



Anti bacterial efficiency of plant Bio active agents on Bamboo spunlace fabric.

KEYWORDS

Anti bacterial, bamboo spunlace, plant extracts.

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ABSTRACT *Bamboo is a soft absorbent material used extensively these days for many applications particularly in health care sector. Bamboo nonwoven finished with natural plant bio active agent enhances its antimicrobial feature and plays an excellent role in anti bacterial study. The present study was focused on extraction of Aloe vera, Aerva lanata, Tectona grandis, Teatree and Rosmarinus officinalis plant bioactive agents using ethanol as solvent in soxhlet apparatus followed by optimizing the plant extract at different concentrations of 1%, 3%, 5% and 7%. Along with it the primary phytoconstituents were screened for the above plants. The various concentrate of the plant extract solutions were then finished on bamboo nonwoven spunlace fabric by loading method. The finished samples were evaluated for the anti bacterial assessment AATCC 90-2011 against gram positive and gram negative pathogens for its performance as antibacterial fabric that can be used in healthcare and hygiene textiles.*

INTRODUCTION

Textile consumers are now becoming much more aware of the deleterious effect that micro organisms may have upon textiles and human hygiene [1]. The textile industry continues to look eco friendly process that can be carried out without toxic textiles chemicals. In view of this point, herbal extracts are excellent candidates for an eco-friendly textile industry [2]. Various plants are used in our traditional practice as an anti microbial agent. The use of plant and plant products could be traced as far back as the beginning of human civilization. Medicinal plants are a source of great economic value all over the world [3].

The screening of plant extracts and plant products for antimicrobial activity has shown that plants represent a potential source of new anti infective agents[4]. In this study *Aloe vera*, *Aerva lanata*, *Tectona grandis*, *Teatree* and *Rosmarinus officinalis* were selected to check its antibacterial efficiency at various concentration levels on bamboo spunlace nonwoven fabric.

MATERIALS AND METHODS

Preparation of plant extracts

The fresh plants of *Aloe vera*, *Aerva lanata*, *Tectona grandis* were collected in Coimbatore, *Teatree* and *Rosmarinus officinalis* were collected from Medicinal Plant Development Association Dodabetta, Ooty. All the five plants were washed in running water and then rinsed in distilled water. The plants were subjected to shade drying for seven days and then it was powdered in an electric grinder. 50g of each source was packed in a thimble and kept inside the extractor with 500 ml of ethanol in the round bottom flask. Extraction process was carried out in the soxhlet apparatus for 12 hours at 40°C. The solution thus obtained was filtered and distilled, the excess solvent was removed by evaporation at room temperature. By this procedure the crude of all the five plants were obtained.

Selection of fabric

Original bamboo fibers have strong antibacterial and germicidal effect and hence they are ideally suitable for medical textiles. The bamboo fibers are also ecofriendly and bio degradable [5]. Bamboo spunlace fabrics with its smoothness and softness it can be used for healthcare textiles. Hence bamboo spunlace fabric was chosen for the study.

Optimizing the plant extracts

Optimization of the crude extracts of *Aloe vera*, *Aerva lanata*, *Tectona grandis*, *Teatree* and *Rosmarinus officinalis* were done to arrive at the

required concentrations of the plant extracts to act as antimicrobial agents on the textile material. To test the potential concentration of the plant extracts the crude was diluted to 1%, 3%, 5% and 7% concentrations. The plant crude was weighed and dissolved for respective concentrated solution in 99.9% ethanol by using a magnetic stirrer.

Application on the fabric

The prepared solutions of various concentrated plant bio active substance were applied on the bamboo spunlace nonwoven fabric surface using an ultra sonic atomizer. The fabric sample is placed in a tray and the solution is sprayed evenly on the fabric. The inlet tube is immersed in the plant solution kept in a beaker, the other end of the tube is connected to an atomizing probe (nozzle), by a small low pressure metering pump the solution is pumped and sprayed on the fabric. The size of the tube was 4mm and 40KHZ wide dispersion probe was used in the study with the flow rate of 10ml/min. The fabric is then subjected to drying at room temperature and taken for further analysis.

Antimicrobial assessment of the finished fabric

The antibacterial assessment of the various concentrations of plant extracts treated fabrics were analyzed against *E.coli* and *S.aureus* as per AATCC 90-2011, agar plate method. The samples were placed in the plates spreaded with inoculums and incubated at 37 ± 2oc for 18-24 hours.

Phytochemical analysis

The plant extracts of *Aloe vera*, *Aerva lanata*, *Tectona grandis*, *Teatree* and *Rosmarinus officinalis* were analyzed for phytoconstituents screening to check for the presence of biologically active compounds like alkaloids, flavonoids, tannins, saponins, phenols and triterpenoids.

RESULTS AND DISCUSSION

Antibacterial assessment

The anti bacterial results of the plant extracts treated bamboo spunlace fabric showed good antibacterial activity for all 1%, 3%, 5% and 7% except for teatree which did not inhibit bacterial growth at 1% and 3% (table 1). It was seen that increase in the concentration of the plant extract showed increase in the zone formation at 7%. When considering its efficiency towards pathogens all plants exhibited good zone from 4mm -7mm in *Aloe vera*, 2mm-4mm in *Aervalanata*, 1mm-5mm in *Tectona grandis*, 2mm-4mm in *Teatree* and 2mm -6mm in *Rosemary*.

Table 1. antibacterial activity of the plant extracts

s.no	Plant source	% conc.	s.aureus (mm)	e.coli (mm)
1	Aloe vera	1	4	4
		3	4	6
		5	4	5
		7	7	6
2	Aerva lanata	1	4	4
		3	4	4
		5	3	4
		7	2	4
3	Tectona grandis	1	2	1
		3	2	2
		5	3	3
		7	5	5
4	Tea tree	1	-	-
		3	-	-
		5	2	3
		7	3	4
5	Rosemary	1	2	-
		3	5	4
		5	6	5
		7	5	5

Photochemical analysis

Preliminary phytochemical screening of the each plant extract gave positive reactions for most of the compounds (table 2). But it was seen that flavonoid was absent in tectona, teatree and rosemary. saponin, tannin, phenol and triterpinoid were commonly present and alkaloid was present only in Aervalanata and Teatree. These phytochemicals has impact to greater extent in inhibiting pathogens. These plant compounds fight against the bacteria and tend to inhibit its growth.

Table -2: Phytochemical analysis of the plant extractrs

S.No	Phytochemical compound	Aloevera	Aerva lanata	Tectona	Tea tree	Rosemary
1	Alkaloids	-	+	-	+	-
2	Flavonoids	++	+	-	-	-
3	Saponins	++	++	+	++	++
4	Tannins	++	++	++	++	-
5	Phenol	++	++	++	++	++
6	Triterpinoids	++	+	-	++	++

CONCLUSION

The present study aimed at evaluating the antibacterial efficacy of *Aloevera*, *Aerva lanata*, *Tectona grandis*, *Teatree* and *Rosmarinus officinalis* at 1%, 3%, 5% and 7% concentration when applied to bamboo spunlace nonwoven fabric. The fabrics exhibited good antimicrobial activity by zone formation around the sample fabric. The plant extracts were able to percolate thus inhibiting the growth of bacteria. Further preliminary screening of phytochemicals was done which showed the presence of major phytochemicals in the plant extracts. These phytochemicals may be responsible for the observed antibacterial quality. Hence these plant bioactive agents can be used for fabricating textile products in the field of medical textiles, hygiene and healthcare products.

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