



## Preparation of Polyherbal Hand Wash

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### ABSTRACT

Microbes and diseases are most commonly transmitted through the hands. Microbial infections have an impact on the skin, which is one of the most important parts of the body. The prevention of communicable diseases and the defence of the skin from hazardous germs depend on regular hand washing. The current study aims to create a polyherbal handwash using a variety of herbal plants, including *Albizia amara* (Arapp), *Hibiscus rosa-sinensis* (Hibiscus), and *Ocimum basilicum* (Sweet basil). Three formulations of a polyherbal hand wash were created, and the formulations appearance, color, odor, pH, viscosity, foam height, and foam retention duration were assessed. The agar plate method was used to evaluate the antibacterial efficacy of the three hand wash formulations against *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Escherichia coli*, and *Staphylococcus mutans*. The zone of inhibition measured demonstrated a considerable antibacterial effect of the polyherbal hand wash as it significantly inhibited bacterial growth in culture plates, according to its activity. It did not cause skin irritation. Consequently, these plant ingredients can be used to make Polyherbal hand wash on a commercial basis.

### INTRODUCTION

Skin is the first protection line of the human body and protects it from pathogens. So, to protect the skin from harmful microbes and to prevent the spreading of many contagious diseases hand washing is an important precaution. Infections and bacteria are primarily spread through the hands. The best way to stop the spread of dangerous bacteria and avoid infections linked to medical care is to practice good hand hygiene. Hand washing is the act of cleaning hands to remove soil, dirt, and pathogenic microorganisms and avoid transmitting transient microorganisms (1). Hand washing removes visible dirt from hands and reduces the number of harmful microorganisms such as *Escherichia coli* and *Staphylococcus aureus* that can be carried by people, food, animal, or equipment & transmitted. Vedic period (3500-1600 B.C.) books on Ayurveda describe practices, including the use of medicinal herbs. In modern complementary and alternative medical practice, plants are the primary source of therapeutics because bioactive components are present in each part of the plant, including the seeds, root, stem, leaves, and fruit.

The benefits associated with the use of medicinal plants are like they are cost-effectiveness and global availability. They are safe as compared to synthetic compounds. The main benefit of medicinal plants is their lack of side effects (2).

Herbal medicine has various therapeutic uses like healing, wound, treating inflammation, skin lesions, leprosy, diarrhoea, scabies, and venereal diseases. Plants have provided a good source of antimicrobial activity and act against several pathogenic microorganisms and resistance towards the synthetic drug (3).

*Ocimum basilicum* is a member of the family *Lamiaceae* and it is found in tropical Asia, Africa, and Central America. In folk medicine, it is used to treat vomiting, intestinal colic, and diarrhoea, menstrual pains, improve kidney function, skin prevent acne, and Skin Irritation (4). *Ocimum basilicum* leaves include substances including eugenol and vicenin, which have a potent antioxidant effect. Because this plant's leaves contain citronellol, limonene, and eugenol, it also exhibited anti-inflammatory qualities (5).

**Table 1 :** Taxonomic of *Ocimum basilicum* (6)

<b>Kingdom</b>	Plantae
<b>Phylum</b>	Magnoliophyta
<b>Class</b>	Magnoliopsida
<b>Order</b>	Lamiales
<b>Family</b>	Lamiaceae
<b>Genus</b>	<i>Ocimum</i>
<b>Species</b>	<i>basilicum</i>

*Albizia amara* belongs to the family Fabaceae, an important medicinal plant found throughout India. Significant medicinal components are present throughout the entire plant. This plant has been used as an important folk medicine for the treatment of several diseases like diarrhoea, gonorrhoea, skin diseases, poisonous bites, and leprosy (7, 8). *Albizia amara*'s wood is dark brown with lighter bands, very sturdy, and used to make cabinets for construction and agricultural purposes. *Albizia amara* plant extracts are widely utilized in traditional medicine (9).

China rose, or *Hibiscus rosa-sinensis* is a member of the

Malvaceae family. This plant has various important medicinal uses for treating wounds, inflammation, fever and cough, diabetes, infections caused by bacteria and fungi, hair loss, and gastric ulcers in several tropical countries (11). Hibiscus stem, root, leaf, and flower extracts have been studied, and the results showed that the photochemical components of the plant contributed to positive health effects for people, such as antioxidant activity, which is the removal of free radicals that can cause DNA damage (12). In India's rural areas, the blossoms were additionally employed as an abortifacient and a method of contraception for both sexes (13).

**Table 2 :** Taxonomy of *Albizia amara* (10)

<b>Kingdom</b>	Plantae
<b>Division</b>	Angiosperms
<b>Order</b>	Fabales
<b>Family</b>	Fabaceae
<b>Subfamily</b>	Mimosaceae
<b>Tribe</b>	Ingae
<b>Genus</b>	<i>Albizia</i>
<b>Species</b>	<i>amara lebbbeck</i>

**Table 3 :** Taxonomic of *Hibiscus rosa-sinensis* (14)

<b>Kingdom</b>	Plantae-Plants
<b>Class</b>	Magnoliopsida
<b>Order</b>	Malvales
<b>Family</b>	Malvaceae
<b>Genus</b>	<i>Hibiscus</i>
<b>Species</b>	<i>rosa-sinensis</i>

## MATERIALS AND METHODS

### Plant Collection:

A sample of *Ocimum basilicum*, *Albizia amara*, and *Hibiscus rosa sinensis* leaves was collected in September (2021) from the Theni district.

### Preparation of Plant Extract:

The collected plant leaves were washed with sterile water, dried, pulverized, and stored in air-tight bottles separately. The aqueous extract of each plant material was prepared by soaking the powdered plant parts in ethanol and sterile distilled water and heated using a heating mantel for about 60 min at 60°C and the polyherbal extracts were filtered using a Whatman filter and stored in the container. The ethanolic and distilled water extracts are shown in Figure 1 (15).

### Antibacterial Activity:

The antibacterial efficacy of *Ocimum basilicum*, *Albizia amara*, and *Hibiscus rose sinensis* extracts and polyherbal hand wash was evaluated against the two major acne-causing bacteria, *Staphylococcus aureus*, *Klebsiella pneumonia*, and *Escherichia coli*, by the well diffusion method. Nutrient Agar (NA) was prepared, sterilized, and poured into plates. (Nutrient Agar Composition (for 100 ml): Peptone: 0.5 g; beef extract: 0.3 g; sodium chloride: 0.5 g; agar: 1.5 g; total pH: 7.0). Pathogen test cultures were grown overnight, and 0.1% of each test organism's culture solution was scattered across the Petri plate using a sterile cotton swab while rotating the plate at an angle of 60 degrees. A 6 mm well borer was used to bore wells on the agar surface of each nutrient Agar plate. About 25 µl, 50 µl, and 100 µl of the samples were loaded into the well, and the plates were incubated in an incubator at 37 °C for 48 h. The antibacterial activity was determined by measuring the inhibitory zones around the wells loaded with natural dyes on all the nutrient agar plates containing test pathogens. The obtained clear zones were observed and measured in millimeters (mm) (16, 17, 18).

### Test Organisms:

Standard culture of *S.aureus*, *K.pneumoniae*, *S.mutans*, and *E.coil* is used in the assay. They were cultured and preserved at 4°C.

### Equipment:

Sterile Petri plate, Test Tube, Conical flask, Whatman filter paper, Incubator, Laminar air flow, pipetting device, Hot air oven.

### Physiochemical Parameters:

#### Physical Evaluation:

Physical evaluation (color, odor, and appearance) was done by sensory and visual inspection and compared with the marketed hand wash.

#### Chemical Evaluation:

##### pH:

Take 100ml of distilled water was used to dissolve 1gm of a sample of Poly Herbal Hand Wash. A digital pH meter that had previously been standardized was used to measure the solution's pH.

##### Foam Height:

A hand wash sample weighing one gram was diluted in 50 ml of distilled water. A measuring cylinder with a capacity of 500 ml received the dispersion. Water was added to the volume to make it 100 ml. There were awarded and set away 25 strokes. It was found that the foam rose over the water volume.

##### Foam Retention:

A 100 ml graduated cylinder was filled with 25 ml of the hand wash gel with 1% alcohol. A hand was placed over the cylinder, and it was shaken ten times. For four minutes, the volume of foam was measured at one-minute intervals (19, 20).

##### Skin Irritation:

Healthy human volunteers, including both male and female

**Table 4 :** Formulation of Polyherbal hand wash

S.no	Ingredients	Botanical Name	Sample	Gram
1	Sweet Basil	<i>Ocimum basilicum</i>	Leaf Powder	20 grams
2	Arappu	<i>Albizia amara</i>	Leaf Powder	20 grams
3	Chinese Hibiscus	<i>Hibiscus rosa-sinensis</i>	Leaf Powder	20 grams
4	Ethanol		Liquid	200ml
5	Sodium Laureth Sulfate		Powder	5 grams

prospects, underwent this evaluation. On a 6 cm<sup>2</sup> patch of skin, about 0.5 g of polyherbal hand wash was used. After an hour of exposure, the skin was examined for any irritation or redness (21).

#### Formulation of Polyherbal hand wash:

A set ratio is used to combine all of the extracted components (22). The Polyherbal Hand wash was prepared by the formula given in Table 4.

### RESULT AND OBSERVATIONS

#### Antibacterial Activity:

The Anti-bacterial efficacy of the formulation of polyherbal Hand Wash was tested against *Staphylococcus aureus*, *Klebsiella pneumonia*, *Escherichia coli*, and *Staphylococcus mutans* by agar plate technique. The results of the zone of inhibition (ZOI) showed that the hand wash prepared from ethanol extract of the combined plant materials show significant antibacterial activity.

The zone of inhibition of formulations measured is shown in Table 5 & Figure 2,3.

#### Physiochemical Parameters:

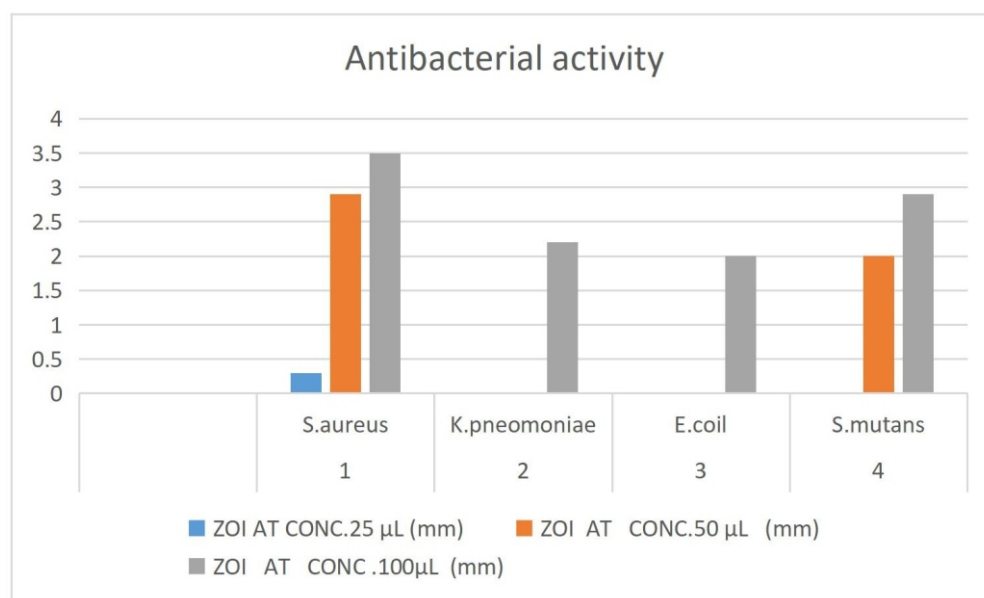
Parameters like color, odor, and appearance were carried out color and texture was evaluated by visual and touch sensation respectively. The odor was inspected by sensing the formulation. The pH solution was measured by a standardized digital pH meter Value is 6.0. The foam height was found to be 7, whereas the foam retention was noticed to be 5 min. The formulated hand wash has significant stability to withstand various high temperature. The observations of the evaluation of physiochemical parameters were given in table 7.

#### Skin Irritation Test:

Skin Irritation Test was evaluated by applying Polyherbal Hand Wash on the skin and left for 30 min, after 30 minutes of washing observe any itching, rashes, or redness on the skin by

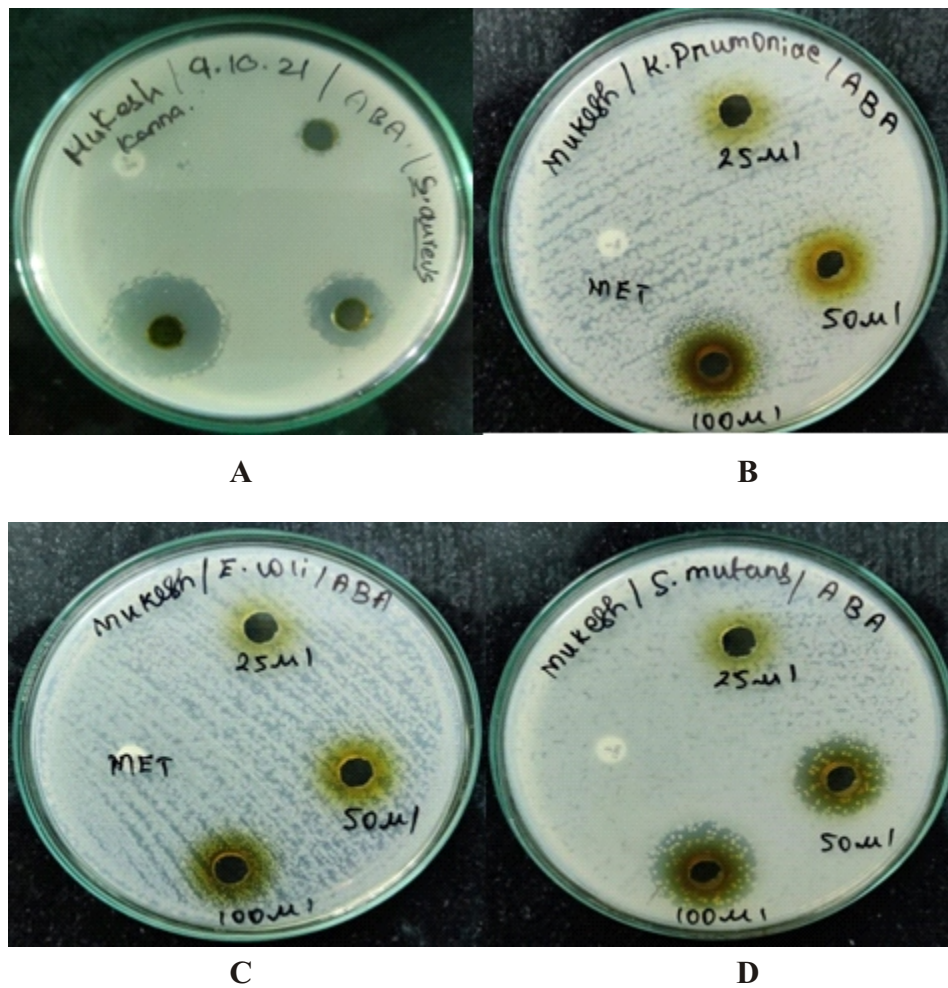
**Table 5 : SOCIO-DEMOGRAPHIC CATEGORIZATION**

S.No.	ORGANISM	ZOI AT CONC.	ZOI AT CONC.	ZOI AT CONC.
		25 $\mu$ L(mm)	50 $\mu$ L(mm)	100 $\mu$ L(mm)
1	<i>Staphylococcus aureus</i>	0.3	2.9	3.5
2	<i>Klebsiella pneumonia</i>	0	0	2.2
3	<i>Escherichia coli</i>	0	0	2.0
4	<i>Staphylococcus mutans</i>	0	2.0	2.9



**Figure 1 : Antibacterial Activity of Polyherbal Hand Wash**





**Figure 2 :** (A) *Staphylococcus aureus* (B) *Klebsiella pneumoniae*  
 (C) *Escherichia coli* (D) *Staphylococcus mutans*

**Table 7 :** Evaluation Parameters Test

S.No	Parameters	Result
1	Formulation	Hand Wash
2	Color	Brownish White
3	Odor	Aromatic
4	Appearance	Good
5	pH	6.0
6	Foam Height	7 cm
7	Foam Retention	5 min
8	High-Temperature Stability	Good

**Table 6 :** Skin Irritation for Subject 1, 2, and 3.

S.NO	Subject	Before Apply	After 30 min
1	Individual 1	No Irritation	No Irritation
2	Individual 2	No Irritation	No Irritation
3	Individual 3	No Irritation	No Irritation

**Applied Sample****After 30 min****Figure 3 :** Individual 1 Skin Irritation

sensory and visual inspection as shown in Table 6 and Figure 3. No irritation was occurred for all the individuals. Therefore, it is considered to be safe to apply.

**DISCUSSION**

Hand hygiene is critical for protecting yourself and others from the spread of infection. It has been recommended to wash hands with soap and water to get rid of germs since ancient times. These soapwater mixtures and synthetic hand wash solutions are effective at killing germs, but frequent use of them increases the risk of dermatitis, itching, irritation, and the development of susceptibility to antibiotics in microorganisms (23)

Plants have the ability to endanger a wide range of phytochemical and biochemical substances that can be adapted to perform various biological functions. Many of these botanical compounds have positive effects on human health over the long term when absorbed and can be effectively used to treat human diseases (24). The *Ocimum basilicum*, *Albizia amara*, and *Hibiscus rosa sinensis* are well-known for its anti-microbial activities (25, 26, 27).

The current study is focused on formulation of polyherbal

handwash using *Ocimum basilicum*, *Albizia amara*, and *Hibiscus rosa sinensis* leaves.

The agar plate method was used to investigate the antibacterial effectiveness of the six hand wash formulations against *Staphylococcus aureus* and *Escherichia coli*. Based on the zone of inhibition results, it was determined that every herbal hand formulation had a substantial antibacterial effect. The polyherbal hand wash formulation significantly inhibited bacterial growth in the culture plate (28). Likewise, the zone of inhibition against *Salmonella* 3.7 cm, *E. coli* with a diameter of 3.6 cm, *S. aureus* 3.2 cm, and other bacteria was created by a hand sanitizer made with *Azadirachta indica*, *Ocimum sanctum*, and *Citrus limon* (29).

The prepared formulation of Polyherbal Hand Wash was subjected to the following physiochemical parameters Table 4. The physiochemical parameters of the prepared hand wash are determined. The evaluation were done on variables such as pH, color, and appearance. The formulation exhibited a good appearance, and characteristics and pH were found in the range of 6.0, which is the desired pH. Other parameters such as the percentage of foam height, foam retention, and high-temperature stability were determined. The quality, effectiveness, and cleansing abilities of soap are actually determined by its physico-chemical characteristics (30).

Human skin possesses an acidic pH of 5.4 to 5.9, which is a crucial component in the defence against microorganisms. Highly alkaline pH may disrupt the lipid lamellae of the epidermis and harm the acid mantle, which may lead to skin dryness because of increased trans-epidermal water loss and the possibility of irritation and allergen exposure (31). Hence, the pH of the formulated handwash was found to be appropriate. Particles are successfully held in a colloidal suspension by foam, which is easily removed with fresh water and also could further boost bacterial decrease (32).

Other than effectiveness, topical products' interest is primarily driven by their safety. Natural products are frequently thought to be harmless, although this is not always the case. For this reason, appropriate tolerance studies are advised prior to any potential practical application (33). Therefore, the formulated handwash doesn't caused any kind of irritations to the tested individuals.

**CONCLUSION**

The results suggest that the hand wash prepared from the various extract of the herbs *Ocimum basicilicum*, *Albizia amara*, and *Hibiscus rosa-sinensis* shows higher antibacterial activity. Thus, the formulated polyherbal hand wash shows good antibacterial properties against skin pathogens. Furthermore, the physiochemical characteristics such as pH, appearance, and high-

temperature stability exhibited satisfactory characteristics. Hence from the above-mentioned parameters, this polyherbal hand wash is suitable for commercial purposes. Hence the basis for using herbs in preparation for hand washing and using these compounds in making antiseptic lotions or soaps in place of chemicals.

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