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Studies on Extraction of Safflower Pigments and its Utilization in Ice Cream

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Abstract

The extractions of pigments from safflower petals were studied. The pigments which yield from yellow safflower (carthamidin) were 29.59% and safflower red (carthamin) was 0.77%. The pigment extracted was further utilized as a natural color in ice cream to replace the synthetic color. The chemical characteristics of ice cream were significantly increased ($P<0.05$) with the addition of carthamidin extract in ice cream. The sensory evaluation of the ice cream fortified with carthamidin was carried out by the panel of 10 trained judges using 9-point Hedonic scale. The addition of carthamidin (0.06 mL) in the ice cream was found to score higher overall acceptability. Further addition of the safflower yellow 0.09 mL scored less for color of the ice cream.

Keywords: Safflower; Color; Extraction; Pigments; Ice cream

Introduction

Safflower (*Carthamus tincttiorius* L.) is one of the world's oldest crops, highly branched, herbaceous, thistle like annual herb with yellow to red petals. It belongs to the family *Asteraceae* of the broad group *Composites*. The safflower is a warm temperature crop, cultivated over the greater parts of tropical Asia, Africa, Russia and China. It is commonly known as "*Kardi*" in Marathi and "*Kussum*" in Hindi. The safflower seeds contain oil (35-45%). The colour of flower varies from whitish yellow to red orange, the most common being deep yellow. Safflower flowers contain two pigments viz. red (carthamin) which is insoluble in water and yellow (carthamidin) which is soluble in water and mainly used as a material for dye and is currently being used as a natural food colorant. The alkaline extracts were used for dyeing silk, wool, cotton and paper, to make the pigment in the state of the precipitate and ancient Chinese manufactured and produced it as red paint for cosmetics [1]. A growing interest in the use of natural dyes in textile coloration has gained. The stringent environmental standards are imposed by many countries. Eco-friendly and biodegradable dyes derived from natural resources have emerged as important alternative to synthetic dyes. Safflower petals contains about yellow (30%) and red pigment (0.83%) [2,3]. Safflower pigments are widely used as stain, additive in beverages and cosmetics, printing and dyeing [4-6].

A wide range of colours, expensive dyes were used to dye the analyzed silk yarns, coccid dyestuffs, madder, weld, young fustic, tannins and an indigoid dye were identified in a 16th century tapestry. Moreover, the use of safflower has been assessed for the first time in a European fabric [7]. Many Chinese medicines are prepared by using dried flowers and extract of flowers. Now-a-days the medicinal uses of flowers in China have become known to the rest of the world. The extract of florets containing pigments are used in treatment of many illnesses such as menstrual problem, cardio vascular diseases pain and swelling associated with trauma. These medicinal preparations have been widely accepted which helps in increasing the demand for the safflower petals. The administration of 1% concentration of safflower petals exerted a positive influence on blood pressure and serum lipid profile of hypertensive and hyperlipdemic subjects [8]. Safflower pigments are safe for food and have curative effects on diseases such as lack of oxygen coronary heart diseases, myocardial infarction, cerebral thrombosis and renal thrombosis etc [9].

India is the largest producer of safflower (2 lakh tones) in the world with highest acreage (4.3 lakh hectares), but it is cultivated as oil seed crop. The valuable safflower petals are being wasted although they are known to be used as coloring agent. It is clear that safflower petals in India are wasted in large quantity and its therapeutic value is also ignored. The carthamidin (yellow pigment) extracted from petals is utilized in food products for preventing petal waste, use of artificial colour and improving therapeutic value of food product. Besides these the safflower petal extracted color can be used up to any extent. Therefore, it is considered worthwhile to prepare value added food product like ice cream by incorporating extracted safflower yellow pigment.

Material and Methods

The safflower petals (variety PBNS-12) were collected from All India Co-ordinated Research Project on Safflower, Marathwada Krishi Vidyapeeth, Parbhani. The buffalo milk required for the preparation of ice cream was obtained from the Dairy Farm, College of Agriculture, Marathwada Krishi Vidyapeeth, Parbhani. The cream was prepared by using centrifugal cream separator.

Extraction of safflower yellow

The extraction of safflower yellow (water soluble pigment) from safflower florets was done [10] (Figure 1-3).

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Determination of chemicals characteristics of safflower petals

The chemicals characteristics such as moisture content, protein, fat, ash and fiber content were determined as per standard procedure [11].

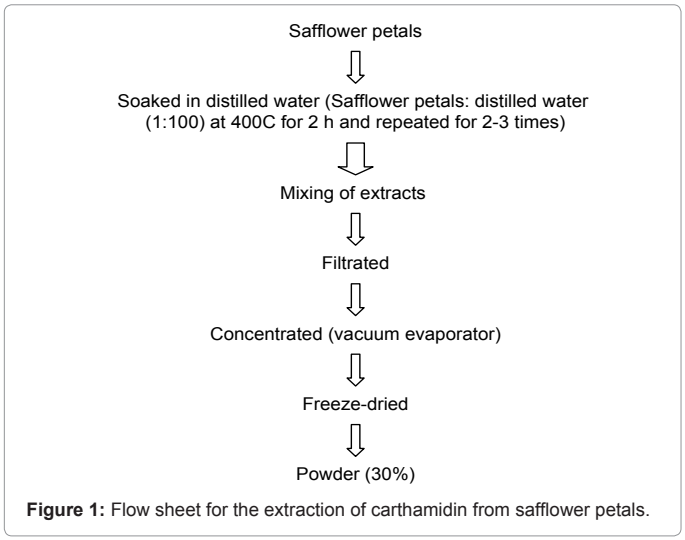

Figure 1: Flow sheet for the extraction of carthamidin from safflower petals.

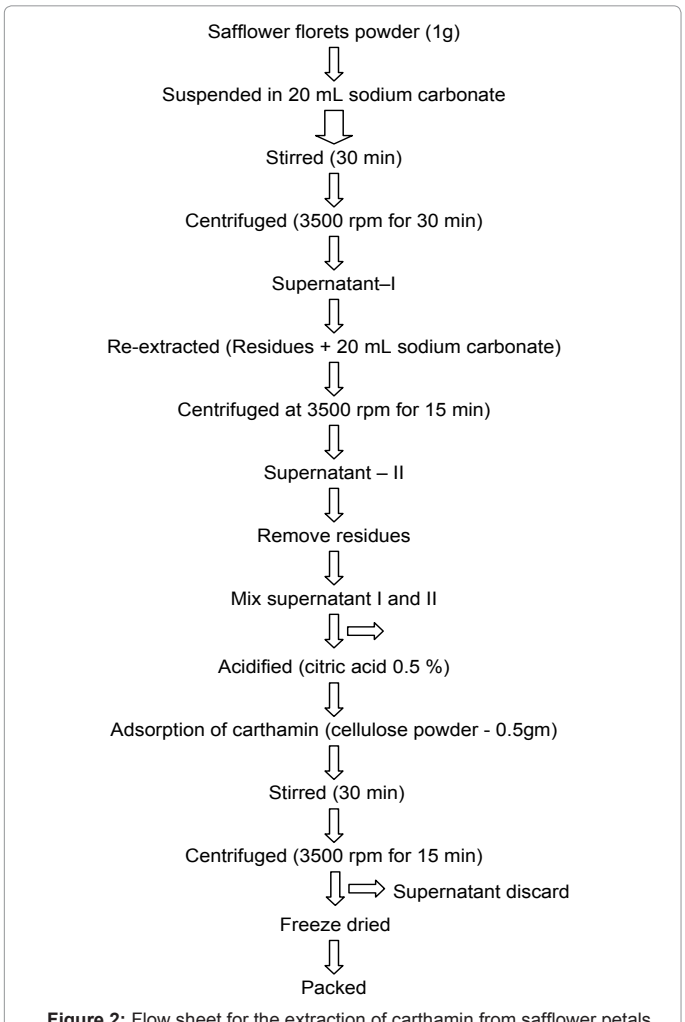

Figure 2: Flow sheet for the extraction of carthamin from safflower petals.

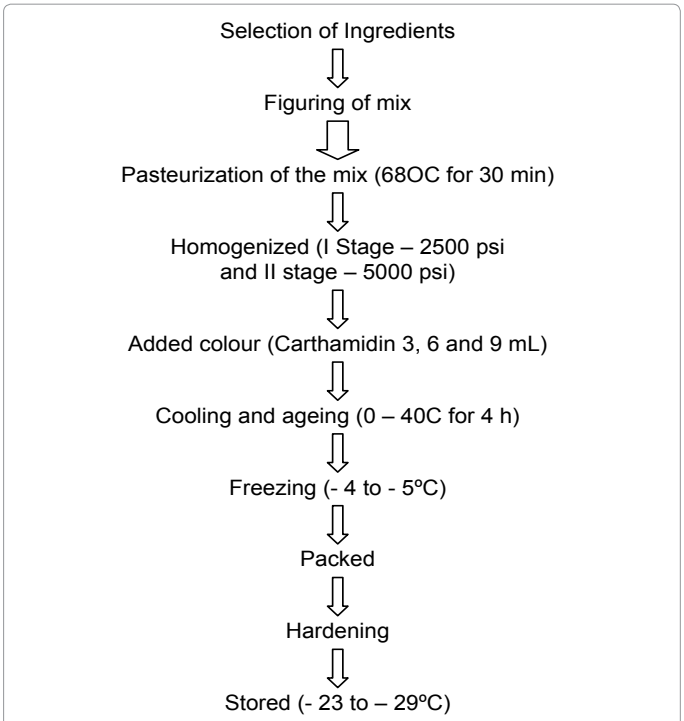

Figure 3: Flow sheet for the preparation of carthamidin extract fortified ice cream .

Constituents	Value (%)
Moisture	4.70
Crude Protein	1.82
Fat	4.80
Ash	10.80
Crude Fibre	11.60
Carthamin (Red)	0.77
Carthamidin (Yellow)	29.59

Each value is average of three determinations

Table 1: Chemical composition of safflower petals.

The ice cream was prepared by incorporation of carthamidin extract (0.03, 0.06 and 0.09 mL).

Organoleptic evaluation

The sensory evaluation of ice cream fortified with varying levels of carthamidin extract was carried out by trained panel of ten judges on a 9.0 point Hedonic scale [12].

Statistical analysis

The data generated in the experiments were recorded and subjected to statistical analysis using standard procedure [13]. The standard errors (SE) and critical differences (CD) at 5% level of significance were worked out for comparison of treatments and presented in the respective tables.

Results and Discussion

Chemical composition of safflower petals

The chemical composition of safflower petals revealed that higher quantity of constituents (Table 1). The safflower petals are nutritive and containing natural colouring pigment. Further the results are in good agreement with the findings of others [2,3,14].

Ice cream	Moisture (%)	Protein (%)	Fat (%)	Total carbohydrates (%)	Ash (%)
Control	62.05	4.85	10.00	21.38	1.52
A	62.40	5.05	10.05	21.78	1.60
B	62.65	5.03	10.10	21.75	1.64
C	63.05	5.00	10.12	21.77	1.69
SE±	0.122	0.076	0.103	0.112	0.058
CD at 5%	0.399	0.249	0.335	0.364	0.188

SE, standard error of the mean; CD, critical difference
A-Ice cream containing 0.03 mL carthamidin; B-Ice cream containing 0.06 mL carthamidin; C-Ice cream containing 0.09 mL carthamidin
Each value is average of three determinations

Table 2: Chemical composition of the ice cream added with carthamidin extract.

Ice cream	Flavour	Body and texture	Colour	Taste	Overall acceptability
Control	8.5	8.8	8.0	8.8	8.3
A	8.3	8.3	8.3	8.1	8.6
B	8.9	8.4	8.6	8.3	8.8
C	8.1	8.0	8.3	8.3	8.3
SE±	0.07	0.06	0.09	0.10	0.09
CD at 5%	0.25	0.19	0.30	0.33	0.30

SE, standard error of the mean; CD, critical difference
A-Ice cream containing 0.03 mL carthamidin; B-Ice cream containing 0.06 mL carthamidin; C-Ice cream containing 0.09 mL carthamidin
Each value is average of ten determinations.

Table 3: Organoleptic evaluation of ice cream added with carthamidin extract.

Chemical composition of ice cream added with carthamidin

The chemical characteristics of ice cream were significantly increased ($P<0.05$) with the addition of carthamidin extract (Table 2). The moisture content was found to be higher in the ice cream incorporated with carthamidin extract than control. Similar trend was observed for fat and ash content of ice cream. The carbohydrates and protein content were found to increase with increase in concentration of carthamidin extract.

Organoleptic evaluation of ice cream added with carthamidin extract

The sensory evaluation of the ice-cream was done on the basis of 9-point Hedonic scale by the panel of 10 trained judges. The color added was 0.03, 0.06, and 0.09 mL carthamidin extract (Table 3). The addition of carthamidin (0.06 mL) scored significantly higher ($P<0.05$) for flavour and overall acceptability. Further, it was found that the texture of all samples was soft with even mouthfeel. The texture among the samples was much uniform with slight variations due to addition of the color. The addition of the more carthamidin in the ice cream has some safflower petals like flavor. Finally it can be concluded that the addition of the carthamidin extract to the value added product i.e. ice-cream could give the natural way of color pigment in the food products as well as give the health benefits of the safflower.

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