

Antibacterial effect of *Andrographis paniculata* against oral microbes - An *in vitro* study

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ABSTRACT

Aim of the Study: The aim of the study was to assess the antibacterial effect of nilavembu extract in dental plaque samples. **Methodology:** This study was carried out in the Saveetha Dental College Outpatient, Department of Periodontics and Microbiology Laboratory. The plaque sample was collected using the curette and transported into the tryptic soy broth, then inoculated into 100%, 200%, and 400% nilavembu extract in the nutrient agar medium. Plaque sample was also placed in the nutrient agar medium without nilavembu extract by streaking method. Then, it was cultured for 48 h, and the bacterial count was noted. **Results:** The study shows that the bacterial growth was reduced by the use of nilavembu extract. Bacterial count without using nilavembu extract was higher than that of medium with nilavembu extract. **Conclusion:** Nilavembu has the ability to reduce the bacterial growth. Nilavembu can be used as an adjunct to scaling and root planing for the treatment of periodontal diseases.

KEY WORDS: Bacterial reduction, Nilavembu extract, Periodontal diseases

INTRODUCTION

Oral diseases are major health problems with dental caries and periodontal diseases among the most important preventable global infectious diseases.^[1] The development of dental caries involves acidogenic and aciduric Gram-positive bacteria.^[2] Periodontal diseases have been linked to anaerobic Gram-negative bacteria.^[3] Various treatment methods including mechanical therapy, local drug delivery system, and flap surgery were used for periodontal diseases. In particular, traditional medicinal plant extracts or phytochemicals that have been shown to inhibit the growth of oral pathogens, reduce the development of dental plaque, influence the adhesion of bacteria to surfaces, and reduce the symptoms of oral diseases will be discussed subsequently.^[4] *Andrographis paniculata* is an annual, branched, herbaceous plant erecting to a height of 30–110 cm in moist, shady places. The stem is acutely quadrangular, much branched and can be broken easily due to its fragile texture.

A. paniculata, commonly known as “King of Bitter”, is a small, annual, branched, and erect plant belongs to the family Acanthaceae.^[5] *A. paniculata* contains diterpenes, lactones, and flavonoids. Flavonoids mainly exist in the root but have also been isolated from the leaves. The aerial parts contain alkanes, ketones, and aldehydes. Although it was initially thought that the bitter substance in the leaves was the lactone andrographolide, later investigations showed that the leaves contained two bitter components - andrographolide and a compound named kalmeghin.

The herbs and its isolates such as isoandrographolide, neoandrographolide, andrographolide, and isoandrographolide are reported to possess antibacterial, anti-inflammatory, hepatoprotective, antidiabetic, antimalarial, antimicrobial, and anti-HIV activity.^[6] *A. paniculata* is used as a folk medicine for reducing inflammation. Three ingredients deoxy andrographolide, Andrographolide, and neoandrographolide are effective in reducing inflammation. The quinic acids were extracted only from the whole plants using the methanol solvents, and they are functioning as an antiplatelet aggregator. Andrographolide and its derivatives have anti-

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ISSN: 0975-7619

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Received on: 21-08-2018; Revised on: 25-09-2018; Accepted on: 27-10-2018

inflammatory effects in experimental models asthma, stroke, and arthritis.^[7,8] The aim of the study was to assess the antibacterial effect of *A. paniculata* against the oral microbes.

MATERIALS AND METHODS

This study was carried out in the Saveetha Dental College Outpatient Department of Periodontics and Microbiology Laboratory. Nilavembu extract was obtained from the VJ pharmaceuticals. It was an ethanolic extract. The sample was collected and split into four different groups.

Group 1: With 100% nilavembu extract. It was prepared by adding 10 μ of nilavembu extract using the micropipette.

Group 2: With 200% nilavembu extract. It was obtained by adding 20 μ of nilavembu extract using the micropipette.

Group 3: With 400% nilavembu extract. It was obtained by adding 40 μ of nilavembu extract using the micropipette.

Group 4: Without nilavembu extract.

Inclusion Criteria

The following criteria were included in this study:

- Persons in the age group of 30–40 years.
- Systemically healthy individuals.
- Patient with periodontal pockets.

Exclusion Criteria

The following criteria were excluded from the study:

- Persons with other systemic illness such as diabetes, cardiovascular disease, renal failure, stroke, and endocrine illness.
- Persons with an acute illness such as fever and immunocompromised persons.
- Chronic alcoholics and smokers.
- Persons with other liver disorder like jaundice.

The plaque sample was collected using the curette and transported into the tryptic soy broth, then inoculated into 100%, 200%, and 400% nilavembu extract in the nutrient agar medium. Plaque sample was also placed in the nutrient agar medium without nilavembu extract

by streaking method. Then, it was cultured for 48 h, and the bacterial count was noted.

RESULTS

The antibacterial efficacy of *A. paniculata* was statistically analyzed using the paired *t*-test. The study shows that the bacterial growth was reduced by the use of nilavembu extract to an extent. Bacterial count without using nilavembu extract was higher than that of medium with nilavembu extract.

The mean microbial count without using nilavembu extract was 190; the microbial count was reduced to 78 by the use of 100% nilavembu extract, further reduction in the microbial count to 44 was achieved by the use of 200% nilavembu extract. Reduction of the microbial count to 13 was obtained by the use of 400% nilavembu extract. This shows that nilavembu extract can be used as an antibacterial agent against the oral microbes.

Tables 1 and 2 showed the bacterial reduction between two concentrations of nilavembu (100% and 200%). In between these two, the microbial count was reduced by 200% nilavembu extract to 44.

Table 3 showed the bacterial reduction between two concentrations of nilavembu (200% and 400%). In between these two, the microbial count was reduced by 400% nilavembu extract to 13

Table 4 showed the bacterial reduction between two concentrations of nilavembu (100% and 400%). In between these two, the microbial count was reduced by 400% nilavembu extract to 13. Thus, an increase in the concentration of nilavembu extract leads to a decrease in the microbial count.

When nilavembu extract was used, the bacterial growth was only 19%, and without the use of nilavembu extract, the bacterial growth was 81%. It shows that nilavembu extract has a greater antibacterial property [Graph 1].

Table 1: The plaque level using the nilavembu extract and antibiotics

Plaque level in 100% nilavembu extract	Plaque level in 200% nilavembu extract	Plaque level in 400% extract	Without nilavembu extract
368	212	42	1448
242	168	32	1356
342	223	62	1245
267	203	22	1456
442	225	34	1346
316	172	45	1256
243	152	25	1789
195	143	19	1678
332	245	23	1345
405	287	43	1678
315.2	203	34.7	1459.7
78.36779384	44.93452026	13.41682195	190.9991565

Table 2: The efficacy of 100% and 200% concentration of nilavembu extract

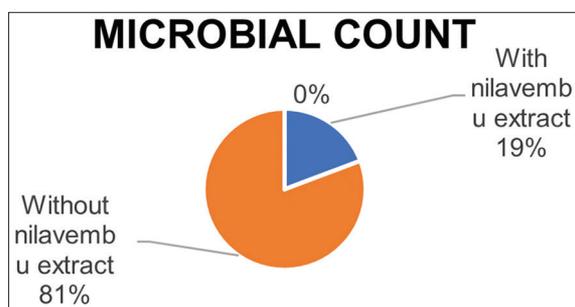
Samples	Bacterial growth
With 100% nilavembu extract	78.3
With 200% nilavembu extract	44.9

Table 3: The efficacy of 200% and 400% concentration of nilavembu extract

Samples	Bacterial growth
With 200% nilavembu extract	44.9
With 400% nilavembu extract	13.4

Table 4: The efficacy of 100% and 400% concentration of nilavembu extract

Samples	Bacterial growth
With 100% nilavembu extract	78.3
With 400% nilavembu extract	13.4

**Graph 1:** The efficacy of nilavembu extract against the oral microbes

DISCUSSION

Periodontitis is one of the most common diseases affecting the teeth. The ultimate goal of periodontal therapy is to cure inflamed tissue, eliminate the periodontal pockets and reduce the number of pathogenic bacteria. Various treatment modalities include mechanical therapy, chemotherapy, and systemic administration of antibiotics. Traditional plant extracts also play a major role in the prevention of periodontal diseases.^[9]

It is evident that *A. paniculata* has various properties against the microorganisms and the present study was done to enhance the antibacterial efficacy

of *A. paniculata*. Andrographolide is a major bioactive phytoconstituent found in various parts of *A. paniculata*, but particularly in the leaves. The chemical name of andrographolide is 3 α , 14, 15, 18-tetrahydroxy-5 β , 9 β H, 10 α -labda-8, 12-dien-16-oic acid γ -lactone.^[10] In this study, when nilavembu extract was used the bacterial growth was only 19%, and without the use of nilavembu extract, the bacterial growth was 81%. It shows that nilavembu extract has greater antibacterial property.

CONCLUSION

Nilavembu has the ability to reduce the bacterial growth. Nilavembu can be found as an adjunct to scaling and root planning for the treatment of periodontal diseases. However, further studies on large-scale population using varied concentrations of the drug may be required to evaluate the long-term effects of nilavembu.

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Source of support: Nil; Conflict of interest: None Declared