INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

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Research Article

Formulation Evaluation of Polyherbal Handwash

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ARTICLE INFO

Published: 23 Apr 2026
Keywords:
Ocimum sanctum, Margosa Tree, Soapberry Sapindus mukorossi
DOI:
10.5281/zenodo.19703718

ABSTRACT

The personal hygiene awareness are increasing in the people now days for better healthy life. But the adverse effects of synthetic chemicals are shown in the formulations. The formulated polyherbal handwash was evaluated for various physicochemical and quality control parameters, including pH, viscosity, foaming ability, spreadability, and stability. Phytochemical screening was performed to confirm the presence of bioactive constituents such as flavonoids, tannins, saponins, and essential oils. Microbial evaluation, including antibacterial activity against common pathogens, was also carried out to assess its efficacy. Hand washing is an extremely significant precaution. Hand hygiene is the single most important simplest and least expensive mean of preventing nasocomial infection. The present study focuses on the formulation and evaluation of a polyherbal handwash using medicinal plant extracts known for their antimicrobial and skin-protective properties.The results demonstrated that the formulated handwash possessed acceptable physicochemical properties, good foaming capacity, and stability over a defined period. The presence of active phytoconstituents contributed to significant antimicrobial activity, indicating its effectiveness in maintaining hand hygiene.

INTRODUCTION

The herbal medicine is also known as botanical treatment or phyto-medicine.herbal medication refers to the uses of any plant seeds, root, leaves, bark, flower and aerial part for medicinal purpose. Herbal medicine have been the treatment and care of numerous disease. Skin being the most exposed part of our body requires protection from skin pathogen. To defend the skin from harmful micro-organism to avoid spreading disease. Hand washing is extremely significant precautions. Hand hygiene is the single most important simplest and least expensive mean of preventing nasocomial infection. Hand washing is main purpose of cleaning hands with removing soil,dirt ,pathogenic microorganisms and avoid transmitting of transient microorganisms. Hygiene

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

is basically defined as the branch of science which is involved in knowledge and practice related to promotion of health.the concept highlights the need of maintaining Hygiene in prevention of disease. Spread of infection (bacterial or viral) can be prevented hygiene practices, an herbal drug treatment gives healthy life.[1]

Hand hygiene plays a vital role in preventing the spread of infections and maintaining overall health. Most commercial handwashes contain synthetic chemicals that may cause skin dryness and irritation on repeated use. To overcome these issues, the present study focuses on the formulation of a polyherbal handwash using natural ingredients such as Tulsi, Neem, Reetha, Beetroot, Glycerin, and salt .

Img. No. 1. : Herbal Handwash

Advantages :-

- Free from harsh synthetic chemicals and artificial additives
- Made from natural and plant-based ingredients, making it safe for regular use.
- Gentle on skin and suitable for all age groups.
- Helps maintain natural moisture of the skin.
- Provides effective cleansing and hygiene.

Disadvantage:-

- Lower and inconsistent foaming compared to chemical-based products.
- Color and fragrance may change over time.
- Herbal odor may not be liked by all users.

1.2 PLANT PROFILE

1. TULSI :-

Synonym: *Ocimum sanctum* , *Ocimum tenuiflorum*

Biologycal Source : Tulsi consists of the dried leaves and flowering tops of *Ocimum sanctum* (also known as *Ocimum tenuiflorum*), belonging to the family **Lamiaceae.**

Figure No.2: Tulsi

Chemical Constituent :

Volatile oil

- Eugenol
- Methyl eugenol
- Camphor

Caryophyllene

- Phenolic compounds
- Rosmarinic acid

Flavonoids

- Orientin
- Vicenin

Uses :

- Acts as a natural antimicrobial agent
- Helps in killing bacteria and germs on hands
- Prevents skin infections and rashes
- Provides soothing and cooling effect to skin
- Reduces inflammation and irritation
- Supports wound healing of minor cuts

2. NEEM :-

Synonyms: *Margosa Tree ,Nim , Azadirachta indica*

Biological Source: Neem consists of the dried leaves, bark, seeds, and other parts of *Azadirachta indica* A. Juss., belonging to the family *Meliaceae.*

FIG. NO.3: NEEM

Chemical Constituents: Neem contains various bioactive compounds, mainly:

- Limonoids , nimbin
- Flavonoids , nimbidin
- Triterpenoids
- Tannins
- Glycosides
- Fatty acids (in neem oil)

Uses :

- Acts as a strong natural antimicrobial agent
- Helps in removing germs and bacteria
- Prevents skin infections
- Reduces itching and irritation
- Promotes healthy and clean skin

Suitable for sensitive and acne-prone skin.

3. REETHA :

Synonyms: Soapnut, Soapberry *Sapindus mukorossi.*

FIG. NO.4: REETHA

Biological Source: Reetha consists of the dried fruits (pericarps) of *Sapindus mukorossi* Gaertn., belonging to the family ***Sapindaceae***.

Chemical Constituents: Reetha mainly contains:

- Saponins (major active constituents)
- Sugars
- Mucilage

- Fatty matter
- Resin, Saponins are responsible for the natural foaming and cleansing action.

Uses:-

- Acts as a natural cleansing agent
- Produces natural foam
- Removes dirt, oil, and microbes
- Gentle on skin compared to synthetic surfactants
- Enhances washing efficiency
- Makes the formulation eco-friendly
- Suitable for regular hand hygiene
- Improves overall quality of herbal handwash

4. BEETROOT :-

Synonyms: Beet, *Garden Beet, Table Beet, Beta vulgaris*

Biological Source: Beetroot consists of the fresh or dried tuberous roots of *Beta vulgaris* L., belonging to the family *Amaranthaceae.*

Chemical Constituents: Beetroot contains:

- Betalain
- Phenolic compounds
- Flavonoids
- Vitamins (A, B-complex, C)
- Minerals (iron, potassium, magnesium)
- Sugars and organic acids

FIGURE NO.3: BEETROOT

Uses

- Acts as a natural colorant
- Enhances the appearance of the formulation
- Provides antioxidant protection
- Nourishes and refreshes the skin
- Makes the product more attractive and herbal
- Safe alternative to synthetic dyes
- Adds skin-friendly properties
- Improves consumer acceptability

2. MATERIALS AND METHODS:-

2.1 Apparatus :-

I. Beaker
II. Measuring Cylinder
III. Mortal and pestle
IV. Volumetric Flask
V. Glass rod
VI. Conical Flask
VII. Test tube

Ingredient	Activity
Tulsi	Antimicrobial Agent
Neem	Antiseptic and antibacterial
Reetha	Foaming agent
Beetroot	Colouring agent , Antioxident
Glycerin	Moisturizing agent
Sodiun Chloride	Thickening Agent
Rose water	As a perfume
Methyl paraben	Preservative

Preformulation study:

Pre formulation study is an important phase in the development of pharmaceutical products. It involves evaluating the characteristics of the drug substance and its compatibility with excipients before creating the final formulation.

a) Bulk density

b) Tapped density

c) carr's index

d) Hausner's ratio

e) Angle of repose

f) %Ash value

g) Solubility

h) Antimicrobial study

2.3.1. BULK DENSITY:

The bulk density of a powder is the ratio of the mass of an untapped powder sample and its volume including the contribution of the inter-particulate void volume.

FORMULA:-

$$\text{BULK DENSITY} = \frac{\text{MASS}}{\text{BULK VOLUME}}$$

2.3.2.TAPPED DENSITY:

The tapped density is an increased bulk density attained after mechanically tapping a container containing the powder sample.

FORMULA:

$$\text{TAPPED DENSITY} = \frac{\text{MASS}}{\text{TAPPED VOLUME}}$$

2.3.3.CARR'S INDEX :-

Carr's Index of any solid is calculated for compressibility of a powder which is based on true density and bulk density.

FORMULA:

$$\text{Carr's Index} = \frac{\text{Tapped Density} - \text{Bulk Density}}{\text{Tapped Density}} \times 100$$

2.3.4. HAUSNER'S RATIO:-

Hausner ratio is defined as the ratio of a powder's tapped bulk density to its poured (loose) bulk density

FORMULA:

$$\text{HAUSNER'S RATIO} = \frac{\text{TAPPED DENSITY}}{\text{BULK DENSITY}}$$

2.3.5. ANGLE OF REPOSE:-

Angle of repose powder poured from a vessel forms a cone-like pile. The angle of repose- the angle between the slope of the pile and the horizontal correlates with the strength of particle-particle interactions and, therefore, is measured to infer flowability.

FORMULA: $\Theta = \tan^{-1}(h/r)$

Where,

h : the height in cm

r : the radius in cm

ɵ : the angle of repose

2.3.6. % ASH VALUE:- residues such as phosphates, carbonates and silicates present in herbal drugs

Formula:

$$\% \text{ ASH VALUE} = \frac{W2-W0}{W1} X100$$

Where,

W2: weight of crucible ash

WO: weight of crucible

W1: weight of sample

2.4. Qualitative Test:-

2.4.1 Test for alkaloids:-

2.4.1.1. Dragendorff's test:- To 1 ml of the extract, add 1 ml of dragendorff's reagent (Potassium Bismuth iodide solution). An orange-red precipitate indicates the presence of alkaloids.

2.4.2.2 Mayer's test:- To 1 ml of the extract, add 1 ml of Mayer's reagent (Potassium mercuric iodide solution). Whitish yellow or cream colored precipitate indicates the presence of alkaloids.

2.4.2 Test for saponins:-

Take small quantity of alcoholic and aqueous extract separately and add 20 ml of distilled water and shake in a graduated cylinder for 15 minutes lengthwise. A 1cm layer of foam indicates the presence of saponins.

2.4.3 Test for Tannins:-

About 200 mg of the plant extract was boiled with 10 mL of distilled water; and 0.1% Ferric chloride was added to the mixture; which was then observed for blue-black coloration indicating the presence of tannins.

2.4.4. Test for Flavonoids :-

200 mg of the plant extract was mixed with 10 mL of ethanol and filtrated. Two mL of the filtrate, concentrated HCl, and magnesium ribbon were mixed. The formation of a pink or red color indicates the presence of flavonoids. Adding 1 mL of distilled water and NaOH to 0.5 mL of crude extract, the formation of a yellowish color indicated the presence of glycosides.

2.5. Methods :-

2.5.1 Extraction:- The process of separating medicinally active portions of plant and animal tissues from the inactive or inert components using selective solvents through standerd extraction process

Types of Extractions:- 1) Decoction 2) Percolation 3) Maceration 4) Solvent Extraction method

Prepration of Extract (Decoction Extraction):-

10 gm of each dry plant material (Neem ,Tulsi , Reetha , Beetroot) were added in 100 ml of water .The mixture was heated on water bath at 30-50 min. and then filtered through filter paper to get the practical free extract .

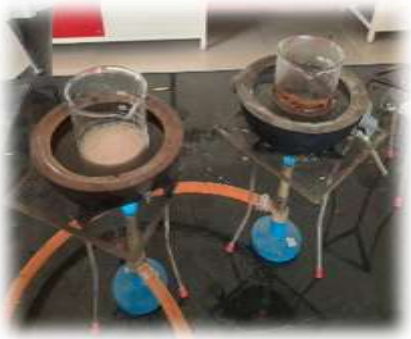

Figure No.4:

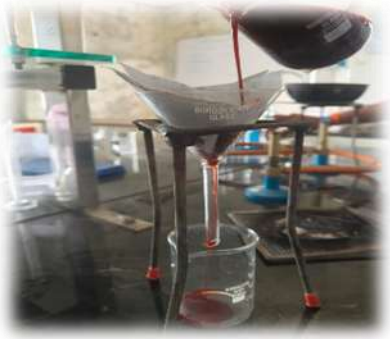

Figure No.5

2.5.2 Formulation of Hand Wash:-

- Collection of all ingredients
- Wash it properly
- Dry and griend
- Prepare aqueous extracts by boiling each powder
- Filter the extracts
- Heat the combined extract gently .
- Allow the mixture to cool to room temperature.
- Add Rose water in small quantity as a flavoring and fragrance agent.
- Stir continuously .
- Adjust volume .

Transfer the prepared herbal hand wash into clean, labeled containers.

2.6. Evaluation Parameter:-

1) pH
2) Viscosity
3) Skin Irritation
4) Organoleptic property
5) Foam height
6) Spreadability

2.6.1 pH :- The pH of the formulated hand wash is measured to ensure it is safe and compatible with skin. It is determined using a calibrated digital pH meter at room temperature. A small quantity of the hand wash is diluted with distilled water, and the electrode is immersed in the solution to record the pH. The ideal pH of a hand wash should be in the range of 5.5 to 7, which is suitable for maintaining skin integrity and avoiding irritation.

2.6.2. Viscosity :- Viscosity is the measure of the thickness and flow property of the hand wash formulation. It indicates how easily the liquid spreads and pours during use. Proper viscosity ensures good consistency, ease of application, and user acceptability. It is commonly measured using a viscometer (such as Brookfield viscometer) at controlled temperature. An ideal hand wash should have moderate viscosity—neither too thick nor too thin—for effective cleaning and handling.

6.3. Skin Irritation :- The formulated hand wash is applied on a small area of skin (usually forearm) and observed for redness, itching, or swelling. The site is monitored for 24–48 hours to check any adverse reaction. Absence of irritation indicates the formulation is safe for skin use.

2.6.4. Organoleptic property :- Organoleptic evaluation of the hand wash involves assessing its physical appearance such as color (chocolaty) , clarity, and consistency. It also includes checking the odor/ fragrance for acceptability and pleasantness. Additionally, texture and feel during use (smoothness, foaming, and after-feel on skin) are evaluated .

2.6.5. Foam height :- Foam height is an evaluation parameter used to measure the foaming ability of the hand wash formulation. It is determined by shaking a fixed quantity of sample with water in a graduated cylinder and recording the height of foam produced. Higher foam height indicates better foaming capacity and consumer acceptability.

2.6.6. Spreadability :- It is the ability of the hand wash to spread easily on the skin surface with minimal effort. It ensures uniform distribution of the formulation during application. Good spreadability indicates proper consistency and better user acceptability.

Figure No.6 Viscocity

Figure No.7 Spredability

Figure No.8. Foamheight

3. RESULT AND DISCUSSION :-

- **Collection of sample :-** Sample was collected from local area of Loha Dist. Nanded 431708
- **Authentication Letter:** The sample was authentified by Dr.Marahthe, HOD (botany dept.) of NES Science College , Nanded.

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Email : sciencecollege1956@gmail.com, www.sciencecollegenanded.org

31/01/2026

Certificate

I have studied the plant material submitted by **Ms. Sontakke Vaishnavi, Mr. Sontakke Vinayak, Sarnar Rameshwar, Taur Disha** and **Mr. Tidke Satyanarayan** students of **B. Pharm** under the guidance of **Mr. S. H. Chavan** (Project Guide), **D. K. Patil Institute of Pharmacy, Loha Dist. Nanded.**

I hereby identify and authenticate that the given Plant material is belonging to

Sr. No.	Botanical Name of Plant	Family
01	*Azadirachta indica A.Juss.*	Meliaceae
02	*Ocimum sanctum L.*	Lamiaceae
03	*Beta vulgaris L.*	Amaranthaceae
04	*Sapindus mukorossi Gaertn.*	Sapindaceae

This certificate is issued as per request and is given only for academic and Research use.

Dr. Vishal R. Marathe

Professor in Botany

(Plant Taxonomy Research Lab)

Department of Botany

N.E.S. Science College, Nanded

3.2 Preformulation Study :-

Table no 2: Preformulation table of *Ocimum sanctum*

Parameter	A (Seive No. 80)	B (Seive No.100)
Bulk Density g/ml	0.83	0.50
Tapped Density g/ml	1.25	0.83
Carrs Index %	65.15%	59.41%
Hausner's ratio	1.5	1.66
Angle of Repose	36'5	32'8

Table no 2:Preformulation table of *Sapindus mukorossi*

Parameter	A (Seive No. 80)	B (Seive No.100)
Bulk Density g/ml	0.62	0.55
Tapped Density g/ml	0.83	0.83
Carrs Index %	73.86 %	65.43%
Hausner's ratio	1.33	1.5
Angle of Repose	30'2	32'8
Ash Value	18.8%	14.1%

Table no 3:Preformulation table of *Beta vulgaris*

Parameter	A (Seive No. 80)	B (Seive No.100)
Bulk Density g/ml	0.71	0.62
Tapped Density g/ml	1.25	0.76
Carrs Index %	55.5%	80.81 %
Hausner's ratio	1.67	1.22
Angle of Repose	21.92	33.3
Ash Value	40.2 %	24%

Table no 4.Preformulation table of *Azadirachta indica*

Parameter	A (Seive No. 80)	B (Seive No.100)
Bulk Density g/ml	0.69	0.55
Tapped Density g/ml	1.25	0.71
Carrs Index %	55.95 %	22.53%
Hausner's ratio	1.81	1.29
Angle of Repose	31'7	31'3
Ash Value	13.37 %	29 %

Figure No.9

Figure No.10

Figure No.11

3.3 Phytochemical test :-

Table no 5.Table for phytochemical test

Test	Observation	Result
Alkaloid Test 1) Dragendroff's Test	Orange red colour was obtained	Alkaloid was present
2) Mayre's Test	Creamy white precipitate was formed	Alkaloid was present
3) Wagners Test	Radish brown precipitate	Alkaloid was present
Flavonoid test Sample + few drop of NaOH, dilute HCI	Yellow colour diapper	Flavonoid was present
Tannin Sample + Ferric Chloride 2%	Blue-Black or Green Colour	Tannin was present
Saponin	Foam is forming	Saponin was present

Figure No.12

Figure No.13

3.4. Formulation table

Table no 6. Formulation of Hand Wash

Ingredient	Batch A	Batch B	Batch C
Neem	4ml	4ml	5ml
Tulsi	4ml	4ml	4ml
Reetha	5ml	6ml	5ml
Beetroot	2ml	2ml	2ml
Glycerine	6ml	7ml	6.5ml
Sodium Chloride	0.5 gm	0.5gm	0.5gm
Water	q.s	q.s	q.s
Rose Water	4ml	4ml	4ml
Methyl Parabean	0.5gm	0.5gm	0.5gm

Figure No.14

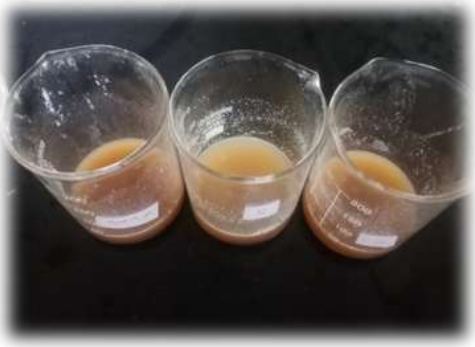

Figure No.15

3.4 Results of Evaluation Parameter:-

Table no 6. Table for evalution parameters

Sr no	Evaluation Parameter	observation
1	colour	Brown
2	odour	Delicate
3	pH	5.2
4	Foam height	5 ml
5	Foam retention	stable
6	Viscosity	38.99
7	Skin irritation test	No irritation

4. CONCLUSION:-

The formulated polyherbal handwash containing neem, tulsi, reetha, and other ingredients showed good cleansing ability with acceptable pH, viscosity, and spreadability. It was found to be skin-friendly and effective due to its natural antimicrobial properties. Overall, the formulation can be considered safe, economical, and suitable for daily use.

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HOW TO CITE: Sontakke Vinayak, Chavan Saiprasad, Sontakke Vaishnavi, Surnar Rameshwar, Taur Disha, Tidke Satyanarayane, Formulation Evaluation of Polyherbal Handwash, Int. J. of Pharm. Sci., 2026, Vol 4, Issue 4, 3778-3788. https://doi.org/10.5281/zenodo.19703718