

Research Article

Herbal coating of denim fabric to enhance the wickability

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Abstract

In this study 100 %cotton denim fabric was treated with herbal combinations of Amanakku, Amman Paccharisi and Avaram by dip method, micro-encapsulation and nano-encapsulation by pad dry cure technique. The treated fabric was analyzed for the change in Wicking behavior of 10, 20, and 30 washes using T test. The results of the experimental study suggested that wicking abilities of finishing techniques did not have any say in the warp direction whereas; the microencapsulation enhanced the wickability in the weft direction. From the statistical analysis, it was evident that there was no significant difference between the groups with respect to fabric warp at 5% level and in weft count there was a significant difference between the groups at the 5% level.

Keywords: Denim, Dip method, Micro-encapsulation, Nano-encapsulation and Wickability

1. Introduction

Natural product market has seen tremendous growth in the last few years. It results in the formulation of a number of proprietary herbal products, majority of them being multi-component formulations¹. Eco textiles gain utmost important as one of the most useful resources that help promote new innovations, in an Eco-friendly manner. Eco-friendly scientists, and researchers are working together to find new fabrics that are friendly to the earth, animals, and humans. Recently there is lot of attraction towards natural based herbs as its eco-friendly and health hazard free nature².

An ideal antimicrobial finishing must satisfy several requirements, of which the most important are a broad spectrum of activity and low toxicity to the consumer³. Micro encapsulation is a technique in which tiny droplets of benefit laden products such as moisturizers, fragrances, deodorizers ,vitamins or repellents are packed in microscopically small capsules sealed hermetically thereby preserving them. It is vital that microencapsules are stable and durable. The diameter of capsule varies from 1m depending upon the application; an area of 1sq cm would contain 1 million capsules.

Nanotechnology is defined as the study and use of structures between 1 nanometer and 100 nanometers in size. To give an idea of how small that is, it would take eight hundred 100 nanometer particles side by side to match the width of a human hair. Making composite fabric with nano-sized particles or fibers allows improvement of fabric properties without a significant increase in weight, thickness, or stiffness as might have been the case with previously-used techniques⁴.The objectives of the study are To optimize the effective herbal of the functional property of the selected finishes, To finish the herbal on the hundred percent cotton denim fabrics using Dip method, Micro-encapsulation and Nano-encapsulation technique and to compare the activity of the herbs in Wickability test.

2. Materials and Methods

2.1 Selection of material

Denim material -100% cotton woven by twill weave -2/1 RHT, weight - 7 ounces, and color - carbon tan were selected for the study.

Pretreatment

Desizing of selected samples to make it suitable for further processing was done. The desizing was done for 100% cotton denim fabric.

2.2 Selection of herbs

Amanakku, Amman Paccharisi and Avaram herbs were selected because they exhibited antimicrobial activity and tannic properties. In the Indian system of medicine *Amanakku*, the leaf, root and seed oil of this plant have been used for the treatment of inflammation and liver disorders. It is reported that this plant possesses anti-diabetic and anti-fertility activities. Methanol extract of the root shows anti-inflammatory and free radical scavenging activity⁵. The, *Amman Paccharisi* has been reported to contain alkaloids, saponins, flavonoids, tannins phenolic acids and amino acids. Traditionally, it is used in treatment of gastrointestinal disorders, bronchial and respiratory diseases, kidney stones, diabetes and in conjunctivitis⁶. *Avaram* seeds are used for diabetetics. The plant is reported to exhibit antibacterial and Microbial activity⁷.

2.3 Extraction process of herbs

This procedure was followed with the reference of the article written by⁸. Methanol and Aqueous extraction was done. The herbal extraction was applied on 100% cotton denim fabric, which was selected as ideal sample; by dip method, microencapsulation and nanoencapsulation by pad dry cure method. This was evaluated after 10, 20 and 30 washes.

2.4 Analysis of Results

The test results of various denim fabric samples on various characteristic features after application of finishes by various methods like dip method, microencapsulation and nano encapsulation were analyzed statistically using 'T' test.

2.5 Method

2.5.1 Wickability test

In this method, wick up was observed by determining the rate of time at which the water moved upward on a fabric strip as per BS3424⁹. The rate (distance per unit of time) at which liquid travels along, or through a fabric specimen is visually observed, manually timed and recorded at specific intervals.

2.5.2 Measuring time at a given distance

Using a marking pen with soluble ink, a line across the end of each specimen at a distance of 5±1mm from the end of the fabric side to be tested, was marked. The 5 mm line denoted the level to which a specimen was to be lowered in the water in the flask (or) beaker which was the test start time.

Using a marking pen with soluble ink, and measured from the 5±1mm line, lines were marked across the width of the specimen at distances of 20±1 and 150±1mm. To facilitate the measurement of wicking distances, intervals of 10± mm were marked along the specimen length between the 20± 1 mm and 150± 1mm lines.

Alternative wicking distances may be used depending on the desired end use of the fabric. When comparing results, the same wicking distance bench mark should be used.

To determine the amount of water for the test, the extra specimens was used, and positioned at the opening of an Erlenmeyer flask by the insertion of a straight pin (or) other device near the end of the specimen. The specimen was allowed to hang in to the flask. Water was added up to the level at which the specimen's 5± 1 mm line was reached; and then the required water level marked on the outside of the flask to remain dry, to prevent premature bleeding of soluble ink marks on the specimen.

The flask was filled with distilled (or) demonized water to the line marked as instructed. The specimen was inserted into the flask, the scissor jaw raised to position the specimen so that the water was at the 5± 1 mm line. Alternatively the approximate amount of water required may be added to a flask, for determining and marking a water level fill line on the outside of a flask, a pipette may be used to raise the water level to the appropriate height. A clean flask with fresh water was used for testing subsequent samples.

The stop watch (or) timer was started as soon as the water reached the 5±mm line and the soluble ink began to migrate upwards. The rise of the water was monitored; time it took for the soluble ink at the marked 20±1mm line to migrate was recorded to the nearest second; the same test was administered for the remaining specimens.

3. Result and discussion

3.1 Wickability Test (minutes)

Table 1 Wickability Test (minutes) of 100% cotton denim finished fabrics

S. No	Fabric samples	Wickability test (minutes) Warp	Statistical Analysis		Wickability test (minutes) Weft	Statistical Analysis	
			'F' value	Significance		'F' value	Significance
1	100% Cotton denim fabric (D)	13.5	13.538	0.006	4.0	17.317	0.003
1a	100% Cotton denim fabric (dip method) (FFD1)	9.0			6.5		
1b	100% Cotton denim fabric (dip method) after 10 washes (FFD10)	8.7			6.0		
1c	100% Cotton denim fabric (dip method) after 20 washes (FFD20)	8.3			5.8		
1d	100% Cotton denim fabric (dip method) after 30 washes (FFD30)	8.1			5.5		
2	100 % cotton denim fabric (Micro-encapsulation method) (MD)	10.5			8.5		
2a	100 % cotton denim fabric (Micro-encapsulation method) after 10 washes(MD10)	9.5			7.5		
2b	100 % cotton denim fabric (Micro-encapsulation method) after 20 washes (MD20)	9.5			7.5		
2c	100 % cotton denim fabric (Micro-encapsulation method) after 30 washes (MD30)	11.0			8.5		
3	100 % cotton denim fabric (Nano -encapsulation method) (ND)	8.5			7.5		
3a	100 % cotton denim fabric (Nano-encapsulation method) after 10 washes (ND10)	8.0			7.3		
3b	100 % cotton denim fabric (Nano-encapsulation method) after 20 washes(ND20)	7.5			6.9		
3c	100 % cotton denim fabric (Nano-encapsulation method) after 30 washes(ND30)	7.1			6.5		

Table 1 and show the wicking tests Properties of Drop Test in samples of Dip method, Micro-encapsulation and Nano -encapsulation

The findings of the wickability test (minutes) of dip, microencapsulated and nanoe- ncapsulated finished fabric was evaluated after 10, 20, and 30 washes; sample D(13.5 minutes) had highest value in warp direction and sample MD, MD30(8.5 minutes) had the same value in weft direction among all the samples.

Hence it is concluded that the finishing techniques did not have any say in the warp direction whereas, the microencapsulation enhanced the wickability in the weft direction.

From the statistical analysis, it was evident that there was no significant difference between the groups with respect to fabric warp at 5% level and in weft count there was a significant difference between the groups at the 5% level.

4. Conclusion

After the procedure it was identified by the investigator that the finishing technique by the dip, microencapsulated and nanoencapsulated finished fabric was evaluated after 10, 20, and 30 washes in the hundred percent cotton denim fabric possessed. The wickability timing was decreased initially in warp direction, and in weft direction, increased on washing, in all the three finishes; by which it had been deciphered that the finish had no say, in absorbency property.

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