



## Research Article

# Extraction and Application of Turmeric Dye on Silk Fabric

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**Abstract** | Natural dyes have been used as colorants in food, leather as well as textile since prehistoric times. These dyes are obtained from vegetable and animal matter with no or very little chemical processing. Turmeric spice is used in making natural dye. In this study dye was developed by using three concentration levels from turmeric powder. Then apply a dye on silk fabric after binding it with vinegar. The dye's colour concentration and color fastness after 15 washes. This research is based on quantitative research. This is experimental research. In this study, access the color concentration on different stages and fastness after 15 washes. In a beaker 1 tablespoon were added and boiled in 100 ml distilled water at 100°C for 10 minutes. After 10 minutes the solution was filtered. Then 15 ml vinegar were added to retain color put the solution in steam soaping machine. The sample were died then rinse the sample and dry it under shadow to penetrate color. Then the sample was washed with tap water for 2 minutes to remove extra color. After this wash all the dyed samples in machine. Put 10 liter water and 50gm detergent and wash for 15 minutes. Same procedure would be followed in level 2 with 2 tablespoons of turmeric. And in level 3 same procedure would be followed with 3 tablespoons of turmeric. In results it shows that in all three level there is a difference while comparing the levels with each other. But while compare to level 1 to its own washes it gives same color fastness on each wash. Same results was showed for level 2 and level 3.

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**Keywords** | Turmeric spice, Concentration, Color fastness, Silk fabric, Washes



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## 1. Introduction

The term sustainability has been introduced in various fields of study, particularly green chemistry (Rehman *et al.*, 2021). This is because the environment is being disrupted by the daily, fast usage of synthetic products, whose effluent burdens are eluted either during production or application

(Tkaczyk *et al.*, 2020).

Regular colors have been utilized as colorants in food, cowhide as well as material since ancient times. These colors are gotten from vegetable and creature matter with no or very little synthetic handling. In 1856, less expensive and effectively accessible manufactured colors were presented, which brought about an

extraordinary decrease in the use of normal colors. In any case, there has been a restoration of interest in normal colors in the worldwide field because of their non-dirtying, non-cancer-causing and eco-accommodating nature. Originating in Southeast Asia and the Indian subcontinent, it requires substantial yearly rainfall and temperatures between 20° and 30°C to flourish. Every year, the plants are taken for their roots, and some rhizomes are used to generate new plants the following season (Ali *et al.*, 2009). The rhizome is ground into a rich orange-yellow powder (Figure 1), which is frequently used as a colouring and flavouring agent, after being cooked in water for 30 to 45 minutes if it is not to be used fresh. The powder is then dried in a hot oven. It is a common ingredient in Asian cooking, particularly in curry and painting (Mansour *et al.*, 2016).

Natural colourants come from a variety of natural sources, including minerals, vegetation, and animals. Natural materials have been used by humans since the beginning of human civilization, but their use started to drastically decrease in the years after the discovery of synthetic colours in 1856. Since then, only artisans, hobbyists, and proprietors of small businesses in the cottage industry sector have used natural dyeing techniques (Rahman *et al.*, 2023).

Additionally, manufactured colors, for example, azo colors are accounted for to be cancer-causing and can cause hypersensitive responses. Germany was quick to step up to the plate and put restriction on creation and utilization of various explicit azo colors. Netherlands, India and a few different nations likewise followed the boycott. Normal colors are notable for delivering extremely remarkable, alleviating and delicate shades when contrasted with manufactured colors. This change in worldview for regular colors is additionally credited to the severe ecological principles forced by numerous nations in light of harmful and unfavorably susceptible responses related with manufactured colors (Arora *et al.*, 2017).

By and large, Man has forever been keen on colors. The speciality of normal coloring returns into ancient times since the Indus Valley civilization. These colors stay the primary material colorants up to the furthest limit of the nineteenth 100 years. Specialists have shown that the majority of engineered colors contain poisonous unrefined substances and intermediates which have an adverse consequence towards the eco-

balance nature, notwithstanding the serious wellbeing perils. Interestingly, normal colors are liberated from such issues. Subsequently, there is a regularly motivation towards the getting back to the utilization of normal colors, with respect to the rigid natural guidelines forced by numerous nations towards the expanded attention to eco-wellbeing and supportable materials in material tinge innovation. As to efficient perspective, there are restricted explores led on the accessibility of natural squanders that could act as hotspots for the extraction of regular colors for material shading, consequently the extraction of variety is a significant stage for coloring to assess and expand its coloring qualities on any material substrate (Mansour *et al.*, 2020).

In this study turmeric was used as natural dye. Since prehistoric times, natural dyes have been employed as colorants in food, leather goods, and textiles. These dyes are made without any, or very little, chemical processing from plant and animal materials. Natural dye is made with turmeric spice. In this investigation, three concentration levels of turmeric powder were used to create the dye.

## 2. Materials and Methods

This chapter discusses the materials and methods used for application of turmeric dye on silk fabric. This research contains three concentration levels. After that washes applied on dyed samples to obtain color fastness.

### 2.1 Sample details

Silk fabric was used as a sample for dyeing. The size of sample was about 2.5 by 2.5 inches. Fabric was purchased from Auriga center Lahore. Turmeric was purchased from Metro store Lahore. Beaker, Burner, Mortar and paste, Crucible tong were the instrument use for extraction.

### 2.2 Turmeric extraction method

In the beaker 1 tablespoon of turmeric dye were added in 100ml water for 10 minutes. The color extracted from turmeric after 10 minutes. In a beaker 1 tablespoon were added and boiled 100 ml distilled water at 100°C for 10 minutes. After 10 minutes the solution was filtered. Then 15 ml vinegar were added to retain color put the solution in steam soaping machine. The sample were died then rinse the sample and dry it under shadow to penetrate color. Then the

sample was washed with tap water for 2 minutes to remove extra color. Same procedure was used for level 2 and level 3.

**2.3 Standard washing**

Detergent= 50gm; Water= 10 litter; Time= 15 minutes.

**2.4 Color fastness to wash**

Sample and multi-fibre conditioned as lab standard temperature and relative humidity. Take fibre sample of 2.5 by 2.5". Wash specimen as per recipe. Final assessment with compare to control group.

**3. Results and Discussion**

This chapter deals with the results of turmeric dye on silk fabric on three concentration level through tables. The following is given the analysis of data as per sequence of objectives.



**Figure 1: Sample dyeing from the extraction of turmeric.**

Figure 1 shows the extraction of dye from turmeric powder in concentration level 1. Add 1 tablespoon of turmeric dye in 10ml water and boiled it for 10 minutes for color extraction. Same recipe was followed for level 2 with 2 tablespoons of turmeric and level 3 with 3 tablespoon of turmeric.



**Figure 2: Concentration levels of turmeric dye.**

Figure 2 shows the three concentration levels of turmeric dye. In level 1, 1 tablespoon of turmeric powder were used that shows lighter shade of yellow.

In level 2, 2 tablespoons of turmeric were used that show dark shade of yellow as compare to level 1. When in level 3 increase the quantity of turmeric to 3 tablespoons so it shows darker color of dye. Results in this table shows that light fastness remain same before and after 5, after 10, and after 15 washes in level 1.



**Figure 3: Machine wash for 15 minutes for each wash.**



**Figure 4: Machine wash for 15 minutes for each wash.**

**Table 1: Light fastness method: ISO 105-B02**

| Level 1         | Results |
|-----------------|---------|
| Before wash     | 1-2     |
| After 5 washes  | 1-2     |
| After 10 washes | 1-2     |
| After 15 washes | 1-2     |

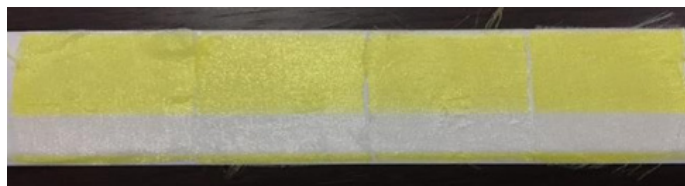
Specifies a method intended for determining the effect on the colour of textiles of all kinds and in all forms to the action of an artificial light source representative of natural daylight.

**Table 2: Light fastness method: ISO 105-B02.**

| Level 2         | Results |
|-----------------|---------|
| Before wash     | 1-2     |
| After 5 washes  | 1-2     |
| After 10 washes | 1-2     |
| After 15 washes | 1-2     |

Specifies a method intended for determining the effect on the colour of textiles of all kinds and in all forms to the action of an artificial light source representative of natural daylight. The test was conducted in Faisal

Spinning Mills LTD Finishing unit. Results in this table shows that light fastness remain same before and after 5, after 10, and after 15 washes in level 2.



**Figure 5: Machine wash for 15 minutes for each wash.**

**Table 3: Light fastness method: ISO 105-B02.**

| Level 2         | Results |
|-----------------|---------|
| Before wash     | 1-2     |
| After 5 washes  | 1-2     |
| After 10 washes | 1-2     |
| After 15 washes | 1-2     |

Specifies a method intended for determining the effect on the colour of textiles of all kinds and in all forms to the action of an artificial light source representative of natural daylight. Results in this table shows that light fastness remain same before and after 5, after 10, and after 15 washes in level 3.



**Figure 6: The three different concentration levels.**

### 3.1 Comparison of three different levels from each other

While comparing the all three concentration levels with each other the difference between all three levels were obtained. In level 1, 1 tablespoon of turmeric were used so it gives lighter tone of shade. In level 2, 2 tablespoons of turmeric were used so it gives dark shade as compare to level 1. On the other hand, in level 3, 3 tablespoons of turmeric dye were used so it gives darker shade of yellow as compare to both level 1 and 2. It show that increasing the amount of turmeric also increase the color consistency.

The previous study was aimed to explore the sustainable dyeing approach of silk fabric with

turmeric powder. For that, dyed silk fabric with the extract of turmeric powder. Dyeing parameters such as temperature, time and mordent concentration were varying for optimizing the process. The color strength, color coordinates, color fastness to wash were evaluated for examine dyeing performance. The samples were dyed with turmeric dye by varying the time and temperature. By analysing the result, the sample mordanted with extracted tannin showed high color strength and good color fastness properties (Sarker *et al.*, 2020).

In current study turmeric dye was applied on silk fabric with three concentration methods. The dye was extracted from turmeric powder and applied on silk fabric. The color fastness was obtained after washes. This study is support the current study in refer to both studies has good color fastness properties.

The objective of this research is to preparation of dye powder from natural dye. The natural dye used in this research was turmeric dye. The natural dyes powder were dyed on silk fabric and then characterized by colour strength (K/S), washing fastness and light fastness. The results showed that the turmeric dye powder showed poor light fastness on silk fabric (Punyacharoennon *et al.*, 2018).

In current study turmeric dye was applied on silk fabric with three concentration methods. The dye was extracted from turmeric powder and applied on silk fabric. The color fastness was obtained after washes. This study dost not support current study because in current study turmeric dye show good light fastness. But in this previous study it shows poor light fastness. Natural dyes have been used as colorants in food, leather as well as textile since prehistoric times. These dyes are obtained from vegetable and animal matter with no or very little chemical processing. Turmeric spice is used in making natural dye.

This research focuses on extraction of natural dye from Turmeric root its application on silk fabric. Natural dye had been extracted from commercially available Turmeric root. The extracted dye had been used for dyeing of silk fabrics. Dyed silk fabric samples were tested for various fastness tests such as fastness to washing. Turmeric dyed silk fabrics were tested for wash fastness, perspiration and sun light. Turmeric color showed excellent fastness property for washing. Turmeric colour dyed fabric improves the fastness

properties (Hegde and Goutham 2015).

In current study turmeric dye was applied on silk fabric with three concentration methods. The dye was extracted from turmeric powder and applied on silk fabric. The color fastness was obtained after washes. This previous study is support the current study in refer to both studies has good color fastness and light fastness properties.

This previous study was intended to assess the color fastness of silk fabrics dyed with turmeric natural colorant. Turmeric dye applied on silk fabric. In case of silk dyed samples color fastness to washing was obtained. The result shows that good color fastness was obtained after wash (Mozumder *et al.*, 2016).

In current study turmeric dye was applied on silk fabric with three concentration methods. The dye was extracted from turmeric powder and applied on silk fabric. The color fastness was obtained after washes. This previous study is support the current study in refer to both studies has good color fastness obtained after washes.

## Conclusions and Recommendations

Natural dyes have been used as colorants in food, leather as well as textile since prehistoric times. A dye was developed by using three concentration levels from turmeric powder. Then apply a dye on silk fabric after binding it with vinegar. After that evaluate dye's color concentration and color fastness after 15 washes.

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## Novelty Statement

Turmeric dye was mostly used for cotton fabric but in this study turmeric dye was applied on silk fabric by making three concentration level.

## Author's Contribution

SS gave the concept of idea, design of work, and interpretation of data. AS is a designer of work and also does the drafting of the manuscript. KH performed

the drafting of the manuscript. ZA give revisions to the manuscript and interpreted data. MNB performed experiment work and interpretation of data.

## Conflict of interest

The authors have declared no conflict of interest.

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