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Formulation and Evaluation of Polyherbal Facewash for Skin Cleansing and Antimicrobial Activity

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Abstract: The present research work was undertaken with the objective of formulating and evaluating a polyherbal facewash containing Ocimum sanctum (Tulsi), Azadirachta indica (Neem), Aloe barbadensis (Aloe vera), and Citrus limon (Lemon peel) to provide an effective, mild, and skin-friendly cleansing preparation with anti-acne, antimicrobial, and skin-nourishing benefits. Synthetic facewash formulations often incorporate chemical surfactants and preservatives that may cause long-term skin sensitivity or irritation. Therefore, the present study was aimed at developing a natural herbal alternative enriched with phytoconstituents that exhibit synergistic therapeutic actions for maintaining skin hygiene and improving overall skin health. Each selected herb possesses well-documented medicinal value in traditional and modern skincare systems. O. sanctum is rich in eugenol and rosmarinic acid, imparting antimicrobial, antioxidant, and anti-inflammatory properties beneficial for reducing acne and purifying the skin. A. indica contains azadirachtin and nimbidin, effective against acne-causing bacteria and inflammation, contributing to clearer and infection-free skin. Aloe vera provides hydration, healing, and soothing effects due to its polysaccharides and glycosides, making the formulation suitable for sensitive and irritated skin. Lemon peel, a natural source of vitamin C and citric acid, supports gentle exfoliation, skin brightening, and reduction of pigmentation and blemishes. The combination of these herbs enhances cleansing efficiency while preserving the natural moisture balance of the skin. The polyherbal facewash was formulated using Carbopol 940 as a gelling agent, glycerin as a humectant, sodium lauryl sulphate as a mild foaming agent, rose water as a toning component, and sodium benzoate as a preservative. The prepared formulation was evaluated for organoleptic properties, pH, spreadability, foaming ability, washability, stability, and skin irritation potential. The facewash exhibited an appealing light-green colour with a smooth, uniform gel-like consistency and a pleasant herbal aroma. The pH of the formulation was found to be 5.8 ± 0.2, which lies within the skin-compatible range and ensures minimal irritation. The foam height measured 1.8 ± 0.1 cm, indicating adequate foaming and cleansing ability.

Keywords: Herbal facewash, Skin care, Formulation, Evaluation, Antimicrobial, Anti-acne, Ocimum sanctum (Tulsi), Azadirachta indica (Neem), Aloe barbendensis

I. INTRODUCTION

A facewash also referred to as a facial cleanser, is a semi-liquid or liquid formulation specifically designed for cleansing the facial skin. It eliminates surface impurities such as sebum, dead cells, dust particles, and microbial contaminants that accumulate on the epidermis. Unlike ordinary soaps, facewash formulations are designed to maintain the natural pH of the skin and preserve its protective lipid barrier. These products are often enriched with herbal or synthetic surfactants, humectants, and active agents to achieve both cleansing and skin-conditioning effects. A typical facewash formulation includes surfactants for cleansing, humectants for moisture retention, preservatives for microbial stability and herbal or synthetic active ingredients for therapeutic or cosmetic purposes.

1.1 Skin

The skin is the largest organ of the human body and serving as a protective barrier between the internal organs and the external environment. It regulates body temperature, prevents dehydration and provides defence against mechanical, chemical and microbial insults.

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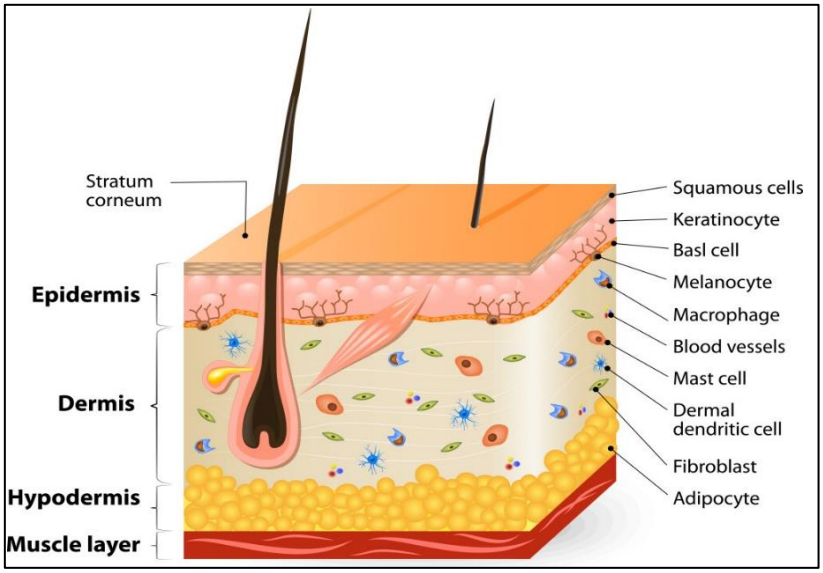

Fig.No.1: Skin diagram

- **Skin layers:**
  1. **Epidermis:** The epidermis is the outermost layer composed primarily of keratinocytes. The stratum corneum is the uppermost sub-layer consists of dead keratinized cells embedded in lipid matrices and it playing a major role in limiting transepidermal water loss and preventing pathogen entry.
  2. **Dermis:** The dermis lies beneath the epidermis and is thicker, providing strength, elasticity and support to the skin. This layer houses blood vessels, sweat glands, sebaceous glands, nerve endings, and hair follicles, all of which help in temperature regulation, sensation, and nutrient supply.
  3. **Subcutaneous Layer:** The subcutaneous layer lies below the dermis and consists of adipose tissue and connective fibers. It functions as an energy reservoir and provides insulation and cushioning to underlying tissues and organs.
  4. **Stratum corneum:** It is the outermost layer of the epidermis, made up of dead, flattened keratinized cells. It acts as the skin's primary protective barrier against environmental damage, microbes, and chemical exposure. This layer prevents water loss from the body, helping maintain skin hydration.
- **Types of Skin:**
  1. **Normal Skin:** Normal skin exhibits balanced sebum secretion, optimal hydration and uniform texture. It requires mild cleansing agents that do not disturb its physiological equilibrium.
  2. **Oily Skin:** Oily skin is characterized by hyperactive sebaceous glands leading to excess oil secretion and acne-prone conditions. Facewash formulations for oily skin typically contain astringent or antimicrobial agents such as salicylic acid or herbal extracts like neem and tea tree oil.
  3. **Dry Skin:** Dry skin lacks sufficient sebum production and appears rough or flaky. Cleansers for dry skin must include emollients and humectants such as glycerine, aloe vera, or hyaluronic acid to enhance moisture retention.
  4. **Combination Skin:** Combination skin exhibits both oily and dry characteristics, typically oily in the T-zone and dry on the cheeks. Balanced formulations containing mild surfactants and conditioning agents are suitable for this type.
  5. **Sensitive Skin:** Sensitive skin reacts easily to external stimuli such as fragrances, preservatives, or harsh surfactants. Hypoallergenic facewash formulations using soothing botanicals like chamomile and calendula are ideal for this skin type.
- **Skin Care Preparations:**
  1. **Creams:** Creams are semi-solid emulsions composed of oil and water phases stabilized by emulsifying agents. They provide hydration, lubrication, and deliver active ingredients for protection or treatment. Depending on composition, they may be classified as oil-in-water or water-in-oil emulsions.
  2. **Lotions:** Lotions are fluid emulsions or suspensions formulated for easy application and rapid absorption. They are suitable for large surface areas and often used for cooling, moisturizing, or medicated purposes.
  3. **Ointments:** Ointments are greasy, occlusive preparations containing high proportions of oil or wax. They are intended for dry or chapped skin where prolonged emollient action is required.
  4. **Gels:** Gels are transparent, semi-solid systems composed of a three-dimensional polymeric network. They offer non-greasy feel, quick absorption, and suitability for both hydrophilic and lipophilic active agents.

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5. **Serums:** Serums are concentrated formulations with low viscosity, designed to deliver potent bioactive such as vitamins, antioxidants, or peptides directly into deeper skin layers.

1.2 Facewash:

Face wash is a specialized facial cleansing product designed to remove makeup, dead skin cells, excess sebum, dirt, pollutants, and other environmental contaminants from the skin of the face. Unlike ordinary soaps, which can strip the skin of its natural oils and moisture, face washes are formulated to maintain the skin's delicate balance, ensuring that it remains hydrated, smooth, and resilient. By effectively cleansing the pores, face washes help prevent common skin disorders such as acne, blackheads, whiteheads, and other blemishes. When combined with complementary skincare products, such as toners and moisturizers, face washes form an integral component of a systematic skincare routine. Modern formulations not only cleanse but also provide therapeutic benefits such as anti-inflammatory, antimicrobial, and antioxidant effects, particularly when enriched with natural or herbal ingredients. Face washes are designed to be gentle, supporting the maintenance of the stratum corneum while promoting healthy skin renewal. They can also facilitate better penetration of subsequent topical products, enhancing the efficacy of moisturizers, serums and sunscreens.

- **Types of Face Wash Based on Skin Type:**
  1. **Oily Skin Face Wash:** Formulated without heavy oils, these cleansers reduce sebum accumulation, minimize pore blockage, and prevent acne formation. They often contain herbal extracts and botanical actives to control excess oil while maintaining hydration.
  2. **Dry Skin Face Wash:** Rich in emollients and moisturizing agents, these cleansers prevent the skin from drying out while removing impurities. Ingredients such as aloe vera, glycerin, and botanical oils help maintain softness and elasticity.
  3. **Normal Skin Face Wash:** Balanced formulations that maintain skin health by gently cleansing without over-stripping oils or moisture.
- **Forms of Face Wash:**
  1. **Cream-Based Face Wash:** These thick, creamy formulations are enriched with moisturizing agents like botanical oils. They are ideal for dry and sensitive skin, as they cleanse effectively without removing essential natural oils. Cream-based face washes provide a soothing effect while ensuring deep pore cleansing.
  2. **Gel-Based Face Wash:** Typically, water-based, gel cleansers have a lightweight, non-greasy texture. Infused with flower extracts and essential oils, they help balance skin pH, making them suitable for sensitive and combination skin. Gel-based washes also provide gentle exfoliation and promote a refreshed, non-oily appearance.
  3. **Liquid Face Wash:** Liquid formulations offer high dosing flexibility and rapid cleansing action. Monophasic liquids dissolve the active ingredients completely, whereas biphasic liquids suspend or disperse actives, offering a controlled cleansing effect.
  4. **Powder Face Wash:** These dry formulations activate with water to form a cleansing paste or foam. They often include gentle exfoliants like rice bran or fruit enzymes, removing dead cells and impurities without abrasive effects. Powder face washes are travel-friendly and customizable in consistency.
- **Properties of Face Wash:**
  1. Facewash accelerates blood circulation and supports skin regeneration.
  2. Facewash controls excessive sebum production to prevent oily skin and clogged pores on the face
  3. It suitable for acne-prone skin due to its therapeutic effects.
  4. Facewash contains plant-based components like neem and aloe vera, which cleanse without removing essential nutrients.
  5. It should be stable, visually appealing, and spread easily on the skin.
  6. It provides a soft, non-greasy feel during application.
  7. It leaves a thin protective emollient layer after use.
  8. Physical action of facewash should flush and open pores without absorption of harmful ingredients.
- **Advantages of Face Wash:**
  1. It helps remove dead skin cells, allowing new skin cells to replace old ones.
  2. It keeps the skin fresh, healthy, and radiant.
  3. Facewash removes dead skin cells, which slows down the development of wrinkles.
  4. It also boosts blood circulation, improving skin vitality and promoting a glowing complexion.
  5. It promotes skin regeneration and rejuvenation.
  6. It prepares the skin to better absorb other skincare products.
- **Disadvantages of Face Wash:**
  1. Facewash should be used moderately; excessive washing can cause dryness and irritation.
  2. It limited in scope: primarily cleanses the face without addressing deeper dermatological concerns.

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3. Some formulations may cause itching, redness, or rashes in sensitive individuals.
4. Repeated use of chemical-based washes may result in long-term skin sensitivity or allergic reactions.

- **Functions of Face wash:**
  1. Facewash regulate cleansing and purifying the skin by removing environmental pollutants, makeup, and excess sebum.
  2. It regulating sebum production in oily skin to prevent clogged pores.
  3. It providing mild exfoliation to remove dead skin cells and promote skin rejuvenation.
  4. It protecting the skin from microbial infections and inflammation.
  5. It hydrating the skin and maintaining pH balance to support overall skin health.
- **Uses of Face Wash:**
  1. Facewash cleanses the skin by removing dirt, pollutants, and makeup.
  2. It helps maintain healthy and glowing skin.
  3. It reduces acne, pimples, whiteheads, and blackheads.
  4. It stimulates skin cell renewal and promotes exfoliation.
  5. Anti-aging: slows the formation of wrinkles and fine lines.
  6. Opens and clears clogged pores for better skin health.
  7. It improves penetration of serums, creams, and moisturizers.

- **Therapeutic Agents in Face Wash:**
  1. **Antimicrobial Agents:** Antimicrobial agents inhibit the growth and reproduction of bacteria on the skin, helping prevent acne and other bacterial skin infections. These agents are crucial for individuals with oily or acne-prone skin. For example, aloe vera has been extensively studied for its antibacterial properties, aiding in wound healing, inflammation reduction, and skin hydration.
  2. **Anti-Inflammatory Agents:** Anti-inflammatory agents reduce swelling, redness, and irritation. Unlike analgesics that act on the central nervous system, these agents mitigate pain by targeting localized inflammation. Curcumin, derived from turmeric, is a widely used anti-inflammatory compound with oxidative stress.
  3. **Anti-Acne Agents:** Anti-acne agents control sebum production, reduce bacterial load, and prevent the formation of pimples and lesions. Common actives include salicylic acid, benzoyl peroxide, and herbal extracts with antimicrobial and sebum-regulating properties. These agents are formulated to address both mild and severe acne without over-drying the skin.
  4. **Antioxidant Agents:** Antioxidants protect the skin from damage caused by free radicals, pollution, and UV exposure. They help maintain a healthy, youthful skin texture and support natural skin repair. Herbal antioxidants like green tea extract and vitamin E from plant oils are widely used in face washes to reduce dullness, improve complexion, and prevent skin aging.

- **Additives in Face Wash:**
  1. **Antioxidants:** Antioxidants prevent oxidative damage to skin cells caused by free radicals. Common antioxidants include vitamins A, C, E and lycopene, which protect the skin from premature aging, environmental stress, and inflammation.
  2. **Gelling Agents:** Gelling agents, such as carbopol or agar, increase the viscosity of liquid formulations without stiffness. They ensure smooth application and maintain stability during storage and use.
  3. **Preservatives:** Preservatives extend the shelf-life of face wash by preventing microbial growth. Examples include methylparaben and propylparaben, which inhibit bacteria, yeast, and molds, ensuring the safety and efficacy of the product.
  4. **Humectants:** Humectants, including propylene glycol, hexylene glycol, and butylene glycol, attract and retain water in the skin, preventing dryness and maintaining suppleness. They are commonly incorporated in both herbal and synthetic formulations to balance hydration.
  5. **Foaming Agents:** Foaming agents, or surfactants, reduce surface tension and promote foam formation, enhancing the cleansing experience. They also aid in the uniform distribution of active ingredients and facilitate the removal of oil and dirt from the skin.

II. AIM

The primary aim of the present research work is to formulate and evaluate a safe, effective, and scientifically standardized herbal facewash using natural ingredients known for their cleansing, antimicrobial, antioxidant, and skin-soothing properties.

The main focus of this study is to develop a polyherbal facewash gel that provides efficient cleansing action, helps prevent acne and microbial infections, maintains the natural pH and moisture balance of the skin, and minimizes irritation

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associated with chemical-based formulations. The formulation will be developed using selected herbal ingredients such as Azadirachta indica (Neem), Ocimum sanctum (Tulsi), Aloe barbadensis (Aloe vera), and Citrus limon (Lemon), which are known for their synergistic therapeutic effects on the skin.

III. OBJECTIVES

1. To perform an extensive literature review on medicinal plants possessing antibacterial, antioxidant, cleansing, and skin-rejuvenating properties suitable for use in cosmetic formulations.
2. To select and procure suitable herbal ingredients such as Neem, Tulsi, Aloe vera, and Lemon based on their traditional and pharmacological significance in skincare.
3. To identify and authenticate the selected plant materials in accordance with standard pharmacognostic and botanical guidelines to ensure their quality and purity.
4. To prepare extracts or use herbal juices/powders by employing suitable extraction techniques that preserve active phytoconstituents and maintain their stability.
5. To formulate a stable polyherbal facewash gel using compatible excipients such as gelling agents (e.g., Carbopol 940), humectants, mild surfactants, and natural preservatives that enhance product texture and performance.
6. To optimize the formulation parameters by adjusting pH, viscosity, spreadability, foaming ability, and appearance to ensure a balanced, user-friendly, and aesthetically appealing product.
7. To perform detailed evaluation tests on the prepared formulation including physicochemical properties, washability, stability studies, and microbial load determination to ensure quality and safety.
8. To conduct comparative analysis of the prepared herbal facewash with a marketed formulation to assess performance, skin compatibility, and consumer acceptability.

IV. NEED OF WORK

In recent years, there has been a significant rise in consumer awareness towards skin health and the use of safe, mild, and eco-friendly cosmetic products. Synthetic facewash formulations commonly available in the market contain chemical surfactants, artificial fragrances, parabens, preservatives, and synthetic colouring agents which may cause long-term adverse effects such as skin irritation, dryness, allergic reactions, and disruption of the natural skin microbiota. This increasing concern has encouraged a shift towards herbal-based cosmetic formulations that are considered safer, more biocompatible, and gentle on the skin. Herbal facewash offers cleansing, moisturizing, and therapeutic effects without the side effects associated with synthetic ingredients, thereby creating a strong need for research and development in this area.

Herbal extracts such as Neem, Tulsi, Aloe vera, and Lemon possess scientifically proven antimicrobial, anti-inflammatory, antioxidant, and skin-nourishing properties, making them suitable for topical skincare products. Despite their traditional use and reported benefits, there is still limited standardized research on the formulation, development, and evaluation of a poly-herbal facewash that combines these ingredients in an optimized ratio for enhanced efficacy and stability. Therefore, there is a need to design a herbal facewash formulation that provides effective cleansing, prevents microbial growth, reduces acne and skin blemishes, and maintains the natural pH of the skin.

Furthermore, the increasing demand for herbal cosmetic products in the global and Indian markets highlights the necessity for scientifically developed and well-evaluated formulations. Most commercially available herbal facewashes lack proper standardization, quality control parameters, and scientific evaluation data. Thus, the development of a standardized herbal facewash supported by scientific evaluation, stability studies, and safety assessment is essential to ensure product efficacy, consumer satisfaction, and regulatory compliance.

Additionally, the project encourages the utilization of natural and cost-effective ingredients that are easily available, renewable, and environmentally friendly. Formulating a herbal facewash not only aligns with current consumer trends and market demand but also promotes sustainable development, reduces chemical load on skin and environment, and supports the use of traditional medicinal plants through a scientific approach.

V. DRUGS AND EXCIPIENTS

5.1 Tulsi:

Fig.No.2: Tulsi

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- **Synonyms:** Tulsi, Holy Basil
- **Biological source:** Tulsi consists of the leaves and aerial parts of Ocimum sanctum Linn.
- **Family:** Lamiaceae.
- **Description:**
  - **Colour:** Green, light to dark green
  - **Odour:** Aromatic, Pleasant
  - **Taste:** Pungent, bitter
- **Chemical constituents:**
  1. Eugenol
  2. Carvacrol
  3. rosmarinic acid
- **Structure:**

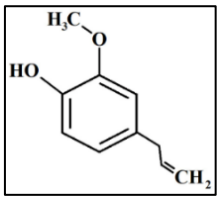

Fig.No.3: Eugenol

- **Properties:**
  1. Anti-inflammatory: Helps calm irritated skin and reduce swelling.
  2. Antioxidant: Shields skin from environmental damage and helps maintain freshness.
  3. Purifying: Helps cleanse and detoxify the skin for a clean and refreshed look.
- **Uses-**
  1. Tulsi helps improve skin complexion and fade dark spots for a brighter appearance.
  2. It helps control acne and breakouts by reducing excess oil on the skin.
  3. Tulsi provides relief from minor skin irritation and discomfort.

5.2 Neem:

Fig.No.4: Neem

- **Synonym:** Nim, Nimba
- **Biological source:** It consists of dried leaves of Azadirachta indica A. Juss.
- **Family:** Meliaceae
- **Description:**
  - **Colour:** Green
  - **Odour:** Pungent, unpleasant bitter
  - **Taste:** Bitter
- **Chemical constituents:**
  1. Azadirachtin
  2. Nimbosterol
  3. Nimbidin

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- **Structure:**

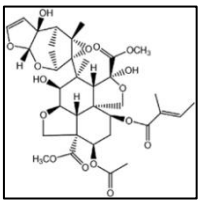

Fig.No.5: Azadirachtin

- **Properties**:
  1. Cleansing: Neem can deep cleanse the skin, making it is soft and smooth.
  2. Antibacterial: It helps prevent the growth of bacteria and skin infections.
  3. Soothing: It can help soothe irritated skin and relieve itchiness, redness and dryness.
- **Uses:**
  1. Neem is used to treat acne and pimples by reducing excess oil.
  2. It is used to lighten acne scars, dark spots, and pigmentation, helping to improve skin tone.
  3. Neem is used to prevent skin infections due to its strong antibacterial and antifungal properties

5.3 Aloe vera:

Fig.No.6: Aloe Vera

- **Synonyms:** Aloe, Musabbar, Korphad (in Marathi).
- **Biological source:** It is the dried latex exuded from the leaves of the Aloe genus, like Aloe barbadensis Miller and Aloe ferox Miller.
- **Family:** Liliaceae.
- **Description:**
  - **Colour:** Dark brown to greenish brown
  - **Odour:** Characteristic, Sour
  - **Taste:** Bitter and Unpleasant
- **Chemical constituents:**
  1. Anthracene glycosides
  2. Barbaloin or Aloin
  3. Isobarbaloin
- **Structure:**

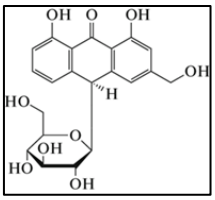

Fig.No.7: Aloin

- **Properties:**
  1. Anti-inflammatory: Helps reduce inflammation by blocking the cyclooxygenase pathway and producing prostaglandins.
  2. Antioxidant: Contains polyphenols that act as powerful antioxidants.
  3. Anti-bacterial, anti-viral, and anti-fungal: Can protect against various infections.

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4. Moisturizing and Hydrating: Provides deep hydration and maintains skin moisture.

- **Uses:**
  1. To lighten skin and reduce blemish marks on the skin.
  2. It having also quite effective for treating acne and pimples on face.
  3. Aloe is used to reduce skin inflammation, redness and irritation.

5.4 Lemon Peel:

Fig.No.8: Lemon Peel

- **Synonyms:** citrus lemon
- **Biological source**: The biological source of a lemon is Citrus limon, a species of evergreen tree.
- **Family:** Rutaceae
- **Chemical constituents:**
  1. Citric acid
  2. Ascorbic acid
  3. Mineral
  4. Flavonoids
- **Structure:**

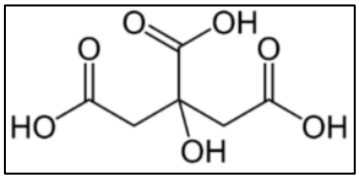

Fig.No.9: Citric acid

- **Properties:**
  1. Antibacterial: Helps fight acne-causing bacteria on the skin.
  2. Astringent: Tightens skin pores and reduces oiliness.
  3. Anti-inflammatory: Reduces redness, swelling, and skin irritation.
  4. Skin-brightening: Contains Vitamin C, which enhances skin glow and reduces pigmentation.
  5. Anti-aging: Delays wrinkles and fine lines by boosting collagen production.
- **Uses:**
  1. Lemon peel is used to lighten dark spots, pigmentation, and acne scars on the skin.
  2. It is used to control excess oil and reduce acne due to its antibacterial nature.
  3. It is used as a natural exfoliator to remove dead skin cells and impurities.
  4. Lemon peel is used to tighten pores and tone the skin for a smooth texture.
  5. It is used to reduce blackheads and whiteheads on the face.

5.5 Glycerin:

Fig.No.10: Glycerin

- **Source:**
  1. It is naturally derived from vegetable oils or animal fats.

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2. It can also be produced synthetically from petroleum-based sources.

- **Properties:**
  1. It is a viscous, water-soluble liquid that is both non-toxic and sweet-tasting.
  2. It shows humectant properties, meaning it attracts and retains moisture in the skin.
  3. Glycerin has emollient properties, which help keep the skin smooth and soft.
- **Structure:**

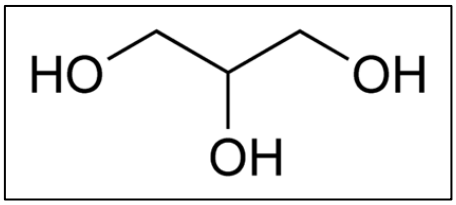

Fig.No.11: Glycerin

- **Chemical Name:** Propane-1,2,3-triol
- **Chemical Formula:** $C_3H_8O_3$
- **Molecular Weight:** 92.09 g/mol
- **Density:** ~1.26 g/cm³ at 20°C
- **Boiling Point:** ~290°C
- **Uses:**
  1. It is used in lotions and creams to moisturize and soften the skin.
  2. It acts as a sweetener, humectant and preservative in products.
  3. It is used in medicines and wound care to help with moisturizing and tissue healing.
  4. Glycerin helps to maintain skin hydration and prevents dryness after washing.
  5. It supports softness and smoothness of the skin by reducing moisture loss.

5.6 Carbopol 940:

Fig.No.12: Carbopol 940

- **Source:**
  1. It is a synthetic polymer obtained by cross-linking acrylic acid.
  2. Carbopol 940 is commercially produced from petroleum-based raw materials and supplied as a white fluffy powder.
  3. It is sourced in pharmaceutical and cosmetic grade for use in topical, skincare, and personal-care formulations.
- **Properties:**
  1. It shows excellent thickening ability even at very low concentrations in water.
  2. Carbopol swells in water and forms a clear and stable gel after neutralization.
  3. It provides good spreadability and gives a smooth, non-sticky texture to formulations.
  4. It helps to stabilize formulations by preventing separation of ingredients.
- **Structure:**

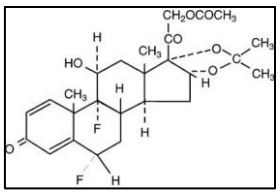

Fig.No.13: Carbopol 940

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- **Chemical Name:** Carbomer 940 (Cross-linked Polyacrylic Acid)
- **Chemical Formula:** $(C_3H_4O_2)_n$
- **Molecular Weight:** Very high molecular weight (approx. 1,250,000–4,000,000 g/mol)
- **Density:** ~1.41 g/cm³
- **Uses:**
  1. Carbopol 940 is used as a gelling and thickening agent in pharmaceutical creams, gels, and ointments.
  2. It is used in face gels, lotions, and moisturizers to provide a clear and smooth gel texture.
  3. Carbopol is used in hand sanitizers to form a stable, consistent, and transparent gel.

5.7 Sodium Lauryl Sulphate (SLS):

Fig.No.14: Sodium Lauryl Sulphate

- **Source:**
  1. SLS is commercially produced from lauryl alcohol which is derived from coconut oil or palm kernel oil.
  2. It is supplied in the form of white powder, flakes, or a clear viscous liquid for cosmetic formulations.
- **Properties:**
  1. It is an anionic surfactant that produces rich foam and effective cleansing action.
  2. SLS has good emulsifying properties, helping to remove dirt, oil, and impurities from the skin.
  3. It shows excellent wetting and spreading ability, improving the performance of face wash formulations.
- **Structure:**

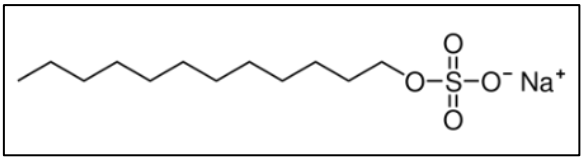

Fig.No.15: Sodium Lauryl Sulphate (SLS)

- **Chemical Name:** Sodium Lauryl Sulphate
- **Chemical Formula:** $C_{12}H_{25}NaO_4S$
- **Molecular Weight:** 288.38 g/mol
- **Density:** ~1.05 g/cm³
- **Uses:**
  1. SLS is used as a cleansing and foaming agent in face wash to remove oil, dust, and impurities.
  2. It helps to create creamy and stable foam, improving user experience during face washing.
  3. It is used as an emulsifier to mix water and oil-based ingredients evenly in formulations.

5.8 Rose Water:

Fig.No.16: Rose Water

- **Synonym:** Gulab Jal, Rose Hydrosol

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- **Biological source:** It is obtained by steam distillation of the fresh petals of Rosa damascena and Rosa centifolia flowers.
- **Family:** Rosaceae
- **Description:**
  - **Colour:** Colourless to pale pink
  - **Odour:** Pleasant, sweet
  - **Taste:** Slightly sweet and floral
- **Chemical Constituents:**
  1. Geraniol
  2. Citronellol
  3. Linalool
- **Structure:**

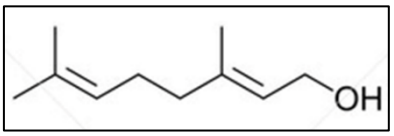

Fig.No.17: Geraniol

- **Properties:**
  1. Rose water has soothing and anti-inflammatory properties that help calm irritated and sensitive skin.
  2. It acts as a natural toner that helps maintain skin pH and tightens pores.
  3. It shows mild antibacterial and antioxidant effects that protect the skin.
- **Uses:**
  1. Rose water is used in facewash as a natural toner to cleanse and tighten skin pores.
  2. It helps reduce skin redness, irritation, and inflammation.
  3. It is used to maintain skin hydration and give a refreshing feel.
  4. It provides natural fragrance to enhance the sensory appeal of cosmetic product.

5.9 Sodium benzoate:

- **Structure:**

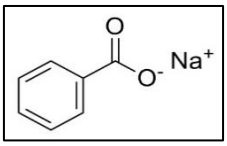

Fig.No.18: Sodium benzoate

- **Chemical Name:** Sodium Benzoate
- **Chemical Formula:** $C_7H_5NaO_2$
- **Molecular Weight:** 144.11 g/mol
- **Density:** ~1.44 g/cm³
- **Properties:**
  1. It works best in slightly acidic products (pH 3–6), which is suitable for face wash formulations.
  2. Sodium benzoate is water-soluble and easily mixes into liquid cosmetic preparations.
- **Uses:**
  1. It maintains product safety and increases the shelf life of the formulation.
  2. It helps protect natural and herbal ingredients from degradation during storage.

5.10 Distilled water:

Fig.No.19: Distilled water

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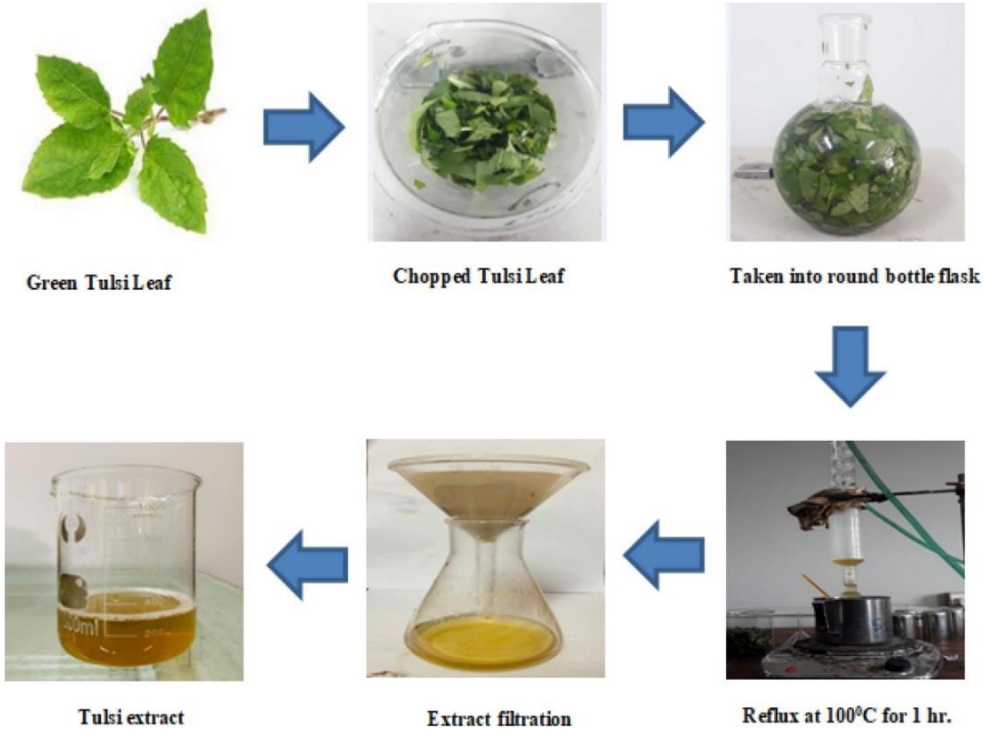
- **Properties:**
  1. Distilled water is free from microorganisms, minerals, and impurities, making it suitable for sensitive skin formulations.
  2. It provides a smooth and clean base for herbal face wash formulations.
- **Uses:**
  1. It is used as the main solvent/vehicle in herbal face wash to dissolve and mix all ingredients.
  2. It acts as a base for the formulation and aids in blending active and supportive components.
  3. Distilled water helps to maintain product clarity, smooth texture, and stability.

VI. FORMULATION TABLE

Sr. No.	Ingredients	Quantity taken	Category
1.	Tulsi leaf extract	5 gm	Skin Purifying Agent
2.	Neem leaf extract	5 gm	Anti-Acne Agent
3.	Aloe vera gel	10 gm	Skin Soothing Agent
4.	Lemon peel extract	2 gm	Skin Brightening Agent
5.	Glycerin	3 gm	Humectant
6.	Carbopol 940	1 gm	Gelling Agent
7.	Sodium Lauryl Sulphate (SLS)	5 gm	Foaming Agent
8.	Rose water	15 gm	Skin Toning Agent
9.	Sodium benzoate	0.5 gm	Preservative
10.	Distilled water	q. s.	Vehicle

VII. METHOD OF PREPARATION

- **Extraction of Tulsi:**
  1. Collect fresh tulsi leaves.
  2. Rinse well to remove dust particles.
  3. Dry leaves in shade to maintain phytochemicals.
  4. Grind dried leaves into powder form.
  5. Perform ethanolic or aqueous extraction (soaking/boiling).
  6. Filter the mixture to obtain tulsi extract used for herbal preparations



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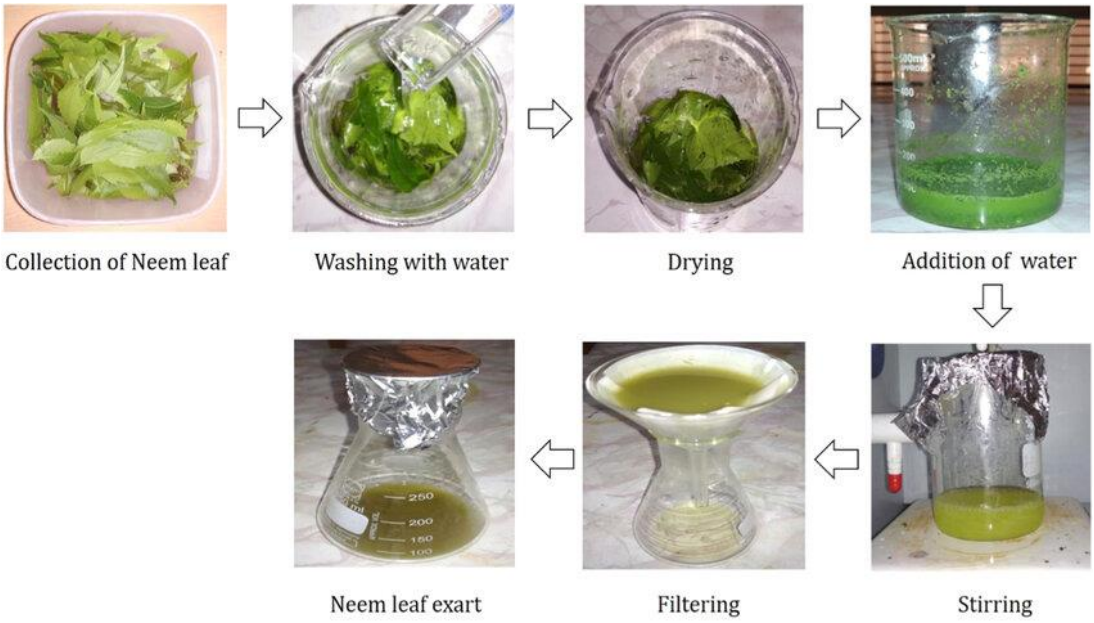
➢ **Extraction of Neem:**

1. Collect fresh neem leaves.
2. Wash thoroughly to remove dirt and impurities.
3. Dry the leaves under shade to preserve active constituents.
4. Grind the dried leaves into fine powder.
5. Boil the powder in distilled water to extract active components (hot extraction).
6. Filter the solution to obtain pure neem extract for use in herbal formulations.



➢ **Preparation of Herbal Facewash:**

1. Weigh all the required ingredients accurately as per the formulation table.
2. Disperse Carbopol 940 in a small quantity of distilled water and allow it to hydrate for 45–60 minutes with gentle stirring to form a uniform gel base.
3. Dissolve glycerin in a small amount of distilled water and add it slowly to the hydrated Carbopol with continuous stirring.
4. Add Aloe vera gel to the base and mix thoroughly to obtain a uniform consistency.
5. Add the herbal extracts (Tulsi, Neem, and Lemon) one by one to the gel base and mix uniformly.
6. Add sodium lauryl sulphate slowly with gentle stirring to avoid excessive foaming.
7. Add sodium benzoate and mix until completely dissolved.
8. Make up the final volume with distilled water and mix well to achieve a smooth and homogeneous formulation.
9. Adjust the pH of the formulation between 5.5–6.5 and record the reading.
10. Transfer the prepared herbal facewash into a clean, airtight container, label properly, and store at room temperature.

VIII. EVALUATION PARAMETERS

1. Organoleptic Evaluation:

This involves sensory evaluation such as colour, odour, appearance, and texture of the herbal facewash. The product should have a pleasant aroma and appealing colour without any unpleasant odour or discoloration.

2. pH Determination:

The pH of the herbal facewash is measured using a digital pH meter. The pH should be between 5.5 and 6.5, suitable for the skin and ensuring mild cleansing without irritation.

3. Foaming Ability:

The foam height is measured after shaking a fixed volume of facewash with water. Foam stability is determined by observing the time taken for the foam to disappear. Herbal facewash should produce stable foam suitable for cleansing.

4. Skin Irritation Test:

Evaluated by applying the facewash on a skin patch contaminated with oil or dirt and determining the percentage of removal after washing. Higher efficiency indicates better cleansing power.

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5. Washability:
Ease of removal of the facewash from the skin surface after application is checked. An ideal herbal facewash should be easily washable with water and leave no residue.

6. Spreadability:
Determined by applying a small quantity of facewash between two glass slides and measuring the diameter of spread. Good spreadability ensures uniform application over the skin.

7. Stability Studies:
The product is stored under various conditions of temperature and humidity to check physical appearance, colour, odour, and pH. Stable formulations show no phase separation or degradation over time.

IX. SUMMARY

Skin is continuously exposed to environmental pollutants, dust, and microorganisms, which makes regular cleansing essential for maintaining hygiene and appearance. Commercial facewash products available in the market are mostly synthetic and contain harsh surfactants, parabens, and artificial fragrances that may cause dryness, irritation, and allergic reactions on prolonged use. Owing to the increasing awareness of the harmful effects of synthetic chemicals, consumers are shifting toward herbal products that are gentle, biodegradable, and enriched with natural bio-actives.

Herbal plants like Neem, Tulsi, Aloe vera, and Lemon are widely known for their antibacterial, anti-inflammatory, antioxidant, and cleansing properties. Neem provides antimicrobial protection and reduces acne; Tulsi offers antiseptic and healing actions; Aloe vera moisturizes and soothes the skin; and Lemon acts as a natural astringent and brightening agent. By combining these herbs into a single formulation, a synergistic effect can be achieved, providing multiple benefits within one product.

In this project, a polyherbal facewash gel is formulated using scientifically justified proportions of herbal extracts along with suitable base ingredients such as Carbopol 940, glycerin, and mild surfactants. The prepared formulations are evaluated for organoleptic and physicochemical parameters—pH, viscosity, foaming ability, spreadability, washability, stability, and microbial load. These studies ensure that the product remains stable, effective, and safe throughout its shelf life.

The expected outcome of the work is the successful development of a standardized herbal facewash formulation that provides efficient cleansing without damaging the natural protective layer of the skin. The formulation will help in reducing microbial contamination, controlling sebum, and maintaining skin smoothness and hydration. The study also promotes the concept of replacing synthetic cosmetic formulations with herbal alternatives that are safer, economical, and environmentally friendly.

Thus, the present research not only contributes to the field of herbal cosmeceuticals but also supports the sustainable utilization of medicinal plants for the benefit of both consumers and the pharmaceutical industry.

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