AN INVESTIGATION ABOUT RELATION BETWEEN COMFORT FEATURES AND SELECTED STRUCTURAL PARAMETERS OF KNITTED FABRICS

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ABSTRACT

In this study, weight, thickness, air permeability and bursting strength properties of knitted fabrics were analysed and the relation between the structural parameters, air permeability and bursting strength of fabrics were investigated. 100% cotton carded yarns spun as 12/1 Ne and 16/1 Ne from the same cotton blend were used. Experimental samples were knitted with two different course density using yarns with two different counts. Thus, fabrics were knitted with four constructions. It was found that, the air permeability was higher and bursting strength was lower for fabrics made from finer yarns. For the same yarn count, air permeability was lower and bursting strength was higher for fabrics having high course density.

Key Words: *Knitted fabric, thickness, bursting strength, air permeability.*

1. INTRODUCION

Today, when consumers choose their clothes, which has become a second skin of the human, they pay attention to clothing comfort besides esthetical characteristics [1,2]. According to their high comfort properties and comfortable touch feelings, knitted fabrics are used extensively in the production of casual clothes which are preferred by consumers when compared with other textile surfaces [3,4]. Thickness and air permability are two important factors to determine the comfort properties of fabrics [5,6].

Thickness of a fabric depends on mass per unit area, type of yarns used in spinning, weaving - knitting structure and finishing. Fabric thickness has influence on heat retention, acoustic and volumetric properties. of the fabric. Previous studies show that when fabric thickness increases, thermal resistance value of the fabric increases, too. So that high thermal insulation can be achieved during activities carried out in cold conditions [2,7-14]. Air permeability expresses that passing ability of air through fibers and yarns constituent of a fabric. It is a feature of use which effect air flow diffused from the human body to environment and air flow from environment to the human body [15]. Air permeability is one of the most important comfort parameters which is related with breathability property [16]. Fabrics which have high air permeability have better heat transfer characteristics and people feel more comfortable in these clothes [3,17-21]. Besides these comfort properties, bursting strength has great importance for knitted fabrics in many ways [22].

In the previous studies, thickness and air permeability factors of fabrics were related with especially thermal comfort property. In this study, weight, thickness, air permeability and bursting strength tests of the fabrics which have different yarn counts and different course

density per centimeter were performed and investigated relevance with structural parameters of knitted fabrics.

2. EXPERIMENTAL

2.1. Material

In this study, 100% cotton carded yarns spun as 12/1 Ne and 16/1 Ne linear density from the same cotton blend were used to knit fabrics. Yarn characteristics used in this study were given in Table 1.

Table1. Yarn characteristics

Sample No	Lineer Density of Yarns (Ne)	Twist Coefficient (α_e)	Strength (cN/tex)	Strength Elongation (%)
1	12/1	4,4	734,8	8,56
2	16/1	4,33	536,8	8,23

Fabrics were knitted with yarns which has two different yarn counts and two different course density per centimeter. In this way, jersey knit fabric in four different construction using the same raw materials were produced. Construction characteristics of the knitted fabrics were given in Table 2.

Table 2. Construction characteristics of the knitted fabrics

Sample No	Linear Density of Yarns (Ne)	Sequence Density Per Centimeter (pieces/cm)	Wale Density Per Centimeter (pieces/cm)	Weight (g/m^2)	Thickness (mm)
1	12/1	7,5	8,5	196	1,339
2	12/1	9,5	8,5	224	1,218
3	16/1	7,5	8,5	161	1,334
4	16/1	9,5	8,5	176	1,209

2.2. Method

Wale and course density per centimeter of fabrics were counted with a lupe which has 1 cm width. Five measurements were taken to obtain of wale and course density per centimeter of fabrics for each sample and average of these measurements was taken [3]. Mass per unit area, thickness, air permeability and bursting strength of samples were measured according to test methods given in Table 3.

Table 3. Test methods [23-26]

Tests	**Test Standarts**
Mass per unit area	TS 251
Thickness	TS EN ISO 5084 7128
Air permeability	TS 391
Bursting strength	TS 393 EN ISO 13938-1

3. RESULTS and DISCUSSION

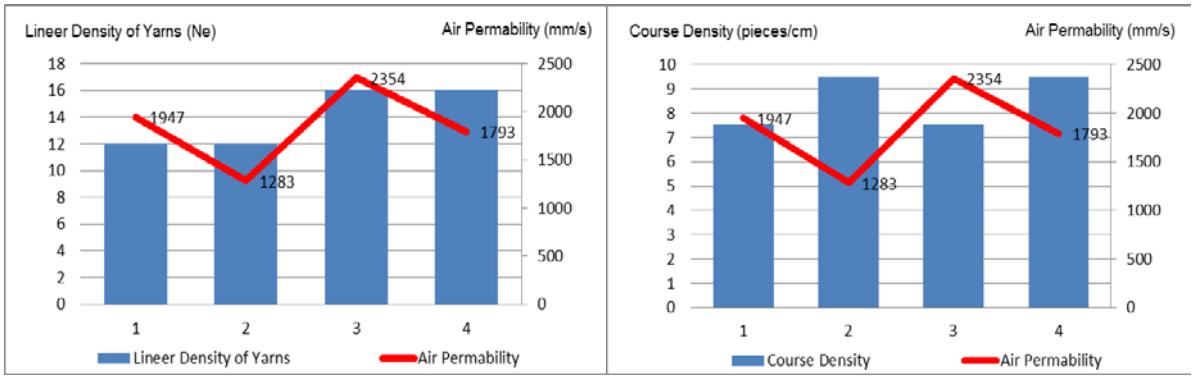
Characteristics and test results of four samples are presented in Table 4.

Table 4. Results of Tests

Sample No	Yarn Density (Ne)	Course Density Per Centimeter (pieces/cm)	Wale Density Per Centimeter (pieces/cm)	Weight (gr/m^2)	Thickness (mm)	Air Permability (mm/s)	Bursting Strength (Pa)
1	12/1	7.5	8.5	196	1.339	1947	578
2	12/1	9.5	8.5	224	1.218	1283	634
3	16/1	7.5	8.5	161	1.334	2354	437,5
4	16/1	9.5	8.5	176	1.209	1793	520,8

From the results presented in Table 4, it is seen that sample 2 has the the lowest air permeability value (1283 mm/s) and the highest bursting strength value (634 Pa). Sample 3 has, the highest air permeability value (2354 mm/s) and the lowest bursting strength value (437,5 Pa).

The effects of yarn count and course density on air permeability were shown in Figure 1.

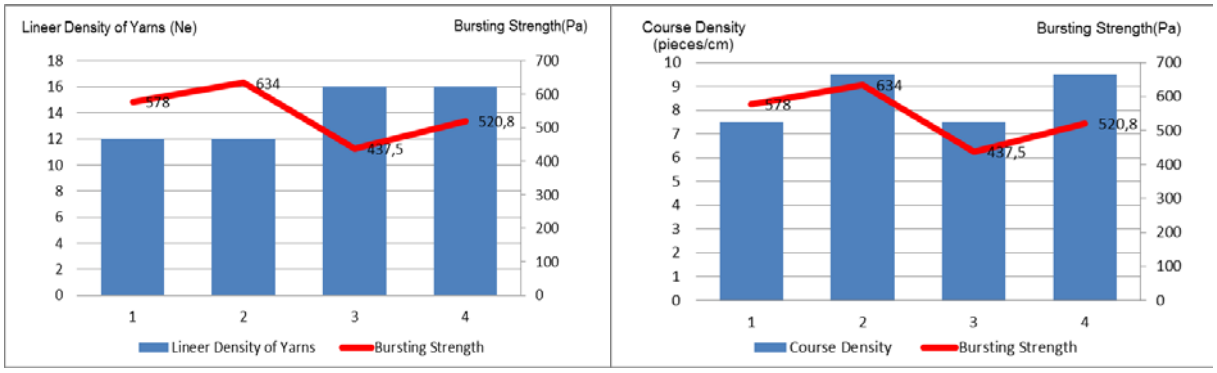


a) b)

Figure 1. Air Permability Test Results
a)Air permability test results depending on lineer density of yarns
b) Air permability test results depending on sequence density

As shown in Figure 1.a) when samples compared which have same wale and course density, samples knitted with yarn count Ne 16/1 have higher air permeability values than samples knitted with yarn count Ne 12/1. As shown in Figure 1 b) air permeability values of samples knitted with density of 7.5 are higher than samples knitted with density of 9.5.

The effects of yarn count and course density on bursting were shown in Figure 2.



a) b)

Figure 2. Bursting strength test results
a)Bursting strength test results depending on lineer density of yarns
b)Bursting stength test results depending on sequence density

As shown in Figure 2 a) when samples compared which have same wale and course density, samples knitted with yarn count Ne 12/1 have higher bursting strength values than samples knitted with yarn count Ne 16/1. As shown in Figure 2 b) bursting strength values of samples knitted with density of 9.5 are higher than samples knitted with density of 7.5.

The relation between air permeability and bursting strength values of samples shown in Figure 3.

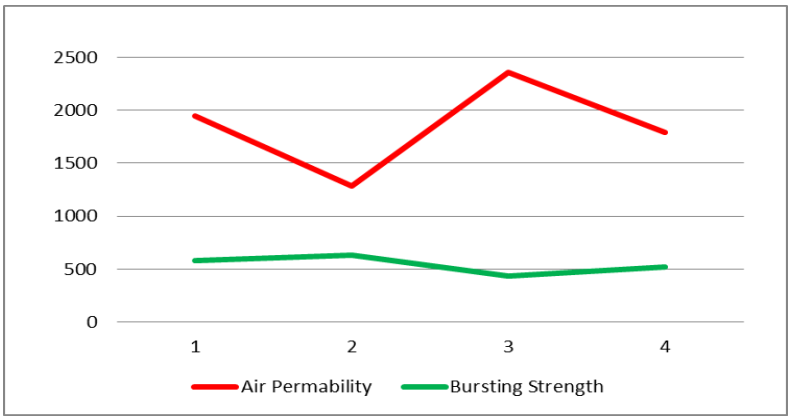


Figure 3. Comparison of air permeability and bursting strength

Figure 3 shows that if air permeability values reduces, the bursting strength values rises.

4. CONCLUSION

Air permeability, thickness and bursting strength are important factors in performance of knitted fabrics. In this study effects of two different structural parameters were investigated on these properties. The yarn count and course density values effect fabric thickness, air permeability and bursting strength. The thickness of knitted fabrics rises when thicker yarns are used. When course density per centimeter of fabric reduces or yarns are finer, the air permeability of fabrics rises. When course density per centimeter of fabric increase and yarns are thicker, the burst strength rises. For each sample when air permeability values reduces, the bursting strength values rises.

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