

Extraction of Natural Dye

Amruta Mokashi, Aditya Patil, Priyanka mude, Vishakha Shirsat, Paresh Bhangale* and Sagar Toge

Department of Chemical Engineering, India

***Corresponding Author:** Paresh Bhangale, Department of Chemical Engineering, India

Received: May 07, 2023; **Published:** May 13, 2023

Abstract

Avoiding environmental pollution is the major goal of dye extraction from plant (natural) sources. Many studies are being conducted worldwide on the applications of natural dyes in following textile industry so which produces a outcome of the current concerned about the use of eco-friendly and biodegradable products. Synthetic dyes have effluent issues not just when they are used in the textile industry, but also when they are made, and potentially even when their intermediates and other basic components are synthesized. After synthetic dyes were discovered in the particular 1856, the usage of natural dyes for textile dyeing prominently dropped. The dyes have become a significant replacement for synthetic coloures in recent years. The created dyes were examined by dyeing cotton cloth. In this study we have to took three different raw material through which extract dye from them and demonstrate the scale of colour they umbrid on material that has been used example taken has onion peel, marigold pomegranate we used different extraction process.

Keywords: Dyes; Textiles; Mordants; Biodegradable; Fabrics

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, dyeing 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.

Equipment's

- Magnetic stirrer.
- Heater.
- Beakers.
- Dryer.

Objectives of this Project

The specific objectives were to analyze the aqueous extraction process of the dyes considering and comparing the results of absorption of the colour on the cloth when the solution is added alcohol or not.

Materials and Methods

Red onion peel

One of the most used vegetables many recipes is the onion. One of the world's biggest onion producers is India. The majority of the world's regions have adopted this. The majority of onions are produced in Asia. Onion peels are a significant source of waste that can be used to make colours and expand the list of sustainable uses.



Figure 1

Marigold flower

The plant is native to the Americas and naturally spreads from the southwestern United States to South America. However, certain species groups are spread globally. In some regions, one species - *T. Minuta* is considered an invasive and dangerous plant. The species grows to a height of 0.1 to 2.2 m. Most species have green pinnate leaves. Sprouts usually have maroon elements and are shiny, orange, yellow, and white in color. Usually between one and four centimeters wide, botanical heads usually have both disc and ray florets.



Figure 2

Pomegranate

The delicious organic fruit known as the pomegranate, *Punica granatum*, may be found growing throughout the Middle East and Caucasus region, north and tropical Africa, the Indian subcontinent.

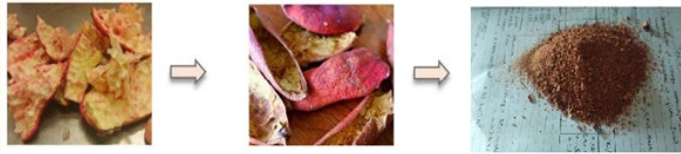


Figure 3

Red onion peel

In this experiment, raw onion peels here are gathered, a solution of acetic acid and distilled water is made, and the mixture is taken with a ratio of 1:9 respectively stirred continuously.

Extracts from several time frames were gathered. The next step is to gather and process a dark ink dye extract to create a dye powder. The dye's yield was measured at 23.3%

Marigold flower

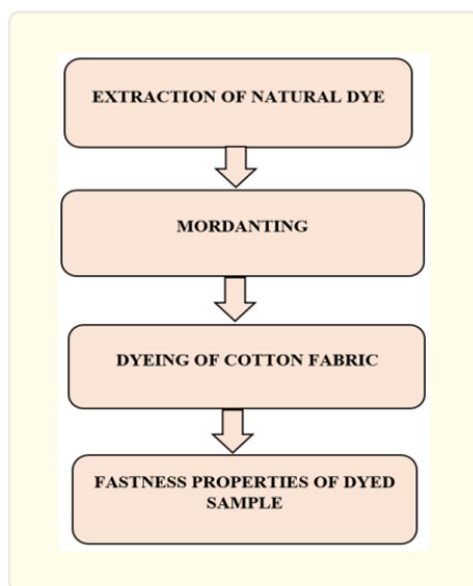
100ml of distilled water and 95°C were combined with 3.3g of the dried marigold flower for two hours. The flower's colouring components were collected and used to colour fabrics.

Pomegranate

The Soxhlet process was employed to remove the dyestuff. The Soxhlet extractor uses dried pomegranate peel powder. 7 g of powder, 168 ml of ethanol and 112 ml of distilled water are combined in a ratio of 1:40 to alcohol. This is consumed out of a flask. In that, the solvent was heated for 100 minutes at 95°C.

The flask in which vapors condenses was fitted with a condenser. When the condensed solvent reaches the top level, the extracted material is returned to the flask. A rotary evaporator was used to further purify the extracted pomegranate dye after it had been filtered using filter paper.

Methodology



We have started taking the three examples onion, Marigold pomegranates. which are by solvent process extraction method which is simple and can be performed easily. We initially started with cleaning the raw material and then measuring it and then adding to the heater. Later on, water is been added according to the amount of drop material weight then we start by boiling the solution and then gradually increase the temperature throughout the process which for 5 gram we took 200 ml water and then heating it from the temperature 50 0C and then gradually increasing it towards higher temperature for these which is 65 0 C for a time period 30 min. boiling the solution in glass beaker covering it with a lid. Initially let in some steam escape after 20 min keeping the lid closed completely to get all the liquid inside stopping the heating after 30 min. then letting the solution the cool and then adding a solution of methanol and water 7:3 ratio which helps with the color to be stronger on the cloth letting the solution the set on room temperature. They extract that now; we have recovered from is 70 and 10 ml. Further in the process now we have to apply the color and cotton cloth and wool-en thread then on later phase we have to give the cloth in salt the bath then starting with the applying of color of the cloth we take a container and completely the sub-merge the cotton clothes and thread. after the removal of cotton cloth and wooden thread from the container when still the cloth and thread is moist. We late it naturally dyes in the presence of natural air and vacuum and then apply to different types of salts or different examples. And we then add we salt according to the amount of solvent present. So, in this case we take 3 gram of salt which is sodium nitrite and calcium carbonate this salt is easily available and placed vital role in the organic color to have more strong stick to the clothes then we have watched one sample and just try another sample and then we are compared. and they we are compared and found to effective way to apply or to which process is more for organic color.

<i>Materials</i>	<i>Methanol and Water (ml)</i>	<i>Colour</i>	<i>Colour scale (1-10)</i>	<i>PH - Scale</i>
Onion peel	7 + 3	Brownish	4	5
Marigold	10	Golden yellow	2	7
pomegranate	10	Green	10	6

* Not used methanol and water.

<i>Materials</i>	<i>Colour</i>	<i>Wash (water)</i>	<i>Colour scale (1-10)</i>	<i>PH - scale</i>
Onion peel	Light pink	100 ml	8	5
Marigold	Pyramid yellow	100 ml	10	8
pomegranate	Light yellow	100 ml	1	4

Result

Our aim for these experiment was to compare the results of to individual components. The first one was giving methanol and water solution and calcium carbonate and seeing the results comparing it with each other solution. Which only had sodium nitrite the final result was the one which one given methanol and water solution had more colour strength than the other.

Future

In future we are trying to add certain chemical which are repelant to insects curves we have made we colour from oraganic compound and it is edible we have to protect the cloth from insects. So we going to apply the certain chemicals one chemical which can be used is permethrin. Then we are going to another chemical increases the strength that is chemical phosphate alum. then the we are going to add furgence on the cloth to keep it fresh and net and tight.

Acknowledgment

I would like to express our gratitude to Vishwakarma Institute of Technology, Bibewewadi and Miss. Amruta Mokashi Mam for giving the opportunity to work on our ideas and bringing them up as a project which helped me to gain the knowledge from several field. Sincere thanks to project.

Conclusion

The colour that is derived from pomegranate, marigold, and onion peels has a number of benefits. The primary benefit is that waste material is used to extract the dye. Therefore, it leverages waste materials to produce enough dye. A renewable and biodegradable dye source. Getting raw materials involves substantially less expense. Additionally, a cotton piece was dyed and turned out to be help. The colour is extremely cost-effective and environmentally safe because it is made from onion peels, marigold flowers, and pomegranate seeds. It is demonstrated that a variety of soft and light coloures can be created by combining various mordants and mordanting methods. This study offers an effective remedy for not just vegetable waste.

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 ultra-

- violet 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.
 11. R Singh and S Srivastava. "Exploration of Flower Based Natural Dyes - A Review". *Research Journal of Recent Sciences* 4 (2017): 6-8.
 12. AK Guha. "Review on Sources and Application of Natural Dyes in Textiles". *International Journal of Textile Science* 8.2 (2019): 38-40.
 13. V Sivakumar., et al. "Ultrasound-assisted enhancement of natural dye extraction from beetroot for industrial applications and natural dyeing of leather". *Ultrason. Sonochem* (2009): 782-789.
 14. V Sivakumar, J Vijayeeswaree and J Lakshmi Anna. "Effective natural dye extraction from different plant materials using ultrasound". *Ind. Crop. Prod.*, 33 2011: 116-122.
 15. Smita Bhuyan, Nabonecta Gogoi and BB Kalita. "Natural dyes and its Antimicrobial effect". *International Journal of Engineering Trends and Technology* (2020).
 16. Adem and ON AL. "Extraction of dyestuff from onion (*Allium cepa* L.) and its application in the dyeing of wool, feathered-leather, and cotton". *Turkish Journal of Chemistry* 20.3 (1996): 194-203.
 17. Ali NF, El-Mohamedy RSR and Rajput S. "Improvement of Antimicrobial Activity for Onion Natural Dyed Fabrics through Chitosan Pretreatment". *Journal of Applied Sciences Research* 9 (2013): 4993-5002.
 18. Iqbal J, Bharti L and Adeel S. "Effect of UV radiation on dyeing of cotton fabric with extracts of henna leaves". *Indian journal of Fibre & Textile Research* 33 (2008): 157-162.
 19. Alemayehu T and Teklemaniam Z. "Application of Natural Dyes for Textiles A Review". *International Research Journal - Granthaa-layah* 2 (2014): 61-68.
 20. P Saravanan., et al. "Extraction and application of an eco-friendly natural dye obtained from *Odinavodier* L bark to cotton fabric". *Library Research Scientist* (2013).
 21. Gulrajani ML. *Natural Dyes and Their Application to Textiles*, edited by Gulrajani, M.L., Gupta, D., IIT New Delhi, India.

Volume 4 Issue 5 May 2023

© All rights are reserved by Paresh Bhangale., et al.