

“Review- on Herbal Sanitizer”

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ABSTRACT:

The first point of contact for bacteria and diseases is hands. A crucial idea and practice in the protection, management, and reduction of infections is hand hygiene. The covid pandemic has raised the need for hand sanitizer, which leaves hands feeling less dry. Novel Corona Virus has spread to 188 nations, leaving those who contract it with a mild respiratory illness.

The frequent use of hand sanitizers is currently one of the main tactics to combat COVID19 and decrease community transmission of infections. However, the greater cost prevents a sizable portion of the general populace from purchasing them. Therefore, a method for making less expensive sanitizers using readily available herbal ingredients, such as Aloe Vera gel, boiled water, surgical spirit, and glycerine, has been provided here. 100 ml of sanitizer were made for an estimated expense of 16 rupees. When this sanitizer is produced in big quantities, it can be very effective for widespread use by regular people.

KEYWORDS :- Razor spines, Aeruginosa, Propionibacteria, Corynebacteria

I. INTRODUCTION:-

Therefore, the best way to prevent the spread of infectious pathogens and nosocomial infections is to practice good hand cleanliness. Eczema (atopic dermatitis), warts, acne, hives, psoriasis, allergies, etc. are among the most prevalent skin conditions. To shield the skin from damaging microbes and stop the development of numerous skin infections Absolutely, hand cleansing is a crucial safety measure. The purpose of the current study is to prepare and physically assess a herbal hand sanitizer using an extract from widely accessible plants. In addition to washing your hands with detergent and water, hand sanitizer also acts as an antiseptic.

Hand sanitizer comes in a variety of formulations, including gel, foam, liquid solution, and others. In the current mechanized lifestyle environment, a customer will always favor ready-

made herbal hand sanitizer formulations over hand washing. Traditional healers have long used plants to treat/prevent infectious illnesses. In vitro research has revealed that certain plant secondary metabolites, including tannins, terpenoids, alkaloids, and flavonoids, have antimicrobial qualities. [1,2]

Background Study :-

Aloe vera is highly effective against herpes simplex virus types 1 and 2, influenza virus, pseudorabies virus, etc., according to D. Sawai's analysis of the plant. Researchers looked into the biochemical aspects and uses of aloe vera and came to the conclusion that it has antibacterial properties. Aloe vera components, different extraction processes, and handling techniques were demonstrated by V.K. Chandegara et al. compared the effectiveness of alcohol-based and non-alcohol-based sanitizers and found that alcohol-based disinfectant is more effective. A formulated Guava hand sanitizer gel's bactericidal ability was investigated by E. M. Yaun and colleagues. Information on COVID 19 illness signs, transmission, epidemiology, pathogenesis, and corona virus phylogenetic analysis was studied by H.A. Rothan et al. He also provided some guidance on how to stop the infection from spreading. To help the public identify and deal with the SARS-COV 2, Lischeng Wang et al. explained the background of SARS-COV2 spreading, the genetic makeup of the corona virus, the mode of transmission, the diagnosis and treatment of SARS COV2, and COVID 19 prevention. A.R. Sahin et al. reviewed the methods for treating and preventing COVID 19 in its early stages and outlined the sources and methods of transmission as well as the pathogenesis of the corona virus. [32]

Need of Herbal Sanitizer :-

To halt or slow the spread of the coronavirus, people are currently using alcohol-based hand sanitizers on a massive scale. The majority of commercial hand sanitizers consist of

isopropyl alcohols and H₂O₂. H.A. Rothan et al. examined data on COVID 19 illness symptoms, transmission, epidemiology, pathogenesis, and corona virus phylogenetic analysis. He also offered some guidance on how to stop the infection from spreading. Lischeng Wang et al. described the history of SARS-COV2 spread, the genetics of the corona virus, the method of transmission, the diagnosis and treatment of SARS COV2, and COVID 19 prevention in order to aid the public in recognizing and dealing with the SARS-COV2. As well as outlining the sources and modes of transmission as well as the pathogenesis of the

corona virus, A.R. Sahin et al. examined the approaches for treating and preventing COVID 19 in its early phases. If these rules are misused, it could be toxic for both the environment and human health.

Hand sanitizer formulations and preparations made from herbal plants have been shown to be effective against pathogens. The findings have also been compared and found to be effective with hand sanitizer formulations made from alcohol. As far as the ecosystem is concerned, these herbal formulations have been deemed safe for human health.

II. MATERIAL AND METHOD:

Table 1 lists the components chosen to make the alcohol-based hand sanitizer as well as their quantities.

MATERIAL	AMOUNT
SERGICAL SPIRIT	17 ML
GLYCERIN	7 ML
ALEO VERA PULP	20 GM
GAUVA LEAF	10 LEAVES
DETTOL	1 ML

CAMPHOR	2 NOC
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Table:1

Material:-

Surgical Spirit:-

Formula: CH₃CHOHCH₃

Synonym: Rubbing Alcohol.

Uses: To kill bacteria and viruses on skin and surfaces.

Glycerin:-

Formula: C₃H₈O₃

Density: 1.26 g/cm³

Boiling point: 290 °C

Molar mass: 92.09382 g/mol

IUPAC ID: propane-1,2,3-triol

Classification: Alcohol, Polyol

Uses:

Uses: Because glycerin functions as a humectant—a substance that helps the skin retain moisture—it

is excellent for the skin. It can hydrate the skin more, alleviate dryness, and revitalize the top layer of the skin. It can soften epidermis because it is an emollient.

Camphor :-

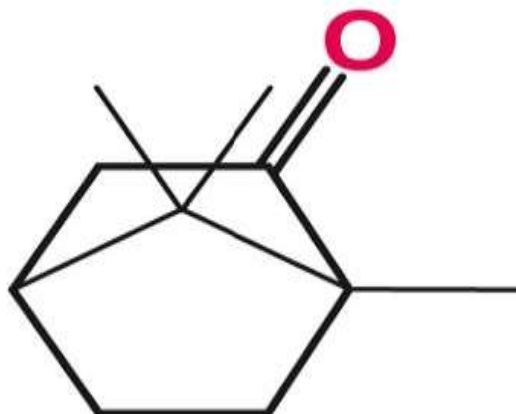
An FDA-approved external antitussive is camphor. (anti-cough). An FDA-approved topical anesthetic and analgesic, camphor is used to treat discomfort. FDA-approved camphor is used to alleviate itching. Camphor Formula: C₁₀H₁₆O

IUPAC ID: 1,7,7-Trimethylbicyclo[2.2.1]heptan-2-one Melting point: 175 °C

Molar mass: 152.23 g/mol

Boiling point: 209 °C

CAMPHOR FORMULA STRUCTURE



Uses :-

Camphor smells very distinctively and is difficult to mistake for anything else, but it is virtually impossible to describe without using neologisms. It has a prickly, largely woody, herbaceous, and spicy aroma that is cooling, largely earthy, and somewhat reminiscent of naphthalene. (aka moth balls).

Gauva leaf

Scientific name: *Psidium guajava*

Rank: Species

Higher classification: Guava

Family: Myrtaceae



Fig :Gauva leaf

Kingdom: Plantae

Order: Myrtales

Uses:

The antibacterial substances lessen inflammation and avoid infection.

Guava has a strong antibacterial activity against gram positive bacteria and a moderate antibacterial activity against gram negative bacterial strains.

Aloe Vera pulp :-



Fig :Aleo vera

Kingdom:Plantae
Clade:Tracheophytes
Clade:Angiosperms
Order:Asparagales
Family:Asphodelaceae
Subfamily:Asphodeloideae
Tribe:Aloeeae
Genus:Aloe

Uses:

1. Razor burn is one type of injury that aloe vera is known to soothe and treat. It happens when the blade damages your epidermis and hair follicles, causing them to swell and become uncomfortable after de-fluffing your face. Applying a thin coating of the gel post-shave will help repair razor bumps, reduce redness, and eliminate the rash while restoring skin equilibrium.

2.Moisturising:

Include aloe vera in your everyday skincare routine for a younger-looking face. According to study published in the Indian Journal of Dermatology, the nutrient-rich gel binds epidermal cells together, softening the skin. They added that zinc works as an astringent to close pores and that amino acids soften hardened skin cells. Aloe vera includes lignin, which helps your skin absorb other ingredients, so it will also increase the effectiveness of your more expensive skincare products.

Side Effects Of synthetic hand sanitizer.

- 1.Reddish epidermis
2. Skin cracking.
3. Skin color redness.
4. Dissatisfaction with skin discolouration
5. Skin flaking
6. May affect your ingested hormones
- 7.If blindness enters your eyes, it impairs eyesight.

Rewiev of observation:

Following an evaluation of all sanitizer's adverse effects, this sanitizer is made with a few particular ingredients. Aloe Vera juice is the next crucial component. Aloe vera is very effective at mending. Due to the presence of polysaccharides and growth hormone gibberellins, it prevents skin from aging.

We carried out two quick tests to determine whether alcohol in sanitizer is correct or incorrect.

Tissue paper test, first. To conduct this exam, take a piece of tissue paper and use a pen to draw a circle in the center of it. Now dispense a few hand sanitizer droplets inside this circle.

Your hand sanitizer is probably fake if the ink begins to fade and spread. However, if the circle is still present and the paper dries rapidly, your hand sanitizer is of good quality and is working as intended .[30]

2 Test of wheat bread Using flour is another way to try the hand sanitizer. Pour some hand sanitizer into a dish with some flour. The mixture should be worked. The hand sanitizer is fake if you can easily knead the bread like you would with water.

The hand sanitizer is authentic if the bread continues to be flaky . [30]

Antimicrobial activity of hand sanitizer:-

Using Mueller Hinchon media and the disc diffusion technique, the hand sanitizer's antimicrobial activity was assessed.Comparative research between the market and laboratory-made sanitizers was conducted. The brand names of the commercial hand sanitizers used were Sterilium, Savlon, Purest, Hand Safe, Genius, and Lab alcohol (70% isopropyl alcohol).

Disc Diffusion Method This approach is based on the idea that an antibiotic concentration gradient is created when an

antibiotic-impregnated disk is put on agar that has already been inoculated with the test bacterium. The antibiotic-impregnated disk picks up moisture and the antibiotic diffuses radially outward through the agar medium. The antibiotic concentration is highest at the disk's edge and gradually decreases as you move away from it until it no longer inhibits the organism's growth, at which time it becomes non-inhibitory. If the agent inhibits bacterial development, a clear zone or ring forms after incubation around an antibiotic disk.[35]

Mueller-Hinton Agar (MHA), the best medium for routine susceptibility tests due to its high reproducibility, low concentration of sulfonamide, trimethoprim, and tetracycline inhibitors, and ability to provide satisfactory growth for the majority of bacterial pathogens, is used for the disk diffusion technique. A suitable broth, such as tryptic soy broth, is used to prepare the inoculum for the disk diffusion technique. This medium is sterilized, dispensed in tubes at 4-5 ml, and made in accordance with the manufacturer's instructions. It is also possible to use sterile 0.9% saline solution. If designed for marine organisms, media are supplemented with 1-2% sodium chloride (NaCl).

Review on Antimicrobial activity of Gauva Leaf:

According to the National Committee for Clinical Laboratory Standards, antimicrobial susceptibility testing was carried out using the well-diffusion technique. Mueller Hinton II plates were used to evaluate the plant extracts for the presence of antibacterial activity. Using a clean borer, 5 mm diameter wells were made in the medium before the plates were streaked with bacteria. All plates were inoculated with the test bacterium, which had already been adjusted to the 0.5 McFarland standard solution. Excess inoculum was then removed by strongly pressing a sterile cotton swab against the inside wall of the tube above the fluid level while rotating the cotton swab several times in the suspension. A final swab around the rim was applied after the agar plate's surface had been streaked over the complete sterile agar surface and the plate had been rotated to guarantee an even distribution of inoculum. The excess moisture on the plates is permitted to dry for 3 to 5 minutes. After bacterial infection of the plates, fifty μ L aliquots of each test extract were poured into each well. Additionally, the wells were positioned in a triangular shape, spaced 2 inches

apart. Three plates were used for each extract to select a bacterium, with the same extract being applied to each dish. Controls were kept for every bacterial strain where the extract was replaced with purified solvents. After being labeled and parafilm-sealed, the dishes are put in an incubator set to 37°C. Each dish was checked for inhibition zones after a 24-hour incubation period. The millimeter measurements of the inhibition zones were taken with a yardstick. The findings were averaged over at least three independent experiments, each of which was conducted in parallel. [36]

Compatibility Studies:

Physical stability of hand sanitizer:

The physical alterations were identified by tracking the sanitizer's pH, color, and odor on a weekly basis. The pH of the sanitizer was measured after it was prepared.

While maintaining hydration and preventing skin dryness, alkaline pH is beneficial for skin. Every week, the sanitizer's color, pH, and odor were tested after it was made in November. The sanitizer's color, odor, or pH were all determined to remain unchanged for 4 months.

Shelf life of hand sanitizer :-

At 4°C, 27°C, and 40°C, the shelf life of the herbal sanitizer that had been made was assessed. The temperature of the hand cleanser was varied, and homogeneity was checked every week. Weeks 0 and 12 of storage were used to ascertain the viscosity and consistency.

Hand Hygiene Recommendations from CDC (USA), WHO and Malaysia Regulations

One of the most important steps to avoid direct or indirect transmission of COVID-19 is practicing good hand hygiene by washing hands or using alcohol-based hand sanitizer. This lowers the amount of SARS-CoV-2 virus that is still viable on contaminated hands. Hand washing is necessary in five situations: before and after direct patient contact, before using invasive devices for patient care, after coming into contact with body fluids or excretions, after touching objects like medical appliances close to the patient, and before beginning any aseptic task.[5]

In order to reduce the amount of all kinds of germs and chemicals on hands, the CDC advises washing hands with soap and water whenever feasible. [6]

Skin exposure to sanitizer:-

Different people's skin sensitivity to the sanitizer was tested, and input was gathered in a consent form. The people responded favorably to the sanitizer's entrancing aroma and calming effects. The participants were instructed to look for erythema, itchiness, burning, and dryness. However, none of the users reported any negative adverse effects from using the sanitizer. Our hand sanitizer had a soothing impact like other commercial hand sanitizers, and no dryness was noticed.

III. CONCLUSION:-

The study's objective was to determine how quickly *Staphylococcus aureus* development decreased after using the specifically made guava hand sanitizer. The hand sanitizer gel made from guava leaf extract was measured to have the same degree of activity as the reference standard. within the inhibiting zone. Additionally, there was no obvious difference from hand disinfectant. Commercial brands B and C used in the research. A comparison of ethanol and water as fluids When isopropyl alcohol was used, the mean zones of inhibition did not change substantially. This demonstrates the effectiveness of antimicrobial hand sanitizer against *Staphylococcus aureus*. The appearance of an inhibition zone created by formulated materials denotes a decrease in pathogens. A example of the antibacterial properties of guava hand sanitizer gel is *staphylococcus aureus*.the plant's main ingredient, such as tannins and other phytochemicals with potential antimicrobial effects Bacterial cell walls and membranes rupturing is the process. The intracellular matrix is irregularly disturbed when microbes are treated with plant extracts. Poor hand sanitation between the people could also be a problem. No matter the setting, the goal of infectious activity prevention and control is to halt the transmission of disease and ensure everyone is safe. Effective infection control techniques, like hand sanitizing, are essential in the face of resistant microbes because of the creation of antibiotics. proactive measures. Hand sanitizer gels are used to decontaminate hands. The result indicates that the gel formulation has excellent appearance and uniformity. The study's objective was to determine how quickly *Staphylococcus aureus* development decreased after using the specifically made guava hand sanitizer. The hand sanitizer gel made from guava leaf extract was measured to have the same degree of activity as the reference standard. within

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IV. DISCUSSION:-

The most frequent way that pathogens are spread to patients is through their hands, and good hand cleanliness can stop infections that are spread during medical procedures and stop the spread of antibiotic resistance. Alcohol-based hand sanitizers are recommended for use during patient treatment based on scientific research and ease of use. With the exception of *Ps. aeruginosa* and *S. cerevisiae*, it can be concluded that herbal hand sanitizer has a significant anti-microbial impact on the specified microorganisms. Therefore, establishing the use of antimicrobial herbal products as a measure to control the multidrug resistant microbes as well as check their spread through hands from one geographical area to another has enormous potential.

REFERENCES:-

- [1]. Kumar Vijay*, Bhardwaj Gagan and Yadav Sunil development and evaluation of alcohol-free hand sanitizer using zinc gluconate & herbal extracts. world journal of pharmaceutical research. 2019; 8(12): 770-775.

- [2]. David L., Dyer Kenneth B., Gerenraich, Peter S., Wadhams, testing a new alcohol-free hand sanitizer to combat infection. *AORN Journal*, 1998; 68(2): 239-251.
- [3]. Lisheng Wanga,b , Yiru Wanga , DaweiYec , QingquanLiua, Review of the 2019 novel coronavirus (SARS-CoV-2) based on current evidence, Article history: Received 7 March 2020 Accepted 14 March 2020 Editor: Jean-Marc Rolain.
- [4]. Ahmet Riza Sahin, Aysegul Erdogan, PelinMutluAgaoglu, YelizDineri, Ahmet Yusuf Cakirci, MahmutEgemenSenel, Ramazan Azim Okyay , Ali MuhittinTasdogan, 2019 Novel Coronavirus (COVID-19) Outbreak: A Review of the Current Literature, Submitted Date: February 11, 2020 Accepted Date: February 12, 2020 Available Online Date: February 12, 2020 ©Copyright 2020 by Eurasian Journal of Medicine and Oncology.
- [5]. Quality Medical Care Section. Medical Development Division. Ministry of Health Malaysia Policies and Procedures on Infection Control. [(accessed on 23 March 2020)];2009 Available online: https://www.moh.gov.my/moh/images/gallery/Polisi/infection_control.pdf
- [6]. Hadaway A. Handwashing: Clean Hands Save Lives. *J. Consum. Health Internet*. 2020;**24**:43–49. doi: 10.1080/15398285.2019.1710981.
- [7]. Emma A. Yaun, and Brian A. Vasquez, Antibacterial activity of formulated *Psidium guajava* (guava) hand sanitizer gel on *Staphylococcus aureus*, Date Received: 10th of April, 2017, Date Accepted: 28th of November, 2017.
- [8]. R. Hirose, T. Nakaya, Y. Naito, T. Daidoji, R. Bandou, K. Inoue, O. Dohi, N. Yoshida, H. Konishi and Y. Itoh, "Situations leading to reduced effectiveness of current hand hygiene against infectious mucus from Influenza virus infecte patients," *MSphere.*, vol. 4, no. 5, (2019).
- [9]. Y. A. Ali, "To study the effect of hand sanitizers used in Kingdom of Saudi Arabia against the common bacterial pathogens," *Int Res J Nat Appl Sciences.*, vol. 2, no. 2, (2015), pp. 2349-4077.
- [10]. F. Alderees, R. Mereddy R, D. Webber, N. Nirmal and Y. Sultanbawa, "Mechanism of action against food spoilage yeasts and bioactivity of *Tasmannia Lanceolata*, *Backhousia citriodora* and *Tasmannia Lanceolata*, *Backhousia citriodora*," *Plant Solvent Extracts Foods.*, vol. 11, no. 179, (2018).
- [11]. P. G. Andrew, C. Dexter and G. Aziz, "Hand Sanitizers: A review of ingredients, mechanisms of action, modes of delivery and efficacy against coronaviruses," *Am J Infect Control.*, (2020).
- [12]. G. Kampf and A. Kramer, "Epideriologic background of hand hygiene and evaluation of the most important agents for scrubs and rubs," *Clinical microbiology review.*, vol. 17, (2004), pp. 863- 893.
- [13]. S. Kim and D. Y. C. Fung, "Antibacterial effect of crude water-soluble arrowroot (*Puerariae radix*) tea extracts on food-borne pathogens in liquid medium," *Letters in Applied Microbiology*, vol. 39, no. 4, pp. 319–325, 2004.
- [14]. S. A. Ibrahim, M. M. Salameh, S. Phetsomphou, H. Yang, and C. W. Seo, "Application of caffeine, 1,3,7-trimethylxanthine, to control *Escherichia coli* O157:H7," *Food Chemistry*, vol. 99, no. 4, pp. 645–650, 2006.
- [15]. S. I. Abdelrahim, A. Z. Almagboul, M. E. A. Omer, and A. Elegami, "Antimicrobial activity of *Psidium guajava* L.," *Fitoterapia*, vol. 73, no. 7-8, pp. 713–715, 2002.
- [16]. P. Jaiarj, P. Khoohaswan, Y. Wongkrajang et al., "Anticough and antimicrobial activities of *Psidium guajava* Linn. Leaf extract," *Journal of Ethnopharmacology*, vol. 67, no. 2, pp. 203–212, 1999.
- [17]. G. D. Lutterodt, "Inhibition of Microlax-induced experimental diarrhoea with narcotic-like extracts of *Psidium guajava* leaf in rats," *Journal of Ethnopharmacology*, vol. 37, no. 2, pp. 151–157, 1992.
- [18]. S. Begum, S. I. Hassan, S. N. Ali, and B. S. Siddiqui, "Chemical constituents from the leaves of *Psidium guajava*," *Natural Product Research*, vol. 18, no. 2, pp. 135–140, 2004.
- [19]. M. S. Karawya, S. M. A. Wahab, M. S. Hifnawy, S. M. Azzam, and H. M. E. Gohary, "Essential oil of Egyptian guajava

- leaves,” Egyptian Journal of Biomedical Sciences, vol. 40, pp. 209–216, 1999.
- [20]. M. A. Morales, J. Tortoriello, M. Meckes, D. Paz, and X. Lozoya, “Calcium-antagonist effect of quercetin and its relation with the spasmolytic properties of *Psidium guajava* L,” Archives of Medical Research, vol. 25, no. 1, pp. 17–21, 1994.
- [21]. South-East Asian (SEA), Regional Workshop on Extraction Technologies for Medicinal and Aromatic Plants, 2006. M. Sunagawa, S. Shimada, Z. Zhang, A. Oonishi, M. Nakamura, and T. Kosugi, “Plasma insulin concentration was increased by long-term ingestion of guava juice in spontaneous non-insulin-dependent diabetes mellitus (NIDDM) rats,” Journal of Health Science, vol. 50, no. 6, pp. 674–678, 2004.
- [22]. A. Mani, R. Mishra, and G. Thomas, “Elucidation of diversity among *Psidium* species using morphological and SPAR methods,” Journal of Phytology, vol. 3, pp. 53–61, 2011.
- [23]. J. F. Morton, “Fruits of warm climates,” Guava, pp. 356–363, 1987.
- [24]. H. M. Burkill, The Useful Plants of West Tropical Africa, 2nd edition, 1997.
- [25]. K. M. Nadkarni and A. K. Nadkarni, Indian Materia Medica-with Ayurvedic, Unani-Tibbi, Siddha, Allopathic, Homeopathic, Naturopathic and Home Remedies, Popular Prakashan Private Limited, 1999.
- [26]. N. S. Ncube, A. J. Afolayan, and A. I. Okoh, “Assessment techniques of antimicrobial properties of natural compounds of plant origin: current methods and future trends,” African Journal of Biotechnology, vol. 7, no. 12, pp. 1797–1806, 2008.
- [27]. R. J. Green, Antioxidant activity of peanut plant tissues [M.S. thesis], North Carolina State University, Raleigh, NC, USA, 2004.
- [28]. A. Sofowora, Medicinal Plants and Traditional Medicine in Africa, Spectrum Books Limited, Ibadan, Nigeria, 1993.
- [29]. F. A. Gonçalves, M. Andrade Neto, J. N. S. Bezerra et al., “Antibacterial activity of guava, *Psidium guajava* Linnaeus, leaf extracts on diarrhea-causing enteric bacteria isolated from seabob shrimp, *Xiphopenaeus kroyeri* (Heller),” Revista do Instituto de Medicina Tropical de Sao Paulo, vol. 50, no. 1, pp. 11–15, 2008.
- [30]. O. Gottlieb and M. Magalhães, “Essential oil of the bark and wood of *Anibacanelilla*,” Perfumery and Essential Oil Record, vol. 51, p. 69, 1959.
- [31]. S. A. Ibrahim, G. Yang, D. Song, and T. S. F. Tse, “Antimicrobial effect of guava on *Escherichia coli* O157:H7 and *Salmonella typhimurium* in liquid medium,” International Journal of Food Properties, vol. 14, no. 1, pp. 102–109, 2011.
- [32]. Dr. Madhuri Alankar Sawai, Aloe Vera .
- [33]. https://www.researchgate.net/publication/349798847_Production_of_cheap_hand_sanitizer_with_herbal_ingredients
- [34]. C. N. Stanley, V. B. Alobari and K. M. Ezealisiji, “Formulation and evaluation of the effectiveness of a novel hand sanitizer using *Pleurotus ostreatus* Oyster mushroom extracts,” Int J Pharma Res Review., vol. 6, no. 1, (2017), pp. 7-1
- [35]. endencia, E. A. (2004). Disk diffusion method. In Laboratory manual of standardized methods for antimicrobial sensitivity tests for bacteria isolated from aquatic animals and environment (pp. 13-29). Tigbauan, Iloilo, Philippines: Aquaculture Department, Southeast Asian Fisheries Development Center.
- [36]. Clinical and Laboratory Standards Institute, “Performance standards for antimicrobial susceptibility testing,” Nineteenth informational supplement M100-S19, Clinical and Laboratory Standards Institute, Wayne, Pa, USA, 2009.

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