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Research Article

Exploring Formulation Strategies And Assessing Efficacy: A Study On Hand Wash Development And Evaluation

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ABSTRACT

Hand cleaning is a necessary daily practice. Using an appropriate hand wash formulation and thorough hand washing were essential due to the fact that hands are a major source of microbial diseases. Many constituents (chemicals) are known to possess antimicrobial properties. Because of this, using these substances as antibacterial agents in the formulation of synthetic handwash is now standard procedure. The latest study involves using vitamin-E to create a synthetic handwash. The manufactured hand wash's antimicrobial activity against skin pathogens was tested using the Streak-Plate technique, and its efficacy was compared to that of a traditional commercial hand wash. With fewer or no negative side effects, the formulation successfully reduced the amount of organisms from hands-based handwash. Due to its increased antimicrobial activity, this handwash can be used in the manufacturing of commercial handwash. The main objective of hand wash preparation is hand hygiene. Numerous hand washes available on the market come with unfavourable side effects like irritation, dermatitis, and itching. To stop these negative consequences, such dermatitis, rage, and itching, use these hand wipes. The synthetic hand wash's formula tries to shield your skin from bacteria and other pathogens while fighting germs. Hand wash is evaluated based on a number of factors, including colour, scent, grittiness, pH, viscosity, spreadability, foam height, foam retention, skin irritation test, cleaning action, filth dispersion test, and antimicrobial activity. Its efficacy was evaluated and contrasted with a hand wash that is sold commercially. The results had little or no negative consequences and fell within acceptable bounds. The goal of this study was to create a hand wash that contains

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vitamin E, which is used to reduce bacterial growth in addition to washing hands. Its recipe was developed keeping in mind how sensitive skin is, so it won't irritate it. Therefore, because of their ingredients, effectiveness on the skin of our hands, and compatibility for all skin types, hand washes are far preferable than essential soaps or the synthetic hand washes that are currently on the market.

INTRODUCTION

Hand washing with soap and water has been a part of personal hygiene for hundreds of years, and it is usually associated with cultural and spiritual rituals.[1] Although the connection between hand washing and the spread of disease was discovered two centuries ago, it is regarded as particularly early when compared to the discoveries made decades later by Pasteur and Lister.[2] Ignaz Semmelweis in Vienna, Austria, and Oliver Wendell Holmes in Boston, USA, discovered that healthcare workers might spread nosocomial infections through their hands in the middle of the 1800s.[3] The skin is among the body's most delicate tissues. It needs to be shielded against illness as a consequence.[4] Cleaning your hands is crucial to maintaining skin free of harmful bacteria and stopping the transmission of contagious diseases.[5] Supervisors need to give workers in food preparation and service the go-ahead to properly wash their hands and fingers in order to be ready for work. It is not mandated by regulatory bodies to use a fingernail brush. Even after ten months of the outbreak, one of our best lines of defence against the virus is handwashing with soap and Handwash. [7] It has long been believed that washing your hands is one of the best ways to stay healthy.[8] Maintaining our health and safety just requires a small amount of work. Aditionally essential to preventing COVID-19 is handwashing.[9] In order to keep ourselves healthy during this epidemic and beyond, maintaining good hand hygiene has to become a daily habit. We accept the new way of life and learn to live with COVID-19 more than ever. [10] Because COVID-19 mostly spreads by direct, indirect (through contaminated items or surfaces), or close contact with infected individuals through the mouth and nasal secretions, handwashing with soap, Handwash, and running water is essential. [11] Handwashing is necessary after coughing or sneezing, when caring for the ill, after using the restroom, before eating or preparing food, and after handling animals or animal faeces in order to prevent the spread of COVID-19 and other COVID-appropriate activities. [12] Washing our hands before handling joint surfaces like doorknobs or handles or after returning from a public place protects both us and others around us. [13] GHD is an international campaign to promote better handwashing habits, with the goal of organising and motivating people worldwide.[14] It is necessary to wash your hands with soap and water throughout important periods of the day. [15] The United Nations recognises Global Handwashing Day on October 15 of each year [16]. To avoid sickness, the global campaign seeks to increase awareness of the benefits of handwashing with soap. [17] With proper handwashing, the risk of respiratory and intestinal infections can be reduced by 25% to 50%. [18] Using a fingernail brush to thoroughly cleanse your hands and fingers is the easiest method to eradicate transient bacteria. [19] Hand contact is the most common way that harmful bacteria can spread and nosocomial illnesses can manifest. [20] Vitamin E was used in a variety of ways. [21] Because of its moisturising qualities, this vitamin E is frequently utilised in soaps and handwashing solutions to avoid dryness and irritation.[22] Though there are a few alternatives, Vitamin-E is a well-liked, all-natural moisturising ingredient that is frequently accessible and reasonably priced.[23] Vitamin-E functions as an antioxidant when applied topically to the skin, shielding it from harm from both internal pollutants and external stimulants. [24]

1. MATERIALS AND METHOD -

The ingredients used for handwash formulation are as follows

1. SLS (Sodium Lauryl Sulfate)
2. Vitamin-E
3. Glycerine
4. Citric acid
5. NaCl
6. Colour
7. Fragrance
8. Water
9. Carbopol

Methods to follow :-

1) Vitamin E was added to the hand wash gel as a moisturising ingredient.

2) Pour roughly 50 ml of water into a beaker.

3) Add enough water to dissolve the preservative methylparaben.

4) Transfer 1.5 g of citric acid into the beaker.

5) Fill the beaker with SLS (Sodium Lauryl Sulphate) and thoroughly swirl with a magnetic bead until all of the SLS dissolves.

6) Add the rose oil, glycerine, and vitamin E after thoroughly combining all the ingredients listed above.

7) Combine 3.5 mL of glycerine, 0.5 mL of vitamin E, and the recommended quantity of rose oil.

8) After mixing all the ingredients, add 4 grams of NaCl to thicken the formulation.

9) After the handwash thickens, measure its pH. You could add a small amount of citric acid if needed.

Formulation and Evaluation of Handwash

Table 1: Formulation of hand wash F-1

Ingredients	Quantity	Uses
SLS	2.5gm	Surfactant
METHYL PARABEN	Q.S.	Preservative
CITRIC ACID	1.25ml	Forms Foam, Cleanser
VITAMIN-E	0.5ml	Moisturization, Antioxidant
GLYCERINE	3.5ml	Humectant, Skin Conditioning
NACL	2.8gm	Viscosity Binder
ROSE OIL	Q.S.	Fragrance
WATER	50 ml	Vehicle
CARBOPOL	1gm	Viscosity

Table 2: Formulation of hand wash F-2

Ingredients	Quantity	Uses
SLS	2.8gm	Surfactant
METHYL PARABEN	Q.S.	Preservative
CITRIC ACID	1.5ml	Forms Foam, Cleanser
VITAMIN-E	0.5ml	Moisturization, Antioxidant
GLYCERINE	3.8ml	Humectant, Skin Conditioning
NACL	4gm	Viscosity Binder
ROSE OIL	Q.S.	Fragrance
WATER	50 ml	Surfactant
CARBOPOL	1gm	Viscosity

INGREDIENTS AND THEIR USES –

1. Sodium Lauryl Sulphate –

An component called SLS is present in the majority of soap formulations available on the market.[25] Sodium Lauryl Sulphate is an artificial detergent and foaming agent that corrodes in order to clean. [26] SLS is used by businesses to produce a rich lather with strong cleaning properties. SLS is regarded as a common comparative material used to gauge how irritating other substances are to the skin. [27]

2. Methyl Paraben –

One kind of paraben is methylparaben.[28] Chemicals called parabens are frequently added to items as preservatives to extend their shelf lives. [29] To stop mould and other dangerous bacteria from growing, they are added to food or cosmetic products. [30] One or two more forms of parabens are also commonly found in the components of goods that contain methyl parabens. Methylparaben is present in many different types of makeup. [31] These consist of: hand washing; soaps; moisturisers; and certain deodorants.

3. Citric Acid –

The Latin term citrus, which refers to a tree whose fruit resembles lemons, is the source of the name of citric acid (2-hydroxy-propane-1,2,3-tricarboxylic acid).[32] It is widely used in many different industries, including the food, chemical, pharmaceutical, and cosmetics sectors.[33] Citric acid is widely utilised as a surfactant and cleaning agent in many different industries, including anti-aging and cleaning.[34]

4. Vitamin-E –

Tocopherols and tocotrienols are two distinct forms of vitamin E that are used in cosmetic products.[35] Four sub-forms of tocopherol or tocotrienols are included in each of these two main groups: alpha-(α-), beta-(β-), gamma-(γ-), and delta-(δ-).[36] Tocopherol is the most widely distributed and abundant form of vitamin E. Vitamin E's benefits for the skin Vitamin E has various advantages when it comes to skin care. [37]

- **Combats free radicals:**

Vitamin E shields skin from harmful free radicals by acting as an antioxidant. 38

- **Strengthens skin's defence against UV radiation:**

Vitamin E, when applied topically, strengthens skin's defence against UV radiation and lessens its damaging effects. [39]

- **Functions as an anti-inflammatory agent:**

Vitamin E reduces swelling, thickness, oedema and erythema, which are common signs of skin inflammation, hence aiding in the fight against skin inflammation following UV exposure. [40]

5. Glycerine –

Glycerine is a colourless, odourless, and non-toxic liquid that is sometimes referred to as glycerol or glycerine on ingredient labels.[41]. It is a component in many different goods, including soap and toothpaste for personal hygiene.[42] Commonly used components can also be found in food goods and medications. Since glycerine is a humectant, it helps to maintain moisture in your skin and hair as well as in products.[43]

6. NaCl –

SLES and co systems are examples of surfactants where the kinetics should be fast. [44] When generated with anionic surfactants, salts cause the elongation of spherical micelles into cylindrical ones, increasing the viscosity of the system.[45] As we have seen, however, the kinetics of micelle elongation may be slowed down if big molecules are used.[46]

7. Carbopol –

Carbopol polymers are polymers of acrylic acid cross-linked with polyalkenyl ethers or divinyl glycol.Carbomers readily absorb water, get hydrated and swell. In addition to its hydrophilic nature, its cross-linked structure and its essentially insolubility in water makes Carbopol a potential candidate for increasing viscosity [47]

F1

F2

ANTI – MICROBIAL STUDIES

Test Microorganism –

A. Antibacterial Hand Wash Study:

In accordance with normal protocol, the antimicrobial efficiency of the generated hand wash was assessed on soil microorganisms using the agar plate technique. To investigate the antibacterial activity against soil microorganisms, two sterile Petri plates were utilised. Before being employed, the nutrient agar solution was applied to the plates and given time to set. Using the Pour Plate Method, the soil extract from the subculture was solidified and plated onto a nutrient agar medium, where it was inoculated for a full day. After the inoculation, wait 24 hours before using the Streak-Plate Method. To test the activity, the plates are put in an incubator set at 37°C. After 48 hours, the leaves were examined to determine if any microbial growth had taken place or had been suppressed. The antibacterial activity of the formulation is tested using the streak-plate method. Using microbial inhibition, the hand wash's efficacy was assessed.

B. To conduct antimicrobial research, a panel of common pathogenic bacteria was utilised. The agar plate method was used to test the Hand Wash compositions' antibacterial effectiveness. The results of the zone of inhibition showed that the VITAMIN-E hand wash has strong antibacterial qualities. Compared to the formulation (F-1), the hand wash formulation's (F-2) activity was marginally higher (F-1). The zone of inhibition for each formulation is shown in the table below.

PHYSICAL EVALUATION -

The handwash was subjected to physical evaluation visually. The test parameter was –

a. Colour – slightly yellow
b. Odour – rose oil

c. Texture – skin smooth

Appearance and Homogeneity –

The handwash was homogenous, slightly yellow in colour, and translucent.

Viscosity –

The gel-based hand wash viscosity was determined using a digital Brookfield viscometer. 50ml of hand wash was taken into 100ml of the beaker, and the tip of the viscometer was dipped into the beaker containing the hand wash formulation and its Viscosity was measured. The Viscosity of F-1 and F-2 was 54 and 62 CPS.

pH –

6.5 – 7

Foaming Index –

In 50ml distilled water, one gram of produced hand wash was dispersed. A measuring cylinder was filled with the dispersion. To get the volume up to 100ml, water was utilized. The remaining volume is filled with water to ten millilitres, and the solution is split into 10 test tubes in increments of one, two, three, and ten millilitres. The test tubes were then forcefully shaken for 15 seconds. The test tube is then left aside for 5 minutes. The height of the foam was also measured.

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

Foam Retention -

In a 100ml measuring cylinder, 25ml of Hand Wash Gel was added and shaken 10 times. For four minutes, the volume of foam was measured at one minute intervals. For 5 minutes, foam retention should be steady.

Stability –

The Stability studies were carried out for Hand wash formulation by storing at different temperature conditions like 40°C, 25°C, and 37°C for one week. During the stability studies, no change in colour and no phase separation were observed in the formulated hand wash.

Spreadability -

0.5gm Hand Wash Gel Sample was placed between two slides and left for roughly 5 minutes, with no further spreading expected. The diameter of the spread circle was measured in centimeters and used as a comparison for spreadability.

COMPARISON OF HANDWASH WITH OTHER COMMERCIAL PRODUCTS –

Sr. No	Evaluation Parameters	Formulated Handwash	Marketed Handwash Dettol
1	Colour	Pale Yellow	Orange
2	Oduor	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	6.5	8.11
8	Foam Retention	15ml	18 ml
9	Stability	Stable	Stable

10	Viscosity	60	70

INGREDIENTS USED IN BOTH HANDWASH

Formulated Handwash	Marketed Handwash Dettol
Sodium Lauryl Sulfate Vitamin-E Glycerin Citric acid NaCl Fragrance-Rose oil Water Carbopol	Aqua, Ammonium Lauryl Sulfate, Sodium Lauryl Sulfate , Glycerin , Propylene Glycol, Sodium Chloride, Cocamide MEA, Glycol Di stearate, Salicylic Acid, Parfum, Tetrasodium EDTA, Hydroxypropyl Guar Hydroxypropyltrimonium Chloride, Citric Acid, Glycol Stearate, Butylphenyl Methylpropional, Citronellol, Linalool, Magnesium Nitrate, Methylchloroisothiazolinone, Methylisothiazolinone

RESULTS AND DISCUSSION –

Using the streak-plate method, the antimicrobial efficacy of a handwash formulation was evaluated. When compared to handwash that is sold commercially, the results demonstrated that the handwash made from vitamin E had a significant amount of activity. The handwash formulation's movement shown a significant reduction in the development of bacteria in culture plates. Visual inspection reveals that the formulation is light yellow in colour, with a smooth texture and rose-like scent. The formulation appears homogenous and translucent. In light of our discussion on grittiness, the formulation lacked grit. For the formulation to cause the least amount of skin irritation, it must have an accurate pH. With a pH of 6.5, the formulation is both appropriate and non-irritating to skin. Wool Yarn soaked in Greece was used to assess the cleaning effect. Since the main goal of any hand wash preparation is to clean, the formulation's evaluation yielded findings that indicated 29% Detergency Power, which is good against elements that resemble oil and grime. Regarding the dispersion of dirt test, the composition is thought to be of low quality if it makes the ink concentrate in the foam. It is best to leave the dirt in the water because it will be more difficult to remove if it becomes stuck in the foam. Therefore, following the formulation examination, the findings indicated that there was no dirt in the foam. After five minutes, the formulation's foam retention was examined and confirmed to be steady. The Ostwald viscometer was used to measure viscosity. Viscosity values were calculated using a 1-minute time gap between the formulation's upper and lower markings on the Oswald viscometer. It is deemed viscous if the formulation takes longer to formulate, and less viscous if the formulation takes less time to formulate than required. By transferring 0.5 grams of sample between the two slides and keeping it there for around five minutes, the spreading ability of the formulation was investigated. The reported time needed by the formulation to travel the distance, expressed in centimetres using a measuring scale, was the parameter selected for taking readings. It was discovered that the formulation had a good spreading ability. The resultant mixture was tested against culture in order to investigate the inhibition. The mixture included a wide range of antibacterial agents, according to the results. Thus, it may be said that the formulation has strong antibacterial properties.

CONCLUSION –

Like cosmetics, cosmeceuticals (cosmetics with alleged medical benefits) are applied topically but contain substances that affect the skin's biological activity. Eighty percent of Asians currently use handwash for basic hand hygiene and primary health care, including the production of hand wash, according to the WHO. The goal of this study was to develop a hand wash that contained Vitamin-E, could be used to wash hands, and would inhibit the growth of bacteria. Its formula

was created keeping in mind how delicate skin is, to prevent irritation. All skin types can use the hand wash, which is far superior to simple soaps or currently available synthetic hand washes due to its ingredients and effectiveness on the skin of our hands.

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