ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 10| Issue: 3| March 2024|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2024: 8.402 || ISI Value: 1.188

DEVELOPMENT OF ALOE VERA HAND SANITIZER

Lewelyn Christine H. Palmero
Laguna State Polytechnic University Sta. Cruz,

ABSTRACT

The aim of the study was to develop a hand sanitizer that offers secure and efficient substitutes. Aloe Vera-based hand sanitizer that has no other potentially dangerous components. Aloe Vera is widely known for its ability to naturally hydrate skin, and its gel-like consistency makes it ideal for use in hand sanitizers. However, many people are unaware that Aloe Vera naturally protects against viral and bacterial illnesses because it contains polyphenols that stop bacterial growth. Aloe Barbadensis (Aloe Vera) Leaf Juice, which is made organically, serves to fight bacteria alongside alcohol without interfering with your hormonal balance. The purpose of the study is to 1.) To determine the properties and its compounds of Aloe Vera as potential Hand sanitizer, 2.) To determine the Quantity of different ingredients in preparation of Aloe Vera Hand Sanitizer, 3.) To test the Microbial Counts of Aloe Vera Hand Sanitizer with Different Essential Oils. The Study used organic Aloe Vera gel was tried as the major components of hand sanitizer, with an additional proportion of grain alcohol, distilled water and essential oils which give varied scent and effect to the hand sanitizer. Microbial test was done by the Department of Science and Technology (DOST) (Regional Standards and Testing Laboratory) to determine the number of microbes present in the hand sanitizer with different essential oils. In light of the findings, Aloe vera hand sanitizer with rose essential oil showed a less number of microbes, which was found similar with the commercial hand sanitizer.

KEYWORDS: *Hand Sanitizer, Aloe Vera, Essential Oils, Microbial test, Disinfectant*

INTRODUCTION

Due to the COVID-19 outbreak, alcohol-based hand sanitizers (ABHS) have proliferated as a frequent alternative to traditional handwashing in healthcare and community settings, driving up demand for alcohol. There are numerous hand sanitizers available in various varieties. The kinds of hand sanitizers that efficiently combat viruses must be taken into account. The majority of ABHS suggested by the WHO are made up of ethanol, isopropyl alcohols, or hydrogen peroxides in a variety of combinations, with the percentage of ethanol or isopropyl alcohol often falling between 60 and 95 percent. For the majority of ABHS, this concentration range can be regarded as the active bactericidal concentration range. The production of ABHS, which drastically cut the world's supply of alcohol, has boosted the demand for alcohol.

In this study, the effectiveness natural substances such as aloe vera, vitamin E, glycerin, and various essential oils (EOs) was assessed. Additionally, these chemicals are generally accessible due to their market availability. Due to its inherent moisturizing and germ-retarding properties as well as its capacity to suppress some bacterial strains, aloe vera gel was used as the vehicle for hand sanitizer. Due to their relative capacities to delay rancidity (i.e., the oxidation or hydrolysis of fats and oils) and moisturize the skin, vitamin E and glycerin were utilized. The EOs, which have a variety of antibacterial properties.

Aloe vera is used as a disinfectant since it is a natural product that is easily available, inexpensive, has few to no adverse effects, and most importantly, is completely biodegradable and does not harm the environment. Aloe vera's soothing properties are crucial in hand sanitizer. When combined with aloe vera, alcohol, which can be abrasive on its own, is less likely to irritate your skin. Additionally, it makes your alcohol last longer, allowing you to utilize the same chemicals to get rid of more germs. A medical plant called aloe vera has long been used to strengthen skin integrity. The anti-inflammatory, anti-bacterial, anti-viral, antiseptic, and wound-healing effects of aloe vera are well documented.

Aloe vera has 75 known compounds, including 20 minerals, 20 amino acids, vitamins, and water. The Egyptian queens Nefertiti and Cleopatra used it as part of their regular beauty regimen. In vitro studies and studies on living organisms have shown that Aloe vera can inhibit thromboxane (an inhibitor of wound healing), improve the wound healing process, and reduce inflammation. Magnesium lactate present in the gel can help reduce inflammation. Aloe vera inhibits IL-6 and IL-8, decreases leukocyte adhesion, raises IL-10 levels, and decreases TNF- levels, which all work together to prevent inflammation.

Strong antiviral, antifungal, and antibacterial activities are found in aloe vera. Compounds like p-coumaric acid, ascorbic acid, pyrocatechol, and cinnamic acid are present in aloe vera, which is known for its antibacterial properties.

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 10| Issue: 3| March 2024|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2024: 8.402 || ISI Value: 1.188

Hand sanitizer formulations and preparations made from herbal plants have been shown to be efficient against infections. The results have also been compared and found to be effective with hand sanitizer formulations made from alcohol. As far as the environment is concerned, these herbal preparations have been deemed safe for human health (Kalaivani et al., 2018, Acharya et al., 2018, Yaun and Vasquez, 2017).

Since, personal hygiene and health precautions is very important, the use of a hand sanitizer is essential for cleaning hands and can prevent the spread of germs, infections and diseases.

Additionally, it can assist in eliminating a variety of viruses and disease-causing substances that may be on your hands, such as the coronavirus SARS-CoV-2. Even the best alcohol-based hand sanitizers, meanwhile, have limitations and can't completely get rid of all bacteria.

When there is no access to soap or water, hand sanitizer is a convenient on-the-go approach to help stop the spread of germs. You can stay safe and stop the spread of infections by using alcohol-based hand sanitizers.

METHODOLOGY

INPUT	PROCESS	OUTPUT
Ingredients: - Aloe vera gel - Grain alcohol - Distilled water - Essential Oils Lavender Peppermint Sampaguita Ylang ylang Rose	Procedure: -Extracting Aloe Vera Gel through: peeling Slicing Straining -Measuring and Mixing all ingredients -Dropping all the essential oils -Pouring into the spray Bottles -Labeling	 Essential Oils

This study utilizes the experimental design wherein the organic aloe vera gel was tried as the major components of hand sanitizer, with an additional proportion of grain alcohol, distilled water and essential oils which give varied scent and effect to the hand sanitizer.

Microbial test was done by the Department of Science and Technology (DOST) (Regional Standards and Testing Laboratory) to determine the number of microbes present in the hand sanitizer with different essential oils.

The *first step* was preparing the ingredients and the needed materials. As shown in table 1, the ingredients used were the organic aloe vera gel, grain alcohol, distilled water, and different prepared essential oils such as lavender, peppermint, sampaguita, ylang-ylang and rose.

The materials include *beaker* for mixing , *plastic canister* as a container for aloe vera gel, *plastic/wooden spoon* for stirring the mixture, medicine *dropper* used for the addition of essential oils , *knife* for peeling, cutting into smaller pieces the aloe vera, (before extracting the aloe vera gel, the leaves are peeled off to get the gel and cut into smaller pieces) then, the *strainer* is for straining the aloe vera gel, and *pump or squeeze bottle* serve as a container for aloe vera hand sanitizer.

The *second step* is measuring the ingredients needed. As shown in table 1, needed measurement is presented.

Step three, was the mixing of different ingredients. After measuring 1 oz. grain alcohol it was mixed with 2 oz. pure aloe vera gel in a small bowl.

Then, 1 oz. distilled water was added and stirred with a wooden/plastic spoon to combine.

Fourth step, was dropping 5 drops of essential oils (lavender, peppermint, sampaguita, ylang ylang, and rose). It was stirred well with the plastic/wooden spoon to combine.

Fifth step, was pouring of the mixture in a clean plastic pump or squeeze bottled. Labeling or indicating the name and the date it was made.

Given the Steps in Preparing Aloe Vera hand Sanitizer, the amount of microorganisms on your hands can be quickly reduced, according to the CDC Trusted Source, by using an alcohol-based hand sanitizer that satisfies the alcohol volume criterion.

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 10| Issue: 3| March 2024|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2024: 8.402 || ISI Value: 1.188

RESULTS AND DISCUSSION

Table 1. Active Components with its Properties of Aloe Vera

Active Components of Aloe Vera	Review of Related Literature
1. ***Vitamins*:** It contains vitamins A (beta-carotene), C and E, B12, folic acid, and choline	Numerous vitamins, including Vitamins A, C, E, B1, B2, B3 (niacin), B6, choline, folic acid, alpha-tocopherol, and beta-carotene, are found in Aloe Vera. A. One of the few plants that contain vitamin B12 is vera. Antioxidant vitamins like vitamins A, C, and E are crucial in the battle against harmful free radicals. Each of the three has a beneficial effect on the immune system, and vitamin C in particular promotes wound healing. It also produces collagen, which keeps the bones, skin, and joints healthy and firm. To keep your night vision normal, you must consume vitamin A. Blood clots, thrombosis, and atherosclerosis can all be avoided thanks to vitamin E. It also facilitates fertility and wound healing.
2. ***Enzymes*:** It contains 8 enzymes: aliiase, alkaline phosphatase, amylase, bradykinase, carboxypeptidase, catalase, cellulase, lipase, and peroxidase.	There are a number of different enzymes found in aloe vera, including amylase, bradykinase, aliiase, alkaline phosphatase, peroxidase, catalase, cellulose, lipase, and carboxypeptidase. When administered topically to the skin, these enzymes function by decreasing inflammation. According to an analysis of the basic peroxidase by Esteban et al., it can be discovered in the internal aqueous leaf parenchyma of the aloe vera plant as well as in the commercially available aloe gel. The possibility that the skin's surface peroxidase enzyme can remove H2O2 was discovered. This shows that the Aloe vera plant possesses pleasing antioxidant qualities, and it also provides support for the use of plant-based medicines to treat a variety of ailments. The aloe vera enzyme kinase is widely known for reducing pain. It has been demonstrated that when used topically, it can lessen inflammation and potentially hasten wound healing. Aloe vera enzymes enhance levels of hyaluronic acid in wounds that are healing and stimulate fibroblast activity and collagen formation in the skin.
3. ***Minerals:*** Provides Calcium, chromium, copper, selenium, magnesium, manganese, potassium, sodium and Zinc.	Ten of the important minerals for your skin are found in aloe vera, and not just for sunburned skin. Calcium, copper, magnesium, potassium, sodium, chromium, iron, manganese, phosphorus, and zinc are some of these minerals. They help you have skin that is more radiant. This makes aloe vera a fantastic addition to your skincare regimen.
4. ***Sugars:*** It provides monosaccharides (glucose and fructose) and polysaccharides: (glucomannans/polymannose).	Aloe can have a variety of polysaccharide types. The amount of each varies with the age of the plant. Aloe contains glucomannan, a soluble fiber fraction, and hemicellulose, a component that binds to fibroblast receptors in some plants' cell walls to promote their proliferation. As a result, it speeds up the healing of wounds. Lignins found in aloe also help its constituent parts to be absorbed through the skin. As a result, when aloe is applied locally or externally, more collagen is created. By retaining water in the skin, mucopolysaccharides moisturize it. The three main mucopolysaccharides found in aloe are heparin,

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 10| Issue: 3| March 2024|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2024: 8.402 || ISI Value: 1.188

	acemannan, and hyaluronic acid, however acemannan is the one that is present in the highest concentration. It has a lengthy carbon chain, largely made up of uronic acids and amino sugars. The antibacterial, antiviral, and antifungal effects of acemannan are all present. It is also one of the most potent plant-derived immunomodulators and is in charge of the organism's immune responses. The macrophage-activating substance acemannan causes germs to bind and be destroyed. It builds up in the cell membranes, creating a distinct protective barrier that strengthens the cell wall as a result. It thus prevents toxins from the gut from being absorbed into the circulatory system. It also helps the bacterial flora in the environment regenerate naturally.
5. ***Anthraquinones:*** It provides 12 anthraquinones.	Anthraquinones have a positive impact on health for those suffering from viral and fungus diseases, as well as malaria. Experiments are often in the stage of evaluating the functional characteristics of anthraquinones in studies. Aloe's two primary anthraquinones are aloe-emodin and aloin. Primarily present in aloe juice, aloe-emodin is a chemical with the major alcohol group. These all work to reduce inflammation and contain lupeol also has analgesic and antibacterial effects.
6. ***Fatty acids:*** It provides 4 plant steroids; cholesterol, campesterol, β-sisosterol and lupeol.	Aloe vera has six antibacterial agents, including lupeol, salicylic acid, urea nitrogen, and phenols, sulphur and cinnamonic acid. These chemicals have an inhibiting effect on fungus, viruses and bacteria.
7. ***Hormones:*** Auxins and gibberellins.	The auxins found in some plant extracts are likely connected to substances that resemble steroids. This would explain why gelatin-induced edema is treated with gibberellin because it has an anti-inflammatory impact.
8. ***Others:*** It provides 20 of the 22 human required *amino acids* and 7 of the 8 essential amino acids. It also contains salicylic acid.	Gibberellins boost protein synthesis in contrast to steroids, which are antianabolic. As a result, they would usually help heal wounds. Salicylic acid, which has anti-inflammatory and antibacterial effects, is also present. Lignin, an inert chemical, increases the other compounds' ability to penetrate the skin when added to topical treatments. About 3% of the gel is made up of soap-like saponins, which have antibacterial and cleaning characteristics.

Table 2. List of Ingredients and their Quantity

Quantity	Unit	Ingredients
1	Ounce/ 20ml	Grain alcohol
2	Ounce/40ml	Pure organic aloe vera gel
1	Ounce/20ml	Distilled water
5	drops	essential oil

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 10| Issue: 3| March 2024|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2024: 8.402 || ISI Value: 1.188

Table 3. Microbial Test Result of the Aloe Vera Hand Sanitizer with Different Essential Oils

Aloe Vera Hand Sanitizer	Aerobic Plate Count, cfu/ml	Interpretation
Lavender essential oil	30 cfu/ml	Many microbes
Peppermint essential oil	70 cfu/ml	Plenty microbes
Sampaguita essential oil	10* cfu/ml	Few microbes
Ylang –ylang essential oil	10* cfu/ml	Few microbes
Rose essential oil	<10* cfu/ml	Less microbes
Commercial Hand Sanitizer	<10* cfu/ml	Less microbes

Legend:
1 = <10* = less microbes
2 = 10* = few microbes
3 = 30 = many microbes
4 = 70 = plenty microbes

cfu/ml =colony forming unit/milliliter

As presented in table 2, aloe vera hand sanitizer with peppermint essential oil got 70 cfu/ml interpreted with *"plenty microbes"*, lavender essential oil got 30 cfu/ml interpreted with *"many microbes",* sampaguita and ylang-ylang essential oils they obtained 10 cfu/ml interpreted with *"few microbes",* and rose essential oil got <10 cfu/ml interpreted with *"less microbes"* which is the same with the commercial hand sanitizer.

A method for testing nonsterile pharmaceutical preparations for their microbial content is described. As far as possible, only solid culture media were used to obtain quantitative results. Aqueous and water-soluble products were tested with membrane-filter techniques. Nonfilterable products were first emulsified or suspended and the homogenate was used for examination. In both procedures, the total number of colonies is determined for aerobic bacteria and fungi. Tests for certain undesirable microbial groups were conducted with selected media. The method described is applicable for finished products, bulk products, raw materials, and active ingredients. Canan and Ceyhan,(2017)

CONCLUSIONS

Based on the findings of the study, the following conclusions were drawn:

1. Aloe vera has strong antiviral, antifungal, and antibacterial activities. Because aloe vera contains substances including p-coumaric acid, ascorbic acid, pyrocatechol, and cinnamic acid, it is known to have an antimicrobial effect.
2. Each ingredient has the following quantities, 1 once of grain alcohol, 2 ounce of pure organic aloe vera gel, 1 once of distilled water, and 5 drops each of essential oil.
3. Aloe vera hand sanitizer with rose essential oil showed a less number of microbes, which was found similar with the commercial hand sanitizer.

Recommendations

In view of the conclusions of the study, the following are offered:

1. Other processes in making hand sanitizer should be established to be able to produce quality projects.
2. It is also advised that the use of other essential oils such as eucalyptus, sandal wood, and lemon grass as alternatives to aloe vera hand sanitizer be investigated further.
3. Because rose essential oil had fewer microorganisms, it is proposed that it be prioritized for future evaluation.

REFERENCES

1. *Abdisssa D, Geleta D, Bacha K, Abdissa N. (2017), Phytochenical investigation of Aloe pulcherrima roots and evaluation for its antibacterial and evaluation for its antibacterial and antiplasmodial activities. Doi: 10,1371*
2. *Alvarez Canovas, I., and Dulsat Ortiz, C., (2018), Lessons Learned from a Distance Course. "More use Could have been Made it . "Universal Journal of Educational Research, 6(9),1921-1927*
3. *Booq, R. (2021). Int.J.Environ.Res Public Health: Formulation and Evaluation of Alcohol Free Hand Sanitizer Gel prevent the spread of Infections During Pandemics*
4. *Chakraborty, A. (2021). Journal of Physics: Conference Series, Volume 1797*
5. *Choi, S.H.,Shin,H.S.(2017). Anti-inflammatory and Anti – bacterial Effects of Aloe vera MAPagainst Multidrug – resistant Bacteri. Natural Product Sciences, 23(4),286.*
6. *GaoY, Kuok Kl, Jin Y, Wang R (2018), Biomedical applications of Aloe vera. Crit Rev Food Sci Nutr 13: 1- 13*
7. *Gupta A, Rawat S.(2017). Clinical importance of Aloe vera: review.Res J Top Cosmet Sci. 8:30-39. Doi: 10.5958/2321*
8. *Hamman,J.,Fox, L., Plessis,J.,Gerber, M.,Zyl,S., and Boneschanns,B.(2014) In vivo skin hydration and anti-erythema effects of Aloe vera, Aloe ferox and Aloe marlothii gel materials after single and multiple applications , Pharmacognosy Magazine, 10 (38),392.*
9. *Josef Backi, C.,(2017), Enthalpy control for the feed water supply in a once-through boiler with disturbance estimation ideas for this work have been highlighted in Backi (2009),but have never been made publicly available due to a pending patent application by the Siemens AG, Munich*
10. *Kar and Bera, IJPSR., (2018) Vol. 9(4): 1416-1423.*
11. *Kumar, R.(2017). Phytochemistry and Pharmacology of Medicinal Herbs. Pp.271.*

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 10| Issue: 3| March 2024|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2024: 8.402 || ISI Value: 1.188

12. *Langmead, L., Makins, R.J., & Rampton, D. S. (2004, February 17). Anti – inflammatory effects of aloe vera gel in human colorectal mucosa in vitro. Alimentary Pharmacology and Therapeutics 19(5).,521-527*
13. *Salehi, M., Zamiri, S., Samadian, H.,Ai, J.,Foroutani, L., Ai, A., and Khanmohammadi, M. (2020, October 30). Chitosan hydrogel loaded with aloe vera gel and terasodium ethylenediaminetraacetic acid (EDTA) as the wound healing material: in vitro and in vivo study.*
14. *Salehi B, Albayrak S, Antolak H, Kregiel D, Pawlikowska E, Sharifi – RadM. Uprety Y, Tsouth Fokou P. Yousef Z., Amiruddin Zakaria Z., Varoni E,. Sharopov F, Martins N, Iriti M, Sharifi – Rad J. Aloe Genus Plants; From Farm to food applications and Phytopharmacotherapy. Int. J Mol Sci 2018; 19: E2843*
15. *Sampath, K.P., Bhowmik, D., Chiranjib, Biswajit, (2010), Journal of Chemical and Pharmaceutical Research, Page 21-29, ISSN no. 0975-7384*