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From Tradition to Innovation : Hibiscus in Modern Anti-Aging Skincare

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Abstract: *Hibiscus (Hibiscus sabdariffa) is a potent natural ingredient widely known for its anti-aging properties due to its rich phytochemical profile, including flavonoids, anthocyanins, and organic acids. This review explores the formulation, mechanism of action, and comparative efficacy of hibiscus-based anti-aging cream against other natural agents. Hibiscus uniquely inhibits elastase activity, promoting collagen synthesis and maintaining skin elasticity. Despite challenges such as compound stability and skin penetration, advancements in nanocarriers and sustainable formulation offer promising future prospects. This study emphasizes the potential of hibiscus in skincare, encouraging further research to enhance efficacy and consumer acceptance*

Keywords: Hibiscus, Skincare, Anti-aging, Antioxidant, UV-protection

I. INTRODUCTION

The quest for youthful, radiant skin has led to an increasing demand for natural anti-aging skincare products. Among these, Hibiscus species have garnered significant attention for their potent antioxidant, anti-inflammatory, and collagen-boosting properties. Commonly known as “the botox plant,” Hibiscus is rich in phenolic compounds, flavonoids, and organic acids that contribute to its skin-beneficial effects (Chen et al., 2022). Natural cosmetics are preferred due to fewer side effects, sustainability, and consumer inclination towards plant-based ingredients. Hibiscus anti-aging creams are emerging as a promising natural alternative to synthetic skincare formulations.primary mechanism of skin aging involves oxidative stress, which accelerates the breakdown of collagen and elastin fibers, leading to wrinkles, fine lines, and loss of skin elasticity (Pang et al., 2021). Hibiscus contains anthocyanins and flavonoids with strong free radical scavenging abilities, effectively mitigating oxidative damage and delaying skin aging (Widowati et al., 2017). The high mucilage content of Hibiscus rosa-sinensis further enhances skin hydration, a crucial factor in maintaining youthful skin (Scartazza et al., 2021).Research has demonstrated that Hibiscus sabdariffa extract promotes collagen synthesis and skin elasticity while reducing transepidermal water loss, suggesting its suitability in anti-aging formulations (Chen et al., 2022). Additionally, enzyme-treated Hibiscus syriacus was found to protect against UVB-induced photoaging in hairless mice, highlighting its potential in photoprotection (Kim et al., 2018). The topical application of Hibiscus rosa-sinensis in anti-aging creams has shown a significant reduction in wrinkles and improved skin texture, supporting its role in dermal rejuvenation (Ashiilah et al., 2023).Furthermore, advances in formulation science have enabled the development of nanovesicle-loaded hibiscus extracts, enhancing skin penetration and improving anti-aging efficacy (Hathout et al., 2024). This nanotechnology-based approach ensures better bioavailability of the active phytochemicals, providing prolonged antioxidant effects and sustained hydration. Comparative studies with other botanical anti-aging agents such as green tea and butterfly pea have demonstrated that hibiscus exhibits superior free radical scavenging and collagen-boosting properties (Asyiah et al., 2022).

The global skincare market is witnessing a shift towards natural and sustainable formulations, with hibiscus-based products gaining popularity for their multifunctional properties (Karim et al., 2021). These products are not only effective in reducing the signs of aging but also cater to consumer preferences for organic and cruelty-free cosmetics. However, challenges such as stability, standardization of active constituents, and long-term safety remain critical considerations for commercial formulations (Rahim et al., 2019).

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Fig. 1(Hibiscus Flower)

Hibiscus and Its Phytochemical Profile

The genus Hibiscus, belonging to the family Malvaceae, is well-known for its diverse species such as Hibiscus sabdariffa, Hibiscus rosa-sinensis, and Hibiscus syriacus, which are widely used in traditional medicine and skincare. The therapeutic potential of hibiscus is attributed to its rich phytochemical profile, including flavonoids, phenolic acids, anthocyanins, organic acids, and mucilage. These bioactive compounds exhibit significant antioxidant, anti-inflammatory, and anti-aging properties (Scartazza et al., 2021). Anthocyanins, primarily delphinidin-3-sambubioside and cyanidin-3-sambubioside, are responsible for the vibrant red pigmentation in Hibiscus sabdariffa and are potent antioxidants that protect skin cells from oxidative stress (Chen et al., 2022). Flavonoids such as quercetin, kaempferol, and luteolin contribute to collagen stabilization and reduce skin inflammation, which is essential for maintaining skin elasticity and preventing wrinkles (Widowati et al., 2017).The mucilage content found in Hibiscus rosa-sinensis plays a crucial role in skin hydration by forming a protective barrier that prevents transepidermal water loss (Scartazza et al., 2021). Organic acids, including hibiscus acid, citric acid, and malic acid, help in exfoliation and skin rejuvenation by promoting cell turnover (Chen et al., 2022). Additionally, Hibiscus syriacus is rich in antioxidants and polyphenols that protect against UV-induced photoaging, reducing skin damage caused by free radicals (Kim et al., 2018). These bioactive compounds work synergistically to promote skin health by enhancing collagen synthesis, improving skin texture, and reducing the signs of aging.

Mechanism of Anti-Aging Action:-

The anti-aging properties of hibiscus are primarily attributed to its rich phytochemical composition, including flavonoids, anthocyanins, organic acids, and mucilage, which work synergistically to combat skin aging. Skin aging is a multifactorial process involving intrinsic (chronological) and extrinsic (environmental) factors such as oxidative stress, UV radiation, and collagen degradation. Hibiscus mitigates these effects through various biological mechanisms, including antioxidant activity, collagen synthesis, hydration, and anti-inflammatory effects (Chen et al., 2022).

1. Antioxidant Defense Against Oxidative Stress

Oxidative stress occurs when the generation of reactive oxygen species (ROS) surpasses the skin's natural antioxidant defense system, leading to cellular damage. Anthocyanins, particularly delphinidin-3-sambubioside and cyanidin-3-sambubioside, found in Hibiscus sabdariffa, exhibit potent free radical scavenging activity, reducing lipid peroxidation and preventing DNA damage (Widowati et al., 2017). This protects skin cells from premature aging caused by environmental factors such as pollution and UV radiation (Kim et al., 2018).

2. Collagen Synthesis and Skin Elasticity

Collagen degradation is a hallmark of skin aging, resulting in wrinkles and loss of firmness. Flavonoids and organic acids in hibiscus stimulate collagen synthesis by promoting fibroblast proliferation, which helps maintain skin elasticity (Chen et al., 2022). Studies have demonstrated that hibiscus extract significantly increases collagen production, reducing fine lines and improving skin texture (Pang et al., 2021).

3. Hydration and Barrier Function

Mucilage found in Hibiscus rosa-sinensis enhances skin hydration by forming a protective film on the skin surface, preventing transepidermal water loss (Scartazza et al., 2021). This contributes to smoother, plumper skin, which is essential for a youthful appearance.

4. Anti-inflammatory and UV Protection

Chronic inflammation accelerates skin aging by breaking down collagen and elastin. Hibiscus contains quercetin and other flavonoids with anti-inflammatory properties that reduce cytokine production, mitigating skin redness and

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inflammation (Rahim et al., 2019). Additionally, Hibiscus syriacus provides protection against UVB-induced photoaging by reducing oxidative damage and maintaining skin homeostasis (Kim et al., 2018).

Methodology for Formulating Hibiscus Anti-Aging Cream

1. Preparation of Hibiscus Extract: Dried Hibiscus sabdariffa or Hibiscus rosa-sinensis petals are powdered and subjected to maceration or Soxhlet extraction using ethanol or hydroalcoholic solvent.The extract is filtered and concentrated under reduced pressure to obtain a semi-solid extract. Studies show hydroalcoholic extraction retains a high concentration of bioactive compounds like anthocyanins and flavonoids (Chen et al., 2022).

2. Oil Phase Preparation:- Beeswax, shea butter, coconut oil, and stearic acid are melted together at 70–75°C in a beaker using a water bath. Vitamin E oil and essential oils are added to the oil phase once the temperature lowers to 40–45°C. Beeswax improves viscosity and forms a protective barrier on the skin, aiding in hydration (Rahim et al., 2019).

3. Aqueous Phase Preparation:-Distilled water, glycerin, aloe vera gel, and hibiscus extract are mixed in another beaker at 70–75°C.Glycerin acts as a humectant, drawing moisture to the skin surface (Scartazza et al., 2021).

4. Emulsification Process:- The hot oil phase is slowly added to the hot aqueous phase with continuous stirring at 1000–1500 rpm using a mechanical stirrer or homogenizer. Stirring is maintained until the mixture reaches room temperature, forming a stable cream. Emulsification is crucial for maintaining homogeneity and stability in cosmetic formulations (Hathout et al., 2024).

5. Final Adjustments:-Essential oils are added at the end to avoid evaporation at high temperatures. The cream is transferred to sterilized containers and stored in an airtight jar.

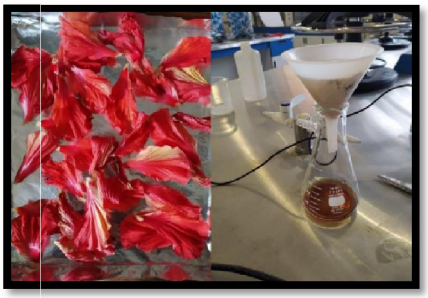

Fig. 2 (Extraction process of Hibiscus)

Evaluation Parameters

Physical Appearance: Color, texture, and homogeneity.
pH: Maintained between 5.5–6.5 to match skin pH.
Spreadability: Assessed by the slip and drag method.
Viscosity: Measured using a Brookfield viscometer.
Stability Study: Conducted under accelerated conditions (40°C ± 2°C, 75% RH) for 3 months (Pang et al., 2021).

Comparative Analysis with Other Natural Anti-Aging Agents

Hibiscus (Hibiscus sabdariffa) is a well-known natural anti-aging agent due to its high concentration of antioxidants, including polyphenols, flavonoids, and anthocyanins, which combat free radical damage and promote collagen synthesis (Rahman et al., 2022). However, other natural ingredients such as Aloe Vera, Green Tea, and Rosehip Oil also exhibit significant anti-aging properties.Aloe vera is rich in vitamins C and E, which enhance skin hydration and elasticity by stimulating fibroblast activity, promoting collagen formation (Kumar & Verma, 2021). Green tea contains catechins, particularly epigallocatechin gallate (EGCG), which protects against UV-induced skin damage by reducing oxidative stress and inflammation (Singh et al., 2020). Meanwhile, rosehip oil is packed with essential fatty acids and vitamin A, which improve skin texture and reduce the appearance of fine lines (Gupta et al., 2021).In comparison, hibiscus stands out for its unique ability to inhibit the activity of elastase, an enzyme that breaks down elastin in the skin, thereby maintaining skin firmness (Patel et al., 2019). While other agents focus on hydration and antioxidant

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protection, hibiscus offers a more holistic anti-aging effect by simultaneously promoting collagen production and preventing elastin degradation.

Challenges and Future Perspectives

The formulation of hibiscus-based anti-aging cream faces several challenges despite its promising potential. One of the primary obstacles is the stability of bioactive compounds such as flavonoids and anthocyanins, which are highly sensitive to heat, light, and pH changes (Gupta et al., 2021). Ensuring the long-term stability of these compounds in topical formulations requires advanced encapsulation techniques like liposomes or nanocarriers, which can add complexity and cost.

Another challenge lies in standardizing extraction methods to achieve consistent phytochemical profiles. Variability in environmental conditions, harvest time, and extraction solvents can significantly impact the efficacy of the final product (Rahman et al., 2022). Additionally, skin penetration remains a critical concern, as many plant-based active ingredients struggle to pass through the stratum corneum, limiting their anti-aging effects (Patel et al., 2019).

In terms of future perspectives, incorporating green technology and biopolymers for sustainable and eco-friendly formulation is gaining attention. Advances in nanoemulsions and microneedle delivery systems offer potential solutions to improve skin penetration and bioavailability (Singh et al., 2020). Furthermore, combining hibiscus extract with other synergistic natural antioxidants could enhance its overall anti-aging efficacy. Ongoing clinical trials and consumer acceptance studies are essential to validate its safety and efficacy on a broader scale.

II. CONCLUSION

Hibiscus (Hibiscus sabdariffa) has emerged as a promising natural anti-aging agent due to its rich phytochemical composition, including flavonoids, anthocyanins, and organic acids, which exhibit strong antioxidant, anti-inflammatory, and elastase-inhibiting properties. The formulation of hibiscus-based anti-aging cream demonstrates significant potential in improving skin elasticity, hydration, and reducing signs of aging. Comparative analysis with other natural agents highlights its unique ability to maintain skin firmness by preventing collagen and elastin degradation. However, challenges such as stability, standardization, and skin penetration need to be addressed. Future advancements in nanotechnology and sustainable formulations can enhance efficacy, offering a novel, eco-friendly approach to skincare.

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