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FORMULATION AND EVALUATION OF HERBAL ANTI-ACNE FACE WASH GEL

[1]Name of 1st author : Nathe Pranjal Sahebrao , [2]Name of 2nd author:Satpute Soniya Sukdev ,

[1]Designation of 1st author: Bachelor of pharmacy,[2]Designation of 2nd author: Assistant professor,

[1]Name of organization: Mahavir Institute of Pharmacy, Nashik, India

ABSTRACT

Natural remedies are more acceptable than synthetic remedies because they are safer and have fewer side effects.Herbal formulations are in increasing demand in the global market. This study deals with the development and evaluation of an herbal anti-acne cleanser containing aqueous extracts of bael leaf (Aegle marmelos) and guava leaf (Psidium guajava). Although various topical herbal formulations for acne are available in the market, the plant has been reported in the literature to have excellent antibacterial, antioxidant and anti-inflammatory activities.Different formulation batches, i.e. F1 to F3 were prepared using various concentrations of triethanolamine. The prepared formulations (F1 to F3) were evaluated for various parameters such as colour, appearance, consistency, detergency, pH and spreadability. Optimized formulation batches were compared with commercial formulations. It was a very good attempt to establish an herbal anti-acne face wash using aqueous extracts of bael and guava leaves.

KEYWORDS

Bael leaves, guava leaves, herbal ingredients, anti acne face wash

INTRODUCTION

Cosmetics:

The word cosmetic comes from the Greek word meaning to embellish. Cosmetics are substances that come into contact with various parts of the human body, such as skin, hair, nails, lips, and teeth. It helps improve or change the appearance of the human body, mask body odour, and protect and condition the skin. In other words, cosmetics are topical products applied externally to the body. Cosmetics can also be applied to the mucous membranes of the mouth and teeth to cleanse and flavour them. Cosmetics can be defined as substances that are rubbed, sprayed, or applied to the human body in a similar manner to enhance, purify, beautify, or alter its appearance. Gentle cosmetics have a nourishing effect on skin and hair.

Herbal cosmetics:

Herbal cosmetics are defined as cosmetics with desired biological activity. Oriental cosmetics have cosmetic effects. The recent increase in the use of herbs in cosmetics is mainly due to their mild and non-toxic properties. Herbal ingredients and natural food supplements are used in cosmetics. Natural products include oils, extracts, extracts, and more. Botanical ingredients include pure ingredients obtained through various processes.

Types of Acne

Acne vulgaris is a very common skin condition that affects almost everyone at some point in life. Acne peaks in the teens, but many men and women in their 20s and 30s also get acne. Acne can be classified into comedones, epidemic acne, pustular acne, cystic acne, and nodular acne. Comedones are non-inflammatory and can be divided into two types: whiteheads and blackheads.

• Whiteheads (obstructive comedones) appear as raised, fresh or white bumps. Blackheads (open comedones), on the other hand, look like open pores with dark patches made up of melanin, sebum and hair follicle cells.

• Papules appear as red, firm, raised lesions, often less than 5 mm in diameter. A pustule is a localized bump on the skin containing a purulent substance.

• Cysts and nodules are tightly raised lesions that affect the deeper layers of the dermis and subcutaneous tissue. The size of cyst is less than 5 mm in diameter and nodules are larger than 5 mm.

The pathogenesis of acne involves several physiological factors. These include excessive proliferation of hair follicles, increased sebum production due to high androgen levels, colonization by microorganisms, Propionibacterium acnes and Staphylococcus epidermidis. New concepts are being developed to better understand the etiology made. These include changes in biological markers, target cell sensitivity, neuroendocrine, genetic and environmental factors. Many herbal and synthetic ingredients have been reported to have significant effects on acne.

There can be various mechanisms, such as:

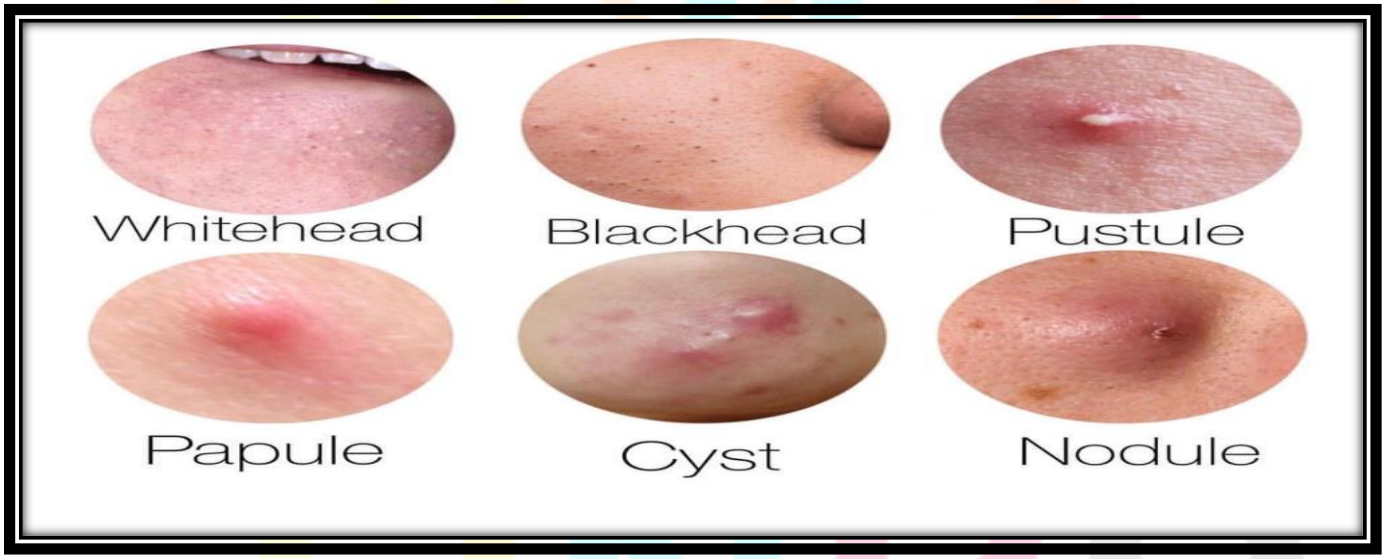
a) Control of sebum secretion.

b) Antibiotics that inhibit Propionibacterium acnes and Staphylococcus epidermidis, which are the main causes of acne.

c) Keratolytic agents that remove the stratum corneum and prevent the accumulation of sebum under the skin.

d) Anti-inflammatory action to prevent worsening of symptoms due to inflammation and redness.

There are number of formulations available in the market with variety of active pharmaceutical ingredients for the treatment of acne. Topical formulations, available in the market are as follows: Gel, Cream, Lotion, Face wash or cleanser, sunscreen, mask and face pack. Bael leaves(Aegel marmelos), guava leaves(Psidium guajava) are reported to have very beneficial effect on acne due to anti-microbial, anti-inflammatory & anti-oxidant activities of different chemical constituents.



Face wash gel

Definition: A face wash is a facial care product used to remove makeup, dead skin cells, oil, dirt, and other types of contaminants from the skin on your face. This helps open pores and prevent skin conditions such as acne. Cleansers can be used as part of skin care along with toners and moisturizers.

Advantages of face wash

• Helps remove dead skin cells and replace old skin cells with new skin cells.

• Keeps skin fresh and healthy.

• Adds radiance to the skin.

• A mixture of dead skin cells and excess sebum can clog pores and lead to acne, pimples, and an utterly tired look. By exfoliating your pores regularly, you can avoid all the above skin problems.

• Removes dead skin cells and delays skin wrinkles.

Properties of face wash

• Peeling promotes blood circulation, promotes skin regeneration and rejuvenation.

• Facial pores and oily skin are caused by excessive sebum secretion from the sebaceous glands.

• Oily skin needs cleansers containing herbs and botanicals to clear pores and reduce sebum build up. These exfoliating cleansers contain anti-inflammatory agents and antioxidants that improve and nourish damaged skin. It is used in the treatment of acne and acne. Enriched with botanicals such as neem, this herbal face wash removes excess sebum without stripping skin of nutrients.

• Must be stable and good looking

• Softens when applied to the skin.

• Should spread easily without pulling.

• Should not feel greasy or sticky when applied.

• The cream residue must not become viscous after the water evaporates.

• Its physical action is to cleanse the skin and open the pores, not absorption.

• A thin emollient film should remain on the skin after application.[2]

Uses of face wash

• Removal of traces of daily make-up.

• Cleansing of the skin.

• Anti-Aging.

• Bath and Renewal for clean, glowing skin.

• Stimulates skin cell renewal and regeneration.

• Unclogs pores.[2]

Agents used in face wash

Therapeutic agents used in face wash

Antimicrobial

In its broadest definition, antimicrobials are agents that interfere with the growth and reproduction of bacteria. Both antibiotics and antimicrobials attack bacteria, but the terms have evolved over the years into two different meanings. Today, antimicrobial agents are most commonly described as agents used to disinfect surfaces and remove potentially harmful bacteria.[3]

Anti-inflammatory

Anti-inflammatory drugs, which make up about half of all analgesics, relieve pain by reducing inflammation, unlike opioids, which act on the central nervous system and block pain signals to the brain.[4]

Anti-Acne

Acne is a skin condition that leads to the eruption of lesions called pimples. The most common condition in adolescence is called acne vulgaris. Anti-acne drugs are drugs that help clear acne, blackheads, acne, and the more serious forms of lesions that appear when teenagers suffer from acne.[4]

Additives used in face wash

Antioxidant

Antioxidants are artificial or natural substances that can prevent or slow down some cell damage. Antioxidants are found in many foods, including fruits and vegetables. They are also available as dietary supplements.

Examples; lycopene, vitamin A, vitamin C, vitamin E. [5]

Gelling agents

Gelling agents are ingredients that will turn water or oil phase into gel. Emulsions thickened with gelling agents are fluid and fluid rather than rigid. Some of these gels become thin (thixotropic) when a force is applied and return to viscous when the force is removed.These gels allow the production of thick products that can be shaken and stirred under high shear for easy filling and spraying.

Examples; Carbopol 940, Carbopol 934. [6]

Preservatives

The main reason for using preservatives is to eliminate the effects of biological agents to make food safer. The greatest danger to consumers is that food becomes spoiled or toxic as a result of the activity of micro-organisms (bacteria, yeast, mold, etc.) in food. Some of these organisms secrete toxic substances ("toxins") that are dangerous and even fatal to human health.

Examples; Methylparaben, Propylparaben.

Wetting Agents

Wetting agents are hygroscopic substances used to keep things moist. It is the opposite of desiccant. They are often molecules with multiple hydrophilic groups, most often hydroxyl groups. However, the amine and carboxyl groups are optionally esterified (the affinity to form hydrogen bonds with water molecules is an important feature). They are used in many products such as food, cosmetics, pharmaceuticals, and agrochemicals. Wetting agents absorb and retain moisture in the surrounding air by drawing water vapor onto and/or below the surface of organisms/objects.

Examples; propylene glycol, hexylene glycol, butylene glycol.

Propellants

Propellants are substances that promote foaming, such as surfactants and blowing agents. Surfactants, when present in small amounts, increase the colloidal stability of a liquid by either lowering the surface tension of the liquid (reducing the work required to form bubbles) or inhibiting bubble coalescence.

Examples: Sodium lauryl sulfate, azodicarbonamide, titanium hydride.

Advantages of Herbal Cosmetics over Synthetic Cosmetics

Herbal cosmetics are a modern trend in the field of beauty and fashion. These treatments are becoming more and more popular as most women prefer natural products over chemicals to improve their beauty. Because these products are free of synthetic chemicals, do not contain synthetic chemicals, and have relatively few side effects, they nourish the body and improve health and well-being. synthetic cosmetics.

1. **Suitable for all skin types**

   Natural cosmetics are suitable for all skin types. Whether you're dark or fair-skinned, you'll find foundations, eyeshadows, lipsticks and other natural makeup products that suit all skin tones. Women with oily or sensitive skin can also use it without worrying about rough skin. Colorants derived from coal tar are widely used in cosmetics. Coal tar is considered a human carcinogen, and the main concern with individual coal tar colors (whether made from coal tar or synthetically) is that they cause carcinogenicity.However, natural colors derived from herbs are a safer.[9]

2. **Wide selection to choose from**

   One will find variety of naturally formulated products including foundations, eyeshadows, lipsticks, blushes, mascaras and concealers. You can also find locally produced natural cosmetics and cosmetics by world-famous designers. Shilajit) etc.

3. **Match your budget**

   Natural cosmetics are not very expensive. In fact, some of these products are even cheaper than synthetic products. It is offered at a discounted price and sells cheaply during clearance sales. All you have to do is complete enough research to look for deals. We rely on natural products for health care. The World Health Organization now recommends and encourages traditional herbal remedies in natural health programs.

4. **Not tested on animals**

   Some cosmetics are safe and effective for human use. To confirm, we first conduct animal experiments. However, natural cosmetics do not have to be tested on animals. These natural formulations are professionally tested in laboratories using state-of-the-art equipment and do not involve animals. [9]

5. No side effects

Synthetic cosmetics can clog your pores and make your skin dry and oily. With natural cosmetics, you don't have to worry about that. The natural ingredients used guarantee no side effects. You can use it anytime, anywhere. For example, herbal cosmetics do not contain parabens. Parabens, the most commonly used preservatives in cosmetics, are suspected of penetrating the skin and disrupting hormonal function. Isotretinoin (Accutane) is an oral medication prescribed only for very severe and disfiguring acne.

Herbal drugs

1. Bael Leaf (Aegle marmelos)

Aegle marmelos (Lin) Correa, commonly known as Bael (or Bell), is a medium-sized, slender, aromatic tree belonging to the Rutaceae family. It is native to India and is abundant in the Himalayan region, Bengal, central and southern India. It is widely planted near Hindu temples and has wood and leaves commonly used for worship. Its branches are armed with sharp, straight thorns. The bark is pale gray, soft, and flakes off in irregular flakes. The pale green leaves are alternate and trifoliate (rarely pentaphyllum). The flowers are greenish-white and sweetly scented, the fruits are yellow-grey and globose, the pericarp is woody, and the seeds are numerous, oval and compressed. The roots are very large, woody and often crooked. Aegle Marmelos is a traditional Indian medicine famous for its mild remedies. It also has broad antibacterial, anti-inflammatory and anti-acne properties.

Taxonomic Classification of Aegle Marmelos

• Kingdom - Plantae.

• Order – Sapindales.

• Family - Rutaceae.

• Subfamily — Aurantiodeae

• Genus — Eagle

• Botanical Name – Eagle Marmelos.

Common Name

• English: Bengal quince, beer fruit, golden apple, Indian quince, stone apple.

• Tamil: Aluvigam, Kuvilam, Mavilangai, Vilwam, Villvam.

• Telugu: Birvam, Marlam, Maredu, Sailsham, Sandiriyam, Srifalam.

• Hindi: Bel, Bili, Sirphal and Bela

• Sanskrit: Adhararutha, Asholam, Atimangaliya, Bilva.

• Bengali: Bael, Bel,

• Gujarati: Biri, Kannada: Bella, Bilba

• Malayalam: Kubalam, Bilwam.

• Orissa: Bello.

Chemical Constituents

Aegle marmelos plant extract contains chemical constituents like alkaloids, terpenoids, coumarins, phenylpropanoids ,tannins ,polysaccharides, flavonoids having different biological activity.

2.Guava Leaves (Psidium guajava L.)

Psidium guajava is a well-known tropical tree widely cultivated for its fruit. Fresh guava leaves have excellent medicinal properties for treating inflammatory acne, scars, age spots, pigmentation and uneven skin tone. Guava leaves have antioxidant and antibacterial properties

Taxonomical classification of Psidium guajava

- Kingdom-Plantae
- Division-Magnoliopsida
- Class-Magnoliopsida
- Subclass-Rosidae

- Order-Myrtales
- Family-Myrtaceae
- Subfamily-Myrtoideae
- Genus-Psidium L.

Vernacular names

- English:Guava,Abas ,Govavier,Kautonga,Kuahpa
- Hindi :Amruta
- Sanskrit:Amratafalam,Perala
- Arabic:Guwafah
- Punjabi:Amrut
- Telugu:Goya-pandu,Jam-pandu

Chemical constituents

Essential oil is present in leaves which contain alpha pinene, limonene, isopropyl alcohol, menthol, terpenyl acetate, caryophyllene.

The guava leaves act as anti bacterial, anti fungal and anti oxidant.

Drug profile of herbal face wash
1.Herbal medicines

- **Aegle Marmelos (Bael leaves)**

Synonym: Indian Bael,Bengal Quince.
Biological source: Bael consist of unripe or half ripe fruits and leaves of the plant known as Aegle marmelos.
Family: Rutaceae
Use: It is used to treat various kind of skin disease because it has good anti bacterial ,anti oxidant, anti-inflammatory, anti fungal and anti acne property.

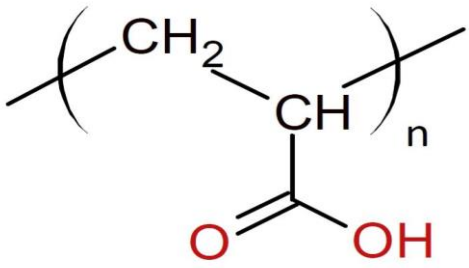
- **Psidium guajava(Guava leaves)**

Synonym: Guajava pyrifera
Biological source: Psidium guajava L.known as guava is a medicinal plant.
Family: Myrtaceae
Use: It is used as an anti microbial, anti bacterial, anti oxidant and anti inflammatory agent to treat acne.

2. Excipient profile

1.Carbopol

Structure:



IUPAC name : Poly (acrylic acid)

Other names : PAA, PAAc, Acrysol, Acumer.

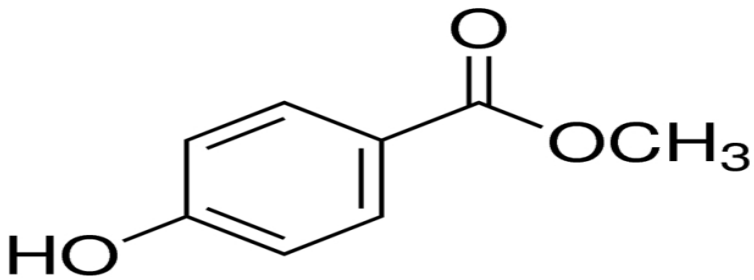
Chemical formula : (C3H4O2)n

Molar mass : variable

Uses: Polyacrylic acid and its derivatives are used in disposable diapers, ion exchange resins and adhesives. They are also popular as thickening, dispersing , suspending and emulsifying agents in pharmaceuticals, cosmetics and paints.

2.Methyl paraben

Structure:



IUPAC name : Methyl 4hydroxybenzoate

Other names : Methyl paraben

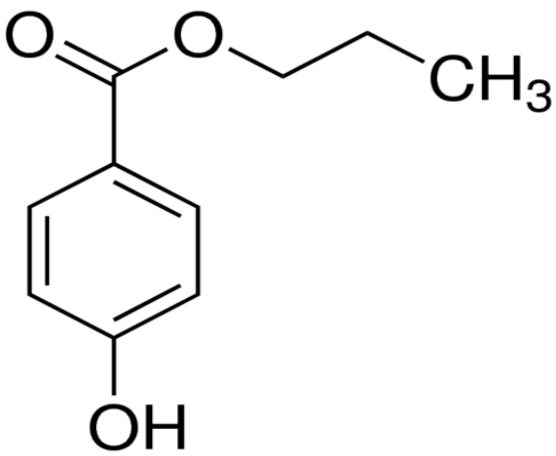
Chemical Formula : C8H8O3

Molar mass : 152.15 g·mol−1

Uses : Methyl paraben is an antifungal agent often used in a variety of cosmetics and personal care products. It is also used as a food preservative.

Methyl paraben is commonly used as a fungicide in Drosophila food media.

3.Propyl paraben



IUPAC name : propyl 4hydroxybenzoate..

Other names : 4Hydroxybenzoesäurepropylester;

Chemical formula : C10H12O3

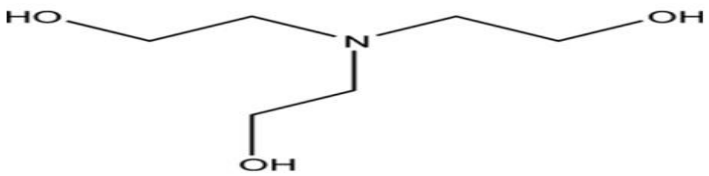
Molar mass : 180.2 g/mol

Density : 1.0630 g / cm3

Melting Point : 96 to 99 °C (205 to 210 °F; 369 to 372 K)

Use : In cosmetics, pharmaceuticals and foods.

4.Triethanolamine



IUPAC Name : Tris (2hydroxyethyl) Amine

Other Names : Triethanolamine

Chemical Formula : C6H15NO3

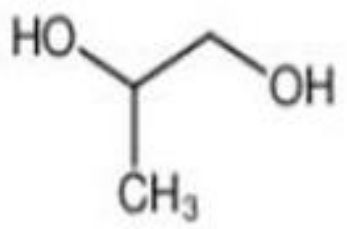
Molar Mass : 149.19 g·mol−1

Density : 1.124 g mL−1

Melting Point : 21.60 °C; 70.88 °F; 294.75 K

Use : Triethanolamine is used primarily as an emulsifier and surfactant. It is a common ingredient in formulations used for both industrial and consumer products. The triethanolamine neutralizes fatty acids, adjusts and buffers the pH, and solubilises oils and other ingredients that are not completely soluble in water.

5.Propylene glycol



IUPAC Name : Propane1, 2 diol

Other Names : Propylene glycol

Chemical Formula : C3H8O2

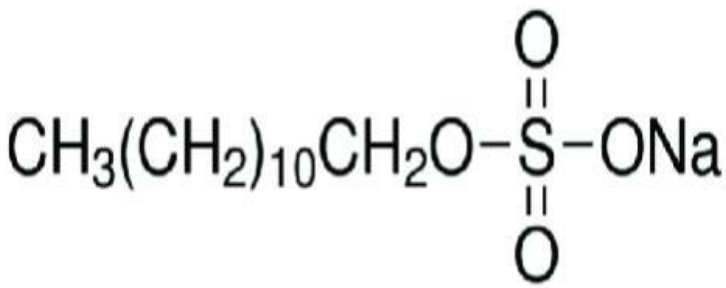
Molar Mass : 76.10 g·mol−1

Density : 1.036 g/ cm3

Melting point : −59 °C (−74 °F; 214 K)

Use : Forty five percent of propylene glycol produced is used as chemical for the production of unsaturated polyester resins. In this regard, propylene glycol reacts with a mixture of unsaturated maleic anhydride and isophthalic acid to give a copolymer. This partially unsaturated polymer undergoes further crosslinking to yield thermoset plastics.

6.Sodium lauryl sulphate



IUPAC Name : Sodium lauryl sulfate

Other Names : Sodium monododecyl sulfate

Chemical Formula : NaC12H25SO4

Molar Mass : 288.372 g/mol

Density : 1.01 g/ cm3

Melting point : 206 °C (403 °F; 479 K)

Use : SLS is mainly used in detergents for laundry with many cleaning applications. SLS is a highly effective surfactant and is used in any task requiring the removal of oily stains and residues.

Table No. 1. Ingredients used with their properties:

Sr.no.	Ingredients	Properties
1.	Ethanol extract of Aegle marmelos	Anti acne
2.	Psidium guajava	Anti bacterial
3.	Carbopol 940	Gelling agent
4.	Methyl paraben	Preservative
5.	Propyl paraben	Preservative
6.	Triethanolamine	Neutralizer
7.	Propylene glycol	Humectant
8.	Sodium lauryl sulphate	Foaming
9.	Distilled water	Vehicle

Table No.2.Formulation table for different batches

Sr.No.	Name of ingredients	F1	F2	F3
1.	Alcoholic extract of Aegle marmelos	0.3gm	1gm	0.3gm
2.	Alcoholic extract of psidium guajava	0.3gm	1gm	0.3gm
3.	Carbopol 940	0.5gm	1.5gm	2.0gm
4.	Methyl paraben	0.03gm	0.06gm	0.06gm
5.	Propyl paraben	0.03gm	0.03gm	0.03gm
6.	Triethanolamine	q.s	0.36ml	q.s
7.	Propylene glycol	1ml	2.5ml	1.5ml
8.	Sodium lauryl sulphate	1gm	2.5gm	3.5gm
9.	Distilled water	q.s to 30 ml	q.s to 30 ml	q.s to 30 ml

METHODOLGY

In our formulations, active ingredients such as bael leaf and guava leaf extracts are selected to provide antimicrobial properties. Face wash gel developed for that purpose. Carbopol 940 was used as gelling agent. Methylparaben and propylparaben are used as preservatives. Triethanolamine was used as the alkalizing agent to achieve good stability. It also contains propylene glycol, which has a soothing effect on the skin. Sodium lauryl sulfate was added to generate foam.

Extraction method:

Bael leaves and guava leaves were washed with distilled water, dried in a drying room at 40-500°C for 24 hours in the shade, and pulverized with a mechanical mixer. After that, about 100 g of bael leaf powder and 100 g of guava leaf powder were separately soaked in 200 ml of ethanol and shaken with a platform shaker at 150 rpm and a temperature of 250° C. to obtain an extract. The soaking process was repeated for 3 days for complete extraction. After 3 days, the contents were filtered off using a simple filtration procedure and the filtrate was collected in another container. [10]

Face wash Preparation:

1) Disperse Carbopol 940 in distilled water, set aside a beaker and allow Carbopol 940 to swell to form a gel.

2) Distilled water was taken, the required amount of methylparaben and propylparaben were taken, dissolved by heating on a water bath, the solution was cooled, and propylene glycol 400 and sodium lauryl sulfate were added.

3) Further required amount of extract is mixed into the above mixture and this solution is added to the Carbopol 940 gel with continuous stirring and triethanolamine is added dropwise to the formulation to obtain the required skin pH. Adjust and add gel to desired consistency.

EVALUATION OF FORMULATION

The prepared face wash formulation was evaluated for following parameters:[11]

1. Colour : The colour of the face wash formulation was checked visually.

2. Odour : The formulation was evaluated for its odour by smelling it.

3. Consistency :It was determined manually.

4. pH : pH of 1% aqueous solution of the formulation was measured by using a caliberated digital pH meter at constant temperature.

5. Spreadability : The spreadibility is determined by using spreadibilty testing apparatus. It consist of wodden block, which is provided by pulley at one end. By this method the spreadibilty was measured on the basis of 'slip' and 'Drag' placed on the ground slide the gel was sandwitched between the slide load of 1 kg was kept on slab so that gel will get spreaded without air bubbles , Excess of gel was scrapped off . Later on, 20 kg of standard weight was placed in pulley with the help of string attached to hook and time required to move till the end was noted and the length of spreaded gel is also noted.

Spreadability was then calculated by using formula

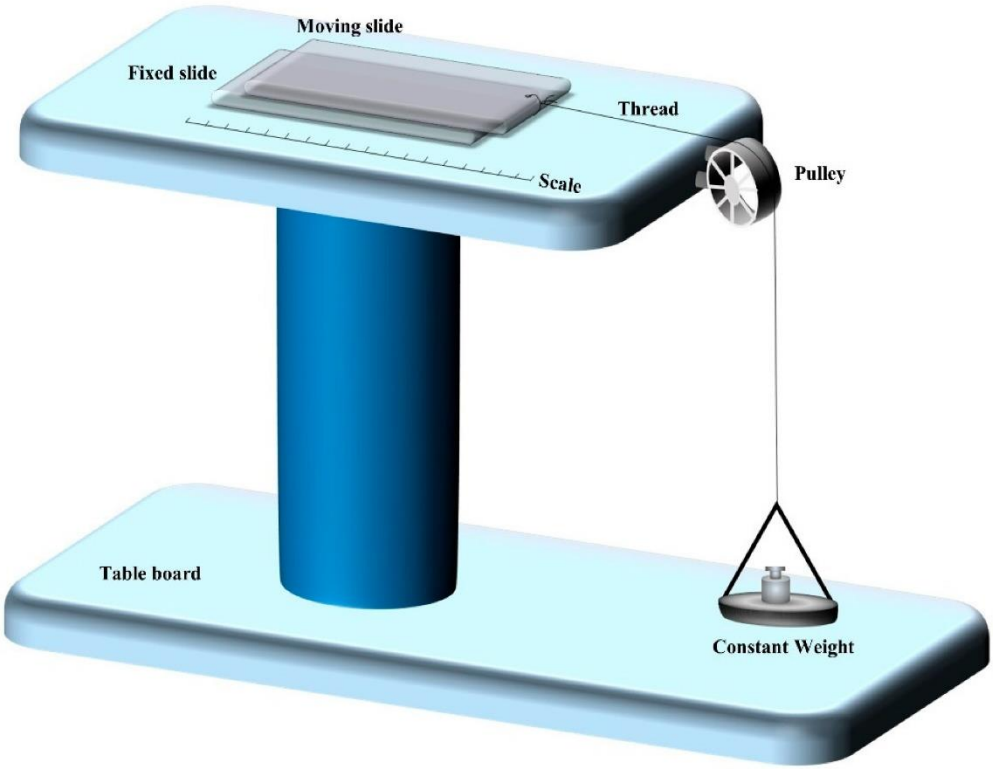
$S = M \times L/T = 20 \times 11/65 = 3.38$ gm.cm / sec

Where, S = is spreadability.

L = length moved by glass slide.

M = weight in the pan

T= time taken to separate the slide completely from each other.



6. Washability: Formulation was applied on the skin and then ease and extent of washing with water was checked manually.

7. Foamability : Small amount of gel was taken in a beaker containing water. Initial volume was noted, beaker was shaken for 10 times and the final volume was noted.

8. Viscosity : About 10ml of formulated sample was taken in the beaker and checked on digital viscometer and observation were recorded.

Table No.3 .Observation on evaluation of herbal face wash

Sr.No.	Parameters	Observation
1.	Colour	Dark green
2.	Odour	Characteristics
3.	Consistency	Semisolid
4.	PH	7.4
5.	Spreadability	3.38 gm.cm/sec
6.	Washability	Washable
7.	Foamability	Foam appears
8.	Viscosity	4406.3 cps

CONCLUSION

Herbal face wash gel containing bael leaves and guava leaves extract was formulated successfully by using carbapol 940 as gelling agent. Three batches were formulated, out of that, batch F2 shows better results for formation of the gel. Evaluation tests were carried out for batch F2 as colour, consistency, pH, spreadability, washability and foamability it showed compatible results. So from the studies it was concluded that the prepared formulation can be effectively used for facial care.

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