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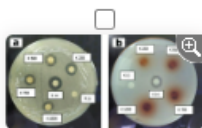


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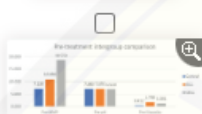


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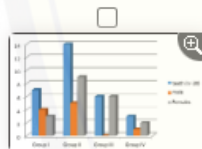


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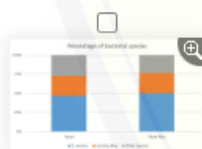


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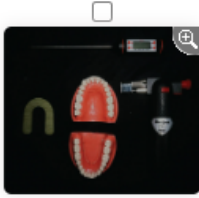


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## Antibacterial Activity of Robusta Coffee (*Coffea robusta*) Husk Extract Against *Streptococcus mutans* and *Lactobacillus acidophilus*: In Vitro Study

### Abstract

**Introduction:** Caries is a tooth and oral illness caused by *Streptococcus mutans* and *Lactobacillus acidophilus* bacteria. The growth of caries-causing bacteria can be controlled by using 0.2% chlorhexidine mouthwash to control plaque, however long-term usage of 0.2% chlorhexidine causes negative effects. Natural components such as robusta coffee (*Coffea robusta*) husk, which possesses active compounds of polyphenols, flavonoids, alkaloids, tannins, and saponins as alternative antibacterials, can be used to reduce adverse effects. The aim of this research is to assess the antibacterial activity of robusta coffee husk extract against *S. mutans* and *L. acidophilus*. **Materials and Methods:** The robusta coffee husk was extracted using the maceration process with 96% ethanol as the solvent. Antibacterial test is conducted against *S. mutans* and *L. acidophilus* using disc diffusion method (Kirby-Bauer) with six treatment groups of extract concentration 250, 500, 750, 1000 mg/mL, positive control (0.2% chlorhexidine), and negative control (aquades steril). The zone of inhibition was measured in millimetres using a digital calliper (mm). The SPSS application was used to examine the calculation findings, which included the Shapiro-Wilk, Levene, One Way ANOVA, and Post Hoc LSD tests. **Results:** Robusta coffee husk extract at 250, 500, 750, and 1000 mg/mL doses shown bactericidal activity in *S. mutans* (radical zone) and bacteriostatic activity in *L. acidophilus* (irradical zone). **Conclusion:** Robusta coffee husk extract has an antibacterial activity against *S. mutans* and *L. acidophilus*. The highest inhibition zone was demonstrated by the 1000 mg/mL concentration of extract.

**Keywords:** Antibacterial, Robusta coffee husk extract, *Streptococcus mutans*, *Lactobacillus acidophilus*

### Introduction

Caries is one of the most frequent dental and oral illnesses in Indonesia, with a 45.3% incidence prevalence that is increasing year after year.<sup>[1]</sup> Caries is caused by four interconnected variables: the presence of a substrate in the form of fermentable carbohydrates, host factors, time, and the growth of bacteria (plaque).<sup>[2]</sup> *Streptococcus mutans* and *Lactobacillus acidophilus* are the most common cariogenic bacteria implicated in plaque development.<sup>[3]</sup>

*S. mutans* is a cariogenic bacterium capable of fermenting carbohydrates into acids. Bacterial metabolism produces acid, which interacts with calcium on the tooth surface, causing demineralization.<sup>[4]</sup> Meanwhile, *L. acidophilus* can create extracellular protein

(EPS) and lactic acid, both of which are involved in plaque formation.<sup>[3,5]</sup> Furthermore, *L. acidophilus* has hydrophobic protein s-layers, which increases *L. acidophilus* capacity to attach to the tooth surface.<sup>[6]</sup>

Efforts to reduce bacteria accumulation can be made by controlling plaque with antimicrobial mouthwash. One of the ingredients in mouthwash that is considered the gold standard for antiplaque and antigingivitis is 0.2% chlorhexidine.<sup>[7]</sup> Because it is particularly active against all germs, chlorhexidine is a high-level disinfectant.<sup>[8]</sup> Long-term and non-adherent usage of chlorhexidine, on the other hand, can induce tooth discoloration, restoration and dorsum of the tongue discoloration,

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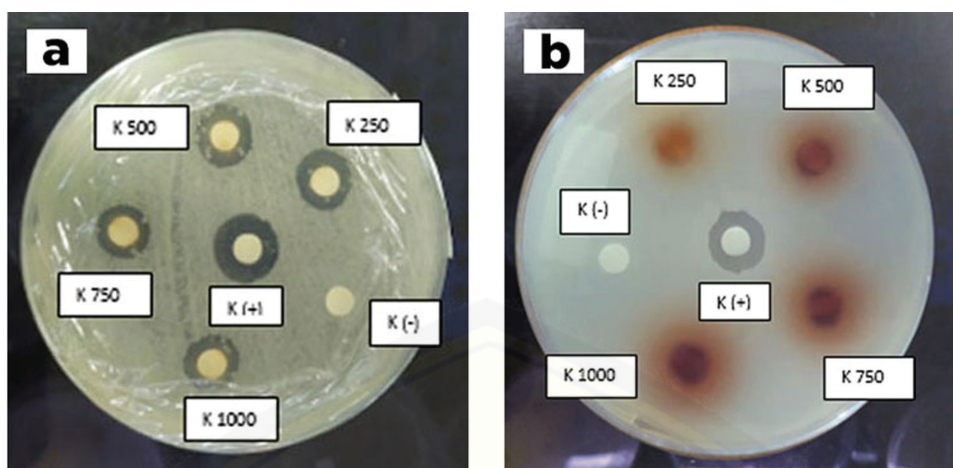
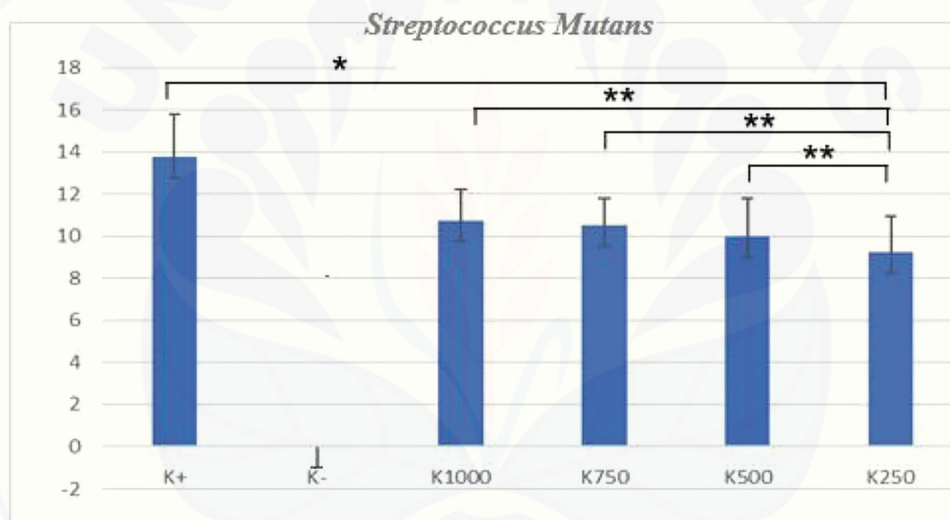


Figure 1: Antibacterial activity against *S. mutans* (a) and *L. acidophilus* (b). K250: 250 mg/mL extract concentration; K500: 500 mg/mL extract concentration; K750: 750 mg/mL extract concentration; K1000: 1000 mg/mL extract concentration; K+: positive control; K-: negative control.

Table 1: Average inhibition zone diameter against *S. mutans*



\*  $P < 0.05$ , \*\*  $P > 0.05$

by the positive control (0.2% chlorhexidine), but not by the negative control (Aquadex steril) (0 mm).

The diameter of the inhibition zone revealed that the robusta coffee husk extract at 1000 mg/mL resulted in the biggest inhibition zone against *S. mutans* of 10.75 [Table 1] and *L. acidophilus* of 15.45 mm [Table 2] and reduced as the husk extract concentration decreased.

The *Saphiro-Wilk* and *Levene* tests for robusta coffee husk extract's antibacterial efficacy against *S. mutans* and *L. acidophilus* yielded ( $P > 0.05$ ), indicating that the findings were normally distributed and homogeneous. The  $P$  value for the *One Way ANOVA* and *Post Hoc LSD* tests was 0.000, indicating that there is a significant difference in the average diameter of the inhibition zone across groups.

## Discussion

By measuring the inhibition zone produced around the paper disc, an antibacterial test was performed to measure the response of microbe growth to an antimicrobial material. There are two sorts of inhibition zones: radical zones and irratical zones. The radical zone is a clean zone around the paper disc that contains no bacterial growth (bactericidal). Meanwhile, the irratical zone is a region where bacteria are just inhibited rather than killed (bacteriostatic), indicated by presence of unclear or equal boundaries between the bacterial colony and a clear zone containing bacteria.<sup>[17]</sup>

The antibacterial activity of robusta coffee husk extract against *S. mutans* and *L. acidophilus* differed, as shown by the type of inhibitory zone created. Bactericidal activity is

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### Conflicts of interest

There are no conflicts of interest.

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