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"Formulation and In Vitro Evaluation of Polyherbal Antibacterial Hand Wash"

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ABSTRACT :

Hands are the primary course of transmission of germs in healthcare, so hand cleanliness is the most vital measure to avoid the spread of harmful germs and avoid healthcare-related contamination. Numerous irresistible diseases can be transmitted from one individual to another through sullied hands. These maladies incorporate gastrointestinal diseases, such as salmonella, and respiratory contamination, such as the flu. Appropriate hand washing can offer assistance to anticipate the spread of germs (such as microscopic organisms and infections) that cause these maladies. So an attempt is made to get ready home-grown hand wash utilising drugs like neem, tulsi, reetha, Aloevera, and glycerin, which are having antibacterial, antiviral, anti-fungal exercises and skin hydration properties. Home grown hand wash was prepared as per standard strategy utilizing home grown fixings and swab tests streaked on Blood and Mac-conkey agar, hatched at 37°C for 24 hrs in oxygen consuming condition for microbial stack evaluation consider. The results propose that hand-washing herbs can make great concealment zones to ensure against skin pathogens. This seem to be the reason for utilizing herbs in arrangement for handwashing and utilizing these compounds in the generation of disinfectant salves or cleansers instep of chemicals.

The increasing demand for natural and safe personal hygiene products has prompted research into herbal formulations for antibacterial hand wash. This review explores the formulation and evaluation of an antibacterial herbal hand wash utilizing the synergistic properties of Tulsi, Neem, Reetha, Glycerin, and Aloe Vera. The antibacterial efficacy of these herbal ingredients against common pathogens is discussed, along with their potential for skin-friendly formulations. Various formulation techniques and parameters for optimizing the efficacy, stability, and sensory attributes of the hand wash are highlighted. Additionally, different evaluation methods including antimicrobial activity testing, physical stability assessment, and consumer acceptability studies are reviewed. The integration of these natural ingredients into a hand wash formulation offers a promising alternative to synthetic antibacterial agents, catering to the growing consumer preference for herbal-based personal care products.[1]

KEYWORDS: Polyherbal, antibacterial hand wash,Tulsi,Neem, Formulation and Evaluation of herbal hand wash.

INTRODUCTION:

Skin is the essential organ in the body that covers a tremendous degree of the body that makes a difference in regulating the body temperature, tactile reactions and contain numerous microbes and micro-organisms. Those microbes utilize these emissions of the body and turn them into metabolites that surrender a characteristic body scent. Cleanliness of the hand is an essential prerequisite to anticipate and in controlling infections.[2]

In recent years, there has been a growing awareness and preference for herbal products due to their perceived safety, efficacy, and environmental friendliness. Among various herbal formulations, herbal hand washes have gained significant attention, especially considering the increasing concern over microbial infections and the need for effective hand hygiene practices.Tulsi (Ocimum sanctum), Neem (Azadirachta indica), Reetha (Sapindus mukorossi), Glycerin, and Aloe Vera are well-known botanical ingredients recognized for their antimicrobial, soothing, and skin-nourishing properties. Combining these natural ingredients into a hand wash formulation presents a promising avenue for developing a potent antibacterial product with minimal adverse effects.Tulsi, commonly referred to as Holy Basil, possesses strong antimicrobial properties due to its rich content of essential oils such as eugenol, thymol, and camphor. Neem, known as the "village pharmacy" in India, is renowned for its broad-spectrum antimicrobial activity attributed to compounds like nimbin, nimbidin, and azadirachtin. Reetha, or Soapnut, contains saponins that exhibit natural cleansing and foaming properties, making it an ideal ingredient for hand wash formulations.Moreover, Glycerin acts as a humectant, attracting moisture to the skin, thereby preventing dryness and maintaining skin hydration. Aloe Vera is valued for its soothing and healing properties, making it beneficial for skin irritation and inflammation.The synergistic combination of these herbal ingredients in a hand wash formulation not only provides effective antibacterial action but also ensures gentle cleansing and nourishment for the skin. Furthermore, the use of herbal ingredients aligns with the growing consumer preference for natural and eco-friendly products, contributing to sustainable practices in personal care.This review aims to explore the formulation and evaluation aspects of antibacterial herbal hand washes incorporating Tulsi, Neem, Reetha, Glycerin, and Aloe Vera. By examining the efficacy, safety, sensory attributes, and stability of such formulations, valuable insights can be gained to optimize their performance and meet consumer expectations in terms of efficacy and user experience.

In the present review anti herbal hand wash containing bioactive constituents such as Ocimum tenuiflorum, Sapindus mukorossi, Azadirachta indica and Aloe vera was formulated and its anti-bacterial efficacy was evaluated in various methods.[3-4]

LITERATURE REVIEW:

- Nameera H. A et al.,(2023) Development and Anti-Microbial Study of Herbal Hand Wash Using Nimba, Tulsi, Sourabhanimba, Kumari.

- Dr. Satendra Kumar et al.,(2022) FORMULATION, DEVELOPMENT AND EVALUATION OF NOVELPOLYHERBAL HANDWASH CONTAINING MEDICINAL PLANT: (MIMOSA PUDICA, AZADIRACHTA INDICA, OCIMUM SANCTUMAND GLYCYRRHIZA GLABRA).

- Jagtar Singh et al.,(2022) Formulation and Evaluation of Anti-Microbial Herbal Hand Wash Gel Containing Aqueous Extract of Sapindus Mukorossi.

- Megha Bahuguna et al.,(2016) FORMULATION AND EVALUATION OF HAND WASH.

➢ Mr.Bhise Akash Bhagwan et al.,(2021) FORMULATION AND EVALUTION OF HERBAL HAND WASH BY USING NATURAL INGREDIENTS BY SIMPLE METHOD.

➢ Aditi Srinivasan et al.,(2022) Formulation and evaluation of organic handwash prepared from herbal extracts.

➢ Aziz Mohammad Khan et al.,(2021) Development and Standardization of Neem and Aloe Vera based Herbal hand wash using Low Cost Indigenous Technology.[12-13]

Advantages of Herbal Hand Wash:

1. Side effects is not applicable.
2. Accept verious types of Skin and body.
3. Toxic Free
4. Friendly in environmental.
5. Prevent all types of harmful bacteria and germs.
6. Biodegradable
7. Removal of elasticity from the skin.
8. Remove the dirt and effectively from the skin.[12]

SCOPE OF STUDY

Aim Of Research:

★ Develop a polyherbal hand wash formulation utilizing natural ingredients such as tulsi, neem, reetha, glycerine, aloe vera, carbopol 940, methyl paraben, rose oil, and purified water.

★ The antimicrobial properties of the herbal ingredients with the moisturizing and cleansing properties of other components to create an effective hand hygiene produc.t

★ To optimize the formulation to achieve a balance between antimicrobial efficacy, sensory attributes (such as fragrance and texture), and user acceptability.

★ The aim is to assess various parameters of the formulated hand wash through in vitro testing[14]

★ determining the pH level to ensure compatibility with skin, evaluating viscosity and spreadability for ease of use, and conducting antimicrobial tests to measure the effectiveness against common pathogens.

★ The goal of this evaluation is to confirm the efficacy and safety of the product for practical use.

★ This aim focuses on ensuring that the hand wash not only cleanses but also helps to maintain the natural moisture balance of the skin, preventing dryness and irritation.

★ Identifying the active compounds responsible for the antibacterial activity within the polyherbal formulation.[15]

Objective Of Research:

- ❖ To design a formulation that balances antibacterial efficacy with sensory attributes and skin compatibility.
- ❖ To assess the antibacterial activity of the formulated hand wash against a panel of bacteria, including both Gram-positive and Gram-negative strains.
- ❖ To conduct skin irritation tests, such as patch testing or in vitro skin irritation assays, to ensure the formulation's safety for regular use on skin.[17-18]
- ❖ To monitor changes in antibacterial activity, pH, viscosity, and appearance of the hand wash over time.
- ❖ To optimize the formulation based on the results of antibacterial efficacy, safety, and stability testing.
- ❖ The motive of our present work is to formulate and evaluate to the herbal hand wash using natural ingredients to prevent personal cleanliness.
- ❖ To protect the skin form hazardous microbes free.
- ❖ To prevent different kind of contagious illnesses.[18-20]

Purpose of research

The purpose of the research on the formulation and in vitro evaluation of polyherbal antibacterial hand wash is to develop an effective product for hand hygiene that utilizes natural ingredients known for their antibacterial properties. This research aims to assess the efficacy of the formulation in killing bacteria commonly found on hands, thus contributing to the development of safer and more environmentally friendly hand hygiene products.

Plan of research

- Literature Review
- Selection of Herbal Ingredients
- Formulation Development
- Antibacterial Efficacy Testing
- Comparison with Commercial Products
- Safety Evaluation
- Optimization
- Documentation and Reporting

Benifits of herbal hand wash

- ★ It also in removal of elasticity from the skin.
- ★ The perfume of the herbal hand wash keeps the skin fresh and lithe.
- ★ The mild foaming action does not cause any irrigation while using herbal hand. Wash.
- ★ The herbal hand washes are very mild yet very effective and can terminate the spread of viruses and germs.
- ★ It also helps to remove the dirt and effectively from the skin.

HERBAL INGREDIENTS:

1.Tulsi:

Synonyms: Holy basil, Ocimum sanctum

Biological Source: Tulsi leaves

Family: Lamiaceae

Information: Tulsi has antimicrobial properties and is commonly used in herbal formulations for its antibacterial effects.[5-6]

Fig:- TULSI.

Fig.No:1 Tulsi

Uses:

- Antibacterial Properties
- Natural Fragrance
- Skin Soothing
- Antioxidant Benefits
- Traditional Healing
- Gentle Cleansing
- Environmentally Friendly

Benefits:

- Antimicrobial Properties
- Skin Soothing
- Antioxidant Effects
- Astringent Properties
- Traditional Healing

2.Neem:

Synonyms: Azadirachta indica

Biological Source: Neem tree leaves and seeds

Family: Meliaceae

Information: Neem is known for its antibacterial and antifungal properties, making it a valuable ingredient in herbal hand wash formulations.[7-9]

Fig.No:2 Neem leaves

Uses:

- Moisturizing
- killing bacteria and germs on the hands
- preventing fungal infections on the skin
- preventing dryness and roughness
- Scalp Health

Benefits:

- helping to keep the hands free from fungal infections
- beneficial in reducing the spread of viruses

3.Reetha:

Synonyms: Soapnut, Sapindus mukorossi

Biological Source: Soapnut tree fruit

Family: Sapindaceae

Information: Reetha contains saponins, which have natural cleansing properties and can help in removing dirt and bacteria from the hands.[10-11]

Fig.No:3 Reetha pods

Uses:

- Cleaning Agent
- Also use in Hair Care
- used in face masks and cleansers
- Medicinal Purposes

Benefits:

- Gentle on Skin
- Moisturizing
- killing germs and reducing the risk of infections
- Environmentally Friendly
- Using reetha in hand wash can be cost-effective

4.Glycerin:

Synonyms: Glycerol

Biological Source: Typically derived from plant or animal fats

Information: Glycerin is a humectant that helps to retain moisture in the skin, making it an important ingredient in hand wash formulations to prevent dryness.

Fig.No:4 Glycerine

Uses:

- moisturizing properties
- It helps to prevent the skin from drying out
- making it feel smoother and more luxurious
- contribute to the texture of the hand wash

Benefits:

- Attracting moisture to the skin and helping to keep hands hydrated.
- Glycerine has soothing properties that help to calm irritated or inflamed skin.
- Regular use of hand wash containing glycerine can help soften the skin.
- Helping to lock in moisture and prevent loss of hydration.
- Glycerine is gentle on the skin and is unlikely to cause irritation.

5.Aloe Vera:

Synonyms: Aloe barbadensis

Biological Source: Aloe vera plant leaves

Family: Asphodelaceae

Information: Aloe vera has soothing and moisturizing properties, and it also possesses antibacterial and antifungal effects, making it beneficial for skin health in hand wash formulations.

Fig.No:5 Aloe Vera

Uses:

- Skin Repair
- Gentle Cleansing
- Antimicrobial
- Moisturizing
- Soothing

Benefits:

- Aloe vera is rich in vitamins, minerals, and antioxidants that help to hydrate and nourish the skin.
- Beneficial for minor cuts or abrasions that may occur on the hands.
- Making it suitable for individuals with sensitive or irritated skin.
- Reducing the risk of infections or skin issues.
- Making it suitable for daily use and for all skin types.

6.Purified water:

Synonyms: Aqua, distilled water

Biological Source: Processed to remove impurities

Information: Purified water serves as a solvent and diluent in hand wash formulations, ensuring the proper mixing of ingredients and providing a base for the product.

Fig.No:6 Purified water

Uses:

- surfactants
- moisturizers
- fragrances

Benefits:

- maximizing their therapeutic properties in the hand wash
- leaving hands feeling moisturized and refreshed after washing
- Dilution
- making it easy to dispense and spread on the hand
- Water contributes to the desired texture and consistency of the hand wash
- Natural Base

7.Rose Oil:

Synonyms:Attar of roses

Biological Source:Rosa centifolia

Family:Rosaceae

Information:Rose oil is often included in herbal hand wash products for its pleasant fragrance and potential skin benefits. It's known for its soothing properties and ability to hydrate and moisturize the skin. Additionally, rose oil is sometimes used for its antimicrobial properties, which can help in keeping hands clean and germ-free. However, it's essential to check the specific ingredients and concentrations in the hand wash to understand the benefits it offers.[21]

Fig.No:7 Rose oil

Uses:

- Antibacterial Properties
- Skin Hydration
- Mood Enhancement

Benefits:

- Helping to effectively cleanse hands and eliminate harmful bacteria.
- The pleasant scent of rose oil adds a luxurious touch to the herbal hand wash.
- Leaving hands delicately perfumed after use.
- Helping to hydrate and nourish the skin while washing.
- Rose oil provides a gentle and non-irritating option for hand washing.

METHODOLOGY:

INGREDIENTS

Tabel No:1 Herbal Ingredients

Sr.No	Ingredients	Family	Latin Name	Quantity
1	Tulsi	Lamiaceae	Ocimum Sanctum	7%
2	Neem	Meliaceae	Azardiracta indica	10%
3	Aloe Vera gel	Asphodelaceae	Aloe barbadensis	8%

4	Reetha	Sapindaceae	Sapindus Mukorossi	5%
5	Glycerine	-	Glycerol	14%
6	Purified water	-	Aqua pura	50%
7	Rose oil	Rosaceae	Rosa Damascena	q.s
8	Sodium Lauryl Sulphate	-	sodium dodecyl sulfate	5%
9	Propyl paraben	-	–	0.3%
10	Carbapol 940	-	-	2%

Table No:2 Required apparatus

Sr.No	Apparatus
1	Water bath
2	Glass rod
3	Breaker
4	Spatula
5	Stand

Table No:3 Function of herbal ingredients

Sr.No	Ingredients	Functions
1	Tulsi	Antimicrobial
2	Neem	Antimicrobial
3	Aloe vera	Antimicrobial

4	Reetha	Foaming agent and antimicrobial
5	Glycerine	Moisturizer
6	Rose oil	Smoothing Property and Fragrance
7	Purified water	Remove Contaminated and base material
8	Sodium Lauryl Sulphate	Foaming agent
9	Carbapol 940	Gelling agent
10	Propyl paraben	Preservative

METHOD OF PREPARATION:

Procedure:

1.Gather the Ingredients:

Collect the required ingredients: Tulsi, Neem, Reetha, Glycerine, Aloe Vera gel, Rose oil and purified water.

2.Prepare the Herbal Infusion:

1.Take 7ml of Tulsi and 10ml of Neem.
2.Remove any impurities or debris from the leaves.
3.In a pot, add 50ml of water and bring it to a boil.
4.Add the Tulsi, Neem, and 5g of Reetha or SLS and carbapol 940 is 2ml and methyl paraben is 0.3%to the boiling water.
5.Let it simmer for about 20 -30minutes on medium heat.

3.Cooling and Straining:

1.After simmering, turn off the heat and let the mixture cool down to room temperature.
2.Once cooled, strain the liquid using a fine sieve or cheesecloth to remove the solid residues.
3.Squeeze out as much liquid as possible from the leaves and pods.

4.Adding Glycerine and Aloe Vera:

1.Measure 14ml glycerine and 8g of Aloe Vera gel and q.s of rose oil.
2.Add them to the strained herbal liquid

5.Mixing:

1.Stir the mixture well using a spoon or whisk to ensure that all the ingredients are thoroughly combined.
2.Continue stirring until the glycerine, rose oil and Aloe Vera gel are fully incorporated into the herbal liquid.

6.Bottling:

1.Carefully pour the prepared herbal hand wash into a clean, empty hand wash bottle or container.
2.Use a funnel if necessary to avoid spills.
3.Seal the bottle tightly with a cap or pump dispenser

7.Labeling and Storage:

1.Optionally, label the bottle with the name and date of preparation.
2.Store the herbal hand wash in a cool, dry place away from direct sunlight.
3.Shake well before each use to ensure even distribution of the ingredients.

EVALUATION TEST:

Table No:4 List of evaluation tests

Sr.No	Tests
1	pH test
2	Viscosity
3	Grittiness
4	Foam height
5	Foam retention
6	Skin irritation
7	Cleaning action
8	Stability

1.pH:

Measures the acidity or alkalinity of the hand wash. The pH level is important as it can affect skin compatibility and the effectiveness of antibacterial agents.

The pH of formulations was measured by digital pH meter.

2.Viscosity:

Refers to the thickness or consistency of the hand wash. Proper viscosity ensures easy application and adherence to the skin, enhancing its effectiveness.

The density of herbal hand wash was determined by using Brookfield viscometer. 50ml of herbal hand wash is taken into 100ml of beaker and the tip of viscometer was dipped into the beaker containing hand wash formulation and its viscosity was measured.

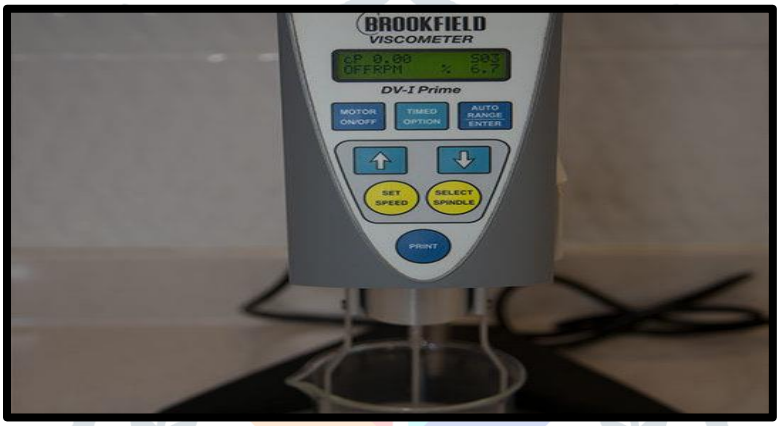

Fig.No:8 Brookfield Viscometer

3.Grittiness:

Evaluates the presence of any abrasive particles in the hand wash that may provide a scrubbing action for better cleaning. However, excessive grittiness can cause irritation to the skin.

Grittiness on Polyherbal hand wash was does not found.

Fig.No:9 Grittiness Test

4.Foam height:

Indicates the ability of the hand wash to produce lather or foam. Foam height can contribute to the perception of cleansing efficacy and user satisfaction.

0.5gm of sample of Herbal handwash was taken and dispersed in 25 ml distilled water. also, transferred it into 500 ml stoppered measuring cylinder; volume was making up to 50 ml with water. 25 strokes were given & stand till waterless volume measured up to 50 ml & measured the foam height; above the waterless volume.

5:Foam Retention:

50ml of the herbal hand wash taken into the 200ml cylinder and Shaked 9 time the volume of foam at 1min.up to 3min is recorded.

Table No:5 Evaluation Test results

Sr.No	Test Name	Result
1	pH	6.20
2	Viscosity	60cps
3	Foam height	150ml
4	Foam retention	20ml

6. Skin irritation:

Assesses the potential for the hand wash formulation to cause irritation or adverse reactions on the skin. It's crucial to ensure that the product is gentle and safe for regular use.

The herbal hand wash wash tekan on the hands till observation.

The hands wash observed after an hour the skin is under the sing of irritancy, redness, itching or not comfortable to us etc.

Fig.No:10Apply Hand Wash

Fig.No:11 After Washing Hand

7.Cleaning action:

Evaluates how effectively the hand wash removes dirt, oil, and bacteria from the skin surface. A good cleaning action is essential for maintaining hand hygiene.

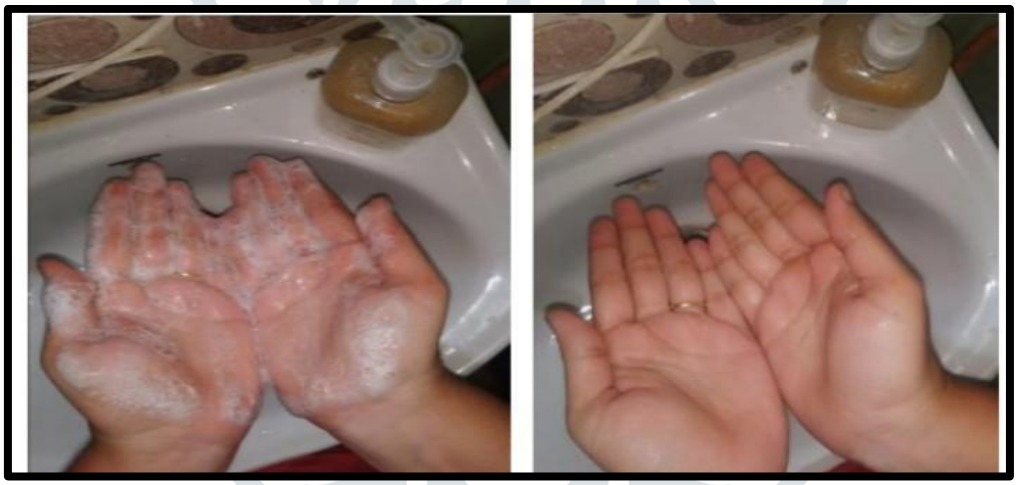

Fig.No:12 Hand Cleaning

8.Stability:

Determines the stability of the formulation over time, including factors like shelf life, consistency, and preservation of active ingredients.

The Stability of Polyherbal Antibacterial Hand Wash storing at different temperatures condition upto few days. During the stability no change in colour, no change in odour

RESULT AND DISCUSSION:

The Polyherbal hand wash evaluation results, such as pH, viscosity, foam height, foam retention, stability studies, Skin irritation test, grittiness, cleaning action given in Table no.2

We observed that the polyherbal hand wash showed light green and greenish-yellow in color with a bitter smelly light lemony fragrant.

pH-The pH of formulations was measured by digital pH meter. The pH formulation was found to be 6.20 that concider to the no irritating and suitable for skin

Grittiness -nevar found to be grittiness and smooth to applicable.

Viscosity- The viscosity of Polyherbal hand wash was determined by using Brookfield Viscometer and the viscosity of Polyherbal hand wash recorded to be 60cps

Stability testing - there is no colour change or phase separation in the formulate Polyherbal hand wash dusring the stability testing.

Foam height - In the prepare Polyherbal hand wash the foam height and foam retention is measured respectively 300ml- 20ml

Cleaning action - the prepare Polyherbal hand wash was taken on hand and mix few water the appearance of hand wash is measured and hand clean very well

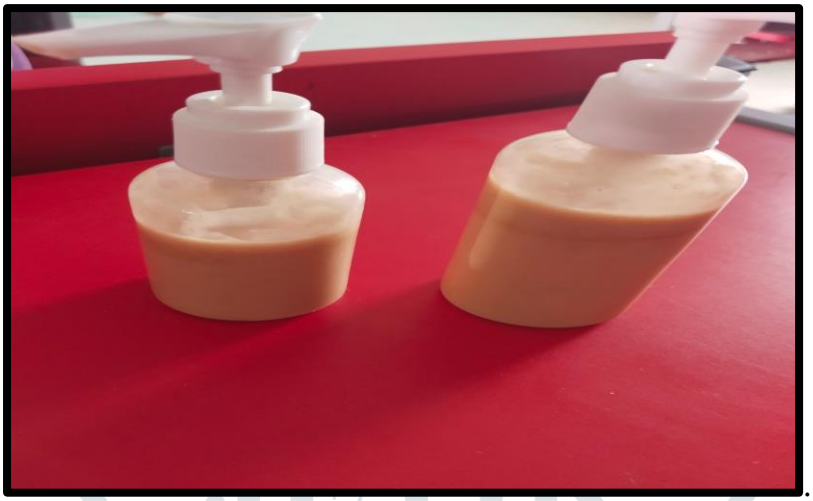

Fig.No:13 final product

Table No:6: Evaluation result of hand wash

Sr.No	Parameters tested	Results
1	Colour	Yellowish
2	Appearance	Translucent
3	Texture	Smooth
5	Irritancy	No.redness, no itching,No infection
6	Spreadability	Good
7	Homogenicity	Good

CONCLUSION:

The polyherbal antibacterial hand wash formulated with Tulsi(Ocimum sanctum), Neem (Azardiracta indica), Reetha(Sapindus mukorossi), aloe vera(Aloe barbadensis), glycerine(Glycerol), rose oil(Rosa Damascena), and purified water(Aqua pura) we have many types of evaluation studies Colour, Odour, pH and Viscometer and grittiness, foam height and foam retention and also cleaning action showed promising results in vitro, indicating its potential efficacy in combating bacteria. Further studies, including clinical trials, are necessary to assess its effectiveness in real-world scenarios and its safety for regular use.

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