

Formulation and Evaluation of Herbal Anti-Tan Cream Containing *Artocarpus heterophyllus* Wood Extract

D Pavitra¹, M Gayatri Devi², K.Suvarna³, B Nagamani⁴, P Uma Devi⁵

¹Assistant Professor, Viswanadha Institute of Pharmaceutical Sciences. Visakhapatnam 531173, Andhra Pradesh

^{2,3}Associate Professor, Viswanadha Institute of Pharmaceutical Sciences. Visakhapatnam 531173, Andhra Pradesh

⁴Professor, Viswanadha Institute of Pharmaceutical Sciences. Visakhapatnam 531173, Andhra Pradesh

⁵Principal, Viswanadha Institute of Pharmaceutical Sciences. Visakhapatnam 531173, Andhra Pradesh

Abstract—The present study focuses on the formulation and evaluation of a herbal anti-tan cream using *Artocarpusheterophyllus* (jackfruit wood) extract as the principal active ingredient. The plant is rich in flavonoids with strong antioxidant and tyrosinase inhibitory potential, making it a promising natural agent for skin brightening and tan removal. The cream was formulated as an oil-in-water (O/W) emulsion using standard cosmetic excipients. Various physicochemical parameters such as appearance, pH, viscosity, spreadability, stability, and irritancy were evaluated. The developed cream exhibited good homogeneity, optimal viscosity, acceptable pH for topical application, and was found to be non-irritant on human skin. The results indicate that *Artocarpusheterophyllus* extract can be effectively utilized in herbal cosmetic formulations aimed at tan removal and skin nourishment.

Index Terms—*Artocarpusheterophyllus*, anti-tan, herbal cream, , pH, , spreadability, viscosity

I. INTRODUCTION

Skin tanning is a common result of prolonged exposure to ultraviolet (UV) radiation, leading to overproduction of melanin and oxidative stress in skin cells. Synthetic depigmenting agents such as hydroquinone and kojic acid, though effective, are associated with irritation and long-term safety concerns. Hence, there is growing interest in herbal alternatives that are safe, effective, and rich in natural antioxidants.

Artocarpusheterophyllus (Family: Moraceae), commonly known as jackfruit, contains flavonoids such as artocarpin and norartocarpin that possess

proven anti-tyrosinase, anti-oxidative, and skin-brightening activities. While fruit and leaf extracts are explored for various uses, wood extract remains underutilized in topical anti-tan products.

The present study aims to formulate a stable, non-irritant herbal cream using *Artocarpusheterophyllus* wood extract as the primary active agent and to evaluate its physical and sensory properties suitable for cosmetic application.

II. MATERIALS AND METHODS

Materials

- Active ingredient: *Artocarpusheterophyllus* wood extract (ethanolic extract, dried powder form).
- Cream base ingredients:
 - Stearic acid – 5%
 - Cetyl alcohol – 2%
 - Liquid paraffin – 5%
 - Glycerin – 5%
 - Triethanolamine – 0.5%
 - Methyl paraben – 0.2%
 - Propyl paraben – 0.02%
 - Perfume – q.s.
 - Purified water – up to 100%

Preparation of *Artocarpus* Extract

The dried wood powder of *Artocarpusheterophyllus* was extracted with 70% ethanol by maceration for 48 hours, filtered, and concentrated using a rotary evaporator at 45°C. The extract was dried under reduced pressure to yield a brownish powder and stored in airtight containers.

Formulation of Herbal Cream

The cream was formulated as an oil-in-water (O/W) emulsion.

- Oil phase: stearic acid, cetyl alcohol, and liquid paraffin were melted together at 70°C.
- Aqueous phase: glycerin, preservatives, and triethanolamine were dissolved in purified water and heated to the same temperature.
- The *Artocarpus* extract (2–4% w/w) was added to the aqueous phase and mixed thoroughly.
- The aqueous phase was added slowly to the oil phase with continuous stirring at 1000 rpm until uniform emulsion was formed.
- The mixture was cooled to room temperature, and perfume was added.

III. EVALUATION OF THE CREAM

Physical Appearance

The prepared herbal anti-tan cream was carefully examined for its color, odor, texture, smoothness, and homogeneity. Visual inspection was performed to ensure that the cream possessed an appealing appearance, free from any phase separation, grittiness, or coarse particles. The evaluation of physical appearance helps to determine the cosmetic acceptability of the formulation and reflects the quality of emulsification and overall product stability.

pH Determination

The pH of the cream plays a vital role in ensuring skin compatibility and formulation stability. A 10% dispersion of the cream in distilled water was prepared, and the pH was measured at room temperature using a calibrated digital pH meter. Maintaining the pH within the normal physiological range of the skin is crucial to prevent irritation, dryness, or damage to the skin's natural protective barrier.

Spreadability

Spreadability indicates the ease of application of the cream and its ability to form a uniform film over the skin surface. It was evaluated by the glass slide method, where a fixed amount of cream was placed between two glass slides, and a specific weight was applied for a set duration. The diameter of the spread area was then measured, and the spreadability was calculated using the formula:

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

where:

- S = Spreadability
- M = Weight applied on the slide
- L = Length of the spread
- T = Time taken

An optimally spreadable cream ensures uniform application, enhanced absorption, and improved user compliance.

Viscosity

The viscosity of the cream was determined using a Brookfield viscometer fitted with an appropriate spindle at a controlled temperature and speed (spindle no. 64 at 25°C and 10 rpm). Results were expressed in centipoise (cP). Viscosity measurement helps to assess the consistency, stability, and ease of handling of the formulation. A cream with appropriate viscosity spreads smoothly, adheres well to the skin, and maintains phase stability during storage and use.

Homogeneity

The homogeneity of the cream was assessed visually and by gentle rubbing between fingers to check for uniform texture and smoothness. The absence of lumps or coarse particles indicates proper mixing and emulsification, which contributes to the overall quality and elegance of the product.

Stability Studies

The stability of the cream was evaluated by storing the samples at different temperature conditions (such as room temperature and elevated temperatures) for a fixed period. Periodic observations were made for color, odor, phase separation, and consistency. Stability studies ensure that the formulation maintains its physical integrity, appearance, and performance over time, confirming its shelf-life and suitability for storage.

Irritancy Test (Patch Test)

To assess the safety and dermatological tolerance of the cream, a 24-hour patch test was performed on healthy volunteers. A small amount of the cream was applied to a defined area of skin, covered with gauze, and observed after 24 hours for any signs of erythema, itching, or inflammation. The absence of irritation confirms that the cream is non-sensitizing and safe for human use.

Washability

The washability of the cream was tested by applying a small portion onto the skin and washing it with water. The ease of removal and the absence of any greasy or oily residue were noted. Good washability

enhances consumer comfort and indicates that the cream can be easily removed without leaving a sticky film.

IV. RESULTS AND DISCUSSION

Parameter	Observation
Color	Light beige
Odor	Pleasant herbal
Appearance	Smooth, homogenous
pH	5.8 ± 0.1
Viscosity	21,000 ± 200 cP
Spreadability	16.5 ± 0.5 g·cm/s
Homogeneity	Excellent
Washability	Easily washable with water
Stability	No phase separation or odor change after 30 days
Irritancy	No erythema or irritation observed

The cream showed smooth texture and uniform distribution of the *Artocarpus* extract. The pH value (≈ 5.8) was within the physiological skin pH range, indicating suitability for topical use. The viscosity and spreadability were found optimal for easy application and adherence. Stability studies confirmed that the cream remained physically stable without any phase separation or discoloration. The irritancy test demonstrated that the cream was safe and well-tolerated on human skin.

V. CONCLUSION

A stable and cosmetically acceptable herbal anti-tan cream containing *Artocarpusheterophyllus* wood extract was successfully formulated and evaluated. The formulation exhibited ideal physical properties, good spreadability, and was non-irritant to the skin. The results support the potential use of *Artocarpusheterophyllus* extract as a safe, effective natural agent for topical anti-tan preparations.

REFERENCES

- [1] Nguyen HX et al. Tyrosinase inhibitory activity of flavonoids from *Artocarpusheterophyllus*. *J Nat Prod*, 2020.
- [2] Garg A, et al. Formulation and evaluation of topical creams. *Indian J Pharm Sci*, 2002; 64(3): 251–253.
- [3] Arora R, et al. Herbal cosmetics for skin care: A review. *Int J Pharm Sci Res*, 2018; 9(10): 4020–4029.
- [4] Chanchal D, Swarnlata S. Novel approaches in herbal cosmetics. *J CosmetDermatol*, 2008; 7: 89–95.
- [5] Prakash O., Kumar R., Mishra A., Gupta R., “*Artocarpus heterophyllus* (Jackfruit): An Overview” (2009). A review covering the phytochemistry (flavonoids such as artocarpin, norartocarpin) and pharmacological activities (including skin-disease usage) of *A. heterophyllus*.
- [6] El-Nashar, H. A. S., et al., “Insights on the Inhibitory Power of Flavonoids on Tyrosinase” (2021). A broader review of flavonoids as tyrosinase inhibitors, which helps in understanding mechanism of action for skin-brightening agents.
- [7] Ranasinghe R., et al., “Nutritional and Health Benefits of Jackfruit (*Artocarpus heterophyllus* Lam.)” (2019). Although mostly about nutritional benefits, this touches also on antioxidant and anti-melanin potentials in jackfruit parts.
- [8] Saad, H.M., et al. Evaluation of anti-melanogenesis and free radical scavenging activity of *Artocarpus* extracts. *J. Cosm. Derm. Sci. Appl.* 2021.
- [9] Arifin, B. Sunscreen Activities of Bark *Artocarpus heterophyllus*. *Open Access Maced. J. Med. Sci.* 2020.
- [10] Gupta, A.K., et al. *Artocarpus heterophyllus* Lam. and *Artocarpus lakoocha* Roxb.: Nutritional and antioxidant assessment of flower extracts. *Plants (MDPI)* 2020;9(10):1329.
- [11] Widyawati, T., et al. Effect of Using Ethanol Extract of *Artocarpus heterophyllus* ... (Cosmetic application). 2023.
- [12] Zheng, Z.-P., Chen, S.-B., Wang, X.-C. Isolation of tyrosinase inhibitors from

- Artocarpus heterophyllus* and use of its extract as antibrowning agent. *Food & Function* 2008.
- [13] Arung, E.T., Wijaya-Kusuma, I., Iskandar, Y.M., et al. Screening of Indonesian plants for tyrosinase inhibitory activity. *J. Wood Sci.* 2005; 51:70-73.
- [14] Arung, E., Shimizu, K. Artocarpus Plants as a Potential Source of Skin Whitening. Review. (Year not specified).
- [15] Fatriasari, W., Anwar, Y., Putri, A. Potential of Tropical Biomass for the Bioactive Ingredients in Cosmetics. Chapter 2024.
- [16] Walimuni, S.W.S., et al. Underutilized Asian Fruits as Functional Foods. *Trends Food Sci. Technol.* 2025.
- [17] Sucontphunt, A., et al. A new potential skin-lightening extract from *Artocarpus* spp. 2024.