



Antimicrobial Finishing on Cotton, Modal and Cotton/Modal Fabrics Using *Cymbopogon Citrates*

KEYWORDS

Knitted fabrics, finishing, *Cymbopogon citrates*, antimicrobial.

***Dr.M.Kanimozhi**

P.Sasikala

Assistant Professor, Department of Costume Design & Fashion, PSG College of Arts & Science, Coimbatore.
*Corresponding Author

Assistant Professor, Department of Costume Design & Fashion, PSG College of Arts & Science, Coimbatore

ABSTRACT Textile sector contributes major pollution to the environment which destroys it drastically. Hence the uses of natural products were gaining importance. In this paper the effect of antimicrobial finish on knitted cotton, modal and cotton/modal fabrics using *Cymbopogon citrates* herbs were discussed. Due to the presence of biological active compounds in *Cymbopogon citrates* it finds application in traditional medicine, it seems that this plant possesses considerable antibacterial activity. Hence in this study methanolic extraction of *Cymbopogon citrates* leaves were used to finish the samples by padding method. The antimicrobial efficacies of the finished fabrics were evaluated by disc diffusion and parallel streak method. Wear study was conducted by converting the finished fabrics into baby cloth diaper and its effect was analyzed. The results reveal that cotton/modal fabrics has good zone of inhibition for both gram positive and gram negative bacteria.

1. INTRODUCTION

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 conversional properties¹. "Finishing is done to improve products appearance, properties and quality". All finishes are added to fibers, yarn or fabrics by either mechanical or chemical (including wet, dry, or heat) processes. Functional finishes represent the next generation of finishing industry, which, make textile materials act by themselves². Natural finishing agent comprises of those substances that are obtained from plants and animals³. Natural finishes have many advantages such as non-toxic, non-irritant, bio degradable, cost effective, easy availability⁴.

Microorganisms are part of our daily life. They join us in different forms mostly unnoticed⁵. 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 hygiene⁶. 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.

Cymbopogon citrates belong to the family Poaceae and genus *Cymbopogon*. Two major species of *Cymbopogon* available in India were *citratus* and *flexuosus*⁷. *Cymbopogon citrates* is a perennial, tall tropical grass growing in dense clumps or tufts 70 – 150 cm or more in height. The slightly enlarged, bulbous, juicy base is the most palatable portion. All parts are strongly lemon – scented⁸. The leaves and oil has good antibacterial and fungicidal properties. It helps to suppress skin diseases and body odour resulting from bacterial infections⁹. Hence in this study antimicrobial finish was given to cotton, modal and cotton/modal knitted fabrics using *Cymbopogon citrates* leaves. The objectives of this study were listed below:

- To find out the availability of natural antimicrobial agent
- To optimize the various parameters for finishing
- To study the effect of natural antimicrobial finish

- To evaluate the unfinished and finished samples for its various properties
- To convert the finished fabrics into baby cloth diaper.

2. MATERIALS AND METHODS

2.1 Materials

2.1.1 Selection of fabric

For this study single jersey knitted fabric of 100% cotton, 100% modal and cotton/modal in the ratio of 50:50 was selected due to its soft and smooth texture. This fibre breathes well, cools to touch and has high absorbency hence suits well for baby diaper.

2.1.2 Selection of source

Cymbopogon citrates leaves were selected to impart antimicrobial finish on the selected fabrics due to its active compound present in it.

2.1.3 Selection of binder

Citric acid is a colourless, odourless cross linking agent which is widespread. At the same time, it is economically and environmentally friendly¹⁰. Hence citric acid was used as a binder for this work.

2.2 Methods

2.2.1 Preparation of powder

The *Cymbopogon citrates* leaves were collected from the plant and washed in clean water to remove the impurities. They were then dried in shade at room temperature for ten days. The dried leaves were then milled to a fine powder using mixer and stored in the dark closed containers until required to retain the active compounds.

2.2.2 Extraction

Methanolic extraction was carried out using the prepared powder. About 10g of the powder was mixed with 50ml of methanol and left as such for 48 hours. Then the solvent was allowed to evaporate and the residue was collected.

2.2.3 Finishing

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

2.2.4 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.

2.2.5 End Product

All the finished fabrics were stitched into baby diapers and used for wear study by five kids under the age group of 13 to 18 months. A questionnaire was prepared and their opinion regarding the product were collected.

3. RESULTS AND DISCUSSION

3.1 Fabric count and GSM

The results of fabric count and grams per square meter of the finished cotton, modal and cotton/modal fabrics were depicted in Figure 1.

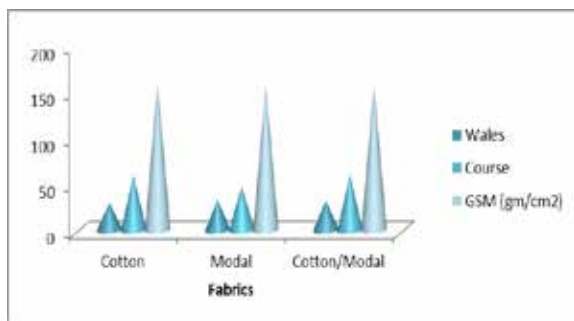


Figure 1: Fabric count and GSM

As far as wales per inch was considered, modal ranks high in wales per inch with the value of 33 followed by cotton/modal. Finished cotton fabric has lowest wales per inch. Cotton and cotton/modal has course per inch value of 60 when compared to modal which has 48 course per inch. The gram per square meter of cotton was high, followed by cotton/modal and modal.

3.2 Abrasion

The abrasion resistance of knitted cotton, modal and cotton/modal finished fabrics were given in figure 2.

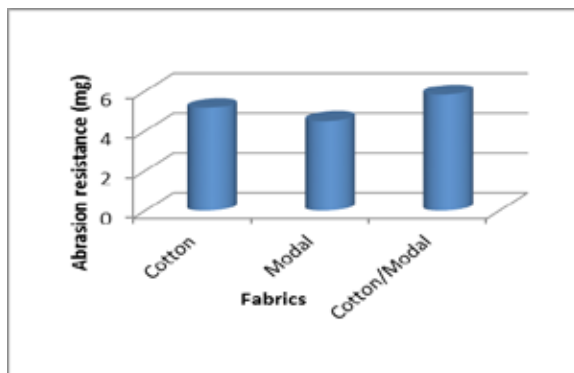


Figure 2: Abrasion

Abrasion resistance of cotton/modal ranks high, followed by cotton and modal respectively.

3.3 Strength and thickness

Figure 5 shows the strength and thickness of treated cotton, modal and cotton/modal fabrics.

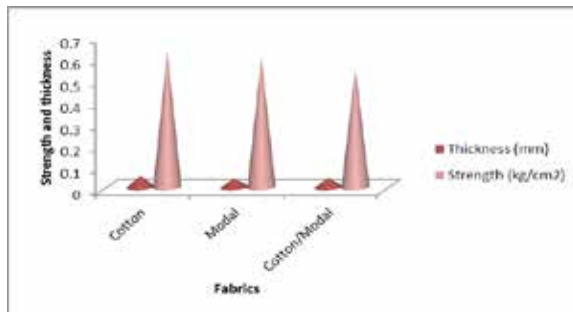


Figure 3: Fabric strength and thickness

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

3.4 Anti-microbial test

The anti-microbial activity of finished fabrics on strains of S. aureus and E. coli were studied using disc diffusion and parallel streak method.

Disc diffusion method

Zone of inhibition of Cymbopogon citrates finished cotton, modal and cotton/modal fabrics were studied using disc diffusion method. Among all the samples cotton/modal has greater resistance to both gram positive and gram negative micro-organisms.

Parallel streak method

Parallel Streak test was performed for Cymbopogon citrates finished cotton, modal and cotton/modal fabrics. The zone of inhibition for both gram positive and gram negative micro-organisms was high for cotton/modal fabrics among all the samples.

3.5 Wear Study

The opinion regarding the wear study was collected and the results were tabulated and analyzed table 1.

Table 1: Findings of the Wear Study

Finished fabrics	Rating Scale								
	Comfort			Absorbency			Appearance		
	E	G	F	E	G	F	E	G	F
Cotton	20	60	20	20	60	20	60	40	-
Modal	40	60	-	100	-	-	40	60	-
Cotton/modal	80	20	-	80	20	-	40	40	20

*E – Excellent ; G – Good ; F – Fair

Among all the cloth diapers, cotton/modal diaper ranks good in comfort, absorbency and softness. Cotton diaper has good appearance.

4. CONCLUSIONS

The society move towards hygienic and less toxic products which has increased the demand for anti-microbial textiles that is effective and safe for humans. The results of this paper clearly demonstrate that Cymbopogon citrates treated samples has zone of inhibition against both gram-positive and gram-negative bacteria. In both disc diffusion and par-

allele streak method it was concluded that cotton/modal fabric has good zone of inhibition for both gram positive and gram negative bacteria. Among all the samples cotton/modal fabric has good abrasion resistance and medium bursting strength. The wear study results reveal that cotton/modal diaper has good comfort and absorbency when compared to diaper made of cotton and modal.

REFERENCE

1. Sudha, S., Dev, G.V.R. and Neelakandan, R. (2006), Plasma application in textiles – an overview, *Journal of the Textile Association*, Vol. 67, No.1, May-June, P.25. | 2. Menezes E. and chezhian, (2007), *functional textiles and apparels*, volume – II, PEE vee publishers, coimbatore, P.p.27-33. | 3. Vasugi, N. and Kanimozhi, M. (2011), An eco-friendly herbal finish for bed linen, *Journal of the Textile Association*, Vol. 72, No.3, Sep-Oct, P.178. | 4. Deshmukh, S.S., Katare, Y.S., Shyale, S.S., Bhujbal, S.S., Kadam, S.D., D. A. Landge, D.A., Shah, D.V. and Pawar, J.B. (2013), Isolation and Evaluation of Mucilage of *Adansoniadigitata* Linn as a Suspending Agent, *Journal of Pharmaceutics*, P.1. | 5. Hipler, V.C. (2006), *Biofunctional Textiles and the Skin*, Kerger Publications, P.179. | 6. Krishnaveni, V. (2013), Combined antimicrobial and coolant finishing treatment for cotton using yashtimadhu (*Glycyrrhizaglabra* L.) roots extract, *Indian Journal of Natural Products and Resources*, Vol. 4(3), Sep, P.p.245-249. | 7. Peter, K.V. (2012), *Handbook of Herbs and Spices*, Volume 2, Wood head Publishing, P.348. | 8. Small, E. (2006), *Culinary Herbs*, 2nd edition, National Research Council Publications, Canada, P.p. 348-349. | 9. Singh, B.R., Singh, R.K. and Ebibeni, N. (2011), Antimicrobial activity of lemongrass (*Cymbopogon citratus*) oil against microbes of environmental, clinical and food origin, *International Research of Pharmacy and Pharmacology*, Vol. 1(9), Dec, P.p. 228-236. | 10. Katović, D.; Flinčec Grgac, S.; Bischof-Vukušić, S.; Katović, A. (2012), Formaldehyde free binding system for flame retardant finishing of cotton fabrics, *Fibres&Textiles in Eastern Europe*, Vol. 20, No.1(90), P.p.94-98. |