



# EXTRACTION OF NATURAL DYES FROM SOME PLANT PARTS AND ITS APPLICATIONS ON FABRICS

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## ABSTRACT

The negative impacts and threat posed by synthetic dyes have led to a significant increase in interest in natural dyes derived from plant sources in recent years. The primary goal of obtaining dyes from natural plant sources is to prevent pollution of the environment. Many studies are being conducted worldwide on the usage of natural dyes in light of the current global concern over the use of eco-friendly and biodegradable products. In this study dyes are extracted from different part of plants i.e., *Ixora Coccinea* Flower (pink), *Nerium Oleander* Flower (red), *Tradescantia Pallida* flower, *Portulaca Oleracea*, *Cissus Qudrangularis* stem and *Celosia Cristata* stem. The fabrics were mordanted with copper sulphate, ferrous sulphate and potassium chromate for fastening of the imparted colours. The dyes produced from these flowers were dyed on cotton fabrics and tested for their colour fastness to washing properties. The dyed cottons fabrics were observed with different shades of colour. Moreover, the dyes obtained from the plant flowers may also be alternative sources to synthetic dyes for the dyeing of natural cotton fibre.

**KEYWORDS:** Natural dyes, Biodegradable, *Ixora Coccinea* Flower (pink), *Nerium Oleander* Flower (red), *Tradescantia Pallida* flower, *Portulaca Oleracea*, *Cisus Quadrangularis* stem and *Celosia Cristata* stem.

## INTRODUCTION

India has a rich plant biodiversity which is ranked 11th as biggest biodiversity in the world. It has approximately 490,000 plant species and there is no doubt that the plant kingdom is a treasure-house of diverse natural products (Neha Grover et al., (2011)).

Dyes can make the world beautiful. Complex chemical molecules called dyes are used to colour items in a range of sectors. Both synthetic and natural dyes are fascinating substances since they are used so frequently in our daily lives. Demand for dyes continues to grow rapidly in various industries such as food, pharmaceutical, cosmetic, paper, textile and leather. Colour is perceived by the human eye through the absorption and reflection of various wavelengths of light by molecules called dyes. The chemicals known as dyes are responsible for the perception of colour in the human eye by both reflecting and absorbing particular light wavelengths.

Synthetic dyes cause harm to humans due to many side effects and allergic reactions. They also do not degrade or lose; it accumulates in the environment and is also destructive to the environment. Approximately 10,000,000 tons of synthetic dyes are used each year. Synthetic dyes may cause skin staining. Risk to disease, human health and other vital organisms.

Natural dyes can come in many different shades and can be obtained from different parts of the plant. Natural dyes are environmentally friendly, hygienic, user friendly and permanent than other colorants. Recently, we have seen a growing resurgence of interest in adoption natural dyes on fibres to worldwide environmental awareness. Today, due to the global trend of environmental awareness, the use of natural colours attracts the production and application of synthetic dyes that generate large amounts of waste and unwanted colours, causing health hazards, environmental pollution and ecological imbalance. Most of alarming and harmful to health due to the presence of toxic chemicals in finished textiles, especially those with skin contact has opened up new challenges for those working in the textile sector industry.

The application of natural dyes in textile industry are for various purposes, viz. dyeing of yarns, which are then woven into cloth, carpet or any other usable form; dyeing of cloths woven earlier; block printing, where the textile materials are printed with the help of printing blocks; Kalamkari where the “Kalam” or pen is used to draw beautiful designs on the cloth (Gopi, 2004). The plant possesses many medicinal properties. Flowers are the most effective fermentation agent, used in Ayurvedic medicines (Kroes et al, 1990). India was a major exporter of herbal dyes but not so recently because of the ban on production of some of the synthetic dyes and intermediates in the developed countries due to pollution problem.

## **Materials and Methods**

The dye was extracted from the fresh plant parts of *Ixora Coccinea* Flower (pink), *Nerium Oleander* Flower (red), *Tradescantia Pallida* flower, *Portulaca Oleracea*, *Cisus Quadrangularis* stem and *Celosia Cristata* stem, which were collected from the nearby villages of Vellore district, Vellore in the month of December, 2023.

## Materials Required

- Plant materials
- Cotton cloths
- Scissor
- Beakers
- Bowls
- Glass rods
- Test tubes
- Test tube stand
- Funnel
- Filter paper
- Tripod stand
- Conical flask
- Mordants
- Knife
- Filter paper
- Mesh

## Plants Used

- Ixora Coccinea Flower (pink)
- Nerium Oleander Flower (red)
- Tradescantia Pallida (flower)
- Portulaca Oleracea (flower and leaves)
- Cissus Quadrangularis stem and
- Celosia Cristata stem.

## Extraction of Dyes

The flowers of various plant materials were collected from the locality. The plant material was weighted using chemical balance (10 gram). It was thoroughly washed with distilled water and allowed to dry. The chopped flower material was dissolved in 100 ml of distilled water in beaker and was heated for 30 minutes at a temperature range of 80-85°C, until the dye was released. The dye from aqueous extraction was filtered through a funnel and filter paper. After the dye was extracted, it was stored in a closed flask, in the refrigerator for further use.

## Preparation of Mordant

### Mordant:

The creation of a bond between the colouring matter and fibre is called mordanting.

### Copper Sulphate

5g of Copper Sulphate was dissolved in 100 ml of distilled water.

### Ferrous Sulphate

5g of Ferrous Sulphate was dissolved in 100 ml of distilled water.

## Potassium Chromate

5g of Potassium Chromate was dissolved in 100 ml of distilled water.

### Preparation of the cloth

The cloth material (cotton) is cut into small pieces (10\*10 cm) and it is dissolved in sodium hydroxide and refluxed for 15 minutes to remove the starch; cellulose and other dirt particles from it.

The cloth treated with sodium hydroxide was put in the mordant solution and simmered for 15 minutes and then it is taken out.

Application of dye to fabrics: The dye is applied to fabric by two methods

- Without Mordant
- With mordant

**Without mordant:** The fabric which is treated with sodium hydroxide is directly immersed at the dye bath and the fabric is simmered for half an hour. After the dye enters through the cloth. The cloth is taken out and dried for further studies.

**with mordant:** The mordanted fabric is immersed in dye bath for half an hour. After that the dye enters through the cloth. The cloth is taken out and dried.

### Result and Discussion

The dye extracted from the flowers and the color of the dye is depended on the compounds (Phenol, Tannin, Fat & Fixed oil, Flavonoids, saponin, steroids, Quinine, Cellulose Terpenoids, Glycosides) present in the respective plant. The dye is then used in the cotton fabric for the fixation of color. The cloth which is displayed above got fixed to the respective dye with the help of mordant. Different mordant were used for different plants. The mordant used were: Copper Sulphate, Ferrous Sulphate and Potassium Chromate. These mordants when added to the dye gave different shades of color and make different types of shades from one plant using the mordant. The mordant sticks into the fabric well again the color does not fade and stay up to the limit mentioned in conclusion.

Sample:1



Fig 1a: Ixora Coccinea Flower  
(pink)



Fig 1b: Chopped flowers



Fig 1c: Extracted Dye

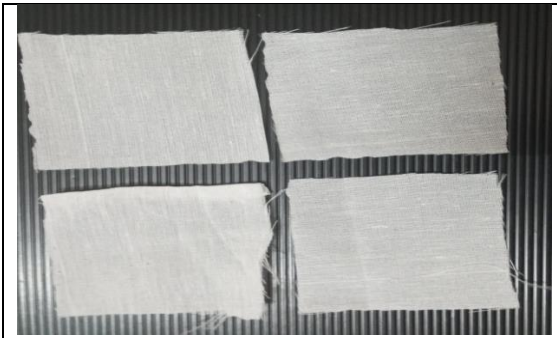


Fig 1d: Cloth before Dye

SAMPLE 1



Fig 1e: Cloth with and without mordants

Sample 2:



Fig 2a: Nerium Oleander  
Flower (red)



Chopped flowers

Fig 2b:



Fig 2c: Extracted Dye

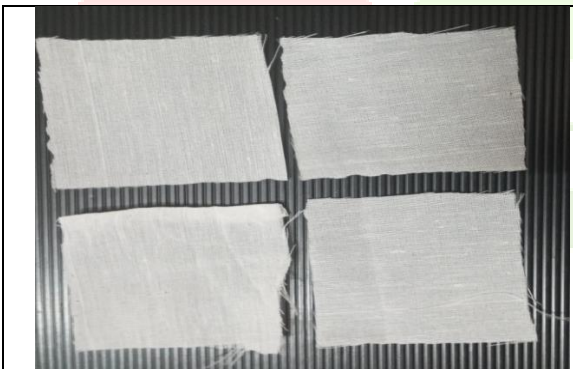


Fig 2d: Cloth before Dye

SAMPLE 2

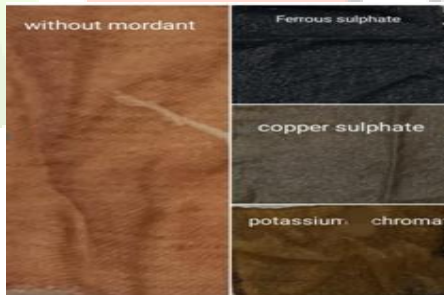


Fig 2e: Cloth with and without mordants

Sample 3:



Fig 3a: Tradescantia Pallida (Flower)

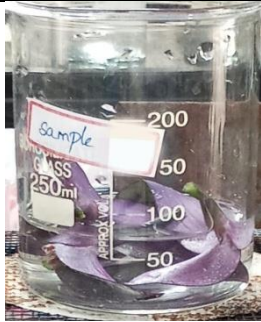


Fig 3b: chopped flower



Fig 3c: Extracted Dye

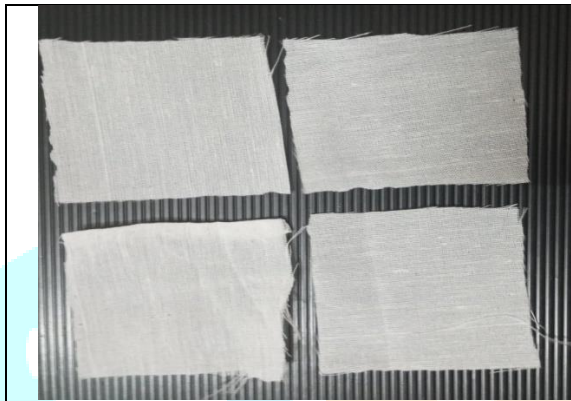


Fig 3d: Cloth before Dye

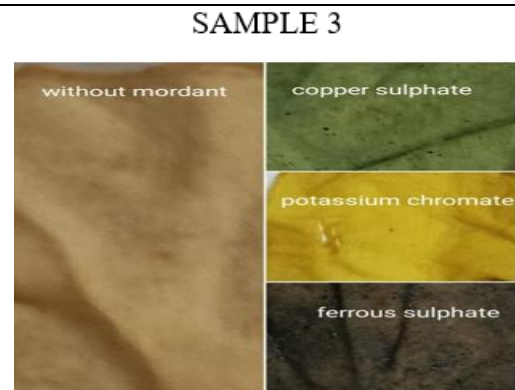


Fig 3e: Cloth with and without mordants

Sample 4:



Fig 4a: Portulaca Oleracea (leaves)



Fig 4b: Chopped leaves



Fig 4c: Extracted Dye

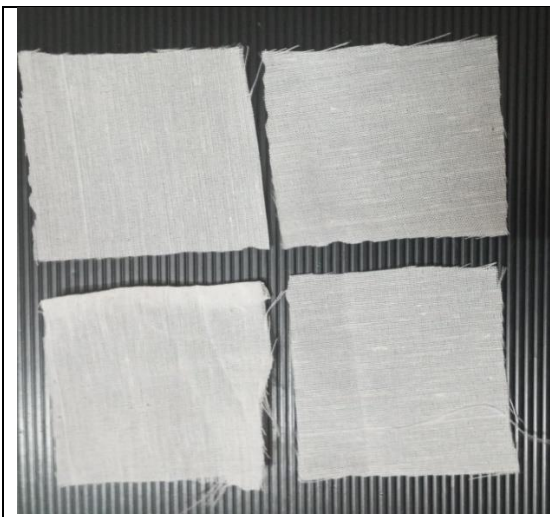


Fig 4d: Cloth before Dye

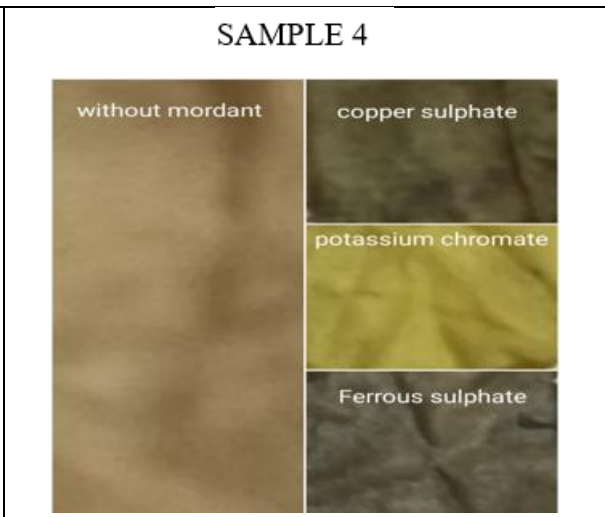


Fig 4e: Cloth with and without mordants

Sample 5:



Fig 5a: Cissus Quadrangularis (stem)



Fig 5b: Chopped stem



Fig 5c: Extracted Dye

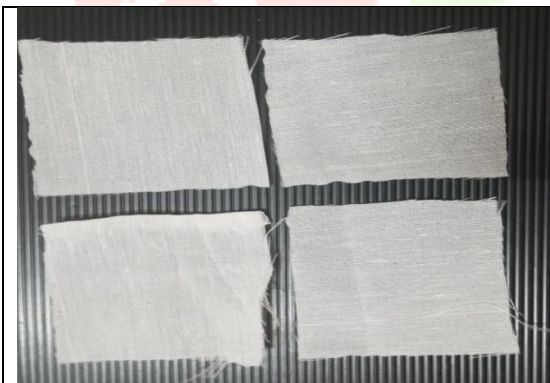


Fig 5d: Cloth before dye



Fig 5e: Cloth with and without mordants

Sample 6:



Fig 6a: Celosia Cristata  
(stem)



Fig 6b: Chopped stem



Fig 6c: Extracted Dye

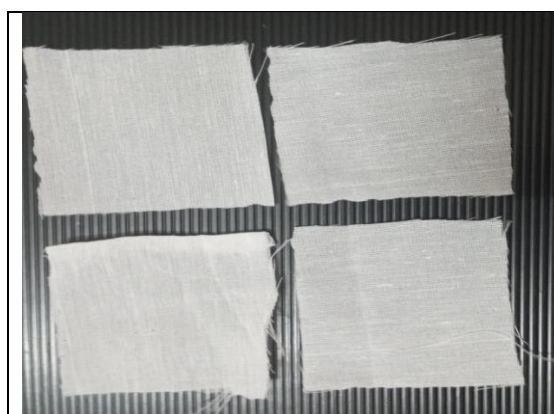


Fig 6d: Cloth before dye

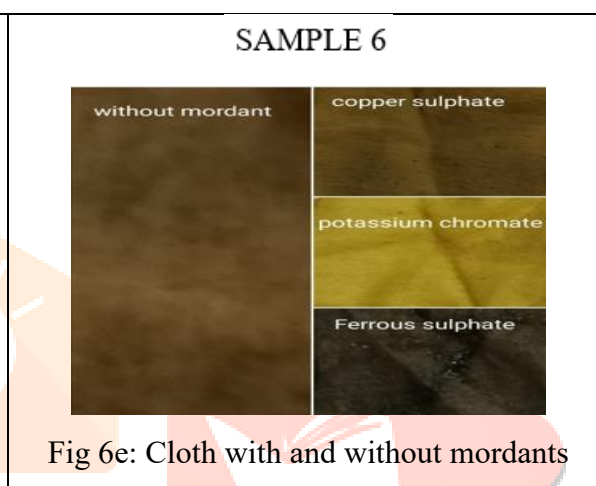


Fig 6e: Cloth with and without mordants

## Conclusion

From this current study it was found that the natural dye extracted from the different plant source extracts can be successfully applied to the cotton fabrics to obtain a wide range of colour shadings along with the application of the mordant as a fixative agent. These dyes are environmentally friendly and harmless when compared to the synthetic dyes. These can easily replace the synthetic dyes, ultimately this can solve the problem caused by synthetic dye in water and land. The result of this dye fabric is that after washing and exposed to sun light for 48 hrs after this limit it will lead to shade up, so need to overcome this limit, introduce a better reagents for further study.

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