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ORIGINAL ARTICLE

Inhibitory effect of cinnamomum burmanii extract against Staphylococcus aureus on acrylic resin denture bases

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Keywords: Acrylic resin, Antibacterial, Cinnamomum burmanii, Dentures, Staphyloccus aureus

ABSTRACT

Background: Denture base acrylic resin properties is susceptible to bacteria colonization which further induce post insertion problems. Objectives: This study aimed to evaluate the antibacterial effect of Cinnamomum burmanii extract against Staphylococcus aureus on heat-cured acrylic resin denture base material. Materials and method: An in vitro post-test only control group design was used with 28 acrylic resin plates (9x9x3 mm) contaminated with S. aureus (0.5 McFarland). Samples were randomly divided into seven groups (n=4): positive control (0.2% chlorhexidine), negative control (aquades), and five treatment groups immersed in C. burmanii extract at concentrations of 25%, 12.5%, 6.25%, 3.125%, and 1.56%. Immersion was performed for 8 hours, after which bacterial colony counts were determined using the Total Plate Count method. Results: Phytochemical screening of the extract showed the presence of flavonoids, alkaloids, tannins, and triterpenoids. All concentrations of C. burmanii extract reduced S. aureus colonies compared to the negative control, with a significant overall difference among groups. The 25% concentration demonstrated the lowest mean colony count and showed an antibacterial effect approaching that of 02% chlorhexidine. Conclusion: These findings suggest that C. burmanii extract, particularly at 25% concentration, has potential as a natural denture cleanser alternatives for reducing S. aureus colonization on acrylic resin bases. (IJP 2025;6(2):163-165)

Introduction

Acrylic resin-based dentures are widely used in dental practice due to their lightweight, aesthetic properties, and affordable cost. However, the porosity properties of acrylic resin make it susceptible to colonization of bacteria such as Staphylococcus aureus, which can lead to denture stomatitis and various oral cavity infections.[1] Several previous studies have shown that bacterial colonization on the surface of acrylic resins may contribute to increased oral and systemic infections.[2]

Efforts to overcome bacterial growth have been carried out with the development of disinfectant materials. The literature shows that the use of chemical cleaners such as chlorhexidine 0.2% is effective in reducing the number of bacteria in dentures.[2] However, long-term use of chlorhexidine can cause side effects, such as discoloration of dentures and mucosal irritation.[3] Therefore, a safer and more effective cleaning alternative is needed. One of the natural ingredients that is known to have antibacterial properties is cinnamon extract (C. burmanii).[3] Several studies have proven that C. burmanii contains antibacterial compounds such as cinnamaldehyde, flavonoids, and tannins.3 These compounds are able to inhibit the growth of various pathogenic bacteria.[4,5]

Staphylococcus aureus is one of the opportunistic pathogenic bacteria that can colonize the surface of acrylic resin denture base. This is especially evident in users with poor dental hygiene and oral cavities. The formation of S. aureus biofilms on acrylic plates has the potential to trigger denture stomatitis, crown infections, and even systemic infections in individuals with weak systemic conditions. Studies on the effectiveness of C. burmanii in inhibiting S. aureus on acrylic resin bases are still limited. Therefore, this study aims to evaluate the extent to which C. burmanii extract can inhibit the growth of S. aureus as a more natural and safe denture cleaner.

Material and Methods

This experimental laboratory study used post-test only control group design.[5] The sample sizes used were 28 heat-cured acrylic resin plates, which were divided into seven treatment groups: Positive control in the form of 0.2% chlorhexidine and negative control in the form of aqueduct and treatment with C. burmanii extract at concentrations of 25%, 12.5%, 6.25%, 3.125%, and 1.56%. Inclusion criteria of the study were acrylic resin plates with a size of 9x9x3mm that have been exposed only to S. aureus. Resin plates that have been physically damaged during treatment including thoe with other bacterial contamination in the study sample were excluded.[6]

The research procedure was carried out by first sterilizing the acrylic resin plates in an autoclave at 121°C for 15 minutes. Plates were further contaminated with S. aureus suspension (McFarland standardization 0.5) and incubated for 24 hours. The samples were then soaked in the test solution for 8 hours according to the treatment

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Table 1. Number of S. aureus colonies after soaking procedure

Group	Mean ± SD
Klorheksidin glukonat 0.2%(+)	1.25±1.893
Akuades (-)	300±40
Ekstrak 25%	1.25±1.893
Ekstrak 12.5%	3.00±1.826
Ekstrak 6.25%	9.75±17.519
Ekstrak 3.125%	23.50±21.111
Ekstrak 1.56%	27.75±6.602

Table 2. Phytochemical test result of cinnamon extract

Parameter	Result
Flavonoid	Positif (+)
Alkaloid (Wagner)	Positif (+)
Alkaloid (Meyer)	Positif (+)
Alkaloid (Dragendorf)	Positif (+)
Tanin	Positif (+)
Saponin	Negatif (-)
Quinon	Negatif (-)
Steroid	Negatif (-)
Triterpenoid	Positif (+)

group criteria. After the procedure, the number of S. aureus colonies was calculated using the Total Plate Count method.[10] This research has received approval from the Ethics Commission of the Faculty of Dentistry, Trisakti University with the number 837/S1/KEPK/FK-G/7/2024.

Results

The results showed that C. burmanii extract at all concentrations had an inhibiting effect on the growth of S. aureus colonies. The group with a concentration of 25% showed the highest inhibition, approaching the effectiveness of chlorhexidine 0.2% table 1. In addition, phytochemical test showed antibacterial compounds contained in cinnamon extract according to several test parameters table 2.

Discussion

The results of this study showed that C. burmanii extract has a significant antibacterial effect against S. aureus on the acrylic resin. This antibacterial effectiveness increases as the concentration of the extract increases, with a concentration of 25% showing the most optimal results, approaching the effectiveness of 0.2% chlorhexidine as a positive control.[7]

These findings are in line with previous research showing that C. burmanii contains active compounds such as cinnamaldehyde, flavonoids, and tannins that have antibacterial effects against various oral pathogens.[7] Further evidence indicates that C. burmanii extracts can inhibit the growth of S. aureus, Candida albicans, and Streptococcus mutans, which are important pathogenic microorganisms in the oral cavity.[7] The present study extends this body of evidence by specifically confirming the effectiveness of C. burmanii in inhibiting the growth of S. aureus on acrylic resin denture base material, a substrate that has been only limitedly investigated to date.[7]

The main limitation of this study is the absence of long-term evaluation of the effectiveness of C. burmanii extract under simulated or actual clinical use conditions. In addition, potential changes in the physical properties of acrylic resin denture bases following immersion in the extract were not assessed. Therefore, further studies are required to evaluate the safety, optimal concentration, and long-term stability of this extract when used as a denture cleansing agent.[9] Despite these limitations, the present findings may serve as a basis for the development of plant-based denture cleansers that are potentially safer than conventional chemical agents such as chlorhexidine.[10] The use of natural ingredients such as C. burmanii may provide a more environmentally friendly alternative and reduce adverse effects' in denture wearers.[11] Overall, this study contributes preliminary evidence supporting C. burmanii extract as a natural alternative for denture hygiene care and highlights the need for further research on its clinical effectiveness and safety in broader applications.[11,12]

Conclusion

The results of this study showed that C. burmanii extract is effective in inhibiting the growth of S. aureus on acrylic resin denture base material. A concentration of 25% yielded the greatest reduction in bacterial colony counts, with an effect comparable to that of 0.2% chlorhexidine. Further studies are needed to evaluate the long-term effectiveness of C. burmanii extract and its impact on the physical properties of acrylic resins. In addition, clinical trials are further needed to confirm the safety and clinical applicability of this extract as a more natural and environmentally friendly alternative to conventional denture cleansers.

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