

Investigation of Antimicrobial Properties of *Mangifera indica* L. Kernel Extract on Multispecies *Enterococcus faecalis*-*Candida albicans* Biofilm in an *Ex Vivo* Tooth Model

Warat Leelapornpisid¹, Worrapan Poomanee²

¹Department of Restorative Dentistry and Periodontology, Faculty of Dentistry, Chiang Mai University, Thailand

²Department of Pharmaceutical Sciences, Faculty of Pharmacy, Chiang Mai University, Thailand

Received: February 8, 2021 • Revised: February 25, 2021 • Accepted: March 10, 2021

Corresponding Author: **Warat Leelapornpisid** Lecturer, Department of Restorative Dentistry and Periodontology, Faculty of Dentistry, Chiang Mai University, Chiang Mai 50200, Thailand. (E-mail: warat.dent@gmail.com)

Abstract

Objectives: This study aimed to assess the antimicrobial efficacy of kernel extract derived from *Mangifera indica* L. grown in Northern Thailand (Kaew-Moragot cultivar) against multispecies *Enterococcus faecalis*-*Candida albicans* biofilms in tooth model.

Methods: Agar diffusion and broth microdilution methods were performed to investigate the antibacterial activities of *M. indica* kernel extract against planktonic *E. faecalis* and *C. albicans*. Time-kill assay was conducted to evaluate time-point of the extract which showed bactericidal and fungicidal effects. Antimicrobial activity of *M. indica* kernel extract against *E. faecalis* and *C. albicans* biofilms was investigated through the use of 25 mg/ml extract solution and compared to traditional root canal medicaments. In order to form biofilms in root canal, the microbial suspension of *E. faecalis* and *C. albicans* in 100:1 was placed in the root canal, with the addition of media every other day for 21 days. The tooth samples were divided into 3 groups (n=40): 0.009 mg/ml normal saline solution (as a negative control), 400 mg/ml calcium hydroxide, and 25 mg/ml *M. indica* kernel extract. The root canal medicaments were consequently applied onto the biofilms for 7 days. After 7 days, cylindrical steel burs with a diameter of 1.6 mm and 1.8 mm were used to collect samples from inner dentin and deeper dentin. The remaining tooth samples were collected as residual roots. The samples were cultured for 24 hours, and 200 μ l of suspension were placed into 96-well microtiter plates for spectrophotometrically testing. The optical density (OD) data were analyzed with two-way ANOVA and Tukey's post hoc tests ($p < 0.05$).

Results: *M. indica* kernel extract demonstrated the antimicrobial activity against multispecies *E. faecalis*-*C. albicans* in root canal. The extract was the most effective in eliminating the biofilms by 30.88% ($p < 0.001$) in inner dentin layer. It was comparable to calcium hydroxide. In residual root, the eliminating effects of calcium hydroxide and *M. indica* kernel extract were comparable with percent inhibitions of 30.45% and 26.99%, respectively.

Conclusions: *M. indica* kernel extract had potential to eliminate multispecies *E. faecalis*-*C. albicans* biofilms up to the residual root. The antimicrobial activity of the extract was comparable to calcium hydroxide, which is a gold standard medicament used in root canal treatment.

Keywords: *M. indica* kernel extract, multispecies biofilm, root canal medicament