ejpmr, 2025, 12(5), 689-697

SJIF Impact Factor 7.065

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Review Article

ISSN 2394-3211

EJPMR

NATURE'S TOUCH: THE POWER OF HERBAL HANDWASHES WITH NEEM, TURMERIC, AND TULSI

Rohit Raj[1]*, Dr. Navjot Singh Sethi[2] and Dr. Jyoti Gupta[3]

[1]IEC UNIVERSITY, Kalujhanda, 174103, Dist. Solan, H. P.

***Corresponding Author: Rohit Raj**

IEC UNIVERSITY, Kalujhanda, 174103, Dist. Solan, H.P.

Article Received on 24/03/2025 **Article Revised on 14/04/2025** **Article Published on 03/05/2025**

ABSTRACT

In order to demonstrate the potential of neem, turmeric, and tulsi for germ-free hand hygiene, this review article investigates the creation and assessment of herbal hand washes. neem's antibacterial and antifungal bioactives, turmeric's curcumin-driven antioxidant and anti-inflammatory effects, and tulsi's adaptogen and antimicrobial qualities combat bacteria without dehydrating the skin. Studies and evaluations have shown that aloe vera provides additional moisture while effectively washing without leaving the skin feeling dry. Although the intensity varies, the scent is gentle enough for those who are sensitive. which contains natural ingredients like lemon, cajeput oil, and clove oil, soothe skin while providing strong germ protection (99.9% in 10 seconds).The handwashes present in their formulations are safer and more eco-friendly than chemical-based ones with quality packaging and price. In this review article we study properties of herbs that is used in herbal handwash. Long-term efficacy research with optimization for other skin types is needed.

KEYWORDS: Herbal handwash, Neem, Turmeric, Tulsi handwash, Natural handwash, Ayurvedic handwash.

I. INTRODUCTION

The hands serve as the primary mode of microbe and disease transfer; hand hygiene is the most effective means of the prevention of the spread of harmful germs and diseases. Hand hygiene in healthcare is the most efficient and best, most simple, and cheapest means of preventing nosocomial infection. Infected hands may act as germ spread vectors. Transmission of outbreaks is carried from one human being to another when a food handler spreads bacteria to his/her contaminated hands and then to the customers through hand contact with food or beverages. The user becomes infected after consumption of these bacteria, which may result in gastrointestinal disease.[1][2]

Health-care workers' hands are primarily responsible for the dissemination of drug-resistant bacteria and disease to patients. As a result, it introduces the problem of hygienic hand washing. Different antimicrobial agents are available in the form of alcohol-based hand cleanser, detergent, and so forth in the market. These solutions or soaps help in the prevention of health-care-associated microbiological contamination, but they have got disadvantages or side effects. Their usage on a regular basis might promote skin irritation and infection resistance.[3]

Natural ingredients make up herbal hand cleanser. Thus, if left in the ecosystem, it can overcome pathogenic resistance and won't harm the environment. From the earliest times, plants have yielded mankind a number of medicinally active compounds, and they remain the original source of pharmacologically active compounds. Plant medicines have been used to treat and prevent disease for thousands of years.[4][5]

Neem

- Azadirachta indica is a member of the mahogany family of plants called Meliaceae and also known as neem, nimtree, or Indian lilac. It extensively inhabits most of Africa and the Indian subcontinent and is one of two Azadirachta species. It usually grows in tropical and semi-tropical climates. Neem trees also grow in southern Iran on islands. Neem oil primarily derives from its fruits and seeds.[6]
- It is a rapidly growing evergreen that reaches a height of 15–20 meters (49–66 feet), and in some instances reaches 35–40 m (115–131 feet) in height. Deciduous, though most of the leaffall in dry weather. The branches spread widely. The crown, not very dense, spherical in shape and 20–25 m (66–82 feet) in diameter in some instances. The neem-tree follows the same pattern.[7]
- Fruit is glabrous olive-like drupe that varies from elongate oval to near roundish in size, measuring ripe fruits to be 14–28 mm (1⁄2–1 1⁄8 in) long and 10–15 mm (3⁄8–5⁄8 in) in width. Thin in nature fruit

skin (exocarp) possesses yellowish-white and very fibrous, bitter-sweet pulp (mesocarp). The mesocarp of the fruit is 3–5 mm (1⁄8–1⁄4 in) thick. Hard white shell (endocarp) of the fruit holds one, seldom two or sometimes three elongated seeds (kernels) covered with brown seed covering.[8]

TRADITIONAL MEDICINE

- Neem products have been utilized in Indian traditional medicine for thousands of years; however, there isn't sufficient clinical data in regards to the use of neem for therapeutic purposes. Neem dosages in humans aren't established; short-term use is safe, however long-term use has the possibility of harming the kidneys or the liver; neem oil is toxic and may be deadly in children. Low blood sugar, infertility, and miscarriage are some of the side effects of neem.[9][10]

PEST AND DISESASE CONTROL

- Neem provides a natural alternative to man-made pesticides and forms the backbone of non-pesticide management (NPM). The crop is sprayed with neem-seed powder that has been steeped in water overnight. It has to be given repeatedly, at least every 10 days, to be useful. Neem doesn't kill the pests. It prevents the crop from getting harmed by acting as an anti-feedant, repellent, and egg-laying deterrent. The pests die of hunger within a couple of days. Neem also prevents the eggs from hatching later. Neem-based fertilisers proved useful in controlling southern armyworm.[11]
- Neem cake can be used as fertilizer. Due to its anti-desertification characteristics and its ability to serve as a great carbon dioxide sink, the neem tree is of critical importance. Another use for it is in keeping the soil fertile.[12]

OTHER USES

- Fertilizer: As a nitrification inhibitor, neem extract is applied to fertilizers (urea).
- Tree: The neem tree is significant because it prevents desertification and may be an excellent carbon dioxide absorber. Maintaining soil fertility is another application for it.
- Animal feed: ruminants and rabbits can occasionally eat neem leaves as fodder.
- Fertilizer: As a nitrification inhibitor, neem extract is applied to fertilizers (urea).
- Teeth cleaning: Neem has long been used as a kind of twig that cleans teeth.[13]

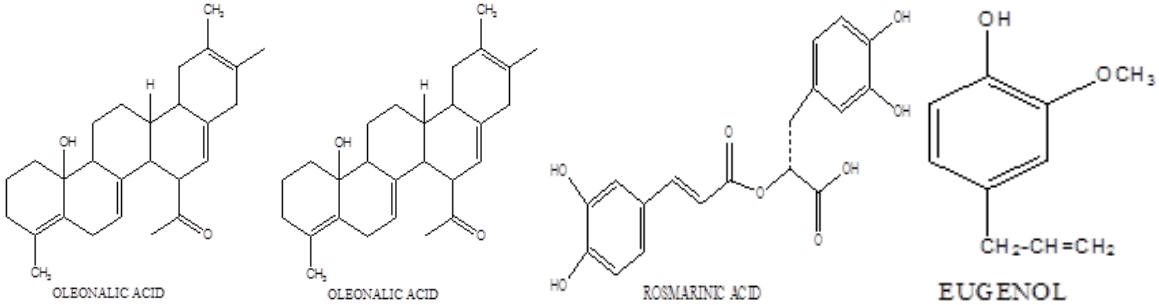
b) TULSI

- A strongly scented perennial herb belonging to the family Lamiaceae, Ocimum tenuliforem has also been called holy basil, tulsi, or tulasi. Originating in the Indian subcontinent, it grows widely as a herb in the tropical parts of the Southeast Asian region. Tulsi grows to produce essential oil and to be used in traditional and religious medicine. It holds a place in the Vaishnava tradition of Hinduism, where devotees worship holy basil plants or foliage, and finds widespread usage in the form of herbal tea and in Ayurveda.[14]
- The most widespread of the three major morphotypes that grow in India and Nepal are the common wild vana tulsi (such as Ocimum gratissimum), the less widespread purple greenleaved (Krishna or Shyam tulsi), and the most widely distributed Ram tulsi (broad and bright green, relatively sweet leaves).[15]

MORPHOLOGY

- Holy basil is a much-branched, 30–60 cm (12–24 in) tall, hairy-stemmed erect subshrub. Leaves are green and purple; they are petiole, simple, and have a decussate phyllotaxy and a strongly scented ovate blade that is up to 5 cm (2 in) long and has usually a margin that is slightly toothed; they have a decussate phyllotaxy and a strongly scented appearance. Purplish flowers appear in close whorls along narrow racemes.[16]
- The most widespread of the three major Indian and Nepalese cultivated forms are Ram tulsi (most widely planted, with broad shiny green leaves featuring a sweetish taste), less common purplish green-leaved (Krishna or Shyam tulsi) and common wild-growing vana tulsi (such as Ocimum gratissimum).[17]

CHEMICAL COMPOSITION OF TULSI



- The main constituents of tulsi essential oil include eugenol (~70%), β-elemene (~11.0%), β-caryophyllene (~8%), and germacrene (~2%). The remainder is composed of other trace chemicals, primarily terpenes.[18]

USES

- Ayurvedic and Siddha systems have utilized tulsi (Sanskrit: Surasa) for the purported cure of illness.

C) TURMERIC

- Curcuma longa is a flowering perennial from the ginger family of plants (Zingiberaceae). Its rhizomes are utilized in the culinary world. Curcuma longa occurs naturally in the Indian subcontinent and the region of Southeast Asia and requires temperatures of 20 to 30 °C (68 to 86 °F) along with a considerable amount of precipitation annually to thrive. Plants are harvested annually for rhizomes, some to be consumed and others to be used for propagation the subsequent season.[19]
- The curcumin, the chief ingredient of the rhizomes, is responsible for the color and flavor of the rhizomes. Some use them fresh or boil them in water and dry them before they grind them into the deep orange-yellow powder used often to color and flavor numerous Asian foods, especially curries, and as a coloring agent. The earthy, mustardy aroma of the turmeric powder comes with heated, bitter, black pepper-like flavors.[20]
- The United States' Food and Drug Administration, the European Parliament, and the World Health Organization have all approved curcumin, a vibrant yellow chemical derived from the turmeric vegetable, as a foodstuff.[21]

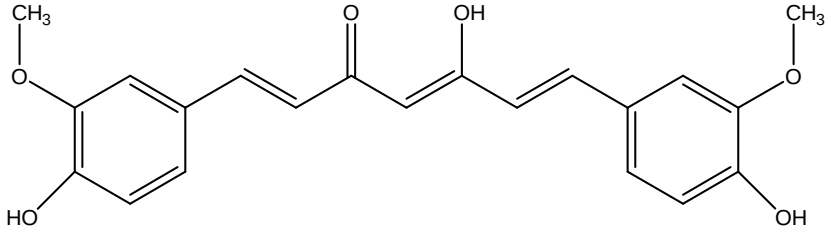
ORIGIN AND DISTRUBUTION

- In spite of being used for centuries in Ayurvedic medicine, where it also goes by the name of haridra, there isn't any concrete clinical evidence that the ingestion of curcumin or of turmeric might treat any disease.[22]
- India has the highest number of Curcuma species (between 40 and 45) in the world. There are around 30 to 40 species in Thailand. Numerous wild species of Curcuma can also be found in other tropical Asian nations. Curcuma longa has a dubious classification; only specimens from South India can be identified as C, according to recent investigations.[23]
- The identification and verification of the phylogeny, the relationship between them, intraspecific and interspecific differences, and identification of the other species and the cultivars in the rest of the world remain necessary. Some of the species which are presently in use and being marketed as "turmeric" in the rest of the world truly belong to a group of similar-looking taxa sharing common nomenclature.[24]

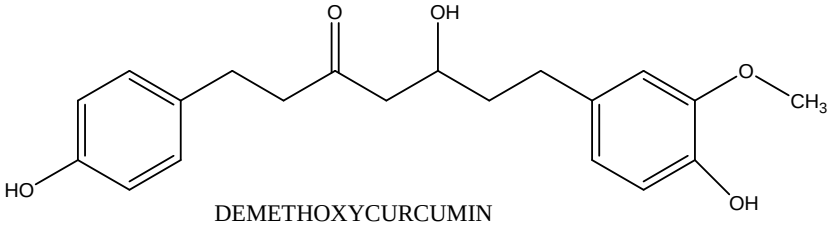
PHYTOCHEMISTRY

- India has the highest number of Curcuma species (between 40 and 45) in the world. There are around 30 to 40 species in Thailand. Numerous wild species of Curcuma can also be found in other tropical Asian nations. According to recent research, Curcuma longa has a dubious taxonomy; only specimens from South India can be identified as longa. It is still necessary to identify and authenticate the phylogeny, relationships, intraspecific and interspecific variation, and even the identification of other species and cultivars in other areas of the world. It has been demonstrated that some species that are now used and marketed as "turmeric" in other regions of Asia really belong to a number of visually identical taxa, sharing local names.[25]
- Based on their long-standing traditional usage, the European Medicines Agency came to the conclusion in 2019 that turmeric herbal teas or other forms taken orally might be used to treat moderate digestive issues such flatulence and sensations of fullness. In South and Southeast Asian woods, turmeric grows wild and is harvested for use in traditional Indian medicine (Siddha or Ayurveda).[26]
- In addition to young banana or plantain plants, taro leaves, barley (jayanti), wood apples (bilva), pomegranate (darimba), Saraca indica, manaka (Arum), or manakochu, and rice paddy, the crop serves as one of the nine ingredients of nabapatrika in Eastern India. Indian people throughout the Indian subcontinent mark their weddings with the Haldi ceremony, gaye holdup in Bengal (i.e., "yellow on the body"). A Thali necklace of dried turmeric tuber covered in string forms part of the Tamil–Telugu wedding ceremony in Tamil Nadu and Andhra Pradesh.[27]
- In India's western and coastal region, the Kannada Brahmins who speak the familiar language of Marathi and Konkani bind the tubers of turmeric to their wrists using threads at the ritual called Kankana Bandhana. Bischoff WE, Reynolds TM, Sessler CN, Edmond MB, and Wenzel discussed the role of using an alcohol-based hand antiseptic that was readily available in affecting the handwashing compliance of health care workers.
- Friedrich Ratzel in 1896 wrote in The History of Mankind that turmeric powder was utilized in Micronesia for ceremonies as well as for decorating the body, garment, and utensils.[28]

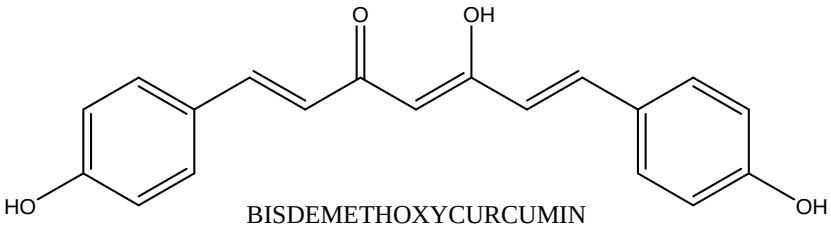
CHEMICAL COMPOSITION



CURCUMIN



DEMETHOXYCURCUMIN



BISDEMETHOXYCURCUMIN

Anatomy and physiology of skin

1. The human body's largest organ, the skin is a layer of usually soft, pliable external tissue that serves as a barrier between the external and internal environments and provides homeostatic and protecting roles. The pH of the skin varies from 4 to 5.6. The skin consists of three layers:[29]

a) **Epidermis**
b) **Dermis**
c) **Subcutaneous Tissue**

a) Epidermis

1. A thin layer of skin is called the epidermis. It is the skin's outermost layer. It is made up of tissue called epithelium. The epidermis serves both protective and tactile purposes. This skin is further separated into five layers, which are as follows:

1. **Stratum Corneum:** Its outermost layer, the stratum corneum, consists of 10 to 30 layers of thin, constantly shedding dead keratinocytes. Because of the fact that its cells are as rough as they are in an animal's horn, the corneum has been dubbed the "Horny layer."
2. **Stratum Lucidum:** Only seen on the skin of the palms, soles, and fingertips, it is made up of four to six rows of flat, transparent, dead keratinocytes that contain a lot of keratin.
3. **Stratum Granulosum:** Between the stratum spinosum and the stratum lucidum lies a thin layer known as the stratum granulosum. This layer aids in creating a waterproof barrier that keeps the body from losing fluids. Keratin, the primary component of skin, is produced in this layer.
4. **Stratum Spinosum:** Between the stratum granulosum and the stratum Basale is the stratum spinosum layer. This layer gives the skin its strength and flexibility.[30][31]

b) The Dermis: The middle layer of skin is called the dermis. The dermis is located underneath the epidermis. Because blood vessels were present, the skin was nourished by nutrients and oxygen and assisted in the removal of waste. It has nerves that aid in the transmission of impulses from the skin. Various sensations, such as touch, pressure, temperature, etc., are included in these signals. Additionally, it includes collagen, a protein that gives skin its resilience.[32]

c) The Subcutaneous Tissue / Hypodermis / Subcutis:
1. It is made up of fat cells and connective tissue and is the deepest layer of the skin. The Subcutis acts as an insulating layer to protect internal body organs and muscles from stress and temperature changes. Our skin must be safeguarded from skin infections because it is the most vulnerable part of our body. Usually found on

the hands are microbes of the resistant and transitory flora types. The deeper layers of the skin are populated by resident flora like Staphylococcus aureus, whereas the surface layers are colonized by transient flora like Gram-negative bacilli. Hand washing is an easy way to get rid of these microbes.[33]

In the current context of a mechanized lifestyle, natural medications are more acceptable because they are perceived as safer and having less adverse effects than synthetic ones. Globally, there is an increasing need for herbal formulations. In response to this command, an attempt has been undertaken to look for antibacterial herbs in the ancient library. These characteristics have been found in Azedarach indica (neem) and Mentha Piperita (pudina).[34]

II. Scientific Evidence and Research

A. Review of Current Research on Topical Uses of Tulsi, Turmeric, and Neem

Because of their bioactive components, neem, turmeric, and Tulsi have all been well researched for their potential medical benefits, especially when applied topically.

- **Neem (Azadirachta indica):** Studies show that neem has antibacterial and anti-inflammatory qualities that are ascribed to substances such nimbin, nimbidin, and azadirachtin. Studies that show neem's effectiveness against bacteria (Staphylococcus aureus, Escherichia coli), fungi (Candida albicans), and even some viruses include those that were published in Phytotherapy Research (e.g., Biswas et al., 2002). Handwash applications may benefit from topical neem formulations, such as lotions and oils, which have demonstrated promise in treating skin infections and accelerating wound healing.[35]
- Antimicrobial Action: Neem's wide-ranging antimicrobial action is active against bacteria (Enterococcus faecalis, Streptococcus mutans) as well as fungi, and parasites. A study conducted in 2016 revealed neem's antibacterial action against E. faecalis to be as good as that of chlorhexidine, validating its application in topical antiseptics. Soaps and face washes of neem (such as Apollo Life Neem Tulsi Face Wash) utilize such action to ward off acne and preserve a clear skin.[36]
- Scabies and Dermatitis: The previously mentioned pilot study proved the effectiveness of neem, in combination with turmeric, to treat scabies, with no adverse effects reported. Neem's anti-inflammatory and healing activity further increases its value in dermatology.[37]
- Wound healing: Neem extracts in foam gel induced healing of orthodontic extraction sockets, as with that of turmeric, and better than that of betadine in a few cases. Its antimicrobial and anti-inflammatory activity fosters tissue regeneration.Applications of Nanoemulgel: Like that of turmeric, that of neem nanoemulgels also promises topical antimicrobial delivery. A 2024 study noted their stability, biocompatibility, and synergistic action with turmeric against microbial infections.[38]
- Skin and Oral Health: Neem is employed in mouthwash and gels to combat plaque and gingivitis, although the evidence is variable in comparison with chlorhexidine. Topically, neem oil and creams are safe for short durations (up to 2 weeks) for the treatment of conditions such as psoriasis and the treatment of lice.[39]
- **Turmeric (Curcuma longa):** Turmeric's main active ingredient, curcumin, has a well-established antibacterial, antifungal, and antioxidant profile. Curcumin's capacity to suppress prevalent skin infections Pseudomonas aeruginosa and Staphylococcus epidermidis was highlighted in a 2016 study published in the Journal of Clinical and Experimental Dermatology Research. Topical therapies based on turmeric have also been investigated for their potential to improve skin health during frequent handwashing by lowering oxidative stress and inflammation.[40]
- Properties of Antibiosis: Turmeric's curcumin shows antibacterial as well as antifungicidal activity, acting against many pathogens such as Enterococcus faecalis. Turmeric has been found to be as effective as 5% sodium hypochlorite and 2% chlorhexidine in suppressing E.[41]
- Wound Healing: Curcumin reduces inflammation and oxidation, promoting faster wound closure. A 2014 study recommended optimized curcumin formulations for cutaneous wounds due to its effects on tissue and collagen regeneration. A 2019 study showed turmeric and neem extracts in gel foam enhanced healing in orthodontic extraction sockets compared to betadine.[42]
- Treatment of Scabies: An Indian village pilot study of 814 individuals treated with a 1:4 mixture of turmeric-neem paste resulted in a 97% cure in 3 to 15 days. This brought into prominence the antimicrobial and anti-inflammatory synergism of the turmeric and neem as a low-cost, synthetic agent replacement.[43]
- Nanoemulgel Formulations: Recent studies (2024) investigated neem- and turmeric-based nanoemulgels as topical drug carriers against microbial infections. These nanoemulgels, prepared with olive oil and Carbopol 934, exhibited good antimicrobial action, biocompatibility, and penetration to the deeper epidermis, counteracting antibiotic resistance.[44]
- Skin Disorders: Turmeric can help conditions such as alopecia, acne, and psoriasis because of its anti-inflammatory effect. The National Psoriasis Foundation advises topical or ingested turmeric for the control of flares, although additional clinical trials are necessary. A 2023 review mentioned that turmeric can be used in the treatment of eczema and radiodermatitis in patients with cancers.[45]
- **Tulsi (Ocimum sanctum):** The essential oils of tulsi, which contain ursolic acid and eugenol, have

broad-spectrum antibacterial properties. A 2014 study published in the Indian Journal of Experimental Biology supported the usage of tulsi in skin care products by confirming its efficacy against Aspergillus niger and Bacillus subtilis. Ethnobotanical studies have investigated its antiviral qualities, especially against encapsulated viruses suggesting that it is relevant for hygiene products. Although the majority of these research concentrate on more general dermatological uses rather than handwashes particularly, taken as a whole, they provide a solid basis for the topical administration of these herbs.[46]

- Antimicrobial Action: Tulsi has broad-spectrum antimicrobial activity against viruses, fungi, and bacteria, such that it is a potential candidate for topical use in the form of hand sanitizers and dressings. A 2017 review mentioned its use as a hand sanitizer and a mouthwash because of its action against human pathogens.[47]
- Acne treatment: Tulsi's antibacterial action can stop acne by combating follicle-blocking bacteria. A 2014 literature review reported experimental findings indicating tulsi's effectiveness against acne-inducing bacteria, although high-quality human trials do not exist. Both tulsi and neem find their way into products such as Apollo Life Neem Tulsi Face Wash, in which they are used to clear pores and prevent recurrence of acne.[48]
- Skin Inflammation and Aging: A study in 2019 proved that the application of tulsi extracts results in strong antioxidant action, promoting healthy skin aging by neutralizing free radical damage. Its anti-inflammatory action can decrease inflammation and erythema in ailments such as eczema, although more work is necessary.[49]
- Wound Healing: Tulsi's anti-inflammatory and antimicrobial action facilitates healing of wounds. Ayurvedic preparations of tulsi are usually combined with other drugs such as neem for synergistic action.[50]
- Safety: Tulsi is safe in low doses when applied topically but must be used with caution by those allergic to the herb or pregnant/breastfeeding without consulting a physician. Patch testing is advisable in the case of sensitive skin.[51]

B. Gaps in Current Research and Need for Further Investigation

the promising Despite properties of neem, turmeric, and tulsi, several research gaps hinder a comprehensive understanding of their efficacy in handwashes:

- **Lack of Standardized Formulations:** It is challenging to evaluate results or create ideal formulations since studies seldom ever employ consistent concentrations or combinations of these plants.
- **Limited Clinical Trials:** Human trials evaluating real-world handwashing scenarios, such as frequent usage or preventing the spread of pathogens, are scarce, and the majority of research is conducted in vitro or using animal models.
- **Synergistic Effects:** Although neem, turmeric, and tulsi are frequently used together in traditional practices, little is known about their combined antibacterial and skin-protective properties in a single handwash. Long-Term Safety: Although these herbal extracts are typically harmless, further research is needed to determine the cumulative effects of everyday exposure (such as the possibility of skin sensitization).
- **Viral Efficacy:** Research on the antiviral effectiveness of these herbs in handwashes is desperately needed, especially for tulsi and neem, given the growing attention being paid to viral transmission Standardized testing procedures, randomized controlled trials, and studies of synergistic formulations should be the main focus of future research in order to verify claims of herbal handwashes.[52]

C. Herbal Handwashes' Drawbacks

Although tulsi, turmeric, and neem have many health advantages, there are a few draw back sousing them in handwashes:

- **Potency:** In order to achieve equivalent pathogen elimination, herbal extracts may need larger concentrations or longer contact durations than synthetic antimicrobials (such as triclosan or alcohol).
- **Stability:** Bioactive substances that are susceptible to light, heat, and pH variations, such as curcumin and the essential oils of tulsi, might shorten the shelf life or decrease the effectiveness of liquid handwash formulations.
- **Standardization:** Disparities in the quality, source, and processing of herbal extracts might result in products with varying antibacterial activity.
- **Customer Perception and Usefulness:** According to some consumers, herbal handwashes are slower-acting or less foamy than standard brands, which may have an impact on compliance. Some customers may also be put off by overpowering herbal odors.
- **Regulatory challenges:** In the absence of strong clinical evidence, herbal handwashes may find it challenging to satisfy strict safety and effectiveness requirements (such as FDA or EU recommendations). Clearer regulatory channels for herbal products and formulation technological advancements like microencapsulation or stabilizers are needed to overcome these constraints.[53][54][55]

III. Useful Implementations and Customer Views

A. Creation Innovations and Difficulties in Herbal Handwashing

Since neem, turmeric and tulsi are complex phytoconstituents, creating herbal handwashes with them that are effective poses special hurdles. Advances are being made to bypass these hurdles, enhancing product efficacy and customer appeal:

- Stability of Active Ingredients: The vital oils of turmeric, neem, and tulsi are all prone to degradation by alterations in pH, heat, and light. Curcumin's antibacterial properties, for instance, could be lost in aqueous environments through degradation.[56]

Such compounds are stabilized through developments like liposomal delivery techniques and microencapsulation techniques to ensure that its activity persists throughout the shelf life period of the product.Solubility and Dispersion: Due to the hydrophobic nature of neem and turmeric extracts, it is sometimes hard to incorporate them into liquid products. Natural surfactants like soap nut saponins and optimization of emulsification processes make solubility better and provide uniform handwash textures.[57]

- Balancing Efficacy and Skin Comfort: Sensitive individuals can cause dryness or redness in skin when subjected to high concentrations of either tulsi or neem. As a counter to this, these herbs are blended with moisturizing components like glycerin or aloe vera to maintain the antibacterial aspects with enhanced skin moisture.[58]

- Preservation issues: handwashes will oftentimes avoid the artificial preservatives, but natural stand-in options like rosemary oil or grapefruit seed extract may not provide broad-spectrum protection. Advances in controlled manufacturing environments and natural blends of preservatives help to promote shelf life without compromise on aesthetics.[59]

- Sensory Appeal: Sensory appeal plays an important role in customer acceptance. Users are likely to be deterred by the strong odor associated with neem or by the discolouration property of turmeric. To enhance the overall wash experience, more current developments include the addition of stabilized turmeric extracts to counteract discolouration and aromatherapy oil combinations (such as lavender or lemongrass) to mask the odor of neem. Such innovations illustrate the growing convergence of modern-day formulation science and ancient herbal tradition to enable herbal handwashes to compete on functionality and appearance with synthetic counterparts.[60][61]

IV. CONCLUSION

Since natural medicines are safer and have fewer side effects, they are thought to be more appropriate than synthetic medications. On the global market, herbal preparations are becoming more and more popular. A herbal gel-based hand cleaner is being made with extract from Argemone Mexicana. Numerous studies have shown that herbs are extremely advantageous substances that may be used as hand wash with fewer negative effects and longer-lasting advantages. According to the statistics, the gel's composition is uniform. Compared to commonly available alcohol-based hand wash preparations, these herbal hand wash formulations performed better. It has been demonstrated that pathogenic bacteria, including Staph aureus, E. coli, and Pseudomonas aeruginosa, are efficient against these germs without harming human tissue. Cosmetics and cosmeceuticals, which are cosmetics with purported therapeutic qualities, are applied topically and contain substances that affect the skin's biological processes. According to WHO estimates, the majority of Asian countries' populations currently utilize herbal medication for hand hygiene, which includes making hand wash. In order to create a polyherbal hand wash gel that contains herbal extract and is utilized for both hand cleansing and bacterial growth prevention, the current study was conducted.

It was made with consideration for the sensitivity of the skin to ensure that it wouldn't irritate it in any way. Therefore, based on their ingredients and efficacy on our hands, as well as their suitability for all skin types, polyherbal hand wash gels are far superior to conventional soaps or already sold hand washes.

REFERENCE

1. Bbiw DK. Useful plants of Ghana – West African use of wild and cultivated plants. Intermediate Technology Publications and the Royal Botanic Gardens Kew, 1990; 7-9.
2. Abbiw DK. Useful plants of Ghana – West African use of wild and cultivated plants. Intermediate Technology Publications and the Royal Botanic Gardens Kew, 1990.
3. AGRI FARMING, "Tulsi Oil Extraction Poocess, Benefits, Uses" [Online]. Available: https: //www.agrifarming. in/tulsi - oil - extraction - process -benefits - uses
4. Aiello AE and Elaine BL: Antibacterial cleaning and hygiene products as an emerging risk factor for antibiotic resistance in the community. The Lancet Infectious Diseases, 2003; 3(8): 501–506.
5. Aja P. M, Nwachukwu N, Ibiam1 U.A, Igwenyi I.O, Offor C.E and Orji U.O:Chemical Constituents of Moringa oleifera Leaves and Seeds from Abakaliki, Nigeria. American Journal of Phytomedicine and Clinical Therapeutics, 2014; 2(3): 310-321.
6. Issac O. Recent progress in chamomile research-medicines of plant origin in modern therapy. 1st edition Czecho-Slovakia, Prague press: 1989.
7. Ali Heyam Saad, Shehab Naglaa Gamil, Rasool Bazigha and Rana Samour1, Formulation and evaluation of herbal hand wash from Matric aria chamomilla flowers extracts. IJRAP, 2011; 2(6): 18111813.
8. Al-Rowaily SL, Abd-ElGawad AM, Assaeed AM, Elgamal AM, El Gendy AENG and Mohamed TA: Essential oil of Calotropis procera: comparative chemical profiles, antimicrobial activity and allelopathic potential on weeds. Molecules, 2020; 25: 5203. doi: 10.3390/molecules25215203

9. Altman RD, Marcussen KC, Effects of a ginger extract on knee pain in patients with osteoarthritis. Arthritis Rheum, 2001; 84-85.
10. Amin, N., Pickering, A. J., Ram, P. K., Unicomb, L., Najnin, N., Homaira, N., et al. (2014).
11. 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.
12. ANSAB (Asia Network for Sustainable Agriculture and Bioresources), 2011. Value Addition Analysis of Ginger Sub-sectors in Nepal, FAD, SNV, July 2011.
13. 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.
14. 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.
15. ASTM. (2013b). ASTM E1174-13 Standard test method for evaluation of the effectiveness of health care personnel handwash formulations. West Conshohocken: ASTM international.
16. 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.
17. Azwanida NN: A review on the extraction methods use in medicinal plants, principle, strength and limitation. Medicinal & Aromatic Plants, 2015; 4(3): 1-6. doi: 10.4172/2167-0412.1000196
18. 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.
19. Bischoff WE, Reynolds TM, Sessler CN, Edmond MB and Wenzel RP. Handwashing compliance by health care workers: the impact of introducing an accessible, alcohol-based hand antiseptic. Arch Intern Med., 2000; 57.
20. Bischoff WE, Reynolds TM, Sessler CN, Edmond MB and Wenzel RP. Handwashing compliance by health care workers: the impact of introducing an accessible, alcohol-based hand antiseptic. Arch Intern Med., 2000.
21. Bjerke NB. The evolution: hand washing to handhygiene guidance. Critical Care Nursing Quarterly, 2004, 27: 295–307.
22. Boyce JM and Pittet D. Guideline for Hand Hygiene in Health-Care Settings. Morbidity and Mortality Weekly Report, 2002; 36.
23. Dr. I. B. Salunkhe (M. SC., Ph. D., Head Departmentof Botany), Sunderrao Solanke Mahavidyalay, Majalgaon.
24. Elizabeth E: Pouring agar plates and streaking or spreading to isolate individual colonies. Methods in Enzymology, 2013; 533: 3-14. doi:
25. Garner JS, and the Healthcare Infection Control Practices Advisory Committee. Guideline for isolationprecautions inhospitals. Infection Control and HospitalEpidemiology, 1996; 17: 53–80.
26. Ghimire, P. L., 2009. Value Chain Analysis of Ginger Sector of Nepal: A Study on Governance Structure and Upgrading strategies for Micro, Small and Medium sized Enterprises. Unpublished. Master‟s Thesis for the Partial Fulfillment of the Degree of MBA in SME Development‟, International SEPT Program, University of Leipzig, Germany.
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, 2016; 16(3): 598 - 604.
28. Jadhav P, Sonne M, Kadam A, Patil S, Dahigaonkar K and Oberoi JK: Formulation of cost effective alternative bacterial culture media using fruit and vegetables waste. International Journal of Current Research and Review, 2018; 10(2): 6-15. doi: 10.7324/IJCRR.2018.1022
29. Jumaa PA. Hand hygiene: simple and complex International Journal of Infectious Diseases, 2005; 9: 3–14.
30. Kanchan T and Atreya A: Calotropis gigantea. Wilderness & Environmental Medicine 2015; 1: 1-2.
31. Katakam RS, Pedarla B, Vasimalla A, Shaik A, Mogudumpuram H and Sudhakarbabu: Formulation of poly herbal hand wash with antimicrobial activity. Indo American Journal of Pharmaceutical Research, 2017; 7(3): 7869-7872.
32. Kokare CR: Pharmaceutical microbiology experiments and techniques. Career Publication Nashik Maharashtra, 2008; 43.
33. Kokate CK: Practical pharmacognosy, Vallabh Prakashan, New Delhi, 1999; 107-121.
34. Lakshmipriya G, Kruthi D and Devarai SK: Moringa oleifera: A review on nutritive importance and its medicinal application. Food Science and Human Wellness, 2016; 5: 49-56.
35. Mahran, GE, Glombitza KW, Mirhom YW, Hartmann R and Michel CG. Novel saponins from Zizyphus spina-Christi growing in Egypt. Planta Medica, 1996.
36. Majumdar S.H et al, Kadam S.S. “Formulation and Antimicrobial Activity of Liquid Herbal Hand Wash”. Journal of Advanced Drug Delivery (JADD)
37. Marcela VJ, Manal MA and Maria LF: Bioactive Components in Moringa oleifera Leaves Protect against Chronic Disease. Antioxidants, 2017; 6(91): 1-13. doi:10.3390/antiox6040091
38. Mashood Ahmad Shah, Satheesh Babu, Hatarjan, Mohd. Goushuddin, Formulation, Evaluation

andAntibacterial Efficiency of Herbal Hand Wash Gel, Research article no.23, Mar - Apr 2014; 120 -124.
39. Mashood Ahmed Shah, Satheesh Babu Natarajan, Mohd. Gousuddi, Formulation, Evaluation and Antibacterial Efficiency of Herbal Hand Wash Gel. Int. J. Pharm. Sci. Rev. Res., 2014; 25(2): 120-124.
40. Maury E, Alzieu M, Baudel JL, Haram N, Barbut F, Guidet B, et al. Availability of an alcohol solution can improve hand disinfection compliance in an intensive care unit. Am J Respir Crit Care Med., 2000.
41. Megha Bahuguna and Shil1pi Kashyap, Formulationand Evaluation of Hand Wash, World Journal of Pharmaceutical Research, 5(7): 1559 -1577.
42. Microbiological evaluation of the efficacy of soapy water to clean hands: randomized, non-inferiority field trial. American Journal of Tropical Medicine and Hygiene.
43. Minakshi G. Joshi, D V Kamat and S D Kamat, 2008; Evaluation of herbal formulation, Natural product radiance, 7(5): 413-415.
44. Mishra G, Singh P, Verma R, Kumar S, Srivastav S, Jha KK and Khosa RL: Traditional uses, phytochemistry and pharmacological properties of Moringa oleifera plant: An overview. Der Pharmacia Lettre., 2011; 3(2): 141-164.
45. Mohammad AA: Therapeutics role of azadirachta indica (neem) and their active constituents in diseases prevention and treatment. Hindawi Publishing Corporation EvidenceBased Complementary and Alternative Medicine, 2016; 1: 1-11.
46. Mossa JS, Tariq M, Mohsin A, Ageel AM, Al-Yahya MA and Al-Said MS: Pharmacological studies on aerial parts of Calotropis procera. Am J Chinese Med., 1991; 19: 223–231. doi: 10.1142/S0192415X91000302
47. Mounika A, Vijayanand P and Jyothi V: Formulation and evaluation of poly herbal hand wash gel containing essential oils. Int J of Pharmacy and Analytical Research, 2017; 6(4): 645-653.
48. Mounika Formulation and evaluation of polyherbal hand wash ijpar.com/sites/default/files/articles/IJPAR.
49. Mounika, Vijayanand P, V. Jyoti, Formulation andEvaluation of Polyherbal Hand wash Gel containingessential oils, International Journal of Pharmacy andAnalytical Research, Oct - Dec 2017; 6(4): 645 - 653.
50. Moustafa AMY, Ahmed SH, Nabil ZI, Hussein AA and Omran MA: Extraction and phytochemical investigation of Calotropis procera: effect of plant extracts on the activity of diverse muscles. Pharm. Biol., 2010; 48: 1080–1190. doi: 10.3109/13880200903490513
51. Nandkishor S. Wani, Ashish K. Bhalerao, Vikram P. Ranawre, Rahul Zanje, Formulation and Evaluation of Herbal Sanitizer, International Journal of Pharmatech Research, Jan - Mar – 2013; 40 - 44.
52. National Disease Surveillance Centre. Preventing Food borne Disease: A Focus on the Infected Food Handler., 2004; 17-20.
53. 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.
54. Padalia U and Salgaonkar S: Development of Anti-Fungal Herbal Hand Wash Gel. International Journal of Life Science A5, 2015; 1: 86-88.
55. Palash Mandal, et al, Prince Kumar Pal. "Formulation and Evaluation of Hand wash of Vitex Negundo". World Journal of Pharmacy and Pharmaceutical Sciences Volume, 2017.
56. Pattnaik PK, Kar D, Chhatoi H, Shahbazi S, Ghosh G and Kuanar A: Chemometric profile & antimicrobial activities of leaf extract of Calotropis procera and Calotropis gigantea. Nat Prod Res., 2017; 31: 1954–1957. doi: 10.1080/14786419.2016.1266349
57. Pittet D. Clean hands reduce the burden of disease. Lancet, 2005; 366: 185-187.
58. 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, July - August 2015; 33(1): 79 – 82. Article No.16.
59. Powar P. V, Bhandari N.R, Arya Ashwini, Sharma P. H., Formulation and Evaluation of Poly Herbal Anti-Bacterial Gel Based Hand Wash. Int. J. Pharm. Sci. Rev. Res., 2015; 33(1): 79-82.
60. Powar PV, Bhandari NR, Arya A and Sharma PH: Formulation and Evaluation of Poly Herbal AntiBacterial Gel Based Hand Wash. Int J Pharm Sci Rev Res., 2015; 33(1): 79-82.
61. Powar PV, Bhandari NR, Arya Ashwini and Sharma PH: Formulation and evaluation of poly herbal anti-bacterial gel based hand wash. International J of Pharmaceutical Sciences Review and Research, 2015; 33(1): 79-82.
62. Power P.V., Bhandaul NR et al "Formulation and Evaluation of Poly Herbal anti-Bacterial Gel Based Hand wash International sourced of Pharmaceutical Sciences, Review and Research.