

# Comparison of some of Denim Fabric Properties produced with different Weft

Shailesh R. Garaniya<sup>1</sup> Prof. A. I. Thakkar<sup>2</sup>

<sup>1</sup>M.E. Student, <sup>2</sup>Head of Department

<sup>1,2</sup>Textile Engineering Department

<sup>1,2</sup>L.D.Colllege of Engineering , Navrangpura, Ahmedabad, Gujarat, India

**Abstract**— The aim of this study was to asses and compares the some of denim fabric properties using three different weft yarns. Threads per inch and weft type are some of the most important parameters that affect both weaving performance and fabric property. Experimental studies were conducted by weaving fabrics with same warp yarn i.e. 9<sup>o</sup>OE Rotor yarn. Three different weft yarns are (1) Excel (2) Cotton (3) Polyester. These all are same count. Denim fabrics was woven in three different twill weave (1) 2/1 (2) 3/1 (3) 2/2. It was found the weave type and weft type affects fabric properties. The weave and weft yarn has great impact on the some of comfort related properties also i.e. air permeability, tensile strength, tear strength, and seam slippage, bursting strength.

**Keywords:** Air permeability, Pick per inch, Tensile strength, Tear strength, Bursting strength, seam slippage

## I. INTRODUCTION

Denim fabrics have been one of the rare clothing groups worn by people in any gender, any social/professional group and country. Now are day denim is most desirable garment for wearer. Denim is fashion icon for youth and number of people increase day by day toward the denim. It was observed that 50% of people under 60 have preferred denim products during their lives. 90% of the people around 14 and 19 ages and 70% of the people around 20 and 29 ages stated that denim products were crucial for their wearing experiences. Its usage has always an increase trend and it is thought that making it more comfortable and improving some properties. [1]

Strength of the fabric is an important property that decides and influences all other performance properties of the fabric. Consideration of the strength of the fabric is very essential while selecting the appropriate fabric for the intended garment, Fibers properties is indirectly affect to fabric properties. It was found that PPI, weave and weft type greatly affect fabric strength. When the threads/inch increases the fabric strength also increases but at higher threads/inch the gain in strength is relatively more. [3]

The air permeability is a very important factor in the performance of some textile materials. There are voids generate between weft and warp yarns in the fabric during interlacement. The void volume in woven fabrics causes air permeability. The air permeability of fabric is determined by the rate of air flow through a material under a differential pressure between the two fabric surfaces. [2]

Seam slippage is the condition where a seam sewn in the fabric opens under load. Some of this gap may close

on removal of the load but some of it may be a permanent deformation. Seam slippage is a fabric problem especially for fabrics that contain slippery yarns. [6]

## II. MATERIALS AND METHODS

27 denim fabric samples (nine sample of each) with three different weave weft and pick densities were used for study. Denim fabric was prepared on the modern high speed air jet loom (tsudakoma 9100).

### A. Methods

#### 1) Evaluation of Fabric Dimensional Properties

Thread density was measured by pick glass. Warp and weft count were measured by Beesley balance. The construction parameters of the fabric samples are given in Table 1.

#### 2) Testing of fabric strength

The tearing strength of the fabric was determined as per the method (ASTMD 1424) using the tearing strength tester.

The Bursting strength was determined as per the method (ASTMD 2210) using bursting strength tester manufactured Comotech Company.

The Air permeability test was on air permeability tester as per the method (ASTMD 737).

The seam slippage was determined as per the method (ASTM D 1683) In this method, cut each specimen to a total length of 350mm perpendicular to the proposed seam, with 250mm on one side of the seam and 100mm on the opposite site of the seam, and a width of 100mm parallel to the stitch line of the seam.

The tensile strength of the fabric was determined as per the method (ASTMD 5034) using the tensile strength tester.

## III. RESULTS AND DISCUSSION

### A. Tensile Strength

The tensile strength of denim fabrics are shown in Table 2. which shown PPI had a positive effect on tensile strength in weft direction. Tensile strength of denim fabric with excels and polyester weft was higher comparing to cotton weft. Weave type also have great impact on tensile strength in weft direction. It was observe that 3/1 twill for excel weft fabric having a good tensile strength compare to other two weave.(Table 2)

### B. Seam Slippage

There was no significant effect on seam slippage for changing weave and PPI. Polyester weft having good result compare to other two weft yarn.(Table 2)

**C. Tear strength**

Tearing strength of denim fabric was not much affected by PPI. But weave having a significant effect on the tear strength in weft direction of denim fabric. Excel weft denim having higher tear strength in weft direction in 3/1 weave compare to other. While polyester given good tear strength in 2/1 and 2/2 weave compare to excel and cotton.(Table 2)

Sr.No	Weave	Weft	PPI
1	2/1 RHT	EXCEL	42
2	2/1 RHT	EXCEL	44
3	2/1 RHT	EXCEL	48
4	2/1 RHT	POLY	42
5	2/1 RHT	POLY	44
6	2/1 RHT	POLY	48
7	2/1 RHT	COTTON	42
8	2/1 RHT	COTTON	44
9	2/1 RHT	COTTON	48
10	3/1 RHT	EXCEL	42
11	3/1 RHT	EXCEL	44
12	3/1 RHT	EXCEL	48
13	3/1 RHT	POLY	42
14	3/1 RHT	POLY	44
15	3/1 RHT	POLY	48
16	3/1 RHT	COTTON	42
17	3/1 RHT	COTTON	44
18	3/1 RHT	COTTON	48
19	2/2 RHT	EXCEL	42
20	2/2 RHT	EXCEL	44
21	2/2 RHT	EXCEL	48
22	2/2 RHT	POLY	42
23	2/2 RHT	POLY	44
24	2/2 RHT	POLY	48
25	2/2 RHT	COTTON	42
26	2/2 RHT	COTTON	44
27	2/2 RHT	COTTON	48

Table. 1 : Fabric constructional parameters [ EPI-64, Warp Count-9<sup>o</sup>OE Cotton, Weft Count-10 Ne]

**D. Air permeability**

PPI having positive effect on air permeability for cotton weft compare to other two weft yarn PPI increase air permeability decrease. 2/2 weaves having good result compare to other two weave.(Table 3)

Sr No	Tensile Strength in Kgf	Tear Strength in Gsm		Seam Slippage %		
		Weft	Warp	Warp	Weft	
1	75.5	94.5	3500	8000	23.9	28.4
2	75	101.8	3300	7700	24.6	27.9
3	75.7	107.8	3000	7700	27.3	29.9
4	75.4	60.6	2900	2300	28.2	34.4
5	68.6	53.2	3100	2400	25.8	29.1
6	75.1	46.5	3300	2400	26.7	31
7	82.4	184.1	3600	11300	27.2	32.8
8	79.7	197.2	3300	11700	26	34.4
9	78.5	219.7	3200	11500	29.5	36.3

10	76	183.5	5300	>12800	30.5	29.2
11	79.7	195.4	5000	>12800	27.4	25.5
12	76.7	207.5	4700	>12800	29.1	29.2
13	77.3	57.1	3900	3100	24.2	29.6
14	76.8	52.3	4200	3300	27.9	27.1
15	78.9	46.9	4600	3300	29.8	30
16	74.7	95.9	5900	10200	25.6	28.3
17	74.7	89.9	5100	10300	27.1	25.2
18	74.5	98.8	4500	9200	28.1	29.1
19	76.6	92	4600	9100	24.3	28.1
20	74.7	84.6	5200	8900	26.6	27.1
21	73.2	106.7	4000	8800	27.8	28.9
22	79.2	56.6	3700	2600	26.4	33.8
23	75.5	49.3	4200	2800	29.9	30.4
24	78.5	42.9	4500	2800	29.2	29.9
25	80.7	179.7	5100	12500	27.5	30.5
26	78.7	198.8	4700	12700	30.8	28.8
27	80.3	206.7	4300	>12800	27	31.9

Table. 2: Strength parameter of Fabrics

**E. Bursting strength**

PPI having no much more effect on the bursting strength. Weave and weft type having significant effect on bursting strength. Polyester and excel having good result compare to cotton yarn weft.(Table 3)

Sr.No	Air permeability m <sup>3</sup> /m <sup>2</sup> /hr	Bursting strength Kg/cm <sup>2</sup>
1	425	25.21
2	390	26.16
3	283	26.69
4	231	14.18
5	336	12.78
6	397	11.98
7	395	27.71
8	313	27.87
9	222	27.68
10	462	27.38
11	495	27.12
12	308	27.47
13	393	15.17
14	478	13.26
15	662	12.53
16	543	27.22
17	532	27.56
18	438	27.87
19	636	27.28

20	773	28.12
21	511	27.12
22	425	13.54
23	607	12.08
24	785	11.58
25	518	28.79
26	490	29.03
27	335	28.87

Table. 3 : Air permeability and bursting strength of fabrics

#### IV. CONCLUSION

Weft types having effect on fabric tensile strength. Tensile strength of denim fabric with excels and polyester weft was higher comparing to cotton weft. Weave type also have great impact on tensile strength in weft direction. 3/1 twill for excel weft fabric having a good tensile strength compare to other two weave. PPI had a positive effect on tensile strength in weft direction. There was no significant effect on seam slippage and bursting strength for changing PPI. Polyester weft having good result for seam slippage compare to other two weft yarn. Weave and weft type having significant effect on bursting strength. Polyester and excel having good result compare to cotton yarn weft.

Excel weft denim having higher tear strength in weft direction in 3/1 weave compare to other weave and weft type. while polyester given good tears strength in 2/1 and 2/2 weave compare to excel and cotton. PPI having positive effect on air permeability for cotton weft compare to other two weft yarn PPI increase air permeability decrease. Weave and weft type having affected the air permeability. 2/2 weaves having good air permeability compare to other two weaves.

#### ACKNOWLEDGMENT

The authors thank the management of L.D. College of Engineering , Ahmedabad for providing the necessary facilities to undertake the above work. The authors are also pleased to acknowledge the co-operation and guidance of Mr. Kirti Shah (Head of weaving Department) of Aarvee Denim Ltd. The authors would even like to thank Mr. Rajesh Patel, (Birla Cellulose) TRADC at Bharuch. for their support to carry-out this research-based project-work.

#### REFERENCES

- [1] R K Nayar, S K Punj & K N Chatterje B K Behera, Comfort properties of suiting fabrics *Ind journal of Fib & Tex Re Vol. 34 june 09 pp 122*
- [2] R.Tugrul OGULATA, Air permeability of Woven fabrics, *journal of Tex and Apparel, Tech and management Vol 5, Issue 2, summer 2006*
- [3] M. D Teli, A. R Khare, Ruma Chakrabati, Dependence of Yarn and Fabrics strength on Structural Parameters, *AUTEX Res Jo, Vol 8, No 3 Sep 2008*
- [4] A Das & S M Ishtiaque, Comfort Characteristics of Fabrics Containing Twist-less and Hollow Fibrous

- Assemblies in Weft, *journal of Tex and Apparel, Tech and management Vol 3, Issue 4, winter 2004*
- [5]Md.Mahbubul Haque, Effect of Weft Parameters On Weaving Performance and Fabric Properties, *Daffodil International Uni Journal of Science and Tech, Volume 4, Issue 2, July 2009*
  - [6] Saville B P, *Physical testing of textile, book*