. In padding enzyme finishing separated each mixed fabric is comprised twice until the wetness of the fabric

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is well compressed. After this we take the enzyme mixed if kept in the sunlight for few hours.

5) Friction tester

The instrument is used to test and measure the coefficient of Friction between the skin and fabrics of various materials with absolute Accuracy in minimum time period. Moreover, this instrument introduces a portable handheld method of testing the fabric friction directly on actual human skin. Figure shows the instrument designed and developed for measuring actual human skin and fabric. The instrument comprises of a central controlling unit, testing platform, actuating arrangement, probe case and power supplying unit. The surface friction testing machine is connected to an operating system which displays the testing results. This instrument measures the static and dynamic friction by applying predefined load onto the specimen.

Table 3
Friction parameters

Setup	Features
Probe material	Hylam
Probe diameter	0.75",1"&2"
Probe profile	Round with turn to lock the "o" ring
Probe speed	1-300 RPM
Pre-load	1-1000 grams
Measurement direction	Rotational (clockwise)
Measurement area	As Per Probe Selection (diameter of 0.75",1"&2")
Total measurement time	1-120 seconds
Contact material	Fabric/skin/skin alternative/artificial skin/ othersurface

4. Result and Discussion

In this friction of the fabric is reduced by applying the soft finish, Here two types of finishing applied in denim fabric They are (i) Enzyme finish and (ii) Natural finish.

Table 4
Analysis of desizing

Sample	Sample weight		Color
	Before	After	
Sample 1	72.05 g	68.26 g	Light blue
Sample 2	75.98 g	71.26 g	Dark blue
Sample 3	49.94 g	46.36 g	Black
Sample 4	88.64 g	84.04 g	Indigo blue

In this we had four different types of samples for our project and we follow the recipe for desizing and then we get desized fabric samples, here we are desized the sample for getting better finishing.

Table 5
Analysis of scouring

Sample	Sample weight		Color
	Before	After	
Sample 1	105.60 g	100.12 g	Light blue
Sample 2	109.25 g	104.15 g	Dark blue
Sample 3	52.7 g	50.4 g	Black
Sample 4	114.20 g	106.4 g	Indigo blue

In here also we do the same thing follow the recipe and then we got Scoured fabric samples but In Scouring of fabric samples get better finishing than Desizing fabric finishing.

Table 6
Analysis of natural finish

sample	Sample weight		Color
	Before	After	
Sample 1	50.23 g	50.54 g	Light blue
Sample 2	60.42 g	61.25 g	Dark blue
Sample 3	26.74 g	26.92 g	Black
Sample 4	56.25 g	56.78 g	Indigo blue

Table 7
Analysis of cellulase enzyme

Sample	Sample weight		Color
	Before	After	
Sample 1	35.76 g	32.54 g	Light blue
Sample 2	37.40 g	34.36 g	Dark blue
Sample 3	24.86 g	21.42 g	Black
Sample 4	44.28 g	41.56 g	Indigo blue

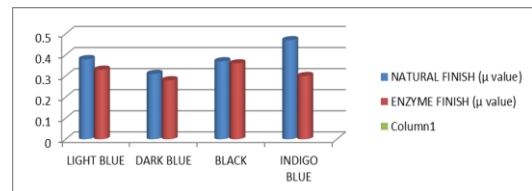


Fig. 1. Desizing with natural finish and enzyme finish

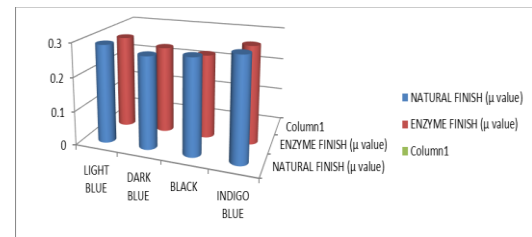


Fig. 2. Scouring with natural finish and enzyme finish

Table 8
Analysis of friction for unfinished finish fabric

Samples	Tested values in n	
	Static friction fs	Dynamic friction fd
Sample 1 (Light blue)	0.38	0.33
Sample 2 (Dark blue)	0.35	0.27
Sample 3 (Black)	0.47	0.33
Sample 4 (Indigo blue)	0.36	0.28

5. Conclusion

The friction test carried out for four different denim fabrics. Cellulose enzyme finish was applied for three denim fabric for the purpose of reducing the friction. In that sample 1 static friction and dynamic friction is reduced slightly, in sample 2 static friction and dynamic friction is clearly reduced but in sample 3 there is some variations due to the fabrics physical properties. Aloe vera finish was applied for the denim fabric for the same purpose to reduce friction. Basically natural is better for everything but here some slight changes happens, so that the natural finish doesn't get better result. We give aloe vera finish

to the denim fabric but it doesn't reduce friction than enzyme finish.

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