

# ORGANIC DYE EXTRACTION FROM BRASSICA OLERACEA VAR. BOTRYTIS (CAULIFLOWER)

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**Abstract** – Dyeing is a process of applying colouring matter directly on cloth like fabric, yarn or fabric without any additives. Dyeing is normally done in a special solution containing dyes and particular chemical material. Dye molecule and fibre may be strong or weak, depending on the dye used. The art of dyeing is as old as our civilization. Dyed textile remnants found during archaeological excavations at different places all over the world provide evidence to the practice of dyeing in ancient civilizations. Today is the world of most scientific and advanced level of dyeing. There are huge numbers of process to do coloration. Natural and man-made colors are also used. In this paper, the Organic dye are extracted from Brassica Oleracea Var. Botrytis (Cauliflower) and fabric dyeing is analysed by applying dye on 100% pure cotton.

**Key Words:** Organic dye, Cauliflower, Mordants, Cotton Fabric, Economics, Handmade.

## 1. INTRODUCTION

### [A] GENERAL

From recent past years, the use of synthetic dye is increases in many important industries. Such as textiles, pharmaceutical, food processing etc. The synthetic dye are easy available and show superior fastness properties over natural dye. However through synthetics dye exhibit superior but it creates many side effects on human body. Natural dyes produce very uncommon, soothing and soft shades as compared to synthetic dyes. On the other hand, synthetic dyes are widely available at an economical price and produce a wide variety of colors; these dyes however produce skin allergy, toxic wastes and other harmfulness to human body. For successful commercial use of natural dyes, the appropriate and standardized dyeing techniques need to be adopted without scarifying

required quality of dyed textiles materials. Therefore, to obtain newer shades with dyes.

### [B] Different Natural Dye in India

1. Blue dyes obtained from Indigo plant
2. Red dyes obtained from Madder plant
3. Black and Brown Dyes obtained from Acacia plant and Walnut husks
4. Saffron Dye obtained from crocus sativus plant
5. Morinda Dye obtained from morinda Citrifolia tree
6. Kamala Dye obtained from Kamala tree
7. Orange Dye obtained from Onion skin and Butternut seed husks.
8. Yellow Dye obtained from Marigolds and Dandelion tree
9. Pink Dye obtained from Roses, Lavender and Camellias.

### [C] Advantages of Natural Dye

1. Minimal Environment Impact.
2. Renewable
3. Color pay-off
4. Safe

### [D] Disadvantages of Natural Dye

1. Cost is very high
2. Availability of Raw materials can vary from season to season.
3. Natural Dyes can also be harmful to some extent.
4. Sustainability.

## 1.1 CHARACTERISTICS OF CAULIFLOWER

Cauliflower is one of several vegetables in the species *Brassica oleracea* in the genus *Brassica*, which is in the family *Brassicaceae*. It is an annual plant that reproduces by seed.

Cauliflower is an annual plant growing as tall as 30 cm (1 ft). Cauliflower may overwinter in temperate regions. The leaves are alternate, simple, oval to curved, and very variable in size: 2–30 cm (1–12 in) long and 1–15 cm (0.4–5.9 in) broad, with larger leaves at the base of the plant and small leaves higher on the flowering stem. The flowers are inconspicuous, yellow-green, 3–4 mm (0.1–0.2 in) in diameter, and mature into a small, hard, dry, lumpy fruit cluster 5–10 mm (0.2–0.4 in) across containing several seeds. The waste cauliflower leaves are collected from the kitchen of Indus university.

## 1.2 TYPES OF CAULIFLOWER

### 1. ORANGE CAULIFLOWER

Also known as the cheeder cauliflower, this is a hybridized variety that develops curds which are bright-orange in colour.

### 2. GREEN CAULIFLOWER

One variety of green cauliflower is called the Romanesco, and it is lime green with pointed pinnacles at the surfaces of the head

### 3. PURPLE CAULIFLOWER

Both Graffiti and Purple Head cauliflower have striking purple curds, which have a mild flavor.

### 4. WHITE CAULIFLOWER

There are actually numerous types of white cauliflower, including the white cloud and the Early white Hybrid, but all white cauliflower consists of white curd, or the head of flower buds, surrounded by enclosing leaves.

- In this we have used WHITE CAULIFLOWER.

## 2. MATERIALS AND METHODS

### APPARATUS:-

- Beakers,
- volumetric flask,
- hot air oven,
- flocculator,
- weighing machine,
- safety gloves,
- water bath,
- turbidity meter,
- cotton cloths.

### MORDANTS:-

A mordant or dye fixative is a substance used to set (i.e. bind) dyes on fabrics by forming a coordination complex with the dye, which then attaches to the fabric (or tissue).

- Ferrous Sulphate ( $\text{FeSO}_4$ ),
- Salt ( $\text{NaCl}$ ),
- potassium dichromate ( $\text{K}_2\text{Cr}_2\text{O}_7$ )
- Copper Sulphate ( $\text{CuSO}_4$ )

### CHEMICALS:-

- Sodium hydroxide ( $\text{NaOH}$ ),
- Conc. Sulphuric acid ( $\text{H}_2\text{SO}_4$ ),
- Ethanol.

### METHODS:

1. Aqueous Extraction Method
2. Alkaline Extraction Method
3. Acidic Extraction Method
4. Alcoholic Extraction Method

### SUBSTRATE

The 100% soft cotton fabric was used as a substrate.



Figure 1 COTTON CLOTH

### SCOURING AND MORDANTING

Scouring of cotton cloth : Cotton clothes used for dyeing were boiled in 10 percent  $\text{NaOH}$  solution for 10 minutes to remove starch and other impurities from the cloth . The  $\text{NaOH}$  treated clothes were then thoroughly washed with cold distilled water.



Figure 2 SCOURED COTTON SAMPLE

Mordanting : The clean scouring clothes were treated with different mordants such as Ferrous Sulphate ( $\text{FeSO}_4$ ), Salt ( $\text{NaCl}$ ), potassium dichromate, Copper Sulphate ( $\text{CuSO}_4$ ).

### AQUEOUS EXTRACTION METHOD

**Step 1-** 50 gm of cauliflower was boiled in 500ml of distilled water at 100 C for 30 minutes.

**Step 2-** After 30 minutes , cauliflower was removed from the extraction solvent .Water content remaining was approx. 175 ml.

**Step 3-** The cotton sample was dipped in the filtered extract for 24 hours

**Step 4-** After 24 hours the cotton sample was removed and the amount of dye extracted was calculated through colorimeter

**Step 5-** The cotton cloth was washed with the tap water and was allowed to dry under normal temperature.

**Step 6-** The difference between the cotton cloth before and after washing was observed.

### ALKALINE EXTRACTION METHOD

**Step 1-** 50 gm of cauliflower was boiled in 1%  $\text{NaOH}$  solution having volume of 500 ml at 100°C for 30 minutes.

**Step 2-** After 30 minutes the cauliflower was removed from the extraction solvent.

**Step 3-** The cotton sample was dipped in the filtered extract for 24 hours.

**Step 4**-After 24 hours the cotton sample was removed and the amount of dye extracted was calculated through colorimeter

**Step 5**-The cotton cloth was washed with the tap water and was allowed to dry under normal temperature.

**Step 6**-The difference between the cotton cloth before and after washing was observed.

**ACIDIC EXTRACTION METHOD**

**Step 1**-50 gm of cauliflower was boiled in 1% NaOH solution having volume of 500 ml at 100°C for 30 minutes.

**Step 2**-After 30 minutes the decolorized cauliflower was removed from the extraction solvent.

**Step 3**- The cotton sample was dipped in the filtered extract for 24 hours.

**Step 4**-After 24 hours the cotton sample was removed and the amount of dye extracted was calculated through colorimeter

**Step 5**-The cotton cloth was washed with the tap water and was allowed to dry under normal temperature.

**Step 6**-The difference between the cotton cloth before and after washing was observed.

**ALCOHOLIC EXTRACTION METHOD**

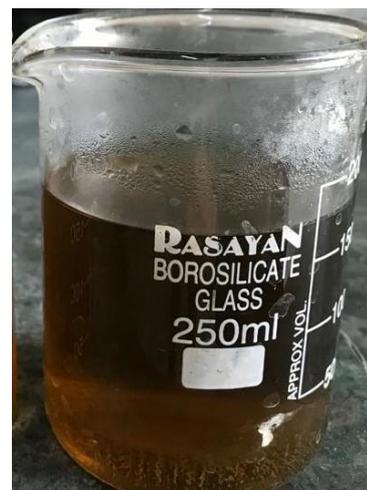
**Step 1**-50 gm of pineapple was boiled in 50 percent alcohol solution of total volume 500 ml for 30 minutes.

**Step 2**-After 30 minutes , the filtered solution was taken and cotton sample was dipped in it for 24 hours .

**Step 3**-After 24 hours , the amount of dye extracted was calculated through colorimeter.



**Figure 3** boiled cauliflower solid waste



**Figure 4** EXTRACTED CAULIFLOWER SOLUTION



**Figure 5** COTTON CLOTH DIPPED INTO SOLUTION

**Table-1** Rating of fastness properties dye and mordent

Sr.No	Solvents	Cotton fabrics	Terry cotton fabrics	COLOURI-METER VALUES
1	Aqueous	Good	Good	153 (F)
2	Alkaline	Good	Good	97(F)
3	Acidic	Good	Good	191(F)
4	Alcoholic	Good	Good	56(F)



Figure 6  
CAULIFLOWER+AL+CUSO4



Figure 7  
CAULIFLOWER+AL+FESO4



Figure 8  
CAULIFLOWER+AQ+FESO4



Figure 9 DIFFERENT COTTON CLOTH WITH DIFF. SOLUTION

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### 3. CONCLUSIONS

By using the process discussed above, different shades of cauliflower can be prepared using different mordants with organic dye. Thus, results obtained from present investigation revealed that, cauliflower has the dyeing potential as a source for cotton dyeing.

As the dye is made from kitchen solid waste it solves the problem of waste disposal as well as becomes a more sustainable option. Natural dyes were used in ancient times and can be used again in future if proper research and resources are used to convert them in a more economical and easily available option.

### ACKNOWLEDGEMENT

This research was supported/partially supported by JAINISHA PATEL & AKSHAY CHAUHAN. We thank our colleagues from INDUS UNIVERSITY who provided insight and expertise that greatly assisted the research, although they may not agree with all of the interpretations/conclusions of this paper.

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