JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

A Review: Formulation and evaluation of natural polymer hand wash with potential pathway

[1]Alok Kumar, [2*]Hans Raj, [3]Jyoti Gupta

[1.] Student of bachelors of pharmacy, School of Pharmacy, IEC University, Baddi.
[2.*] Associate Professor, School Of Pharmacy, IEC University, Baddi.
[3.] Associate Professor, Head of Department, IEC School of Pharmacy. IEC University, Baddi.

ABSTRACT

Handwashing is relied upon in numerous fields as a primary means to prevent transmission of harmful pathogens. While handwashing is a key step in disease prevention, the factors controlling its effectiveness are not always well understood, and there are extensive variations in the methodology used to assess each of these factors. This review summarizes the various factors that can impact handwashing effectiveness as well as the methods and results of studies evaluating each of these factors related to handwashing. Numerous methods are available to inoculate hands as well as to recover microorganisms from hands, and for a given method, experimental variables can be changed between researchers. These variations amongst methods as well as variations in reporting experimental results can make it difficult to compare studies as, well as challenging to accurately interpret the results between studies. Standardization of methods and reporting requirements are necessary to allow for comparison of studies so that more accurate conclusions about the handwashing process can be made.

Keywords: Handwashing, prevention, microorganisms, methodology.

INTRODUCTION

Hand washing with soap and water has been taken part of personal hygiene for hundreds of years and has Been usually embedded in spiritual and cultural behavior.(1) Although, the link among Hand washing and the spread of disease changed into set up simplest two centuries in the past, despite the fact that this can be considered as extra ordinarily early with admire to the discoveries of Pasteur and Lister that passed off decades later.(2,3) In the middle of 19th century, Ignaz Semmelweis in Vienna (Austria), and Oliver Wendell Holmes in Boston (USA), revealed that

the hands of health care work spread nosocomil infection(4,5). In 1847, observations of Sem that after performing autopsies by physician on their hands had a disagreeable odorpite hand washing with soap and water before entering the clinic. He hypothesized therefore that "cadaverous particles" were transmitted via the hands and caused the childbed fever. After a theory of disease offering developed by Pasteur, Semmelweis's findings goes worldwide acceptance after his death, when Pasteur developed the scientific theory of disease offering a theoretical explanation for Semmelweis's findings.(6) In 1980s remarkable evolution made in concepts of hand hygiene in health care(7). Simultaneously in the same year first national hand hygiene guidelines were published, furthermore several other countries also published the new guidelines in this array.(8) In the year 1995 and 1996, the CDC/HICPAC within the USA recommended that besides antimicrobial soap or alcoholic antiseptic agent be used for washing hands.(9) Skin being the most exposed part of our body requires protection from skin pathogens.(10) The hands of Health Care workers (HCWs) are the primary routes of transmission of multidrug resistant pathogens and infection to the patients.(11) Hence, it brings up the use of antiseptic for hand wash purpose(12). Many of the chemical antiseptics are now available in market as alcohol based sanitizers, chlorhexidine products etc(12). These soaps or solutions help to reduce health care associated transmission of contagious diseases ore effectively but they have some shortcomings or adverse effects.(13) Their frequent use can lead to skin irritation and also resistant among pathogens(14). Organisms such as Staphylococcus aureus, Pseudomonas spp., Klebsiella pneumonia & Proteus vulgaris are some of the skin pathogens (15).Hand washing is an important way to help fight the spread of disease. Hand washing removes visible dirt from hands and reduce the number of harmful microorganisms.(16) Harmful bacteria and viruses such as, E. coli and Salmonella can be carried by people, animals or equipment and transmitted to food.(17)

History

Handwashing and Impact on the Food Industry Proper hygiene and effective handwashing are essential to food safety.(18) It is estimated that foodborne pathogens, both major known pathogens as well as unspecified agents, cause 47.8 million illnesses, 127,830 hospitalizations, and 3,037 deaths in the U.S. each year (Scallan et al. 2011).(19) While eliminating all foodborne disease is unrealistic, certain food safety practices such as handwashing are an effective tool to reduce disease incidence.(20) Section 2-301.12 of the FDA Food Code states that proper handwashing can result in a 2 to 3 log reduction in transient bacteria as well as a 2-log reduction in transient viruses and protozoa (USFDA 2013).(21) Transfer of pathogens from the hands of food workers to food significantly contributes to the spread of foodborne illness, and the improvement of handwashing in food workers is critical to decrease the amount of foodborne illness outbreaks (22)

Material and Methods

Material

Among the most crucial substances employed in the current investigation to develop a gel-based herbal hand wash was Argemone Mexicana(23). Argemone Mexicana leaf was harvested in the Sangli district of Maharashtra. (24)The specimens were authenticated by YCP, Karad College. (25)Triethanolamine, cabopol-934, Sodium lauryl

sulphate, Methyl paraben, Rose Water, and perfume were procured from RCP in Kasegaon, Maharashtra(26). Chemicals of analytical grade are employed in the preparation.Bacterial strains Escherichia coli (gram–ve) ATCC 10531 Pseudomonas aeruginosa (gram–ve) ATCC 25619 Staphylococcus aureus (gram +ve) (27)

Method

Preparation of Extracts11

In a 100 ml methanol solution, 10g of dry plant material was added (9 parts of methanol: 1 part of water)(28). This combination was warmed for 12 to 24 hours in a water bath at 60°C, filtered, and plant extract was extracted.(29) Formulation of Gel Based Herbal Hand Wash using extracts of Argemone Mexicana Preparation of gel base: Herbal gel was prepared overnight using deionized water and 1 percent w/w carbopol-934 as a gelling agent(30). To achieve homogeneous polymer dispersion, the swollen polymer was then agitated using a mechanical stirrer.(31) By adding modest volumes of triethanolamine and stirring continuously, the pH was raised to 7.0 (32)

Sr.no	Ingredients	Quantity taken	Role
1	Cabopol-934	0.25mg	Jelling
2	Purifired	20ml	Vehicles
3	Triethanolamine	q.s	Neutralizer

Table no 1:-preparation of herbal gel base for herbal hand wash (33)

Collection of plant material:

The plants Neem [Azadirachta indica] & Peppermint [Mentha piperita] leaves were collected from Gurukrupa Institute of Pharmacy College Campus, Majalgaon.(34) To remove sand particles from sample, wash it thoroughly with fresh water. (35)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. (36)Powdered material was extracted with a suitable solvent.(37) . Ritha powder, turmeric powder, Clove oil and Tulsi oil were collected from the local market of Majalgaon. Soil extract were chosen for antibacterial activity.(38)

Extraction of plant material: 10 grams of each dry plant material Neem, Peppermint powder and 5gm of Ritha powder were added in water.(39) The mixture was heated on water bath at 600 C for 1 hour, and then filtered through Whatman Filter Paper to get the particle free Extract.(40)

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.(41)

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 form a Homogenous Gel and then the required quantity of Rose oil was added for Fragrance.
7) Lastly, it was stored in well closed container and labelled suitably for further analysis(42)

Collection of plant materials:

The plants Mimosa pudica L and Azadirachta indica A were collected from the garden area of NGSMIPS Campus, Deralaktte, Mangalore.

Preparation of herbal leaf extracts:

The collected plants Mimosa pudica L and Azadirachta indica A leaves are taken and coarsely powdered. 10 grams of coarsely powdered leaves of both plants were soaked in 200 ml of methanol and kept for maceration for about 3-4 days.

After maceration the extract is filtered and the filtrate was collected and used for making hand wash.(43)

Preparations of herbal hand wash formulations:

Formulation 1 (F-1):

In this formulation the hand wash was prepared using 20 ml of mehonolic extract filtrate. To this filtrate 6g of SLS , glycerin 40 ml , 0.3 g of methyl paraben, 5ml of rose merry oil is added and the volume is made up to 100ml with purified water.

Formulation 2 (F-2):

This formulation was prepared by adding 20 ml of lemon juice to 20 ml of methonolic extract filtrate of Mimosa pudica L and Azadirachta indica A leaves. The remaining ingredients include all the same as mentioned above in formulation 1 (44)

Table 2: Formulation of poly herbal hand wash F 1

INGRIDIENT	QUANTITY
Methanolic extract of mimosa pudica L and Azadirachta indica	20ml
Sodium lauryl sulphate	6gm
Glycerin	40ml
Methyl 386araben	0.3gms
Rosemerry oil	5ml
Purified water	100ml

(45)

Table 3: Formulation of poly herbal hand wash F 2

INGRIDIENT	QUANTITY
Methanolic extract of mimosa pudica and Azadirachta indica	20ml
Sodium lauryl sulphate	6gm
Glycerin	40ml
Methyl 386araben	0.3gms
Rosemerry oil	5ml
Purified water	100ml
Lemon Water	20ml

(46)

TABLE 4: Antimicrobial activities of polyherbal hand wash formulations

ORGANISM	**ZONE OF INHIBITION IN Cms**		
	Std.Drug	F-1	F-2
BACILUS SUBTILUS	1.4	3.4	3.8
STAPHYLOCOCCUS AUREUS	2.7	3.8	4.3
PSEUDOMONAS AERUGINOSA	2.7	3.6	4.2
ESCHERICHIA COLI	1.8	3.3	3.8

(47)

Evaluation of Gel Base for Herbal Hand Wash

Physical Evaluation

Visual inspection of the Poly-Herbal Gel Based Hand Wash was performed. The test parameters were colour, odour, texture., Appearance and Homogeneity

PH

In 100 millilitres of distilled water, 1 gm of gel-based herbal hand wash was mixed. The pH of the mixture was examined using a previously standardised digital pH metre

Viscosity

The thickness of a gel-based herbal hand cleanser was tested using a digital Brookfield viscometer.

Irritancy Test:

During irritancy checks, there is no redness, edema, inflammation, or discomfort in the preparation. Thesethings are absolutely safe to use on the skin(48)

Foam Retention

50 ml of the gel-based herbal hand wash was agitated 10 times in a 250ml graduated cylinder. The quantity of foam was monitored at 1-minute periods for 4 minutes. Foam retention should be stable over a period 5 minutes.

Spreadability

The spreadability device was made out of a wooden block with a pulley attached to one end. To measure spreadability, this method evaluated the slip and drag properties of gels.

An excess of gel (nearly 2g) from the research was applied to this ground slide. After that, the gel was placed between this slide and a glass slide with the same proportions as the fixed ground slide, as well as a hook.

A 1 kg weighted plate was placed on top of the two slides for 5 minutes to release air and create a homogeneous gel coating between them. Excess gel was pulled away from the edges. The top plate was then pulled with an 80-gram pull. With the help of the string linked to the hook, the time (in seconds) taken for the top slide to traverse a distance of 7.5 cm may be estimated. When the time is shorter, spread ability is easier. (49)

The Anti-microbial efficacy of the formulations of Polyhedral Hand Wash was tested on Staphylococcus aureus, Psuedomonas aeruginosa, Bacillus subtill and Escherichia coli by agar plate technique. The results of zone of inhibition showed that the hand wash prepared from methanol extract of the combined plant materials shown significant antimicrobial activity. The hand wash prepared with lemon juice (F-2) showed little higher activity than the formulation prepared without lemon juice(50)

Conclusion

Natural remedies are regarded to be more suitable than synthetic therapies since they are safer and have lesser adverse effects. Herbal preparations are gaining popularity on the international market. Argemone Mexicana extract is being used to make a herbal gel-based hand cleanser. As per the observations of many researches, herbs are highly beneficial agents that may be used as hand wash with reduced adverse effects and longer lasting benefits. The data indicate that the gel composition is homogenous. These herbal hand wash compositions outperformed widely available alcohol-based hand wash preparations. Pathogenic bacteria such as Staph aureus, E. coli, and Pseudomonas aeruginosa have been monstratedto be effective towards Staph. aureus, E. coli, and Pseudomonas aeruginosa, with no negative effects on human tissue.

Reference

[1]. Ravi K, Pratibha MD, Kolhapure SA. 2005;Evaluation of the antimicrobial efficacy and safety of Pure Hands as a hand sanitizer: Indian Journal of Clinical Practice, 15(10),19-27.

[2]. Mashood Ahmed Shah, Satheesh Babu Natarajan, Mohd. Gousuddi , 2014; Formulation, Evaluation and Antibacterial Efficiency of Herbal Hand Wash Gel. Int. J. Pharm. Sci. Rev. Res., 25(2),120-124.

[3]. National Disease Surveillance Centre. Preventing Food borne Disease: A Focus on the Infected Food Handler. 2004.17-20.

[4]. Ali Heyam Saad, Shehab Naglaa Gamil, Rasool Bazigha and Rana Samour1, 2011; Formulation and evaluation of herbal hand wash from Matric aria chamomilla flowers extracts. IJRAP,2 (6) ,1811-1813.

[5]. Pittet D. 2005, Clean hands reduce the burden of disease. Lancet; 366: 185-187.

[6]. Powar P. V, Bhandari N.R, Arya Ashwini, Sharma P. H., 2015; Formulation and Evaluation of Poly Herbal Anti-Bacterial Gel Based Hand Wash. Int. J. Pharm. Sci. Rev. Res., 33(1),79-82.

[7]. Abbiw DK. Useful plants of Ghana – West African use of wild and cultivated plants. Intermediate Technology Publications and the Royal Botanic Gardens Kew; 1990.

[8]. Saurabh Rajvaidhya, B.P.Nagori, G.K.Singh ,B. K. Dubey, Prashant Desai and Sanjay Jaina, 2012; review on argemone Mexicana linn – an Indian medicinal plant. International journal of pharmaceutical sciences and research. (01), 2494-2501.

[9]. Kumar L, Verma R, 2010, In-vitro evaluation of topical gel prepared using natural polymer. Int. Drug Delivery. 2, 58-63.

[10].Minakshi G. Joshi, D V Kamat and S D Kamat, 2008; Evaluation of herbal formulation, Natural product radiance 7(5);413-415.

[11].Nikita d. Gidde *, priyanka v. Desai, priyanka v. Bagade, seema u. Shinde, manojkumar m. Nitalikar., 2021, formulation and evaluation of herbal hand sanitizer using argemone mexicana and calendula officinalis plant extract, international research journal of pharmacy

(11)Rotter M. Hand washing and hand disinfection. In: Mayhall CG, ed. Hospital epidemiology and infectioncontrol, 2nd ed. Philadelphia, PA, Lippincott Williams & Wilkins, 1999: 1339–1355.

[12] Jumaa PA. Hand hygiene: simple and complexInternational Journal of Infectious Diseases, 2005, 9: 3–14

[13] Simmons BP. Guidelines for hospital environmentalcontrol. Section 1. Antiseptics, hand washing, and hand washing facilities. In: Centers for Disease

(14)Control and Prevention (CDC), ed. CDC Hospitalinfections program (HIP) guidelines for prevention andcontrol of nosocomial infections. Atlanta, GA, Springfield, 1981: 6–10

[15] Bjerke NB. The evolution: hand washing to handhygiene guidance. Critical Care Nursing Quarterly 2004, 27: 295–307.

[16] The Healthcare Infection Control Practices AdvisoryCommittee (HICPAC).Recommendationforpreventing the spread of vancomycin resistance. Infection Control and Hospital Epidemiology, 1995, 16: 105–113.

[17] Garner JS, and the Healthcare Infection ControlPractices Advisory Committee. Guideline for isolationprecautions inhospitals. Infection Control and HospitalEpidemiology, 1996, 17: 53–80.

[18] The skin "boundless anatomy and physiology"[online]. Available: https: //courses. lumenlearning. com/boundless - ap/chapter/the - skin/#: ~: text=The%20epidermis%20is%20a%20thin, divided%20into%20five%2C%20separate%20layers.

[19] Shaloo, Shayna Shafi, Simran Singh, Shashi Verma, Ritesh Kumar Tiwari and Devika Tripathi, Formulation and Development of Mint containingHerbal Hand Sanitizer, European Journal ofPharmaceutical and Medical Research, 2017 [11], 454- 457.

[20] Powar P. V, Bhandari N. R, Arya Ashwini, Sharma P. H., Formulation and Evaluation of Poly Herbal Anti - Bacterial Gel Based Hand Wash, International Journalof Pharmaceutical Sciences Review and Research, 33(1) July - August 2015; Article No.16, Pages: 79 - 82.

[21] Nandkishor S. Wani, Ashish K. Bhalerao, Vikram P. Ranawre, Rahul Zanje, Formulation and Evaluation ofHerbal Sanitizer, International Journal of PharmatechResearch, Jan - Mar - 2013, 40 - 44.

[22] Dr. I. B. Salunkhe (M. SC., Ph. D., Head Departmentof Botany), Sunderrao Solanke Mahavidyalay, Majalgaon.

[22] Mounika, Vijayanand P, V. Jyoti, Formulation andEvaluation of Polyherbal Hand wash Gel containingessential oils, International Journal of Pharmacy andAnalytical Research, Vol.6, Issue 4, Oct - Dec 2017, P. N.645 - 653.

[23] Zeeshan Afsar, Salma Khanam, Formulation andEvaluation of Polyherbal Soap and Hand Sanitizer, International Research Journal of Pharmacy, 2016, 7[8]

[24] andeep DS, Narayana Charyulu R, Prashant Nayak, Aliss Maharjan, Indira Ghalan, Formulation ofAntimicrobial Polyherbal Hand Wash, Research J. Pharm and Tech., July 2016, 864 - 866

[25] Megha Bahuguna and Shil1pi Kashyap, Formulationand Evaluation of Hand Wash, World Journal ofPharmaceutical Research. Volume 5, Issue 7, 1559 -1577

[26] AGRI FARMING, "Tulsi Oil Extraction Poocess, Benefits, Uses" [Online]. Available: https: //www.agrifarming. in/tulsi - oil - extraction - process -benefits - uses

[27] Hany. M. Yenia, Methanolic Extract of NeemAzadirachta Indica] and its Antibacterial Activityagainst Foodborne andContaminated Bacteria Sodiumdodecyl Sulphate Polyacrylamide gel Electrophoresis[SDS PAGE], American Eurasian J. Agricultural andEnvironmental Science, 16 [3]: 598 - 604, 2016

[28] Mashood Ahmad Shah, Satheesh Babu, Hatarjan, Mohd. Goushuddin, Formulation, Evaluation andAntibacterial Efficiency of Herbal Hand Wash Gel, Research article no.23, Mar - Apr 2014, Page no.120 -124

[29] Sharma RM, Shaha K, Patel J. Evaluation of preparedformulations andto compare formulated shampoo with Marketedshampoo. IntPharmPharm Sci 2011; 3 (4): 402 - 5.

[30] Surupsing M. Vlavi*, Akash D. Patil, HarishchandraM. Yeowle, Vipul H. Jain and Pawar SP., Formulationand Evaluation of Herbal Shampoo Powder, International Journal of Pharma And Chemical
Research, Volume 3 Issue 3 Jul – Sep 2017, 495.

[31] Rina Maskare, Nitin Indurwade, Abhishek Purohit, Veena Atrahe, Formulation and Evaluation of Polyherbal Hand Sanitizer, International Journal ofPharmacy and Biological Science, 2019,

(32) Amin, N., Pickering, A. J., Ram, P. K., Unicomb, L., Najnin, N., Homaira, N., et al. (2014).

(33) Microbiological evaluation of the efficacy of soapy water to clean hands: randomized, non-inferiority field trial. American Journal of Tropical Medicine and Hygiene,

(34) Ansari, S. A., Sattar, S. A., Springthorpe, V. S., Wells, G.A., & Tostowaryk, W. (1989). In vivo protocol for testing efficacy of hand-washing agents against viruses and bacteria: experiments with rotavirus and Escherichia coli. Journal of Applied and Environmental Microbiology,

(35) ASTM. (2013a). ASTM E2870-13 Standard test method for evaluating relative effectiveness of antimicrobial handwashing formulations using the palmar surface and mechanical hand sampling. West Conshohocken: ASTM International.

(36) ASTM. (2013b). ASTM E1174-13 Standard test method for evaluation of the effectiveness of health care personnel handwash formulations. West Conshohocken: ASTM international.

(37) Ayliffe, G. A. J., Bagg, J. R., Davies, J. G., & Lilly, H. A. (1988) Hand disinfection: a comparison of various agents in laboratory and ward studies. Journal of Hospital Infection.

(38) Bartzokas, C. A. Corkill, J. E., & Makin, T. (1987). Evaluation of the skin disinfecting activity and cumulative effect of chlorhexidine and triclosan handwash preparations on hands artificially contaminated with Serratia marcescens. Infection Control.

(39) Benson, L. Bush, L., & DeBlanc, D. (1990) Importance of Neutralizers in the stripping fluid in a simulated healthcare personnel handwash. Infection Control and Hospital Epidemiology.

(40) Bettin, K., Clabots, C., Mathie, P., Willard, K., & Gerding, D. N. (1994) Effectiveness of liquid soap vs. chlorhexidine gluconate for the removal of clostridium difficile bare hands and gloved hands. Infection Control and Hospital Epidemiology.

(41) Burton, M., Cobb, E., Donachie, P., Judah, G., Curtis, V., & Schmidt W. P. (2011). The effect of handwashing with water or soap on bacterial contamination of hands. International Journal of Environmental Research and Public Health. Centers for Disease Control and Prevention. (2009). OPRP General Information on Hand Hygiene.

(42)Bustin, S. A., Benes, V., Garson, J. A., Hellemans, J., Huggett, J., Kubista, M. et al. (2009). The MIQE Guidelines: Minimum information for publication of quantitative real-time PCR experiments.Clinical Chemistry.

(43)Chamberlain, A. N., Halblab, M. A., Gould, D. J., & Miles, R. J. (1997). Distribution of bacteria on hands and the effectiveness of brief and thorough decontamination procedures using non-medicated soap. Zentralblatt fur Bakteriologie.

(44)Contreras, P. A., Sami, I. R., Darnell, M. E.R., Ottolini, M. G., & Prince, G. A. (1999)Inactivation of respiratory syncytial virus by generic hand dishwashing detergents and antibacterial hand soaps. Infection Control and Hospital Epidemiology.

(45)Davidson, C. A., Griffith, C. J., Peters, A. C., & Fielding, L. M. (1998). Evaluation of two methods for monitoring surface cleanliness—ATP bioluminescence and traditional hygiene swabbing. Luminescence.

(46)Edmonds, S. L., McCormack, R. R., Zhou S. S., Macinga, D. R., & Fricker, C. M. Hand Hygiene Regimens for the Reduction of Risk in Food Service Environments. Journal of Food Protection.

(47) Edmonds, S. L. Zapka, C., Kasper, D., Gerber, R., McCormack, R., Macinga, D., et al. Effectiveness of hand hygiene for removal of Clostridium difficile spores from hands. Infection Control and Hospital Epidemiology.

(48)Fischler, G. E., Fuls, J. L., Dail, E. W., Duran, M. H., Rodgers, N. D., & Waggoner, A. L.). Effect of hand wash agents on controlling the transmission of pathogenic bacteria from hands to food. Journal of Food Protection.

(49)Fuls, J. L., Rodgers, N. D., Fischler, G. E., Howard, J. M., Patel, M. Weidner, P. L., et al.. Alternative hand contamination technique to compare the activities of antimicrobial and nonantimicrobial soaps under different test conditions. Applied and environmental Microbiology .

(50)Gibson, H., Taylor, J. H., Hall, K. E., & Holah, J. T. (1999). Effectiveness of cleaning techniques used in the food industry in terms of the removal of bacterial biofilms. Journal of Applied Microbiology.