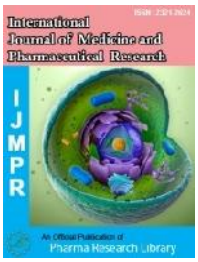
International Journal of Medicine and Pharmaceutical Research

Journal Home Page: www.pharmaresearchlibrary.com/ijmpr



RESEARCH ARTICLE

Comparision of Nano Antimicrobial Finished Organic Cotton and Bamboo Knits

S. Jayapriya*[1], Dr. G. Bagyalakshmi[2]

[1]*Assistant Professor and Head, Department of Costume Design and Fashion, Nehru Arts and Science College, Coimbatore Tamil Nadu, India*
[2]*Associate Professor, Department of Textiles and Clothing, Avinashilingam Institute for Home Science and Higher Education for Women University, Coimbatore, Tamil Nadu, India*

ABSTRACT

Now-a-days there is a gaining attention for Knit fabrics to be used in wider range including Technical Textiles. Two different Fabrics of Single Jersey Knit, Organic Cotton and Bamboo were used for the study. The Antimicrobial finish of nanoencapsulated Organic Cotton and Bamboo knit fabrics were tested for their effectiveness.

Keywords: *Antimicrobial, Organic Cotton, Bamboo, Knitted Fabric, nanoencapsulation*

ARTICLE INFO

***Corresponding Author**
S. Jayapriya
1Assistant Professor and Head, Department of Costume Design and Fashion, Nehru Arts and Science College, Coimbatore, T.N, India
MS-ID: IJMPR3579

PAPER QR-CODE

ARTICLE HISTORY: Received 19 December 2017, **Accepted** 29 January 2018, **Available Online** 10 February 2018

Citation: S. Jayapriya and G. Bagyalakshmi. Comparision of Nano Antimicrobial Finished Organic Cotton and Bamboo Knits. *Int. J. Med. Pharm. Res., 2018, 6(1): 17-20.*

CONTENTS

1. Introduction

There is a vast potential in medical clothes with textile finishes and enormous application of antimicrobial finish in textiles. Nano technology is the most promising area in all disciplines. A lot of innovations are happening in every day but still there is a hope of new research work in nanotechnology. Nano encapsulation is a method wherein the interior core is surrounded with wall material and it is in nano size. Plant bioactive agents can be released with the help of **Herbal** nano encapsulated finish in the fabric. Studies notify that many plants posses antibacterial activity which can be used for Textiles (1). When Natural herbs are used for the extraction of eco-friendly finish, it lowers the cost and also its allergic reaction caused when compared with synthetic compounds (2). The present study aims at constructing Antimicrobial finished nanoencapsulated Organic Cotton and Bamboo knit fabrics using Herbal combinations and evaluating its effectiveness in standard test methods.

The objectives of the study are as follows:

- To choose suitable herbs and Fabrics
- To treat organic cotton and bamboo fabric using the best herbal finish
- To assess qualitatively the antimicrobial activity in antibacterial nanofinished organic cotton and bamboo knitted fabrics

2. Materials and Methods

2.1. Solvent Extraction of Collected Herbs and Fabric Selection:

The Fresh plant material of the three different plants (*Punica granatum, Moringa concanensis, Psidium guajava)* were washed twice in fresh water, air dried and powdered using a mortar and pestle and stored in air tight container. 6 gram of powdered plant material was combined in different ratios like (1:2:3) and added to 1000 ml of 80% ethanol solvent. The prepared composite kept in a reciprocating shaker for 24 h for continuous agitation at 150 rpm/min for thorough mixing and also complete elucidation of active materials to dissolve in the respective solvent. Then, extract was filtered by using muslin cloth followed by Whatman no.1 filter paper. Finally, the residues were collected and stored for further experiment. Bamboo and Organic Cotton Single Jersey Knit Fabrics were selected. By considering the ecofriendliness in them the above two fabrics were selected.

2.2. Wall and core materials

The herbal extract composite (*Punica granatum, Moringa concanensis, Psidium guajava*- 1:2:3 combination) prepared were encapsulated using bovine albumin fraction as the wall material and the nanoparticles as the core material.

2.3. Bacterial cultures used

Escherichia coli and *Staphylococcus aureus* are the Two bacterial cultures, which were commercially used and hence it was procured

2.4. Nanoencapsulation

The coacervation process of the herbal extract enclosed with Bovine serum albumin protein followed by cross-linking with glutaraldehyde. Then the Herbal composite was incubated with a requisite of 4% protein solution (W/V) for one hour in room temperature. The pH of the solution was adjusted to 5 .5 by 1M HCL using digital pH meter. Then ethanol was added to the solution in the ratio of 4:1 (V/V). The rate of herbal extract addition was carefully controlled at 1 ml per minute. The coacervate so formed was hardened with 25% glutaraldehyde for 2 hours to allow cross-linking of protein. Organic solvents were then removed under reduced pressure by rotary vacuum evaporator and the resulting nanocapsule were collected and stored for further studies.

2.5. Fabric finishing with Nanoencapsules using Exhaust Method:

The selected fabric sample (Bamboo and cotton) was finished with the prepared composite of nanoencapsules according to the following recipe (3). About Two litre solution containing 1400g of nanocapsule was used to finish one meter of cotton and bamboo fabric. The fabric was immersed in the herbal nanoencapsulates along with binder solution (8% citric acid) for 30min under 50ºC in an oven. After 30min, the fabric was removed and air dried in shade.

2.6. Antibacterial Activity By AATCC 147

Sample of the test material along with untreated test material is placed in close contact with agar surface that is already streaked with an inniculums of *Escherichia coli* and *Staphylococcus aureus* (4). The test material is checked for the clear area of growth under and in the sides after incubation for the antibacterial activity of the specimen. The middling width of a zone of inhibition with the streak on both the sides of the test specimen is measures for its effectiveness (5). To compute the effectiveness of antimicrobial textiles, examination methods adopted in controlled conditions should reproduce results wanted (6).

2.7. Wash Durability Testing (AATCC 124-1996)

The samples were washed with 5% neutral soap solution for 20 mins and dried. The washed samples were tested for the retention of antimicrobial activity after every10 launderings for 30 washes using standard procedures.

3. Results and Discussion

3.1. Antibacterial Activity By AATCC 147

The AATCC Bacteriostasis agar plates were prepared by pouring 15ml of AATCC Bacteriostasis agar media into sterile petri plates. The plates were allowed to solidify for 10min and the bacterial culture was inoculated as single line followed by the four lines without refilling the inoculation loop. The antibacterial activity of cotton and bamboo unfinished fabric, Nanocapsule finished fabric and its durability to washed including 10^{th} , 20^{th} and 30^{th} were evaluated by cutting the fabric into 5 X 2.5 cm size with the diameter of 2.5 cm was placed over the inoculated bacterial species. The plates were kept for incubation at 37ºC for 24 hours. The zone of inhibition produced was measured at the completion of incubation and it's noted in millimetre.

Table 1: Antibacterial activity by AATCC 147

S.No	Fabric Sample	Zone of inhibition in mm	
		E.coli	***S.aureus***
1	Nanocapsule finished Bamboo	42	51
2	Nanocapsule finished Organic Cotton	40	41

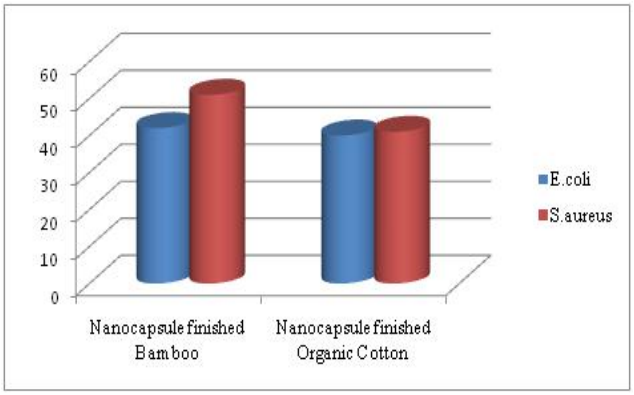


Figure 1: Antibacterial activity by AATCC 147

From the above Table 1 and Figure 1 , it can be identified that Nanocapsule finished Bamboo posses the maximum Zone of inhibition in mm against *S.aureus*, and Nanocapsule finished Organic Cotton showed a lower Zone of inhibition in mm against *E.coli.*

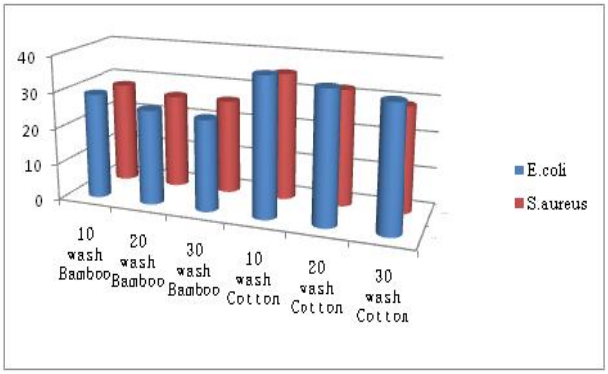


Figure 2: Antibacterial activity by AATCC 147 (Wash durability)

From the Table 2 and Figure 2 it can be concluded that in nano Bamboo fabrics *E.coli* showed the highest Zone of inhibition in mm.

3.2. Antifungal Activity Assessment by AATCC 30 - 2003 Test Method: The antibacterial activity of cotton and bamboo unfinished fabric, Nanocapsule finished fabric and its durability to washed including 10^{th} , 20^{th} and 30^{th} were placed in intimate contact with Antifungal agar medium, which has been previously swabbed with broth suspension culture of test organisms *Aspergillus niger* (ATCC 6275) and *Trichoderma reesei* (ATCC 28020). The antifungal effectiveness is measured by recording the clear area of uninterrupted growth below and in sides of the fabric, after incubation (5).

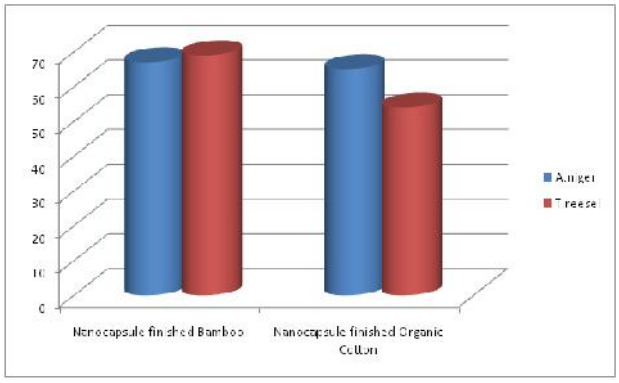


Figure 3: Antifungal activity assessment by AATCC 30 - 2003 test method

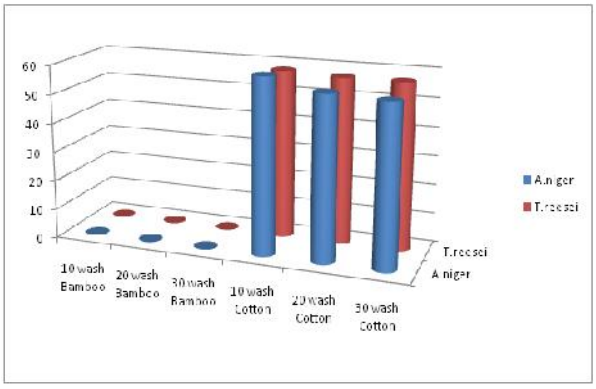


Figure 4: Antifungal activity assessment by AATCC 30 - 2003 test method (Wash durability)

Table 2: Antibacterial activity by AATCC 147 (Wash durability)

S.No	Fabric Sample		Zone of inhibition in mm	
			E.coli	***S.aureus***
1	Nanocapsule finished Bamboo	10^{th} Wash	29	28
2		20^{th} Wash	26	26
3		30^{th} Wash	25	26
4	Nanocapsule finished Cotton	10^{th} Wash	38	35
5		20^{th} Wash	36	32
6		30^{th} Wash	34	29

Table 3: Antifungal activity assessment by AATCC 30 - 2003 test method

S.No	Fabric Sample	Zone of inhibition in mm	
		A.niger	*T.reesei*
1	Nanocapsule finished Bamboo	67	69
2	Nanocapsule finished Cotton	65	54

Table 4: Antifungal activity assessment by AATCC 30 - 2003 test method (Wash durability)

S.No	Fabric Sample		Zone of inhibition in mm	
			A.niger	***T.reesei***
1	Nanocapsule finished Bamboo	10^{th} Wash	0*	0*
2		20^{th} Wash	0*	0*

3		30^{th} Wash	0*	0*
4	Nanocapsule finished Cotton	10^{th} Wash	60	58
5		20^{th} Wash	56	57
6		30^{th} Wash	55	57

4. Conclusion

Clothing which was considered as mere has now changes its applications in Functional areas too. There are more researches happening in exploring new potential Antimicrobial finishes for the benefit of humankind. There is a lot of research focus and added value of technical textiles. Hence textile finishes with more add on value in it can be employed in Medical environment. It also paves way to a niche market in the global arena.

5. References

[1] Thilagavathi G and Rajendra kumar K, Development of ecofriendly antimicrobial finishes using herbs, *Indian Journal of Fiber and Textile Research*, 2005, 30: 431-436.

[2] El-Shafei A, M.K. El-Bisi, S. Zaghloul and R. Refai. Herbal Textile Finishes –Natural Antibacterial Finishes for Cotton Fabric, *Egyptian Journal of Chemistry*, 2017, 60(2): 161- 180.

[3] Sumithra M, Raaja VN, Antifungal Activity of Herbal Finish on 100% Cotton Denim Fabric, *Journal of Fashion Technology and Textile Engineering*, 2014, 3(1).

[4] Sathianarayanan M P, Bhat N V, Kokate S S, Walunj V E (2010), Antibacterial finish for cotton fabric from herbal products, *Indian Journal of Fiber and Textile Research*, Vol. 35, pp: 50-58

[5] Jayapriya S and Bagyalakshmi G. Textile Antimicrobial Testing and Standards, International Journal of Textile and Fashion Technology (IJTFT), 2013, 4(1):1-10

[6] Wayne Swofford. An Overview of Antimicrobial Testing for Textile Applications, AATCC Review, 2010, 10(6): 51.

[7] AATTC Test Method 30-2004 (2012), Antifungal activity, assessment on textile materials: mildew and rot resistance of textiles, AATCC Technical manual, American Association of Textile Chemists and Colorists, Research Triangle Park, NC., pp: 80-82.