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Development Of Sustainable Product Using Natural Dyes

Reshmitha M[1], Santhi N[2]

[1]*Department Of Apparel And Fashion Design,PSG College Of Technology, Coimbatore 641004 , India*
[2]*Department Of Apparel And Fashion Design,PSG College Of Technology, Coimbatore 641004 , India*

Abstract: Dyeing Industry Uses Synthetic Dyes As It Gives Brighter Shades And Also Good Fastness Properties Than Natural Dyes. But The Water Which Comes Aswaste From Dyeing Industry Which Consists Of Carcinogenic Amines, Which Causes Very Series Health Hazards And Spoils The Environment. As A Result, Now Natural Dyes Are Becoming Promising Elements To Develop Natural And Sustainable Products.In This Paper, It Studiesabout Fabric Performance, Durability And Laundering Properties Of Cotton And Aloe-Vera Fabric Dyed With Natural Dyes Using Shibori Dyeing Technique And The Dyed Fabric Have Been Used For Various Applications.

Keywords:Aloe- Vera,Cotton, Natural Dyes, Shibori;

1. INTRODUCTION

Dyeing Is The Application Of Colouring The Textile Materials In Any Form Like Fibre, Yarns, And Fabrics As A Goal Of Achieving Colour With Desired Colour Fastness.Naturaldyes Are Biodegradable But It Cannot Fulfil The Huge Demand For The Textile Sector (1). Additionally, They Often Have Low Densities And Lower Processing Costs Than Synthetic Materials.

Clothes Made Of Natural Fibres Such As Cotton Are Often Preferred Over Clothing Made Of Man-Made Fibres By People Living In Hot And Humid Climates. Nature In Its Abundance Offers Us A Lot Of Materials That Can Be Called Fibrous. Plant Fibres Are Obtained From Various Parts Of Plants, Such As The Seeds (Cotton, Kapok, Milkweed), Stems (Flax, Jute, Hemp, Ramie, Kenaf, Nettle, Bamboo), And Leaves (Sisal, Manila, Abaca), Fruit (Coir) And Other Grass Fibres. Fibres From These Plants Can Be Considered To Be Totally Renewable And Biodegradable. Plant Fibres, Which Have A Long History In Human Civilization, Have Gained Economic Importance And Are Now Cultivated On A Large Scale Globally (2). Therefore This Paper Discussing About Developing A Sustainable Product With The Available Natural Dyes On Natural Fabric (Plant Fibre) Using A Japanese Dyeing Technique. The Main Objectiveof The Study Is To Produce A Sustainable And Eco-Friendly Product To The Mankind.

2. MATERIALS AND METHODS

2.1. Materials

The Fabrics That Are Used In This Study Are Cotton And Aloe- Vera, Fibres Are Natural Biodegradable, Soit Istaken For Research And It Has Been Sourced From HSPS Textile Pvt. Ltd (Harpar Group), New Delhi, India.

Table 1. Material Specification

Specification	Cotton(A)	Aloe-Vera(B)
Ends Per Inch	60	60
Picks Per Inch	48	48
Count Fabric Width Type Of Weave	20s 60inch Plain Weave	20s 60inch Plain Weave

The Caesalpinia Sappan Linn (Sappan Wood), The Punica Granatum (Pomegranate). The Senegaliacatechu (Accasia Catechu) Was Obtained In The Form Of Dried Heartwood Slices From A Local Market In And Around Dindigul, Tamilnadu.

Fig 1.(A) Sappan Wood;Fig 1. (B)Pomegranate Shell

2.2. *Extraction Of Dyes*

- **Pomegranate Shell –** The Shell **O**f Pomegranate Was Dried In Sunlight To Remove Moisturecontent. After Drying It Was Crushed To Small Piecesand It Is Taken For Colour Extraction. The Dye Extraction Was Performed By Mixing The Plant Material In Distilled Water (Or Ethanol) In The Weight Ratio Of 1:3 And Boiling For A1hour.

- **Sappan Wood -** The Extraction Of Colorants From Caesalpinia Sappan Linn Using Water And Ethanol Were Compared. The Collected Heartwood Of Caesalpinia Sappan Linn. Was Dried And Later Crushed To Small Pieces Before Being Used For Dye Extraction. The Dye Extraction Was Performed By Mixing The Plant Material And Distilled Water (Or Ethanol) In The Weight Ratio Of 1:3 And Boiling For 1h.

- **Myrobalan –** The Powered Raw Material Is Soaked In Water For 12 Hours. The Material To Liquor Ratio Was Kept 1: 20. After Soaking For 12 Hours It Is Boiled At Simmering Point (90-92^{0}C) For 30 Minutes To One Hour Until The Dye Raw Material Is Exhausted Then It Is Filtered Through A Clean Cotton Cloth.The Extracted Liquid Dye Is Used For Dyeing.

2.3. Methods

2.3.1. Pre-Treatment

A Mordant Is A Used To Adheresboth Fibres And To Thedye. Various Mordant Will Give Different Hue Colour With The Same Dye. The Pre-Treatmentwas Carried Out For Cotton And Aloe-Vera Fabrics With Myrobalan Seeds In The Ratio Of 1:10 For About8hours.

2.3.2. Pre-Mordanting

In Pre-Mordanting, 100 G Of Cotton And Aloe Vera Fabric Was Treated With 60 Ml Of Alum With Material To Ratio Of 1:10 For 30 Minutes At 50 ^{0}C On Heating Mantle. After This Process The Material Is Dried In Atmosphere Without Washing And Then, The Material Is Dyed With Pomegranate And Sappan Wood.

2.3.3Shibori Dyeing Technique

- The Types Of Shibori Dyeing Techniques Used In This Project Are Kanoko, Arashi, Kumo.

- **Kanoko Shibori -** The Bound-Resist Technique, 100g Of Cotton And Aloe Vera Fabrics Are Taken. It Is Accordion Folded Involving Binding Certain Sections Of The Cloth Using Thread Or Rubber Bands, A Desired Pattern Will Be Obtained.

Fig 2. (A) Kanoko Folding Technique

- **Arashi Shibori -** The Pole-Wrapping Technique, For Cotton And Aloe Vera Fabrics Are Taken. The Fabric Is Placed On The Table, The Pipe Is Placed On The Corner Of The Fabric And Then Started To Roll The Fabric And Tied With A Rope Around It. This Dyeing Technique That Results In Diagonal Stripes That Are Reminiscent Of Storm Driven Rain.

Fig 2. (B) Arashi Folding Technique

- **Kumo Shibori -** The Spider Web Technique, For Cotton And Aloe Vera Fabrics Are Taken. The Fabric Is First Accordion Folded. Then It Is Folded In The Triangle Form

Alternatively, And Finally It Is Tied With A Thread Or Rubber Bands At The Corners.

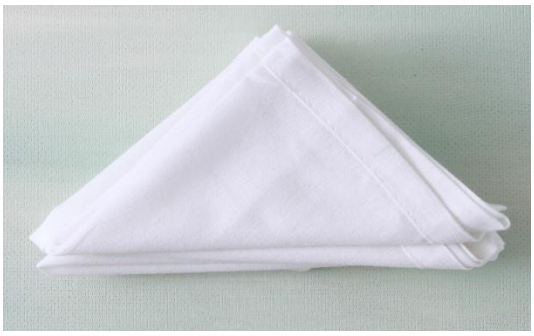

Fig. 2 (C) Kumo Folding Technique

2.2.4. Dyeing

A 50 Gram Of Each Pomegranate Shell And Sappan Wood Are Taken And Soaked In The Water With Ratio1:50 For 24 Hours In Separate Beakers. After 24 Hours It Was Boiled For 15 To 20 Minutes And Both The Pre-Mordant Fabric Was Treated With This Dye Liquor For 30 Minutes Where Salt And Soda Ash Added As Fixing Agent.

2.2.5. Post- Mordanting

After Dyeing The Materials Like Cotton And Aloe-Vera Fabric Have Been Treated With 10% Of Alum At 60 ^{O} C For About 30- 45 Minutes, And Then Followed By Rinsed And Dried.

3. RESULTS AND DISCUSSIONS

The Cotton And Aloe-Vera Fabric Dyed With Pomegranate And Sappan Wood Was Taken And Analysed The Effectiveness Of Fastness Properties Of The Fabric.
Table 2.Colour Fastness To Perspiration

Colour Change		Staining	
	Dyes	Cotton	Aloe Vera
4-5	Pomegranate Shell	3-4	4
4-5	Sappan Wood	3	3

In Table 2. The Colour Fastness To Perspiration, The Result Analysis That When Compare To Cotton And Alovera Fabricthe Staining Was Good In Cotton Dyed With Pomegranate Shellthan Sappan Wood Dyed Material.

Table 3.Colour Fastness To Wash

Colour Change	Dyes	Staining	
		Cotton	Aloe Vera
4-5	Pomegranate Shell	4-5	4-5
4-5	Sappan Wood	4-5	4-5

According To Colour Fastness To Wash, The Result Analysis From The Table 3 Both Cotton And Aloe-Vera Fabric Dyed With Pomegranate Shell And Sappan Wood Having Excellent Wash Fastness.

Table 4.Colour Fastness To Rubbing

Fabric	Dyes	Dry Rub	Wet Rub
Cotton	Pomegranate Shell	3	2-3
	Sappan Wood	3	2-3
Aloe-Vera	Pomegranate Shell	3	2-3
	Sappan Wood	3	2-3

According To Colour Fastness To Rubbing The Result Analysis From The Table 4 Both Cotton And Aloe-Vera Fabric Dyed With Pomegranate Shell And Sappan Wood Was Having Good Fastness In Dry Rubbing Than Wet Rubbing.

4. OBSERVATION

4.1. Laundering Durability

The Treated Samples Were Laundered Using ISO 105-C06: 1987 Standards. The Materials Wereimmersed In The Solution For 35 Minutes At 40°C. Samples Were Rinsed And Dried In Atmosphere. The Below Chart Shows The Comparison Of Laundering Durability Between The Two Samples.

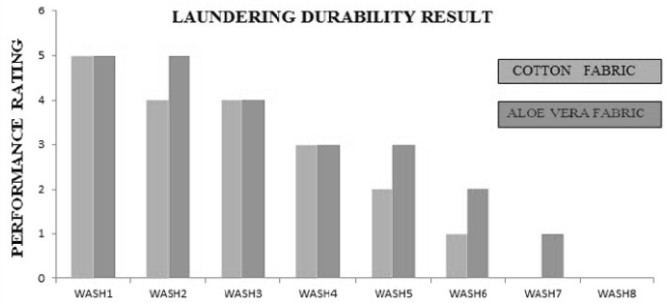

Fig. 3. (A)Laundering Durability

The Cotton And Aloe-Vera Fabric Dyed With Pomegranate Shell And Sappan Wood,Analysis That After 20 Cycles, The Aloe-Vera Fabric Shows Good Laundering Up To 5 Washes Whereas The Cotton Fabric Shows Only Up To 3 Washes. From Figure 3 (A) The Interpretation, It Justifies That The Aloe-Vera Fabric Has Better Laundering Durability Than Cotton.

4.2. Washing Fastness

The Washing Fastness Of The Dyed Sample Was Analysed By AATCC 61-2A. The Change In Colour And The Staining Of The Adjacent Fabrics Were Analysed With The Standard Grey Scale.

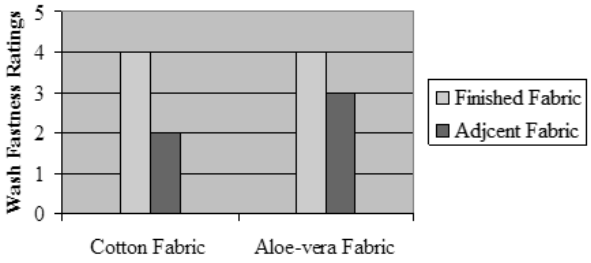

Fig. 4. (A) Washing Fastness

On Comparing The Wash Fastnessof Cotton And Aloe-Vera Fabric From The Figure 4 (A)It States That Inadjacent Fabrics Staining Rating Is Better For Aloe-Vera Fabric Than Cotton.

4.3. Wick Ability

Wick Ability Is Analysed In For Both Cotton And Aloe-Vera Fabricsin Warp And Weft Directions.

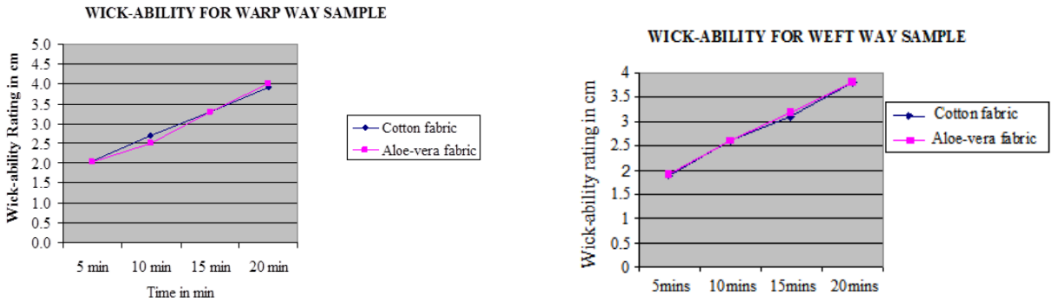

Fig. 5. (A) Wick Ability Warp Way ; (B) Wick Ability Weft Way

The Result Analyses From The Figure 5 (A) And From 5 (B) The Effects Of Wick-Ability Were Good In Both Fabrics.

5. PRODUCT DEVELOPMENT

After Dyeing Products Were Developed By Using Shibori Dyeing Technique, The Products Developed Are A- Line Crop Top And Face Mask.

Fig. 6. (A) A-Line Crop Top (Pomegranate Shell); (B) Face Mask (Sappan Wood)

6. CONCLUSION

Sustainable Clothing Is Safe For People And The Environment, Avoiding Any Materials That Contain Carcinogens, Toxins, Or Other Harmful Chemicals. Eco- Friendly Clothing Is Made Through Sustainable Practices That Reduce Water Consumption, Waste Production And Alsoit Reduces Pollution. So In This Study We Have Used Cotton And Aloe-Veraas Natural Materialswhich Are Dyed With Natural Dyes In Japanese Dyeing Technique – Shibori. The Result Shoes That, When Compare To Cotton And Aloe-Vera Dyed With Pomegranate Shell And Sappan Wood , The Laundering Durability And Wash Fastness Was Good In Aloe-Vera Fabric. The Dye Affinity Of The In Shibori Dyeing Technic Aloe-Vera Fabric Shows Good Than Cotton.

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