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Research Article

Formulation and Evaluation of Lipbalm

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ABSTRACT

The development of an SPF lip balm as a protective measure against UV radiation is crucial for preventing skin damage, particularly on the delicate lips, which are especially vulnerable to UV-induced harm. UV radiation can cause conditions such as sunburn, premature aging, and an increased risk of skin cancer over time. Given the thinner and more sensitive skin of the lips, the need for a lip balm with adequate sun protection factor (SPF) is essential to shield against these detrimental effects. This study aims to develop a lip balm infused with SPF properties, utilizing natural ingredients. Carica papaya, a plant with proven therapeutic potential and abundant in the Kasargod district of Kerala, India, was selected for its phytochemical profile, which includes flavonoids known for their antioxidant and photoprotective properties. These flavonoids are effective at neutralizing free radicals and are believed to absorb UV radiation, preventing cellular damage. The successful extraction and analysis of papaya's flavonoid content confirm its potential as a natural agent for the formulation of a sunscreen lip balm. This research highlights the promising role of Carica papaya in developing a lip balm that provides effective sun protection, contributing to skin health and offering a natural alternative to chemical-based sunscreens.

INTRODUCTION

Lip balm is a cosmetic product designed to moisturize, soothe, and protect the lips. It is typically applied to prevent dryness, chapping, or irritation caused by environmental factors like wind, cold, or sun exposure. Lip balms typically contain ingredients such as beeswax, shea butter, petroleum jelly, or natural oils, which form a protective layer on the lips to retain moisture and protect against dryness. Some lip balms also contain additional benefits, such as SPF for sun protection, or flavoring and tint for added appeal. There are various types of lip balms available, catering to different needs and preferences. Here are some common types:

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1. Moisturizing Lip Balms

These lip balms focus on hydrating and softening dry, chapped lips. They often contain ingredients like beeswax, coconut oil, shea butter, and vitamin E.

2. Medicated Lip Balms

These lip balms are designed to provide relief from dry, chapped, or cracked lips. They may contain ingredients like menthol, camphor, or phenol.

3. SPF Lip Balms

These lip balms offer protection against the sun's UV rays, helping to prevent sunburn and skin damage. They often contain ingredients like zinc oxide or titanium dioxide.

4. Tinted Lip Balms

These lip balms provide a subtle wash of color while moisturizing and protecting the lips. They come in various shades and finishes.

5. Natural and Organic Lip Balms

These lip balms are made with natural ingredients, such as essential oils, herbs, and plant extracts. They often appeal to those seeking a more organic approach to lip care.

6.Flavored Lip Balms

These lip balms come in various flavors, such as mint, fruit, or sweet flavors. They can add a fun twist to lip care.

Advantages of lip balm:

- Sun Protection: The primary benefit of SPF lip balm is its ability to protect your lips from the harmful effects of UV rays, reducing the risk of sunburn, dryness, and irritation caused by sun exposure.
- Prevents Premature Aging: Just like the skin on the rest of your face, your lips are susceptible to wrinkles and fine lines due to sun damage. SPF lip balm helps protect against these signs of aging by shielding the lips from UV rays.
- Reduces the Risk of Skin Cancer: Prolonged exposure to UV rays can increase the risk of skin cancer, including on the lips. Using SPF lip balm helps lower this risk by providing a layer of protection.
- Hydrates and Soothes: Many SPF lip balms contain moisturizing ingredients like shea butter or coconut oil, helping to keep lips hydrated and soft while protecting them from the sun.
- Prevents Chapping: The sun can cause lips to become dry and cracked. SPF lip balm keeps your lips smooth and healthy by moisturizing and providing a protective barrier.
- Convenient Protection: Lip balms are easy to carry and apply, making it simple to reapply.

MATERIAL AND METHODS

List of Materials, Instruments and Equipments:

Table no:1 Plant material used for the development of formulation

Sr. No	Botanical Name	Verniar Name	Source/ Supplier
1	Caricapapaya	papaya	Kanhangad

Table no: 2 Ingredients used for the development of formulation

Sr. No	Material/ Solvent	Manufacture/ Supplier
1	Beeswax	Burgoyne Burbidges & Co, Mumbai
2	Cocoa butter	Minimal Confection, Surat
3	Almond oil	Research Lab Fine Chem Industries, Mumbai
4	Coconut oil	Marico, marico Ltd palaym
5	Vitamin E	Procter & Gamble Hygiene and Healthcare Ltd

6	Glycerin	Medlise Chemicals Kannur
7	Rose oil	Burgoyne Burbidges & Co, Mumbai
8	colourant	Purenso Global Indore

Table no:3 Equipments used for the formulation

Sr. No	Equipment	Supplier/ Manufactuer
1	Digital weighing balance	K-Roy, Pentacsolution
2	Digital pH meter	Labtronics Model-LT-10, Pentacsolution
3	Hot air oven	Rotek, Pentac solution

Materials used

CARICA PAPAYA

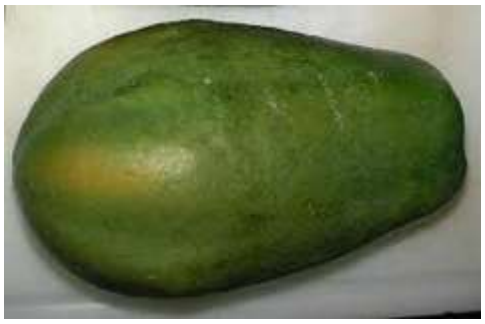


Figure1: carica papaya fruit

Biological source:

Papain is the dried and purified latex of green fruit and leaves of carica papaya .linn of family Caricaceae

Medicinal uses

- Antioxidant effect
- Anticancer property
- Improve heart health
- Anti-inflammatory
- Improve digestion
- Protect against skin damage
- Anti-aging

ALMONOIL:

Figure2 : Almond oil

Biological Source:

Almond oil is a fixed oil obtained by expression from the seeds of Prunus amygdalus (Rosaceae) var. dulcis (sweet almonds) or P. amygdalus var. amara (bitter almonds).

Uses:

- Increased health health
- Anti-inflammatory
- Reverse sun damage
- Moisturising
- Rejuvenate

COCONUT OIL:

Figure3:coconut oil

Biological source:

Coconut oil is the oil expressed from the dried solid part of endosperm of coconut, Cocos nucifera L. belonging to family Palmae .

Uses:

- Intense Hydration
- Protective barrier

- Healing Properties
- Antibacterial Benefits

BEES WAX:

Figure4:beeswax

Biological source:

Beeswax is the purified wax obtained from honeycomb of hivebee , Apis mellifera Linn and other species of Apis, belonging to family Apidae.

Uses:

- Hydrates chapped lips
- Protective barrier
- Soothing effect
- Anti-inflammatory
- Moisturizing

CACOA OLEUM (COCOA BUTTER):

Figure 5:cocoa oleum

Biological source:

It is obtained from roasted seeds of Theobroma cacao Linn., belonging to family Sterculiaceae.

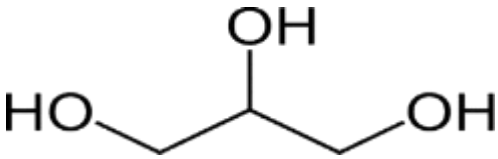
Uses:

- Hydrates
- Protects
- Nourishes
- Antioxidants

GLYCERIN:

Figure no.6.Glycerine

Chemical structure:



Uses:

- Moisturizer
- Skin lightening
- Deep moisturization
- Potential to improve lip appearance
- Treatment for chapped lips

VITAMIN E

Figure.no.7.vitaminE

Uses:

- Antioxidant Protection
- Prevention of Rancidity
- Enhancing the Shelf Life
- Maintaining Consistency
- Healing and Repair

ROSE OIL :

Figure8:rose oil

Uses:

- Nourishes dry and chapped lips
- Perfuming agent
- Restore moisture
- Keep your lips soft and supplement

METHODS

PREPARATION OF PAPAYA JUICE

The sample used was papaya fruit by hand picking. samples obtained as much as 500 gm. The collected samples were then cleaned of dirt, then peeled, set aside the papaya seeds and washed with clean water then cut into pieces, then blended, after that filtered using a filter cloth and obtained papaya juice as much as 225 ml.

PRE-FOMULATION EVALUAION

Test for flavonoids :

A total of 1ml of papaya juice was put into a test tube, then 2 drops of ethanol were added, then shake until homogeneous, then 0.1 mg of magnesium powder, 2 drops of concentrated HCL were added. A yellow, orange or red color is formed, then papaya juice contains flavonoid compound.

Test for tannins :

1 ml of papaya juice was put into a test tube then added 2 drops of FeCl3 10%. If the solution is green ,purple, blue or black, then papaya juice is positive for tannins.

Test for saponins :

A total of 1 ml of papaya juice was put into a test tube then added 10 ml of hot water then cooled and shaken for 10 seconds. After shaking, if the solution causes foam as high as 1- 10 cm for not less than 10 minutes and then drops of 2NHCL, the foam does not disappear, then papaya juice is positive for saponins.

3. Preparation of SPF lip balm

Table no: 4 Formula of composition of SPF lipbalm

Sr.No	Ingredients	F0	F1	F2	F3
1	Papaya pulp juice	___	5ml	7.5ml	10ml
2	Almond oil	1.5ml	1.5ml	1.5ml	1.5ml
3	Coconut oil	1.5ml	1.5ml	1.5ml	1.5ml
4	Beeswax	3g	3g	3g	3g
5	Cocao oleum	3g	3g	3g	3g
7	Glycerin	1.5ml	1.5ml	1.5ml	1.5ml
8	Vitamin E	0.015ml	0.015ml	0.015ml	0.015ml
9	Rose oil	3-4drops	3-4drops	3-4drops	3-4drops
10	Colourant	Qs	Qs	Qs	Qs

PROCEDURE:

Weigh the beeswax and cocoa oleum (mass1). Place them in a China dish. Set the China dish in a

water bath and melt the beeswax and cocoa oleum together at 65-70°C. In another dish, combine the papaya pulp juice, almond oil, coconut oil, glycerine , and vitamin E (mass2).Gently heat the oils to ensure they melt and blend together. Once both Mass 1 (beeswax and cocoa oleum) and Mass 2 (oils and glycerine) are fully melted, slowly add Mass 2 to Mass 1. Stir well until the mixture becomes homogeneous and all ingredients are fully incorporated. Then add colourant to the mixture and stir until it evenly distributed. Add a few drops of rose oil for fragranc and mix thoroughly. Carefully pour the final mixture into the moulds .Allow the mixture to cool and set at room temperature. Once the product has set and solidified, remove it from the moulds.

EVALUATIONOFLIPBALM

Physical evaluation:

Physical parameters such as color, odor, appearance and dosage form are evaluated.

Phytochemical screening

Test for flavonoids :

A small amount of sample was put into a test tube, then 2 drops of ethanol were added, then shaken until homogeneous, then 0.1mg of magnesium powder, 2 drops of concentrated HCL were added. A yellow, orange or red color is formed, then sample contains flavonoid compound.

Test for tannins :

To the sample add 2 drops of FeCl3 10%. If the solution is green, purple, blue or black , then sample is positive for taninns.

Test for saponins :

Sample was taken in a test tube then added 10 ml of hot water then cooled and shaken for 10 seconds. After shaking ,if the solution causes foam as high as1-10 cm for not less than 10 minutes and then drops of 2N HCl, the foam does not disappear, then sample is positive for saponins.

pH test :

To test the pH of lip balm using a pH meter, take a small sample of the lip balm, dissolve it in a small amount of distilled water, then carefully insert the pH meter electrode into the solution and read the displayed pH value

Melting point :

To check the melting point, the material was made melted to fill capillaries .The temperature at which melting of the lip balm sample was observed was considered the melting point.

Spreadability:

Spreadability is determined using a slide. The formulation is sandwiched between two slides and a load is applied; the recipe has been spread on the slides .Visual observations were made regarding the uniformity of the layer formation.

Homogenity test:

Homogeneity test was carried out using an glass slide. A number of samples were smeared on a slide then closed and pressed with another slide, then observed the homogeneity of the sample which did not show any coarse grains from the preparation.

Determination of SPF

Lipbalm preparation I is weighed as much as 1g. Each lipbalm was transferred to a 100 ml volumetric flask and then diluted with 70%

ethanol then filtered with filter paper. A total of 5ml of the solution was pipetted, put into a 25 ml volumetric flask, then diluted with 70% ethanol after which the samples were ready to be analyzed to determine the SPF value for sample using UV-Visible spectrophotometer measured in the wavelength range of 290-320 nm with 5 nm intervals.

SPF=CF×∑EE(ƛ)×I(ƛ) ×A(ƛ)

Description:

EE = Erythemal effect spectrum I=Intensity of the light spectrum A=Absorption of sunscreen products CF = correction factor

RESULTS

Pre-formulation evaluation:

SL NO	Test	Observation	Results	Inference
1	Test for flavonoids	The solution turns yellow		Presence of flavonoids
2	Test for tannins	The solution does not give green, blue or black		Absence of tannins
3	Test for saponins	The foam does not disappear		Presence of saponins

Physical Evaluation :

Sr. No	Formulation	F0	F1	F2	F3
1	Color	Maroon	Maroon	Maroon	Maroon
2	Appearance	smooth	smooth	smooth	Presence of Gritty particles

Analytical evaluation:

TEST	F0	F1	F2	F3
pH	4.5	5.06	5.22	5
Melting point	63^0C	62^0C	64^0C	59^0C
Homogenity	Good	Good	Good	Presence of lumps
Spreadability	10.5g.cm/sec	10.9g.cm/sec	11.8g.cm/sec	11g.cm/sec

Determination of SPF

Tableno10: Determination of SPF

Wavelength	EE×I	F0		F1		F2		F3	
		Abs	EE×I×Abs	Abs	EE×I×Abs	Abs	EE×I×Abs	Abs	EE×I×Abs
290	0.015	0.139	0.0020	0.947	0.0142	1.0413	0.0156	1.843	0.02764
295	0.0817	0.158	0.0129	0.770	0.0629	1.735	0.1417	1.448	0.1183
300	0.2874	0.171	0.0491	0.720	0.2069	1.205	0.3463	0.837	0.2405
305	0.3274	0.181	0.0592	0.679	0.2225	1.925	0.6310	1.423	0.4665
310	0.1864	0.179	0.0333	0.696	0.1297	0.872	0.1625	0.872	0.1625
315	0.0834	0.178	0.0148	0.502	0.0418	1.042	0.0874	1.205	0.1009
320	0.0180	0.167	0.003	0.357	0.0064	0.635	0.0114	1.294	0.0233
		Total:0.1713		Total:0.6844		Total:1.3961		Total:1.139	
		SPF:1.713		SPF:6.844		SPF:13.961		SPF:11.39	

DISCUSSION

The development of an SPF lip balm as a protective measure against UV radiation is a critical area of research, given the harmful effects of sun exposure on skin health, particularly the delicate skin of the lips. UV radiation is known to cause skin damage, leading to conditions like sunburn, premature aging, and ,in the long term, an increased risk of skin cancer. The lips, due to their thinner and more sensitive skin, are especially vulnerable to UV-induced damage. Thus, creating a lip balm with adequate sun protection factor (SPF) can play a pivotal role in preventing such damage.

In the present study, the primary focus was to formulate a lipbalm enriched with SPF properties using natural ingredients. The plant Carica papaya was selected due to its proven therapeutic potential and its availability in the Kasaragod district of Kerala, India. The selection of this plant was based on its phytochemical profile, which includes flavonoids—compounds known for their antioxidant properties. These flavonoids are not only effective at neutralizing free radicals but are also believed to offer photo protective effects by absorbing UV radiation and preventing cellular damage. The successful extraction and analysis of papaya's flavonoid content confirm its suitability as a natural agent for formulating a sunscreen lip balm.

The formulation of the lip balm involved using different concentrations of papaya extract and combining them with other excipients to form stable and effective dosage forms. The lip balm was developed in four different formulations (F0,F1,F2,andF3), and various evaluations were performed on these formulations to determine their suitability as effective sun protection products.

Among the four formulations, F2 emerged as the most promising candidate based on its stability, SPF value, and overall performance. The pH of the formulation was found to be 5.2, which is within the acceptable range for the lips, ensuring that it is non-irritating and safe for use shown in table.no.6.

The melting point of the lipbalm, measured at 64°C, was within the normal range, indicating a good balance between texture and stability shown in table.no.7. Moreover, the spreadability of the F2 formulation was excellent at both room temperature and when refrigerated, making it practical for daily use.

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