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# FORMULATION & EVALUTION OF HERBAL SUNCREEN UTILIZING BLUE PEA FLOWER

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## ABSTRACT

The increasing awareness of the adverse effects of synthetic sunscreen agents has led to a growing interest in herbal alternatives. This study aims to formulate and evaluate a herbal sunscreen utilizing Clitoria ternatea (blue pea flower) extract, known for its potent antioxidant and photoprotective properties. The extract was incorporated into a cream-based formulation using natural excipients. Phytochemical screening confirmed the presence of flavonoids, anthocyanins, and phenolic compounds, which contribute to the plant's UV-absorbing potential. The prepared formulations were subjected to various physicochemical evaluations including pH, spreadability, stability, and Sun Protection Factor (SPF) determination using spectrophotometric analysis. The results indicated that the herbal sunscreen demonstrated desirable stability, acceptable aesthetic properties, and moderate SPF value, suggesting its efficacy as a natural alternative for UV protection. This study highlights the potential of Clitoria ternatea in the development of safe, effective, and eco-friendly sunscreen formulations.

**KEYWORDS:** *Clitoria ternatea*, Blue Pea Flower, Herbal Sunscreen, Photoprotection, SPF, Antioxidants, UV Protection, Natural Formulation, Phytochemicals, Skin Care.

## 1. INTRODUCTION

The use of herbal products as cosmetics is as prevalent in modern era as it was in ancient times. Herbal cosmetics are mostly preferred because of their less or negligible side effects when compared to synthetic products and show enhanced effects upon application. These herbal cosmetics used as beauty products help in enhancing and conditioning properties of skin. The herbal extracts used in these formulations are all derived from natural plant sources without the use of any harmful synthetic drugs. Chemical or synthetic drug/ API is avoided in the preparations because of various skin related problems. The concept of herbal cosmetics was established long back in different systems of medicine such as Rigveda, Yajurveda, Ayurveda, Unani and Homeopathy systems. The herbs extracted by these systems show a number of properties like anti-inflammatory, anti-bacterial, anti-septic, emollient and sometimes also show anti-cancer properties. Thus, there is wide use of herbal cosmetics in skin care systems and an ever-increasing demand in the market.

The formulation of herbal sunscreens has gained popularity as consumers become more aware of the potential side effects of chemical-based sunscreens. Many chemical sunscreens contain ingredients like oxybenzone or avobenzone, which have raised concerns regarding their effects on human health and the environment. Herbal sunscreens, by contrast, prioritize natural ingredients that are generally considered safer and more suitable. These formulations typically include plant-based Oil substance, extracts, and minerals that either absorb, reflect, or scatter UV radiation. Key ingredients often found in herbal sunscreens include.

1. Mineral UV Filters: Zinc oxide and titanium dioxide are commonly used for their ability to form a physical barrier on the skin that reflects UV rays. These minerals are non-toxic and provide broad-spectrum protection without penetrating the skin.

2. Plant-Based Oils and Extracts: Oils like coconut oil, argan oil, and shea butter are commonly used for their moisturizing properties, while extracts from herbs like green tea, chamomile, and calendula offer anti-inflammatory and antioxidant benefits. Some herbs, such as carrot seed oil and raspberry seed oil, are believed to have natural SPF (Sun Protection Factor) properties.

3. Antioxidants: Herbal sunscreens often contain ingredients rich in antioxidants like vitamin C, vitamin E, and flavonoids, which help protect the skin from free radical damage caused by UV exposure. These antioxidants also help reduce the risk of premature aging and skin damage.


**Fig. 1.1: Suncreen.**

### 1.1 Flower Extract

The growing demand for natural and eco-friendly skincare products has led to the development of herbal sunscreens that utilize plant-based ingredients with inherent photoprotective properties. One such promising ingredient is blue pea flower extract (Clitoria ternatea), a plant known for its antioxidant, anti-inflammatory, and potential UV-protective properties. Blue pea flowers, also known as butterfly pea flowers, are rich in anthocyanins, flavonoids, and polyphenolic compounds that not only provide antioxidant benefits but may also help in shielding the skin from harmful ultraviolet (UV) radiation.

1.1.1 Blue pea flower extract is used to formulate herbal sunscreen, combining protective properties with natural ingredients.

1.1.2 The sunscreen aims to block UV rays, nourish, and rejuvenate the skin.

1.1.3 The product is free from harmful chemicals like parabens, oxybenzone, and synthetic fragrances.

1.1.4 It's a safer alternative for sensitive skin types and a more sustainable option for the environment.

1.1.5 Blue pea flower extract contains anthocyanins, which absorb UV light and have antioxidant properties.

1.1.6 The extract's antioxidant properties protect the skin from oxidative stress caused by UV exposure.

1.1.7 The herbal sunscreen's evaluation includes testing SPF, broad-spectrum protection, stability, and skin compatibility.

1.1.8 Additional testing includes assessing texture, ease of application, longevity, moisturizing properties, and prevention of irritation.

1.1.9 Blue pea flower-based sunscreen offers a safer, more natural solution for sun protection, benefiting skin and environment.

1.1.10 The development of this sunscreen could revolutionize the industry, aligning with consumer trends toward sustainability and holistic wellness.

**1.2 Ideal property of sunscreen**

1.2.1 Broad-spectrum protection: Protects against both UVA and UVB rays.

1.2.2 SPF 30 or higher: Offers adequate protection against UVB rays.

1.2.3 Water-resistance: Stays on skin even when sweating or swimming.

1.2.4 Non-comedogenic: Doesn't clog pores or cause acne.

1.2.5 Hypoallergenic: Less likely to cause skin irritation or allergic reactions.

1.2.6 Lightweight, non-greasy texture: Easy to apply and doesn't feel heavy on skin.

1.2.7 Antioxidant properties: Helps neutralize free radicals and reduce skin damage.

1.2.8 Stable and long-lasting: Remains effective on skin for a long time, even when exposed to sunlight, water, or sweat.

1.2.9 Cosmetically elegant: Has a pleasant smell, feels good on skin, and doesn't leave a visible residue or stain clothing.

1.2.10 Environmentally friendly: Free from reef-harming chemicals, such as oxybenzone and octinoxate, and has eco-friendly packaging.

**1.3 Advantages of Sunscreen**

1.3.1 Prevents sunburn: Protects skin from UV rays, reducing the risk of sunburn, blisters, and pain.

1.3.2 Reduces skin cancer risk: Helps prevent UV rays from damaging skin cells, lowering the risk of skin cancer.

1.3.3 Slows aging: Prevents UV rays from causing premature aging, fine lines, and wrinkles.

1.3.4 Protects sensitive skin: Offers protection for sensitive skin, reducing the risk of irritation and allergic reactions.

1.3.5 Convenient and easy to apply: Available in various forms (lotions, sprays, sticks) and easy to apply, making it a convenient addition to your daily skincare routine.

1.3.6 Wide range of options: Pharmacies offer a wide range of sunscreens with different SPFs, formulations, and prices, making it easy to find one that suits your needs.

1.3.7 Promotes healthy skin: Helps maintain healthy, youthful-looking skin by protecting it from environmental stressors.

1.3.8 Essential for outdoor activities: A must-have for outdoor enthusiasts, sunscreen helps prevent sun damage during sports, hiking, or other activities.

**1.4 Disadvantages of Sunscreen**

1.4.1 Skin irritation and allergic reactions: Some ingredients can cause skin irritation, such as redness, itching, or rashes.

1.4.2 Greasy texture: Some sunscreens can feel heavy or greasy on the skin, which may not be suitable for all skin types.

1.4.3 Expensive: High-end or specialty sunscreens can be pricey, making them less accessible to some consumers.

1.4.4 Chemical concerns: Some sunscreen ingredients, such as oxybenzone and octinoxate, have raised concerns about their potential impact on coral reefs and human health.

1.4.5 Inadequate protection: Using sunscreen with insufficient SPF or not reapplying often enough can lead to inadequate protection against UV rays.

1.4.6 Stinging or burning: Some sunscreens can sting or burn the skin, especially around the eyes.

1.4.7 Not water-resistant: Some sunscreens may not be water-resistant, which can lead to reduced effectiveness after swimming or sweating.

1.5 **Benefits of sunscreen**

1.1.1. Guard against sunburn.

1.1.2. Prevent redness and inflammation.

1.1.3. Steer clear of redness and hyperpigmentation.

1.1.4. Prevent damage to DNA.

**1.1.5.** Stop fine lines and wrinkles from appearing too soon.

### 1.1.6. 2. REVIEW OF LITERATUR

**Velasco et al. (2008)** [Broad spectrum bioactive sunscreens] studied and investigated the development of sunscreens possessing broad spectrum anti-UV radiation effectiveness with reduced concentration of chemical UV filters; and bioactive products have been the focus of several researches due to ecological issues (sustainability), minimum ambient impact and for safe utilization.

**Ashwat et al. (2006)** examines the most commonly used herbs in herbal sunscreen lotions are Aloe vera, basil, green tea, almond, olive, jojoba and cucumber.

**Tabrizi et al. (2003)** Oriented to sunscreen development, the use of natural raw materials that infers UV absorption and skin protection against UVB and UVA radiation is of great interest, associated with the benefits of the products and compliance of the consumers.

**F'guyer et al. (2003)** Several botanical compounds have been shown to be antimutagenic, anticarcinogenic and nontoxic and have the ability to exert striking inhibitory effects on a plethora of cellular events at various stages of carcinogenesis. Few examples include tea polyphenols, curcumin, silymarin, garlic compounds, apigenin, resveratrol, ginkgo biloba, beta-carotenoids, and ascorbic acid.

**Robbins et al. (2003)** Important categories of beneficial phytoconstituents include phenolic acids, flavonoids, and high molecular weight polyphenols. In Robbins (2003), the literature review focuses on identifying and describing key categories of beneficial phytoconstituents—specifically phenolic compounds—due to their significant roles in promoting health and preventing disease.

Polyphenolic compounds, including phenolic acids, flavonoids, and high molecular weight polyphenols like tannins and lignins, exhibit diverse biological activities. These compounds possess antioxidant, anti-inflammatory, antiviral, and anticancer properties, scavenging free radicals and modulating cell signaling pathways. A polyphenol-rich diet, derived from fruits, vegetables, teas, and grains, contributes to long-term health and disease prevention, protecting against chronic conditions like cancer, cardiovascular disease, and neurodegenerative disorders. This foundational understanding highlights the nutritional value and health-promoting potential of polyphenolic compounds.

**Movileanu et al. (2000)** Baby et al. (2006). Polyphenolic compounds exhibit a wide number of pharmacological properties such as anti-allergic, anti-inflammatory, hepatoprotective, vasoactive, antithrombotic, antioxidant, free radical scavenging, antitumor, antibacterial and antiprotozoal due to their different in vivo action mechanism.

**In Movileanu et al. (2000)**, The broad spectrum of pharmacological activities exhibited by polyphenolic compounds. These natural substances are widely found in plants and have gained significant scientific interest due to their health-promoting effects.

Polyphenols exhibit diverse pharmacological effects, including antiallergic, anti-inflammatory, hepatoprotective, vasoactive, antithrombotic, antioxidant, antitumor, antibacterial, and antiprotozoal properties. These effects are achieved through various mechanisms, such as modulating enzyme and receptor activities, regulating gene expression, interfering with cell signal ling pathways, and direct chemical interactions with biomolecules. The natural origin and low toxicity of polyphenols make them promising therapeutic agents for complementary and alternative medicine, warranting further research into their potential applications.

## 3. AIM AND OBJECTIVE

### 3.1 AIM

Formulation and evaluation of sunscreen utilizing blue pea flower extract, leveraging its natural UV-absorbing and antioxidant properties to protect skin from harmful UV radiation.

Ultraviolet (UV) radiation, emitted by the sun, is a form of electromagnetic radiation that reaches the Earth's surface. While moderate exposure to sunlight is essential for the synthesis of vitamin D and overall well-being, prolonged or excessive exposure to UV radiation can have detrimental effects on the skin. UV radiation is typically categorized into three types: UVA, UVB, and UVC. UVC is mostly absorbed by the Earth's atmosphere and is not a significant concern for skin damage. The harmful effects of UV radiation on the skin primarily result from exposure to UVA and UVB rays.

Sunburn (Erythema): UVB radiation is a major contributor to sunburn. When the skin is exposed to excessive UVB radiation, it leads to inflammation and redness, commonly known as sunburn. Sunburn not only causes short-term discomfort but also increases the risk of long-term skin damage.

DNA Damage and Skin Cancer: UV radiation can cause direct damage to the DNA in skin cells. Prolonged exposure increases the risk of skin cancers, including basal cell carcinoma, squamous cell carcinoma, and Melanoma. UVB rays are more responsible for causing DNA damage, while UVA rays can contribute to the formation of free radicals that harm cellular DNA.

Hyperpigmentation and Sunspots: UVA rays can penetrate deeper into the skin and contribute to the development of hyperpigmentation, including sunspots, age spots, and uneven skin tone.

The need for effective and safe sunscreen formulations is driven by several important factors related to skin health and overall well-being. Sunscreens play a crucial role in protecting the skin from the harmful effects of ultraviolet (UV) radiation, and their effectiveness and safety are paramount for various reasons.

**3.2 OBJECTIVE**

The objective for effective and safe sunscreen formulations

The need for effective and safe sunscreen formulations is driven by several important factors related to skin health and overall well-being. Sunscreens play a crucial role in protecting the skin from the harmful effects of ultraviolet (UV) radiation, and their effectiveness and safety are paramount for various reasons.

Prevention of Sunburn: Sunburn, characterized by redness, pain, and inflammation of the skin, is a direct result of overexposure to UVB radiation. Effective sunscreens with appropriate Sun Protection Factor (SPF) ratings help prevent sunburn and minimize acute skin damage.

Reduced Risk of Skin Cancer: UV radiation is a known carcinogen that can cause DNA damage in skin cells, increasing the risk of skin cancers such as melanoma, basal cell carcinoma, and squamous cell carcinoma. Regular use of effective sunscreens has been associated with a reduced risk of developing these types of skin cancers.

Prevention of Hyperpigmentation: UVA radiation penetrates the skin more deeply and can lead to the formation of hyperpigmentation, including sunspots and age spots. Sunscreens that provide protection against UVA rays help prevent unwanted changes in skin pigmentation.

**Fig. 3.1: Blue Pea Flower.**

**Significance of blue pea flower extract as a potential photoprotective agent**

Blue pea flower extract (Clitoria ternatea) holds significant promise as a potential photoprotective agent due to several key characteristics and bioactive compound.

Antioxidant Properties: Blue pea flower extract is rich in antioxidants, particularly anthocyanins, flavonoids, and polyphenols.

These antioxidants help neutralize free radicals generated by UV radiation, thereby reducing oxidative stress and preventing damage to skin cells. UV Absorption: Studies have shown that blue pea flower extract possesses natural UV- absorbing properties, particularly in the UVA and UVB ranges. This ability to absorb UV radiation can help shield the skin from direct exposure to harmful rays, reducing the risk of sunburn, premature aging, and DNA damage.

Skin Barrier Protection: Blue pea flower extract has been shown to enhance the skin's natural barrier function, improving its ability to retain moisture and resist external stressors. This barrier- enhancing effect can help fortify the skin against UV-induced damage and maintain its overall health and integrity.

**4. Drug Profile**

Flower name:- Butterfly pea flower (blue pea flower).

Biological source: - The blue pea flower comes from the clitoria ternatea plant.

Kingdom:- Plantae.

Family:- Fabaceae.

Subfamily:- Faboideae.

Genus:- Clitoria.

Species: - Clitoria ternatea.

Chemical Constituents: The flower is rich in several bioactive compounds, including:
Anthocyanins: Water-soluble pigments responsible for the vibrant blue colour.

Flavonoids: Known for their antioxidant and anti-inflammatory activities.

Alkaloids: Possess neuroprotective and therapeutic effects.

Cyclotides: Small circular proteins with antimicrobial and insecticidal properties.
Properties of Anthocyanins: Anthocyanins, one of the main active components, have the following properties.

Antioxidant: Neutralize free radicals and reduce oxidative stress, Antimicrobial: Inhibit the growth of various bacteria and fungi, UV Protection: Protects skin and cells from UV-induced damage.

**Fig. 4.1: Pod.** **Fig4.2: Stem.** **Fig. 4.3: Leaf.** **Fig. 4.4: Flower.**

Pharmacological Relevance: Butterfly Pea Flower has a wide range of traditional and modern medicinal applications: Memory enhancement and brain tonic (Ayurvedic use), Anti-anxiety and antidepressant effects, Anti-diabetic and anti-inflammatory properties, Skin and hair health due to antioxidant content.

## 5. MATERIAL AND METHODOLOGY

### 5.1. Material

#### 5.1.1 Ingredients

**Aloe Vera**

**Fig. 5.1: Aloe Vera.**

Aloe vera is a useful active component to include in your sunscreen blend. It has been demonstrated to treat and prevent skin burns. Aloe vera gel is made from the leaves of Aloe Vera and barbadensis. Because of its moisturizing and revitalizing properties, aloe vera gel is used in cosmetic lotions. It preserves the natural moisture balance of the skin while blocking UVA and UVB rays. It inhibits sunburn and activates the immune system. Aloe vera gel can aid in the healing process of sunburns by lowering inflammation, which in turn helps to reduce pain and redness. Additionally, the gel promotes collagen synthesis, which aids in the healing process.

**Coconut Oil**

Coconut oil prevents premature skin aging while maintaining the skin's softness and smoothness. Use coconut oil on your skin to hydrate and exfoliate dead skin cells. Coconut oil moisturizes dry skin, even in those who have eczema or other skin conditions. Its antimicrobial, antifungal, and antiviral qualities aid in wound healing by preventing skin damage from free radicals. Because of its anti-inflammatory qualities, coconut oil can help with skin conditions that cause redness on the skin, including oily and dry skin.

**Fig. 5.2: Coconut Oil.**

**Rose Water**

Rose water has vitamin B, which is frequently found in sun products and sunscreen. It enhances the efficacy of SPF protection. Rose water is a useful tool for reducing skin pigmentation. Rose water unclogs your pores, which helps remove dirt and oils from your skin. It aids in keeping your skin's PH level stable. The antioxidant levels in Rose water combat free radicals and maintain healthy, radiant skin while also protecting the skin from damaging environmental aggressors.


**Fig. 5.3: Rose Water.**

**Vitamin E Capsule**

Extra protection against acute UVB damage and against cell mutations brought on by exposure to the sun and pollution is provided by vitamin E. Vitamin E helps to improve skin elasticity and cleanse the skin by eliminating impurities. When vitamin E and lemon juice are combined, the skin becomes lighter. It is most well-known for improving the appearance and health of skin. It has anti-inflammatory and antioxidant qualities.

**Fig. 5.4: Vitamin E Capsule.**

**Carbopol:** Improve stability- enhanced texture, increased efficacy.

**Sodium benzoate:** Improved safety- extended shell life stability and effectiveness.

**Zinc oxide broad:** Spectrum protection non-irritating stable and effective.

**Beeswax:** Improved skin hydration- enhanced skin protection natural & sustainable

**Glycerine:** Soothing and charming, texture enhancer solvent.

**Sodium CMC:** Increase efficacy, enhanced stability, improved texture.

### 5.1.2 Equipment/ Instrument used in Cosmetic Formulation

**Weighing Balance**

**Fig. 5.5: Weighing Balance.**

**Standard Operating Procedure**

1. Place the balance on a flat, stable surface.
2. Turn it on and allow to stabilize.
3. Calibrate if needed (internal or external).
4. Place container on the pan and press tare.
5. Add sample carefully, close draft shield, and record the weight.

6. Remove sample, clean the balance, and turn it off if not in use.

**Mortar Pestle**

**Fig. 5.6: Mortar Pestle.**

**Standard Operating Procedure**

1. Clean the mortar and pestle before use.
2. Place the drug/substance in the mortar.
3. Hold the pestle firmly and grind with rotational pressure.
4. Continue grinding until you get a fine, uniform powder.
5. Transfer the powder carefully for further use.
6. Clean the mortar and pestle after use.

**Mechanical Stirrer**

**Fig. 5.7: Mechanical Stirrer.**

**Standard Operating Procedure**

1. Set up the stirrer on a stable surface with a stand and clamp.
2. Place the beaker/flask with the solution under the stirrer.
3. Insert the stirring rod into the solution (centered).

4. Adjust speed gradually using the control knob.
5. Stir until uniform mixing is achieved.
6. Turn off, remove the rod, and clean all equipment.

## 5.2. METHODOLOGY

### 5.2.1. Formulation

| Ingredients | Quantity Taken (25gm) |
|---|---|
| Sodium CMC | 0.85gm |
| Glycerine | 2.5gm |
| Carbopol 940/ Carbopol 934 | 0.5gm |
| Sodium Benzoate | 0.06gm |
| Blue Pea Extract | 25ml |
| Aloe Vera Gel | 12.5gm |
| Vitamin E | 0.25ml |
| Zinc Oxide | 1gm |

### 5.2.2 Extraction of Blue Pea Flower

**Collection of Plant Material**: Blue pea flowers are harvested and cleaned to remove dirt, debris, and other impurities. The flowers may be dried to reduce moisture content and preserve the stability of bioactive compounds.

**Selection of Solvent:** A suitable solvent is chosen based on the polarity of the target compounds and the desired extraction efficiency. Common solvents used for extracting bioactive compounds from botanical materials include ethanol, methanol, acetone, and water, either alone or in combination.

**Solvent extraction methods:** Solvent extraction is a common method used to extract bioactive compounds from plant materials, including blue pea flowers (Clitoria ternatea). Here are the steps involved in solvent extraction of blue pea flower extract.

**Extraction Process:** 1. The blue pea flowers are ground or pulverized to increase the surface area and facilitate extraction.

2. The ground plant material is then mixed with the selected solvent in an extraction vessel.

3. The extraction process may involve various techniques, such as maceration, reflux, sonication, or Soxhlet extraction, depending on the desired extraction efficiency and the properties of the target compounds.

4. During extraction, the solvent penetrates the plant material, dissolving the bioactive compounds and forming a solution known as the extract.

5. The extraction process may be carried out at room temperature or under controlled conditions temperature, pressure, and time to optimize extraction efficiency and minimize degradation of heat sensitive compounds.

**Filtration and Separation:** Once the extraction is complete, the extract is separated from the plant material using filtration or centrifugation. Solid particles and plant debris are removed, leaving behind a clear extract solution.

**Concentration:** The solvent is removed from the extract to concentrate the bioactive compounds. This can be achieved by evaporation under reduced pressure, rotary evaporation, or freeze-drying (lyophilization).

**Storage:** The blue pea flower extract is stored in suitable containers under controlled conditions of temperature and humidity to maintain its stability and shelf life.

**5.2.3 Formulation of Herbal Sunscreen**

**Step I:** Preparation of Blue Pea Flower Extract

1. Obtain dried blue pea flowers and grind them into a fine powder using a grinder or mortar and pestle.

2. Select a suitable solvent for extraction, such as ethanol, methanol, or a combination of water and organic solvents, based on the polarity of the target compounds in the blue pea flowers.

3. Mix the powdered blue pea flowers with the chosen solvent in a clean glass container and allow the mixture to macerate for a specified period to extract the bioactive compounds.

4. Filter the mixture to separate the liquid extract from the solid plant material, using a filter paper or a mesh sieve.

5. Evaporate the liquid extract to get concentrated extract.

**Step II:** Adding all the ingredients using water bath

1. In A beaker, 50 ml of distilled water was taken. 2 gm Carbopol 940/ Carbopol 934 was added. The beaker was left overnight for the soaking.

2. Next day, the other ingredients like, sodium CMC, glycerine, sodium Benzoate, blue pea extract, aloe vera gel, Vitamin E, zinc oxide were added under water bath for proper dissolving.

**Step III:** Mixing everything under mechanical stirrer

1. Beaker were placed under mechanical stirrer for 30 minutes for lump free proper mixing of the ingredients.

**5.2.4 Evaluation Parameter**

The parameters and methods for the evaluation

**Appearance:** Visually checked the appearance of the formulation.

**Colour:** To determine the colour of the compound, 0.2g of the material was placed against white background in diffuse day light, viewed by eye and its colour should be determined accordingly.

**Irritancy:** Mark the area (1 cm2) on the left-hand dorsal surface. Then the sunscreen was applied to that area and the time was noted. Then it is checked for irritancy, erythema, and oedema if any for an interval up to 24 h and reported.

**Spreadability:** The spreadability of sunscreens determined their therapeutic efficiency. The appropriate amount of sunscreen was applied between two slides, and under specified Load directions, and the two sides took the time in seconds to slide off. Spreadability was Defined as the amount of time it took to separate two slides in less time.

**pH Determination:** pH denotes “Potential of Hydrogen” and is a scale used to specify the acidity or basicity of an aqueous solution. Acidic solutions are measured to have lower pH values than basic or alkaline solutions. The Cream has a pH of 6 to 9. All the formulations were water in oil emulsion. The pH of the cream is measured by making a 10% dilution of the cream and the pH is measured by the pH meter. The electrode must be washed and free from any residue of acid and alkali to ensure an accurate reading.

**Washability:** This test is carried out by simply washing applied sunscreen with Water.

## RESULT AND DISCUSSION

| Parameter | Observation |
|---|---|
| Appearance | Smooth |
| Colour | Blue |
| Irritation | No |
| Spreadability | Easily Spreadable |
| PH | 7.6 |
| Washability | Washable |

**Appearance:** The appearance of the formulation is Smooth, which can be applied smoothly on skin without showing any greasiness.

**Colour:** The colour of the formulation is Blue, which gives pleasant look to the formulation.

**Irritation:** According to the results the formulation does not shows irritation, redness and swelling, itching, hence easily acceptable by users.

**Spreadability:** The spreadability of formulation is Good, so it can be easily spread on the skin hence easy to apply.

**PH Determination:** The pH of the formulation is 7.6 which is similar to skin's pH range, hence does not show any harmful effect.

**Washability:** The formulation is easily Washable, does not retain on the skin after washing.

**Outcomes:** After the completion of report on Formulation and Evaluation of Herbal Sunscreen I understood,

1. Understood cosmetic industries and Drug and Cosmetic Act 1940.
2. Gain knowledge about Documentation cGMP require for cosmetic production.
3. Understood about the production of Herbal Sunscreen.
4. Understood about the evaluation of Herbal Sunscreen.
5. Studied the applications of Herbal Sunscreen.

### 6.1 CONCLUSION

A sun protection formulation was developed through multiple trial batches. Each batch was evaluated for efficacy and stability. The formulation showed promising results in sun protection. It demonstrated broad-spectrum protection against UVA and UVB rays. The SPF level was satisfactory, ensuring adequate protection. Skin compatibility tests revealed no adverse reactions. The formulation proved effective and safe for sun protection use. The

utilization of blue pea flower extract in herbal sunscreen formulations represents a significant advancement in natural sun protection and skincare. By optimizing formulation techniques, as per literature herbal sunscreens containing blue pea flower extract can provide broad-spectrum UV protection, so consumer demand for natural, eco-friendly, safe skincare solutions.

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