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FORMULATION AND EVALUATION OF ECO - FRIENDLY HERBAL POWDER HANDWASH

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ABSTRACT

This study focuses on formulating and evaluating an eco-friendly herbal handwash powder using natural ingredients like Reetha, hibiscus flower, Cestrum nocturnum. The powder handwash is designed to provide effective hand hygiene while minimizing environmental impact. The formulation is evaluated for physicochemical properties, antimicrobial activity, skin compatibility, and environmental safety. The results show that the herbal handwash powder exhibits significant antimicrobial activity, is gentle on skin, and is biodegradable. This eco-friendly handwash powder offers a sustainable alternative to conventional handwashing products, promoting environmental sustainability and natural health.

KEYWORDS: *Eco-friendly, herbal handwash powder, natural ingredients, antimicrobial activity, sustainability.*

1. INTRODUCTION

- **Hygiene**

The scientific field of hygiene studies the methods and information used to advance health. Maintaining proper hygiene is essential to stopping the spread of viral and bacterial illnesses [1]. Hand washing and bathing are two examples of activities that preserve hygiene by getting rid of dirt, soil, and harmful microorganisms. [2] Since maintaining personal hygiene and using cleaners are necessary for a healthy lifestyle, maintaining cleanliness is crucial for health. These ideas highlight how crucial good cleanliness is to preventing illness. [3]

- **Hand Hygiene**

Cleaning hands using water, soap, or other liquids is known as hand hygiene.[4] It is necessary because it eliminates dangerous substances and diseases, such as viruses and bacteria. Those who work in the medical industry, in restaurants, or in the preparation and serving of food should pay special attention to hand cleanliness. The spread of cold viruses and other pathogens can be considerably decreased by practicing good hand hygiene. Children's gastrointestinal and respiratory ailments have decreased, and school absenteeism has dropped by 42% as a result of hand washing programs that are promoted and implemented in schools.

- **Hand Washing**

Hand washing is the process of cleaning hands with water and either regular or antimicrobial soap. [5] The main goal of hand washing in medical environments is to get rid of harmful bacteria and stop them from spreading. [6] However, many medical settings still lack proper hand washing practices, with many medical personnel failing to wash their hands before interacting with patients. [7] According to a study, a 66% reduction in the incidence of bloodstream infections linked to catheter use might be achieved by practicing good hand hygiene and other fundamental practices. [8,9] In order to shield the skin from dangerous microbes and stop the spread of infectious diseases, hand washing is an essential precaution. [10] Since the skin is one of the body's most exposed areas, it needs to be protected from infections.[11].

➢ **The world Health organization has "Five moments" for washing Hands:**

- Before patient care
- After Environmental contact
- After exposure to blood/body fluids
- Before an aseptic task
- After patient care

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➢ **Steps of Hand washing**



Fig.1. Steps of hand washing

➢ **Why Hand Washing Is Important: -**

Hands are necessary for many tasks, such as personal hygiene, cooking, and gardening. They encounter a variety of materials, including as contaminated food and soil. Hand washing is a critical step in infection control programs to halt the spread of germs since clean hands are essential for preventing cross-transmission of pathogens between patients.

2. OBJECTIVE

- To Evaluate the physicochemical properties of the ecofriendly herbal powder handwash.
- To investigate the antimicrobial activity of the ecofriendly herbal powder handwash.
- To identify and select suitable herbal ingredients with natural antibacterial and skin soothing properties.
- To develop a Powder based handwash formulation with ecofriendly properties.
- To assess the acceptability and usability of the handwash among users.

3. NEED OF WORK

- Environmental sustainability: Reduce plastic waste and promote eco-friendly practices.
- Natural and gentle ingredients: Provide a gentle, non-toxic alternative to conventional handwashes.
- Antimicrobial efficacy: Ensure effective hand hygiene using natural ingredients.
- Consumer demand: Meet growing demand for eco-friendly and sustainable products.
- Regulatory compliance: Ensure product safety and efficacy while complying with regulations.
- Innovation**:** Develop a unique product that combines natural ingredients and eco-friendliness.

This work can contribute to:

- Sustainable living
- Natural health and wellness
- Environmental conservation
- Innovative product development

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4. DRUG & EXCIPIENT PROFILE

4.1. Reetha



Fig. 2. Reetha

Synonym :- Sapindus mukorossi, Haithaguti, Ritha, Aritha,
Biological source :- Dried fruit of Sapindus tree
Family :- Sapindaceae
Chemical constituents :- Present in Reetha are saponins, sugars and mucilage, The seed kerners Reetha are a rich souce proteins and show a balanced amino acid composition as per world Health organization
Uses :- Detergent

4.2 Hibiscus Flower



Fig.3. Hibiscus flower

Synonym: - Jawanda, chaina Rose
Biological source: - It consist of dried flowers and leaves of Hibiscus rosa sinessis
Family: - Malvaceae
Chemical constituents: - Present in Hibiscus are protein, carbohydrates, minerals, Iron, Thiamine, Carotene, Riboflavin and Ascorbic acid
Uses: - Antimicrobial property
Antioxidant Power
Skin brightening
Gentle Cleaning

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4.3 Butea Monosperma



Fig.4. Butea Monosperma

Synonym: - Palash, Dhak, Flame of the forest
Biological source: - It consists of dried flowers and leaves of Butea Monosperma (lam) Kuntze
Family: - Fabaceae
Chemical constituents: - Flavonoids, tannins, Glycoside, Sterols, Fatty acid, galic acid
Uses: - Antimicrobial and Antibacterial properties
Natural cleansing and sanitization
Soothing and moisturizing

4.4. Methyl Paraben: - Methyl and Propyl Parabens Uses Parabens are antimicrobial chemicals used as preservatives in packaged foods, Pharmaceuticals, cosmetics, and personal care products. Methyl and propyl parabens are commonly found together in Paraben mixtures used in consumer products. [12]

4.5. Sodium lauryl Sulphate (S LS):-

Sodium Lauryl Sulfate (SLS) is a widely used surfactant in cleaning products, cosmetic, and personal care products. SLS's uses in these products have been thoroughly evaluated and determined to be safe for consumers and the environment. Sodium Lauryl Sulfate (SLS), also known as Sodium dodecyl sulfate, is a widely used surfactant in cleaning products, cosmetics, and personal care products. The sodium lauryl sulfate formula is a highly effective anionic surfactant used to remove oily stains and residues. It is found in high concentrations in industrial products, including engine degreasers, floor cleaners, and car wash products, where workplace protections can be implemented to avoid unsafe exposures. SLS is also used in lower concentrations in household and personal care products such as cleaning products, toothpastes, shampoos, and shaving foams.[13]

4.6. Cestrum Nocturnum



Fig.5. Cestrum Nocturnum

Synonym: - Cestrum leuocarpum
Biological source: - It is the whole plant this includes the leaves, flowers and fruits through the flowers and their strong fragrance are most often associated with the plants use.
Family: - Solanaceae
Chemical Constituents: - Alkaloids, Flavonoids, phenolic acids, tannins, essential oil, Glycoside.

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Uses: - Anti – aging effect
Skin brightening
Soothes skin irritation
Antioxidant effect
Antimicrobial activity

5. MATERIAL AND METHODS

Material:

- Reetha
- Hibiscus flower
- Butea Monosperma flower
- Methyl Paraben
- Sodium lauryl Sulphate

Formulation Table: -

Table no.1. Formulation Table

Sr.no.	Ingredients	Quantity	Properties
1.	Hibiscus flower	4 gm	Antimicrobial agent
2.	Reetha	2 gm	Foaming agent
3.	Butea Monosperma	4 gm	Antimicrobial / Antifungal agent
4.	Sodium lauryl Sulphate	2 gm	Foaming agent
5.	Methyl Paraben	1 gm	Preservative
6.	Cestrum nocturnum	2 gm	Flavouring agent

Preparation of Herbal Handwash

Steps of Herbal Hand Wash Formulation:

- **Drying:** All plant materials are dried and ground into a powder.
- **Weighing:** The required quantities of each ingredient are weighed individually.
- **Size Reduction: -** The crude ingredients were collected and these ingredients were size reduced using hand driven mixer individually.
- **Mixing:** All these fine ingredients were mixed thoroughly by mixer to form a homogenous fine powder.
- **Sieving:** The mixture is passed through a sieve (no. 120) to ensure a fine, uniform powder.

6. Evaluation test

6.1. Determination of pH



Fig.6. Determination of pH

A 1%w/v dispersion of handwash powder is prepared in distilled water and shaken gently for 30 minutes for homogenous dispersion. The dispersion is filtered through Whatman filter paper at room temperature and the pH of the filtrate is measured by digital pH meter. The measurement of sample is performed in triplicate and the results is expressed as the mean of measured observations. The acceptable pH between 5.5-10.5.

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6.2. Foaming Index: -



Fig.7. Foaming index

It is determined by taking 10ml of 1%w/v dispersion of handwash powder in 100ml measuring cylinder. The dispersion is stirred mechanically for 30 minutes for creating the foams. When the maximum foams are produced, the volume occupied by the foams is recorded and the mean of the three respective observations is recorded. Result calculated by measuring the height of foam developed in the measuring cylinder.

6.3. Angle of repose



Fig.8. Angle of repose

It is determined by heap method. Briefly the powder is poured through a glass funnel from a definite distance to the smooth horizontal surface until a heap of maximum height is formed in a conical form. The diameter and the height of the heap is determined, and the tangent of the angle is determined by following expression

Angle of repose(^{0}) = $\tan(hr)$

Where, 'h' is the height of heap and 'r' is the radius heap made by powder.

The table shows, the powder having angle of repose 25 exert an excellent powder flow. The powder having angle of repose between 25-30 exert good powder flow.

The powder having angle of repose between 30-40 exert passable powder flow.

The powder having angle of repose greater than 40 exert very poor powder flow

Table no.2 Angle of repose

Angle of repose	Type of flow
25	Excellent
25-35	Good
35-40	Passable
>40	Very poor

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6.4. Bulk Density

The Handwash powder is poured freely in 100ml measuring cylinder up to the mark with their natural flow. The upper surface of powder is made regular with the help of spatula. The volume occupied by the powder is noted down and represented as bulk volume and the weight as bulk mass.



Fig 9. Bulk density

6.5. Tapped Density

It is determined by using tapped density test apparatus. The powder taken in measuring cylinder (50ml) of the apparatus is tapped in up and down position up to the specified distance until it is compressed to the constant volume. The open end of the measuring cylinder is covered with aluminum foil to prevent the loss of lines due to dusting at the time of tapping. As the tapped volume increases density decreases.

6.6. Washability

Formulations were applied on the skin and then ease and extent of washing with water were checked manually.

6.7. Solubility

Solubility is defined as the ability of the substance to soluble in a solvent. One gram of the powder is weighed accurately and transferred into a beaker containing 100 ml of water. This was shaken well and warmed to increase the solubility. Then cooled and filter it, the residue obtained is weighed and noted.

6.8. Skin /eye irritation test

The eye and skin irritation tests revealed that the herbal handwash powder shows no harmful effect on the skin and eye. This is due to the low quantity of synthetic surfactants. Most synthetic surfactants produce inflammation of the corneal irritation. But in this formulation of herbal handwash powder, the uses of all ingredients are obtained naturally. So, it does not produce any harmful effect on the skin and eye.

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Formulation of Herbal Handwash powder :-



Fig.10. Formulation

Advantages of Herbal Hand wash :-

- No side effects.
- Bacteria on our hands can be minimized.
- It also helps to clear antiseptic and fungal problem faced by the skin.
- It also helps to remove dirt and oil effectively from the skin.
- Easier access compared to using soap and water.
- The easiest way to get rid of microorganism.
- Hand wash prevent germs from entering into our body [14]

7.RESULT AND DISCUSSION

Here are some potential results of formulating and evaluating an eco-friendly herbal handwash powder

Sr.no.	Evaluation test	Result
1.	Colour	Beige (Light brown)
2.	Odour	Slightly sweet
3.	pH	7
4.	Solubility	Easily soluble
5.	Skin irritation test	No irritancy

Conclusion

The formulation and evaluation of the eco-friendly herbal handwash powder demonstrate its potential as a sustainable and effective alternative to conventional handwashing products. With its natural ingredients, antimicrobial properties, and gentle skin compatibility, this product can contribute to:

1. Environmental sustainability
2. Natural health and wellness
3. Effective hand hygiene

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This eco-friendly herbal handwash powder offers a promising solution for individuals seeking natural and sustainable personal care products.

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