



Development, formulation & evaluation of polyherbal handwash using M.oleifera and Holy Basil

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ABSTRACT :

The study developed a herbal handwash using botanical ingredients like moringa leaves, tulsi leaves, cloves, reetha, orange peel, and aloe vera. Tests showed the handwash maintained a slightly acidic pH, was effective, and had significant antimicrobial activity. The formulation offers a promising alternative to conventional handwash products, but further research is needed to determine its long-term effectiveness and commercial viability.

KEYWORD : Moringa oleifera, tulasi, herbal handwash powder, hand hygiene.

INTRODUCTION :

Utilizing the healing properties of plants, phyto-medicine, or herbal medicine, has emerged as a valuable resource for addressing various ailments and bolstering defense against infections. In the realm of hand hygiene, an essential practice in disease prevention, herbal remedies offer a diverse range of benefits, from promoting wound healing to reducing inflammation and combating diseases. For instance, moringa, renowned for its antimicrobial properties, aids in the fight against pathogens and drug-resistant infections.

Anatomy and physiology of skin :

Consisting of the epidermis, dermis, and subcutaneous tissue, the skin serves as a protective shield, playing a vital role in maintaining pH levels within the range of 4 to 5.6 and ensuring homeostasis.

Epidermis :

The epidermis, a thin layer of skin made up of epithelial tissue, acts as the outermost protective barrier, responsible for touch sensation and protective functions.

1. Stratum Corneum :

The Stratum Corneum is the top layer of the epidermis, consisting of 10-30 thin layers of dead keratinocytes that are constantly sloughed off.

2. Stratum Lucidum :

Located on the fingertips, palms, and soles, the outer layer of skin called the epidermis is composed of four to six layers of clear, soft, inactive keratin cells that are rich in keratin.

3. Stratum Granulosum :

The Stratum Granulosum, situated between the stratum spinosum and stratum lucidum, acts as a water-resistant barrier by generating keratin, which is the main structural element of the skin.

4. Stratum Spinosum :

Situated between the basal layer and the granular layer, the Stratum Spinosum plays a vital role in supplying the skin with resilience and elasticity.

b) The Dermis :

Positioned between the epidermis and subcutaneous tissue, the dermis plays a crucial role as a skin layer containing blood vessels, nerves, sensory signals, and collagen, ultimately contributing to the skin's overall strength.

The Subcutaneous Tissue / Hypodermis / Subcutis:

The skin, being the most exposed area of the body, requires safeguarding against skin pathogens. Hands possess both transient and resilient flora, with the transient flora inhabiting the outer layers and the resilient flora residing in deeper layers.

Concept of skin care

Skin care includes a range of elements such as cleaning, fragrancing, aesthetics, body scent, and keeping skin well-being. With aging, priorities switch from beauty concerns to healing and prevention objectives. Factors like sun exposure and prolonged dampness start to become more important. Attention shifts from visible areas like the face, arms, and legs to more hidden parts of the body.

Skin care procedure and skin care product

Skin care procedures are vast but lack sufficient documentation, with a wide range of products available for cleansing, soothing, restoring, strengthening, and protecting the skin. However, the underlying functions of these products can be summarized as:

Skin Care Overview

- Removing dirt, sebum, microorganisms, and dead skin cells.
- Alleviating uncomfortable skin symptoms such as itching, burning, and odors.
- Repairing damaged skin, like dry or inflamed skin.
- Strengthening resilient but fragile skin.
- Shielding damaged, intact, and fragile skin.
- Providing a pleasing skin texture.

Hand hygiene for the general public

Existing evidence indicates a correlation between handwashing and the risk of infections in community environments, mainly in more developed countries. The most persuasive data suggests that handwashing is effective in preventing the transient presence of infectious agents on hands or those transmitted through fecal-oral or respiratory pathways, with regular soap being sufficient for this purpose.

Skin Barrier properties and effect of hand hygiene practice

The skin, which covers an average adult of 1.75 square meters, is comprised of five layers. One of these layers is the stratum corneum, a tough layer made of keratin and lipids that acts as a primary defense barrier, maintaining the skin's hydration and flexibility. Every 2 weeks, the stratum corneum is renewed, and daily shedding of particles from healthy skin releases bacteria, with males having a more pronounced dispersal pattern. Factors such as water content, humidity, pH levels, and shedding rates play a role in the protective properties of the skin barrier.

Health Benefit of Moringa Oleifera***Nutritional Properties***

Moringa oleifera, commonly referred to as the 'Miracle Tree', is celebrated for its nutritional richness and therapeutic potential in addressing diverse health concerns. Renowned for its abundance of essential minerals, protein, and vitamins, its leaves offer a nutritional powerhouse, while its pods are a notable source of dietary fiber and protein.

The use of different parts**Leaves :**

Moringa leaves are esteemed for their abundance of vitamins, minerals, and antioxidants, featuring compounds like quercetin and kaempferol that contribute to their antioxidant properties.

Root :

The root bark of Moringa exhibits potential in the treatment of gastric ulcers and mucosal lesions by reducing acidity and elevating gastric juice pH.

Pod Husk :

The husks of Moringa oleifera pods are notable for their richness in various bioactive compounds such as alkaloids, flavonoids, tannins, triterpenoids, diterpenoids, and cardiac glycosides.

Seed :

Moringa oleifera seeds are valued for their high content of phytochemicals, antioxidants, and distinctive compounds. They are particularly rich in oil, containing 22-40% fat.

Origin and distribution

Moringa oleifera, originally native to regions such as India, Pakistan, Africa, and Arabia, has gained global presence, spreading to diverse locations including the Philippines, Cambodia, Central America, as well as North and South America, and the Caribbean Islands.

Cultivation Condition

Moringa oleifera is a deciduous tree typically of small to medium size, commonly encountered in tropical regions, foothills, and mid-hill areas of Nepal. Flourishing in direct sunlight, it thrives with a minimum annual rainfall of 250mm and can endure temperatures spanning from 12 to 40 degrees Celsius.

Propagation

Moringa oleifera propagation can be accomplished through seeds, cuttings, or a combination of both techniques. Direct seeding is particularly effective, thanks to the plant's notable germination rate. To encourage optimal leaf production, it is recommended to space Moringa plants either 15x15 cm

Medicinal Properties

Moringa oleifera, hailed as a medicinal tree, offers a myriad of health advantages. Its therapeutic properties extend to addressing conditions such as diabetes, heart disease, anemia, arthritis, respiratory ailments, skin disorders, liver issues, paralysis, sterility, rheumatism, digestive disorders, among others. Recognized as the 'plant of the year' in India in 2008, Moringa is also utilized in treating afflictions like ascites, pneumonia, and venomous bites.

Wound Healing

Moringa's leaves, roots, and seeds possess blood-clotting properties that facilitate wound healing. Research conducted by V.I. Hukkeri revealed antipyretic and wound healing effects in ethyl acetate and ethanolic extracts derived from Moringa oleifera leaves, seeds, and dried leaves.

Antibacterial and Antimicrobial Activity

Moringa exhibits potent antibacterial and antifungal properties, making it effective in combating various infections affecting the skin, blood, urinary tract, and digestive system. Specifically, extracts from Moringa roots, bark, and juice demonstrate antibacterial effects.

Anti-inflammatory Activity

Moringa extract is renowned for its efficacy in treating both chronic and acute inflammations, such as those associated with conditions like diabetes, respiratory issues, heart disease, arthritis, and obesity.

Anti-diabetic Activity

Moringa leaf powder demonstrates remarkable effectiveness in reducing lipid and glucose levels, regulating oxidative stress, and decreasing both blood sugar and cholesterol levels.

Antispasmodic, Antiulcer and Hepatoprotective Activities

Both the roots and leaves of Moringa oleifera exhibit antispasmodic properties, notably through ethanol extracts and their constituents. The ethanol extract, enriched with trans, is a traditional remedy for diarrhea. **Anti-tumor and Anti-ulcer Activity**

Moringa leaves demonstrated promising antitumor activity. In vitro assays revealed significant inhibitory effects on Epstein-Barr virus-early antigen. Furthermore, Niazimicin, a potent chemopreventive agent in chemical carcinogenesis, exhibited effectiveness in mice. Moreover, seed extracts displayed efficacy against hepatic carcinogen metabolizing enzymes, antioxidant parameters, and skin papillomagenesis.

Anti-hypertensive

Moringa leaf juice is recognized for its cardiovascular advantages attributed to its diuretic properties and its ability to lower lipid levels and blood pressure. Its leaves contain compounds such as nitrile, mustard oil glycosides, and thiocarbamate glycosides, which have demonstrated efficacy in reducing blood pressure in rats through a calcium antagonist mechanism

Hand Care

- Regular hand washing can reduce surface oil, allowing detergents to penetrate deeper into the skin.
- Like ethanol, alcohol can weaken the skin's lipid barrier.
- Moisturizing hand cream is recommended to prevent lipolysis.
- Washing hands before or after hand washing can cause skin irritation.
- Wearing gloves when hands are wet increases the risk of skin burns.
- Regular hand moisturizer protects skin from dryness.

Hand wash

Hand hygiene entails washing hands with soap and water to remove viruses, bacteria, and dirt. Proper drying after washing helps prevent recontamination. The World Health Organization advises washing hands for 20 seconds before and after activities, particularly after using the toilet, changing diapers, feeding, eating, and handling food. Excessive hand washing can damage the skin, so it's advisable to use moisturizing lotion

Steps and duration

Hand Washing Instructions

- Hold warm, cold running water.
- Use plenty of soap and foam carefully.

- Cover your back, elbows and underarms.
- Wash your hands for at least 20 seconds.
- Wash your hands under running water.
- Avoid cleaning the container as it can become contaminated again.
- Wash your hands with a clean towel or air dryer.

Substance used

Soap and detergents

Surfactants, such as soaps or detergents, in water effectively eliminate microorganisms by disrupting their lipid bilayer membrane and protein structure, and emulsifying oils for easy washing.

1. Solid soap

Surfactants, such as those found in soaps or detergents, when combined with water, effectively eradicate microorganisms by disrupting their lipid bilayer membrane and protein structure, as well as emulsifying oils for easy removal.

2. Antibacterial soap

Although popular among health-conscious consumers, there is no evidence that the use of recommended antiseptics or disinfectants leads to antibiotic-resistant organisms.

3. Warm water

While warm soapy water is deemed more effective than cold water in removing dirt and bacteria according to the World Health Organization.

4. Hand sanitizer

Alcohol-based hand sanitizers are highly effective in eliminating bacteria but may have limited efficacy against certain viruses, such as norovirus, which is responsible for most cases of contagious gastroenteritis

5. Wipes

Alcohol-based wipes for hand washing serve as a convenient alternative for travelers lacking access to soap and water, as they contain at least 60% alcohol.

6. Ash or mud

In low-income communities where soap affordability is a challenge, ash or soil is sometimes used as a substitute.

Liquid hand wash

Hand soap in liquid form is a mild and convenient product created for frequent use in order to cleanse and disinfect hands. It is formulated with gentle ingredients in an uncomplicated yet efficient blend that effectively eliminates germs and bacteria. Specifically designed for children, this hand hygiene essential is crafted for everyday use to uphold cleanliness.

Qualities of liquid handwash

- Delightful lather
- Effortless rinsability
- Reduced skin sensitivity
- Rich or velvety texture
- Enjoyable scent

Advantages of Herbal Hand wash

- Secure and with minimal negative impact.
- Helps in decreasing bacterial invasion.
- Aids in blocking bacteria from getting in.
- Purifies hands by eliminating grime and dirt.
- Supports maintaining adequate hand moisture.
- Leaves skin feeling soft and nourished.
- Free of any harsh chemicals.
- Enhances skin suppleness.
- Readily available in both urban and rural regions.
- Cheaper than artificial wipes.
- Enhanced efficacy.

Hand care products

Guidelines for Hand Cream Usage

- Offer gloves in compact, disposable packages.
- Note that hand creams and lotions may impact the efficacy of hand sanitizers and the quality of gloves.

- Apply water-based hand creams prior to wearing gloves to avoid compromising the latex glove integrity.

Indications for hand washing and hand antisepsis

Guidelines for Proper Hand Washing

- The act of hand washing is essential to eliminate dirt and harmful microorganisms from the hands.
- It is recommended to either wash hands with soap and water or sanitize them.
- Prior to direct contact with patients, inserting invasive devices, and following contact with unbroken skin, hands must be decontaminated.
- During patient care, hands should be decontaminated when transitioning from a contaminated area to a clean one.
- After discarding gloves, and before eating or using the restroom, hands need to be decontaminated.

Protocol for hand disinfection

The CDC has issued a new recommendation advocating the use of alcohol-based hand rubs over conventional soap and water for maintaining hand hygiene. This advancement is especially advantageous in operating rooms where anesthesiologists are unable to step away from the patient to access a scrub sink before or after procedures like line placement.

Hand Hygiene

Guidelines for Hand Hygiene:

- Hand hygiene encompasses washing hands with soap and water as well as using a waterless antiseptic for antisepsis.
- Utilize alcohol-based hand rubs to sanitize hands thoroughly, ensuring complete coverage.
- The process of handwashing with soap and water includes wetting hands, applying soap, scrubbing vigorously, rinsing, and drying with a towel.
- While non-antimicrobial soap and water are acceptable, bar soap should be used with drainage racks.
- It is advised not to use multiple-use cloth towels in healthcare environments.

Routine handwash:

Utilizing water and soap without antimicrobial properties to eliminate dirt and temporary microorganisms.

Antiseptic handwash :

Effective Hand Hygiene Procedure

- Utilizing water and antimicrobial soap to eliminate microorganisms.
- Sequential steps involve gathering materials, moistening hands and wrists, lathering soap, and scrubbing hands vigorously.
- Thoroughly rinsing hands and gently drying them.
- In the absence of sensors or foot pedals, opt for a clean paper towel to turn off the faucet.

Hand hygiene product

Soap:

Soaps, which contain detergents, have limited effectiveness against microbes unless they also contain antiseptics. Regular use can lead to dryness, irritation, and potentially result in increased bacterial populations.

Alcohol:

Antiseptics that are alcohol-based, containing isopropanol, n-propanol, or ethanol, function by altering proteins and possess strong antibacterial, antifungal, and antiviral capabilities. They swiftly and consistently reduce the presence of microbes on the skin. Certain commercial products may incorporate extra chemicals for heightened effectiveness. Nonetheless, alcohol-based antiseptics can have a drying effect on the skin.

Handwashing and Impact on food Industry

Effective food safety measures, including sanitation and proper hand hygiene, play a vital role in preventing illness. It is imperative to prioritize the improvement of handwashing practices among food handlers to effectively combat and minimize outbreaks of foodborne illnesses, which often stem from inadequate sanitation practices. Various challenges such as lack of necessary supplies, limited access to sinks, time constraints, high work volume, stress, lack of oversight, deficient training, and insufficient education for food handlers can hinder proper handwashing procedures. Therefore, enhancing the efficiency and efficacy of handwashing techniques is paramount in ensuring the prevention of contamination and ultimately safeguarding public health.

Primary Factor influencing effective handwashing

The effectiveness of handwashing can be affected by various factors such as how often it is done, the type of soap used, how long it lasts, and the technique employed. According to the 2013 FDA Food Code, focusing on scrubbing, rinsing, and drying during handwashing is crucial. Neglecting these steps could lead to a decrease in the effectiveness of handwashing. It is essential to grasp these elements for the enhancement of handwashing practices.

Handwashing Time

Proper handwashing is essential for eliminating germs from hands, and research shows that a 20-second wash is sufficient for effectiveness. According to the 2013 Food Code, it is required for food workers to thoroughly wash their hands and exposed forearms for 20 seconds, with at least 10-15 seconds devoted to vigorous rubbing. Despite these guidelines, many people in public restrooms and hospitals tend to wash their hands for only 15 seconds or even less. An observational study discovered that the average handwashing time among participants was just 5.2 seconds.

MATERIAL :

1. Moringa Oleifera

Kingdom: Plantae

Marathi name: Shevga



Moriga Oleifera powder

- **Chemical Constituent :**

Main Constituent

1. Saponin

Many plant extracts containing saponins are widely used as health products and supplemental medicines for the prevention and treatment of human diseases such as obesity, vascular diseases, and cancer.

2. Triterpenoids

The potential biological activities of triterpenoids include antiinflammatory, anticarcinogenic, antidiabetic, hepatoprotective, antimicrobial, antimycotic, analgesic, immunomodulatory, and cardiotoxic

3. Tannis :

Plant tannins are polyphenols that are widely found in terrestrial plants and in some marine plants (phloroglucinol). Plant tannins have been used as additives in animal production for many years (1). They may affect metabolism or the gut microbiota (2, 3), with the aim of improving performance or meat quality

Uses :

Various studies have shown that *M. oleifera* leaves possess significant nutritional value and exhibit a range of beneficial activities, including anti-tumor, anti-inflammatory, anti-ulcer, anti-atherosclerotic, and anti-convulsant properties.

2. Tulasi

Holy basil or Tulsi, scientifically known as *Ocimum sanctum*, is a plant belonging to the Lamiaceae family. It is a perennial plant with a pleasant aroma. Tulsi is renowned for its detoxifying, purifying, and antimicrobial properties. It effectively eliminates 99.99% of germs, making it an excellent hand protector.



Tulasi leaf

Chemical Constituents

- **3% Carvacrol**

Carvacrol is a phenol that is a natural monoterpene derivative of cymene. An inhibitor of bacterial growth, it is used as a food additive. Potent activator of the human ion channels transient receptor potential

- **Eugene methyl Ether**

Methyleugenol is used as a flavouring agent in jellies, baked goods, non-alcoholic beverages, chewing gum, candy, puddings, relishes and ice cream. It is also widely used as a fragrance ingredient in perfumes, toiletries and detergents. Methyleugenol has been used as an anaesthetic in rodents.

3. Clove

The aromatic flower buds of a tree in the Myrtaceous family, *Syzygium aromaticum*, are known as cloves. They are frequently utilized as a spice, flavoring, or fragrance in various consumer goods, including toothpaste, soaps, and cosmetics. The exploration of herbal medicinal products has proven to be a valuable avenue for uncovering novel pharmaceutical compounds that have been effective in treating severe illnesses.



Clove Powder

Chemical Constituents

1. Sesquiterpenes

sesquiterpenoid lactones are antimicrobial, disrupting the cell wall of fungi and invasive bacteria, whereas others protect the plant from environmental stresses that would otherwise cause oxidative damage.

2. Monoterpene

These compounds presented numerous actions, such as allelochemical functions between plants, and between plants and predators or in wound healing. Many monoterpenes possess antitumour activity in animal and cell models. They have also antioxidant, antimicrobial and anti-protozoa properties

3. Traditional use

The presence of various chemical constituents in high concentrations with antioxidant activity is responsible for the effective role of clove in inhibiting different degenerative diseases.

4. Reetha

Kingdom: plantae

Family: sapindaceae

Common name: soapberry



Reetha Powder

Chemical Constituents

1. Saponin

The amphiphilic nature of the saponins enables them to act as soaps and detergents as they can dissolve membranes; however, since the saponins can hemolyze erythrocytes they are highly toxic if they reach mammalian blood.

2. Mucilage

As well as maintaining hydration, mucilages play a role in maintaining water and oxygen in seed tissues. Due to the presence of polysaccharides in their chemical composition, they are a source of energy [2,61]. Mucilages are thus important for seed germination.

3. Orange Peel Powder

Botanical name: Citrus aurantium

Family: Rutaceae

Common name: Orange peel extract



Orange Peel Powder

Chemical Constituents

1. Limonene

Limonene is a chemical found in the peels of citrus fruits and in other plants. It is used to make medicine. Limonene is used for obesity, cancer, and bronchitis.

2. Valencene

Valencene and nootkatone are aromatic sesquiterpenes with known biological activities, such as antimicrobial, antioxidant, anti-inflammatory, and antitumor.

Uses

1. Sun Tan Remover

Orange Peel Powder serves as a natural remedy for removing sun-tan and lightening the skin.

2. Anti-acne

This natural exfoliator is a proven solution for acne and is particularly beneficial for individuals with oily skin. It effectively deep cleanses the skin by eliminating dirt, pollution, impurities, excess oil, and sebum, resulting in fresh and toned skin.

3. Anti-ageing

Its antioxidant properties combat free radicals, resulting in a radiant and youthful appearance.^[37]

4. Aloe Vera Powder

Kingdom: plantae

Order: Aspargels

Family: Xanthorrhoeaceae

Bionomical name: Aloe vera



Aloe Vera Powder

Chemical Constituents

1. Aloins

It is used as a stimulant-laxative, treating constipation by inducing bowel movements.

2. Isobarbaloins

Anti-tumor : Inhibits tumor formation and potential malignant tumors

Anti-diabetic : Hypoglycemic effect by lowering insulin levels in the blood

Cosmetic uses :Moisturizing and anti-aging properties help in the use for skin care and various beauty related products

USES

- Aloe is a powerful remedy for soothing and healing burned skin.
- Aloe vera is known for its ability to promote smooth and radiant skin.
- This remarkable plant serves as an excellent moisturizer for the skin.

METHODOLOGY

Measure require ingredient properly



Ensure ingredient are fine powder free from any contamination



In clean and dry container mix well until they well combine Preservative like methyl parabean ,sodium lauryl sulphate to mixture (act as cleansing ,surfactant)



mix dry ingredient and additives until uniformly distributed



transfer into suitable container and labelled



store away from direct sunlight to main effectiveness



Perform a patch test on a small skin area to check for any negative reactions.

Method of Preparation :

1. **Drying** : Every powder is in a dehydrated state and crushed.
2. **Weighing** : Each necessary measurement for making herbal handwash powder was weighed separately.
3. **Reduction in size**: The raw materials were gathered and then manually crushed using a hand-operated mix
4. **Blending**: All these finely ground ingredients were blended thoroughly in a blender to a fine uniform powder.
5. **Seiving** : The fine powder was then sieved through mesh size no.:120, to obtain the required amount of fine powder.

Formulation of herbal handwash powder/mixing of ingredient:

The plant material, which had been reduced in size, was sifted through a sieve with a mesh size of 120 to create a fine powder. All necessary ingredients were then combined according to the specified formulation. After thoroughly mixing the herbal powder that had been sifted, a handwash powder preparation was created.

Formulation of herbal handwash powder (30gm):

Table No.1

| Ingredients | Uses |
|------------------------|---------------------|
| Moringa leaves powder | Antimicrobial agent |
| Tulasi leaves powder | Purifying agent |
| Clove powder | Antibacterial agent |
| Reetha powder | Foaming agent |
| Orange peel powder | Fragrance |
| Aloe vera powder | Moisturizing agent |
| Sodium Lauryl Sulphate | Foaming agent |
| Methyl paraben | Preservative |

Table No.2 Formulation table

| Ingredients | F1 (gm) | F2 (gm) | F3 (gm) | F4 (gm) | F5 (gm) |
|------------------------|---------|---------|---------|---------|---------|
| Moringa leaves powder | 10 | 10 | 10 | 10 | 10 |
| Tulasi leaves powder | 5 | 5 | 4 | 5 | 4.5 |
| Clove powder | 2 | 3 | 3 | 2.5 | 1.5 |
| Reetha powder | 3 | 2 | 3 | 4 | 4 |
| Orange peel powder | 2 | 3 | 2 | 2.5 | 3 |
| Aloe vera powder | 5 | 3 | 4.5 | 3 | 3 |
| Sodium Lauryl Sulphate | 2 | 3 | 2.5 | 2 | 3 |
| Methyl paraben | 1 | 1 | 1 | 1 | 1 |

EVALUTION OF HERBAL HANDWASH POWDER

Preliminary Test

The handwash powder formulation was then evaluated based on the following parameters

Organoleptic Evaluation

An assessment of the sensory attributes such as color, aroma, flavor, and consistency was conducted.

General Powder characteristics

A study was conducted to assess the sensory attributes which included color, odor, taste, and texture. Color was evaluated visually, while texture was analyzed by touch.

Particle Size :

Particle size plays a crucial role in determining various properties, including spreadability and grittiness. To evaluate the particle size, the sieving method was employed.

Angle of repose :

The crucial angle is the angle that can never be greater than that between a powder stack's surface and the horizontal flow.

Bulk density :

The weight of a powder is divided by its volume to determine its bulk density. Next, the Bulk Density is calculated with the help of the given equation. Mass of the herbal powder handwash divided by volume equals bulk density.

Tapped density :

Measured in grammes per cubic centimetre (g/cm³), "tapped density" refers to the higher bulk density attained by mechanically tapping a container containing the powdered sample.

Physiochemical Evaluation :

pH :

The pH of a 10% handwashing solution diluted with distilled water was measured in a room at 25°C. To measure the pH, a digital pH metre was used.

Washability :

Formulations were applied to the skin, and then manual inspection was performed to assess how simple and effective it was to cleanse with water.

Solubility :

A substance's solubility refers to its capacity to dissolve in a particular solvent. To increase solubility, the mixture is forcefully mixed and heated. The solution is then filtered when it has cooled.

Extractive values

Determination of water-soluble extractives:

The method was carried out by using chloroform water in place of ethanol and adhering to the instructions provided in order to compute the alcohol-soluble extractive. For every sample, the proportion of water-soluble extractive was ascertained.

Dirt dispersion :

Two droplets containing 1% powder handwash were added to a big test tube holding 10 ml of distilled water. After that, the tube was sealed, shaken ten times, and a droplet of India ink was added. After assessment, the ink content of the foam was categorised as None, Light, Moderate, or Heavy.

Stability study :

10 ml of distilled water were placed in a big test tube, and two drops of a 1% powdered handwash solution were added. Next, an individual drop of India ink was added. Ten shakes were performed on a sealed test tube. The resulting foam's ink content was evaluated and categorised as None, Light, Moderate, or Heavy.

Nature of hand after washes :

Type of hands after washes: Volunteers' comments might be gathered to gauge the nature of hands following a wash.

Foaming index :

One can compute the foaming index by dividing the swelling index by 1000. The swelling index calculates how many millilitres one gramme of medicine takes up.

Skin / eye irritation test :

The results of the skin and ocular irritation tests showed that there are no adverse effects of the herbal handwash powder on the skin or eyes.

RESULT AND DISCUSSION :

1. Preliminary test of organoleptic evaluation:

Table no.03 Organoleptic Properties

| Organoleptic Properties | F1 | F2 | F3 | F4 | F5 |
|-------------------------|--------|-------------|-------|------------|-------|
| Colour | Green | faint green | Green | Dark green | Green |
| Texture | Smooth | Smooth | Thick | Smooth | Thick |

| | | | | | |
|-------|----------|---------|---------|----------|----------|
| Odour | Aromatic | Perfume | Perfume | Aromatic | Aromatic |
|-------|----------|---------|---------|----------|----------|

(± mean SD)

2. Preliminary test of Angle of repose**Table no.04 Angle of repose**

| Formulation | Method | Height (cm) | Radius of cone | $\tan\theta=h/r$ | $\theta=\tan^{-1}(h/r)$ | Flow property |
|-------------|--------|-------------|----------------|------------------|-------------------------|---------------|
| F1 | Funnel | 2.5 | 3.5 | 0.857 | 35 | excellent |
| F2 | Funnel | 2.4 | 3.6 | 0.666 | 33 | fair |
| F3 | Funnel | 2.6 | 3.4 | 0.764 | 37 | good |
| F4 | Funnel | 2.5 | 3.5 | 0.857 | 35 | excellent |
| F5 | Funnel | 2.5 | 3.5 | 0.857 | 35 | excellent |

(± mean SD)

3. Preliminary test of bulk density:**Table no.05 bulk density**

| Formulation | Density-1 (kg/m ³) | Density-2 (kg/m ³) | Density-3 (kg/m ³) |
|-------------|--------------------------------|--------------------------------|--------------------------------|
| F1 | 0.4 | 0.5 | 0.5 |
| F2 | 0.3 | 0.3 | 0.4 |
| F3 | 0.6 | 0.5 | 0.5 |
| F4 | 0.5 | 0.4 | 0.5 |
| F5 | 0.4 | 0.5 | 0.4 |

(± mean SD)

4. Preliminary test of tapped density:**Table no.06 tapped density**

| Formulation | Density-1 (kg/m ³) | Density-2 (kg/m ³) | Density-3 (kg/m ³) |
|-------------|--------------------------------|--------------------------------|--------------------------------|
| F1 | 0.70 | 0.70 | 0.71 |
| F2 | 0.69 | 0.69 | 0.70 |
| F3 | 0.72 | 0.72 | 0.73 |
| F4 | 0.71 | 0.71 | 0.72 |
| F5 | 0.69 | 0.71 | 0.69 |

(± mean SD)

5. PH**Table no.07 pH of formulation**

| Formulations | pH-1 | pH-2 | pH-3 |
|--------------|------|------|------|
| F1 | 6.3 | 6.4 | 6.3 |
| F2 | 6.5 | 6.5 | 6.4 |
| F3 | 6.6 | 6.6 | 6.5 |
| F4 | 6.5 | 6.4 | 6.4 |
| F5 | 6.3 | 6.2 | 6.2 |

(± mean SD)

CONCLUSION :

The formulation of an herbal handwash using *Moringa oleifera*, Tulsi powder, Reetha powder, Clove powder, and Aloe Vera powder can provide a natural and effective alternative to synthetic handwashes. By leveraging the unique properties of these herbal ingredients, the handwash offers antimicrobial protection, skin nourishment, and gentle cleansing, making it a valuable addition to the range of personal care products. Further research and testing are essential to optimize the formulation and ensure its safety and efficacy.

According to the World Health Organization (WHO), approximately 80% of individuals in Asian nations presently depend on herbal remedies as their primary form of healthcare. Recent studies have shown that hand washing powders containing herbal extracts can effectively control irritation. Consequently, hand sanitizers incorporating various herbs are deemed superior to plain soaps and conventional hand sanitizers due to their natural properties and compatibility with different skin types. Since alcohol is a significant contributor to skin diseases, respiratory problems, and

gastrointestinal issues, powdered hand sanitizers are gaining popularity due to reduced risk of contamination compared to liquid soaps. One of the advantages of hand washing powders is their ability to preserve uncontaminated soap.

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