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Formulation and Evaluation of Herbal Face Wash Gel

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Abstract: ***Acne is the common skin problem that 85% of the teenagers face today. Natural remedies are more acceptable in the faith that they are safer with less side effects than the synthetic ones. Natural remedies are more acceptable with the belief that they are safe and having less side effects. Herbal drugs have been used since many years not only in Asian countries but also worldwide for social well being. Herbal formulations have rising demand in the world market. In this study, herbal anti-acne face wash gels were prepared using polymers Carbopol and extract of aegle marmelos (bel patra). bel patra show the antibacterial property and are widely used in modern herbal medicine. Results showed that the gels were non-irritant, stable and posses anti-acne activity. From this study, herbal Gel was proved to be stable and considered as an effective herbal formulation for acne treatment. Prepared formulation was evaluated for various parameters like colour, appearance, consistency, pH, viscosity.***

Keywords: Acne, carbopol, anti-acne activity, aegle marmelos .

I. INTRODUCTION

The oldest healthcare system in the world is likely India's herbal drug business. The Vedas, an ancient religious text of the Indians, describe an ancient form of herbal healing because the history of herbs in ancient India is so old. The use of herbs and natural remedies to treat health problems is central to the ancient herbal healing practices of Ayurveda and Unani. Even though it might seem like herbal remedies are something new to western healers and doctors, the majority of recommended medications still contain plant extracts.

Acne may cause long-lasting and detrimental psychosocial and physical effects. It is associated with depression and anxiety, regardless of disease severity, although the psychological effects usually improve with treatment. Furthermore, acne may cause permanent scarring that is difficult to correct. Acne vulgaris is characterized by noninflammatory, open or closed comedowns and by inflammatory papules, pustules, and nodules. Acne vulgaris typically affects the areas of skin with the densest population of sebaceous follicles (e.g., face, upper chest, back). Local symptoms of acne vulgaris may include pain, tenderness, or erythema Systemic symptoms are most often absent in acne vulgaris. Severe acne with associated systemic signs and symptoms, such as fever, is referred to as acne fulminans. Severe acne, characterized by multiple comedowns, without the presence of systemic symptoms, is known as acne conglobate. A gel is a solid jelly like material that can have properties ranging from soft and weak to hard and tough. Gels are defined as a substantially dilute cross linked system, which exhibits no flow when in the steady-state. By weight, gels are mostly liquid, yet they behave like solids due to a three dimensional cross-linked network within the liquid. It is the crosslinking within the fluid that gives a gel its structure (hardness) and contributes to the adhesive stick track. The therapeutic use of medicinal plants has gained considerable momentum in the world during the past decade. The overuse of synthetic drugs with impurities results in higher incidence of adverse drug reactions in more advanced communities has motivated mankind to go back to nature for safer remedies. However, it should be ensured that commercial formulations based on medicinal plants are safe, effective and of standard quality. Today, over the world, there is a great deal of interest in Ayurvedic system of medicine and thus the demand for various commonly used medicinal plants in the production Ayurvedic medicine is ever increasing.[(1)]

A. Skin Care Preparations

The development of skin care products has been amazing. People use a variety of skin care products, such as foot powder, lipstick, mouthwash, and complexion creams, in an effort to safeguard their bodies, enhance their personalities, and prevent body odour. Skin care preparations are defined as items that are meant to be rubbed, poured, sprinkled, sprayed, or otherwise applied to the human body or any part of the body for cleansing, beautifying, promoting attractiveness, or changing the look of skin.(1).

In terms of cosmetic preparations, Ayurveda describes the use of different herbs like amla and haldi. Without realizing the risks, many European women of the eighteenth century used lead carbonate to whiten their skin. died from lead poisoning (1).

B. Skin Care Preparation for Face

1) Cleansing creams and lotions
2) Compact powders
3) Rouges
4) Face packs and masks
5) Face washes(2)

C. Face Wash

1) Definition

Makeup, dead skin cells, oil, dirt, and other kinds of pollutants are all removed from the epidermis of the face using a cleanser, a facial care product. This facilitates pore cleaning and shields against skin issues like pimples. Along with a toner and moisturizer, a cleanser can be used as part of a face care routine. (2)

2) Advantages of Face Wash

- It helps to remove dead skin cells that helps new skin cells replace old one
- It helps to keep skin fresh and healthy.
- It makes the skin to look radiant
- The mixture of dead skin cells and excessive oil clog pores, which can lead to acne white heads, blackheads and total weary appearance. Exfoliating the pores regularly, avoids all the above skin problems.
- Removing dead skin cells that means your skin will develop wrinkles at a slower pace.(2)

3) Properties of face - wash

- Exfoliation fosters skin regeneration and rejuvenation and quickens blood circulation.
- The overproduction of sebum by sebaceous glands blocks pores on the face and contributes to oily skin.
- Cleansers with herbs and botanicals that will unclog pores and lessen oil accumulation are necessary for oily skin. Anti-inflammatory and antioxidant ingredients in these exfoliating cleansers help to heal and nurture damaged skin.
- Herbal face wash, which has many health benefits, is used to cure acne and pimples. Herbal facial wash, which contains rich plant-based components like neem, removes excess oil without depleting the skin's nutrients.
- It should be strong and present a nice look.
- When applied to the epidermis, it ought to become softer.
- It ought to disperse without trailing.
- Throughout implementation It shouldn't feel sticky or oily.
- The cream residue after water vaporization shouldn't thicken up.
- Its physical effect ought to be pore opening and skin flushing rather than absorption.

4) Uses of face-wash

- After use, a light emollient film ought to be left on the epidermis. (2)
- To remove all traces of makeup every day
- For cleansing the skin.
- Anti-aging,
- Bath and renewal keeping the skin clean and shiny.
- Stimulates there generation of the skin cells and their renewal.
- Help plug the pores clear(2)

5) Agents use in face wash

a) Use of medicinal ingredients in facial washes Antimicrobial An antimicrobial is a substance that prevents the development and reproduction of bacteria, according to the broadest meaning. Although both antibiotics and antimicrobials target bacteria, these words have developed over time to denote two distinct concepts. Nowadays, agents used to disinfect surfaces and eradicate possibly harmful bacteria are most frequently referred to as "antimicrobials." (3)

- *Anti-inflammatory:* It is a characteristic of a substance or therapy that lessens swelling or inflammation. About half of analgesics are anti-inflammatory medications, which treat pain by reducing inflammation as opposed to opioids, which act on the central nervous system to suppress pain signals to the brain. (4)
- *Anti-acne:* A skin condition known as acne causes an outbreak of zits or pimple-like blemishes. Acne vulgaris is the name of the disease that affects teenagers the most frequently. The medications known as antiacne medications help a teen with acne get rid of their pimples, blackheads, whiteheads, and more serious forms of lesions. (4)

b) Additives used in face wash

- *Antioxidants:* Antioxidants are chemicals, either man-made or natural, that may stop or postpone certain types of cell damage. Fruits and vegetables, among other foods, contain antioxidants. Moreover, they are offered as dietary supplements. Examples: - Lycopene, Vitamin A, Vitamin C, and Vitamin E. (5)
- *Gelling Agent:* Gelling agents are substances that can transform an oil or water phase into a thicker yet flexible gel. Emulsions that have been thickened using gelling agents will be less rigid and more mobile. Several of these gels exhibit thixotropy, which causes them to thin when force is applied and return to viscosity when the force is removed. These gels enable the production of thick products that can be shaken or agitated vigorously for simpler bottling or spraying. Examples: - Carbopol 940, Carbopol 934. (6)
- *Preservative:* Preservatives are primarily used to make food safer by reducing the impact of biological elements. The biggest risk to customers is food spoilage or becoming hazardous due to the presence of microorganisms (such as bacteria, yeast, or mould). Several of these creatures have the ability to release poisons, which are harmful to human health and even lethal. Examples include propyl and methyl parabens. (7)
- *Humectants:* The antitheses of desiccant, humectants are hygroscopic substances that are employed to maintain moisture in objects. It is frequently a molecule having many hydrophilic groups, most frequently hydroxyl groups, although it can also include amines, carboxyl groups, and sometimes esterified hydrophilic groups (its affinity to form hydrogen bonds with molecules of water is the crucial trait). They are an ingredient in a variety of goods, including as food, cosmetics, pharmaceuticals, and insecticides. The humectants bring water vapour into and/or beneath the surface of the organism or object by absorption, attracting and holding onto the moisture in the air nearby. Hexylene glycol, butylene glycol, and propylene glycol are among examples. (8)

- *Foaming Agent:* A surfactant or blowing agent is an example of a substance that serves as a foaming agent. Little amounts of a surfactant can lower a liquid's surface tension (lessen the effort required to produce foam) or raise the colloidal stability of a substance by preventing bubbles from coalescing. A blowing agent is a gas that forms the gaseous element of the foam. Examples: - titanium hydride, azodicarbonamide, and sodium lauryl sulphate. [9]

D. Herbs in Face Wash

1) Advantages of Herbal Cosmetics over Synthetic cosmetics

The most recent fashion and beauty trend is herbal cosmetics. Since natural products provide the body with nutrients, improve health, and provide satisfaction because they are free from synthetic chemicals and have comparatively fewer side effects than synthetic cosmetics, most women choose natural products over chemicals for their personal care to enhance their beauty. The following are a few benefits of utilizing natural cosmetics that make them preferable to synthetic ones:

a) *Compatible with all Skin Types:* All skin types can use natural cosmetics. Whether you have dark skin or are fair, you may discover natural cosmetics like foundation, eye shadow, and lipstick that work for you. These can be used by women with sensitive or oily skin without compromising their skin's state. Coal tar is known to be a human carcinogen, hence the main worry with individual coal tar colors (whether made from coal tar or synthetically) is that they may cause cancer. Coal tar-derived colors are widely used in cosmetics. However, natural SS colors made from herbs are more secure. [10]

b) *Wide Selection to Choose From:* Although natural cosmetics are still a relatively young category in the cosmetics business, they already provide a wide range of cosmetics for all make-up enthusiasts to choose from. There are various naturally formulated cosmetics available, including foundation, eye shadow, lipstick, blush, mascara, concealer, and many more. Also, one can get locally produced natural cosmetics or those created by well-known international designers. Several herbal extracts are available, including Andrographis Paniculata (Kalmegh), Asparagus Racemosus (Shatawari), Boswellia Serrata (Salai Guggal), Asphalt (Shilajit), and others. [10]

c) *Fits your Budget:* Natural cosmetics don't cost a lot. In some cases, these goods are less expensive than synthetic ones. During sales, they are presented at a reduced price and are sold for a low cost. Simply conduct enough research to hunt for excellent bargains. According to a WHO estimate, 80% of the world's population relies on natural goods for their healthcare due to the negative side effects and escalating costs of modern medicine. Due to their accessibility, affordability, and relative safety, traditional herbal remedies are being encouraged and recommended by the World Health Organization in natural health care Programmes [10].

d) *Not tested on Animals:* To make sure they are suitable for human use, several cosmetics are initially tested on animals. Yet, it is not necessary to test natural cosmetics on animals. Experts evaluate these natural products in labs using cutting-edge machinery without involving any animals [10].

e) *No Side Effects:* Your skin may become irritated and break out from using synthetic beauty products. Your skin may become dry or oily as a result of them clogging your pores. One need not be concerned about them with natural cosmetics. The use of natural components ensures no negative effects; they can be used anywhere, at any time. For instance, herbal cosmetics are free of parabens, the most common preservative in cosmetics that can permeate the skin and is thought to interfere with hormone function. Parabens are the most extensively used preservative in cosmetics. to get rid of mild to moderate acne. The oral medication isotretinoin (Accutane) is only ever used for extremely bad, disfiguring acne. [10]

2) Cynodon Doctylon (Bermuda Grass)

A perennial grass called Cynodon doctylon is one of the most prevalent weeds in India. Other frequent names for it are durba (Bengali), garikoihallu (Kanarese), durva (Marathi), durva or haritali (Sanskrit), arugampullu (Tamil), garikagoddi (Telugu), and dhubkhabbal (Punjabi).

It is also known as dhub, doob, or harialil. It is a tough, perennial grass that is found all across the globe, but it is native primarily to warm, temperate, and tropical climates. It is a creeping grass that is quick-growing, strong, drought-resistant, light green in colour, and gritty in texture. It comes in little, cylindrical segments that range in length from 3 to 20 mm and have a diameter of 2 to 3, occasionally 4. India's traditional medicine, Cynodon doctylon, is well known for its effectiveness in treating minor ailments. Moreover, it exhibits a broad variety of antibacterial, anti-inflammatory, and anti-acne activities (11,12,13)

Fig no.1: Cynodon Doctylon

II. DRUG, HERB, EXCIPIENTS PROFILE

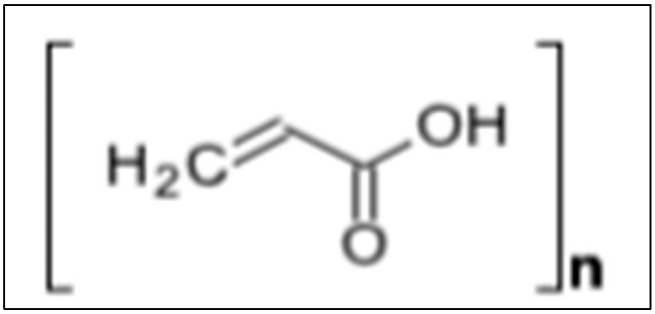
A. *Bel Patra* [14]

Fig no.2: Bel Patra leaves

- Synonyms: Aegle marmelos
- Biological sources: Native tree from India
- Family: Rutaceae
- Uses: Due to the presence of anti-bacterial, anti-fungus, and anti-inflammatory properties of bale, it is an excellent remedy for skin infections. Bael leaf oil inhibits common types of fungus that infect the skin. It can also be beneficial for skin rash and itchy bumps.

Description: Aegle marmelos is a deciduous shrub or small to medium-sized tree, up to 13 meters (43 feet) tall with slender drooping branches and rather open, irregular crown. The bark is pale brown or grayish, smooth or finely fissured and flaking, armed with long straight spines, 1.2–2.5 centimeters (1⁄2–1 inch) singly or in pairs, often with slimy sap oozing out from cut parts. The gum is also described as a clear, gummy sap, resembling gum arabic, which exudes from wounded branches and hangs down in long strands, becoming gradually solid. It is sweet at first taste and then irritating to the throat.

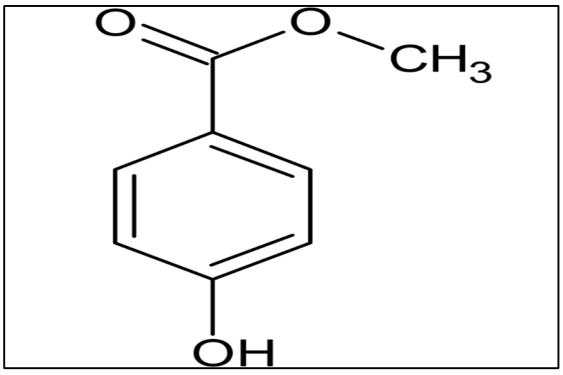
B. Carbopol 934[15]



- IUPAC Name: Poly (acrylic acid)
- Other names: PAA, PAAc, Acrysol, Acumer.
- Chemical formula: $(C_3H_4O_2)$ 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. Dry PAAs are sold as white, fluffy powders. In the dry powder form, the positively charged sodium ions are bound to the polyacrylate, however in aqueous solutions the sodium ions can dissociate. The presence of many metal cations allows the polymer to absorb a high amount of water**.**

Description: For a description of unrelated compounds expanded by two carbon units, Poly acrylic acid (PAA or Carbomer) is generic name for synthetic high molecular weight polymers of acrylic acid. They may be homopolymers of acrylic acid, crosslinked with an allyl ether pentaerythritol, allyl ether of sucrose or allyl ether of propylene. In a water solution at neutral pH, PAA is an anionic polymer, i.e. many of the side chains of PAA will lose their protons and acquire a negative charge. This makes PAAs polyelectrolytes, with the ability to absorb and retain water and swell to many times their original volume. Dry PAAs are found in the market as white and fluffy powders. Carbomer codes (910, 934, 940, 941 and 934P) are an indication of molecular weight and the specific components of the polymer. For many applications PAAs are used in form of alkali metal or ammonium salts e.g. sodium polyacrylate.

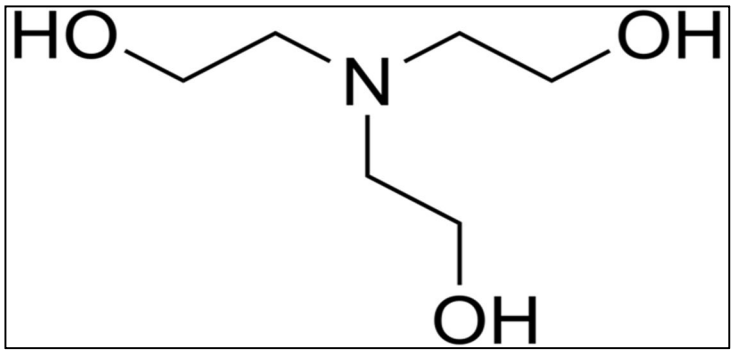
C. Methyl Paraben[16]



- IUPAC name: Methyl 4hydroxybenzoate
- Other names: Methyl paraben
- Chemical Formula: $C_8H_8O_3$
- 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
- Solubility: Soluble in water (2.5 g/l at 25° C), benzene (slightly soluble), carbon tetrachloride (slightly soluble), ethanol, ether, acetone, DMSO, methanol, warm oil (25 g/l), and warm glycerol (1 g/70 ml).

Description: Methylparaben is a 4-hydroxybenzoate ester resulting from the formal condensation of the carboxy group of 4-hydroxybenzoic acid with methanol. It is the most frequently used antimicrobial preservative in cosmetics. It occurs naturally in several fruits, particularly in blueberries. It has a role as a plant metabolite, an antimicrobial food preservative, a neuroprotective agent and an antifungal agent.

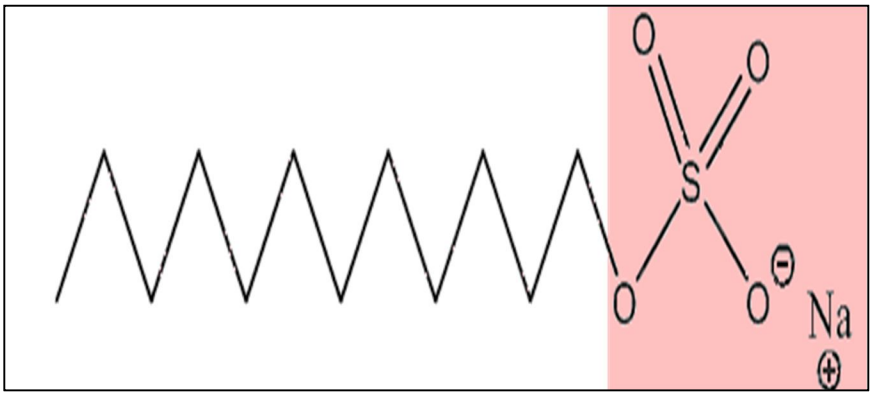
D. Triethanolamine[17]



- IUPAC Name: Tris (2hydroxyethyl) Amine
- Other Names: Triethylolamine
- Chemical Formula: $C_6H_{15}NO_3$
- 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 solubilizes oils and other ingredients that are not completely soluble in water.
- Solubility: Triethylamine is soluble in water to the extent of 112.4 g/L at 20 °C. It is also miscible in common organic solvents, such as acetone, ethanol, and diethyl ether.

Description: Triethanolamine is used primarily in making surfactants, such as for emulsifier. 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 solubilizes oils and other ingredients that are not completely soluble in water. Triethanol ammonium salts in some cases are more soluble than salts of alkali metals that might be used otherwise, and results in less alkaline products than would from using alkali metal hydroxides to form the salt. Some common products in which triethanolamine is found are sunscreen lotions, liquid laundry detergents, dishwashing liquids, general cleaners, hand sanitizers, polishes, metalworking fluids, paints, shaving cream and printing inks.

E. Sodium lauryl sulphate[18]



- IUPAC Name: Sodium lauryl sulfate
- Other Names: Sodium monododecyl sulfate
- Chemical Formula: $NaC_{12}H_25SO_4$
- 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.

Description: SLS is what's known as a "surfactant." This means it lowers the surface tension between ingredients, which is why it's used as a cleansing and foaming agent.

Most concerns about SLS stem from the fact that it can be found in beauty and self-care products as well as in household cleaners. Sodium laureth sulfate (SLES) is a surfactant with a similar chemical formula. However, SLES is milder and less irritating than SLS.

III. MATERIAL AND INSTRUMENTS

A. Materials

Table No. 1. List of chemicals

Sr. no.	Ingredients	Properties
1.	Bel patra	Anti acne
2.	Carbapol934	Gelling agent
3.	Triethanolamine	Neutralizer
4.	Sodium lauryl sulphate	Foaming agent
5.	Methyl paraben	Preservative
6.	Distilled water	Vehicle

B. Instruments

Table No. 2. List of Instruments

Sr.no.	**Instruments**	**Model**
1.	pH meter	Labtronics LT11
2.	Brookfield viscometer	Fungilab

IV. EXPERIMENTAL

A. *Preparation of Herbal Extracts*

1) *Extraction of Bel patra:* 5gm of bel Patra powder was prepare from dry bel patra leaves. powder was prepared by using grinder machine.50ml of water and 5gm of powder were macerated, and left to stand for 24 hrs. after that filter the above mixture and filter liquid use for gel preparation.

2) *Method of Preparation of Gel Containing Extract:* Carbopol 934 was first blended with distilled water and filtered water, and then allowed to swell for a day. The liquid then needed to be stirred to help the carbopol934 gel. Add the necessary amounts of sodium lauryl sulphate or methyl to 5ml of distilled water, then dissolve on a water bath. After then, the solution was chilled.

Weight the needed quantity of extract of bel patra leaves and transfer it to an another beaker, where it was dissolved in gel base and 0.025 ml of triethanolamine was added drop by drop to achieve the proper skin pH and gel consistency (6.8–7). The two liquids were then combined using a glass rod. Using this method, we developed five formulations with five distinct proportions of Carbopol. 1, 9, 80, 60, and 50% are the respective percentages. There are preservation agents like methyl paraben.

Table No. 3. Preparation of Herbal face washes Gel

Sr.no.	Ingredients(gm)	F1	F2	F3	F4	F5
1.	Carbapol932	0.50	0.60	0.80	0.90	1.0
2.	Distilled water(ml)	30	30	30	30	30
3.	Bel Patra extract	1	1	1	1	1
4.	Methyl paraben	0.15	0.15	0.15	0.15	0.15
5.	Triethanolamine	0.025	0.025	0.025	0.025	0.025
6.	Sodium lauryl sulphate	0.20	0.20	0.20	0.20	0.20

Fig.no.3: Placebo herbal Gel

The prepared face wash formulation was evaluated for following parameter [13, 19]

1) *Color:* The formulation of the face wash was visually inspected for colour.
2) *Odor:* The formulation's odour was assessed by sniffing it.
3) *Consistency:* It was chosen by hand.
4) *pH:* A calibrated digital pH meter was used to test the pH of a 1% aqueous solution of the formulation at a steady temperature.
5) *Spreadability:* Spreadability was check manually. Our gel was easily spreadable.
6) *Washability:* After applying the formulation to the skin, the degree and simplicity of water washing were physically assessed.
7) *Foamability:* A small quantity of gel was added to water in a beaker. After recording the initial volume, the beaker was shaken ten times to record the final volume.
8) *Viscosity:* A 10 ml sample that had been prepared was placed in a beaker and examined using a digital viscometer. The results were then recorded.

Fig.No.4: Foamability test

Fig.No.5: pH test

V. RESULT & DISCUSSION

Table No.4: Characterization of Herbal Face wash gel

Sr.No.	Parameter	Observation
1.	Color	Dark green
2	Odour	characteristics
3	Consistency	Semisolid
4	pH	7.4
5.	Spreadability	3.38gm.cm/sec
6.	Washability	Washable
7	Foamability	Foam appear
8	Viscosity	4406.3 cp

A. Characterization of Herbal Face wash Gel

Due to their biodegradability, biocompatibility, suitability for topical applications, and low immunogenicity, gels have the potential to be a successful, viable, safe, and cost-effective method for administering herbal medicine.

1) Physical Test

It includes the color, odor and consistency were done.

The characterization of Herbal Face wash gel was inspected by visual eye and it was observed that color was dark green, odor was characteristics and the consistency of face wash gel was semisolid. The formulation of the face wash was visually inspected for color. The formulation's odor was assessed by sniffing it and Consistency was chosen by hand.

2) pH of Face Wash Gel

A calibrated digital pH meter was used to test the pH of a 1% aqueous solution of the formulation at a steady temperature. As the pH of the optimized formulation was 7.4, which is close to the pH of the skin, there are no negative effects. It was determined that the formulation's pH value was appropriate for topical application.

3) Spreadability of Face Wash Gel

Spreadability was check manually. Our gel was easily spreadable. The spreadability measurements show that a modest amount of shear can quickly spread the gel. The spreadability of formulation was spread in 3.38gm.cm/sec.

4) Washability of Face Wash Gel

After applying the formulation to the skin, the degree and simplicity of water washing were physically assessed. The semisolid face wash gel was easily washable.

5) Foamabilty of Face Wash Gel

A small quantity of gel was Added to water in a beaker. After recording the initial volume, the beaker was shaken ten times to record the final volume. The foam was appearing in normal or with sufficient.

6) Viscosity of Face Wash Gel

A 10 ml sample that had been prepared was placed in a beaker and examined using a digital viscometer. The result was herbal face wash gel 4406.3 cp viscous is observed.

Fig no.6: Herbal face wash Gel

VI. CONCULSION

Using carbopol 940 as a gelling agent, an herbal face wash gel containing Aegle marmelos (Bel patra) extract was effectively created. Out of the three batches that were created, batch F2 exhibits better gel formation results as compared to other batch formulation. For batch F2, evaluation tests were conducted, and the findings in terms of colour, consistency, pH, spreadability, washability, and foamability were consistent. Therefore, it was determined from the research that the created formulation can be utilized effectively for facial care. Any ailment benefits from using natural treatments. It is risk-free and has fewer adverse effects. Herbal formulations are in high demand on the global market. Establishing the herbal face cleanser with bel patra extracts is a really commendable effort.

Natural remedies are boon to any disease. It is safe as well as having less side effects. In the world market, herbal formulations are in a great demand. It is a very good attempt to establish the herbal face wash containing extracts of bel patra. It was concluded that the present research might hopefully bring advancement in the treatment of acnes using herbs as well as in developing poly herbal formulations for safe and effective management of diseases.

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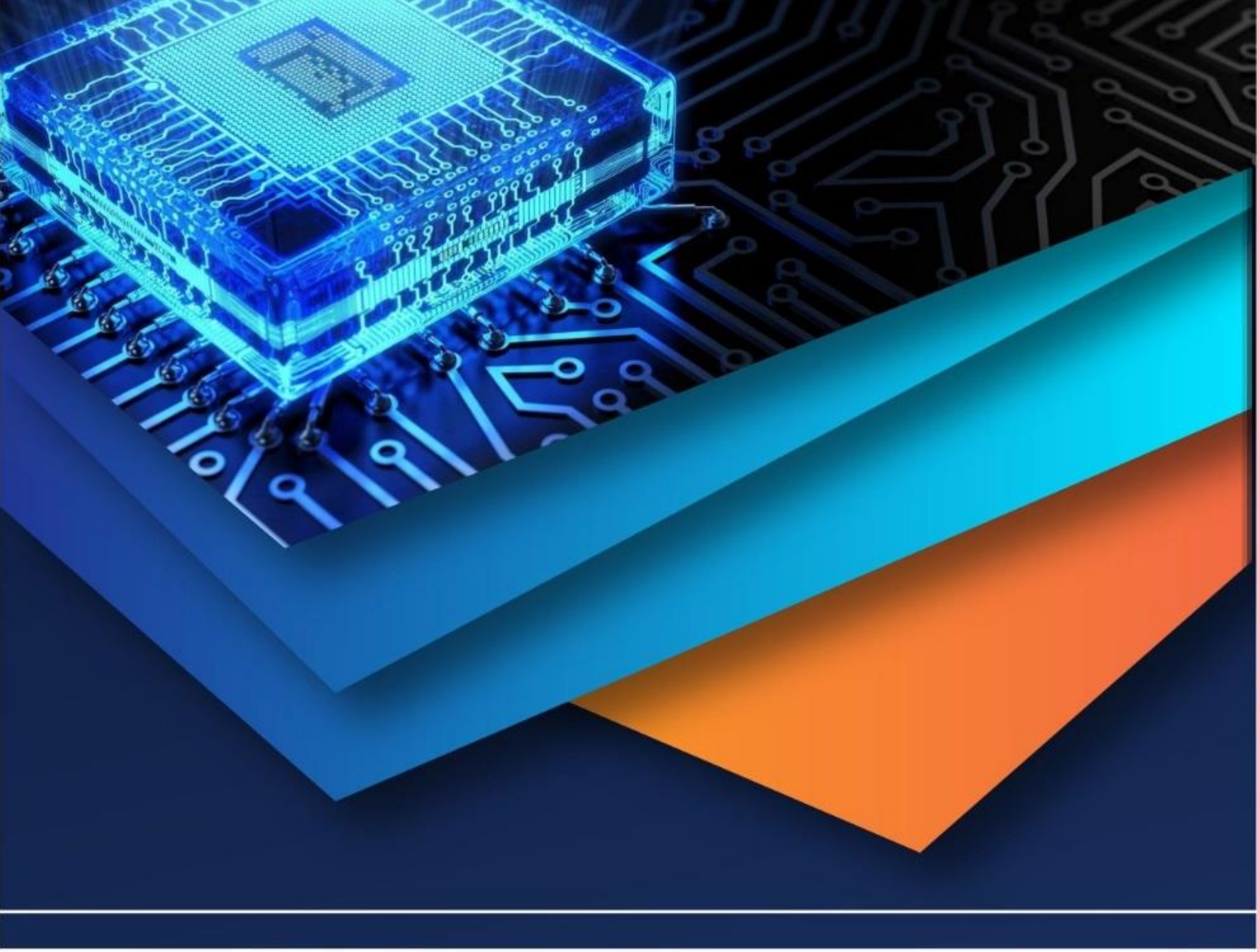

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