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Preparation and Evolution of Herbal Hand Sanitizer

Prof. Chavan D. K., Mote Rajkumar Tukaram, Lande Vishal Shahadeo, Nagargoje Vivek Vasudev, Nikhil Bhagwan Gaikwad
Aditya Pharmacy College, Beed, Maharashtra, India

Abstract: *There has been a growing concern about the overuse of chemical hand sanitizers and their potential adverse effects on health and the environment. Therefore, herbal hand sanitizers have emerged as a safe and effective alternative to chemical-based sanitizers. The use of herbal extracts in hand sanitizers not only provides antimicrobial activity but also offers additional benefits such as moisturization and skin conditioning. Furthermore, herbal hand sanitizers are eco-friendly and sustainable, making them a preferable choice for environmentally conscious consumers. Overall, the use of herbal hand sanitizers can help promote hand hygiene while also addressing concerns related to the overuse of chemical sanitizers.*

Keywords: Hand Sanitizer, Antibacterial, Poly Herbal

I. INTRODUCTION

Plants have been used for medicinal purposes for centuries, and many modern drugs have been derived from plants. In addition to antibiotics, plants also contain compounds that have antiviral, antifungal, and anti-inflammatory properties1,2. For example, tea tree oil is a natural antiseptic that has been used to treat wounds and skin infections. Aloe vera has anti-inflammatory properties that make it effective in treating burns and other skin conditions. Some other plants that have been studied for their antibacterial properties include garlic, turmeric, and honey3,4. However, it is important to note that not all plant- based treatments are safe or effective, therefore it is always best to consult a healthcare professional before using any herbal remedies5,6

1. Neem and tulsi are known for their antibacterial properties and have been used in traditional medicine For centuries. Neem has been shown to have antibacterial, antiviral, and antifungal properties, and is

Commonly used in India as a natural remedy for a range of health issues. Tulsi, also known as holy Basil, has been used in Ayurvedic medicine for thousands of years and has been shown to have Antibacterial and antifungal properties as well. Both neem and tulsi can be used in hand sanitizers to Kill bacteria and other microorganisms.

2. Hand sanitizer can help guard against other bacterial and viral infections in addition to coronavirus Infections, as it is effective in killing a wide range of microorganisms. Regular use of hand sanitizer Can help prevent the spread of illnesses such as cold, flu, and gastrointestinal infections that are caused By bacteria and viruses.

However, it is important to consider that hand sanitizer is not a substitute for Proper hand washing and other hygiene practices, and should be used in combination with other Measures such as wearing a mask and practicing social distancing to reduce the risk of infection.

3. Hand sanitizer is generally quicker and more convenient than washing hands with soap and water, Which requires access to a sink and running water. Hand sanitizer can be applied anywhere and at any Time, making it a convenient option for people who are on the go or do not have access to hand Washing facilities.

4. Hand sanitizer is quick and simple to use, making it a convenient option for people who are on the go Or do not have access to hand washing facilities. To use hand sanitizer, you simply need to apply a Small amount to your hands and rub them together until the sanitizer evaporates. This process takes Only a few seconds and can be done anywhere, making hand sanitizer a convenient option for Maintaining hand hygiene in various settings. However, it is important to note that hand sanitizer Should be used properly and in conjunction with other hygiene practices, such as covering your

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mouth And nose when coughing or sneezing, to reduce the risk of spreading infectious diseases.

Aims & Objectives :

he main aim of a polyherbal hand sanitizer is to provide effective hand hygiene for preventing and controlling infections. This is achieved by utilizing the antimicrobial properties of various herbal extracts to kill or inhibit the growth of harmful microorganisms on the skin. Additionally, herbal sanitizers often offer benefits beyond just killing germs, such as moisturizing and nourishing the skin.

Here's a more detailed breakdown of the aims and objectives:

To provide a convenient and effective way to clean and sanitize hands when soap and water are not readily available.

To reduce the risk of acquiring infections by eliminating or inhibiting the growth of pathogens on the hands.

To significantly reduce the number of bacteria and viruses on the hands.

To promote healthy skin by providing moisturizing and nourishing properties through herbal extracts.

Objectives:

To create a product that is safe for use on the skin, effective in killing microorganisms, and provides a pleasant sensory experience.

To leverage the antimicrobial and other beneficial properties of various herbal extracts.

To ensure the product is well-tolerated by most users and avoids causing irritation or dryness.

To develop a product that is eco-friendly and sustainable, considering the impact on the environment and the use of natural resources.

To contribute to better public health outcomes by promoting hand hygiene and reducing the spread of infections.

Herbal hand sanitizers, a topic explored in numerous research papers, offer a natural and often more sustainable alternative to traditional alcohol-based sanitizers. Literature reviews highlight their potential for both antimicrobial efficacy and added benefits like moisturizing and skin conditioning. However, studies also emphasize that herbal sanitizers may not always achieve the same level of effectiveness as alcohol-based solutions in killing bacteria and viruses, particularly when a high level of germ reduction is needed.

Key Aspects of Herbal Hand Sanitizer Literature Review:

Many studies focus on evaluating the antimicrobial properties of different herbal extracts against various bacteria and viruses. The effectiveness of specific herbs can vary, with some showing strong antimicrobial activity against specific pathogens, while others may be more effective against certain types of bacteria or fungi.

Research explores different formulations of herbal hand sanitizers, including the use of various plant extracts, essential oils, and gelling agents like Carbopol 940. Studies also evaluate the physical properties of these formulations, such as pH, viscosity, and spreadability, to ensure they are suitable for practical use.

Some reviews compare herbal hand sanitizers to conventional alcohol-based sanitizers, highlighting the pros and cons of each. Herbal sanitizers can offer advantages in terms of being more gentle on the skin and potentially less irritating, while alcohol-based sanitizers are often more effective at killing a wider range of pathogens.

o Herbal sanitizers often contain ingredients that can moisturize and soothe the skin, reducing the risk of dryness and irritation that can occur with alcohol-based sanitizers.

o Many herbal ingredients are natural and biodegradable, making herbal sanitizers a more environmentally friendly option.

o Herbal sanitizers can be made with readily available and affordable ingredients, offering a cost-effective alternative to commercial products.

o Herbal sanitizers may not be as effective as alcohol- based sanitizers in killing all types of pathogens, particularly when a high level of germ reduction is necessary.

o The shelf life of herbal sanitizers can vary depending on the ingredients and storage conditions, and they may be more susceptible to degradation than alcohol-based sanitizers.

o While generally considered safe,

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some individuals may be allergic to certain herbal ingredients, and it's important to consider the potential for adverse reactions.

In summary, literature on herbal hand sanitizers showcases their potential as a natural and sustainable alternative to traditional sanitizers, with a focus on antimicrobial activity, formulation, and comparison with conventional products. While they offer benefits like gentler skin care and environmental friendliness, they may not always achieve the same level of germ reduction as alcohol-based solutions.

Herbal hand sanitizers are prepared by mixing herbal extracts with alcohol and other ingredients. Evaluation includes testing for physical properties, pH, viscosity, spreadability, alcohol content, and skin sensitivity. Microbial testing is also crucial to determine the sanitizer's effectiveness against bacteria, viruses, and fungi.

Method of Preparation:

Herbal extracts are typically prepared by soaking dried, powdered plant material in ethanol.

Alcohol (ethanol or isopropyl alcohol), herbal extracts, glycerin, and water are mixed gradually.

Carbopol and other thickening agents may be added to create a gel-like consistency.

The mixture is homogenized, and the pH is adjusted to a suitable range (typically 5.5-7).

The final formulation is packed into sterile containers. Testing and Evaluation:

1. Visual assessment of color, odor, and texture (appearance and homogeneity).
2. Testing for pH, viscosity, spreadability, and alcohol content.
3. Patch tests to ensure no skin irritation or allergies.
4. Bactericidal, virucidal, and fungicidal tests to assess effectiveness against pathogens.

Key Considerations:

Alcohol (ethanol or isopropyl alcohol) is the primary antimicrobial agent, with a concentration typically ranging from 60% to 95% for effective hand sanitizers.

The pH of the hand sanitizer should be within the skin's pH range (typically 5.5-7) to avoid irritation.

The hand sanitizer should have a suitable viscosity for easy application and spreadability on the hands.

Different herbal extracts can be used for their antimicrobial, anti-inflammatory, and moisturizing properties.

Specific Tests:

- Measured using a pH meter or test strips.
- Can be determined using a hydrometer, distillation methods, or gas chromatography.
- Measured using a viscometer.
- Assessed by applying the sanitizer to a surface and observing its spread.
- Performed using standard cup plate methods or quantitative suspension tests.

Neem

Nimb (Hindi), Limba (Marathi).

It is dried from leaves and seed oil of the Azadirachta indica plant.

Meliaceae

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Chemical Constituents:
Nimbin, Nimbidin, Azadirachtin, Quercetin, etc.
Neem helps reduce bacteria.
Neem may help reduce gum inflammation.
Neem prevents the growth of bacteria in the mouth.
Neem has properties involving fresher breath.

Tulsi

Queen of Herbs
It is dried from leaves of Ocimum sanctum plant.
Lamiaceae
Chemical Constituents:
Eugenol, Ursolic acid, Rosmarinic acid, Flavonoids.

Aloe vera gel can be incorporated into hand sanitizers to provide moisturizing and soothing benefits without compromising their effectiveness. When making your own hand sanitizer, you can mix aloe vera gel with rubbing alcohol, such as isopropyl alcohol (91-99% alcohol). A common ratio is 2 parts alcohol to 1 part aloe vera gel, ensuring a high enough alcohol content to kill most germs (around 60%).
Here's a more detailed look at using aloe vera gel in hand sanitizer:

Procedure
Preparation of Extract for Hand Sanitizer:

Using dried leaves of neem and tulsi, powdering them mechanically, and soaking them in ethanol overnight is A common method of extracting their active components. Once the extraction is complete, the mixture is Typically filtered using a funnel and filter paper to remove any solid particles or impurities, leaving behind a Clear liquid extract. This extract can then be used as an ingredient in hand sanitizer formulations, providing Natural antibacterial and antiviral properties to the product. It is important to note that while plant extracts can Be effective in killing microorganisms7,8
Aloe vera Biological Information:
• Aloe barbadensis Miller.
• Succulent.
• Lanceolate, succulent, and rich in water, with a thin cuticle on the outer layer (exocarp) and a clear, jelly-like parenchyma (pulp or gel) inside.

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• The leaf gel is primarily used in cosmetics, pharmaceuticals, and food due to its chemical composition, which provides various medicinal and healing properties, according to ScienceDirect.com.
• While Aloe barbadensis Miller is the most common scientific name, other names are sometimes used, such as "true aloe" or simply "aloe vera," according to the International Journal of Pharmaceutical Research and Applications.

Rose Water

What to know. CDC recommends washing hands with soap and water whenever possible because handwashing reduces the amounts of all types of germs and chemicals on hands. If soap and water are not available, using a hand sanitizer with at least 60% alcohol can help you avoid getting sick and spreading germs to others.
Carbopol is a common thickening agent used in hand sanitizer formulations. To prepare a hand Sanitizer solution using carbopol, deionized water is typically added gradually to the carbopol powder While being constantly stirred. This process helps to ensure that the carbopol is evenly dispersed Throughout the water, preventing the formation of clumps or lumps. Once the carbopol is fully Dispersed, other ingredients such as alcohol, plant extracts, and humectants may be added to the Solution, depending on the desired formulation. The resulting mixture is typically thick and viscous, Making it easy to apply and spread evenly on the hands.
Triethanolamine is often added to hand sanitizer formulations as a pH adjuster, as it can help to Neutralize the acidity of other ingredients such as carbopol or citric acid.
When adding triethanolamine to a hand sanitizer mixture, it is important to add it slowly and after Thorough mixing to prevent the potential production ofair bubbles in the finished product. Air bubbles Can reduce the efficacy ofthe hand sanitizer by creating pockets ofair where bacteria or viruses may Survive. Therefore, it is important to mix the ingredients carefully and thoroughly, taking care to avoid Creating air bubbles, in order to ensure the effectiveness of the final product.
After the hand sanitizer mixture is prepared, it is typically allowed to rest or “cure” for a period of time Before it is used. This is done to allow the ingredients to fully mix and any air bubbles to dissipate, Ensuring that the hand sanitizer is fully effective and free of any potential defects or inconsistencies. The curing time may vary depending on the specific formulation and ingredients used, but a common Practice is to hold back the hand sanitizer for 24 hours before packaging or using it. This allows the

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Evaluation Test

1. Organoleptic Test: The gels were reported to be homogeneous, transparent, and easy to use with a Light and continuous flow. They did not exhibit any syneresis (separation of liquid from a gel-like substance), Which is a positive attribute.

However, the gels developed a bubble-like appearance with overnight storage Which is a common occurrence in gels and is generally not considered a major issue. The bubbles disappeared After a light shake, indicating that the gels were able to maintain their homogeneity and followability.The color ofthe gel was reported as yellowish-white, which could be due to the presence of certain active Ingredients or additives used in the formulation. The odour was described as characteristic, which could be an Indication of the presence of specific fragrances or natural extracts used to enhance the product's essence.

2. pH Evaluation: the pH values of the hand sanitizer gel formulations were measured using a digital pH meter. The aim of the study was to evaluate how various manufactured formulations were neutralized, which likely refers to the process of adjusting the pH ofthe formulation to a desired level.The ideal pH range for a topical dose form, such as a hand sanitizer gel, should be within the skin's natural pH Range of 4.0 to 7.0 to prevent skin irritation and inflammation. The pH

measurements obtained in this study Were reported to average around 4.3, which is fairly acidic and falls within the lower end of the skin's natural pH range.

3. Viscosity: The viscosity of hand sanitizer gel formulations is an important aspect that affects their Consistency and flowability when applied to the skin. A higher viscosity can result in a thicker and more gel-Like consistency, which may be preferred by some users. The viscosity of the generated gel formulations was

Measured in this study, and the effects of gel components were examined. The results indicated that the Produced formulations had higher viscosities compared to pure ethanol and water. This suggests that the gel Components, such as thickeners or gelling agents, were effective in increasing the viscosity of the Formulations.

4. Spreadability Study: Spreadability is an important factor to consider when developing hand sanitizer Formulations, as it can affect both customer compliance and the effectiveness of product. A hand sanitizer Gel with poor spreadability may not be applied evenly, which can result in areas of the skin being missed and Potentially leaving areas ofthe skin unprotected.To test the spreadability ofthe hand sanitizer gel formulations, a gel spreadability test was conducted in this Study. The test measures the time it takes for the gel to spread over a surface and the force

required for Spreading. The optimum gel formulation should have a quicker spreading time and require less force to spread (i.e., high spreadability).

Herbal hand sanitizers offer a promising alternative to conventional chemical-based products, demonstrating effectiveness against various microorganisms while also being skin-friendly and eco-friendly. Studies show that herbal extracts can provide antimicrobial activity, moisturization, and soothing benefits.

II. CONCLUSION

Based on the findings of the study, it can be concluded that herbal hand sanitizers can have a substantial Bacterial impact on targeted microorganisms. This suggests that there is potential for expanding the use of Antibacterial herbal products as a way to combat multidrug-resistant bacteria and prevent their spread from Person to person. Additionally, the use of natural herbal hand sanitizers can be considered an alternative to chemically-made Hand sanitizers containing active silver nitrates. This is because herbal hand sanitizers are generally more Economical, efficient, and ecologically responsible, and may be preferred by those who prefer natural

Products. However, it should be noted that further research is needed to fully understand the effectiveness and safety of Herbal hand sanitizers. Additionally, it is important to ensure that any herbal products used for hand Sanitization are properly formulated and manufactured to ensure their efficacy and safety.

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