

## Formulation and development of herbal facewash using Beal leaves: *Aegle marmelos*

Rutuja S Rokade <sup>1,\*</sup>, Sakshi R Vidhate <sup>1</sup>, Disha S Kale <sup>2</sup> and Shravan. J. Somani <sup>2</sup>

<sup>1</sup> Pratibhatai Pawar College of Pharmacy, Wadala Mahadev, Shrirampur. DBATU University, Lonere, Maharashtra, India.

<sup>2</sup> Department of Pharmaceutical Analysis, Pratibhatai Pawar College of Pharmacy, Wadala Mahadev, Shrirampur, Maharashtra, India.

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### Abstract

In this study, herbal anti-acne face wash gels were prepared using polymers Carbopol and extract of aegle marmelos (beal patra), which show the antibacterial property and are widely used in modern herbal medicine. Results showed that the gels were non-irritating, stable, and possess anti-acne activity. Acne is a common skin problem that 85% of teenagers face today. Herbal drugs have been used for many years, not only in Asian countries but also worldwide for social well-being. Herbal formulations have rising demand in the global market. This study demonstrated the stability of herbal Gel, which is now regarded as an efficient herbal acne treatment formulation. A number of characteristics, including color, appearance, consistency, pH, and foamability, were assessed for the prepared formulation. Because natural remedies are safer and have fewer side effects than synthetic ones, they are more widely accepted. The demand for herbal formulations is rising on the international scene. The creation and assessment of a herbal anti-acne cleanser with aqueous bael leaf (*Aegle marmelos*) extracts are the subjects of this study. Despite the fact that there are many topical herbal remedies for acne on the market, the plant has good antibacterial, antioxidant, and anti-inflammatory properties according to published research.

**Keywords:** Herbal; Facewash; Beal Leaves; Skin; *Aegle Marmelos*; SLS

### 1. Introduction

#### 1.1. Skin

The skin acts as a first-order physical barrier against the environment and covers the entire external surface of the body, making it the largest and most important organ for protection. Its duties include controlling body temperature and guarding against poisons, infections, microorganisms, trauma, and ultraviolet (UV) light.

The epidermis, dermis, and hypodermis are the three primary layers of skin, and they are vulnerable to a variety of issues such as rashes, wrinkles, acne, and skin cancer.

The largest organ in the body, the skin is composed of water, protein, lipids, and minerals. Your body temperature is shielded by your skin. Skin nerves enable you to experience temperature changes. The integumentary system includes your skin, hair, nails, sweat glands, and oil glands. "Integumentary" refers to the outer layer of a body.

##### 1.1.1. Skin surface

The skin's undamaged surface is ridged by lines that cross to form distinctive patterns and pitted by the openings of sweat glands and hair follicles, orifices. On every given body part, everyone has somewhat similar markings, but each

\* Corresponding author: Rutuja S Rokade.

person's details are distinct. The lines are pointing in the direction of elastic tension in general. Every part of the body has a distinct topography due to the countless deep and shallow pores that exist there. Similar to the deeper grooves and ridges found on the palms and soles, the skin lines are primarily formed prior to childbirth. Each person's small details on every part of their body are unique. Because of their high relief, fingerprints are utilized as a means of personal identification.

Due to usage or injury, some of the wrinkles on the skin's surface develop after birth. For instance, wrinkles on the forehead emphasize underlying congenital lines that become more prominent as people age. Wrinkles appear when the skin ages and loses firmness. Certain jobs produce skin marks that might be temporary or permanent, depending on the length of time and severity.

Dermatoglyphics are the distinctive, alternating ridges and grooves that are etched on the palms of the hands and the soles of the feet. The ridges have different courses, but there is a consistent structural plan to how they are arranged in different places. The ridges appear to be continuous, but they are actually quite irregular, branching, and have different lengths. Each little patch of surface has ridge details that are unique to that person, that person alone, and even that person's identical twin. Dermatoglyphics is the most well-known physical trait for personal identification because of this unfailing signature.

There are three layers of tissues make up the skin:

- Epidermis
- Dermis
- Hypodermis

### Epidermis

The outermost layer of skin that is visible and tactile is called the epidermis. Skin cells are made of the protein keratin, which combines with other proteins to form this layer. Keratin is the building block of skin cells. The layer of skin

- Acts as a protective barrier: The Skin Layer prevents germs and bacteria from getting into your bloodstream and body and causing infections. Rain, sun, and other environmental factors are also protected from.
- Makes new skin: Skin cells are constantly being produced by the epidermis. Your body sheds about 40,000 old skin cells every day, and these new cells take their place. Every 30 days, your skin regenerates.
- Protects your body: The immune system of the body includes the Langerhans cells found in the epidermis. They assist in warding off illnesses and germs.
- Provides skin color: The pigment that gives skin its color, melanin, is found in the epidermis. Your skin, hair, and eyes are colored according to the amount of melanin in your body. Melanin producers tend to have darker skin tones and may tan more quickly.

### Dermis

90% of the thickness of skin is made up of the dermis. This skin's middle layer:

- Contains elastin and collagen: Collagen is a protein that gives skin cells their strength and durability. Skin is kept flexible by elastin, another protein that is present in the dermis. It also aids in the reshaping of stretched skin.
- Promotes hair growth: Hair follicle roots adhere to the dermis.
- Maintains touch: Dermal nerves alert you when something is extremely soft, itchy, or too hot to handle. You can also feel pain thanks to these nerve receptors.
- Produces oil: The dermis contains oil glands that contribute to smooth, soft skin. Additionally, oil keeps your skin from absorbing excessive amounts of water during swimming or rainstorms.

### Hypodermis

The fatty layer of skin is called the hypodermis. Over the hypodermis:

- Cushions bones and muscles: Hypodermis fat shields bones and muscles from harm in the event of a fall or other mishap.
- Contains connective tissue, which binds the strands of skin to the muscles and bones.

- Supports blood vessels and nerves: In the hypodermis, blood vessels and nerves in the dermis (middle layer) enlarge. To connect the hypodermis to the rest of the body, these blood vessels and nerves branch out.
- Controls body temperature: The hypodermis's fat prevents you from becoming overly hot or cold.

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## 2. Conditions and Disorders

Your skin, the body's outermost defense system, is vulnerable to a number of issues. These consist of:

- Allergies, such as poison ivy rashes and contact dermatitis.
- Injuries.
- Bug bites, including those caused by ticks, spiders, and mosquitoes.
- Cancer of the skin, including melanoma.
- Skin conditions such as cellulitis.
- Dry skin and skin rashes.
- Skin conditions such as psoriasis, eczema, and acne.
- Skin lesions, including skin tags, freckles, and moles.
- Wounds, scars, and burns (including sunburns).

### 2.1. Care

As you age, you lose elastin and collagen. The dermis, or middle layer of the skin, becomes thinner as a result. The skin may sag and wrinkle as a result.

Although there is no way to stop aging, you can keep your skin healthier by doing these things:

- Use sunscreen every day, even if you spend most of your time indoors. Select a sunscreen that offers at least 30 broad-spectrum sun protection factor (SPF).
- Avoid getting tanned indoors or out. Skin damage results from tanning. It can cause skin cancer and age the skin.
- Look for healthy approaches to stress relief. Certain skin conditions can worsen due to stress.
- Check your skin and moles on a regular basis for any changes that might indicate skin cancer.
- Give up using tobacco products and smoking. Skin ages more quickly from nicotine and other chemicals in cigarettes and electronic cigarettes.
- Wash your face in the morning and at night with mild cleansers.
- To avoid dry skin, take regular showers and use moisturizing lotion.

### 2.2. Facial skin

The quality of your skin care regimen depends on the products you use. Poor quality products can be harmful and ineffective, while high-quality products can improve the appearance of your skin both now and in the future. The dermatologists at Skin Center of South Miami elaborate on the significance of high-quality skin care and facial products in this blog post.

The thickness of facial skin varies from person to person and experiences a generalized age-related thinning of the dermis. There is subcutaneous fat all over the face, and it is divided into lobules by connective tissue septa. The face's skin and subcutaneous tissue can be separated into aesthetic units based on the color, texture, thickness, and mobility of their respective skin types. As one ages, this visual division becomes increasingly noticeable. In addition to surgery, aesthetic units have a significant clinical role to play in skin resurfacing procedures. Scarring from incisions made at these units' borders is less noticeable.

Acne fulminans is the term for severe acne that is accompanied by systemic signs and symptoms, such as fever. Acne conglobate is a severe form of acne marked by recurrent comedones in the absence of systemic symptoms. A gel is a solid substance that resembles jelly and can have hard, tough, or soft qualities. Gels are described as a significantly diluted cross-linked system that, in its steady-state, shows no flow. Gels are primarily liquids by weight, but because of a three-dimensional cross-linked network within the liquid, they behave like solids. A gel's structure, or hardness, is derived from internal crosslinking within the fluid, which also helps the adhesive stick track.

Humanity's desire to return to nature for safer solutions has been sparked by the overuse of synthetic drugs containing impurities, which increases the incidence of adverse drug reactions in more developed societies. It is imperative to

guarantee that commercial formulations derived from medicinal plants are safe, efficacious, and meet standard quality standards. The demand for various commonly used medicinal plants in the production of Ayurvedic medicine is constantly rising due to the growing interest in the Ayurvedic system of medicine around the world today.

### 2.3. Etiologic factor

Usually, after a rhytidectomy, large hematomas that have not been quickly drained cause the facial skin to die. The incidence of necrosis ranges from 1.1% to 3.0%.<sup>22</sup> Large hematomas may result in ischemia and cell death by compromising the skin's arteries and causing vascular congestion. In addition, smoking and systemic diseases like Raynaud's disease<sup>42</sup> put the patient at risk for necrosis following rhytidectomy. Skin necrosis can also be caused by technical errors such as injury to the subdermal plexus during flap elevation, excessive wound-closure tension, or CO<sub>2</sub> laser treatment of compromised skin.

#### 2.3.1. Major Points

- The two most frequent causes of skin flap necrosis are undiagnosed hematomas and tobacco use.
- The best way to prevent surgery in high-risk patients (smokers, for example) is to avoid it altogether.
- Loss of full-thickness tissue will leave scars.
- For hypertrophic scarring, management usually consists of cautious waiting combined with sparing use of local steroid injections.
- Good skin care is important for the following reasons:
- It maintains the health of your skin: As you exfoliate throughout the day, it's critical to maintain the health and radiance of your skin. A good regimen can help keep your skin looking its best, treat wrinkles, and help prevent acne.
- Your skin will appear younger: As you get older, the cells in your skin turnover more slowly, giving the appearance of duller, less radiant skin. By using a high-quality skin care line, you can encourage your body to produce new, younger skin cells in place of the dead ones.
- Prevention is simpler than correction: It is less expensive and easier to prevent skin issues than to attempt to treat them down the road.
- You'll feel more confident in yourself: Improving the appearance of your skin will make you feel better about yourself.

The following elements can be combined to make a successful skin care regimen:

- **Cleanser:** Use a face-specific product to gently cleanse your face. You should look for an oil-free cleanser if you have oily skin, and you should choose a cleanser without alcohol if you have dry skin. Next, give it a warm water rinse.
- **Toner:** After cleansing your face, use toner to help restore nutrients to your skin while making it smooth and calm.
- **Moisturizer:** Even if you have oily skin, moisturizers ought to be applied after every facial wash. If your skin type is like this, go for a gel or oil-free product.
- **Sunscreen:** Using a separate sunscreen every day, regardless of cloudiness, can still be beneficial even if your moisturizer contains sunscreen. Select one with an SPF of at least and broad-spectrum protection.
- **Exfoliator:** This step can come first or after cleansing, depending on your preference. They ought to be utilized no more than twice a week at most.
- **Serum:** A serum can aid in the treatment of particular problems, like redness

#### 2.3.2. Types of products for face

Though most of us already know that proper skin care goes beyond simply washing your face, you may start to feel a little lost once you start using moisturizers and exfoliators. There are countless product varieties available, and if you don't even know what these products are meant to do, you can't possibly create the ideal routine for yourself.

You don't need to be stressed if you've been wondering what the difference is between face oil and serum and how in the world you use them. Dermatologists Drs. Margarita Lolis and Debra Jaliman are here to explain all the different kinds of skin health products so you can understand what they are, how they work, and how to use them correctly.

#### 2.3.3. Types of products for face

- Cleanser / Facewash
- Exfoliator

- Treatment
- Serum
- Face oil
- Sunscreen
- Moisturizer
- Chemical peel
- Toner
- Face Mask
- Eye cream

#### Cleanser / facewash

The majority of dermatologists concur that cleaning your face twice a day is essential for removing pollutants, debris, and bacteria. On the other hand, some skin types respond better to specific kinds of cleansers.

the common mistakes people make are not getting a product that is ideal for their skin type and using the same product in the morning and at night. For instance, a person who frequently breaks out might use a cleanser containing salicylic acid only to discover that it has the opposite effect. Dry skin produces more oil, which only serves to increase the likelihood of a breakout. Seeing a dermatologist for a skin evaluation and product recommendation that best fits your skin type would be the best course of action

#### Exfoliator

Any skin care regimen must include exfoliation, but for those who are new to the game and don't know what an exfoliator actually does, it can be intimidating. In a nutshell, an exfoliator is any substance or tool that is applied to the skin in order to remove dead skin cells; these can be chemical or physical.

By applying mechanical force, physical or manual exfoliators remove dead skin cells from the skin's surface layer. However, as board-certified dermatologist Visoslav Tonkovic-Capin, MD notes, "Chemical exfoliators (like salicylic acid or glycolic acid) chemically break or dissolve bonds between dead skin cells." "The skin appears [more] radiant and youthful as the dead skin cells become loose and shed off." Additionally, they prevent acne and inflammation by opening the pores and allowing their contents to escape onto the skin's surface. Exfoliators kill harmful bacteria by lowering the pH of the skin because they are mild acids, according to him.

#### 2.3.4. Treatment

Specific skin issues like acne, dark spots, hyperpigmentation, fine lines, and inflammation are addressed with treatment products. "All skin treatment products are subject to FDA approval and are subject to regulation. They can be found as medicated face pads, solutions, serums, creams, gels, and lotions.

The condition you're dealing with will determine the kind of treatment you require and the advantages it will provide for your skin. Salicylic acid and benzoyl peroxide are used to treat acne, topical steroids are used to treat skin allergies and inflammation, and retinoids like tretinoin and adapalene are used to treat fine lines and wrinkles. Anti-aging treatment formulas also contain growth factors and vitamin C.

#### 2.4. Serum

According to Dr. Jaliman, "antioxidants, which help fight free radical damage, are usually found in serums." "They may also include anti-aging components like peptides and retinols, which promote the synthesis of collagen." These products are excellent for hydrating dry skin because they deeply penetrate the skin. They work best when applied after cleansing, and you can treat your skin while you sleep by applying them underneath a moisturizer.

#### 2.5. Face Oil

Regardless of your skin type, nutrient-rich face oils assist in constructing a strong protective layer for your skin. They are particularly beneficial for people with dry skin because they can be highly hydrating. "Almost any skin type and problem can benefit from the use of argan oil and vitamin E." "Ideally, a moisturizer or serum should have two or three drops added. Tea tree oil works wonders for acne-prone skin, and vitamin C oil helps minimize scarring.

## 2.6. Sunscreen

Regardless of the season, sunscreen is crucial for shielding your skin from UV rays. Fortunately, sunscreen application doesn't have to be limited to the standard bottle. "Even in the winter, everyone should use an SPF moisturizer. It's especially more crucial to protect your face if you live in a warmer climate or are outside." Knowing your skin type and using sunscreen that is appropriate for it are crucial. Certain sunscreens can clog pores because they are oily. For this reason, it's ideal to use a moisturizer with sunscreen integrated that was made to address a specific skin concern.

## 2.7. Moisturizer

Applying moisturizer all over your body will help keep your skin looking younger. According to her, moisturizer should be applied twice a day to the face, neck, and décolletage as well as to the elbows, knees, and feet. While there are many different types of moisturizers for different skin types, glycerin or hyaluronic acid-containing moisturizers are the best options if you want to keep your skin hydrated.

## 2.8. Chemical Peel

Chemical peels tend to be more thorough than exfoliators in removing excess dead skin cells because they remove the skin's outer layer. Usually, they include lactic, salicylic, or glycolic acids. "Use it once every two weeks; if you are prone to eczema or rosacea, stay away from these." Intense chemical peels are usually applied by a professional, but there are also at-home DIY peels that can be used to treat hyperpigmentation, wrinkles, sun damage, and acne scars.

## 2.9. Toner

Twice a day, use toner after cleansing to get rid of extra makeup residue or other impurities. According to Lolis, "toners shrink pores and restore skin to its natural pH balance." "This is significant because soaps and chemicals in cleansers upset our pH balance, which in turn increases oil production and starts a vicious cycle of breakouts." Those with delicate skin types ought to use toner without alcohol.

## 2.10. Face Mask

All skin types can benefit from the wide variety of masks available on the market, which include hydrating, drying, and even brightening varieties. "If you do this once a week, your skin will look different and breakouts will have more time to heal and dry up. Additionally, I love applying calming masks to my cheeks and clarifying masks to my forehead, chin, and jawline. You can switch things up. The secret is to make sure nothing is preventing the mask from penetrating the skin by applying it to clean, exfoliated skin.

## 2.11. Eye Cream

Eye creams are typically designed to address particular concerns around the eyes, like wrinkles, puffiness, and dark circles. According to Lolis, there are creams that address multiple problems concurrently and include ingredients like peptides, glycerine, caffeine, chamomile, hyaluronic acid, and antioxidants. "Eye creams are designed specifically to reach the delicate skin surrounding the eyes." They can be applied once or twice daily, but Jaliman advises using retinol or peptide eye creams at night to promote the production of collagen.

### 2.11.1. Facewash

Face washes are intended to get rid of debris, bacteria, impurities, and makeup that irritate the skin. The hard part is that excessive cleansing, water exposure, or harsh soaps deplete your skin's natural moisture content, making it more prone to dryness and irritation.

#### Advantages

- It facilitates the removal of dead skin cells, allowing new skin cells to grow in their place.
- It supports healthy, youthful skin.
- It gives the skin a radiant appearance.
- Dead skin cells and too much oil clog pores, resulting in whiteheads, blackheads, and a generally tired appearance. Frequent pore exfoliation helps prevent all of the aforementioned skin issues.
- Eliminating dead skin cells, which will cause wrinkles to appear more slowly.

## 2.12. Properties of Facewash

- Exfoliation promotes blood circulation acceleration and skin renewal.

- Sebaceous glands overproduce sebum, which clogs facial pores and causes oily skin.
- For oily skin, cleansers containing herbs and botanicals that will unclog pores and reduce oil accumulation are essential. These exfoliating cleansers' anti-inflammatory and antioxidant components support the restoration and maintenance of damaged skin.
- Acne and pimples are treated with herbal face wash, which has numerous health advantages. Rich plant-based ingredients like neem found in herbal face wash help to eliminate extra oil without depleting the skin's nutrients.
- It ought to be attractive and robust.
- It should soften when applied to the epidermis.
- It should scatter without leaving a trace.
- When implemented, it shouldn't feel greasy or sticky.
- After the water vaporizes, the cream residue shouldn't get thicker.

### **2.13. Uses**

- The skin should have a thin layer of light emollient left on it after use. To thoroughly cleanse the skin each day by removing all traces of makeup.
- anti-aging
- Bathing and rejuvenation maintain clean, glossy skin.
- encourages the production and renewal of skin cells.
- assist in clearing the pores

### **2.14. Why is face wash essential?**

Face wash has additional uses besides just removing impurities from the skin. This blog post will discuss the benefits of using face wash as part of a skincare routine.

### **2.15. Removes build-up**

When we come into contact with dirt, pollutants, bacteria, and products that contain chemicals, our skin becomes less shiny. Inadequate cleansing of the face can lead to the accumulation of certain substances in the skin, which can cause imperfections and open pores. Using face wash gives these substances a hard fight, opens pores, and raises the skin's oxygen content. It also removes makeup that has already been applied to the skin. Your skin becomes fresh and clean after using a face wash.

### **2.16. Hydrates the skin**

Skin that is dehydrated is rough and dry, and it is more likely to crack and become extremely dry. Face wash helps keep the skin's pH balance in check and moisturizes the skin enough to prevent dryness. Skin that is adequately hydrated stays supple and soft. It lessens obvious signs of aging and gives the skin a younger appearance.

### **2.17. Removes dead skin cells**

The skin is harmed by dead skin cells, which cause numerous uneven and unwanted breaks. To improve the health of your skin, the face wash gently nourishes it and removes dead skin cells. Face wash gives your skin a natural, alluring glow by removing dead skin cells. As a result, it facilitates skin exfoliation by exposing new skin layers.

### **2.18. Fights skin problems**

Impurities can cause serious skin damage and a wide range of skin issues if they are not completely removed from the skin. Among the numerous skin conditions brought on by unhealthy skin are acne, pimples, fine lines, dark spots, dark circles, and uneven skin tone. Face wash protects the skin from these types of disorders by eliminating all impurities. It provides you with flawless skin and combats skin-related problems.

### **2.19. Imparts fragrance**

Face washes are available in a wide variety of scents, from calming to energizing. These scents provide you with an enchanted experience, combat sweat and grime odors, and prolong the pleasant smell of your skin. Face washes give you the freedom to select the scent of your choice.

### 3. Types of face washes

#### 3.1. Gel Facewash

For those with sensitive, oily, or acne-prone skin, the clear gel face wash is a great option. Gel cleansers, which are intended for deep cleansing, glide onto the skin and work to remove excess sebum from pores while simultaneously nourishing and unclogging every part of your skin without being overly harsh. It's critical to search for a gentle gel face cleanser that leaves the skin feeling constantly moisturized and fresh, such as the vitamin C gel facewash.

#### 3.2. Cream face wash

A cream face wash usually contains moisturizing ingredients like milk or honey and has a thicker consistency. Cleansers that are lotion or cream-based are designed to deeply cleanse your skin while providing it with hydration. Their thicker and stronger consistency makes them ideal for all skin types, but especially for dry, mature skin in the winter. They can be used to remove makeup. If you prefer double cleansing, the cream face wash is an excellent option for your second cleansers.

#### 3.3. Foam face wash

Combination skin types benefit greatly from foam cleansers because they fall in between gel and cream cleansers. They could begin as a cream or gel and then quickly thicken into a rich foam. Gel facewashes are not as effective at removing extra oil as foam cleansers are. Your skin feels revitalized and incredibly light after using the foaming particles, which lift grime, dirt, and impurities. However, since foam cleansers tend to remove essential oils from the skin, be sure to moisturize your skin thoroughly after using one.

#### 3.4. Micellar cleanser

The lightest kind of cleanser is called micellar water, and it looks and feels like regular water. It is composed of tiny oil molecules that, rinse-free or not, lift makeup, oil, and dirt like a magnet. All skin types can benefit from the mild, gentle, yet effective formula of this cleanser. This multipurpose product effectively cleanses, tones, and removes makeup from your skin.

#### 3.5. Clay face wash

By extracting excess oil and toxins from your pores, clay face washes help to purify your skin and leave it feeling clean and glowing. Since clay face washes typically don't include any harsh ingredients or cleansing agents, they're ideal for oily and combination skin types but can also be used on sensitive skin types.

#### 3.6. Bar cleanser

This is not your typical soap—it's the bar cleanser. It's a moisturizing, cleansing bar that works wonders at removing excess oil, debris, and makeup without using soap and is kind to skin. It is incredibly simple to use and carry, doesn't remove your skin's natural oils, and is beneficial for people with dry skin.

Now that you know about the various kinds of face washes, explore a variety of Garnier skin care products to discover the ideal cleanser for effortlessly displaying your ideal skin!

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### 4. Bael leaves (*Aegle marmelos*)

The three-pronged leaf of the bael tree, which is revered in India, is thought to represent Shiva's trident. The three roles of creation, preservation, and destruction are also connected to the three-pronged leaf. For a very long time, the plant was used in medicine and cuisine.

Bael (or Bell) Correa, also known as *Aegle marmelos* (Lin) Correa, is a medium-sized, slender, aromatic tree in the Rutaceae family. It is indigenous to India and grows widely in Bengal, central and southern India, the Himalayan region, and other areas. It has leaves and wood that are frequently used for worship, and it is widely planted close to Hindu temples. Its branches are equipped with straight, sharp

spines. The bark is soft, pale gray, and flakes off in strange patterns. The alternating, trifoliate, pale green leaves are uncommonly.



The pentaphyllum. The pericarp is green, the fruits are globose and yellow-grey, and the flowers are greenish-white and sweetly scented.

woody, with a large number of compressed, oval-shaped seeds. Large, woody, and frequently crooked roots are present. Eleanor Marmelos. is a well-known traditional Indian medicine known for its gentle treatments. It also possesses broad anti-inflammatory, antibacterial, and anti-acne properties.

#### 4.1. Properties

Aegle Marmelos's taxonomic classification is as follows:

- Kingdom: Plantae.
- The Rutaceae family.
- Subclass: Aurantiodeae
- Species: Eagle
- Eagle Marmelos is the botanical name.

#### 4.2. Common Name

- English: Indian quince, stone apple, beer fruit, golden apple, and betel quince.
- Aluvigam, Kuvilam, Mavilangai, Vilwam, and Villvam are Tamil words.
- Telugu: Sandiriyam, Srifalam, Sailsham, Birvam, Marlam, and Maredu.
- Bel, Bili, Sirphal, and Bela in Hindi
- Adhararutha, Asholam, Atimangaliya, and Bilva in Sanskrit.
- Bael, Bel, in Bengali
- Bella and Bilba in Kannada, Biri in Gujarati
- Kubalam, Bilwam in Malayalam.
- Bello in Orissa.

#### 4.3. Chemical Constituents

Alkaloids, terpenoids, coumarins, phenylpropanoids, tannins, polysaccharides, and flavonoids are among the chemical components found in Aegle marmelos plant extract that have varying biological activities.

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## 5. Material And Methodology

### 5.1. Material

- Beal Leaves
- Carbapol 934
- Sodium Lauryl Sulphate
- Methyl Paraben
- Triethanolamine
- Distilled Water

#### 5.1.1. Beal Leaves



**Figure 1** Beal Leaves

- Synonyms: Aegle marmelos
- Biological sources: Native tree from India
- Family: Rutaceae

Uses : Bale is a great treatment for skin infections because of its anti-inflammatory, anti-fungus, and antibacterial qualities. Common fungal infections of the skin are inhibited by betel leaf oil. It can also help with itchy bumps and skin rashes.

Description: Aegle marmelos is a small to medium-sized deciduous tree or shrub that can grow up to 13 meters (43 feet) tall. Its crown is rather open and irregular, and its branches droop slightly. The bark is smooth or finely fissured, flaking, and pale brown or grayish. It is armed with long, straight spines that measure 1.2–2.5 centimeters (1/2–1 inch), either individually or in pairs. Often, the cut portions of the bark leak slimy sap. Another description of the gum is a clear, gummy sap that resembles gum arabic and drips from injured branches. The sap hangs down in long strands and eventually solidifies. It tastes sweet at first, but then it irritates the throat.

## 5.2. arbapol 934

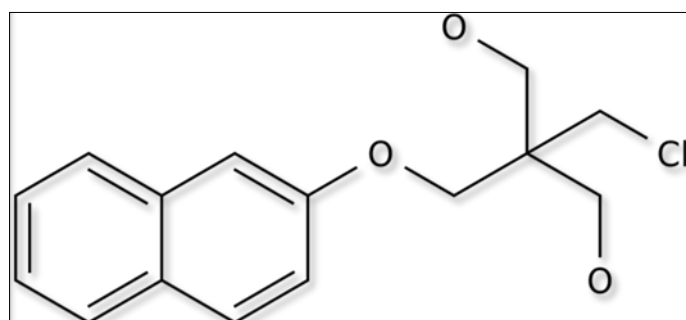


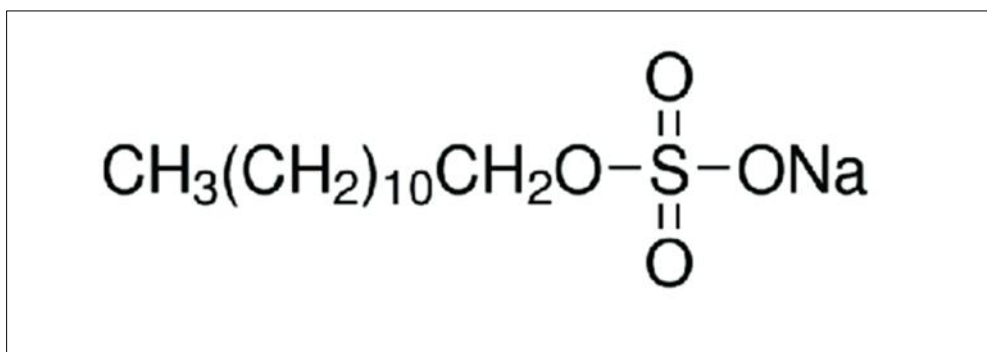
Figure 2 Carbapol 934

- IUPAC Name: Poly (acrylic acid)
- Other names: PAA, PAAc, Acrysol, Acumer.
- Chemical formula: (C<sub>3</sub>H<sub>4</sub>O<sub>2</sub>)
- Molar mass: variable

Uses : Adhesives, ion exchange resins, and disposable diapers are products that contain polyacrylic acid and its derivatives. They are also widely used in paints, cosmetics, and pharmaceuticals as thickening, dispersing, suspending, and emulsifying agents. Dry PAAs are marketed as fluffy, white powders. Positively charged sodium ions are bonded to polyacrylate in dry powder form, but they can separate in aqueous solutions. The polymer's ability to absorb large amounts of water is due to the presence of numerous metal cations.

Description: Synthetic high molecular weight polymers of acrylic acid are known by the generic name Polyacrylic Acid (PAA or Carbomer), which describes unrelated compounds expanded by two carbon units. These could be acrylic acid homopolymers crosslinked with pentaerythritol allyl ether, sucrose allyl ether, or propylene allyl ether. PAA is an anionic polymer in a pH-neutral water solution, meaning that many of its side chains will become negatively charged and lose their protons. Because of this, PAAs are polyelectrolytes, meaning they can absorb and hold water and swell to several times their initial volume. Dry PAAs are available as fluffy, white powders in the market. Carbomer codes, which include 910, 934, 940, 941, and 934P, provide information about the polymer's specific components and molecular weight. PAAs are utilized in many applications as ammonium salts or alkali metals, such as sodium polyacrylate.

### 5.3. Sodium Lauryl Sulphate



**Figure 3** Sodium Lauryl Sulphate

- IUPAC Name: Sodium lauryl sulfate
- Other Names: Sodium monododecyl sulfate
- Chemical Formula: NaC<sub>12</sub>H<sub>25</sub>SO<sub>4</sub>
- Molar Mass: 288.372 g/mol
- Density: 1.01 g/ cm<sup>3</sup>
- Melting point: 206 °C (403 °F; 479 K)

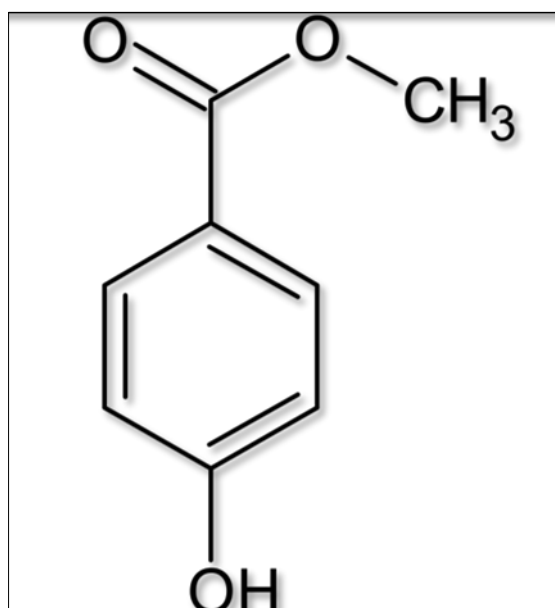
Uses: SLS is primarily utilized in laundry detergents with a variety of cleaning uses. SLS is a surfactant that works very well for any task where removing oily residues and stains is necessary.

Description: SLS is referred to as a "surfactant." It is used as a cleansing and foaming agent because it reduces the surface tension between ingredients.

The majority of concerns regarding SLS are related to its presence in household cleaners, cosmetics, and self-care products.

A similar chemical formula is shared by the surfactant sodium laureth sulfate (SLES). SLES, on the other hand, is less harsh and irritable than SLS.

### 5.4. Methyl Paraben



**Figure 4** Methyl Paraben

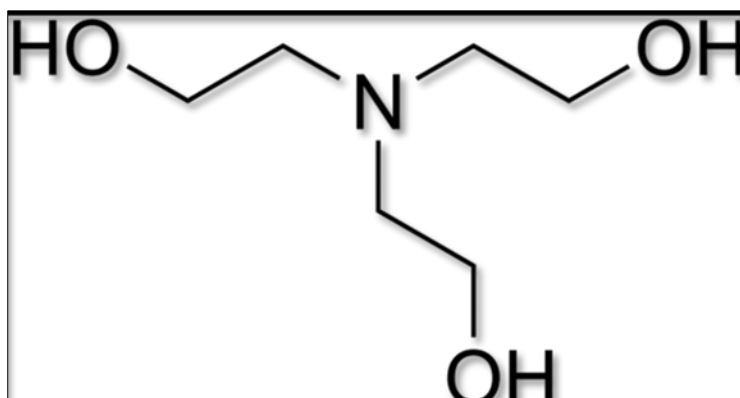
- IUPAC name: Methyl 4hydroxybenzoate
- Other names: Methyl paraben
- Chemical Formula: C<sub>8</sub>H<sub>8</sub>O<sub>3</sub>
- Molar mass: 152.15 g•mol<sup>-1</sup>
- Uses : A common antifungal ingredient in many cosmetics and personal hygiene products is methyl paraben.

It serves as a food preservative as well. Methyl paraben is frequently used in Drosophila food media as a fungicide.

Solubility: Soluble in warm oil (25 g/l), warm glycerol (1 g/70 ml), ethanol, ether, acetone, DMSO, benzene (slightly soluble), and carbon tetrachloride (slightly soluble).

Description: Formal condensation of 4-hydroxybenzoic acid's carboxy group with methanol yields methylparaben, a 4-hydroxybenzoate ester. It is the antimicrobial preservative that is most commonly used in cosmetics. It is found naturally in many fruits, especially blueberries. It functions as an antifungal, neuroprotective, antimicrobial, and plant metabolite. It is also used as a food preservative.

### 5.5. Triethanolamine



**Figure 5** Triethanolamine

- IUPAC Name: Tris (2hydroxyethyl) Amine
- Other Names: Triethylolamine
- Chemical Formula: C<sub>6</sub>H<sub>15</sub>N<sub>3</sub>O<sub>3</sub>
- Molar Mass: 149.19 g•mol<sup>-1</sup>
- Density: 1.124 g mL<sup>-1</sup>
- Melting Point: 21.60 °C; 70.88 °F; 294.75 K

Uses : The main applications of triethanolamine are as a surfactant and emulsifier. It is frequently included in formulas for both consumer and commercial goods. Triethanolamine stabilizes and buffers pH levels, neutralizes fatty acids, and solubilizes oils and other substances that aren't entirely soluble in water.

Solubility: At 20°C, triethylamine dissolves in water to a concentration of 112.4 g/L. Additionally, it is miscible in acetone, ethanol, and diethyl ether—common organic solvents.

Description: The main application of triethanolamine is the synthesis of surfactants, like emulsifiers. It is frequently included in formulas for both consumer and commercial goods. Triethanolamine stabilizes and buffers pH levels, neutralizes fatty acids, and solubilizes oils and other substances that aren't entirely soluble in water. In certain instances, triethanol ammonium salts are more soluble than other possible alkali metal salts, and they produce fewer alkaline products than when the salt is made from alkali metal hydroxides. Sunscreen lotions, liquid laundry detergents, dishwashing liquids, general cleaners, hand sanitizers, polishes, metalworking fluids, paints, shaving cream, and printing inks are a few common products that contain triethanolamine.

## 6. Methodology

### 6.1. Preparation of Herbal Extracts

Maceration Extraction of Beal patra: Dried bel patra leaves were processed into 5g of powder. A grinder was used to prepare the powder. 5 grams of powder and 50 milliliters of water were macerated, then allowed to stand for a full day. Following that, filter the mixture mentioned above and the liquid used to prepare the gel.

Method of Preparation of Gel Containing Extract: After blending carbopol 934 with filtered and distilled water, it was left to swell for a day. To aid in the carbopol 934 gel, the liquid then needed to be stirred. To 5ml of distilled water, add the required amounts of sodium lauryl sulphate or methyl, and then dissolve on a water bath. The solution was then chilled.

**Table 1** Ingredients with their Properties

Sr.No	Ingredients	Properties
1.	Beal Leaves	Anti-Acne
2.	Carbapol 934	Gelling Agents
3.	Triethanolamine	Neutralizer
4.	Sodium Lauryl Sulphate	Foaming Agents
5.	Methyl Paraben	Preservatives
6.	Distilled Water	Vehicle

## 7. Results and discussion

**Table 2** Observations

Sr.No	Parameters	Observations
1.	Color	Brown
2.	Odour	Characteristics
3.	Consistency	Semisolid
4.	Washability	Washable
5.	Foamability	Foamable
6.	Ph	7.4

## 8. Characterization of Herbal Facewash Gel

### 8.1. Physical Test

It includes color, odour and consistency

Visual inspection of the Herbal Face Wash Gel's characteristics revealed that it was brown in color, had a distinct scent, and had a semisolid consistency. The color of the face wash's formulation was examined visually. Smelling the formulation allowed us to evaluate its odor, and we manually selected Consistency.

### 8.2. Washability

Following skin application of the formulation, the extent and ease of water washing were measured. It was simple to wash the semisolid face wash gel.

### 8.3. Foamability

In a beaker, a small amount of gel was added to water. The beaker was shaken ten times to record the final volume after the initial volume was recorded. The foam was either normal or present in sufficient amounts.

### 8.4. PH

A 1% aqueous solution of the formulation was tested for pH using a calibrated digital pH meter at a constant temperature. There are no adverse effects because the optimized formulation's pH of 7.4 is similar to the pH of the skin. The pH value of the formulation was found to be suitable for topical application.

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## 9. Conclusion

An efficient herbal face wash gel containing *Aegle marmelos* (Bel patra) extract was made using carbopol 940 as a gelling agent. When compared to the other batch formulation, batch F2 shows superior gel formation results out of the three batches that were created. Evaluation tests were performed on batch F2, and consistent results were obtained regarding color, consistency, pH, spreadability, washability, and foamability. Consequently, the study showed that the developed formulation is useful for taking care of the face. Natural remedies are beneficial for any illness. It carries no risk and produces few side effects. On the international market, herbal formulations are highly sought after. It's quite admirable that the herbal face cleanser was established using *bel patra* extracts. Natural cures are a blessing.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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