

## Synthesis and Characterization of Non Alcoholic Hand Washer by Using Natural Herbs



Chemistry

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### ABSTRACT

*Hand washer is an antiseptic liquid and sanitizes hand without water. The commercial hand washer kills 95% of the germs however it is harmful to the natural skin cells. The hand sanitizer is useful because it requires no water and also in conditions where clean water is not available.*

*Here the prepared "effective non alcoholic herbal hand sanitizer" by using some natural herbs which helps not only to kill the germs on the skin but also protect the natural skin cells. Its biological activity against some bacteria and fungi has been tested in the laboratory. It kills 95% of germs and has no any side effects.*

**Introduction:** A hand sanitizer is a supplement or alternative to hand washing using soap and water. Many preparations are available for washing the hands like gel, foam, and liquid solutions. Alcohol based hand sanitizers are more effective in killing microorganisms than soaps. Some non alcoholic hand sanitizers are also available in the market, but in case of germophobe person who has a habit of frequently using hand sanitizer like lotion, suffers various hazardous side effects.

Many sanitizers contains isopropyl alcohol, glycerin, carbomer, fragrance, aminomethyl propanol, propylene glycol, isopropyl myristate, tocopheryl acetate etc. are the active ingredients. Ethyl alcohol is used to enhance absorption of other ingredients of the sanitizer. Alcohol improves the penetration of other chemicals through the skin by "deflating" the skin, which is disruption of the oils in the skin. The other way of alcohol absorption is through the inhalation of the vapors. **Isopropyl alcohol**, also called rubbing alcohol, is a petrochemical that can be absorbed through the skin and through inhalation of vapors. It is a known neurotoxin, means toxic to the nervous system.

Glycerin has very low toxicity but it can be irritating to the skin. Glycerin is hygroscopic, means it can absorb the water from the environment. Glycerin without water or with enough water can extract water out of the skin and it becomes dry. **Carbomer** is a generic term for products made from the petrochemical acrylic acid. Carbomers are able to absorb a large amount of water and keep ingredients from separating into liquid and oil components. **Fragrances** made from dozens of chemicals, many of them are highly toxic. One ingredient present in most fragrances is phthalates plastics. Chronic Phthalates affect sex hormones, especially in infants. **Aminomethyl propanol** is a chemical used to alkalize the pH of skin. **Propylene glycol** is petroleum or plant-based chemical which irritates the skin, eyes and lungs. **Isopropyl myristate** is a low toxic wax prepared from animal or plant fat. **Tocopheryl acetate** is a synthetic vitamin.

In alcohol-free hand sanitizers, benzalkonium chloride and triclosan are used and both are toxic. Repetitive uses of these toxic chemicals on skin may create problem in future. Natural herbs are not toxic and are easily available. So alcohol free herbal hand sanitizer has prepared and tested for biological activity.

### Material and method:

Medicinal leaves like Tulsi (*Ocimum tenuiflorum*), Neem (*Azadirachta indica*), Bael (*Aegle marmelos*) and Bhumiamba (*Phyllanthus niruri*) are air dried for about fifteen days in a dark place. Indian spices like Cinnamon (*Cinnamomum verum*) and Clove (*Syzygium aromaticum*) are selected for the extraction.

All medicinal leaves and spices are finely grinded and double

filtered through cloth. The equivalent amounts of all powdered leaves and spices mixed and marinated overnight in ethyl alcohol and reflected continuously about 6 to 7 hrs. After reflection, the extract has filtered twice through muslin cloth. Aloe Vera gel and vinegar is used to improve the thickness and as a preservative.

### Biological activity

The extract of sanitizer is screened for in vitro growth inhibitory activity against gram positive bacteria *E-coli* and gram negative bacteria *Pseudomonas aeruginosa*. Nutrient agar plates were made uniformly surface inoculated from the culture of the tested microorganisms. Well was made on the agar medium. Normal saline was used to prepare the inoculums of the bacteria to be used for the antibacterial study<sup>[1-2]</sup>.

The extract of sanitizer was also screened for in vitro growth inhibitory activity against *Aspergillus niger* and *Candida albicans*. Sabouraud dextrose agar plates made uniformly and ditch made on the agar medium at the centre. Two separate striking lines of fungi were made on both the sides of ditch<sup>[2]</sup>. The various concentrations of sanitizer are

0.5cm<sup>3</sup>, 1.0cm<sup>3</sup> and 1.5cm<sup>3</sup>.

Mueller Hint Agar Media (HI Media) was used to subculture various strains of microorganisms. The lowest concentration which completely inhibited visible microbial growth was recorded as the Minimum inhibitory concentration (MIC). Under aseptic conditions, sanitizer with different concentrations (0.5 to 1.5 cm<sup>3</sup>) were added to the disc and

ditch were placed on the numbered plates. Then the plates were incubated at room temperature for 24hr. During this period, the test solution diffused and the growth of the inoculated microorganisms were affected. Antibacterial activity was indicated by presence of clear inhibition zone around the well and antifungal activity was indicated by the presence of inhibition zone nearer to the ditch. The activity of commercial sanitizer was also recorded using the same procedure as above at the same concentrations.

### Result and discussion:

We observed that our herbal sanitizer is moderate to higher active against both bacteria *E-coli* and *Pseudomonas aeruginosa* at the concentration 1.0cm<sup>3</sup>. At lowest concentration it shows lowest to moderate activity against both the bacteria. Following figure shows the inhibitor zones of sanitizer against bacteria and fungi.

Fig-1



**fig 1: Antibacterial activity of hand washer against *E-coli* at lowest concentration.**

Fig-2



**fig 2: antifungal activity of hand sanitizer against *Aspergillus Niger* at concentration of 1.0cm<sup>3</sup>**

Sanitizer shows moderate to lowest activity against *Aspergillus niger* and *Candida albicans* at the concentration 1.0cm<sup>3</sup>. The various concentrations of commercial sanitizer had taken as standard. The activity results are indicated in the table 1.

**Table 1.**

Herbal Sanitizer	<i>E-coli</i>			Pseudomonas aeruginosa		
	0.5cm <sup>3</sup>	1.0cm <sup>3</sup>	1.5cm <sup>3</sup>	0.5cm <sup>3</sup>	1.0cm <sup>3</sup>	1.5cm <sup>3</sup>
	+	++	+++	+	++	+++
	<i>Aspergillus niger</i>			<i>Candida albicans</i>		
Herbal Sanitizer	0.5cm <sup>3</sup>	1.0cm <sup>3</sup>	1.5cm <sup>3</sup>	0.5cm <sup>3</sup>	1.0cm <sup>3</sup>	1.5cm <sup>3</sup>
	+	++	+++	+	++	+++

+ = Mild Active

++ = Moderately Active

+++ = Highly Active

It is concluded that the any compounds have antimicrobial activity may act either by killing the microbes or by inhibiting multiplication of the microbes by blocking their active sites of enzymes<sup>[3]</sup>. This is also probably due to the greater lipophilic nature of the compound. This lipophilicity enhances the penetration of the sanitizer into lipid membrane and blocks the metal binding sites on enzymes of micro organisms<sup>[4]</sup>. Sanitizer also disturbs the respiration process of the cell and blocks the synthesis of protein in cell and restricts further growth of organisms<sup>[5]</sup>.

**Conclusion:** According to results and discussion it is clear that the prepared hand sanitizer is more effective against some bacteria and fungi. The use of natural herbs gives hazardless effects,

so we can use it again and again several times in a day.

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