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Research Paper

A Green Cosmeceutical Approach to Skin Ageing Using Carica Papaya in A Polyherbal Cream

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ABSTRACT

Skin ageing is a natural biological process influenced by intrinsic factors such as genetics and hormonal changes, as well as extrinsic factors including ultraviolet radiation, pollution, stress, and poor lifestyle habits. These factors lead to wrinkles, dryness, pigmentation, and loss of skin elasticity due to oxidative stress and reduced collagen production. The present study focuses on a green cosmeceutical approach for managing skin ageing through the formulation and evaluation of a polyherbal anti-ageing cream using natural ingredients. Carica papaya was selected as the primary ingredient because of its rich content of antioxidants, vitamins A, C, and E, and the enzyme papain, which helps in skin rejuvenation and exfoliation. It was combined with other herbal ingredients such as Aloe vera, Curcuma longa (turmeric), and Azadirachta indica (neem) to enhance moisturizing, anti-inflammatory, antimicrobial, and antioxidant properties

INTRODUCTION

Herbal cosmetic products have been used historically in India and many parts of the world, highlighting their long-standing cultural importance and traditional value in beauty and personal care. Cosmetics products are substances applied to the human body for cleansing,

beautifying, or changing appearance, and they have a long history of using plant-based (phyto) ingredients in their formulations. The growing demand for herbal cosmetics is due to their eco-friendly benefits and their compatibility with the modern preference for a natural and healthy lifestyle. Plants play an important role in the formulation of herbal cosmetics and help in the

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development of new cosmetic products [1]. Consumers increasingly prefer products that are easy to use, safe, and made with natural ingredients that support health, making them more favorable than synthetic products. Skin ageing is a natural biological process in which the skin gradually loses its structural integrity, elasticity, and functional capacity over time. It occurs due to both intrinsic (internal) and extrinsic (external) factors[1].

- **Intrinsic ageing (chronological ageing):**
This is the natural ageing process controlled by genetics and physiological changes that occur with increasing age. It leads to slower cell turnover, reduced collagen production, decreased elastin fibers, thinning of the epidermis, dryness, and formation of fine wrinkles.

- **Extrinsic ageing:**
This occurs due to environmental and lifestyle factors and often accelerates the ageing process. Major causes include prolonged exposure to ultraviolet (UV) radiation (photoaging), pollution, smoking, stress, poor nutrition, lack of sleep, and excessive use of harsh cosmetic products.

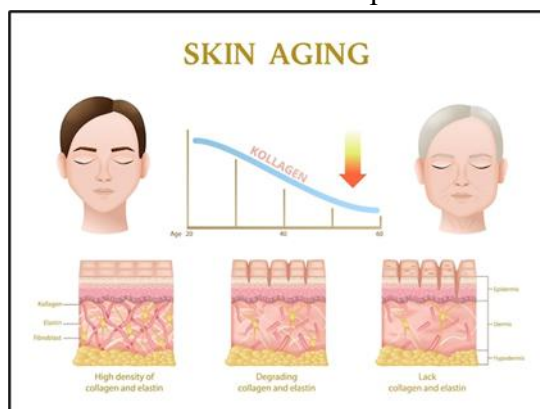


Fig no. 1. Skin Aging

❖ BACKGROUND OF POLYHERBAL CREAMS

Herbal cosmetics have gained significant importance in recent years due to the growing awareness about the adverse effects of synthetic chemicals used in conventional cosmetic products.

Herbal creams are semi-solid emulsified formulations containing medicinal plant extracts that provide therapeutic as well as cosmetic benefits for the skin. These formulations are widely used for moisturizing, anti-ageing, skin protection, and treatment of various dermatological conditions[2].

❖ IMPORTANCE OF POLYHERBAL CREAMS:

Herbal creams play an important role in modern cosmetology and dermatology due to their natural origin, therapeutic benefits, and minimal side effects. These formulations are prepared using plant extracts and herbal ingredients that provide nourishment, protection, and treatment for various skin conditions. With the increasing awareness about the harmful effects of synthetic chemicals in cosmetic products, herbal creams have gained widespread acceptance among consumers worldwide[3].

❖ BENEFITS OF POLYHERBAL INGREDIENTS OVER CHEMICAL FORMULATIONS

To diagnose, treat, mitigate, or alter the physiology or structure of an animal or human, a herbal formulation is a dosage form that comprises one or more herbs, or processed herbs, in a specified dose to provide certain nutritional, cosmetic, and other advantages. A variety of procedures, including as fermentation, distillation, expression, fractionation, extraction, purification, and concentration are used to create herbal remedies for whole plants, broken-up or chopped plants, or plant components. Ground or powdered botanical materials, tinctures, extracts, essential oils, expressed juices, and processed exudates are among them[4].

BENEFITS OF POLY HERBAL INGREDIENTS INCLUDE:

- Effectiveness
- Low risk of adverse effects
- Widespread availability
- Low cost

❖ Materials Used

The materials used for the formulation of herbal anti-aging cream include both herbal active ingredients and cream base materials. Base materials such as almond oil, coconut oil, beeswax, and stearic acid are used to form the cream base and provide smooth texture. Distilled water acts as the aqueous phase, while glycerine is added as a humectant to maintain skin hydration. Preservatives like methyl paraben and propyl paraben are used to prevent microbial growth, and fragrance or rose water may be added to improve the odor and acceptability of the final formulation[5].

➤ Papaya



Fig no. 2 Papaya

Taxonomical Rank	Taxon
Kingdom	Plantae
Division	Magnoliophyta (angiosperm)
Class	Magnoliopsida (dicotyledons)
Order	Brassicales
Family	Caricaceae
Genus	Carica

➤ Biological Source

Papaya is obtained from the fruit of *Carica papaya* L., a tropical plant of the family Caricaceae, widely cultivated in India and other tropical countries. The fruit and its latex contain enzymes such as papain and chymopapain, which are used in medicinal and cosmetic preparations[6].

➤ Chemical Constituents

The main chemical constituents of papaya obtained from *Carica papaya* include a variety of biologically active compounds. Papaya contains important proteolytic enzymes such as papain, chymopapain, and caricain, which help in breaking down proteins and are widely used in medicinal and cosmetic preparations. The fruit is also rich in vitamins, especially vitamin A, vitamin C (ascorbic acid), vitamin E, and B-complex vitamins, which provide antioxidant and skin-protective effects. In addition, papaya contains carotenoids such as β -carotene, lycopene, and cryptoxanthin, which contribute to its antioxidant activity. It also possesses alkaloids like carpaine, along with flavonoids, phenolic compounds, saponins, and tannins. Furthermore, papaya provides essential minerals such as calcium, potassium, magnesium, and iron.

➤ Parts Used : Fruit

➤ Morphological Features

The plant *Carica papaya* is a fast-growing, soft-wooded tropical herbaceous tree that can grow about 3–10 meters in height. The stem is erect, cylindrical, hollow, and usually unbranched, with prominent leaf scars. The leaves are large, palmately lobed, and deeply divided, measuring about 30–60 cm in diameter, and are arranged spirally at the top of the stem with long hollow petioles.

➤ Uses

The fruit of *Carica papaya* is widely used in herbal creams because of its rich content of enzymes, vitamins, and antioxidants. Papaya contains the proteolytic enzyme papain, which helps in removing dead skin cells and promoting gentle exfoliation, making the skin smoother and brighter. The presence of vitamins A, C, and E provides strong antioxidant properties, which help in protecting the skin from damage caused by free radicals and slow down the signs of skin ageing such as wrinkles and fine lines. Papaya also has moisturizing and skin-softening properties, which help in maintaining skin hydration and improving skin texture[7].

➤ Preparation of Herbal Extract (drying method)

The collected fresh leaves were dried using the sun drying method. The plant materials were first cleaned to remove dust and unwanted impurities and then spread evenly on clean, dry trays. These trays were kept under direct sunlight during daytime hours for effective drying. The leaves were turned at regular intervals to ensure uniform drying on all sides and to prevent moisture retention. Sun drying was selected because it is a simple, economical, and convenient method for removing moisture from plant materials. The drying process was continued for several days until the leaves became completely dry, crisp, and brittle. Proper drying helps prevent microbial growth, increases shelf life, and prepares the plant material for grinding into powder and further use in herbal formulation[8].

➤ Preparation of Polyherbal Herbal Powder

Fresh leaves of *Carica papaya* (papaya), *Curcuma longa* (turmeric), *Azadirachta indica* (neem), and fresh *Aloe vera* leaves were collected from reliable natural sources and carefully selected based on their freshness and quality[9]. The plant materials were thoroughly washed with clean water to

remove dust, dirt, and other foreign particles. After cleaning, the leaves were cut into small pieces and spread evenly on clean trays for shade drying to preserve their active phytoconstituents. The drying process was continued for several days, and the materials were turned periodically to ensure uniform drying and to prevent moisture retention. *Curcuma longa* rhizomes were cleaned, sliced into small pieces, and dried separately until they became completely moisture-free[10].



Fig no. 3 preparation of polyherbal Herbal extract

❖ Procedure

Step 1: Collection and Preparation of Herbal Materials

Fresh papaya, turmeric, neem leaves, and aloe vera leaves are collected and washed properly with distilled water to remove dust and impurities. The plant materials are shade dried and then powdered separately. Aloe vera gel is extracted from fresh leaves, while papaya pulp is separated from ripe fruits. The dried powders of neem and turmeric are subjected to extraction using suitable solvents such as ethanol or water, and the extracts are concentrated.

Step 2: Preparation of Oil Phase

In a clean beaker, ingredients such as beeswax, stearic acid, liquid paraffin/almond oil, and other oil-soluble components are taken. These ingredients are heated on a water bath at about 70–

75°C until they melt completely and form a uniform oil phase.

Step 3: Preparation of Aqueous Phase

In another beaker, distilled water is taken and heated to the same temperature (70–75°C). Add glycerin, borax, and other water-soluble ingredients. Then add the prepared herbal extracts of papaya, turmeric, neem, and aloe vera into this phase and mix thoroughly.

Step 4: Emulsification Process

The hot aqueous phase is slowly added to the oil phase with continuous stirring. Stirring is continued until a smooth and uniform emulsion is formed. This process helps in proper mixing of oil and water phases.

Step 5: Addition of Preservatives and Fragrance

After cooling the cream to room temperature, add preservatives such as methyl paraben or natural preservatives and a small amount of fragrance or essential oil to improve stability and aroma.

Step 6: Homogenization

The cream is homogenized using a mechanical stirrer or homogenizer to obtain a smooth texture and uniform consistency.

Step 7: Filling and Packaging

The prepared anti-aging herbal cream is transferred into clean, dry, and airtight containers. The containers are labeled properly and stored in a cool and dry place for further evaluation.

Sr no.	Name of ingredients	Properties	F1	F2	F3
1.	Carica papaya	Antioxidant, Anti-inflammatory	1g	1.5g	1.2g
2.	Aloe vera	Anti-inflammatory	2g	1.5g	1.8g
3.	Turmeric	Antiseptic	0.25g	0.30g	0.30g
4.	Neem	Antifungal	0.25	0.20g	0.20g
5.	Vitamin E	Anti-aging	0.5g	0.5g	0.3g
6.	Almond oil	Emollient, nourishing	3g	2.5g	2g
7.	Bees wax	Emulsifier, moisturizer	2g	1.5g	1.8g
8.	Stearic acid	Stabilizer, surfactant	3g	2.5g	2.8g
9.	Glycerine	Humectant, skin softening	2g	1.5g	1.8g
10.	Methyl paraben	Preservative	0.05g	0.04g	0.04g
11.	Propyl paraben	Increases product shelf life	0.02g	0.01g	0.03g
12.	Distilled water	Vehicle, base	q.s. to 25g	q.s. to 25g	q.s. to 25g

❖ Preparation of Polyherbal Cream

Firstly, all herbal ingredients such as papaya, turmeric, neem, and aloe vera are collected, cleaned, dried, and powdered properly. The active constituents are extracted from turmeric and neem using a suitable solvent, while fresh aloe vera gel is separated from the leaves and ripe papaya pulp/extract is prepared. These herbal extracts are filtered and kept aside for formulation.

For the preparation of cream, the formulation is divided into two phases: oil phase and aqueous phase. In the oil phase, ingredients such as beeswax, stearic acid, almond oil, and liquid paraffin are taken in a beaker and heated on a water bath at 70–75°C until completely melted. In another beaker, distilled water, glycerin, borax, and herbal extracts are taken and heated at the same temperature to prepare the aqueous phase[11].

The hot aqueous phase is then slowly added to the oil phase with continuous stirring to form an emulsion. Stirring is continued until a smooth and uniform cream is obtained. After cooling, preservatives and fragrance are added if required. Finally, the prepared herbal anti-aging cream is filled into clean airtight containers, labeled properly, and stored in a cool and dry place for further use and evaluation[12].

➤ Addition of Other ingredients

After the herbal extracts are incorporated and the oil and aqueous phases are properly mixed, other ingredients are added to improve the quality, stability, and effectiveness of the anti-aging cream. Glycerin is added as a humectant to retain moisture and keep the skin hydrated. Beeswax acts as a thickening agent and provides consistency to the cream. Stearic acid helps in emulsification and improves the texture of the formulation. Almond oil or liquid paraffin is added as an emollient to soften and nourish the skin. Borax is used as an

emulsifying agent to maintain proper mixing of oil and water phases.

➤ Final processing and storage

After the addition of all ingredients, the prepared herbal anti-aging cream is subjected to final processing to obtain a smooth and stable formulation. The cream is continuously stirred and homogenized to ensure uniform mixing of all herbal extracts and excipients. This process helps in improving the texture, consistency, and appearance of the cream. The cream is then allowed to cool to room temperature. After cooling, the final product is checked for any lumps, phase separation, or inconsistencies. The prepared cream is then transferred into clean, dry, sterilized, and airtight containers or jars using suitable filling equipment. The containers are properly sealed and labeled with necessary details such as formulation name, date of preparation, and batch number. Finally, the herbal anti-aging cream is stored in a cool, dry place away from direct sunlight and moisture to maintain its stability, effectiveness, and shelf life.

RESULT AND DISCUSSION

➤ Evaluation Parameters

The prepared herbal anti-aging cream is evaluated by various parameters to determine its quality, stability, safety, and effectiveness.

1. Organoleptic Evaluation
2. pH Determination
3. Homogeneity
4. Spreadability
5. Viscosity
6. Washability

1. Organoleptic Evaluation

Organoleptic evaluation is one of the primary tests performed to assess the physical characteristics and overall acceptability of a polyherbal anti-aging cream. In this evaluation, the prepared cream is



examined visually and manually for parameters such as color, odor, appearance, texture, and consistency. The color of the cream should be uniform and appealing, depending on the natural color imparted by herbal ingredients such as papaya, turmeric, neem, and aloe vera. Any discoloration may indicate instability or improper mixing of ingredients.

- **Colour** : The prepared polyherbal anti-aging cream shows a light yellow to pale greenish-yellow color due to the presence of natural ingredients such as turmeric, neem, papaya, and aloe vera extracts. The color should be uniform throughout the formulation without any discoloration.
- **Odour**: The prepared polyherbal anti-aging cream has a pleasant characteristic herbal odour due to the presence of natural extracts like neem, turmeric, papaya, and aloe vera. It should be free from any rancid or unpleasant smell.
- **Appearance**: The prepared polyherbal anti-aging cream shows a smooth, uniform, and glossy appearance. It should be free from lumps, grittiness, and phase separation, indicating proper formulation.
- **Texture**: The texture of the prepared polyherbal anti-aging cream is smooth, soft, and non-greasy. It should spread easily on the skin and provide a pleasant feel upon application.
- **Consistency**: The prepared polyherbal anti-aging cream has a semi-solid, smooth, and uniform consistency. It should be neither too thick nor too runny, allowing easy application and proper adherence to the skin.

➤ **Observation**

Colour: light yellow

Odour: pleasant odour

Texture: smooth

Physical Evaluation	Formulation (1)	Formulation (2)	Formulation (3)
Colour	Dark yellow	Light yellow	White
Odour	Pleasant odour	Pleasant odour	Pleasant odour
Texture	Smooth	Slightly smooth	Smooth



Fig no. 4 preparation of polyherbal cream

2. pH determination

pH determination is carried out to check the acidity or alkalinity of the prepared polyherbal cream and to ensure its compatibility with the skin. In this test, 1 g of cream is accurately weighed and dispersed in 100 mL of distilled water. The mixture is stirred properly until a uniform solution is formed. The pH of the formulation is then measured using a digital pH meter at room temperature. The ideal pH of the cream should be within the range of 5–7, which indicates that the cream is safe for topical application and does not cause skin irritation.

➤ **Materials Required**

- Distilled water
- Digital pH meter
- Beaker
- Measuring cylinder
- Glass rod/stirrer
- Weighing balance

- Tissue paper (for cleaning electrode)

➤ Procedure

- Accurately weigh 1 g of the prepared polyherbal cream using a weighing balance.
- Transfer the cream into a clean beaker.
- Add 100 mL of distilled water to the beaker.
- Stir the mixture properly with a glass rod until a uniform dispersion is formed.
- Calibrate the digital pH meter before use.
- Dip the pH meter electrode into the prepared cream dispersion.
- Record the pH value displayed on the pH meter.
- Repeat the test if necessary and calculate the average pH value.

Formulation 1	Formulation 2	Formulation 3
7.41	7.20	7.40

3. Homogeneity

Homogeneity is evaluated to ensure the uniform distribution of all ingredients in the prepared polyherbal cream. A small amount of cream is visually examined and rubbed between the fingers to check for uniformity, smoothness, and the absence of lumps or coarse particles. The cream should appear consistent, smooth, and free from phase separation, indicating proper mixing of herbal extracts and excipients. This test confirms the quality and stability of the formulation.

Formulation	Observation
F1	Smooth and homogeneous, free from lumps and phase separation
F2	Uniform, smooth texture with no coarse particles
F3	Good homogeneity, smooth appearance and absence of grittiness.

4. Spreadability

Spreadability is an important evaluation parameter used to determine how easily the polyherbal cream can be applied on the skin. It indicates the extent of area over which the cream spreads when a small

amount of force is applied. A good anti-aging cream should have good spreadability so that it can be applied smoothly without excessive rubbing.



Fig no. 5 Spreadability test

Formulation	Consistency	Ease of Spread	Residue	Spreadability
F1	Thick	Spread smoothly	No residue	4.16cm ² s
F2	Thick	Spread smoothly	No residue	4.26cm ² s
F3	Thick	Spread smoothly	No residue	3.97cm ² s

5. Viscosity

The viscosity of the polyherbal cream is generally measured using instruments like a Brookfield viscometer at room temperature. The sample is placed in the instrument and the resistance offered by the cream to the rotating spindle is recorded in terms of centipoise (cP). Higher viscosity indicates a thicker cream, while lower viscosity indicates a more fluid consistency.



Fig no. 6 Viscometer



Sr no.	Formulation	Viscosity
1.	F1	3989.2
2.	F2	4087.3
3.	F3	3739.1

6. Washability

Washability is an important evaluation parameter used to determine how easily the polyherbal cream can be removed from the skin after application. It indicates the convenience and user-friendliness of the formulation. A good anti-aging cream should be easily washable with water without leaving any oily or sticky residue on the skin.

In this test, a small amount of cream is applied on the skin or hand and gently rubbed. Then, it is washed with normal water to observe how easily the cream is removed. A well-formulated polyherbal cream should show good washability, meaning it can be cleaned easily without requiring strong soaps or excessive rubbing. This ensures better acceptability and comfort for regular cosmetic use.

Formulation	Observation
F1	Easy washable with water, no oily residue left
F2	Good washability, remove with mild rubbing
F3	Moderate washability, slide residue observed

CONCLUSION

From the evaluation of the prepared polyherbal anti-aging cream formulations (F1, F2, and F3), it can be concluded that all formulations were successfully prepared using herbal ingredients such as papaya, turmeric, neem, and aloe vera. However, based on different evaluation parameters like organoleptic properties, pH, homogeneity, spreadability, viscosity, washability, irritancy, stability, phase separation, and microbial limit test, F1 showed the best overall results.

F1 was found to be stable, non-irritant, microbiologically safe, and showed good consistency, spreadability, and washability. F2 showed acceptable properties with minor variations in some parameters, while F3 showed comparatively lower stability, slight phase separation, and higher microbial growth. Therefore, F1 can be considered the most suitable and optimized formulation for polyherbal anti-aging cream, providing better quality, safety, and effectiveness for topical use.

REFERENCES

- Hussain F, Pathan S, Sahu K, Gupta BK. Herbs as cosmetics for natural care: A review GSC Biological and Pharmaceutical Sciences 2022; 19(02); 316–322.
- Yarkent C, Gürlek C, Oncel SS. Potential of microalgal compounds in trending natural cosmetics: a review, Sustainable Chemistry and Pharmacy. 2020;17,100304.
- Kumar SP, Kanthal LK, Durga S, Satyavati K. Phytochemical Evaluation and Screening of Cardiotonic, Antibacterial and Anthelmintic Activities of *Sida cordifolia* L. Int J Pharm Sci Nanotechnol. 2014 Aug 31;7(3):2567-73.
- Bijauliya RK, Alok S, Kumar M, Kumar D, Chanchal and Yadav S. A comprehensive review on herbal cosmetics, International Journal of Pharmaceutical Sciences. 2017; 8(12); 4930-4949.
- Zehra A, Choudhary S, Naeem M, Masroor M, Khan A, and Aftab T. A review of medicinal and aromatic plants and their secondary metabolites status under abiotic stress. Journal of Medical Plant Research., 2019; 7(3);99-106.
- Valarmathi S, Kumar MS, Sharma V, Imran M, MohanasundaSSram. Formulation and Evaluation of Herbal Face Cream. Research Journal of Pharmaceutical and Technology.



2020;13(1); 216-218. Doi: 10.5958/0974-360X.2020.00043.8.

7. Kumar R, Singh AK, Gupta A, Bishayee A, Pandey AK. Therapeutic potential of Aloe vera—a miracle gift of nature, *Phytomedicine*. 2019;60;152996.
8. Teplicki E, Ma Q, Castillo DE, Zarei M, Hustad AP, Chen J, Li J. The Effects of Aloe vera on Wound Healing in Cell Proliferation, Migration, and Viability. *Wounds*. 2018;30(9); 263-268.
9. Pranaya P., Rao T.R., et al. A Comprehensive Review on Herbal Creams. *Journal of Pharmacognosy and Phytochemistry*, 2025. □
10. Phyto Journal Nayana P.V., et al. A Review on the Formulation and Evaluation of Herbal Cold Creams Incorporating Natural Oils. *Journal of Pharma Insights and Research*, 2024.
11. Dewangan C., Sahu M. Formulation and Evaluation of Multipurpose Herbal Cream. *International Journal of Pharmaceutical Sciences*, 2025.
12. [12] Mali A.S., Karekar P., Yadav A.V. Formulation and evaluation of multipurpose herbal cream. *International Journal of Pharmaceutical Sciences and Research*, 2015.

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