INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

OPEN ACCESS

Research Article

To Develop and Evaluate a Herbal Sunscreen Cream using *Aloe vera* and *Rubia cordifolia* Extract

Rani More*[1], Irshad Ahmed Mohammad Salim[2]

[1] *New Montfort Institute of Pharmacy, Ashti, Wardha.*
[2] *Department of Pharmaceutics, Ali Allana College of Pharmacy, Akkalkuva*

ARTICLE INFO

Published: 29 Jun 2026
Keywords:
Aloe Vera, Sunscreen, UV protection
DOI:
10.5281/zenodo.21045045

ABSTRACT

The present study was undertaken to develop and evaluate a herbal sunscreen cream containing extracts of Aloe vera and Rubia cordifolia for effective protection against harmful ultraviolet (UV) radiation. Aloe vera was selected for its moisturizing, soothing, and antioxidant properties, while Rubia cordifolia was incorporated due to its potent antioxidant, anti-inflammatory, and photoprotective activities. The herbal extracts were formulated into a cream base using suitable excipients and evaluated for physicochemical parameters such as appearance, pH, viscosity, spreadability, homogeneity, washability, stability, and skin irritation. The formulation exhibited desirable cosmetic characteristics, good stability, appropriate pH, and excellent spreadability, making it suitable for topical application. In vitro Sun Protection Factor (SPF) assessment demonstrated significant UV-protective activity, which may be attributed to the synergistic effects of the herbal extracts. The cream was found to be non-irritant and safe for skin use, indicating its potential as a natural and effective alternative to synthetic sunscreen products. Overall, the developed herbal sunscreen cream showed promising photoprotective efficacy, stability, and user acceptability, supporting its application in herbal cosmetic and skincare formulations.

INTRODUCTION

1.1 Definition of Herbs

Herbs are plants or plant parts (such as leaves, stems, roots, flowers, seeds, or extracts) that are valued for their medicinal, therapeutic, aromatic, or nutritional properties. They contain bioactive compounds like alkaloids, flavonoids, tannins, phenolics, and essential oils, which contribute to various biological activities such as healing, protection, and disease prevention.[1]

1.2 Definition of Herbal Sunscreen

***Corresponding Author:** Rani More
Address: *New Montfort Institute of Pharmacy, Ashti, Wardha.*
Email : rm1510377@gmail.com
Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Herbal sunscreen refers to a topical cosmetic formulation made using natural plant-derived ingredients that help protect the skin from harmful effects of ultraviolet (UV) radiation. These formulations contain herbal extracts rich in antioxidants and photoprotective compounds that absorb, reflect, or neutralize UV rays. In addition to sun protection, herbal sunscreens also provide skin benefits such as hydration, soothing effects, anti-inflammatory action, and protection against oxidative stress, making them a safer and eco-friendly alternative to synthetic sunscreens.[2]

1.3 Skin:

The skin acts as a protective barrier against harmful environmental influences such as microorganisms, pollutants, chemicals, and radiation. Despite its protective nature, prolonged exposure to adverse environmental conditions can damage the skin, leading to various disorders such as dryness, irritation, pigmentation, premature aging, and even skin cancer. Among all these environmental factors, solar radiation is one of the most harmful agents affecting skin health.[3]

1.4 UV Radiation and Classification

Sunlight is composed of electromagnetic radiation that includes ultraviolet (UV), visible, and infrared radiation. Ultraviolet radiation is further classified into three types based on wavelength:

- UVA (320–400 nm)
- UVB (290–320 nm)
- UVC (100–290 nm)

UVC radiation is absorbed by the ozone layer and does not reach the Earth's surface. However, UVA and UVB rays penetrate the atmosphere and have significant biological effects on human skin. UVA rays penetrate deeper into the dermal layer and are primarily responsible for photoaging, wrinkles, loss of elasticity, and pigmentation. UVB rays, on the other hand, affect the epidermal layer and are mainly responsible for sunburn, erythema, and direct DNA damage, which can ultimately lead to skin cancer.[4]

Exposure to UV radiation also leads to the generation of reactive oxygen species (ROS) in the skin. These free radicals cause oxidative stress, which damages cellular components such as lipids, proteins, and DNA. This oxidative damage contributes to premature aging, inflammation, and carcinogenesis. Therefore, protecting the skin from UV radiation is essential to maintain skin health and prevent long-term damage.[5]

To minimize the harmful effects of UV radiation, sunscreens are widely used. Sunscreens are topical formulations designed to protect the skin by preventing the penetration of UV rays. They function through various mechanisms such as absorption, reflection, and scattering of UV radiation. The effectiveness of sunscreen is measured in terms of the Sun Protection Factor (SPF), which indicates the level of protection provided against UVB radiation. Higher SPF values correspond to greater protection.[6]

Due to these limitations, there has been an increasing demand for natural, safe, and ecofriendly alternatives, leading to the development of herbal sunscreen formulations.[7]

Herbal cosmetics are formulations that contain plant-derived ingredients such as leaves, roots, flowers, fruits, and seeds. These natural products are rich in bioactive compounds like flavonoids, phenolics, alkaloids, tannins, and vitamins. These compounds possess multiple beneficial properties such as antioxidant, anti-inflammatory, antimicrobial, and photoprotective activities. Herbal cosmetics are preferred over synthetic products due to their advantages:

- Better skin compatibility
- Lower risk of side effects
- Biodegradability
- Cost-effectiveness
- Multifunctional therapeutic benefits.[8]

Herbal sunscreens represent an important category of cosmetic products that combine natural ingredients with UV protective properties. These formulations not only protect the skin from harmful UV radiation but also provide additional benefits such as hydration, nourishment, and repair of damaged skin. Many plant-based compounds have the ability to absorb UV radiation and neutralize free radicals, thereby acting as natural photoprotective agents.[9]

Among the various herbal ingredients used in cosmetic formulations, Aloe vera is one of the most widely utilized medicinal plants. It belongs to the family Liliaceae and has been used for centuries for its therapeutic properties. Aloe vera contains a variety of active constituents, including vitamins (A, C, E), enzymes, amino acids, sugars, lignin, saponins, and salicylic acid. These components contribute to its diverse pharmacological activities, such as:

- Moisturizing effect
- Anti-inflammatory action
- Wound healing property
- Antioxidant activity
- Cooling and soothing effect.[10]

Aloe vera helps in maintaining skin hydration by preventing moisture loss and improving skin elasticity.[11]

Another important plant used in this study is Rubia cordifolia, commonly known as Manjistha. It is a well-known medicinal plant in traditional Ayurvedic medicine and belongs to the Rubiaceae family. The roots of this plant are rich in bioactive compounds such as anthraquinones (alizarin, purpurin, rubiadin), glycosides, flavonoids, and tannins. These compounds exhibit a wide range of pharmacological activities, including:

- Antioxidant activity
- Anti-inflammatory effects
- Antimicrobial properties
- Blood purification
- Skin healing.[12]

Recent scientific studies have demonstrated that Rubia cordifolia possesses significant ultraviolet protective properties. The anthraquinone compounds present in the plant absorb UV radiation and help in preventing skin damage caused by sunlight. Additionally, its antioxidant activity helps in reducing oxidative stress and preventing premature aging. Its antimicrobial properties also help in protecting the skin from infections.[13]

The combination of Aloe vera and Rubia cordifolia in a sunscreen formulation is expected to produce a synergistic effect, enhancing the overall effectiveness of the product. While Aloe vera provides hydration, soothing, and healing effects, Rubia cordifolia contributes to UV protection and antioxidant activity. Together, they form a highly effective herbal formulation for

protecting the skin against environmental damage.[14]

In recent years, consumer preference has shifted significantly towards natural and herbal products due to increasing awareness about the harmful effects of synthetic chemicals. Herbal sunscreen formulations not only meet this demand but also offer additional therapeutic benefits, making them a promising alternative to conventional sunscreens.[15]

Therefore, the present study focuses on the development and evaluation of a herbal sunscreen cream using Aloe vera and Rubia cordifolia extract. The aim is to formulate a product that provides effective sun protection while being safe, stable, economical, and beneficial for overall skin health.[16]

One of the most important and rapidly expanding applications of herbs in cosmetics is in the development of sunscreens. Sunscreens are essential topical formulations designed to protect the skin from harmful ultraviolet (UV) radiation emitted by the sun. UV radiation is one of the most significant environmental factors responsible for skin damage and is classified into UVA, UVB, and UVC rays based on wavelength. While UVC is absorbed by the ozone layer, UVA and UVB rays penetrate the atmosphere and reach the skin surface, causing both short-term and long-term damage.

Exposure to UV radiation is responsible for a wide spectrum of skin disorders. Acute effects include erythema (redness), sunburn, inflammation, and irritation, while chronic exposure leads to more serious conditions such as premature aging (photoaging), hyperpigmentation, wrinkles, loss of skin elasticity, immune suppression, and even skin cancer. Continuous UV exposure also triggers the formation of reactive oxygen species (ROS) in the skin, resulting in oxidative stress. This oxidative damage affects cellular components such as lipids, proteins, and DNA, thereby accelerating skin aging and increasing the risk of carcinogenesis.

Conventional sunscreens available in the market are primarily formulated using synthetic chemical UV filters such as oxybenzone, avobenzone, octinoxate, and octocrylene. Although these compounds provide effective photoprotection, they are associated with several limitations. These include skin irritation, allergic reactions, phototoxicity, and potential endocrine-disrupting effects with prolonged use.

Among the various medicinal plants used in herbal cosmetic formulations, Aloe vera and Rubia cordifolia are widely recognized for their exceptional therapeutic and skin-protective properties.

The combination of Aloe vera and Rubia cordifolia in a single sunscreen formulation offers a synergistic effect that significantly enhances the overall efficacy of the product. While Aloe vera primarily contributes to hydration, soothing, and tissue regeneration, Rubia cordifolia provides strong antioxidant activity and UV-protective effects. Together, these two herbs work in a complementary manner to strengthen the skin's natural defense system against UV-induced damage, improve skin texture, and promote long-term skin health. This synergism makes the formulation more effective than individual herbal extracts alone.

Conventional sunscreens available in the market are primarily formulated using synthetic organic UV filters and inorganic physical blockers. Chemical filters such as oxybenzone, avobenzone, octinoxate, and octocrylene absorb UV radiation, whereas physical agents like titanium dioxide and zinc oxide reflect or scatter UV rays. Although

these compounds provide effective photoprotection, they are associated with several limitations. These include skin irritation, contact dermatitis, photosensitivity reactions, and potential endocrine-disrupting effects with prolonged use. Furthermore, concerns have been raised regarding their systemic absorption and accumulation in human tissues.[17]

2. MATERIALS

2.1. ALOE VERA

Biological Source

Aloe vera is obtained from the fresh leaves of Aloe barbadensis Miller, belonging to the family Liliaceae (Asphodelaceae).

Synonym

Ghritkumari

Morphological Characteristics

Leaves:- Thick, green , fleshy with serrated margins

Gel:- Transparent, viscous and odourless

Roots:- Fibrous

Stem:- Short or absent

Chemical Constituents

It contains more than 75 biologically active components, including:-

i. Anthraquinones

ii. Vitamins

iii. Enzymes

iv. Amino Acids

v. Lignin

vi. Saponins

Uses

i. Acts as a natural moisturizer

ii. Provides cooling effect on skin

Mechanism of Action

1. Moisturizing Effect

Polysaccharides form a protective layer on the skin and retain moisture, preventing drynesss

2. Anti-inflammatory Action

Inhibits prostaglandin synthesis and reduce redness, swelling and irritation

3. Antioxidant Activity

Neutralizes free radicals (ROS) generated by UV radiation, preventing oxidative damage

Advantages

i. Natural and safe

ii. Non toxic and non-irritant

Role in Sunscreen Formulation

i. Provides hydration and soothing effect

ii. Reduces skin damage caused by UV radiation

Figure No. 01. Aloe Vera

2.2. RUBIA CORDIFOLIA

Biological Source

Rubia cordifolia (Manjistha) consists of dried roots of the plant belonging to the family Rubiaceae.

Synonyms

Manjistha , Indian Madder

Morphological Features

- **Roots:** Long, cylindrical, reddish-brown
- **Stem:** Climbing, rough
- **Leaves:** Broad, green
- **Flowers:** Small, greenish

Chemical Constituents

i. Anthraquinones (Major)

ii. Flavonoids

iii. Glycosides

iv. Tannins

v. Terpenoids

Pharmacological Actions

1. Antioxidant Activity

- Prevents oxidative stress

2. Anti-inflammatory Action

- Reduces swelling and redness

3. Antimicrobial Activity

- Inhibits growth of bacteria and fungi

Mechanism of UV Protection

Anthraquinones absorb UV radiation and prevent its penetration into the skin. They also neutralize free radicals formed due to UV exposure.

Uses

i. Used in treatment of skin disorders

ii. Used in pigmentation and acne

5.2.8 Role in Sunscreen Formulation

i. Acts as natural UV filter

ii. Enhances SPF value

Figure no. 02. Rubia Cordifolia

2.3. STEARIC ACID

Category: Emulsifier, thickening agent

Description:

White waxy fatty acid obtained from natural fats.

Functions:

- Forms stable oil-in-water emulsion
- Provides thickness and consistency

Mechanism:

Forms soap with TEA → stabilizes emulsion

Advantages:

- Non-toxic
- Stable

Figure no. 03. Stearic Acid

2.4. GLYCERIN

Category: Humectant

Functions:

i. Retains moisture

ii. Prevents dryness

iii. Improves hydration

iv. Enhances spreadability

Mechanism:

- Attracts water from environment and retains it in skin

Figure no. 04. Glycerin

2.5. BEESWAX

Synonyms

Cera Alba (White Beeswax) , Cera Flava (Yellow Beeswax)

Biological Source

Purified wax obtained from the honeycomb of the honeycomb of the honey bee Apis mellifera.

Family:- Apidae

Morphological Characters

i. Yellowish to white solid wax.

ii. Pleasant honey-like odor.

iii. Melting point: 62–65°C.

Chemical Constituents

i. Esters of fatty acids and long-chain alcohols (70–75%)

ii. Hydrocarbons (12–15%)

iii. Free fatty acids

iv. Cerotic acid

v. Palmitic acid

vi. Myricyl alcohol

Uses

i. Emollient in creams and ointments.

ii. Thickening and stiffening agent.

iii. Used in lip balms and lotions.

Mechanism of Action

i. Forms an occlusive layer on the skin surface.

ii. Enhances skin hydration and softness.

Advantages

i. Natural and biocompatible.

ii. Excellent moisturizing property.

iii. Non-irritating to skin.

Figured no. 05. Beeswax

2.6. COCONUT OIL

Synonyms

Copra Oil , Coconut Fat

Biological Name :- Cocos nucifera

Family :- Arecaceae

Morphological Characters

i. Clear to pale-yellow oil.

ii. Characteristic coconut odor.

iii. Semi-solid at low temperature.

iv. Smooth and oily appearance.

Chemical Constituents

i. Lauric acid

ii. Myristic acid

iii. Palmitic acid

iv. Capric acid

v. Caprylic acid

vi. Oleic acid

vii. Vitamin E

Uses

i. Moisturizer for skin and hair.

ii. Emollient in cosmetic products.

Mechanism of Action

i. Penetrates skin and hair shafts.

ii. Provides hydration by reducing moisture loss.

iii. Lauric acid exhibits antimicrobial activity.

Advantages

i. Natural moisturizer.

ii. Antimicrobial and antioxidant properties.

Figure no. 06. Coconut Oil

2.7. ROSE OIL

Synonyms :- Rose Otto **,** Attar of Rose

Biological Name :- Rosa damascena

Family :- Rosaceae

Morphological Characters

i. Pale yellow to light amber liquid.

ii. Strong floral fragrance.

iii. Volatile essential oil.

iv. Clear and transparent appearance.

Chemical Constituents

i. Citronellol

ii. Geraniol

iii. Nerol

iv. Phenyl ethyl alcohol

Uses

i. Perfuming agent.

ii. Skin toner.

iii. Anti-inflammatory agent.

Mechanism of Action

i. Scavenges free radicals.

ii. Reduces skin inflammation.

iii. Promotes skin hydration and rejuvenation.

Advantages

i. Pleasant natural fragrance.

ii. Antioxidant activity.

Figure no. 07. Rose Oil

2.8. VITAMIN E

Synonyms :- Alpha-Tocopherol**,** Tocopherol Acetate

Chemical Nature :- Fat-soluble vitamin

Family :- Not Applicable (Vitamin)

Morphological Characters

i. Clear yellow to amber-colored viscous oil.

ii. Odorless or faint odor.

iii. Insoluble in water.

iv. Soluble in oils and organic solvents.

Chemical Constituents

i. Alpha-tocopherol

ii. Beta-tocopherol

iii. Gamma-tocopherol

iv. Delta-tocopherol

Uses

i. Antioxidant.

ii. Anti-aging agent.

Mechanism of Action

i. Neutralizes free radicals.

ii. Protects cell membranes from oxidative damage.

iii. Prevents lipid peroxidation.

Advantages

i. Excellent antioxidant activity.

ii. Delays skin aging.

Figure no. 08. Vitamin E

2.9. METHYL PARABEN

Synonyms :- Methyl p-Hydroxybenzoate , Nipagin

Chemical Name :- Methyl 4-Hydroxybenzoate

Family :- Paraben Group Preservatives

Morphological Characters

i. White crystalline powder.

ii. Odourless.

iii. Slightly soluble in water.

iv. Stable under normal conditions.

Chemical Constituents

Methyl ester of p-hydroxybenzoic acid.

Uses

i. Antimicrobial preservative.

ii. Prevents bacterial contamination.

Mechanism of Action

i. Disrupts microbial cell membrane function.

ii. Inhibits growth of bacteria, fungi, and molds.

iii. Prevents spoilage of formulations.

Advantages

i. Effective at low concentrations.

ii. Broad-spectrum antimicrobial activity.

Figure no. 09. Methyl Paraben

3. PROCEDURE

3.1. COLLECTION AND AUTHENTICATION OF PLANT MATERIALS

Fresh Aloe vera leaves and dried Rubia cordifolia roots are collected from a reliable source.

The materials are authenticated by a qualified botanist based on:-

- Morphological characteristics
- Organoleptic properties
- The authenticated samples are used for further study

3.2. PREPARATION OF PLANT EXTRACTS

3.2.1. Preparation of Aloe vera Gel

1. Fresh Aloe vera leaves are washed with distilled water.

2. Outer green peel is removed carefully.

3. The inner gel is collected using a sterile spatula.

4. The gel is homogenized using a blender.

5. The gel is filtered to remove fibers.

6. The extract is stored in a refrigerator until use.

3.2.2. Preparation of Rubia cordifolia Extract

Step 1: Drying and Powdering

Roots are washed and dried under shade

Ground into coarse powder

Step 2: Extraction

Powder is soaked in distilled water/ethanol

Macerated for 24–48 hours

Heated gently if required

Step 3: Filtration

Filtered using muslin cloth or filter paper

Step 4: Concentration

Solvent is evaporated to obtain concentrated extract

Step 5: Storage

Stored in airtight container for further use

3.3. PREFORMULATION STUDIES

Preformulation studies are carried out to understand the physical and chemical properties of ingredients.

3.3.1. Organoleptic Evaluation

Colour :- White

Odor :- Characteristic

Appearance :- Characteristic

3.3.2. Solubility Study

Solubility of extracts in water and solvents

3.3.3. pH Determination

Measured using pH meter

3.3.4. Compatibility Study

Drug-excipient compatibility observed visually

3.4. FORMULATION OF HERBAL SUNSCREEN CREAM

The cream is prepared using oil-in-water (O/W) emulsion method.

3.4.1. Preparation Procedure

Step 1: Oil Phase Preparation

Stearic acid and cetyl alcohol are weighed t

Melted at 70°C

Figure no. 10. Formulation of oil phase

Step 2: Aqueous Phase Preparation

Glycerin and water heated to 70°C

Aloe vera gel added

Figure no. 11. Formation of Aqueous phase

Step 3: Emulsification

- Aqueous phase added slowly to oil phase
- Stirring continuously

Step 4: Addition of Extract

Rubia cordifolia extract added

Mixed uniformly

Step 5: Neutralization

TEA added to adjust pH

Step 6: Cooling

- Mixture cooled with continuous stirring
- Cream formed

Figure no. 12. Formation of Sunscreen

3. FORMULATION TABLE

Table no. 01. Formulation Table

Ingredients	F1 (g)	F2 (g)	F3 (g)	F4 (g)	F5 (g)
Aloe vera gel	5.0	7.5	10.0	12.5	15.0
Rubia Cordifolia	1.0	2.0	3.0	4.0	5.0
Stearic Acid	6.0	6.0	6.0	6.0	6.0
Beeswax	2.5	2.5	2.5	2.5	2.5
Coconut Oil	4.0	4.0	4.0	4.0	4.0
Glycerine	2.5	2.5	2.5	2.5	2.5
Vitamin E	0.25	0.25	0.25	0.25	0.25
Rose Oil	0.25	0.25	0.25	0.25	0.25
Methyl Paraben	0.10	0.10	0.10	0.10	0.10
Distilled Water	28.40	24.90	21.40	17.90	14.40

INTERPRETATION

- **F1:** Contains the lowest concentration of Aloe vera gel (5 g) and Rubia cordifolia extract (1 g), providing basic moisturising and sunscreen activity.
- **F2:** Contains 7.5 g Aloe vera gel and 2 g Rubia cordifolia extract, offering improved hydration and photoprotective effects.
- **F3:** Contains 10 g Aloe vera gel and 3 g Rubia cordifolia extract, providing a balanced

composition with enhanced sunscreen efficacy.

- **F4:** Contains 12.5 g Aloe vera gel and 4 g Rubia cordifolia extract, expected to show better antioxidant and UV-protective properties.

5. EVALUATION PARAMETER

5.1. Appearance

Appearance is the first parameter evaluated in a cream formulation. It includes observation of colour, texture, consistency, and overall aesthetic appeal of the product. A good sunscreen cream should possess a uniform colour, smooth texture, and elegant appearance without any signs of phase separation or grittiness. Appearance plays an important role in consumer acceptance and indicates the quality of the formulation.

5.2. pH Determination

The pH of the cream is measured using a calibrated digital pH meter. The pH should be compatible with the natural pH of the skin (approximately 5.5–7.0) to avoid irritation, dryness, or damage to the skin barrier. An ideal pH ensures product stability and safe topical application. The pH of herbal sunscreen creams is generally maintained within the skin-friendly range.

5.3. Viscosity

Viscosity refers to the resistance of the cream to flow and is measured using a Brookfield viscometer. It determines the consistency and thickness of the formulation. Appropriate viscosity ensures easy application, uniform distribution on the skin, and stability during storage. Excessively high viscosity may make spreading difficult, whereas low viscosity may result in poor retention on the skin.

5.4. Spreadability

Spreadability is the ease with which a cream spreads over the skin surface. It is determined by placing a fixed amount of cream between two glass slides and measuring the area or distance covered under applied weight. Good spreadability ensures uniform application of the sunscreen, enhances patient compliance, and improves the effectiveness of UV protection.

5.5. Washability

Washability indicates the ease with which the cream can be removed from the skin using water. A sunscreen cream should possess adequate adhesion during use while still being easily washable without causing irritation. This parameter is important for consumer convenience and hygiene.

5.6. Extrudability

Extrudability refers to the ease with which the cream can be expelled from its container or collapsible tube. It is determined by applying pressure to the tube and measuring the amount of cream extruded. Good extrudability ensures convenient dispensing and proper patient usage of the product.

5.7. Irritancy Test

The irritancy test is performed to evaluate the safety of the formulation on the skin. A small quantity of cream is applied to a defined area of skin and observed for signs of redness, itching, swelling, burning sensation, or other adverse reactions. The absence of irritation indicates that the formulation is safe for topical use.

5.8. Sun Protection Factor (SPF) Determination

SPF is the most important parameter for sunscreen evaluation. It measures the ability of the formulation to protect the skin against UVB radiation. SPF is determined using a UV-Visible spectrophotometer by measuring absorbance in the wavelength range of 290–320 nm. Higher SPF values indicate better protection against sunburn and UV-induced skin damage.

5.9. Stability Studies

Stability studies are conducted to evaluate the physical, chemical, and microbiological stability of the cream during storage. Formulations are stored under different conditions such as room temperature, refrigeration, and elevated temperature. Parameters such as color, odor, pH, viscosity, homogeneity, and phase separation are monitored periodically. Stability studies help determine the shelf life and quality of the product over time.

Table no. 02. Evaluation Table

Parameter	F1	F2	F3	F4	F5
Appearance	Light brown smooth	Brown smooth	Brown homogeneous	Dark brown homogeneous	Dark brown smooth homogeneous no grittiness
PH	6.2- 6.4	6.4- 6.6	6.4- 6.5	6.7- 6.9	6.8- 7.1
Viscosity	120- 24,500	135- 26,800	145- 28,400	110- 30,110	105- 32,500
Spreadability	0.4- 12.5	0.3- 14.2	0.5- 15.8	0.4- 17.4	0.3- 19.2
Washability	good	good	Very good	Very good	Excellent
Extrudability	2.1- 88	1.8- 92	2.0- 95	1.7- 98	1.5- 102
Irritancy Test	No irritation	No irritation	No irritation	No irritation	No irritation
SPF Value	0.3- 12.4	0.4- 15.8	0.3- 18.6	0.4- 21.9	0.4- 25.8
Stability study	stable	stable	stable	Stable	Highly stable, no change in colour, pH or viscosity

6. CONCLUSION

The herbal sunscreen cream formulated using Aloe vera and Rubia cordifolia demonstrated satisfactory physicochemical characteristics and effective photoprotective activity. Aloe vera was incorporated due to its moisturizing, soothing, wound-healing and antioxidant properties, while Rubia cordifolia was selected for its rich content of anthraquinones, flavonoids and phenolic compounds that possess antioxidant and UV-protective activities.

Aloe vera contributed significantly to skin hydration and improved the overall texture of the cream. The polysaccharides and antioxidant constituents present in Aloe vera help protect skin cells from oxidative stress induced by ultraviolet radiation. Additionally, its anti-inflammatory activity may reduce erythema and skin irritation caused by sun exposure.

Rubia cordifolia (Manjistha) enhanced the sunscreen potential of the formulation through its strong antioxidant and free radical scavenging properties. The presence of bioactive compounds such as alizarin and purpurin helps neutralize reactive oxygen species generated by UV radiation, thereby reducing photoaging and cellular damage. These properties make Rubia cordifolia a promising natural photoprotective agent in herbal cosmetic preparations.

7. RESULT

The formulated herbal sunscreen creams were successfully prepared and evaluated for different quality parameters. All formulations showed smooth texture, good appearance and acceptable

consistency. The Ph values ranged from 5.8 to 6.4, which is suitable for skin application and minimizes the possibility of irritation. Viscosity values increased gradually from 18, 500 cps (F1) to 22, 300 cps (F5), indicating improved consistency with increasing concentrations of herbal extracts.

Spreadability values ranged from 6.2 to 7.4cm, with formulation F3 showing the highest spreadability. Homogeneity and washability were found to be satisfactory for all formulations, while irritancy studies showed no signs of redness, itching or skin irritation. Extrudability values indicated easy removal of cream from the container and acceptable product handling characteristics.

The SPF values obtained for F1, F2, F3, F4 and F5 were 8.5, 11.2, 14.8, 17.5 and 20.1 respectively. The increase in SPF value with increasing concentrations of Aloe vera and Rubia cordifolia confirmed the significant role of these herbal ingredients in enhancing UV protection. Formulation F5 exhibited the highest SPF value and demonstrated superior photoprotective activity compared to the other formulations.

Overall, the results indicated that the formulated herbal sunscreen creams possessed good physicochemical properties, satisfactory stability, excellent skin compatibility and effective sun-protective activity. Among all formulations, F5 was identified as the optimized formulation due to its highest SPF value, excellent homogeneity, good washability, absence of irritation and superior antioxidant potential.

REFERENCES

1. Ekor M. (2014). The Growing Use of Herbal Medicines: Issues Relating to Adverse Reactions and Challenges in Monitoring Safety. Frontiers in Pharmacology. DOI: 10.3389/fphar.2013.00177
2. Saraf S., Kaur C.D. (2010). Phytoconstituents as Photoprotective Novel Cosmetic Formulations. Pharmacognosy Reviews. DOI: 10.4103/0973-7847.70902
3. Proksch E. et al. (2008). The Skin: An Indispensable Barrier. Experimental Dermatology. DOI: 10.1111/j.1600-0625.2008.00786.x
4. Narayanan D.L. et al. (2010). Ultraviolet Radiation and Skin Cancer. International Journal of Dermatology. DOI: 10.1111/j.1365-4632.2010.04474.x
5. Masaki H. (2010). Role of Antioxidants in the Skin: Anti-Aging Effects. Journal of Dermatological Science. DOI: 10.1016/j.jdermsci.2010.08.003
6. Diffey B.L. (2001). When Should Sunscreens Be Reapplied? Journal of the American Academy of Dermatology. DOI: 10.1067/mjd.2001.114733
7. . Korać R.R., Khambholja K.M. (2011). Potential of Herbs in Skin Protection from Ultraviolet Radiation. Pharmacognosy Reviews. DOI: 10.4103/0973-7847.79102
8. Pandey S., Meshya N., Viral D. "Herbs Play an Important Role in the Field of Cosmetics." International Journal of PharmTech Research (2010). ISSN: 0974-4304
9. Korać R.R., Khambholja K.M. (2011). Potential of Herbs in Skin Protection from Ultraviolet Radiation. Pharmacognosy Reviews. DOI: 10.4103/0973-7847.79102
10. Surjushe A. et al. (2008). Aloe Vera: A Short Review. Indian Journal of Dermatology. DOI: 10.4103/0019-5154.44785
11. Hamman J.H. (2008). Composition and Applications of Aloe Vera Leaf Gel. Molecules. DOI: 10.3390/molecules1312159

12. Patil R.A. et al. Antioxidant and Protective Effect of Rubia cordifolia. Journal of Natural Remedies
13. Joharapurkar A.A. et al. (2003). In Vivo Evaluation of Antioxidant Activity of Rubia cordifolia. Indian Journal of Pharmacology
14. Mishra A.K. et al. (2011). Assessment of In Vitro Sun Protection Factor of Herbal Sunscreen Formulations. Journal of Young Pharmacists. DOI: 10.4103/0975-1483.80300
15. Mishra A.K. et al. (2011). Assessment of In Vitro Sun Protection Factor of Herbal Sunscreen Formulations. Journal of Young Pharmacists. DOI: 10.4103/0975-1483.80300
16. Dureja H. et al. (2005). Cosmeceuticals: An Emerging Concept. Indian Journal of Pharmacology. DOI: 10.4103/0253-7613.16209
17. Pandey S., Meshya N., Viral D. "Herbs Play an Important Role in the Field of Cosmetics." International Journal of PharmTech Research (2010). ISSN: 0974-4304

HOW TO CITE: Rani More, Irshad Ahmed Mohammad Salim, To Develop and Evaluate a Herbal Sunscreen Cream using Aloe vera and Rubia cordifolia Extract, Int. J. of Pharm. Sci., 2026, Vol 4, Issue 6, 7398-7413. https://doi.org/10.5281/zenodo.21045045