

The Use of Medicinal Plant Extract in Hand Sanitizer and Spray to Combat Against COVID-19

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The present report is an investigation of commonly used hand sanitizer and spray in India to fight against Covid-19. Apart from alcohol, the rest part of the sanitizer and spray belongs to colors, water, preservatives therefore some medicinal plants are added to the formulation because of their antimicrobial property. The study, therefore, aims to analyze medicinal plant extract utilized in hand sanitizer and spray, its composition, and its manufacturer too. The hand sanitizer and spray were gathered from various sources and their manufacturers, the composition of medicinal plant extract was noted down. The present study finds 63% of sanitizer and spray uses medicinal plants in their composition. Medicinal plant-based hand sanitizer and spray manufactured all over the country in which pharmaceutical, personal care, and cosmetics, herbal product-based companies and industries are the largest producer. A total of 19 medicinal plants were recorded in which *Azadirachta indica* and *Alove barbadensis* were most commonly used. The composition of hand sanitizer and spray medicinal plant extracts included around 0.15 to 0.20% of the total. The study concluded that the use of medicinal plant extract in hand sanitizer and spray is encouraging and antiviral potential medicinal plants are incorporated in the formulation. The use of *Alove barbadensis* also protects moisture and avoids the dehydration caused by alcohol. Therefore the study will be helpful to aware the peoples and manufacturing industries for the use of hand sanitizer and spray based on medicinal plants.

Keywords: *Alove barbadensis*; *Azadirachta indica*; Covid-19 pandemic;
Hand sanitizer and spray; Herbal products; Medicinal plant extract.

The entire world is facing a serious health pandemic Covid-19, outbreak from Wuhan, China on 31st December 2019. India is among the adversely affected nation especially in the second wave of the pandemic. The first Covid-19

case was reported in India on January 27, 2020, and it is now reached to 3.32Cr and 3.44L death and still going on. As per the guidelines social distancing, the use of facial masks, and hand sanitization are some effective measures to control

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the spread of the virus.¹ By habit we always touch our mouth, face, nose, and eyes which are the entry of various pathogens including Coronavirus therefore cleaning of hands from time to time is so necessary and must during the covid-19 pandemic. There are some common ways to clean our hands like tap water and soap. An alternative method of handwashing with soap and water is hand sanitizer, they are the substances that act as both cleaning and disinfecting the agents.² The common modes of delivering the active ingredient in hand sanitizers, whether alcohol or other disinfectants are foams, gels, cream, wipes, and sprays.³ Mostly two types of sanitizers are used that is -Nonalcohol based sanitizer- Non based alcohol sanitizer is less irritating than alcoholic. Alcohol-based sanitizer- Less user-friendly but has more efficacies to reduce contamination.⁴

The effectiveness of sanitizes is started with its formulations. Mostly alcohol-based sanitizer is most effective. It is found that the most effective hand sanitizer products are alcohol-based formulations containing 62%–95% of alcohol as it is capable of denaturing the proteins of virus coat and lipid envelope derived from the host cell.² 60% to 90% n propanol has more antibacterial activity than absolute alcohol by inhibiting the membrane synthesis or protein formation,⁵ unfortunately the effectiveness against non-enveloped viruses is still debatable.⁶ synthetic and alcohol-based sanitizer destroy the infecting agents in hand but also the beneficial flora of our hands. When we use herbal sanitizer drying of the skin is less and leaves more moisture.⁷ Aqueous extracts of perennial plants leave, that are Eucalyptus, Neem (*Azadirachta indica*), and Sadabhar (*Catharanthus roseus*),⁸ various herbal oils such as Cinnamon oil, Eucalyptus oil, menthol oil, and lavender oil showed better antimicrobial activity and are used to make herbal sanitizers.⁹ Therefore the present study aims to investigate medicinal plant extract commonly utilized in hand sanitizer and spray in India. The study may uncover the manufacturers, quantity, and volume of plant extract, antiviral properties of plants studied before, etc. The report may be useful to aware people of the medicinal plant-based hand sanitizer and sprays because the awareness about herbal products is directly related to getting its benefits¹⁰.

MATERIALS AND METHODS

Hand sanitizer and spray are frequently utilized in the home, commercial complexes, public places therefore initially collected from our homes and offices. The product and/or its information were also gathered from our colleague. And finally, internet web sources were mapped too. After gathering the product, its manufacturer, license to manufacture was noted down to ensure that the product is made with government permission. After this, the composition of the product was noted in which contribution of the medicinal plant was specially recorded. The number of medicinal plants used in a particular product and the composition of the extract were also noted down. The medicinal plant used in sanitizer and spray were listed and its antiviral activity studied before was compiled. The complex data were then arranged in the form of tables and figures. Statistical tools were applied to satisfy the objectives of the work.

RESULTS

The outcomes of the present study highlight the manufacturer of sanitizer and spray, a medicinal plant used in the composition, its quantity, and antiviral activity are also presented. There are only a few consumer product companies that manufacture the hand sanitizer and spray before Covid 19 pandemic that can utilize only in hospitals and laboratories. But during the pandemic, a huge demand flow shortens the supply in the country everywhere. Therefore several manufacturers take an interest to make hand sanitizer and spray for public demand. In the present work hand sanitizer and spray collected were manufactured by companies based on pharmaceutical, chemical, ayurvedic, cosmetics, and so on (Figure 1). Not only did the very well-known companies and brands like ZyduS, Dettol, Nycile, Savlon, Lifebuoy, and Himalaya participate in the production but also micro-companies flourished during the pandemic. These companies launch band new products too. Now day manufacturers are available all over the country. In our investigation leading manufacturing, states belong to Maharashtra (19.05%) followed by Uttarakhand (17.46%), Himachal Pradesh

Table 1. Antiviral activities of medicinal plant extract used in various hand sanitizers and spray

| S. No. | Plant common name | Botanical name | Family | Antiviral activity against | References |
|--------|-------------------|-------------------------------|-----------------------------|-------------------------------------|------------|
| 1 | Coriander | <i>Coriander sativum</i> | Umbellifers | Measles virus | 11 |
| 2 | Neem | <i>Azadirachta indica</i> | mahogany family (Meliaceae) | hepatitis B virus | 12 |
| 3 | Nagarmotha | <i>Cyperous scariosus</i> | Cyperacea. | hepatitis B virus | 13 |
| 4 | Wild garlic | <i>Allium ursinum</i> | Amaryllidaceae | Influenza B | 14 |
| 5 | Alove vera | <i>Aloe barbadensis</i> | Asphodelaceae | Herpes simplex virus(HSV) | 15 |
| 6 | Lemone | <i>Citrus limon</i> | Rutaceae | HIV-1, influenza | 16 |
| 7 | Tulsi | <i>Ocimum sanctum</i> | Lamiaceae | SARS-CoV-2 | 17 |
| 8 | Cinnamon | <i>Cinnamomum verum</i> | Lauraceae | Avian Influenza | 18 |
| 9 | Lemongrass | <i>Cymbopogon</i> | Poaceae | HSV-1 and HSV-2 | 9 |
| 10 | Mint | <i>Mentha arvensis</i> | Lamiaceae | Respiratory Syncytial Virus (RSV) | 19 |
| 11 | Poppy seed | <i>Papaver rhoeas</i> | Papaveraceae | Dengue virus | 20 |
| 12 | Kapoor | <i>Hedychium spicatum</i> | Zingiberaceae | HIV -1 | 21 |
| 13 | Ajwain | <i>Trachyspermum ammi</i> | Apiaceae | Japanese encephalitis virus | 22 |
| 14 | Tea tree | <i>Melaleuca alternifolia</i> | Myrtaceae | Influenza, HSV-1, HSV-2 | 23 |
| 15 | Rosemary | <i>Rosmarinus officinalis</i> | Labiatae | Hepatitis, HSV-1, HSV-2 | 24 |
| 16 | Eucalyptus | <i>Eucalyptus rostrata</i> | (Myrtaceae) | HSV-1, HSV-2 | 25 |
| 17 | Papaya | <i>Carica papaya</i> | Caricaceae | Zika Virus, dengue | 26 |
| 18 | Turmeric | <i>Curcuma longa</i> | Zingiberaceae | dengue, hepatitis B, and Zika virus | 27 |
| 19 | Hriversa | <i>Pavonia odorata</i> | Malvaceae | SARS CoV-2 | 28 |

(15.87%), and Gujarat (9.52%) (N=63 products). The manufacturer blended various colors and fragrances for consumer attention. Among which addition of medicinal plant extract is observed.

Several manufacturers added various medicinal plant extract in the hand sanitizer and spray. In the present study, there are 63% (N=63 products) products having one or more medicinal plants. Most of the products were found with one to two medicinal plant extract (41.27%) followed by three to four (12.7%) and five to six (9.53%) plants with an average of 2.6 medicinal plants per product. While 36.51% of products have no medicinal plant extract. The volume of each medicinal plant in the product was found 5 to 10mg/10g (0.05 to 0.10%) while the average total volume of medicinal plant in the product was recorded from 15 to 20 mg/10g (0.15 to 0.20%). There are 19 medicinal plants of different families that were recorded as a composition of hand sanitizer and spray the coverage of medicinal plants in hand sanitizer and spray is presented in **figure 2**. Based on the coverage *Azadirachta indica* was found the most frequently used medicinal plant followed by *Aloe barbadensis*, *Ocimum sanctum*, and so on.

DISCUSSION

The use of medicinal plant extract in hand sanitizer and spray is mainly due to the

antimicrobial properties of the metabolite present. However, there are certainly other reasons like the fulfillment of the quantity. The alcohol is required 70% more enough to kill the germs and the rest 30% may include mainly water while coloring and fragrance in very small proportion. So instant of water there are some possibilities to include such constituents that not only mimic the water but also make hand sanitizer and spray more effective. Keeping in mind medicinal plant extracts are one very useful alternate. The medicinal plant recorded in the present investigation from different hand sanitizer and spray were found antiviral (**Table 1**). Therefore it is excellent to include these plant extracts in hand sanitizer and spray. Some previous study reveals with the conceptualization of present study. Pandya *et al.*²⁹ has been used extract of *Terminalia chebula* and *Azadirachta indica* to make disinfectant for household cleaning purpose. The disinfectant was found active against some pathogen. In the present finding it is observed that the formulation is based on even two or more medicinal plant. In a previous study the investigator utilizes lemon, neem and blend of both to create an improved sanitizer³⁰. The formulated sanitizer was found better than the most popular sanitizer brand sterillium. Similar finding was reported in a formulation based on the extract of *Ocimum sanctum* and *Eucalyptus globules*³¹. The formulated

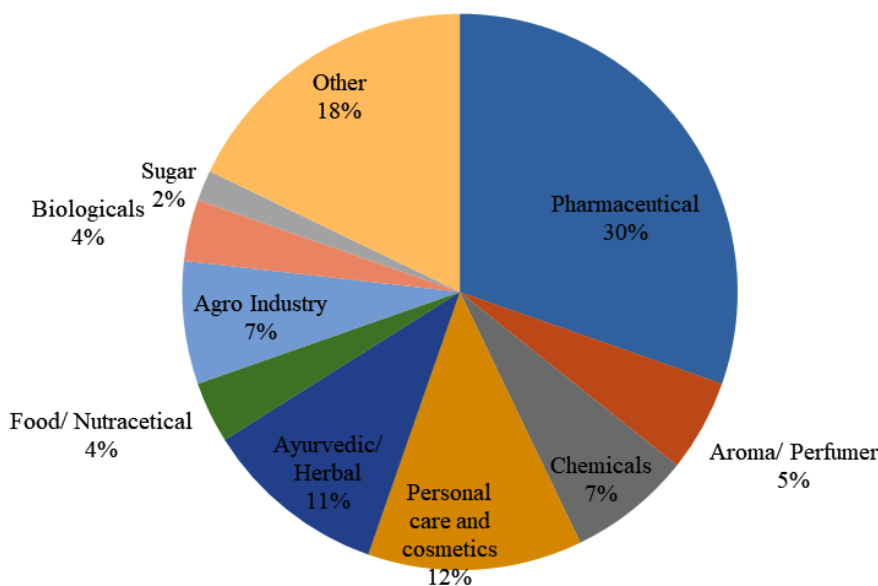


Fig. 1. Hand sanitizer and spray manufacturer industries in India

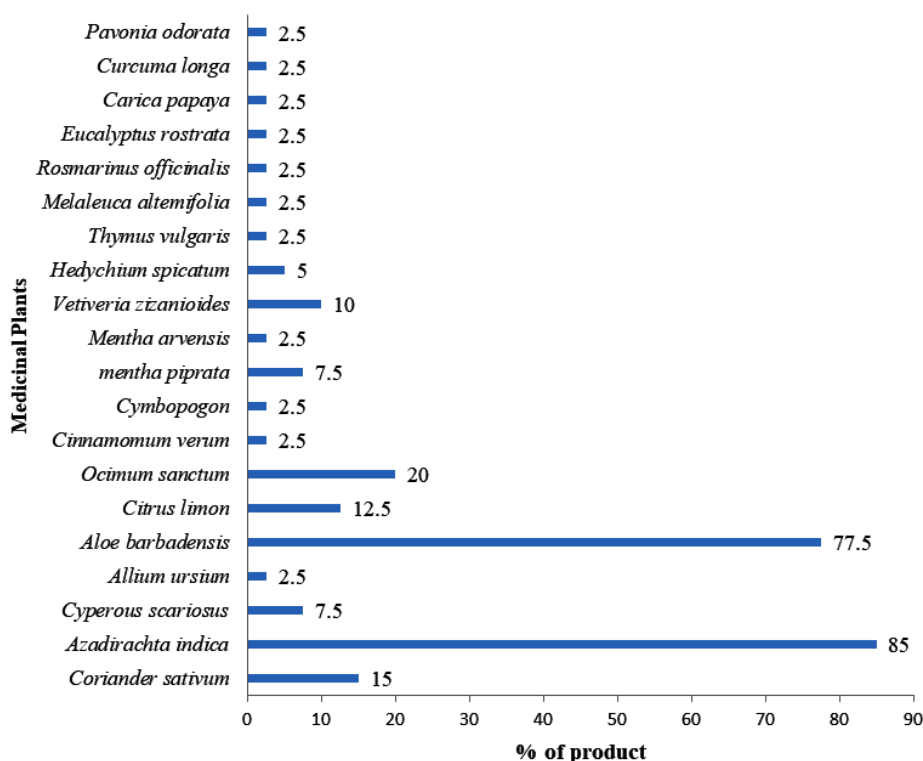


Fig. 2. Medicinal plant contributed in the hand sanitizer and spray and their coverage

sanitizer was observed to be superior than standard non medicinal plant based sanitizer.

Among the various reasons for adding medicinal plant extract in hand sanitizer and spray, the emollient and moisture protecting properties of some plant extract is also an important basis. The overuse use of alcohol-based hand sanitizer and spray adversely affects the skin by removing the oil layer of the applied area. The alcohol-based hand sanitizer and spray having more than sixty percent of alcohol cause dehydration of the skin.³² The dry hand had other complications like aging, effect on the microbiome, etc.³³ *Alove vera* is a very well known and widely used plant for various skin-related issues. The *Alove vera* contains mucopolysaccharides, amino acids, zinc, etc. that improve moisture, soften, elasticity, decrease wrinkles and tighten the skin pores.³⁴ Therefore the use of such medicinal plant extract having moisture protecting properties is so necessary.

CONCLUSION

India is rich in medicinal plant diversity and its utilization is since from the civilization. The extract of the plants is utilized in Ayurveda, Siddha, Unani, naturopathy, and many other traditional and modern treatment methods. Various plants like giloy, tulsi, dalchini have been already utilized in the improvement of immunity during Covid 19 pandemic. Hand sanitizer and spray have a very important role in disinfecting hands and surfaces to mimic the spread of viruses. A significant number of products have been added extracts of medicinal plants in hand sanitizer and spray in India. The antiviral and dehydration protecting properties are the major reasons behind adding a medicinal plant in hand sanitizer and spray.

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Conflict of Interest

The authors declare no conflict of interest

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REFERENCES

- WHO, Coronavirus disease (COVID-19) advice for the public. Cited 2021 October 31. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public>
- Kramer A., Galabov A.S., Sattar S.A., Döhner L., Pivert A., Payan C. et al. Virucidal activity of a new hand disinfectant with reduced ethanol content: Comparison with other alcohol-based formulations. *J. Hosp. Infect.* 2006; **62**: 98–106.
- Jing J.L.J., Thong P.Y., Rajendran J.C.B., Jason R.M., Nagendran T., Thiagarajan M. Hand Sanitizers: A Review on Formulation Aspects, Adverse Effects, and Regulations. *Int. J. Environ. Res. Public Health.* 2020; **17**: 3326.
- Andrew P.G., Dexter C., Aziz G. Hand sanitizers: A review of ingredients, mechanisms of action, modes of delivery, and efficacy against coronaviruses. *Am. J. Infect. Control.* 2020; **48**: 1062–7.
- Thomas P. Long-term survival of bacillus spores in alcohol and identification of 90% ethanol as relatively more spori/bactericidal. *Curr. Microbiol.* 2012; **64**:130–9.
- Manocha S., Walley K.R., Russell J.A. Severe acute respiratory distress syndrome (SARS): A critical care perspective. *Crit. Care Med.* 2003; **31**: 2684–92.
- Grace X.F., Sowmya K.V., Darsika C., Arul J., Shanmuganathan S. Polyherbal Hand Sanitizer - Formulation and Evaluation. *Indian J. Pharm. Pharmacol.* 2015; **2**(2): 143-4.
- Singla D., Saini K. Formulation of an Herbal Substitute for Chemical Sanitizer and its Evaluation for Antimicrobial Efficiency. *Int. J. Chemtech. Res.* 2019; **12**(03): 114-20.
- Almeida K.B., Araujo J.L., Cavalcanti J.F., Romanos M.T.V., Mourão S.C., Amaral A.C.F. et al. In Vitro Release And Anti-Herpetic Activity Of *Cymbopogon Citratus* Volatile Oil-Loaded Nanogel. *Rev. bras. farmacogn.* 2018; **28**(4): 495-502. doi:10.1016/j.bjp.2018.05.007.
- Mahish P.K., Mahobia R., Yadav J. Use and Awareness of Herbal Medicines among Literate Population. *International Journal of Pharma and Bio Sciences* 2016; **7**(4): 174 – 8.
- Panda S., Rana G., Nayak, J.K., Mishra I., Bhattacharyay D. In silico analysis of phytochemicals from *Coriandrum sativum* against measles. *Plant Cell Biotechnol. Mol. Biol.* 2020; **21**: 9-10.
- Tiwari V., Darmani N.A., Yue, B.Y.J.T., Shukla D. In Vitro Antiviral Activity of Neem (*Azardirachta indica* L.) Bark Extract Against Herpes Simplex Virus Type-1 Infection. *Phytother. Res.* 2009; **24**(8): 1132-40. doi: 10.1002/ptr.3085
- Mohammad K.P., Mohammed S.A., Ahmed H.A., Sakina N. The in vitro and in vivo anti-hepatotoxic, anti-hepatitis B virus and hepatic CYP450 modulating potential of *Cyperus rotundus*. *Saudi Pharm. J.* 2019; **27**(4): 558-64. <https://doi.org/10.1016/j.jsps.2019.02.003>
- Lanzotti V., Scala F., Bonanomi G. Compounds from *Allium* Species with Cytotoxic and Antimicrobial Activity. *Phytochem. Rev.* 2014; **13**(4): 769-91. doi:10.1007/s11101-014-9366-0.
- Rezazadeh F., Moshaverinia M., Motamedifar M., Alyaseri M. Assessment of Anti HSV-1 Activity of *Aloe Vera* Gel Extract: an In Vitro Study. *J. Dent. (Shiraz).* 2016; **17**(1): 49-54.
- Rezatofghi S.E., Ebrahimian M., Lordifar P., Mehravar N., Seyednejad S.M. Antiviral Activity of *Citrus limon*, *Matricaria recutita* L., *Allium Ascalonicum* L., and *Rosa Damascene* Against New Castle Disease Virus. *Vet. Microbiol.* 2014; **10**(128): 1-8.
- Patel B., Sharma S., Nair N., Jaseela M., Ramesh K., Dhobi M. Therapeutic Opportunities of Edible Antiviral Plants for COVID-19. *Mol. Cell. Biochem.* 2021; **476**: 2345-64.
- Singh N. Rao A.S., Nandal A., Kumar S., Singh S., Showkat G.A., Balasubramanian N. 2020, Pythochemical and Pharmacological Review of *Cinnamomum verum* J. Presl-a versatile spice used in food and nutrition. *Food Chem.* 2021; **338**: 127773.
- Li Y.X., Liu Y., Ma A., Bao Y., Wang M., Sun Z.L. In Vitro Antiviral, Anti-Inflammatory, and Antioxidant Activities of the Ethanol Extract of *Mentha piperita* L. *Food Sci. Biotechnol.* 2017; **26**(6):1675-83. doi:10.1007/s10068-017-0217-9
- Lavanya P., Ramaiah S., Anbarasu A. Ethyl 4-(4-methylphenyl)-4 pentenoate from *Vetiveria zizanioides* inhibits Dengue NS2B-NS3 Protease and Prevents Viral Assembly: A Computational

- Molecular Dynamics and Docking Study. *Cell Biochem. Biophys.* 2016; **74**(3):337-51.
21. Dinesh G., Sushma T., Aseesh P.A. review account on medicinal value of *Hedychium spicatum* Buch-Ham ex Sm: Vulnerable medicinal plant. *J. Med. Plant Res.* 2010; **4**(25):2773-7.
 22. Roy S., Chaturvedi P., Chowdhary A. Evaluation of Antiviral Activity of Essential Oil of *Trachyspermum ammi* Against Japanese Encephalitis Virus. *Pharmacogn. Res.* 2015; **7**(3):263. doi:10.4103/0974-8490.157977.
 23. Schnitzler P., Schön K., Reichling J. Antiviral Activity of Australian Tea Tree Oil and Eucalyptus Oil against Herpes Simplex Virus In Cell Culture. *Pharmazie.* 2001; **56**(4):343-347.
 24. AL-Megrin W., AlSadhan N., Metwally D., Al-Talhi R., El-Khadragy M., Abdel-Hafez L.J. Potential Antiviral Agents of *Rosmarinus officinalis* Extract Against Herpes Viruses 1 And 2. *Biosci. Rep.* 2020; **40**(6): doi:10.1042/bsr20200992.
 25. Abu-Jafar A., Mahmoud H. Antiviral Activity of *Eucalyptus Camaldulensis* Leaves Ethanolic Extract on Herpes Viruses Infection. *International Journal of Clinical Virology* 2017; **1**(1):001-9.
 26. Haddad J.G., Carcauzon V., El Kalamouni O., Desprès P., Garcia C., Remize F., El Kalamouni C. Papaya Fruit Pulp and Resulting Lactic Fermented Pulp Exert Antiviral Activity Against Zika Virus. *Microorganisms* 2020; **8**(9):1257. doi:10.3390/microorganisms8091257.
 27. Zorofchian M.S., Abdul K.H., Hassandarvish P., Tajik H., Abubakar S., Zandi, K. A Review on Antibacterial, Antiviral, And Antifungal activity of Curcumin. *Biomed. Research International* 2014; 1-12. doi:10.1155/2014/186864.
 28. Priya S.B., Deattu N., Sunitha P.G., Suresh J., Nargis N.R. Exploring the Insilico Properties and Docking Studies of Sudarshan Churna for Anti-Sars-CoV-2 Activity. SSRN: <https://ssrn.com/abstract=3697539> or <http://dx.doi.org/10.2139/ssrn.3697539>
 29. Pandya U., Doshi A., Sahay N.S. Development of herbal disinfectants formulation for mopping households and its antibacterial activity. *Nat. Prod. Res.*, 2017; **31**(22):2665-2668. doi: 10.1080/14786419.2017.1283491
 30. Patankar RS., Chandak N. Formulation of Herbal Sanitizers and Determining Their Antimicrobial Activities Against Skin Pathogens. *International Journal of Innovative Science and Research Technology.* 2018; **3**(8):169-177.
 31. Nandkishor SW., Bhalerao AK., Ranaware VP., Zanje R. Formulation and Evaluation of Herbal Sanitizer. *International Journal of PharmTech Research.* 2013; **5**(1):40-43.
 32. Bo S., Min Z., Zhibin H., Linqiang Z., Jing S., Yonghao N. Towards greener and more sustainable cellulose-based hand sanitizer products. *JB&B.* 2017; **2**(2):56-0.
 33. Shegun V.O., Alaba T.A., Modupe E.O., Awe T.V., Adelabu M.A., Ayoyinka B.F. et al. Alcohol-Based Hand Sanitizers: Review of Efficacy and Adverse Effect. *JHMN.* 2020; **81**:1-12.
 34. Amar S., Resham V., Saple D.G. Aloe Vera: A Short Review. *Indian J. Dermatol.* 2008; **53**(4):163-6.