

Eco-Friendly Herb Extracts Treated On Cotton Fabric Using Antibacterial Activity

Dr. M.sumithra,

Assistant Professor, Department Of Textiles And Apparel Design, Bharathiar University, Coimbatore

ABSTRACT: Eco-friendly products are highly beneficial to our health as also to the environment. The quality of our lives can be greatly improved with the use of these green products that are made from natural raw materials. In this work, medicinal herbs such as Tribulusterrestris – Whole plant, Cissusquandrangularis – Whole plant, Leucasaspara - Stem, Leaf and flower, Passiflorafoetida – Stem, Leaf and flower and Cereus janacaru – Whole plant have been selected for finishing hundred percent cotton fabric using dip method. The finished fabrics have been tested for its antimicrobial activity using standard test method ENISO 20645 and it is concluded that Tribulusterrestris – Whole plant have good antibacterial activity. When compared to other herbs, Tribulusterrestris – Whole plant enhanced the wearing capacity of the fabric for an extended period without any skin/dermal irritations and infections.

Keywords: Antibacterial Activity, Cotton Fabric, Dip Method, Eco-Friendly and Medicinal Herb

I. INTRODUCTION

'Eco-friendly' refers to a friendly relationship between humans and their habitats. In other words, humans taking good care of the environment in which they live. Today, in order to protect the environment; the consumers have had a change in their mind set, and have turned towards eco-friendly clothing. Now, many clothing companies offer such eco-friendly clothes due to the increase in demand for Green Fabrics, as mentioned by Bajwa & Chawla (2011). Herbal remedies are safer than the corresponding pharmaceutical drugs, says Jose (2005). Cotton fabrics by their water absorbent capability, absorb human perspiration, thus increasing the comfort feel of the wearer. The humid Indian climatic conditions lead to perspiration which is an excellent ground for the growth of microorganisms, which is not visible to the human eye, this has to be cured by the application of antimicrobial finishes on to the fabric during the final processing stage to impart better antimicrobial properties Farida et al (2015). Textiles are excellent substrate for bacterial growth and microbial proliferation under appropriate moisture, nutrients and temperature conditions. In the ample of various finishes, importance is given to herbal antimicrobial finish since people take much care about health and hygiene. The herbal antimicrobial agent for textile material is an agent that destroys or inhibits the growth of micro-organism like bacteria, fungi, yeast and algae views Hooda et al (2013).

There are many ways in which the surface properties of a fabric can be manipulated and enhanced, by implementing appropriate surface finishing and coatings. Hence the present study is taken up with the following objectives.

II. OBJECTIVES

To screen for functional properties such as Antibacterial from selected herbs, To optimize the effective herbal of the functional property of the selected finishes, To finish the herbal on the hundred percent cotton fabric using dip method and to identify the good antibacterial activity in herbs.

III. MATERIALS AND METHODS

Materials:

100% cotton woven fabric were used for this study. The medicinal herbs used for the research work were sourced in and around Coimbatore district. The plant parts were washed twice in freshwater to remove epiphytes and other extraneous matter from the plants. The selected five herbs were used for the antibacterial finish.

IV. METHODS

Pre-treatment of fabric

Desizing of selected samples to make it suitable for further processing was done. The desizing was done for selected 100% cotton woven fabric.

Selection of herbs

For this research Tribulus terrestris – Whole plant, Cissus quadrangularis – Whole plant, Leucas aspera - Stem, Leaf and flower, Passiflora foetida – Stem, Leaf and flower and Cereus janacaru – Whole plant have been selected. These herbs were selected because they exhibited antibacterial activity and tannic properties.

Extraction process of herbs

The extraction process was done in three stages, such as drying, grinding and extraction. Two types of extraction methods were followed: methanol and aqueous extraction was done for all the five selected herbs.

Methanol extraction

The following recipe was used for the Methanol extraction of selected five herbs individually.

Recipe

Herbal powder	-	5.5 grams
Methanol	-	70 ml
Aqueous (distilled Water)	-	20 ml
Temperature	-	Room temperature
Time for incubation	-	24 hours
Filter paper	-	Whatmann no.1 filter paper

Procedure for methanol extraction

The above selected recipe was used for extraction. 5.5 grams of the herbal powder was mixed thoroughly with methanol and water and it was kept in airtight conical flask. The conical flask was incubated for 24 hours in the room temperature. The supernatant was filtered using a Whatmann no.1 filter paper and the filtrate was dried and the methanol was evaporated at room temperature. When exposed to the air. The filtrate was collected and kept in an air tight container for further study. The same method was used to collect filtrates of herbal powder of selected five herbal samples.

Aqueous extraction

The following recipe was used for the aqueous extraction of selected five herbs.

Recipe

Herbal powder	-	5.5 grams
Aqueous (distilled water)	-	100 ml
Temperature	-	Room temperature
Time for incubation	-	24 hours
Filter paper	-	Whatmann no.1 filter paper

Procedure for aqueous extraction

5.5 grams of dried herbal powder was mixed in 100ml of water slowly and mixed thoroughly in an air tight conical flask by shaking the flask for thorough mixing of herbal powder. The powder was allowed to dissolve in the water homogeneously. Then the extract solution was filtered with Whatmann no.1 filter paper. The sediment/filtrate extract was allowed to dry in the room temperature. The filtrate/extract was collected and kept in an air tight container for further study. The same procedure was followed for selected five herbs.

Preparation of fabric

The desired 100% cotton woven fabric material was cut in to 10 cm X 10 cm. This sample was sterilized with UV rays in a laminar air flow chamber for 30 minutes and this was kept in a sterile place for further study.

Finishing of fabric

The following recipe was used to finish the selected fabrics by **dip method** using the extracted herbs.

Recipe

Samples	-	2.5cm ± 0.1cm diameter
Solvent	-	The above extracted methanol and aqueous
Time	-	20 minutes
Sterilization	-	UV rays by Laminar air flow chamber

Temperature - room temperature

For finishing the fabric by dip method, the desized sterile samples was cut with circular disc of diameter 2.5cm ± 0.1cm .The extracted solvent was added in a beaker .The fabric samples were immersed in the solvent for twenty minutes and then the sample were removed from the solvent and dried in the air without washing. The finished cotton samples were sterilized by UV rays in the laminar air flow chamber to avoid microbial growth on the surface of the fabric. The same procedure was followed for the aqueous extract method of finish also. The sterile finished fabric sample was kept in a sterile container.

Preliminary Analysis of Qualitative Antibacterial activity ENISO 20645 method.

The finished samples (both methanol and aqueous) were qualitatively assessed for the antimicrobial activity. The following microbes were selected for this study according to the ENISO 20645 standard.

- Test organisms - *Escherichia coli* ATCC 11229and
- *Staphylococcus aureus* ATCC 6538

Preparation of Inoculums

The lyophilized sample of the above two strains of bacteria were inoculated in to a sterile peptone broth in a conical flask. The two conical flasks containing the bacterial samples were incubated at 37 °C for 24 hours. The inoculums were ready for bacterial culture.

Preparation of culture medium

The cultural medium used for the qualitative study the bacteriostasis nutrient agar was prepared using the following ingredients.

Recipe

- Peptone - 0.5 grams
- Yeast extract- 0.3 grams
- Sodium chloride- 2 grams
- Agar –agar - 2.25 grams
- Distilled Water -100 ml

The culture medium was autoclaved at 120 °C for 15 minutes at a pressure of 15 lb. The Agar- agar medium was transferred into sterile Petri plates and allowed to solidify. This product was thus called as nutrient agar. This was used as subtract for the growth of the selected bacteria.

Procedure for qualitative antimicrobial inhibition

The inoculum of the test bacterial sample in the conical flask was inoculated. The cotton swabs dipped in the inoculums were swabbed on the Nutrient Agar surface uniformly.

The sterile fabric samples were immersed in the herbal extract for 30 minutes and dried in sterile condition. Then this was placed in the nutrient agar surface using a sterile spatula and forceps. After placing the samples all the Nutrient Agar Petri dishes were incubated at 37 °C for 18 to 24 hours.

After incubation the plates were examined for the zone of bacterial inhibition around the fabric samples. The size of the clear zone of bacterial growth inhibition around the finished samples was evaluated which was the inhibitory effect of the herbal extract.This method was followed with the reference of Erdem and Yurudu (2008).

V. RESULT AND DISCUSSION

Antibacterial activity assessment using dip method by ENISO 20645 standard test

Table-1 Analysis of herbs for antibacterial activity by ENISO 20645

S. No	Herbs used	Solvents used for extraction	Antibacterial activity – Zone of Bacteriostasis (mm)	
			Escherichia coli	Staphylococcus aureus
1.	Tribulusterrestris – Whole plant	Aqueous	0	0
		Methanol	0	21
2.	Cissusquadrangularis – Whole plant	Aqueous	0	0
		Methanol	0	19
3.	Leucasaspara - Stem, Leaf and flower	Aqueous	0*	0
		Methanol	0	20

4.	Passiflorafoetida – Stem, Leaf and flower	Aqueous	0	0
		Methanol	0	20
5.	Cereus janacaru – Whole plant	Aqueous	0	0
		Methanol	0	19

0* - No bacterial growth beneath the test fabric

Table 1, Show the analysis of herbs for antibacterial activity for selected herbs, from the study it was concluded that *Tribulusterrestris* – Whole plant (figure 1) have more antibacterial activity 21 mm on the hundred percent cotton fabric when compared to other herbs. The *Tribulusterrestris* – Whole plant characters enhanced the wearing capacity of the 100 % cotton fabric for an extended period without any skin/dermal irritations/infections.

Figure 1 *Tribulusterrestris* – Whole plant



VI. CONCLUSION

After the procedure it was identified by the investigator that the finishing technique by the dip method in the hundred percent cotton fabric possessed good antibacterial activity in *Tribulusterrestris* – Whole plant when compared to other herbs. In turn the *Tribulusterrestris* – Whole plant herbs enhanced the wearing capacity of the 100 % cotton fabric for an extended period without any skin/dermal irritations/infections.

REFERENCES

- [1]. Bajwa, R.K., Chawla, R., (2011), Ecofriendly Textiles & Eco Labelling -Essential for Survival, Textile Review, p.2.
- [2]. Jose, J., (2005), Medicinal and aromatic plants, Discovery Publishing House, Delhi, p-162.
- [3]. Farida P. Minocheherhomji; Bhumika Solanki; Farida et al (2015). An Innovative Alliance of Ayurveda and Textile, Scholars Journal of Applied Medical Sciences (SJAMS), ISSN 2320-6691 (Online) Sch. J. App. Med. Sci., 2015; 3(2F):925-931.
- [4]. Hooda, k. Khambra, n. Yadav & v. K. Sikka; effect of laundering on herbal finish of cotton, International Journal of Textile and Fashion Technology (IJTFT) ISSN 2250-2378 Vol. 3, Issue 4, Oct 2013, 35-42 .
- [5]. Erdem, K., Yurudu, A.S.N.O., (2008), The Evaluation of Antibacterial Activity of Fabrics Impregnated with Dimethyltetradecyl (3-(Trimethoxysilyl) Propyl) Ammonium Chloride, IUFS, Journal of Biology, Vol. 67(2), and Pp.115-122.