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Formulation And Evaluation Of Herbal Lip Serum With Spf

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ABSTRACT

The lip serum with SPF is a concentrated product that provides protection from sunlight, hydration, plumping, and healing effect on lips upon application. This also provides a brown tint to the lips. Lip serums contain smaller molecules when compared to lip oils which helps to penetrate deeper into the skin. The projects aim to formulate a Herbal lip serum with SPF that provides protection from sunlight, heals sunburn, and prevents *Actinic cheilitis*. The objective of the project was to formulate a multifunctional lip product that provides protection, hydration, and healing effect.

The Herbal lip serum with SPF was prepared by using carrot seed oil, coconut oil and other ingredients in specific quantity. The formulation was prepared by incorporating Carrot seed oil and Coconut oil into melted shea butter and beeswax and is stabilized by vitamin E. Five formulations (F1-F5) was prepared with varying concentrations of ingredients The formulations were evaluated for organoleptic properties, SPF, pH, irritancy and spreadability to ensure product quality and consistency. The formulation F4 was found to be the best among the five preparations as it showed greater consistency, SPF, and homogeneity. The results demonstrated the successful development of a Lip serum with sun protection, uniform brown tint, smooth texture, ideal pH and good spreadability. The findings suggest that the developed Lip serum to be a stable, safe, and effective lip care product which can deliver multiple benefits. The formulation successfully meets the intended objectives, providing moisturization, soothing, sun protection and healing

effect, making it suitable for diverse lip types. The developed formulation holds promise as a natural, effective, and high-quality addition to lip care routines, which can be used both day and night and whenever required. Further higher studies are required to explore the efficacy and safety of this formulation in larger population.

INTRODUCTION

Lips are the prominent part of the body. They lack the natural sun protecting agent melanin. Hence its important to protect them from UV rays. Due to the UV rays UVA & UVB, lips get dry and dehydrated leading to sunburn, cracking and skin peeling.

Herbal Lip Serum with SPF helps in protection from UV rays along with hydration, healing, and beautification. The main ingredient used is Carrot seed oil along with zinc oxide which provide the SPF protection. The antioxidants present in carrot seed oil helps to provide a shield against the UV rays. The coconut oil provides healing effect along with a shine to the lips.

A lip serum is an advanced lip care product formulated to deliver deep hydration, nourishment. It can also be used beneficial against the lip oils. Studies conclude that lip oils act only as a barrier to lips. They can cause damage to already dry and chapped lips. Lip Serum contains more concentrated active ingredients that aims at treating specific lip concerns, such as healing, fine lines, or intense hydration needs.

MATERIALS USED

MATERIALS
Zinc oxide
Undiluted Carrot Seed Oil
Coconut oil
Shea Butter
Beeswax (Cosmetic grade)
Vitamin E
Aloe Vera Gel
Essential Oil
Iron oxide Brown

INGREDIENTS USED

INGREDIENTS	BIOLOGICAL SOURCE	CHEMICAL CONSTITUENTS	USES
Carrot seed oil	Obtained from the dried seeds of the wild carrot plant, Daucus carota.	Carotol, Carotenoids, Limonene, Camphene	Anti-inflammatory, Anti-oxidant, Anti- bacterial, Skincare& Cosmetic purpose.
Coconut oil	Obtained from stone fruit of the coconut tree (cocos nucifera)	Lauric acid, Myristic acid, Palmitic acid, Oleic acid, Stearic acid.	Anti-bacterial, Deep moisturization, Anti-aging effect.
Shea butter	Obtained from shea tree, Vitellaria paradoxa	Triglycerides, Vitamin A and E, Fatty acid , Cinnamic acid.	Skin irritation treatment, Contact dermatitis, Greasiness.

INGREDIENTS	BIOLOGICAL SOURCE	CHEMICAL CONSTITUENTS	USES
Aloe vera	Obtained from the dried juice of the leaves of Aloe Barbadensis Miller	Anthracene glycosides, Barbaloin, Resins, Iso barbaloin	Anti inflammatory, Anti oxidant, Wound healing
Zinc oxide	Obtained from natural zinc ore	Zinc, Oxygen	Anti-aging, Anti-microbial, Wound healing, Protection from sun damage
Bees wax	Obtained from the honey comb of bees Apis mellifera	Ceresin, Palmitic acid, Oleic acid, Cetyl alcohol, Vitamin E	Preparation of ointments, Candles, Lipstick, Lip balms

RELEVANCE

The lips are a prominent feature of the facial area, making them continuously exposed to external factors such as sunlight, wind, harsh weather conditions, and dental treatments. Since lips lack the natural sun protecting agent melanin. So, it is important to provide an external source to protect them from sunlight. Rapid cell renewal occurs in the lip's stratum corneum which leads to immature corneocytes to get exposed on the skin surface leading to transpire more water from the lips. This causes dryness and roughness on the skin. Therefore, cosmetic products designed for lip care are an excellent solution to prevent dryness and roughness.

In recent years, there has been an increasing demand for the development of more natural cosmetic products. People started preferring natural products as cosmetics realizing their benefits. Lip oils are available in the market. However, studies have concluded that lip oils do not hydrate the lips; they only act as a barrier. If your lips are dry and dehydrated beneath the surface, they are likely to remain that way. Simply applying oil on top may, over time, worsen dry, cracked skin. A lip serum penetrates deeper than a balm or gloss, delivering nourishing ingredients to the areas where they are most effective. Lip Serum often contains more concentrated active ingredients that aims at treating specific lip concerns, such as healing, fine lines, or intense hydration needs.

Sunlight can cause the lips, particularly the lower lip, to become tough and dry. Individual aged 45 and older, as well as those with fair skin who have experienced significant sun exposure, are particularly vulnerable to the effects of sun damage. Prolonged exposure to sunlight can lead to the development of precancerous lesions known as actinic keratoses. Sun damaged lips may exhibit dryness and a scaly texture, resembling sandpaper. These alterations are classified as precancerous, especially when the lip surface becomes thinner, exhibits redness, and forms sores (ulcers). It is advisable for individuals with these symptoms to seek evaluation from a medical professional or dental practitioner. Keratoacanthomas are neoplastic lesions of the skin that certain specialists classify as a variant of skin cancer. These growths predominantly manifest on areas of the skin that have been exposed to sunlight. Sun damage to the lips can be effectively minimized by applying a lip balm or lip serum that includes sunscreen and by donning a wide-brimmed hat to protect the face from the detrimental effects of the sun rays.

Sunburned lips may exhibit symptoms such as redness, swelling, tenderness, and the formation of blisters. Additionally, individuals who are susceptible to them may experience the onset of cold sores and fever blisters because of sunburned lips. Another condition linked to sunlight is premature aging, which occurs when UV radiation breaks down collagen and elastin, leading to the development of wrinkles, fine lines, and a reduction in skin volume. Chronic dryness of the lips, particularly following sunburn, can result in a parched and cracked condition. This may cause discomfort and elevate the likelihood of infections.

AIM

The aim of the study is to formulate and evaluate a Lip serum with SPF containing carrot seed oil as the active ingredient.

OBJECTIVES

The objectives of the study were the following:

- To understand the importance of lip protection from UV rays.
- To conduct the review of literature.
- To conduct pre formulation studies.
- To collect materials.
- To formulate 5 different formulations by varying the concentration of ingredients.
- To conduct the study of SPF property of the formulation.
- To conduct the evaluation process of the formulation.
- To find out the best formulation from the product obtained by evaluation parameters.

PREFORMULATION STUDY OF DRUG AND EXCIPIENTS

Preformulation studies are laboratory investigations conducted to assess the properties of active substances and excipients, ensuring the formulation is stable, effective, and safe.

A brief preformulation study was conducted to understand the following:

- Predicting drug performance: predict how a drug will interact with excipients and how it will be processed during manufacturing.
- Optimizing manufacturing: help to determine the best manufacturing method for producing the drug.
- Physical and chemical stabilities and incompatibilities of the formulation.

SOLUBILITY

The solubility of excipients and active ingredients were carried out using water, ethanol, and n-hexane in room temperature and at 75^0C to find out any solubility issues, crystal growth etc.

EFFECT OF LIGHT

Exposure to light can affect the stability and efficiency of the formulation and can cause degradation of certain substance. Ingredients were subjected to natural day light at room temperature for a fixed period, to check whether the presence of light has any effect on the stability and efficiency of the compound.

HYGROSCOPICITY

Hygroscopicity is the property of a substance or ingredient that enables it to absorb moisture from the surrounding air upon exposure. Hygroscopic materials retain water content by surface adsorption or capillary condensation which can affect the stability of the drug and formulation. To detect the hygroscopicity the solid ingredients were kept at room temperature for a fixed period.

PREPARATION OF HERBAL LIP SERUM WITH SPF

- The required amount of beeswax and shea butter was placed in a beaker, melted in a water bath, and simmered.
- To this carrot seed oil and coconut oil is added and left to simmer.
- The beaker was removed from the water bath and zinc oxide was added little by little by continuous stirring without foam formation.
- To this colouring agent was added and stirred continuously.
- The mixture was left undisturbed to let them cool.
- To the cool mixture aloe vera gel was added.
- One capsule of Vit E and few drops of essential oil was mixed to the final product.
- The lip serum obtained was transferred to a container and labelled.

MASTER FORMULA

Composition of serum formulation	F1	F2	F3	F4	F5
Zinc oxide	0.5g	0.3g	0.5g	0.5g	0.5g
Undiluted carrot seed oil	7ml	6ml	6ml	7ml	6ml
Coconut oil	5ml	6ml	6ml	5ml	7ml
Shea butter	3g	0.5g	1g	1.5g	2g
Bees wax (cosmetic grade)	0.5g	0.5g	0.5g	0.5g	0.5g
Vitamin E capsule	2	3	1	1	1
Aloe vera gel	2ml	3ml	2ml	2ml	2ml
Essential oil	1drop	1drop	1drop	1drop	1drop
Coloring agent	0.2g	0.2g	0.2g	0.2g	0.2g

EVALUATION OF LIP SERUM FORMULATION

1. ORGANOLEPTIC PROPERTIES

All prepared formulations were evaluated for its organoleptic properties for its color, odor, texture., appearance and consistency

The prepared lip serum formula was examined for their appearance and consistency by a visual inspection and the formulas were observed for their smooth and consistent texture. Visual inspection was carried out to ensure the uniformity of color, texture and free from any foreign particles.

2. HOMOGENEITY

The homogeneity and consistency of the formulations was characterized by evaluating the physical appearance of the prepared formulations.

3. SPREADABILITY

The spreadability of the lip serum was assessed using the glass slide method. A 1cm diameter circle was marked at the center of a glass slide, and 0.5g of lip serum was placed inside the circle. Another glass slide was then placed on top of the first, creating a sandwich arrangement. A 500g weight was placed on the upper slide and left for 5 minutes. After this time, the weight was removed, and the increase in diameter was measured three times to calculate the average diameter.

$$S=d^2 \times \pi/4$$

Where, S =Spreading area depending on mass (mm^2)

d=spreading area diameter (mm)

4. IRRITANCY TEST

The prepared lip serum formulation was applied on the hairless soft area of hand and evaluated for irritation on applied area within 24 hours after application.

5. VISCOSITY

The viscosity of the prepared formulations was measured using a Brookfield viscometer. The lip serum was rotated at a speed of 100 rotations per minute using spindle LV61. The corresponding dial was recorded.

6. pH MEASUREMENT

The pH meter was first calibrated using a standard buffer solution. Then, 0.5g of lip serum was accurately weighed and dissolved in 50ml of distilled water. Afterward, the calibrated pH meter was used to measure the pH of the lip serum.

7. DETERMINATION OF SPF

SPF of formulated lip serum were calculated by the application of Mansur equation.

Instruments

The instrument used was a Shimadzu 1700 UV spectrophotometer with 1cm matched quartz cells for all measurements. A digital analytical balance and ultrasonic sonicator were used in the study. The validated pipette, volumetric flask, and beakers were made up of borosil glass.

Sample preparation

1.0g of each sample was weighed and placed into a 100ml volumetric flask. To this n-Hexane is added and subjected to ultrasonic treatment for 5 minutes. The mixture was filtered using cotton and discarded the first 10ml. A 5ml was then transferred into a 50ml volumetric flask and diluted with n-hexane. Similarly, a 5ml was transferred into a 25ml volumetric flask and diluted using n-hexane. The absorbance of each aliquot was measured from 290-320 nm at 5nm intervals, with n-hexane as a blank. The absorbance values were recorded three times at each point, and the measurements were processed using Mansur's equation (Mansur et al., 1986).

$$SPF = CF \sum_{290}^{320} EE(\lambda) \times I(\lambda) Abs(c)$$

Were,

CF= correction factor

EE[λ] = Erythemal effect spectrum

Abs[λ] = Absorbance of product

EE values are constant

The prepared solution was scanned between 290-320 nm, and the absorbance values obtained were multiplied by the corresponding EE and I value. The results were then summed and multiplied by the correction factor (10).

RESULTS AND DISCUSSION

Five Lip serum formulations (F1 – F5) were prepared using varying concentrations of ingredients.

PREFORMULATION STUDIES – OUTCOMES

1. **SOLUBILITY**
   - Carrot seed oil was soluble in coconut oil and beeswax
   - Zinc oxide was soluble in shea butter and insoluble in water.
   - The final product was soluble in n-hexane.
2. **EFFECT OF LIGHT**
   - It was found that the presence of light has no effect on the stability of the ingredients for a predetermined period of time.
3. **HYGROSCOPICITY**
   - Zinc oxide is a white solid that has hygroscopic properties.

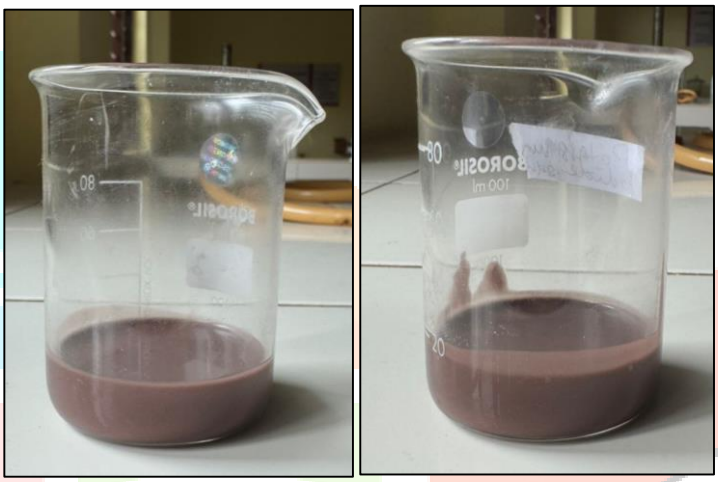
EVALUATION- RESULTS

1. **ORGANOLEPTIC PROPERTIES**

All the prepared formulations were evaluated for organoleptic properties. Color, odour, consistency, and texture of all five formulation was examined physically.

PARAMETER	F1	F2	F3	F4	F5
COLOUR	Brown	Brown	Brown	Brown	Brown
ODOUR	Pleasant	Pleasant	Pleasant	Pleasant	Pleasant
CONSISTENCY	Very thick	Watery	Thick	Light gel like	Creamy
TEXTURE	Smooth	Smooth	Smooth	Smooth	Smooth

F1 F2 F3



F4 F5

2. HOMOGENITY

The five formulations developed were homogenous which was characterized by evenly distributed color, phase separation and absence of lumps or coarse particles in the lip serum.

PARAMETER	F1	F2	F3	F4	F5
HOMOGENITY	Satisfactory	Poor	Fair	Excellent	Good

3. SPREADABILITY

All five formulations were tested for spreadability. In this test, the area covered by a fixed amount of serum sample was measured after the sample was evenly spread on a glass slide.

PARAMETER	F1	F2	F3	F4	F5
SPREADABILITY (mm^2)	3115	2920	2640	4775	2289

4. IRRITANCY TEST

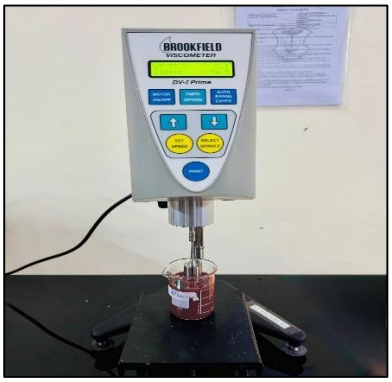
The prepared serum formulations show no redness, edema, rashes, inflammation, and irritation within 24 hours after application. The absence of irritation or allergic reactions concludes that the prepared serum formulations are safe to use on lips.

PARAMETER	F1	F2	F3	F4	F5
IRRITANCY	NIL	NIL	NIL	NIL	NIL

5. VISCOSITY

Viscosity of the prepared formulations was evaluated with Brookfield viscometer. The lip serum was rotated at 100 rotations per minute and the corresponding dial reading are as follows:

PARAMETER	F1	F2	F3	F4	F5
VISCOSITY (cP)	50.5	16.1	40	33.9	28



6. pH

The pH of all cosmetic preparations should be optimal to ensure the stability and safety of the formulation on application on to the skin. The preparation should impart no irritation to the lips after application. All the prepared formulations were tested for their pH.

The readings from the pH meter were found to be in between range 4.0 and 6.0 which indicate that the preparation is suitable for application on to the lips as it is compatible with the lips pH.

PARAMETER	F1	F2	F3	F4	F5
PH	4	4.6	5.2	4.3	5.6

7. SPF DETERMINATION

SPF determination of the formulated Lip serum was done by taking N- hexane as a diluent. The samples were scanned in 290-320 nm range and SPF values of all the five formulations are represented.

SPF value for F1(Formulation 1)

Wavelength (nm)	EE× I	Dilution with n-hexane (Abs)	Abs× EE× I
290	0.015	0.1832	0.0027
295	0.082	0.1621	0.0132
300	0.287	0.1201	0.0344
305	0.328	0.1048	0.0343
310	0.186	0.0734	0.0136
315	0.084	0.0428	0.0035

320	0.018	0.0413	0.0007
TOTAL			0.1024
SPF			1.024

SPF value for F2 (Formulation 2)

Wavelength (nm)	EE× I	Dilution with n-hexane (Abs)	Abs× EE× I
290	0.015	1.1031	0.0165
295	0.082	1.1011	0.0902
300	0.287	0.0918	0.0263
305	0.328	0.0813	0.0266
310	0.186	0.0612	0.0113
315	0.084	0.0411	0.0034
320	0.018	0.0400	0.0007
TOTAL			0.1750
SPF			1.750

SPF value for F3 (Formulation 3)

Wavelength (nm)	EE× I	Dilution with n-hexane (Abs)	Abs× EE× I
290	0.015	0.1811	0.027
295	0.082	0.1513	0.012
300	0.287	0.1492	0.042
305	0.328	0.0789	0.025
310	0.186	0.0642	0.011
315	0.084	0.0496	0.004
320	0.018	0.0351	0.006
TOTAL			0.1247
SPF			1.247

SPF value for F4 (Formulation 4)

Wavelength (nm)	EE× I	Dilution with n-hexane (Abs)	Abs× EE× I
290	0.015	0.524	0.00786
295	0.082	0.452	0.03706
300	0.287	0.391	0.11221
305	0.328	0.325	0.10660
310	0.186	0.228	0.04240
315	0.084	0.144	0.01209
320	0.018	0.075	0.00135
TOTAL			0.31957
SPF			3.1957

SPF value for F5 (Formulation 5)

Wavelength (nm)	EE× I	Dilution with n-hexane (Abs)	Abs× EE× I
290	0.015	0.1154	0.0017
295	0.082	0.1201	0.0098
300	0.287	0.1036	0.0297
305	0.328	0.0788	0.0258
310	0.186	0.0851	0.0158
315	0.084	0.0682	0.0057
320	0.018	0.0409	0.0007
TOTAL			0.0892
SPF			0.892

PARAMETER	F1	F2	F3	F4	F5
SPF	1.024	1.750	1.247	3.1957	0.892

The SPF is a quantitative measure of the effectiveness of the lip serum formulation in preventing sunburn and other skin damage. A lip serum with SPF should have broad absorbance between 290-320 nm. SPF determination was carried out using the UV spectrophotometric method along with Mansur's equation.

The SPF values indicate all the formulations having good UV absorbing properties in which formulation 4 is comparatively better.

SUMMARY & CONCLUSION

The combination of Carrot seed oil (Daucus carota), Coconut oil (Cocos nucifera), Zinc oxide (zinc oxide), Shea butter (vitellaria paradoxa), Bees wax (cera alba) and Vitamin E capsule oil in an herbal lip serum holds tremendous potential in the field of cosmetics. The aim of the present study is fabrication & characterization of herbal lip serum composed of carrot seed oil, coconut oil, zinc oxide, beeswax, shea butter & vitamin E oil. The lip serum was formulated by melting beeswax and shea butter by using beaker in a water bath. To this add carrot seed oil, coconut oil and zinc oxide to get a homogenous mixture. Five formulation F1, F2, F3, F4 & F5 were prepared by varying the concentration of coconut oil, zinc oxide, shea butter and Bees wax. The formulated serum was made to undergo a series of evaluation studies such as organoleptic properties, homogeneity, spread ability, SPF determination, short term stability study, irritancy test, pH measurement and viscosity. Based on the data obtained from evaluation studies it was found that formulation F4 was the best among the five as it showed great consistency, SPF, and homogeneity during the whole period of study. It's pH, consistency and spread ability were also in the ideal range. The herbal lip serum thus formulated was found to be stable and efficacious, easy to apply and gives a moisturizing effect and UV protection. It helps to get rid of pigmented, chapped lips and provides shining appearance. Since the method adopted for the study was simple and economic, this method may possess industrial scalability.

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