

IJARSCT ISSN: 2581-9429

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 5, Issue 10, March 2025



Extraction of Natural Dyes from Plants

Aman Ganesh Surekar¹, Patil Jayashree Shailesh²

Research Scholar (M.Sc. II), Department of Chemistry, J.S.M. College, Alibag, Raigad¹ Assistant Professor, Department of Chemistry, J.S.M. College, Alibag, Raigad² amansurekar@gmail.com and jayupatil25@gmail.com

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 Qudrangularisstem 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, Hibiscus Flower (red), Merigold Flower (yellow or orange), Asian pigeon wings flower

I. INTRODUCTION

Dye is an aesthetic substance that is used to colour the fibre and fabrics that is used in our day-to-day life. Normally the classification of dyes is done into natural and manmade dyes (ie., synthetic dyes). The synthetic dyes are mainly used since 1856 to dye the fibre and fabric materials, due to its superior properties than the naturally extracted substances. The synthetic dyes have outstanding colour fastness capabilities and a reasonable price. These dyes, which are leftovers from the production of crude oil, are highly carcinogenic, highly poisonous, and can prevent benthic photosynthesis. However, natural dyes have deodorizing characteristics in addition to being anti allergic, nontoxic, and quickly biodegradable. Additionally, these colors are bio-compatible, eco-friendly, and have a green philosophy, so they do not have any negative impact on the environment. These natural dyes have been used to dye fabric materials and other objects since the Bronze Age. In recent years their use has extended to antimicrobial finishing of textiles, UV protective clothing, food coloration and pharmaceuticals etc.Because they do not require any strong acid and alkali for their use and production. Their demand is constantly increasing. The term "natural dyes" includes all dyes that are obtained from natural sources such as plants. minerals, and animals. But the colour content and colour yield of natural dyes are comparatively less than synthetic dyes. Natural dyes also have various disadvantages in their properties. As already mentioned, they do have colour fastness problems such as colour yield, reproducibility results, dying procedures are different and difficult and fastness properties.

So, the dyeing in order to manufacture diverse dye colours with variable levels of colour fastness and to make natural dyes more tolerant to textile materials, industries utilise mordants. When metallic or mineral salts are added to a natural dye bath, the dye is either intensified or the colour is altered. They also have a significant impact on how well the final hue is light- and wash-fast. The materials that the dyes are meant to colour are not immediately affected by them. They need a mordant to fix with the fabric because they are Substantial. In words to increase the dye's proper and even absorption, a mordant is a substitute that intensifies the chemical reaction that occurs between dye and fibre. Stainless steel, enamel, and other non-reactive materials can be used for colouring containers. Materials like brass and iron shouldn't be utilised because they undergo their own mordanting here.

Copyright to IJARSCT www.ijarsct.co.in



DOI: 10.48175/IJARSCT-24752



275



International Journal of Advanced Research in Science, Communication and Technology

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 5, Issue 10, March 2025



II. METHODOLOGY

Selection and Collection of Plant Materials :

Criteria for Selection:

High dye content. Availability in local regions.

Sustainability and ease of harvesting.

Plant Parts to Collect:

Roots (e.g., madder, turmeric).

Leaves (e.g., indigo, henna).

Flowers (e.g., marigold, hibiscus)

Preservation:

Wash and dry plant materials to prevent degradation. Store in airtight containers or bags in a cool, dry place.





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.





Copyright to IJARSCT www.ijarsct.co.in



DOI: 10.48175/IJARSCT-24752





International Journal of Advanced Research in Science, Communication and Technology

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 5, Issue 10, March 2025







Preparation of Mordant

Alum

0.748g of Alum and 0.187g of Washing soda were mixed in 100ml of water and was stored for further use. Vinegar

50 ml of 5% ascetic acid is mixed with 100ml of water. From that 25ml of it were taken and mixed with 100ml of distilled water.



III. LITERATURE REVIEW

Research on the extraction of natural dyes from plants has experienced significant growth in recent years, reflecting a heightened interest in sustainable and eco-friendly alternatives to synthetic dyes. This surge is evident from the increasing number of studies focusing on various extraction techniques, plant sources, and applications across different industries.

Advancements in Extraction Techniques: Traditional methods such as aqueous and solvent extraction have been widely documented. However, recent literature highlights a shift towards more efficient and sustainable techniques:

Ultrasound-Assisted Extraction (UAE): This method has gained attention for its ability to enhance dye yield and reduce extraction time. For instance, a study on henna leaves demonstrated that UAE achieved a dye yield of 17.96% under optimal conditions, outperforming conventional methods.

Microwave-Assisted Extraction (MAE): MAE has been explored for its efficiency in extracting dyes from various plant materials, offering reduced solvent usage and processing time.

Enzyme-Assisted Extraction: The use of enzymes to break down plant cell walls has been investigated to improve dye extraction efficiency.

Copyright to IJARSCT www.ijarsct.co.in



DOI: 10.48175/IJARSCT-24752



277

International Journal of Advanced Research in Science, Communication and Technology

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 5, Issue 10, March 2025

Diverse Plant Sources: Research has expanded to include a variety of plant sources for dye extraction:

Food and Beverage Industry Wastes: Studies have explored the potential of extracting dyes from waste materials like pressed berries, grape skins, and vegetable peels, promoting waste utilisation.

Flower-Based Dyes: Comprehensive reviews have been conducted on extracting dyes from flowers, focusing on pigments such as anthocyanins and carotenoids.

The body of research on the extraction of natural dyes from plants has grown substantially, encompassing various extraction methods, plant sources, and applications. This trend underscores a collective movement towards sustainable practices and the development of eco-friendly dyeing solutions.

IV. RESULTS 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.



V. CONCLUSION

Different parts of the plants were used for the extraction of dyes such as leaves, flowers, vegetables, etc and different types of mordants were used for fixing the dye into the fabric. In ancient days people have used natural dyes to paint their caves. Over 15,000 BC man began to produce those natural dyes which have been used in textiles as well. In order to understand the art and history of dyeing, we must first understand the process of dyeing itself. Natural dyes can be broken down into two categories: substantive and adjective. Most ancient and medieval dyers mordanted their yarns and fabrics before dyeing them. Different fibers also have different tendencies to absorb natural and synthetic dyes. Wool, a protein-based fiber, has been found in Europe dating back to 2000 BC. In Europe the art of dyeing rose to new heights with the diversity of climate, culture and migration or invasion waves. Eventually, the old natural dyes lost popularity in favor of the newer synthetic ones.

ACKNOWLEDGMENT

It gives us pleasure to present my project on "Extraction of natural dyes from plants". The able guidance of all teaching staff of department made this study possible. I express my deep sense of gratitude and respect to my guide Dr. Jayashree Shailesh Patil (Assistant professor), Department of chemistry, J.S.M College, Tal. Alibag, Dist. Raigad for her inspire guidance on constructive criticism and constant encouragement during the completion of this project.I place my sincere thanks to Head of Chemistry Department and Principal Dr. Sonali Patil, J.S.M COLLEGE ALIBAG for giving me opportunity to complete this work and providing the necessary facilities. I would also like to

Copyright to IJARSCT www.ijarsct.co.in



DOI: 10.48175/IJARSCT-24752



278

by USO 0001:2015 0001:2015 Impact Factor: 7.67

IJARSCT ISSN: 2581-9429



International Journal of Advanced Research in Science, Communication and Technology

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 5, Issue 10, March 2025



appreciate all teaching and non-teaching staff of J.S.M. College, Alibag. My special thanks to my all friends M.Sc.-II for their friendly suggestion and timely help during preparation of soap. I must like to thanks University of Mumbai and Chemistry Department for giving us an opportunity to explore this subject by conducting this project. Finally, I would like to thank everybody who played a very important role towards the completion of this work, as well as expressing of this work, as well as expressing my apology that I could not mention all the names one by one.

REFERENCES

- [1]. O Ersin., et al. "Extraction of natural dye from onion skin (Allium cepa) and use for leather dyeing". Journal of Textiles and Engineer 19.88 (2019): 1-7.
- [2]. Adeel S., et al. "Dyeing of cotton fabric using aqueous extract of pomegranate (Punica Granatum)". Asian J.Chem 21.5 (2009): 3493-3499.
- [3]. Goodarzian H and Ekrami E. "Dyeing wool with a dye extracted from pomegranate (Punica Granatum) peel". World Applied Science Journal 8.11 (2010): 1387-1389.
- [4]. MD. Luque de Castro, F. Priego-Capote, J. Chromatogr. A (2010).
- [5]. MG Silva., et al. Multi-functional with onion skin extract. 18th World Textile Conference (AUTEX 2018), Materials Science and Engineering 460,10P Publishing (2018).
- [6]. M Seema. "Silk dyeing with onion skin extract". International Journal of Home Science 3.2 (2017): 313-317.
- [7]. A Hussain and Y Elhassancen. "Natural dye from red onion skin and used for dyeing cotton fabrics to produce resistance to ultraviolet radiation (UVR) in women's headwear". American Journal of Science 10.3 (2014): 129-139.
- [8]. M Kumaresan., et al. "Preparation of Nano Natural Dyes from Russelia Equisetiformis Flowers and Application to Fabric Using Mordants"". SSRG International Journal of Applied Chemistry 4.1 (2017).
- [9]. R Singh and S Srivastava. "Critical review on the extraction of natural dyes". International Journal of Home Science (2019).
- [10]. S Verma and G Gupta. "Natural dyes and their applications". International Journal of Research and Analytical Reviews 4.4 (2018): 57-60.



