International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 05 Issue 17
July 2018

Assessment of Antimicrobial Activity of Developed Banana Fiber Fabric

M.Jayakumari [1],

[1]Assiistant Professor,Department of Textiles and Apparel Design,Bharathiar University,Coimbatore

ABSTRACT

The use of natural fibers such as flax, hemp, jute or sisal in this industry so far is small due to unavailability of a durable semi-finished product with constant quality. Advances in recent research and development have shown that these aspects can be improved significantly with the technology. Rapid interest has grown in the natural fiber sector due to the cheap availability of raw materials and their property of better stiffness per weight than glass, which results in lighter components. Yet another reason for the sudden attention to this area is that the environmental impact is smaller as the natural fiber can be recycled thermally and these fibers come from a renewable resource (Rijswijk *et al.*, 2001). These fibers can be explored to develop various technical textiles which are the need of the hour. This study aims in developing technical textiles that can serve multipurpose uses like soundproof, fireproof and antimicrobial at the same time

Keywords: Banana Fiber, Antimicrobial

INTRODUCTION

Banana has good specific strength comparable to those of conventional material, like glass fiber and has a lower density then glass fibers.Industrial textiles are now more often viewed as a subgroup of a wider category of technical textiles. These mainly involve those textile products used in the course of manufacturing operations such as filters, machine clothing, conveyor belts, abrasive substrates etc. or which are incorporated into other industrial products such as electrical components and cables, flexible seals and diaphragms, or acoustic and thermal insulation for domestic and industrial appliances.

These multifunctional finished fabrics would be a demand in many industrial products such as lining materials in coolants, washing machines and high end equipment to prevent the accidental damages and increasing the lifespan of the materials. When providing such kind of functional finishes to the fabric, the need for longer shelf life is important. Keeping this in mind the finished fabrics were also given an antimicrobial finish using commercially available

antimicrobial agents. By doing so the finished fabrics would have a longer shelf life and reduces the damage of the fabricated material.

OBJECTIVES

- To extract the fibers from Banana pseudo-stem and pre-treat them.
- To analyze the characteristics of banana fiber
- To explore the natural antimicrobial activity of banana fabrics and to develop a antimicrobial finish using commercial antimicrobial agents.

METHODOLOGY

ANTIMICROBIAL FINISHING OF BANANA FABRICS

PAD-DRY-CURING OF BANANA FABRIC

Principle

Padding is the most common finishing method for the application of the formulation to the textile materials in continuous process. Padding consists of contacting the textile materials with the formulation, usually by immersion and squeezing the formulation out with squeeze rolls.

Procedure

The pre-treated banana fabrics were coated with commercially available antimicrobial agent namely AB1000. This fabric was used for disc diffusion assay and quantitative bacterial reduction methods respectively. The plasma treated fabric was primarily coated with citric acid to ensure better binding of the prepared formulation using pad-dry-cure method.

For 1 gm of the fabric 20 ml of the plant extract and about 1.6 gm of citric acid was used as binder, the fabric was kept immersed in the treatment solution for 20 minutes. The padding mangle was run at 20-kgf/cm2 pressure (20 rpm speed). After padding, the fabric was air-dried and then cured for 3 min at 1400 C and immersed for 5 min in 2 g/l of sodium lauryl sulfate to remove unbound solutions and rinsed to remove the soap solution followed by air-drying. A 100% wet pick-up was maintained for all of the treatments.

ANTIBACTERIAL ASSESSMENT OF THE TREATED FABRICS

The antibacterial efficacy of the test fabric was assessed using the following tests.

a. Agar diffusion method (SN 195920)

b. Parallel streak method (AATCC 147)

c. Percentage reduction test (AATCC 100)

QUALITATIVE ASSESSMENT - AGAR DIFFUSION METHOD

The prepared dressings were placed in intimate contact with AATCC Bacteriostatic agar, which has been previously inoculated (Mat culture) with an inoculum of test organisms. After incubation, a clear area of interrupted growth underneath and along the side of the test material indicates antibacterial activity of the antimicrobial wound dressing.

Culture medium used

AATCC bacteriostatic agar medium was used as a growth medium for evaluation.

Composition

Peptone	10g
Beef extract	5g
Sodium chloride	5g
Agar	1.5 %
Distilled water	1000ml

Heating to boiling was done to dispense ingredients; pH 7.0-7.2 was adjusted with 1N sodium hydroxide solution if necessary.

Test specimen

The samples were cut into circular discs of 2 cm diameter.

Test organisms

Standard cultures of Escherichia coli and Staphy¬lococcus aureus were obtained from the MTCC, Imtech, Chandigarh were inoculated with sterile nutrient broth and incubated for about 24 hours and used to determine the inhibition action of the fabrics.

Escherichia coli (ATCC 11230), Staphy¬lococcus aureus (ATCC 6538) were the standard Gram positive and Gram negative cultures for the assessment of antibacterial activity of textile substrates as per the recommendation of AATCC.

Procedure

Sterile AATCC Bacteriostasis agar was dispensed in sterile Petri dishes. The culture specimen was adjusted to108cfu/ml. Using sterile cotton swab the test organisms were swabbed over the surface of the agar plate. The prepared fabrics were kept in the center of the plate and gently pressed. The plates were incubated at 37oC for 18-24 hours.

Evaluation

The incubated plates were examined for the interruption of growth over the inoculums. The size of the clear zone was used to evaluate the inhibitory effect of the test fabrics.

INTERPRETATION OF RESULTS

EN ISO 20645

Agar diffusion test was used to determine the antibacterial activity of the fabrics. The untreated and fabrics treated with antimicrobial agent were assessed for their antibacterial efficacy against *Staphylococcus aureus* ATCC 6538 and *Escherichia coli* ATCC 25922. The extent of their antibacterial activity (Zone of inhibition in mm) was measured and tabulated in the table---. The maximum antibacterial activity was observed against Gram negative bacteria *E. coli* of about 37mm followed by Gram positive bacteria *S. aureus* of 33 mm. The antibacterial activity of the control fabrics without treatment also showed zone of inhibition in case of Gram negative bacteria, which could be due to its natural property. Therefore, the zone of inhibition observed against Gram negative bacteria could also attribute to the natural efficacy of the fabric.

Antibacterial Assessment EN ISO 20645 Test Method

Sample	Zone of inhibition (mm)	
	S. aureus	***E. coli***
Control	-	12
Antimicrobial agent (AB 1000) finished banana fabric	33	37

Fabrics finished with commercially available antimicrobial agent inhibited all the studied organisms effectively (Plate----). Therefore, when these kinds of fabrics when used in the

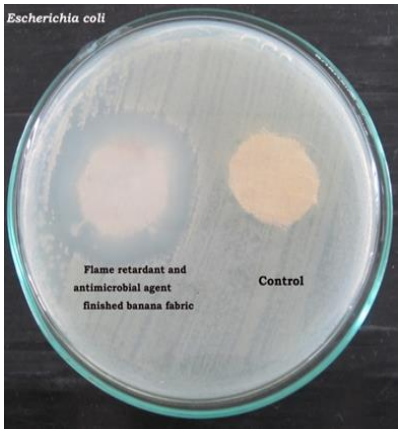
settings to provide flame proofing could have a longer life as they would be prevented from microbial attack.

ASSESSMENT OF ANTIFUNGAL ACTIVITY

AGAR DIFFUSION METHOD (AATCC 30 – TEST METHOD III)

Antifungal activity of the treated fabric was determined using AATCC 30 method. The fabric treated with antimicrobial agent was subjected to test their antifungal activity. Zone of mycostasis in mm were measured and tabulated in Table---- and shown in Plate-----

Sample	Zone of inhibition (mm)	
	A.niger	*T.reesei*
Flame retardant (Ecoflame CT6) and Antimicrobial agent (AB 1000) finished banana fabric	80	60



The maximum mycostasis of about 80 mm was observed against *Aspergillus niger* followed by 60 mm against *Trichoderma reesei* for the fabric treated with anti-microbial agent while there

is no zone of mycostasis for untreated fabric. Thus, the natural had significant hydrophilicity to absorb the agent thus producing zone against the test cultures studied.

SUMMARY AND CONCLUSION

The procured banana fibers were pre-treated with various concentration of sodium hydroxide for removing the components that hinder is activity. Among, various concentrations used 5 % of NaOH showed better yield and better processed fibers. The pretreated fibers were then spun to yarn and characterized. The yarn was then weaved using handloom weaving which was used for the study. Weaved fabric was characterized physically and chemically. The natural fibers has been explored for its potential as technical textile which could be used in various machines and commercial buildings as it can serve as flame retardant material which could reduce the accidents caused due to short circuits and other damages. Though, it has these properties, in order to increase its shelf life finishing the material with antimicrobial agents would be the most appropriate.

Therefore, the banana fabrics were finished with commercially available antimicrobial agent AB1000 which showed significant resistance against both Gram positive (18mm) and Gram negative (21mm) bacteria and mixed fungal spores. The results of AATCC 147 also showed that the fabric had good antibacterial effect of 15mm against E. coli and 17mm against S. aureus, similarly AATCC 100 method showed approximately 98% reduction in case of both the strains. The soil burial test showed that the fabric when finished with AB1000 has good strength in the fibers even after 9 days under the soil. This revealed the finished fabric had an efficient antimicrobial property**.**

REFERENCES

• Abdul Hakim Abdullah, Afiqah Azharia, Farrahshaida Mohd Salleh , Sound Absorption Coefficient of Natural Fibres Hybrid Reinforced Polyester Composites Jurnal Teknologi (Sciences & Engineering) 76:9 (2015) 31–36.

• Kumar, M.; Kumar, D. Comparative study of pulping banana stem. Int. J. Fibre Text. Res. 2011, 1, 1–5.

e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 05 Issue 17
July 2018

• Indian horticulture database 2011, Ministry of Agriculture, Government of India.

• van Rijswijk, K., Brouwer, W.D. and Beukers, A., (2001), Application of Natural Fibre Composites in the Development of Rural Societies, Structures and Materials Laboratory, Faculty of Aerospace Engineering, Delft University of Technology, 20 December 2001.