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DESIGN AND EVALUATION OF A HERBAL SUNSCREEN GEL ENRICHED WITH ALOVERA, TULSI AND TURMERIC EXTRACT

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ABSTRACT:

Introduction-Excessive exposure to ultraviolet (UV) radiation is a major cause of skin damage, leading to premature aging, hyperpigmentation, and increased risk of skin cancer. The growing demand for natural and safer alternatives to synthetic sunscreens has encouraged the development of herbal formulations with photoprotective properties. The present study focuses on the formulation and evaluation of a herbal sunscreen gel incorporating Aloe vera and turmeric extracts. Aloe vera is known for its moisturizing, soothing, and anti-inflammatory properties, while turmeric possesses strong antioxidant and UV-protective activities due to the presence of curcumin**.** The gel was prepared using a suitable gelling agent and evaluated for physicochemical parameters such as pH, homogeneity, stability, and Sun Protection Factor.

Two widely used herbal ingredients are:

Aloe vera – Known for soothing, moisturizing, and healing properties.

Curcuma longa (Turmeric) – Rich in curcumin, a strong antioxidant and anti-inflammatory compound that help protect against UV-induced damage.

Materials and Methods- Herbal extract derived from Aloe vera, turmeric, Tulsi were selected on their photoprotective and antioxidant capabilities. The base of herbal sunscreen can be prepared by the melted beeswax. The base of herbal ingredients are evenly distributed and easy to apply.

Result- The herbal sunscreen gel exhibited acceptable spreadibility, stability under diverse storage conditions and an appropriate 7 and the sun protection factor was found to be 14%. The presence of significant antioxidant activity suggested the potential for skin protection from oxidative damage.

Conclusion: An herbal sunscreen gel formulated using Aloe vera and Turmeric extract can provide moderate sun protection along with antioxidant, anti-inflammatory, and moisturizing benefits. Proper formulation and evaluation ensure stability, safety, and effectiveness. This type of formulation represents a promising alternative to synthetic sunscreens and aligns with the growing demand for natural cosmetic products. These are rich in antioxidant and soothing agents.

INTRODUCTION:

Sunscreen- is a topical product made to shield the skin from the sun's damaging ultraviolet (UV) rays. Usually, it has active components that reduce UV radiation penetration into the skin by absorbing, reflecting, or scattering it. Sunscreen is primarily used to prevent sunburn, premature skin ageing, and skin cancer brought on by prolonged UV exposure. Different formulations of sunscreens are available to suit different skin types and activities. These include lotions, creams, gels, sprays, sticks, and powders. They frequently include a mix of inorganic and/or organic substances, such as zinc oxide, titanium dioxide, octocrylene, oxybenzone, and avobenzone, which combine to offer broad-spectrum defence against UVA and UVB radiation [1].

Herbal sunscreen- Using natural, plant-based components is the main goal of herbal sunscreens, which are similar to conventional sunscreens in that they aim to protect against the sun's harmful UV rays. A range of plant extracts with possible sun-protective qualities are usually included in these. Extracts from plants such as aloe vera, green tea, chamomile, liquorice root, grape seed, and shea butter are a few examples of such components. These botanical extracts frequently include vitamins, antioxidants, and other substances that may help counteract UV-generated free radicals, lowering oxidative stress and possible skin damage. Mineral-based compounds, such zinc oxide and titanium dioxide, which are naturally occurring minerals that physically block or scatter UV rays without penetrating the skin, are also used in some herbal sunscreens [2].It also protects the skin from sunburn. For topical application, a wide range of sunscreens are available, including lotions, gels, sprays, and foams (including whipped or expanded foam). Powders, among other things. Sunscreen is commonly used in conjunction with clothing, especially when worn with sunhats, sunglasses, and specially made sun-protective clothing. Using umbrellas is also considered a protective measure. For instance, topical treatments such as herbal sunscreen creams protect the skin from UV rays and reduce the chance of sunburn and other skin damage incidents [3].But historically, the use of synthetic chemicals has proved harmful to the environment and human health. Numerous chemicals, dyes, synthetic materials, and their derivatives can cause a wide range of skin disorders and have numerous negative effects, according to extensive study. Thus, whenever feasible, we give top priority to using natural cosmetics [4].A wide variety of sunscreen products, including

Oils, sticks, gels, creams, and lotions, are available on the international market. Sunscreens that offer sufficient protection against UVA rays must be used with these items. There are two main forms of sunscreens: chemical and physical. While physical sunscreens act as a temporary protective barrier by reflecting damaging rays away from the skin, chemical sunscreens by absorbing UV radiation [5].An additional category of sunscreens includes both inorganic and organic filters. High-energy UV rays are absorbed by chemical sunscreens, which then reflect or scatter them to create physical barriers. Organic molecules provide protection against a wider range of UV radiation than chemical sunscreens. Certain ultraviolet (UV) light wavelengths are absorbed by organic filter components due to their chemical makeup. The filter moves from a low-energy to a high-energy condition. UV rays are scattered and reflected back into the surroundings by inorganic filters. Physical barriers to UV light are another function of inorganic filters. Inorganic filters are referred to as broad [6].Herbal ingredients used in cosmetic formulations have a number of advantageous qualities, such as antioxidant, antibacterial, antiseptic, and anti-inflammatory effects. Additionally, compared to their synthetic counterparts, herbal treatments are frequently linked to fewer negative side effects. It is crucial to remember that the cosmetic product category includes all skincare items, including lotions, creams, and shampoos. A significant amt. of herbal substances are used for cosmetic purposes; these products are frequently referred to as "herbal cosmetics." The minimal occurrence of side effects is the reason for the growing demand for herbal medicines. Herbs and shrubs are the only ingredients used in herbal cosmetics. There are no harmful effects on human skin from substances derived from natural plants[7]. Curcumin contains anti-inflammatory and antioxidant qualities. More than a hundred distinct

components of curcumin have been found. Curcuminoids, which are colouring chemicals, and turmerone, an essential oil, make up the majority of turmeric. Antioxidants called curcuminoids. [8,9].

MATERIAL AND METHODOLOGY

Drug and Chemicals

Aloevera gel

Coconut oil

Tulsi oil

Rose water

Beeswax

Vitamin E

Turmeric Extract

List of Materials:

Sr.No.	Ingredients	Quantity	Role
1	Alo vera gel	1.5gm	Anti-inflammatory
2	Beeswax	2gm	Thickening agent
3	Coconut oil	2gm	Anti-fungal
4	Turmeric extract	0.1gm	Anti-bacterial
5	Tulsi oil	1gm	Anti- oxidant
6	Vitamin E	0.2gm	Anti- oxidant
7	Rose water	2gm	Foaming agent

ALOVERA:

Aloe and Aloe Indica are the synonym of Aloe vera. It is derived from the dried, yellow and bitter latex found in the leaves of plant Aloe barbadensis. It belongs to the family of Liliaceae. One useful active ingredient to have in your sunscreen's arsenal is aloe vera. It has been shown to be effective for both skin treatments. Aloe vera leaves and A. barbadensis are the source of aloe vera gel, which is used in cosmetic lotion for its revitalising and moisturising properties. It retains the natural moisture balance of the skin and blocks UVA and UVB rays. It promotes immune system intervention and prevents sunburn. By lowering inflammation, aloe vera gel can aid in the healing process of sunburns by easing discomfort and redness. Additionally, the gel promotes collagen synthesis, which aids in the healing process [10]. Aloe vera has 75 potentially active components, including as vitamins, minerals, lignin, enzymes, carbohydrates, amino acids, salicylic acids, and saponins [11,12,13].

Figure No.-1

COCONUT OIL:

Copra oil is the synonym of Coconut oil. It is derived from the dried solid endosperm of the mature fruit of the Coccus Nucilfera Linn. It belongs to the family of Palmaceae. Coconut oil is used as a moisturiser and to exfoliate dead skin cells, keeping the skin smooth and supple while avoiding premature ageing. Dry moisturising with coconut oil.
Its antibacterial, antifungal, and antiviral qualities help to promote wound healing and shield the skin from free radical damage, especially in those with conditions like eczema.
Because coconut oil contains anti-inflammatory qualities that lessen skin redness, it can aid with dry and oily skin issues by lowering inflammation. [14].

ROSE WATER:

Rose flower water is the synonym of rose water. It is derived from the steam distillation of fresh, aromatic rose petals primarily from the Rosa Damascena. It belongs to the family of Rosaceae. Vitamin B, which is frequently used in sunscreen and sun products, is found in rose water. It contributes to increasing SPF's efficacy. Skin pigmentation can be lightened with rose water. Rose water unclogs your pores, removing oil and debris from your skin. It keeps your skin's PH level stable. Gulab Jal is an antioxidant-rich moisturising and nourishing substance that protects skin from environmental aggressors and combats free radicals to maintain healthy, radiant skin [15, 16, 17].

VITAMINE:

Tocopherol is the synonym of vitamin E. It belongs to the family of Tocochromanols. Vitamin E offers further defence against acute UVB ray damage and against cell mutation brought on by exposure to the sun and pollutants. Vitamin E aids in skin cleansing, impurity removal, and skin elasticity enhancement. Lemon juice and vitamin E work together to lighten skin. It is most well-known for improving the appearance and health of the skin. It possesses anti-inflammatory and antioxidant qualities [18].

TURMERIC:

Indian Saffron and Curcuma are the synonym of Turmeric. It consists of the dried, fresh rhizome of the plant known as Curcuma Longa. It belongs to the family of Zingiberaceae. It is used in skin care products, spot treatment and face mask. Curcuma is bitter in taste and aromatic in odour. Turmeric has anti-allergenic and anti-inflammatory qualities. Because it is the best blood cleanser, it helps mend wounds and is used for all conditions involving blood coagulation [19].

Figure No.-2

TULSI: Holi Basil is the synonym of Tulsi. It consists of the fresh and dried leaves of the plant known as Ocimum sanctum Linn. It belonging to the family of Labiatae. The key active constituents including volatile oil, unsolid acid and flavonoids. Tulsi plant's leaf extracts had increased antioxidant activity and served as a sunscreen. The polyphenol components in the leaf extract were discovered to have an antioxidant or free radical scavenging action [20].

Figure No.- 3

BEESWAX:

Purified waxis the synonym of Bees wax. It is a natural, purified secretion obtained from the honey comb of honey bees primarily from the Apis mellifera Linn. It belongs to the family of Apidae. Uses- It is used in creams and ointments as a thickening and emulsifier. It forms a protective layer on the skin, helps retain moisture, and improver the texture and stability of skin care products [21].

MACERATION OF TULSI:

Round bottom flask, 25.0g of crushed raw material was macerated with 200ml of 100% ethanol, covered with aluminium foil, and left in the dark for seven days. To a consistent and thorough extraction, the round-bottom flask was shaken continuously. A fresh Muslin cloth was used to filter the mixture, and the filtrate was gathered in a beaker that had been cleaned. The filtrate and leftover maceration extract were separated and stored within the cabinet for additional screening [22,23,24].

Figure No.-4

EXTRACTION OF TURMERIC: Prepare the Soxhlet apparatus thimble and assemble the apparatus. Load 10 to 20 gm of turmeric powder into Soxhlet thimble. Add 200 to 500 ml of solvent to the collection flask. Heating the solvent to its b.p. Allow the solvent to vaporise, condense and drip back into the thimble for 1 to 2 hours. When the solvent level in the thimble reaches the top syphon. Remove solvent using evaporation. Use filter paper to remove impurities. Yielded a crude curcuminoid extract [25,26].

Figure No.-5

METHOD OF FORMULATION:

1. Oil Phase Preparation- Take 2gm bees wax and 2gm of coconut oil in a clean beaker. Heat gently (70 degree Celsius) until beeswax melts completely.

Add 0.2gm vitamin E oil and 0.1gm turmeric powder to the melted mixture. Stir well.

2. Aqueous Phase Preparation- In another beaker, mix 1.5gm aloe vera gel ,1gm of Tulsi oil and 2gm of rose water.

Warm the mixture to the same temperature to the oil phase.

3. Emulsification- Slowly add the warm aqueous phase into the oil phase while stirring continuously.

Stir 5-10 min using a stirrer and smooth cream forms.

4. Cooling and Packaging -Allow the cream to cool the room temperature. Once cooled, transfer the cream into a clean container.

Store in a cool, dry place away from the direct sunlight. [25,26,27,28].

EVALUATION:

Sun Protection Factor[SPF]-The SPF of the cream was determined using an in vitro UV spectrophotometric method. The following formula was used:

SPF is equal to $CF \times \sum [EE(\lambda) \times I(\lambda) \times Abs(\lambda)]$

Where, CF stands for correction factor, and its value is 10.

The erythemal effect of light at a specific wavelength is represented by $EE(\lambda)$. The intensity of solar radiation at that wavelength is denoted by $I(\lambda)$.

The sample's absorbance at particular wavelengths between 290 and 320 nm is represented by $Abs(\lambda)$. The computation was based on the constant product of EE and I for each wavelength. A UV spectrophotometer provided the absorbance measurements.

PH Determination- To make sure the formulation was suitable for skin, its pH was assessed. Standard buffer solutions were initially used to calibrate a digital pH meter.

50 millilitres of distilled water were used to dissolve about 0.5 grams of cream, and the pH of the resultant mixture was noted.

Homogeneity Test - Both visual and tactile inspection were used to evaluate the cream's homogeneity.

When the cream was applied, it was examined for lumps, even ingredient distribution, and smooth consistency**.**

Ease of Removal- To assess the removability, the cream was applied to a specific area of the skin and washed off with plain tap water after a short duration. The ease with which the cream was removed was noted**.**

Appearance Evaluation- Visual criteria like colour, surface smoothness, and a pearl-like sheen (pearlescence) were used to assess the cream. The formulation's cosmetic acceptability was rated using these attributes.

Skin Irritancy Test-To assess any possible skin irritation, a patch test was performed. After applying the cream to a specific skin area, observations were taken every few hours for up to twenty-four hours. Erythema, or redness, oedema, or other indications of irritation were examined at the site.

After Feel Analysis-By applying a certain amount of cream and monitoring user input, post-application effects such smoothness (slipperiness), moisturising ability (emollience), and the amount of residue left on the skin were assessed.

About 90% of the potential sun protection is provided by the combination of the substances in your herbal sunscreen. This implies that your cream may provide UV protection.

Actual testing is required to ascertain the precise level of protection, even though this is an estimate based on the substances' inherent qualities [24,25,26,27,28].

Observation:

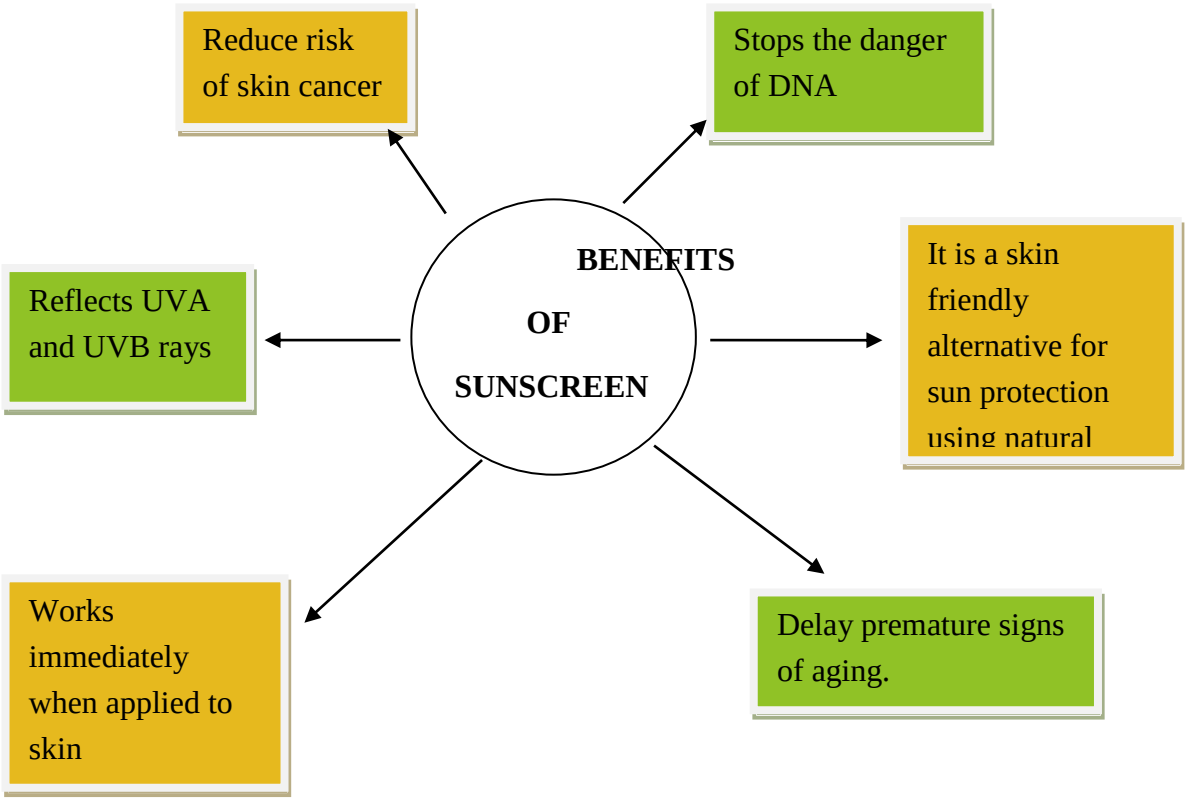
Sr. No.	Parameters	Observation
1	Colour	Light green
2	Odour	Characteristics
3	Spread ability	Good
4	PH	7
5	Test for Irritancy	No irritation reaction
6	Sun protection in %	14.2%

Storage:

Store in a cool, dry place, away from moisture and sunlight.

Shelf Life:

1-2 yrs when stored properly in sealed container.



Sr.No.	Merits	Demerits
1	Easily available.	They are difficult to mask in terms of taste and odour.
2	No side effects.	It also requires long term therapy.
3	They are inexpensive.	Higher the SPF, higher the risk of irritation for skin.
4	Non- toxic	It can give white cast.
5	Easy to manufacture.	Limited shelf life.

Conclusion:

The developed herbal sunscreen, containing Aloe vera gel, Turmeric extract, Tulsi oil, Rose water, Beeswax, Coconut oil can show a strong potential. It is a safe and effective alternate to the chemical sunscreen. The formulation offers a combination of natural sun protection, skin hydration and anti- inflammatory benefits.

These are rich in antioxidant and soothing agents; the cream helps to protect the skin from the UV rays and environmental damage. Herbal formulation offers a promising.

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