

Formulation and Evaluation of Face Serum Using Daucus Carota Extract and Honey through Emulsion Method

Ms. Zeenath T A, Anusree K S, Shahana Shajahan, Mr. Surya Shine, Mr. Nikhil Ninan Jacob, Ms. Jilby Saju

*Students of Al-Azhar college of Pharmacy,
– Ast. Prof, Dept. Pharmaceutics, Al Azhar college of Pharmacy*

Date of Submission: 25-06-2024

Date of Acceptance: 05-07-2024

ABSTRACT

Carrot face serum is a highly concentrated product based on oil in water emulsion. High carotenoid content of carrot extract causing its potential to be developed as antioxidant activity in cosmetic preparations, which neutralize free radicals, which are unstable molecules that are generated internally by the body as well as externally by UV rays, pollution.

Honey gives mild lightening properties, which help to reduce acne scars and hyperpigmentation over time. The objective is to formulate carrot containing carotenoids face serum and determine antioxidant activity of the extract. Face serum was tested for its color, pH, physical appearance, spreadability, viscosity, microbial testing etc.

I. INTRODUCTION COSMETICS

Cosmetics are also known as makeup products which are commonly used by young aged adults to improve their appearance and to show them pleasantly.

The food and drug administration of America states that “cosmetics are retender to be applied on the human body for beautifying, cleansing, changing the appearance, attractive promotion without influencing or changing the function of the body structure. [1]

Cosmetics market is still rapidly growing with new ranges of cosmetics. New ingredients are added to formulas in order to obtain innovative activity and higher external effects such as anti-aging, anti-inflammatory, antibacterial, regenerating, soothing, relaxing muscles, simply moisturizing or cleaning. The market of natural and organic cosmetics has been growing in last

decades. The increase in interest in this type of product is a consequence of the concern that consumers have been presenting in relation to the environment and health. In addition to the appreciation the use of sustainable ingredients in cosmetic formulations, the consumers are also concerned about pollution caused by the use of plastics, which leads industries to reinvent themselves and rethink about the composition of packaging. The factor that most drives the purchase of natural and organic cosmetics is the fact that the consumer, in addition to contributing to the preservation of the environment, is also using a sustainable product. The growing demand for natural and organic cosmetics results in a concern of the brands with the organic issue, with the decreased use of animal derived ingredients and with the updating the parameters required for certification of a cosmetic as natural or organic. Due to the few studies available in this area, the importance of clarifying the definitions and concepts of natural and organic cosmetics is evident, in order to contribute with accurate information for the cosmetic sector.[2]

COSMETIC SERUM

Serum is a highly concentrated product based on water or oil as any other cream. Serum or concentrates contain approximately 10 times more of biologically active substances than cream. Therefore, quicker and more effectively copying with cosmetic problem. Face serum is a lightweight, topical skin care product that contain a higher concentration of active ingredients like hyaluronic acid, glycolic acid and vitamin C, known for their effectiveness face serums are often used to manage specific skin care concerns, such as

wrinkles or dark spots.

Serums are thinner than moisturizers, which makes them perfect for layering and they can come in a variety of different formulas including gels, oils and light creams; They can even have a water-like consistency in some cases.[1]

Absorption to Skin

The facial serum is widely used for various applications. Serum has property of penetrating into deeper skin layers and shows rapid absorption on to the skin due to its non-greasy texture and unique formula. They are formulated with high concentration of active ingredients. [4]

Serum Effect

When concentrates are used the skin immediately gets the necessary amount of active substances in such form which assimilates easier. The active substances in high concentration act in the same way as creams - they moisturize, rejuvenate, lift up etc. The only difference is that in case concentrates are used correctly the noticeable results will be reached quicker.

According to effect produced all serum are strictly divided in following category:

- Lifting up
- Revitalizing
- Moisturizing
- Nourishing
- Anti inflammatory
- Smoothing
- Anti stress

Serum act locally upon face and neck. Exceptional cases should be taken of the skin around where special preservatives and bases are used and the doses of active constituent accurately calculated. Serum can be used irrespective of age. When using concentrate, you can always get not only quick cosmetics effects but also, psychological satisfaction after the treatment because they will be seen practically immediately. The pH level of other serums varies from 5 to 6.5, in eyelids serums it must be neutral – 7 (as pH level of human tears). [24]

Benefits of face serum

3.FORMULATION OF FACE SERUM SL.No	INGREDIENTS	OFFICIAL FORMULA (100%)	WORKING FORMULA (25ml)
1.	Extract	60%	15ml

Use of serum also depends on the season and climate where a person permanently lives. In hot climate, concentrates are based on water (for normal and dry skin) or accompanied by antiseptic concentrates (for oily skin as they have a slight drying effect). Use of oily bases is not recommended in this case as it may lead to pore bridging. For this reason, oil bases of any cosmetics whether it is a cream or a concentrate are recommended for cold or variable climate, in winter. To get the most benefits from a serum, use it as the label recommends. In general, you should put on serum before heavier products. In the morning apply serum after cleansing, but before moisturizer and sunscreen. In the evening apply serum after cleansing but before night cream. Always put the serum on first after cleansing, because you want those expensive, active ingredients to penetrate as deeply as they can prior to applying other creams that might create a barrier. Generally, face serum is packed with high percentage of active ingredients that targets various skin concerns effectively. They have combination of active ingredients that not only target a particular skin concern but solves various other issues related with it. Serums are lighter skin care formulations than moisturizers. The thinner viscosity allows the serum to be absorbed more easily into your skin. This makes a face serum an ideal first step in the layering process. [24]

II. METHODOLOGY

1. COLLECTION OF PLANT

The plant is biennial in nature and is harvested usually after a year. The roots of carrot are best harvested during the second summer. Allow the carrot roots to air dry after harvesting.[6]

2. PREPARATION OF ROOT EXTRACT

Air dried carrot root were powdered using motor and pistol. For carrot extract, 10gm of dried and powdered root were mixed with 70% ethanol. The contents were kept in water bath for 1hour at 40 degrees Celsius. After cooling extracts were filtered successively by What Mann filter paper. [8]

2.	Triethanolamine	8%	2ml
3.	Honey	8%	2ml
4.	Tween 20	4%	1ml
5.	Carbomer	8%	2g
6.	Sodium benzoate	2%	0.5g
7.	Citric acid	2%	0.5g
8.	Glycerine	4%	1ml
9.	Coconut oil	2%	0.2ml
10.	Rose water	q.s	q.s
11.	Distilled water	q. s	Up to 25ml
12.	Perfume	q.s	q.s

PROCEDURE:

An emulsion (o/w) was prepared as per the formula given below.

1. Oily phase: tween 20, coconut oil.
2. Aqueous phase: carrot extract, triethanolamine, carbomer, honey, sodium benzoate, glycerine, citric acid, rose water and small quantity of distilled water.

The oily phase was added to aqueous phase slowly by triturating and then kept under magnetic stirring, add water up to q. s to get oil in water based biphasic emulsion. [16]

4. EVALUATION TEST OF FACE SERUM

(a) DETERMINATION OF DPPH RADICAL SCAVENGING ACTIVITY

The free radical scavenging activity was determined by the method. The extract was dissolved in methanol at various concentration, then 2,4,6,8 ml of each extract solution was mixed with 0.2ml of DPPH solution. After incubation at room temperature for 30 mints the absorbance was measured at 517nm. The negative and positive controls were run in parallel. Scavenging activity was calculated using the formula. [5]

$$\% \text{Scavenging} = [(A517 \text{ control} - A517 \text{ sample})] \times 100$$

(b) DETERMINATION OF CAROTENE

Beta carotene after releasing by ethanolic hydroxide and after extraction into petrol ether could be determined by spectrophotometry at wavelength 450nm. Content of beta carotene in carrot was assessed by method of calibration curve with measuring of absorbance of standard solution of potassium dichromate. Carrot (1gm) was put in flask and added 20ml of ethanolic solution NaOH, then 20ml of HCl (1:1) was added. The Flask content was quantitatively put on filter and by acetone till it's no soluble part was colourless. Filtrate was put into separating funnel (500ml) added 40ml petroleum ether and filled to ¾ water phase is colourless.[25]

(c) CHEMICAL TEST FOR CARROT EXTRACT

1. TEST FOR FLAVANOIDS:

To 1ml of crude extract, a few drops of dil. NaOH was added. An intense yellow colour appeared in the plant crude extract.

2. TEST FOR CARBOHYDRATES:

I. FEHLING'S TEST:To a few drops of extract, add equal volume of fehling's solution A and B. boil for few minutes.

II. MOLISCH'S TEST: To the extract add 2-3 drops of molisch's reagent and con. Sulphuric acid.[23]

3. TEST FOR SAPONINS:

1ml solution of extract was diluted with distilled water to 10ml and shaken for 15minutes.

(d) CHEMICAL TEST FOR HONEY

1. MOLISCH TEST: To the carbohydrate solution in the test tube, add 2 drops of alpha- naphthol solution followed by con. Sulphuric acid along the side of the test tube.

2. FEHLING'S TEST: To the carbohydrate solution in the test tube, equal volume of Fehling's solution A and B is added, heated in a boiling water bath.

3. BENEDICT'S TEST: To the carbohydrate solution in a test tube, Benedict's reagent is added, heated in a boiling water bath.

4. IODINE TEST: To the carbohydrate solution, 2 drops of iodine solution are added. [22]

(e) COLOUR AND APPEARANCE

Colour and appearance of the formulation is observing visually. Change in colour also indicates chemical instability. [1]

(f) DETERMINATION OF pH

The formulation of serum is meant for topical application. So, their pH should be similar to that of skin. The skin as an acidic range and the pH of the skin serum should be in the range of 5-9. To ensure the required shelf life of skin serum, chemical materials is essential. That is, it should either be too acidic nor too alkaline. Based on above point it was through that the standard pH of skin should be in the range of 4 - 5.5.

The pH is determined by using pH paper.[1]

(g) DETERMINATION OF VISCOSITY

The viscosity is the most important parameter in the evaluation of cosmetic product; Viscosity governs many properties such as spreadability, pour ability of the product from the container. As viscosity is affected by many factors such as change in temperature, change in manufacturing conditions, quality of raw material,

it is very important to measure the viscosity of product. Viscosity of the formulation was determined by Ostwald viscometer.[1]

(h) DETERMINATION OF SPREADABILITY

2gm of serum sample was placed on a surface of a slide. Another slide was attached to a weight of 0.8g through a thread. The time (seconds) required to spread the serum formulation on the slide was taken as a measure of Spreadability. [1]

(i) MICROBIOLOGICAL STUDY

Requirement Media: Nutrient Agar Apparatus, test tube, petri dish

Procedure: Sterilize the work area with disinfectant. Wash and dry thoroughly all the apparatus required. Prepare the dilution of the product take 1gm/ml of product and add to first test tube with pipette and shake it thoroughly then take 1ml from it in second test tube and prepare further dilution in same way. **Total bacteria count:** Weigh accurately required quantity of nutrient agar and add 50 ml of water in an autoclave conical flask. Autoclave it at 121°C for 15 min. When the temperature reduces to 45°C add 1ml of dilution of the product to autoclave Petri dish and add 20ml of nutrient agar medium and mix by rotating in the clock wise and anticlockwise direction Allow the plate to solidify. Incubate this plate for 48 hours at 37°C.[29]

(j) ASH VALUE

The extract was taken in a crucible with a flat bottom, and ashing was carried out at 600°C in a muffle furnace. [26]

(k) ABSORBANCE TIME

Apply the serum to the skin, use a stopwatch to record the time, and then assess how quickly it absorbs.[26] **(l) WASHABILITY**

Apply the serum to the skin, and then personally test how easily and thoroughly it can be washed off with water.[26]

(m) STABILITY STUDIES

The sample of serum was kept at 5°C, room temperature 40°C. The changes in physical appearance, colour, feel etc., were studied.[1]

III. RESULT AND DISCUSSION

1. PREPARATION OF EXTRACT:

The extract was prepared by maceration process using 70% alcohol.

CHEMICAL TEST FOR CARROT

SL.NO	EXPERIMENT	OBSERVATION	INFERENCE
-------	------------	-------------	-----------

1.	TEST FOR FLAVANOID: To 1ml of crude extract, a few drops of dil.NaOH was added. An intense yellow colour appeared in the plant crude extract.	which became colourless on the addition of a few drops of dil. Acid which indicates the presence of flavonoids.	Presence of flavonoids.
2.	TEST FOR CARBOHYDRATE: (a) FEHLING'S TEST	Appearance of reddish orange colour.	Presence of carbohydrate.
	b) MOLISCH'S TEST	Formation of purple colour ring can be seen at	Presence of carbohydrate.
3.	TEST FOR SAPONINS: 1ml of solution of extract was diluted with distilled water to 10ml and shaken for 15min.	Development of stable foam.	Presence of saponins

4. CHEMICAL TEST OF HONEY:

EXPERIMENT	OBSERVATION	INFERENCE
1. MOLISCH'S TEST: To the carbohydrate solution in a test tube, 2 drops of α -naphthol solution is added followed by Con. H ₂ SO ₄ along the side of the test tube.	violet ring develops at the junction of two liquids.	Presence of reducing sugar.
2. FEHLING'S TEST: To the carbohydrate solution in a test tube, equal volume of Fehling's solution A and B is added, heated in a boiling water bath	Formation of reddish brown precipitate.	Presence of reducing sugar.
3. BENEDICT'S TEST: To the carbohydrate solution in a test tube, Benedict's reagent is added, heated in a boiling water bath.	Formation of orange or red precipitate.	Presence of reducing sugar.
4. IODINE TEST: To the carbohydrate solution, 2 drops of iodine solution added.	Formation of blue-black colour.	Presence of starch.

5. DETERMINATION OF ANTIOXIDANT ACTIVITY:

Report: The antioxidant activity of extract was found to be 0.48%.

6.DETERMINATION OF CAROTENE:

The aqueous phase and oily phase was found to be colourless.

7. COLOUR AND APPEARANCE:

The texture, colour, and aroma of the face serum were directly examined in order to gauge its physical characteristics. The product has a yellowish orange finish and were non-greasy and non-oily with pleasant smell.

8. pH OF THE SERUM:

The formulation’s pH was found to be 5, which is close to the expected value.

9. SPREADABILITY:

The formulation would have good spreadability and it was observed to be 20 seconds which is close to the expected value. There is a viscosity and spreadability has a linear relationship in rheological studies. The lower the viscosity, the lower the surface tension, and the higher the spreadability.

10. MICROBIOLOGICAL STUDY:

The results of antimicrobial studies indicate that agar plate of test inoculum doesn’t show any growth of microorganism after 24 hours incubation. The result indicating that the formulations was free of microorganisms and safe to use.

11.ASH VALUE:

The ash value of the extract was found to be 0.5%, which is close to the expected value

12. ABSORBANCE TIME:

The serum starts to absorb as soon as it is applied to the skin and is fully absorbed in 90 seconds, which is nearer to the expected value.

13.WASHABILITY:

The wash ability of the formula was evaluated. The skin was left fresh, luminous and moist after it’s simple removal.

14.VISCOSITY:

The viscosity of the formulation was assessed using Ostwald viscometer, and it was found to be 1050 cps which is close to the expected value.

15. STABILITY STUDY:

Throughout the stability study, the product’s quality, safety, and efficacy are maintained.

SL NO.	TEMPERATURE	PARAMETER	INFERENCE	
			During Preparation	After Stability Study
1. ROOM TEMPERATURE		<ul style="list-style-type: none"> • APPEARANCE • ABSORBANCE • SPREADABILITY • PHASE SEPERATION • pH 	<ul style="list-style-type: none"> • Yellowish orange • 1-2 minutes • 20 sec • Nil • 5 	<ul style="list-style-type: none"> • Yellowish orange • 1-2 minutes • 20 sec • Nil • 5
2.	FREEZER TEMPERATURE	<ul style="list-style-type: none"> • APPEARANCE • ABSORBANCE • SPREADABILITY • PHASE SEPERATION • pH 	<ul style="list-style-type: none"> • Yellowish orange • 1-2 minutes • 22 sec • Nil • 5 	<ul style="list-style-type: none"> • Slight yellowish orange • 1-2 minutes • 25 sec • Nil • 5

IV. CONCLUSION

Face serum is the most important part of the today’s modern life. As they are mainly used for the beautification purpose, their demand increases vigorously. The functional properties of cosmetic face serum are significantly higher than most cosmetics. The higher moisturizing, skin brightening, antioxidant, antiaging and

depigmentation property of the face serum it is attracting consumers instead of any other cosmetic products such as creams, gel and lotions.

Carrot has been used since ancient times to nourish and rejuvenate the skin. The antioxidant activity of carotenoid presents in carrot extract have been reported to repair the damage done to skin tissue by the free radicals and stop them from

causing further harm. The antioxidant activity is due to the presence of carotenoids which is present in carrot root extract.

Therefore, for obtaining the highest benefit carrot root extract face serum is formulated

REFERENCE

- [1]. Prajakta s. thorat, hrushikeshbhatane., General review of face serum. WORLD JOURNAL OF PHARMACEUTICAL RESEARCH, volume:12, page no: 6-13.
- [2]. Cleberbarros, rosannabarros NATURAL AND ORGANIC COSMETICS, version:2, page no: 1-2.
- [3]. Totor, jerrard,etal., Anatomy of skin. PRINCIPLES OF ANATOMY AND PHYSIOLOGY, volume : 12, page no: 148-153.
- [4]. Arun dev sharma., Formultion and evaluation of herbal based antiaging face serum. FOLDSCOPE AND ITS APPLICATION, volume :2, page no: 127-130
- [5]. Nahui ye, pei hu,etal.,preparation and characterisation of antioxidant peptide from carrot seed protein. JOURNAL OF FOOD QUALITY volume: 2018, page no:3-6
- [6]. [https://www.kzndard.gov.za/images/Documents/Horticulture/Veg_prod/carrots.p df](https://www.kzndard.gov.za/images/Documents/Horticulture/Veg_prod/carrots.pdf)
- [7]. kyativarshney and kriti Mishra, An analysis of health benefits of carrot. INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN ENGINEERING AND MANAGEMENT, volume: 9, page no: 2
- [8]. yashabkumar and Harrison marish, Antibacterial activity of seed and leaf extract of carica papaya var.Pusa dwarf linn. IOSR JOURNAL OF PHARMACY AND BIOLOGICAL SCIENCE, volume: january 2014, page no: 30
- [9]. <https://st-b.in/nluefnpmQCb>
- [10]. [https://cosmetics.specialchem.com/ingredients/triethanolamine#:~:text=Triethanolamine%20\(TEA\)%20is%20a%20non,it%20interacts%20with%20the%20skin.](https://cosmetics.specialchem.com/ingredients/triethanolamine#:~:text=Triethanolamine%20(TEA)%20is%20a%20non,it%20interacts%20with%20the%20skin.) 11. [https://www.clinikally.com/blogs/news/carbomer-the-secret-behind-the-texture-of-your-skincare-products.](https://www.clinikally.com/blogs/news/carbomer-the-secret-behind-the-texture-of-your-skincare-products)
- [11]. <https://www.kiehls.com/skincare-advice/glycerin-skin-benefits.html#:~:text=Studies%20show%20that%20glycerin%20can,continuous%20hydration%20for%20several%20days.&text=It's%20also%20been%20shown%20to,commonly%20used%20in%20skincare%20formulations.>
- [12]. <https://ases.in/products/sodium-benzoate#:~:text=It%20is%20commonly%20used%20as,in%20liquid%20medicines%20like%20syrups.>