Application of Eclipta Leaves, Achras Zapota Leaves and Nyctanthes Arbortristis Flowers on Organic Cotton Fabric with Bio Wash

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Abstract

To rescue from the harmful effects of those chemical wastes the research work was focused on eco friendly natural dyes. The best in eco-friendly fabrics, “Organic cotton” was selected for the study. Extracted natural dyes from the selected natural resource (Eclipta Leaves, Achras Zapota Leaves and Nyctanthes Arbortristis Flowers) were applied onto organic cotton yarn with no using of chemicals & mordents. Enzymatic Bio wash has been further done to the naturally dyed organic cotton fabric. The colorfastness properties of natural dyed organic cotton fabric were observed and concluded.

Keywords: Achras Zapota: Cellulase enzyme: Eclipta: Nyctanthes Arbortristis: Sapindus seeds

Introduction

Environmental issues are becoming more crucial all over world. Textile processing industry is characterized not only by the large volume of water required for various unit operations but also by the variety of chemicals used for various processes [1].

Organic cotton fabrics are generally understood as cotton that is grown from plants without chemical fertilizers or pesticides which are not genetically modified, though organic cotton has less environmental impact than conventional cotton and it costs more for its production [2,3].

Natural dyes can exhibit better biodegradability and generally have a higher compatibility with the environment. Natural dyes are obtained from substances such as flowers, trees, shrubs, buries, lichens, shellfish, leaves, insects and minerals [4-8].

The three herbs Eclipta Leaves, Achras Zapota Leaves and Nyctanthes Arbortristis Flowers were selected since Eclipta leaves are anti toxicity in nature, Zapota leaves demonstrated character of antioxidant activity and Nyctanthes Arbortristis flowers has antiviral and antifungal activities in vitro [9-11].

Today enzymes have become an integral part of textile processing. Enzyme application is inevitable tool in modern industry where environmental aspect plays critical role to sustain in the competitive market. Enzyme (Cellulase) treatment gives the fabric a smoother and glossier appearance [4-8].

Materials and Methods

Selection of yarn

Organic cotton was purchased in yarn stage from the yarn dealer, Erode, Tamil Nadu which is of 80s count since the end use is going to be used for baby wear. Fabric Specifications are shown in Table 1a.

Methods

Scouring

Scouring was done using Sapindus seeds without using of chemicals. Sapindus seeds (Figures 4a and 4b) were collected from Coimbatore Agricultural University. The sapindus seeds were dried under shade and ground to fine powder.

Enzyme (Cellulase) treatment gives the fabric a smoother and glossier appearance [4-8].

Bleaching

Catalase Enzyme is the bleaching agent which is chosen for the study to bleach the organic cotton yarn.

The bleaching of organic cotton yarn was done in the bath with liquor ratio 1:20 with 5 g/l of sapindus seeds solution (soap nut) using laboratory winch machine. The yarn was loaded into the bath at 400°C for 3 hours. The yarn was then thoroughly washed with cold water and dried.

Selection of dye

Eclipta leaves, Achras Zapota leaves and Nyctanthes Arbortristis flowers were selected since Eclipta leaves are anti toxicity in nature. Zapota leaves demonstrated character of antioxidant activity and Nyctanthes Arbortristis flowers have antiviral and antifungal activities in vitro [9-11].

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Table 1a: Fabric Specifications.

<table>
<thead>
<tr>
<th>Material</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loom</td>
<td>Pit loom</td>
</tr>
<tr>
<td>Ends per inch</td>
<td>76</td>
</tr>
<tr>
<td>Picks per inch</td>
<td>43</td>
</tr>
<tr>
<td>Fabric Thickness</td>
<td>0.28mm</td>
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<tr>
<td>Weave</td>
<td>Plain weave</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Colour fastness to washing</th>
<th>Change in colour</th>
<th>Staining</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eclipta</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Achras Zapota</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Nyctanthes Arbortristis</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

NOTE: 1-Very poor, 2-Poor, 3-Medium, 4-Good, 5-Excellent

Table 1b: Colour fastness to washing of dyed organic cotton fabrics.

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flowers have been collected from Coimbatore area and it is used as natural eco friendly dyeing agent. The specified three (Eclipta leaves, Achras Zapota leaves and Nyctanthes Arbor-tristis flowers) herbs were selected (Figures 5a-5c).

These three herbs were selected because of the following aspects as per the literature review, Eclipta leaves are anti toxicity in nature, Zapota leaves demonstrated character of antioxidant activity and Nyctanthes Arbo-tristis flowers has antiviral and antifungal activities in vitro.

Main active principle constituents of Eclipta leaves are coumestans such as wedelolactone and demethylwedelolactone, polypeptides, polycytylenes, thiophene derivatives, steroids, triterpenes and flavonoids, Structure of wedelolactone is shown in Figure 1 and the structure of Zapota leaves in Figure 2.

Chemical constituents of Nyctanthes arbor-tristis flowers (Figure 3) contain essential oils, nyctanthin, D-mannitol, tannins, glucose, carotenoids, glycosides including β-monogentiobioside ester of α-crocin (or crocin-3), β-monogentiobioside-β-D monoglucoside ester of α-crocin, and β-digentiobioside ester of α-crocin (or crocin-1).

**Extraction of natural dye solution from Eclipta**

250 gms of Eclipta leaves are shadow dried and ground well to fine powder. 1 liter of boiling water was added to the finely powdered dried eclipa leaves for about 2-3 hours. Then it is filtered using nylon cloth.

**Extraction of natural dye solution from Achras Zapota**

Achras Zapota fresh leaves were boiled in 1 litre of water for about 2-3 hours. Then it is filtered using nylon cloth.

**Extraction natural dye solution from Nyctanthes Arbo-tristis**

Nyctanthes Arbo-tristis fresh flowers were boiled in 1 litre of water for about 2-3 hours. Then the extracted dye solution is filtered using nylon cloth.

**Application of Natural Dyes on Organic Cotton Yarn**

The dyeing of organic cotton yarn was done in the bath with liquor ratio 1:20 with 10 gpl of dye solution using Laboratory winch dyeing machine. The yarn was loaded into bath at 900°C to 1200°C for 2-3
Natural dyeing eliminates the harmful effect of dye powder and prevents the skin from allergies and rashes. It is found that all the three Natural dyed organic cotton fabric shows good in color fastness to Washing, Rubbing and Sunlight. The colorfastness to sunlight of dyed Eclipta, Achras Zapota and Nyctanthes Arbortristis dyed organic cotton fabric is shown in Table 3. It is found that the dyed sample shows good colour fastness.

