Natural pigment extraction from *Ixora coccinea* for its use in cosmetic products

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ABSTRACT

Recently, the demand for natural pigments has increased due to the hazardous side-effects of synthetic colors such as cancer, allergies, and organ damage. Natural colors are pigments obtained from natural sources and they have replaced the use of synthetic colors in many industries because they are biodegradable, eco-friendly, and do not cause any side effects. *Ixora coccinea* (Rubiaceae family) is a flowering shrub that is known for its medicinal properties and most commonly grows in Asia. The present study aims to natural pigment extraction from *Ixora coccinea* flowers using water as a cost-effective way to obtain natural colors. The characterization of the pigment using UV- Visible spectroscopy, Fourier Transformed Infrared Spectroscopy (FTIR), and High-Resolution Mass Spectrometry (HRMS) showed the possible presence of anthocyanin, cyanidin 3-rutinoside, as the abundant compound. The antioxidant and cytotoxicity of the pigment will be tested for its applications in cosmetic industries. The antibacterial assay showed significant antibacterial activity at higher pigment concentrations. Finally, an attempt to grow *in vitro* culture of *Ixora coccinea* will be done for mass production of the pigment.

Keywords: *Antibacterial activity, Antioxidant, Cytotoxicity, HRMS analysis, Natural colorant*

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INTRODUCTION

Pigment: Molecules that absorb a specific wavelength of light and reflect all others.

Biopigment: Any chemical substance obtained either from plants, animals, or microbes that are capable of coloring food, drugs, cosmetics, or any part of the human body.

Ixora coccinea: A shrub growing mostly in various regions of India, Bangladesh, and Sri Lanka as ornamental plants.

Fig. 1 *Ixora coccinea* plant

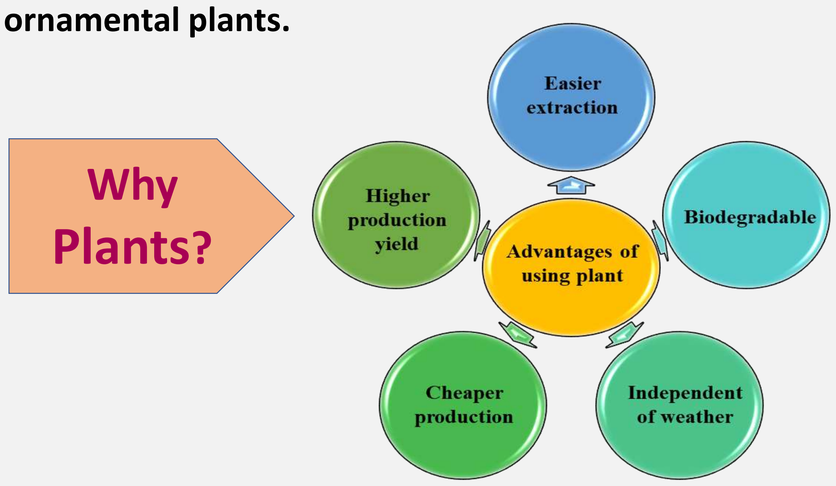

Fig. 2 Advantages of using plant pigments

OBJECTIVE

Natural pigment extraction from *Ixora coccinea* flowers using water as a cost-effective way to obtain natural colors and its application in making cosmetic products.

METHODOLOGY

Collection of *Ixora coccinea* flowers and extraction of pigment using water as solvent.

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Estimation of Total Phenolic Content (TPC) and Total Flavonoid Content (TFC)

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Pigment characterization

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Antibacterial activity of the pigment

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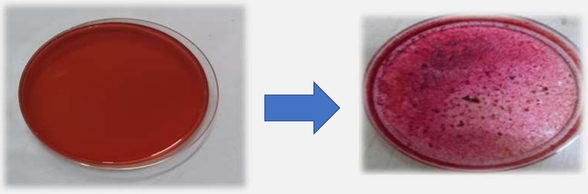
Product formulation (Lip balm and Lipstick)

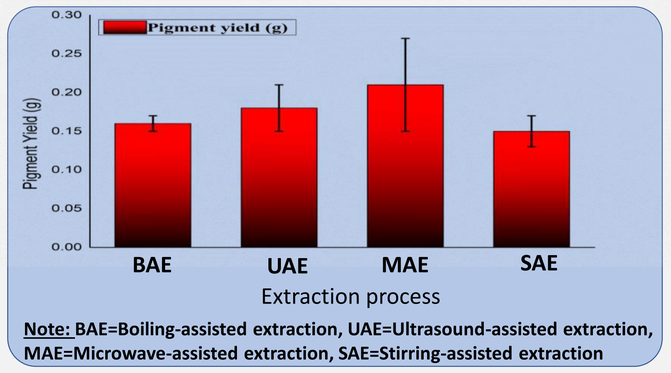
RESULTS

1.



Deep red-colored pigment with 21% yield using water

Fig.3 Dried pigment obtained in Petri plates



Note: BAE=Boiling-assisted extraction, UAE=Ultrasound-assisted extraction, MAE=Microwave-assisted extraction, SAE=Stirring-assisted extraction

Fig. 4 yield of pigment obtained through various extraction process

2.

- TPC = 1.65±0.92 mg of GAE/g of extract
- TFC= 1.55.25± 22.3 mg of QE/g of extract

Where, GAE= gallic acid equivalent and QE= quercetin equivalent

3.

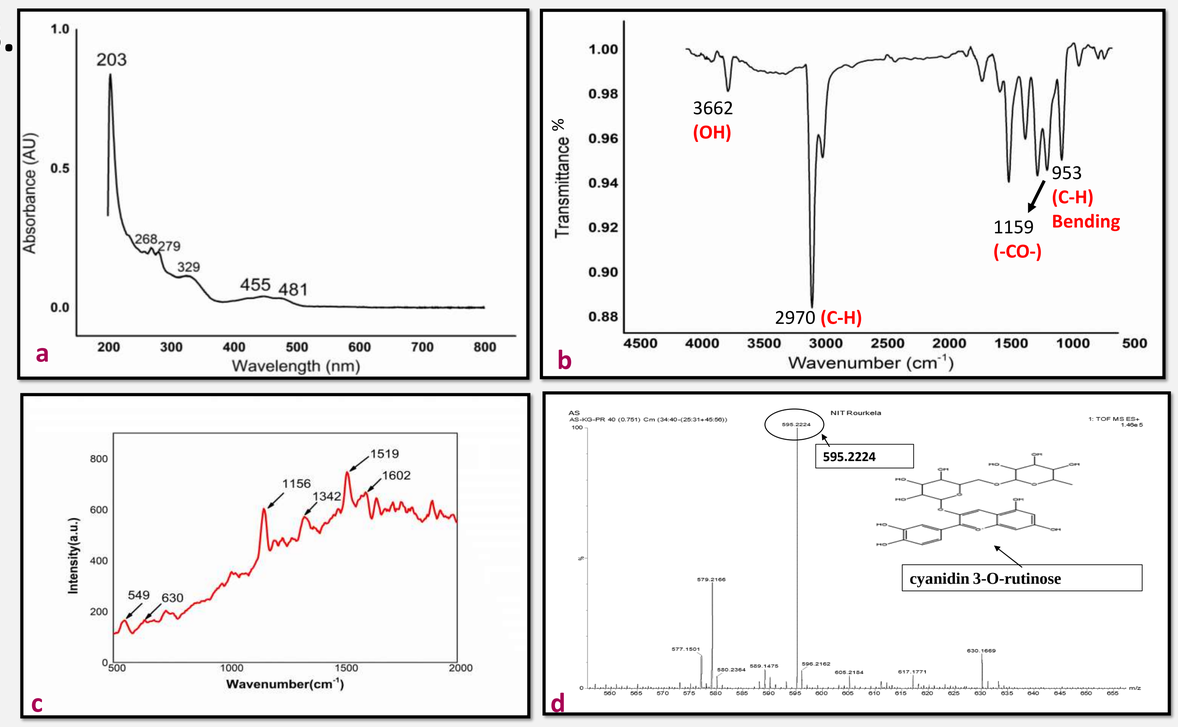


Fig. 5 Pigment characterization by (a) UV-visible spectrophotometer, (b) Fourier Transformed Infrared spectroscopy (FTIR), (c)Raman spectroscopy, and (d)High-Resolution Mass Spectrometry (HRMS).

4.

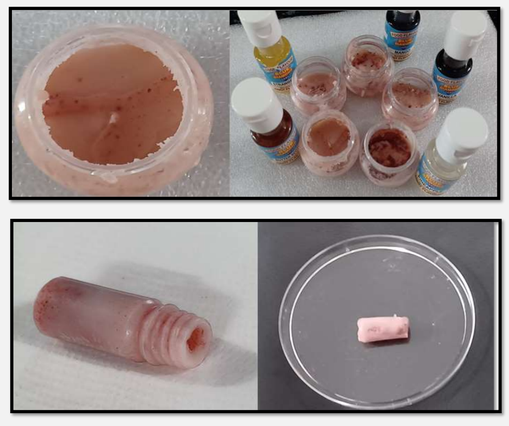
a b

Fig. 6 Antibacterial activity of pigment against (a) *E. coli* (b) *B. subtili*

Table 1: Result of antibacterial activity of pigment

S.No	Bacterial strain	Concentrations of pigment			
		control	10 mg/mL	20 mg/mL	40 mg/mL
1.	*Escherichia coli*	-	0.18±0.02 cm	0.29±0.01 cm	0.39±0.03 cm
2.	*Bacillus subtilis*	-	0.8±0.02 cm	0.9±0.01 cm	1.2±0.2 cm

5.



a b

Fig. 7 Product formulation: (a) Lip balm (b) Lipstick

Table 2: Analysis of different parameters for products

S.No.	PARAMETERS	OBSERVATIONS (at 25°C and 4°C)	
		Lip balm	Lipstick
1	Colour	Cream	Cream
2	Odour	Pleasant	No odour
3	Melting point	50.8°C	61.2°C
4	Spreadability	Good	Intermediate
5	pH	6	6

CONCLUSION

- Deep red colored pigment was obtained from *Ixora coccinea* flowers which was characterized as anthocyanin.
- Two different products, i.e., lip balm and lipstick, were made from the pigment which indicate the application of pigment in cosmetic industry.

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