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# MICROEMULSION BASED HERBAL ANTISEPTIC SPRAY: A NATURAL REMEDY

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**ABSTRACT** Current study explains about the formulation of microemulsion based topical antiseptic sprays. There is an inclined demand for the use of topical antiseptic sprays. Topical antiseptics helps to break the chain of transmission of virus, bacteria, fungi and other microbes by preventing or inhibiting the growth of microorganisms. It is useful in treatment of bacterial and skin infections more efficiently. Herbal antiseptic agents have natural antimicrobial action and hence they have lesser side effects when compared with synthetic antiseptics, it also has emollient action which helps in soothing the skin. Spray preparations can provide concentrated content release, they have ability to dry quickly and are easy to use. Aloe vera and clove oil are mainly used active ingredients in this formulation, they are effective against broad spectrum of pathogens. Herbal antiseptic spray was evaluated for its spray angle, pH, viscosity, droplet size etc. Various parameters like zeta potential test and zone of inhibition tests were performed to determine stability and antimicrobial action of herbal antiseptic spray. Microemulsions have gained significant attention because of their excellent properties related to their stability, solubility, simplicity, and formulation aspects. The application of microemulsions is not limited to drug delivery via the oral, topical or ocular routes, but may also be seen in cosmetics, immunology, sensor devices, coating, textiles, analytical chemistry, and spermicide.

**KEYWORDS :** Microemulsion, Antiseptic spray, Anti-microbial activity, Topical application.

## INTRODUCTION

Skin infections refer to acute conditions of inflammatory microbial occupation of the skin layers and underlying soft tissues [14]. Skin infections is considered as one of the most frequent types of infection, which requires medical support . [1,2]

WHO organized first global meeting on skin diseases in November 2023. Overall, skin conditions are estimated to affect 1.8 billion people at any point in time. In tropical and resource-poor settings, skin infections, which can be of bacterial, viral, fungal or parasitic origin, are the commonest cause of disease. It is therefore important that endemic countries adopt holistic, community-oriented approaches to addressing comprehensively skin infections and all other skin conditions as part of universal health coverage. Without early diagnosis and treatment, skin diseases can negatively impact individuals, families and communities by causing long-term disability, stigmatization and mental health conditions. According to the Global Burden of Disease Study, 15 different dermatologic concerns accounted for 1.79% of the total global burden of disease in 2013. This was calculated using disability-adjusted life years (DALYs) index, of which cellulitis, viral skin diseases and fungal skin diseases accounted for 0.04%, 0.16%, and 0.15%, respectively. Skin and subcutaneous conditions, next to iron deficiency anaemia, tuberculosis, and sensory organ diseases were the leading reasons inducing disability in the world [9,18].

Antiseptic agents are the chemical substances used to kill or inhibit the growth of microorganisms when applied in or on a living tissue such as skin, mucous membrane. Topical antiseptic sprays are used to decrease the microbial count, they are helpful in prevention of transmission of infections.

Ideal properties for antiseptics include widespread and rapid bioactivity against bacteria, fungi and viruses, no toxicity or damage to the healthy tissue, and insignificant absorption into the systemic circulation following external application [14]. Uncomplicated skin infections located in superficial layers, typically can be controlled with a topical antimicrobial agent, Antiseptic products may contain one or more active ingredients and are presented in various formulations and preparations, They are commonly used as pre-operative skin preparations for prevention of surgical site infections , as routine skin hygiene such as hand-washes and hand rub products or for treating skin and wound diseases [14]. For skin and wound infections in deeper skin layers, antibiotics are more normally prescribed; in contrast, topical antiseptics are preferred for infections at the outermost surface. In such cases, the aim is to minimize any microbial colonization in a wound or on the skin surface without causing any deleterious effects on the living tissue or impeding the healing process [14,22]. Owing to the broad-spectrum of antimicrobial activity alongside with the varying inhibitory mechanisms, topical antiseptics are advocated as a potential alternative to topical antibiotics in the treatment of minor skin infections

A micro emulsion is a thermodynamically stable fluid. The particle size of micro emulsions ranges from about 10–300 nm. Because of this small particle size, micro emulsions appear as clear or translucent solutions. The stability of microemulsion is dependent on the interfacial tension between the dispersed and continuous phases.

## MATERIALS AND METHODS

Aloe vera gel is extracted from a fresh leaf of aloe plant, by cutting outer leaf of the base of the plant. Clove oil was procured from Dabur India limited. Ethanol, glycerin, methyl paraben, propylparaben, tween-80 are analytical grade excipients used in the formulation.

### Preparation of microemulsion based antiseptic spray:

Solution of Aloe vera gel with water is prepared with the help of mechanical stirrer for 30 to 40 minutes. Weighed amounts of clove oil (20% w/w), tween 80 (10% w/w) is added to this solution. Stir the solution. In a separate beaker, take measured amounts of ethanol (30% w/w) and glycerin (5.0% w/w). To this add required amount of methylparaben, propyl paraben (2.0% w/w), mix the solution.

Prepared oil phase is mixed with aqueous aloe vera solution by using a mechanical stirrer for 1 hour at 60ºC until both phases are uniform. Resultant solution is filtered to remove solid particles and transfer it to a final container. Resultant micro emulsion is evaluated for various tests.

**RESULTS AND DISCUSSION:**

**Droplet size analysis of microemulsion:**

The droplet size distribution of microemulsion can be determined by either light scattering technique or electron microscopy. This technique has been suggested best method for predicting micro emulsion stability.

**Spray angle:**

Spray angle of the antiseptic spray was determined in the following manner: First the distance will be fixed between papers from the nozzle, then one actuation is sprayed on to the paper and measure radius of the circle. Spray angle is calculated from the equation, Spray angle = tan-1 (1/R) , where R is the average radius of the circle which is one cm.

**Delivery amount:**

The delivery amount was determined according to the procedure stated in USP. Valves are pressed continuously for 5 seconds each time and sufficient time was allowed between each actuation to avoid significant canister cooling. The total weight loss was calculated from each container as a deliverable amount.

**pH:**

The digital pH meter is used to determine the pH. The pH range for spray must be 4.5 to 7.5.

**Density:**

The pycnometer was used to determine the density of the spray. Here the dried and emptied pycnometer is used, the sample was filled in it and air bubbles were allowed to rise to the top before inserting the stopper the pycnometer was handled by the neck with one or 2 layers of paper between the fingers and the bottle to avoid expansion due to heat of the hand. The proper value of the density was known by dividing the resultant weight of liquid by its volume in pycnometer.

**Viscosity:**

The viscosity of antiseptic spray was determined using an Ostwald viscometer. 30 ml spray solution was filled in Ostwald viscometer. The flow of solution from A to B point was measured in time in the viscometer reading was taken at least 3 times. The viscosity of the spray solution was measured against the viscosity of the water.

**Zeta potential test:**

Zeta potential test for microemulsion was determined by using Zestier HAS 3000 (Malvern Instrument Ltd., UK). Samples were placed in clear disposable zeta cells and results were recorded. Before putting the fresh sample, keywords are washed with the methanol and rinsed using the sample to be measured by for each experiment. the zeta potential is determined.

**Leak test:**

Two types of leak test are being performed as described below. Immediate leak test: Filled aerosol containers are allowed to sink in warm water (around $50^{0}$c) for About 10 seconds, immediately after the filling. The bubbling in water is being identified as a leakage in the container.

Delayed leak test: Accurately weighed aerosol containers are keeping at room temperature for 2 months. After this time period the containers are weighed again. The difference in the weight of a container is being identified as leakage in the container.

**RESULTS AND DISCUSSION**

Results and discussion of Herbal antiseptic spray formulation:

**1. Physical evaluation:**

The antiseptic spray formulation was subjected to physical evaluation visually for the test parameters.

**Colour:** Translucent.

**Odour:** Clove oil like smell.

**Texture:** Thin liquid.

**2. Appearance and Homogeneity:**

The antiseptic spray formulation was found to homogenous and translucent in nature.

**3. Determination of pH:**

The pH of the antiseptic spray formulation was determined using a digital pH meter. The digital pH meter was calibrated priorly with the buffer tablets 4,7, and 9 and the pH of the solution was determined by adding 1ml of formulation to 100ml of distilled water.The pH of the formulation was noted and indicated in table 1.

**Table no.1 pH of the formulation**

| Formulation | pH value |
|---|---|
| F1 | 7.0 |
| F2 | 7.3 |
| F3 | 7.5 |

The pH values of spray formulation were found between 7.0and 7.5 These were close to neutral and were found to be non-irritant.

**4. Viscosity**

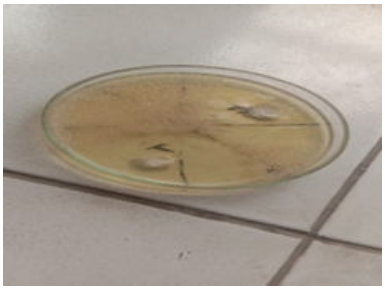
The viscosity of the antiseptic spray formulation was measured using Brookfield viscometer. The spindle was rotated at different RPM and readings of viscosity of antiseptic spray formulation at each speed were noted in table no.2.

**Table no.2.** - Viscosity values

| Formulation | Viscosity values(cps) |
|---|---|
| F1 | 2020 +/- 115.33cps |
| F2 | 2330+/- 170.88cps |
| F3 | 2500+/- 208.81cps |

**5.Antibacterial activity:**

The antimicrobial study was performed by measuring and comparing the diameter of zones of inhibition (in mm) for the selected formulations. The zone of inhibition can be defined as the clear region around the well that contains an antimicrobial agent. It is known that the larger the zone of inhibition, the more potent the antimicrobial agent. The antimicrobial activity of the selected formulations was determined using the agar well diffusion method. The antimicrobial activity of the formulations was compared to the standard against Bacillus subtilis. The results indicated that all the selected formulations showed comparable ZOI with the standard.



**6.Skin Irritation Test:**

The antiseptic spray was applied to the skin and left for 30 min to evaluate the skin Irritation test, even after 30 minutes there are no symptoms of itching, redness, and sensation of irritation of the skin was not found. As it has a cooling effect to the skin with pleasant fragrance no irritation on the skin is caused.

**7. Spreadability:**

0.5gm of Sample of antiseptic spray was pressed between two slides

and left for about 5 minutes where no more spreading was expected. The diameter of the spread circle was found to be 3 cm with no additional spread-ability observed.

**8. Zeta potential test:**

Zeta potential test was performed according to standard preparation. As the standard value is the -0.256mV.

**Table no.3** Zeta potential values.

| Formulations | Zeta potential values (Mv) |
|---|---|
| F1 | -0.195Mv |
| F2 | -0.252Mv |
| F3 | -0.256Mv |

From the above results and discussion, it was found that formulation 3(F3) was in optimized range i.e, globule size= 50-80 µm. Zeta potential value= -0.256Mv

## CONCLUSION:

Most of the world's population uses herbal antiseptic sprays due to their strong antimicrobial properties and primary healthcare benefits. Herbal sprays also has soothing nature, less irritation to skin when used. Essential oils like clove oil have antiseptic action. Use of natural antiseptic sprays helps in reducing cellular toxicity, tissue toxicity, thereby reducing side effects. Antiseptic sprays are useful for prevention and inhibition of the growth of viruses, bacteria and fungi in contrary antibacterial sprays are effective in killing or slowing the growth of bacteria only. From the evaluation test performed an optimal formulation comprising a herbal antiseptic spray with 3:2 ratio of aloe vera and clove oil can be a potential alternative to commonly used antiseptic sprays. Optimized micro emulsion shows good stability and does not cause any irritation or adverse response on the skin when applied. The results of the present study clearly indicated promising potentials of the prepared micro emulsion based herbal topical antiseptics spray for inhibitory action.

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