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Formulation and Evaluation of Polyherbal Handwash

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Abstract : Healthcare workers (HCWs), who labour in the healthcare profession, must be protected from external skin pathogens because the skin is the most exposed part of the body. The main means by which multidrug resistant pathogens are spread among medical professionals and patients is through their hands. As a result, hand-washing products are increasingly being used as antiseptics. There are a variety of chemical-based handwashes on the market, including alcohol-based sanitizers, chlorohexidine products, soaps, and solutions that help to more effectively decrease the spread of infectious diseases in the healthcare setting. However, these products have some limitations and negative side effects. their regular use may cause staphylococcus and other pathogens to become resistant, as well as cause cutaneous irritation

1INTRODUCTION

Healthcare workers (HCWs), who labour in the healthcare profession, must be protected from external skin pathogens because the skin is the most exposed part of the body. The main means by which multidrug resistant pathogens are spread among medical professionals and patients is through their hands. As a result, hand-washing products are increasingly being used as antiseptics. There are a variety of chemical-based handwashes on the market, including alcohol-based sanitizers, chlorohexidine products, soaps, and solutions that help to more effectively decrease the spread of infectious diseases in the healthcare setting. However, these products have some limitations and negative side effects. their regular use may cause staphylococcus and other pathogens to become resistant, as well as cause cutaneous irritation. Skin infections like staphylococcus, aureus pseudomonas spp, klebsiella pneumonia, and proteus vulgaris are also resistant to antibiotics. Handwashing is crucial in the battle against micropathogens and microbacterial agents. The hand wash and soaps wipe away the obvious dirt from the hands and lessen the amount of harmful, toxic microorganisms. E- coli and selemonella are two harmful bacteria that are spread by humans, animals, and food. In order to characterise the therapeutic

potential of different herbs, much work has been done on the use of traditional herbal products in south-east Asian countries. In this study, the surfactant properties of soap nut extract and the anti-microbial properties of neem oil have been explored and incorporated. Create a handwash with a gel foundation

Since ancient times, hand washing with soap and water has been considered a crucial component of personal hygiene and is frequently ingrained in spiritual and societal practises. Although the connection between hand washing and the spread of disease was established only two centuries ago, this can be viewed as extremely early in comparison to the discoveries made by Pasteur and Lister, who passed away decades later. Ignaz Semmelweis in Vienna (Austria) and Oliver Wendell Holmes in Boston (USA) both made the discovery that healthcare workers' hands disseminate the nosocomial infection in the middle of the 19th century.

Semmelweiss concluded from his observations made in 1847 that, despite washing his hands with soap and water before entering the clinic, the doctors' hands did not smell pleasant after conducting autopsies on the patients. Therefore, he proposed that "cadaverous particles" spread through contact with palms and resulted in childbed fever. Following the development of Pasteur's disease theory, which provided a theoretical justification for Semmelweis' findings, the latter's findings gained widespread recognition after the scientist's passing. In the 1980s, ideas of hand hygiene in healthcare underwent notable change. The first national hand hygiene guidelines were released simultaneously that year, and a number of other nations also issued the new recommendations in this array The CDC/HICPAC published two reports in 1995 and 1996. It is advised in the USA to cleanse hands with something other than antimicrobial soap or an alcoholic antiseptic

Skin is the largest organ in the human body and the outermost layer of tissue that is typically soft and flexible. It functions as a physical barrier between the interior and exterior environments and is responsible for maintaining homeostasis and providing security. Skin has a pH of 4 to 5.6. Three layers make up the skin:

the epidermis, the dermis, and the subcutaneous tissue.

(a) Epidermis
(b) Dermis
(c) Subcutaneous tissue

The skin's epidermis is the topmost covering. It is the skin's outermost covering. Epithelial tissue makes up this structure. Activities of the The epidermis provides contact and defence. This Skin is further separated into five sections, including the following:

The stratum corneum. The epidermis' topmost layer, the Stratum Corneum, is composed of 10 to 30 incredibly thin layers of dead keratinocytes that are constantly shedding. Because of the corneum's cells' horn-like toughening, it is known as the "Horny layer." Second, Stratum Lucidum Only found on the epidermis of the fingertip, palm, and sole, it is made up of four to six rows of clear, flat, dead keratinocytes that are heavily keratinized. No. 3 Stratum Granulosum Between the stratum spinosum and stratum lucidum is a narrow layer called the stratum granulosum. This layer aids in creating a waterproof shield that works to stop the body from losing fluid. The primary component of keratin, which is produced in this stratum, is

Stratum Spinosum Between the stratum basale and the stratum granulosum is the stratum spinosum layer. This layer gives epidermis flexibility and strength. Stratum Basale 5) (Stratum germinativum) Eight to ten rows of multiple-sided keratinocytes with bundles of keratin intermediate filaments; melanocyte and intraepidermal macrophage extensions are present. (b) The Dermis: The Dermis is the skin's inner layer. The dermis is located below the epidermis. Because blood vessels were present, the epidermis was nourished by

oxygen and nutrients and assisted in removing waste. It has nerves that assist us in relaying signals from the epidermis. These cues come in many different flavors, including touch, pressure, temperature, etc. Collagen, a peptide that is responsible for providing elasticity, is also present.

The Subcutaneous Tissue, also known as the Hypodermis or Subcutis, is the skin's deepest layer and is composed of fat cells and connective tissue. The Subcutis serves as an insulation layer to safeguard internal organs and muscles from shock and temperature shifts. The most exposed portion of our bodies, the skin, needs to be protected from skin pathogens. On the hands, transient and resistant flora type microbes are typically found. Staphylococcus aureus is an example of a resident flora that colonises lower skin layers. Gram negative bacilli is an example of a transient flora that colonises the superficial skin layers. [7] Natural remedies are more popular in the current mechanised lifestyle because people believe they are better and require fewer side effects. compared to the fake ones, side effects. The desire for herbal formulations is rising on the global market. A search of the classical texts for herbs with antimicrobial properties was made in light of this ultimatum, and it was discovered that Azadirachta indica (Neem) and Mentha Piperita (Pudina) possess this antimicrobial activity [8].

2 LITERATURE REVIEW

2.1) Zeeshan Afsaret et al. (2016)):

the development and assessment of multi-herbal soap and hand sanitizer. The goal of this research study was to create hand sanitizer and soap formulations using Cassia fistula, Milletia pinnata, and Ficus religiosa extracts while also examining the extracts' potential antimicrobial effects against common pathogens that cause nasocomial infections. Additionally, to assess the prepared formulations' testability and phytochemical parameters so that they can be further standardised and applied economically. Cassia fistula, Milletia pinnata, and Ficus religiosa were first collected by Zeeshan Afsaret et al. (2016) from the Mysore region, and the specimens were authenticated at RRL in Bangalore. Zeeshan Afsaret and colleagues employed Cassia fistula, Milletia pinnata, and Ficus religiosa leaves and bark that had been dried in a hot air oven atFor extraction, the material was dried at 35°C for three days, ground to a mesh size of #40, and stored airtight. Solvents like Petroleum ether, chloroform, ethyl acetate, methanol, and 40% methanol were used by Zeeshan Afsaret et al. (2016) for extraction. This study used the agar well diffusion technique for preliminary antimicrobial screening against the bacteria E. coli (MTCC - 1698), S. aureus (MTCC - 1143) and P. aeruginosa. (MTCC - 2453). To create the formulation, the extracts with the highest level of action were chosen. In their study, Zeeshan Afsaret et al. (2016) created the combination in two distinct concentrations, i. e. 250 mg each (750 mg) and 500 mg each (1500 mg), and these concentrations were then employed in the formulation and assessment parameter was evaluated. The majority of the extracts showed good antibacterial activity, although zones of inhibition spanning from 14 to 18 mm were particularly active in the ethyl acetate and methanolic bark extracts of Milletia pinnata, Cassia fistula, and Ficus religiosa. Additionally, the zones of inhibition for the produced formulations' antimicrobial activity tests ranged from 18 to 26 mm, which was much better than the zones of inhibition for individual extracts.

2.2) Rina maskare et al. (2019)

creation and assessment of a multi-herbal hand sanitizer. This project's goal was to create a herbal hand sanitizer and see if the mixture had any antimicrobial properties against the typical pathogens that cause nasocomial infections. Azadirachta indica and Eucalyptus globule leaves were used by Rina Maskare et al. (2019). The leaves were gathered from Gondia City in 2019 and later dried in sheds before being coarsely powdered and used in subsequent work. The technique used by Rina Maskare et al. (2019) for the formulation of hand sanitizer is as follows. Azadirachta indica and Eucalyptus globulus were first extracted in MIBP Gondia using ethanol and methanol that was purchased from S D FINE - CHEMLIMITED in Mumbai, India. Escherichia coli, Pseudomonas aeruginosa, and other bacterial strains are also present. demonstrated good antibacterial activity against E. coli, S. aureus, and B. subtilis with 1.56 mg/ml, 3.12 mg/ml, 3.12 mg/ml, and 1.56 mg/ml, 3.12 mg/ml, 3.12 mg/ml, respectively, and mild to moderate antibacterial activity against P. aeruginosa with 6.25 mg/ml and 12.5 mg/ml, respectively.

2.3) Mounika et al (2017)

creation and assessment of a multi-herbal hand wash gel using essential oils. Evaluation of the antibacterial efficacy of different herbal oils, including eucalyptus oil, cinnamon oil, geranium oil, peppermint oil, rosemary oil, colve oil, and orange oil, was the main goal of this research project. The pour plate method was used to test the herbal hand wash gel's anti-microbial effectiveness against common organisms, and the findings were compared to industry antibacterial standards. The oils are first collected by A. Mounika et al. from Allin exporters in Mumbai and Ooty. In this synergistic anti-microbial preliminary screening was conducted using pour plate methods against E. Coli and S. Aureus. A. Mounika et al. created two formulations, the first of which uses HPMC - 50 as a gelling agent. Using carbapol 940, and others. The project by A. Mounika et al. revealed the results after evaluation parameters were checked. The combination of cinnamon and geranium oil was equally efficient against both bacteria, according to zone of inhibition. Wider zones of inhibition are produced against S. aureus (7.5 mm) and E. coli (8 mm).

2.4)..Mashood Ahmed Shah et al. (2014)

evaluated the antibacterial effectiveness of a herbal hand wash gel and evaluated its composition. This study project's goal was to create and assess a polyherbal hand wash gel that contained cinnamon oil. Salmonella, E. coli, and S. Aureus were used as test organisms for the herbal hand wash gel's anti-microbial activity, and the findings were compared to industry antibacterial standards. The cinnamon, mentha, lavender, eucalyptus, and nutmeg oil were first procured from alpha compounds in India by Mashood Ahmed Shah et al. Salmonella, E. coli, and S. aureus were procured from Lincoln University College Malaysia's school of microbiology. In this synerio, gramme positive and gramme negative microbes were tested for anti-microbial activity using the spread plate method. Mashood Ahmed Shah and others developed a version of

3. Problem definition

Synthetic soap containing solutions that are now commonly available in the market do help reduce health care associated transmission of contagious diseases & pathogens more effectively but they do have some shortcomings or adverse effects. Their frequent use can lead to skin irritation and also create resistant among pathogens. Also the companies manufacturing such synthetic formulations leave these harmful chemicals into the environment which may lead to disturbance in the various eco systems. So this study gives a new approach to come back antibiotic resistant of pathogenic organism and provide safe and healthy living through germ free hand. As Herbal Hand wash contains natural ingredients that do overcome pathogenic resistance and also if left in the environment will not create any disturbance in the eco systems

Materials and method Collection of plant material:

The plants Neem [Azadirachta indica] & Peppermint [Mentha piperita] leaves were collected from Gurukrupa Institute of Pharmacy College Campus, Majalgaon. To remove sand particles from sample, wash it thoroughly with fresh water. The plant material dried under sunlight for 4 to five days. Then the dried plant material where crushed, sieved to get nearly fine amorphous powder. Powdered material was extracted with a suitable solvent. [8], [9]. Ritha powder, turmeric powder, Clove oil and Tulsi oil were collected from the local market of Majalgaon. Soil extract were chosen for antibacterial activity.

Extraction of plant material:

10 grams of each dry plant material Neem, Peppermint powder and 5gm of Ritha powder were added in water. The mixture was heated on water bath at 60^0 C for 1 hour, and then filtered through Whatman Filter Paper to get the Particle free Extract. [8], [10]

Authentication of plant material

The plant material was Identified and Authentify by Dr. I. B. Salunkhe (M. SC., Ph. D., and Head Department of Botany),Sunderrao Solanke Mahavidyalay, and Majalgaon. [11]

Method of Preparation

1) Polyherbal Hand wash Gel was prepared using Carbopol 940 as Gelling agent which is socked in 15ml distilled water overnight.
2) Neem and Peppermint extracts, Ritha Powder along with Tulsi and Clove oil were measured accurately and dissolved by gentle heating.
3) After heating, keep the solution aside for sometimes.
4) The required quantity of Sodium lauryl Sulphate dissolved in 10ml distilled water along with Glycerine were mixed in above aqueous phase with continuous stirring.
5) The methyl paraben was dissolved in remaining quantity of purified water and dispersed into the extract.
6) The swelled polymer (Carbopol 940) was stirred using a mechanical stirrer to ensure the uniform dispersion of polymer and finally added into the above mixture to forma Homogenous Gel and then the required quantity ofRose oil was added for Fragrance.
7) Lastly, it was stored in well closed container and labelledsuitably for further analysis [8], [9]

Formulation Table:

Table 1: Formulation Table

Sr. No.	Ingredients	Quantity (gm/ml)	Uses
1	Neem	10	Antimicrobial Agent
2	Tulsi	10	Purifying Agent
3	Pudina	5	Antibacterial Agent
4	Clove Oil	0.50	Antibacterial Agent
5	Ritha	5	Foaming Agent
6	SLS	3	Foaming agent
7	Carbopol 940	5	Gelling Agent
8	Methyl Paraben	0.50	Preservative
9	Glycerin	2.5	Softening Agent
10	Rose Oil	Q. S.	Perfume
11	Distilled Water	Up to 100ml	Vehicle
12	Turmeric	Q. S.	Colorant

Evaluation Parameters of Polyherbal Hand wash Gel

The following assessment criteria were applied to the prepared formulation of Polyherbal Hand Wash Gel :

1) **Organoleptic Evaluation**

Color, odor, and material parameters were tested. Visual and tactile perception were used, respectively, to assess colour and texture. Through the use of formulation sensing, the odour was examined.

2) **Appearance and Homogenicity:**

Visual inspection was used to assess appearance and homogenicity.

3) **Grittiness:**

The formulation was assessed after 1ml of Gel was taken on finger tips and rubbed between two fingertips.

4) **PH:**

100ml of distilled water was used to dissolve 1gm of Polyherbal Hand Wash Gel sample. A standardised digital pH metre was used to measure the pH solution.

5) **Spread ability:**

In order to prevent further spreading, 0.5gm of Polyherbal Hand Wash Gel Sample was placed between two slides and left in place for roughly 5 minutes. The spreaded circle's diameter, which was measured in centimeters, served as a benchmark for spread ability.

6) **Viscosity:**

Using an Ostwald viscometer, the viscosity of Polyherbal Hand Wash Gel was measured.

7) **Foam Height:**

The viscosity of Polyherbal Hand wash Gel was determined by using Ostwald viscometer.
Polyherbal Hand Wash Gel sample weighing one gramme was dissolved in 50 ml of distilled water. Transfer of dispersion into measuring container. Water was added to the volume to make it 100ml. 10 test tubes with consecutive portions of 1, 2, 3, and 10 ml of this solution are used.

8) **Foam Retention:** **A 100ml measuring cylinder was filled with 25ml of Polyherbal Hand Wash Gel, and it was shaken ten times. For 4 minutes, the amount of foam was measured at 1-minute intervals. Foam retention needs to hold steady for at least five minutes.**

9) **Stability:**

By storing the Polyherbal Hand Wash Gel formulation at various temperatures, including 40°C, 25°C, and 37°C for 1 week, stability studies were conducted. No phase separation or colour change in the hand wash formulation was seen during the stability experiments.

10) Cleaning Action:

A beaker containing 200ml of water and 1g of Polyherbal Hand Wash Gel was filled with 5g of wool, which was then placed in grease and agitated for 4 minutes. The sample was pulled out of the solution, dried, and weighed. Using the formula, the amount of grease eliminated was determined.

Formula: - DP = 100 (1 - T/C)

Where, DP = Percentage of Detergency powerT = Weight of Formulated Preparation

C = Weight of Marketed PreparationCalculation:

Wool Weight of formulated preparation = 13.98Wool Weight of marketed preparation = 19.5

DP = 100 (1 - T/C)

DP = 100 (1 - 13.98/19.5)

DP = 100 (1 - 0.71)

DP = 100 × 0.29DP = 29 %

11) Dirt dispersion test:

10ml of distilled water were put to a test tube before 1ml of Polyherbal Hand Wash Gel was added. After adding a dab of Indian ink, the test tube was stopped, then shaken. None, light, moderate, or strong ink content was judged to be present in the foam.

12) Antimicrobial Study of Polyherbal Hand wash Gel:

According to protocol, the agar plate method was used to test the Polyherbal Hand Wash Gel's microbiological effectiveness on soil microbes. For the purpose of evaluating the antimicrobial action against soil microbes, two sterile petri plates were used. Agar solution containing nutrients was placed on the dishes, and solidification was permitted. After solidifying, soil extract from the subculture was added using the Pour Plate Method to the nutrient agar media and infected for 24 hours. Two holes were created in it using the Cup Plate Method after it had been injected for 24 hours. Marketed herbal hand wash (Patanjali) is placed in the first compartment, and Formulated Polyherbal Hand Wash Gel is placed in the second. It was made sure that the sample was positioned level with the opening. Plates are positioned. 37°C incubator to test the activity. After 48 hours, the plates were checked to see if the Zone of Inhibition had formed. The antimicrobial activity of the formulation is determined from the Zone of Inhibition. Measuring the extent of the zone of inhibition allowed researchers to gauge the effectiveness of Polyherbal Hand Wash Gel.

2. Result and Discussion

Table 2: Result and discussion

Sr. No.	Evaluation Parameters	Formulated Polyherbal Hand wash Gel	Marketed Herbal Hand wash (Patanjali)
1	Colour	Light Yellow	Light Orange
2	Odour	Rose like	Pleasant
3	Texture	Smooth	Smooth
4	Appearance and Homogeneity	Translucent	Translucent
5	Grittiness	Non - Gritty	Non - Gritty
6	Skin Irritation test	No irritation	No Irritation
7	pH	7.92	8.11
8	Foam Retention	15ml	18ml
9	Stability	Stable	Stable
10	Cleaning Action	29%	29%
11	Dirt dispersion	Light	Light

Viscosity

Table 3: Viscosityof Formulated Polyherbal Hand wash

Sr. No.	Time (min)
1	05: 24: 99
2	06: 04: 54
3	06: 32: 23

Table 4: Viscosity of marketed Hand wash

Sr. No.	Time (min)
1	10: 28: 31
2	08: 57: 11
3	09: 16: 41

Spread ability

Table 5: Spreadability of formulated polyherbal hand wash

Sr. No.	*Diameter (cm)*	*Radius (cm)*
1	3.4	1.7
2	4	2
3	4.2	2.1

Table 6: Spreadability of marketed hand wash

Sr. No.	*Diameter (cm)*	*Radius (cm)*
1	3.5	1.75
2	3.5	1.75
3	4.0	2.0

Foam Height

Table 7: Foam Height of formulated polyherbal hand washgel

Test tube	*Sample: water*	*Foam Height (cm)*
1	1: 9	1
2	2: 8	1.3
3	3: 7	1.4
4	4: 6	1.5
5	5: 5	1.8
6	6: 4	2

7	7: 3	2
8	8: 2	2.3
9	9: 1	3.3
10	10: 0	3.5

Table 8: Foamheight of marketed hand wash

Test tube	*Sample: water*	*Foam Height (cm)*
1	1: 9	0.5
2	2: 8	1
3	3: 7	2
4	4: 6	2.1
5	5: 5	2.3
6	6: 4	2.7
7	7: 3	3.8
8	8: 2	4.0
9	9: 1	4.2
10	10: 0	4.4

Antimicrobial Activity

Table 9: Antimicrobial activity Formulated PolyherbalHand wash Gel

Efficacy	Diameter
Before Incubation	1.8cm
After Incubation	3.4cm

Table 10: Antimicrobial activity of marketed hand wash

Efficacy	Diameter
Before Incubation	1.8cm
After Incubation	3.6cm

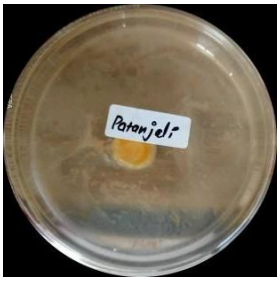
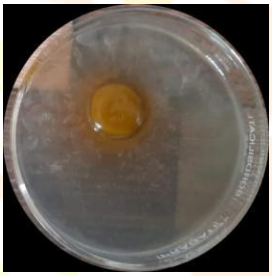


Figure 1 (a): before incubation of formulated polyherbalhand wash

Figure 1(b) before incubation of market handwash

Figure 2 (a): after incubation of formulated polyherbal handwash



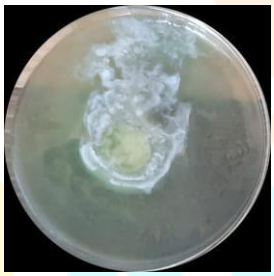


Figure 2 (b): after incubation of marketed hand wash

Visual examination of the formulation reveals that it is smooth in texture, light golden in color, and has a rose-like odour. The mixture has a homogeneous, translucent look. As we discuss grittiness, it was discovered that the composition is not gritty. To reduce skin sensitivity, the formulation's pH must be precisely calibrated. The formulation's pH of 7.9 is appropriate for skin and non-irritating. Greece-dipped wool yarn was used to evaluate the cleaning action. Any hand wash preparation's primary goal is to perform a cleaning action, so the evaluation of the formulation's findings revealed 29% Detergency Power, which is effective against materials like dirt and grease. Test the mixture for dirt dispersion. causes the ink to concentrate in the foam is regarded as being of low quality; dirt should remain in the water; grime that remains in the foam will be challenging to rinse away. Therefore, the findings of the formulation evaluation revealed that there was no dirt in the foam. When the formulation's foam retention was tested, it was discovered to be steady after 5 minutes. Viscosity was assessed using an Ostwald viscometer. The measurements of viscosity were dependent on the time it took for the formulation to move from the upper marking to the lower marking of the Oswald viscometer, which was a 1 minute interval. If the formulation requires more time, it is considered viscous; if it takes less time, the formulation's viscosity is regarded as less than the prerequisite. By passing 0.5 grammes of the sample between the two plates and letting it sit for about 5 minutes, the spreading ability of the formulation was examined. The time reported by the formulation to travel a distance that was measured in centimetres using a measuring scale served as the parameter set for collecting readings. The formulation was discovered to have excellent spreading properties. The final formulation was tested against soil culture to determine the zone of inhibition. The findings indicated that a wide range of antibacterial compounds were present in the formulation. Investigation results showed that the formulation created an inhibition zone for soil culture. The observed diameter was recorded as being 1.8 centimetres before incubation, and the zone of inhibition was noticed after incubation. spreads out to 3.4 centimetres in circumference. The formulation therefore has strong antibacterial action, it can be said.

. Conclusion

Cosmeceuticals, which are applied topically like cosmetics but contain ingredients that affect the biological processes of skin, are cosmetics with medicinal qualities. According to the WHO, 80% of thev

Future scope

The market now offers many chemical hand cleansers as alcohol-based sanitizers made of other synthetic detergents. Alcohols and detergents do help to stop the spread of harmful diseases among healthcare workers, but they also have drawbacks and damaging effects on the ecosystem and human tissues. The frequent use of such synthetic chemical-based products can cause pathogen resistance as well as skin irritation. Due to the addition of synthetic chemicals and alcohols, the production costs of such synthetic formulations are also expensive. Natural ingredients must be used in lieu of synthetic chemicals to solve these issues. Natural ingredients don't harm the ecosystem or human skin in any way. So, a novel method to fight pathogenic bacteria that are resistant to antibiotics could be herbal hand washing. through clean hands, sustain a secure, healthy, natural way of life. Furthermore, because these

plants are abundantly accessible in nature and are simple to grow, herbal formulations can also lower manufacturing costs and have been shown to be more cost-effective than synthetic chemicals.

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