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Formulations of Poly Herbal Gel based Hand Sanitizer

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Abstract

The primary mode of transmission of microbes and infections is through the hands. Hand hygiene is thus the most important measure for avoiding the transmission of harmful germs and preventing infections. Hand sanitizer kills hazardous microorganisms on the hands while also preventing scratching, irritation, and dermatitis. The main aim of this research work is to develop a polyherbal hand sanitizer that is both alcohol-based and alcohol-free. Various essential oils, water and IPA, extracts of Neem leaf (Azadiractaindica), Tulsi leaf Ocimum sanctum L.), Kesudo leaf, Orange peel, Pulp of Aloe, were components of the hand sanitizers instead of synthetic ingredients. All of the ingredients have antimicrobial properties and smoothing effects on the hands. Physicochemical parameters such as pH, viscosity, and foam stability were determined along with antibacterial activity of hand sanitizer on selected strains of microorganisms. The findings show that the formulations have strong appearance characteristics, and the sanitizer's overall characterization showed that the formulations have no unpleasant color or odor.

Keywords: *Hand sanitizer, Hand hygiene, Essential oils, Plant extracts*

INTRODUCTION

The primary mode of transmission of microbes and infections is through the hands. Nowadays, hand sanitizer has been widely used in any public area. Many commercial products can be found with highly alcohol aroma, caused by 60% of alcohol composition. (Wijana et al. 2020) The emergence of COVID-19(CORONA VIRUS DISEASE -2019) pandemic has

risen to be a significant global public health concern and led to extensive use of hand disinfectants given its contagious nature. In developing countries majority of the population still exploits traditional folk medicine derived from plant resources. Medicinal use of herbal preparations is first mentioned in ancient Hindu texts like Vedas and these herbs are an important part of 'medicinal science of Indian culture Ayurveda.(Grace et al. 2015)Natural herbs and their varied extracts have been used globally in therapeutic since antiquity. In developing countries majority of the population still exploits traditional folk medicine derived from plant resources. Since the hands are the most exposed part of the body, they needed to be shielded from bacterial infections. Hand washing has long been suggested as a way to avoid the transmission of germs, viruses, and other pollutants. Hand care has traditionally consisted of washing hands with soap and then rinsing them with water to extract the soap. Antimicrobial materials, on the other hand, do not need a water rinse since they evaporate on touch. As a consequence, such items are known as rinse less hand sanitizers. In recent years, they've gained popularity as a new way to sanitize hands. When using a rinse less hand sanitizer, the user applies the substance to his or her hands and rubs them together, allowing the product to evaporate or absorb into the skin. Lotions, liquids, gels, and foams are among the antimicrobial products available.

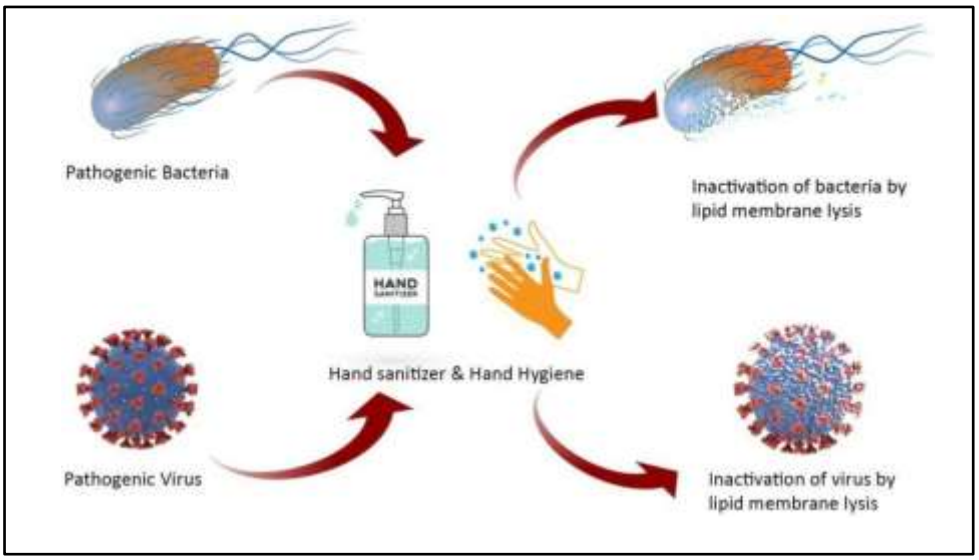

Figure 1: Schematic representation of mechanism of Hand sanitizer

Hand sanitizer is a liquid generally used to decrease infectious agents on the hands. Hand sanitizers that don't need rinsing can be divided into two groups: alcohol-based and non-alcohol-based products.(Kramer et al. 2002)

Alcohol-based sanitizers make up a large portion of the chemical antiseptics on the market. These formulations, which include soaps and solutions, reduce health-care-associated transmission of infectious diseases, but they have certain disadvantages or side effects, such as skin irritation and pathogen tolerance. (Katakam Revathi Sushma et al 2017)Secondary metabolites present in plants include phenolic compounds, tannins, terpenoids, alkaloids, and flavonoids, all of which have been found to have antimicrobial properties. As a result, there has been an increase in the development of herbal disinfectants and the evaluation of their efficacy (Cowan 1999). Natural products as antimicrobial compounds have a number of potential benefits, including less side effects, improved patient tolerance, low cost, renewability, and biodegradability (Alwafi Ridho Subarkah 2018). With this in mind, an attempt has been made to show classical collected works for antimicrobial herbs in order to formulate low-cost polyherbal hand sanitizer. Various essential oils, water and IPA, extracts of Neem leaf (Azadiractaindica), Tulsi leaf (Ocimum sanctum L.), Kesudo leaf, Orange peel, Pulp of Aloe(Sawai and Islamia 2014), were components of the hand sanitizers instead of synthetic ingredients, which are known to have antimicrobial activity against disease caused by microorganism. Neem (Azadirachtaindica) (Rathod 2012) belonging to family Meliaceae and Tulsi (Ocimum sanctum L.)(Vij and Gupta 2021) belonging to the family Lamiacea are used for medicinal purpose since centuries in India.Extract of Neem leaves is widely used for different purpose in various formulations in rural areas since time immemorial and it is now proved to have antiplaque and antimicrobial properties. Tulsi leaves are reported to exhibit insecticidal and antibacterial activities.(Chandra et al. 2016) The crude plant and its extracts are used in various infections and as a cough remedy and expectorant based on the traditional experience.

Thus, the present work was endeavored to formulate polyherbal hand sanitizer including combination of different concentration of plant extracts having different medicinal and chemical

properties useful for formulating herbal sanitizer. After formulation, physico-chemical parameters was evaluated and compared with the reference hand sanitizer from market.

MATERIAL AND METHOD

- **Extract Preparation of Neem (Azadirachtaindica) :**

10 gram of dried powdered sample was soaked in 100ml of distilled water & left undisturbed for 24 hrs. After 24 hours, the suspension was shaken and this mixture was filtered through filter paper to obtain the aqueous extract. The filtrate was then stored in an air tight container (Singla and Saini 2019)

- **Extract Preparation of Tulsi (Ocimum sanctum):**

Powdered sample were subjected to successive extraction with water, and 50% ethanol by Soxhlet method. The extracts were collected and distilled off on a water bath at atmospheric pressure. Extracts were stored in refrigerator (Rathod 2012)

- **Extract Preparation of Orange peel(Citrus x aurantium):**

Orange peel was oven dried, grinded to powder and extraction procedure carried out using methanol as solvent in a soxhlet extractor. The effects of time and temperature on the extraction process were considered and results obtained showed an optimum extraction temperature and time of 50ÂºC and 120 minutes respectively.

- **Extract Preparation of Kesudo (Buteamonosperma):**

Collect Leaf of kesudo and boiled for some hours. When totally changed the color than collect the filtrate of leaf. And used as extract for preparation (Yerragunta et al. 2016)

- **Extract Preparation of Aloe vera**

Mature, healthy and freshly collected leaves of Aloe vera were washed with clean water, and then dissected longitudinally and colorless parenchmatous tissue (aloe gel) was scrapped out carefully using a sterile knife without the green fibers. The collected gel was grinded and mixed with 100 ml of hot water and allowed for 24hours; the extract was then filtered through Whatman filter paper and evaporated. The aqueous extract was obtained (Stanley et al. 2014)

METHOD OF PREPARATION OF HAND SANITIZER (Wijana et al. 2020)

- About 0.5 g of Carbopol was diluted in 30 ml of distilled water at 80°C.

- The mixture was stirred at200 rpm for 5 minutes.
- Mixture of 2 drops triethanolamine, 0.1 g propyl paraben, and 1 mL of glycerin diluted in 10 mL of alcohol 70% was prepared. The Carbopol and alcohol mixture were then homogenised.
- Add Extract of plants and essential oils drop wise.
- Stirred at some 1 hours and get gel based formulation.

Same procedure will be followed for alcohol free sanitizer

Figure 2: Images of Preparation of extract and sanitizer

Table 1: Key Components and their activities

Sr. No.	Components	Activity	Quantity %	References
1	Carbopol - 940 (acrylic acid based polymer)	Act as thinking agent.	0.5 g	
2	Triethanolamine	Act as an emulsifier agent and surfactant agent.	2 drops	
3	Glycerin	Act as humectants.	1 ml	

4	Propylparaben/Citric Acid	Act as preservative.	0.5 gm	(Garner, Siol, and Eilks 2014)
5	Vitamine E (alpha tocopherol) 	Anti- oxidant activity	1 ml	(Lee et al. 2020)
6	**Extract of herbal drug**			
A	Kesudo (*Buteamonosperma*) 	Anti- microbial activity	10 ml	(Suthar et al. 2016)
B	Tulsi (*Orange Sanctum L.)* 	Anti –Septic activity Anti – bacterial activity	10 ml	(Milala, Sofyan, and Wahjudi 2014)
C	Neem (*Azadirachtaindica L.)*	Anti – Septic activity , Anti- Bacterial activity	10 ml	(Rathod 2012)

				
D	Orange peel (*Citrus aurantiumdulcis)* 	Anti – Inflammatory, Anti – Bacterial activity	10 ml	(Wijana et al. 2020)
E	Aloe vera (*Aloe barbadensis miller*) 	Anti- Bacterial activity , Anti-Oxidant activity	5 ml	(Nejatzadeh-Barandozi 2013)
F	IPA	Denaturation of proteins in the plasma membrane	20 ml	(Lee et al. 2020)
*	Water	As a Solvent	Up to 100 ml	-

Table 2: formulation table of hand sanitizer

Sr no.	With alcohol	Qty	Without Alcohol	Qty
1	Carbopol -940	0.5 g	Carbopol -940	0.5 g
2	Triethanolamine	2 drops	Triethanolamine	2 drops
3	Glycerin	1 ml	Glycerin	1 ml
4	Propylparaben	0.5 gm	Propylparaben	0.5 gm
5	Vitamin E	1 ml	Vitamine E	1 ml
6	Alcohol	20 ml	-	-
7	Kesudo extract	10 ml	Kesudo extract	10 ml

8	Orange peel extract	10 ml	Orange peel extract	10 ml
9	Aloe Vera	5 ml	Aloe Vera	5 ml
10	Tulsi extract	10 ml	Tulsi extract	10 ml
11	Neem extract	10 ml	Neem extract	10 ml
12	Water	Up to 100 ml	Water	Up to 100 ml

EVALUATION OF FORMULATED POLYHERBAL HAND SANITIZER

Physico-chemical evaluation

Physical appearance/visual inspection

The formulation prepared was evaluated for the clarity, color, odor, foam producing ability, Homogeneity and Appearance. Clarity, homogeneity and color was checked by necked eyes against white background and the odor was smelled (Salvi Neelima 2019)

Determination of pH

The pH values of all prepared formulations were determined by using digital pH meter. The measurement was done in previously calibrated pH meter at room temperature (25°C).

Determination of % of solid contents

Because hand sanitizer is easy to apply and rinse out by hand, it usually has an appropriate amount of solid content. In a previously clean, dry, and weighed evaporating dish, 2 gms of hand sanitizer was placed. The dish and sanitizer were weighed again to confirm the sanitizer's exact weight. By placing the evaporating dish on a hot plate, the liquid portion of the sanitizer was evaporated. The weight and thus % of the solid contents of sanitizer left after complete drying was calculated.

Dirt dispersion test

In a large test tube, two drops of the prepared sanitizer were added to 10 mL of distilled water. One drop of India ink was added to this solution, and the test tube was sealed and shaken ten times. The amount of ink in the foam denoted by the rubric None, Light, Moderate, or Heavy.

Viscosity evaluations

The viscosity of Poly herbal hand sanitizer was determined using digital Brookfield viscometer at 100 rpm

Table 3: Result and Discussion

Physical Appearance/ characteristics

Parameter		Alcohol based Sanitizer	Alcohol free Sanitizer
Color		Green and Brown	Green
Odor		Perfumed	Perfumed
pH		6.5	6.1
Homogeneity		Uniform	Uniform
Appearance		Liquid	Liquid
	Temperature		
	0°	Viscous	Viscous
	30 °	Less Viscous	Less Viscous
	45 °	Less Viscous	Less Viscous

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