

Formulation and Evaluation Herbal Sunscreen Cream

Ms. Pradnya S. Walli¹, Ms. Ankita P. Jatale², Dr. Swati P. Deshmukh³

¹Department of Pharmaceutics, Shraddha Institute of Pharmacy, Washim

²Department of Pharmacology, Shraddha Institute of Pharmacy, Washim

³Professor, Department of Pharmacology, Shraddha Institute Of Pharmacy, Kondala Zambre, Washim-444505

Abstract:

Coconut and Sunflower oils have phytochemical components that can prevent human skin from being exposed to sunlight. These ingredients have the power to soften and moisturize skin. The purpose of this study is to identify the composition of skin cream that protects the skin from sunlight while also understanding its chemical and physical properties. The current study aims to develop herbal sunscreens that will effectively protect skin from harmful sun rays, sunburn, and skin cancer. These sunscreens will contain turmeric, which has a strong antiseptic property that shields skin from bacteria caused by excessive sweating, coconut oil, which is used as a sun-block agent and helps protect skin from sun damage, and aloe vera, which has a cooling effect on the skin. The physicochemical properties, spreadability, irritation, dye, Washability, and stability of the prepared herbal sunscreens were assessed. Turmeric and aloe vera gel, two herbal excipients that brighten skin and have anti-inflammatory, anti-aging, and other effects, are extracted using an exploratory method in this study. Evaluation is done on the formulation's chemical and physical characteristics, which facilitate judgments regarding the formulation's efficacy.

Keywords: Sunscreen, Nourishment, Skin care and Semisolid dosage form.

Introduction:

India's cosmetics business is growing at a very quick pace. The quantity of new products hitting the market, particularly through e-marketing, served as a clue. The majority of Indian women already have a green consumer mindset, therefore natural ingredient cosmetics are currently in style. Consequently, a wide range of natural substances, particularly those with bioactive components that are beneficial to health, are frequently employed in cosmetic goods. Natural products must meet certain criteria, like being readily available, having no negative effects, requiring no special equipment for preparation, being made of renewable resources, and being reasonably priced.^[1]

These days, using sunscreen is essential to shielding our skin from the damaging UV radiation. Finding a suitable sun protection product that is both non-greasy and skin-moisturizing is challenging. In addition to shielding the skin from damaging UV rays, the herbal sunscreen also removes the need for chemical sunscreens. The general public is now more conscious of the safety of chemical-based sunscreens. Sunscreen with a chemical base penetrates the skin and makes it uncomfortable and itchy.^[2] As a result, producers everywhere have started creating herbal sunscreens in an effort to stop the negative impacts of synthetic chemical-based goods. Herbal sunscreens contain natural oils like jojoba, almond, olive, rose, and coconut oils that hydrate the skin and go deeper into the skin's layers to prevent indications of early aging. Herbal compounds with anti-inflammatory, antioxidant, and broad spectrum UV absorption capabilities include green tea, amla, lemon, turmeric, and others. In addition, they tighten the skin, treat acne, remove dark circles, fade scars, and efficiently prevent skin damage. In order to prevent the need for artificial coloring, these natural products also offer self-color.^[3]

Products containing sunscreen can be created as sprays, gels, lotions, creams, sticks, powders, and ointments^[4]. Sunscreen preparations are intended to be applied topically in order to absorb or reflect UV rays away from the skin, so preventing direct skin penetration. Products for sunscreen are designed and developed

with regulatory issues in mind.^[5] Emulsion types of creams are W/O or O/W, mostly depending on the preferences of the makers.

Ingredients:

Aloe vera:

Synonym: Aloe, Ghritkumari.

Family: Liliaceae.

Biological Source: Dried juice collected by incision from the bases of leaves from various species of aloe.

Geographic Source: Aloes are indigenous to East and South Africa, but have been introduced into the West Indies and into tropical countries, and will even flourish in the countries bordering on the Mediterranean



Fig.1: Aloe vera plant.

Benefits:

- First- and second-degree sunburns have both been successfully treated with it. It has been discovered that aloe vera gel shields human skin from all negative effects of radiation. Aloe vera has long been used to treat skin injuries (burns, wounds, insect bites, and eczemas) as well as stomach problems because of its anti-inflammatory, antibacterial, and wound-healing properties and properties.
- It avoids a prolonged kind of hypersensitivity when exposed to UV radiation and reduces the production and secretion of immunosuppressive cytokines like interleukin-10, which are secreted by epidermis keratinocytes (IL-10).^[6]

Turmeric:

Synonyms

Saffron Indian; haldi (Hindi); Curcuma;
Rhizoma cur-cumae.

Biological Source

Turmeric is the dried rhizome of *Curcuma longa* Linn. (syn. *C.domestica* Valetton)

Family: Zingiberaceae.

Geographical Source

The plant is a native to southern Asia and is cultivated extensively in temperate regions. It is grown on a larger scale in India, China, East Indies, Pakistan, and Malaya.^[7]



Fig. 2: Turmeric.

Vitamin E

It is a group of eight [fat soluble](#) compounds that include four [tocopherols](#) and four [tocotrienols](#).

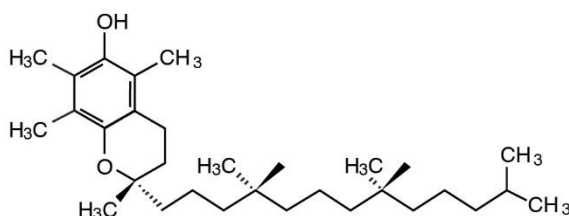
Vitamin E (α -tocopherol)

Fig. 3 : Vitamin E Structure

Sources:

- Wheat germ oil.
- Almonds.
- Peanuts, peanut butter.
- Beet greens, collard greens, spinach.
- Pumpkin.
- Red bell pepper^[8]

Coconut oil

Synonyms

Coconut oil, coconut butter, copra 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.

Geographical Source

Coconut is widely distributed throughout the world.

It is largely cultivated in African and southeast Asian countries. Coconut also known as copra is a dietary as well as industrial product throughout the world. Large quantity of oil is produced in India, Sri Lanka Malaysia, South Africa, China, Indonesia, and other countries^[9]



Fig. 4 : Coconut oil

Sunflower oil

Biological Source

It is a fixed oil obtained from the ripe and dry seeds of *Carthamus tinctorius* Linn.,

Family: Compositae.

Geographical Source

This is one of the most ancient crops cultivated in Egypt as a dye-yielding herb. Now, it is cultivated as an oil seed plant and regarded as substitute for sunflower. It is cultivated in Russia, Mexico, India, United States, Ethiopia, and Australia.^[10]



Fig. 5 : Sunflower oil

Green tea

- **Type:** Tea
- **Country of origin:** China
- **Region of origin:** East Asia
- **Colour:** Green
- **Ingredient:** Tea leaves
- **Plant:** Camellia sinensis



Fig. 6 : Green Tea

Benefits:

- Vitamin E found in green tea hydrates and nourishes the skin.
- It heals and brightens the skin in addition to moisturizing it.
- This component lightens dark spots and reverses sun damage, acne lesions and other skin irritations brought on by irritants in the surroundings.^[11]

Preparation of herbal extract:**Turmeric**

Maceration technique: About 15 g of finely ground turmeric powder was dissolved in 100 ml of 70% alcohol. The preparation was left undisturbed for 48 hours.^[12]



Fig. 7 : Turmeric
Extraction

Aloe Vera:

Centrifugation method should be carried out at 5°C temperatures, 10000 rpm speed and 30 min duration of centrifuge, without addition of acetone to pulp so as to obtain higher gel recovery (50.17 %) and good quality of gel.^[13]

Coconut oil:**Hot extraction process**

Coconut oil is extracted from coconut milk by heating it in hot extraction procedures. The heating process denatures the proteins in coconut milk, which destabilizes the milk emulsion. By heating coconut milk at 100–120°C for 60 minutes, or until the water evaporates entirely, the virgin coconut oil (VCO) can be extracted. In order to extract the volatile coconut oil (VCO) from coconut milk, the protein is cooked slowly in a VCO cooker to coagulate it. The oil is then released from the stubborn residue by filtering through muslin fabric and heating the leftover residue one more time to extract even more oil.^[14]

Sunflower oil:

To make coarse meal, the dehulled sunflower seeds are ground. This is subsequently crushed with hammer mills or grooved rollers into homogeneous fine particles. To extract oil, this fine meal is heated and then pressed in expellers.^[15]

Green Tea:

In a 50 mL centrifuge tube with a specific liquid/solid ratio, green tea powder (0.50 g) and 85°C water (18 mL) were combined for the hot water extraction process. The extraction was then completed for a predetermined amount of time at room temperature (25°C). Following extraction, the crude extract was centrifuged for 10 minutes at $12,000 \times g$ ^[16]

Formulation of cream:

The necessary amounts of coconut oil, green tea, bee wax, and sunflower seeds were heated for one hour in a water bath. Other components like aloe vera, turmeric, and vitamin E were added gradually while stirring continuously until a smooth and uniform paste was formed when the oil phase reached room temperature. The produced herbal sunscreen was then preserved by adding a preservative and kept in a cool place for further investigation or assessment.

Ingredient	F1	F2
Coconut oil	5ml	15ml
Sunflower oil	2g	2g
Bees wax	1.5gm	2.5gm
Green tea	2.836g	2.836g
Aloe vera	20ml	10ml
Turmeric	375g	375g
Vitamin E	400mg	400mg
Preservative	0.5%	0.5%

Table 1: Composition of herbal sunscreen formulations

Evaluation of Herbal Sunscreen Formulations

1. Physical Parameters:

Appearance, colour, and homogeneity were determined.

2. Determination of pH:

The pH of sunscreens made of herbs was measured with a digital pH meter. After 1 g of the formulation was dissolved for 2 hours in 100 ml of freshly made distilled water, pH was determined. Ensuring that the pH of the herbal sunscreens generated matches the skin's pH after a full day of application was the aim of this investigation. Triple checking was done on the results, and S.D. was noted.

3. Spreadability:

The therapeutic efficacy of herbal sunscreens was established by their spreadability. The two sides took the prescribed amount of time in seconds to slip off when the proper amount of herbal sunscreen was placed in between them and under the load directions. The amount of time it required to divide two slides apart in less time was called spreadability.

The formula for calculating it is:

$$S = M \times L / t$$

Where M = weight tied to upper slide

L = length of glass slide

T = time taken to separate the slides

4. Skin Irritation:

Examine For the skin irritation study, three groups of six healthy rats of each sex (1273/PO/Re/S/09/CPCSEA) were employed. The animals had unrestricted access to water and were fed regular animal feed. On one of the research days, the rats' backs were shaved clean, and 5 cm² of the area was marked on both sides; one side was used as a control while the other was put to the test. The following categories were graded: 0, 1, 2, 3 for no reaction, slight patchy erythema, slight but confluent or moderate but patchy erythema, and severe erythema with or without edema, in that order.

5. Washability:

A small amount of cream was applied on the hand and then few minutes washed the hand with tap water.

6. Microbial test of the sunscreen cream:

According to the findings of microbiological tests, there are no microbes in any of the treatments, including the control. It resulted from the usage of methyl paraben. One ingredient that is utilized as a preservative is methyl paraben. This substance has the power to keep bacteria and fungi from growing on the cream.

Conclusion:

The objective of the current study was to develop a reliable herbal sunscreen. Sunscreens containing coconut oil (F1 and F2) were discovered to be stable, exhibit strong antioxidant action, and likely have SPF values of 20 and below, respectively. It has also been demonstrated that these natural sunscreens do not cause mutations. It may be said that the current research will hopefully result in better ways to cure sunburns caused by exposure to UV light. Additionally, the study provides a number of evaluation tests that fully explain the product's function and use components that are both safe and less harmful to skin. It's the most effective,

palatable, and consistent method for figuring out how well herbal sunscreens work. Therefore, the results of this study can aid in the establishment of uniform standards for herbal sunscreens by producers, scientific associations, and regulatory bodies.

Result And Discussion:

Based on the results of research that has been done on the formulation and evaluation of sunscreen skin cream made by adding a variety of natural extracts made from Aloe vera and coconut oil. Following are the results of the analysis conducted on the extracts of these natural ingredients can be seen in Table.1, following results of various evaluation are as

1. The sample has good appearance, which show whit colour as well as homogeneity.
2. The normal pH value of skin on most of face and body lies between 4.7-5.75, pH, pH of the cream base to be in rang of 6.2-6.9 which is good for skin pH. Herbal sunscreen cream pH determined upto the rang of 5.5-6.5 by using pH meter.
3. Spreadability calculated by $S=M \times L / t$ this formula and the answer was 34.92gmcm/sec. in which M was 11.64gm, L was 7.5 cm and t was 2.5sec.
4. After seven days of using herbal sunscreens, a skin irritation study found no irritation, sensitivity.
5. The colour was not change after pouring a sample into phloroglucinol solution, it indicate their is no oxidation in sample was occurred.
6. Based on the results of microbial tests in all treatments (including control) the microbial are absent. It was due to the presence of methyl paraben used. Methyl paraben is an additive used as a preservative. This material has the ability to protect the cream from the growth of bacteria and fungi.

Reference:

1. R. Yanuarti, N. Nurfitriyana, M. Zuchryanto, G. Pratama, A. Munandar, A. Ilhamdy, J. Jumsurizal, I. Kurniawan, E3S Web of Conferences 324, 05001 (2021) <https://doi.org/10.1051/e3sconf/202132405001> MaCiFIC 2021.
2. Sander M, Sander M, Burbidge T, Beecker J. The efficacy and safety of sunscreen use for the prevention of skin cancer. CMAJ. 2020;192(50):1802–10.
3. Y. Shah, R. Mewada, International Journal of Pharmaceutical Chemistry and Analysis (2023).
4. Ashley LW. Sunburn and sunscreen preparations. and others, editor. Springer,; 1993. doi:10.1007/978-94-011-1482-0_16.
5. Bhalke RD, Kulkarni SS, Kendre PN, Pande VV, Giri MA. A facile approach to fabrication and characterization of novel herbal microemulsion-based UV shielding cream. Futur J Pharm Sci. 2020;6(1):1–10.
6. <https://www.pharmacy180.com/article/aloe-170/>
7. <https://www.pharmacy180.com/article/turmeric-283/>
8. <https://go.drugbank.com/drugs/DB00163>
9. <https://www.pharmacy180.com/article/coconut-oil-291/>
10. <https://www.pharmacy180.com/article/safflower-oil-299/>
11. T. Zhao,1 Chao Li, S. Wang, and X. Song, National library of Medicine [Pubmed](2022).
12. M. Abraham, S. Nambiar, V. Charagannavar, Journal of clinical and diagnostic research ISSN:0973-709X
13. Dr. V. Chandegara, A. Varshney, Gel extraction of Aloe vera leave, ResearchGate (2005).
14. R. Agarwal, Bosco SJD, Food Processing & Technology eISSN: 2381-182X (2017)
15. Etienne Le Clef, Timothy Kemper, AOCS Press, Journal of ScienceDirect (2015)
16. Khomendra Kumar Sarwa, Mithun Rudrapal and Manabendra Debnath, BIOSCIENCES BIOTECHNOLOGY RESEARCH ASIA, June 2013 ResearchGate.
17. R. Tiwari, I. Singh, Monisha Gupta, L. Singh, Gaurav Tiwari, Pharmacophore, 13(3) 2022, Pages: 41-49 (2022)
18. Y. Shah, R. Mewada, International Journal of Pharmaceutical Chemistry and Analysis 2023;10(2):116–124 (2023)
19. N. Ritonga, Rini and T. Anggraini, Asian Journal of Applied Research for Community Development and Empowerment. Vol4 (2020), No.1
20. Lusia, Hendra, W. Suryani, and E. Margery, Int. J. Chem. Eng. Syst. 5 (2020)

21. N. Amberg and C. Fogarassy, *Resources* 8, 3 (2019)
 - a. Aswal, M. Kalra, and A. Rout, *Der Pharm. Lett.* 5, 1 (2013)
22. Hanay C, Osterwalder U. Challenges in Formulating Sunscreen Products. *Curr Probl Dermatol.* 2021; 55:93-111. doi:10.1159/000517655
23. Skotarczak K, Osmola-Mańkowska A, Lodyga M, Polańska A, Mazur M, Adamski Z. Photoprotection: facts and controversies. *Eur Rev Med Pharmacol Sci.* 2015;19(1):98-112.
24. Supriya S. Design and Evaluation of Polyherbal Formulation for Treatment of Malaria. *Int J Pharm Phytopharmacol Res.* 2021;11(3):1-5. doi:10.51847/R4UUoZG8x.