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APPLICATION OF NATURAL DYE EXTRACTED FROM RED PRICKLY PEAR FRUIT ON COTTON WOVEN FABRIC WITH DIFFERENT MORDANTS AND TECHNIQUES

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Abstract: This study is aimed to Eco-Friendly dyeing with natural mordant the dye extracted from Red prickly pear fruit and were selected 3 types of natural mordant Areca Catechu, Terminalia Chebula, Musa Paradisiaca on 100% cotton woven fabric with 40^s counts of fabric. and before the dyeing, the fabric was treated pretreatments, Desizing, Scouring and Bleaching. The natural dye was extracted from red prickly pear fruit on direct method. Were dyed fabrics with mordant in three methods Pre mordant, Post mordant, Simultaneous mordant. Dyed samples were tested and evaluated for Fabric tensile strength, Fabric stiffness, Fabric crease recovery, Fabric weight (GSM), Fabric abrasion resistance, Colour fastness to washing, Rubbing, Perspiration.

Index Terms **- Red prickly pear fruit, mordant, pretreatment, dyeing, testing,**

I. INTRODUCTION

The all natural dyes derived from the natural sources from plants, animal and minerals. The red prickly fruit is disposed no uses from plant off on the land and decomposed regularly hence the discarded fruits may be collected from the tree at hill stations and it used to extract the dyes colouring fabrics. Natural dye from fruit and natural mordant both is Eco-Friendly and inexpensive. Most of the natural dyes are non-substantive in nature and hence require a mordant to fix them to the fabric. Usually from chemical component metallic salts such as copper sulphate, ferrous sulphate, alum, chrome, etc. are used as mordants. In this process we used natural mordents it is also Eco-Friendly and inexpensive. The mordent used from 1. Areca Catechu (Pakku), 2. Terminalina Chebula (Kadikkai) and 3. Musa Paradidiaca (Banana Stem).

II. Methodology

2.1 Natural Dye

Natural dye extracted from red prickly pear fruit. They were collected from local hill station in Salem district, Tamilnadu, India. The collected fruit cleaned well, peeling and pulped, pulped liquid was removed from seeds and filtered thoroughly. And then filtered extraction stored in air tight container and placed at cool area.

2.2 Natural Mordants

We decide to select the three types of natural mordents Areca Catechu, Terminalia Chebula, Musa Paradisiaca. **Areca Catechu** nut dye provide a reddish brown shade on the fabric and dye absorbency is good, **Terminalia Chebula** used as a mordant for dyeing it has good dye fixing properties, **Musa Paradisiaca** is gave vanilla cream colour and it has a good dye absorbency properties. These all mordants were collected from super market in salem district, tamilnadu, india. Three mordant were cleaned well and juice was extracted thoroughly. Extraction mordant juice were stored in air tight container separately and placed at cool area.

III. Dyeing

100% cotton woven fabric was selected for natural dyeing with 40^s counts of fabric, the aim is to select the cotton fabric is too water absorbency capacity. Desizing, Scouring and Bleaching were treated before dyeing with correct sequence process. Three mordant techniques were followed, Pre mordant, Post mordant, Simultaneous mordant.

Pre mordant technique is dump the fabric first on mordant bath with 90^o C in duration of one hour, then the fabric dump into the dye bath directly with 90^o C in duration of two hours.

Post mordant technique is dump the fabric first on dye bath with 90^o C in duration of two hours, then the fabric dump into the mordant bath directly with 90^o C in duration of one hour.

Simultaneous mordant technique is the process of mixing dye and mordant on same bath and dump into the fabric directly with 90^o C in duration of two hours. After dyeing the fabric were dried with hot oven.

Red prickly pear fruit

Cleaned Red prickly pear fruit

Dye Extraction

Dyeing Process

IV. Result and Discussion

The dyed and undyed fabrics were analysed for physical properties such as tensile strength, stiffness, fabric crease recovery, areal density, (GSM: grams per square metre) and fabric abrasion resistance Table 4.1.

Since fastness is the important criteria for coloured textiles, the dyed fabrics were tested for their colour fastness – washing, rubbing (Dry and Wet), perspiration (to Acidic Condition) perspiration (to Alkaline Condition) Table 4.2. And the dyed fabric pictures 4.3. The results are tabulated as follows:

Table 4.1: Physical Properties

Sr. No.	Sample Code	Fabric Tensile Strength (Elongation) MM		Fabric Stiffness MM	Fabric Crease Recovery	Fabric weight (GSM)	Fabric Abrasion Resistance			Result
		Warp	Weft				Original Weight	Abraded Weight	Average Weight Loss	
1	DCAC01	5.2	3.0	4.1	60	1.22	0.21	0.19	0.03	**Very Poor**
2	DCAC02	4.6	3.8	3.5	40	1.21	0.27	0.23	0.04	
3	DCAC03	3.8	2.8	5.2	55	1.21	0.28	0.26	0.02	
4	DCTC01	4.8	2.5	3.8	47	1.22	0.28	0.27	0.01	**Poor**
5	DCTC02	4.5	2.8	4.6	65	1.21	0.21	0.19	0.03	
6	DCTC03	4.1	3.3	3.8	58	1.22	0.28	0.27	0.01	
7	DCMP01	4.9	3.8	5.4	45	1.17	0.27	0.25	0.02	**Good**
8	DCMP02	3.4	3.6	4.2	50	1.26	0.23	0.20	0.03	**Very Good**
9	DCMP03	3.6	3.4	3.6	43	1.22	0.22	0.18	0.04	**Excellent**

Table 4.2 : Colour Fastness

Sr. No.	Sample Code	Colour fastness to washing	Colour fastness to Rubbing (Dry)		Colour fastness to Rubbing (Wet)		Colour fastness to Perspiration (to Acidic Condition)		Colour fastness to Perspiration (to Alkaline Condition)		Result
			Colour Change	Staining	Colour Change	Staining	Colour Change	Staining	Colour Change	Staining	
1	DCAC01	5	2	1	2	2	1	2	2	3	**Very Poor**
2	DCAC02	3	2	3	4	5	3	4	4	4	
3	DCAC03	3	2	4	3	4	4	5	4	5	
4	DCTC01	4	4	3	2	3	2	3	2	1	**Poor**
5	DCTC02	3	2	4	3	4	4	4	4	3	
6	DCTC03	2	4	3	5	4	5	4	5	4	
7	DCMP01	3	1	2	3	3	2	2	1	2	**Good**

8	DCMP02	2	3	4	4	3	4	3	4	4	**Very Good**
9	DCMP03	1	4	3	5	4	5	4	4	5	**Excellent**

Table 4.3: Dyed fabric pictures

V. Conclusion

The use of natural dyes should be viewed as a superior option since natural colourants are becoming more and more popular around the world because they are safer and more environmentally friendly. Natural dyes are superior than synthetic colours in many ways, including greater environmental friendliness and biodegradability. Natural dyes come in a broad variety of hues and can be made from the roots, leaves, flowers, and fruits of plants, among other plant parts. As people grow more conscious of the environmental and ecological issues associated with the use of synthetic dyes, there has been a rise in interest in natural dyes. Using natural dyes requires the use of mordants to establish the colour. Shades will vary depending on the mordant used. They also enhance lightfastness and colour. Natural mordants like, Areca Catechu (Pakku), Terminalina Chebula (Kadikkai) and Musa Paradidiaca (Banana Stem). could be used in place of metallic mordants.

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