Research Article

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Evaluation of the Antibacterial Efficacy of the Aloe Vera: An In Vitro Study

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ABSTRACT

Background: To evaluate the antibacterial properties of Aloe vera through effect on the cultures of pathogenic microorganisms.

Material & Methods: Agar disc diffusion method was used for the assessment of antibacterial activity of aloevera. Five different concentrations (1.6%, 3.125%, 6.25%, 12.5%, 25%) of aloe vera extract was made by dilution with inert solvent saline. The extracts were subjected to microbiological investigation to evaluate the antibacterial property of aloe Vera. Zones of inhibition were measured in millimetre by using Vernier calliper.

Results: Aloevera was found to be effective against both S. mutans and L. casei.. **Conclusion:** Aloevera, was found effective against streptococci and lactobacilli.

Keywords: Antimicrobial activity, aloe-vera , streptococcus, L. casei.

INTRODUCTION

Dental caries is an irreversible microbial disease of the teeth characterized by demineralization of the inorganic portion and destruction of the organic substance of the tooth which often leads to cavitation.[1]It is a complex and dynamic process where a multitude of factors influence and initiate the progression of disease. There are practically no geographic areas in the world where inhabitants do not exhibit some evidence of dental caries. Due to global antibiotic resistance by bacteria the race to discover new antibacterial agents is on.[1] One approach involves the search for new therapeutic agents with novel modes of action from natural resources.[2] Aloe vera has been found to be effective against many gram positive and gram negative bacteria ie Staphylococcus aureus Escherichia coli, Helicobacter pylori and salmonella typhi, Klebsiella pneumonia, streptococcus pyogenus, Pseudomonas aurigonosa,.[3,4] Anthraquinones. and saponins in aloe vera have direct antibacterial properties ,while indirect bactericidal activity attributed to polysaccharides through stimulation of phagocytic leukocytes to destroy bacteria .[5] The current study is intended to evaluate and compare invitro, the efficacy of Aloe Vera and Tulsi as anticariogenic agents with saline as a control.

MATERIALS AND METHODS

Preparation of Aloe vera extract

Fresh Aloe vera leaves were dried in sun light. 300 gm of powdered aloe vera was macerated with 100% ethanol. The extracts were filtered with Whatman filter paper to obtain a clear filtrate. The

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filtrates were reduced at 60^{0}C to obtain a solid residue.

Preparation of 5 different concentrations of extracts.

To make a solution of 25%, 1 gm of extract was added into 4 ml of sterile saline.1ml of solution was then added to 1ml of sterile saline to create 12.5% dilution of the extract. In similar manner separate solutions of 6.25%, 3.125%, and 1.6% were prepared.

Reagent and material:

Brain heart infusion agar, Rogosa agar, S mutans culture, Lactobacilllus casei culture, sterile glass petri dishes, Aloevera.

Method:

Brain heart infusion agar and Rogosa agar media were prepared according to manufacturer's instructions. 20ml of medium was poured into sterile glass petri dishes. After the medium was set, 5 holes of 8mm diameter were punched out in the medium and agar plugs were removed. S mutans and Lactobacilli casei cultures removed from stock and concentration adjusted to 10^5 organism/ml were used for inoculation of the medium. BHI agar was used for S. mutans and Rogosa agar for L. casei.

Once the organism were inoculated and spread on the surface of the medium, plates were inoculated with aloe vera. One plate was used for one particular concentration of the extract. In each plate 5 different holes were filled with different volume of extract (75 micro liter, 50 micro liter, 25 microliter, 10 micro liter, 5 micro liter) of one particular concentration of extract. The concentration used was 1.6%, 3.125%, 6.25%, 12.5%, 25%. The plates were incubated in CO_2 for 48 hrs and the zone of inhibition was noted, measured and recorded. [fig 1-2]

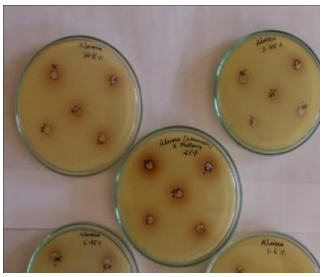


Fig 1

Fig 2

Fig 1-2: Showing zone of inhibition of streptococcus mutans and Lactobacilli by Aloevera

RESULTS

Strains of *S. mutans and Lactobacillus casei* were selected to study the effect of aloevera extract. Antimicrobial activities of Aloevera against streptococcus mutans are shown in table I. At the 6.25% concentration of aloevera, a minimum zone of inhibition of 15 mm was achieved at a volume of 50 µl and 12 mm at 25µl. At lower volumes, A maximum zone of inhibition (26mm) was achieved at 25% concen -tration and 75µl volume. Against Lactobacillus casei Aloevera showed minimum zone of inhibition at 3.125% and 50 µl volume and 28mm of maximum zone of inhibition was achieved at a volume of 75µl and 25% concentration..(Table 2)

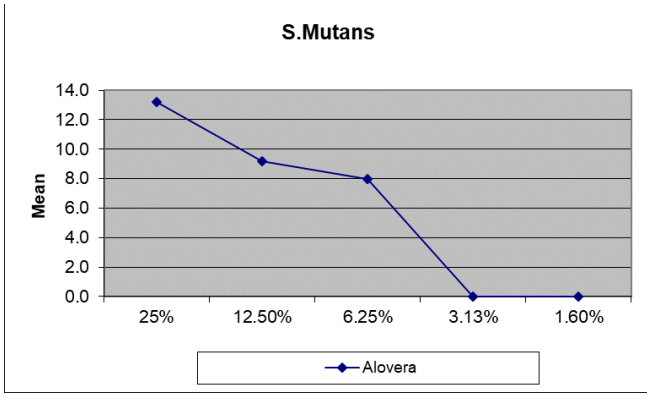
Table 1: Zone of inhibition against Streptococcus Mutans

	Concentration				
Alovera	**25%**	**12.5%**	**6.25%**	**3.125%**	**1.6%**
75 ml	26 mm	18 mm	15 mm	R	R
50 ml	22 mm	15 mm	15 mm	R	R
25 ml	18 mm	15 mm	12 mm	R	R
10 ml	R	R	R	R	R
5 ml	R	R	R	R	R

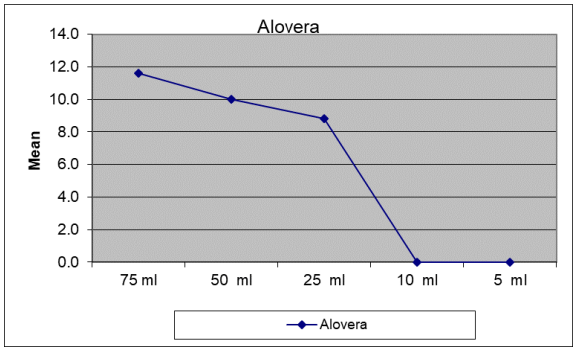
Table 2: Zone of inhibition against Lactobacilli casei

	Concentration				
Alovera	**25%**	**12.5%**	**6.25%**	**3.125%**	**1.6%**
75 ml	28 mm	20 mm	15 mm	12 mm	R
50 ml	24 mm	17 mm	10 mm	10 mm	R
25 ml	13 mm	12 mm	R	R	R
10 ml	R	R	R	R	R
5 ml	R	R	R	R	R

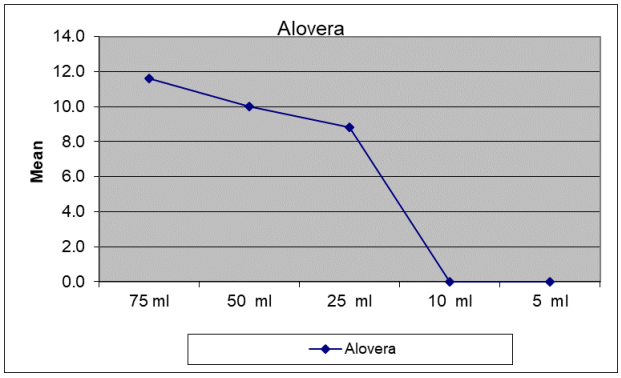
Graph 1: Zone of inhibition against Streptococcus Mutans at different concentrations of Aloe vera extract



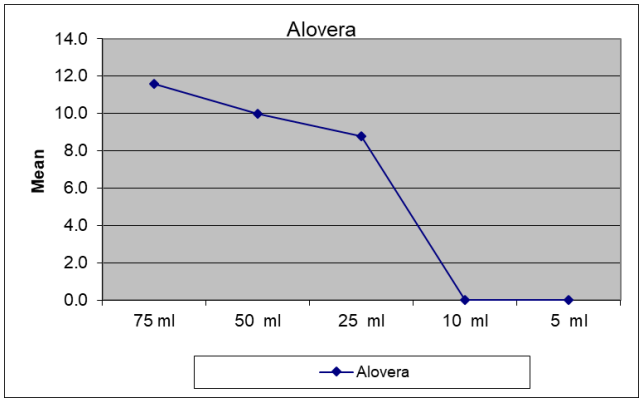
Graph 2: Zone of inhibition against Streptococcus Mutans at various volumes of Aloeera extract.



Graph 3: Zone of inhibition against Lactobacilli at different concentrations of Aloe vera extract



Graph 4 : Zone of inhibition against Lactobacilli at various volumes of different Aloe vera extract



DISCUSSION

Tooth decay is caused by certain type of acid producing bacteria, specifically streptococcus mutans and lactobacillus which cause damage in the presence of fermentable carbohydrates such as sucrose, fructose and glucose.[1] so streptococcus mutans and Lactobacilli are the main culprit micro organism responsible for dental caries. For prevention of dental caries their level should be reduced in oral cavity.

Plants and herbs have been in use as a source of therapeutic compounds. since ancient time .plants

has got a great attention of scientist for the development of alternative drugs to cure different diseases. Aloe vera was used in the current study. Anthraquinones and saponins found in whole leaf of aloevera have direct antibacterial properties whereas polysaccharides have an indirect bactericidal activity through stimulation of phagocytic leukocytes to destroy bacterias. Its antibacterial activity can be easily utilized for prevention of dental caries.[6]

According to a recent study, based on Gas Chromatography Mass Spectrometry, antibacterial property of aloevera is due to p- coumaric acid (Mol. Wt. 165), ascorbic acid (Mol. Wt. 177), pyrocatechol (Mol. Wt .110), and cinnamic acid (Mol. Wt 148).[7] It has been reported that flavonoid constitutes of the plant posses antioxidant properties.[8] Phenolic constituents of the plant are found to be highly effective free radical scavengers and also exhibit antioxidant properties.[9]

Urasolic acid and Carvacrol are other ingredients which can be responsible for the antibacterial activity of the plant. Aloe vera abundantly available, easily accessible, economical feasible and may poses minimum side effect.

CONCLUSION

Aloevera is effective against both streptococcus mutans and Lactobacillus casei. Future in vivo studies are needed for deeper understanding about these herbs.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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