



ANALYSIS OF NATURAL ALMOND AND JAMUN LEAVES COMBINED EXTRACTION FOR ENHANCEMENT OF ANTIBACTERIAL FUNCTIONALITY

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ABSTRACT

The present study is focused on antibacterial fabric finished with herbal extracts. An ecofriendly antibacterial coating has been given to the organic cotton fabric using almond and jamun leaves. The herbal extracts have been coated on the fabric using well diffusion method. Tamarind seed powder is been used as a mordant for the fixation of finish. Scanning Electron Microscope (SEM) is used for the analyzing the coated sample. Physical testing is been done to test the strength of the fabric.

Key Words:

Antibacterial finish, organic cotton, Jamun and Almond leaves, Tamarind seeds, SEM.

1. INTRODUCTION

Organic Cotton, is ecofriendly fabric that is used for baby wear, under wear, bed spreads, medical textiles, bath robes etc. It is naturally grown without any chemicals like pesticides. Textiles, play an important role in the need of human beings. Most of the textiles are been used in medical field and hotels. Medical textiles is an important sector that plays an vital role in health and hygiene of the people.

Antibacterial finish, reduces the growth of microorganisms and degradation, commonly used in wound dressing. New technologies have been introduced in antibacterial finishes to protect the user from bacterial attacks rather than protecting the fibre from degradation. Mordant, is already fixed to the fabric naturally. It is a metal salt that creates affinity between fibre and the dye. In this context, the selective species of herbs were selected for antibacterial activities and the extracts were applied to organic cotton fabrics.

2. MATERIALS AND METHODS

2.1 Selection of Fabric

The 100 % organic cotton fabric with (124 GSM) were selected for this experiment due to their better absorbency. Organic cotton enhances biodiversity and biological cycles, in that way it is an advantage for human health and the environment. Production of organic cotton is growing rapidly worldwide even though the organic cotton properties are not good as regular cotton fibre.

2.2 Selection of Natural Mordant

Tamarind seed granule. - 300 grams

Water - 2 liters

The finely powdered tamarind seed coat (300 g) was extracted with water (2 L) for 2 hours at boil and after cooling it was filtered through a fine muslin cloth and the filtrate was collected separately. The remaining residue was extracted three more times in order to complete the extraction. The total extract wash heated to boil and was allowed to stand overnight and filtered again. Using brine saturated solution the clear filtrate is concentrated in a water bath and is been treated. A brown coloured tamarind seed coat tannin in powder form is obtained by filtering the brownish colored precipitate and dried in an oven.

2.3 Selection of Herbs for Antibacterial Activity

There are two natural leaves were selected almond leaves and jamun leaves. Almond and jamun leaves have anti-bacterial, and anti-fungal, property. The almond & jamun leaves were collected from Pollachi, Coimbatore district.

Solvent Extraction of herbs

Almond leaves - 100grams

Jamun leaves - 100grams

Water - 2 liters

Almond and Jamun herbs are grounded with 2 liters of water and solution was filtered for further process. Fresh plant materials were washed twice in fresh water, air dried and ground using a mortar and pestle and stored in an air tight container for further study. 6 gram of powdered plant material was added to 100 ML of 80% ethanol solvent individually and kept in a reciprocating shaker for 24 hours for continuous agitation at 150 rpm/min for thorough mixing of active materials to dissolve. Then, muslin cloth is used to filter followed by Whatman no.1 filter paper.

2.4 Antibacterial activity of Herbs by Well Diffusion Method

The antibacterial activity of the ten different plant extracts was evaluated by Agar well diffusion method. Sterile nutrient plates were prepared. For solidification the plates were left for 5 minutes and by well borer 6 mm were punctured. *Staphylococcus aureus* (ATCC 6538) and *Escherichia coli* (ATCC 8739) inoculum suspension of 0.1% were swabbed uniformly over the surface of the agar. 100 µl of each herbal extract was loaded into the well and the plates were kept for incubation at 37°C for 24 hours. The antibacterial activity was measured in millimeters and the zone of inhibition was recorded.

3. RESULTS AND DISCUSSION

3.1 Assessment of Antibacterial property test (EN ISO-20645)

TABLE 1 Antibacterial Activity -(EN ISO-20645)

Sl.No	Samples	zone of inhibition (in cm)		
		<i>Staphylococcus Aureus</i>	<i>Bacillus Subtilis</i>	<i>Shigella Sp</i>
1	COS	No zone	No zone	No zone
2	PMS	No zone	No zone	No zone
3	MMS	1.2	No zone	0.6
4	POMS	No zone	No zone	No zone
5	WMS	0.6	No zone	No zone

**COS- Controlled Sample, PMS- Pre mordanting, MMS- Meta mordanting, POMS- Post mordanting, WMS- Without mordant.

Plate-1

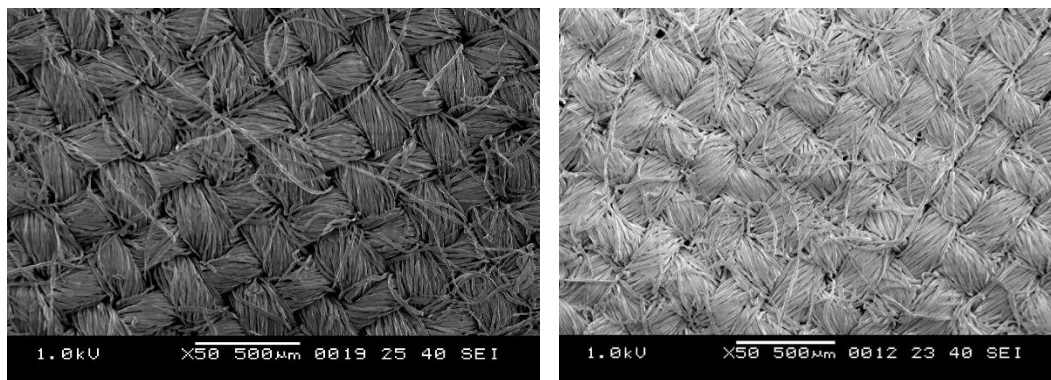
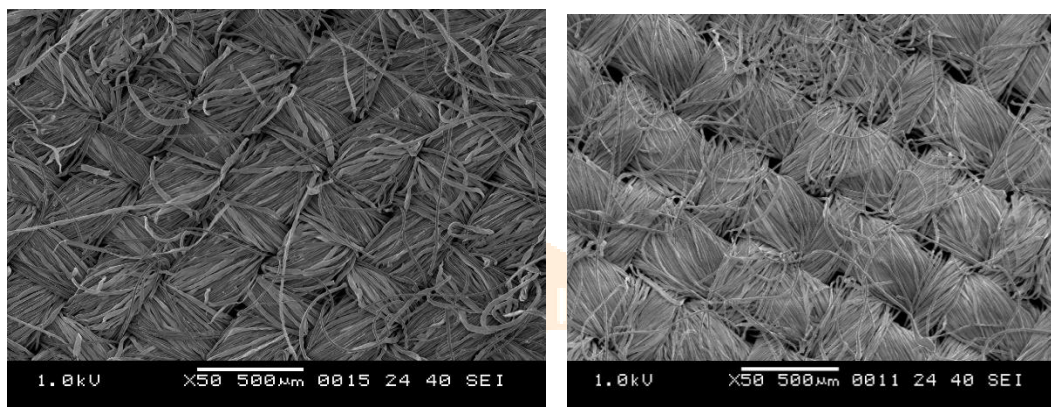


From the above Table-1 and Plate-1, shows that the Antibacterial activity was evaluated in terms of Zone of inhibition, measured and recorded in centimeter. It was clearly showing that the meta mordanting extract showed 1.3cm in *staphylococcus aureus* and *shigella sp* showed 0.6cm inhibition. Whereas, in without mordant the zone showed 0.6cm inhibition against *staphylococcus aureus* whereas the remaining mordant has no zone of inhibition.

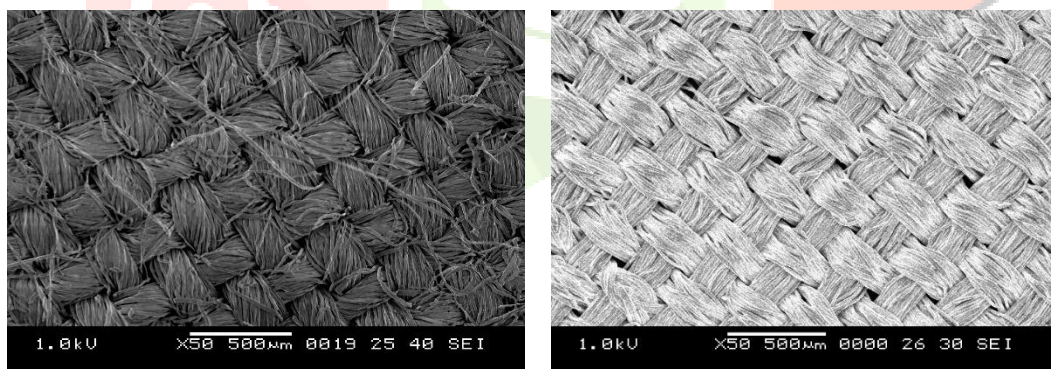
3.2 Analysis of SEM

Analysis of Scanning Electron Microscopic (SEM) of Treated Fabrics

The surface topography was tested using Scanning Electron Microscopic. A SEM micrograph of organic cotton sample covered with a 10 nm gold film deposited with the help of a sputter coater. In this example, image is preserved with no visible charging artifacts. However, in certain cases the sputtered metal might not reach the underlying fibers because of the 3D dimensionality of fibers, and will therefore charge under the electron beam. The air molecules present in the microscope chamber permits the electrical charges to detect a conductive path and then leaves the specimen surface.

Plate-2 -Pre - Mordanting**Plate-3 -Meta Mordanting**

The fabric count structure was very tight and there is very less gap between the yarns and treated fabric shows some openness compare to pre-mordant sample gets slacked.

Plate-4-Post Mordanting

The fabric count structure was very tight and there is very less gap between the yarns and treated fabric shows some openness compare to pre-mordant sample gets slacked. The analysis of SEM images of untreated and treated cotton fabrics are given in the representative plates reveals about the SEM micrographs of treated fabric of post mordanting techniques. These figures show clearly about the effect of finishing treatment in the corresponding materials and the subsequent process. The effect of concentration is clearly seen from the SEM micrographs as given in the Figures for cotton fabrics. The treatment makes the fabrics uniform so as to get improvement in their behaviors.

3.3 Fabric Thickness

TABLE 2- Fabric Thickness for Controlled and Treated Samples

S.No	Testing sample	Thickness (in mm)	
		Controlled	Treated
1	COS	0.16	0.19
2	PMS	0.18	0.21
3	MMS	0.19	0.32
4	POMS	0.19	0.22

The fabric thickness is good for the treated sample compared to the untreated sample. The treated sample gained thickness that can be used for al long run.

3.4 Fabric Weight

TABLE 3- Fabric Weight for Controlled and Treated Samples

S.No	Testing sample	Weight of the fabric (in GSM)	
		Controlled	Treated
1	PMS	128.2	131.4
2	MMS	129.4	133.4
3	POMS	127.8	130.0

Fabric weight of the treated sample is good as compared to the untreated sample, that shows after treatment fabric gained weight that can be used for long run.

CONCLUSION:

Antibacterial finishes are done to the fabrics for preventing bacterial effects for the user as well as the fibre degrading and people now are more conscious about their health and prefer organic products than chemicals. The research can be carried out with mercerized organic cotton samples. The findings can be tried with biopolymer application along with the mordant techniques. The research can be carried out with different fabrics like bamboo, banana. The antibacterial activity herbs can be combined with two to three herbs. Organic cotton that is free from chemicals are preferred by people and also, they invest on harm free products.

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