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Eucalyptus globules -Infused Herbal Hand Wash Gel: Formulation and Evaluation

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ABSTRACT: In this study, we will create and evaluate a herbal hand wash that uses eucalyptus globules extract as its main component. The hands are a primary vector for the spread of many infectious diseases and bacteria. The purpose of washing one's hands in a healthcare setting is to remove germs and other potentially contagious bacteria. In addition to lowering the quantity of harmful germs, washing one's hands also makes dirt and grime less obvious. An herbal handwash formulated using a methanolic extract of Eucalyptus globulus (Nilgiri) was developed by the researchers involved in this investigation. Throughout history, this herb has been used medicinally on several occasions. This herbal hand wash formulated with water was created with the intention of promoting "personal hygiene" in mind. No matter what you're doing at the shelter—feeding, cleaning, preparing food—it's imperative that you always wash your hands thoroughly. Product is now available for purchase. There are certain drawbacks to using synthetic antibacterial hand sanitizers. Instead of using synthetic hand sanitizers, which can cause inflammation, dryness, skin irritation, rashes, and other side effects, consumers should look for things that have always been made of natural components. Before utilizing a hand wash that has extra skin benefits, more research should be done. The cup plate approach was utilized to ascertain the antibacterial characteristics of a hand wash formulated with diverse plant extracts. It was shown that washing hands with a mixture of and water using the cup plate approach was advantageous, and the phytoconstituents in the extracts played a role in their overall activity. The leaves were extracted and utilized to create a natural soap. Following curing, herbal hand washes are tested for a broad variety of physical and chemical properties, such as pH, color, smell, look, spreadability, foam height, foam retention, cleaning action, and consistency, among many others. These handwashes are completely safe to use.

KEYWORDS: Eucalyptus globules, Hand wash, herbal extract, health care, Infection, hygiene.

I. INTRODUCTION

Over the years, herbal remedies have been effectively used to manage and treat numerous ailments[(1)]. Herbal hand washes contain a blend of natural herbs, many of which exhibit strong antimicrobial properties. These formulations are both cost-effective and beneficial for health, making them a practical alternative to conventional products.

Hygiene

Hygiene is a scientific discipline that promotes health through the application of knowledge and practices that reduce disease risk. Personal hygiene, particularly hand hygiene, plays a crucial role in curbing the spread of infectious diseases. Routine cleaning practices such as bathing and hand washing remove dirt, debris, and harmful microorganisms. Maintaining hygiene is essential for overall health, and it underscores the importance of using effective cleansing agents regularly[(2)].

Hand Washing

Hands are the primary route for the transmission of many infections. Regular handwashing is effective& affordable ways to prevent illnesses & maintain personal hygiene. It significantly reduces the risk of hospital-acquired infections. Using soap and water not only removes visible dirt but also eliminates harmful microorganisms. This is especially critical for healthcare workers, whose hands can act as carriers of pathogens. While chlorhexidine and alcohol-based sanitizers—are effective, their prolonged use may cause skin irritation and microbial resistance. Hence, herbal hand washes offer a safer

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alternative[3,4].

Key Features of Herbal Hand Wash
- Easy to rinse off
- Non-irritating to the skin
- Pleasant natural fragrance
- Biodegradable and environmentally friendly
- Low toxicity
- Efficient cleansing
- Good foaming ability[5].

Advantages
- Effectively reduces hand-borne bacteria
- Causes minimal to no side effects
- More convenient than traditional soap and water
- Efficiently removes dirt and oil
- Provides a simple method to eliminate microbes
- Prevents germs from entering the body [1].

Drawbacks
- Possible long-term skin sensitivity
- Risk of developing dermatitis or eczema due to irritation

Additional Benefits
- Easily available
- More economical than chemical-based hand washes
- High efficacy with fewer adverse reactions
- Promotes hand hygiene more naturally
- Less likely to cause allergies or skin problems
- Keeps hands soft, smooth, and moisturized
- Provides protection against infections
- Kills 99.9% of bacteria
- Leaves a pleasant scent post-use[6].

Scope

Herbal hand washes offer a soothing and aromatic cleansing experience that preserves skin softness and freshness. With gentle foaming action, they are safe even for sensitive skin. These formulations help cleanse impurities and excess oils while addressing antiseptic and fungal skin concerns.

Frequent handwashing with herbal products helps prevent gastrointestinal, respiratory, and skin infections. Natural, handcrafted soaps are especially beneficial for individuals with sensitive skin or conditions like eczema and psoriasis. Ingredients like glycerin enhance moisture retention, ensuring the skin stays soft and hydrated[7,8].

Eucalyptus globulus
Botanical Name: Eucalyptus globules
Synonym:
Marathi Name: Nilgiri
English Names: Eucalyptus, Tasmanian Blue Gum Tree
Sanskrit Name: Tailapatra, Sugandhapatra
Leaf Characteristics:
Juvenile Leaves: Opposite, ovate, and horizontal
Mature Leaves: Alternate, lance-shaped or curved, glossy, dark green, thick, and leathery
Biological source: Eucalyptus oil is the volatile oil obtained by the hydrodistillation of fresh leaves of eucalyptus globulus.
Family: Myrtaceae
Main Chemical Component: 1,8-cineole[9].

Fig. No.1: Eucalyptus globules

Aloe vera
Botanical name: Aloe barbadensis miller
Synonyms:
English: Aloe vera
Hindi: Ghritakumari, Gwarpatha
Sanskrit: Ghritakumari, Kumari
Marathi: Korpad
Kannada: Lolesara
Leaves: It is a perennial succulent xerophyte with elongated leaves that contain a clear gel.
Biological source: Aloe is the dried juice collected by incision, from the bases of the leaves of various species of Aloe.
Family: Asphodelaceae (Liliaceae)
Chemical Constituent: All variety of aloes a yellow coloured crystalline substance known as barbloin (c-glycoside), resin & aloe-emodin. Isobarbalion is present in curacao and cape aloes.[10].

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Fig. No.2: Aleo vera

Reetha
Botanical Name: Sapindus Mukorossi
Synonym:
Hindi: Reetha, Aritha
Gujarati: Arithi,
Marathi: Ritha,
Kannada: Antuvalakayi,
Sanskrit: Arishtaka, Arishta
Seeds: The "reetha seed" refers to the seed of the reetha plant, which can be used for growing the plant itself or, when processed, as a natural shampoo and other cleansers.
Biological source:- it consist of dried fruit of SapindusTrifoliatus (S.I), SapindusMukorassi (N.I.)
Family: Sapindaceae
Chemical Constituents: Fruit contains saponin (10-11.5%), sugar(10%) and mucilage[11].

Fig.No.3: Reetha

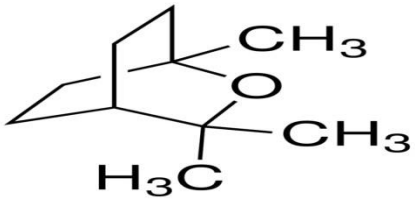
Aim: The aim of this present study is to prepare and evaluate herbal hand wash by using different plants extract.

Objectives:
1) It should maintain hygiene.
2) They should be suitable for all skin types.
3) It should provide moisture to hand.
4) It should provide good aroma to hand.
5) It should remove bacteria, dirt and oil from hand.

Experimental work:

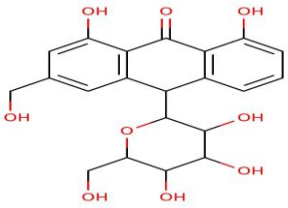
➢ **Drug Profile:**

Eucalyptol:
Chemical Name: 1,8-cineole
Chemical Formula: $C_{10}H_{18}O$
Structural Formula:



Discription:
Colorless Liquid: Eucalyptol is a liquid with a colorless appearance**.**
Solubility: Insoluble in water, but miscible with organic solvents.
Theoretical Uses: anti-inflammatory, antioxidant, and antimicrobial properties[12].

Aloin:
Chemical Name: C-glycosyl
Chemical Formula: $C_{21}H_{22}O_9$
Structural Formula:



Description:
Colour: Yellow Brown Colour
Solubility: Moderately soluble in water and more soluble in organic solvents.
Theoretical Uses: anti-inflammatory, antioxidant[13].

Saponin
Chemical Name: Sapienic Acid
Chemical Formula: $C_{16}H_{30}O_2$
Molar Mass: 254.414 g·mol−1
Structural Formula:

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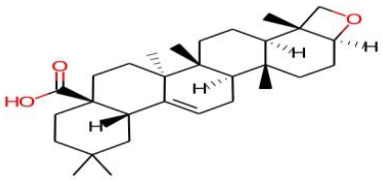
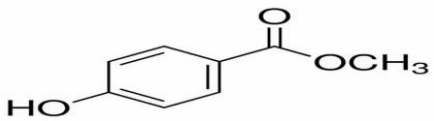


Description:
Colour: colorless
Solubility: Insoluble in water
Theoretical Uses: anti-microbial activity[14].

Excipient Profile:
1. Sodium Lauryl Sulphate:
Synonym: Sodium monolauryl sulphate.
Chemical formula: $C_{12}H_{25}SO_4Na$.
Structural Formula:

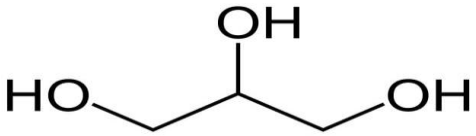
Description:
Colour: White.
Solubility: Highly soluble in water.
Theoretical Use: Foaming agent.

1. Methyl paraben
Synonym: Methyl 4-hydroxybenzoate
Molecular Formula: $C_8H_8O_3$
Molar Mass: 152.15 g/mol
Structural Formula:



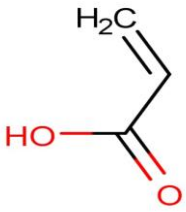
Description:
Colour: White Needles
Melting Point: 213 °C to 217 °C
Boiling Point: 270-280°C
Solubility: Soluble in water
Theoretical Uses: Used as a preservative

2. Glycerine
Synonym: Glycerol
Molecular Formula: $C_3H_8O_3$
Molar Mass: 90.09g/mol.
Structural Formula:



Description:
Colour: Colourless
Boiling Point: 290°C
Melting Point: 17.8°C
Solubility: highly soluble in water and many other common solvents
Theoretical Use: Used as an emollient, humectants.

3. Carbapol-940
Synonym: Carboxypolymethylene
Molecular Formula: $(C_3H_4O_2)_n$
Molar Mass: 102.13 g/mol
Structural Formula:



Description:
Colour: Colourless
Boiling Point: 116 °C
Melting Point: 12.5 °C
Solubility: Carbopol-940 is not fully soluble in water
Theoretical Use: Gelling agent

Identification Tests

Standard procedures were used to analyze the bioactive constituents in plant extracts using different solvents with slight modifications:

Alkaloids:
- Mayer's Test: Creamy white precipitate with Mayer's reagent.
- Wagner's Test: Reddish-brown precipitate with Wagner's reagent.
- Murexide Test: Purple precipitate with potassium chlorate and HCl.

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Phenols:
- Ferric Chloride Test: Red/blue color indicates phenols.
- Litmus Test: Color change confirms acidic/basic nature.

Tannins:
- Ferric Chloride Test: Red coloration confirms tannins.

Saponins:
- Foam Test: Persistent foam indicates saponins.
- Lead Acetate Test: White precipitate formation.

Terpenoids:
- Salkowski Test: Reddish-brown precipitate.

Carbohydrates & Glycosides:
- Molisch's Test: Violet ring formation.
- Fehling's test: Red precipitate after hydrolysis confirms reducing sugars.
- Benedict´s test: Little amount of filtrates + Benedict´s reagent (5ml) heated on a water bath for few minutes.

Flavonoids:
- Shinoda Test: Magenta color indicates flavonoids[15].

II. MATERIALS AND METHODS:

Materials

Fresh Eucalyptus leaves were collected from Ashokrao Mane College of Pharmacy, Peth-vadgaon, Kolhapur, Maharashtra. They were shade-dried for 10 days, powdered, and 60 g of powder was used for extraction.

Extraction Method (Soxhlet Method):

Powdered leaves were placed in a thimble inside a Soxhlet apparatus. Methanol was used as a solvent for continuous hot extraction until the siphoning solvent showed no residue upon evaporation.

Formulation of Herbal Hand Wash:
- Mix methanolic eucalyptus extract with glycerin under stirring.
- Prepare a gel by dispersing Carbopol-934 in distilled water.
- Combine the gel with the extract mixture.
- Add reetha, sodium lauryl sulfate, methylparaben, and fragrance as per standard formulation.
- Homogenize the final mixture at room temperature for uniform consistency.

Formulation Table:

Table No.1: Formulation Table

Name of Drug	Formulation			Properties
	F1	F2	F3	
Eucalyptus Extract	2 g	2.5 g	3g	Antimicrobial
Aloe vera	5 g	5 g	5g	Smoothning
Reetha Extract	1 ml	1 ml	1ml	Cleansing
Carbopol-934	2 g	2 g	2g	Gelling
Glycerine	3 ml	3 ml	3ml	Moisturizing
Sodium Lauryl Sulphate	2 g	2 g	1.7g	Foaming
Methyl paraben	0.2 g	0.3 g	0.3g	Preservative
Orange oil	2 drop	3 drop	3 drop	Flavouring
Distilled Water	q.s.	q.s.	q.s.	Vehicle

A. Evaluation parameter

1} Physical properties

The hand wash is checked for colour, odour, texture and appearance.

- Colour: A visual inspection was done to determine the colour of the prepared formulation.
- Odour: The hand wash odour was evaluated by applying it to the hand and inhaling the formulate.
- Appearance &homogeneity: Uniform appearance and was translucent and in forest green colour.
- Texture: Smooth.

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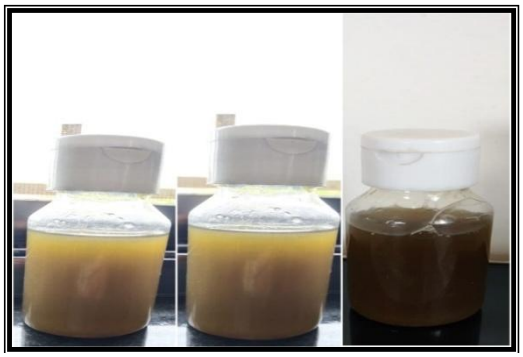

Fig. No. 4: Formulation

2} pH test
One hundred milliliters of purified water was mixed with one gram of herbal hand wash gel. A standardized digital pH meter was used to test the pH of the solution [16].

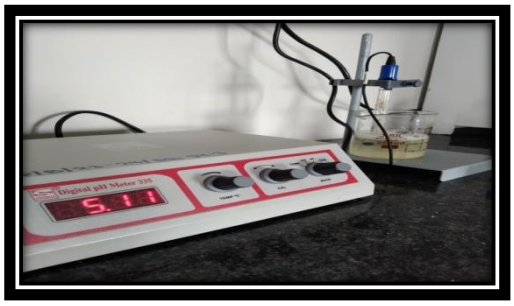

Fig. No. 5: pH Meter

3} Skin irritation test
The skin's sensitivity was assessed by applying the herbal handwash and leaving it on for half an hour. Using both tactile and visual means, the skin was examined for redness, irritation, or rashes after the 30-minute period had elapsed[17].

4} Foaming capacity
The amount of foam generated immediately after the formulation is agitated and aerated.

Method:
For the foaming test, 40 ml of the 1% hand wash solution were placed in a 100 ml graduated measuring cylinder, covered with hand, and shaken ten times; the volume of foam was measured.

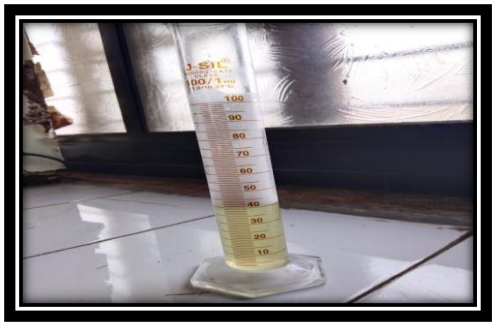

Fig. No.6: Foaming Capacity

5} Washability
Washability is a test performed to check that hand wash is easily washable or leaves any residue on hand after use.

Fig. No. 7: Washability

6} Stability test
To ensure the herbal hand wash liquid remained stable, it was left at room temperature for a week after measurement. The prepared hand wash did not undergo any color change or phase separation throughout the stability testing [18].

7} Viscosity
We used a computerized Brookfield viscometer to find out how thick the hand soap was[6].

Fig. No. 8: Viscosity

8} Spreadability test
Half a gram of each formula was sandwiched between two slides and allowed to sit for about five minutes, at which point any further spreading was anticipated. As a benchmark for

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spread ability, we measured the diameters of spread circles in centimeters. The outcomes that have been produced are the mean of two separate analyses[6].

Fig. No. 9: Spreadability

9} Grittiness
After rubbing 1 milliliter of gel between two fingertips, the formulation was tested[16].

10} Foam retention

Ten times, 25 milliliters of hand wash gel was shaken in a 100 milliliter measuring cylinder. The observed foam retention volume at 1-minute intervals for 4-minutes should remain constant for a minimum of 5 minutes[1].

Fig. No. 10: Foam retention

11} Dirt dispersion test
Analyzes how well the hand wash removes dirt and grime when used on hands.

The procedure involved adding 1 milliliter of herbal hand wash gel to 10 milliliters of distilled water in a test tube. After adding a drop of Indian ink, the test tube was sealed and shook. No ink, mild, moderate, or strong ink was determined to be present in the foam[16].

12} Antimicrobial Study of herbal Hand wash Gel

For the antimicrobial test, nutrient agar medium is utilized. Following the manufacturer's instructions, nutrient agar was autoclaved at 121 degrees Celsius for 45 minutes. The sterile medium was left to cool between 37 and 38 degrees Celsius. The nutrient agar solution was pipetted into the plates and let to set. The microbes from the subculture were introduced into the nutrient agar medium once it had solidified. The sub-cultured bacteria were introduced to the petri plate by hitting them on the surface medium, and then they were left to incubate. Subsequently, three wells were bored into each plate using a borer to collect Herbal Extracts, Herbal Formulation, and the commercially available reference standard. The test and reference samples were allowed to permeate through it while the microbes grew in an incubator set at 37°C for 24 hours after they were immediately added. We used a zone meter to measure the inhibition zone after incubation and made note of the results [19].

III. RESULT AND DISCUSSION:

1) Identification Test

Table No.2: Identification Test

Chemical Test	Observation
Alkaloids	+Ve
Phenol	+Ve
Tannins	+Ve
Saponins	+Ve
Terpenoids	+Ve
Carbohydrates	+Ve
Flavonoids	+Ve

2) Evaluation Test:

After completion of evaluation parameter the Eucalyptus globulus has good antibacterial property.

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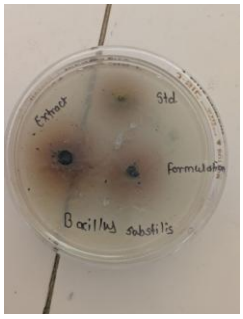
Table No.3: Evaluation Parameter

Parameter	F1	F2	F3
Colour	Brownish green	Brownish green	Green
Odour	Orange like	Orange like	Orange like
Texture	Smooth	Smooth	Smooth
Appearance and Homogenicity	Translucent	Translucent	Translucent
PH	5.45	5.11	6.12
Viscosity	34cP	56cP	48cP
Skin Irritation Test	No Irritation	No Irritation	No Irritation
Foaming Capacity	50 ML	60 ML	62 ML
Washability	Washable	Washable	Washable
Stability	Stable	Stable	Stable
Spreadability	Spreadable	Spreadable	Spreadable
Grittiness	Non Gritty	Non Gritty	Non Gritty
Foam Retention	10 ML	12 ML	9 ML
Cleansing Action	29%	32%	29%
Dirt Dispersion	light	light	Moderate

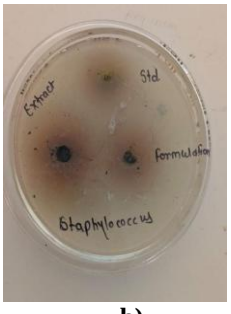
Antimicrobial Test:

Table No.5: Antimicrobial Test

Test Organism	Concentration	Zone of Inhibition (mm)
Bacillus subtilis (Gram +ve)	Extract	17.40
	Std.(10µg/ml)	15.20
	Handwash	15.60
Staphylococcus aureus (Gram +ve)	Extract	16.70
	Std.(10µg/ml)	15.30
	Handwash	15.80
Proteas vulgaris (Gram –ve)	Extract	18.30
	Std.(10µg/ml)	17.50
	Handwash	17.80
Salmonella typhi (Gram -ve)	Extract	20.35
	Std.(10µg/ml)	18.40
	Handwash	18.90



a)



b)

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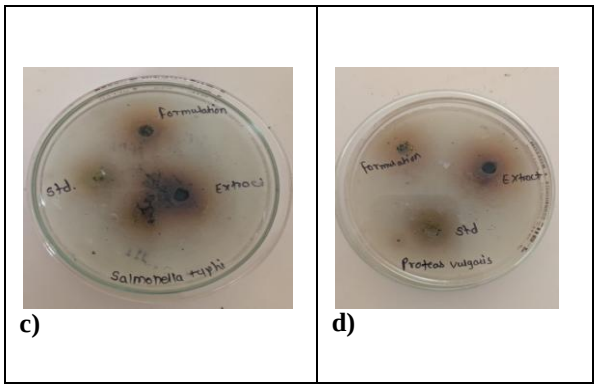

Fig. No. 11: Antimicrobial Activity against a) Bacillus subtilis (Gram +ve), b) Staphylococcus aureus (Gram +ve), c) Proteas vulgaris (Gram –ve), d) Salmonella typhi (Gram -ve).

IV. CONCLUSION

Although they are applied topically, the components of cosmeceuticals—a type of cosmetic that has or is believed to have therapeutic properties—influence the skin's biological functioning. Eighty percent of Asians, according to WHO, utilize herbal medicine as part of their basic health care, which includes making hand wash. Herbal hand wash gel that effectively cleans hands and inhibits the formation of bacteria, the current investigation was conducted. Because skin is so sensitive, its ingredients were carefully chosen to ensure that it would not irritate even the most sensitive skin. So, it's safe to say that the herbal hand wash gel is superior to basic soaps and currently available synthetic hand washes, both in terms of contents and efficacy on human skin. After preparing three batches of herbal hand wash (F1, F2, and F3), we conducted the aforementioned assessment tests and discovered that formulation F2 performed the best, passing all of the evaluation criteria.

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