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Review Paper

Formulation And Evaluation of Alcohol Based Herbal Hand Sanitizer

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ABSTRACT

The key objective of preparing a polyherbal hand sanitizer is that it maintains "hand hygiene". Hand hygiene is crucial in preventing, controlling, and reducing the risk for any infection that one can acquire. Hand sanitizer generally can prevent the transmission chain of microorganisms and other bacteria from our hand to various parts of our body. Hand hygiene is imperative and considered one of the crucial steps for food manufacturing, food service, and home preparations, as well as in other day care operations. Hand sanitizer will avoid adverse effects such as itching, irritation, dermatitis etc. Therefore, instead of a synthetic formulation, an attempt has been made to formulate an herbal hand sanitizer by selecting some plant extracts, which are easily available in nature, like Neem, Eucalyptus oil, Lemongrass oil, Alum, etc. The formulation of the hand sanitizer is checked for its physical parameters. The hand sanitizer is formulated through a dispersion method, which includes alcohol, carbopol 940, polysorbate 20, glycerin, triethanolamine, preservatives, etc. The main aim is to provide a hand sanitizer that is antimicrobial in nature. Key findings were pH within the range of 6.56-6.67, and viscosity was between 376 to 838g/ml. Spreadability was within an acceptable range of 6.33 to 7.16. Drug content was determined as eucalyptus oil: F1, 89.8%; F2, 93%; F3, 97.4%, and for lemongrass oil, F1 had an amount of 87%, F2 had 88%, and F3 contained 90%. [1][2][3].

INTRODUCTION

Hygiene is defined as the maintenance of the practice of cleanliness, which is of utmost importance in the maintenance of well-being. Maintenance of body hygiene, along with the use

of the cleanser, is important for a healthy life. The above ideas highlight the importance of maintaining hygiene in the prevention of diseases. Body skin is the most exposed body area to daylight, environmental pollution, and also offers

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some sort of protection from the invasion of foreign particulars/pathogens. Commonly occurring skin related issues include diseases like eczema/atopic dermatitis, warts, acne, psoriasis, rashes, allergic reactions, etc. In order to protect our body skin from harmful microorganisms and to avoid the spread of different skin-related diseases, hand washing is definitely a crucial practice to follow. Hand sanitizers are one of those widely utilized hygienic products to help avoid germs and viruses from our body parts, i.e., our hands. The different types of hand sanitizers' preparations available in the market include gel, foam, and liquid solution forms. Denatured alcohol (ethanol) mostly acts as the active component in the preparation of hand sanitizers. The inactive components found in hand sanitizers' preparations include carbopol 940 for thickening alcohol gel, glycerin for liquid rubs, polysorbate 20 for emulsifying or solubilizer agents, and plant essential oils. Soap has less efficacy in destroying microorganisms compared to alcohol-based hand sanitizers without causing much drying to the hands. The alcohol content in each hand sanitizers' preparation varies from 60-81%, but 62% acts as the average alcohol content in each hand sanitizers' preparation available in the market. The major portion of bacteria, fungus, and virus gets killed when alcohol-based hand sanitizers' preparations containing alcohol destroy microorganisms. Alcohol-based hand sanitizers act as alternatives to hand washing with cleaning soap not requiring water. It has additionally been proven to boost compliance with hand hygiene and significantly reduce the rate of infection. Plant extract has a potential as antimicrobial compounds against several pathogenic micro-organisms which cause infectious disease and resistance towards synthetic drugs. The advantage of using herbal essential oils are that they are cheap, easily available and having less side effects in comparison to chemical products. Traditional healers have long used the

plant in infectious situations. Because plants have secondary metabolites which contain tannins, alkaloids, terpenoids and flavonoids etc., it has been determined to possess in-vitro antimicrobial properties. Thinking about this ultimatum, an effort has been made to screen classical literature for the herbs with anti-microbial properties, and it's been determined that Eucalyptus oil, Lemongrass oil, Neem, and Alum hold that antibacterial potency. Along these lines, we planned to formulate and evaluate alcohol-based herbal hand sanitizer, including alcoholic extracts of these astonishing herbs, utilizing other reasonable excipients, which can be used as ready to use alcohol-based herbal hand sanitizer.^{[1][3][4]}

Benefits of Using Herbal Hand Sanitizer:

Ease of availability: Herbs are easily available in rural as well as urban areas, so they can be easily used by anyone.

Cheap: The cost of the herbal plants is less compared to the chemical ingredients used in synthetic hand sanitizers.

Increased efficiency: Herbal hand sanitizers are more efficient in promoting hand hygiene.

Fewer side effects: Herbal hand sanitizers have fewer side effects than other hand sanitizers.

Pleasant Fragrance: Essential oils such as lemongrass and eucalyptus provide a refreshing, natural aroma, avoiding the harsh chemical smell of synthetic sanitizers.

Environmentally Friendly: Since herbal sanitizers are made from biodegradable and plant-based ingredients, they are eco-friendly and safe for both humans and the environment^{[1][3][5]}.

MATERIALS AND METHODS:

Materials:

Leaves of Neem (*Azadirachta indica*), Lemongrass oil (*Cymbopogon citratus*), Eucalyptus oil (*Eucalyptus Globulus*), and Alum were collected



from the local area of Bhiwandi region, India. The plant material was identified and authenticated by the Department of Pharmacognosy of Shri Pandit Baburao Chaugule College of Pharmacy^{[1][4][7]}.

THE MATERIAL / HERBAL PLANTS WHICH WERE USED IN THE PRESENT STUDY TO PREPARE HAND SANITIZER, IS GIVEN BELOW WITH THEIR PROPERTIES.

Herbal Hand Sanitizer made from herbs, which contain a combination of these extracts

1) **Neem** (*Azadirachta indica*)

Scientific name – *Azadirachta Indica*

Order – Sapindales

Family – Meliaceae

Higher classification – *Azadirachta*

Kingdom – Plantae

Genus – *Azadirachta*.

Properties: Neem is an important source of compounds having anti-microbial, anti-inflammatory, anti-fungal, anti-malarial, anti-tumor, anti-oxidant, and anti-viral properties or it acts instantly on the contaminants and provides protection against germs.

2) **Lemon grass** (*Citrus Cymbopogon*)

Scientific name – *Cymbopogon Citratus*

Family – Poaceae

Order – Poales

Kingdom – Plantae

Genus – *Cymbopogon*

Properties: Lemon grass is an important medicinal plant of the family Poaceae. Lemon grass powder removes impurities detoxify the skin, and it might help prevent the growth of some bacteria and yeast. It also has a fabulous fragrance; it is a stress buster.

3) **Eucalyptus oil** (*Eucalyptus Globulus*)

Scientific name – *Eucalyptus Globulus*

Family – Myrtaceae

Kingdom – Plantae

Genus – *Eucalyptus*

Properties: *Eucalyptus*, particularly its essential oil rich in 1,8-cineole (*eucalyptol*), is widely recognized for its potent decongestant, antimicrobial, and anti-inflammatory properties.

4) **Alum**

Formula of potash alum – $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$

Properties: Alum is bacteriostatic, which means it prevents bacteria from growing, making it useful as a preservative. It reduces bacterial growth in personal care products and extends their shelf life.

Methods:

Volatile Oil Extraction Procedure:

Preparation of Lemongrass: Fresh lemongrass was collected and washed with tap water to remove the dust and dirt from its surface. After draining free water on the surface of the lemongrass stem, weigh 100 gms of leaves and chopped into small pieces with a sharp-edged knife.^{[1][2][6]}

Preparation of Neem: The leaves of the neem tree are thoroughly washed, dried in the shade, and ground into a fine powder. This powder is then subjected to extraction using ethanol through a maceration process lasting several hours. Following this, the extract is filtered and concentrated to achieve a semi-solid consistency, which is subsequently utilized in the formulation of hand sanitizer^{[2][7]}.

Hydro Distillation Procedure:

First of all, purified water was taken into a round-bottom flask.

Then, cut leaves samples were placed in round bottom flask for distillation.

After this, the round-bottom flask was attached to the connecting pipe of the condenser, and a mercury thermometer was inserted in the hole of the flask to touch the top of the leaf bed.

Then heating mode was switched on and kept in a pre-selected position to obtain desired rate of heating. Observations of cumulative extracted oil volume, temperature of the extraction chamber, and energy meter reading were recorded at every 30-minute time interval. The weight of hydrosol, spent eucalyptus leaves, and lemongrass, and leftover water in the extractor was also recorded at the end of each distillation test.

At the end of the process, extracted eucalyptus and lemongrass oils were stored in a refrigerator below 4°C.^{[1][4][5]}

The alcohol-based herbal hand sanitizer was made by continuously stirring Carbopol 940 into distilled water. The product was set aside for 24 hours after homogeneous mixing. Denatured alcohol, polysorbate 20, glycerin, and all of the extracts had been combined with the aqueous medium. Finally, to create a homogeneous product, 0.70% of Triethanolamine and 0.25% of each of the preservatives methyl and propyl paraben were added. Prepared product was stored in airtight High-density polyethylene (HDPE) containers. The formulated hand sanitizer was used initially for physical evaluation and then for screening for antimicrobial sensitivity.

Formulation table^{[1][2][5]}

Procedure for formulation of Hand Sanitizer:

SR.NO	INGREDIENT	QUANTITIES		
		F1	F2	F3
1	Distilled water	8.94ml	8.34ml	7.74ml
2	Denatured alcohol	18.4ml	18.0ml	18.4ml
3	Neem leaves extract	0.30ml	0.45ml	0.60ml
4	Eucalyptus oil	0.30ml	0.45ml	0.60ml
5	Lemongrass oil	0.30ml	0.45ml	0.60ml
6	Alum	0.15ml	0.30ml	0.45ml
7	Carbopol 940	0.21mg	0.21mg	0.21mg
8	Triethanolamine (q.s.)	0.26q.s (to produce)	0.26q.s (to produce)	0.26q.s (to produce)
9	Glycerine	0.69ml	0.69ml	0.69ml
10	Polysorbate 20	0.15ml	0.15ml	0.15ml
11	Camphor	0.15gm	0.15gm	0.15gm
	Total	30.0ml	30.0ml	30.0ml

CONCLUSION

The present work was carried out to develop a novel alcohol based herbal hand sanitizer. It is a safe, effective, beneficial, and overall chemical-free way of stopping the transmission of diseases. The alcohol-based herbal hand sanitizer containing eucalyptus oil, lemongrass oil, neem extract, and alum exhibits various antibacterial, antifungal, and antiseptic activities, which help in treating bacterial diseases and removing pathogens

to maintain sanitization. This Methodology adopted for the preparation of alcohol based herbal hand sanitizer was very simple and cost-effective. The three formulations were prepared and named F1, F2, and F3. From the various Anti-microbial studies performed, the prepared F3 formulation is very effective for bacterial disease problems.^{[1][2][3][4]}

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