

Evaluation of Antibacterial Activity of Natural Dyed & Fragrance Finish on Modal Fabric

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Abstract— The textile industries play a major role in the discharge of wastewater in the form of dyestuff and chemical substrates. The wastewater will be polluting the land resources and degrade the water surface layer, to overcome that alternative method of natural dyeing was used. Many peoples will suffer due to the presence of chemical substances in the material. So the naturally available herbs are used for the study to avoid skin irritation. In the present study, teak leaves are used to dye the textiles. During dyeing, the brown shades were observed. The plant is used in the treatment of urinary discharge, bronchitis, cold and headache. The various phytoconstituents isolated from which has been reported to antimicrobial Activity, anti-tumor activity, etc. It causes less toxicity and generally exhibits better biodegradability and compatibility with the environment. Modal is called a cellulose man-made fabric, essentially a variety of rayon. Modal is a registered trademark of Lenzing AG Groups. It is more water-absorbent than cotton. The natural dye can be absorbed more quickly than cotton fabrics. The aromatic finish is used to enhance the value of the product. The study indicates that almost all variables showed their performance and to evaluate the efficacy of the plant for its antibacterial activity.

Keywords: Biodegradability, Modal Fabric, Tectona Grandislinn, Artemisia Pallens, Antibacterial Activity, Colourfastness

I. INTRODUCTION

Today textile production is characterized by higher quality requirements, productivity, and greater flexibility to meet the basic requirement of the global market. The contributions of the textile industry to the Indian economy are notable but with a blemish pollution industry. (1) The Dyestuff industrial wastes in the form of wastewaters and atmospheric gases are polluting the neighbouring area. (2). The Uses of non-toxic and eco-friendly natural dyes on textiles have become an important matter due to the increased environmental awareness. (3). Natural dyes are biodegradable and they can be easily used without any environmental concerns. Recently, many commercial dyers have started using natural dyes to overcome the environmental damage caused by synthetic dyes. (4) Natural dyes produce very uncommon, soothing and soft shades as compared to synthetic dyes. Colouring matter extracted from the roots, stems, leaves or barriers and flowers of various plants (5). Tectona Grandis Linn is commonly known as "teak", large deciduous tree with light brown bark, leaves, broadly elliptical, flowers are white, and have a pleasant smell. The most important species and the whole plant are claiming to cure several diseases according to Indian traditional methods. (6) Artemisia species is a small and aromatic herbaceous plant, and most of them yield

essential oils. Leaves are very small, bluish-green with yellow flowers are used as floral decorations and yield as an essential oil known as oil of Davana, and it is useful as antiseptic and disinfectant. Some of these oils are used as medicine such as perfumery, vermifuge, stimulant, etc. It is emotionally balancing, calming down anxiety. (7,8) Modal is a kind of Cellulose fibres. It has a soft, slinky texture, making it comfortable to wear, because of the properties like more absorbent, Dye well, very colourfastness. It is made from beech trees, so the dye can be absorbed more quickly than cotton. Modal is fairly colorfast, due to that property fabric washed in warm or hot water. (9) In the present study, the dyes extracted and applied on the modal fabric with the natural finishing of herbal aroma oil and to evaluate their antibacterial activity of the herbs on the surface of the fabrics and to find the efficiency of the coloring material.

II. SELECTION OF FABRIC & DYE EXTRACTION

The 100% Bleached modal woven fabric was purchased from Tirupur local market. The selected material was chosen due to its fast observing property naturally and soft texture, breathable nature makes it wearable and it feels good against the skin. The GSM of the fabric was 140 gm/cm². Tectona grandis leaves were collected in the southern hill stations and wash thoroughly with water to remove the impurity particles present in the leaves. Grinds the leaves extract with water to form a pasty condition and the substance to deposit in the conical flask. Filter the substance using ordinary and whats Mann no.1 filter paper. Then it is allowed to drying in the shade for one week then it is formed into flakes and grinds it to form a powder. The mordant is known as a dye-binding agent as well as a catalyst to improve the action to uptake the dye substance in the fabric uniformity and evenness. Alum is one of the most commonly used mordant and fixing agents in the natural dyeing techniques.

III. DYEING & FINISHING OF THE SELECTED FABRIC

In the current research work, for the dyeing, Dye (%) is 10%; the material liquor ratio is 1:30. The sodium chloride was acting as an electrolyte (25gpl), mordant alum (10gpl), temperature maintained at 90°C and time was one hour. The simultaneous process method was used in the dyeing of the fabric. Softener was used to soften the fabric by mixing the palm oil, coconut oil for washing. Washed the fabric with cold water and dried the fabric in the shade for 24 hours. For the fragrance finish, the Material: Water ratio is 1:30, the binder is citric acid (2-3 drops), artemisia pallens oil (50%) and Time= 30 minutes. Immersed the fabric in the solution and continuously stir the fabric. Pad dry cure method was used for the fragrance finish. Rinse the fabric in the cold water and allow the fabric to dry at room temperature.

IV. AGAR DIFFUSION METHOD

The natural and fragrance finished samples were placed in the agar diffusion plate, which has been inoculated with the tested organisms like E.Coli and S.aureus. After the incubation, bacterial organisms are uninterrupted growth underneath and the side of the tested material indicates the antibacterial activity of the fabric. The zone of inhibition was measured in mm by the effectiveness of the zone on the plate.

V. ASSESSMENT OF ANTIBACTERIAL FINISHED FABRIC - EN ISO 20645 TEST METHOD

In the antibacterial activity of the natural dyed and fragrance finished fabric was determined by test method using a sterile agar disc diffusion method. The agar plates were prepared by pouring 15ml of media into sterile Petri plates. The plates were allowed to solidify for 5 minutes and 0.1% inoculums suspension of staphylococcus aureus and Escherichia coli were swabbed uniformly and the inoculums were allowed to dry for 5 minutes. The natural dyed and fragrance finished modal fabric with the diameter of 20+ 2mm was placed on the surface of the medium and the plates were kept for incubation at 37 c for one day. The zone of inhibition formed around the fabric was measured in millimeter.

VI. RESULT & DISCUSSION

DYED		FINISHING	
Air permeability (cc)	Air resistance (sec)	Air permeability (cc)	Air resistance (sec)
61.17	0.0061	55.23	0.0070

Table 1: Evaluation of Air Permeability

While the fabric is increased in Air permeability after dyeing when compared to the finished fabric. The air permeability is low for the fragrance finished samples. The air resistance is very low for the samples due to nature of the fabric.

S.NO	Sample	Drop test in seconds
1	S	7.53

Table 2: Evaluation of Water Permeability (Drop Test)

If the water absorbency value is more the water will absorb slowly, the samples show that the value is higher, so the sample absorbs the water slowly.

S.NO	Colorfastness to washing	S
1	Change in color	3-4
2	Cotton range	4

Table 3: Colorfastness to Washing

Colorfastness- Grey scale rating: change in color: 5- no change, 4- Slightly changed, 3- Noticeably changed, 2- considerably changed, 1-much changed. From the above statement, the sample S shows that the change in color is noticeably changed.

S.NO	Colorfastness to rubbing	S
1	DRY	5
2	WET	4
3	Cotton range for staining	4-5

Table 4: Colorfastness to Crocking/Rubbing

Staining: 5- No staining, 4- slightly stained, 3- noticeably stained, 2-considerably stained, 1-much stained. In the dry & wet rubbing technique, the sample S shows that the staining is not stained in dry technique. From the above statement, the dyes are slightly stained in the wet fabrics.

S.NO	Colorfastness to sunlight	S
1	Fading 20 hours	4

Table 5: Colorfastness to Light

Colorfastness- Grey scale rating: change in color: 5- no change, 4- Slightly changed, 3- Noticeably changed, 2- considerably changed, 1-much changed. The samples S, shows that there was slightly change in sunlight.

SAMPLE S	BEFOR E WASH	After 10 WASHE S	After 20 WASHE S	After 30 WASHE S
S	5	4	3	2

Table 6: Evaluation of Wash Fastness for Fragrance Finish

The quality assessment was carried out with the help of 25 members who have the knowledge on fabric quality. The following results were obtained for the washing fastness of the fragrance finished samples. Colorfastness-change in smell: 5- no change, 4- Slightly changed, 3- Noticeably changed, 2- considerably changed, 1-much changed.

The fragrance finished sample before wash has no change in smell, after 10 washes the sample S has slightly changed in smell. After 20 washes, the sample has S has noticeably changed in smell. After 30 washes, the sample has S has considerably changed in smell.

S.NO	SAMPLE	ZONE OF INHIBITION (mm)	
		S.AUREUS	E.COLI
1	FINISHED FABRIC	32	30

Table 7: Evaluation of Antibacterial Activity of Fabric

From the above assessment, the modal fabrics which showed the zone of inhibition were good. For E.Coli is 30 mm and S.aureus is 32mm.



Fig. 1: Escherichia Coli

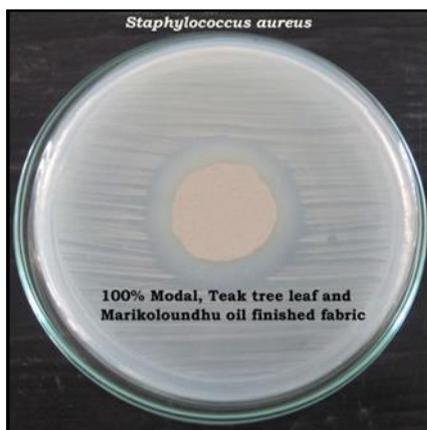


Fig. 2: Staphylococcus Aureus

VII. CONCLUSION

The current research is based on the modal fabric with the natural dyed and fragrance finish. It is eco-friendly; a natural-based dyeing technique is applied to the fabric. The Dyed fabric has lighter shades. The fragrance finish of *Artemisia pallens* oil shows that the presence of fragrance in the material. It is emotionally balancing and calming. It is soothing to rough, dry, chapped skin, skin infections and cuts. The dyes and fragrance finish herbs have natural antibacterial activities. It is not allergic, non-toxic to human beings. The antibacterial activity also assessed by the disc diffusion method, it also shows that the better zone of inhibition.

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REFERENCE

- [1] Bai, K., (2010), "Statistical methods", Sulthan Chand and Sons, Educational Publishers, New Delhi, 5th Edition, Pp.63.
- [2] Smith.J.L.,(2003), "Textile Processing", Abhishek publications, Chandigarh-17, India, Pp-62,72,122
- [3] Agarwal. K., (2009) "Application Of Natural Dyes On Textiles", Indian Journal Of Fibre & Textile Research, 34, Pp. 384-399
- [4] Jyoti Arora*, Prerna Agarwal, Gunjan Gupta (2017), "Rainbow of Natural Dyes on Textiles Using Plants Extracts: Sustainable and Eco-Friendly"Processes, Green and Sustainable Chemistry, 2017, vol. 7, Pp.35-47
- [5] Tassew Alemayehu, Zenebesh Teklemariam, (2014) "Application Of Natural Dyes On Textile: A Review", International Journal Of Research–Granthaalayah, Vol.2 (Iss.2):November, Issn- 2350-0530, Pp.61,62,65
- [6] Neha kheraa* and Sangeeta bhargavab, (2013) "Phytochemical and pharmacological evaluation of *tectona grandis.linn*" , International Journal of Pharmacy and Pharmaceutical Sciences, Vol 5, Issue 3 ISSN- 0975-1491
- [7] J. Suresh, A. Singh*, A. Vasavi, M. Ihsanullah and S. Mary (2011), "Phytochemical and pharmacological properties of *artemisia pallens*", International Journal of Pharmaceutical Sciences and research, Vol. 2, Issue 12
- [8] Anjali D. Ruikar 1, Gayatri S.Kamble , Vedavati G. Puranik, Nirmala R. Deshpande, (2009), "Antimicrobial Screening of Medicinal Plant –*Artemisia pallens*", International Journal of PharmTech Research, Vol.1, No.4, pp 1164-1166, ISSN : 0974-4304
- [9] Md. Hasan-Al Mamun, Asheke Mostofa, Md Anwar Hossain, Monir Khan, Md. Zakaria1, Most Sabina Yeasmin(2017), "Effect of Reactive Groups of Reactive Dyes on Dyeing of Modal Fabrics, International Journal of Textile Science 2017, vol.6, issue 6, Pp: 158-164