



## Ethnodentistry –*Cynodon dactylon* availing in periodontology

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### Abstract

**Context:** *Cynodon dactylon* (durva) is a perineal grass, one of the most commonly occurring weeds in India. It is considered a sacred grass next to Tulsi by the Hindus. This plant is recognized for its cooling, hemostatic, diuretic and tonic properties since ancient times. According to Ayurveda, *Cynodon dactylon* plant is pungent, bitter, fragrant and it also has heating, anthelmintic, antipyretic and hemostatic properties. Given the alarming incidence of antibiotic resistance in pathogens raises concern among medical practitioners, there is constant need for new and effective therapeutic agents. Hence there is a need to develop alternative antimicrobial drugs for the treatment of infectious disease from medicinal plants.

**Aims:** To determine the antimicrobial activity of *Cynodon dactylon* (Minimum inhibitory concentration and zone of inhibition) against *Aggregatibacter actinomycetemcomitans*, *Porphyromonas gingivalis* and *Tannerella forsythia* in human dental plaque.

**Methods and Material:** A lab based invitro experimental study design was adopted. Methanolic extract of *Cynodon dactylon* was prepared. Pure cultures of *A. actinomycetemcomitans*, *P. gingivalis* and *T. forsythia* were obtained and antimicrobial activity of *C. dactylon* extract was tested.

**Results:** Minimum inhibitory count of *Cynodon dactylon* for *A. actinomycetemcomitans* is 0.625 mg/ml, *P. gingivalis* is 1.25 mg/ml and *T. forsythia* is 2.5 mg/ml. Minimum bactericidal concentration of *Cynodon dactylon* for *A. actinomycetemcomitans* is 10 mg/ml, *P. gingivalis* is 10 mg/ml and *T. forsythia* is 10 mg/ml.

**Conclusions:** *Cynodon Dactylon* methenolic extract demonstrated an antimicrobial activity against *A. actinomycetemcomitans*, *P. gingivalis* and *T. forsythia*. maximum antimicrobial potential was observed against *A. actinomycetemcomitans* that is 0.625 mg/ml. thus this product can be used in mouthwash, toothpaste, local drug delivery agent for treating periodontal diseases.

**Keywords:** *Cynodon Dactylon*; Periodontitis; Durva; Plaque; Antimicrobial

### Key Messages

The resistance to antibiotics among microorganisms has reached the summit. Hence the world is badly in need of alternative therapeutic agents. An attempt has been made to highlight the use of Bermuda grass in treatment of periodontitis. This study determines the antimicrobial activity of *Cynodon dactylon* (Bermuda grass) against few of the periodontal pathogens such as *A. actinomycetemcomitans*, *P. gingivalis* and *T. forsythia*.

### Introduction

Periodontal disease is a chronic infectious disease of the oral cavity and one of the leading causes of tooth loss in humans. This chronic inflammatory disease that affects the supportive tissues of the teeth has a complex etiology [1]. One of the major etiological

factors for periodontal disease is the dental plaque biofilm on the teeth surfaces [2]. The noxious products produced by the bacteria in dental plaque triggers the inflammatory process in the periodontal tissues [3].

Medicinal plants play a very important role in pharmaceutical industry in developing alternative drugs to overcome the pitfalls possessed by the synthetic drugs. The development of drug resistant pathogens that are mostly involved in nosocomial infection has raised concern among the medicinal practitioners. It was believed that the intense use of a number of synthetic antimicrobial drugs also contributed to the development of various side effects. Given the alarming incidence of antibiotic resistance in pathogens raises concern among the medicinal practitioners, there is a constant need for new and effective therapeutic agents. Hence there is

a need to develop alternative antimicrobial drugs for the treatment of infectious diseases from medicinal plants [4].

Bermuda grass is known by many names such as doob grass, durva grass, dogs tooth grass, devils' grass, conch grass, and *Cynodon dactylon*. It is named as dog's tooth grass because dogs search this grass for its stomach ailments, hence the name. *Cynodon dactylon* is a perineal, pantropical species of grass which belongs to the family poaceae, it is found almost everywhere in tropical, sub-tropical and even in semi-arid climates (Watson and Dallwitz 1992). It is grown in the tropical climate ranges between latitude of 30°S and 30°N [5]. Scientifically it is tested to have antidiabetic effect, diuretic activity, antioxidant, anticancer potentials, anti-ulcer activity, right heart failure protecting activity, and anti-allergic effect. Traditionally *C. dactylon* is used as a rejuvenator and for wound healing [6].

The aim of this study was to determine the antimicrobial activity of *C. Dactylon* against some periodontal pathogens such as *A. actinomycetumcomitans*, *P. gingivalis*, *T. forsythia* which are the main causative organisms in periodontal diseases.

## Subjects and Methods

### Plant collection (*Cynodon dactylon*)

The plant *Cynodon dactylon* was authenticated and collected from the Indian council of medical research center, Belagavi. Samples were collected during the day light time. Prior to extraction, the plant sample were cleaned thoroughly with distilled water to remove soil and dirt.

### Plant extraction

The whole plant of *Cynodon dactylon* which was cleaned by distilled water was dried for 24 hours in a drying chamber at 40°C and powdered using a mechanical blender. Approximately 40g of this powder was later soaked in 150 ml methanol and shaken on a platform shaker at 970 rpm with temperature of 25°C. The mixture was then filtered three times using activated charcoal crystals and filter paper to obtain the plant extract. This plant extract was later sonicated for 40 minutes at 40°C, after which it was evaporated and concentrated using laboratory water bath for 24 hours until a thick gelatinous form of extract was obtained.

### Test microorganisms

ATCC strains of three different periodontal pathogens were obtained from KLE University's Dr. Prabhakar Kore Basic Research Centre, Belagavi, Karnataka. The test microorganisms in our study were *Tannerella forsythia* (ATCC 43037), *Porphyromonas gingivalis* (ATCC 322) and *Aggregatibacter actinomycetumcomitans* (ATCC 33384).

### Antimicrobial study

Minimum inhibitory concentration (MIC) of Bermuda grass was assessed against ATCC (American type culture collection) strains of *Tannerella forsythia* (ATCC 43037), *Porphyromonas gingivalis* (ATCC 322) and *Aggregatibacter actinomycetumcomitans* (ATCC 33384). Inoculums of standard strains of organisms were prepared as per 1.0 McFarland standard. Culture media used was brain heart infusion (BHI) broth. 10 mg/ml was the concentration of Bermuda grass used. Dissolving media: dimethyl sulfoxide (DMSO). Serial dilution starts from 2<sup>nd</sup> tube and was continued till 9<sup>th</sup> tube. The first tube was positive control and 10<sup>th</sup> tube was negative control.

Dilution tubes	<i>T. forsythia</i> MIC	<i>p. gingivalis</i> MIC	A. a MIC	<i>T. forsythia</i> MBC	<i>p. gingivalis</i> MBC	A.a MBC
1	+	+	+	+	+	+
2	+	+	+	-	-	-
3	+	+	+	-	-	-
4	-	+	+	-	-	-
5	-	-	+	-	-	-
6	-	-	-	-	-	-
7	-	-	-	-	-	-
8	-	-	-	-	-	-
9	-	-	-	-	-	-
10	-	-	-	-	-	-

Table 1

## Results

Minimum inhibitory concentration value of *Cynodon dactylon* for

- *actinomycescomitans* is 0.625 mg/ml,
- *P. gingivalis* is 1.25 mg/ml.
- *T. forsythia* is 2.5 mg/ml.

Minimum bactericidal concentration value of *Cynodon dactylon* for

- *actinomycescomitans* is 10 mg/ml.
- *P. gingivalis* is 10 mg/ml.
- *T. forsythia* is 10 mg/ml.

## Discussion

Periodontitis is a multifactorial inflammatory disease affecting the tissue surrounding the teeth. Various chemotherapeutic agents have been administered locally, orally or parenterally to treat the bacterial etiology along with conventional therapy. The administration of systemic antimicrobial drugs has failed to achieve the adequate concentration at the required sites and its frequent usage has led to bacterial resistance.

Studies proved that gram negative bacteria were more resistant to antibiotics than gram positive bacteria [4]. In the arena of local drug delivery, literature shows effective use of herbs like tulsi, green tea, aloe vera, neem. However, no study has been reported using *Cynodon Dactylon*, a commonly found weed in the treatment of periodontal diseases.

Bermuda grass consists of large number of organic compounds such as alkaloids, flavonoids, glycosides, tannins, terpenoids and other phenols as secondary metabolites which are used as defense mechanisms against specific pathogens (Fransisco and Pinotti 2000, Zwenger and Basu 2008, Chong, et al. 2011) [4].

This study demonstrated the antimicrobial activity of *Cynodon Dactylon* against some periodontal pathogens and proved to be most effective against *A. actinomycescomitans* which is the main causative organism for aggressive periodontitis. This study is in agreement with Janurius Gobilik and Khim Phin Chong who reported that *Cynodon Dactylon* has antimicrobial activity against some common pathogens such as *Escherichia Coli*, *Staphylococcus aureus* and *Pseudomonas aeruginosa*, which are highly associated with nosocomial infection. Another similar study by Jigna Parekh et al reports the antimicrobial activity of *C. dactylon* against *S. epidermidis* and *B. subtilis* which causes food poisoning [7].

In future we are planning to incorporate the methanolic extract of *Cynodon dactylon* in mouthwash, toothpaste, oral irrigants, and as a local drug delivery agent as this grass is easily available, abundant in our region, very economical and easily recognizable, it is feasible to conduct experimental work and results obtained would be very helpful for designing the large clinical trials to treat periodontal diseases.

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