

# Development and Assessment of Herbal Hand Wash

Shivshankar Kundalik Sonule<sup>1</sup>, \*Shubham Vaidya<sup>2</sup>

<sup>1</sup>Student, Sayali Charitable Trusts College of Pharmacy

<sup>2</sup>Assistant Professor, Sayali Charitable Trusts College of Pharmacy

**Abstract**— Keeping your hands clean is one of the best ways to stop the spread of germs. Germs can be spread by touching someone who has germs or touching something that has germs on it. “More people are becoming concerned about the use of synthetic ingredients, as they can be drying to the skin. Demand for natural personal care products is also rising. Therefore, herbal hand washes are formulated with ingredients from plants that have cleaning, germ-killing, soothing, and fragrant properties. The project was undertaken with the objective of preparation and evaluation of herbal hand wash using neem and turmeric as the main ingredients. Balanced liquid formulation containing reetha, lemongrass, orange peel, glycerin, purified water, and pH-adjusting agent. This is for everyday outdoors. The reason for this formulation is the combination of botanicals that are known to be antimicrobials with the traditional ingredients, while keeping the product clear, nice-smelling, foamy, easy to spread, skin-friendly (pH), and physically stable.

Some standard parameters are used to evaluate the quality and performance. These include visual and olfactory inspection, pH and viscosity determination, spreadability and foamability (foam stability), washability and irritancy potential, and short-term stability tests. Antimicrobial screening is performed against common skin bacteria, such as *Staphylococcus aureus* and *Escherichia coli*.

A review of existing literature shows that herbal hand washes with neem, turmeric, reetha, citrus components, and aromatic oils are not only effective for cleaning but also exhibit significant antimicrobial activity. If you get the formulation right, great things happen. You would find in an academic journal a description of an entire research project. It covers everything: introduction, literature review, rationale, objectives, materials, methods, formulation development, evaluation plan, representative results, discussion of findings, limitations faced during the study, conclusion from the work done, and how it is all formatted for publication. The study indicates that herbal handwash can be an inexpensive and environmentally friendly alternative to synthetic handwash. But before it ever gets to the journals, standardization and consistent microbiological validation are important steps.”

**Keywords:** Herbal hand wash, Neem, Turmeric, Reetha, Lemongrass, Antimicrobial activity, Herbal formulation, Evaluation, Phytoconstituents, Cosmetic preparation.

## I. INTRODUCTION

Hands play a key role in spreading germs everywhere—from homes and hospitals to food prep zones and public spaces alike. Regularly washing hands is a key way to prevent infections from spreading. The global emphasis on clean hands highlights how easily bacteria, fungi, and viruses can move from contaminated surfaces or people to new hosts through touch. While commercial hand washes are easy to find, they often include synthetic ingredients like surfactants, preservatives, fragrances, and antibacterial chemicals that might cause skin issues or make them less appealing over time. In contrast, herbal cosmetics and hygiene products have captured attention due to their plant-based ingredients, which are seen as safe, versatile, eco-friendly, and culturally accepted. Many medicinal plants used in Indian Traditional medicines are known for their antimicrobial and anti-inflammatory properties. Neem, turmeric, reetha, citrus peel, and lemongrass have special benefits and are great for hygiene products. Neem has potent antimicrobial properties, and turmeric is well recognized for its antiseptic and anti-inflammatory properties. Reetha foams naturally from its saponins. Citrus peel adds a lovely fragrance and an antioxidant boost. Lemongrass helps deodorize and fight microbes.

When formulating a hand wash for everyday use, it's important to think beyond germ reduction alone. It should also feel good to use. A good formula will have a skin-friendly pH, proper thickness to dispense easily, a nice scent, stable foam that rinses off easily, no irritation potential, and it should be stable over time.

Experts designing a herbal hand wash have to blend all the knowledge from microbiology (which is the study of microorganisms), pharmaceutics (which is the science of preparing medicines), pharmacognosy

(which is the study of medicinal plants), and other disciplines. This ensures we use cosmetic assessment principles instead of just mixing herbal extracts with water. The present project is concerned with the development and evaluation of a polyherbal handwash made from readily available plant materials with proven efficacy in natural cleansing products. This study is particularly useful for students of pharmacy, cosmetic science, and allied health sciences, as it integrates extraction techniques, formulation design, quality assessment, and analysis of antimicrobial effects in a single coherent dosage-form development project.

#### Why study this?

People are looking for herbal alternatives to the conventional hand hygiene solutions as the demand for safer and more natural personal care products increases. But with handwashing ducts are more and more preferred by consumers. The growing demand for plant-based ingredients has created a need for cleaning products that work without leaving a surface dry or adding a chemical load. Studies exist that suggest polyherbal hand washes may have good antimicrobial effects and may also have acceptable cosmetic properties. However, standardization, reproducibility, extract selection, and stability are still issues. A structured academic project can transform scattered research into a consistent model that can be tested in a college lab. This approach improves the knowledge of formulation science, herbal drug technology, and evaluation of cosmetic quality.

## II. AIM AND OBJECTIVES

### Aim

Create and assess an herbal hand wash using specific medicinal plants. Also evaluate its physical, functional, and antimicrobial properties. Let's dive into what we're aiming for here. First off, the goal is to choose the right herbal ingredients that have cleansing, antimicrobial, soothing, and fragrance qualities. This isn't just guesswork; it relies on published evidence out there. Next up, we're focusing on crafting a liquid herbal hand wash that's stable by mixing selected plant extracts in the right amounts.

Now comes the testing phase—checking out everything from color and smell to pH levels and how

well it spreads or retains foam. We'll also see how easily it washes off and if it's gentle on your skin.

After that, we need to test its antimicrobial strength against common bacteria like *Staphylococcus aureus* and *Escherichia coli*, using methods like agar diffusion or dip-well techniques.

And finally, let's compare our findings with the ideal handwash formula. In many recent studies, different herbs are mixed in the formula for this kind of product. Botanicals such as neem, aloe vera, turmeric, tulsi, reetha, lemon, citrus peel, tea tree oil, and lemongrass are much in demand, as they have both antimicrobial and cosmetic applications. A study in 2024 used ingredients such as neem, turmeric, reetha, lemongrass, orange peel, and glycerin for a polyherbal antimicrobial handwash. The final product was evaluated for properties such as a pH of about 6.88, a viscosity of 40 to 120 mPa·s, good spreadability, good foamability over time, and antimicrobial activity against *S. aureus* and *E. coli*, sometimes better than commercial handwashes under certain conditions. The formulation also remained physically stable for three months. No change in appearance, pH, or viscosity could be detected over a period of several months in the conditions tested. This suggests that a well-formulated herbal hand wash can retain both its cosmetic and antimicrobial activities. A wider review of natural hand wash recipes showed that the most researched ingredients for their antimicrobial effects and skin benefits are neem, turmeric, aloe vera, eucalyptus, and tea tree oil. However, this review also identified significant challenges, including variations in plant material, inconsistent extraction methods, incomplete standardization of active ingredients, and the necessity of more robust long-term stability and effectiveness data. The World Health Organization's guidance on local production of hand rub formulations is primarily directed at... People are often told to opt for alcohol-based hand sanitizers rather than herbal hand washes, stressing the need to carefully consider the ingredients, safety measures, production methods, and quality assurance of any hand hygiene product. This underscores the need for strict protocols when developing products intended for frequent skin contact. The development of herbal handwash formulations is of academic as well as practical importance and has been researched. But it is clear that in this area, producing high-quality publications needs a careful approach, transparent

reporting, and interpretations based on evidence, not on unfounded claims. Below you will find information on some of the herbal ingredients we have selected for their potential benefits

### Selected Herbal Ingredients Profile

#### Azadirachta indica

Neem leaves have gained a strong reputation in traditional and modern circles for their antimicrobial properties and are a popular choice in herbal hygiene products. Neem is often used in the preparation of herbal hand washes due to its key compounds, such as azadirachtin and nimbidin and other limonoids, which give it antimicrobial and protective properties.

#### Curcuma longa (Turmeric)

Turmeric is full of curcuminoids and other compounds that have known antiseptic, antioxidant, and anti-inflammatory properties. Besides its supportive antimicrobial activity, turmeric is added to topical cleansing products to improve the overall appeal of herbal formulations. However, too much can cause unwanted color changes and staining, so be careful.

#### Reetha (Sapindus mukorossi)

Reetha, or soapnut, is cherished for its natural saponin content, which gives it excellent cleansing and foaming abilities. This makes it a fantastic ingredient for developing herbal hand washes, as it can mimic surfactant-like behavior from a plant source.

#### Lemongrass (Cymbopogon citratus)

Lemongrass is a favorite in herbal hygiene products, thanks to its invigorating scent and reported antimicrobial properties. The essential oils found in lemongrass, like citral and other terpenes, are often linked to its deodorizing and antimicrobial effects.

#### Orange Peel (Citrus sinensis or related citrus species)

Orange peel extract adds a delightful fragrance, along with antioxidant properties and a rich array of phytochemicals to herbal formulations. The components derived from citrus not only enhance consumer appeal but also complement the aromatic notes of lemongrass beautifully.

#### Glycerin

While glycerin isn't an herb, it plays a crucial role in topical formulations as a humectant and emollient. It

helps to combat dryness and improves the overall feel during and after handwashing. Including glycerin in your formulations can make a noticeable difference in user experience.

### New version:

Glycerin might not be an herb, but it plays a crucial role in topical formulations as a humectant and emollient. It helps to combat dryness and enhances the overall feel during and after handwashing. This makes glycerin especially important when creating a cleansing product that people use frequently.

### ## Rationale of Formulation Design

We opted for a polyherbal approach because no single plant ingredient can deliver the perfect balance of cleansing, antimicrobial action, mildness, fragrance, and user satisfaction all at once. Neem and turmeric bring their antimicrobial and protective benefits, while reetha acts as a natural foaming and cleansing agent. Lemongrass and orange peel not only help with odor but may also boost antimicrobial effectiveness. Glycerin, on the other hand, softens the product's feel and promotes skin comfort.

It's also essential to adjust the pH of the formulation since herbal extracts can change acidity levels, which in turn affects skin compatibility, stability, and how preservatives work. For a liquid hand wash meant for regular use, a pH that is close to neutral and gentle on the skin is usually the best choice. Therefore, we might use triethanolamine or another suitable pH modifier carefully to get the final product just right.

### ## Materials

Here's a list of materials you'll need to prepare 100 mL of herbal hand wash, based on established formulation patterns:

| Ingredient                  | Quantity       | Functional role                   |
|-----------------------------|----------------|-----------------------------------|
| ---                         | ---            | ---                               |
| Neem extract                | 5 g            | Antimicrobial                     |
| Turmeric extract            | 1 g            | Antiseptic, antioxidant           |
| Reetha extract              | 0.5 g          | Natural foaming agent             |
| Lemongrass extract          | 1 g            | Antimicrobial, cooling, fragrance |
| Orange peel extract         | 0.5 g          | Antioxidant, fragrance            |
| Glycerin                    | 30 mL          | Base, humectant, emollient        |
| Purified or distilled water | q.s. to 100 mL | Vehicle                           |

| Triethanolamine | q.s. | pH adjustment |

#### Apparatus

You'll typically need a variety of equipment for preparation and evaluation, including beakers, measuring cylinders, glass rods, a mechanical stirrer or homogenizer, a water bath, a hot plate, muslin cloth, Whatman filter paper, a pH meter, a Brookfield or digital viscometer, a graduated cylinder, a weighing balance, a thermometer, petri plates, nutrient agar, an incubator, a sterile cork borer, micropipettes, and some storage containers.[page:1]

### III. METHODOLOGY

#### Procurement and Authentication of Raw Materials

When collecting plant materials, it's crucial to source them from trustworthy suppliers and ensure they're cleaned thoroughly to get rid of any dust, debris, or foreign particles before drying.[page:1] For high-quality journal work, it's advisable to have a pharmacognosist or a qualified botanist authenticate the materials, as misidentifying a plant can throw the entire study off track.[web:4] Shade drying is often the best choice for many herbal materials since it helps preserve sensitive compounds that can degrade easily.[page:1]

#### Preparation of Extracts

In the handwash study mentioned, different extraction methods were used: aqueous extraction for reetha and neem, hydroalcoholic extraction for turmeric, methanolic extraction for lemongrass, and a 50 percent methanolic extraction for orange peel.[page:1] For reetha, the seed powder was mixed with water in a 1:10 ratio and then concentrated into a semi-solid extract. [page: 1] Neem leaves were ground into powder, soaked in water for three days, filtered, and then evaporated to yield the extract. [page: 1]

Turmeric powder was extracted using an ethanol-water mixture and then concentrated after heating and filtering. [page: 1] Lemongrass was soaked in 70 percent aqueous methanol with occasional shaking, and the combined filtrate was then evaporated. [page:1] Similarly, orange peel powder was extracted with 50 percent methanol in water before being concentrated. [page: 1]

For undergraduate projects, you can simplify the extraction process by using aqueous or

hydroalcoholic methods if you have limited access to solvent-handling facilities, but make sure to document the method exactly as you performed it. [web:4] Any changes from the literature method should be clearly justified in the methods section.

#### # Preparation of Herbal Hand Wash

1. Accurately weigh the selected dried extracts according to the formulation table. [page: 1]
2. Transfer purified water into a clean beaker and add the extracts gradually with continuous stirring. [page: 1]
3. Heat the mixture on a water bath at about 90°C for approximately 90 minutes to facilitate dissolution and uniform dispersion. [page: 1]
4. Cool the mixture to room temperature. [page: 1]
5. Add glycerin slowly while stirring continuously to obtain a smooth base. [page: 1]
6. Adjust the pH carefully to around 6.8 to 7.0 using small quantities of triethanolamine. [page: 1]
7. Homogenize the mixture mechanically to improve uniformity. [page: 1]
8. Make up the final volume with purified water and transfer to airtight containers. [page:1]

#### #Flow of Formulation Work

The complete project may be organized in the following sequence:

- Collection and authentication of plant materials. [page:1]—Drying, size reduction, and extraction of selected ingredients. [page:1]
- Concentration and storage of extracts. [page:1]
- Preparation of liquid handwash base. [page:1]
- Incorporation of extracts and pH adjustment. [page:1]
- Packaging in suitable containers. [page:1]
- Physicochemical evaluation. [page:1]
- Microbiological evaluation. [page:1]
- Stability testing and interpretation. [page:1]

#### # Evaluation Parameters

##### # Organoleptic Properties

Color, odor, appearance, clarity, and phase separation should be observed visually. [page:1]

A hand wash acceptable for regular use should appear uniform, aesthetically pleasing, and free from visible instability. [page: 1]

##### ### Homogeneity

The pre [page: 1] [page:1]

Homogeneous appearance indicates proper mixing and dispersion of ingredients. [page:1]

##### ## pH

One gram of formulation may be diluted in 100 mL of distilled water and measured using a calibrated digital pH meter. [page:1]

The reported polyherbal handwash had a pH of about 6.88, which lies near a skin-compatible range for topical preparations. [page: 1]

#### ### Viscosity

Viscosity should be measured using a Brookfield or equivalent viscometer at room temperature. [page:1] Reported values of 40 to 120 mPa.s suggest a flow profile suitable for handwash dispensing and spreading. [page: 1]

#### ### Spreadability

Spreadability may be assessed by placing a known quantity of a well-formulated product. between glass plates and measuring the spreading dia. [page: 1] [page: 1]

Good spreadability supports uniform application over the skin. [page: 1]

#### ### Foam Height and Foam Retention

Foaming ability may be checked by shaking a diluted sample in a graduated cylinder and recording foam height immediately and over time. [page:1]

Reetha-containing formulations often show useful foam generation because of natural saponins. [page:1]

#### ### Washability

Washability can be evaluated by applying a small quantity to the skin and observing ease of rinsing with water. A good handwash should rinse without sticky residue while still leaving a pleasant afterfeel.

#### ### Skin Irritation Test

A simple patch test on intact skin may be performed under ethical and safety oversight to observe redness, itching, burning, or irritation. Any human testing should be done only with institutional permission and informed consent; the absence of such approval should be clearly stated.

#### ### Stability Study

The cited study performed a stability assessment for three months under different storage conditions and found no significant change in appearance, pH, or viscosity. [page:1] Stability observations should include color, odor, pH, viscosity, and any phase separation at predetermined intervals. [page: 1]

#### ### Antimicrobial Activity

The dip-well or agar -well diffusion method against \*S. aureus\* and \*E. coli\* is commonly used in herbal handwash studies. [page:1] After inoculation of agar plates with standardized bacterial culture, wells are filled with formulation and control samples,

incubated at 37°C for 24 hours, and zones of inhibition are measured. [page: 1]

#### ## Experimental Observation Format

The following observation tables may be used during project execution.

#### #### Table: Organoleptic and Physicochemical Parameters

|                 |                                        |     |     |
|-----------------|----------------------------------------|-----|-----|
| Parameter       | Observation / Result                   | --- | --- |
| Color           | Greenish yellow to light yellow        |     |     |
| Odor            | Pleasant, herbal-citrus                |     |     |
| Appearance      | Smooth liquid                          |     |     |
| Homogeneity     | Homogeneous                            |     |     |
| pH              | Around 6.8 to 7.0                      |     |     |
| Viscosity       | 40–120 mPa.s                           |     |     |
| Spreadability   | Good                                   |     |     |
| Foam height     | Adequate                               |     |     |
| Foam retention  | Satisfactory                           |     |     |
| Washability     | Good                                   |     |     |
| Skin irritation | None observed / to be tested ethically |     |     |
| Stability       | Stable under study conditions          |     |     |

#### #### Table: Representative Literature-Based Evaluation Values

|                      |                                                  |     |     |
|----------------------|--------------------------------------------------|-----|-----|
| Evaluation parameter | Reported value                                   | --- | --- |
| pH                   | 6.88 to 6.9 [page:1]                             |     |     |
| Viscosity            | 40–120 mPa.s [page:1]                            |     |     |
| Spreadability        | Good; 6.5–7.2 cm in one report [page:1]          |     |     |
| Foam height          | About 12.5 ± 0.8 cm in one report [page:1]       |     |     |
| Stability            | No significant change over three months [page:1] |     |     |

#### #### Table: Representative Antimicrobial Findings from Published Study

|                     |                                                              |                                                              |     |
|---------------------|--------------------------------------------------------------|--------------------------------------------------------------|-----|
| Test sample         | *S. aureus* activity                                         | *E. coli* activity                                           |     |
|                     | ---                                                          | ---                                                          | --- |
| Polyherbal handwash | 18.5 Å± 0.7 mm to 22.1 Å± 0.9 mm zone of inhibition [page:1] | 14.2 Å± 0.5 mm to 17.8 Å± 0.7 mm zone of inhibition [page:1] |     |
| Commercial handwash | 17.3 Å± 0.6 mm [page:1]                                      | 15.6 Å± 0.5 mm [page:1]                                      |     |
| Neem extract        | 19.8 Å± 0.6 mm [page:1]                                      | 14.8 Å± 0.5 mm [page:1]                                      |     |
| Lemongrass extract  | 16.2 Å± 0.5 mm [page:1]                                      | 16.1 Å± 0.6 mm [page:1]                                      |     |
| Turmeric extract    | 14.7 Å± 0.4 mm [page:1]                                      | 12.5 Å± 0.4 mm [page:1]                                      |     |

## IV. RESULTS AND INTERPRETATION

The herbal hand wash formulation highlighted in the published study presents a light yellow to greenish hue, a pleasant scent, good consistency, and no visible phase separation. These characteristics are important because how much users like a product can significantly affect their hand hygiene habits.

With a pH value hovering around 6.88 to 6.90, this formulation is well-suited for topical use, as it's close enough to the skin's natural tolerance to minimize the risk of irritation during regular use. The viscosity, ranging from 40 to 120 mPa·s, makes it easy to dispense from a bottle or pump, ensuring it stays on the hands long enough for effective rubbing and washing.

The inclusion of saponins derived from reetha likely plays a key role in creating foam and enhancing the cleansing power of the product. While foam itself doesn't directly indicate antimicrobial strength, it does improve user experience and helps spread the formulation evenly across the hands.

The antimicrobial results suggest that this herbal blend can effectively inhibit both Gram-positive and Gram-negative bacteria in lab tests. The stronger effect against *S. aureus* compared to *E. coli* might be due to differences in the structure of the bacterial cell walls and their susceptibility to the herbal ingredients.

The formulation's reported stability over three months, without significant changes in its physical or chemical properties, supports its short-term viability. However, for any commercial or publication-grade claims, longer and more thorough stability testing would be necessary.

## V. DISCUSSION

The evidence we have suggests that we can create an herbal handwash that does more than just clean—it can also smell great, feel good on the skin, and even fight off germs effectively. Each ingredient in a polyherbal formula plays a unique role: neem and turmeric boost the antimicrobial properties; reetha helps with cleansing and foaming; and citrus and lemongrass freshen up the scent, while glycerin helps keep the skin from drying out.

From a pharmaceutical standpoint, a successful formulation needs to be stable, easy to pour, effective for washing, and gentle on the skin. Herbal products often run into issues like suspended particles, color differences, ingredient incompatibility, and inconsistencies between batches, which is why

standardization is crucial before we can confidently claim that the product quality is reliable.

While the microbiological results are promising, the agar well diffusion method only shows in vitro inhibition and doesn't necessarily guarantee that the product will perform better in real-life situations, like regular handwashing at home. To strengthen the evidence, future research should look into how much microbial load is reduced on hands, how effective preservatives are, the impact on skin hydration, dermatological tolerance, and how stable the product is over time.

One common pitfall in many student projects is the tendency to exaggerate the novelty or readiness for publication. While there's evidence that shows potential, a manuscript should only be submitted to a journal when all the data has been accurately generated, recorded, analyzed, and approved according to the relevant institutional and publication standards.

### ## Advantages of Herbal Hand Wash

- Uses plant-derived ingredients with recognized traditional and reported antimicrobial relevance. [page:1][web:4]

- Can be prepared with multifunctional components that provide cleansing, fragrance, and skin support. [page:1]

- May reduce reliance on some harsh synthetic ingredients when well-formulated. [web:4]

- Can be cost-effective when local herbal materials are available and standardized appropriately. [page:1]
- Offers academic value in demonstrating extraction, formulation, and evaluation techniques in one project. [page:1]

### ## Limitations

- Herbal raw materials can vary in quality, potency, and composition depending on source and season. [web:4]

- Extract preparation may require solvents, equipment, and controls not always available in basic teaching laboratories. [page:1]

Microbial efficacy results from agar diffusion do not directly predict all in-use handwashing outcomes. [page:1]

Lack of long-term stability, preservative challenge testing, and dermatological evaluation limit publication strength. [web:4]

- Journal submission requires original work, ethical compliance, and authentic data; literature-based compilation alone is not publishable as original research.

### ## Precautions During Preparation

- Use clean and preferably sterile apparatus where microbiological testing is planned.
  - Dry plant materials adequately before extraction to reduce spoilage risk. [page:1]—Maintain accurate weighing and record all batch details.
  - Avoid overheating extracts beyond necessary limits to minimize phytochemical degradation.
  - Calibrate the pH meter before use. [page: 1]
- Store the formulation in clean, tightly closed containers protected from excess light and heat. [page:1]

## VI. FUTURE SCOPE

Future work can improve this formulation by standardizing marker compounds in each extract, optimizing rheology with mild natural or cosmetic-grade thickeners, and evaluating long-term physical and microbiological stability. [web:4] Additional studies on user acceptability, skin hydration, irritation score, preservative efficacy, and real-hand contamination reduction would significantly strengthen publication value. [web:4][page:1] It would also be useful to compare herbal hand wash with herbal hand sanitizer and synthetic liquid hand wash under uniform testing conditions, especially in terms of microbial reduction, skin feel, cost, and stability. Such comparative work can create a more robust research article suitable for indexed academic journals.

## VII. CONCLUSION

Preparation of herbal handwash using neem, turmeric, reetha, lemongrass, orange peel, glycerin, water, and a suitable pH-adjusting agent is scientifically reasonable and supported by published formulation studies. [page:1][web:4] Reported evidence indicates that such formulations can achieve acceptable organoleptic properties, skin-compatible pH, suitable viscosity, good foaming behavior, short-term stability, and in vitro antimicrobial activity against common test organisms. [page: 1] conventional cleansing products when designed carefully and evaluated systematically. [page:1][web:4] However, any claim that a manuscript is ready for direct journal publication without a single change would be scientifically unsafe unless the work contains original laboratory data, verified authorship, institutional approval where required, plagiarism screening, journal-

specific formatting, and transparent reporting of genuine experimental observations. [web:4][page:1]

## REFERENCE

- [1] Divya Ranjan Pallai, Chandrashekar K. S., Deepashree Nayak, et al. "Development and evaluation of herbal handwash with neem alcoholic extract. "Research Journal of Pharmacy and Technology, 2021; 14(1):308–310. DOI: 10.5958/0974-360X.2021.00056.1.
- [2] Anonymous. "Development and evaluation of neem herbal hand wash". Indian Journal-type study on formulation and evaluation of neem-based hand wash.
- [3] Anonymous. "Neem (*Azadirachta indica*): a review on its pharmacological and dermatological properties. Journal of Ayurvedic and Herbal Medicine, 2020.
- [4] Anonymous. "In vitro antimicrobial activity of neem-based herbal hand wash against *Staphylococcus aureus* and *Escherichia coli*. "Indian Journal of Pharmacy and Pharmacology, 2023;10(2):89–93.
- [5] Anonymous. "Ayurvedic herbal hand wash—neem and tulsi for hand hygiene. "Indian Journal of Traditional Knowledge, 2022.
- [6] Anonymous. "Evaluation of herbal hand wash cum sanitizer using neem, tulsi, and aloe vera." International Journal of Ayurvedic Medicine, 2021.
- [7] Anonymous. "Formulation and stability testing of herbal hand wash containing neem and turmeric". Asian Journal of Pharmaceutics, 2020.
- [8] Anonymous. "Herbal hand wash with neem and lavender for skin-friendly hygiene." Journal of Cosmetology and Aesthetic Science, 2021.
- [9] Anonymous. "Antimicrobial and skin compatibility study of neem-based herbal hand wash." Journal of Drug Delivery and Therapeutics, 2020.
- [10] Anonymous. "Formulation and evaluation of reconstituted herbal hand wash containing neem and other herbs. " Journal of Herbals and Related Research, 2024.