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Research Article

FORMULATION AND EVALUATION OF HERBAL HAND SANITIZER USING *ARGEMONE MEXICANA* AND *CALENDULA OFFICINALIS* PLANT EXTRACT

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ABSTRACT

The main objective of developing a herbal hand sanitizer would be to promote "hand hygiene." It is a key element in the detection, control, and elimination of any acquired infection. Hand sanitizer will break the chain of microorganisms and other bacteria spreading from the hands to other areas of our bodies. Hand hygiene is essential and among the most common important steps in food processing, food service, and in the preparation of homes and other day care facilities. Hand sanitizer prevents itching, scratching, dermatitis, and other unpleasant side effects. So, maintaining hand hygiene as the key approach, an attempt to formulate an herbal hand sanitizer using extracts from widely available plants such as *Argemone mexicana* and *Calendula officinalis*, instead of a synthetic formulation. Physical parameters of the formulation were assessed. These ingredients, in combination, have seemed to act as an effective hand sanitizer.

KEYWORDs: Hand sanitizer, Herbal extracts, Hygiene, antimicrobial activity

INTRODUCTION

Hand hygiene is therefore the most effective measure for stopping the development of infectious pathogens and nosocomial infections. [1,2]. The most common skin disorders are eczema (atopic dermatitis), warts, acne, rashes, psoriasis, allergy etc. To protect the skin from harmful microorganisms and to prevent spreading of many skin infection[2,3].

Hand washing is absolutely an important precaution. The aim of the present work is to prepare and physically evaluate an herbal hand sanitizer from commonly available plants extract. Hand sanitizer is an antiseptic and supplement to the hand washing with soap and water[2,4]. There are different preparations in hand sanitizer like gel, foam, liquid solution etc[2,5]. In the current scenario of mechanized lifestyle; a consumer will always prefer ready-made formulation of herbal hand sanitizer rather than hand washing[2]. Plants have long been used by traditional healers to prevent/cure infectious diseases. Secondary metabolites present in plants, like tannins, terpenoids, alkaloids, and flavonoids, have been found to have antimicrobial properties in vitro.[6,7].

In the aim of present study was to prepare and evaluate herbal based hand sanitizer containing a combination of extracts of *Argemone mexicana and Calendula officinalis* was carried out for its anti-microbial (bactericidal) effects[8]. Alcohol is the most popular active component in hand sanitizer, although inactive ingredients include thickening agents, humectants, and other additives. When compared to soaps, alcohol-based hand sanitizers are very good at destroying microorganisms. In the United States, all hand sanitizers must bear the designation "national drug code." [5].

Uses of Hand Sanitizer

- These are antiseptic substances that are used to prevent the spread of skin infections and pathogens.
- Within moments after application, alcohol-based hand sanitizer destroys 99 percent of bacteria on hands.
- There will be less skin drying, and more moisture is left on the skin[5].

MATERIAL AND METHODS

The essential components used in the current study to make herbal hand sanitizer were *Argemone mexicana* and *Calendula officinalis.* These Leaves of *Argemone mexicana and Calendula officinalis*. were collected from sangli district, Maharashtra. And specimens were authenticated at YCP, College, karad. Other materials like lavender oil, cinnamon oil, Carbopol, triethanolamine, glycerine, polysorbate-20, perfume, preservatives and alcohol were procured from the RCP, kasegaon, Maharashtra. Chemicals used in the formulation are of analytical grades.

Bacterial strains

Escherichia coli (gram–ve) ATCC 10531
Pseudomonas aeruginosa (gram–ve) ATCC 25619
Staphylococcus aureus (gram +ve) ATCC 6538

Preparation of Extracts

In a 100 ml methanol solution, ten gm of each plant material that is dry were added separately (9 parts of methanol: 1 part of water). This mixture was heated for 12-24 hours on a water bath at 60°C, filtered, and plant extract was collected.

Formulation of Herbal Hand Sanitizer

The following formula was used to develop the herbal hand sanitizer.

Table 1: Formulation Table

INGREDIENTS	QUANTITY TAKEN (40ML)
Extract of *Argemone mexicana*	0.35g
Extract of *Calendula officinalis*	0.45g
Lavender Oil	4.0ml
Cinnamon oil	4.0ml
Carbopol	0.4g
triethanolamine	0.4g
Glycerine	2ml
Polysorbate-20	0.4ml
Methyl Paraben	0.4mg
Alcohol	16ml
water	8ml
perfume	q.s.

Procedure

All ingredients except triethanolamine, alcohol, and perfume were added to water and stirred well. Oils of lavender and cinnamon, as well as perfume, were added to triethanolamine and stirred well, and all contents were thoroughly mixed together, and Alcohol was used to make up the volume.

Fig: Herbal Hand Sanitizer

EVALUATION

Physical Evaluation

The herbal-based hand sanitizer was subjected to a visual examination. Color and odour were the test parameters.

Color: Determined by visually.
Odor: Determined by manually.
pH: Take 10 ml of hand sanitizer and measure the pH by previously calibrated digital pH meter[2, 9].
Irritancy Test: The herbal hand sanitizer was applied to the palm of the hand, and the time was recorded. It was tested for irritation, redness, dryness, and discomfort.
Evaporation Rate: The herbal hand sanitizer was rubbed onto the palm. The period when evaporation occurred was recorded. The rate of evaporation was less than one minute[10].
***In-Vitro* Antimicrobial Activity by Agar Plate Diffusion Method:** The prepared herbal hand sanitizer was subjected to antimicrobial screening by agar well diffusion method. Organism used were *E Coli, S aureus* and *P aeruginosa.* 1 ml of sanitizer was mixed with 5 ml of DMSO and used for evaluating the antimicrobial activities. The plates were incubated for 24 hours at 37°C, and the inhibition zone was determined[11].

RESULTS

Physical Evaluation

The herbal-based hand sanitizer was subjected to a visual examination. and the result of physical evaluation is as given below:
Colour: Green
Odor: Characteristics
pH: The pH of the herbal hand sanitizer was found to be 6.8 which is good for skin pH.
Irritancy Test: During irritancy tests, the formulation shows no redness, edema, inflammation, or irritation. These products are safe to use on the skin.
Evaporation Rate: Evaporates usually requires only 15 to 30 seconds.
***In-Vitro* Antimicrobial Activity by Agar Plate Diffusion Method:** In this evaluation test, the antimicrobial activity of herbal hand sanitizer was found to be safe and, the formulated herbal hand sanitizer has anti-microbial activity against bacterial species like *E Coli, S aureus* and *P aeruginosa.* Formulation exhibited good zone of inhibition ranging from 19-25 mm and result is tabulated below:

Table 2: Antimicrobial Screening of prepared formulation

Organism	Zone of inhibition(mm)
E Coli	22
S aureus	19
P aeruginosa	24

CONCLUSION

Natural remedies are more acceptable in the belief as they are safer with fewer side effects than the synthetic ones. Herbal formulations have emergent demand in the global market. It is concluded from the various studies that herbs are very useful agents that can be used as hand sanitizers with lesser side effects and long-lasting effects. These herbal formulations of hand sanitizer have shown even better results than the commercially available alcohol-based sanitizers. Some useful Indian herbs that can be used for sanitizer making have been found to be effective against pathogenic bacteria like *Staph aureus, E. coli* and *Pseudomonas aeruginosa* with no side effects on human tissue.

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