

## THE INQUIRY OF ANTIBACTERIAL FINISHES ON MODAL BLENDED KNITTED FABRIC

Dr.M.Sumithra, Assistant professor, Department of Textiles and Apparel Design, Bharathiar University, Coimbatore

### ABSTRACT

In this article an attempt has been made to approach of developing antibacterial finish using *acacia catechu*. For this study 100% modal fabric, 50:50 (modal/cotton), 50:50 (modal/organic cotton) variants of fabrics were coated with *acacia catechu* leaves by using pad dry cure method. The antibacterial activity of the finished 3 variants of fabrics were assessed against the bacteria namely *staphylococcus aureus* and *Escherichia coli* and it is concluded that when compared to all 3 finished fabrics, the fabric coated with 50:50 modal cotton fabric have good antibacterial activity, it may be due to *acacia catechu* inhibited in the fabric well.

### KEY WORDS

*Acacia catechu*, Antibacterial, Cotton, Modal and Organic cotton

### I. INTRODUCTION

Textile is a type of material composed of natural or synthetic fibers. Types of textiles include animal-based material such as wool or silk, plant-based material such as linen, cotton, and synthetic material such as polyester and rayon. Textiles are often associated with the production of clothing. However, for the main types of textiles, plain weave, twill, or satin weave, there is little difference between the ancient and modern methods(1).

Modal is a wood pulp based cellulosic fibre, made out of pure wooden chips from the beech tree, technically as the European Schneider Zelkovatree. While viscose rayon can be obtained from the wood pulp from a number of different trees, Modal uses only beech wood, thus it is essentially a variety of viscose rayon, a generic name for modified viscose rayon fibre that has high tenacity and high wet modulus(2).

Cotton is a soft, staple fibre that grows in a form known as a boll around the seeds of the cotton plant, a shrub native to tropical and subtropical regions around the world, including the Americas, India and Africa. The fibre most often is spun into yarn or thread and used to make a soft, breathable textile, which is the most widely, used natural-fibre cloth in clothing today (3).

Organic cotton is grown using methods and materials that have a low impact on the environment. Organic production systems replenish and maintain soil fertility, reduce the use of toxic and persistent pesticides and fertilizers, and build biologically diverse agriculture. Third-party certification organizations verify that organic producers use only methods and materials allowed in organic production (4).

Antibacterial textile products continue to increase in popularity as demand for fresh smelling, skin friendly, and high performance fabrics goes on. Modern performance fabrics are required in many specialist applications, sports textile is one example. These need to exhibit high degrees of performance in terms of longevity and durability and by imparting antibacterial properties to the fabric. These properties can be improved as well as increasing the comfort and hygiene factor making them more pleasant to wear. Odour can be neutralized and skin problems caused by bacterial growth reduced thus emphasizing the hygiene nature of the treated product(5).

*Acacia catechu* is a commonly occurring tree in India up to height of 1500m. This plant material is used as anodyne, astringent, bactericide, refrigerant, stimulant, and styptic, masticatory expectorant and antiphlogistic. It is also used in asthma, cough, bronchitis, colic, diarrhoea, and dysentery, boils, in skin affections and sores and for Somatises. The bark is used as an anthelmintic, antipyretic, anti-inflammatory, in bronchitis, ulcers, and anaemia and gum troubles (6).

Considering all the above factors the following objectives of the study are

- To select the knitted fabric with Modal blends in the combination of 100% Modal, 50:50 (Modal/Cotton) and (50:50) (Modal/Organic cotton) for this study.
- To find out the antibacterial agent for this study
- To finish the selected fabric using *Acacia Catechu*.
- To evaluate the Antibacterial property using standard method.

## 2. MATERIALS AND METHODS

### 2.1 MATERIALS

The fabric was sourced from market with respect to the expected quality requirements. The fabric chosen was specified in Table-1. *Acacia catechu* were collected from Coimbatore district.

Table-1 – Specification of the selected variants

Sl. No	Fabric	Ratio	Blend
1	Modal	100%	-----
2	Cotton	50:50	Cotton/Modal
3	Organic Cotton	50:50	Organic cotton/Modal

### 2.2 METHODS

#### 2.2.1 PRETREATMENT OF FABRIC

##### Scouring

Scouring is an important operation by which natural impurities (greases, waxes, fats, etc) and acquired impurities from the fabric are removed, view niir board (2002).

##### Recipe:

Fabric	: 200 gms
Caustic soda	: 20 gms
Spectra JET M	: 26 ml
Water	: 16 liters
P <sub>H</sub>	: 6
Temperature	: 95 <sup>0</sup> C

##### Procedure:

The 100% modal, 50:50 cotton/modal and 50:50 organic cotton/modal are the fabrics were selected for scouring. The material liquor ratio used was 1:8 and the selected fabrics were weighed accurately. Soft water was filled in the soft flow machine, 20 grams of caustic soda and 26 grams of wetting agent spectra JET M was added to 16 litres of soft water. Spectra JET M was a multi-functional product functioning as a wetting agent, deformer, stabilizer, sequestering agent and lubricator. This wetting agent is detergent whose foams were removed by the deformer and the stabilizer decomposes the nascent oxygen and the sequestering agent deactivates the minerals present as calcium, magnesium and iron during scouring process. Lubricator functions as the anti-creasing agent during the scouring process on the soft flow machine. Next, the fabrics were steeped in to this thoroughly mixed liquor and the solution to

95<sup>0</sup>C for 30 minutes. The fabrics after scouring were washed first with hot water and then with cold after thoroughly and dried in sun light.

### Bleaching

Bleaching, is a process that removes the impurities, and the natural colouring matters left in the material produce a good white colour, says Dantyagi (2002). Bleaching of textiles has been practiced for a very long time.

#### Recipe:

Fabric	: 200 gms
Hydrogen Peroxide	: 8 gms
Wetting agent	: 26 ml
p <sup>H</sup>	: 20 ml
Water (Material liquor Ratio)	: 16 litres
Time	: 20 Minutes
Temperature	: 70-80 <sup>0</sup> C
Acetic acid	: 13 ml

#### Procedure:

The 100% modal, 50:50 cotton/modal and 50:50 organic cotton/modal fabrics were selected for bleaching. The scoured fabrics were further bleached in order to remove any colouring matter that may be present in the fabrics. The fabrics were bleached in a bath containing 16 litres of soft water, 8 grams of hydrogen peroxide and 20 ml of wetting agent and the solution heated to 75<sup>0</sup>C for 20 minutes. The liquor was then drained and the fabrics was given the hot water wash and drained once. The peroxide killer as added in the form of 12 grams of peroxide killer which kills the non-reacted peroxide from the fabric boiled to 70<sup>0</sup> C for 20 minutes. Then this was given a hot wash and dried once. Next 13 ml of acetic acid was added and run for 20 minutes at 50<sup>0</sup>C and then two cold washes were given and drained once. The fabrics after scouring were washed first with hot water and then with cold after thoroughly and dried in sun light.

## 2.3 SELECTION OF NATURAL SOURCE OF FINISHING

### 2.3.2 SELECTION OF BINDER

The binder should be colourless, odourless, evenly thick, smooth and good adhesion says Khoia et.al.(2002). Citric acid is one of the bulk chemicals mainly used by the food and pharmaceutical industries. Citric acid was commercially isolated from lemon juice. A commercial scale was developed using sugar beet molasses and hydrocarbon as substrates and fungal cell as substrates and fungal cells as microbes. Citric acid is a good cross linking agent or binder in spite of its low cost, widespread availability and ecological acceptability highlights, Vikusiae et.al.,(2001). Hence the investigator planned to select the binder of citric acid for her study.

### 2.3.3 EXTRACTION OF NATURAL SOURCE

The air dried Coleus Andronicus country borage leaves were made in powder from, 100g of the powder was extracted with 500ml of ethanol (analytically grade). The mixture was allowed to stand for 24 hours (Plate-I). The mixture was now filtered and evaporated carefully and the regulated water bath was maintained at temperature of 80<sup>0</sup> c to yield to deep green semi-solid extract weighing 7.5gms. It was stored

in a refrigerator at 4°C. The extraction can be carried out from natural finishing agent by aqueous, and acidic or alcoholic method. Among this alkaline extraction shows good result.



PLATE-I

### 3. APPLICATION OF ANTIBACTERIAL FINISH

The selected each 1 meter fabric was finished with the optimized solution. The extracted solution was inside the padding mangle (Plate-II) the fabric was passed inside the machine for 15 minutes. Then cured for 15 minutes at 80°C for the good penetration of the finishing agents. Then fabric was removed from the curing chamber, then washed thoroughly and dried in the shade.

#### 3.1 Recipe:

Herbal Solution	: 100percent
Critic Acid	: 1:20
Time	: 45 min
Temperature	: 80°C
pH	: 5

#### 3.2 Drying:

Temperature	: 45 °c to 140 °c
Time	: 10 minutes.

#### 3.3 Curing:

Temperature	: 70°C to 160°C
Time	: 2 minutes



Plate-II

#### 4. EVALUATION OF THE ANTIBACTERIAL TEST FOR FINISHED FABRICS

The effect of the extracts on the test organisms, were studied by following well diffusion method. The organisms *Staphylococcus Aureus* and *Escherichia coli* were taken for this study. The pure culture of the isolated organism is inoculated on to the sterile mulla hinto agar plant (4mm thickness) following pour plate method. Three or four colonies and similar colonies are transferred into 5ml of the sterile brain heart infusion broth and incubated at 25°C and for 2 hours. After the incubation, a sterile nontoxic modal swab is dipped into the broth and soaked nicely and was swabbed on the entire surface of the media and ensured that the organism has spread throughout the surface of the medium, and the plates were allowed to dry for 5 to 10 minutes. Using a septic technique with the inoculated media, with approximate distance between the discs. The plate were then immediately incubated at 27°C for 24 hours. The diameter of the zones formed around the paper discs were measured in mm and recorded.

#### 5. RESULT AND DISCUSSION

##### Evaluation of Antibacterial activity of finished fabric

The following Table-11 shows the Antibacterial activity of control and finished fabrics. The antibacterial finished fabrics against *Staphylococcus Aureus* and *Escherichia coli*.

TABLE-11

S.No.	SAMPLE	Antibacterial activity zone(mm)	
		<i>Staphylococcus Aureus</i>	<i>Escherichia coli</i>
1	100 % MODAL FABRIC	0	0
2	FINISHED 100 % MODAL FABRIC	11 mm	13 mm
3	50:50 COTTON MODEL FABRIC	0	0
4	FINISHED 50:50 COTTON MODEL FABRIC	15 mm	17 mm
5	50:50 ORGANIC COTTON MODAL	0	0

	FABRIC		
6	FINISHED 50:50 ORGANIC COTTON MODAL FABRIC	13 mm	14 mm

From the Table 11 shows that antibacterial activity in samples 100 % modal fabric, 50:50 cotton model fabric and 50:50 organic cotton modal fabric reveals that 50:50 cotton model fabric Finished samples was found to exhibit maximum zone of inhibition for *Staphylococcus Aureus*(15 mm) and *Escherichia coli* (17mm) when compared to other two samples.so thefinished 50:50 cotton model fabric shows better result and this fabric has higher rate of protection against the human pathogens than other two fabrics.

## 6.CONCLUSION

This work has given a novel idea in finishing of knitted fabric with herbs for antibacterial activity. The finished fabrics were found to be very good in 50:50 modal cotton fabric and helps to protect the human beings free from skin infections, fungal growth and bad odour

## 7.REFERENCES

- 1.Business dictionary,<http://www.businessdictionary.com/definition/textile.html>
2. Prashant Verma, (28 march 2014) modal fibre, received 13 January 2014, [www.fibre2fashion.com](http://www.fibre2fashion.com) ,Knowledge › Article › Textile
3. Textile school, Cotton Fibers – the king of fibers, Mar 28, 2018, <https://www.textileschool.com/129/cotton-fibers-the-king-of-fibers/>
4. Organic Cotton Facts, June 29, 2012, organic trade association, [www.fibre2fashion.com](http://www.fibre2fashion.com) › Knowledge › Article ›Apparel/Fashions
- 5.kathyrun bunce, (April 2001), The layman’s guide to anti-microbial fabric and testing methods, march 2014[www.fibre2fashion.com](http://www.fibre2fashion.com) › Knowledge › Article › Textiles
6. Shirish S. Pingale, HEPTOPROTECTION BY ACACIA CATECHU IN CCL4 INDUCED LIVER DYSFUNCTION, Article-024 ISSN 0976 – 044X,*International Journal of Pharmaceutical Sciences Review and Research*, Pune, Volume 5, Issue 1, November – December 2010, Page 150