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FORMULATION AND EVALUATION OF HERBAL SKIN LOTION CONTAINING *MILLINGTONIA HORTENSIS* EXTRACT: PHYSICOCHEMICAL AND ANTIBACTERIAL ASSESSMENT

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ABSTRACT

The present study aimed to formulate and evaluate a herbal skin lotion incorporating *Millingtonia hortensis* (Indian Cork Tree) extracts obtained through aqueous and ethanolic maceration methods. Flowers of *M. hortensis* were collected during peak fragrance season (November–December) and subjected to maceration in distilled water and ethanol to yield aqueous and ethanolic extracts, respectively. These extracts were incorporated into oil-in-water lotion formulations using beeswax, carbopol 934, stearic acid, liquid paraffin, avocado oil, vitamin E, borax, citric acid, methyl paraben, propyl paraben, and rose water.

Physicochemical evaluations included appearance, pH, viscosity, spreadability, washability, homogeneity, smoothness, absorbency, and irritation potential. The aqueous extract herbal lotion (AEH) exhibited superior spreadability (8.5 cm) and moderate antibacterial activity against *Pseudomonas aeruginosa* (zone of inhibition: 20 mm) compared to the ethanolic extract herbal lotion (EEH; spreadability: 7.9 cm, zone of inhibition: 15 mm). Both formulations were non-irritant, smooth, homogenous, and easily washable, though the pH values were above the normal skin range (5.5–6.5), indicating the need for adjustment.

The study confirms that *M. hortensis* extracts contribute beneficial phytoconstituents, including flavonoids and phenolics, which enhance antimicrobial and cosmetic properties. These findings suggest that the formulated herbal lotion is a safe, stable, and eco-friendly alternative to synthetic skin products, with the aqueous extract formulation showing slightly higher efficacy. Further clinical studies and stability assessments are recommended to optimize pH and enhance antibacterial performance.

KEYWORDS: *Millingtonia hortensis*, herbal lotion, aqueous extract, ethanolic extract, antibacterial activity, spreadability, phytoconstituents, topical formulation, skin care, cosmetic evaluation.

1. INTRODUCTION

Herbal formulations have gained significant importance in the pharmaceutical and cosmetic industries due to their safety, effectiveness, and minimal side effects compared to synthetic products. Among various herbal cosmetics, herbal skin lotions occupy a central role because they provide essential skin care benefits such as moisturization, nourishment, protection from environmental pollutants, and relief from skin irritation. A lotion is a semi-liquid topical preparation intended for application on the skin to improve its health and appearance. When formulated using herbal ingredients, it becomes a natural alternative that is gentle, biocompatible, and suitable for long-term use.

The human skin is constantly exposed to dust, UV radiation, microorganisms, and harsh climatic conditions, leading to dryness, pigmentation, infections, and premature aging. Conventional lotions often contain artificial chemicals like parabens, silicones, sulfates, and synthetic fragrances that may cause irritation or long-term adverse effects. In contrast, herbal lotions are enriched with plant-derived bioactive compounds such as flavonoids, alkaloids, terpenoids, saponins, tannins, essential oils, and phenolic compounds, which promote skin healing and enhance its natural protective barrier. These phytoconstituents exhibit anti-inflammatory, antioxidant, antimicrobial, soothing, and rejuvenating properties, making them ideal components of skincare formulations.

Fig: 1 Body Lotion.

1.1 Types of Herbal Lotion

Face lotion: These are also known as bleaching cream, and they do more to conceal skin tone than to lighten it. Similar to whitening lotion.

Fig 2: Face Lotion.

Shaving lotion: The content of after shave lotion is often similar to that of astringent lotions, with a larger percentage acting as a moderate antiseptic to help prevent infection of any abrasion.

Fig 3: Shaving Lotion.

Hair lotion: The hair follicles are stimulated with hair lotion typically they are scented with stimulating oil.

Fig 4: Hair Lotion.

By Formulation Type:

- **Water based lotion:** Light, suitable for oily or normal skin.
- **Oil based lotion:** Richer, good for dry skin.
- **Emulsion or creams:** Thicker lotions with both oil and water.
- **Gel based lotion:** Often lighten and cooling.

1.2 Classification of Herbal Lotion:

Herbal lotions can also be classified by their main botanical component.

- **Aloe vera based:** soothing, cooling, hydrating
- **Neem based:** Antibacterial, Antifungal
- **Turmeric based:** Anti-inflammatory, Brightening
- **Calendula based:** Healing, Gentle for sensitive skin
- **Tea tree based:** Antiseptic, Good for acne prone skin

1.3 Classification of Herbal Lotion

Table 1: Classification Of Herbal Lotion.

CATEGORY	EXAMPLE OF USES
Moisturizing lotion	Aloe vera, calendula- soothe and hydrate skin
Anti-inflammatory	Chamomile, turmeric- reduce swelling, redness, or irritation.
Antiseptic/ Anti-bacterial	Neem, tea tree- help cleanse and disinfectant the skin.
Antiaging	Ginseng, green tea- reduce signs of aging, firm skin.
Acne treatment	Witch hazel, tea tree- manage oily skin and breakouts.
Sun protection	Carrot seed oil, raspberry seed oil- natural SPF properties (usually minimal)
Skin healing	Gotu kola, comfrey- promote wound or scar healing

2. PLANT PROFILE

MILLINGTONIA OFFICINALIS FLOWERS:

2.1 Common Names

- Indian cork tree
- Jasmine or Akash neem
- Akash nim

2.2 Plant Description

- **Habit:** Tall, deciduous tree (15-25m) with a straight trunk, few branches, and a rounded crown.
- **Leaves:** Opposite, 2-3 pinnate (fern-like), dark green, with ovate/elliptic leaflets, pointed tips, and entire margins.
- **Flowers:** Clusters of fragrant, white, tubular flowers with long corolla tubes, blooming at night and falling by morning.
- **Bark:** Pale brown, corky, and easily removable.
- **Fruit:** Slender, linear, flattened capsules containing winged, disc-shaped seeds.
- **Scent:** Strong, sweet fragrance, especially in the evening.

2.3 Scientific Classification

- **Kingdom:** Plantae (Plants)
- **Clades:** Tracheophytes, Angiosperms, Eudicots, Asterids
- **Order:** Lamiales
- **Family:** Bignoniaceae (Trumpet Creeper Family)
- **Genus:** Millingtonia
- **Species:** M. hortensis (L.f.)
- **Common Names:** Indian Cork Tree, Tree Jasmine, Akas-nim (Hindi), Maramalli (Tamil).

2.4 Nutritional Benefits

- Rich in Antioxidants
- Respiratory Health
- Anti-inflammatory, Antimicrobial & Antifungal
- Liver Protection (Hepatoprotective)

2.5 Fruits Characteristics

- **Type**: The fruit is a two-valved septicidal capsule, meaning it splits open when mature to release the seeds.

- **Shape and Size:** It is slender, linear, oblongoid, and flat, typically measuring about 22–35 cm (or even up to 60 cm) in length and 1.5–2.8 cm in width. It is pointed at both ends (acute).
- **Texture**: The capsule is smooth and woody when mature.
- **Seeds**: The fruit contains many seeds that are thin, compressed, and discoid (disc-shaped). Each seed is surrounded by a large, transparent, membranous wing, which aids in wind dispersal.
- **Dispersal:** In nature, the winged seeds are dispersed by the wind**.**
- **Viability:** In cultivation, the viability of the seeds is low unless they are sown immediately after the fruit ripens, so the plant is often propagated through cuttings or suckers.
- **Fruiting Season:** Fruiting generally occurs during the cooler months, typically from November to February in India**.**

2.6 Chemical Constituents

Table 2: Chemical Constituents of *Millingtonia Officinalis.*

CHEMICAL CONSTITUENT	FUNCTIONS
Alkaloid	Bioactive compounds with potential anti-inflammatory, analgesic, and antimicrobial effects
Flavonoid	Antioxidants that help neutralize free radicals and reduce oxidative stress
Tannins	Astringent compounds with antimicrobial and anti-inflammatory properties
Phenolic Compound	Known for antioxidant and anti-aging effects
Essential Oils	Contain aromatic compounds with antimicrobial and therapeutic uses
Steroids & Terpenoids	May support anti-inflammatory and immune-modulating activities

2.7 Use of *Millingtonia Officinalis* In Herbal Lotion

Table 3: Uses Of *Milligtonia Officinalis* In Herbal Lotion.

S.NO	USE	BENEFITS IN HERBAL LOTION
1.	Moisturizer	Deeply hydrates and nourishes dry, rough, or flaky skin.
2.	Anti-aging agent	Rich in antioxidant that reduce fine lines and wrinkles.
3.	Healing aid	Help soothes and repair damaged or inflamed skin (eg: sun burn eczema)
4.	Skin softener	Improves skin elasticitiy and smoothness.
5.	Antioxidant protection	Neutralizes free radical, preventing oxidative stress.
6.	Collagen booster	Vitamin C and E support collagen synthesis and skin firmness.

7.	UV protection support	Offers mild natural sun protection and post-sun care relief.
8.	Scar and stretch mark treatment	Promotes regeneration of skin tissue and fades marks overtime.

Fig 5: ***Millingtonia Officinalis.***

3. MATERIALS AND METHODS

3.1 Collection of Plant Materials

To collect Millingtonia hortensis (Indian Cork Tree) flowers for research, pick them early in the morning when fragrant oils peak, preferably in November-December.

3.2 List of Chemicals

Table 4: List of Chemicals.

S.NO	LIST OF CHEMICALS	USES
1.	Bees wax	Emulsifier
2.	Carbopol 934	Thickener
3.	Citric acid	pH adjuster
4.	Methyl paraben	Anti-microbial preservative
5.	Propyl paraben	Anti-microbial preservative
6.	Liquid paraffin	Emollient
7.	Stearic acid	Stabilizer
8.	Vitamin E	Anti-oxidant
9.	Borax	Emulsifier& Stabilizer
10.	Rose water	Soothing agent

3.3 Extraction Procedure of *Millingtonia Officinalis*

3.3.1 Aqueous Extraction (Water Extract): (Method: Maceration)

Materials Required

- Dried plant powder – 50 g
- Distilled water – 500 mL
- Conical flask
- Water bath
- Muslin cloth & Whatman No.1 filter paper

Procedure (Maceration Method)

- Take 50 g of powdered plant material in a conical flask.
- Add 500 mL of distilled water.
- Shake well and keep for 24 hours at room temperature.
- Stir occasionally every 2–3 hours.
- Filter using muslin cloth followed by Whatman No.1 filter paper.
- Concentrate the filtrate on a water bath at 40–50°C.
- Dry the extract and store in a desiccator.

3.3.2 Alcoholic Extraction (Ethanolic): (Method: Maceration

Materials Required

- Plant powder – 50 g
- Ethanol (95%) / Methanol – 300 mL
- Soxhlet apparatus
- Heating mantle
- Rotary evaporator / water bath

Procedure (Maceration Method)

- Place 50 g of powdered plant material in a thimble.
- Insert the thimble into Soxhlet extractor.
- Add 300 mL of ethanol into the round bottom flask.
- Heat gently and allow extraction for 6–8 hours until siphon becomes colorless.
- Cool and filter the extract.
- Concentrate the filtrate using a rotary evaporator or water bath at 40–50°C.
- Dry the extract and store in airtight container.

3.3.3 Storage of Extracts

- Store both extracts in amber-colored bottles

- Keep at 4°C for further phytochemical or formulation studies.

3.4 FORMULATION OF HERBAL SKIN LOTION

Table 5: Formulation Of Herbal Skin Lotion.

S.NO	PHASE	INGREDIENTS	QUANTITY
1.	Oil phase	Bees wax	4g
		Carbopol 934	0.3g
		Liquid paraffin	15ml
		Stearic acid	2g
		Vitamin E	0.5ml
		Avocado oil	5ml
2.	Aqueous phase	Millingtonia extract	5ml
		Citric acid	0.5g
		Methyl paraben	0.05g
		Propyl paraben	0.02g
		Borax	0.5g
		Rose water	Q.S

Procedure

For Aqueous Extract Herbal Lotion (AEH): The aqueous extract of *Millingtonia hortensis* was prepared by maceration method, in which 50 g of dried powdered plant material was soaked in 500 mL of distilled water and kept for 24 hours with occasional stirring. The mixture was then filtered using muslin cloth followed by Whatman filter paper, and the filtrate was concentrated on a water bath at 40–50°C to obtain the extract. For the formulation of lotion, the oil phase consisting of beeswax, stearic acid, liquid paraffin, avocado oil, and vitamin E was heated to 70–75°C until completely melted. Separately, the aqueous phase containing the prepared aqueous extract, rose water, borax, citric acid, methyl paraben, and propyl paraben was also heated to the same temperature. The hot aqueous phase was then slowly added to the oil phase with continuous stirring to form an emulsion. The mixture was stirred for 10–15 minutes using a homogenizer, followed by gradual cooling with continuous stirring. The pH was adjusted to 5.5–6.5 if necessary, and the final lotion was transferred into clean, sterilized containers and stored properly.

For Ethanolic Extract Herbal Lotion (EEH): The ethanolic extract of *Millingtonia hortensis* was prepared using Soxhlet extraction, where 50 g of dried plant powder was placed in a thimble and extracted with 300 mL of ethanol (95%) for 6–8 hours. The extract was then filtered and concentrated using a rotary evaporator or water bath at 40–50°C, and the dried extract was stored in an airtight container. For lotion preparation, the oil phase containing beeswax, stearic acid, liquid paraffin, avocado oil, and vitamin E was heated to

70–75°C until melted. The aqueous phase was prepared by dissolving the ethanolic extract (after partial evaporation of ethanol), along with rose water, borax, citric acid, methyl paraben, and propyl paraben, and heated to the same temperature. The aqueous phase was gradually added to the oil phase with continuous stirring to form a stable emulsion. The mixture was stirred for 10–15 minutes, then cooled gradually with constant stirring. The pH was adjusted to 5.5–6.5, and the final formulation was transferred into sterilized containers, labeled, and stored under suitable conditions.

3.5 EVALUATION PARAMETERS

3.5.1 Appearance: The color, odor and homogeneity of the lotion were visually determined.

3.5.2 Consistency and Grassiness: Both this parameter was performed on the skin. They both were checked by applying on skin.

3.5.3 pH: Lotion pH was measured with a digital pH meter. The pH meter was calibrated using standard buffer solution. About 5 ±0.01 g of the lotion was weighed in a 100 ml beaker and dissolved in 45.0 ml of distilled water and dispersed the lotion in it. The pH of lotion was measured at 27ousing the pH meter.

3.5.4 Smoothness: The smoothness of the lotion formulation was tested by rubbing between the fingers and observes whether the lotion is smooth, clumped, and homogenous or rough.

3.5.5 Spreadability test: 0.1g Sample was applied between two glass slides and was compressed to uniform thickness by placing 100gm weight for 5minutes. Weight was added to the pan. The Spreadability was calculated by using radius of circle formed by compressed slide.

Spreadability =m*l/t

- m = Weight tide to upper slide
- l = length moved on the glass slide
- t = time taken.

3.5.6 Washability: A portion of lotion was applied over the skin of hand and allowed to flow under the force of flowing tap water for 10 minutes. The time when the lotion completely removed was noted.

3.5.7 Homogeneity: The formulation was tested for homogeneity by visual appearance and by touch.

3.5.8 Absorbency: Rated at which product is perceived to be absorbed into skin. Evaluated by noting changes in skin surface. Rated slow-moderated-fast.

3.5.9 Viscosity: The measurement of viscosity of the prepared gel was done with a Brookfield viscometer spindle no.7 and speed 60rpm at 25ºC. The formulated lotion was directly immersed into the spindle and the viscosity was measured.

3.5.10 Irritancy test: The formulated lotion shows no redness, edema, irritation and inflammation during studies. The formulated cream is safe to use.

3.5.11 Anti-Bacterial Activity: Ager Well Diffusion

Preparation of Inoculum: Grow Propionibacterium spp. in nutrient broth for 24–48 hours under anaerobic conditions until it reaches 0.5 McFarland turbidity (~1.5×10^8 CFU/mL).

Inoculation of Agar Plate: Pour sterilized and cooled Mueller-Hinton Agar into Petri dishes. Once solidified, spread 100 µL of bacterial inoculum evenly over the surface using a sterile swab to create a lawn culture. 0

Well Formation: Using a sterile cork borer or pipette tip, punch uniform wells (6–8 mm in diameter) into the agar. Remove the agar plugs carefully.

Addition of Samples: Fill each well with 50–100 µL of the test sample. One well should be filled with Ciprofloxacin solution (standard concentration: 5–10 µg) as the positive control. Include a blank or solvent only well as the negative control (e.g., distilled water or ethanol if used as solvent).

Pre-diffusion (Optional): Allow the plate to stand at room temperature for 30–60 minutes to enable diffusion of the sample into the agar. Incubation: Incubate plates at 37°C for 24–48 hours in an anaerobic chamber or GasPak jar.

Measurement of Zone of Inhibition: After incubation, measure the diameter of the inhibition zones (including the well) in millimeters using a ruler or caliper.

4. RESULTS AND DISCUSSION

4.1 EVALUATION OF HERBAL LOTION

Table 6: Evaluation of Herbal Lotion.

S.NO	CHARACTERISTICS	PARAMETERS FOR ETHANOLIC LOTION	PARAMETERS FOR AQUEOUS LOTION
1.	Colour	Yellowish white	Yellowish white
2.	Odour	Rose like	Rose like
3.	pH	8.2	10
4.	Smoothness	Smooth	Smooth
5.	Consistency	Grease	Non- greasy

6.	Spreadability	7.9cm	8.5cm
7.	Washability	Easily washable in water	Easily washable
8.	Viscosity	3.9 poise	0.01 poise
9.	Homogenecity	Homogenous	Homogenous
10.	Iriritation	No irritation	No irritation
11.	Absorbency	Higher absorbance	Moderate absorbance

Fig 6: Aqueous & Ethanolic Extract.

Fig 7: Herbal Lotion.

4.2 ANTI-BACTERIAL ACTIVITY

Table 7: Anti – Bacterial Activity For Herbal Lotion

S.No	Microorganisms	Control	EEH	AEH	EE	AE	Ciprofloxacin
		Zone of inhibition in mm					
1.	*Pseudomonas aeruginosa*	-	15	20	2	1	40

- **AE – Aqueos Extract**
- **EE – Ethanolic Extract**
- **AEH – Aqueos Extract Herbal Lotion**
- **EEH – Ethanolic Extract Herbal Lotion**

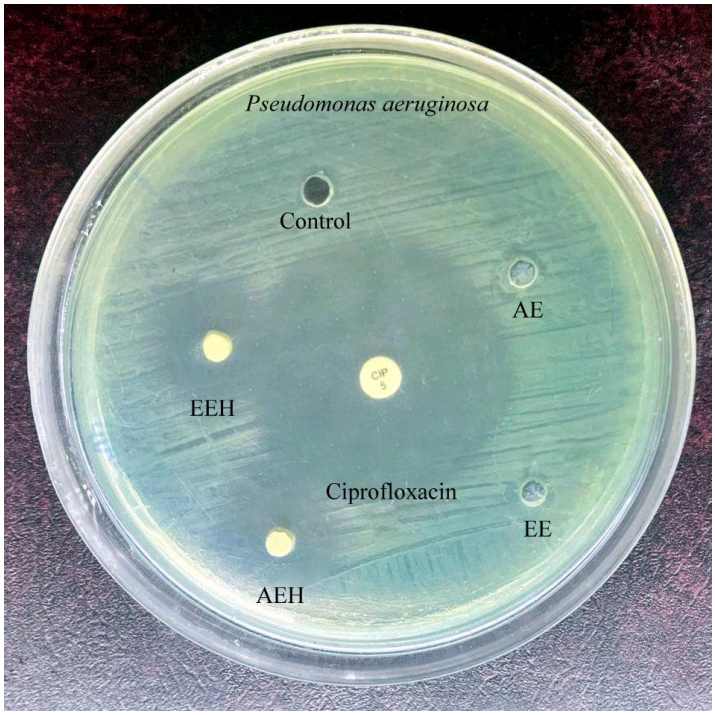

Fig 8: Anti – Bacterial Activity For Herbal Lotion.

4.3 LABEL

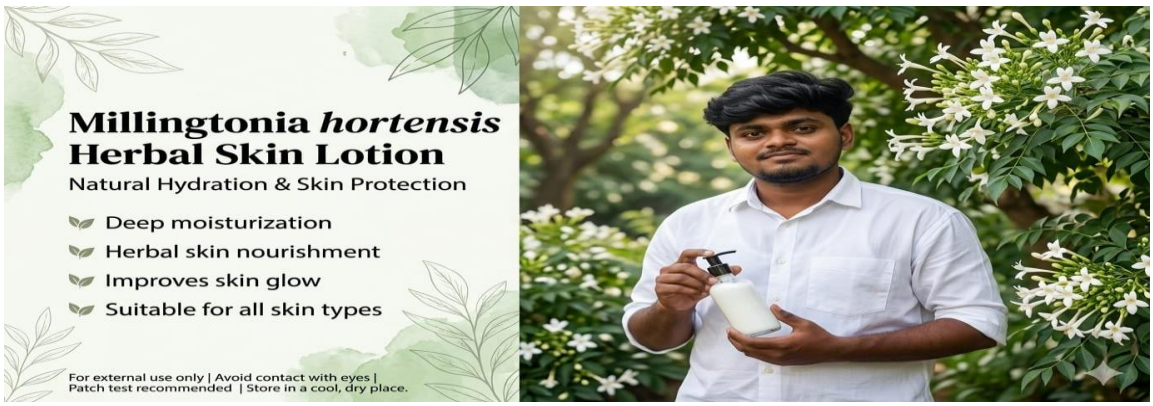

Fig 9: Label & Instruction.

DISCUSSION

The present study was carried out to formulate and evaluate a herbal skin lotion containing *Millingtonia hortensis* extract using both aqueous and ethanolic extraction methods. The prepared formulations were assessed for various physicochemical parameters and antibacterial activity. The results showed that both formulations possessed acceptable organoleptic properties such as yellowish-white color, pleasant odor, and smooth texture, indicating good cosmetic acceptability. The lotions were found to be homogenous and non-irritant, making them suitable for topical application.

The spreadability of the aqueous lotion (8.5 cm) was higher than that of the ethanolic lotion (7.9 cm), suggesting better ease of application and uniform distribution on the skin. In terms of consistency, the aqueous lotion was non-greasy, whereas the ethanolic lotion showed slightly greasy nature, which may influence user preference. The pH values of both formulations (8.2 and 10) were above the normal skin pH (5.5–6.5), indicating that pH adjustment is necessary to improve skin compatibility and avoid long-term irritation. The viscosity results showed variation between formulations, affecting their texture and spreadability.

The antibacterial activity study revealed that both formulations exhibited inhibitory effects against *Pseudomonas aeruginosa*. The aqueous extract lotion (AEH) showed a higher zone of inhibition (20 mm) compared to the ethanolic extract lotion (EEH) (15 mm), indicating better antibacterial activity. However, both were less effective than the standard drug (Ciprofloxacin – 40 mm), suggesting moderate antibacterial potency. These findings confirm that the presence of phytoconstituents such as flavonoids, tannins, and phenolic compounds in *Millingtonia hortensis* contributes to its antimicrobial and anti-inflammatory properties. The study supports the growing importance of herbal formulations as safer and eco-friendly alternatives to synthetic products.

5. CONCLUSION

The present study concludes that the herbal lotion formulated using *Millingtonia hortensis* extract is safe, stable, and exhibits moderate antibacterial activity. The formulation demonstrates good physicochemical properties and is suitable for topical application without causing irritation. Among the two formulations, the aqueous extract lotion showed better antibacterial activity and spreadability, making it more effective compared to the ethanolic formulation.

However, the alkaline pH of the formulations requires optimization to ensure better compatibility with skin. Further studies such as clinical evaluation, stability testing, and enhancement of antibacterial efficacy are recommended. Overall, this formulation has strong potential as a natural, eco-friendly, and effective alternative to synthetic skincare products, with added benefits of safety and suitability for long-term use.

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