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Study on the Properties of the Dye obtained From the Alternanthera Brasiliana Plant

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***Abstract*: Natural dye are dyes are derived from plants or minerals.in this project we use alternanthera brasiliana plant as natural dye. We used the leaves of this plant to extract the 100% natural dye. This plant which has medical applications, in this project we found out, this plant played a vital role in the field of medical textiles. This dye has the anti- microbial property. Extraction of this dye is used in woven fabric which as medical application.**

***Keywords*: Cotton fabric, Dyeing, Anti-microbial testing.**

1. Introduction

Dyeing is the application of dyes or pigments on textile materials such as fibers, yarns and fabrics with the object of achieving color with desired fastness. Dyeing is normally done in a special solution containing dyes and particular chemical material [1]. Dye molecules are fixed to the fiber by absorption, diffusion or bonding with temperature and time being key controlling factors. The bond between dye molecules and fiber may be stronger, weak, depending on the dye used. Natural dyes are colorants derived from plants or minerals [2]. The majority of natural dyes are vegetable dyes from plant sources-roots, berries, leaves and wood and other biological sources such as fungi and lichens. Natural dyes are biodegradable, nontoxic and non-allergic [3]. They do not cause any health hazards and hence they can be used easily without many environmental concerns. The shades produced by natural dyes are usually soft, lustrous and soothing to the human eye [4].Natural dyes are easy to extract the colors by boiling the plants, leaves, bark in water. Natural dyes have the subtle beauty that cannot be recreated by synthetic dyes. Fresh leaf dyeing has the advantage of no required additives or auxiliaries as well as the benefit of not requiring reduction [5]. The oldest and most widely used natural dye is Indigo, since last 4000 years [6]. The aim of this mini project is to extract dye from alternentheras Brasiliana and to use them for making anti-microbial clothing's. The antibacterial treated fabric was subjected to antimicrobial activity test (disc diffusion test method) [7].

2. Plant Overview

- Botanical name: alternanthera brasiliana
- Common name: purple joy weed
- Maximum found: south America and central America
- Genus name: alternanthera, Species name: brasiliana
- Erect, sprawling and herbaceous plant.
- Grows up to 3 meters tall.
- Plant color (red, green and purple).
- Leaf length (1 to 10cms), width (0.7 to 5cms).
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Fig. 1. Alternanthera brasiliana

1) Anti-Bacterial Finishing

Anti-bacterial finishing is done on the cotton fabric to satisfy the following objectives:

- To control the spread of micro-organism over the textile material.
- To avoid infection from microbes.
- To prevent the formation of microbial colonies.
- Anti-microbial finishing process destruction of microbes in fabric
- To act as dis-infectant.

3. Materials

Table 1
Fabric

S. No	Fabric Parameter	
1	Fiber type	Cotton
2	Weave	Plain
3	EPI	40
4	PPI	44
5	Warp count	20s
6	Weft count	20s

1) Experimental view

The leaves are taken from the plant. It is dried in oven at 100 degree Celsius for hours. The dried leaves are crunched into fine powder form. The powder is boiled along with water at 80 degree Celsius. Bleached fabrics are added to the samples. Then it is kept in the water bath at 75 degree Celsius for an hour. It is

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taken out and dried in oven. Different properties like color, washing and are tested. Conical flask, petri plates and test tubes are taken and it is washed thoroughly. Then it is packed in the autoclave bag, and kept in autoclave at 100 Degree Celsius for one hour for the purpose of sterilization. After sterilization process it is taken out. In conical flask 50ml of nutrition agar is taken and it is diluted with 150 ml of pure distilled water. The opening of the conical flask is closed with tightly packed cotton knob and it is spinned using the spinner machine then it is taken out. After this process the prepared fluid is evenly (30 ml) taken in the six petri plates. Then the bacillus bacterium added to it. Then it is kept in the laminar air flow chamber for the UV treatment for 1 hour, after this process the fabric samples are cut into small piece and kept in the petri plates. Then all the petri plates are taken and kept in the incubator for 24 hours.

2) Anti-microbial clothing

As this plant naturally contains anti-bacterial, anti-fungal and other medicinal properties, so it protects the fabric from bacteria and other microorganisms from attaching to the fabric surface [8].

3) Pre-moderanting & dyeing

B. Moderanting agent copper sulphate

Concentration: 10% M: l - 1:30

Time – 60 minutes

Temperature – 80 Degree Celsius Chemical used – Copper sulphate

Fig. 1. Dyed Fabric Sample 1

Concentration: 20%
M: L – 1:30
Time – 60 minutes
Temperature – 80 Degree Celsius Chemical used – Copper Sulphate

Fig. 2. Sample 2

Potassium di-chromate
Concentration: 10%
M: L ratio: 1:30
Duration: 60 minutes Temperature: 80 Degree Celsius
Moderant Used: Potassium dichromate

Fig. 3. Sample 3

Concentration: 20%
M:L ratio: 1:30
Duration: 60 minutes Temperature: 80 Degree Celsius
Moderant Used: Potassium dichromate

Fig. 4. Sample 4

1) Moderanting agent alum

Concentration: 10% M:l – 1:30
Time – 60 minutes
Temperature – 80 Degree Celsius Chemical used: Alum

Fig. 5. Sample 5

Concentration: 20% M: l – 1:30
Time – 60 minutes
Temperature – 80 Degree Celsius Chemical used – Alum

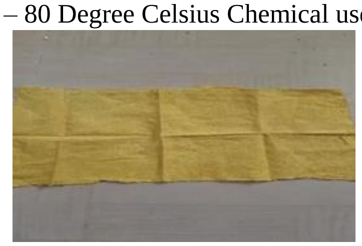


Fig. 5. Sample 6

2) Modranting agent kadukkai powder

Concentration: 20%
M: L ratio: 1:30
Duration: 60 minutes Temperature: 80 Degree Celsius Mode rant Used: kadukkai powder

Fig. 6. Sample 7

3) Anti-microbial testing

The herbal treated fabric is tested for its antibacterial activity by quantitative method. Disc diffusion method is one of the quantitative test methods which was used to analyze the antibacterial activity of the finished fabrics [9]. The samples which are treated with different concentrations were taken, a small piece from each fabric is cut and were inoculated with the specified gram-positive bacteria (Bacillus) and gram-negative bacteria (Escherichia coli) test organisms [10]. The test organisms were subculture using nutrient agar medium. The tubes containing sterilized medium were inoculated with the respective bacterial strains. After incubation at 37oC for 18 hours, they were stored in a refrigerator [11]. The nutrient agar medium was sterilized by autoclaving at 121oC for 15 mins. After that the small pieces of fabric which were cut already are kept in the agar medium. As there are many samples to be tested big discs are used for this purpose [12]. These discs are divided into ten parts i.e., five for garlic treated fabric and five for adamant creeper treated fabrics with both gram-positive and gram-negative bacteria respectively [13]. The same process is done for the herbal extracts, instead of the treated fabrics the extract itself is used as a test specimen. The extracts are tested in small discs with gram-positive and gram- negative bacteria respectively [14].

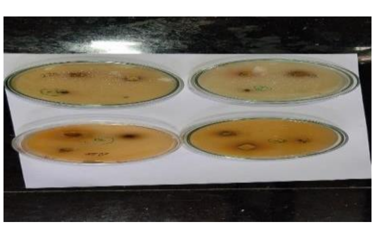
4) Zone of inhibition

Zone of inhibition it the process in which resist property of antimicrobial is checked. If the diameter of the gap is around 4cms it is proved that the done project has high resistance to the microbes. In our project the zone of clearance is appeared. And it is resisted to the microbes. Hence it is successfully tested [15]. A Zone of Inhibition Test, also called a Kirby-Bauer Test, is a qualitative method used clinically to measure antibiotic resistance and industrially to test the ability of solids and textiles to inhibit microbial growth [16]. Researchers who develop antimicrobial textiles, surfaces, and liquids use this test as a quick and easy way to measure and compare levels of inhibitory activity. With this method, approximately one million cells from a single strain are spread over an agar plate using a sterile swab, then incubated in the presence of the antimicrobial object (ex: an oxacillin disk, pictured below). If it is resistant to the antimicrobial agent, then no zone is evident, such as on the agar plate. Zone of Inhibition Testing is a fast, qualitative means to measure the ability of an antimicrobial agent to inhibit the growth of microorganisms.

4. Results and Discussion

Table 2
Zone inhibition of anti-microbial fabric

Concentration of dye in percentage	Moderant used in percentage	Zone of inhibition in radius(cm) against Bacillus
4	Copper sulphate10%	0.1
8	Copper sulphate20%	0.2
12	Potassiumdichromate10%	0.2
16	Potassium dichromate 20%	0.3
20	Alum -10%	0.1
24	Alum-20%	0.3
28	Kadukai – 20%	0.4



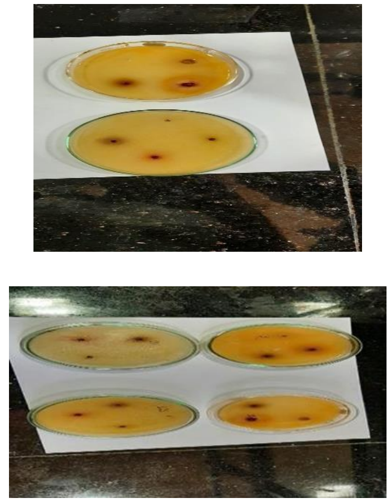


Fig. 8. Tested results of zone of inhibition

1) Antibacterial activity of the finished fabric

The antimicrobial activity of the samples finished with different concentrations of the herbal Alternanthrera brasiliana [17]. The antimicrobial activity of the fabric samples finished with Alternanthera brasiliana at different concentrations against the gram positive and gram negative microbes [18]. The fabrics samples finished with low concentrations, showed poor zone of inhibition when compare with fabric samples finished with high concentration. The same trend was followed for both gram positive and gram negative. This indicates that the amount of herbal influence the antimicrobial activity [19]. Fabrics finished using both Alternanthera brasiliana showed considerable antibacterial activity against both the bacteria. Similar zone of inhibition were obtained in the herbal. Alternanthera brasilliana. Zone of inhibition testing is fast and inexpensive relative to other laboratory tests for antimicrobial activity [20]. Zone of inhibition testing is especially well suited for determining the ability of water-soluble antimicrobials to inhibit the growth of microorganisms. A number of samples can be screened for antimicrobial properties quickly using this test method [21].

5. Conclusion

The herbal treated cotton fabric was assessed the antimicrobial activity using disc diffusion test method. The treated samples shows good antimicrobial activity in all concentrations of the herbal against the both gram positive and gram negative microbes. The concentrations of herbal influence the antimicrobial activity of the fabric. When increase the concentration of herbal, the antimicrobial activity increases. This confirms that the herbal, Alternanthera brasiliana have good antimicrobial activity can be used to finish the textiles for antimicrobial textiles.

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