



**Daffodil**  
*International*  
**University**



**Faculty of Engineering**  
**Department of Textile Engineering**

**Study on Fabric Assistance of Various Woven  
(Denim) Fabrics**

**Code: TE-400**

**Course Title: Project (Thesis)**

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**This Report has been Provided as Part of the Requirements for  
the Bachelor of Science Degree in Textile Engineering**

**Advanced in Fabric Manufacturing Technology**

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**30th June 2025**



## APPROVAL LETTER

30th June 2025

To

The Head of the Department,

Department of Textile Engineering,

Daffodil International University, Daffodil Smart City (DSC), Ashulia, Savar, Dhaka-1216.

Subject: Request for Approval of Thesis.

Dear Respected Sir,

I would like to inform you that the students with IDs 213-23-1046, Md. Mahmudul Hasan Fahad, ID 213-23-1079, Md. Salman Sakib, and ID-213-23-1052, Akib Jawad, the project report named "Study on Fabric Assistance of Various Woven (denim) Fabrics." for their last assessment. This report is made with suitable research techniques and a careful analysis of actual data and relevant sources, the entire report is made. The report was crucial in giving the audience a plenty of informative information since the students actively engaged in their projects.

For this reason, we request you to accept our thesis report and give it a thoughtful consideration for the final grade.

Yours Sincerely,

-----  
Supervisor

Dr. Md Mahbubul Haque

Professor & Program Director, M.Sc.

Department of Textile Engineering

Faculty of Engineering

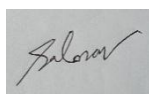
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## DECLARATION

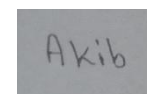
We so affirm that the research presented in this thesis “**Study on Fabric assistance of Various Woven (Denim) Fabric**” is completely unique, hasn’t been submitted to other university for credit toward a degree and has been appropriately cited in all materials and resources used



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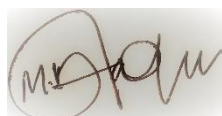


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This is to confirm that, to the best of our knowledge, each student above declaration is accurate.



-----  
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## ACKNOWLEDGEMENT

First and foremost, we are grateful to Almighty Allah for giving us the courage and will to carry out this undertaking. Since this has been a terrible experience for us, we believe that our initiative has enabled us to lessen testing challenges.

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We also want to show our sincere gratitude to all of our teacher of the Department of Textile Engineering for their unwavering support. We want to thank Daffodil International University's Honorable Vice Chancellor, Chairman, Register, and each Department for giving us the workspace we needed for our research. Last but not the least we would like to show warm gratitude to our parents for their blessings, support and love without that we may not be able to finish this research.

From the depths of our hearts, we are profoundly thankful to all of you.



## **ABSTRACT**

The goal of this research is how different fabric weave structure, yarn count, EPI and PPI affects the strengths of woven (denim) fabrics. Fabric properties greatly depends on the constructional parameters, process followed and machine condition. Denim fabrics are normally produced with natural fiber such as cotton. This study shows the variety of fabric assistance of cotton woven (Denim) fabric from different weave structures yarn count, EPI and PPI. It was supposed to have variations based on different weave structures. Fabric density also affects the fabric assistance of woven (Denim) fabrics. Through this work we found the connection between theoretical conceptions and practical work. Through this work we found that when the fabric is woven the strength increases significantly. The tensile strength of twill fabric is normally high and in denim fabric it's always higher than other woven fabrics. The stiffness, abrasion resistance, pilling resistance, tearing strength varies from various weave structures and yarn count. The test results are showed in further progression of this study along with necessary data and graphs.



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# **Chapter -1**

## **Introduction**



Fabric is the basic textile material made from fibers or yarn. Fabrics are produced by interlacing two sets of yarn or by inter-looping one set of yarn or by interlocking natural or man-made fibers. These are known as woven, knitted, non-woven and braided fabric. Woven fabrics are widely used for the production of denim fabric as it provides more strength than others.

Woven fabric has more versatility because of its construction as it is produced by interlacing two sets of yarn. Where one set is called warp yarn (lengthwise) and other is called weft yarn (widthwise). Warp yarns are normally sized because it undergoes lots of tensions. By sizing the yarns it gives more strength to the yarn which helps to avoid yarn breakage during weaving. In denim fabric warp yarns are normally dyed and weft yarns are left undyed. Normally twill designs are used to produce denim fabric with various repeat number such as 3/1 LHT, 2/2 LHT, 3/1 RHT. The variation of designs have effects on the mechanical properties on the fabric. Due to textile fabric materials resistance, external force causes shape change. It depends on the mechanical properties, the way of load and its tension is applied.

Denim is widely used globally due to its durability, versatility and aesthetic appeal. It is quite a complex process as it is influenced by some factors such as fiber selection, yarn construction, dyeing process, weaving process and finishing treatments. The denim industry is continuously evolving based on consumer demands and fabric strength plays important role to meet those demands. This study investigates the impacts of fabric assistance due to denim weave structure and give valuable insights about the impacts how yarn count, weave structure affects the mechanical properties of fabrics.

To overview all the points above, the thesis named “**Study on fabric assistance of various woven (Denim) Fabric**” was done. We tested different woven structure denim fabrics and evaluated the data that different structures have some effects on the fabric strength.



## **1.1 Objectives of the Study:**

- Find out the strength of various structured woven fabric.
- Evaluate the effectiveness of selected fabric assistance.
- Comparative analysis how different weave structures responds to various fabric.
- Investigate the causes of a variety of strengths.

## **1.2 Outcome of the Study:**

- Higher GSM shows more fabric assistance.
- Coarser count yarn shows more strength.
- More densely fabric has more tensile strength.

## **1.3 Limitations of the Study:**

- Lack of samples.
- Lack of appropriate atmospheric condition.
- Lack of precision.



## **Chapter-2**

# **LITERATURE REVIEW**

Denim is a durable and versatile fabric which is widely used in Textile industry such as apparel, technical textile, and many industrial applications. The physical properties of denim especially its tensile strength depends on the strength of the individual yarns and how they interlace in the fabric structure. This literature review intends to evaluate the correlation of yarn strength to fabric strength in terms of what happens to the tensile properties after interlacement. Strength of yarn is a very important parameter to determine the behavior of fabric and its usability. Many different studies seem to agree that the degree of interaction of the yarns in the fabric during weaving determines the higher level of the fabric strength.

Fabric tensile strength also depends on types of yarn used to produce fabric. Fabric made from ring spun yarn generally provides more strength than rotor spun yarn. Ring spun yarn has better fiber orientation, fiber migration and fiber compactness than rotor spun yarns. This type of structural advantages exhibits higher strength with other benefits like, better abrasion resistance, pilling resistance and air permeability.

Denim fabrics made by using ring-spun yarns exhibited better tensile and tear strength properties than denim fabrics made by using open-end rotor spun yarns. On the contrary, denim produced using open-end rotor yarns have better abrasion resistance, pilling resistance and air permeability than those produced using ring-spun yarns. (1)

The strength of fabric not only depends on the strength of yarn alone, but also on other factors including type of fiber or blend use, twist amount, twist direction, yarn count, spinning systems, yarn bending behavior, frictional properties. It is also shown that fabric geometry, thread density, weave design also has great influence on fabric strength. (2)

The tensile strength deals with the force required to break a large number of yarns simultaneously in either warp or weft direction. The force at which the material breaks is directly proportional to cross-section. The tensile force recorded at the moment of rupture is termed as the tensile strength at break or tenacity [3].

Besides cross-section the warp and weft densities also effect the tensile strength. As crimp is increased with the increase of thread densities and yarn lies more obliquely in relation to the plane of the fabric, greater force is required to balance the load applied in that plane [4].

Strength of a fabric is not a simple addition of yarn strength. Interlacement, weave structure and fabric density also play a significant role. We can measure the difference



Of tensile strength before interlacement and after interlacement by FAR. Fabric Assistance Ratio (FAR) is the ratio which defines the value of tensile strength increase when yarns are converted to fabrics by interlacement. Strength increases with increase of density in weave, because of the greater degree of friction and interlacing. Weaker fabrics have lower strength because looseness allows more considerable movement of the yarns when tension is applied. Fabric strength derives more from the warp yarns due to their higher twist and lower tensile properties than from the weft yarns. Balanced weaves move the center of stress equally. There are many methods to evaluate the Strength of Fabric and Yarn such as, single yarn tensile test which determines the resistance of a yarn to breaking. Strip and grab test which assess fabrics under terms of strength with regard to interlacement. The strength of denim fabric depends on more than the strength of the yarns from which it is made. When yarns are woven together, their strength increases because the yarns interlace together and supports each other. This process is measured by the Fabric Assistance Test which helps to know the magnitude to which the fabric's strength is enhanced after weaving. Denim twill weaves have better strength than denim plain weaves due to their diagonal structure. Furthermore, the lengthwise yarns (warp) contribute more than crosswise (weft) yarns to the strength of the fabric. The single yarn strength test and fabric tensile test are used to check how the strength of the yarn is transformed into the strength of the fabric.



## **Chapter-3**

# **METHODOLOGY**

### 3. Methodology

#### 3.1 Materials Tested:

100% cotton Denim Twill Fabric.



Figure-01 (Samples)

#### 3.2 Method Used:

##### 3.2.1 EPI and PPI of the sample fabric:

This study intends to show, how the strength of yarn transfer to the strength of fabric. In this experiment determination of the warp and weft density plays a crucial role to the end result. We prepare cut sample of at least 10 cm x 10 cm from different areas of the main sample fabric to ensure variability and accurate test result. All the samples are pre conditioned to the standard testing atmosphere ( $21 \pm 1^{\circ}\text{C}$  temperature and  $65 \pm 2\%$  relative humidity) for 24 hours before the test. Now all the samples are ready to test.

For EPI test, the samples are placed on a flat and illuminated surface under good lighting condition. Position the pick glass over the warp direction of the sample fabric and carefully align to the warp yarn before counting. Then count the number of individual yarns with the help of a counting needle and repeat this process for five time from five different cut sample across the width and take average to determine the final result.

For PPI test, the samples rotated 90 degrees to align to the weft direction with the viewing scale. Then repeat the same process as used for EPI. Record a minimum of five times from five different cut sample across the length and take average to determine the final result.

Equipment Used:

1. Pick Glass
2. Counting Needle
3. Marking Pen
4. Measuring Template
5. Fabric Samples



Figure- 02 (Needle)

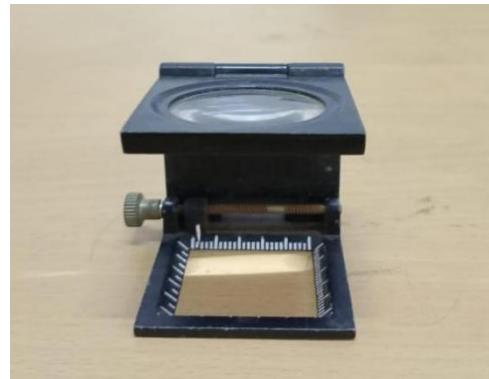


Figure-03 (Counting Glass)

### **3.2.2 Determination of weave structure:**

To evaluate the strength of the fabric, determination of weave structure is very crucial because it influences the fabric's strength, texture, porosity, and visual characteristics. We prepare cut sample of at least 10 cm x 10 cm from different areas of the main sample fabric to ensure variability and accurate test result. All the samples are pre conditioned to the standard testing atmosphere ( $21 \pm 1^{\circ}\text{C}$  temperature and  $65 \pm 2\%$  relative humidity) for 24 hours before the test. Now all the samples are ready to test.

Place the sample flat under good lighting condition and align with the pick glass. Then observe the pattern of interlacement. Find out regularity or repetition units of warp and weft threads. Using a needle gently separate threads from the surface to reveal interlacing. Track how warp and weft threads interlace together. On a graph paper Mark warp threads as vertical and weft as horizontal. Then Draw a weave diagram on the graph paper where the square box is filled when the warp threads are over the weft threads. After that identify the weave structure using weave diagram with standard weave pattern references.

Equipment used:

1. Pick Glass
2. Fabric Dissection Tools (Needles, tweezers)
3. Tracing Paper
4. Pencil and Ruler
5. Conditioned Fabric Samples

### 3.2.3 GSM test:

GSM is very important for fabric strength; it reflects mass per unit area of the fabric. Preconditioning is necessary prior to the test and make sure that the fabric is free from crease and folds. Then place the fabric on a flat cutting pad. Use the GSM cutter to cut a round sample of known area. Then record the mass with the help of a digital balance. We repeat this test for five times and take the average for each sample.

Equipment used:

1. GSM Cutter
2. Weighing Balance
3. Cutting Pad
4. Conditioned Fabric Samples



Figure-04 (GSM cutter)

### 3.2.4 Count test:

The yarn count refers to the fineness or thickness of yarn. It plays crucial role for defining fabric quality, appearance, and strength. Before test we need to separate individual yarn from preconditioned fabric sample for both warp and weft direction. Then cut all the yarn to a similar length by using the cutting template. Cut either full length or half-length according to the requirement and select the weight for Beesley's Balance according to the cutting length. Place the balance on a stable horizontal surface then hang the yarn on the left hook of the balance and hang the standard weight on the right pan. After stabilize count the number of individual yarn, it corresponds to the yarn count in English Cotton Count (Ne).

Equipment used:

1. Beesley's Balance
2. Yarn Samples
3. Conditioned Fabric Samples
4. Scissors
5. Tweezers
6. Standardized Templates
7. Weight Set for Beesley's Balance



Figure-05 (Templates)



Figure-06 (Beesley's Balance)

### 3.2.5 Tensile Strength Test:

By using Titan Universal testing machine, the breaking force and elongation at break is recorded for at least five samples in each direction, and average values are calculated to assess the fabric's tensile strength and elongation.

Equipment used:

1. Titan Universal Testing Machine
2. Fabric Specimens
3. Clamping Jaws
4. Ruler or Measuring Scale
5. Scissors



Figure-07 (Titan Universal Testing Machine)



## **Chapter-4**

# **Experimental Data**

## 4.1 Experimental data of fabric weight (Oz/ yd<sup>2</sup>):

We have gathered denim cloth for our thesis experiment. Let's now calculate the denim fabric's weight (Oz/ yd<sup>2</sup>). These are the samples:

For fabric-01

Observations.	Weight (Oz/ yd <sup>2</sup> )	Average (Oz/ yd <sup>2</sup> )
01.	14.36	14.36
02.	14.36	
03.	14.37	

Table - 01

For fabric-02

Observations.	Weight (Oz/ yd <sup>2</sup> )	Average (Oz/ yd <sup>2</sup> )
01.	11.89	11.88
02.	14.88	
03.	14.87	

Table - 02

For fabric-03

Observations.	Weight (Oz/ yd <sup>2</sup> )	Average (Oz/ yd <sup>2</sup> )
01.	10.26	10.25
02.	10.25	
03.	10.25	

Table - 03

For fabric-04

Observations.	Weight (Oz/ yd <sup>2</sup> )	Average (Oz/ yd <sup>2</sup> )
01.	15.00	15.02
02.	15.02	
03.	15.01	

Table - 04

For fabric-05

No.	Weight (Oz/ yd <sup>2</sup> )	Average (Oz/ yd <sup>2</sup> )
01.	10.40	10.50
02.	10.60	
03.	10.50	

Table - 05

For fabric-06

Observations.	Weight (Oz/ yd <sup>2</sup> )	Average (Oz/ yd <sup>2</sup> )
01.	13.26	13.20
02.	13.14	
03.	13.20	

Table - 06

## 4.2 Experimental data of yarn count:

We have gathered denim cloth for our thesis experiment. Let's now calculate the denim fabric's weight (Oz/yd<sup>2</sup>). These are the samples:

For warp yarn of fabric-01

Observations.	Count (Ne)	Average
01.	6.95	7.01 Ne
02.	7.5	
03.	6.5	
04.	7.2	
05.	6.9	

Table - 07

For warp yarn of fabric-02

Observations.	Count (Ne)	Average
01.	6.9	7.02 Ne
02.	7.3	
03.	6.7	
04.	7.35	
05.	6.85	

Table - 08

For warp yarn of fabric-03

No.	Count (Ne)	Average
01.	8.9	8.97 Ne
02.	9.25	
03.	8.7	
04.	9.15	
05.	8.85	

Table - 09

For warp yarn of fabric-04

Observations.	Count (Ne)	Average
01.	6.91	7.04 Ne
02.	7.36	
03.	6.75	
04.	7.3	
05.	6.88	

Table - 10

For warp yarn of fabric-5

Observations.	Count (Ne)	Average
01.	9.00	8.98 Ne
02.	9.32	
03.	8.74	
04.	9.11	
05.	8.75	

Table - 11

For warp yarn of fabric-06

Observations.	Count (Ne)	Average
01.	8.3	7.99 Ne
02.	7.88	
03.	7.8	
04.	8.11	
05.	7.9	

Table - 12

We have gathered denim cloth for our thesis experiment. Let's now calculate the denim fabric's weight (Oz/yd<sup>2</sup>). These are the samples:

For weft yarn of fabric-01

Observations.	Count (Ne)	Average
01.	6.26	6.10Ne
02.	5.88	
03.	6.3	
04.	6.2	
05.	5.9	

Table - 13

For weft yarn of fabric-02

Observations.	Count (Ne)	Average
01.	10.26	10.10Ne
02.	9.88	
03.	10.3	
04.	10.2	
05.	9.9	

Table - 14

For weft yarn of fabric-03

Observations.	Count (Ne)	Average
01.	9.26	9.10Ne
02.	8.88	
03.	9.3	
04.	9.2	
05.	8.9	

Table - 15

For weft yarn of fabric-04

Observations.	Count (Ne)	Average
01.	6.91	7.04Ne
02.	7.36	
03.	6.75	
04.	7.3	
05.	6.88	

Table - 16

For weft yarn of fabric-05

Observations.	Count (Ne)	Average
01.	7.81	8.04Ne
02.	8.46	
03.	7.85	
04.	8.2	
05.	7.88	

Table - 17

For weft yarn of fabric-06

Observations.	Count (Ne)	Average
01.	6.91	7.02Ne
02.	7.1	
03.	6.8	
04.	7.3	
05.	6.9	

Table – 18

### 4.3 Experimental data of EPI and PPI:

We have gathered denim cloth for our thesis experiment. Let's now calculate the denim fabric's weight (Oz/yd<sup>2</sup>). These are the samples:

For fabric-01 (EPI)

Observations.	EPI	Average
01.	66	67
02.	67	
03.	68	

Table – 19

For fabric-02 (EPI)

Observations.	EPI	Average
01.	70	70.33
02.	71	
03.	70	

Table - 20

For fabric-03 (EPI)

Observations.	EPI	Average
01.	75	74.6
02.	75	
03.	74	

Table - 21

For fabric-04 (EPI)

Observations.	EPI	Average
01.	68	68
02.	68	
03.	68	

Table - 22

For fabric-05 (EPI)

Observations.	EPI	Average
01.	73	72.33
02.	72	
03.	72	

Table - 23

For fabric-06 (EPI)

Observations.	EPI	Average
01.	76	75.66
02.	76	
03.	75	

Table - 24

We have gathered denim cloth for our thesis experiment. Let's now calculate the denim fabric's weight (Oz/yd<sup>2</sup>). These are the samples:

For fabric-01 (PPI)

Observations.	PPI	Average
01.	50	48.33
02.	47	
03.	48	

Table - 25

For fabric-02 (PPI)

Observations.	PPI	Average
01.	53	52
02.	52	
03.	51	

Table - 26

For fabric-03 (PPI)

Observations.	PPI	Average
01.	50	49
02.	51	
03.	50	

Table - 27

For fabric-04 (PPI)

Observations.	PPI	Average
01.	50	50
02.	52	
03.	48	

Table - 28

For fabric-05 (PPI)

Observations.	PPI	Average
01.	51	50.66
02.	51	
03.	50	

Table - 29

For fabric-06 (PPI)

Observations.	PPI	Average
01.	53	53.33
02.	54	
03.	43	

Table – 30

### 4.3.1 Data Collection:

The collected fabric's data is given below:

Sample fabric SL	Yarn count		Fabric weight (Oz/ Sq yds)	EPI	PPI
	Warp	Weft			
1	7 R	6 R	14.36	67	49
2	7 OE	10 OE	11.88	71	52
3	9 OE	9 OE	10.25	74	49
4	7 R	7 R	15.02	68	50
5	9 OE	8 OE	10.5	72	51
6	8 OE	7 OE	13.2	75	53

Table-31

#### 4.4 Fabric assistance in warp and weft direction:

We have done strength test in universal strength test machine to check the fabrics and the yarn strength. We have followed the ISO standards. The collected fabric's data is given below:

Sample fabric SL	Tensile Strength					
	Warp (N)		Difference (%)	Weft (N)		Difference (%)
	Fabric	Yarn		Fabric	Yarn	
1	3174.86	2075.07	53.00%	2255.48	1427.52	57.99%
2	2453.48	1505.20	63.00%	973.41	644.64	51.00%
3	1656.95	1274.58	29.99%	1202.40	720	67.00%
4	3124.97	2029.2	54.00%	2233.62	1450.4	54.00%
5	1679.32	1216.9	37.99%	1153.40	730	58.00%
6	2618.13	2094.5	25.00%	1797.12	1404	28.00%

Table- 32

## 4.5 Fabric elongation in warp and weft direction:

We have done strength test in universal strength test machine to check the fabrics and the yarn elongation .We have followed the ISO standards. The collected fabric's data is given below:

Sample Fabric Sl.	Elongation %					
	Warp		Difference	Weft		Difference
	Fabric	Yarn		Fabric	Yarn	
01						
02	42.70	12.34	30.36	22.10	6.73	15.37
03	36.79	6.84	29.95	18.67	7.04	11.63
04	30.14	8.04	22.1	22.16	8.84	13.32
05	41.50	12.10	29.4	21.12	6.40	14.72
06	31.10	7.50	23.6	18.50	7.10	11.4
07	37.12	10.20	26.92	20.50	6.50	14

Table -33



## **Chapter-5**

### **Results and discussions**

## 5.1 Result:

We have collected the data from the factory where we have done our internship as we collected the fabric sample from them. And after that we have also tested those sample to verify those data. To verify those data we followed the ISO standards

Yarn count		E PI	P PI	Tensile Strength				Elongation %				FAR	
W ar p	W e f t			Fabric		Yarn		Fabric		Yarn		Wa rp	We ft
				War p wise (N)	Weft wise (N)	War p (N)	Weft (N)	Wa rp wis e	We ft wis e				
7 R	6 R	6 7	4 9	3174 .8	2255 .4	2075 .0	1427 .5	42. 7	22. 1	12. 3	6.7 3	53 %	58 %
7 O	1 O	7 1	5 2	2453 .4	973. 41	1505 .2	644. 6	36. 8	18. 6	6.8 4	7.0 4	63 %	51 %
9 O	9 O	7 4	4 9	1656 .9	1202 .4	1274 .5	720	30. 1	22. 1	8.0 4	8.8 4	30 %	67 %
7 R	7 R	6 8	5 0	3124 .9	2233 .6	2029 .2	1450 .4	41. 5	21. 1	12. 1	6.4 0	54 %	54 %
9 O	8 O	7 2	5 1	1679 .3	1153 .4	1216 .9	730	31. 1	18. 5	7.5 0	7.1 0	38 %	58 %
8 O	7 O	7 5	5 3	2618 .1	1797 .1	2094 .5	1404	37. 1	20. 5	10. 2	6.5 0	25 %	28 %

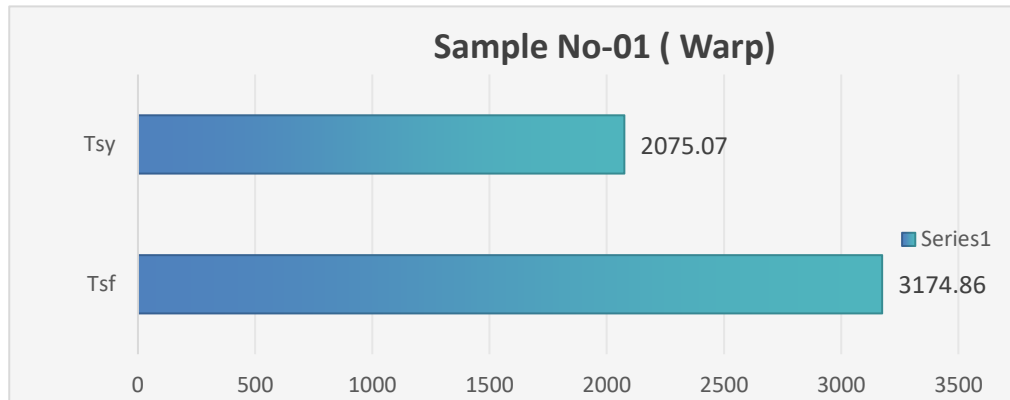
Table-34

### Strip Method

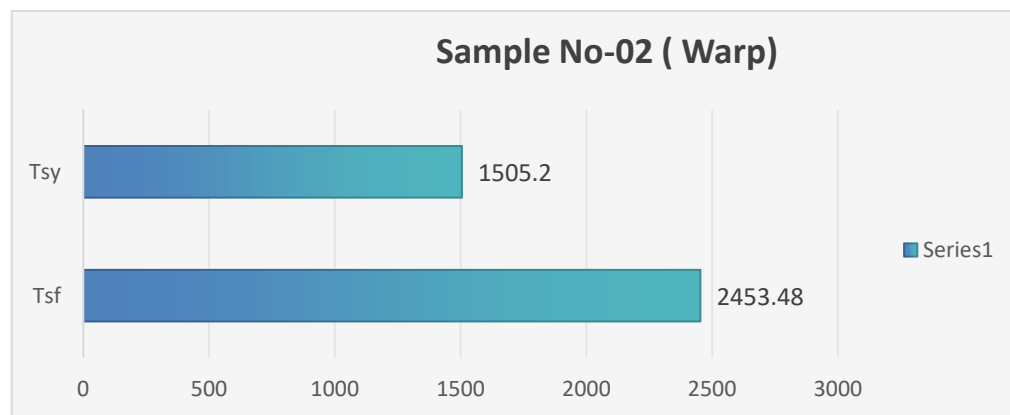
Method No: **ISO-13934-1**

Sample Size (Length - **30 cm**, Width - **5 cm**)

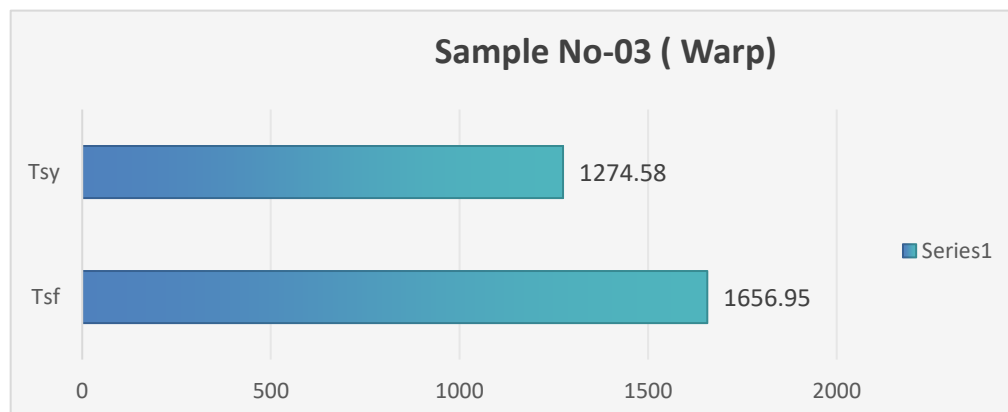
We have gathered denim cloth for our thesis experiment. Let's now examine the denim fabric's bar chart showing fabric assistance in the warp direction. These are the samples:



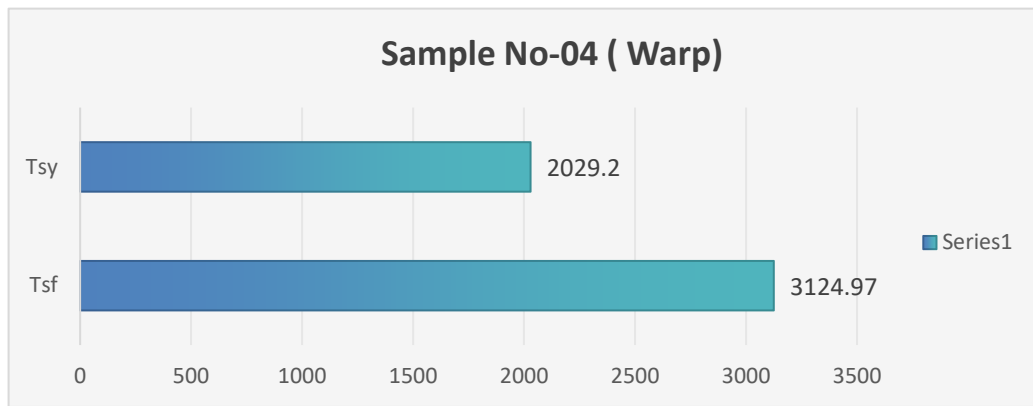
Bar chart-01



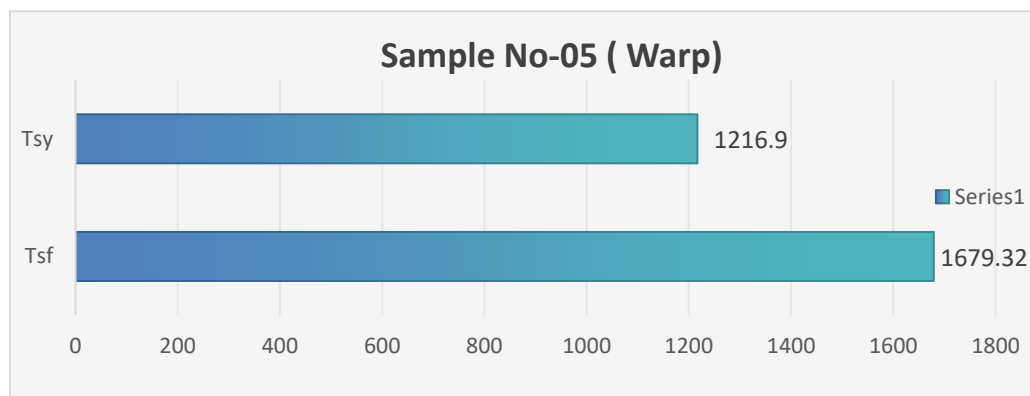
Bar chart-02



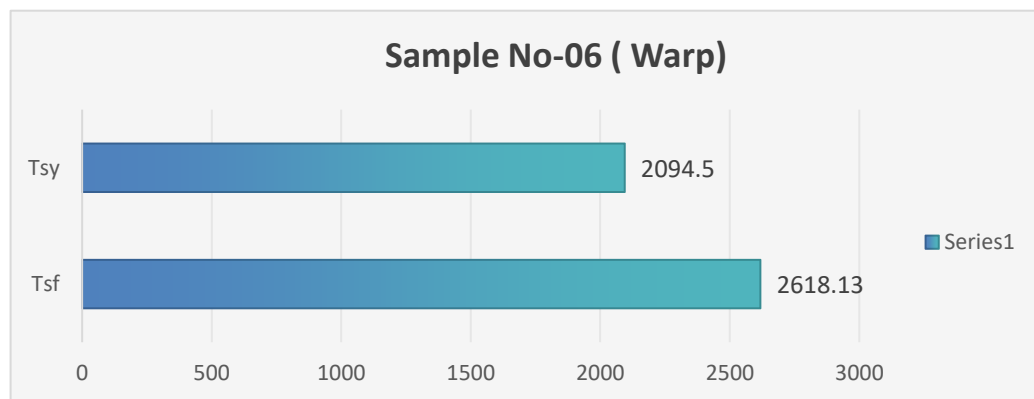
Bar chart-03



Bar chart-04

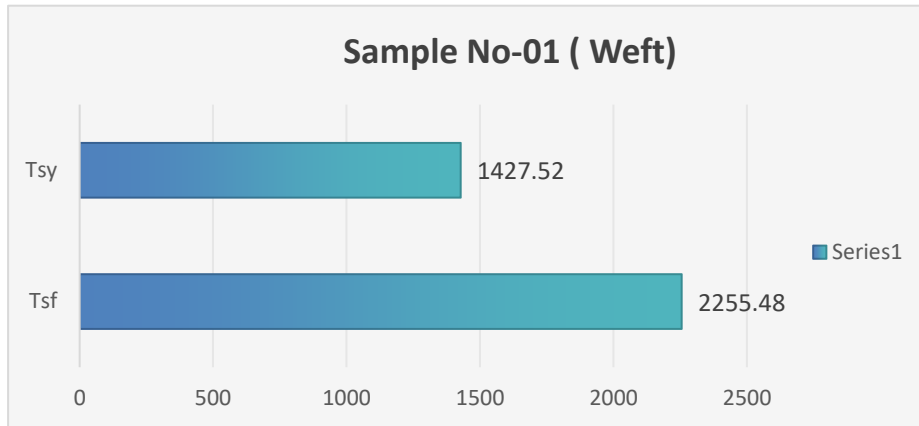


Bar chart-05

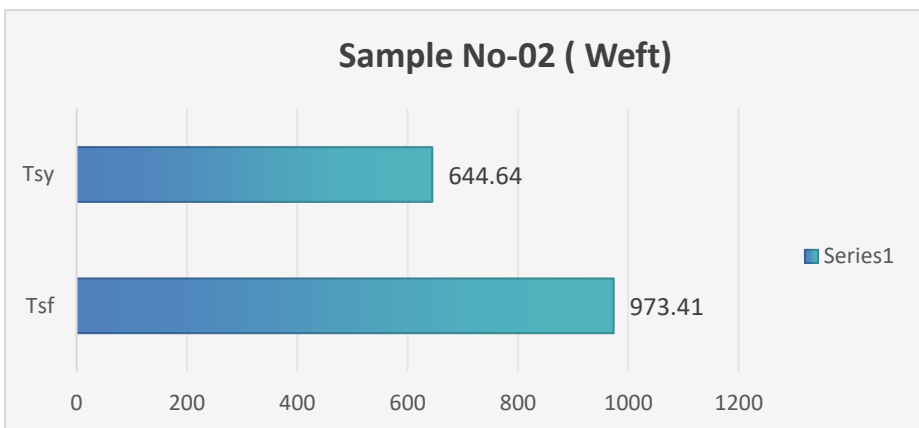


Bar chart-06

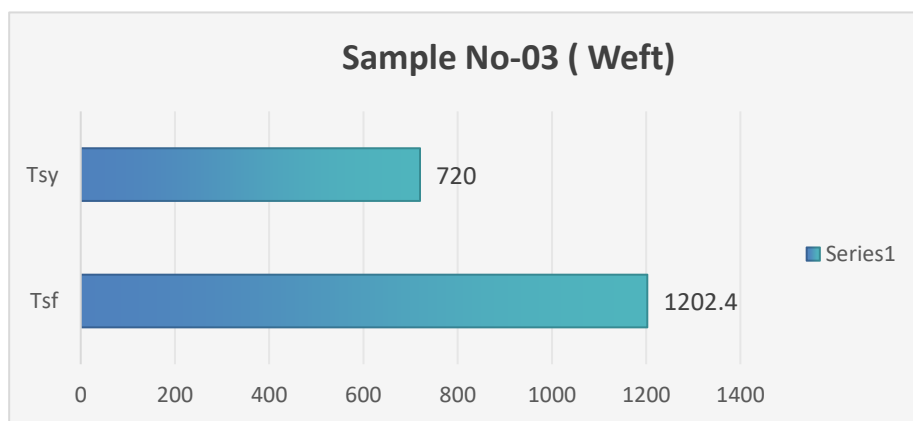
We have gathered denim cloth for our thesis experiment. Let's now examine the denim fabric's bar chart showing fabric assistance in the warp direction. These are the samples:



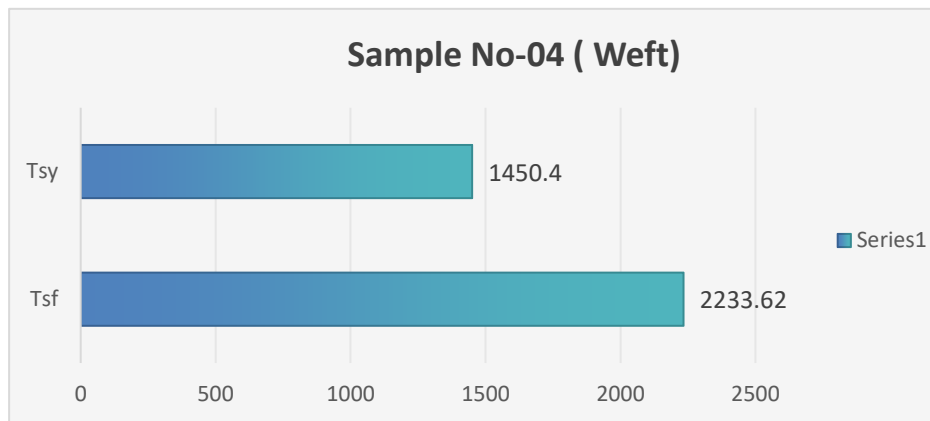
Bar chart-07



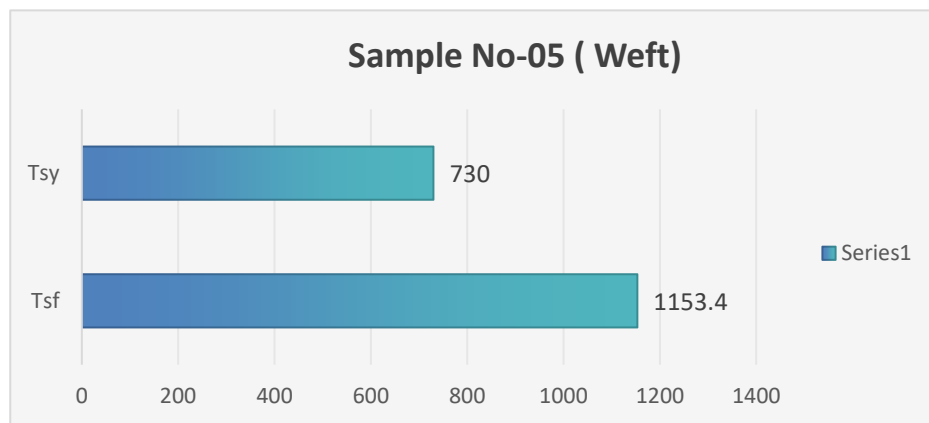
Bar chart-08



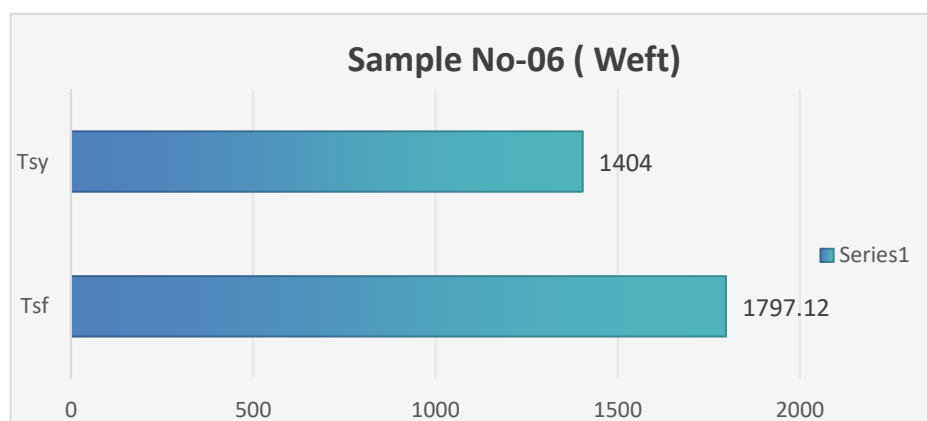
Bar chart-09



Bar Chart-10



Bar chart-11



Bar chart-12

## 5.2 Discussion

The tensile strength, elongation and fabric assistance ratio of various fabric samples which were collected from the factory and were analyzed by **Titan Universal Testing Machine** and results were obtained following the ISO 13934-1 standard using the strip method.

The obtained data from the table-34, noticeable variations were found in both tensile strength and elongation across different samples. The warp wise tensile strength of fabric ranged from **1656.9 N** to **3174.8 N**, where the weft wise tensile strength was ranged from **973.41 N** to **2233.6 N**. This variations were found because of different weave structures and yarn quality.

While in yarn strength, the warp yarn strength ranged from **1216.5 N** to **2094.5 N** and the weft yarn strength ranged from **644.6N** to **1450.4 N**.

The elongation of warp direction for fabric ranged from **30.22%** to **42.7%** and weft direction ranged from **18.68%** to **22.11%**. The yarn elongation indicates that yarn elasticity and fabric construction influenced the fabric performance. Normally in denim fabric it is found that the elongation in weft direction is higher than the warp direction but in our case it is completely opposite. Because in denim fabric spandex or lycra fiber is used in weft direction which increases the weft wise elongation but in our collected samples lycra fiber was not used in weft yarns.

The obtained **Fabric Assistance Ratio** ranged from **20%** to **63%** in warp direction and in weft direction it ranged from **28%** to **68%**. Which indicates that strength increases significantly when the yarns are woven together. It showed strength of the fabric in warp direction increases more than 50% in several cases. As well as in weft direction the strength increases significantly.



## **CHAPTER-6 CONCLUSION**



Overall, the study shows the significant impact on the fabrics mechanical performance because of fabric construction, yarn count and fabric density. The tensile strength, elongation and Fabric Assistance Ratio analysis of the tested fabric samples showed significant variation due to differences in weave structure. Warp wise tensile strength was higher than the weft wise. Similarly it is observed in yarn strength and elongation. In the contrary of denim fabric behavior the warp wise direction was higher than in the weft, due to absence of lycra fiber in weft yarns. The **FAR** results further showed that fabric strength increases noticeably when yarns are interlaced and with strength enhancement of over 50% in many warp and weft direction.

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