

Formulation And Evaluation for Herbal Sunscreen Cream

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Abstract—Herbal sunscreens are gaining popularity due to their safety, biocompatibility, and eco-friendly nature compared to synthetic sunscreens. The present review focuses on the formulation and evaluation of an herbal sunscreen cream containing avocado oil, neem extract, and aloe vera. These natural ingredients possess antioxidant, anti-inflammatory, and UV-protective properties. The formulation was prepared using standard emulsification techniques and evaluated for physicochemical parameters such as pH, spreadability, viscosity, stability, and sun protection factor (SPF). The results indicated that the formulation exhibited good stability, skin compatibility, and an SPF value of approximately 30, demonstrating effective protection against harmful UV radiation. This review highlights the potential of herbal ingredients in developing safe and effective sunscreen formulations.

I. INTRODUCTION

Exposure to ultraviolet (UV) radiation leads to various harmful effects on the skin, including sunburn, premature aging, and skin cancer. Sunscreens are topical formulations designed to protect the skin by absorbing, reflecting, or scattering UV radiation.

However, synthetic sunscreens may cause skin irritation, allergic reactions, and environmental concerns. Herbal sunscreens offer a safer alternative due to their natural origin and therapeutic benefits.

Avocado oil:

Rich in vitamins A, D, and E; provides moisturization and UV protection

Neem extract:

Exhibits antibacterial, antifungal, and anti-inflammatory properties

Aloe vera:

Known for soothing, hydrating, and healing effects

These ingredients collectively enhance the effectiveness of herbal sunscreen formulations.

II. LITERATURE SURVEY

1. Narayanan DL, Saladi RN, Fox JL 2010

Ultraviolet (UV) radiation is classified into UVA (320–400 nm), UVB (290–320 nm), and UVC (100–290 nm). UVA penetrates deeper into the dermis causing premature aging, while UVB affects the epidermis leading to sunburn and DNA damage. Prolonged exposure results in oxidative stress, immune suppression, and increased risk of skin cancer.

2. Jangde R, Daharwal S J. 2011

Herbal sunscreens contain plant-based bioactive compounds such as flavonoids, tannins, and phenolic acids that exhibit natural UV absorption and antioxidant properties. These compounds reduce free radical formation and protect skin cells from photodamage.

3. Hughes MC, Williams GM, Baker P, Green AC. 2013

Regular use of sunscreen has been shown to significantly reduce signs of photoaging such as wrinkles, pigmentation, and loss of skin elasticity by preventing collagen degradation caused by UV exposure.

4. Dreher ML, Davenport AJ. 2013.

Avocado oil contains oleic acid, linoleic acid, and vitamins A, D, and E, which enhance skin penetration and provide deep moisturization. It also exhibits antioxidant activity, helping to neutralize free radicals generated by UV radiation.

5. Biswas K, Chattopadhyay I, Banerjee RK, Bandyopadhyay U. 2002.

Neem contains bioactive compounds such as nimbin, azadirachtin, and quercetin which possess antimicrobial, anti-inflammatory, and antioxidant properties. These help in preventing skin infections and reducing inflammation caused by sun exposure.

6. Surjushe A, Vasani R, Siple DG. 2008.

Aloe vera contains polysaccharides, glycoproteins, and vitamins that promote wound healing and hydration. It helps in soothing sunburn, reducing erythema, and improving skin repair mechanisms.

7. Serpone N, Dondi D, Albini A. 2007.

Zinc oxide acts as a physical sunscreen by reflecting and scattering both UVA and UVB radiation. It is photostable, non-toxic, and suitable for sensitive skin.

8. Ashawat MS, Saraf S, Saraf S. 2007.

Herbal formulations showed good physicochemical stability, antioxidant activity, and skin compatibility, making them suitable alternatives to synthetic cosmetics.

III. AIM AND OBJECTIVE

Aim: formulate and evaluate an herbal sunscreen cream using natural ingredients such as avocado oil, neem extract.

Objective:

- To develop a stable herbal sunscreen formulation
- To evaluate physicochemical properties
- To determine SPF value
- To ensure safety and skin compatibility
- To promote herbal alternatives over synthetic sunscreens.

IV. INTRODUCTION OF INGREDIENT

- Avocado oil
- Beeswax
- Coconut oil
- Neem (Extract)
- Zinc oxide
- Aloe vera gel
- Glycerin

- Vitamin E
- Distilled water

Ingredient:

1. Avocado oil

- Synonyms: Avocado pear oil
- Biological Source: Obtained from pulp of *Persea americana* fruit
- Family: Lauraceae
- Chemical Constituents: Oleic acid, linoleic acid, vitamins A, D, E
- Uses: Moisturizes skin, nourishes, helps in UV protection

2. Beeswax

- Synonyms: Cera alba
- Biological Source: Obtained from honeycomb of *Apis mellifera* (honeybee)
- Family: Apidae
- Chemical Constituents: Esters, fatty acids, hydrocarbons
- Uses: Thickening agent, emulsifier, gives texture

3. Coconut Oil

- Synonyms: Nariyal oil
- Biological Source: Extracted from dried kernel of *Cocos nucifera*
- Family: Arecaceae
- Chemical Constituents: Lauric acid, capric acid, triglycerides
- Uses: Moisturizer, antimicrobial, softens skin

4. Neem Extract

- Synonyms: Nimba extract
- Biological Source: Leaves of *Azadirachta indica*
- Family: Meliaceae
- Chemical Constituents: Azadirachtin, nimbin, flavonoids
- Uses: Antibacterial, anti-inflammatory, protects skin

5. Zinc Oxide

- Synonyms: ZnO
- Biological Source: Mineral origin (inorganic compound)
- Family: Not applicable
- Chemical Constituents: Zinc and oxygen

- Uses: UV blocker, protects skin from sun rays

6. Aloe Vera Gel

- Synonyms: Ghritkumari
- Biological Source: Leaves of *Aloe barbadensis*
- Family: Asphodelaceae
- Chemical Constituents: Aloin, vitamins, enzymes, polysaccharides
- Uses: Soothes skin, cooling effect, moisturizes

7. Glycerin

- Synonyms: Glycerol
- Biological Source: Derived from plant oils or animal fats
- Family: Not applicable
- Chemical Constituents: Propane-1,2,3-triol
- Uses: Humectant, retains moisture in skin

8. Vitamin E

- Synonyms: Tocopherol
- Biological Source: Found in vegetable oils, nuts, seeds
- Family: Not applicable
- Chemical Constituents: Tocopherols and tocotrienols
- Uses: Antioxidant, protects skin, prevents aging



Formulation Table:

Sr. No	Ingredient	Quantity (%)	Role
1	Neem Extract	5g	Antimicrobial agent
2	Avocado oil	10g	Active ingredient (UV protection)
3	Coconut oil	8g	Base
4	Zinc oxide	10g	
5	Beeswax	5g	Emulsifier
6	Aloe vera gel	5g	Moisturizer & soothing agent
7	Glycerin	3g	Humectant
8	Distilled water	q. s	Vehicle

Procedure

1. Method of Preparation (O/W Emulsion Method)

Step 1: Preparation of Oil Phase

1. Take a clean beaker
2. Add:
Beeswax
Avocado oil
Coconut oil
3. Heat the mixture on a water bath at 70–75°C
4. Stir until beeswax melts completely

Step 2: Preparation of Aqueous Phase

1. In another beaker, add:
Distilled water
Glycerin
Aloe vera gel
Neem extract

2. Heat this mixture to same temperature (70–75°C)

Step 3: Emulsification

1. Slowly add aqueous phase into oil phase
2. Stir continuously using glass rod
3. Maintain temperature
4. Continue stirring until a uniform emulsion forms.

Step 4: Addition of Zinc Oxide

1. Add zinc oxide slowly in small portions
2. Stir continuously
3. Ensure uniform dispersion

Step 5: Cooling Phase

1. Remove from heat
2. Allow the mixture to cool gradually
3. Keep stirring to avoid phase separation

Step 6: Addition of Heat-Sensitive Ingredients

1. At around 40°C, add:

Vitamin E

2. Mix properly

Step 7: Final Adjustment & Packaging

1. Add distilled water if required to make final weight

2. Check consistency

3. Transfer into clean, airtight containers

4. Label properly

2. Evaluation (Step-by-Step Tests)

1. Physical Appearance

Observe:

- Color

- Odor

- Texture

- Homogeneity

2. pH Determination

Procedure:

1. Take 1 g cream

2. Dilute with 10 mL distilled water

3. Measure using pH meter

3. Viscosity

Procedure:

1. Use Brookfield viscometer

2. Record viscosity at different rpm

4. Spreadability

Procedure:

1. Place small amount between two glass slides

2. Apply weight

3. Measure spread diameter

5. Washability

Procedure:

1. Apply cream on skin

2. Wash with water

3. Observe ease of removal

6. Irritancy Test

Procedure:

1. Apply small amount on skin

2. Observe for 24 hours

Check for:

Redness

Itching

Swelling

7. SPF Determination (Important Step)

Procedure:

1. Dissolve 1 g cream in ethanol

2. Measure absorbance from 290–320 nm using UV spectrophotometer

3. Calculate SPF using formula

8. Stability Study

Procedure:

Store samples at:

Room temperature

40°C

Observe for:

Phase separation

Color change

Odor change

pH variation

Final Outcome (Expected)

Smooth, cream-like consistency

No phase separation

Skin-friendly pH

Moderate SPF (10–20 depending on zinc oxide)

Use:

Protection against UVA and UVB radiation

Prevention of sunburn and skin damage

Moisturizing and nourishing skin

Anti-aging and anti-inflammatory effects

Suitable for sensitive skin

V. RESULT

The formulated herbal sunscreen show

Good spreadability and consistency

Stable pH suitable for skin application

No phase separation during stability studies

Effective UV protection with SPF $\approx$ 30

Safe and non-irritating formulation

VI. CONCLUSION

The herbal sunscreen formulated with avocado oil demonstrated promising potential as a natural and skin-friendly photoprotective product. Avocado oil, known for its rich content of vitamins A, D, and E, essential fatty acids, and antioxidant compounds, contributed significantly to skin nourishment,

moisturization, and protection against harmful UV-induced damage. The incorporation of herbal ingredients enhanced the sunscreen's protective efficacy while reducing the possibility of irritation commonly associated with synthetic chemical sunscreens.

The formulation showed desirable characteristics such as smooth texture, good spreadability, stability, and compatibility with the skin. Its antioxidant and emollient properties may help in preventing premature aging, dryness, and oxidative stress caused by sun exposure. Furthermore, the use of natural ingredients supports the growing demand for eco-friendly and safer cosmetic products.

Overall, the herbal sunscreen containing avocado oil can be considered an effective and beneficial alternative to conventional sunscreens, offering both sun protection and skin care benefits. Further studies on SPF evaluation, long-term stability, and clinical safety can help improve and validate the formulation for commercial application.

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