Formulation and Evaluation of Herbal Sunscreen for Karanja Leaves

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Abstract: Sunscreen protects the skin from the damaging effects of the sun. Sunscreens are now an essential component of every person's skin care regimen. The majority of marketed sunscreen creams are costly and contain potentially harmful or cancer-causing synthetic chemicals. For this reason, it was necessary to create and test a safe and efficient sunscreen lotion with antioxidants to help counteract the long-term damage caused by free radicals from the sun and to avoid sunburn, wrinkles, scars, cracks, and premature ageing. Karanja oil boosts sunscreens' ability to protect, primarily from UVB rays. That is, antimicrobial, calming, and anti-aging qualities. The goal of this study was to create a photoprotective herbal sunscreen based on extract from Karanja leaves that had high SPF, antioxidant properties, and UVA and UVB shields to protect against damaging sun radiation. Physical, rheological, antifungal, and antibacterial qualities of the produced product were assessed. The prepared sunscreen's stability study and in vitro SPF value were determined in order to determine the formulation's effectiveness.

Keywords: Karanja leaves, Sunscreen, SPF, UV rays, Antimicrobial.

1. INTRODUCTION

The people of early civilization used a diversity of products made from plants as sun agents. UV protection is extremely popular because of the photo protective property of sunscreens. Since its main components are flavonoids, phenolic compounds or vegetable oils, it provides antioxidant, wound healing, antibacterial, premature aging, and moisturizing, anti-inflammatory and anti-UV-A protection and is UV protected.

Karanja leaves has been used as a folk medicinal plant, as a molecule of interest, Karanja is an antioxidant and contains bioflavonoid that possesses many differing properties, including anti-inflammatory and antisolar effects. Karanja (Pongamia pinnata) is described in Ayurvedic literature for its antibacterial properties. The antibacterial and antifungal properties of Karanja are attributed to pongaroten (degenin) and karanjin (a flavanol).

The intend of present study was formulation of novel Karanja leaves-based photo protective herbal sun protective novel cream having antioxidant properties, elevated SPF value and obligatory homogenous UVA/UVB protection. The prepared sun protective cream was evaluated for its physical, rheological, antifungal and antibacterial properties. To recognize the effectiveness of prepared formulation, SPF value calculated and its stability study was also carried out.

The market's synthetic sunscreen formulations have a number of negative side effects. Certain active chemicals found in synthetic sunscreen formulations, such as oxybenzone, retinoic acid, and benzophenone, have the potential to cause cancer. As a result, scientists are focusing on creating herbal sunscreens that work well and have few or no negative effects. One of the instruments for evaluating quality is phytochemical evaluation, which involves marker compound analysis, chemo profiling, and initial phytochemical screening utilizing contemporary analytical methods.

The common name for Pongamia pinnata (Family: Febaceae) is Karanj. It is used in traditional Ayurvedic and Siddha medical systems to treat a range of skin conditions, including leprosy, psoriasis, and eczema. Together with its ability to absorb ultraviolet light, the extract's antioxidant components make it an extremely powerful sunscreen that helps against wrinkles, skin cancer, and premature aging.

Skin: The skin is the body’s largest organ, forming a protective barrier against the external environment and regulating body temperature.

- Function of the skin:
- Protection
- Regulation

- Sensation
- Immunity

Benefits of Herbal Sunscreen

1. Natural and Gentle: Herbal sunscreen are formulated with plant-based ingredients, making them gentler on the skin and less likely to cause irritation.
2. Reduced Risk of Irritation: They are often free from harsh chemicals and additives that can irritate sensitive skin.
3. Eco-Friendly: Herbal sunscreen are generally made with renewable resources and minimal packing, making them a more sustainable choice for the environment.
4. Potential for Skin Benefits: Some herbal ingredient used in sunscreens have antioxidant properties that can help protect against free radical damage and contribute to overall skin health.
5. Broad Spectrum Protection: Herbal sunscreen can provide broad spectrum protection against both UVA and UVB rays, which is crucial for preventing sunburn and other skin damage.
6. Long-Lasting Protection: Some herbal sunscreen can provide long-lasting sun protection, reducing the need for frequent reapplication.

Plant Profile:

Botanical name	Pongamia pinnata
Kingdom	Plantae
Class	Magnoliopsida
Order	Fabales
Family	Febaceae
Genus	Pongamia
Region	Indian, Southeast Asia

Experimental Work:

Preparation of plant extract karanja leaves

1. Collection: Collect fresh marigold flowers in garden or any place.

2. Cleaning: Remove dirt, insects and any debris from the flowers. This is typically done by gently rinsing the petals with clean water and allowing them to dry naturally.

3. Drying: Using dried flowers, this are air dry or use a dehydrator. Or also put in sunlight for 24 hr.

Preparation of plant extract (Soxhlet Extraction)

1. Weigh 30g of dried leaf powder
2. Place the powder in a thimble and insert into the Soxhlet extractor
3. Use ethanol the hydro-alcoholic mixture, As Solvent 300-400ml 40g
4. Allow the Until soxhlet cycle to run Fox 6-8 hours the siphoning becomes colorless.
5. After Filter extraction. paper Filter the Solution using to remove Solid residues.
6. Concentrate the Filtrate using a water bath at 40-50°C until a semi-solid of day extract is obtained.

Sr. No	Ingredient	F1	F2
1.	Karanja leaf extract	2.5ml	3.7ml
2.	Bees wax	2.5gm	2.5gm
3.	Steric acid	1.5gm	1.5gm
4.	Coconut oil	2ml	2ml
5.	Glycerin	2ml	2ml
6.	Aloe Vera gel	1ml	1ml
7.	Vitamin E	0.5ml	0.5ml
8.	Essential oil	2-3 drops	2-3 drops
9.	water	8ml	8ml

Formulation Table:

Formulation process:

Step 1: Prepare the oil phase

- Weigh and combine beeswax, steric acid, and coconut oil in a beaker.
- Heat gently in a water bath to 70◦C
- Until completely melted and homogenous.

Step 2: Prepare the aqueous phase

- In a separate beaker, mix glycerin, aloe vera, and rose water.
- Heat this mixture to 70◦C (same as oil phase)
- To insure uniform mixing

Step 3: Emulsification

- Slowly add the hot aqueous phase to the hot oil phase with continuous stirring
- Use a mechanical stirrer or hand blender to ensure proper emulsification
- Stir continuously while the mixture begins to cool and form a semi solid cream

Step 4: Add active and additive (cool phase)

- Once the mixture cools to below 40◦C
- Add karanja leaf extract (3.75g), mix well
- Add vitamin E, preservative, essential oil
- Continue stirring until the cream is smooth and homogenous

Step 5: Final adjustments

- Check and adjust the pH to 5.5-6.5 (if necessary)
- Transfer the cream into clean, sterilized container.
- Store at cool and dry place.

Phytochemical test:

Phytochemical	Test Method	Procedure	Observation	Inference
Alkaloids	Mayer's test	Extract + Mayer's reagent	Creamy white, reddish, or brown ppt	+
Flavonoids	Alkaline reagent test	Add NaOH solution + extract	Intense yellow color that fades with acid	+
Tannins	$FeCl_3$ test	$FeCl_3$ + extract	Blu-black or greenish precipitate	+
Saponins	Foam test	Shake extract vigorously with water	Persistent froth (1cm or more)	+
Terpenoids	Salkowski's test	Add chloroform & conc. sulfuric acid + extract	Reddish-brown at interface	+
Glycosides	Keller-Killiani test	Extract + glacial acetic acid + $FeCl_3$ + conc. sulfuric acid	Reddish-brown at junction	+

Evaluation Parameter:

1. Physical appearance

Parameter such as color, odor and texture of formulation

- Color:- Color check by visual inspection.
- Odor:- Odor check by olfactory sensation.
- Consistency:- By apply on skin.

2. PH Measurement

By using digital pH meter at least 1-2ml of serum was taken and mix in 10 ml of o/w and by pH meter c heck the reading. Standard reading is between 5-7

- Texture – smooth, semi-thick cream
- Type – Oil in water emulsion
- Spreadability – moderate to good (spreads easily without being runny)
- Feel on skin – Non greasy if well- emulsified, may feel slightly rich due to coconut oil and beeswax.
- Absorption – should absorb within 1-2 min with light massage.
- Appearance- Glossy or matte depending on ratio of oil to water and emulsifier blending.

Characterization of Karanja based herbal sunscreen

- Evaluation of physical parameters

Parameters like colour, appearance and odour of formulated sunscreens were evaluated.

- pH determination

Formulated sunscreen's PH was calculated using pH meter.2gm of each sunscreen was accurately weigh and dispersed in 20ml distilled water & stored it for 2 hrs. The pH estimation was carried out and results were noted.

- Irritancy study

Mark an area (1cm³) on the left dorsal face. Apply cream on marked area. Irritation, erythem. edema were then monitored periodically for up to 24 hours, and the duration was recorded an d reported.

- Spreadability

Place the preparation on two glass slides and place a 50 g weight on the top slide for 5 minutes to compress the cream into a thick layer. Add 50 grams of weight to pot. The time in seconds) required for the separation of these slides is used to measure spread.

RESULT

Formulation and Evaluation of herbal sunscreen for Karanja Leaves was prepared.

Evaluation	Result
Physical Appearance	yellowish
PH	6.16
Homogeneity	Good
Spread Ability	Good
Skin irritation	No

CONCLUSION

This study was conducted with aim to develop and estimate Karanja based photoprotective herbal sunscreen. The formulation karanja leaves based cream exhibited no reddishness, irritation inflammation. The test of red dye affirms that the prepared sunscreen was O\W emulsion type. Also the homogeneity test confirms the oil evenly distributed in cream. When sunscreen was kept for longer period, it was found that there was no alter in colour of cream. Also the formulated cream exhibited non greasy, later application of cream on the skin. The slipperiness, emolliency and quantity of rest left after applied on skin was prominent. The cream was with no trouble removed by washing under tap water. Studies have proven that sunscreen made with karanja oil consistently block UV rays and increase UV protection. Additional clinical studies are needed for further confirmations.

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