Antibacterial Finishes on Nonwoven Fabric With Pterocarpus Marsupium And Gymnema Sylvestre

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Abstract- *This paper reports the herbal products for antimicrobial finishing of textile substrates. Textiles in apparel have retained an important place in human life, starting now into developing of newer high technology and interdisciplinary products. Health care and hygiene products include both disposable and non-disposable products mainly used in hospitals such as surgical gowns, surgical masks and gloves, diapers, sanitary napkins, wipes and incontinence products. Plants and plant product are traditionally used for healing of wounds, burn injuries, anti fungal, anti viral, anti bacterial and anti microbial activity against skin infections. Herbal plant extract for antimicrobial finishing in textiles because of the excellent antimicrobial and eco friendly properties exhibited by them. Nowadays the consumers are demanding eco-friendly products. Hence the research has been carried out to use natural herbal plant extracts for antibacterial finishing in textiles because of the excellent antibacterial properties exhibited by them.*

Keywords- Antibacterial Finish, Gymnema Sylvestre, NonWoven Fabrics, Pterocarpus Marsupium,

I. INTRODUCTION

Non-woven fabrics are differentiated text which covers overall stream from fibers to final products and includes features of manufacturing and finish process with specialized application end use. Application range of non-woven fabrics is extended to all the industrial fields needless to say apparel, bio- and medicals, automobiles, architectures, construction and environmental. The rapid growth in technical textiles and their end-uses has generated many opportunities for the application of innovative finishes. Antimicrobial textiles with improved functionality find a variety of applications such as health and hygiene products in several medical applications, such as infection control and barrier material. Evolution is a constant and human race is constantly trying to upgrade to better quality of life. One of the outcomes of this "growth" is the need for healthier living through better hygiene. Health care and hygiene products include both disposable and non-disposable products mainly used in hospitals such as surgical gowns, surgical masks and gloves, surgical drapes, surgical foot wear and head wear, staff apparel, towels, bedding, diapers, sanitary napkins, tampons, panty shield, wipes, incontinence products

The term technical textiles was coined in the 1980s to describe the growing variety of product and manufacturing techniques being developed primarily for their technical properties and performance rather their appearance or other as aesthetic characteristics, remark Nadiger et al. (2008). They generally fall in two category i.e. disposables or durables and provide the basis for a wide variety of consumer, industrial and health care products used around the world, describe Advarekar et al. (2007). The rapid growth in technical textiles and in their end uses has generated many opportunities for the application of innovative finishes. Novel finishes of high added value for apparel fabrics, home textiles are also greatly appreciated by a more, discerning and demanding consumer market, indicates Holmes (2007). The modern trend is towards the production of durable and lasting finishes.

The term antibacterial finishes indicates controlling or limiting the growth of bacterial colonies and their extinction, defines Achwal (2003). The antibacterial finish protects wearers of the textile product for against bacterial, dermatophytic fungi, yeasts, viruses and other deleterious microorganisms, states Jasuja (2004). Antibacterial control, destroy or suppress the growth of microorganisms and their negative effects of odour, staining and deterioration.

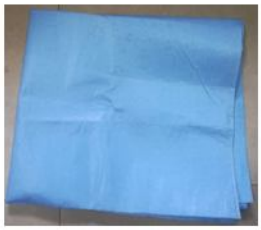
G. Sylvestre is used in folk, Ayurvedic system to treat type 1 and 2 diabetes. It is also used in the treatment of urinary complaints, stomach problems, piles, chronic cough, breathing troubles, asthma, eye complaints, cardiopathy, constipation, jaundice, and bronchitis, It is also used by trials to treat to neutralize the toxin of snake bite. (Selvanayagam 1995)

Parts of the Indian Kino (heart wood, leaves and flowers) have long been used for their medicinal properties in Ayurveda. The heart wood is used as an astringent and in the treatment of inflammation. The wood and bark of *Pterocarpus* are known for their anti-diabetic activity (Ivorra et al., 1989; Kameswara et al., 2001)

II. MATERIALS AND METHODS

Selection of Material

Poly/Viscose Nonwoven fabric was purchased from TITs consultancy SWAKAR HOUSE, Coimbatore. Fabric details are given in table 1

FABRIC SAMPLE	FABRIC DETAILS		
	1	Fabric	Non woven blended
	2	Composition	Poly/viscose
	3	GSM	101
	4	Thickness	0.40 mm

Selection of herbal

The herbs selected for antimicrobial finishes were *Pterocarpus marsupium* and *Gymnema Sylvestre*. The herbs leaves powder were purchased from Genius Herbal Private Limited Pachapalaiyam.

Extraction of Herbs

Carbinol Solvents were used for the extraction purpose, which could help to bring out the components present in the herb. Extraction was carried out by dissolving 10gms of the each herbal powder in 100ml the mixture was kept overnight under room temperature. After overnight the extract was filtered using what man no.1 filter paper. The filtrate was collected and evaporated at room temperature and kept for further studies.

Finishing Treatment on Fabric

Polyester Viscose Non-woven fabric was finished by using the carbinol extracts of each herbal *Pterocarpus Marsupium and Gymnema Sylvestre* by pad-dry-cure method separately. In padding technique, fabric was passed through two iron rollers revolving at different speed in opposite direction as the application of finish by padding is more convenient and many of the problems related to exhaust techniques can be avoided primarily in padding stage.

Polyester Viscose Non Woven Fabrics using padding mangle. The fabrics samples were immersed in the prepared herbal extracts and were passed through a padding mangle. The padded fabric was air dried and then cured for 3 min at 140 ˚C.

III. ANTI BACTERIAL ACTIVITY OF TREATED FABRIC

Principle

The Parallel Streak Method has filled a need for a relatively quick and easily executed qualitative method to determine antibacterial activity of diffusible antimicrobial agents on treated textile materials. The objective of this test was to detect bacteriostatic activity on textile materials. The Parallel Streak Method has proven effective over a number of years of use in providing evidence of antibacterial activity against both Gram positive and Gram negative bacteria.

Specimens of the test material including corresponding untreated controls of the same material were placed in intimate contact with AATCC bacteriostasis agar, which has been previously streaked with an inoculum of a test bacterium. After incubation, a clear area of interrupted growth underneath and along the sides of the test material indicated antibacterial activity of the specimen. A standard strain of bacteria was used, which was specific to the requirements of the materials under test.

Culture medium used

AATCC bacteriostasis agar medium was used as growth medium for valuation. (Composition is as mentioned earlier).

Test specimens

Test specimens of both treated fabric were taken, and they were cut in to pieces of 25mm x 50mm size. A 50mm length permitted the specimen to lay across 5 parallel inoculums streaks each of diminishing width from both 8mm to 4mm wide.

Test cultures used

Escherichia coli (ATCC 11230), *Staphylococcus 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 petridishes. 24 hrs broth cultures of test organisms were used as an inoculum. Using sterile 4mm inoculating loop, a loop full of culture was loaded and transferred to the surface

of the agar plate by making five parallel inoculum streaks approximately 60mm in length and spaced 10mm covering the central area of the petridish without refilling the loop. The test specimen was gently pressed transversely, across the five inoculums of streaks to ensure intimate contact with agar surface. The plates were incubated at 37°C for 18 to 24 hours.

IV. RESULT AND DISCUSSION

The inoculated plates were examined for the interruption of growth along the streaks of inoculums beneath the fabric and for a clear zone of inhibition beyond the fabric edges as shown in plates. The average width of the zone of inhibition around the test specimen was calculated in mm and values are given in the table 2.

Plate 1 – E.coli

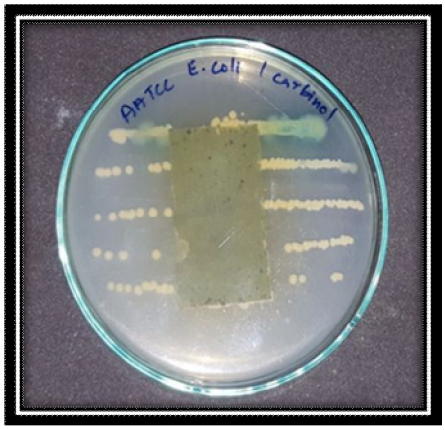


Plate 2- S.aureus

Plate 1 and 2 are Antibacterial Activity of *Pterocarpus Marsupium* treated non woven fabric.

Plate 3- E. coli

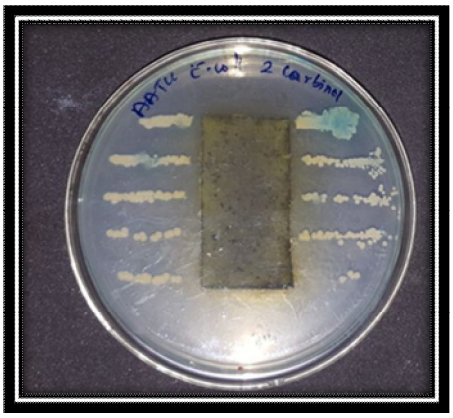


Plate 4- S. aureus

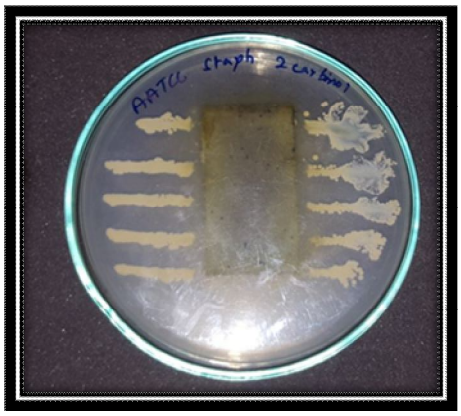


Plate 3 and 4 are Antibacterial Activity of *Gymnema Sylvestre* treated non woven fabric.

Table- 2 Antibacterial Activity of Treated Non Woven Fabric

S. No	Samples	Zone of inhibition (mm)	
		E.coli	*S.aureus*
1.	*Pterocarpus Marsupium*	18	21
2.	*Gymnema Sylvestre*	22	19

The antibacterial activity of *Pterocarpus Marsupium* plant E.coli is 18mm and S.aureus is 21mm zone of inhibition in the treated fabric. The antibacterial activity of *Gymnema Sylvestre* plant E.coli is 22 and S. aureus is 19 mm zone of inhibition in the treated non woven fabric.

V. CONCLUSION

There are vast resources of natural antimicrobial agents which can be used for imparting useful antimicrobial property to textile substrates. The activity and composition also vary depending on their geographical location, age and method of extraction. *Pterocarpus Marsupium* and *Gymnema Sylvestre* treated fabrics show good antimicrobial activity on

treated samples The performance of both treated fabrics is satisfactory. Two Antibacterial finished fabric which can be used in medical textiles as drapes, mask, and wipes. Thus using of the disposable products with antimicrobial finishing can provide a good protection to the people.

REFERENCES

[1] Achwal, (2003), "Antibacterial finishes and their modification", Colourage, Vol. 50, No. 1, January, P. 58.
[2] Adivarekar, R.V., Kanoorgo, N.V. and Sabaie, A.G., (2007), "Super absorbent polymers in textiles synthesis and application", Asian Textile Journal, Vol. 16, No. 6, June, P. 36.
[3] Benjamin, J. Miller, David Namiz, William V. Lewit and Allan, Holme, I., (2007), "Colouration Technology", Vol. 123, April, P. 59.
[4] Jasuja, (2004), "Antibacterial and anti-insect finishes", New Cloth Market, Vol. 18, No. 12, December, P. 13.
[5] Kameswara RB, Giri R, Kesavulu MM and Apparao CH (2001) Effect of oral administration of bark extracts of *Pterocarpus santalinus* L. on blood glucose level in experimental animals. *Journal of Ethnopharmacology* 74:69-74.
[6] Nadiger, G.S. and Ghosh, P.S., (2008), "An important technical textile segment", MedicalTextiles, Asian Technical Textiles, Vol. 2, No. 1, January – March, P. 35.
[7] Selvanayagam, Z.E. Gnanavendhan, S.G. Chandhra Shekaran, P. Balakrishna, K. and Rao, R.B. (1995) Plants with antisnake venom activity- a review on pharmacological and clinical studies. *Fitoterap*, 65: 99-11.