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Research Article

**DEVELOPMENT AND EVALUATION OF ANTI-AGING
HERBAL CREAM USING TRIDAX PROCUMBENS****Ms.Sapna Minatai Musale¹, Prof. Komal A. Dongare², Dr.Surwase K.P³**^{1,2,3}Aditya Institute of Pharmaceuticals, Beed, Sarda Estate, Pimpalner Road, Beed,
Maharashtra-431122**Abstract:**

Skin aging is a progressive biological process that affects the structural and functional integrity of the skin. It is characterized by the appearance of wrinkles, fine lines, dryness, reduced elasticity, rough texture, and pigmentation changes. Both intrinsic factors such as genetic predisposition and chronological aging, as well as extrinsic factors including ultraviolet radiation, environmental pollution, smoking, and lifestyle habits contribute significantly to the aging process. The increasing awareness regarding the adverse effects associated with synthetic cosmetic products has generated considerable interest in the development of herbal formulations possessing better safety profiles and therapeutic benefits.

Tridax procumbens is a medicinal herb widely recognized for its antioxidant, anti-inflammatory, antimicrobial, and wound-healing properties. The plant contains numerous phytoconstituents including flavonoids, phenolic compounds, tannins, alkaloids, and carotenoids that contribute to its biological activities. The present study was undertaken to formulate and evaluate an anti-aging herbal cream containing Tridax procumbens extract. The cream was prepared using natural ingredients such as green tea extract, coconut oil, olive oil, beeswax, and vitamin E. Various physicochemical parameters including appearance, color, odor, pH, viscosity, spreadability, homogeneity, and irritation potential were evaluated. The formulated preparation exhibited acceptable physicochemical properties, good stability, and excellent skin compatibility. The antioxidant activity of the herbal constituents suggests their potential role in preventing oxidative stress-induced skin damage. The developed formulation may therefore serve as a safe and economical herbal alternative for maintaining healthy and youthful skin.

Keywords: *Tridax procumbens, Anti-aging cream, Herbal cosmetics, Antioxidant activity, Skin protection, Flavonoids*

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1. INTRODUCTION:

The skin is the largest and one of the most important organs of the human body. It forms the primary barrier between the internal physiological environment and external surroundings. Apart from providing mechanical protection, the skin performs several essential functions including temperature regulation, sensory perception, immune defense, prevention of water loss, and maintenance of overall homeostasis. In an average adult, the skin covers an area of approximately 1.5–2.0 square meters and constitutes nearly 15% of total body weight.¹

A healthy skin barrier is necessary for protecting the body against microbial invasion, ultraviolet radiation, chemical exposure, and physical injury. However, with advancing age, structural and functional changes occur within the skin that gradually impair its protective capacity and aesthetic appearance. These changes are collectively referred to as skin aging.

Skin aging is a complex biological process influenced by both intrinsic and extrinsic factors. Intrinsic aging, also known as chronological aging, is genetically programmed and occurs naturally over time. It is associated with thinning of the epidermis, decreased collagen production, reduced cellular turnover, and diminished skin elasticity. In contrast, extrinsic aging results from environmental factors such as prolonged ultraviolet exposure, pollution, smoking, poor nutrition, and psychological stress. Among these factors, ultraviolet radiation is considered the major cause of premature skin aging, commonly referred to as photoaging.²

At the molecular level, aging is associated with oxidative stress caused by excessive generation of reactive oxygen species (ROS). These reactive molecules damage proteins, lipids, nucleic acids, and cellular membranes, ultimately leading to cellular dysfunction. Oxidative stress also stimulates matrix metalloproteinases (MMPs), enzymes responsible for collagen degradation. Continuous collagen breakdown and reduced collagen synthesis result in wrinkle formation, loss of elasticity, and skin sagging.³

Modern cosmetic science focuses on preventing or delaying these aging-related changes through the use of topical formulations. Anti-aging creams are among the most widely used cosmetic products because they provide direct delivery of active ingredients to the skin surface. These formulations generally contain antioxidants, moisturizers, collagen stimulators, anti-inflammatory agents, and photoprotective compounds that work synergistically to improve skin health.⁴

Although synthetic anti-aging agents such as retinoids and chemical antioxidants are effective, their prolonged use may be associated with irritation, redness, peeling, dryness, and hypersensitivity reactions. Consequently,

researchers have increasingly focused on plant-derived ingredients that offer comparable efficacy with improved safety. Herbal cosmetics have gained significant popularity due to their natural origin, affordability, availability, and lower risk of adverse effects.⁵

2. SKIN STRUCTURE AND ITS ROLE IN AGING

The skin consists of three major layers namely the epidermis, dermis, and hypodermis. Each layer contributes uniquely to maintaining skin health and functionality.

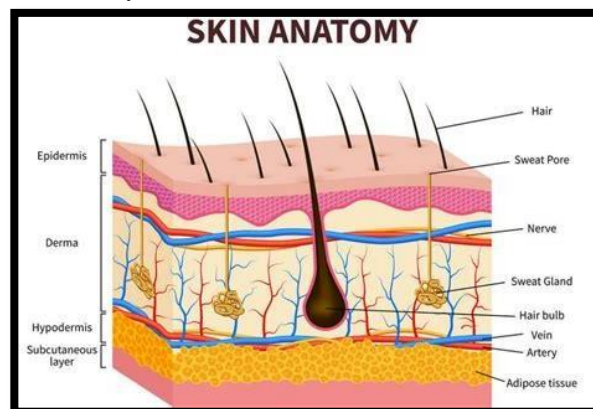


Figure 1. Skin Anatomy

The epidermis is the outermost layer and serves as the first protective barrier against environmental insults. It consists of five distinct strata including the stratum corneum, stratum lucidum, stratum granulosum, stratum spinosum, and stratum basale. The stratum corneum is composed of dead keratinized cells embedded within a lipid matrix that prevents excessive water loss and protects against microbial invasion.⁶

The dermis lies beneath the epidermis and provides structural support through a dense network of collagen and elastin fibers. Fibroblasts present within the dermis are responsible for synthesizing these structural proteins. The dermis also contains blood vessels, lymphatics, nerves, hair follicles, and sebaceous glands that contribute to skin nourishment and physiological functioning.⁷

The hypodermis or subcutaneous tissue is the deepest skin layer and consists mainly of adipose tissue. This layer functions as an energy reserve, thermal insulator, and protective cushion against mechanical injury.

With aging, significant alterations occur within all three layers of the skin. The epidermis becomes thinner and more fragile, while cellular turnover decreases considerably. The dermis experiences reduced collagen synthesis and fragmentation of elastin fibers, leading to loss of firmness and elasticity. Furthermore, diminished vascularization and decreased hydration contribute to skin dryness and delayed wound healing.⁸

Another important factor influencing skin health is the acid mantle. The skin surface normally maintains a slightly acidic pH ranging from 4.5 to 5.5. This acidic environment supports normal microbial flora and inhibits the growth of pathogenic microorganisms. Maintenance of this pH is therefore crucial for preserving barrier integrity and preventing skin disorders.

3. SKIN INFECTIONS AND LIMITATIONS OF SYNTHETIC CREAMS

Skin disorders and infections represent a major global healthcare concern. Bacterial and fungal pathogens are among the most common causes of dermatological conditions. Organisms such as *Staphylococcus aureus*, *Streptococcus pyogenes*, *Candida albicans*, and *Trichophyton rubrum* are

frequently associated with skin infections and inflammatory disorders.

Many conventional cosmetic formulations contain synthetic preservatives, fragrances, emulsifiers, and stabilizers that may trigger allergic reactions and contact dermatitis in susceptible individuals. Long-term exposure to certain synthetic chemicals may also compromise skin barrier function and increase sensitivity.⁹

These limitations have encouraged the development of herbal formulations containing naturally derived active ingredients. Herbal creams not only provide cosmetic benefits but may also offer antimicrobial, antioxidant, anti-inflammatory, and wound-healing effects. Such multifunctional activity makes herbal products attractive alternatives for anti-aging skincare applications.¹⁰

Table 1. Common Skin Problems Associated with Synthetic Cosmetic Products

Skin Concern	Major Causes	Possible Effects on Skin
Bacterial Infections	<i>Staphylococcus aureus</i> , <i>Streptococcus pyogenes</i>	Redness, inflammation, pustules, skin damage
Fungal Infections	<i>Candida albicans</i> , <i>Trichophyton rubrum</i>	Itching, scaling, irritation, ringworm
Allergic Reactions	Synthetic fragrances and preservatives	Skin rashes, redness, itching
Contact Dermatitis	Chemical emulsifiers and stabilizers	Swelling, irritation, burning sensation
Skin Sensitivity	Long-term exposure to synthetic ingredients	Increased skin reactivity and discomfort
Barrier Dysfunction	Harsh cosmetic chemicals	Moisture loss, dryness, impaired protection
Premature Skin Aging	Oxidative stress and chronic irritation	Wrinkles, fine lines, reduced elasticity

The increasing incidence of skin infections, allergic reactions, and irritation associated with synthetic cosmetic ingredients has created a growing demand for safer herbal alternatives. Herbal formulations containing natural bioactive compounds offer antioxidant, antimicrobial, anti-inflammatory, and wound-healing properties, making them promising candidates for anti-aging skincare applications.¹¹

4. RATIONALE FOR SELECTING TRIDAX PROCUMBENS

Tridax procumbens Linn., commonly known as coat buttons or Mexican daisy, belongs to the family Asteraceae. The plant is widely distributed throughout tropical and subtropical regions and grows abundantly in India as a common roadside herb. Despite being considered a weed in many areas, the plant has long been utilized in traditional medicine systems for the treatment of wounds, inflammation, infections, and various skin disorders. The medicinal value of *Tridax procumbens* is attributed to its rich phytochemical composition. Numerous investigations have reported the presence of flavonoids, alkaloids, carotenoids, tannins, terpenoids, and phenolic compounds within the plant. These constituents possess potent antioxidant and anti-inflammatory activities that may help protect skin cells against oxidative damage.¹²

The selection of *Tridax procumbens* for the present study was based on its documented wound-healing, antimicrobial, antioxidant, and skin-protective properties. These characteristics suggest its potential

utility as a natural ingredient in anti-aging cosmetic formulations.

6. DRUG AND EXCIPIENT PROFILE

6.1 *Tridax procumbens*

Synonyms

Tridax pilosa, *Chrysanthemum procumbens*

Biological Source

Tridax procumbens is a medicinal herb commonly distributed throughout tropical and subtropical regions including India, Africa, and Southeast Asia. The plant grows abundantly as a roadside herb and has been extensively utilized in traditional medicine for the treatment of wounds, inflammation, skin disorders, and microbial infections.

Family

Asteraceae

Genus

Tridax

Pharmacological Importance

Tridax procumbens possesses a broad spectrum of pharmacological activities attributed to its rich phytochemical composition. The plant contains

flavonoids, alkaloids, phenolic compounds, carotenoids, tannins, and terpenoids that contribute to its therapeutic effects.

The antioxidant constituents help neutralize reactive oxygen species responsible for cellular damage and premature aging. Anti-inflammatory compounds reduce tissue inflammation and oxidative injury, while antimicrobial constituents provide protection against bacterial and fungal pathogens. These combined activities make *Tridax procumbens* a valuable herbal ingredient for anti-aging cosmetic formulations.

Uses of *Tridax procumbens*

- Promotes wound healing and tissue regeneration.
- Exhibits potent antioxidant activity.
- Possesses anti-inflammatory properties.
- Demonstrates antimicrobial effects.
- Supports skin rejuvenation and repair.
- Reduces visible signs of aging.
- Traditionally used in Ayurvedic and folk medicine.¹³

6.2 Green Tea



Figure 2. Green Tea

Green tea is obtained from the leaves of *Camellia sinensis* and belongs to the family Theaceae. It is one of the richest natural sources of polyphenolic compounds and has been extensively investigated for its health-promoting properties.

The major bioactive constituents of green tea include catechins, flavonoids, caffeine, and amino acids. Among these compounds, epigallocatechin gallate (EGCG) is considered the most potent antioxidant. Green tea protects skin cells from oxidative damage induced by ultraviolet radiation and environmental pollutants. In addition, it exhibits anti-inflammatory activity by reducing the production of inflammatory mediators.

The incorporation of green tea extract into anti-aging formulations provides enhanced protection against free radical damage while supporting overall skin health and appearance.

Uses of Green Tea

- Antioxidant protection.
- Reduction of oxidative stress.
- Anti-inflammatory activity.
- Prevention of photoaging.

- Improvement of skin texture and appearance.¹⁴

6.3 Coconut Oil



Figure 3. Coconut Oil

Coconut oil is derived from the kernel of mature coconuts obtained from *Cocos nucifera*. It belongs to the family Arecaceae and contains a high concentration of medium-chain triglycerides including lauric acid, capric acid, and caprylic acid. Due to its excellent emollient and moisturizing properties, coconut oil is widely used in cosmetic preparations. It forms a protective layer on the skin surface that minimizes moisture loss and maintains hydration. Lauric acid present in coconut oil also exhibits antimicrobial activity against various microorganisms.¹⁵

In anti-aging formulations, coconut oil contributes to skin softness, smoothness, and protection against dryness, thereby improving overall skin condition.

Benefits of Coconut Oil

- Natural moisturizing agent.
- Improves skin hydration.
- Supports barrier function.
- Possesses antimicrobial properties.
- Enhances skin smoothness and elasticity.

6.4 Olive Oil



Figure 4. Olive Oil

Olive oil is obtained from the fruits of *Olea europaea* and belongs to the family Oleaceae. It is rich in monounsaturated fatty acids, polyphenols, tocopherols, and other antioxidant compounds that contribute to its beneficial effects on the skin.

The antioxidant activity of olive oil helps protect cellular structures from oxidative stress while reducing free radical-mediated damage. Its emollient nature improves skin hydration and elasticity, making it a valuable ingredient in topical formulations intended for skin nourishment and rejuvenation.¹⁶

Regular application of olive oil-containing products may help maintain skin softness and delay the appearance of age-related skin changes.

Benefits of Olive Oil

- Strong antioxidant activity.
- Improved skin nourishment.
- Enhanced elasticity.
- Protection against environmental damage.
- Prevention of excessive dryness.

6.5 Bees Wax



Figure 5. Bees Wax

Beeswax is a natural wax secreted by honey bees (*Apis mellifera*) belonging to the family Apidae. It consists primarily of esters, fatty acids, and hydrocarbons that provide excellent physicochemical characteristics for topical formulations.

Beeswax functions as a thickening agent, stabilizer, and emollient in cream formulations. It improves the consistency and texture of the product while forming

a protective film on the skin surface. This protective barrier reduces transepidermal water loss and enhances skin hydration.

The compatibility of beeswax with natural oils and herbal extracts makes it particularly useful in herbal cosmetic preparations.¹⁷

Benefits of Bees Wax

- Improves cream consistency.
- Acts as a natural stabilizer.
- Prevents moisture loss.
- Enhances formulation texture.
- Provides protective action on the skin.

7. MATERIALS AND METHODS:

7.1 Materials

The materials used for the preparation of the anti-aging herbal cream included *Tridax procumbens* extract, green tea extract, coconut oil, olive oil, beeswax, vitamin E oil, and essential oil. All materials employed in the study were of pharmaceutical grade and suitable for topical application.

7.2 Equipment Used

The formulation and evaluation processes were carried out using standard laboratory equipment to ensure accuracy and reproducibility.

Table 2. Equipment Used in Preparation of Cream

No.	Instruments	Manufacturer/Supplier
1	Magnetic Stirrer	Labcare Instruments
2	Weighing Balance	Shimadzu India

7.3 Formulation of Anti-Aging Herbal Cream

Three formulations containing varying concentrations of *Tridax procumbens* extract were prepared to determine the effect of extract concentration on the physicochemical properties of the cream.¹⁸

Table 3. Formulation of Anti-Aging Cream from *Tridax procumbens*

Sr. No.	Ingredients	A	B	C	Uses
1	Tridax procumbens Extract	1.05 gm	1.4 gm	2.1 gm	Anti-aging, Antioxidant
2	Green Tea Extract	1.05 ml	1.4 ml	2.1 ml	Anti-inflammatory
3	Coconut Oil	3.75 ml	5 ml	5 ml	Moisturizing
4	Olive Oil	3.75 ml	5 ml	5 ml	Antioxidant
5	Bees Wax	1.80 gm	2.4 gm	3.6 gm	Emollient
6	Vitamin E Oil	0.45 ml	0.6 ml	0.3 ml	Skin Health
7	Essential Oil	Q.S	Q.S	Q.S	Fragrance

7.4 Ingredients Used

Table 4. Ingredients

Sr. No.	Ingredients
1	Tridax procumbens
2	Green Tea
3	Coconut Oil
4	Olive Oil
5	Bees Wax
6	Vitamin E

7.5 Extraction of *Tridax procumbens*

Method: Soxhlet Extraction

Fresh leaves of *Tridax procumbens* were collected, washed thoroughly with distilled water, and shade dried for several days until complete removal of moisture. The dried material was pulverized to obtain coarse powder.

Approximately 20–30 g of powdered plant material was packed into a filter paper thimble and transferred into the Soxhlet extraction apparatus. Ethanol was used as the extraction solvent. The extraction process was continued for approximately 6–8 hours until the solvent in the siphon tube became colorless, indicating exhaustive extraction of phytoconstituents.

The obtained extract was filtered and concentrated using a water bath maintained below 50°C to remove excess solvent. The concentrated semisolid extract was stored in an airtight container until further use in cream formulation.¹⁹

7.6 Preparation of Anti-Aging Herbal Cream

The cream was prepared using an oil-in-water emulsion technique. Coconut oil, olive oil, and beeswax were mixed to form the oil phase and heated until complete melting occurred. In a separate container, *Tridax procumbens* extract and green tea extract were mixed to prepare the aqueous phase.

The aqueous phase was gradually incorporated into the oil phase with continuous stirring using a magnetic stirrer to obtain a uniform emulsion. Vitamin E oil and essential oil were subsequently added and mixed thoroughly. The formulation was allowed to cool gradually while stirring continuously to obtain a smooth and homogeneous cream. The final product was transferred into sterilized containers and stored under suitable conditions until evaluation.²⁰

8. EVALUATION PARAMETERS

The prepared anti-aging herbal cream formulations were evaluated using various physicochemical and safety parameters to ensure their suitability for topical application. Evaluation of the formulations was carried out to determine their appearance, color, odor, pH, viscosity, and irritation potential. These parameters are important because they directly influence the quality, stability, efficacy, and patient acceptability of topical cosmetic preparations.²¹

8.1 Appearance

Appearance is one of the primary quality attributes of any cosmetic product. A visually acceptable formulation improves consumer confidence and market acceptability. The prepared cream formulations were examined visually for texture, consistency, homogeneity, smoothness, and the presence of any phase separation.

A good herbal cream should possess a smooth texture, uniform consistency, and elegant

appearance without grittiness or separation of ingredients. The appearance study also provides preliminary information regarding formulation stability.

8.2 Colour Evaluation

Colour evaluation was performed by visual inspection under normal daylight conditions. The colour of the formulation is influenced by the concentration of herbal extract and excipients incorporated into the cream base. Uniform colour distribution indicates proper mixing and homogeneity of ingredients.

The colour of a cosmetic preparation should be aesthetically acceptable and remain stable throughout storage without significant discoloration.

8.3 Odour Evaluation

Odour plays a significant role in consumer acceptance of cosmetic products. The formulations were evaluated for their characteristic fragrance and the presence of any unpleasant smell. Essential oils incorporated into the formulation contributed to the overall fragrance profile of the cream.

A pleasant odour enhances patient compliance and indicates the absence of degradation of formulation components.²²

8.4 pH Determination

The pH of topical formulations is a critical parameter because it influences skin compatibility and stability. The pH values of the prepared creams were determined using a calibrated digital pH meter. The ideal pH range for topical creams is generally between 4.5 and 6.5, which closely resembles the natural pH of human skin. Formulations within this range are less likely to cause irritation and help maintain the integrity of the skin barrier.

8.5 Viscosity Determination

Viscosity is an important rheological property that affects spreadability, consistency, and ease of application. The viscosity of the prepared formulations was determined using suitable viscometric methods.

An optimum viscosity ensures uniform application of the cream on the skin surface and prevents excessive flow or stiffness. Proper viscosity also contributes to formulation stability and user acceptability.

8.6 Skin Irritation Test

The skin irritation study was carried out to assess the safety of the prepared herbal cream. A small quantity of formulation was applied to the skin and observed for any signs of redness, itching, swelling, burning sensation, or allergic reaction.

The absence of irritation indicates that the formulation is safe for topical use and compatible with skin tissues.²³

9. RESULTS AND DISCUSSION:

The prepared anti-aging herbal cream formulations were evaluated systematically to determine their physicochemical characteristics and suitability for topical application. The results obtained from various evaluation parameters are presented below.

9.1 Appearance Test

Table 5. Appearance Test

Formulation	Appearance
F1	Smooth Film
F2	Smooth Film
F3	Smooth

The appearance study revealed that all formulations possessed acceptable physical characteristics. The creams exhibited smooth texture and satisfactory homogeneity without evidence of phase separation. Among all formulations, F2 demonstrated superior appearance with excellent smoothness and uniform consistency. The results suggest that the selected formulation components were compatible and produced stable cream systems.

9.2 Colour Evaluation

Table 6. Colour Evaluation

Formulation	Colour
F1	White
F2	Dark White
F3	Pale Brown

The colour evaluation demonstrated gradual changes with increasing concentration of *Tridax procumbens* extract. Formulation F1 appeared white, whereas F3 exhibited a pale brown colour due to the higher concentration of herbal extract. Formulation F2 showed a dark white appearance that was considered aesthetically acceptable for topical application.

9.3 Odour Evaluation

Table 7. Odour Evaluation

Formulation	Odour
F1	Characteristic
F2	Characteristic
F3	Characteristic

All formulations exhibited characteristic odour due to the presence of herbal ingredients and essential oil. No unpleasant or rancid smell was observed during evaluation. Formulation F2 showed particularly good fragrance acceptability and retained its characteristic aroma throughout the study period.

9.4 pH Determination

Table 8. pH Determination

Formulation	pH
F1	5.3
F2	5.5
F3	6.0

The pH values of all formulations were found within the acceptable range for skin application. Formulation F2 exhibited a pH value of 5.5, which closely matches the physiological pH of the skin.

Maintenance of this pH is important for preserving skin barrier function and minimizing irritation.

9.5 Viscosity Determination

Table 9. Viscosity Determination

Formulation	Viscosity
F1	40 cps
F2	48 cps
F3	60 cps

Viscosity studies indicated that formulation F2 possessed optimum consistency suitable for easy application and spreadability. Formulation F1 showed comparatively lower viscosity, whereas F3 exhibited higher viscosity due to increased extract concentration. The viscosity of F2 was considered ideal for cosmetic application.

9.6 Irritation Test

Table 10. Irritation Test

Formulation	Observation
F1	Slight Irritation
F2	No Irritation Observed
F3	Slight Irritation

The irritation study revealed that formulation F2 was completely free from irritation and produced no adverse skin reactions. In contrast, slight irritation was observed with formulations F1 and F3. These findings indicate that F2 possessed superior skin compatibility and safety.

10. DISCUSSION

The present study successfully demonstrated the feasibility of developing an anti-aging herbal cream using *Tridax procumbens* extract. The incorporation of natural ingredients such as green tea extract, coconut oil, olive oil, beeswax, and vitamin E contributed significantly to the overall quality and therapeutic potential of the formulation.

The antioxidant-rich phytoconstituents present in *Tridax procumbens* play a crucial role in protecting skin cells from oxidative stress, one of the major causes of premature aging. Green tea extract further enhanced the antioxidant and anti-inflammatory activity of the formulation. Coconut oil and olive oil improved moisturization and skin nourishment, while beeswax provided structural stability and improved consistency.

Among the three formulations evaluated, F2 demonstrated the most desirable characteristics including acceptable appearance, suitable colour, pleasant odour, optimum viscosity, skin-compatible pH, and absence of irritation. These findings suggest that F2 may be considered the optimized formulation for topical anti-aging applications.

11. CONCLUSION:

The present investigation successfully achieved the formulation and evaluation of an anti-aging herbal

cream containing *Tridax procumbens* extract. The study demonstrated that the selected herbal ingredients could be effectively incorporated into a stable and aesthetically acceptable cream base.

The phytochemical constituents present in *Tridax procumbens*, particularly flavonoids, phenolic compounds, tannins, and terpenoids, contribute significantly to its antioxidant, anti-inflammatory, and antimicrobial properties. These activities are beneficial in protecting the skin from oxidative damage and delaying the appearance of visible signs of aging.

The prepared formulations exhibited satisfactory physicochemical characteristics including appropriate appearance, colour, odour, pH, and viscosity. Among the formulations studied, F2 emerged as the optimized formulation because of its superior stability, acceptable consistency, and excellent skin compatibility. The absence of irritation further confirmed its suitability for topical use.

Based on the results obtained, it may be concluded that *Tridax procumbens*-based anti-aging cream possesses considerable potential as a safe, effective, and economical herbal cosmetic product. Further clinical investigations and long-term stability studies are recommended to establish its therapeutic efficacy and commercial applicability.

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