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# ANTIMICROBIAL ACTIVITY OF SPIRULINA PLATENSIS SOLVENT EXTRACT AGAINST ENTEROCOCCUS FAECALIS AND CANDIDA ALBICANS

Dental Science

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## ABSTRACT

The aim of this study was to investigate antibacterial activity of spirulina platensis solvent extracts against Enterococcus faecalis. Methods: the methanolic extract of Spirulina platensis was prepared. The antibacterial activity of Spirulina platensis extracts were determined by Agar diffusion method. NaOCl will be used as positive control and saline will be used as a negative control. Extracts along with controls (100µl each) were added to the wells. The agar plates were incubated at 37 °C for 24 hours. The diameters of the inhibition zones around the materials were measured in mm using digital vernier calipers after 24 hours. Results: The antimicrobial efficacy of Spirulina extract was comparable to that of Chlorhexidine. The extract at high concentrations (10%) was more effective than at low concentrations (1% and 5%)

## KEYWORDS

Spirulina platensis, Enterococcus faecalis. Chlorhexidine, Candida Albicans

## INTRODUCTION

Microorganisms in the infected root canals always pose a challenge to a clinician. Eradication of these microorganisms before the completion of the treatment increases the chances of successful endodontic therapy. However, the persistence of microorganisms leads to treatment failure [1].

Enterococcus faecalis (E. faecalis) is normally present in the oral cavity and can also be detected in treated root canals in small numbers. They are reported to be present in teeth with failed endodontic treatment in large numbers [2].C. albicans, is commonly isolated yeast and is the most predominant organism present in failed root canal treatment with periradicular pathosis [3].

Irrigation, which facilitates the removal of pulp tissue and microorganisms, serves as a supplement to instrumentation. But because of the side effects and ineffectiveness of conventional irrigants, various alternatives have been proposed [4].

A blue green alga named *Spirulina* has become a health food worldwide. *Spirulina*, which belongs to microalgae of the class Cyanophyta is an edible, microscopic, multicellular, filamentous organism. It is a rich source of protein, vitamins, minerals, etc [5]. *Spirulina platensis* or its extract has the ability to prevent cancers, reduce nephrotoxicity of pharmaceuticals and toxic metals, decrease cholesterol level in blood and it also protects against the harmful effect of radiation [6].

Hence, the aim of the present study is to evaluate the antimicrobial activity of *Spirulina platensis* solvent extract against *Enterococcus faecalis* and *Candida albicans.*

## MATERIALS AND METHODOLOGY:

### Preparation of extracts

*Spirulina platensis* powder was obtained from commercial source and extract was prepared using methanol as solvent. 50 grams of SP powder was dissolved in 200 ml of methanol solvent and was kept at room temperature for 24hrs with intermittent shaking. After the incubation, the extracts were filtered using sterile whatmann filter paper number 1. The Solvent extracts were kept in the incubator at 37-40ºC for evaporation. The extract in semisolid form were stored in sterile screw cap container and kept at 2-8ºC until use. Different concentrations of extract (1, 5 and 10%) were prepared in sterile distilled water

### EXPERIMENTAL GROUPS

Group 1 – 1% spirulina extract
Group 2 – 5% spirulina extract
Group 3 – 10% spirulina extract
Group 4 – 3% NaOCl
Group 5 – 2% chlorhexidine

Saline suspension of overnight agar cultures of E. faecalis and C. albicans were made and was adjusted to 0.5 MacFarland turbidity standard.

Lawn culture of test organisms were made on agar media with sterile cotton swab. Approximately 5mm diameter wells were punched on the agar surface. Extracts along with controls (100µl each) were added to the wells. The agar plates were incubated at 37 °C for 24 hours. The diameters of the inhibition zones around the materials were measured in mm using digital Vernier callipers after 24 hours. The results were tabulated and analysed statistically.

## RESULTS

**Table - 1**

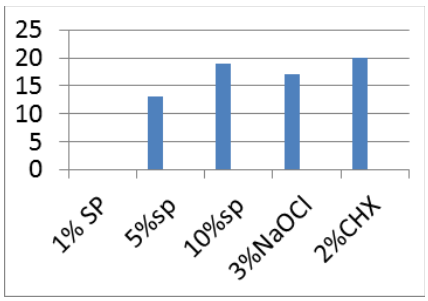


Table -1 shows the mean zones of inhibition for E.faecalis.

**Table-2**

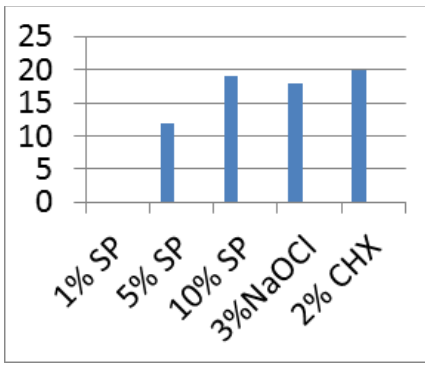


Table- 2 shows the mean zones of inhibition for Candida albicans.

Chlorhexidine possessed the highest antimicrobial efficacy against both E.faecalis and Candida albicans. Methanolic extract of *Spirulina* (5% & 10%) also possessed antimicrobial properties against *E.faecalis* and *Candida albicans.* NaOCl showed lesser efficacy than 10% *Spirulina* and Chlorhexidine.

The antimicrobial efficacy of *Spirulina* extract was comparable to that of Chlorhexidine.

The extract at high concentrations (10%) was more effective than at low concentrations (1% and 5%).

## DISCUSSION

Nature continues to be a medicinal source for an impressive number of modern drugs. Recently cyanobacteria are screened for antibiotics and other pharmacologically active compounds and has received considerable attention. *Spirulina* is recognized to have the potential of producing a large number of antimicrobial substances like many other cyanobacteria species [5].

E. faecalis and Candida albicans were chosen as the test organisms because these are the organisms present in the root canal system, which are considered to be the most resistant and are a possible cause for failure of root canal treatment [7].

The agar diffusion test was used in this study as it is most commonly used preliminary methods for assessment of the anti-microbial activity of root canal irrigants. It aids to compare the test materials directly against the test microorganisms. It also allows to determine which material has more antimicrobial activity in the local microenvironment of the root canal system [8].

Previous publications reported that the compounds such as 1-Octadecene, 1-Heptadeceane which are found in algae show anticancer, antioxidant and antimicrobial activity (Lee et al., 2007; Mishra and Shree 2007) [9] [10].

Spirulina possesses antimicrobially active lipids and active fatty acids in high concentrations. Lampe et al. (1998) hypothesized that lipids act by disrupting the cellular membrane of bacteria, fungi and yeasts. They kill microorganisms by penetrating the extensive meshwork of peptidoglycan present in the cell wall and reaching the bacterial membrane leading to its disintegration [11].

*Spirulina* extract was previously used in the treatment of OSMF and also in scaling and root planing as an adjunct for elimination of bacteria [12]. This is the first study of its kind, which was done to introduce Spirulina, an algae, as a root canal irrigant. Studies revealed that the use of organic solvents in the preparation of algal extracts provide more consistent antimicrobial activity [13].

Demule et al. (1996) explained that the antimicrobial activity of methanolic extract of *S. platensi* was due to the presence of γ-Linolenic acid.14 So in this study methanolic extract of spirulina was used. The results of the present study showed that methanolic extracts of spirulina (10%) had good antimicrobial efficacy against *E.faecalis* and Candidia albicans [14].

- 1% extract did not show any antimicrobial activity.
- When 5 % and 10 % extracts were compared 10 % extract showed better activity.
- The antimicrobial efficacy of methanolic extract of *Spirulina* (10%) was comparable to that of Chlorhexidine (2%).

## CONCLUSION

It is concluded from the study that extracts of *Spirulina platensis* used in the present investigation showed good antibacterial activity against the pathogens used. Further more *Spirulina* has antioxidant antiinflammatory properties and may be used as an adjuvant in endodontic therapy.

Further, in vitro and clinical studies are required to evaluate its efficacy, biocompatibility, and safety factors before it can conclusively be recommended for use in endodontic therapy.

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