

Herbal hand sanitizer: A review

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ABSTRACT: The objective of herbal hand sanitizer is “hand hygiene”. It is a vital principle in the prevention, control, and reduction of any acquired infection. Mainly hand sanitizer can stop the chain of transmission of microorganisms and other bacteria from hand to different parts of our body. Hand hygiene is important and one of the most critical steps in food production, food service as well as in homes and other daycare preparations. Hand sanitizer avoids adverse effects like itching, irritation, dermatitis etc. So, maintaining hand hygiene as the prime criteria-instead of some synthetic formulation, an attempt has been made to formulate a herbal hand wash by using some extracts of commonly available plants like *Andrographis paniculata*, ginger, lemon juice. Surely, these ingredients in combination behave as an effective hand sanitizer.

Key Words: Herbal extracts, hand hygiene, antimicrobial agents.

I. INTRODUCTION: HAND SANITIZER

According to the World Health Organization (WHO), “an alcohol-containing preparation (liquid, gel, or foam) designed for application to the hands to inactivate microorganisms and/or temporarily suppress their growth. Such preparations may contain one or more types of alcohol, other active ingredients with excipients, and humectants^[1]”

The emergence of the Corona virus Disease-2019 (COVID-19) pandemic has risen to be a significant global public health concern and led to extensive use of hand disinfectants given its contagious nature. Hands are the primary mode of transmission of microbes and infections. Hand hygiene is therefore the most important measure to avoid the transmission of harmful germs and prevent the infections. Hand hygiene is the single most important, simplest, and least expensive means of preventing nosocomial infections^[2]. Contaminated hands can serve as vectors for the transmission of microorganisms. Pathogenic microorganisms accountable for outbreaks are

spread from the hands of the food handler to others when the food handler contaminates his/her hands and then passes these microorganisms to consumers via hand contact with food or drinks. The consumer is exposed following the ingestion of these microorganisms, which may cause gastrointestinal illness. Hand contact with ready-to-eat foods represents a very important mechanism by which pathogens may enter the food supply. Food handlers whose work involves touching unwrapped foods to be consumed raw or without further cooking or other forms of treatment have been identified as a particular risk group^[3].

To protect the skin from harmful microorganisms and to prevent spreading of many contagious diseases, hand washing is absolutely an important precaution. Hand washing is the act of cleaning the hands with soap and water for the purpose of removing soil, dirt, pathogenic microorganisms and avoid transmitting transient microorganisms. Food production workers and food service personnel must be taught to use correct hand and fingertip washing by management in preparation for work^[4]

Any health-care worker, caregiver or person involved in direct or indirect patient care needs to be concerned about hand hygiene and should be able to perform it correctly and at the right time^[5]; reported a study that demonstrated a decline in diarrheal illnesses (due to *Shigella*, *Giardia* and rotavirus) in day care centers when employees were taught to use good hand washing procedures^[6]. Hand washing removes visible dirt from hands and reduces the number of harmful microorganisms such as, *E. coli* and *Salmonella* can be carried by people, animals or equipment and transmitted to food^[7]. By far the most common mode of pathogen transmission to food by the infected food handler is via faecally contaminated hands. Poor hand hygiene is the contributing factor^[3]. WHO has recommended all people should wash hands before, during and after preparing food, before eating food, before and after caring for someone who is sick, before and after treating a cut or wound, after using the toilet. After blowing your



nose, coughing, or sneezing, after touching an animal or animal waste, after handling pet food or pet treats and after touching garbage^[8]. For generations, hand washing with soap and water has been considered a measure of personal hygiene.

1.1 HISTORY OF HANDSANITIZER

In 1966, hand sanitizers came into existence in healthcare facilities and were popularized significantly in the early 1990s. The concept of cleansing hands with an antiseptic agent probably emerged in the early 19th century. In the current scenario of mechanized life style; a consumer always prefers ready-made formulation of alcohol hand rub rather than hand washing. As early as 1822, a French pharmacist demonstrated that solutions containing chlorides of lime or soda could eradicate the foul odors associated with human corpses and that such solutions could be used as disinfectants and antiseptics. In a paper published in 1825, this pharmacist stated that physicians and other persons attending patients with contagious diseases would benefit from moistening their hands with a liquid chloride solution^[9]. Hand sanitizers, otherwise known as hand antiseptics is an alternative to hand washing with soap and water.

1.2 GENERAL COMPOSITION OF HANDSANITIZER

The base of all hand sanitizers is alcohol. The alcohol used may be isopropyl alcohol (Isopropanol), ethanol-propanol or povidone-iodine. Alcohol based hand sanitizers are more effective in killing microorganisms. An alcohol is any organic compound in which the hydroxyl

functional group (OH) is bound to a saturated carbon atom. The primary alcohol usually forms the base of hand sanitizer which is about 60%. Hand sanitizer effectiveness starts with its formula. The base of all hand sanitizers is alcohol, added to vitamin E, aloe vera (or another softening ingredient), and glycerine. The essential, and germ killing ingredient in hand sanitizers is the alcohol, and the minimum amount one needs for a sanitizer is 60%. Several studies suggested that sanitizers with at least 70% alcohol were suggested to kill 99.9% of the bacteria on hands^[10]. Alcohol combined with quats (quaternary ammonium cations) such as benzalkonium chloride quats are added at level up to 200 parts per million to increase antimicrobial effectiveness^[11].

1.3 Limitations of Alcohol based hand sanitizers:

- Alcohol based hand sanitizers causes rashes and irritation to applied area.
- Sometimes they causes burning sensation.

To overcome these limitations of Alcohol based hand sanitizers we generally use herbal hand sanitizers.^[12]



1.4 Advantage of herbal hand sanitizers:

- These are antiseptic products used to avoid the transmission of skin infections/pathogens.
- Drying of the skin is less and leaves more moisture.
- Herbal ingredients provides extra beneficial effects as well.^[13]
- Herbal handwashing can reduce the number of young children who get sick and help prevent school absenteeism.



- Handwashing by herbal handwash can help prevent illness. Getting a yearly flu vaccine is the most important action you can take to protect yourself from flu. Besides getting a flu vaccine, CDC recommends everyday preventive actions including frequent handwashing with handwash and water.
- Handwashing is easy! Effective handwashing is a practical skill that you can easily learn, teach to others, and practice every day to prepare for an emergency.



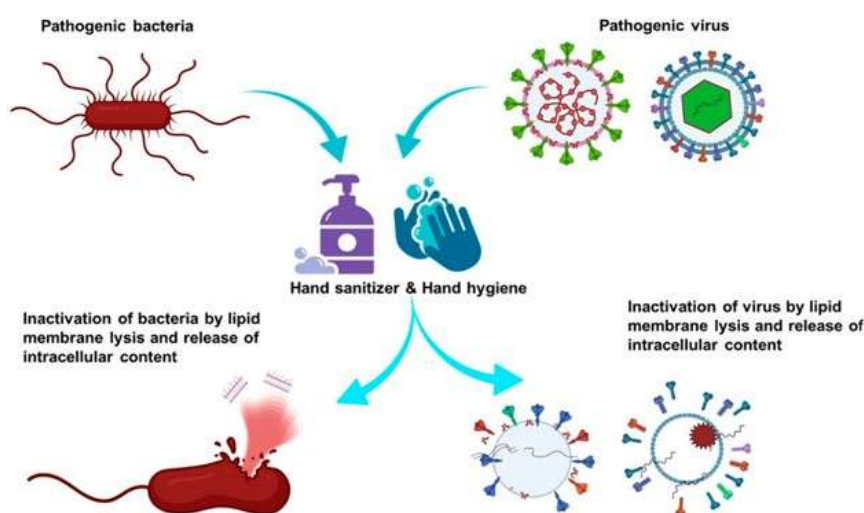
- Herbal sanitizers can reduce about 97% of the bacteria on your hands.



1.5 MECHANISM OF ACTION

The compound, n-propanol, is the most commonly used alcohol compound in biocides^[13]. It is not known with much confidence the exact mechanism of alcohol's antimicrobial activity; however, it may be related membrane damage, and inhibition or uncoupling of mRNA and protein synthesis through effects on ribosomes and RNA polymerase^[14] or associated with protein denaturation^[13]. For activity against bacteria, its optimal bactericidal efficacy is achieved at

concentrations between 60% and 90%^[15]. In fact, absolute alcohol, or alcohol that is no more than 1% water, is less bactericidal than alcohol. Water is thus critical in the protein denaturation process, if not multiple, are affected by alcohol, essential metabolic pathways, membrane damage and loss of cellular integrity ultimately occur. However, alcohols exhibit bactericidal activity against vegetative bacteria-those undergoing metabolism and binary fission but not against spores^[16].



1.6 VARIOUS TYPES OF HERBAL HAND SANITIZER DOSAGEFORM

Hand sanitizer can generally be categorized into two groups: alcohol-based or alcohol-free. An alcohol based hand sanitizer (ABHS) may contain one or more types of alcohol, with or without other excipients and humectants, to be applied on the hands to destroy microbes and temporarily suppress their growth. ABHS can effectively and quickly reduce microbes covering a broad germicidal spectrum without the need for water or drying with towels. Nevertheless, there are a few shortcomings with the effectiveness of ABHS, such as its short-lived antimicrobial effect and weak activity against protozoa, some non-enveloped (non-lipophilic) viruses and bacterial spores^[27].

On the other hand, the alcohol-free sanitizer makes use of chemicals with antiseptic properties to exert the antimicrobial effects. These chemicals have a different mode of action and function according to their chemical functional groups^[28-30]. As they are non-flammable and often used at low concentrations, they are relatively safer

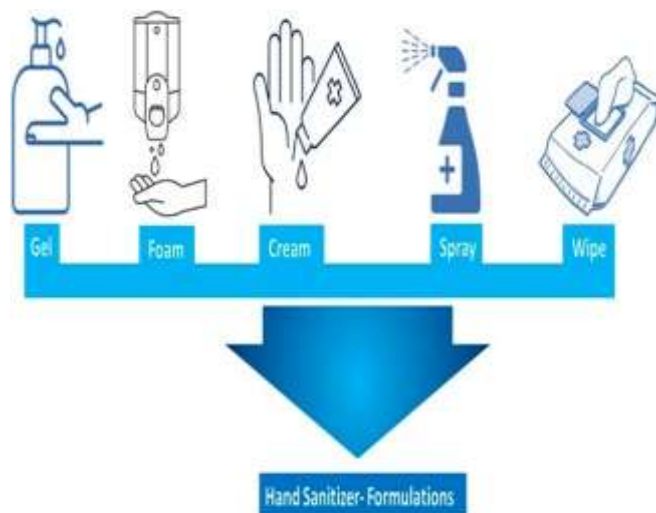
to use among children as compared to ABHS.

Herbal hand sanitizers are available in different dosage forms, namely gel, liquid and foam. As each type has its own characteristics, a study was conducted to understand the impact on sensory attributes that may affect user's acceptance of the product and ultimately influence usage leading to hand hygiene compliance. The overall result showed that gels and foams are more widely accepted compared to liquid, especially in terms of handle ability, though the latter left a high clean feeling and took a shorter time to dry.

ABHS in the form of a spray which triggers stream aerosol solution allows direct contact of the alcohol solution with the target surface. However, there are several limitations associated with the sprays, including overspray, breathed by patients and flammability. Ready-to-use alcohol "Hand Sanitizing Wipes (HSW)" is a pre-wetted towelette containing disinfectants, antiseptics, surfactants, etc. in a sealed package ready for use in topical disinfection. The advantage of HSW is eliminating the possible contaminations and transfer of pathogens due to towelettes reuse.

However, the longer storage time could increase the probability of losing antimicrobial/viricidal

activity due to the possible binding of active ingredients .



1.7 FORMULATION :

Sr No	Ingredient	Quantity (ml)
1	Ginger	10 ml
2	Lemon Extract	10ml
3	Angrographis paniculata	10ml
4	Carbapol 940	1ml
5	Triethanoplamine	1ml
6	Glycerine	5ml
7	Polysorbate-20	1ml
8	Perfume	1ml
9	Preservative	1ml
10	Alcohol	20ml
11	Water	40ml

Ginger: Ginger is used as disinfectant



Lemon Extract: Lemon Extract is used as cleaning agent and as fragrance.



Andrographis paniculata: used as anti microbial agent



Carbapol 940: used as thickening agent
Triethanolamine: used as pH adjuster
Glycerine: used as humectant
Polysorbate-20: Used as Surfactant
Perfume: Used as smelling agent
Alcohol: used as anti microbial agent
Water: Used as solvent

ginger, lemon was prepared by Maceration process.

- Other ingredients except triethanolamine were added in water and stirred well using a mechanical stirrer.
- To this, the extracts were added and stirred. Then triethanolamine and perfume was added and the volume was made up using water.

1.8 METHOD OF PREPARATION:

- Ethanolic extract of Andrographis Paniculata,

1.9 EVALUATION TESTS:

Sr no	Test name
1.	General appearance
2.	pH
3.	Viscosity
4.	Antimicrobial activity
5.	Irritancy Test

1. General Appearance

The general appearance of sanitizer formulation is determined by observing its visual identity. Clarity and color was checked by naked eyes against white background, the odor was smelled.

2. Appearance and Homogeneity

The film forming hand sanitizer was homogeneous and translucent in nature.

3. pH

The pH of each batch was measured separately using a pH meter. The pH meter was calibrated with buffer solutions of pH 4 and pH 7 respectively.

Then pH of each batch was measured.

4. Viscosity determination

The viscosity was determined by using Brookfield viscometer where the spindle no. 7 was used with rotation at 60 rpm.

5. Irritancy Test

Five healthy volunteers were selected. The hand sanitizer was applied on their palm and time was noted. Irritancy, redness, dryness and itching were checked.

II. BENEFITS TO SOCIETY

In the present pandemic situation as the world is unlocking it increases the chances of infection by viruses by touching surfaces at public spaces such as bus stops, hotels, malls etc. It is an innovative step helping us fight the pandemic.^[14]

2.1 FUTURE SCOPE

There seems no end to the pandemic situations and the lockdowns prove a havoc on economy and mental health of citizens in this situation living with situation is the only option making need of sanitising even important innovations such as film that gives continuous protection against the bacteria and viruses makes the life of people easy and also relieves the psychological tension. The hand sanitisation industry has a huge scope for innovation and research much of work is remaining and has a future scope to develop herbal hand sanitizers.^[15]

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