



# Herbal Antimicrobial Finishing on Cotton, Modal and Cotton Modal Fabrics

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## Abstract

The world of textile industry is going through revolutionary changes aimed at the unique needs of the modern customers. Textile substrates can be now modified to provide additional functional requirements apart from providing conventional properties. Finishing is done to improve products appearance, properties and quality. Functional finishes represent the next generation of finishing industry, which, make textile materials act by themselves. Micro organisms become a part of our day to day life. Thus antimicrobial finish gains greater momentum. Hence this paper highlights the importance of antimicrobial finish on cotton, modal and cotton modal fabrics using *Azadirachta indica*.

## Introduction

Environmental considerations are now becoming vital factors during the selection of consumer goods including textiles all over the world<sup>1</sup>. However due to increased awareness of the polluting nature of textile effluents social pressures are increasing on textile processing units. Awareness about eco-friendliness in textiles is one of the important issues in recent times since textiles are used next to skin<sup>2</sup>. Owing to the demands of global consumer the researches were being carried out on new eco-friendly processes.

Natural finishes comprises of those substance that are obtained from plants and animals. Environmental consciousness also ranks high during the selection of consumer goods everywhere. Natural finishes have many advantages such as non toxic, non irritant, biodegradable, cost effective, easy availability, etc<sup>3</sup>. Concern for the green environment along with public awareness led to the innovation of many new natural finishes<sup>4</sup>.

Microorganisms are part of our daily life. They join us in different forms mostly unnoticed<sup>5</sup>. In today's world the need for antimicrobial textiles is in an increasing rate due to the detrimental effect of microorganisms on textiles as well as human hygiene. So it is essential to control or inhibit the growth of these organisms on textile fabrics, which turns out to be undesirable for the wearer. Hence there exists a need for antimicrobial textiles.

In this study antimicrobial finish was given to cotton, modal and cotton modal knitted fabrics using *Azadirachta indica* leaves. This study has the following objectives:

- To find out the availability of the natural antimicrobial agent
- To optimize the various parameters for finishing
- To study the effect of natural antimicrobial finish
- To evaluate the finished samples for its various properties
- To convert the finished fabrics into baby diaper.



## Materials

### Selection of Fabric

Cotton and modal fibre has soft and smooth texture. It breathes well, cool to touch and has high absorbency. Hence 100% cotton, 100% modal and modal cotton in the ratio of 50:50 was selected for this study.

### Selection of Source

It is widespread that *Azadirachta indica* leaves have a good antimicrobial property. Moreover it has been proved that *Azadirachta indica* leaves has no side effect on humans. Hence *Azadirachta indica* was selected for this study. The selected leaves were washed and dried in shade. These leaves were then powdered by grinding.

### Selection of Binder

In chemical citric acid there was a loss in strength and also colour change occurs. Hence lemon juice was used as a binder for this study which contains citric acid.

## Methods

### Extraction

Methanolic extraction was carried out using the *Azadirachta indica* powder and left as such for 48hours. Then the solvent was allowed to evaporate and the residue was collected.

### Finishing

All the three types of knitted fabrics were finished using two dip padding technique with the *Azadirachta indica* extract and citric acid in the material liquor ration of 1:10.

### Evaluation

The finished fabrics were evaluated for its various properties such as wales per inch, course per inch, grams per square meter, thickness, bursting strength and abrasion resistance. The antimicrobial property was assessed using disc diffusion method and parallel streak method.

### End Product

All the finished fabrics were converted into baby diaper. These diapers were used for wear study

## Results and Discussion

The test results of the finished cotton, modal and cotton modal were depicted in table.1

**Table.1**

**Objective Evaluation of Samples**

Tests	Cotton	Modal	Cotton Modal
Wales per inch	30	33	32
Course per inch	60	48	60
Grams per square meter (gm/cm <sup>2</sup> )	160.4	156.7	159.4
Thickness guage (mm)	0.054	0.042	0.044

Bursting strength (kg/cm <sup>2</sup> )	0.63	0.6	0.55
Abrasion resistance (mg)	5.1538	4.5	5.829

As far as wales per inch were considered, modal ranks high in wales per inch with the value of 33 followed by cotton modal. Cotton and cotton modal has course per inch value of 60 when compared to modal which has 48 course per inch.

Among all the finished samples cotton has high thickness value of 0.054 followed by cotton modal and modal respectively. The bursting strength of cotton and modal ranks high when compared to cotton modal fabrics.

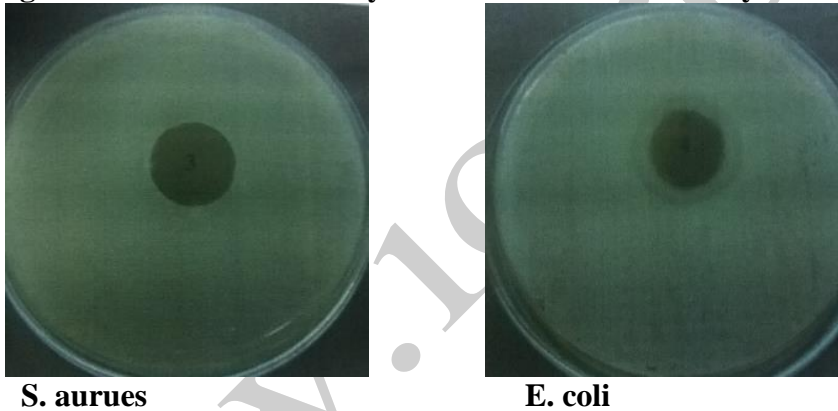
The gram per square meter of cotton was high, followed by cotton modal and modal. Abrasion resistance of cotton modal ranks high, followed by cotton and modal respectively.

### Anti-Microbial Test

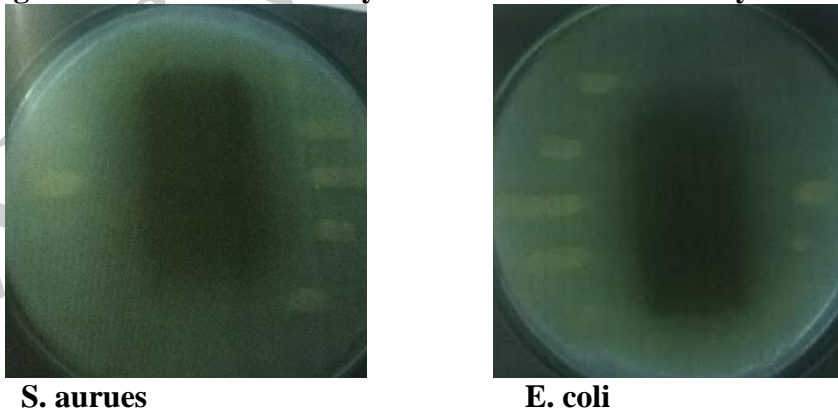
#### Disc Diffusion Method

Zone of inhibition of *Azadirachta indica* finished cotton, modal and cotton modal were studied using disc diffusion method. Among all the samples cotton modal (Fig.1) has greater resistance to both gram positive and gram negative micro-organisms.

**Fig. 1 Antimicrobial Activity of Cotton Modal Fabric by Disc Diffusion Method**



**Fig. 2 Antimicrobial Activity of Cotton Modal Fabric by Parallel Streak Method**



## ii) Parallel Streak Method

Parallel Streak test was performed for *Azadirachta indica* finished cotton, modal and cotton modal fabrics. The zone of inhibition for both gram positive and gram negative microorganisms was high for cotton modal fabrics (Fig.2) among all the samples.

## Wear Study

Among all the cloth diapers, cotton modal diaper (Fig.3) ranks good in appearance, comfort, absorbency and softness.

**Fig. 3 Cotton Modal Diaper**



## Conclusion

From this study it was concluded that cotton modal knitted fabric has good absorbency, wicking and soft texture. In both disc diffusion and parallel streak method cotton modal fabric has good zone of inhibition for both gram positive and gram negative bacteria. Cotton modal fabric has good abrasion resistance and medium bursting strength. Hence it can be used for baby diaper.

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