

Extraction and application of antimicrobial agents using neem and siriyangai leaves for home furnishing

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Received: 28.03.2014; Accepted: 19.05.2014

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■ **ABSTRACT :** The extraction was taken from the herbal plant of neem and siriyangai leaves. The cotton fabric was dyed with this extraction by dyeing method. The treated fabric was examined by antimicrobial testing method (AATCC 147 and 30). The neem finished fabric showed good antimicrobial activity when compared with untreated fabric. The siriyangai finished fabric showed better antimicrobial activity when compared with untreated fabric and also neem finished fabric. Both antimicrobial finished fabrics were applicable for home furnishing (curtains), as well as used for medical purpose in the form of curtains.

■ **KEY WORDS:** Antimicrobial agents, Neem, Siriyangai, Furnishing

■ **HOW TO CITE THIS PAPER :** Kavitha, S, Annappoorani, S. Grace and Shanthi (2014). Extraction and application of antimicrobial agents using neem and siriyangai leaves for home furnishing. *Asian J. Home Sci.*, 9 (1) : 308-312.

The textile material is goods carrier of various types of micro-organisms and can cause health related problems to the wearer. In order to protect the wearer from such infection, the textile fabric can be finished with anti-microbial agents. The anti-microbial finishing is used when the chances of bacterial growth are high and safety is paramount. This type of finishing often improves the life span of the articles to which it is applied. It is effective on any substrate, including cellulose, synthetics, blends and non-textile surface and can improve the hand of most fabric. Now-a-day's everybody is very conscious and taking more care about health and hygiene. We can see everywhere curtains like offices, hotels and homes. But those curtains are not washed daily like our clothes. There is a 100 per cent change to form microbes like bacteria and fungi. So, antimicrobial finishing is very useful and need in home furnishing.

■ RESEARCH METHODS

Selection of fabric:

16's count cotton fabric was selected for home furnishing application. GSM of the fabric was 220 Duck weave fabric. In textile industry it is also called as cotton canvas.

Selection and collection of herbs:

The neem and siriyangai leaves were selected for antimicrobial application. Both leaves have antimicrobial compound. Leaves were collected from different locations of Coimbatore and Mattur district. Plate 1 shows the neem and siriyangai leaves used for the study.

Preparation of herbs:

The collected leaves of neem and siriyangai were shadow dried within room temperature (Plate 2). Because of the moisture content they cannot be stored without drying. After drying, grinding was done to break down the leaves of the plant into very small units ranging from large coarse fragments to fine powder.

Herbal extraction process:

Active substances were extracted from the powder by liquid extraction method. The powdered plant material was extracted with water by adding 1kg of herbal powder in 3 litre of water for 24 hours to separate the antimicrobial extraction. The herbal extraction was filtered using muslin cloth as shown in Plate 3.



Neem



Siriyangai

Plate 1: Neem and Siriyangai leaves



Neem



Siriyangai

Dried stage

Plate 2: Neem and Siriyangai leaves



Plate 3: Herbal extraction



Dyeing process:

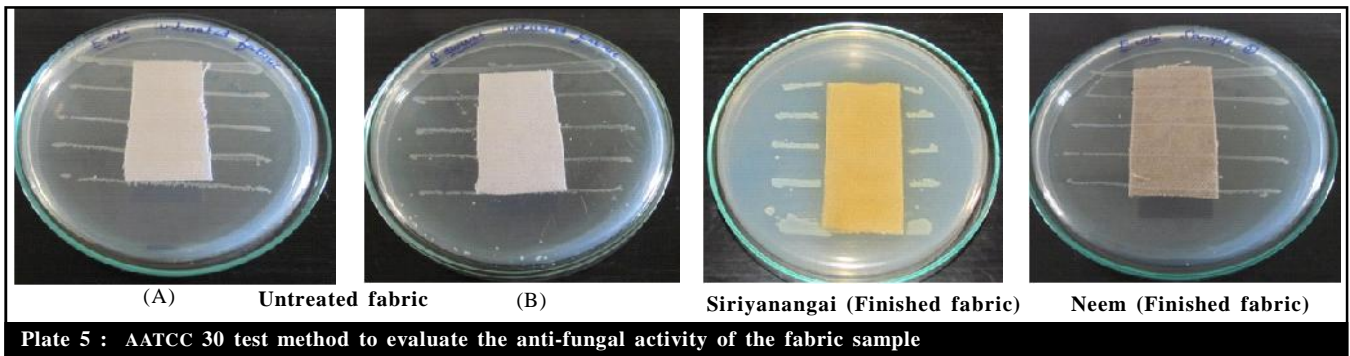
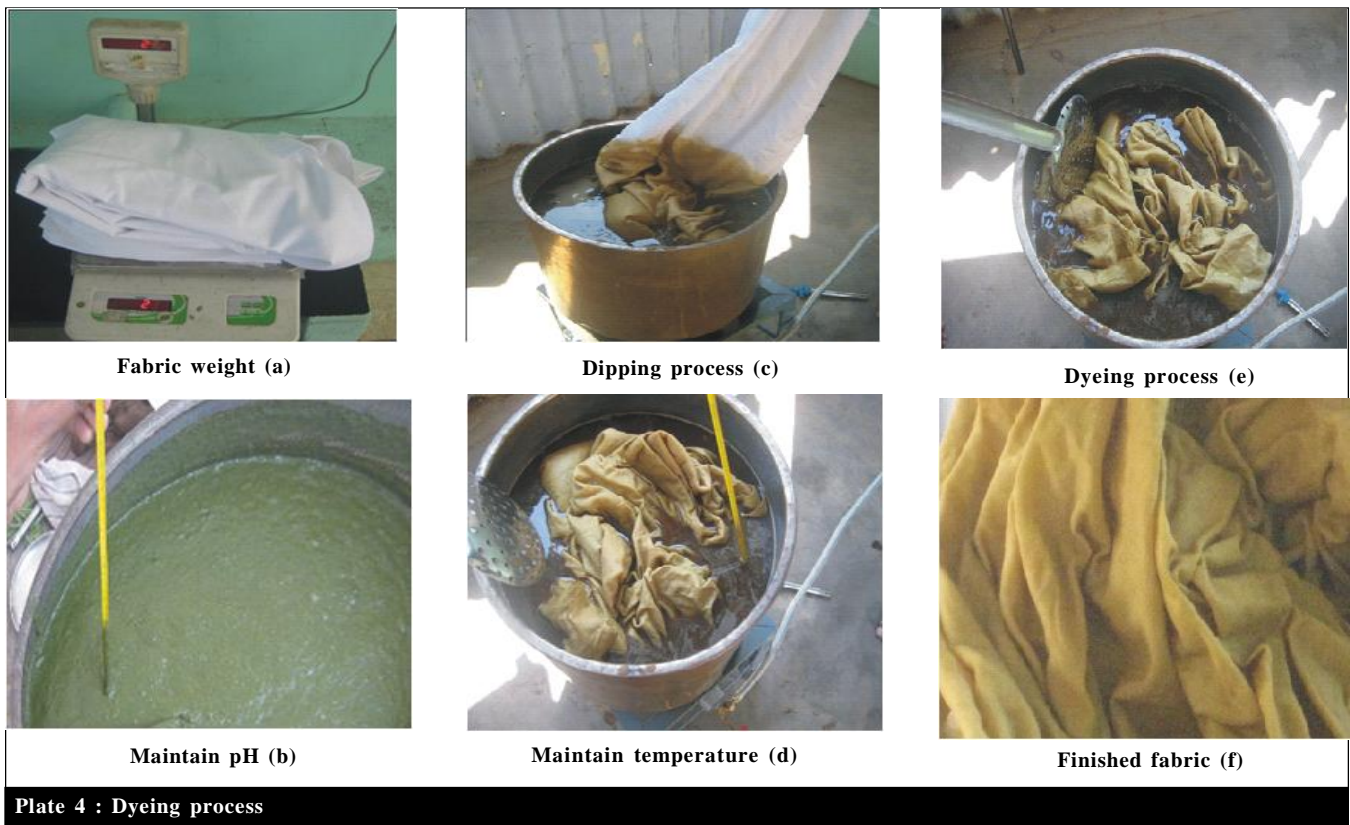
Weight the fabric using weight balance machine. Depending upon the fabric weight, the extraction was taken at 1:15 ratio for antimicrobial application. In dye bath depending upon the ratio, the herbal extraction water dissolved along with soda ash 10 gpl, salt water 30 gpl (grams per litre) and mixed well thoroughly. Now place the fabric inside the dye bath and maintain 70°C to 90°C for one hour where the pH value should be 8.5 to 9. After an hour, make cold wash for 2 times. Then place the fabric inside the dye bath again with water and mix with required amount of wetting oil and maintain it 70°C for 15 minutes. After completing the process, the fabric can be washed thoroughly for 2 to 3 times and dry in room temperature. Plate 4 shows the dyeing process.

Testing process:

In this work, the qualitative agar diffusion test and the quantitative bacteria reduction through AATCC 147 and AATCC 30 were used to assess the antimicrobial activity of the fabric.

AATCC 147 test method to evaluate the antibacterial activity of the fabric sample:

The fabric sample cut rectangular in shape with 25* 50 mm was taken for the analysis. Sterile bacteriostasis agar was dispensed in to Petri dishes. Broth cultures (24 hours) of the test organisms were used as inoculum. Using sterile inoculation loop, the test organisms (*Escherichia coli* and *Staphylococcus aureus*) were streaked, 5 lines with 4 mm



width over the surface of the agar plate. Pre-sterilized samples were placed over the inoculated agar surface by using sterile forceps. After placing the samples, all the plates 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 sample. The size of the clear zone was used to evaluate the inhibitory effect of the sample (Plate 5).

AATCC 30 test method to evaluate the antifungal activity of the fabric sample:

An inoculum of 1.0 ml was evenly distributed over the surface of the agar. The fabric discs were pre wetted (not rubbed or squeezed) in water containing 0.05 per cent of a non-ionic wetting agent (triton x- 100) and placed on the agar surface. The inoculum of 0.2 ml was distributed evenly over each disc by means of a sterile pipette. All the specimens were incubated at a temperature of 28°C for seven days.

At the end of the incubation period, the percentage of the surface area of the disc covered with the growth of the fungus was reported by observing visually (Plate 6) using a microscopic (40x) and interpreted as follows:

- No growth (if present, the size of the growth free zone in mm was reported).
- Microscopic growth (visible only under the microscope).
- Macroscopic growth (visible to the naked eye).

End use of anti-microbial finished fabric (curtains) :

Finally anti-microbial finished fabric can be converted into home furnishing (curtains). Four curtain designs were chosen for construction and these are pinched pleated, door curtain, decorative curtain and loop curtain. They can be used for doors as well as windows also. These curtains are hygienic in nature because had given natural antimicrobial finish using

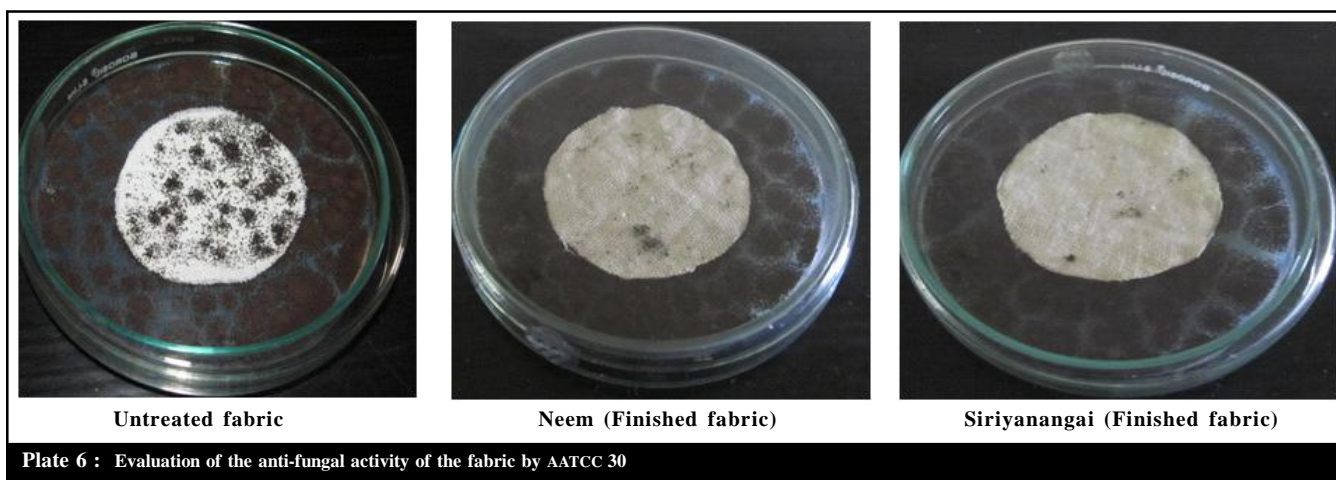


Plate 6 : Evaluation of the anti-fungal activity of the fabric by AATCC 30



Plate 7 : End use of anti-microbial finished fabric (curtains)

Table 1: Antibacterial activity of the anti-microbial fabric (AATC147)

Sr. No.	Fabric samples	Zone of bacteriostasis (mm)	
		<i>Staphylococcus aureus</i>	<i>Escherichia coli</i>
1.	Untreated fabric	0	0
2.	Neem finished fabric	0	0
3.	Siriyangai finished fabric	29	30

Table 2: Anti-fungal activity of the antimicrobial fabric AATCC 30

Sr. No.	Sample	Zone of mycostasis (%) <i>Aspergillus niger</i>
		1.
2.	Neem finished fabric	40
3.	Siriyangai finished fabric	60

herbs. It's applicable in hospitalities and is shown in Plate 7.

■ RESEARCH FINDINGS AND DISCUSSION

The results of the present study as well as relevant discussions have been presented under following sub heads:

Anti-bacterial activity of the anti-microbial fabric (AATCC 147):

The antibacterial assessment of herbal extract was tested against two test organisms of gram-positive bacterium (*Staphylococcus aureus*) and gram-negative bacterium (*Escherichia coli*) and is given in Table 1.

From Table 1 it is clear that the siriyangai leaves finished sample was found to be having anti-bacterial activity against the mentioned organisms than the neem leaves finished and untreated fabric.

Anti-fungal activity of the anti-microbial fabric AATCC 30:

The antifungal activity of the antimicrobial fabric using AATCC 30 is shown in Table 2.

From Table 2 it is clear that both neem leaves and siriyangai leaves treated sample were found to be having anti-fungal activity against the mentioned organisms. Latha *et al.* (1995), Sukanya *et al.* (2009), Jothi (2009) and Srivastava (2011) have also made some observations related

to the present investigation.

Conclusion:

It may be concluded that, compared the selected herbal plants of neem and siriyangai leaves finishing samples showed that siriyangai leaves were having more antimicrobial activity than neem leaves. Finished fabric can be converted into home furnishing curtains.

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