

Influence of Blend Ratio and Yarn Count on Bursting Strength of Plain Single Jersey Knitted Fabric

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Abstract— In order to determine the serviceability of a knitted garment, bursting strength is a very important physical property of knitted fabric. This property affects other mechanical properties also. Bursting strength test can analyze that how much stress can be applied on knitted fabric during regular use. In this work, the effect of blend ratio and count of yarn on the bursting strength of plain single jersey knitted fabric was determined and the origin of this behavior has been discussed. To carry out the work, same circular knitting machine and knitting parameters were used to produce 100% single jersey knitted fabric with polyester-cotton blended yarns having various blend ratio and yarn count. A significant result was found that the more ratio of polyester in yarn, the more bursting strength of fabric and vice versa when yarn count was same. On the other hand, the coarser the yarn used, the more stronger fabric was produced with same blend ratio.

Index Terms— Blend ratio, Bursting strength, Knitted fabric, Physical property, Plain single jersey, Polyester-cotton yarn, Yarn count

1 INTRODUCTION

Bursting strength is very significant in various ways among the physical and mechanical properties of knitted fabrics. Bursting strength is the force which is applied perpendicularly on the fabric surface to break the fabric. Measuring the tensile strength in the wale and course directions in knitted fabrics are not appropriate, as knitted fabric is the structure with loop formation. Testing the bursting strength for knitted fabric is required as this strength is against multi directional forces to the fabric. [1]

Bursting strength is a measurement process of determining strength in which the material is stressed in all the directions at the same time and is therefore more applicable for materials such as knitted fabrics. The standard type of bursting strength test uses an elastic diaphragm to load the fabric, the pressure of the fluid behind the diaphragm being used as the measure of stress in the fabric. [2]

Majority of the mechanical and physical properties of knitted fabrics depend on the technical specifications of knitting machines, the properties of yarns

(such as the yarn count) and the twist amount of yarn, as well as the raw material used to produce the fibers present in the yarn. [3]

The bursting strength of knitted fabric is significant in many ways. The fabric should have enough strength against forces working on it during dyeing, heat treatment, finishing and regular use. Therefore, it is very tough to predict the bursting strength of knitted fabrics before performing strength tests. [4]

2 MATERIALS AND METHODS

Three plain single jersey knitted fabrics were produced from Cotton/Polyester carded ring spun yarns of count Ne 30 having three different blend ratios of cotton 60%/polyester 40%, cotton 65%/polyester 35% and cotton 80%/polyester 20%. Other three sample knitted fabrics were produced from same blend ratio 65% cotton/35% polyester having different yarn count 34 Ne, 32 Ne and 28 Ne.

All the knitted fabrics were produced by a Keumyong Model KM-3WV single jersey circular knitting machine working at 12 rpm. Sample knitted fabrics with gauge 28 gauge, and 34" diameter were made having all knit loops from each considered yarn. The atmosphere of knitting room had 65% relative humidity and a temperature of $25 \pm 2^\circ\text{C}$. The six samples were produced having stitch length of 2.80 mm. The knitting procedure was conducted at constant machine settings and the samples were kept in a standard atmospheric condition for 24 hours to obtain dry relaxation state required for subsequent testing.

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Bursting strength of all samples was tested according to ISO 13938-2 by using a SDL M229P Pnu burst digital bursting tester with diaphragm correction. All readings were taken under standard atmospheric conditions ($20 \pm 2^\circ\text{C}$, $65 \pm 2\%$ relative humidity (RH)) for 24 h according to ASTM D1776-08e1 (2009).

3 EXPERIMENTAL DATA

The bursting strength test results are tabulated for the six single jersey knitted fabric samples.

Table 1: Bursting strength result for the same count of yarn

Yarn count	Blend ratio	Bursting strength (kPa)
30 Ne	60% Cotton 40% Polyester	293.3
30 Ne	65% Cotton 35% Polyester	216.6
30 Ne	80% Cotton 20% Polyester	200.3

Table 2: Bursting strength result for the same blend ratio of yarn

Blend ratio	Yarn count	Bursting strength (kPa)
65% Cotton 35% Polyester	34 Ne	184.0
65% Cotton 35% Polyester	32 Ne	196.6
65% Cotton 35% Polyester	28 Ne	237.3

4 DATA ANALYSIS

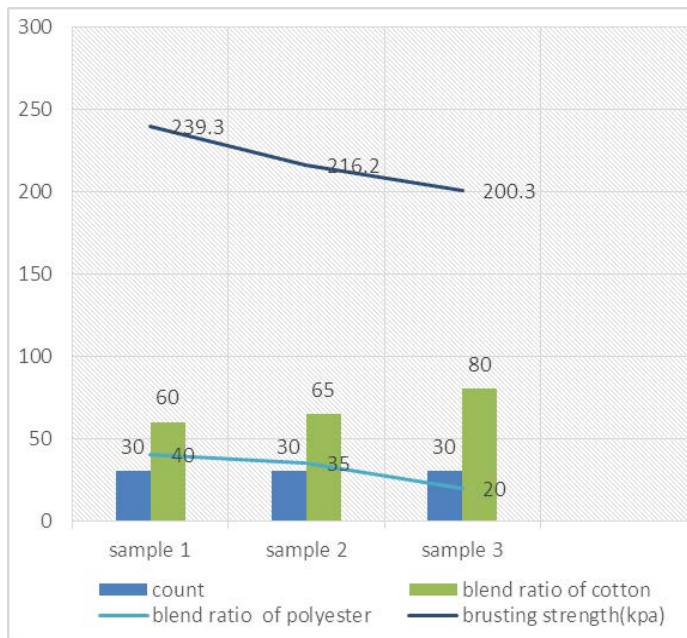


Fig. 1: Effect of blend ratio on bursting strength when yarn count is same

According to experimental data and graph analysis, it is observed that for the same yarn count with higher content of cotton in the blend ratio of the yarn, plain single jersey knitted fabric has low bursting strength as the tenacity of cotton yarn is lower than polyester.

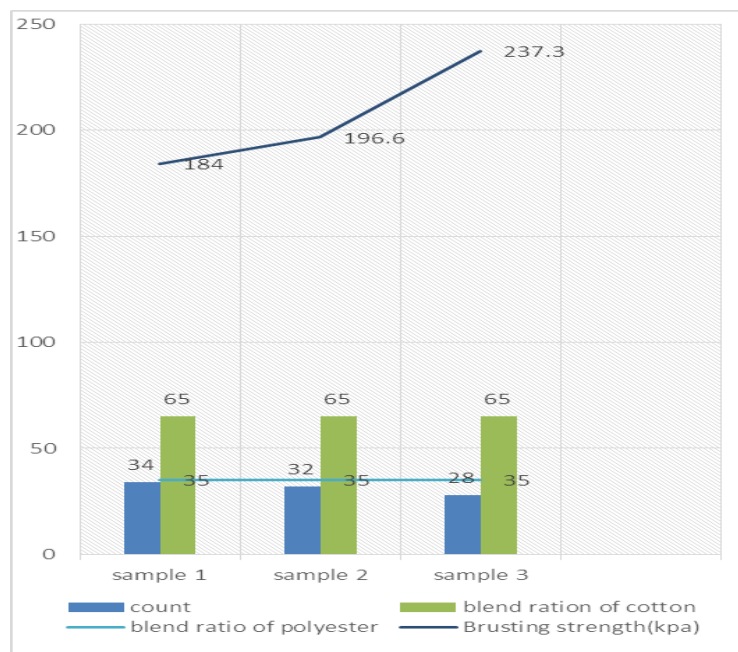


Fig 2: Effect of yarn count on bursting strength when blend ratio is same

According to experimental data and graph analysis, it is observed that for the same blend ratio in the yarn with the coarser count yarn, plain single jersey knitted fabric has high bursting strength as the tenacity of cotton yarn is lower than polyester.

5 RESULT AND DISCUSSION

The result says that when blend ratio of cotton is increased in the yarn then the bursting strength of single jersey knitted fabric is decreased with the same count of yarn and vice versa.

The result also finds that bursting strength of single jersey knitted fabric is decreased when finer count of yarn is used and vice versa.

6 CONCLUSION

For determining the bursting strength of single jersey knitted fabric, yarn count and blend ratio can influence a lot. So, blend ratio and yarn count are important influencing factor for bursting strength. The experiment can be carried out with other blend ratio, yarn count and different fabric structures.

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