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Extraction and Quantitative Estimation of Bio Active Component (Yellow and Red Carthamin) from Dried Safflower Petals

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Abstract

Objectives: The present investigation was undertaken to explore safflower florets for extraction and identification of colorants (yellow and red) that can be used in different food products. **Methods/Analysis**: The safflower yellow colour was extracted by suspending it in distill water and the red colour with sodium carbonate solution. The extracted safflower yellow and red colour carthamin pigments were spectrophotometrically characterized and further identified by using thin layer chromatography by measuring Rf values. Moreover the quantitative estimation of these valuable pigments was also performed. **Findings**: The varieties grown in parbhani region (i.e. spiny and non spiny) exists potential for safflower yellow and carthamin, as these pigments are valuable as food dyes. Novelty of the study: :In the future, natural food dyes will continue to widely acceptable in food products due to their non–allergic and non-carcinogenic properties. Hence it was thought worthwhile to explore these florets for extraction of colorants that can be used in different food products. In this study extraction and identification of the important pigments from safflower florets were under taken.

Keywords: Carthamin, Nonspiny, Petals, Safflower, Spiny

1. Introduction

The flower of safflower, (*Carthamus Tinctorius*) is utilized for producing medicines, as food colorants and natural red dye. Many investigations have disclosed the chemical structures of the yellow and red pigments contained in the flower petals[1-3] In recent years, public concern over the use of synthetic dyes in food has grown rapidly and the general public prefers the use of natural dyes in foods[4-5]. Water soluble yellow and water insoluble red carthamin pigments can be extracted from safflower florets. These pigments have some medicinal value such as curative effect on coronary heart diseases, myocardial infection, cerebral throbosis and some gynaecological uses[6]. In the future, natural food dyes will continue to widely acceptable in food products due to their non-allergic and non-carcinogenic properties[7]. Hence it was thought worthwhile to explore these florets for extraction of colorants that can be used in different food products. In this study extraction and identification of the important pigments from safflower florets were under taken.

2. Materials and Methods

Dried safflower petals was obtained from Agronomy Dept. and immediately used for the experiment.

2.1 Extraction of Safflower Yellow Colour

The safflower yellow colour was extracted by the procedure as described in Figure 1.

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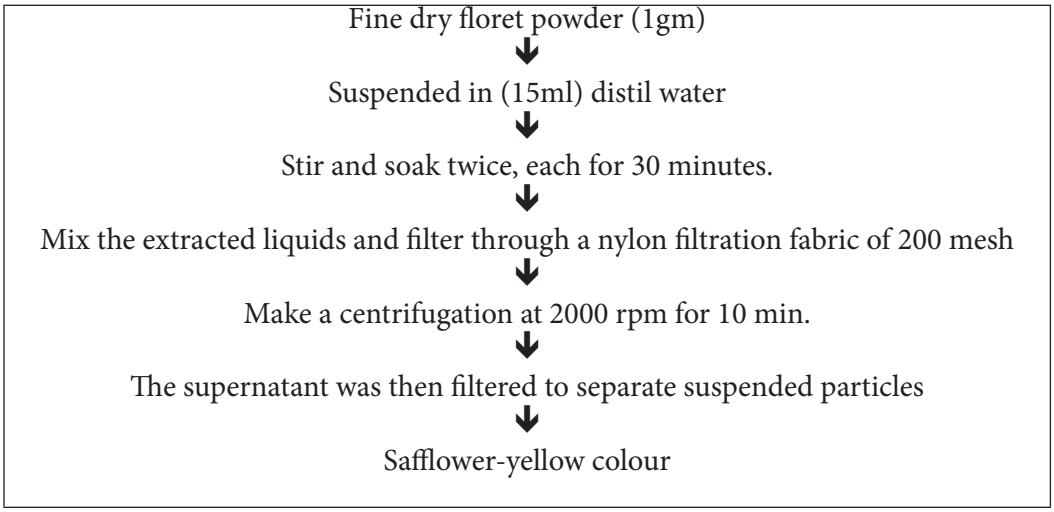

Figure 1. Techniques to separate safflower yellow.

2.2 Extraction of Safflower Red Colour

The safflower red colour was extracted by the procedure as detailed in Figure 2.

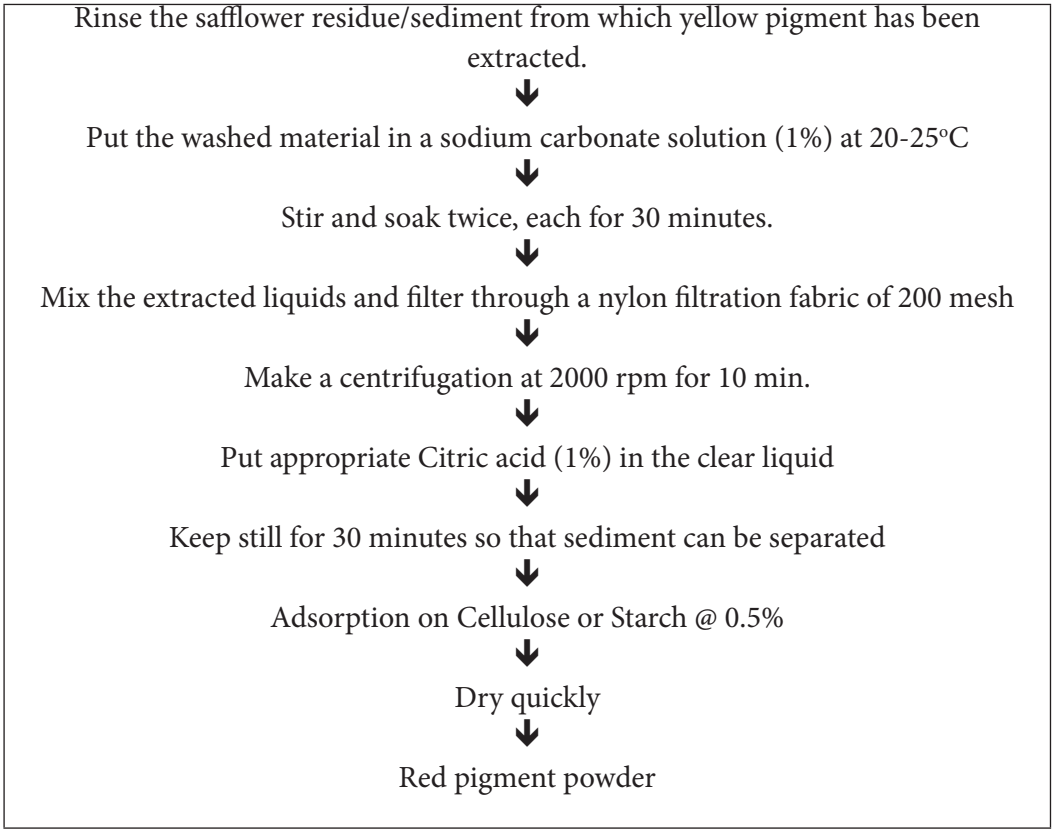

Figure 2. Techniques to separate safflower red.

2.3 Spectrophotometric Measurement

The spectrophotometric measurement of carthamin and yellow pigments (water extract) was followed from 380-620 nm for carthamin and from 385-500 nm for safflower yellow.

2.4 Thin-layer Chromatography

Thin- layer chromatographic identification was performed as per earlier report[8,9]. The Rf values of yellow pigments and the red carthamin were examined on silica gel G. The chromatographic solution consisted of distilled water: isobutanol: ethanol : formic acid (4: 7 : 4 : 4). The chromatogram developed on the thin layer is dried and the Rf values were measured.

2.5 Quantitative Estimation of Safflower Yellow and Carthamin Pigments

The chromatogram developed is further used for the quantitative estimation of pigments by spectrophotometric techniques by eluting the chromatogram in respective soluble solvent system.

3. Result and Discussion

The characteristics of extracted safflower yellow and red (carthamin) are presented in Table 1

From Table 1 it is revealed that safflower yellow colour has maximum absorption wavelength at 400 nm ± 10 and was water soluble while red carthamin has maximum wavelength of 520 nm and soluble in alkaline solutions most commonly Sodium carbonate.

3.1 Chromatographic and Spectrophotometric Values of Safflower Yellow

The spectrum of extract have a distinctive light absorbing at 400 nm was obtained. For the aim of confirmation the extract (yellow colour) went through chromatic division on silica gel for thin layer chromatography and Rf value was measured and presented in Table 2.

Table 1. Characteristics of safflower yellow and red colour

Sr. No.	Characteristics	Yellow colour	Red colour
1	Absorption maxima	400 nm	520 nm
2	Absorbance	1.725	1.29
3	Colour value	75Y + 15R + 2B	30Y + 10R
4	pH	3.53	8.73
5	Acidity	1.32	--
6	TSS	3	--
7	Solubility	Water	Alkaline solution

Table 2. Chromatographic and spectrophotometric values of safflower yellow

Sample	Colour	Maximum absorbance run (nm)	Silica gel type	R_f value
Water-soluble yellow pigment	Yellow	400	Silica gel G	0.85

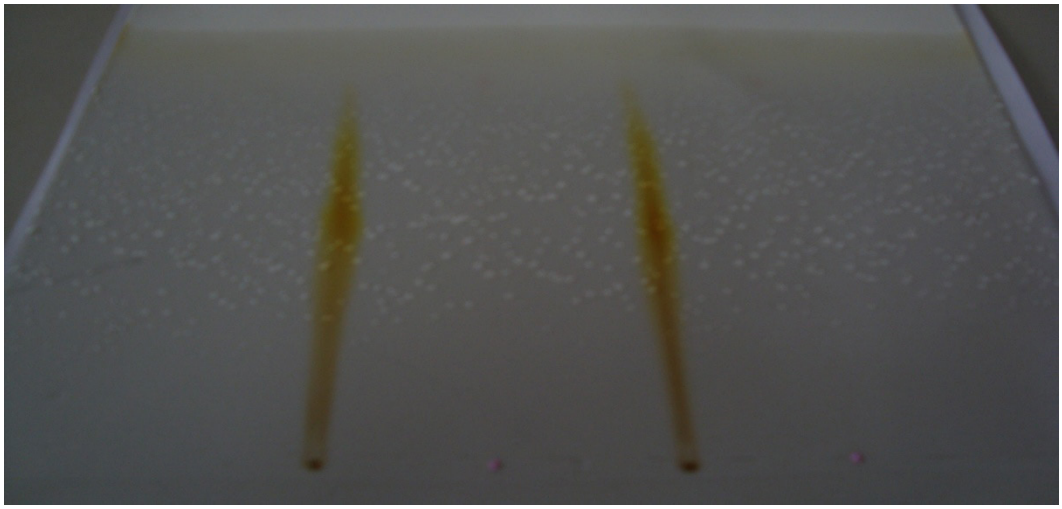

Figure 3. Thin Layer Chromatography for Safflower yellow pigment.

3.2 Chromatographic and Spectrophotometric Values

The chromatographic and spectrophotometric values of carthamin are depicted in Table 3. The values (Table 3) suggested that the spectrum of light absorbing at 520 nm, which is further used for thin layer chromatographic technique. The chromatogram of the carthamin ascended in the form of red horizontal line (Figure 4) with RF value is 0.93. The chromatogram obtained is further used for estimation of carthamin red.

The variety wise quantitative estimation of safflower yellow and carthamin are presented in Table 4. The value for safflower yellow is ranged in between 24 to 28% where as for the carthamin is 0.3 to 0.8 so the variety grown in our region has both the pigments in their petals, which can be explore for the extraction of colourants.

Table 3. Chromatographic and spectrophotometric values of carthamin (Red)

Sample	Colour	Maximum absorbance (nm)	Silica gel type	R_f value
Water insoluble red pigment (carthamin)	Red	520	Silica gel G	0.93

Table 4. Quantitative estimation of safflower yellow and Carthamin red.

Sr. No.	Safflower Variety	Safflower Yellow (%)	Carthamin (Red) (%)
1	PBNS -12	28.2	0.32
2	SHARDA	26.12	0.36
3	PBNS-40	25.14	0.83
4	NARI-6	24.80	0.88

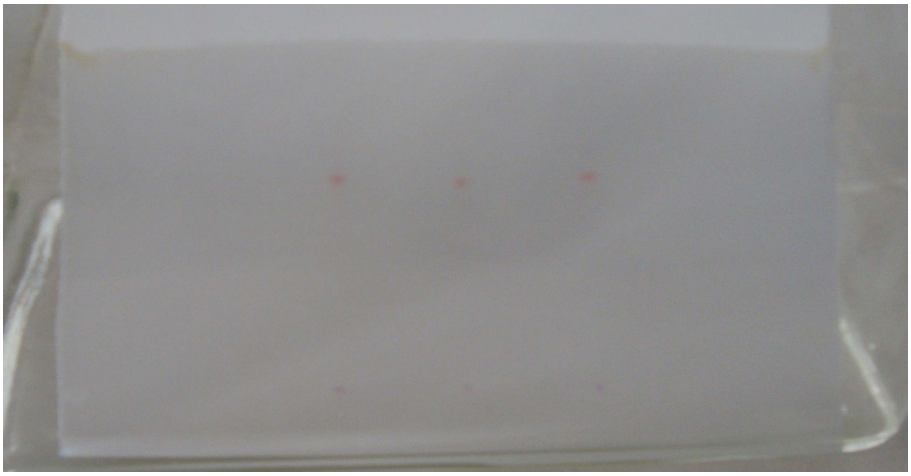

Figure 4. Thin Layer Chromatography for Carthamin Red pigment.

4. Conclusion

Water soluble yellow and water insoluble red carthamin pigments can be extracted from safflower petals, having potential as 'food colorant' and natural red dye. In the future natural food dyes will continue to be widely acceptable in food product due to their non- allergic and non- carcinogenic properties with better stability over PH, Temperature and different solute concentration and presence of polar solvent. Thus it is shown that the varieties grown in this region (i.e. spiny and non spiny) exists potential for safflower yellow and carthamin, as these pigments are valuable as food dyes.

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