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Preparation of hand sanitizer at home through plant extracts

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ABSTRACT

This research investigates the development of a hand sanitizer using plant extracts as the main ingredients. The aim is to develop a new hand hygiene option using the antimicrobial properties of specific plant extracts. The main components consist of isopropyl alcohol (ethanol), aloe vera gel, and essential oils like tea tree oil. The goal is to create a hand sanitizer using an optimal alcohol concentration and including natural ingredients for potential additional advantages. The research underscores the significance of following recommended guidelines for hand sanitizer formulation and usage as indicated by health authorities. It also stresses the necessity for additional research to confirm the effectiveness and safety of homemade hand sanitizers.

Introduction:

Hand sanitizer is a solution typically in liquid, gel foam, intended for the reduction or elimination of microorganisms, including bacteria, viruses, and fungi, when applied to the hands. It is utilized as a substitutive method for conventional hand washing with soap and water in circumstances where access to soap and water is restricted or unfeasible. Hand sanitizers commonly feature an active component, frequently alcohol, which functions to exterminate or impede the proliferation of microorganisms on the skin. The overarching objective of hand sanitizers is to advance hand hygiene through the reduction of potentially pathogenic microorganisms on the hands, thereby contributing to the mitigation of infectious diseases and illnesses. The utilization of hand sanitizers has become increasingly prevalent in cases where hand washing amenities are not readily accessible, such as during travel, in healthcare environments, or in emergency circumstances. It is crucial to emphasize that effective hand sanitizers ought to comprise an ample amount of the active ingredient, typically alcohol, and must be applied in accordance with the recommended guidelines to guarantee their efficacy. Health organizations, such as the World Health Organization and the Centers for Disease Control and Prevention offer recommendations for the development and utilization of hand sanitizers in order to guarantee their effectiveness and safety. While it is feasible to prepare hand sanitizer using plant extracts at home, it is crucial to acknowledge that commercially manufactured hand sanitizers are designed to adhere to specific efficacy and safety standards. The effectiveness of homemade hand sanitizers can vary and there is a risk of not making it correctly, which could result in a product that doesn't effectively kill germs. It's essential to understand that these suggested concentrations are broad recommendations and may not guarantee an exact level of antimicrobial efficacy. The important thing to remember is that the effectiveness of hand sanitizer depends on the amount of alcohol it contains, while any additional botanical extracts are seen as an extra bonus. It is recommended to follow the recommendations given by health organizations and seek advice from qualified professionals when making DIY products. It's crucial to follow the safety guidelines and recommendations provided by health authorities when using hand sanitizer. It is important to note that while homemade sanitizers may offer convenience, commercial sanitizers are subjected to comprehensive testing to guarantee their efficacy and safety. It is recommended that individuals adhere to the practice of thoroughly washing their hands with soap and water for a minimum duration of 20 seconds whenever feasible, as this method continues to be the most effective [1].

Plant extracts used in sanitizer

Numerous botanical extracts have been acknowledged for their potential antimicrobial efficacy, leading to their integration into various formulations for homemade hand sanitizers. It is crucial to acknowledge that the efficacy of plant extracts in eradicating pathogens can be variable, and incorporating them into a homemade sanitizer may not confer the same degree of certainty as commercially manufactured sanitizers with standardized compositions. Tea tree oil is recognized for its antimicrobial attributes. Extensive research has been conducted to investigate its efficacy in eradicating a wide range of bacteria, viruses, and fungi. The inclusion of this substance is frequently observed in domestically produced sanitizing products. The selection of lavender oil is frequently driven by its appealing aroma; however, it also exhibits antimicrobial properties. Although not as potent as tea tree oil, it may serve as a valuable complement in terms of fragrance and potential antimicrobial properties. Peppermint oil is recognized for its invigorating aroma and potential antimicrobial qualities. "Occasionally, it is incorporated into artisanal sanitizers for its aromatic properties." Extensive research has been conducted on the antimicrobial properties of eucalyptus oil. The substance possesses a discernible camphoraceous aroma and has the potential to enhance the overall efficacy of a homemade sanitizing product. Thyme essential oil or thyme extract is composed of thymol, a compound characterized by its established antimicrobial properties. The incorporation of thyme extract in certain formulations is grounded in its potential antimicrobial properties [2].

Formulation for sanitizer

Table 1: Plant extracts for 100 ml formulation and their antimicrobial activities

Sr.No	Plant Extract	Main Constituents	Amount for 100 ml	Antimicrobial Activity
1	Tea Tree Oil	Terpinen-4-ol, α-trepanned	10-15 drops	Broad-spectrum Antibacterial, Antiviral, Antifungal
2	Lavender Oil	Linalool, linalyl acetate	10-15 drops	Mild Antibacterial, Antifungal, Aalming fragrance
3	Peppermint Oil	Menthol, menthone	10-15 drops	Mild Antibacterial, Antiviral, refreshing scent
4	Eucalyptus Oil	Eucalyptol (1,8-cineole)	10-15 drops	Antimicrobial, decongestant, expectorant
5	Thyme Extract	Thymol, carvacrol	5-10 drops	Strong Antibacterial, Antifungal

Table 2: Ingredients used for hand sanitizer

Sr.No	Ingredients	
1	Isopropyl alcohol	(99% or at least 60% alcohol content)
2	Aloe vera gel	Add 1/3 cup of aloe vera gel to the alcohol
3	Essential oils	(e.g., tea tree oil, lavender oil) for added fragrance and potential antimicrobial properties
4	Vitamin E oil	Add a few drops of vitamin E oil

Formulation No: 1

In the formulation of a sanitizer, it is imperative to ensure that the end product is efficacious in decreasing the microbial load on the hands. The predominant component found in the majority of hand sanitizers is alcohol, with the suggested options being isopropyl alcohol (isopropanol) or ethanol as the principal active substance.

Ingredients

Isopropyl Alcohol (Ethanol): It is recommended to utilize a high-concentration alcohol, particularly in the range of 60% to 70%, in order to achieve optimal effectiveness. Isopropyl alcohol (commonly known as rubbing alcohol) or ethanol (also referred to as grain alcohol) can be utilized for this purpose. It is recommended to modify the quantity in accordance with the intended final alcohol concentration.

Aloe Vera Gel: Aloe vera gel is frequently incorporated into formulations to effectively provide hydration and inhibit the skin from becoming dehydrated. It also contributes to maintaining consistency. The objective is to achieve a

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ratio of 2:1 alcohol to aloe vera; however, it is important to note that this proportion may be modified in accordance with individual preference.

Essential Oils: The inclusion of essential oils, such as tea tree oil, lavender oil, or eucalyptus oil, may serve to provide aromatic qualities as well as potential supplementary antimicrobial attributes. Utilize a small quantity of drops according to individual preference.

Glycerin or Vitamin E Oil (Optional): Incorporation of glycerin or vitamin E oil has the potential to mitigate skin dryness. The inclusion of these ingredients is discretionary and may be modified according to individual preferences [3].

Formulation No: 2

Ethanol/Isopropanol 70%, Hydrogen peroxide 2%, Glycerine 3%, Alovera gel 25%

Procedure for preparation of sanitizer

The precise quantities of 70 ml of ethanol/isopropanol, 3 ml of hydrogen peroxide, 3 ml of glycerine, and 25 ml of aloe vera gel should be accurately measured using a clean measuring cup or scale. The ethanol/isopropanol, hydrogen peroxide, glycerin, and aloe vera gel were combined in a sterile bowl. "The solution should be thoroughly mixed through stirring. " It is recommended to employ a funnel for the purpose of transferring the mixture into small, sanitized bottles with hermetically sealed lids. It is imperative to appropriately designate the bottles with the constituents and directives for use. Utilize a minimal quantity, approximately equivalent to the size of a dime, and distribute it over the hands. Friction should be applied to the hands by rubbing them together in order to ensure comprehensive coverage of all surfaces until the hand sanitizer has completely dried. It is essential to ensure that all equipment and containers are thoroughly cleaned and sanitized. This demonstration results in the production of 100 milliliters of hand sanitizer with a conclusive alcohol concentration of roughly 70%, in accordance with the suggested protocols. The consideration of hydrogen peroxide serves to use its known antiviral properties. The joining of glycerin serves to upgrade dampness levels, whereas aloe vera gel contributes extra skin-soothing qualities. It is fitting to form alterations to the amounts agreeing to individual inclinations, whereas guaranteeing that the extreme liquor concentration is no less than 60%, as prompted by therapeutic specialists [4].

Importance

It is important to recognize that while plant extracts may have some antimicrobial properties, the overall effectiveness of a hand sanitizer depends on many factors, such as the concentration of active ingredients and the specific formulation used. When making hand sanitizer at home, it is advisable to use ingredients with proven antimicrobial properties and follow the recommendations of well-known health organizations. In addition, the concentration of alcohol in the disinfectant plays a critical role in its effectiveness in killing microbes. It is very important to prioritize hand washing with soap and water when available, using hand sanitizer as an additional preventative measure [5].

Conclusion

The utilization of plant extracts in the formulation of a hand sanitizer within a non-commercial environment presents a compelling opportunity to explore alternative, natural solutions for hand hygiene. The inclusion of botanical extracts, such as tea tree oil, in the formulation of the sanitizer has the potential to enhance its antimicrobial properties, thereby increasing its effectiveness. The employment of isopropyl alcohol (ethanol), aloe vera gel, and essential oils constitutes a holistic approach aimed at achieving antimicrobial efficacy while also enhancing skin moisturization and imparting aromatic qualities. Further research and validation are necessary in order to establish the consistency and reliability of these DIY remedies.

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