

Comparative evaluation of antimicrobial efficacy of 10% Xanthoxylum acanthopodium leaves extract, 5% Hedychium coronarium rhizome extract and 2.5 % sodium hypochlorite as root canal irrigant against Enterococcus faecalis: An in vitro study

¹Dr. Pheiroijam Herojit Singh, Post-graduate student, Department of Pediatric and Preventive Dentistry, Jaipur Dental College, Rajasthan, India.

²Dr. Ningthoukhongjam Rati Devi, Assistant Professor, Department of Conservative Dentistry & Endodontics, Dental College JNIMS, Imphal, Manipur, India.

³Dr. N. Sukumar Singh, Associate Professor, Department of Conservative Dentistry & Endodontics, Dental College JNIMS, Imphal, Manipur, India.

Corresponding author: Dr. Pheiroijam Herojit Singh, Post-graduate student, Department of Pediatric and Preventive Dentistry, Jaipur Dental College, Rajasthan, India.

Citation of this Article: Dr. Pheiroijam Herojit Singh, Dr. Ningthoukhongjam Rati Devi, Dr. N. Sukumar Singh, “Comparative evaluation of antimicrobial efficacy of 10% Xanthoxylum acanthopodium leaves extract, 5% Hedychium coronarium rhizome extract and 2.5 % sodium hypochlorite as root canal irrigant against Enterococcus faecalis: An in vitro study”, IJDSIR- May - 2020, Vol. – 3, Issue -3, P. No. 139 – 141.

Copyright: © 2020, Dr. Pheiroijam Herojit Singh, et al. This is an open access journal and article distributed under the terms of the creative commons attribution noncommercial License. Which allows others to remix, tweak, and build upon the work non commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: Irrigation of root canal is an important factor for the success of endodontic therapy. Extract from leaves, fruits or roots of medicinal plants and herbs have potential antiseptic properties and can be used as intracanal irrigant against root canal pathogens.

Aim: To determine the antimicrobial efficacy of 10% *Xanthoxylum acanthopodium* leaves extract and 5% *Hedychium coronarium* rhizome extract as root canal irrigant against *Enterococcus faecalis*.

Material and methods: Agar diffusion test was used to determine the antimicrobial efficacy. Extract of

Xanthoxylum acanthopodium leaves was grouped as GROUP-I, *Hedychium coronarium* rhizome extract as GROUP-II and sodium hypochlorite as GROUP-III. The zone of inhibition of growth of *Enterococcus faecalis* was evaluated. Statistical analysis was conducted using one way ANOVA.

Result: There was significant difference in inhibitory effect among the irrigants (p value < 0.05). 2.5% sodium hypochlorite showed maximum inhibitory effect on growth of *Enterococcus faecalis* followed by 5% *Hedychium coronarium* rhizome extract and 10% *Xanthoxylum acanthopodium* leaves extract.

Keywords: *Enterococcus faecalis*, rhizome, *Xanthoxylum acanthopodium*

Introduction

Mechanical preparation alone cannot determine the success of endodontic therapy. Mechanical preparation can be performed using latest technology but without proper irrigation the success of root canal therapy cannot be determined. Hence irrigation is one important factor for the success of endodontic therapy. Irrigation helps to flush out pathogens from the root canals. Complete elimination of microbes from the root canals can be achieved through chemo-mechanical preparation.

Clinical studies have shown that *Enterococcus faecalis* is an important factor in root canal therapy failure, and is immune to a number of antimicrobials¹. Therefore complete removal of *Enterococcus faecalis* should be considered by irrigation. The ideal properties of root canal irrigants include providing broad antimicrobial action range, dissolving residues of necrotic pulp, removing smear layer and non-toxic when extruded beyond root apex. The most commonly used root canal irrigants are sodium hypochlorite, chlorohexidine, hydrogen peroxide and normal saline. However these chemical irrigants produce adverse side effects. Recently through herbology many medicinal herbs and plants extract have been experimented and shown potential antimicrobial activity as root canal irrigants.

The present in vitro study was conducted to evaluate the antimicrobial activity of *Xanthoxylum acanthopodium* leaves extract and *Hedychium coronarium* rhizome extract as root canal irrigants against *Enterococcus faecalis* and compare them with sodium hypochlorite.

Materials and Methods

The present study was conducted in the Department of Oral Pathology & Microbiology, Dental College & Hospital, JNIMS, Imphal, Manipur, India after taking

prior permission from the Head of Department. In the present study 10% *Xanthoxylum acanthopodium* leaves extract and 5% *Hedychium coronarium* rhizome extract were selected as experimental groups and named as GROUP-I and GROUP-II respectively. 2.5% sodium hypochlorite was selected as positive control group and named as GROUP-III. The antimicrobial activity of GROUP-I and GROUP-II were determined by their inhibitory effect on the growth of a single strain of *Enterococcus faecalis* ATCC 29212.

1. Preparation of 10% *Xanthoxylum acanthopodium* leaves extract (GROUP-I)

10 mg of freshly crushed leaves of *Xanthoxylum acanthopodium* was soaked in 100 ml of distilled water for 24 hrs at room temperature. The extract was decanted and then filtered using filter paper to remove residues. The filtrate was then kept in refrigerator at 4°C before being reconstituted for further use.

2. Preparation of 5% *Hedychium coronarium* rhizome extract (GROUP-II)

5 mg of freshly crushed rhizomes of *Hedychium coronarium* was soaked in 100 ml of distilled water in a conical flask for 24 hrs at room temperature. The extract was decanted and then filtered using filter paper. The filtrate was then kept in refrigerator at 4°C.

3. Agar diffusion test

A single species of *Enterococcus faecalis* ATCC 29212 was prepared for culture in a sterile Brain Heart Infusion agar. At 37°C overnight the agar plates were incubated, and the growth of the bacteria was tested after 24 hours. On the agar plates containing *Enterococcus faecalis* culture were made three uniform wells with a diameter of 6 mm.

10 ml of each extract were added in their respective wells and incubated for 24 hrs at 37°C in an incubator. 2.5% sodium hypochlorite was used as positive control group.

After incubation, the agar plates were removed and the diameters of the zone of inhibition of bacterial growth by the three groups were measured in centimeters. Five such tests were performed to obtain significant results.

Results

The results were tabulated and statistical analysis was conducted with IBM SPSS version 20 using one way ANOVA. **Table 1** showed significant difference between the diameters of the zone of inhibition of bacterial growth by the three groups. Maximum antimicrobial activity was shown by 2.5% sodium hypochlorite followed by 5% *Hedychium coronarium* rhizome extract and 10% *Xanthoxylum acanthopodium* leaves extract.

Discussion

The key aim of endodontic therapy is to eliminate all micro-organisms from the root canals and prevent re-infection after treatment. Endodontic root canal irrigants also have to complement mechanical preparation to remove bacteria from root canals.

Chemomechanical preparation may be considered as an important factor for the success of endodontic treatment.

The most commonly isolated microorganisms before root canal treatment include Gram -ve anaerobic rods, Gram +ve anaerobic cocci, Gram +ve anaerobic and facultative rods, *Lactobacillus* species, and Gram +ve facultative *Streptococcus* species². Most of them are easily eliminated during chemomechanical preparation. However, facultative anaerobes are mostly unable to eliminate completely from root canals with intracanal medicaments.

The most commonly used irrigants in clinical practices today are sodium hypochlorite, chlorhexidine, hydrogen peroxide and normal saline. However, these chemicals produce side effects to patients and hence their replacements with herbal compounds have been experimented. In the present study extracts of *Hedychium coronarium* rhizome and *Xanthoxylum acanthopodium*

are used as irrigants. In Manipur, *Hedychium coronarium* rhizome extract is being used as medicine against tonsillitis, bronchitis and other respiratory diseases. Leaves of *Xanthoxylum acanthopodium* is being used as disinfectant and in toothache in Manipur.

Conclusion

In the present study the zone of inhibition of bacterial growth by *Hedychium coronarium* and *Xanthoxylum acanthopodium* were comparable to that of sodium hypochlorite. Hence the extract of these herbs can be used as alternative irrigant in endodontic therapy.

References

1. Castilho AL, Saraceni CH, Díaz IE, Paciencia ML, Suffredini IB. New trends in dentistry: plant extracts against *Enterococcus faecalis*. The efficacy compared to chlorhexidine. Braz Oral Res 2013 Mar-Apr;27(2):109-115.
2. Sundqvist G. Taxonomy, ecology, and pathogenicity of the root canal flora. Oral Surg Oral Med Oral Pathol 1994 Oct;78(4):522-530.

Legends Table

Table 1. Comparison of the zone of inhibition of growth of <i>E. faecalis</i> by the three groups- Group-I(10% <i>Xanthoxylum acanthopodium</i> leaves extract), Group-II(5% <i>Hedychium coronarium</i> rhizome extract) and Group-III(2.5% sodium hypochlorite)		
Group	Zone of Inhibition (Mean ± S.D)	P value
GROUP-I	12.30 ± 2.60	0.001*
GROUP-II	14.6 ± 1.41	
GROUP-III	18.45 ± 1.71	
*p value < 0.005 (Significant difference)		