



## **Cotton fabric dyeing process from *Eucalyptus camaldulensis* leave's natural dye**

**Gyanendra Tripathi<sup>1</sup>, Mukesh Kumar Yadav<sup>2\*</sup>, Yogesh Kumar Tiwari<sup>3</sup>**

<sup>1</sup>Arise Carpets, 43- St. Jhones Colony, Madauli, Varanasi-221108, Uttar Pradesh, India

<sup>2</sup>Department of Kayachikitsa, Institute of Medical Sciences, Banaras Hindu University, Varanasi-221005, Uttar Pradesh, India.

<sup>3</sup>Dr. BhimRao Ambedkar University, Agra-282004, Uttar Pradesh, India

**Abstract :** Natural dyes are obtained from animals or vegetables matter without any chemical processing. Increasing awareness of the environmental and health hazards associated with the synthesis, processing and use of synthetic dyes, has created a worldwide interest in textiles, dyed with natural dyes. This research article contains the process to obtain natural dye from *Eucalyptus camaldulensis*.

**Keywords :** *Eucalyptus camaldulensis*, environmental, natural dyes, textiles.

### **Introduction:**

Natural dyes are eco-friendly, bio-degradable, less toxic and less allergic as compared to synthetic dyes<sup>(1)</sup> and may also provide health benefits to the wearer. Natural dyes can be used for dyeing almost all types of natural fibers. Recent research shows that they can also be used to dye some synthetic fibers. Apart from their application in textiles, natural dyes are also used in the coloration of food, medicines, handicraft items and toys, and in leather processing, and many of the dye-yielding plants are used as medicines in various traditional medicinal systems. Textile processing industry is one of the major environmental polluters. In order to process a ton of textile, it has to use as much as 230 to 270 tons of water. The effluent generated by this much water would pollute the environment as it may contain a heavy load of chemicals used during textile processing.

### **Botanic Description:**

*Eucalyptus camaldulensis* commonly grows to 20 m tall, occasionally reaching 50 m, with a trunk diameter of 1m. (max. 2m) ; in open formations has a short, thick bole and a large, spreading crown; in plantations has a clear bole of 20 m with an erect, lightly branched crown; bark smooth, white, grey, yellow-green, grey-green or pinkish grey, shedding in strips or irregular flakes; rough bark occupies the 1st 1-2 m of the trunk. The tree can grow to 375-480 feet (125-160 meters). *Eucalyptus* trees belong to the myrtaceae family. Their name originates from the Greek word "eucalyptol" which means "well covered".

**Leaves** grey-blue, alternate, drooping, 8-22 cm long, 1-2 cm wide, often curved or sickle shaped, tapering, short pointed at base. Inflorescence axillary, solitary, 7-11 flowered; flower buds white, globular rostrate or ovoid-conical; operculum hemispherical, rostrate or conical, 4-6 x 3-6 mm, obtuse. Fruit very small capsules at the end of thin stalks, 5-8 mm, valves 4, containing minute seeds.



Fig. (i) *Eucalyptus camaldulensis* (Tree)



Fig. (ii) *Eucalyptus camaldulensis* (Leaves)

## Materials and methods:

Source: *Eucalyptus camaldulensis*.

The dyeing process of cotton was carried out in three stages-

- (i) Extraction of dye from the plant source
- (ii) Mordanting
- (iii) Dyeing.

### (i) Extraction of dye:

The samples were collected and washed thoroughly with water to remove any dirt. The samples were ground into powder (small pieces) using grinder. To find the optimum extraction condition, experiment were conducted in aqueous extraction at various range of pH (3-8) and temperature ( $35 \pm 2$  and  $100$  °C) with M:L ratio 1:10.

### (ii) Mordanting:

The mordant's namely onion ash, lemon peel ash, soap nut, and harda (tannin treatment) were used as a natural mordant. Mordanting was carried out in three stages-

- (a) Pre-mordanting
- (b) Simultaneous mordanting
- (c) Post-mordanting.

#### (a) Pre-mordanting:

In pre-mordanting process the scored fabrics were first treated with mordant and then dyed using extract of plant. The fabrics were treated with each of the mordant mentioned above in the 1:10 M:L ratio for 35 minutes at  $35 \pm 2$  °C. Then the mordanted fabric was used for dyeing.

#### (b) Simultaneous mordanting:

In simultaneous mordanting process the fabrics were immersed in equal mixture of the mordant and the dye extract for 40 min at  $30 \pm 2$  °C followed by washing and drying of the dyed fabrics.

**(c) Post-mordanting**

In this process the dyed fabric was treated with mordants at  $30\pm 2^{\circ}\text{C}$  for 50 min with M:L ratio 1:10.

**(iii) Dyeing**

The experiments were performed in each dyeing was done at  $30\pm 2^{\circ}\text{C}$  and for 30 min.

**Washing Fastness**

Dyed sample was placed between two pieces of non dyed white samples (control). These three pieces were held together by stitching round the edges. The pre-heated soap solution (Tide at  $50^{\circ}\text{C}$ ) in the ratio of 1:50 i.e. 0.5g/25 mL water, was taken in a vessel added 1.0 g of sandwiched fabric for 45 minutes, then the specimen was removed and rinsed in cold water<sup>(2)</sup>.

**Rubbing fastness**

The rub fastnesses of the dyed fabrics were carried out by rubbing the fabrics manually and checking for fading of color by using Crock meter<sup>(3)</sup>.

**Light Fastness**

The fabric was exposed to sun light for 24 h. The colour fastness to light was evaluated by comparison of colour change of the exposed portion to the unexposed original material.

**Results and discussion:**

*Eucalyptus camaldulensis* grows in all warm countries of the world and was originally a native of Persia. The rind of *Eucalyptus camaldulensis* contains a considerable amount of tannin, about 19% with pelletierine.

**Fabric cotton colored with different mordants:****(i) Mordant –Soap nut****(ii) Mordant- Onion ash**



**(iii) Mordant- Lemon ash**

**(iv) Mordant- Harda**

**References:**

1. V. K. Gupta, Indian Textile Journal,1998, 5(108) 15.
2. Samanta AK, and Agarwal, Application of Natural Dyes on Textiles, IJFTR, 2009, 34, 384-399.
3. Raja D, Arputharaj A, Prakash C, Ramesh B and Koushik CV, Study on Dyeing Behaviour of Cotton/Organic Cotton Knitted Fabrics. Indian J. SciTechnol, 2010, 3(7), 746-751.

**\*\*\*\*\***