

Antimicrobial Studies on Cellulosic Fibre

M. Badmanaban^{1*}, K. Naveenraj², M. Gopalakrishnan³

^{1,2}Student, Department of Textile Technology, Bannari Amman Institute of Technology, Erode, India

³Associate Professor, Department of Textile Technology, Bannari Amman Institute of Technology, Erode, India

Abstract: The present investigation was carried out to restore the vintage artwork of dyeing with herbal dye from leaves of *Acalypha indica*. It is belonging to own circle of relatives Euphorbiaceae, generally acknowledged kuppaimeni. And the herbal dye from leaves of *Vitex negundo*, generally acknowledged nochi. The dye has suitable scope withinside the business dyeing of cotton in clothes industry. In the existing study, degummed fabric had been dyed with chemical and herbal mordants. Dyeing turned into accomplished by pre-mordanting, post mordanting and simultaneous mordanting project focuses over eco-friendly natural antimicrobial finishing knitted fabric. The fabric is treated with the dye prepared from *Acalypha Indica* (Kuppaimeni) through pad-dry-cure method. Then the treated knitted fabric was put under various tests like Functional (Anti-bacterial) *Acalypha indica* shows effect on bacteria like *E. coli* and *S. aureus*. Anti-bacterial property is high enough to show effect. Characteristics test like XRD, EDX, SEM, FTIR are taken. XRD shows the high-level presence of dye particles on the surface of the fabric. SEM & EDX shows the particle, they're having the proper size to hold on and give perfect outlook. FTIR result comes out good showing negative to harm full materials presents through peak. Physical property tests like Burn test, Water observation, Elasticity test are trialed on *Acalypha indica* treated fabric and plain Knitted fabric. The results are comparatively similar no great difference in drop of fabric after *Acalypha indica* treatment.

Keywords: Antimicrobial, Anti-Bacterial, Cellulosic fabric.

1. Introduction

The plant *Acalypha Indica* is mostly grow in Indian rode sides in large amount. Its name either describes it's native "Indica" in *Acalypha Indica* refers to India. This type of plant is not mostly grown in agriculture fields or in large forming. This plants *Acalypha Indica* is grown on their own through different types of seed transport in nature it does not require continues watering or large amount of water it can survive with occasionally watering. The main distribution of this type genus is in the tropical and sub-tropical places. *Acalypha Indica* generally utilized in customary restorative arrangement of India and numerous different nations. Clinical use instance of this plant is exceptionally high in both outside and inside body issues. This plant has been accounted for to have hostile to disease, against diabetic, hostile to oxidant, against bacterial, antifungal hepatoprotective, calming, and furthermore used to check enemies of ulcers and wounds mending (Rodw 2021).

2. Materials and Methods

A. Materials

The main source for preparing dye.



Fig. 1. *Acalypha Indica* fresh & dried Leaf

The fig. 1, represents the plant *Acalypha indica* from village from Perundurai. The other image in it shows the dried stage of the plant leaf. Agent used for extraction of dye from the plant. Ethanol (99.9%) Lab reagent LR grade. It was sold by Ng Enterprises, Osmanabad Maharashtra. Fabric used for dyeing and testing.



Fig. 2. Cotton Knitted Fabric

The fig. 2, is the fabric taken for dyeing. This a white cotton knitted fabric without any chemical treatment. It is in the length of 1m to 1m only the needed part of the fabric will be taken for dyeing. The secondary material used in preparing dye and dye storing.



Fig. 3. Apparatus and Chemicals

*Corresponding author: badmanaban.tx19@bitsathy.ac.in

The fig. 3, has two 20ml containers and 100ml beaker used in preparation of dye. The 20ml containers are used for storing dye. polytechnic sheet is used as to provide an airtight to the beaker to avoid the evaporation of ethanol in it.

B. Experimental Procedure for Anti-microbial treatment

The fresh *Acalypha Indica* plant leaves were plucked and cleaned in clear water for 3 times to remove the unwanted substance present on the surface of the leaf. Then it is dried under sun shade outside to rapid dry the leaf which is suitable for making powder. The 100% dried leaves obtained from the sun shade dry were put into a crusher to have a very tiny powder partial. Which is then taken measured, for testing and dye preparation.

3. Results and Discussion

Table 1
Knitted fabric specification

Type of Structure	Single Jersey
Dimension Thickness	
Grams per square meter (GSM)	0.49m1 27.99 g/m ²
Yarn Particulars	
Material of yarn	Cotton 30s
Count of yarn	
Course Per Inch	50
Wales Per Inch	35
Tightness Factor	1.84
Type of Machine	Circular Knotted Machine
Loop Length/ 100 loop	
1 Loop length	24cm 0.24cm

A. Water Observation Test

This test provides us the information of the prepared fabric for water absorption percentage. Both treated and plain fabric is taken for the test.

Table 2

	Treated fabric	Untreated fabric
Length	10cm	10 cm
Width	4cm	4cm
Timing	30 seconds	1 minute

The table provide the details of the time taken for different fabrics to observe the water drop placed on each fabric. The time difference helps us to fine the result for water absorption property.



Fig. 4. Water observation trail (untreated fabric)

The fig. represents the process of testing the plain fabric. The pillar is used for placing a single drop of water on the fabric. The duration for the water drops absorption is noted and shown is the table.



Fig. 5. Water observation trail (treated fabric)

B. Nano Particles Characterization Test

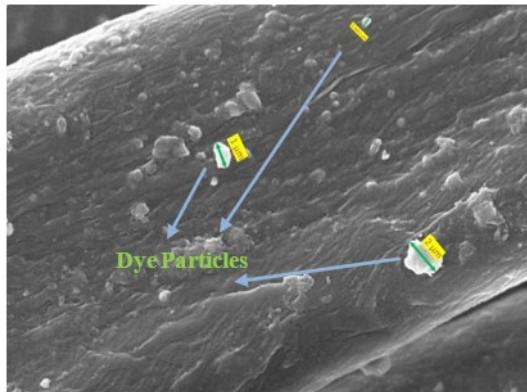


Fig. 6. 10,000 X Zoom (SEM) treated

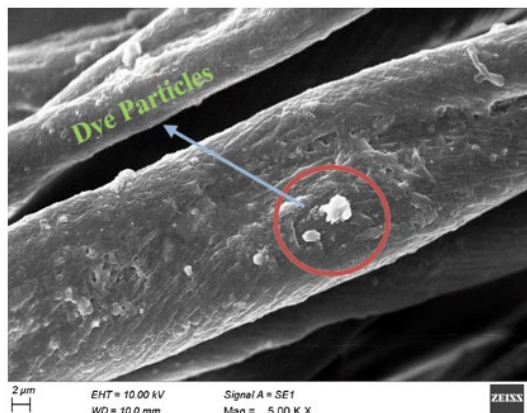


Fig. 7. 5,000X Zoom (SEM) treated

Table 3

Trail Value (10 k X zoom) fabric A, Indic Treated fabric

Element	Weight %	Atomic %	Error %
C K	35.17	42.56	6.12
N K	3.71	3.85	16.98
O K	57.42	52.16	7.44
Cl K	1.41	0.58	9.07
K K	2.29	0.85	17.99

Table 4

Trail Value (5k X zoom) fabric A, Indic Treated fabric

Element	Weight %	Atomic %	Error %
C K	35.48	42.73	5.92
N K	3.44	3.56	19.53
O K	58.17	52.6	7.39
Cl K	0.9	0.37	12.91
K K	2.01	0.74	23.52

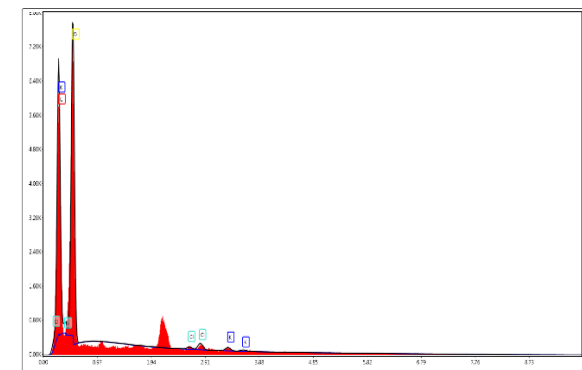


Fig. 8. Acalypha indica treated fabric graph (5k x Zoom)

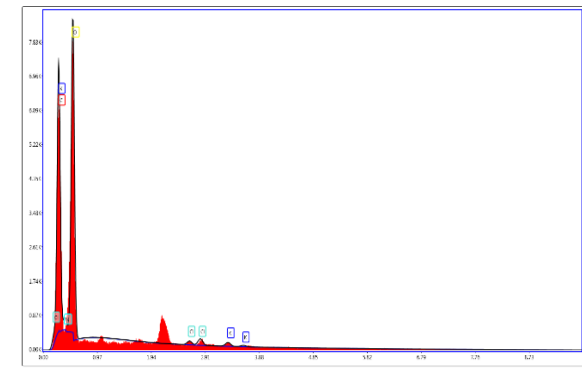


Fig. 9. Acalypha indica treated fabric graph (10k x Zoom)

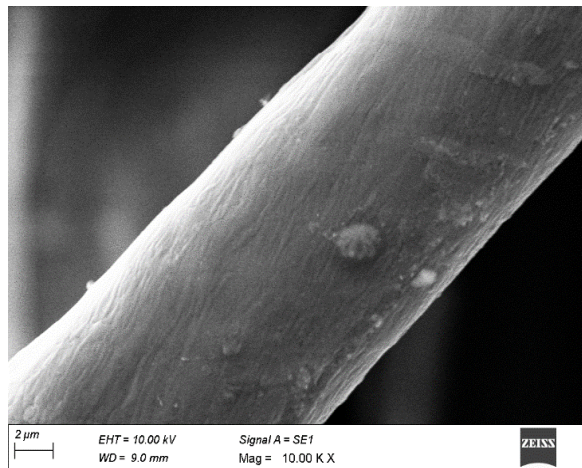


Fig. 10. 10,000 X Zoom (SEM)

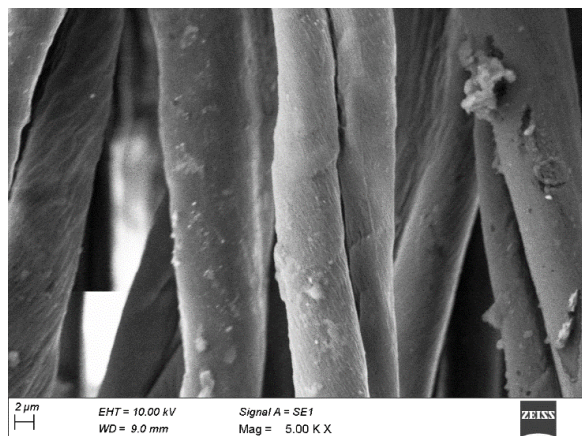


Fig. 11. 5,000 X Zoom (SEM)

Table 5
Testing value (10k X zoom)

Element	Weight %	Atomic %	Error %
C K	35.8	42.86	5.73
N K	3.47	3.56	19.46
O K	58.81	52.86	7.33
Cl K	0.43	0.18	21.73
K K	1.48	0.55	29.08

Table 6
Testing value (5k X zoom)

Element	Weight %	Atomic %	Error %
C K	35.21	42.31	5.77
N K	4.09	4.22	16.65
O K	58.55	52.53	7.39
Cl K	0.59	0.24	15.84
K K	1.89	0.7	22.17

Table 7

Reference code	00-001-0157
Compound name	Calcium Carbon Oxalate Hydrate
Common name	Calcium Oxalate Hydrate
PDF index name	Calcium Carbon Oxalate Hydrate
Empirical formula	C ₂ H ₂ CaO ₅
Chemical formula	CaC ₂ O ₄ ·H ₂ O

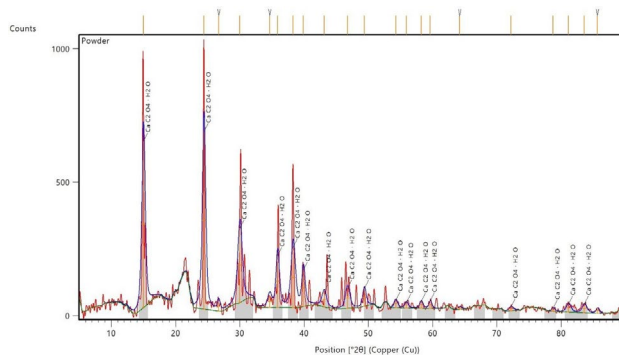


Fig. 12. Graph chat (XRD) A. Indica powder

4. Conclusion

Acalypha indica and Vitex negundo treated fabric have high water absorption property compared to un treated cotton knitter fabric. This have high air partibility property. This both comes together by giving better comfort. This may get stains on it but as it is only used as one-use fabric that is not a considerable. The elasticity property of the Acalypha indica treated fabric is completely lower than the untreated knitted fabric. The particle size is really very small enough to penetrate through smaller pores. The SEM and EDX test result comes out to prove that. Smaller particle size helped in better dyeing. The particle size is really very small enough to penetrate through smaller pores. The SEM and EDX test result comes out to prove that. Smaller particle size helped in better dyeing. Acalypha indica dyed fabric have property to defend bacteria and protection against bacterial skin problems. We can place Acalypha indica and Vitex negundo dyed fabric on the infected place on infected person. Effect of the output is 50% cure on insisted bacterial skin problems.

References

- [1] Arun Kanti Guha (2019) A Review on sources and Application of Natural Dyes in Textiles. *International Journal of Textile Science*, 8(2): 38-40.
- [2] Ado A., Yahaya H., Kwalli A. A., Abdulkadir R. S... Dyeing of Textiles with Eco-Friendly Natural Dyes: A Review. *International Journal of Environmental Monitoring and Protection*. Vol. 1, No. 5, 2014, pp. 76-81.
- [3] D Jothi Extraction of natural dyes from african marigold flower (*tagetes erecta* l) for textile coloration. Textile Engineering Department, Bahir Dar University, Bahir Dar, Ethiopia. *IJCPS*, 2013: Vol.1(8): 502-509, June 2008.
- [4] Geetha B and V. Judia Harriet Sumathy. Extraction of Natural Dyes from Plants. *International Journal of Chemistry and Pharmaceutical Sciences*. Postgraduate & Research Department of Biotechnology. *IJCPS*, 2013: Vol.1(8), December 2013.
- [5] H Krizova. Natural dyes, their past, present, future and sustainability. Faculty of Textile Engineering, Dept. of Material Engineering (11 February 2016).
- [6] Jeannette Lucejko. Colour fading in textiles: A model study on the decomposition of natural dyes. *Microchemical Journal*, 85, (2007), 174–182.
- [7] K. H. Prabhu and Aniket S. Bhute. Plant based natural dyes and mordants: A Review. Department of Textile Chemical and Colour, Wool Research Association. *J. Nat. Prod. Plant Resour.*, 2012, 2 (6):649-664.