



Exploring A New Sense of Sustainable Culture in Expanding Textile Industry: Fabric Dyeing From Tea and Coffee Residue

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ABSTRACT:

Personalization and Emotional Sustainability highlighting the contexts 'Luxury with a value' has plagued the current luxury fashion market. A major transformation has witnessed during the past few years due to the growth of affluent young upper market consumers, who investigate the products, which create a link among emotions, feelings and values of life. Therefore, the report will comprehensively analyses a strategic plan created towards a personalized range of luxury textiles orienting through the nostalgic emotions. The textiles will be produced through a series of experimental applications where the color texture to be blended hand in hand to impress the new look. Food and Textile industries are considered to be the most vital industries for human survival. The food industry generates an enormous amount of waste which is used as animal feed or undergoes composting or just go as landfills. Some of these organic wastes contains coloring pigments which can be effectively used to color textiles. Hence there is a possibility to bridge the gap utilizing the waste from food industry to color textile materials. Natural dyes from plant sources are required in large amounts which may cause depletion of natural resources. Considering these factors, the waste material from food industry, which is available at little, or no cost can be effectively used to color textiles, this would make natural dyeing affordable and bring about sustainability in textile dyeing process. This study was carried out considering the sustainability aspect which is mutually beneficial to food and textile industries. Natural dyes can be found in the kitchen can produce beautiful hues. A simple dyeing process can be used to color the fabric at home utilizing available resources in the home kitchen. tea dust and filter coffee dust which are part of everyday kitchen waste were used for the study. Instead of these wastes going directly as landfills, dye was extracted prior to its disposal. Cotton fabric, mordanted with Alum, was dyed with the extracted dye. Since these dyes are natural in origin, they are safe and eco-friendly. This study proves that throw-away kitchen waste can be utilized to extract dyes that can be used to create value-added products.

Key words: Food Waste, Natural Dyes, Sustainable, Value-Addition

Citation: Mrs.P.A.P.H.Manthriratne, Exploring A New Sense of Sustainable Culture in Expanding Textile Industry: Fabric Dyeing from Tea and Coffee Residue, *International Journal of Current Business and Social Sciences*. ISSN- 2312-5985, 10 (6), 26-31, (2024).

1. INTRODUCTION

Solid waste generated from industries, agriculture, and houses mostly goes as landfills in developing countries which is of great environmental concern. Hence a sustainable approach to solve this problem is necessary in the management of solid wastes. The unused portions of fruits or vegetables, leftover portions from household kitchens, restaurants, etc. contain organic matter in high amount which can be considered as a source for creating value-added products before it goes as a landfill. Vegetable wastes, such as shells, scrap, etc, occur during various processes in the vegetable supply chain. It is estimated that around 30 percentage of vegetable waste occurs during the consumer level globally. Consumer usage of vegetables in households, canteen, and restaurant account for the remaining 20 percentage Rais & Sheoran (2015).

Today, the waste generated in the household contributes to environmental threats and ways to develop a model to recycle the waste in possible areas is the need of the hour. This kitchen waste has the potential to function as a source of extraction of natural dyes AshishT et al. (2020). The kitchen waste disposal in a way that does not create a bio-burden is looked upon all around. Utilizing kitchen waste for extracting dyes is beneficial, as usage of natural dyes will also have a positive impact on the economic growth of the rural dyers Jain et al. (2021).

2. GENERAL OBJECTIVES

1. To investigate the role of Crime and Anti-Money Laundering (AML) Act in preventing fraud in commercial banks
2. To evaluate the concept of Know Your Customer (KYC) and its impact in preventing fraud among commercial banks.
3. To evaluate the impact of technology in preventing fraud in commercial banks
4. To determine the effects of internal controls in preventing fraud in commercial banks

The use of natural resources to color textiles might lead to the depletion of the same. Hence the present study was undertaken as an exploratory study to extract dyes from waste which is generated every day from the home kitchen, at no cost and easily available. It focuses on ways to upcycle the kitchen waste by extracting dyes from the two popular and widely used beverages namely tea and coffee residues after the beverage extraction. Black Tea and Coffee are the most widely consumed non-alcoholic beverages in the world. The major polyphenolic compound present in black tea are Theaflavins, So far more than 25 theaflavins are found in black tea Koch (2020).

The decoction waste, before it goes as a landfill, is used in the extraction of color to dye the textile material hence adds value to the product. Simple dyeing process which could be carried out at home was adapted in the study which can be done in the convenience of available resources. Colorfastness tests and antimicrobial analysis were carried out to find the efficiency of the dyes. The qualitative phytochemical analysis of the Tea and Coffee extracts were also carried out to confirm the presence of phytochemicals.

3. LITERATURE REVIEW

The earliest form of coloring textiles was using Natural dyes. Since ancient times natural dyes have been used for coloring body, food, walls of caves, leather, and textiles The use of natural dyes from plants can be traced back to 2600 B.C. in China. Based on the archeological evidence, initially only a

small number of plants and animals were used as sources to extract natural dyes Che & Yang (2022). Natural dyes, can be derived from varies parts of plants like roots, stems, leaves, flowers, fruits; Also, from animal sources and natural-colored ones. Dyes can be obtained from other sources like fungi, snails, insects, etc. Tamilarasi & Banuchitra (2021). The beneficial aspects of using natural dyes are manifold as they are ecofriendly, safe, easily obtained from renewable sources and gentle to the human eye. These dyes do not cause any health hazards and do not create any disposal problems. India is a rich source of colorants, there are around 500 varieties of plants from which dyes can be easily extracted Yadav et al. (2023).

Dyes obtained from natural sources are pleasant and can be used instead of synthetic dyes due to its environmental benefits Yusuf & Shahid-ul-Islam (2017). The coloring component present in most of the natural dyes, is only a small amount of its total solid weight. Hence a huge amount of the raw material is necessary to dye a small quantity of textiles. Since a huge amount of the dye source is required for the extraction of dye, it may result in overexploitation of the natural resources. Lot of efforts have been undertaken globally to address the limitations of natural dyes and find alternate sources because of their tremendous advantages to the environment Kulkarni et al. (2011). Waste material, available at no or little cost, can be used as an alternate source for natural dyes that makes it cost-effective and affordable and brings about sustainable approach in textile dyeing process.

4. RESEARCH METHODOLOGY

Material used- Plain weave cotton fabric was used for the dyeing process. The cotton material was bleached and scoured prior to dyeing process to remove the possible impurities like dirt, or any other finishing agent present on the fabric and to aid in even absorption of the dye.

Collection of Raw materials: The tea dust (3 roses tea) after the extraction of tea (decocotion) and the filter coffee (Cothas filter coffee) dust after the extraction of coffee (decocotion) were collected. The extraction of both the beverages namely tea and coffee were done only with water and without adding milk. The tea and filter coffee dust after extraction were shade dried separately for three days.

Pre- mordanting: The cotton fabric was subjected to pre-mordanting using Alum (Potassium aluminum sulfate).

Tea: To extract the dye, 100 grams of the dried tea dust was soaked in 2 liters of water and left for one hour. Then, the contents were boiled for half an hour to extract the color from the tea dust. The extract was filtered using a cotton cloth and was used as the dye bath to color the mordanted cotton fabric.

Coffee: To extract the dye, 100 grams of the dried coffee dust was soaked in 2 liters of water and left for one hour. Then, the contents were boiled for half an hour to extract the color from the coffee dust. The extract was filtered using a cotton cloth and was used as the dye bath to color the mordanted cotton fabric.

Dyeing process: The pre-mordanted cotton fabric was introduced into the dye bath (tea and coffee dye bath separately) and was stirred gently. The contents were boiled for one hour at 90°C with constant turning of the material. Then the dyed cotton fabric was rinsed three times in cold water and was dried in shade. (Table 1)

Color fastness properties: The dyed fabrics were subjected to color fastness assessment such as light, crocking, washing, perspiration and pressing. The standard methods followed for the analysis of color fastness is as follows.

5. RESEARCH FINDINGS

Extraction of dyes: The dyes were extracted from the residues after tea and coffee extraction using the aqueous extraction method which can be easily adopted at home.

Application of extracted dyes to cotton fabric: The extracted dyes were applied to cotton fabric which was mordanted using a safe and easily available mordant alum. The tea and coffee dyed samples showed shades of brown color. (Table 1)

Tea extract dyed cotton fabric produced an elegant pale to golden orangish color while the coffee dyed cotton fabric produced a golden yellowish color with good wash fastness properties.

The tea and coffee dyed samples showed very good to excellent dry crock fastness in comparison with wet crock fastness which was rated very good.

- The tea and coffee dyed sample showed good wash fastness rating. The color staining on various fabrics while washing was also very light hence were rated between very good to excellent.
- The acidic and alkaline perspiration colorfastness tests carried out on the dyed samples showed very good results to colour change. The observation on the colour staining on various fabrics was also very light hence were rated between very good to excellent.
- The dry and wet pressing colorfastness results of both the samples shows very good to excellent colorfastness.
- The overall results of the samples dyed from the residue of tea and coffee extracts showed good to excellent results to color fastness to Washing, Rubbing, Perspiration and Pressing. While the colorfastness of the samples dyed with tea and coffee extracts to light showed fair fastness (Figure 1)

Assessment of color strength of the dyed fabrics:

The shade developed on the cotton fabric was assessed after dyeing the pre-mordanted fabric.

The qualitative phytochemical analysis of the Tea and Coffee extracts confirmed the presence of various phytochemicals, like alkaloids, saponins, proteins, phenols, and carbohydrates. The result shows that terpenoids and amino acids were absent.

Table 1 Cotton Fabric Subjected to Mordanting and Dyeing



Bleached and
Scoured Fabric

Mordanted Fabric

Tea Dyed Fabric

Coffee Dyed Fabric

Source Pictures from author's tea and coffee dyeing experiments

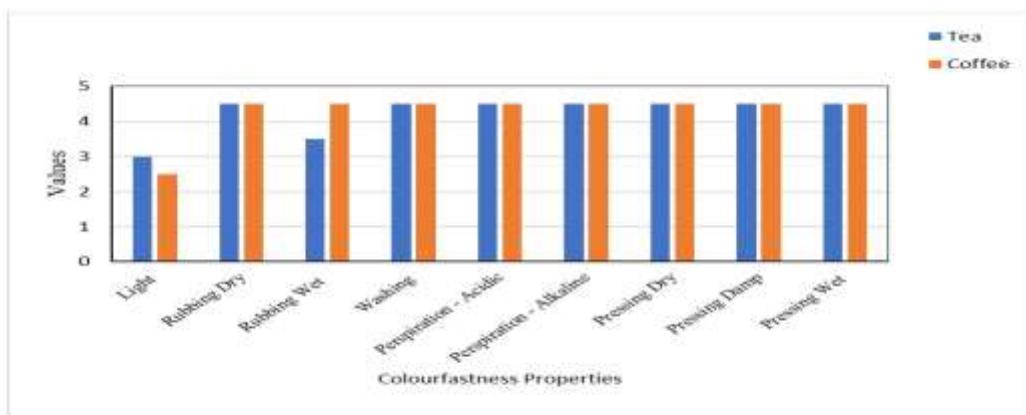


Figure 1 Color Fastness Properties of the Tea and Coffee Dyed Samples

6. CONCLUSIONS

Natural dyeing one of an ancient art form of coloring textiles can be revived in a sustainable manner. This study shows a simple dyeing process which can be carried out at home using available resources. It is an innovative upcycling approach towards kitchen waste management. Hence a small initiative can contribute to the revival of the art, protecting the environment and to promote sustainability. This study proves that wastes from kitchen could also be a potential source to extract color which can be employed for textile coloration. It is evident from the study that the waste generated after extracting tea and filter coffee still contain significant amounts of functional ingredients. In addition, the extract obtained contains sufficient amounts of color to dye fabric and hence it can be effectively used to dye textiles and it gives unique shades. The color fastness properties of these dyes were also very good. Since these dyes are natural in origin, they are eco-friendly dyes suitable for green technology. Hence beverage waste generated from food industry which has the coloring pigments can be effectively utilized to color textile materials hence producing value addition. It is an innovative, simple, and eco-friendly waste management solution in textile dyeing.

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