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**Asia's first journal for the nonwovens and technical textiles segment**



# Nonwoven & Technical Textiles

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Asia's first journal for the nonwovens and technical textiles segment



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From The Editor's Desk



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TEX-REVOLUTION

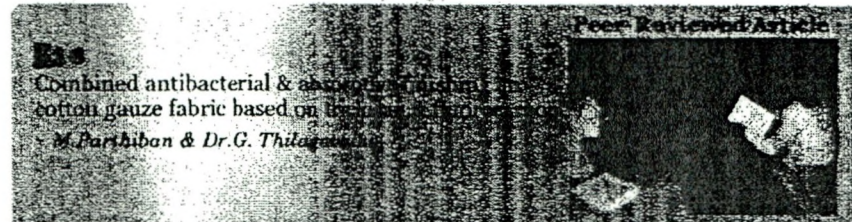
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News & Innovations



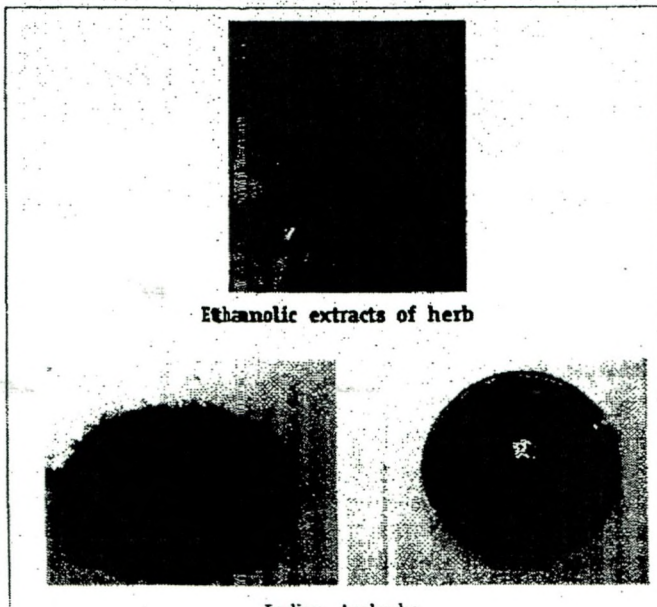


Basically, with a view to protect the wearer and the textile substrate itself antimicrobial finish is applied to textile materials. Though the use of antimicrobials have been known for decades, it is only in the recent couple of years several attempts have been made on finishing textiles with antimicrobial compounds. The consumers are now increasingly aware of the hygienic life style and there is a necessity and expectation for a wide range of textile products finished with antimicrobial properties. A wide palette of antimicrobial compounds is now in use but differ in their mode of action. Many commercial antimicrobial agents are effective but they are not compatible with skin and the environment. So, the natural herbal products can be used for antimicrobial finishes since there is a tremendous source of medicinal plants with antimicrobial composition to be the effective candidates in bringing out herbal textiles. The present research work aims at developing an eco-friendly natural antimicrobial finished from natural herb Indian Acalypha for textile application. The herb, has the remarkable properties of curing skin diseases like Syphilitic ulcer, bedsores, maggot infested sores and wounds, rashes and rheumatism. The Indian Acalypha extract (50%, 75% and 100% respectively) are applied on cotton fabric in pad dry cure method. An attempt also made to assess the healing activity of the Indian Acalypha treated shirt on skin allergies and rashes. An extensive study was conducted to assess the antimicrobial effectiveness of the herb by employing standard test methods and findings are discussed in this paper.

## Experimental

### Material

Cotton fabric with the count of 2x 40's and plain weave



was selected for the study. The fabric was desized, scoured and bleached prior to the application of finish.

### Antimicrobial herb

Indian Acalypha (Kuppiv aeni) is the plant species chosen for the study. Fresh leaves of acalypha were shadow dried and made into a fine powder.

### Finish Application

Ethanollic extracts of herb were applied to cotton fabric by dipping in bath at M:L ratio 1:10. The fabric was then dried at 80°C for 10 minutes to remove the moisture. Finally the fabric samples were tested for antimicrobial activity as per the standard test methods.

## Standard quantitative test methods

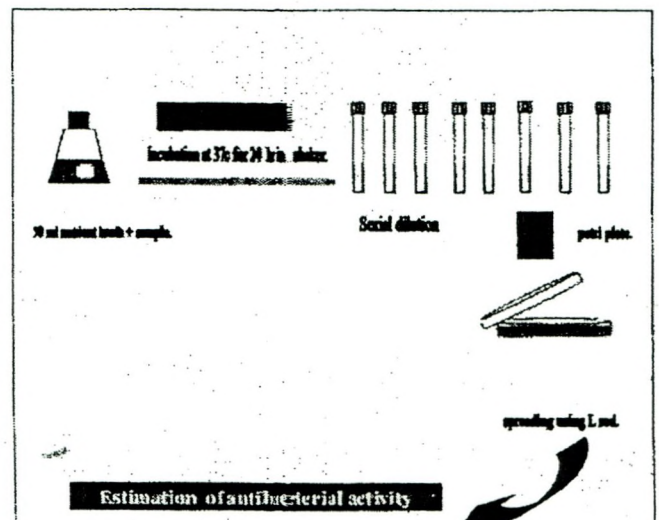
### Anti Bacterial Activity

**AATCC-100-1998 (USA): Quantitative Assessment of Antibacterial finishes on textiles - measures the degree of antibacterial activity - Agar diffusion Test**

The 2"x 2" Samples were prepared from the Indian Acalypha samples (untreated, 50%, 75% and 100% treated). 500ml Elenmeyer conical flasks containing 50ml of nutrients broth were prepared and sterilized at 121°C for 15 minutes. It was then allowed to cool. The fabric samples were then transferred aseptically into the conical flasks respectively. These were incubated at 37°C for 24 hours in shaker at 121rpm. After incubation their absorbance were measured at 600nm.

**AATCC-147-1998 (USA): Qualitative Antibacterial Assessment of diffusible antibacterial agents ("quick method")- Agar diffusion Test**

50ml of nutrient agar was prepared and sterilized at





C for 15 minutes. Petri plates were autoclaved in hot air at 121°C for 30 minutes. 20ml of Nutrient agar was poured into each of these plates and were allowed to solidify.

A series of 8 test tubes containing 4.5ml of sterile water was taken. 0.5ml of culture from nutrient broth containing the 100% treated samples was transferred aseptically into the first test tube. Serial dilution was carried out until its reduced dilution was 10<sup>-8</sup> (-8)

100 micro liters of 10<sup>-8</sup> diluted culture was taken aseptically and poured onto the Petri plates. This was spread by using L rod. The plates were incubated at 37°C for 16-18 hours. Similar procedure was carried out for untreated sample; sample treated with 50% and 75% and 100% concentrations.

### Anti Fungal Activity

**ATCC 30-1993: Antifungal activity, Assessment of textile material: mildew and rot resistance of textile material - Agar Diffusion Test**

500ml Elenmeyer conical flask containing 50ml of PD broth was prepared and sterilized at 121°C for 15 minutes. It was then allowed to cool. The fabric samples were transferred aseptically into the conical flasks respectively. These were kept at room temperature for 3 days. Then the growth of fungi in the conical flask was observed after 3 days.

#### Mycelia growth test:

50ml of PD agar was prepared and sterilized at 121°C for 15 minutes. 20ml of agar was poured. Then the 1x1 inch fabric was placed on the agar. Then the mycelia growth on the fabric was measured.

### Results and discussion

**AATCC-100-1998 (USA): Quantitative Assessment of antibacterial finishes on textiles - measures the degree of antibacterial activity - Agar diffusion Test**

Absorbance of the sample is directly proportional to the concentration of the cells in the sample. The absorbance values of all five samples were compared. It was found that the sample treated with 100% concentration gives low absorbance value. This indicates that the 100% treated samples do not support much the growth of bacteria compared to oth-

Absorbance tests at 600 nm	
Sample	Indian Acalypha
Untreated sample	1.09
50% treated sample	0.93
75 % treated sample	0.87
100 % gel treated sample	0.82

ers. The samples taken from the fabric treated with 75% concentration also gives low absorbance value when compared to untreated sample.

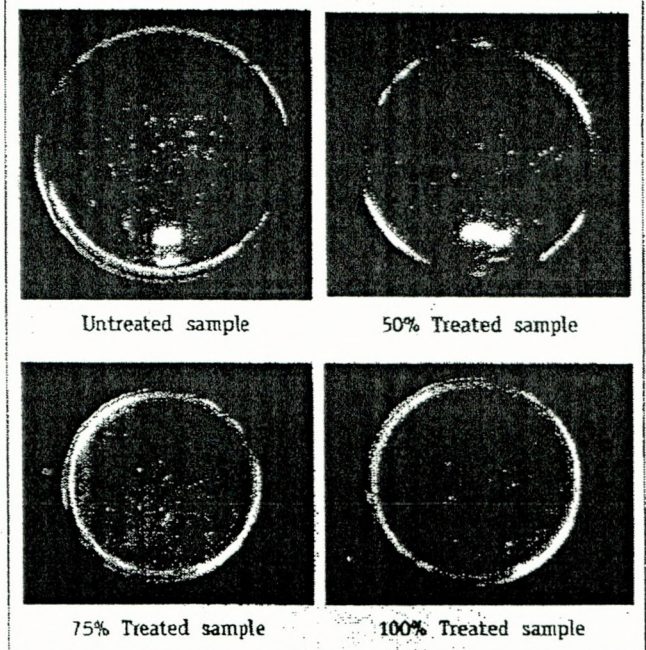
**AATCC-147-1998 (USA): Qualitative Antibacterial Assessment of diffusible antibacterial agents ("quick method") - Agar diffusion Test**

After incubation, the plates were observed for bacterial growth. Then the numbers of colonies were counted for each plate. This showed that 100% treated samples have got less number of colonies when compared to other samples.

Samples treated with 75% concentration also got less number of colonies when compared to untreated sample.

The results indicate that 100% treated sample do not support the bacterial growth to larger extent, where as 50% and 75% treated sample to a smaller extent when compared to untreated sample.

Antibacterial activity of Indian Acalypha leaf treated fabric

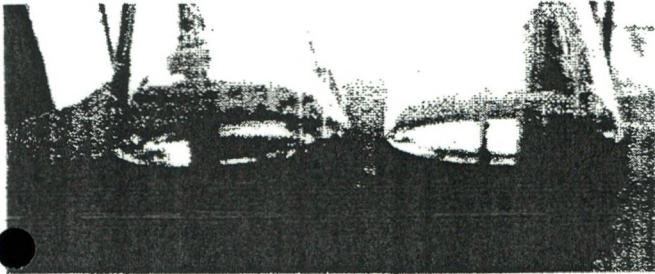


**AATCC 30-1993: Antifungal activity, Assessment of textile material: mildew and rot resistance of textile material-Agar Diffusion Test**

It was found that there is no growth of fungi in the conical flask containing 100% treated acalypha fabric. This indicates that 100% treated fabric gives good anti fungal finishing. There is some growth of fungi in the conical flasks containing 50% and 75% treated acalypha fabric when compared to 100% treated fabric. But there is less growth when compared to untreated fabric. This indicates that other treated fabric also has better anti fungal activity.

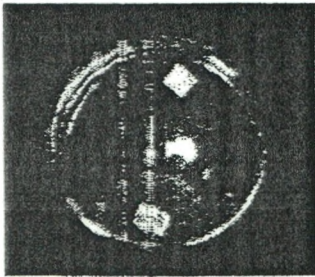


**AATCC 30 tests for Indian Acalypha**



**Mycelia growth test:**

**Mycelia growth test (acalypha)**

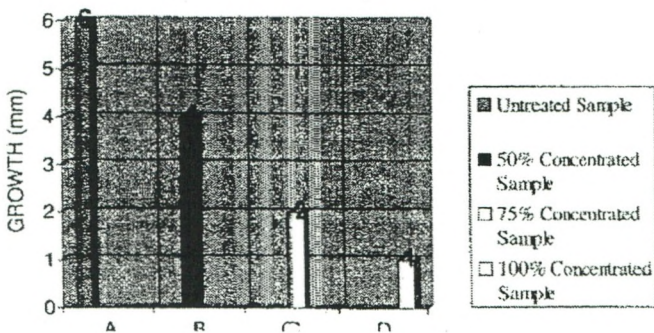


There is a reduction in the growth of mycelia in all the treated samples when compared to untreated fabric samples. The 100% treated sample shows maximum anti fungal activity than others.

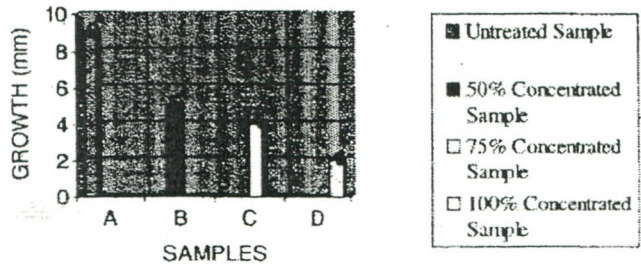
**Mycelia growth measurement**

Sample	Indian Acalypha	
	2 days	4 days
Untreated sample	6 mm	9 mm
50% treated sample	4 mm	5 mm
75% treated sample	2 mm	4 mm
100% treated sample	1 mm	2 mm

**MYCELIAL GROWTH (AFTER 2 DAYS)**



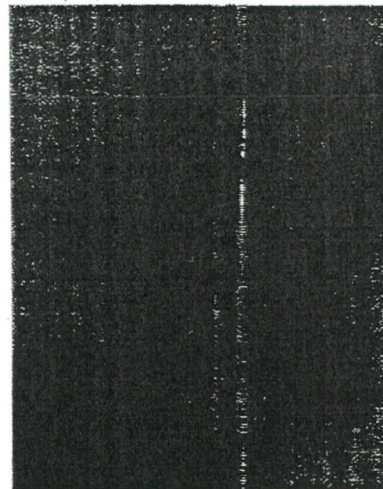
**MYCELIAL GROWTH (AFTER 4 DAYS)**



**Wear sample study**

The garment Men's Shirt was especially developed for controlling the skin rashes and itching and ringworms in the internal body parts like neck, arms and elbows. As per the questionnaires filled by the wearer and the comments stated by them, it was understood that the garment did not cause any rashes, irritations or allergies to the body. They stated that the handle of the garment was very soft and also curing and reducing skin rashes and itching day by day.

**Indian Acalypha treated product- men's shirt**

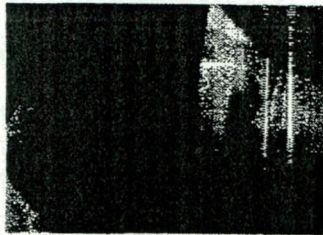


**Skin allergies- wear study - results**

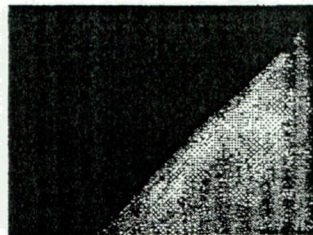




Before



After



### Wash Durability of Finishes

The antimicrobial activity of the finished samples was evaluated for fastness to washing after different wash cycles. The finished samples were washed using the standard detergent (1% owf) and sodium carbonate (1% owf) at 40C. The antimicrobial activity was assessed after 10,15,20,25 washes by challenge test. The washing fastness tests carried out revealed that 50% concentration of all the samples lasted for 15 washes, 75% concentration samples lasted for 20 washes and 100% concentration of all the treated samples stood for about 25 washes. It is observed that the activity diminished gradually as the number of wash frequencies increase.

SAMPLE	After 10 Washes	After 20 Washes	After 30 Washes
	Indian Acalypha	Indian Acalypha	Indian Acalypha
UNTREATED	16	23	-
50% CONC.	7	10	13
75% CONC.	5	8	11
100% CONC.	4	5	7

### Conclusion

This research work has given a new idea in finishing of cotton with herbs for antimicrobial activity (Indian Acalypha). The antimicrobial activity on cotton has added a colorful feather to cotton finish. From the studies conducted Indian Acalypha is found to contain active antimicrobial substances that can control the growth of microbes and also curing skin rashes and itching. 100% treated samples exhibited maximum antimicrobial activity in all the tests. The treated fabric is found to be very hygienic with less fungi and bacteria as well as making the cloth much softer than before. The finish is cost effective and eco-friendly. It will also lay the foundation for medical textiles, where re-

searches can be carried out on the applications of Indian Acalypha-finished cotton for remedies of various skin diseases. Apart, the study will surely enhance the export quality of cotton fabrics especially when Indian exporters face tough competition after globalization. In a nutshell this study has opened doors for production of better eco-friendly medically treated cotton fabrics.

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