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# FORMULATION AND EVALUATION OF ALOVERA HAND SANITIZER

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## ABSTRACT

Hand sanitizer is an alternative to the hand washing with soap water. Hand sanitizer is the most important measure to avoid the transmission harmful microbes and prevent the infection, to keep the skin safe from harmful microorganism and to prevent spreding of many infectious disease. The crucial idea and practice in the prevention, management and decrease of diseases is hand cleanliness. We created aloevera hand sanitizer utilizing other components such Eucalyptus oil, hydrogen peroxide, glycerin, vit E, Ethanol, distilled water, camphor. Different formulation are prepared and charaterised using eucalyptus oil is an active pharmaceutical ingredient. The PH of herbal sanitizer found to be 6-6.5 with no irritation to skin. Natural aloevera hand sanitizer are affordable, effective and environmentally friendly.

**KEYWORDS:** Formulation, Evaluation, Hand Sanitizer.

## INTRODUCTION

Hands are primary mode of transmission of disease causing bacteria, viruses and other micro-organism. So, Hand hygiene is the most important measure to avoid the transmission of harmful micro- organism and thereby we can prevent the infections. To maintain hand hygiene the most simplest, and least expensive means is to sanitize hands using sanitizer.[1] Hand sanitizer, also called hand antiseptic, or hand rub, agent applied to the hands for the purpose of removing common pathogens (disease causing organisms). Hand sanitizers typically come in foam, gel, or liquid form. Hygiene is defined as maintenance of cleanliness practices which carries utmost importance in maintenance of health. Contaminated hand can give out vectors for the transmission of microorganisms.[2] Hand contact with ready-to-eat

foods symbolizes a very important means by which pathogens may enter the food supply. To guard the skin from harmful microorganisms and to prevent spreading of many communicable diseases, hand washing is absolutely an important safeguard. Before the invention of contemporary medicine, plants were the chief remedy for treating various diseases. With the arrival of different antibiotics, microbes also slowly develop resistance to these substances. These bring researchers importance towards the plants having antimicrobial, antibacterial properties.[3]

In the current scenario of mechanized life style; a consumer will always prefer ready- made formulation of alcohol hand rub rather than hand washing (application of a non- antimicrobial or antimicrobial soap; and mechanical friction is generated by rubbing the hands together for 1 minute, followed by rinsing with water, and then drying thoroughly with a disposable towel).[4] Indian traditional herbal medicine is very famous since India is leadingin the medicinal systems of Ayurveda and Siddha.[5] These medicinal plants are also important source of other type of beneficial compounds including the ingredients for functional foods. The functional foods promoted the better health to prevent the chronic illness. Plant based hand sanitizers are very common in India. There are many advantages of herbal hand sanitizers as compared to chemical-based hand sanitizers which are toxic and there are many health issues have been discussed.[6]

The alcohol based hand sanitizer claim to kill 99.99% microbes and it is most effective.[7] Herbal content in the formulation i. e. eucalyptus oil and alcohol which act as disinfectant is responsible for the anti-bacterial action and causing hands germs free.[8]

Eucalyptus oil also known as nilgiri oil obtained from leaves of Eucalyptus globulus belonging to Myrtaceae family. Eucalyptus oil has wide application. It is traditionally used as an anti-viral, antiseptic, insect repellent, flavoring. According to different studies, Eucalyptus oil also shown to be effective against viruses.[9] Hydrogen peroxide(H2O2) is added in the formulation as an antiseptic and helps to eliminate bacterial spores.[10]

So, the present studies deals with effective way of using eucalyptus oil by formulating alcohol based hand sanitizer to maintain hand hygiene.

**General Information Of Hand Sanitizer**

**How to Use Hand Sanitizers**

By now, you've seen guidelines for wishing your hands with soap and water. Scrub for 20 seconds. Pay attention to your thumbs and fingernails. Don't touch the faucet once your hands are clean, and use a clean towel.

The emphasis on using regular soap and water is no accident. It's the best way to get rid of germ of all kinds, and when done correctly, it's effective against the novel coronavirus that cause COVID-19.

You should wash your hands regularly, especially after spending time in public, before preparing food or eating, and after you sneeze, cough, or blow your nose.

But you may not always have access to hand soap and a sink. In a pinch, hand sanitizer can be a convenient alternative. To use hand sanitizer effectively against the any type of virus, you need the right type, amount, andapplication method.

**Choose the Right Hand Sanitizer**

Because the COVID-19 pandemic has made some name-brand sanitizers harder to find, you may see new hands on store shelves. Before putting a bottle in your cart, read the product label.

You should choose an alcohol-based hand sanitizer that contains at least 60 percent alcohol. The Food and Drug Administration has also advised against band sanitizers that contain methanol, a substance that can be toxic when rubbed into skin. Some hand sanitizers are labeled as containing ethanol or ethyl alcohol but actually contain methanol. You can use the FDA's searchable database to make sure your hand sanitizer brand isn't one of the offenders. In addition, the FDA has not approved any hand sanitizers, so steer clear of brands labeled "FDA approved". Homemade hand sanitizer is not recommended. If it's not made correctly, hand sanitizer can be ineffective or even harmful to you skin.

**Use the Right Amount of Hand Sanitizer**

One mistake many people make is using too little hand sanitizer, especially if your dispenser doesn't provide rough in one squeeze.

The World Health Organization recommends applying a "coin-sized amount" of gel. In other words, you need enough hand sanitizer to cover both sides of your hands and between your fingers- just as you do with hand soap.

**Apply Hand Sanitizer Correctly**

After applying the gel, rub it in thoroughly. Pay attention to the back of your hands, thumbs, and between your fingers. Like washing your hands at a sink, this process should take about 20 seconds.

When you're done, your hands should be dry. Don't wipe or rinse off the gel.

**Storing Hand Sanitizer**

Chances are, you're using more hand sanitizer these days than ever before. But sanitizer does have a shelf life.

Its alcohol content gradually drops as the expiration date approaches. If you have expired hand sanitizer, dispose of it and get a new bottle. Store your hand sanitizer in a cool, dry location. Avoid direct sunlight and repeated exposure to heat.

When you return home, bring your hand sanitizer inside instead of tossing it into the glove box or a cup holder. While there's little risk of combustion, extreme heat can speed up alcohol evaporation especially if air gets inside the bottle.[23]

**BENEFITS OF HAND SANITISER**

**1. Cleanliness**

This should not come as a surprise. One of the premier benefits of hand sanitizer is just that: it sanitizes. It is intended to eliminate germs, and take cares of that business. When used appropriately, hand sanitizers can get rid 99.9% of the germs on your hands.

The CDC prescribes washing your hands whenever you are around food (making it or eating it), animals, trash, and those are only the tip of the iceberg. At the point when you wind up in these circumstances, hand sanitizer is the ideal addition to (or occasional substitution for) washing your hands with soap and water.

**2. Portability**

It is impossible to take a sink with you everywhere. In some circumstances where you have to wash your hands, soap and water are not always going to be accessible.

A small container of hand sanitizers can go into your glove compartment, a tote, or even your

pocket. It is also ideal for when you are getting a nibble at a game or have recently left a public space, similar to the market.

**3. Ideal for Group Settings**

At the workplace, in the classroom, or in any space with heaps of foot traffic, germs spread rapidly. Regardless of whether you are preparing to eat or taking out the trash, others' germs can affect you (particularly when you are in close contact with other people). This is why having hand sanitizers accessible is perfect for group settings. Educators, students, and office workers can eliminate germs occasionally for the duration of the day without leaving their study hall or work area, and even people who go to the gym can use a squirt of hand sanitizer before jumping to the next exercise machine.

**4. Decreases Risk Of Illness**

Particularly during flu season, limiting your exposure to others' germs is critical for your wellbeing. Each time you pause for during the day, you lessen your odds of becoming ill. Indeed, even a quick outing to a companion's home or the store can expose you to germs that could cause a cold, flu, or different diseases, so keeping your hands as clean as conceivable is important.

**5. Hands That Feel Softer**

This may be one of the most astounding advantages of hand sanitizer, however, it is not unrealistic. Hand sanitizers that do not contain alcohol can really improve the surface of the skin on your hands (note that hand sanitizers with alcohol will not have this impact).

Some hand sanitizers contain emollients that soften your skin, giving you more pleasant looking and smoother hands. You will certainly see a difference in how moisturized your skin feels and looks. During pandemics like COVID-19 or flu seasons, avoid using hand sanitizers that contain alcohol, as they wash away the skin's common oils and can make it crack, which in turn produces an entry point for microorganisms.[24]

## LITERATURE OF SURVEY

**(1) Suryawanshi V. *et al.*, (2020)**

The main idea behind formulation of alcohol based herbal hand sanitizer is to sanitize hands. Washing our hands is very much important to reduce, prevent and control the infection. So, this formulation is formulated to maintain hand hygiene. The alcohol based hand sanitizer

claim to kill 99.99% microbes and it is most effective. Different formulations are prepared and characterized using eucalyptus oil as an active pharmaceutical ingredient. The pH of herbal hand sanitizer found to be 6 with no irritation to skin.[25]

**(2) Chandravanshi J. *et al.*,(2021)**

Hands are the first mode of transmission of microbes and infections. Hand hygiene is a key principle and exercise in the prevention, control and reduction of infections. Due to COVID pandemic the need of hand sanitizer has increased which causes less dryness to hand. Considering the need, we prepared a polyherbal sanitizer using seven plant extracts with other ingredients including isopropyl alcohol, camphor, hydrogen peroxide, glycerol and water. The ingredients were selected on the basis of their antimicrobial property. The ingredients and sanitizer were evaluated for antimicrobial property and showed potent activity against gram positive bacteria S. aureus, whereas mixture of extracts showed potent activity against all the bacterial strains used except B.[26]

**(3) Kumar A. *et al.*, (2022)**

Microbes and diseases are first spread through the hands. A crucial idea and practice in the prevention, management, and decrease of diseases is hand cleanliness. The COVID epidemic has raised the demand for hand sanitizer, which reduces hand dryness. The majority of study has been on maintaining cleanliness by preventing germs from entering the body through hands. After discussing the advantages of eliminating microorganisms, the goal of the current investigation is established. Natural herbal hand sanitizers are affordable, effective and environmentally friendly.[27]

**(4) Dhamankar S. *et al.*, (2022)**

This research paper is centred on the effectiveness, bringing to light and optimistic effectof herbal hand sanitizer using aloevera leaves extract. A large portion of the research has focused on hygiene by controlling the entry of pathogens into the body through hands. Having run over the positive advantages on reducing the microbes, the aim for the current study is set up. Natural herbal hand sanitizer are effective, environment, friendly, and biodegradable, inexpensive.[28]

**(5) Kusarkar P. *et al.*, (2022)**

Majorly this research has focused on Hand Hygiene. Since hands are the primary mode of transmission of various disease causing germs. With the help of proper methods of washing

hands and sanitization during daily lifestyle as well as during Patient care can inhibit or reduce the chances of infection. Goal of this research is to prepare environment friendly biodegradable Herbal Hand sanitizer and Herbal Handwash which shows effective antibacterial and are inexpensive.[29]

**(6) Jadhav D. *et al*., (2023)**

Hand hygiene is an essential factor to prevent or minimize the spread of infections. The results showed that the organoleptic characteristics of all prepared hand sanitizer gels were considered acceptable. The antimicrobial effectiveness test demonstrated that the prepared hand sanitizer gels had antimicrobial activities against different gram-positive and gram-negative bacteria and Candida albicans yeast. This study suggested that the prepared natural hand sanitizer gel with 1.25% (v/v) Lavender oil can be a potential alternative to commonly used alcohol-based hand sanitizer.[30]

**AIM:-** Formulation and evaluation of aloe Vera hand sanitizer.

**OBJECTIVES**

1. It is used in killing foreign microorganism on hand.
2. To study anti- bacterial antiseptic effect of sanitizer.
3. To formulate it within a short period of time.
4. The need of hand sanitizer has increased which causes less dryness to hand.
5. To prepare environment friendly bio-degradeable hand sanitizer.

**RATIONAL OF WORK**

The main purpose of this study is to help create a product that is cheaper and could use the same quality as the one through the use of commercial sanitizers.

This study aims to help people who do not have enough money to buy expensive hand sanitizers. It also helps the researchers determine the similarities and differences between the two products have by comparing their qualities.

The procedure of making this product is simple. It is easy to make since the materials used are found in stores and have the cheapest price. The study advised us to use more Aloe Vera for the product to be more jelly.

## PLANT PROFILE

### Aloe vera[11]

**Table No. 1: Aloevera Profile.**

| Kingdom | Plantae |
|---|---|
| Sub- kingdom | Trachiobionta |
| Super- division | Spermatophyta |
| Division | Mangnoliophyta |
| Class | Liliopsida |
| Sub class | Lilidae |
| Order | Liliales |
| Family | Aloaceae |
| Genus | Aloe L. |
| Species | Aloe vera |

## MATERIAL[12]

**Table No. 2: Materials Used.**

| Sr. No. | Ingredients | Chemical Constituents | Uses | Image |
|---|---|---|---|---|
| 1 | Aloevera | Lupeol, Salicylic acid, urea nitrogen, cinnamomic acid, phenol, and Sulphur | Antimicrobial, antibacterial, antioxidant |  |
| 2 | Eucalyptus oil | 1,8-cineol & α-pinene | Deoderant properties |  |
| 3 | Glycerin | Glycerin | Lubricant, Emmolient |  |
| 4 | Vitamin E | Vitamin E | Nurishing agent |  |

| | | | | |
|---|---|---|---|---|
| 5 | Camphor | Camphor | Fragance, soothes, itchiness and redness |  |
| 6 | Hydrogen peroxide | Hydrogen Peroxide | Disinfectant |  |
| 7 | Ethanol | Ethanol | Anti infective |  |
| 8 | Distilled water | Distilled water | Vehicles |  |

## EXPERIMENTAL WORK

### Collection of leaves

The plants leaves were collected for the preparation of sanitizer from in and around the campus the hospital premises. The plant was selected on the basis of its potent antimicrobial activity reported in research articles. The plants used for the study were Eucalyptus globules (Niligiri), Aloe barbadensis (Ghritkumari). The plant leaves collected were, washed, cleaned and shade dried in a laboratory. After drying plant extract was prepared in ethanol and used for the preparation of hand sanitizer.[13]

### Preparation Of Extract For Hand Sanitizer

- Fresh Aloe vera were collected.
- Washed thoroughly to remove the unwanted particles and dust
- The Aloe vera leaves are cut into half and inner pulps are separated from leaves by knife.
- The pulps were grinded in grinder machine.
- Then put the gel into separate bowl.[14]

**METHOD**

(1) The prepared extract of aloe vera was added in to beaker containing ethanol.

(2) Glycerin were mix with aqueous phase.

(3) Hydrogen peroxide was also added in beaker.

(4) Eucaptylus oil were added drop wise with constant stirring to avoid air bubbles formation and to obtain uniform homogeneous gel followed by adding vitamin E.

(5) To this filtrate 2gm of camphor was added and then volume is made upto 50ml with distilled water.[15]

**img. No. 1: Preparation of Aloevera Gel.**

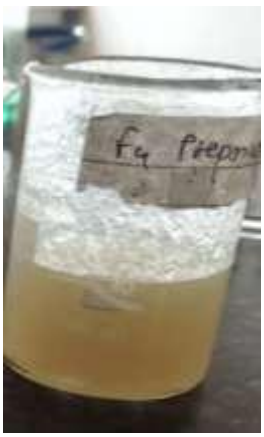
**FORMULATION COMPOSITION OF ALOE VERA SANITIZER[16]**

| Sr. No | Ingredients | Quantity | | | |
|---|---|---|---|---|---|
| | | F1 | F2 | F3 | F4 |
| 1. | Aloe Vera | 15ml | 17.5ml | 20ml | 22.5ml |
| 2. | Eucaptylus oil | 1.25 ml | 1.25ml | 1.25ml | 1.25ml |
| 3. | Glycerin | 2.5ml | 2.5ml | 2.5ml | 2.5ml |
| 4. | Vitamin E | 0.25ml | 0.25ml | 0.25ml | 0.25ml |
| 5. | Camphor | 2gm | 2gm | 2gm | 2gm |
| 6. | Hydrogen peroxide | 1ml | 1ml | 1ml | 1ml |
| 7. | Ethanol | 15ml | 15ml | 15ml | 15ml |
| 8. | Distilled water | q.s 50ml | q.s 50ml | q.s 50ml | q.s 50ml |

**img. 2. A**
**(Formulation 1)**

**img. 2. B**
**(Formulation 2)**

**img. 2. C**
**(Formulation 3)**



**img. 2. D**
**(Formulation 4)**

## EVALUATION TESTS

### Organoleptic Test

The prepared samples were inspected visually to check the texture, odor, and color of the gelsin semisolid conditions.[17]

### PH Evaluation

The pH measurement of the formulated gels was measured using a digital pH meter (Mettler-Toledo pH meter, USA). The pH measurements represent the mean ± standard deviation (SD)of three replicates.[18]

### Viscosity (Rheological Properties)

The rheological and flowability properties of the prepared gels were determined at room temperature using a TCV 300 viscometer (Cambridge applied laboratories viscometer, TX, USA). A piston of a range of 1–10 cP was used, as the formulations had a texture equivalent to water, and the temperature was set to room temperature (≈24 °C). One mL from each

prepared hand sanitizer was filled into the measurement chamber. The chamber was capped for 60 s until it was stable, and then the data were recorded.[19]

**Spreadability**

According to the methods outlined in, the spreadability of the produced hand sanitizers was assessed by spreading 0.5 gm of each formulation gel over a pre-marked transparent glass with a 2 cm diameter. After that, a second clear glass was added on top, and the contents were distributed over five minutes by adding a 500 g weight. Using this technique, the spreadability was assessed based on the gels' properties of slip and drag. The borders were scraped clean of extra gel.[20] The diameter of the spreading area of each formulation was determined and represented by the mean ± SD of three replicates. The following equation was used to determine the spreading percentage: Spreadability% = A2/A1 ×100

Where, A1 is initial area before spreading (cm) and A2 is final area after spreading (cm)

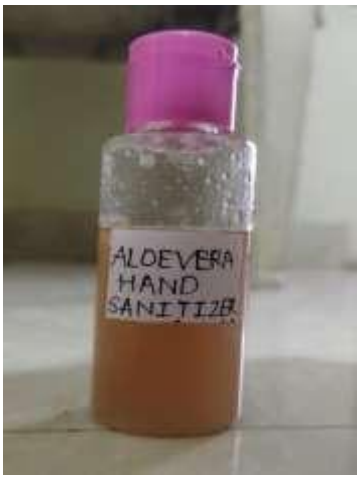
**Antimicrobial Activity of Hand Sanitizer**

**Microbial Suspension Preparation**

The American Type Culture Collection (ATCC) was used to gather gram-positive and gram negative bacteria, as well as opportunistic pathogenic yeast (C. albicans), as reference microorganisms to assess the antimicrobial effectiveness of produced hand sanitizers. E. coli, P. aeruginosa, K. pneumoniae, S. aureus, M. luteus, and S. epidermidis were among the bacterial isolates. The ATCC provided the C. albicans yeast. According to [21, 22] Mueller–Hinton broth was used to make the bacterial and yeast suspensions, also referred to as inoculums. Every microbe was cultivated on Mueller–Hinton agar media and left in the incubator overnight at 37 °C.

**PACKAGING**

The hand sanitizer was packed in transparent as well as refillable fine mist spray bottle which provides uniform mist with one easy push and the Hand sanitizer was packed in transparent as well as refillable dispenser pump containing bottle. Before filling the formulation into the container the packaging containers were rinsed with water and then rinsed with ethanol to drain out the remaining water droplets.[31]




**Img. No. 3: Prepared Aloevera Hand Sanitizer.**

## EXPECTED OUTCOME

- It shows lesser side effects than Marketed Formulation.
- It can be use as antibacterial.
- It can be use as anti-viral.
- It can consume less time.
- It shows greater efficiency than Marketed Formulation.
- It is cost effective than Marketed Formulation.
- It encourages collagen production.
- It feeds your skin.

## RESULTS

The present study was carried out to formulate Aloe Barbandis (Aloe Vera), extracts based hand sanitizer. The formulation was prepared by using herbal ingredients and excipients that are compatible with any similar hand cleansing formulations. It was organoleptically evaluated to ensure product stability and performed In-vitro antimicrobial test to demonstrateits efficacy against infectious bacteria which are collected from volunteers.

| Sr. No. | Evaluation Parameter | Observation |
|---|---|---|
| 1 | Appearance: Colour<br>Odour | Yellowish white<br>Characteristics |
| 2 | pH | 6-6.5 |
| 3 | Clarity Testing | Clear |
| 4 | Viscosity | 1.30-0.50 |
| 5 | Irritancy | No irritancy |

**Evaluation Parameters**

**A. Organoleptic Properties**

For the hand sanitizer, color was brown and odor was aromatic, while appearance was good.

**B. Physical Properties**

**a) pH**

pH of the hand sanitizer was in between 6 to 6.5.

**b) Viscosity**

The viscosity of hand sanitizer was found to be 1.30-0.50.

**c) Skin Irritancy Test**

Hand sanitizer shows no any skin irritancy.

**d) Antimicrobial testing of the prepared formulations**

In this particular evaluation test, the antibacterial of herbal hand sanitizer were found to be safe as well as according to this information, we can say that the herbal hand sanitizer and shows to some extent lesser activity than pure antibiotic Gentamycin. But, definitely the formulated herbal hand sanitizer has anti-microbial activity against bacterial species like E coli, S aureus and P aeruginosa.

**DISCUSSION**

The prepared Herbal Hand sanitizer are tested for its quality and efficacy. Hence, evaluation tests like organoleptic properties, physical properties and antibacterial test were carried out. The prepared Herbal Hand sanitizer showed excellent effect against various microorganisms. The prepared formulation of Hand sanitizer appears greenish with liquid consistency. Aloe Vera used in respective formulations shows better result. Herbal Hand Sanitizer which are prepared with one herbal plant with multidimensional properties are very effective against the bacteria which are most resistant to the disinfection process and multidrug-resistant pathogens. The herbals used in formulations are widely used for medicinal purpose. These Herbals are also rich in various compounds. The prepared formulations were checked for its efficacy with the help of standard cup plate method and it was proved that both formulations were beneficial against various microbes. The result showed that the Herbal Hand sanitizer is very effective with multidimensional activities.

## CONCLUSION

Most of the people do not even know the importance of using Herbal Hand sanitizer. Since, Hands are the primary mode of spreading various infections. Proper methods of washing and drying hands can prevent infection. Hence, it was proved that the Herbal Hand sanitizer is very effective against various bacteria, viruses and microbes and must in recent circumstances. As compared to chemically prepared Hand sanitizer, Herbal Hand sanitizer is very effective, environment friendly, biodegradable and inexpensive. Mostly Herbal Hand Sanitizer protect us from many daily encounter bacteria. The result suggest that the constituents of the various extracts of aloe Barbandis and their combination are capable of giving superficial anti-microbial, antibiotic as well as antibacterial activity and they are able to inhibit the many pathogens than commercially available antiseptic soap.

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