

ANTIMICROBIAL FINISHING OF DENIM FABRIC



BY: M. SUMITHRA

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ABSTRACT

Denim is a popular garment worldwide among all the group of people. . The word denim is almost synonymously used with high fashion garments. Though the usage of denim has significantly increased, the functional finishes in the denims has been given least importance. The finishes will be a great value addition since denims are worn for an extended period of time and several properties like the antimicrobial, are necessary for the denim fabric. The present work is one such approach of developing antimicrobial finishes which can be scaled up to the level of industries on commercial and the architecture of the denim fabrics. Out of the vast and numerous natural antimicrobial finishes available in the plant kingdom twenty natural herbs suspected having the antimicrobial efficiency have been selected for functional finishing on denim fabrics. Among them, three natural herbs namely, *Euphorbia hirta*, *Senna auriculata* and *Jatropha curcas* were found to be effective in antimicrobial efficiency. The selected herbal extracts were combined to provide maximum antibacterial activity on the denim fabrics. The results indicated that the combination of 1:3:2 of the selected herbs were found to show highest antibacterial activity. This work will throw more light on the value addition and marketability of the denim fabrics and its related products.

INTRODUCTION

The textile industry occupies a leading position in the hierarchy of the Indian manufacturing industry. It has several new directions in the era of liberalization. Textile is one of the major industrial sectors where use of water, energy and polluting chemicals is very high, because of increased health and environmental issues; people have become more environmental conscious. A trend of eco friendly processing is becoming more and more popular. Government agencies are putting more restrictions for control on effluent quality. In these circumstances, processors are looking for eco friendly alternative chemicals for processing. India has about 45,000 plant species among them, several thousands have been claimed to possess medicinal properties. Over the past decade, substantial progress has been made in research on the natural products for the treatment of several dreaded diseases, like AIDS and cancer. Although a significant number of studies have used know purified plant chemicals, very few screening programmes have been initiated on crude plant materials. Even so, we have barely scraped the surface in our efforts to exploit the plant world for finishes, Pointed out by Deepti Gupta and Ankur laha (2007)

The number of bio-functional textiles has increased considerably over the last few years. The awareness of health and hygiene for consumers has increased the demand. Now-a-days textiles worn close to the body has been developed for a variety of different applications as far as medicinal and hygienic tasks.

A major factor that has stimulated interest in antimicrobial finishes using natural sources has been the current vogue that promotes natural and eco friendly life style. In addition textile consumers are now becoming much more aware of the deleterious effects that microorganisms may have upon textiles and human hygiene (Natarajan, 2002). An innovative approach to make the cloth microbial resistant to apply the plant extracts containing active substances (Ian Holme, 2002). These natural antimicrobial substances are not only eco-friendly but also from renewable sources. Bacteria and fungi are microbes that can grow on textiles (Bhoomika, 2007). Microbial growth, especially bacteria, in textile materials can result in the deterioration of fabric properties, development of foul smells, skins irritation, and cross infections. Following are the functions of antimicrobial finishes,

- To avoid cross infection by pathogenic microorganisms.
- To control the infestation by microbes
- To arrest metabolism in microbes in order to reduce the odor formation
- To safeguard the textile products from staining, discolouration and quality deterioration

The spread of denim culture, all over the world brought with it a trend of fast changing fashions and manufacturing technology (Dr.Hireni Mankodi,2010). Every body loves denim.Almost everyone in the world owns at least one denim garment .Today, popular, high fashion, denim garments can demand top dollar at retail. Denim is a twill weave with blue warp threads and white filling threads. Denim is designed by the weight of a yard of fabric. A 14 ounce denim is heavy duty, while a 10 ounce denim is for summer wear (Understanding fabrics – A guide to understanding fabrics)

Jeans are the most prevalent denim garment worn all over the world by rich and poor, young and old alike.’ one of the amazing things about denim is that it’s been around forever and is still growing in popularity”. Antimicrobial fabrics can enter microbial growth in one of two ways. Either passively by inhibiting the growth of microorganisms through inherent surface structure without the use of agents – linen for example displays such characteristics, as well as lambs wool. Or actively using antimicrobial agents to either kill or inhibit the growth of any microbe present such as in treated denim fabrics (Shirley technologies Ltd.,).

Anti – microbial finish causes a fabric to inhibit the growth of microbes.The humid and warm environment found in textile fibers encourages the growth of the microbes.Infestation by microbes can cause cross- infection by pathogens and the development of odor where the fabric is worn next to skin.In addition,stains and loss of fiber quality of textile substrates can also take place.With an aim to protect the skin of the wearer and the textile substract itself,an anti-microbial finish is applied to textile materials views by (Kadolph, Sara J., ed.:2007).

So in denim fabric antimicrobial herbal finishing work is carried out not much. So an attempt has been made to improve the usage of herbal finishes in denim fabrics. With the above background information the present research work has been planned .

OBJECTIVES

- To study on antimicrobial finishing of denim fabric using methanolic and aqueous extract of selected medicinal herbs.
- To gain functional properties from the natural herbs.
- To standardize the effective herbal combination for the functional activities.
- To standardize the finishing process of the herbal combination on the 4 different denim fabric.

SELECTION OF TEXTILE MATERIAL

The fabric was sourced from the market with respect to the expected quality requirements. The specifications of the selected fabrics were chosen as mentioned in Table 1. The selected fabrics were washed with hot water before finishing.

Table 1: Specifications of the selected Denim Variants

Substrate	Warp count	Weft count	Blend	Weave	Weight in Ounces	Colour
100%cotton	16s ring slub	20s ring	100% cotton	2/1 RHT	7	Carbon tan
Cotton/polyester	16s ring slub	330 DENIER	68%cotton+32% polyester	2/1 RHT	7	Carbon tan
Cotton/poly Lycra	16s ring slub	360 denier poly spandex	68% cotton+32% Poly spandex	2/1 RHT	7	Carbon tan
Cotton/Core spun Lycra	16s ring slub	16s Core spun spandex	68% cotton+32% core spun spandex	2/1 RHT	7	Carbon tan

HERBAL EXTRACTION:

(i) Drying process

The collected plants were dried with in a temperature range of 100 – 140 °F as they cannot be stored without drying to avoid breakdown of important compounds and contamination by microorganisms. After drying, those portions of the plant to be used from other parts of the plants were separated from dirt and other extraneous matter manually.

(ii) Grinding process

Grinding or mincing of the leaves was carried out in a mixer. The fine powder obtained after grinding was used for extraction.

(iii) Extraction process

Each 100g of the powdered plant material was mixed with 1000 ml of methanol in airtight conical flask. After overnight incubation, the supernatant was filtered through Whatman no.1 filter paper and the filtrate was dried to evaporate the organic solvent at room temperature. The sediment after evaporation was used for finishing the denim fabrics.

3	<i>Senna auriculata</i>	Water	0	0	0	0	0	0	0	0
		Methanol	0	0	0	0	0*	25	25	24
4	<i>Passiflora foetida</i>	Water	0	0	32	0	0	0	0	0
		Methanol	0	0	0	0	0	0	0*	0*
5	<i>Euphorbia hirta</i>	Water	0	0	25	24	0	0	0	0
		Methanol	0	0	0	0	0*	0	0	0

Selection of best herbal combinations:

The selected best three herbs were combined in various ratios. Maximum ten combinations were tested and that was shown in table no. 5. From this the proportion of 1:3:2 was selected as efficient for the activity against both organisms. This is the combinations of Methanolic extract of *Jatropha* (leaves), methanolic extract of *Senna auriculata* (leaves) and aqueous extract of *Euphorbia hirta* (Leaves and stem).

Table 5: Antimicrobial activity of Herbal Combinations on Denim Variants

S. No	Combinations Herbal combination	Denim variations and antibacterial activity - zone of inhibition (mm)							
		Escherichia coli				Staphylococcus aureus			
		A	B	C	D	A	B	C	D
1	1:01:01	0	0	0	0	23	23	23	0
2	1:02:01	0	0	0	0	23	23	24	23
3	2:01:01	0	0	0	0	0	0*	0*	0*
4	1:01:02	0	0	0	0	0	0	0	24
5	2:02:01	0	0	0	0	0*	23	0	0
6	1:02:02	0	0	0	0	0*	23	23	23
7	2:01:02	0	0	0	0	23	24	23	23
8	3:01:02	0	0	0	0	23	0	0	0
9	1:03:02	0	0	0	0	23	25	25	25
10	1:02:03	0	0	0	0	0	0	0	23

CONCLUSION

Twenty medicinal herbs are selected for this study. The best five activity herbs were chosen and that was again tested for its consistency in results. From the results Methanolic extract of *Jatropha* (leaves), *Senna auriculata* (leaves) and aqueous extract of *Euphorbia hirta* (leaves and stems) were chosen as best three and the combinations were evaluated by next trial. The selected combination for the further study are 1:3:2.

References:

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