

## PREPARATION, EVALUATION, AND CLINICAL APPLICATION OF SAFFLOWER CREAM AS TOPICAL NUTRITIVE AGENT

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### ABSTRACT

**Objective:** The objective of this study was to formulate and evaluate safflower seeds oil as herbal nutritive skin cream and to study its clinical effect.

**Methods:** After collecting the safflower seeds, the oil was extracted using an expeller or cold pressing. Physical parameters of oil were determined. Determination of unsaturated fatty acids was done by gas-liquid chromatography (GLC). The oil is then placed in an emulsifier to form cream using various additives and all formulas evaluated according to physical properties, PH, and viscosity.

All symptoms such as skin damage by sunlight, skin aging, oxidative damage after sunburn or after chemical treatments, all of these conditions have recovered. Statistical data analysis was carried out using Statistical Analysis System, and all recorded data for analysis of variance and least significant difference were at least the significant difference at level 0.01.

**Results:** The results of the GLC analysis indicated that safflower oil contains five different fatty acids, including linoleic acid (56.37%), linolenic acid (15.02%), stearic acid (2.37%), oleic acid (14.83%), and palmitic acid (7.91%).

Refractive index values, density, and specific gravity were 1.476, 0.921 g/cm<sup>3</sup>, and 0.925, respectively.

The results of a clinical study showed the effect of safflower cream as an antioxidant which protected the skin in particular from oxidative damage after sunburn and reduced the symptoms of skin aging. This effect was evident in both concentrations 10% and 15% when compared with control.

Control response rate, 10% of safflower cream, and 15% of safflower cream were reached to 76%, 85%, and 92% within 2 weeks of treatment, respectively.

**Conclusion:** The study showed the importance of safflower oil as a source of omega-3 and contains various unsaturated fatty acids which act as an antioxidant to restore skin health and aging resistance. This study approved that safflower oil characteristics can make it the main ingredients in the preparation of topical agents for the treatment of various skin problems.

**Keywords:** Safflower, Clinical application, Nutritive.

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### INTRODUCTION

It is widely known that the largest organ in the body is the skin; it is about 20 ft<sup>2</sup> of total area. It is main purpose for body protection from invasive elements and microbes in particular. It also helps regulating the temperature of the body and allows the sense of touch, cold, and heat [1]. There are different factors that affects on the skin such as ultraviolet (UV) radiation, for example, sun damage, dehydration, and microorganisms like bacteria invasion, mechanical trauma, and physical injuries [2]. The chemical products used for cosmetics or skin care are gaining attention because of the negative effect on skin and health. Furthermore, the chemical additives of skin care products may lead to skin irritation and allergic reactions [3]. Such as the harmful effect of steroids chemical agents when used for skin bleaching. Recently, the herbal or medicinal plants were used as a source for skin care products. The extracts of herbs showed more powerful antioxidant activity and keep the skin looking not only healthy but also years' younger [4]. The most benefit of herbal extracts in skin care belongs to their natural agents such as omega3, vitamins, and minerals. Furthermore, the plant part extracts contain natural nutrients like Vitamin E that keeps skin healthy [5]. The safflower (*Carthamus tinctorius* L.) plant (Fig. 1) is considered as one of the most important medicinal plants, the seeds of this plant are rich in edible oil, and the components of its oil are unsaturated fatty acids such as oleic acid (omega 9), linolic acid,

linolenic acid (omega 6), and palmitic acid [6]. All these unsaturated fatty acids have different benefits for skin diseases or care. The aim of this study was to formulate and evaluate safflower seed oil as nutritive skin cream and study its clinical effect.

### MATERIALS AND METHODS

#### Materials

Plant material seeds of safflower plants were collected from safflower farm or field at Karbala town during seeding stage (May 2017).

#### Methods

##### *Safflower oil extraction*

Safflower oil was extracted from seeds using expeller pressing (cold pressing). The extraction process was done in AL-Raed factory for vegetable oils production. After extraction, the oil was kept at low temperature because safflower oil is primarily composed of less stable polyunsaturated and monounsaturated fatty acids. It can be particularly susceptible to degrade by heat, air, and light which trigger and accelerate oxidation [7].

##### *Physical examination of oil*

Density, refractive index (using digital refractometer, Abbe type universal, Germany), and specific gravity for safflower oil are determined.

### Gas-liquid chromatography (GLC) analysis of oil

Gas chromatography technique was used to determine fatty acids among the completion of its methyl esters preparation. This technique was conducted in the laboratory of sciences and technology. Adding 3 ml of n-heptane in a test tube was performed to accomplish esterification. Glycerol supernatant was obtained by vortexing the tubes for 5 min, and 0.2 ml from samples was used to conduct analysis [8].

Model GC 1000 of GLC, according to Dany co., Italy, with flame ionization detector and DS 1000 interface integrator which was attached to the column for the purpose of methyl ester separation was 0.33 mm diameter from the inner side and 30 mm of length. The temperature of the columns was fixed to be from 100 to 200°C with a gradual increment of 30°C per min. Then, it was stopped and again raised at a rate of 10°C/min until reached the final temperature. The detector and injector's temperature was fixed at 200°C until reached the final temperature.

### Cream: Preparation of safflower

Oil in water (O/W) emulsion-based cream (semisolid formulation) was formulated. The emulsifier (stearic acid) and other oil soluble components (safflower oil and cetyl alcohol) were dissolved in the oil phase (almond oil) and heated to 75°C. The preservatives (methyl paraben and propylparaben) and other water-soluble components (triethanolamine and propylene glycol) were dissolved in the aqueous phase and heated to 75°C. After heating, the aqueous phase was added in portions to the oil phase with continuous stirring until cream is formed then left at room temperature until cooled [9].

### Characterization of safflower cream formulas

#### Physical properties

The cream was observed for color, odor, and appearance [10].

#### Determination of pH

About 0.5 g of the cream weighed and dissolved in 50 ml distilled water, and its pH was measured [11].

#### Viscosity

Rheological measurements regarded as sensitive tools for detecting structural changes in pharmaceutical creams and should be regarded as an integral part of the quality evaluation of pharmaceutical creams. The viscosities of formulated safflower creams were measured by Brookfield viscometer (DV-II) at room temperature [12].

### Clinical study

The clinical study was carried out at Al-Razi center of alternative medicine, Baghdad, Iraq. Ninety patients were included in this study and divided into three groups randomly, group treated with conventional treatment (nutritive cream vitamins A, C, and E lipolic complex) as control, Group B treated with 10% safflower cream, and Group C treated with 15% safflower cream. All symptoms such as skin aging, skin damaged by the sunlight, and oxidative damage after sunburn or after chemicals treatments were followed for 6 months. All clinical studies were conducted in accordance with the Ethical Committee of College of pharmacy/Al-Mustansiriyah University.

### Statistical analysis

The analysis of the statistical data was conducted by the Statistical Analysis System statistical program, and all the recorded data were applied for the analysis of variance and least significant difference at level 0.01 was used to compare the studied parameters [13].

## RESULTS

### GLC analysis of safflower oil

The results were referred that safflower oil had different five fatty acids including linolic acid (Lin) (56.37%), linolenic acid (L) (15.02%), stearic acid (S) (2.37%), oleic acid (O) (14.83%), and palmitic acid (P) (7.91%) as shown in Figs. 1-3.



Fig. 1: The safflower (*Carthamus tinctorius* L.) plant

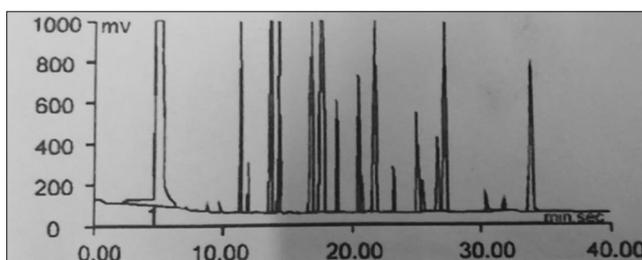


Fig. 2: Gas liquid chromatography analysis of standard safflower oil

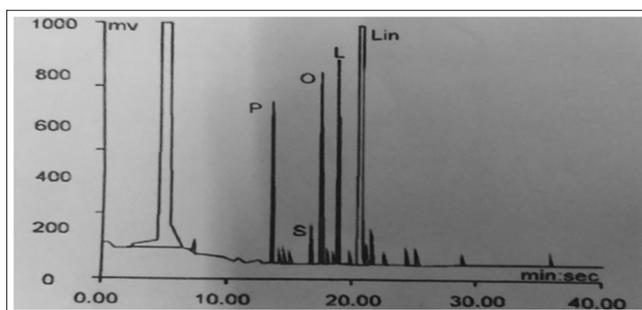


Fig. 3: Gas liquid chromatography analysis of safflower oil

### Physical properties of safflower oil

The results referred that the values of refractive index, density, and specific gravity were 1.476, 0.921 g/cm<sup>3</sup>, and 0.925, respectively. Moreover, the general properties were pale, yellow, bright, and clear oily liquid. The prepared cream formulas as shown in Table 1 were white in color with good odor and elegant and homogenized appearance. The produced cream pH was recorded to be 6 which are perfect for the intended topical application, and hence, the skin's pH is from 4.5 to 6. The cream viscosity was found to be different at different revolution per minute (rpm). Viscosity was decreased at 0.5 rpm to 20 rpm from 4897 to 442 centipoise. Therefore, if the rate was decreased, the viscosity of the cream will increase. Therefore, the cream viscosity was in inverse proportionality to the rate of the shear [14].

### Clinical study

Age and sex distribution in this study is presented in Table 2. The age groups of 19-24, 24-30, 30-40, and 40-55 were about 67.7%, 15.55%, 8.88%, and 7.77% respectively. The percentage of males was about 23.33% and female percentage about 76.66%.

The results in Table 3 showed the effect of safflower oil cream as antioxidant agent which protects the skin specifically in the face from oxidative damage after sunburn and decreases the symptoms of skin aging, and this effect was obvious in both concentrations 10% and 15% when compared with control.

The percentage of response for control, 10% safflower cream, and 15% safflower cream was reached to 76%, 85%, and 92% on 2 weeks of treatment, respectively,

Table 1: Components of safflower cream formulas

Ingredients	Formula (% w/w)	
	F1	F2
Safflower oil	10	15
Stearic acid	6	6
Cetyl alcohol	3	3
Almond oil	5	5
Propylene glycol	4	4
Triethanolamine	2	2
Methylparaben	0.05	0.05
Propylparaben	0.05	0.05
Distilled water	QS	QS

Table 2: Age and sex distribution in the study population

Distribution	n (%)			
	Control	10% safflower cream	15% safflower cream	Total
Age (years)				
19-24	20 (66.66)	18 (60)	23 (76.66)	61 (67.7)
24-30	3 (10)	8 (26.66)	3 (10)	14 (15.55)
30-40	4 (13.33)	2 (6.66)	2 (6.66)	8 (8.88)
40-55	3 (10)	2 (6.66)	2 (6.66)	7 (7.77)
Sex				
Male	4 (13.33)	8 (26.66)	9 (30)	21 (23.33)
Female	26 (86.66)	22 (73.33)	21 (70)	69 (76.66)
Total	30 (100)	30 (100)	30 (100)	90 (100)

Control: Vitamins A, C, and E cream

Table 3: Patient's response for safflower cream in different time intervals

Groups	3 weeks on treatment	4 weeks on treatment	2 weeks after end of the treatment
Control	71%	75%	73%
10% safflower cream	76%	81%	80%
15% safflower cream	85%	92%	91%

while these percentages were reached to 81% and 92% for 10% safflower cream and 15% safflower cream, respectively, during 4 weeks of treatment.

The percentage of control was reached to 71% and 75%, respectively, at 2 and 4 weeks of treatment. The percentage of control, 10% safflower cream, and 15% safflower cream after 2 weeks from the end of treatment was reached to 73%, 80%, and 91%, respectively.

## DISCUSSION

The unsaturated fatty acids or essential fatty acids (EFA) not make from the body or skin but get them from the foods, seeds oils, and key elements. In an omega 3 and 6 fatty acids and other essential diets, routine skin care would be able to build blocks of healthy cell membranes [15]. These polyunsaturated fats also help to produce the skins natural oil barrier, critical in keeping skin hydrated, plumper, and younger looking [16]. Therefore, the safflower cream results in this study prevented the drying, inflammation, and prone to white heads and black heads. Essential fatty acids can be real care to the skin. Safflower cream because it contains omega-3 and omega 6 which consist of poly unsaturated fatty acids (oleic acid, linoleic acid as well as Vitamin A, E, D and K which are soluble in safflower oil. Other studies about essential

fatty acids were suggested that essential fatty acids may diminish the rate of inflammation with acne and also reduce photodermatitis-induced sun sensitivity. Other studies found that psoriasis treatment also includes medication and essential fatty acids.

## CONCLUSION

The study showed the importance of safflower oil as a source of omega-3 and contains various unsaturated fatty acids which act as an antioxidant to restore skin health and aging resistance. According to the results of this study, safflower oil characteristics make it the main ingredients in the preparation of various natural topical agents for the treatment of various skin problems.

## AUTHOR'S CONTRIBUTIONS

All the work was carried out by Ibtihal Abdulkadhim Dakhil, Ibrahim S. Abbas, and Nidhal K. Maraie.

## CONFLICTS OF INTEREST

The authors declared that they have no conflicts of interest.

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## REFERENCES

- Jolene H. Eat Prity: Nutrition for Beauty, Inside and Out. China; 2014.
- World Health Organization. Dept of Child and Adolescent Health and Development. Epidemiology and Management of Common Skin Diseases in Children in Developing Countries. Geneva; 2005. Available from: <http://www.who.int/iris/handle/10665/69229>.
- Bocca B, Pino A, Alimonti A, Forte G. Toxic metals contained in cosmetics: A status report. Regul Toxicol Pharmacol 2014;68:447-67.
- Boelsma E, Hendriks HF, Roza L. Nutritional skin care: Health effects of micronutrients and fatty acids. Am J Clin Nutr 2001;73:853-64.
- Dania FA, IbrahimS A, Ashour HD. Investigation of the main alkaloid of London rocket (*Sisymbrium irio* L.) as a wild medicinal plant grown in Iraq. Int J Pharm Sci Rev Res 2016;39:279-81.
- Bäumler E, Fernández MB, Nolasco SM, Pérez EE. Comparison of safflower oil extraction kinetics under two characteristics moisture conditions statistical analysis of non-linear model parameters. Braz J Chem Eng 2014;31:553-9.
- Shahid A, Asma R, Habib R, Shakil M. Phytochemical and biological screening of *Ricinus communis* seed oil grown wild in Jammn and Kashmir. J Pharm Phytochem 2016;5:89-92.
- Sruthi BK, Gurupadaya BM, Sairam KV, Kumar TN. Development and validation of GC method for the estimation of eugenol in clove extract. Int J Pharm Pharm Sci 2014;6:473-6.
- Mishra A, Saklani S, Milella L, Tiwari P. Formulation and evaluation of herbal antioxidant face cream of *Nardostachys jatamansi* collected from Indian Himalayan region. Asian Pac J Trop Biomed 2014;4:679-82.
- Ibrahim SA, Mohammed JH, Ali HM. Analysis with evaluation of drying temperature on essential oil content of *Achillea frarantissima* L. and *Artemisia herb-alba* L. Int J Pharm Pharm Sci 2013;5:913-4.
- Muthukumarasamy R, Ilyana A, Fithriyani NA, Najihah NA, Asyiqin N, Seka M. Formulation and evaluation of natural antioxidant cream comprising methanolic peel extract of *Dimocarpus longan*. Int J Pharm Clin Res 2016;8:1305-9.
- Uganda RE, Deivi SK. Formulation and evaluation of natural palm oil based vanishing cream. Int J Pharm Sci Res 2013;4:3375-80.
- Fair PH, Fortner AR. The role of formula feeds and natural productivity in culture of the prawn, *Macrobrachium rosenbergii*. Aquac Int J 1981;24:233-43.
- Nair SS, Mathew M, Sreena K. Formulation and evaluation of herbal cream containing *Curcuma longa*. Int J Pharm Chem Sci 2012;1:1362-8.
- Black HS, Rhodes LE. The potential of omega-3 fatty acids in the prevention of non-melanoma skin cancer. Cancer Detect Prev 2006;30:224-32.
- MaraieNK, Abdul-Jali TZ, Alhamdany AT, JanabiH A. Phytochemical study of the Iraqi *Beta vulgaris* leaves and its clinical applications for treatment of different dermatological diseases. World J Pharm Pharm Sci 2014;3:5-19.