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**Research Article** 

## ANTIMICROBIAL ACTIVITY OF ALOE VERA GEL EXTRACT AGAINST DENTAL PATHOGENS

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#### ABSTRACT

The present study was conducted to assess the antimicrobial potential of *aloe vera* against bacterial strains which causes the dental caries by disc diffusion technique. The organisms reported to cause dental caries such as *Streptococcus mutans, Streptococcus salivarious* and *Fusobacterium nucleatum* were used to evaluate the antimicrobial activity of *Aloe vera* gel extract, which were isolated from dental caries. Ethanolic extract of *Aloe vera* gel at various  $(100 - 500 \ \mu g)$  concentrations were used and the antimicrobial activity was evaluated by disc diffusion method. Doxycycline (100mg) was used as positive control for comparison. Ethanolic extract of *Aloe vera* gel exhibited dose dependent inhibition against *Streptococcus mutans* and *Streptococcus salivarious*. All the concentrations of ethanolic extract of *Aloe vera* gel showed strong antibacterial activity against *Fusobacterium nucleatum*. From the result it was concluded that, ethanolic extract of *Aloe vera* gel exhibited antimicrobial activity against the organisms which causes dental caries.

**Keywords:**-Aloe vera gel, Dental caries, Antimicrobial activity, *Streptococcus mutans, Streptococcus salivarious* and *Fusobacterium nucleatum*.



#### INTRODUCTION

Ayurveda is a medical system primarily practiced in India that has been known for nearly 5000 years recommends a combination of lifestyle management, and treatment with specific herbs to cure various diseases. There are approximately 1,250 medicinal plants being used in formulating beneficial measures [1]. Herbal medicines have two special characteristics that distinguish them from chemical drugs, use of crude herbs and prolonged usage. Experience has shown that there are real benefits in the long-term use of whole medicinal plants and their extracts, since the constituents in them work in conjunction with each other. Several popular conventional drugs on the market are from various herbs.

Herbal medicines have fewer side effects and are safer to use than conventional medications. It is well documented that medicinal plants confer considerable antibacterial activity against various microorganisms including bacteria's responsible for dental caries. Phytochemicals for the prevention, treatment and maintenance of periodontal diseases are identified. They may be tannins, terpenoids, flavonoids, alkaloids, etc. Antimicrobial activities of these have been found to be particularly useful for periodontal diseases [2].

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Aloe vera (L.) is a perennial succulent xerophyte, which develops water storage tissue in the leaves to survive in dry areas of low or erratic rainfall. The innermost part of the leaf is a clear, soft, moist, and slippery tissue that consists of large thin-walled parenchyma cells in which water is held in the form of a viscous mucilage [3]. Therefore, the thick fleshy leaves of aloe plants contain not only cell wall carbohydrates such as cellulose and hemicellulose but also storage carbohydrates such as acetylated manners [4]. Aloe vera has been used for many centuries for its curative and therapeutic properties, and although over 75 active ingredients from the inner gel have been identified, therapeutic effects have not been correlated well with eachindividual component [5].

Many of the medicinal effects of aloe leaf extracts have been attributed to the polysaccharides found in the inner leaf parenchymatous tissue [6], but it is believed that these biological activities should be assigned to a synergistic action of the compounds contained therein rather than a single chemical substance [7]. Apart from Aloe being used extensively in the cosmetic industry, it has been described for centuries for its laxative, antiinflammatory. immunostimulant, antiseptic [8]. wound and burn healing [9], antiulcer [10], antitumor [11], and anti-diabetic [12] activities. In dental complications, Aloe vera was found to be used in the sites of periodontal surgery, toothpick injuries, chemical burns, aphthous ulcers, gum abscesses, dry socket, lichen planus, benign pemphigus and gingival problems associated with AIDS, leukemia, migratory glossitis, geographic tongue and burning mouth syndrome, denture sore mouth, candidiasis, desquamative gingivitis, vesiculobullous diseases, acute monocytic leukemia, xerostomia [13]. The major challenge and problem is the lack of scientific evidence on Aloe vera for its effect on dental caries, so effort was taken to study the antimicrobial activity of ethanolic extract of Aloe vera gel against the bacteria causing dental caries.

#### MATERIALS AND METHODS

# Collection of Clinical Sample, Isolation and Identification of Dental Pathogen

Dental plaque samples were collected from the adult patients in Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry. The dental plaque sample was inoculated on blood agar plates and incubated for 18-24 hours at 37°C streak plate technique and the pathogens were isolated and identified by Bergey's manual [14].

#### Plant Collection & Authentication

Aloe vera was collected from the medicinal garden of Sri Lakshmi Narayana Institute of Medical

#### Extraction of gel from *Aloe vera* leaves

The fully expanded leaves of *Aloe vera* were selected from the plants, washed with distilled water and were subjected to surface sterilization with 70% Iso propyl alcohol. The Parenchymatous covering of the leaves were peeled and the gel drained out. Slurry was formed with the help of pestle and mortar, leaf gel was dried in the oven at 80°C for 48 h. and then powdered. 10 grams of this powder was soaked in 100ml ethanol as solvent, for 24 h. The contents were then filtered through Whatman filter paper no. 1 and the filtrate was evaporated to dryness. This dried extract was further powdered and stored in refrigerator.

#### **Preparation of Disc**

The discs were prepared by sterile filter paper dried in an oven to remove moisture. The extracts were applied on the dried filter paper disc by micropipette to obtain disc containing 100µg, 200µg, 300µg, 400µg and 500µg of extract concentration in each disc.

#### **Antibacterial Assays**

Antibacterial activities of ethanolic extracts of *Aloe vera* gel were evaluated by disc diffusion method. A 100  $\mu$ L of diluted bacterial suspension (5 x 106 cfu mL-1) of test bacterial strains was spread on the surface of Muller Hinton agar. Then sterile disc containing 100  $\mu$ g, 200  $\mu$ g, 300  $\mu$ g, 400  $\mu$ g and 500  $\mu$ g of *Aloe vera* gel extracts was placed onto the surface of agar plate. For negative control, discs were impregnated with solvent. Plates were incubated at 37°C for 24 h and diameters of inhibition zones (mm) were determined.

#### **RESULTS AND DISCUSSION**

Antimicrobial activity of ethanolic leaf extract of *Aloe vera* gel (100  $\mu$ g – 500  $\mu$ g) was studied against *Streptococcus mutans, Streptococcus salivarious* and *Fusobacterium nucleatum* by disc diffusion method and the result were given in table 1. Doxycycline was used as reference control. *Aloe vera* gel extract exhibited dose dependent antimicrobial activity against *Streptococcus mutans* and *Streptococcus salivarious*.

The zone of inhibition *Aloe vera* gel extract at 100  $\mu$ g against *Streptococcus mutans* and *Streptococcus salivarious* was 8.35±0.74 and 6.71±0.21 respectively. The zone of inhibition of *Aloe vera* gel extract at 500  $\mu$ g against *Streptococcus*  mutans and Streptococcus salivarious was increased to 16.42±0.84and 15.78±0.92 respectively. There was dose dependent increase in antimicrobial activity of Aloe vera gel extract against Streptococcus mutans and Streptococcus salivarious. The zone of inhibition of *Aloe vera* gel extract at 100 µg and 500 µg against *Fusobacterium nucleatum* was  $15.32\pm0.62$  and  $16.51\pm0.71$  respectively. The antimicrobial activity of *Aloe vera* gel extract was comparable to the effect of Doxycycline.

Table	1.	Antimicrobial	activities	of	ethanolic	leaf	extract	of	Aloe	<i>vera</i> gel	against	Streptococcus	mutans,
Streptococcus mutans and Fusobacterium nucleatum by disc diffusion method													

		Zone of Inhibition (mm)						
Extract	Concentrations	Streptococcus	Streptococcus	Fusobacterium				
		mutans	salivarious	nucleatum				
Doxycycline	100mg	18.35±0.95	17.66±0.42	16.88±0.74				
Ethanolic	100 µg	8.35±0.74	6.71±0.21	15.32±0.62				
Leaf Extract	200 µg	10.40±0.96	8.61±0.31	15.76±0.16				
of	300 µg	12.82±0.82	10.23±0.72	16.29±0.93				
Aloe vera gel	400 µg	15.31±0.77	13.48±0.53	16.32±0.84				
	500 μg	16.42±0.84	15.78±0.92	16.51±0.71				

#### CONCLUSION

The antimicrobial activity of ethanolic leaf extract of *Aloe vera* gel extract was studied on dental caries causing dental pathogens. From the result it was concluded that, ethanolic extract of *Aloe vera* gel exhibited dose dependent inhibition against *Streptococcus mutans* and *Streptococcus salivarious*. All the concentrations of ethanolic extract of *Aloe vera* gel showed strong antibacterial activity against *Fusobacterium nucleatum*. From the study it was found that, natural products may be the easy way in controlling the various dental disorders with a least side effect.

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