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Research Paper

Development of antimicrobial finish from false daisy (*Eclipta alba)* for cotton fabric

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■ **ABSTRACT :** Soxhlet method was used for the extraction of False dasiy with methanol. The antimicrobial activity of false daisy extract was determined by the Disc diffusion method and determine the optimum values of three concentrations 3, 5, 7 g/lit. and time values 12, 18, 24 hours whereas temperature, medium and pH used for optimization of extraction conditions were kept constant. False daisy extract was applied on cotton fabric by direct and microencapsulation techniques. The physical properties of untreated and treated fabric were assessed to determine the appearance, performance and serviceability of the fabric. The test samples were assessed for fabric weight, thickness, drapability, bending length, flexural rigidity, crease recovery, moisture regain, tensile strength, elongation, whiteness index using standard test methods. The efficacy of the microencapsulated samples assessed by testing antimicrobial activity after 5, 10, 15, 20 launder-o-meter washing cycles. The absorbance value of microencapsulated sample after 0 washes 1.102 and 1.757 even after 20 washing cycles. False daisy shows greater reduction of bacterial growth. The antimicrobial activity of microencapsulated sample significantly reduced after every washing cycle.

■ **KEY WORDS:** Antimicrobial, Cotton, Efficacy, Optimization, Microencapsulation

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Textiles play an important role in the daily lives of humans. The demand for various quality attributes of these textiles are based on enhancing the properties through proper finishing. Fabrics that are fire resistant, wrinkle resistant and stain repellent are already in the market while other property enhancing treatments, such as UV protective and antimicrobial, are being researched. Antimicrobial textiles have been developed for use in the medical industry for some time. Currently, the antimicrobial textiles used in the health care industry are disposable non-woven and wound dressing materials. Some of the treatments used are harmful to our environment not only because of the chemicals used in the treatments, but also because the treated textiles are not reusable (Vinay and Gotmare, 2011).

Herbal textiles are finished entirely with herbal extractions, without using any sort of chemicals. These herbs are applied directly to the fabric with the natural ingredients, so that the medicinal value of the herbs can be kept intact. No chemical process is adopted while

finishing process. Herbal treated cloth has the ability to protect us from various skin diseases, provide relief from viral infectious diseases and mental depressions since the herbal finished clothes or garments come in prolonged contact with the human body. The medical properties of herbs are known to cause no damage to the human body (Jayalakshmi and Manjusha, 2011).

The present study was therefore designed impart the antimicrobial activity of False daisy extract to the cotton fabric. Direct and Microencapsulation techniques were used to apply the finish.

■ RESEARCH METHODS

Fresh mature green leaves of false daisy were collected, washed and allowed to dry in hot air oven at 40^0C temperature. After complete drying they were made into fine powder by crushing and grinding. Dry powder was weighted and subjected to organic solvent to get the concentrated extract. Extraction of false daisy done with methanol.

Method of extraction :

The powdered raw material was packed in the body of the soxlet extractor. The solvent was placed in the flask. The solvent was boiled on heating flask, which got converted into vapours. These vapours entered into the condenser through the side tube and got condensed into hot liquid which fell on the column of the plant powder. When the extractor was filled with the solvent, the level of siphon tube also raised up to its top. The solvent containing active constituents ran into the flask, thus empting the body of extractor. The soluble active constituents of the plant remained in the flask while the solvent was repeatedly volatilized. The solvent containing active constituents was collected from the flask and transferred to the beaker which was placed on the water bath in order to evaporate the solvent. At last the solidify mass of the plant extract was obtained. The extract obtained was weighted and percentage yield was calculated in terms of air dried powder weight of the plant material.

Fabric finishing treatments with false daisy extract:

Direct application :

On the basis of weight of the fabric, quantity of herbal extract and citric acid used as cross linking agent were calculated. The material to liquor ratio was taken as 1:20. Acetic acid was used to maintain pH 5-6. The samples were immersed in the finish bath for 30 minutes. After that the fabric was placed in trough containing the solution of herbal extract for 5 minutes and passed the fabric through the herbal solution. Samples were passed between two rollers of pneumatic padding mangle at a pressure of 2.5 psi and uniformly squeezed. The fabric was dipped in the solution and passed again between the rollers of padding mangle to give a wet pick of its maximum take up. It was known as two dip two nips operation. The fabric was sent for subsequent drying and curing operation after it left the padding mangle. The fabric was dried at 80^0 C for 3 minutes and cured at 120^0 C for 2 minutes on a curing chamber (Santosh, 2010).

Microencapsulation method :

Microencapsulation is a process by which very tiny droplets of liquid or particles of solid are covered with a continuous film of polymeric material. Micro-capsulation was done using herbal extract as core material and gum acacia as wall/sheath material. Ten grams of acacia powder was allowed to swell for 15 min in 100 ml of hot water. To this mixture, 50 ml of hot water was added and stirred for 15 min maintaining the temperature between 40^0 and 50^0. One and half gram of core material (herbal extract) was slowly added under stirring conditions. Stirring was continued for another 15 minutes and then 10 ml of 20 per cent sodium sulphate and 6 grams of citric acid was added. The stirring was stopped and mixture was freeze dried in a freezer to develop microcapsules. Cotton fabric was immersed in the microcapsule solution and padded through pneumatic padding mangle. The treated fabric was dried at 80^0C for 5 minutes (Sathianaryanan *et al.*, 2010).

Determination of microbial population on untreated and treated fabric :

AATCC-147-1998 (USA): Qualitative Antibacterial Assessment -Agar diffusion Test :

Fifty ml. of nutrient agar was prepared and sterilized at 121^0C for 15 minutes. Petri plates were autoclaved in hot air oven at 121^0C for 30 minutes. 20 ml of nutrient agar was poured into each of these plates and were allowed to solidify. A series of 8 test tubes containing 4.5 ml of sterile water was taken. 0.5 ml of culture from

Nutrient broth containing the 100 per cent gel treated sample was transferred aseptically into the first test tube. Serial dilution was carried out until its reduced dilution was 10^{-8}. 100 micro litres of 10^{-8} diluted culture was taken aseptically and poured onto the Petri plates. This was spreaded by using L rod. The plates were incubated at 37^0C for 24 hours (Krishnaveni *et al.,* 2010).

The effectiveness of antimicrobial finish on morphology and selected fabric properties :

The physical properties of untreated and treated fabric were assessed to determine the appearance, performance and serviceability of the fabric. The test samples were assessed for fabric weight, thickness, drapability, bending length, flexural rigidity, crease recovery, moisture regain, tensile strength, elongation, whiteness index using standard test methods.

Efficacy of antimicrobial finish :

The efficacy of the finish was analyzed by washing all finished samples with pre-determined number of washing cycles in 'Launder-o-meter' by using standard test ISO:6330-1984E. The fabric samples were then subjected to microbial testing and the bacterial growth was analyzed after 5, 10, 15 and 20 washing cycles.

■ RESEARCH FINDINGS AND DISCUSSION

The percentage yield of false daisy plant extract was found to be 55.50 per cent in terms of air dried powder weight of the plant material.

Absorbance value of the sample is directly proportional to the concentration of cells in the sample. The absorbance value for all samples is given in Table 1. The absorbance value of untreated sample was 1.89. Using the absorbance value at 600nm, there was significant reduction in bacterial growth having absorbance value 1.57 with direct application and 0.89 with microencapsulation treatment of false daisy extract through pad-dry-cure method.

Physical and mechanical properties :

The physical properties have greater influence and play an important role in determining the quality of the fabric. Data presented in Table 2 shows that the GSM value of control cotton sample was 148.88 g/m^2 . When false daisy extract was directly applied, the GSM of the sample was 171.11 g/ m^2. The GSM was 158.20 g/m^2 after giving microencapsulation treatment using false daisy extract to the fabric.

Table 1 : Absorbance value of untreated and treated fabric

Treatments	(Absorbance value at 600nm)
Untreated	1.89
Direct	1.57
Microencapsulated	0.89

The fabric thickness of untreated sample was approx 0.534 mm. When direct treatment of false daisy extract with pad-dry-cure method was given to the fabric, the fabric thickness increased to 1.413 mm. As comparison to untreated sample, fabric thickness increased to 0.940 mm when microencapsulation treatment was given. When clove extract was not applied on fabric, the bending length was 3.28 cm in warp and 1.43 cm in weft direction, After direct application of false daisy extract, bending length of fabric was 1.16 cm in warp direction and 1.88 cm in weft direction. After applying the false daisy microcapsules to the fabric, bending length increased to 1.55 cm in warp and 2.17 in weft direction.

Flexural rigidity is a measure of stiffness associated with the handle. It is revealed from the Table 2 that the flexural rigidity of control sample was 446.26 mg-cm in warp direction and 47.24 mg-cm in weft direction. The microencapsulated fabric showed 60.21 mg-cm of flexural rigidity whereas, directly treated fabric by pad-dry-cure method resulted in 25.72 mg-cm of flexural rigidity I warp direction. The flexural rigidity of false daisy directly treated sample by pad-dry-cure method was 102.55 mg-cm in weft direction. When microencapsulation treatment of false daisy extract was given, the flexural rigidity increased to 159.37 mg-cm in weft direction. The crease recovery of warp and weft untreated fabric was found to be 36.67^0 and 43.33^0, respectively. After diving false daisy direct finish treatment by pad –dry-cure method, the crease recovery angle was 37^0 and increased to 51.33^0 after giving microencapsulation treatment. It was further indicated that, in false daisy directly treated sample, the crease recovery angle was 50.67^0 in weft direction. Crease recovery angle increased to 63^0 after giving false daisy microencapsulation treatment in weft direction.

The moisture regain percentage was 0.47. When cotton fabric treated with direct application of false daisy extract, the moisture regain increased to 0.81 per cent. It further increased to 0.95 per cent after

Table 2 : Physical and mechanical properties

Properties		Treatments		
		Untreated	Direct application	Microencapsulation
GSM		148.78±0.153	171.11±0.094	158.20±0.146
Thickness		0.426±0.113	1.413±0.008	0.940±0.001
Bending length	Warp	3.35±0.030	1.16±0.013	1.55±0.017
	Weft	1.43±0.176	1.88±0.024	2.17±0.014
Flexural rigidity	Warp	446.21±0.520	25.72±0.092	60.21±0.161
	Weft	47.24±0.124	102.55±0.869	159.37±0.182
Crease recovery	Warp	34.33±2.27	37.00±1.154	51.33±0.881
	Weft	42.33±1.201	50.67±1.202	63.00±6.244
Moisture regain		0.47±0.01	0.81±0.01	0.95±0.03
Drapability		75.43±0.318	76.70±0.208	77.77±0.145
Tensile strength	Warp	25.06±0.67	25.30±0.25	24.36±0.27
	Weft	22.11±0.20	20.49±0.34	19.04±0.23
Elongation	Warp	25.80±0.10	73.46±0.26	34.96±0.09
	Weft	37.56±0.12	25.03±0.15	25.20±0.15
Whiteness index		42.57±0.07	11.98±0.47	6.89±0.05

Table 3 : Absorbance value after different washing cycles

Washing cycle of microencapsulated finish	Absorbance value at 600 nm
0	0.894
5	01.146
10	1.276
15	1.574
20	1.891

microencapsulation treatment. The drape co-efficient of untreated sample was 80.67 per cent. The drape co-efficient increased to 76.70 per cent and further increased to 77.77 per cent after giving direct microencapsulation treatment, respectively. The tensile strength of untreated fabric was 23.73 kg and 23.02 kg in warp and weft direction, respectively. After giving the direct application of false daisy extract with pad-dry-cure method, the tensile strength was 25.30 kg and it slightly decreased to 24.36 kg for microencapsulation treated fabric. In case of weft direction of fabric, the tensile strength of false daisy directly treated sample by pad-dry-cure method was 20.49 kg. When microencapsulation treatment of false daisy extract was given, the tensile strength decreased to 19.04 kg. It is revealed from the Table 2 that elongation of untreated fabric was 25.33 per cent and 37.16 per cent in warp weft direction, respectively. After giving the direct application of false daisy extract with pad-dry-cure method, the elongation was increased to 73.46 per cent in warp direction and decreased to 25.03 per cent in weft direction. As compared to untreated sample the elongation got increased to 34.96 per cent in warp direction and decreased to 25.20 per cent in weft direction, after giving the microencapsulation treatment using false daisy extract. Whiteness index of untreated fabric was found to be 42.24. After giving the direct treatment with false daisy extract by pad-dry-cure method, the whiteness index decreased to 11.98 and further decreased to 6.89 after giving microencapsulation treatment.

Efficacy of microencapsulated finish :

The efficacy of the microencapsulated samples assessed by testing antimicrobial activity after 5, 10, 15, 20 launder-o-meter washing cycles has been depicted in Table 3.

The absorbance value for unwashed false daisy microencapsulated sample was 0.894 and it increased to 1.146 after five washing cycles. After 10 washing cycles, the absorbance value of false daisy microencapsulated sample was 1.276, it increased to 1.574 and 1.891 after 15 and 20 washing cycles, respectively.

Conclusion :

False daisy extract directly applied on fabric through pad-dry-cure method and with microencapsulation treatment is found to have good antimicrobial activity against natural flora. Cotton fabric

treated with microcapsules of false daisy extract are shown to have effective antimicrobial activity upto 20 lauder-o-meter washing cycles. The scope of implementation and commercialization of this herbal extract as an anti-microbial finish in textile is a noval idea.

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■ REFERENCES

Krishnaveni, V., Amasamani, S. and Rajkumar, G. (2010). Development of eco-friendly herbal antimicrobial finish on cotton fabric using *Calendula oficinalis* (Marigold). *Man Made Tex.,* **5**(1):373-376.

Santosh, G. (2010). Anti-microbial textiles. *Indian J. Fib. Tex. Res.,* **13**(2):230-235.

Sathianaryanan, M.P., Bhat, N.V., Kokate, S.S. and Walung, W.E. (2010). Antimicrobial finish for cotton fabric from herbal products. *Indian J. Fib. Tex. Res.,* **35**(3): 50-58.

Vinay, G.N. and Gotmare, V.D. (2011). Innovative developments in antimicrobial textiles *Indian Tex. Res. J.,* **12** (2) : 102-132.

■ WEBLIOGRAPHY

Jayalakshmi, I. and Manjusha, K.J. (2011). Ayurvedic medicated application on textile material. *www.fibre2fashion.com.*