

## REVIEW

### Utilization of robusta coffee bean extract (*Coffea canephora*) as an alternative herbal in applied dentistry

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#### ABSTRACT

**Keywords:** Applied dentistry, *Coffea canephora*, Herbal medicine, Oral health, Robusta coffee

**Background:** Indonesia is a major producer of Robusta coffee, which has variations in chemical qualities such as caffeine, polyphenols, flavonoid compounds, tannins, alkaloids, and chlorogenic acid. Research shows that Robusta coffee bean extract has potential in dental applications. The importance of Robusta coffee as an agricultural commodity and source of active ingredients with health benefits, especially in dental care. **Objectives:** This literature review aims to evaluate the effectiveness of Robusta coffee as oral herbal medicine. An electronic search was carried out on PubMed, Science Direct, and Google Scholar with manual search from 2018 to 2024 following the PRISMA 2020 guidelines. The review incorporated studies related to the utilization of Robusta coffee bean extract that can be applicable for oral health care. **Conclusion:** Robusta coffee bean extract has significant potential as an active material in dental health care, with clear antibacterial, antioxidant, and wound-healing abilities. Robusta coffee bean extract-based products as oral herbal medicine can give significant advantages to oral health. Further research is needed to optimize its use in health products. (IJP 2024;5(2):116-118)

#### Introduction

Indonesia is a major producer of coffee, with Robusta coffee being the dominant type.<sup>1</sup> The chemical quality parameters of Robusta coffee in western Indonesia have been studied, with variations found in caffeine, sucrose, total fat, and fatty acid.<sup>2</sup> Quality evaluation of Robusta coffee in Jambi Province has identified promising clones with good flavor and high productivity.<sup>3</sup> Robusta coffee beans are therefore Indonesia's natural wealth with the best quality in Southeast Asia.<sup>4</sup>

A series of studies have demonstrated the potential of robusta coffee bean extract in dental applications. A gel containing 40-50% robusta coffee bean extract increased the number of fibroblasts, aiding wound healing after gingivectomy.<sup>5</sup> Toothpaste with 12.5-50% robusta coffee bean extract can inhibit the growth of *Aggregatibacter actinomycetemcomitans* and *Treponema denticola*, bacteria associated with periodontal disease.<sup>6,7</sup> Further research supports these findings, showing that robusta coffee bean extract at concentrations of 1-3% inhibits the growth of *Porphyromonas gingivalis*, another periodontal disease-causing bacterium.<sup>8</sup> These studies collectively suggest that robusta coffee bean extract has potential as an alternative herbal ingredient in dental care.

Overall, this study underscores the importance of robusta coffee not only as a major agricultural commodity but also as a source of active ingredients with significant health benefits. Robusta coffee bean extract shows great potential in various medical and health applications, especially in the field of dental health. Thus, further development and continued research is essential to optimize the use of robusta coffee in health products.

#### Literature Studies

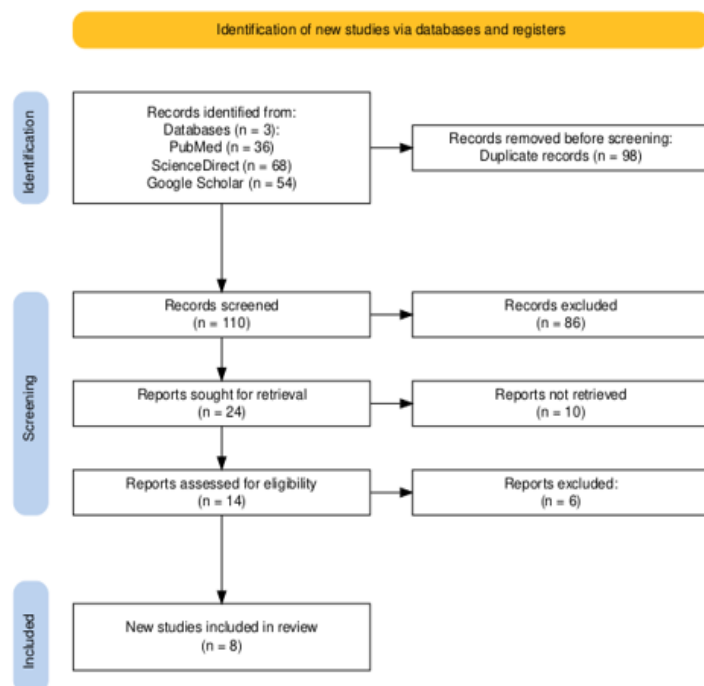
The studies included in this literature review were selected based on predetermined inclusion and exclusion parameters. Studies included in this study were chosen according to these inclusion criteria: Research publications that discuss the utilization of robusta coffee bean extract (*Coffea canephora*) as an alternative herbal ingredient in applied dentistry; Published in the period 2018-2024; Registered in PubMed, ScienceDirect, and Google Scholar. The exclusion criteria used are: Review studies; Published before 2018; Not available as free full-text journals.

The PICOS criteria are used in the search of literature with population (P) criteria used for patients with oral cavity diseases. Intervention (I) criteria used is Robusta coffee as the selected herbal medicine treatment. Comparison (C) criteria used is other herbal medicine treatments. Outcome (O) criteria used is the potential of Robusta coffee in managing oral diseases and about the study (S) used is In vitro and In vivo design.

The review was conducted by PRISMA 2020 guidelines [figure 1](#). The initial stage of literature search in 3 electronic databases (PubMed, ScienceDirect, and Google Scholar) using the keywords "(Robusta Coffee OR *Coffea canephora*) AND Herbal Medicine" and manual searches resulted in 158 studies. In the second stage, 98 duplicated articles were removed and resulted in 110 articles. The next stage was the title and abstract screening with 86 articles not meeting the PICOS and inclusion-exclusion criteria, resulting in 24

**Table 1. Literature review results**

No	Title	Author/Year	Study Design	Outcome
1.	Inhibition of Robusta Coffee Bean Extract ( <i>Coffea Canephora</i> ) against <i>Porphyromonas gingivalis</i> Bacteria (in vitro)	Dianastri, R.N., et al./ (2021)	In vitro	Robusta coffee bean extract at concentrations of 1-3% inhibits the growth of <i>Porphyromonas gingivalis</i> , another periodontal disease-causing bacterium.
2.	Anti-Peri-implantitis Bacteria's Ability of Robusta Green Coffee Bean ( <i>Coffea Canephora</i> ) Ethanol Extract: An In Silico and In Vitro Study	Nugraha, A. P., et al./ (2023)	In vitro	Robusta Green Coffee Bean ethanol extract has high antioxidant ability against <i>A. actinomycetemcomitans</i> (Aa), <i>P. gingivalis</i> (Pg), <i>F. nucleatum</i> (Fn), and <i>P. intermedia</i> (Pi). 50% RGCB ethanol extract may act as strong anti-peri-implantitis bacteria
3.	Inhibition of Toothpaste Containing Robusta Coffee Bean Extract ( <i>Coffea canephora</i> ) Against the Growth of <i>Aggregatibacter actinomycetemcomitans</i> Bacteria In Vitro	Farahdila, N.A., et al./ (2024)	In vitro	Toothpaste with 12.5-50% robusta coffee bean extract can inhibit the growth of <i>Aggregatibacter actinomycetemcomitans</i> and <i>Treponema denticola</i> , bacteria associated with periodontal disease.
4.	Antibacterial power of toothpaste containing robusta coffee bean extract ( <i>Coffea canephora</i> ) against <i>Treponema denticola</i> : An experimental laboratory study.	Perdana, M.D., et al./ (2024)	In vitro	Toothpaste containing robusta coffee bean extract at concentrations of 12.5; 25; and 50% has antibacterial power against <i>Treponema denticola</i> .
5.	Antioxidant, antimicrobial and healing properties of an extract from coffee pulp for the development of a phytocosmetic	Dos Santos, É.M., et al./ (2024)	In vitro	Robusta green bean coffee, had the best results in FRAP antioxidant assay, total phenolics, higher chlorogenic acid content, antibacterial activity against <i>Staphylococcus aureus</i> , and less cytotoxic potential, that showed desirable antioxidant, antimicrobial and healing properties
6.	Effectiveness of Robusta Coffee Bean Extract Gel ( <i>Coffea canephora</i> ) on Increasing the Number of Fibroblasts in Post-Gingivectomy Wound Healing	Rahmadani, N., et al./ (2022).	In vivo	A gel containing 40-50% robusta coffee bean extract increases the number of fibroblasts, aiding wound healing after gingivectomy.
7.	Coffee pulp: From a by-product of coffee production to a potential anticariogenic mouth rinse! An in vivo study	Bollamma, P. B. K., et al./ (2023)	In vivo	Coffee pulp extract-based mouth rinse showed a statistically significant reduction. It can be a potential anticariogenic agent that offers few advantages over chlorhexidine.
8.	Inhibiting the growth of periopathogenic bacteria and accelerating bone repair processes by using robusta coffee bean extract	Sari, D. S., et al./ (2023)	In vitro & in vivo	Robusta coffee bean extract with a concentration of 12.5-50% has a growth inhibitory effect on <i>P. gingivalis</i> , <i>A. actino-mycetemcomitans</i> , and <i>S. viridans</i>



**Figure 1. PRISMA 2020 guidelines**

articles being reviewed full-text. 10 studies did not have full-text available and six studies were excluded. Eight suitable studies were found and used in this literature review.

The table below [table 1](#) shows some research results regarding the potential of robusta coffee (*Coffea canephora*) as an alternative herbal material in applied dentistry.

All eight studies resulted in significant results on the efficacy of robusta coffee as a potential treatment for oral health care problems. Studies by Dianastri, et al., 2021; Nugraha et al., 2023; Farahdila, et al., 2024; Perdana et al., 2024; Dos Santos et al., 2024; and Sari et al., 2023 studied that robusta coffee green bean extract has the potential to fight oral cavity bacteria (*P. gingivalis*, *A. actinomycetemcomitans*, *F. nucleatum*, *P. intermedia*, *S. aureus*, *S. viridans*, and *T. denticola*) because it contains active compounds, such as phenolics, higher chlorogenic acid, also higher potential as antioxidant and antibacterial activity. As well as studies conducted by Rahmadani et al., 2022 and Bollamma et al., 2023 studied that the gel and coffee pulp from robusta coffee extract have been shown to significantly aid in wound healing and have anticariogenic properties. With this ability against oral cavity bacteria, this coffee can be a herbal medicine for oral diseases including periodontal diseases, peri-implantitis, and also healing properties.

## Discussion

The reviewed studies collectively underscore the significant potential of Robusta coffee bean extract (*Coffea canephora*) and its by-products as effective agents in the treatment and prevention of various oral health issues. Notably, the antibacterial properties of Robusta coffee extract have been consistently demonstrated across multiple studies, with findings indicating its inhibitory effects on key oral pathogens such as *Porphyromonas gingivalis*, *Aggregatibacter actinomycetemcomitans*, *Fusobacterium nucleatum*, and *Treponema denticola*. These pathogens are closely associated with periodontal diseases and peri-implantitis, making the extract a promising natural alternative to conventional treatments. Furthermore, the antioxidant and wound-healing properties of Robusta coffee extract, highlighted in studies by Dos Santos et al. (2024) and Rahmadani et al. (2022), reveal its potential to reduce oxidative stress and enhance tissue regeneration, particularly in post-gingivectomy wound healing. The incorporation of Robusta coffee extract into oral hygiene products, such as toothpaste and mouth rinses, as demonstrated by Farahdila et al. (2024) and Bollamma et al. (2023), further suggests its practical application in everyday oral care. These findings advocate for the continued exploration of Robusta coffee extract as a viable herbal medicine for oral health, with future research needed to optimize formulations, understand underlying mechanisms, and confirm efficacy through clinical trials. The broad-spectrum benefits of Robusta coffee extract, including its antibacterial, antioxidant, and healing properties, position it as a promising candidate for enhancing oral health outcomes and developing new, effective oral care products.

## Conclusion and Suggestion

The results of this study indicate that robusta coffee bean extract holds significant potential as an active herbal ingredient in dental health care due to its pronounced antibacterial and wound-healing properties. These findings suggest that robusta coffee bean extract could play a valuable role in oral care by effectively combating harmful bacteria and promoting the healing of oral tissues. Incorporating this extract into oral care products could provide a safe and effective alternative to traditional treatments, offering a natural and accessible option for enhancing oral health outcomes. As further research validates these benefits, robusta coffee bean extract could become a key component in developing advanced oral hygiene solutions.

Further research and development into robusta coffee bean extract as an oral herbal medicine could greatly benefit oral health. By studying the bioactive compounds in robusta coffee beans, we may uncover new therapeutic properties that can help prevent and treat common oral health issues. This exploration could lead to innovative oral care products with natural ingredients, offering an alternative to traditional treatments and promoting more effective and sustainable oral hygiene solutions.

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## References

- Martauli ED. 2018. Analysis Of Coffee Production In Indonesia. *Journal of Agribusiness Sciences*. 1(2), p.112-20.
- Marsilani ON, Wagiman, & Sukartiko AC. 2020. Chemical Profiling of Western Indonesian Single Origin Robusta Coffee. *IOP Conference Series: Earth and Environmental Science*, 425(1).
- Martono B, Izzah NK, & Ibrahim MS. 2023. Exploration and Evaluation of Robusta Coffee Quality in Merangin Regency, Jambi Province. *E3S Web of Conferences*. 373(04010), p.10.
- Nugraha AP, Ardani IGAW, Sitalaksmi RM, Ramadhani NF, Rachmayanti D, Kumala D, Kharisma VD, Rahmadani D, Puspitaningrum MS, Rizqianti Y, Ari MDA, Nugraha AP, Noor TNEBTA, Luthfi M. 2023. Anti-Peri-implantitis Bacteria's Ability of Robusta Green Coffee Bean (*Coffea Canephora*) Ethanol Extract: An In Silico and In Vitro Study. *Europe Pubmed Central*. 17(3), p.649-62.
- Rahmadani N, Wahyukundari MA, & Harmono H. 2022. Efektivitas Gel Ekstrak Biji Kopi Robusta (*Coffea canephora*) terhadap Peningkatan Jumlah Fibroblas pada Penyembuhan Luka Pasca Gingivektomi. *STOMATOGNATIC - Jurnal Kedokteran Gigi*. 19(1), p.13-8.
- Farahdila NA, Pujiastuti P, & Sari DS. 2024. Daya Hambat Pasta Gigi yang Mengandung Ekstrak Biji Kopi Robusta (*Coffea canephora*) Terhadap Pertumbuhan Bakteri *Aggregatibacter actinomycetemcomitans* Secara In Vitro. *STOMATOGNATIC - Jurnal Kedokteran Gigi*. 21(1), p.52-5.
- Perdana MDD, Praharani D, & Sari DS. 2024. Daya Antibakteri Pasta Gigi yang Mengandung Ekstrak Biji Kopi Robusta (*Coffea canephora*) terhadap *Treponema denticola*: Eksperimental Laboratoris. *Padjadjaran Journal of Dental Researchers and Students*. 8(1), p.112-9.
- Dianastri RN, Astuti P, & Prasetya RC. 2021. Daya Hambat Ekstrak Biji Kopi Robusta (*Coffea Canephora*) terhadap Bakteri *Porphyromonas gingivalis* (in vitro). *STOMATOGNATIC - Jurnal Kedokteran Gigi*. 18(2), p.69.
- Bollama PBK, Nanjamma KK, & Ponnappa KC. 2023. Coffee Pulp: From a By-Product of Coffee Production to A Potential Anticariogenic Mouth Rinse! An In Vivo Study. *Journal of Conservative Dentistry and Endodontics*. 26(6), p.693-6.
- Dos Santos EM, de Macedo LM, Ataide JA, Delafiori J, de Oliveira Guarnieri JP, Rosa PCP, Ruiz ALTG, Lancellotti M, Jozala AF, Catharino RR, Camargo GA, Paiva-Santos AC, Mazzola PG. 2024. Antioxidant, Antimicrobial and Healing Properties of An Extract from Coffee Pulp for The Development of A Phytocosmetic. *Scientific Reports*. 14(1), p.4453.
- Sari DS, Pujiastuti P, Fatmawati DWA, Mardiyana NA, Wulandari AT, Arina YMD. 2023. Inhibiting The Growth of Periopathogenic Bacteria and Accelerating Bone Repair Processes by Using Robusta Coffee Bean Extract. *The Saudi Dental Journal*, 35(4), p.322-9.