



Safflower Oil: A Potent Moisturizing Agent

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Abstract: Improper balance of water content of the stratum corneum and skin surface lipids leads to the dryness of the skin and other dry skin problem. Skin moisturizer helps to prevent effect of drying and chapping. It provides non-volatile residual film which retains moisture and makes the skin soft. Vegetable oil composed of essential fatty acids, which helps to maintain the skin hydration, tone the skin up, improves suppleness and regenerate the skin. Safflower seed oil is a rich source of unsaturated fatty acids. Gas chromatography technique exhibited flower oil containing 52.65% of Omega 6 fatty acid and 24.79% monounsaturated fatty acid. Literature reveals that safflower seed oil contain high percentage of unsaturated fatty acid i.e Linoleic acid which was analyzed and it gives the protective effect on the skin and has excellent moisturizing property.

KEYWORDS: Safflower Oil, *Carthamus tinctorius*, Linoleic acid, Moisturizing cream.

1. Introduction:

Skin is the most important part represents the most supercritical layer of the body, so it is constantly exposed to the different environmental stimuli. [1]

Exposure to the external factors as well as endogenous factors may disrupt the balance between the water content of the stratum corneum and skin surface lipids. [2][3]

Disruption of skin barrier led to the various skin problems such as roughness, scaling, cracks, redness and an uncomfortable feeling of tightness, sometimes with itching and stinging.[4]

Treatment with moisturizer aims at maintaining skin integrity and well-being by providing a healthy appearance of the individual. Moisturizers work by forming an oily layer on the top of the skin that trap water within the skin.[5]

Vegetable oils are successfully employed in personal care products due to its softening and smoothing property. One of the oil included in this group is Safflower oil, which is not only used in modern personal care industry, but from ancient times.[6]

Safflower oil is obtained from species of *Carthamus tinctorius* from family Asteraceae. It contains high percentage of unsaturated fatty acids which gives protective and reparative effect on skin and hair which is attributed by its high content of triglycerides of Linoleic acid. [7]

2. Materials and Methods

2.1. Analysis of Oil Sample:

Before proceeding for formulation Safflower oil was evaluated to check its purity level by performing following tests. The tests were carried out as per BIS specification IS3491:1965.[8]

2.1.1. Identification of fatty acids:

The Safflower seed oil was subjected to Qualitative and Quantitative tests to identify chemical composition of fatty acids. It was determined by Gas Chromatography technique. (AO AC 969.33)

2.1.2. Determination of Acid Value:

10 gm of the substance was dissolved in 50 ml of mixture of equal volumes of ethanol (95%) and ether, previously neutralized with 0.1 M Potassium hydroxide to phenolphthalein solution. 1 ml of phenolphthalein was added and titrated with 0.1 M Potassium hydroxide until faint pink colour was observed.

$$\text{Acid value} = 56.11 N V / W$$

Where, V = no. of ml of 0.1 M KOH required

N = normality of KOH

W = Weight of substance in gms.

2.1.3. Determination of Saponification value:

2gm substance was taken in 200ml flask fitted with reflux condenser. 25ml of 0.5 M ethanolic KOH a little pumice powder was added in it and boiled under reflux on water bath for 30 minutes. 1ml of phenolphthalein was added in it and titrated immediately with 0.5 M Hydrochloric acid. Operation was repeated omitting the substance being examined.

$$\text{Saponification value} = 56.1 (B-S) N / W$$

Where, B = volume in ml of std. HCL required for blank

S = volume in ml of std. HCL

N = normality of std. HCL

W = weight of material in gms taken for test

2.1.3. Determination of Specific gravity:

The test was performed as per Bureau of Indian Standards specification for Safflower oil IS 3491:1965.

2.1.3. Determination of Refractive index:

The test was performed as per Bureau of Indian Standards specification for Safflower oil IS 3491:1965 using Abbe's Refractometer.

2.2 Formulation of Moisturizing Cream:

Oil in water emulsion cream base was formulated, and to the selected base the active Safflower oil was incorporated in various concentration of 1 to 5%.

Table no :1. Formulation of Safflower oil Moisturizing cream:

Ingredients	F1	F2	F3	F4	F5
Stearic acid	5%	5%	5.5%	6%	7%
Cetyl alcohol	3%	3.5%	4%	4.5%	5%
Beeswax	2%	2%	2%	2%	2%
Mineral oil	1%	1%	1%	1%	1%
Safflower oil	1%	2%	3%	4%	5%
Propyl paraben	0.2%	0.2%	0.2%	0.2%	0.2%
Glycerin	0.5%	0.5%	0.5%	0.5%	0.5%
Triethanolamine	1%	1%	1%	1%	1%
Methyl paraben	0.2%	0.2%	0.2%	0.2%	0.2%
Distilled water	86.1%	84.6%	82.6%	80.6%	78.1%

2.3. Evaluation of Moisturizing cream:

2.3.1. Determination of Skin Moisture content:

To measure the moisture content of the skin 30 volunteers with normal skin were selected. The test was performed on the inner side of arm where six squares of 2cm were drawn with gap of 1cm. Then base and each formulation were applied into squares, the amount taken was 0.2 gm approx. which should fill each square. Then each formulation was compared with cream base. This was performed using digital skin moisture meter (SK-30). After every 15 minutes of applying gel the readings were taken till 2 hours.

2.3.3. Determination of pH:

Weigh accurately 5 gm of the cream in a 100 ml beaker. Then 45 ml of Distilled water were added and cream is dispersed in the cream. The pH is determined using pH meter (Toshiwal Inst. MFG.Pvt.Ltd) at room temperature according to BIS of Skin creams IS 6608:2004. [9]

2.3.4. Determination of Total Fatty Matter:

About 2 gm of moisturizing cream was accurately weighed in conical flask or round bottom flask. 25ml of HCL was added to it and refluxed for one half hour. After refluxing, the content of the flask was poured into 300 ml separating funnel. The conical flask was rinsed with 50 ml of ether in the portion of 10 ml. The ether was poured in the separating funnel. The separating funnel was shaken well and left until two layer separate. The aqueous layer was separated out and ether layer was shaken out with 50 ml portion of ether 5 times. All the ether extract were combined and was washed with water until it is free from acid. The ether extract were filtered through a filter paper containing sodium sulphate into a petridish which has been previously dried at a room temperature of 600C and weighed. The sodium sulphate on the filter paper was washed with ether and combined the washing of the filtrates. Ether was distilled off and material was dried remaining in the petridish at a temperature 600C of constant mass.

2.3.5. Determination of Water content:

10 gm of cream was taken and transferred into conical flask. After that 200 ml of toluene and few pieces of dry pumice stone is added to it. Apparatus was connected and the toluene was poured through the top of the condenser to fill the receiving end of the trap. The flask was heated gently for 15 minutes and then toluene was then refluxed at the rate of 2 drop/sec. When the water has distilled over the inside of the condenser tube was then rinsed with a tube brush attached to copper wire and saturate with toluene. The distillation was continued for 5minutes after the source of heat was removed and the receiving tube was allowed to cool at room temperature when the water and toluene was separated and volume of recorded.

2.3.6. Accelerated stability test:

To check the stability of the formulation various physical parameters like change in pH, color, Odor were checked for one month.

3. Result and Discussion:

3.1. Identification of fatty acids:

Quantitative and qualitative analysis of safflower oil was done by gas chromatography method. The Linoleic acid content was found to be 52.6%, Alpha-Linoleic acid was found to be 5.79% and oleic acid was found to be 24.18%.

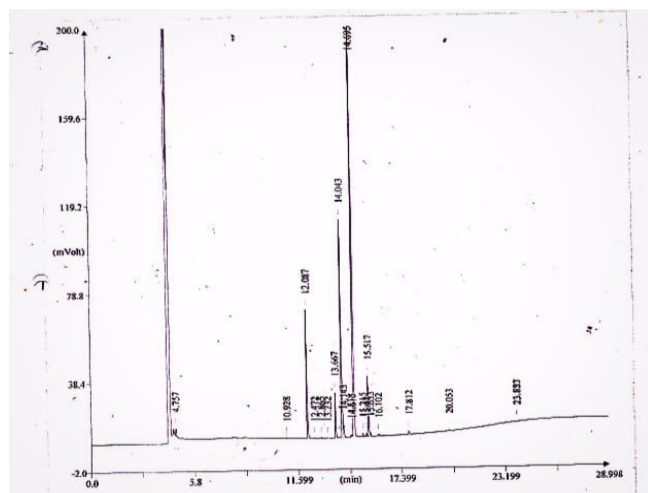


Fig.1. Gas Chromatography report

3.2. Evaluation of Safflower oil:

Acid value, Saponification value, Refractive index and Specific gravity were determined which was found to be in the range of standard values as per BIS 3491:1965. Results are given in table no 2.

TableNo2:EvaluationofSaffloweroilaccordingtotheBISofSaffloweroills3491:1965:

Sr.No.	Name of Test	Standard range	Obtained value
1	Acid value	Not more than 6.0	0.28
2	Saponification value	186-196	192
3	Specific gravity at 40°C	0.905-0.925	0.9150
4	Refractive index at 40°C	1.4674-1.4689	1.4680

3.1. Formulation of Moisturizing cream:-

Incorporation of Safflower oil in moisturizing cream delivers oil to the skin surface and stabilizes the product. It is desirable to have a moisturizing cream capable of depositing moisturizing aid on skin surface. Various moisturizing cream bases were formulated and the one with good consistency and spreadability were selected as base. Safflower oil was incorporated from 1% to 5% in which formulation with 1% safflower was having undesirable consistency. Viscosity was modified for further formulation. In which 2-4% containing safflower oil moisturizing cream yielded an acceptable formulation. Formulation containing 5% safflower oil had undesirable consistency. Formulation containing 2%, 3% and 4% safflower oil was selected for further evaluation.

3.2. Evaluation of Moisturizing Cream:

3.2.1. Determination of Skin Moisture content:

The hydration of skin on which F2, F3 and F4 was applied found to be increased. Hydration for F3 and F4 was found to be similar, so the minimum concentration F3 containing 3% of safflower oil is selected for further studies like pH, water content, total fatty matter content and accelerated stability tests. Studies showed comparable moisture content for 2%, 3% and 4% active containing cream

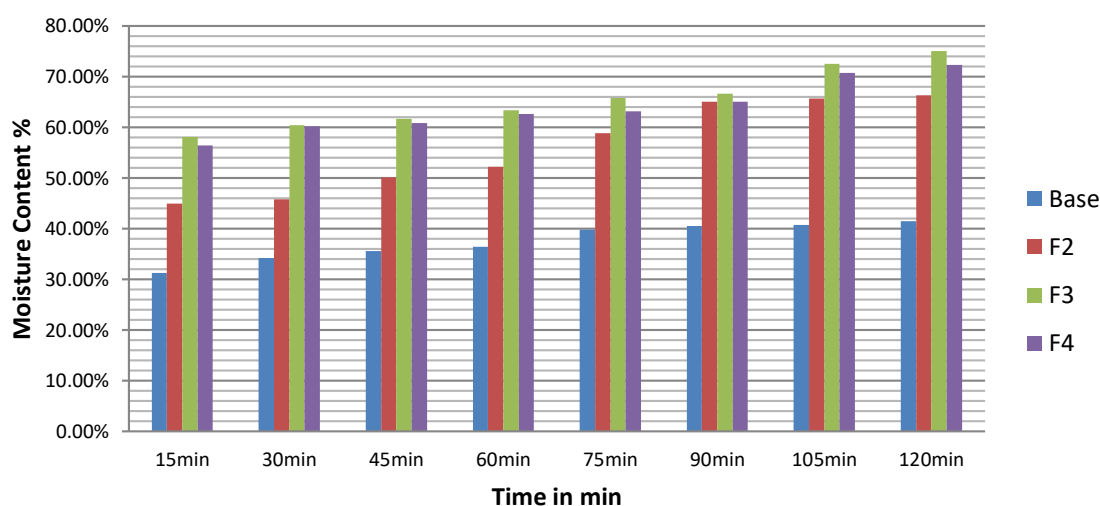


Fig. 2. Graphical representation of moisture content of skin.



Fig No 2, 3: Determination of moisture content of skin after applying all formulations.

3.2.2. Determination of pH

The pH of moisturizing cream with 3% of safflower oil was **7.5** which was determined using pH meter (Toshiwal Inst. MFG.Pvt.Ltd) at room temperature.

3.2.3. Determination of Total Fatty Matter:-

The formulation is broken up to diluted mineral acid and the fatty material is extracted with petroleum ether. It is weighted after removal of solvent. The total fatty matter of 3% oil containing moisturizing cream was found to be **6.9%**. Cream containing 3% of safflower oil was within desired range (pH range as per BIS: min 5.0%).

3.2.3. Determination of water content:

The water content % by mass of moisturizing cream containing 3% of safflower oil was found to be **74.21%**.

Table no: 6. Results of Evaluation tests for Finished product:-

Sr. no	Tests	Result of 3% containing Safflower oil cream
1	Determination of pH	7.5
2	Determination of Total Fatty Matter	6.9%
3	Determination of water content	74.21%

3.2.4. Accelerated stability test:

The accelerated stability study of the finished product was carried out daily for one month. It was found that there was no significant change in odor, color and pH. Hence, product was found to be stable at different temperatures.

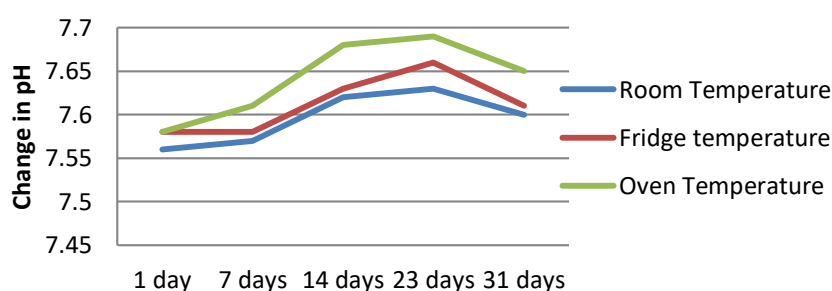


Fig.4. Graphical representation of change in pH

Conclusion:

Study revealed that safflower seed oil is potential source of polyunsaturated and Omega 6 fatty acids. The moisturizing cream with 3% concentration of safflower seed oil exhibits pronounced moisturizing effect on the skin. It passes all the mentioned tests successfully. The product was found to be acceptable in all terms of evaluation parameters.

Hence, it is concluded that safflower seed is can be used as a moisturizing agent in cosmetics preparations.

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