APPLICATION FOR BLENDS OF CHITOSAN, LYOCELL FIBER TO CONTROL BACTERIAL GROWTH

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ABSTRACT

Natural and synthetic cellulose fibers are essential for the day-to-day functioning of the textile industry. Thanks to their features, these fibers give best antibacterial properties. And also cellulose fibers are included in the group of high comfort fibers.
Within this study, as using Chitosan fibers & with fibers such as Cotton & Lyocell of different proportions derived from different mixtures; anti-bacterial knitted fabrics will be developed.
The anti-bacterial and anti-microbic performance is given with the inhibition of the bacteria's growth. Chitosan, Lyocell are the best choise for this aim.

Key Words: Chıtosan, Anti-Bacterial, Cotton, Lyocell

1. INTRODUCTION

The anti-bacterial and anti-microbic performance is given with the inhibition of the bacteria's growth.
Chitosan has a chemical structure very similar to that of cellulose such as cotton and rayon. Chitosan fiber has the high level of comfort, the antiallergic and the high humidity absorption give to the clothes realized with chitosan the capability to be used to direct skin contact, as in underwear, socks, pyjamas, and so on[1].
Comparisons of lyocell with viscose in both laboratory and test markets proved that the fibers were sufficiently different to deserve separate marketing strategies.
Lyocell is:

- stronger than any other cellulosic fibers, especially when wet
- easy to process into yarns and fabrics alone or in blends
- easy to blend (unique fiber presentation)
- easy to spin to fine count yarns
- very stable in washing and drying
- thermally stable
- easy to dye to deep vibrant colours
- capable of taking the latest finishing techniques to give unique drape
- comfortable to wear[2]

The assessment of the antimicrobial activity was carried out according to the standard procedure described in the AATCC test method 100-2004[3]. As seen table 1, %100 cotton fabrics do not have antibacterial activity. On the other hand %100 lyocell fabrics and %100 Chitosan fabric have effective antibacterial activity. To increase antibacterial efficiency of cotton fabrics chitosan fibers and/or Lyocell fibers can be added to cotton fibers. In this case produced fabrics from cotton/Lyocell or cotton/Chitosan yarns have anti-bacterial activity.

Zhang (2003), etc. was examined the effect of concentration, molecular weight, and degree of deacetylation of chitosan on antibacterial activity on %100 cotton fabric. Bacteria reduction is evaluated using the modified Quinn method. 0.3 g / l concentration of chitosan applied and to establish strong links to cotton fabric glutaric dealdehid is used. Cotton fabrics treated with chitosan show a good ability to inhibit bacteria formation. In studies using glutaric dealdehid fabric showed long lasting antimicrobial effect.

In a study conducted by Aly(2004) etc. cotton fabrics were treated with chitosan citrate wrinkle-resistant and antimicrobial properties have been investigated. The carboxylic groups in the chitosan citrate structure were used as active sites for its fixation onto cotton fabrics. The fixation of the chitosan citrate on the cotton fabric was done by the padding of chitosan citrate solution onto cotton fabrics followed by dry-cure process. The factors affecting the fixation processes were systematically studied. The antimicrobial activity and the performance properties of the treated fabrics, including tensile strength, wrinkle recovery, wash fastness and whiteness index, were evaluated. The finished fabric shows adequate wrinkle resistance, sufficient whiteness, high tensile strength and more reduction rate of bacteria as compared to untreated cotton fabric.

In a study conducted by Lim and Hudson (2004) O-acrylamidomethyl-N-[(2-hidroksi-3 trimetil amonyum) propil] chitosan klorid (NMAHTCC), was applied to cotton fabrics by a pad-batch
method in the presence of an alkaline catalyst. The 1% NMA-HTCC treated cotton showed 100% bacterial reduction on the fabric. The fabric maintained over 99% of bacterial reduction even after 50 home launderings. [6].

Qi (2004) etc. was examined of antibacterial activity of chitosan nanoparticles. The physicochemical properties of the nanoparticles were determined by atomic force microscopy (AFM), FTIR analysis, and XRD pattern. The antibacterial activity of chitosan nanoparticles and copper-loaded nanoparticles against E. coli, S. choleraesuis, S. typhimurium, and S. aureus was evaluated by calculation of minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC). Results show that chitosan nanoparticles could inhibit the growth of various bacteria tested.

Palamutçu (2007) etc. was examined antimicrobial activity and performance changes of silver, triclosan, Dichlorophenol, Quaternary ammonium and chitosan on %100 cotton fabrics. Antimicrobial activities after 1,5,10 and 20 are showed. In this study when used different microorganisms in the antimicrobial activity were varied.

2. MATERIAL – METHOD

In this study, cotton, tencel and chitosan fibers mixed in different proportions antibacterial properties of knitted fabrics were investigated.As a result of studies on the fabric ATTCC antibacterial tests were conducted according to standard 100-2004[3].

3. RESULTS AND DISCUSSION

You can see the fabrics which prepare for this study in table 1.

Table 1: Anti-bacterial results of several fabrics

FIBER TYPE *(%)*			*COMBINATION RATIO (%)*	*BACTERIAL REDUCTION (%)*
COTTON	*LYOCELL*	*CHITOSAN*		
100			100	-
	100		100	92.38
		100	100	99.99
85		15	100	99.73
	85	15	100	99.99
95		5	100	94.00
	95	5	100	99.99

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In this study the aim is to produce more comfortable and more hygienic yarns and fabrics.

4. CONCLUSION

This study indicated that lyocell and chitosan fibers have antibacterial properties. Also having a common area of cotton fibers of various blend ratios of the fibers mixed with the antibacterial performance evaluation, consideration of cost and performance data of the optimum mixing ratio was determined.

5. REFERENCES

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