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Extraction of Natural Food Colours from Medicinal Plant and Estimation of Bio-Active Compounds-Psychology of Food Colouring

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Abstract: ***Natural and edible pigments can be extracted from bioresources which can be used as natural food colouring agent with fortified natural Bio- Active compounds to induce the natural nutritional property as commercial synthetic colours are hazardous. Chlorophyll, carotenoid, and phycobili proteins are the major pigments present in Medicinal plants. Extraction of high quality natural food colouring from Medicinal plant with Fortified Bio-Active compound and efficient impact of these colouring on chemical, microbial and sensory quality of jelly dessert were evaluated. The main objectives of the present study were to extract colour pigments along with Bio-Active compounds from Medicinal Plant using ethanol, methanol and water as solvents while. The stability, sensory, microbial and nutritional quality was measured after preparation of jelly using natural colour. These pigments have a shelf life of more than six months in 5% citric acid at ambient temperatures. The colour attributes of the jelly dessert prepared using natural colours retain more than thirty days at room temperature. Agar jelly prepared using natural food colours had significantly higher concentrations of calcium and Potassium and fortified Bio- Active compound. Natural food colours &Bio- Active compounds in jelly resulted in high Sodium content and high magnesium content when compared to jelly prepared using artificial colours. The protein content, carbohydrate and fat contents in the jelly dessert was made using natural food colouring. By undergoing toxicity test, the food colours which were tested were found to be non-toxic and were found to be in higher ranges of nutrition indicating that these dyes can be used as food supplement.***

Keywords: Bio-Active compounds, Medicinal plant, Food Colour, Fortified Natural Colours

1. Introduction

Food Colors
It is any dye, pigment or any other substance which imparts color when it is added to a certain food item. They are of many forms such as liquids, gels and pastes. It is used both in commercial food production and domestic home cooking.

a) Types of Food Colors

- Organic Natural Colors

Natural food colors are preparations obtained from foods and other edible natural source materials obtained by physical and/or chemical extraction resulting in a selective extraction of the pigments relative to the nutritive or aromatic constituents.

- Inorganic Natural Colors

Aluminum dust and silver for silver gray color, gold for real gold color, iron oxides for yellow, red, brown or black colors, and titanium dioxide for white color and calcium carbonate for opaque appearance are important inorganic natural colorants. These colorants are used in the production of confectionery coating, liqueur decoration, chocolate, calcium carbonate.

- Nature Identical Colors

These are man-made colors or pigments which are also found in nature.
Eg: Carotenoids, Beta carotene and Canthaxanthinetc

- Artificial Food Colors

They are produced by chemical synthesis or by chemical modification of several precursor compounds in contrast to natural food colors. Eg. They are classified as azo dyes, Triarylmethane dyes and chemically related colors.

b) Issues due to Chemical Food colours:-
Thethreemostwidelyusedculprits-Yellow5, Yellow 6 and Red 40-contain compounds, including benzidine and 4-aminobiphenyl that research has linked with cancer. Research has also associated food dyes with problems in children including allergies, hyperactivity, learning impairment, irritability and aggressiveness

2. Aim and Scope

2.1 Aim

The ultimate aim is to produce Natural food colours by extracting pigments out of medicinal plant with fortified bio-active compounds.

2.2 Scope

- To replace the usage of Synthetic food colours by Natural food colours in Food items.
- To reduce the amount of harmful substances in the food we consume

2.3 Objective

- To evaluate and elucidate pigments from different kinds of Medicinal Plant
- To extract and characterize various pigments and their properties.

3. Methodology

a) Sample Collection of Medicinal Plant
b) Pulverization of Medicinal Plant
c) Extraction
d) UV-visible Spectroscopy
e) Lyophilisation

a) Sample Collection of Medicinal Plants

- TURMERIC: Turmeric is a type of grass - a clump, about 1 meter high and flowers appear from pseudo-stem stem with a length of about 11-16 cm and white. Its root tuber is dark yellow, smells of aromatic fragrance and tastes slightly sweet. The main part of the turmeric plant is the rhizomes that are in the soil. The rhizome has many branches and grows creeper, the outer skin is yellow
- Saffron: The spice saffron is made from the dried stigmas of the plant *Crocus sativus* L. The main use of saffron is in cooking, due to its ability to impart colour, flavour and aroma to foods and beverages. However, from time immemorial it has also been considered a medicinal plant because it possesses therapeutic properties.
- Beetroot: Beet**s** or *Beta vulgaris* are a popular vegetable used all over the world. They are appreciated for their unique taste, colour and flavour. They have a lot of health benefits which include improving heart health, reducing birth defects, improving digestive health, boosting cognitive function, and aiding weight loss.
- Blue Berries: It can be used in the treatment of the walls of blood vessels, pancreas, and intestines. Blueberries prevent aging of nerve cells. Basically, berries are indispensable tool for use by patients with diabetes, as they reduce blood sugar.

b) Pulverization

Fresh Samples of different species were collected and then they are subjected to pulverization using a pulverizer. The biomass and the extract were collected and processes.

c) Types of Extraction

- Soxhlet Extraction
- Sonication
- Solvent Extraction Using Shaker
- Microwave Extraction
- Rotary Evaporation
- Thin Layer Chromatography
- Column Chromatography
- Uv-Visible Spectroscopy

d) Lyophilisation

Figure 3.1: Lyophilisation

4. Result & Discussion

a) LC-MS

It is a technique that combines the physical separation capabilities of liquid chromatography with the mass analysis capabilities of mass spectrometry. While liquid chromatography separates mixtures with multiple components, mass spectroscopy provides structural identity of the individual components with high molecular specificity and detection sensitivity. This technique can be used to analyze organic, inorganic, biochemical compounds found in complex samples of environmental and biological origin.

b) LC-MS Graphs for Turmeric

The liquid fractions obtained from column chromatography of TURMERIC were analyzed in this method and the components present were represented in the graph.

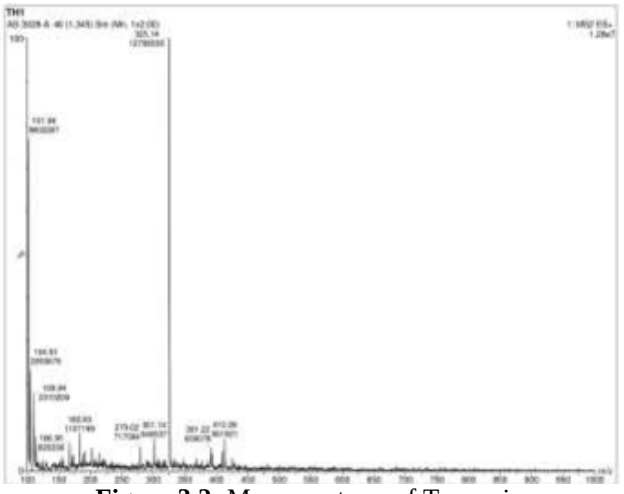


Figure 3.2: Mass spectrum of Turmeric

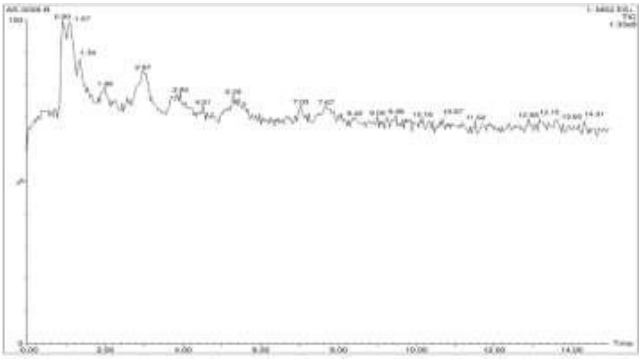


Figure 3.3: Chromatogram of Turmeric

c) LC-MS Graphs for Saffron

The different fractions obtained from column chromatography of Saffron were taken and was analyzed. The components present where represented in the form of graph.

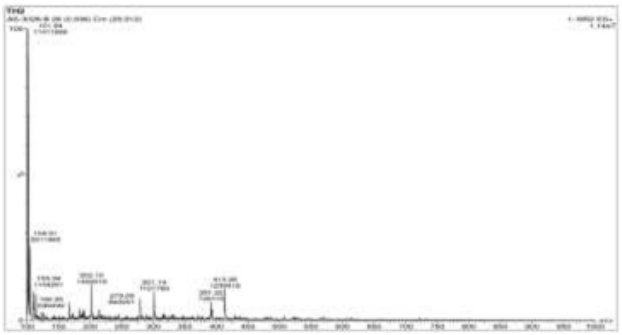
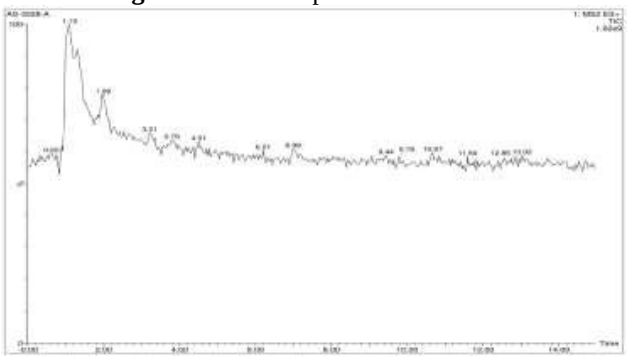


Figure 3.4: Mass spectrum of Saffron



d) Estimation of pigments using different solvents

Table 3.1: Estimation of pigment using Solvents

Compounds	Ethanol (µg/ml)	Methanol (µg/ml)	Water (µg/ml)
Chlorophyll 'a'	14.3122	21.9178	1.0532
Chlorophyll 'b'	10.0401	15.7578	0.8507
Total chlorophyll	24.3453	38.5741	1.9133
Carotenoids	0.1024	0.0774	0.1735
Allophycocyanin	0.1819	0.2103	0.0115
Phycocyanin	0.0289	0.0104	0.0011

The compounds which were present in the medicinal plant samples were found out by the method of (Lichtenthaler *et.al.,)*

e) Estimation of pigments from different species

Table 3.2: Estimation of pigments from species

Components	Turmeric (µg/ml)	Saffron (µg/ml)	Thread type (µg/ml)
Chlorophyll 'a'	0.0100	0.00111	0.003448
Total chlorophyll	0.1921	0.043	0.024
Chlorophyll C1 and C2	3.921	1.7254	5.5314
Carotenoids	0.007815	0.00458	0.0124
Fucoxanthin	0.478	0.903	0.2158

The medicinal plant sample which was extracted using different solvents were subjected to UV spectrum and the necessary calculations were done using methods of (Arnon, 1949) and (Jeffrey, 1975)

f) Estimation of Pigments Using UV Visible Spectrophotometry

The seaweed extracts which were extracted were subjected to this method. The different extracts were taken one by one and were scanned using UV visible spectrophotometer. The compounds which were available in the extracts were shown in the graph. (GOERICKE, R *et.al.,* 1992)

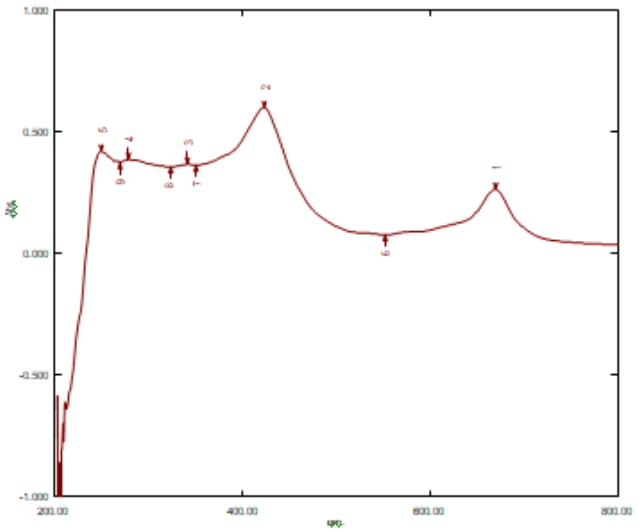


Figure 3.6: Graph for UV visible spectroscopy of Turmeric

g) Graph for UV visible spectroscopy of Turmeric

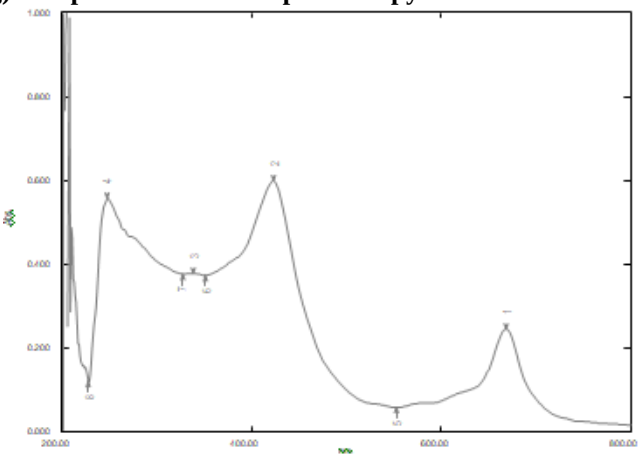


Figure 3.7: Graph for UV visible spectroscopy of Saffron

h) Graph for UV visible spectroscopy of Blue Berries

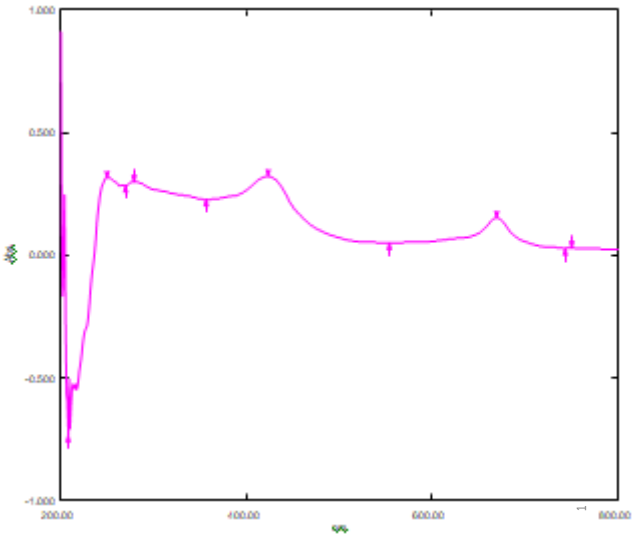


Figure 3.8: Graph for UV visible spectroscopy of Blue Berries

5. Conclusion

Hereby we conclude that, by carrying out the above mentioned extraction of **natural food colours from**

medicinal plant with fortified bio-active compounds & the extracts were taken and were analysed for further uses and they were characterized as non-toxic and can be used for consumption purposes.

Estimation of toxic components:-

Table 3.3: Estimation of toxic components in TURMERIC & SAFFRON extract

S.no	Parameters	Method	Units	Results Turmeric	Result Saffron
1	Lead as Pb		mg/l	BDL (DL:0.1)	BDL (DL:0.1)
2	Arsenic as As		mg/l	BDL (DL:0.1)	BDL (DL:0.1)
3	Cadmium as Cd	CTL/SOP/ FOOD/09 0-2014	mg/l	BDL (DL:0.1)	BDL (DL:0.1)
4	Mercury as Hg		mg/l	BDL (DL:0.1)	----------

References

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