

Ecofriendly Antimicrobial Finishes of Cotton Denim Fabric Using Herbal Extracts

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1. ABSTRACT

This paper clarifies about the Nano embodied completion in materials. An ecofriendly normal enemy of microbial completion has been arranged from the plant extricates for material application. Herbal extracts from medicinal plants have been applied to cotton denim fabric by the method of Nanoencapsulation. The application of Nano encapsulation is carried out by pad dry cure method. All the treatments have shown good antimicrobial properties and good washing durability up to 30 washes. The aftereffect of the antimicrobial action depends on the standard test strategy .

2. INTRODUCTION:

The buyers are mentioning material things with better displays, even in the "standard" attire and home materials districts. Indeed, critical item separation in the space of materials can be accomplished by elite properties, in corresponding with visual appearance. A portion of these properties were grown essentially for "defensive" clothing however these days they are frequently present in useful materials utilized for "ordinary" clothing. Numerous texture makers are committing increasingly more thoughtfulness regarding attempt to place into the market items with new impacts that can address a significant added esteem

Against microbial completions have expanded its significance in the new years for a few reasons. They serve the buyer by offering insurance from the unsafe impacts of specific microorganisms. Microorganisms are minute life forms, yet can be generally hazardous for making mischief to our way of life in an unexpected way. They incorporate an assortment of microorganisms like Bacteria, Fungi, Algae and infections. Microbes are uni-cell living beings, which develop quickly under warmth and dampness. Further, sub divisions in the microorganisms family are Gram positive (Staphylococcus

aureus), Gram negative (E-Coli), spore bearing or non-spore bearing sort. Some particular kinds of microbes are pathogenic and cause cross contamination

This examination targets fostering an ecofriendly normal antimicrobial completion from therapeutic plant extricates for material application. Some particular flavors of plants were distinguished and evaluated for their antimicrobial exercises. This concentrates were applied to cotton denim textures. A broad examination was led to survey the antimicrobial viability of the spice by utilizing standard test technique and the discoveries are talked about in this paper. As textures are exposed to washing; the wash strength of completions is a significant issue. Despite the fact that a significant number of the natural concentrates have shown great antimicrobial property in the wake of applying on texture, their wash solidness is poor. Thus, unique method Nano embodiments and cross connecting were utilized to fix the home grown concentrates on the texture which access water solidness up to 30 washes [1].

3. EXPERIMENTAL PROCEDURE:

3.1. Materials and Methods:

100% Cotton Fabric used in this investigation was received from KG denim, Coimbatore. Jatropha (leaves and seeds), sennaauriculata (leaves), and Euphorbia hirta (mixture of stem, leaf and flower) were procured from different region in and around Coimbatore district which were authenticated by the Botanical survey of India.

3.2. Pretreatment process;

The plant parts were washed twice in freshwater to remove epiphytes and other extraneous matter from the plants. These home grown materials were shadow dried and powdered by utilizing granulating machine. The home grown powders were put away in a dry compartment for additional investigations.

3.3. Herbal extraction;

From the collected herbs the best three herbs were combined in the ratio 1:3:2 which are Jatropha (leaves and seeds), sennaauriculata (leaves), and Euphorbia hirta (mixture of stem, leaf and flower). For these three plants the following extraction has been done [2].

4. EXTRACTION PROCESS:

4.1. Methanolic extraction;

Each 6g of the powdered plant material was blended in with 100 ml of methanol in impermeable funnel shaped flagon. After overnight hatching, the supernatant was sifted through Whatman no.1 channel paper and the filtrate was dried to dissipate the natural dissolvable at room temperature. The residue after dissipation was utilized for completing the denim textures.

4.2. Aqueous extraction:

Each 6g of dried natural powder was blended into the 100ml of water before that add little water from that to homogenize the powder well and afterward add the excess water. Then, at that point take the concentrates by separating the blend through the What man No. 1 channel paper and the filtrate was utilized newly for the examination [3].

5. FABRIC TREATMENT WITH HERBAL PRODUCTS:

5.1. Direct application method:

Methanol extracts of the herbs were directly applied on 100% cotton denim fabric by pad dry cure method. 2% of the herbal extract was applied on the fabric along with 8% citric acid as cross linking agent by pad dry cure method. Padding was carried out in a pneumatic padding mangle at 55 degree C.

5.2. Antimicrobial Test:

The herbal treated cotton fabric were tested for the antimicrobial properties against gram positive as well as gram negative bacteria according to the AATCC method. Antimicrobial activities of the treated fabrics were evaluated by both quantitative (AATCC- 147) and quantitative (AATCC- 30) methods [4].

5.3. Wash Durability Test:

The nanocapsules completed cotton texture was dissected for their wash strength by exposing the example to washing and testing its antibacterial proficiency. The denim texture was exposed to washing by mechanical machines and the antibacterial action of the washed texture was surveyed by AATCC 147 test strategy.

6. RESULTS AND DISCUSSION:

6.1. Qualitative Antibacterial Assessment by Aatcc 147

The texture tests with the width of $2\text{cm} \pm 0.1\text{cm}$ were taken for the examination. Every one of the examples were submerged into the concentrate for 30 minutes and dried and surface disinfected in UV radiation. Sterile bacteriostasis agar was administered in to Petri dishes. Stock societies (24 hours) of the test organic entities were utilized as inoculum. Utilizing sterile q-tip the test organic entities (*Escherichia coli* and *Staphylococcus aureus*) were cleaned over the outside of the agar plate. Presterilized tests were set over the cleaned agar surface by utilizing sterile spatula. Subsequent to setting the examples, every one of the plates were hatched at 37°C for 18 to 24 hours. After brooding the plates were analyzed for the zone of bacterial restraint around the texture test. The size of the unmistakable zone was utilized to assess the inhibitory impact of the home grown concentrate.

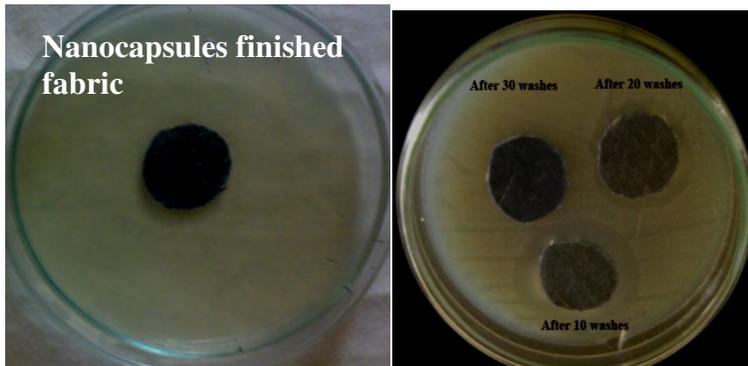
6.2. Antibacterial Activity of Nano finished Fabric (AATCC147):

The bacteriostatic activity of the copper impregnated fabrics against *S. aureus* and *E. coli* werestudied and this activity was indicated by zone of inhibition (fig 1 (a) to 2.(b)). However, the cotton fabric withcopper nanoparticles showed maximum antibacterialactivity. This result demonstrated that coppernanoparticles can be used to prepare sterile fabrics [5].

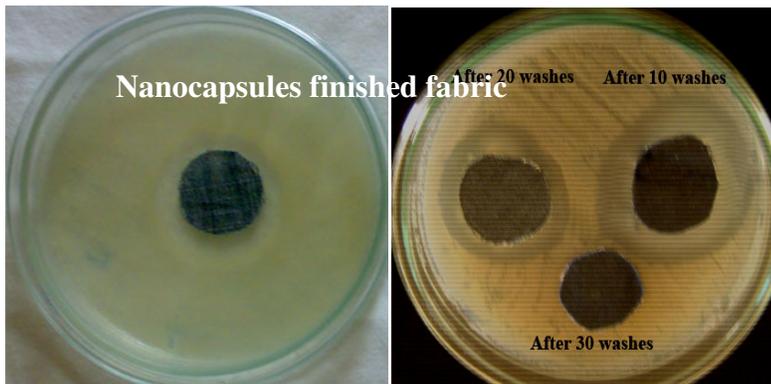
Antibacterial Activity of the Finished Fabric – AATCC 147

S. No.	Fabric samples	Zone of Inhibition (mm)	
		<i>Escherichia coli</i>	<i>Staphylococcus aureus</i>
1	Nanocapsules finished denim fabric	33	35
2	Nanocapsules finished fabric after 10 washes	32	33
3	Nanocapsules finished fabric after 20 washes	28	30
4	Nanocapsules finished fabric after 30 washes	24	25

ACTIVITY AGAINST *Escherichia coli*



ACTIVITY AGAINST *Staphylococcus aureus*



6.3. Analysis of Antifungal Activity by Qualitative Method (AATCC 30)

An inoculum of 1.0ml was evenly distributed over the surface of the agar. The fabric discs were pre wetted (not rubbed or squeezed) in water containing 0.05% 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 and using a microscopic (40X) and interpreted as follows:

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

Antifungal Activity (AATCC 30):

The antifungal activity of the Nanoencapsulation treated fabrics against *Aspergillus niger* was studied and this activity was indicated by zone of mycostasis shown in (fig.3's). The antifungal activity of cotton fabrics with and without Nanoencapsulation was evaluated. In the fabrics without Nanoencapsulation (control) no zone of mycostasis was observed. However, the cotton fabrics with Nanoencapsulation presented maximum zone of mycostasis [6].

ANTIFUNGAL ASSESSMENT OF THE FABRIC – AATCC 30

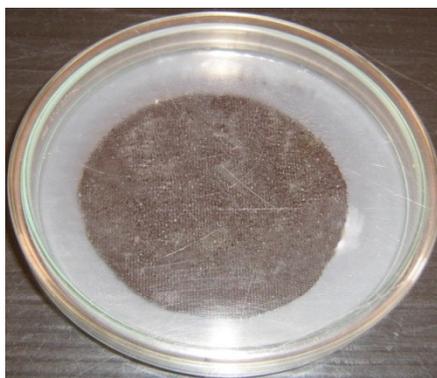
S. No.	Fabric Samples	Antifungal activity (Mycelial reduction - %)
1.	Nanocapsules finished denim fabric	100
2.	Nanocapsules finished fabric after 10 washes	90
3.	Nanocapsules finished fabric after 20 washes	85
4.	Nanocapsules finished fabric after 30 washes	30

ANTIFUNGAL ACTIVITY – AATCC 30

ACTIVITY AGAINST *Aspergillus niger*

Nanocapsules finished fabric

Nanocapsules finished fabric – after 10 washes



after 20 washes



after 30 washes



7. Conclusion:

The method has been developed to prepare Nano encapsulation finish on 100% cotton fabrics to impart functional properties. The Nano encapsulated cotton denim fabric is found to have the antimicrobial property even after 30 industrial washes. It also clearly demonstrated that the treated fabrics showed increased antibacterial and antifungal effect in comparison with the untreated fabric. The results also demonstrated that higher antibacterial activity was observed against **S.aureus** and **E.coli** both in qualitative and quantitative tests, and also higher antifungal activity was observed against **Aspergillus's Niger**.

Here, an innovative Nano encapsulation approach based on the application of medicinal herbs extracts used as antimicrobial agents for textiles is discussed. It is a very important aspect to prove that the particular fabric is Eco friendly and the current examination shows that the texture is climate cordial with no destructive synthetics. Hence the finished antimicrobial fabric is considered to be an eco-friendly fabric.

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