

STANDARDIZATION OF NATURAL DYE EXTRACTION METHOD FROM WASTE FLOWERS AND ITS UTILIZATION IN HOLI POWDER

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Keywords:

Flower waste management, Holi colours, solvent extraction, Natural dyes, Eco-friendly, Industrial application

Introduction:

Flower waste is one of the most important as well yet overlooked class of organic waste. This kind of waste is produced at production site, religious places, recreational places, community halls, hotels, grave yard, flower markets etc. Lot of flower waste is also generated after social events like birthdays, weddings and funerals etc. In the fiscal year 2024, the floricultural produce in India amounted to over 3231 thousand tons (Anon,2024). In developing countries like India and Sri Lanka, 40 per cent of the total flower production is unsold and goes as waste due to lack of amenities like cold chain management facilities, lack of market network etc. A study estimated that the amount of flower waste generated per day in India is approximately 4738 t (Sharma *et al.*, 2018a).

Flowers are thrown after offering to the God/Goddess, called as “*nairmalya*” is normally thrown in water bodies due to some beliefs. When flower waste is thrown in water bodies, they decrease the oxygen content in the water which is detrimental to the water bodies and also causes water pollution thus, severely affect the quality of water. Flowers dumped in open spaces become a breeding ground of mosquitoes and other insects, produce a foul smell, cause land pollution and severely impairing the visual and aesthetic appeal of the place. Holi, the festival of colour is celebrated all over India. During this festival a good quantity of synthetic ‘holi’ powder is used every year, which contain heavy metals, sand and soil. Considering the threat of heavy metals to the environment and human health, natural herbal gulal is one such approach to overcome these issues (Das *et al.*,2015).

With this back ground the current research focuses on conversion of floral waste into wealth which helps to generate more income also protect the nature including environment and cope up with solid waste management issues and environmental pollution.

Objectives:

1. Standardization of natural dye extraction method from waste flowers

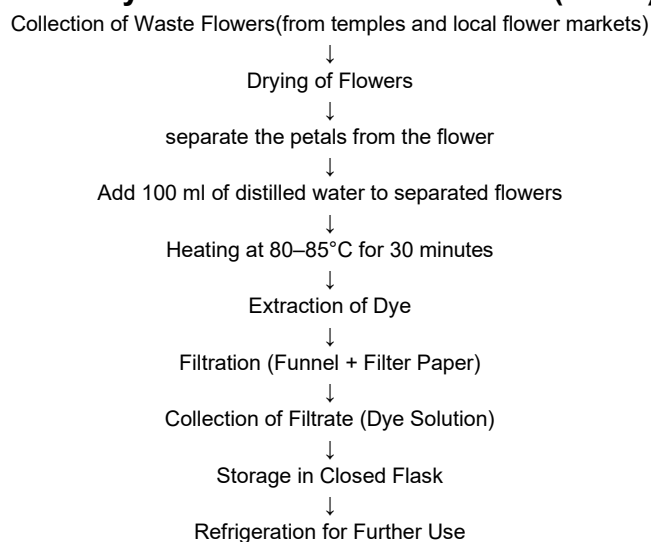
2. Development of natural holi powders with different filler base materials
3. To work out the economics

Methodology:

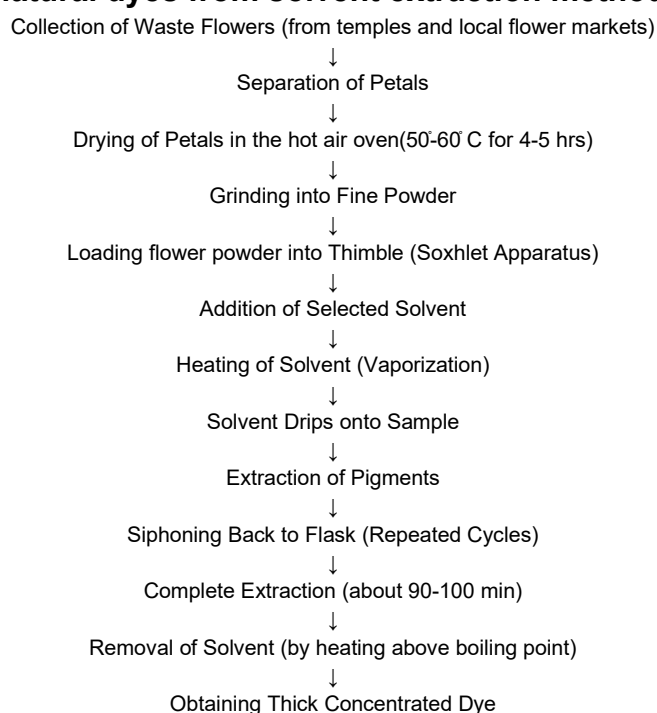
Treatment Combinations

Sl. No.	Interaction effect	
1.	C_1M_1	$C_1(\text{Green colour floral waste}) \times M_1(\text{Methanol})$
2.	C_1M_2	$C_1(\text{Green colour floral waste}) \times M_2(\text{Water})$
3.	C_2M_1	$C_2(\text{Yellow colour floral waste}) \times M_1(\text{Methanol})$
4.	C_2M_2	$C_2(\text{Yellow colour floral waste}) \times M_2(\text{Water})$
5.	C_3M_1	$C_3(\text{Blue/purple colour floral waste}) \times M_1(\text{Methanol})$
6.	C_3M_2	$C_3(\text{Blue/purple colour floral waste}) \times M_2(\text{Water})$
7.	C_4M_1	$C_4(\text{Red/ pink colour floral waste}) \times M_1(\text{Methanol})$
8.	C_4M_2	$C_4(\text{Red/ pink colour floral waste}) \times M_2(\text{Water})$

1. Extraction of natural dyes from traditional method (water)



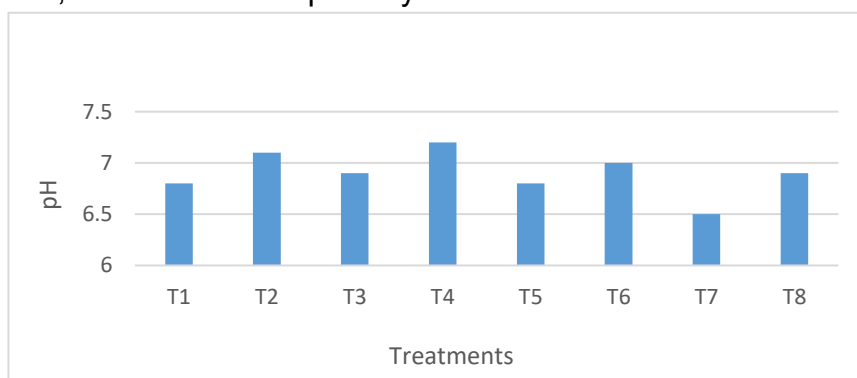
2. Extraction of natural dyes from solvent extraction method



Result and Conclusion:

Solvent extraction proved to be more efficient for dye extraction, as it produced higher colour intensity. This is because floral pigments diffuse more readily and dissolve more effectively in organic solvents. Additionally, organic solvents penetrate plant tissues more efficiently, facilitating the breakdown of cell walls and enhancing pigment release, which results in a higher dye yield compared to aqueous extraction (Al-Alwani *et al.*, 2015). The extracted dye exhibited a slightly acidic to neutral pH, making it suitable for safe application.

Furthermore, the dye obtained through solvent extraction can be effectively utilized in the preparation of Holi colours. Among the different base materials tested—tapioca flour, rice flour, and talc powder—tapioca flour showed superior performance in terms of colour retention, texture, and overall acceptability.



Prepared Holi colours

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Future Scope:

The future scope of this project includes:

1. Chemicals free natural dyes extracted from waste flowers will be utilize in various industries, including the preparation of holi colors, textile dyeing, food processing, and cosmetics.
2. Collaborations with industries can support large-scale adoption.
3. Certification for organic or green labels can increase consumer trust.
4. The project can support rural entrepreneurship and women empowerment.
5. Advancements in extraction techniques and improved colour fastness can support large-scale production and commercialization