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FORMULATION AND DEVELOPMENT OF CHEMICAL FREE ECO FRIENDLY HANDWASH POWDER

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ABSTRACT

A herbal handwash was prepared using extracts of leaves of curry leaves, hibiscus powder, turmeric powder, reethe, orange pill, potato pill, tabrind pulp. The antibacterial of the prepared herbal handwash against skin pathogens was checked using Disc diffusion method and results were compared with the commercially available antiseptic soap. The results showed that the herbal handwash gave larger inhibition zone than the commercial antiseptic soap against Staphylococcus aureus and Pseudomonas aeruginosa. The efficacy of the herbal handwash was evaluated using Glove Juice method which revealed that the herbal handwash is efficient in reducing higher number of organisms from the hands than the commercial antiseptic soap. Hence, due to the higher antimicrobial activity these plant materials can be used in the preparation of herbal handwash on a commercial scale.

KEYWORDS: *curry leaves, hibiscus powder, turmeric powder, reethe, orange pill, potato pill, tamarind pulp, beet roots juice, salt .*

INTRODUCTION

Hygiene

Hygiene is a branch of science concerned with the practices and knowledge aimed at promoting health. Adhering to hygiene practices is crucial for preventing the spread of bacterial and viral infections[1].Activities such as hand washing and bathing remove dirt, soil, and infectious microbes, thereby maintaining hygiene.[2] Maintaining cleanliness is vital for health, as keeping bodily hygiene and using cleansers are essential for healthy living. These concepts underscore the importance of hygiene in disease prevention.[3]

Hand Hygiene

Hand hygiene involves cleaning hands with water, soap, or other liquids. [4]It is essential because it removes harmful chemicals and pathogens, including bacteria and viruses. Hand hygiene is particularly important for individuals in the medical field, those working in restaurants, and anyone involved in food preparation and service. Effective hand hygiene practices can significantly reduce the transmission of cold viruses and other germs. Promoting and implementing hand washing programs in schools has led to a 42% reduction in school absenteeism and decreased the incidence of gastrointestinal and respiratory illnesses among children.

Hand Washing

Hand washing involves cleaning hands with plain or antimicrobial soap and water.[11] practice can range from a brief rinse to extensive scrubbing.[5] In healthcare settings, the primary purpose of hand washing is to remove pathogenic microorganisms and prevent their transmission.[6] However, the adherence to hand washing protocols remains inadequate in many medical environments, with numerous healthcare professionals neglecting to wash their hands before patient contact.t.[7]A study demonstrated that proper hand washing and other basic procedures could reduce the rate of catheter-related bloodstream infections by 66%.[8,9]

The skin, being one of the most exposed parts of the body, requires protection from pathogens. [10]Hand washing is a crucial precaution to protect the skin from harmful microorganisms and prevent the spread of contagious disease.[11] Using a fingernail brush correctly to clean hands and fingertips is an effective way to remove transient microorganisms. Hand washing not only removes visible dirt but also reduces the number of harmful microorganism.[1

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SIX STEPS TO EFFECTIVE HAND WASHING [16]

Step 1



Fig. 1 Wet hands and apply soap. Rub palms together until soap is bubbly.

Step 2



Fig. 2 Rub each palm over the back of the other hand

Step 3



Fig. 3 Rub between your fingers on each hand.

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Step 4



Fig. 4 Rub your hands with the fingers together

Step 5



Fig. 5 Rub around each of your thumbs.

Step 6



Fig. 6 Rub in circles on your palms. Then rinse and dry your hand

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Hand Washing and Its Importance

Hands are essential for numerous activities, including farming, cooking, and personal hygiene. They come into contact with various substances, including soil and contaminated food. Clean hands are crucial for stopping the spread of germs, making hand washing a key measure in infection control programs to prevent cross-transmission of microorganisms between patients.

Plant Extracts in Hand Wash Formulation

Plant extracts have been used for centuries in traditional medicine, functional foods, natural dyes, cosmetics, detergents, and disease treatments. This study focuses on formulating herbal hand washes using various plant extracts known for their antibacterial properties, thereby establishing them as potent antimicrobial agents.

AYURVEDIC APPROACH IN HAND HYGIENE

Ayurveda, the traditional medicinal system of India, dates back over 6,000 years. It provides guidelines for maintaining health and treating diseases. The term "Ayurveda" means "knowledge of life," and it encompasses both curative medical science and comprehensive healthy living practices. Guidelines for maintaining health are known as "Swastha vritta."

Despite hand hygiene being the simplest and least expensive method of preventing healthcare-associated infections and antimicrobial resistance, poor hand hygiene practices persist due to a lack of scientific knowledge, awareness of risks, and availability of facilities.

Ayurvedic Herbs for Hand Hygiene

An Ayurvedic approach was used to screen classical literature for herbs with cleansing properties.[13,14,15] The "Pancha Valkala" combination, which includes the barks of five plants, has properties such as:

- Vranaprakshlana (wound cleansing)
- Vranaropana (wound healing)
- Shothahara (anti-inflammatory)
- Upadanshahara (curing ulcers)
- Visarpahara (curing skin diseases)

The Pancha Valkala comprises the barks of:

- Vata (Ficus bengalensis Linn.)
- Udumbara (Ficus glomerata Roxb.)
- Ashwattha (Ficus religiosa Linn.)
- Parisha (Thespesia populnea Soland ex. Correa)
- Plaksha (Ficus lecor Buch. Hum)

HISTORY OF HERBAL HAND WASH

The importance of hand hygiene was first highlighted by the Austrian-Hungarian physician Ignaz Semmelweis in 1847. Working at the Vienna General Hospital's Maternity Department, Semmelweis discovered that puerperal fever, a severe infection occurring after childbirth, was significantly reduced when medical staff washed their hands with a chlorinated lime solution after performing autopsies. This simple practice brought down the incidence of fatal puerperal fever from 10% (with a range of 5–30%) to about 1–2%.

During Semmelweis's time, the prevailing belief was that diseases were caused by various unrelated factors, and each case was considered unique. Semmelweis proposed a revolutionary hypothesis that cleanliness was the key to preventing infections. Despite the compelling evidence, his ideas were largely dismissed, ridiculed, and ignored by his contemporaries. Facing professional backlash, Semmelweis was dismissed from his position and had to relocate to Pest. His frustration with the medical community's indifference led him to write increasingly angry letters to prominent obstetricians, accusing them of negligence.[16]

Unfortunately, Semmelweis's advocacy for hand hygiene was not recognized during his lifetime. In 1865, he was committed to an asylum, where he died of septicemia, possibly due to a severe beating by guards. It wasn't until years later, when Louis Pasteur's germ theory of disease provided a scientific basis for his findings, that Semmelweis's contributions were fully appreciated. Today, he is acknowledged as a pioneer of antiseptic process.

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In recent times, Semmelweis University in Budapest has continued his legacy by adopting advanced digital tools to teach proper hand disinfection techniques. The university's Department of Surgical Research and Techniques introduced a UV dye-based, computer-imaging device to enhance hand hygiene education, earning recognition with the 1st ICPIC Innovation Academy Award.[17]

BENEFITS OF USING HERBAL HAND WASH

Ease of Availability: Herbal ingredients are readily accessible in both rural and urban areas, making them convenient for widespread use.

Cost-Effective: Herbal plants are generally cheaper than the chemical ingredients found in synthetic hand washes, offering an economical alternative.

Increased Efficiency: Herbal hand washes can be more effective in promoting hand hygiene due to the natural antibacterial properties of certain herbs.

Fewer Side Effects: Compared to synthetic hand washes, herbal options typically have fewer side effects, reducing the risk of skin irritation and other adverse reactions.

MATERIAL AND METHODS

Collection of Plant Materials

Leaves of curry leaves, hibiscus flowers, orange peels, potatoes, reetha (soapnut), tamarind, lemon, and turmeric were collected from the market in Badnapur. Hibiscus and curry leaves were additionally obtained from the College of Agriculture in Badnapur.

Curry Leaves (Murraya koenigii)

Curry leaves come from a small deciduous aromatic shrub, Murraya koenigii, part of the Rutaceae family. Native to South Asia, it grows in Sri Lanka, Bangladesh, China, and India, including regions like the Himalayas, Maharashtra, Tamil Nadu, Kerala, and Assam. Known for its vibrant leaves, curry leaves are used as a flavoring agent in Indian cuisine and have various names such as Kadipatta (Hindi),

Karuvepillei (Tamil), and Kariveppilee (Malayalam).



Scientific Classification

- Kingdom: Plantae
- Clade: Tracheophytes
- Order: Sapindales
- Family: Rutaceae
- Genus: Bergera
- Species: B. koenigii
- Binomial Name: Bergera koenigii (L.)

- **Chemical Constituents**: Contains compounds like cinnamaldehyde, carbazole alkaloids (mahanimbine, girinimbine, mahanine), and nutrients such as carotenoids, beta-carotene, calcium, and iron.
- **Categories**: Antibacterial, antiviral, antifungal, laxative, and anti-inflammatory properties.

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Tamrind

Tamarind is a large evergreen tree cultivated throughout India, except in the Himalayas and western dry regions. The fruit pulp is a common spice in South Asian cuisine.



Scientific Classification

- Kingdom: Plantae
- Clade: Tracheophytes
- Order: Fabales
- Family: Fabarecea
- Binomial Name: Tamarindus indica

Hibiscus Flower (Hibiscus rosa-sinensis)

Hibiscus flowers are known for their large, colorful, trumpet-shaped blooms and are rich in natural acids, iron, phosphorus, calcium, and vitamin B complex.

Scientific Classification

- Kingdom: Plantae
- Clade: Tracheophytes
- Order: Malvales
- Family: Malvaceae
- Subfamily: Malvoideae
- Tribe: Hibisceae
- Genus: Hibiscus

- Categories: Anti-inflammatory, antimicrobial, antioxidant properties.

Turmeric:-

Turmeric is used widely as a spice and medicinal herb, recognized for its distinctive yellow color and flavor.



Turmeric rhizome and powder

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- **Scientific Classification:**
  - Kingdom: Plantae
  - Clade: Tracheophytes
  - Order: Zingiberales
  - Family: Zingiberaceae

  - **Binomial Name:** Curcuma longa
- **Synonyms**: Curcuma domestica Valeton
- **Categories:** Anti-inflammatory, potential treatment for degenerative eye conditions, metabolic syndrome, and arthritis.

Potato pills

Potato peels are rich in bioactive compounds with antimicrobial and antioxidant properties, making them a potential ingredient in hand wash formulations.



Scientific Classification

- Kingdom: Plantae
- Clade: Tracheophytes
- Order: Solanales
- Family: Solanaceae

Binomial Name: Solanum tuberosum L.

Salt

Salt acts as a preservative in herbal hand wash powder by enhancing its shelf life, inhibiting microbial growth, and promoting stability. It increases viscosity, regulates bubbles, and improves cleaning ability. Additionally, salt can act as a hardener, adjust pH, stabilize the soap mixture, and enhance lathering. The use of salt in hand wash formulations is crucial for maintaining quality and efficacy over time.



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Beetroot

Beetroot powder can add a natural pink or red hue to cosmetics and can be used in formulations like soaps, lotions, and lip balms.
The search results do not contain any information about the use of "bear root" as a coloring agent. The focus is solely on beetroot powder **.**
Beetroot (Beta vulgaris) is an excellent natural coloring agent that can be used in various herbal formulations:



REETHA

Reetha, also known as soapnut, contains saponins which have natural cleansing properties and is commonly used in Ayurvedic shampoos and cleansers.



Fig. 11 Reetha (Sapindus mukorossi)

Scientific Classification:

- Kingdom: Plantae
- Clade: Tracheophytes
- Order: Sapindales
- Family: Sapindaceae
- Genus: Sapindus
- Species: S. mukorossi

ORANGE PEEL:-

Orange peel powder is rich in Vitamin C and limonene, providing skin lightening and anti-inflammatory benefits. It helps brighten dark areas and reduces wrinkles.

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Lemon peel

Lemon peel powder is beneficial for skin whitening, cleansing, and reducing pimples, thanks to its Vitamin C and citric acid content.



- **Scientific Classification**
  - Kingdom: Plantae
  - Clade: Tracheophytes
  - Order: Sapindales
  - Family: Rutaceae
  - Genus: Citrus
  - Species: C. limon

PREPARATION OF HERBAL HAND WASHES

Steps of Herbal Hand Wash Formulation:

1. Drying: All plant materials are dried and ground into a powder.
2. Weighing: The required quantities of each ingredient are weighed individually.
3. Size Reduction: The dried ingredients are reduced in size using a hand-driven mixer.
4. Mixing: The fine powders are thoroughly mixed to form a homogeneous mixture.
5. Sieving: The mixture is passed through a sieve (no. 120) to ensure a fine, uniform powder.

Formulations

Formulation Table

Sr. No	Ingredients	Quntity	Action
1	Curry leaves	3 gm	Antimicrobial
2	Hibiscus flower	2.5 gm	Antibacterial
3	Turmeric	3 gm	Anti inflammetry
4	Orange pill	2 gm	Fragrance
5	Tamrind pulp	2.5 gm	Antimicrobial
6	Lemon pill	2 gm	Antifertility
7	Reetha	2 gm	Foming agent

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8	Salt	2 gm	Preservative
9	Beetroot	10 ml	Colouring agent
10	Potato	6 gm	Softing agent

Evaluation of Poly Herbal Hand Wash

Sr. No.	Parameters	Observations
1	Odour	Orange Like
2	Colour	Light Green
3	pH	7
4	Viscosity	51cp
5	Foam Height	350 ml
6	Foam retention At 4 min	25.2 ml

Physical Evaluation Test

1. Odor: The poly herbal hand wash was found to have an orange-like odor.
2. Color: The color of the hand wash was observed to be light green.
3. pH: Measured using a digital pH meter and found to be 7.
4. Viscosity: Measured using a Brookfield viscometer at 35°C with spindle no. 63 RPM, recorded as 51 centipoise.
5. Stability: Stability tests were conducted at various temperatures (5°C, 20°C, 37°C, and 45°C) for 24 hours. No color change or phase separation was observed.
6. Skin Irritation Test: The hand wash was applied to the skin for 5-10 minutes, and no irritation was noted.
7. Foam Height: 5 grams of the hand wash were dispersed in 50 ml of water, shaken, and the foam height was measured.
8. Foam Retention: Foam volume was measured at 1-minute intervals for 4 minutes.

Fig.17 Foam Ht. for F1

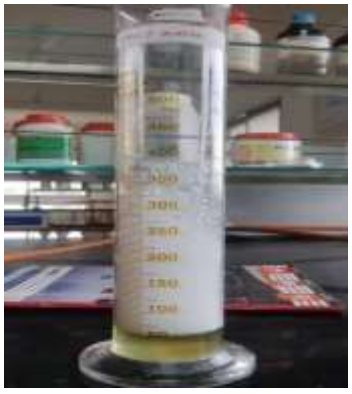


Fig.18 Foam Ht. for F2



Foam Retention

A 100 ml measuring cylinder was filled with 25 ml of the 1% poly herbal hand wash. Hands were placed over the cylinder and it was shaken five times. For 4 minutes, the volume of foam was measured at 1 minute interval

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Results and Discussion

Results:

Sr. No.	Parameters	Observations
1	Odour	Orange Like
2	Colour	Light Green
3	pH	7
4	Viscosity	51cp
5	Foam Height	350 ml
6	Foam retention At 4 min	25.2 ml

Discussions

The organoleptic evaluation results, such as odor, pH, viscosity, foam height, foam retention, stability studies and irritability test given in Table 4. We observed that the poly herbal hand wash showed light green and greenish-yellow in color with a bitter smelly light lemony fragrant. The pH of these formulations ranged between 5.9 - 7.4 that's means suitable for the skin and non-irritating. The viscosity of these formulations was recorded between 50 - 51 centipoises pascal seconds (CPS). During the stability tests, there was no color change or phase separation in the prepared poly herbal hand wash.

CONCLUSION

Hands are the primary source of disease related to skin, respiration, gastro intestinal tract etc. Due to various disease and germs, the bar soap get contaminated which may lead to spread of germs. In this sophisticated world liquid hand washes are used much more frequently than the bar soap. In the pharmaceutical industry, there are numerous marketed liquid formulations such as poly herbal hands wash. Out of them, we found mostly chemical-based preparation. Before evaluation, in these formulations of curry leaves, tamrind purl, turmeric, hibiscus, lemon peel, orange peel, beetroot, salt all ingredients will we taken in powder form without beetroot liquid from. It is the middle viscosity test (Brooke field viscometer), non-irritancy, spread ability, wash ability, etc. The result is good & ready for human use.

FUTURE SCOPE

The main aim of the poly herbal hand wash powder is to promote hand hygiene using natural ingredients. Herbal medicines offer effective remedies for various health conditions. Many commercial hand washes have adverse effects like itching and irritation. This formulation, using Azadirachta indica and Ocimum tenuiflorum, offers antimicrobial activity and protection against disease-causing bacteria, providing a safer alternative to synthetic hand washes.

REFERENCES

1. *Bloomfield, SF et. Al. "The effectiveness of hand hygiene procedures including hand- washing and alcohol-based hand sanitizers in reducing the risks of infections in home and community settings," American Journal of Infection Control, 2007; 35(1): 1-64.*
2. *Scott E., "Microbial Risk Reduction: The Benefits of Effective Cleaning In Preparation", American Journal of Infection Control, 2010; 4: 435-436.*
3. *Palak Vyaset et. Al., "Antimicrobial Activity of Ayurvedic Hand Sanitizers" International Journal of Pharmaceutical &Biological Archives, 2011; 2(2): 762-766.*
4. *Jefferson T, Foxlee R, Del Mar C et al. "Physical interventions to interrupt or reduce the spread of respiratory viruses: systematic review", British Medical Journal, 2007; 336(7635): 77–80.*
5. *Luby SP, Agboatalla M, Feikin DR, Painter J, Billhimmer W, Atref A, Hoekstra RM, "Effectof hand-washing on child health: a randomized control trial", The Lancet Infectious Diseases,2005; 366(9481): 225–33.*
6. *Baker et al. "Association between Moderate-to-Severe Diarrhea in Young Children in the Global Enteric Multicenter Study" (GEMS) and "Types of Handwashing Materials Used by Caretakers" in Mirzapur, Bangladesh, American Journal of Tropical Medicine and Hygiene, 2014; 91(1): 181-189.*
7. *Keeping hands clean. Centers for Disease Control and Prevention website.*

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EPRA International Journal of Research and Development (IJRD)
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8. *Www.cdc.gov/healthywater/hygiene/hand/handwashing.html. Accessed January 13, 2013.*
9. *Bowen A et al., "Alcohol Based Hand Sanitizers: Assurance and Apprehensions Revisited"American Journal of Tropical Medicine and Hygiene, 2007; 76: 1166-1173.*
10. *Guinan M, Mc Guckin M, Ali Y, "Alcohol Based Hand Sanitizers: Assurance andApprehensions Revisited", American Journal of Infection Control, 2002; 30: 217-220.*
11. *Sandora TJ, Shih MC, Goldmann DA, "Epidemiology and Risk factors for Clostridiumdifficile infection in children", American Journal of Infection Control, 2008; 121: 1555-1562.*
12. *World Health Organization. WHO Guidelines on Health Hygiene in Health Care. Geneva, Switzerland: World Health Organization, 2009.*
13. *Sutra sthana et. Al. Charak Samhita, Chaukhambha Sanskrit Series, Varanasi, 2001, II Edition.*
14. *Astaanga Sangraham Sutra sthana, Indu, Shashilekha, Edited by Vd. Anant Damodar Athawale, Shrimad Atreya Prakashanam, 1980.*
15. *Larson E. "Skin hygiene and infection prevention:More of the same or different approaches?", European Journal of Clinical Microbiology and Infectious diseases, 1999; 29: 1287-1294.*
16. *LTHT Infection Control Policies, Policy No. 4; Hand Hygiene; retrieved on 7/4/2010(http://www.leedsth.nhs.uk/sites/infection_control/documents/hand_hygiene _Nov_06.pdf).*
17. *Hand Washing-Wikipedia, Free encyclopedia; retrieved on 7/4/2010 (http://en.wikipedia.org/wiki/hand_washing).*