

# Antimicrobial properties of bamboo of fabric finished with Vempadam Bark (*ventilago mdraspantana*) Extract

C.Javakarbanu, Faculty, Dept Textiles/ & Apparel Design, Bharathiar University E-mail ID:

[jbcdfpsg@gmail.com](mailto:jbcdfpsg@gmail.com)

G.Manimekalai, Research scholar, SVPISTM, Coimbatore. E-mail ID: [mekalapsqcdf@gmail.com](mailto:mekalapsqcdf@gmail.com).

## ABSTRACT

The dry rind of the vempadam bark (*ventilagomdraspantana*) has been used as stuff since earlier time. In the present study the dye extracts were obtained from the rinds of the vempadam bark (*ventilagomdraspantana*) and used for bamboo fabric. The fabrics were assessed for antimicrobial and colour fastness properties. The antimicrobial assessment is performed quantitatively by parallel streak method (AATCC 147) against the organism *Escherichia coli* and *staphylococcus aureus*. The fabric were also assessment the fabric were also assessed for fastness properties such as colour fastness to washing and colour fastness to rubbing, sunlight as per the standards method. Wash durability test showed that the antimicrobial activity of the fabric was durable up to 10 wash cycles

**Keywords:** natural dye, bamboo fabric, antimicrobial,

---

## 1. INTRODUCTION

Up to the end of the 19<sup>th</sup> century natural dyes were the main colorants for textile. India textile industry is one of the leading textile industries in the world. Though was predominantly unorganized industry even a few years back, but the Scenario started changing after the economic liberalization of Indian economy in 1991. The opening up of economy gave the much needed thrust to the Indian textile industry, which has now successfully become one of largest industry in the world. (Kothari *et.al* 2008) Natural dyes can be sorted into three categories, natural dyes obtained from plants, animals, and minerals. Although some fabrics such as silk and wool can be color simply by being dipped in the dye, others such as cotton require a mordent, states says that (Arora 2009). it has become increasingly important for antimicrobial agents to meet environmental and low toxicity criteria while retaining their functionality. Therefore, it is vital to research

and develop eco-friendly antibacterial agents extracted from plant / animals for the textile application. (liolios.et al., 2007: Pereira, 2007: Jasso de rodriguez., et al., 2007) Bamboo fabric is very soft and can be worn directly next to the skin. Many people who experience allergic reaction to other natural fibers, such as wool or hemp, do not complain of this issue with bamboo. The fiber is naturally smooth and round without chemical treatment, meaning that there are no sharp to irritate the Skin. (R.Hardin. *et.al*2009) Bamboo fabric is favored by companies trying to use sustainable textile, because the bamboo plant is very quick growing and does not usually require the use of pesticides and replanted yearly to replenish stocks. The process of making unbleached bamboo fiber is very light on chemicals that could potentially harm the environment. (Shanmugasunderam 2007)

This study investigates the antimicrobial functionality of cotton fabric dyed using natural aqueous dyeing solutions obtained by extraction from vempadam bark (*ventilagomdraspantana*) *Staphylococcus aureus* and *Escherichia colimicroorganism* typically known to grown on textiles, were used as test organisms for the antimicrobial study. The antibacterial activity of the treaded AATCC method and found to have remarkable antimicrobial activity. In addition to the antimicrobial functionality the natural extract dyed fabric were also assessed for the fastness and wash durability properties.

## **2. MATERIALS AND METHODS**

### **2.1 Materials**

The dry rinds of the vempadam bark (*ventilagomadraspantna*) and mordant myrobalan, alum were collected from the Gandhigram, University in Dindugul. Bamboo bleached fabric of 40s count was purchased from National textile corporation limited, Coimbatore

### **2.2Preparation of sample**

The first rind of vempadam bark were dried under shade to remove the moisture content. After it has completely dried the bark rind were ground to a fine powder .the dry powder obtained was used for the process extraction

### **2.3. Extraction of dye solution**

The rind of the vembadam bark (*ventilagomadraspantna*) is dried and ground to a fine powder. The dry powder obtained is used for the process of dyeing. Aqueous dye solution was prepared by adding 100g of the vembadam bark rind fine powder to1 litter of distilled water in beaker. The extraction was done at 60<sup>0</sup>C 1hour. The hot solution was filtered through a clear filtrate. The filtrate was stored at 4<sup>0</sup> C and used for dyeing of bamboo and linen.

#### **2.4 Mordanting and Dyeing Process of Bamboo fabric**

Alum and myrobalan were used as mordant according to previous literature. Alum was used as pre-mordant, in which the fabric was treated with 3% alum for 20 minutes. The mordanted fabrics were dyed with the extracts. The solution was filtered and used for further dyeing process.

Bamboo fabric was dyed by the standard method as prescribed by Gulrajani and Gupta, (2001) for natural dyes. The vembadam bark dye solution was added into dye bath. The temperature was maintained at 60°C to 90°C. After 5 minutes 10 g/l common salt, was added to the dye bath. 2.5g/l soda ash was added after 60 minutes and dyeing continued for further 15 minutes at 90°C then the fabric thoroughly in cold water.

#### **2.4 ANTIBACTERIAL ACTIVITY BY QUALITATIVE METHOD (AATCC 147)**

The fabric sample was cut in a rectangular in shape with 25cm. 50 mm was taken for the analysis. Sterile Bacteriostasis agar was dispensed in to Petri dishes. Broth cultures (24 hours) of the test organisms were used as inoculums. Using sterile inoculation loop, the test organisms (*Escherichia coli* & *Staphylococcus aureus*) were streaked, 5 lines with 4 mm width over the surface of the agar plate. Presterilized samples were placed over the culture inoculated agar surface by using sterile forceps. After placing the samples, all the plates were incubated at 37 °C for 18 to 24 hours. After incubation, the plates were minutes for the zone of bacterial inhibition around the fabric sample. The size of the clear zone was used to evaluate the inhibitory effect of the sample.

#### **2.5 Colour Fastness to washing**

Wash fastness of all dyed sample was measured by the ISO 105-C03 testing method. Dyed sample were taken, stitched with one of the shorter side of the adjacent bleached fabric and was put to the bath containing 3gpl of soap, 2gpl of sodium carbonate and 1:3 MLR ratio at 60C for 30 minutes. Then the specimen was washed with hot water and cold water

#### **2.6 Colour Fastness to Rubbing**

Rubbing fastness of all the dyed sample was measured by dry and wet rubbing method. The dyed sample was fastness to the flat base of the crock meter and the bleached bamboo and linen measuring 5cm x5cm was mounting the sample, the handle was rotated to ten complete turn at the rate of one turn per second to slide the covered finger back and forth twenty time. Then both the dyed and bleached fabric was evaluated with grey scale for change and staining. The mean value wear tabulated.

#### **2.7 Sun light to washing**

Sunlight fastness of all dyed sample were exposed to sun for a period of time and then compared with an unexposed sample. A sample size of 35cm x 12cm was cut from dyed bamboo and linen fabric the sample was divided in to nine equal parts and making was made on the strip was covered with a back chart papers, marked with equal number of divisions. First division was exposed on sunlight. The second division was cut and exposed on sun light and so on .Finally the first division after exposure for seven days was assessed for colour change in comparison with the original using a grey scale rating. The mean values were tabulated.

### 3. RESULT AND DISCUSSION

#### 3.1 ANTIBACTERIAL ACTIVITY BY QUALITATIVE METHOD (A ATCC 147)

S. No.	Fabric sample	Antibacterial activity (Zone of Bacteriostasis (mm))	
		<i>Staphylococcus aureus</i>	<i>Escherichia coli</i>
1	The antibacterial activity of the Dyed bamboo with alum mordant fabric	33	32
2	The antibacterial activity of the Dyed bamboo with Myrobalan mordant fabric	37	36

While evaluating the antimicrobial activity of natural dye treated bamboo fabric as tested by parallel streak method a clear zone of inhibition was observed for both the test organisms. The result of parallel streak method is presented in figure.(1) the case of the antimicrobial activity of natural dyes bamboo with alum and Myrobalan mordant treated bamboo fabric by parallel streak method, the zone of inhibition was observed to be natural dyes bamboo alum with mordant 33mm for s.aureus and 32mm e.coli. Natural dyes bamboo with myrobalanmordant 36mm for s.aureus and 37mm e.coli.

**Antibacterial activity of treated bamboo Fabric-parallel streak test (AATCC 147)**

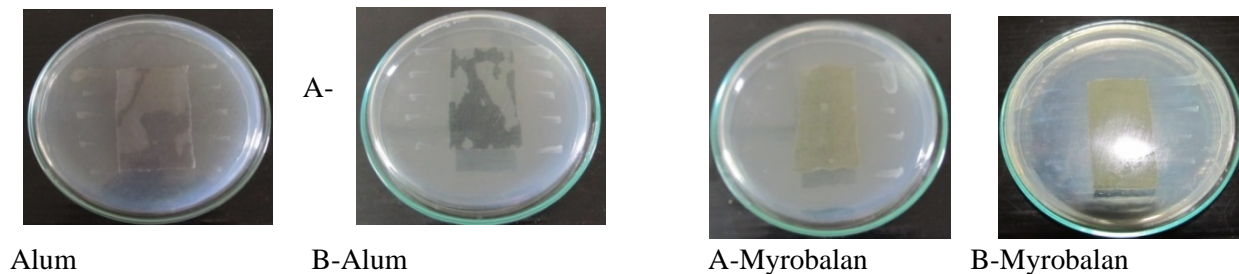


Figure 1. Plates showing Antibacterial activity of parallel streak method of *ventilagomadraspatina* extract treated fabric against (a) *Staphylococcus* (b) *Aureus Escherichia coil*

**3.2 WASH DURABILITY TEST FOR ANTIMICROBIAL ACTIVITY**

S. No	clove oil finished linen fabric	wash durability Zone of Bacteriostasis (mm)	
		<i>Escherichia coli</i>	<i>Staphylococcus aureus</i>
1.	After 5 washes	40	40
2.	After 10 washes	39	39
3.	After 15 washes	38	38
4.	After 20 washes	30	31

Wash Durability of Bamboo Finished Fabric		
Sample	<i>Escherichia coli</i>	<i>Staphylococcus aureus</i>

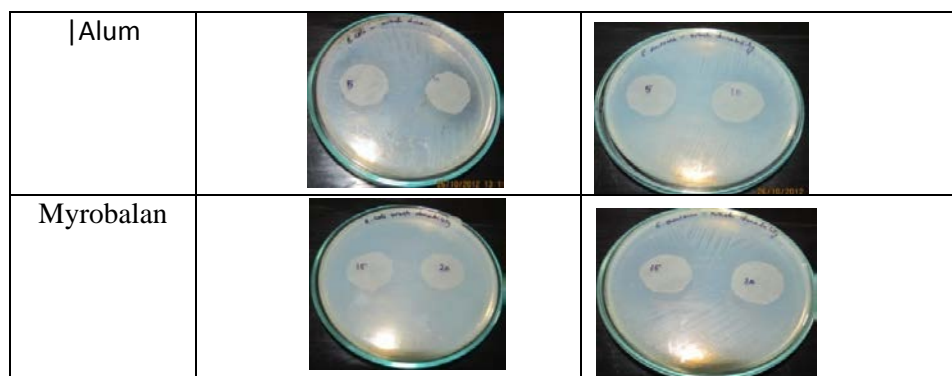


Figure 2. Plates showing wash durability of bamboo finished fabric (*ventilagomadraspantna*) extract treated fabric against (a)*Escherichia coli* (b) *Staphylococcus Aureus*

Wash durability test carried out with the test fabric showed that the significant antimicrobial activity was activity retained in the fabric treated with extract up 20 wash cycles. The assessment of wash durability of treated fabric was tabulated and represented in table (4.3.1) According to the result, after 5 washes, the natural dyed mordant Myrobalan finished fabric showed maximum inhibition against both the test organisms with average size of 40mm for *Staphylococcus aureus* and *Escherichia coli* whereas after 10 washes an inhibition of 39mm was seen against both the test organisms. After 15 washes, an inhibition of 38mm was found against both the test organisms. Even after 20 washes, an inhibition against both the test organisms with average size of 30mm against for *Staphylococcus aureus* and 31mm against *Escherichia coli* was observed. This study revealed that finished fabric natural dyed bamboo fabric with Myrobalan exhibited antimicrobial activity even after 20 washes.

### 3.3 COLOUR FASTNESS PROPERTY TO WASHING AND LIGHT AND RUBBING

The colour fastness properties of the cotton fabric dyed with natural extract were tested according to ISO standard terms according to the standard grey scale for colour change and grey scale for colour staining the result are observed and presented in table the colour fastness property of *ventilagomdraspantanadyed* fabric to lighting and rubbing were ranging from good to excellent level.

Sample	Washing		Sunlight		Rubbing			
					Wet Bamboo		Dry bamboo	
	Myrobalan	Alum	Myrobalan	Alum	Myrobalan	Alum	Myrobalan	Alum
Stain	4-5	3-4	3-4	3-4	3-4	3-4	2-3	4-5
Color in change	4-5	3-4	4-5	3-4	4-5	3-4	4-5	4-5

**Table 1.1:** Color fastness to washing and sunlight, rubbing

**NOTE:1 – Very poor; 2 – Poor; 3 – Medium; 4 – Good; 5 – Excellent**

#### 4. CONCLUSION

Bamboo fabric is very soft and can be worn directly next to the skin. Many people who experience allergic reaction to other natural fibers, such as wool or hemp, do not complain of this issue with bamboo. The fiber is naturally smooth and round without chemical treatment, meaning that there are no sharp to irritate the Skin The natural dyeing solution were obtained by from rind of *ventilagomadraspatina* used for dyeing bamboo fabric. Fastness properties of the dyed sample were studied. The natural extracts with cotton fabric had more affinity towards fabric and more stability of colorant to light, rubbing .washing and perspiration. The fabric dyed with the natural colour from *ventilagomdraspantanaextracts* displayed excellent antimicrobial activity against both the test organisms

#### SUGGESTION FOR FURTHER STUDIES

- The similar study can be done using natural dye and chemical dyes
- The woven or non-woven could be further developed as a developed as a different finishing method and test method
- The study can be used for children garment and medical textile and home textile

#### Reference:

1. Arora, A. textbook of dyes, Sonali publications, India, 2009
2. Gulrajani. M.L Srivastava, R.C.,Goel. m.,2001 colour gamut of natural dyes on cotton yarn colour technology 117,225-228

2Harin.R, Susan. S.Wilson, renukaDhandapani, and Vikram (2009) “An Assessment of the validity of claims for Bamboo Fabric” The University of Georgia. AATCC Review. Vol.9 No .10, October, 33-35..

3. Kothari.V.K and Sangeethyadav (2008) “Textile Innovation” The Indian Textile Journal, vol.17. no.11, November.

4. Liolios., cLaoure, w.,Boulaacheb,gortzio.NIoanna, c ..2007 chemical composition and antimicrobial activity of the essential oilof Algerian phlomisbeveide noe.subsb.bovei, moleculesiz 772-781

5.Shanmugasundaram O.L (2007) “The department of textile technology” K.S.R College of technology. Tiruchengode. “The Indian textile journal, Vol.8. Pg.53-53

IJSER



IJSER

IJSER

IJSER

IJSER