



FORMULATON AND EVALUATON OF HERBAL SANITIZER

Chaitanya Dilip Patil¹, Sneha Sunil Chitare², Tejas Kailas Gosavi³

Student, Department of Herbal, Smt. Sharadchandrika Suresh Patil College Of Pharmacy Chopda.

Abstract:

Objective: 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. Material: Considering the need we prepared a herbal sanitizer using three plant oils with other ingredients including isopropyl alcohol, glycerol, lemon, alovera gel, rose water, methyl paraben, polysorbate 80, vitamine E, and water. The ingredients were selected on the basis of their antimicrobial property. Result: The sanitizer pH was midly acidic with good shelf, texture and odor. No turbidity was seen when kept at higher temperature 15 days and showed no skin dryness with soothing effect after using sanitizer on different volunteers.

Keywords: Hand hygiene, antimicrobial activity, pandemic, essential oils, herbal sanitizer.

Introduction:

Hand hygiene is now regarded as one of the most important element of infection control activities. In the wake of the growing burden of health care associated infections, the increasing severity of illness and complexity of treatment/superimposed by multi-drug resistant pathogen Infections, health care practitioners are reversing back to the basics of infection preventions by simple measures like hand hygiene. This is because enough scientific evidence supports the observation that if properly implemented, hand hygiene alone can significantly reduce the risk of cross-transmission of infection in healthcare facilities Hygiene is defined as maintenance of cleanliness practices which carries utmost importance in maintenance of health. Simple hygiene technique is single most important, easy and least expensive means of preventing health care- associated (nosocomial) infections and the spread of antimicrobial multidrug resistance.

Nowadays, in COVID-19 pandemic the need of cleaning hands has become mandatory and people have become aware of cleaning hands Hand sanitizer or hand antiseptic is an alternative to the hand washing with soap and water.

New infections, bacterial or viral, have often raised significant threats to public health across the world. One in all these hazardous pathogens is severe acute respiratory syndromecoronavirus 2 (SARS-CoV-2), which is renowned to cause coronavirus disease 2019 (COVID-19) that was declared a worldwide pandemic by the globe Health Organization (WHO) at the beginning of 2020. The preventive protocols to deal with COVID-19 are just supportive so as to attenuate the spread of this disease because the best approach. Frequent and reliable hand washing is one amongst the numerous approaches adopted to prevention of disease. Herbal Hand Sanitizer is one of the way to prevention of various bacteria and viruses. For the outcome of sanitizers, the presence of the disease-producing agent on the host should be susceptible to the active ingredient present in the product. Alcohol-based waterless sanitizers should be rubbed thoroughly for 30 seconds, which followed by complete air-drying can reduce various microorganisms. Even alcohol-free formulations, such as the SAB (surfactant, allantoin, and BAC) hand sanitizer, show its effect when used properly. some studies also reveal that many hand sanitizers are ineffective against bacterial spores, enveloped viruses (e.g., norovirus), and encysted parasites (e.g. Giardia).

The hand sanitizers are available in the form of liquid, foam or easy flowing gel formulations, which can be applied on palm of the hand, rub the product over all surfaces of hands and fingers until hands are dry. The product is widely used by the doctors, surgeons before and after the surgery, pathologists, and researchers and is also used at restaurants, toiletries etc. The medical and applied medical science colleges in their laboratories also have hand sanitizer which the students use after every practical class.

Benefits of hand sanitizer:

1. The advantages of hand sanitizers are that it is more portable, convenient, not time consuming and easy to use.
2. Who apply the sanitizer have lower risk of spreading gastrointestinal (stomach) and respiratory infection.
3. Hand sanitizers which are commercially available contain ingredients which help in preventing dryness of skin.
4. The frequency of absentees in the classroom can be reduced by 20 percent if hand sanitizers are used properly as it will not cause illness.

Limitations:

1. The alcohol content of sanitizer should not be less than 60 percent. The proportion of alcohol should be in between 60 and 95 percent when in use. The ingredient should be in the form of ethyl alcohol, isopropanol, or ethanol, which are acceptable. Every sanitizer is not manufactured equally; hence, it should be checked before purchasing.
2. For the efficacy or proper effectiveness of the sanitizer, it should be used on hands, which are free from soil, dirt, blood, or lubrication.
3. Hand sanitizers are not an alternative to hand washing; rather, it is a harmonizing habit which is far more effective when used in conjunction with soap and water.

Top 4 herbal sanitizer brand in India:

1. Herbal Strategi Nature Clean Hand Sanitizer
2. Tree Wear Natural Alcohol- free Hand Sanitizer
3. Palm Safe Alcohol-free Hand Sanitizer Foam
4. Puro Herbal Hand Sanitizer Gel

Table 1 - Antiviral activities of medicinal plants used in herbal sanitizer

Sr.No	Plant Common Name	Botanical Name	Family	Antiviral Activity Against
1	Tulsi	Ocimum sanctum	Lamiaceae	SARS-COV-2
2	Eucalyptus Oil	Eucalyptus Rostrata	Myrtaceae	HSV-1, HSV-2
3	Mint	Mentha Arrensis	Lamiaceae	Respiratory Syncytial Virus (RSV)
4	Lemone	Citrus Limon	Rutaceae	HIV-1, Influenza
5	Alove-vera	Aloe Barbadensis	Asphodelaceae	Herpes Simplex Virus (HSV)

India Hand Sanitizer Market Trends:

The Spread of Coronavirus Disease (COVID-19) With the sudden outbreak of the COVID-19 pandemic, the World Health Organization (WHO) has recommended the use of hand sanitizers for self-preservation and minimizing the spread of the coronavirus. The increasing number of deaths caused by the virus has further triggered an alarming response from consumers, thereby increasing the emphasis on hand hygiene as a preventive measure from contracting the infection. Moreover, the implementation of the Swachh Bharat Mission by the Government of India and various other campaigns by the private organizations that involve providing hand sanitizers at railway stations, hospitals, shopping malls and educational institutes has also created a positive impact on the product demand.

Material Method:

Table – Formulation of Herbal Hand Sanitizer.

Sr.No	Ingredients	Quantity	Category
1	Water	5ml	Vehicle
2	Isopropyl Alcohol	25ml	Anti-bacterial agent
3	Tulsi Oil	2ml	Purifying agent
4	Eucalyptus Oil	2ml	Antiseptic, Expectorant
5	Mint Oil	2ml	Anti-bacterial agent
6	Aloe Vera Gel	4ml	Anti-viral agent
7	Glycerine	4ml	Humectant, Emulsifier
8	Rose Water	2ml	Fragrance
9	Lemone	1.5ml	Anti-bacterial agent
10	Methy Paraben	0.5gm	Preservative
11	Polysorbate 80	0.8ml	Emulsifier
12	Vitamin E	1.2ml	Antioxidant

6.2 FORMULATION

1. Preparation 1: After this take isopropyl alcohol in a breaker and then add volatile oils, i. e. Tulsi oil, eucalyptus oil and mint oil, drop by drop stirr solution by using magnetic stirrer. Then adjust speed stirrer constant throughout the for the procedure for the uniform mixing of isopropyl

alcohol and oils. After slowly add port-wise of lemone extract (Citrus) into the above mixture. Now turn off magnetic Stirrer and keep this preparation aside for 24hrs.

- Preparation 2: After this measure rest of the ingredients and pour it all in another beaker, then fix mechanical stirrer into the beaker in such a way that it should not touch the bottom of the beaker. Then add measurable amount of aloe vera gel and glycerin. Due to adding of aloe Vera gel and glycerol in to the mixture, which now has completely looking like a transparent gel. Now the beaker which contains all the rest ingredients (i. e. Rose water, methyl Paraben, polysorbate 80 and vitamin E mix this preparation properly with clean glass rod.

7.0 EVALUATION PARAMETER OF HERBAL SANITIZER:

7.1 General Appearance:

Sr No.	Characteristics	Result
1	Colour	Yellowish Transparent
2	Odour	Peppermint odour
3	Texture	Liquid like

7.2 pH:

The optimal PH value of skin on most of one face and bodylines between 5.7 and 6.75 so skin's natural ph. is mildly acidic.

This as follows:

Batches	Reading 1	Reading 2	Reading 3
F1	5.44	5.44	5.45
F2	5	5.1	4.99
F3	4.99	5	5.3

7.3 Viscosity Determination:

The viscosity was determined by using Brookfield viscometer where the spindle no. 7 is used with rotation at 60 rpm.

Batches	Reading 1	Reading 2	Reading 3
F1	2.24	2.24	2.25

F2	2	2.2	1.99
F3	1.99	2	2.3

7.4 Irritancy Test:

25 volunteers were selected. The herbal hand sanitizer was applied on their palms and the time was noted. Irritancy, redness, dryness and itching were checked.

7.5 Evaporation Rate:

25 healthy volunteers were selected. The herbal hand sanitizer was applied on their palms, while rubbing the sanitizer on their palms, evaporation takes place and the time was noted.

7.6 Antimicrobial activity:

For this method, Mueller-Hinton plates were used. surface each plate streaked by sterile cotton swab with reference bacterial strain. Then agar plate punched with a sterile cork borer size poured 100 μ L of each sample (sanitizer) with micropipette bore. Plates were allowed stand for 30 Then 37°C inhibition (mm) the bacterial three herbal sanitizers measured.

7.7 Determination of Efficacy of Herbal Sanitizer:

To check efficacy a 200mm size of petriplate were taken. In that LB agar were cooling two one for other for test selected. Without sanitizer hand assistant were placed control and with applying sanitizer hand of assistant placed use. Then plates were incubated 37°C for 24hours. The decrease number colony was determined.

7.8 Physical stability of herbal sanitizer :

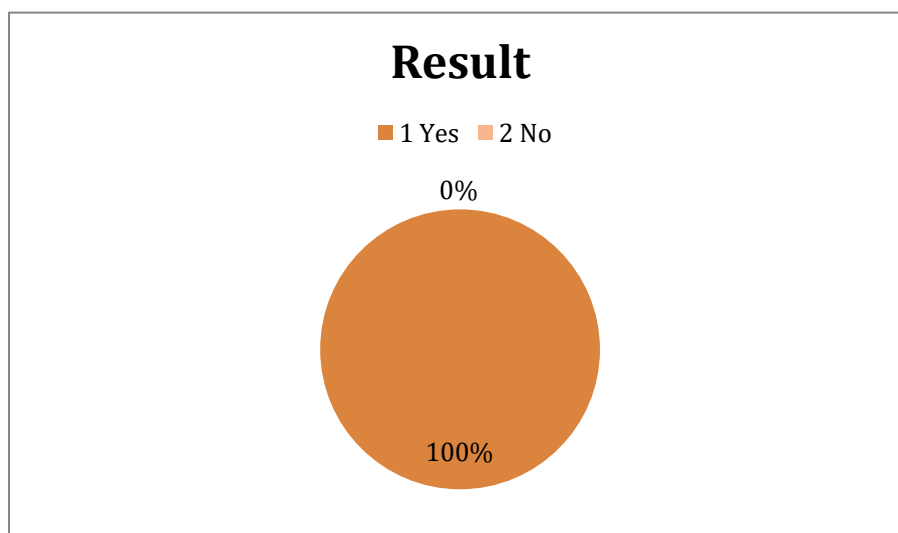
The pH of the sanitizer determined after preparation and a week interval. The herbal sanitizer were checked for turbidity also weekly. Viscosity and consistency were determined at weeks 0 and 12 storage.

Results:

The results of the questionnaire that was provided to the 2 volunteers to conduct the acceptability test and skin irritation study.

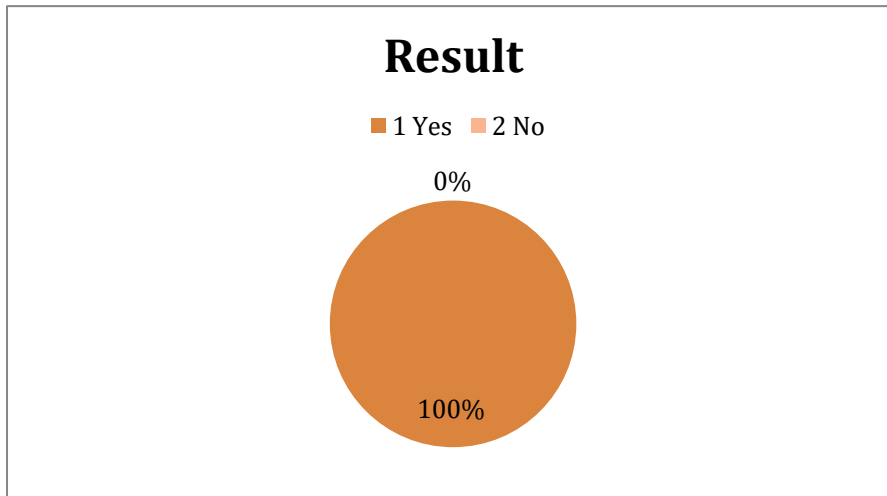
Gender:

25 responses



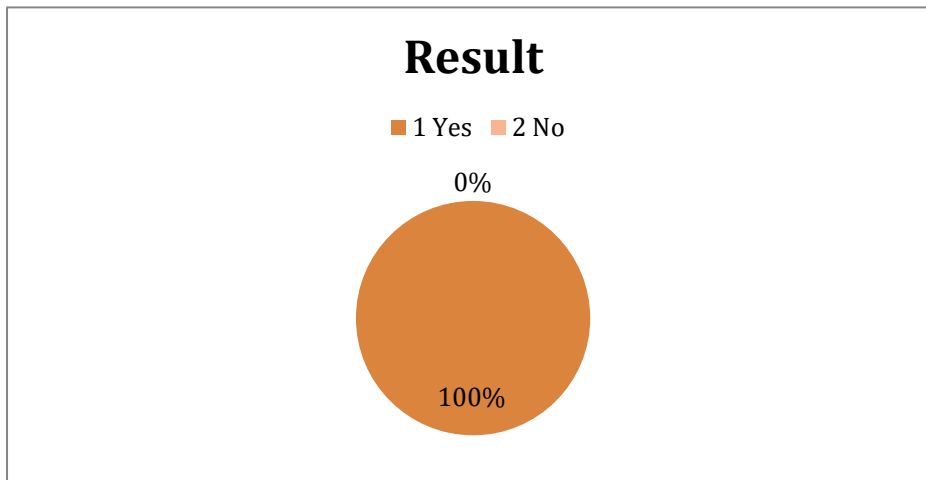
Any health condition :

25 responses



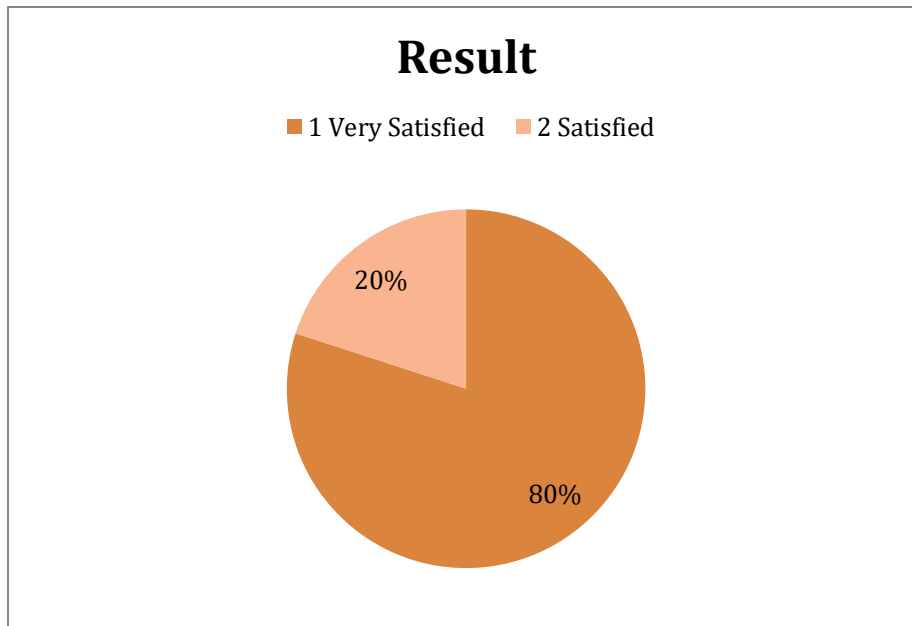
Allergies :

25 response



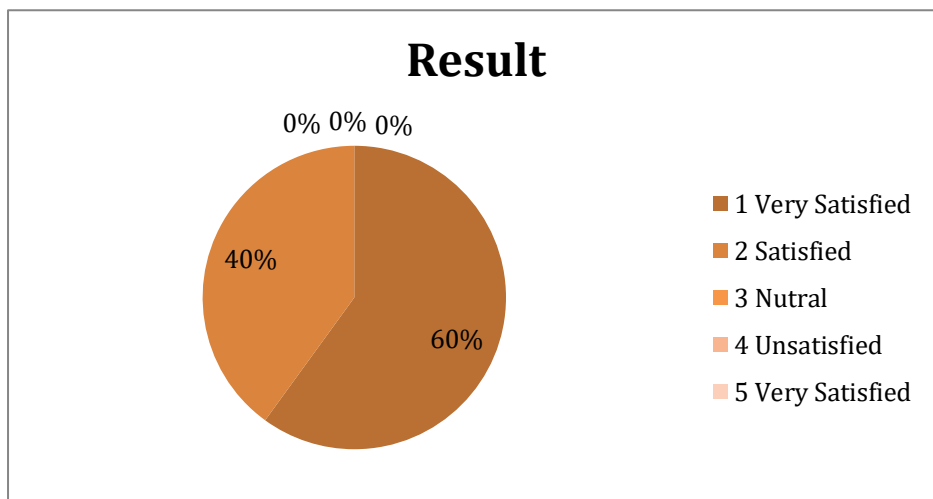
Skin Condition :

25 responses



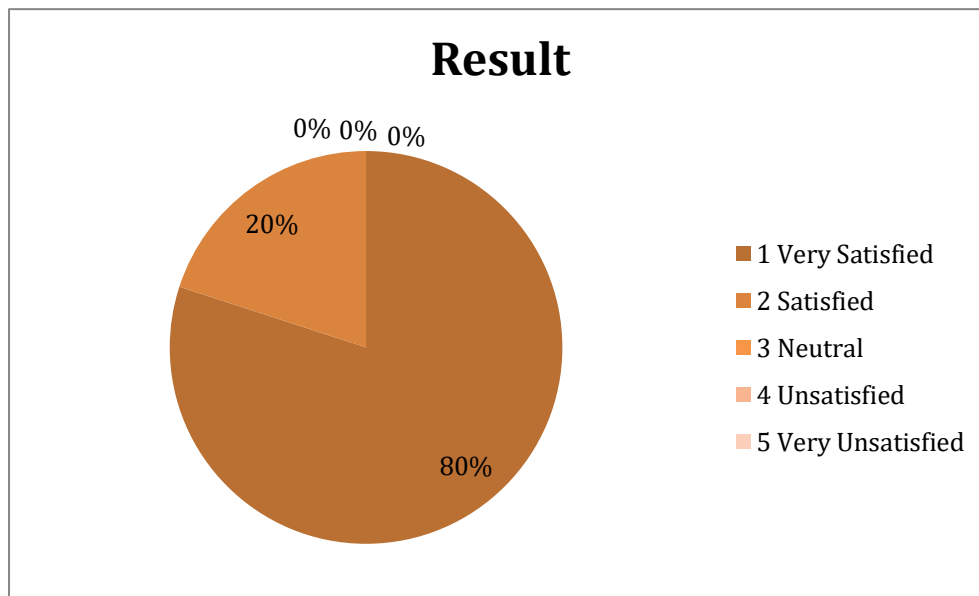
Product appearance :

25 responses



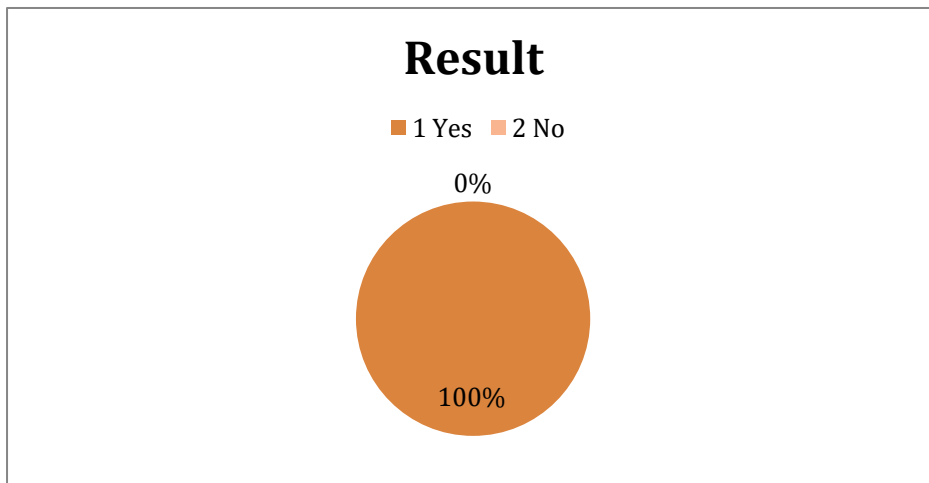
Product Smell :

25 responses



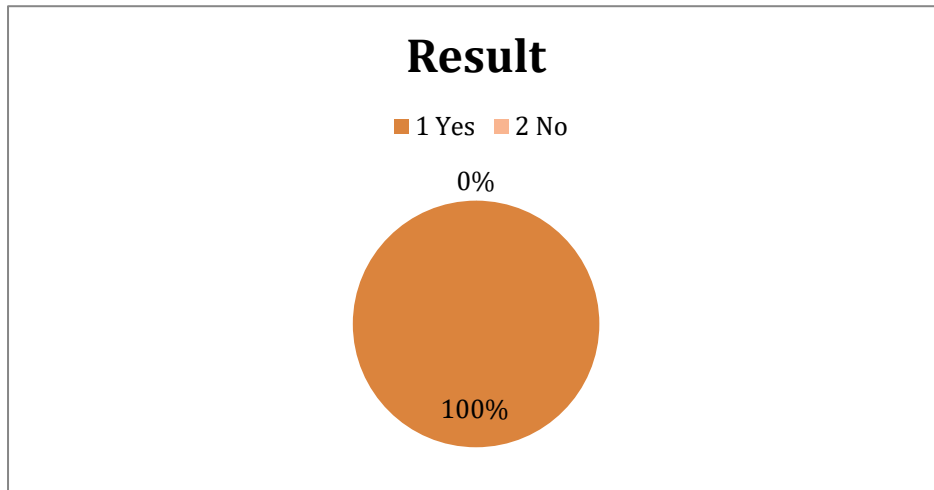
Irritation Or Burning Sensation:

25 response



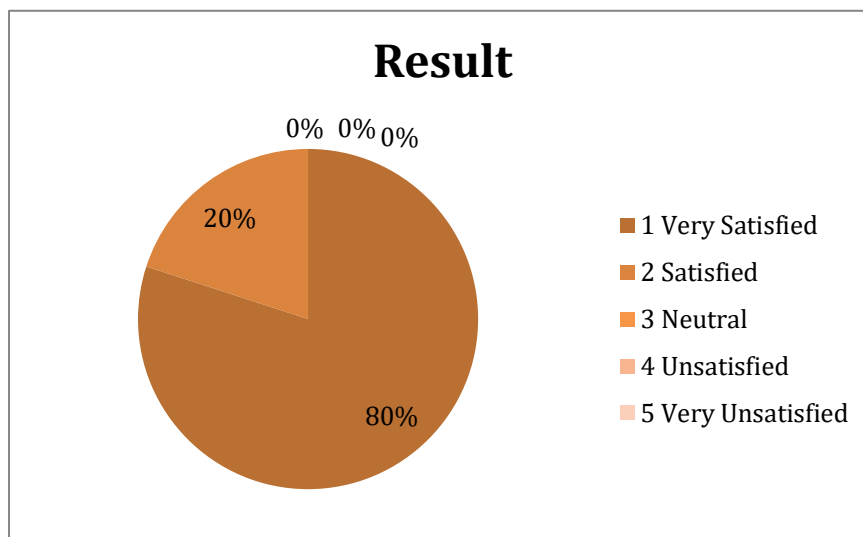
Redness:

25 responses



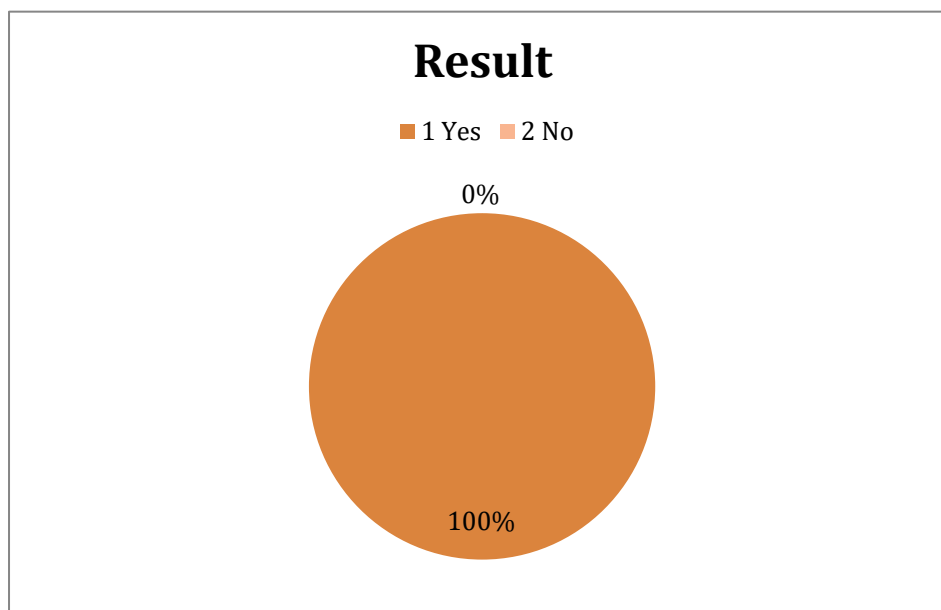
Do you like the product?

25 responses



Product overall satisfaction:

25 responses

**8.1 Antimicrobial activity of herbal hand sanitizer by agar plate diffusion method (cup plate method) :**

In present study the antimicrobial activity of trial drug was carried out by the agar plate diffusion method. Different concentrations were incorporated into an agar medium in a petridish .

Responses of organisms to the sanitizer were measured and compared with the response of the standard commercial Herbal Sanitizer.

Concentration of Drug	Formulation 1	Formulation 2	Formulation 3	Commercial
	F1	F2	F3	C1
(mg/ml)/ Organisms				
E. coli ATCC	37±3.0	31±1.3	32±1.3	32±1.1
E. coli MDR	37±3.3	37±3.4	37±3.0	32± 1.0
S. aureus ATCC	33±1.9	33±2.0	32±2.5	32±1.8
S. aureus ATCC BAA	32±2.2	32±2.6	33±2.2	31±1.9

Ps. Aeruginosa ATCC	31±2.8	31±2.3	32±2.0	37±1.2
Ps. Aeruginosa ATCC BAA	31±2.5	31±2.6	21±2.8	36±1.2

To check efficacy a 200mm size of petriplate were taken. In that 200ml of LB agar were poured. After cooling of agar two plates one for control and other for test were selected. Without applying sanitizer hand of assistant were placed on control plate and with applying sanitizer hand of assistant were placed use as test. Then plates were incubated at 37°C for 24 hours. The decrease in number of colony was determined. Same procedure was followed for all three sanitizers.

8.2 Efficacy of Herbal Hand Sanitizer:

8.3 Physical stability of Herbal Hand Sanitizer:

The physical changes were determined by observing color, odour and pH of the sanitizer was checked. The pH of sanitizer was 5.7 and 6.75 so skins natural pH is mildly acidic.

8.4 Skin Exposure to Herbal Hand Sanitize:

Skin sensitivity of the sanitizer was checked on different individuals and feedback was collected in consent form. The individuals gave positive response with mesmerizing odour and soothing effect after using sanitizer. The individuals were asked to observe redness, irritation, burning sensation and dryness. But no side effects were seen in any individuals after using sanitizer. Like other commercial sanitizer, our sanitizer gave soothing effect and no dryness was observed.

CONCLUSION:

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 herbal sanitizer using three plant oils with other ingredients including isopropyl alcohol, glycerol, lemon, alovera gel, rose water, methyl paraben, polysorbate80, vitamine E, 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 extract showed potent activity against all the strains. The antimicrobial activity was compared with other commercial herbal sanitizer and maximum activity was showed against *E. coli* ATCC, *E. coli* MDR, *S. aureus* ATCC, *S. aureus* ATCC BAA, *Ps. Aeruginosa* ATCC, *Ps. Aeruginosa* ATCC BAA by all the sanitizer used. The efficacy of herbal sanitizer was checked on hands of 25 volunteers of laboratory workers, patient and their relatives with written and oral consent. The sanitizer reduced or eliminate the growth of bacteria. The time interval effect was also checked at a time gap of two hours also showed the effect of hand sanitizer for longer time with reduction in bacterial growth. The sanitizer pH was mildly acidic with good shelf, texture and odor. No turbidity was seen when kept at higher temperature 15 days and showed no skin dryness with soothing effect after using sanitizer on different volunteers.

REFERENCE:

1. Mathur, P. (2011) Hand hygiene: Back to the basics of infection control. *Ind. J. Med. research*, vol 134(5): pg 611-620.
2. PalakVyaset al Antimicrobial Activity of Ayurvedic Hand Sanitizers. *International Journal of Pharmaceutical & Biological Archives*. 2011; 2(2):762-766.
3. Thombare, M. A., Udugade, B. V, Hol, T. P, Mulik, M. B, Pawade, D. A. (2015) Formulation and evaluation of novel herbal hand sanitizer. *Indo American J. Pharma. Research*, vol 5(1): pg 483-488.
4. R. Kapil. H. K. Bhavsar and M. Madan. "Hand hygiene in reducing transient flora on the hands of healthcare workers an educational intervention," *Indian J Med Microbiol*, vol. 33, no. 1, (2015), pp. 125-128.
5. C. N. Stanley, V. B. Alobar: and K. M. Ezealisiji "Formulation and evaluation of the effectiveness of a novel hand sanitizer using *Pleurotusostreatus* Oyster mushroom extracts," *Int J Pharma Res Review*, vol. 6, no. 1, (2017), pp. 7-15.
6. G. Kampf and A. Kramer. "Epidemiologic background of hand hygiene and evaluation of the most important agents for scrubs and rubs," *Clinical microbiology review*, vol. 17, (2004), pp. 863-893.

7. M. David, "Assessment of soap skin-substantively and other hygiene regimens for skin disinfection" *Int J Biosci*, vol 4, no. 2. (2009), pp. 89-94.
8. P. A. Jumaa, "Hand hygiene simple and complex," *International Journal of Infectious Diseases*. vol. 9. (2005). pp. 3-14.
9. S. Silvia, I. A. Nurul and C. L. Delly, "Formulation and effectiveness of a hand sanitizer gel. Produced using Salam Bark Extract," *Int J App Pharm*, vol 10, no. 1, (2018).
11. C.K. Kokate, A.P. Purohit and S.B. Gokhale *Book of Pharmacognosy Volume 1&2*, NiraliPrakashan 47 edition, page no. 1.19,1.40,1.53.
12. Masamichi, Y., Meisaku, K., Chihiroito, Hiroshi, F. (2000) Quantitative study of flavonoids in leaves of Citrus plants. *J. Agri. Food Chem.*, vol 48: pg.3865-3871.
13. Wani, N. S., Bhalerao, A. K., Ranaware, V. P., Zanje, R. (2013) Formulation and Evaluation of Herbal Sanitizer. *Int. J. of PharmTech Research*, vol 5(1): pg. 40-43.
14. B. F. Nejatizadeh, "Antibacterial activities and antioxidant capacity of Aloe vera," *OrgMed ChemLett.*, vol. 3, no. 1. (2013).
15. K. Deepak, K. K. Satyendra, K. Gopal, P. Vidyut, P. Pradyot and N. Gopal, "Evaluation of the antibacterial activity of commonly used alcohol based hand sanitizers on common pathogenic bacteria," *Indian J Appl Res.*, vol. 5, no. 3, (2015).
16. Schmidt, R. H. 2012. Basic elements of equipment cleaning and sanitizing in food processing and handling operations. <http://edis.ifas.ufl.edu/fs077>, accessed on November 8, 2014.
17. Kampf, G.; Kramer, A. Epidemiologic background of hand hygiene and evaluation of the most important agents for scrubs and rubs. *Clin. Microbiol. Rev.*, 2004; 17: 863–893.
18. Fendler, E.; Groziak, P. Efficacy of Alcohol-Based Hand Sanitizers against Fungi and Viruses. *Infect. Control Hosp. Epidemio*, 2002; 23: 61–62. [CrossRef].
19. Gerberding, J.L.; Fleming, M.W.; Snider, D.E., Jr.; Thacker, S.B.; Ward, J.W.; Hewitt, S.M.; Wilson, R.J.; Heilman, M.A.; Doan, Q.M. Morbidity and Mortality Weekly Report Guideline for Hand Hygiene in Health-Care Settings; Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force; Centers for Disease Control: Atlanta, GA, USA, 2002; 51.
20. Bissett, L. Skin care: An essential component of hand hygiene and infection control. *Br.J. Nurs*, 2007; 16: 976–981. [CrossRef] [PubMed].