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Assessment of Antimicrobial Activity of Different Leaves Extracts Using Silk Fabric

P. Dhanalakshmi[1], Dr.R.I.Sathya[2]
Research scholar[1], [2]Professor, Department of Home Science, The Gandhigram Rural Institute -Deemed To Be University, Gandhigram, Dindigul District-624302,Tamil Nadu

Abstract: ***Natural dyes/colorants are derivative from flora and fauna are believe to be used as safe due to its nontoxic, non carcinogenic and biodegradable in nature. In this study two different plants of carica papaya leaves and thespesia populnea leaves were collected and prepared the dye extracts using aqueous extraction method. The extracted dyes were optimized using UV-Visible spectrophotometer. The dyeing was carried out with the optimized conditions of dye extracts on mordanted silk fabrics. The dyed silk fabric were evaluated by fastness properties with ISO standards .Two different extracts finished with silk fabric were tested against antimicrobial activity. CPL and TPL silk dyed sample revealed GOOD inhibitory zones against the test bacteria as per the AATCC-147 test standards.***

Keywords: Natural dyes, carica papaya leaves, Thespesia populnea leaves, UV-Visible spectrophotometer, antimicrobial test.

I. INTRODUCTION

In textile industry, dyeing or coloration of the textile substrate is one of the vital finishing process. While traditional natural dyeing goes back to more than three thousand years ago. The modern industry mostly use synthetic/chemical dyes. However, the natural dyes possess some positive characteristic such as soft and lustrous colors to the textile dyeing. Natural dyes can be classified in a numerous ways based on their source, origin, chemical structure, method of application and the obtainable hue. In natural dyes, plants are the major sources have been used for extraction of dyes. Plant sources includes roots, twigs, stems, barks, leaves, flowers, wood shaving, fruits, rind and seeds are used as natural dye sources.[1] The major advantage of using natural dyeing is to reducing the usage of synthetic (petrochemical based) dyes. ([2]&[3]) By adding of different mordants like metallic salts or natural tannin – containing plants in the process of natural dyeing it improved the dye ability and fastness properties of textile. And also it alter the shade and intensity or darkness of the dyed fabrics. ([2]&[3]) In textile industry the long term exposure and use of synthetic dyes may cause serious environmental and health related problems. Therefore, there is growing interest in the re-introduction of natural dyes as non-toxic and eco friendly substances. ([2], [3], [4]–[9]) From this point of view the aim of this research paper was to extract the natural dye from two different leaves extracts namely carica papaya leaves and thespesia populnea leaves. By aqueous extraction method the leaves dyes were extracted and applied on silk fabric using suitable mordant then it was assess to against antimicrobial activity and fastness properties.

II. MATERIALS AND METHODS

A. Selection Of Source And Fabric

Carica papaya and thespesia populnea plant leaves were collected from in and around campus of gandhigram ,dindigul district. The fresh leaves were shade dried and it was ground in a electric blender to make the fine powder form. The fresh leaves and dried, crushed leaves were shown in the figure 1 &2.raw silk fabric were chosen and purchased from khadi bhavan shop, madurai district, tamil nadu.



Figure1: Carica papaya (a)fresh, (b)dried and (c)powder leaves

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Figure 2: Thespesia populnea (a)fresh (b)dried and (c)powder leaves

B. Pretreatment Of Fabric

The selected fabric was degummed using mild soap and soda ash. Then it was allowed to wash with detergent (2g/L) at 60^0 C maintained for 10 minutes. Degummed fabric was bleached to improve the whiteness of the fabric. In bleaching process 2ml/L hydrogen peroxide, wetting agent(1g/L) maintaining a temperature at 90^0C for 60 minutes and it was washed with detergent (2g/L) at 60^0 C keep for 10 minutes.

C. Mordanting

Alum chosen as suitable mordant for carica papaya leaves extracts as well as thespesia populnea leaves extracts in this study. Among mordanting techniques, pre mordanting, method were found to give better shade for carica papaya leaves extracts .In pre mordanting about 1-3 % of the mordant has been taken for 90 mints at 110^oC with material to liquor ratio 1:30. In thespesia populnea leaves extracts post mordanting method was found to be give a better shades among these mordanting methods. About 1-3 % of the mordant has been taken for 90 mints at 90^oC with material to liquor ratio 1:30 was carried out in post mordanting methods.

D. Extraction Of Dye

Dyeing was carried out by aqueous extraction method for both of leaves extracts. About 10 gm of dried powder source were soaked in 100ml of aqueous solvent in a conical flask and then subjected to the water bath for an hour. The extract was filtered and its absorption of dye determined by UV-Visible spectroscopy. The concentration, temperature, pH, time, combination yielding the maximum absorption was taken as optimum condition for extraction of dye.In carica papaya leaves extracts the optical maximum absorbance wavelength at λ 296 nm were estimated by using UV-VIS absorbance spectrometer. Thespesia populnea leaves , optical maximum absorbance wavelength at λ 361 nm were estimated by using UV-VIS absorbance.

E. Dyeing Of Material

The pre mordanting methods pre-treated silk fabric was dyed with carica papaya leaves extracts under optimized conditions such as concentration of dye at 6%, dye extracted time at 90 mints, temperature 110^oC, pH is 8 and material to liquor ratio is 1:30.

Pre-treated silk fabric was dyed with thepisiea populnea leaves extracts under optimized conditions such as concentration of dye at 5%, dye extracted time at 60 mints, temperature 90^oC, pH is 7 and material to liquor ratio is 1:30.

F. Assessment Of Color Fastness

Color fastness of silk dyed fabric were evaluated for rubbing, light, wash fastness properties in accordance with standard testing methods of AATCC165,AATCC 176,and the sample were tested by grey scale as per ISO 105 A03 and ISO 105A02(assessing staining and assessing change in colour) standards.

G. Assessment of Antimicrobial Activity

The antimicrobial activity were tested for dyed with different leaves extracts accordance with standard Parallel Streak Method AATCC 147. By using a 4 mm inoculating loop, one loop full of the diluted inoculums was transferred to the surface of Nutrient Agar (NA) plates by making five streaks approximately 60 mm in length, spaced 10 mm apart covering the central area of a standard Petri plates without refilling of loop.

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Test specimens were cut with a rectangular die (25x50 mm) and were placed to inoculate NA transversely across the five inoculums streaks. Petri plates were incubated for 18 – 24 hr at 37 ^{0} C. Examination was done at incubated plates for interruption of growth along the streaks of inoculums below the specimen and for a clean zone of inhibition along a streak on each side of the test specimen was calculated.

III. RESULTS AND DISCUSSION

A. Color Fastness Of Silk Dyed Fabric

Table –3.1.a Fastness properties of silk dyed fabric with different leaves extracts using alum mordant

Methods	Washing Fastness	Rubbing Fastness		Light fastness
Silk fabric dyed with carica papaya leaves extracts		Dry	Wet	
i)Pre-mordanted				
iiPost-Mordanted	4-5	5	4-5	5
iii)Simultaneous	4-5	4	3-5	4
	4	4	3-5	4
Silk fabric dyed with thespesia populnea leaves extracts				
i)Pre-mordanted				
ii)Post-Mordanted	3-5	4-5	3-5	4-5
iii)Simultaneous	4-5	5	4-5	5
	3-5	4-5	3-5	4-5

From the above the table revealed that the fatness properties of silk dyed fabric with carica papaya leaves extracts and thespesia populnea leaves extracts by using alum mordant.Wash fastness to silk dyed with carica papaya leaves extracts with alum mordant were graded as no colour staining to negligible colour staining(4-5) for pre and post mordanting and there is no colour staining (4) for simultaneous method. Fastness to crocking in dry condition pre mordanted graded as excellent(5) and remaining method graded as there is no color staining on the fabric (4). In wet condition pre mordanted graded as no colour staining to negligible colour staining(4-5) and fairly to good(3-5) evaluated for post and simultaneous method. Fastness to lighting graded as excellent(5) for pre-mordanting and there is no color staining on the fabric (4) were stated as post and simultaneous method.

Wash fastness to silk dyed with thespesia populnea leaves extracts with alum mordant were graded as no colour staining to negligible colour staining(4-5) for post mordanted and remaining method graded as fairly to good(3-5). Fastness to crocking in dry condition pre and simultaneous mordanted graded as no colour staining to negligible colour staining(4-5) and post mordant was graded as excellent (5).In wet condition post mordant was graded as no colour staining to negligible colour staining(4-5) remaining method graded as fairly to good(3-5).Fastness to lighting graded as excellent(5) for post mordanting and no colour staining to negligible colour staining(4-5) for pre and simultaneous mordanting method.

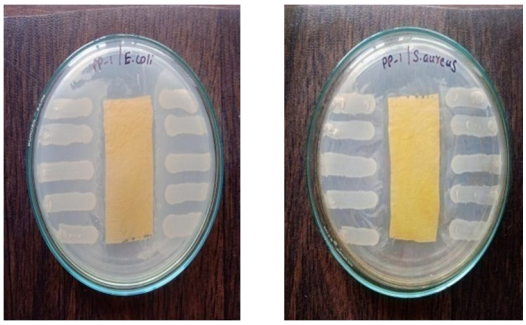
B. Anti Microbial Activity Of Silk Dyed Fabric (AATCC 147 – Parallel Streak Method)

Table-3.2.a Parallel streak method- Antibacterial activity

Sample No.	Zone of Inhibition (in mm)	
	Escherichia coli	Staphylococcus aureus
CPLE in silk dyed fabric	30.3	30.6
TPLE-1 in silk dyed fabric	29.3	29.4

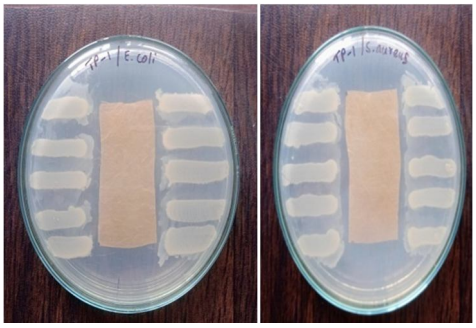
CPLE-Carica Papay Leaves Extracts; TPLE-Thespesia Populnea Leaves Extracts

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Escherichia coli Staphylococcus aureus

Figure 3: CPLE in silk dyed fabric against antimicrobial activity**.**



Escherichia coli Staphylococcus aureus

Figure 4:TPLE in silk dyed fabric against antimicrobial activity.

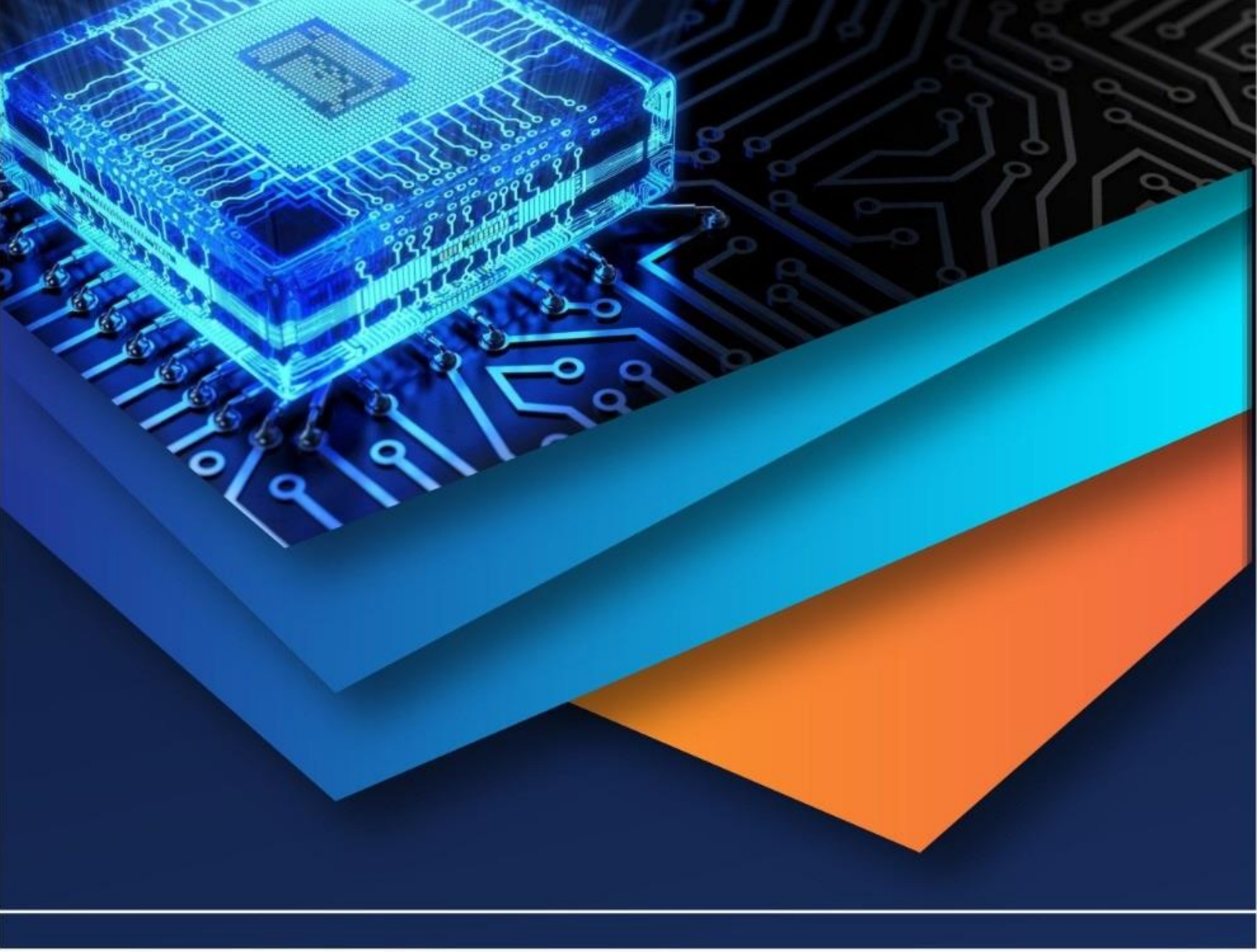
Table-2 indicates that the zone of inhibition in the CPL silk dyed sample followed by E.coli an S.aures of 30.3mm and 30.6mm respectively. The zone of inhibition in TPL silk dyed sample followed by E.coli an S.aures of 29.3mm and 29.4mm respectively. Both of the CPL,TPL extracts finished fabric exhibited GOOD inhibitory zones against the test bacteria as per the AATCC-147 test standards.

IV. CONCLUSION

Carica papaya and thespesia populnea leaves extracts with alum mordanted silk dyed fabrics were asses to washing and crocking in dry and wet condition and light fastness properties were graded as excellent(5) , no colour staining to negligible colour staining(4-5) in most cases. The leaves extract finished fabrics exhibited GOOD inhibitory zones against the test bacteria as per the AATCC-147 test standards. The leaves extracts containing phytochemical constituents attributed the antibacterial activity against test bacteria.

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