

to foods, artifacts, or humans. The major modus of dissemination of these viruses and diseases to clinicians is palms of healthcare staff. A easy and easiest way to avoid medical diseases that are directly obtained from airborne particles can be accomplished by means of hand grooming [4].

In many topical and difficult-surface uses, pro-septic's and disinfectants are commonly utilized in hospitals and different medical facilities. It is a vital element of managing infections and helping deter nosocomial infections, of particular [4]. The worries about potential for microbial pollution and possibility of contamination within food and consumer industries in general have lead as well to increasing widespread use of antiperspirants and disinfectants. These products contain a wide range of active chemicals (or biocides), some of which are utilized for anti-sickness, disinfection and recycling for hundreds of years.

The location of bacteria through hands to different objects such as food, objects, others articles leads to spreading of disease. More specifically healthcare employees come in contact with such multi-drug resistant bacteria and are majorly responsible in transmitting these microbes. In order to prevent hands from infections or harmful pathogens, regular cleanliness is very important. It is impossible to have access to soaps at every place. Therefore, hand washes, sanitizers or disinfectants are important tools to maintain hygiene within oneself and around surroundings. Most of the chemical anti-septics present in markets are alcohol centered and thus presents some disadvantages or side effects, which may include skin irritation, or related infections.

Many herbs centred drugs are developed and available in the market to tackle the aforementioned problems. According to various microbiologists, biotechnologists phytochemicals present within plants are potent candidates for anti-microbial activity [5]. Various screening has been performed in plant extracts to identify their anti-microbial activity. The main motive behind it is to determine phytochemicals with anti-microbial activity so that they can be used as anti-septics, disinfectants, dentrifiers and other chemotherapeutic agents [4].

Skin is the most unveiled component of the body that is more prone to infection as it allows entry of pathogens. While using alcohol based formulations the skin becomes dry and may leads to cracking of skin. This ultimately allows a passage for entry of harmful micro-organisms within the skin that further leads to infection. *S. aureus* and *S. pyogenes* strains are mainly responsible for causing skin infection [6]. The prevalence of nosocomial infections is astonishingly rising, leading to extensive hospitalization, severe morbidity and mortality and emerging as crucial problems in hospital service. *Enterococcus species*, *Pseudomonas species*, & *Staphylococcus aureus* are occasional microorganisms that cause main nosocomial ailments [7]. Opportunistic fungal infections are highly significant in HIV infection, and psoriasis, skeletal fluorosis and coccidiosis are most prevalent infections. Also these pathogenic micro-organisms make themselves resistant to multiple drugs used against them [7]. Thus, there is a need of the hour to shift towards modified chemicals taken from biodiversity that possess anti-microbial activity and are effective in retarding the growth of such organisms thereby preventing the increase in chances of infection and any severe adversities related to it. Herbs are formulated and tested for their purity and effectiveness in a variety of preparations as disinfectants. Various medicinal compositions are prepared like hand washes, sanitizers, gels, serums, ointments, toothpastes, medicinal fumigants, etc. The majority of preparations developed and tested demonstrated strong antimicrobial features and defensive effect over skin. Plants with significant antimicrobial attributes are considered to possess broad secondary metabolites, which are commonly utilized in conventional medicines. Some species have showed good activity over skin. The extracts they refine are normally used for disinfecting the flesh, hands and exterior wounds. The most widely used herbs includes: *Azdirachta indica*, *Anthemis Nobilis*, *Camellia sinensis*, *Ficus religiosa*, *Hibiscus sabdariffa*, *Eucalyptus globulus*, *Ficus religiosa*, *Gaultheria procumbens*, *Quercus rubra*, *Rhamnus purshiana*, *Salix alba*, *Arctium lappa*, *Curcuma zedoaria* and many more. Some of the active compounds are listed below [8, 4] (Table 1).

Table 1: List of common herbs comprising disinfectant property along with their active compounds.

Active compounds	Herbs
Triterpenes	<i>Azdirachta indica</i>
Essential oils	<i>Anethum graveolens</i> , <i>Aegle marmelos</i> , <i>Cinnamomum verum</i> , <i>Piper betel</i> , <i>Rosmarinus officinalis</i> , <i>Valeriana officinalis</i>
Terpenoids	<i>Anthemis Nobilis</i> , <i>Aegle marmelos</i> , <i>Arctium lappa</i> , <i>Allium sativum</i> , <i>Artemisia dracunculus</i> , <i>Cinnamomum verum</i> , <i>Capsicum annum</i> , <i>Centella asiatica</i> , <i>Citrus paradise</i> , <i>Eucalyptus globulus</i> , <i>Ficus religiosa</i> , <i>Matricaria recutita</i> , <i>Mentha piperita</i> , <i>Ocimum basilicum</i> , <i>Rosmarinus officinalis</i> , <i>Syzygium aromaticum</i> , <i>Thymus vulgaris</i> , <i>Valeriana officinalis</i>
Phellandrene	<i>Anethum graveolens</i>

Flavonoids	<i>Anthemis Nobilis, Camellia sinensis, Ficus religiosa, Hibiscus sabdariffa</i>
Coumarins	<i>Anthemis Nobilis, Carum carvi, Galium odoratum</i>
Andrographolides	<i>Andrographis paniculata</i>
Arabinogalactan proteins	<i>Andrographis paniculata</i>
Tannins	<i>Arctium lappa, Artemisia dracunculus, Cinnamomum verum, Eucalyptus globulus, Ficus religiosa, Gaultheria procumbens, Quercus rubra, Rhamnus purshiana, Salix alba, Thymus vulgaris</i>
Polyacetylene	<i>Arctium lappa</i>
Allicin	<i>Allium sativum, Allium cepa</i>
Caffeic acids	<i>Artemisia dracunculus, Thymus vulgaris</i>
Berberine Alkaloid	<i>Berberis vulgaris, Hydrastis Canadensis</i>
Anthraquinones	<i>Cassia fistula, Hypericum perforatum, Rhamnus purshiana, Cassia angustifolia</i>
Fistulic acid	<i>Cassia fistula</i>
Capsaicin	<i>Capsicum annum</i>
Rhein	<i>Cassia angustifolia</i>
Curcuminoids	<i>Curcuma zedoaria</i>
Asiaticoside	<i>Centella asiatica</i>
Catechin	<i>Camellia sinensis</i>
Polyphenols	<i>Eucalyptus globulus, Gaultheria procumbens, Hibiscus sabdariffa, Quercus rubra, Rhamnus purshiana, Thymus vulgaris</i>
Phenolic alcohol	<i>Glycyrrhiza glabra, Thymus vulgaris, Punica granatum</i>
Xanthone derivatives	<i>Garcinia mangostana</i>
Luteolin	<i>Nelumbo nucifera</i>
Saponins	<i>Panax notoginseng</i>
Withafarin A	<i>Withania somniferum</i>
Eugenol	<i>Syzygium aromaticum</i>
Lactone	<i>Withania somniferum</i>
Phenolic glucosides,Salicin	<i>Salix alba</i>
Terpenoid Thymol	<i>Thymus vulgaris</i>

Many herbal centered products are available, such as cleaning agents, disinfectants, and odour remover, skincare products that emit chemicals that can affect human health and trigger environmental hazards. Therefore the people are inclining more towards herbal products. Recently a herbal disinfectant was prepared from *T.chebula* for cleaning purpose and its anti-bacterial efficacy was evaluated. It was observed that, the formulation showed potent anti-bacterial activity against *E.coli*, and *S.aureus* [9]. Further, efficacy of herbal tea tree oil and aloe vera was evaluated with commercially available chlorhexidine which is specifically a cavity disinfectant utilized in dentistry. Results conducted for this study represented a statistical reduction in total viable count after comparing between after and before excavation in each group ($p < 0.05$) and after excavation and after disinfection in each group ($p < 0.05$) apart from control group. After-disinfection, 2% w/v of chlorhexidine presented significant reduction in total viable count, which was further followed by 1% tea tree

oil and aloe vera [10]. Thus it was concluded that, herbal disinfectants can be effectively utilized as disinfecting agent for developed cavity.

From the aforementioned citations it can be clearly visualized that, the herbal formulations comprises immense potential to be used as an alternative source of disinfecting agent against synthetic agents. These prevent exploitation of synthetic components and thus prevent the environmental degradation. Moreover, utilization of herbal products does not cause any side effects and also their term of storage is more in comparison to synthetic products.

Herbal sanitizer

Another form of herbal formulation includes herbal sanitizers, which are more demanded nowadays. Due to increase in communicable diseases it has become important to practice hygiene at every step and on regular basis. It is not possible to have access to

disinfectant soap at every point thus to combat from such situation sanitizers has been brought into practice.

Many alcohol based sanitizers were administered into daily practice but due to some loopholes they stop gaining importance and people shifted towards herbal sanitizers. This is specifically due to the fact that the essential oils, herbs used in herbal sanitizers apart from their sanitization property also are skin friendly and thus prevents the skin from any damage thereby leading to reduction in infection caused due to damaged skin. Continuous application of alcohol centered sanitizers makes skin dry and patty. This type of skin increases the chances of permeation of bacteria or harmful pathogen within the skin thereby increasing the chances of infection. Thus people shifted towards herbal sanitizers as it comprises many advantages as mentioned below in Figure 1.

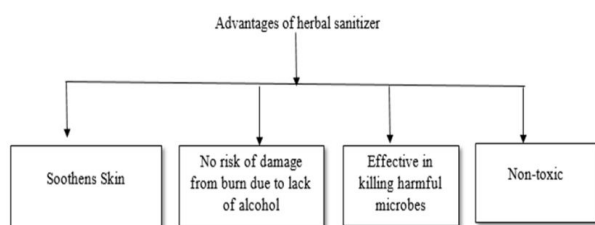


Figure 1: Advantages of herbal sanitizers over alcohol based sanitizers.

The bacteriostatic impacts of different herbal compositions over skin surface and in animated objects surface have been observed. Herbal hand sanitizer contained extracts of different herbs which included *Azadirachta indica*, *Citrus limon* and alike and were found to be healthy. Recently in 2018 an herbal formulation by combining extracts of neem and lemon juice was developed and their anti-microbial activity was determined against hand isolates and control sample. The formulated sanitizer was compared for their efficacy with sterillium sanitizer. It was observed that, the sterillium sanitizer was effective against standard organism but was not effective against hand isolates. While the developed herbal sanitizer was effective against both standard organism and hand isolates as well. In MIC test maximum zone of inhibition was shown by herbal formulation but not sterillium sanitizer [11].

Another research was conducted to evaluate anti-microbial activity of aq. extracts of perennial plants leaves which specifically included eucalyptus, neem and Sadabhar by using numerous techniques like finger imprint methods, agar well diffusion method and alike. Further the results obtained were augmented and anti-microbial activity of each of them was evaluated which resulted in order of Eucalyptus to more potent and neem the least. Considering this hand sanitizer was formulated [12].

Further, another formulation was developed by combining leaves extract of *Coriandrum sativum*, neem, Tulsi, clove, lemon grass and cinnamon and their efficacy

was evaluated against *E.coli*, *Paeriginosa*, *S.aureus* and *B.subtilis*. The experiment revealed that, herbal sanitizer was effective in killing micro-organisms from hand. The prepared sanitizer was also checked for its physical properties which included, color, odor, pH and alike [13].

Herbal antiseptic gels

It was claimed that herbal extracts comprising antiseptic gels have been produced for the processing of acne, dandruffs and wounds. Such gels are correlated with physical characteristics and behaviour of consumer samples. Topical coriander oil composition with antibacterial activities against *P. acne* and *S. epidermidis* is formulated and tested. Hair serum comprising antidandruff hydro-alcoholic neem leaves extracts using an antimicrobial effectiveness gelling agents such as carbopol 934 was comparative with market formulations for physical characteristics such as colour, look, durability, washing ability, pH, propagation. A comparative assessment of the antimicrobial efficacy of *Morinda citrifolia*, Papain and Aloe Vera gel preparations was conducted out for disinfection assessment of denticals when infected with *Enterococcus faecalis* [4].

A randomized double blind clinical trial was conducted on 70 patients with chronic anal fissure ailment. In this trial patients were administered with Persian herbal formulation and a synthetic formulation (diltiazem) and their effectiveness was determined. Both groups of patients were given same clinical facilities to determine the effect of the formulation. It was observed that patients treated with diltiazem faced some side effects such as headache, allergy and alike. While patients treated with herbal formulation lead to significant reduction in pain and aided in wound healing at much faster rate as compared to diltiazem [14].

Nowadays one problem faced by adolescents is acne. Blockage of pores by oil, dust and sweat makes the skin pores blocked and chances of bacterial infection increases. To combat from such problem a herbal formulation comprising *R.serpentian*, *C.longa* and Neem is developed. The contents added in the formulation possess anti-septic, anti-oxidant and anti-bacterial properties which is good enough to treat problems related to acne formation [15].

Herbal dentrifices

A vital part of person's wellbeing is oral hygiene. Oral hygiene induces various kinds of oral disorders, such as tooth decay when ignored. Infections, eating habits and way of living are primary reasons of oral disorders. Two popular risks to oral hygiene are dental caries and periodontal diseases. Array of secondary plant metabolites possessing anti-microbial activity have been widely used in traditional treatment of diverse fields of pharmacy. Medicinal plants were commonly used for personal hygiene in traditional medicine. There is also evidence of antibiotic, but not antimicrobial plant extract tolerance to microorganisms that are present in swollen gums. Antibiotic extracts did not cause gingiva allergy, as

opposed to antibiotics. Table 2 represents medicinal plants that were used in treating dental problems

Table 2: List of herbs used as dentrifices.

Herbs	Part utilized	Traditional usage
Acorus calamus	Rhizome	Used in treating painful teeth and gums
Neem	Leaves	Used as anti-bacterial agent
Ginger	Roots	Used as anti-septic
Bombax ceiba	Gum	Used to cure tooth ache
Banyan	Bark	Used to cure toothache
Citrus medica	Fruit	Used to cure bleeding gums
Datura stramonium	Seeds	Used to cure oral ailments
Clove	Fruit	Anti-bacterial
Juglens regia	Oil and fruit	Tooth Ache, Pyorrhoea
Myrica esculenta	Bark	Used to cure toothache
Quereus infectora	Fruit	Anti-bacterial
Ricinus communis	Twigs & leaves	Dental carries
Urtica dioica	Roots	Tooth ache
Vitex negundo	Leaves	Toothache
Zingiber officinale	Rhizome	Tooth ache
Ocimum sanctum	Leaves	Tooth inflammation

A gel formulation comprising *Morinda citrifolia*, Papain, aloe vera was developed and tested for its anti-microbial activity against *Enterococcus faecalis*. It was observed that the developed formulation inhibited maximum number of bacterial population in comparison to control. Recently, herbal centered toothpowder was developed by combining clove, neem stems, stevia leaf, salt, ginger, acacia stem, mustard oil, and amla. Their activity against *Streptococcus mutants* were tested [16]. Results indicated that the herbal powder was effective in treating the dental carries and other tooth related disorders.

Thus from the cited information it can be inferred that herbal formulations in any case were found to be effective in treating the disorders of any field which may include but not limited to dental problem, pain related disorders, personal hygiene and alike. Whatever the case may be from the entire test conducted it was observed clearly that herbal formulation was equally or greatly effective than synthetic formulations. This develops an understanding that why people are inclining towards herbal formulations. Also the environmental degradation can be prevented by restricting the usage of synthetic components.

CONCLUSION

Natural plant products due to the presence of active compounds play important role against pathogenic organisms. Moreover, being cost-effective and faith of rural/backwards areas in natural herbs, are gaining importance in regular life of individuals. An herbal product cures diseases without causing any side effects in addition to treating the disease effectively. The present

review discussed about importance of herbal centered products in different medicinal fields. The field discussed here included utilization of herbal formulations as disinfectant, sanitizer, antiseptic ointment, and dentrifices. Some of the active compounds possessing disinfectant property are also discussed herein in a tabulated form. Also list of herbs used as dentrifices is also represented. From all the cited work it was inferred that whatever the situation be, whether it is a comparison between herbal formulation and synthetic formulation at lab scale or any clinical trials experiments, herbal formulation was found to be effective in treating the disease/ailments without causing any lethal effects. Moreover, the costs of such formulations are not much so it can be accessible to any group of the society.

REFERENCES

1. Ramteke VD, Vadlamudi VP, Waghmare SP, et al. Evaluation of anthelmintic activity of indigenous herbal formulation in goats. Indian J Vet Pathol 2008;1-20.
2. Nyachuba D.G. Foodborne illness: Is it on the rise? Nutri Rev. 2010;68(5): 257-269.
3. Snyder CS, Moodie DS. American academy of pediatrics. Congenit Heart Dis 2012;7(2):200-201.
4. Khanam S, Afsar Z. Herbal disinfectants: A review 2013;3(1):258-273.
5. Ranilla LG, Kwon YI, Apostolidis E, et al. Phenolic compounds, antioxidant activity and in vitro inhibitory potential against key enzymes relevant for hyperglycemia and hypertension of commonly used medicinal plants, herbs and spices in Latin

- America. *Bioresour Technol* 2010;101(12):4676-4689.
6. Jiang X, Clark RA, Liu L, et al. Skin infection generates non-migratory memory CD8 + T RM cells providing global skin immunity. *Nature* 2012;483(7388):227-231.
 7. Kimura AC, Johnson K, Palumbo MS, et al. Multistate shigellosis outbreak and commercially prepared food, United States. *Emerg Infect Dis* 2004;10(6): 1147-1149.
 8. Pandya U, Doshi A, Saha, NS. Development of herbal disinfectants formulation for mopping households and its antibacterial activity. *Nat Prod Res* 2017;31(22):2665-2668.
 9. Swathy Anand PJ, Athira S, Chandramohan S, et al. (2016). Comparison of efficacy of herbal disinfectants with chlorhexidine mouthwash on decontamination of toothbrushes: An experimental trial. *J Int Soc Prev Community Dent* 2016;6(1):22-27.
 10. Patankar RS, Chandak N. Formulation of herbal sanitizers and determining their antimicrobial activities against skin pathogens 2018;3(8): 169-177.
 11. Singla D, Sain, K. Formulation of an herbal substitute for chemical sanitizer and its evaluation for antimicrobial efficiency. *Int J Chemtech Res* 2019;12(3):114-120.
 12. Thombare MA, Udugade BV, Hol TP, et al. Formulation and evaluation of novel herbal hand sanitizer. *Indo Am J Pharm Res* 2015;5(01): 483-488.
 13. Tavakoli-Dastjerdi S, Motavasselian M, Emami SA, et al. Efficacy of a combination of herbal gel versus topical diltiazem (2%) in chronic anal fissure healing: A randomized double-blind clinical trial. *J Herb Med Pharmacol* 2019;8(2):139-145.
 14. Rasheed A, Avinash KR, Mohanalakshmi S, et al. Formulation and comparative evaluation of poly herbal anti-acne face wash gels. *Pharm Biol* 2011;49(8):771-774.
 15. Bharathi M, Rajalingam D, Vinothkumar S, et al. (2020). Formulation and evaluation of herbal tooth powder for oral care. *Int J Pharm Life Sci* 2020;8(1):1-5.