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Antimicrobial activity of aloe vera and cucumber extract against enterococcus faecalis and candida albicans - in vitro study.

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Abstract

Introduction: Use of traditional herbal products provided noteworthy antimicrobial properties with fewer side effects. Aloe vera is an herb bestowed with thera peutic and cosmetic pro perties which include anti-in flammatory, antioxidant, anti-bacterial, immune-boos ting and hypo glycaemic properties. Cucumber also exhibits a wide range of in vitro and in vivo pharma co logical effects.

Aim: The aim of the present study was to evaluate the anti-microbial properties of Aloe vera and Cucumber

extracts against Enterococcus faecalis and Candida al bicans cultured in laboratory conditions with by Disk Diffusion tests.

Materials and Methods: Commercially available cu cumber and aloe vera aqueous extracts were pur chased. The anti-bacterial efficacy was tested by disc diffusion method using Brain heart infusion agar media and Sabouraud dextrose agar.

Results: Antimicrobial property of aqueous extracts of Aloe vera and Cucumber showed least to no zone of in hibition against tested microorganisms.

Conclusion: There is no antimicrobial property of aqueous extracts of Aloe vera and Cucumber extract against E. faecalis and C. albicans. So aqueous extracts cannot be used as an antimicrobial remedy to treat oral infections

Keywords: Antimicrobial, Aloe vera, Cucumber C. albicans, E. faecalis, Herbal

Introduction

Oral diseases prevail as the most common oral problem and diverse variants of oral microbes are associated with them²³⁰. E faecalis is a gram-positive, anaerobic, non motile, commensal, spherical bacterium. It is one of the most common patho gens causing no socomial in fections². This bacterium is most commonly found in peri apical lesions³. E. faecalis has been found to colonize in dental implants leading to peri-implantitis. Peri-implantitis has more complex and more diverse patho genic micro flora when compared to Perio don titis⁴.

E faecalis has unique chara cteristics. They are facultative anaerobes and they can survive extreme alkaline pH and high salt concentrations⁵. E faecalis can invade dentinal tubules, structures surrounding implants and resist nutritional flow, resulting in deprivation⁶. Unlike other pathogens, E faecalis can colonize the root canal space and it can also colonize in dental implants. It is the only infectious organism that is capable of surviving without the support of other bacteria^{7,8}. E faecalis may be a "keystone" player in dental implant bone loss or peri-implantitis.

While bacteria play a major part in oral micro biota, fungi also play a small part. C. albicans reside as a com mensal in oral cavity and most frequent colonizer. C. albicans forms a biofilm and hyphae in dental implants to produce hydrolytic enzymes and candialysin⁹. It is more frequently isolated in peri-implantitis, on which it forms a thick biofilm over peri implant surface¹⁰. Antimicrobial therapy is the main treatment for these infections. Since antimicrobial resistance has been docu mented by various drugs against these organisms, the need for natural herbal remedies has increased¹¹.

Aloe vera, an herb bestowed with therapeutic and cosmetic properties, is a member of the Aspho delaceae family with its origin in the African continent¹². It is a cactus-like plant that can grow in hot and dry weather due to its high capacity in maintaining water. Currently, more than 75 active ingredients of the Aloe vera inner gel have been identified.

The gel consists of 98-99% water and the remaining 1-2% contains the active com pounds, including aloes in, aloe Mannan, ace Mannan, aloin, aloe ride, aloe-emodin, methyl chromones, naftoqu in ones, saponin, flavonoids, amino acids, sterols, and vitamins. The levels of these compounds in Aloe plants are highly variable according to species and strain, as well as growth conditions. The pharma co logical actions of Aloe vera gel as studied in vitro and in vivo include anti-in flammatory, antioxidant, anti-bacterial, immune-boosting and hypo glycaemic pro perties.^{13,Error!} Reference source not found.,Error! Reference source not found,15,Error! Reference source not found.

Cucumber (Cucumis sativus L.) belongs to the Cucurbitaceae ¹⁷. The nutrient profile of Cucumis sativus L. includes water (96.4%), carbohydrate (2.8%), iron (1.5 mg/100 g), vitamin B (30 IU/100 g), protein (0.4%), mineral (0.3%), fat (0.1%), calcium (0.01%), phosphorus (0.03%), and ascorbic acid and enzymes such as creps in have also been reported in the fruits¹⁹. Cucumber exhibits a wide range of in vitro and in vivo pharmaco logical effects. Cucumber extract showed antioxidant activities against various assays including total oxyradical scavenging capacity (TOSC) assay, DPPH, reduction assay, Trolox equivalent anti-oxidant capacity

(TEAC), total radical-trapping anti-oxidant parameter (TRAP) or ferric reducing-anti oxidant power (FRAP) assays.^{20,21,22,23} Cucumis sativus L. fruit and seed extracts are reported to have antibacterial and antifungal activity. ^{24, 25} Cucumis sativus L. showed cytotoxic activity against human cancer cell lines²⁶.

Several bioassays such as disk-diffusion, well diffusion, and broth or agar dilution are well known and commonly used to evaluate the antimicrobial property of these natural, herbal components. So, this study is aimed to evaluate the antimicrobial properties of Aloe vera and Cucumber extracts against Enterococcus faecalis and Candida albicans cultured in laboratory conditions with by Disk Diffusion tests.

Materials and methods

Study design was In-vitro experimental study. This study was approved by The Institutional Ethics Committee with Code No – 07022302. The study was conducted in the Department of Microbiology, Tagore Dental College and Hospital, Chennai, India.

Sample collection:

Commercially available cucumber (Cucumis sativus) and aloe vera aqueous (Aloe babrdensi smiller) extracts from Purenso select Brand were purchased. Both the extracts are prepared by Hydro extraction method.

Microbiological procedures

The antimicrobial property of aqueous extracts of Aloe vera and cucumber extracts was assessed against Entero coccus faecalis (ATCC 19433) and Candida albicans using well diffusion method. To culture Enterococcus faecalis - Brain heart infusion (BHI) agar was used and to culture Candida albicans - Sabouraud dextrose agar (SDA) [Fig1] was used. Pure culture of C. albicans ATCC 76615 was maintained in SDA media for 37° C for 24 hours and E. faecalis ATCC 19433 was main tained in Brain heart infusion agar for the same 37° C for 24 hours [Fig2]. For each microorganism, three such plates were prepared and total of 6 plates were incu bated. In the first agar plate 3 wells of each 8 mm diameter was punched and were filled with aqueous extract of Aloe vera in one well of each plate [Fig3]. In the second agar plate, similar volumes of aqueous extract of Cucumber were filled in the wells. Likewise, all the 6 plates were filled. All the plates were incubated at 37°C for 18 hours. The antibacterial activity was interpreted from the size (diameter) of inhibition zone observed as clear zone surrounding each well on the agar plates.







Fig 2: Pure culture growth of (a) E. faecalis (b) C. albicans



Fig 3: Aqueous extracts of Aloe vera and cucumber. **Results**

Aqueous extract of Aloe vera and Cucumber did not demonstrate antibacterial property against Enterococcus faecalis and Candida albicans by well diffusion method. No zone of inhibition was appreciated around the wells of the plates incubated in both against Enter ococcus faecalis and Candida albicans.

Conclusion

Different parts and various types of extracts possess different spectrum of antimicrobial properties. Aqueous extracts do not possess any significant antimicrobial properties against Enter ococcus faecalis and Candida albicans. This study may be useful to evaluate and com pare the antimicrobial potential of Aloe vera and Cucumber in different extracts in further studies. Future studies are required to assess the antimicrobial properties against various other oral pathogens.

Discussion

Oral diseases are most profoundly caused by oral micro biota²³⁰. E. faecalis is the most commonly found organism in cases of failed treatments and resistant infections. C, albicans is also a most commonly found commensal in oral cavity. E. faecalis and C. albicans are one of the major micro-organisms causing periimplantitis¹⁰.

Several antimicrobial agents are available for treatment of these infections but they may exhibit intrinsic or secondary resistance to the drug during treatment²⁷. Some of them include toxicity to drugs, immediate hyper sensitivity reactions, tooth staining².

To overcome these possible limitations, the needs for natural herbal remedies have increased¹¹. The main need for these herbal extracts is that they are safer to the human body, abundantly available, have therapeutic pro perties and economical.

The natural herbal remedy used in our study is the Aloe vera which is now a growing trend due to their enormous therapeutic properties like anti - inf lammatory, antibacterial, wound healing and anaesthetic properties¹⁴⁻¹⁷. Aloe vera also possess anti-oxidant activity. This was observed in two non-cellular in vitro systems and by incubation with inflamed body part tissue layer bio psies³². We also used another herbal product which is the Cucumber extract which is shown to possess antifungal, antioxidant and cytotoxic properties²⁴⁻²⁶. Review of literature revealed that aqueous and ethanolic extract of Aloe vera has shown antimicrobial properties. However, ethanolic extract of Aloe vera was found to possess better antibacterial property than the aqueous extract against Entero coccus faecalis²⁸. However there were not many known studies regarding the antimicrobial activity of Cucumber extracts against C. albicans.

The aim of the study was to evaluate the antimicrobial properties of Enterococcus faecalis and Candida albicans against commercially available Aloe vera and Cucumber extract. Agar well diffusion method is the most commonly used method for evaluating the antimicrobial pro perties of plant or animal extracts²⁹.

However aqueous extract of Aloe vera and Cucumber extract did not inhibit Enterococcus faecalis and Candida albicans.

The result of our study is in accordance with a study conducted by Yavagal et al²⁸ in which they concluded that aqueous extract of Aloe vera does not possess appreciable antibacterial property whereas Ethanolic extract of Aloe vera possess antibacterial property against Enterococcus faecalis. A study conducted by Ehsani M et al ³⁰ showed that Aloe vera gel produced weak antibacterial activity in disk diffusion and micro dilution tests against E. faecalis, S. mutans and S. aureus. Using the agar diffusion method, Pandy and Mishra¹⁷ demonstrated that an ethanolic extract of Aloe vera leaves produced a wider zone of growth inhibition than the aqueous extract against Enterococcus aureus.

Foongs et al³¹ in another study said that on antibacterial assay, the aqueous Cucumber extracts were inactive against all microorganisms tested. The results well predicted as the extracts from organic solvents exhibit more significant antimicrobial activities compared to the aqueous extracts.

This study showed that there is least to no antimicrobial property of aqueous extracts of Aloe vera and Cucumber extract against E. faecalis and C. albicans. Hence aqueous extracts cannot be used as an antimicrobial remedy to treat oral infections.

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