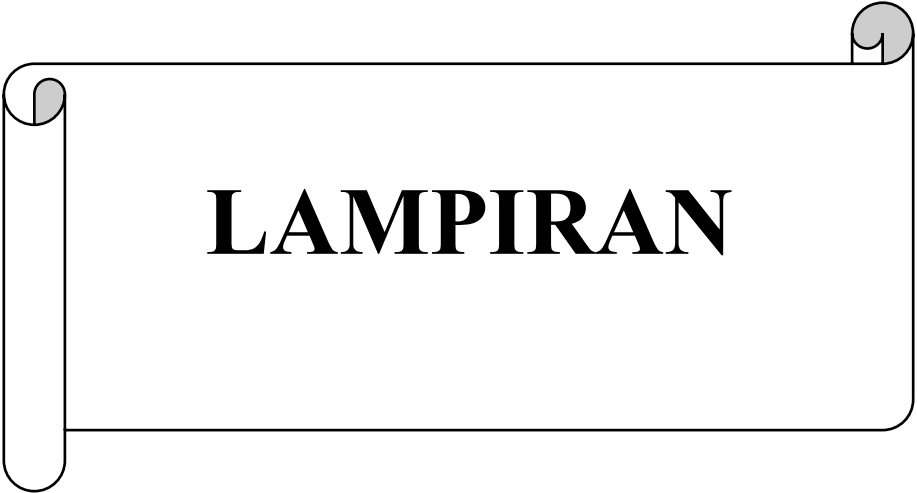




LAMPIRAN



LAMPIRAN 1.
ABSTRAK JURNAL

Comparative Evaluation of Herbal Matcha Extract and 2% Chlorhexidine Gluconate on Periodontal Health Status: A Clinico-microbiological Study

Ankita V Gadekar¹, Arun S Dodamani², Prashanth K Vishwakarma³, Anoli S Agrawal⁴, Saloni D Wankhede⁵, Sharvari T Tadas⁶

Received on: 17 May 2025; Accepted on: 18 June 2025; Published on: 15 July 2025

ABSTRACT

Aim: To evaluate and compare the gingival and periodontal health status in patients after using Matcha mouthrinse and 2% chlorhexidine (CHX) gluconate mouthwash and also evaluate the efficacy of Matcha extract on *Porphyromonas gingivalis* (*P. gingivalis*) and *Streptococcus mutans* (*S. mutans*).

Material and methodology: It is a randomized clinical trial study with 32 adult patients having mild-to-moderate gingivitis and periodontitis. They were divided into two groups, each with 16 patients. Group A was given Matcha extract, and group B was given 2% CHX gluconate. All participants were brought to baseline by oral prophylaxis. They were asked to use their particular group mouth rinse for rinsing twice a day for 1 minute. Indices were taken at baseline, 7, 14, and 28 days. Minimal inhibitory concentration (MIC) was checked for Matcha extract on both *P. gingivalis* and *S. mutans* bacteria, and gingival crevicular fluid (GCF) was taken at baseline and after 28 days to check colony-forming units (CFUs) of the samples.

Results: Matcha mouthrinse significantly reduced the inflammatory condition of gingivitis and periodontitis ($p < 0.05$) and is comparable with 2% CHX gluconate. *In vitro* evaluation of Matcha extract at various concentrations of MIC shows its effectiveness on *P. gingivalis* and *S. mutans*.

Conclusion: To conclude, Matcha mouthrinse may be recommended as an alternative mouthrinse for improving oral health status.

Clinical significance: The findings of this study suggest that Matcha mouthrinse, a natural and antioxidant-rich alternative, is effective in reducing gingival and periodontal inflammation, with outcomes comparable to the gold standard 2% CHX gluconate. Additionally, Matcha extract demonstrated antibacterial efficacy against key periodontal pathogens *P. gingivalis* and *S. mutans*. This highlights its potential as a safer, herbal-based adjunct in periodontal therapy, especially for patients seeking non-chemical or side-effect-free options for maintaining oral hygiene and preventing disease progression.

Keywords: Anti-inflammatory, Antioxidant, Gingivitis, Mouthwash, Periodontitis.

The Journal of Contemporary Dental Practice (2025): 10.5005/jp-journals-10024-3880

INTRODUCTION

In 2021, over 1 billion people were affected by severe periodontitis, which increased the disease burden of periodontitis on the population.¹ Gingivitis and Periodontitis are multifactorial inflammatory diseases of the oral cavity that result in alveolar bone destruction and are the main reason for tooth loss. In India, periodontal diseases are common among adults. Studies report prevalence rates ranging from 42 to 51%, with gingivitis affecting around 46.6%. Mild-to-moderate periodontitis occurs in 26.2%, and severe cases occur in 19% of the population.^{2,3} Periodontal disease is characterized by complex host-parasite interactions that lead to gingival inflammation, loss of connective tissue attachment, periodontal ligament destruction, and alveolar bone resorption.^{4,5} It is mostly associated with the accumulation of microbial plaque containing more than 300 types of bacterial species.^{6,7} Dental caries represent a significant public health issue in India, affecting approximately 54.16% of the Indian population, with prevalence rising to 85% among adults aged 65-74 years.⁸ *Streptococcus mutans* (*S. mutans*) has been identified as a plaque-forming bacterium and can adhere firmly to tooth surfaces in the presence of sucrose and release acids, fermenting various dietary sugars associated with caries-inducing potential.⁹ *Porphyromonas gingivalis* (*P. gingivalis*), a Gram-negative asaccharolytic oral bacterium, has been considered

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Source of support: Nil

Conflict of interest: None

to play an important role in periodontal biofilms, which are involved in the initiation and progression of periodontal diseases.¹⁰ In addition, inflammation induced by dental plaque can impair systemic health through bacteremia, the systemic dissemination of locally produced inflammatory mediators.¹¹

Effective microbial plaque control methods should remove all plaque, reduce plaque levels below the threshold for disease, and alter plaque pathogenicity. Mechanical plaque control includes brushing and flossing, but its success is limited because it is time-consuming and technically difficult for most individuals.^{12,13}

Article

Natural Therapeutic Agents' Efficacy in Preventive Strategies against the Periodontal Pathogen *Aggregatibacter actinomycetemcomitans*: An In Vitro Study

Sima Hermes, Sham Alatwan, Anders Johansson *  and Anna Bogren

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Abstract: Adolescent carriers of the *Aggregatibacter actinomycetemcomitans* JP2 genotype have an increased risk of developing periodontitis, due to the bacterium's high leukotoxin (LtxA) production. LtxA contributes to marginal bone loss by killing immunity cells, thus activating the proinflammatory interleukin-1 β (IL-1 β), which, in turn, activates the osteoclasts. A possible strategy to prevent periodontitis might be to neutralize LtxA in JP2-infected individuals. The aim of this study was to investigate whether extracts from Matcha or Guava leaves can prolong the viability of macrophages in cell cultures by neutralizing the highly leukotoxic JP2 genotype bacteria. The *A. actinomycetemcomitans* JP2 genotype was pretreated with extracts from either Matcha or Guava leaves. Later, the extracts were rinsed off, before JP2 bacteria were exposed to macrophage cell cultures. The experiment was repeated, where JP2 bacteria were persistently treated with the extracts instead, i.e., the extracts were not rinsed off. The macrophage viability after bacterial exposure was analyzed and compared with that of macrophages exposed to untreated JP2 bacteria. IL-1 β secretion in the cell culture medium was quantified in all group samples. Pretreatment of the *A. actinomycetemcomitans* JP2 genotype with Matcha or Guava leaf extracts moderately neutralized LtxA activity, which resulted in prolonged macrophage viability and decreased IL-1 β secretion. These effects of prolonged macrophage viability were enhanced when extracts were persistently present during the exposure period. The results indicate that Matcha and Guava leaf extracts have effects on the virulence of the *A. actinomycetemcomitans* JP2 genotype that may be useful in future treatment strategies to prevent periodontitis in JP2 bacterium carriers.

Keywords: *Aggregatibacter actinomycetemcomitans*; leukotoxin; interleukin-1 β ; green tea; guava; Matcha®



Citation: Hermes, S.; Alatwan, S.; Johansson, A.; Bogren, A. Natural Therapeutic Agents' Efficacy in Preventive Strategies against the Periodontal Pathogen *Aggregatibacter actinomycetemcomitans*: An In Vitro Study. *Oral* **2024**, *4*, 405–416. <https://doi.org/10.3390/oral4030033>

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1. Introduction

Gum disease, also known as gingivitis and periodontitis, is a global health issue according to the World Health Organization [1]. Gingivitis is a plaque-microbiota-induced gingival confined inflammation. If left untreated, gingivitis may progress to periodontitis, where the supporting tissue of the tooth gradually degrades [2].

It has been demonstrated that 2 to 4 days of plaque accumulation results in an “initial” inflammatory lesion (vasculitis) in the gingival tissues. Within 4 to 10 days, an “early” lesion develops, characterized by lymphocytes and collagen break down. With further accumulation of plaque, an “established” inflammatory lesion with a predominance of plasma cells develops within two to three weeks. In some individuals, this stage transitions to an “advanced” lesion with progressive loss of attachment, loss of the alveolar bone and formation of deep periodontal pockets, clinically manifest as periodontitis [3]. Deep periodontal pockets serve as a reservoir for bacterial dysbiosis.

The prevalence of periodontitis in adult populations is relatively high. Cross-sectional studies have shown that about 40% of adults are affected. However, the severity of the

Clinical and Salivary Antioxidant Effects of Matcha Tea in Patients with Gingivitis: A Randomized Controlled Trial



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Abstract:

Introduction: Gingivitis, the initial stage of periodontal disease, is characterised by inflammation driven by dental biofilm and associated with oxidative stress. Matcha tea, a powdered green tea rich in antioxidants, has shown potential health benefits. This study aimed to investigate the effect of Matcha tea consumption on clinical periodontal parameters and salivary antioxidant levels in patients with gingivitis.

Methods: A randomised controlled clinical trial was conducted with 41 participants diagnosed with gingivitis. Participants were randomly allocated to a Matcha tea group (n=21) who consumed two cups of Matcha tea daily for 30 days, or a control group (n=20) who received standard oral hygiene instructions. Primary outcomes were clinical periodontal parameters (Plaque Index [PI], Bleeding on Probing percentage [BOP%], Gingival Index [GI]), and secondary outcomes were salivary levels of Malondialdehyde (MDA), Superoxide Dismutase (SOD), and Glutathione Peroxidase 1 (GPX1), assessed at baseline and after 30 days.

Results: Both groups showed significant within-group improvements in PI, BOP%, and GI at the 30-day follow-up ($p < 0.01$). However, there were no statistically significant differences in these clinical parameters between the Matcha tea and control groups at the endpoint. The Matcha tea group exhibited a significant reduction in salivary MDA levels ($p = 0.002$) and significantly higher salivary SOD ($p = 0.047$) and GPX1 ($p = 0.027$) levels compared to the control group at the 30-day follow-up.

Discussion: The biochemical improvements are attributed to Matcha's potent antioxidants, which favorably modulate the oral redox balance. The lack of superior clinical outcomes suggests that the profound effect of mechanical plaque control may have overshadowed any adjunctive benefits from Matcha within the 30-day trial. This highlights a potential disconnect between systemic antioxidant modulation and localised clinical changes in gingivitis management.

Conclusion: Daily consumption of Matcha tea for one month favorably modulated salivary antioxidant biomarkers in patients with gingivitis, reducing lipid peroxidation and increasing antioxidant enzyme levels. However, these biochemical changes did not translate into statistically significant differences in clinical periodontal parameters beyond standard oral hygiene within this study's timeframe.

Clinical Trial Registration Number: NCT06912958

Keywords: Matcha tea, Gingivitis, Oxidative stress, Salivary biomarkers, Antioxidants, Randomized controlled trial (RCT), Periodontal health.

Multimodal inhibitory effect of matcha on *Porphyromonas gingivalis*

Ryoma Nakao,¹ Ayami Takatsuka,^{1,2} Kengo Mandokoro,² Naoki Narisawa,² Tsuyoshi Ikeda,³ Hideki Takai,⁴ Yorimasa Ogata⁴

AUTHOR AFFILIATIONS See affiliation list on p. 16.

ABSTRACT *Porphyromonas gingivalis* has been associated with progression of periodontitis, characterized by inflammation and destruction of periodontal tissues. Here, we report that matcha, a product of *Camellia sinensis*, hampers the adherence and survival of *P. gingivalis* through multiple tactics. Matcha extract (ME) inhibited the growth not only of *P. gingivalis* but also of *Prevotella nigrescens* and *Fusobacterium nucleatum*, while it did not inhibit growth of nine species of oral streptococci and *Aggregatibacter actinomycetemcomitans*. ME-mediated *P. gingivalis* growth inhibition was characterized by both morphological and physiological changes at the bacterial envelope, which were accompanied by nano-particle formation and decreased membrane fluidity/permeability without loss of membrane integrity. ME also triggered autoaggregation of *P. gingivalis* in a major fimbriae (FimA)-dependent manner. In addition, adherence of *P. gingivalis* was dramatically inhibited by ME, irrespective of fimbriae. Furthermore, a structure-activity relationship study tested a series of catechins isolated from ME and identified the pyrogallol-type B-ring of catechins as essential for *P. gingivalis* growth inhibition. In a clinical study to assess the microbiological and therapeutic effects of matcha mouthwash in patients with periodontitis, the *P. gingivalis* number in saliva was significantly reduced by matcha mouthwash compared to the pre-intervention level. A tendency toward improvement in probing pocket depth was observed in the matcha group, although the difference was not statistically significant. Taken together, we present a proof of concept, based on the multimodal inhibitory effect of matcha against *P. gingivalis*, and that matcha may have clinical applicability for prevention and treatment of periodontitis.

IMPORTANCE Periodontitis, a multifactorial inflammatory disease of the oral cavity, results in alveolar bone destruction, and is a major cause of tooth loss of humans. In addition, emerging evidence has demonstrated associations between periodontitis and a wide range of other chronic inflammation-driven disorders, including diabetes mellitus, preterm birth, cardiovascular disease, aspiration pneumonia, rheumatoid arthritis, cognitive disorder, and cancer. In the present study, we report that matcha, a product of *Camellia sinensis*, hampers *Porphyromonas gingivalis*, a major periodontal pathobiont, in not only a series of *in vitro* experiments but also a pilot intervention clinical trial of patients with periodontitis, in which matcha mouthwash statistically significantly reduced the *P. gingivalis* number in saliva, as compared to the pre-intervention level. Taken together, we suggest that matcha may have clinical applicability for prevention and treatment of periodontitis.

KEYWORDS periodontal disease/periodontitis, *Porphyromonas gingivalis*, *Camellia sinensis*, matcha, membrane fluidity, membrane potential, catechins, FimA, mouthwash, probing pocket depth

Oral health is an indispensable part of overall general health and well-being. Periodontal disease is an infection-driven chronic inflammatory disease that affects

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The authors declare no conflict of interest.

See the funding table on p. 17.

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Does Daily Intake of Matcha Tea Enhance The Periodontal Health of Patients With Localised Gingivitis: A Control Study

Rasha Salah Abood / Firas Bashir Hashim Al-Taweel / Hadeel Mazin Akram / Hayder Raad Abdulbaqi

Background: Gingivitis is a reversible, dental biofilm-induced inflammation which is characterised by bleeding on probing (BOP) and oxidative stress in the gingival tissues. Matcha tea, a type of green tea with high antioxidant content, has been reported to enhance periodontal health, but its exact beneficial efficacy remains to be investigated.

Objective: This pilot-controlled trial aimed to investigate the influence of daily consumption of matcha tea on gingival status and salivary 8-hydroxy-deoxyguanosine (8-OHdG) concentration in localised gingivitis patients, as well as to determine the bleeding on probing (BOP) threshold that predicts for gingival health after intervention.

Methods: Twenty-seven adults with localised gingivitis (BOP >10% but ≤30%) drank matcha tea twice a day for 30 days while maintaining oral hygiene habits. Clinical parameters, including plaque index (PI) and BOP, as well as salivary 8-OHdG, were evaluated at baseline and post-intervention. After treatment, patients with BO <10% were reassigned as healthy, and those with BOP ≥10% as gingivitis. Regression and correlation analyses, including the Wilcoxon and Mann-Whitney test, ANCOVA, and receiver operating characteristics (ROC) curve, were performed to determine a BOP cut-off value that would predict gingival health.

Results: PI, BOP, and 8-OHdG were statistically significantly decreased in the entire cohort after 1 month. Patients reassigned as healthy underwent a greater reduction in PI (from 28.3 ± 7.5 to 17.5 ± 5.3), BOP (from 16.4 ± 5.0 to 5.6 ± 2.5) and 8-OHdG (from 6.9 ± 1.6 to 5.6 ± 1.8 ng/ml). In contrast, patients with gingivitis had statistically significant reductions in PI and BOP, but not in 8-OHdG. The mean BOP reduction was statistically significantly higher in healthy subjects. A ROC calculation revealed a BOP cut-off <18% at baseline, indicating a high likelihood of achieving gingival health following ingestion of the matcha tea (sensitivity = 0.92, specificity = 0.70).

Conclusion: Daily intake of matcha tea for 1 month improved gingival health and decreased oxidative stress markers in the localised gingivitis patients. A <18% baseline BOP predicted successful transition to gingival health after intervention. These results corroborate the adjuvant therapy of matcha tea in the treatment of gingivitis, and further large-scale randomised trials are recommended.

Source of funding: No external funding was received.

Keywords: gingivitis, matcha tea, 8-OHdG, saliva

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10.3290/j.ohpd.c_2268*

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Periodontal inflammations are common oral health diseases with accelerated rates of incidence and prevalence.³² Gingivitis is the inflammation confined to the gingival tissues surrounding teeth. Individuals might develop gingivitis at any age, from childhood to old age. In literature, a high prevalence of gingivitis (approximately 50-100%) has been

reported in dentate adults.^{1,29} Untreated gingivitis increases the risk for developing more advanced periodontal lesions (periodontitis) in which permanent destruction of tooth-supporting bone occurs, leading to tooth loss.¹⁷ Therefore, management of gingivitis is of pivotal importance for periodontal health and saving teeth.¹⁸

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A decorative scroll graphic with a black outline and grey shading on the left and right sides, framing the text.

LAMPIRAN 2.

LEMBAR KONSULTASI KARYA TULIS ILMIAH

LEMBAR KONSULTASI KARYA TULIS ILMIAH

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Nama Pembimbing I : Rena Setiana Primawati S.ST, M.K.M
Judul Karya Tulis Ilmiah : *Matcha (Camellia Sinensis)* sebagai Penghambat Pertumbuhan Bakteri Plak Gigi untuk Kesehatan *Gingiva*

No	Tanggal	Kegiatan	Saran Pembimbing	Paraf
1.	10 November 2025	Pengajuan Judul	Cari materi-materi yang sesuai judul Yang dipilih	
2.	15 Desember 2025	Bimbingan BAB I	Perbaikan isi, dan tata tulis	
3.	23 Desember 2025	Bimbingan BAB II	Perbaikan isi, tata tulis, dan kerangka teori.	
4.	05 Januari 2026	Bimbingan BAB III	Perbaikan metode penelitian	
5.	04 Februari 2026	Bimbingan PPT	Cek kelengkapan KTI	
6.	20 Februari 2026	Pengajuan Seminar Proposal	Persiapan Seminar Proposal	
7.	16 April 2026	Revisi Seminar Proposal	Lanjutkan BAB IV dan BAB V	
8.	20 Mei 2026	Bimbingan BAB IV	Perbaiki tata tulis	
9.	22 Mei 2026	Bimbingan BAB V	Perbaikan kalimat pada kesimpulan	
10.	2 Juni 2026	Konsultasi Abstrak	Perbaikan nama penulis	
11.	3 Juni 2026	ACC BAB IV dan V	Lengkapi lampiran KTI	
12.	4 Juni 2026	Konsultasi kelengkapan KTI	Periksa kembali KTI dengan teliti	
13.	5 Juni 2026	Pengajuan Seminar Hasil KTI	Persiapan Seminar Hasil KTI	

Tasikmalaya,2026
 Mengetahui,
 Ketua Program Studi Kesehatan Gigi
 Program Diploma Tiga

Rena Setiana Primawati, S.S.T, M.K.M
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Nama Pembimbing II : Agung Widyagdo, S.Si.T., MDSc
Judul Karya Tulis Ilmiah : *Matcha (Camellia Sinensis)* sebagai Penghambat Pertumbuhan Bakteri Plak Gigi untuk Kesehatan *Gingiva*

No	Tanggal	Kegiatan	Saran Pembimbing	Paraf
1.	10 November 2025	Pengajuan Judul	Perbanyak sumber untuk materi	
2.	15 Desember 2025	Bimbingan BAB I	Perbaikan materi dan tata tulis	
3.	23 Desember 2025	Bimbingan BAB II	Perbaikan tata tulis dan perbanyak sumber untuk materi	
4.	05 Januari 2026	Bimbingan BAB III	Perbaikan metode penelitian	
5.	04 Februari 2026	Bimbingan BAB I - BAB III	Perbaiki penulisan Daftar Pustaka	
6.	20 Februari 2026	Pengajuan Seminar Proposal	Persiapan Seminar Proposal	
7.	16 April 2026	Revisi Seminar Proposal	Lanjutkan BAB IV dan BAB V	
8.	2 Juni 2026	Bimbingan BAB IV dan BAB V	Perbaiki tata tulis, dan cek kesesuaian materi dengan judul	
9.	3 Juni 2026	ACC BAB IV dan V	Lengkapi lampiran KTI	
10.	4 Juni 2026	Konsultasi kelengkapan KTI	Periksa kembali KTI dengan teliti	
11.	5 Juni 2026	Pengajuan Seminar Hasil KTI	Persiapan Seminar Hasil KTI	

Tasikmalaya,2026

Mengetahui,
 Ketua Program Studi Kesehatan Gigi
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LAMPIRAN 3.

**MASUKAN DARI
PENGUJI SEMINAR
HASIL**

Lembar Revisi Seminar Hasil Karya Tulis Ilmiah

Nama : Tsaniaturrohmah
 NIM : P20625023039
 Prodi : DIII Kesehatan Gigi
 Judul : *Matcha (Camellia Sinensis)* sebagai Penghambat
 Pertumbuhan Plak Gigi untuk Kesehatan *Gingiva*
 Waktu Sidang : Senin, 08 Juni 2026

No.	Dosen Penguji	Masukkan	Perbaikan	Keterangan
1.	Rena Setiana Primawati, S.ST, M. K.M	Memfokuskan pembahasan pada bakteri plak gigi dan <i>gingivitis</i> .	Materi telah direvisi dengan memusatkan pembahasan pada bakteri plak gigi sebagai faktor penyebab <i>gingivitis</i> .	
2.	Lina Rismayani, S.ST, M.Kes	- Menambahkan data kasus <i>gingivitis</i> berdasarkan Survei Kesehatan Indonesia (SKI) Tahun 2023. - Memperbaiki isi abstrak agar lebih sistematis dan sesuai kaidah penulisan ilmiah. - Menambahkan alur penulisan penelitian studi literatur. - Memperbaiki metode penulisan pada bagian metode penelitian. - Menentukan dan memperjelas kata kunci yang digunakan dalam pencarian literatur.	- Data prevalensi <i>gingivitis</i> berdasarkan SKI 2023 telah ditambahkan pada bagian latar belakang. - Abstrak telah direvisi sesuai masukan penguji. - Alur penulisan penelitian telah ditambahkan pada bagian metode penelitian. - Metode penelitian telah direvisi dan disesuaikan dengan pedoman penulisan studi literatur. - Kata kunci pencarian telah ditetapkan dan dicantumkan pada metode penelitian.	

		- Memperbaiki hasil dan pembahasan agar lebih terstruktur dan sesuai dengan tujuan penelitian. - Menambahkan penjelasan mengenai cara konsumsi dan penyeduhan matcha.	- Bagian hasil dan pembahasan telah direvisi sesuai masukan penguji. - Penjelasan mengenai cara konsumsi dan penyeduhan matcha telah ditambahkan pada pembahasan.	
3.	drg Anie Kristiani, M.Pd	- Menyeragamkan penggunaan istilah <i>Plaque Index</i> agar konsisten dalam seluruh naskah. - Menyesuaikan format daftar pustaka untuk sumber yang ditulis oleh penulis yang sama sesuai pedoman penulisan. - Menyusun kembali riwayat pendidikan pada biodata penulis secara sistematis.	- Penulisan istilah <i>Plaque Index</i> telah diseragamkan pada seluruh bagian naskah. - Format daftar pustaka telah diperbaiki dan disesuaikan dengan pedoman yang berlaku. - Riwayat pendidikan pada biodata penulis telah disusun kembali secara kronologis.	



LAMPIRAN 4.
BIOGRAFI PENULIS

BIOGRAFI PENULIS



Tsaniaturrohmah lahir di Boyolali pada tanggal 07 Juni 2003. Merupakan anak kedua dari tiga bersaudara dari pasangan Bapak Ferri Agus Sobari dan Ibu Wahidatun Handayani. Menetap di Jl. Sindangwangi 02/05, Kelurahan Karikil, Kecamatan Mangkubumi, Kota Tasikmalaya. Riwayat Pendidikan yang pernah ditempuh oleh penulis adalah :

TK Al-Amin	= 2007 - 2009
SDN Sirnasari	= 2009 - 2015
SMP IBS Darul Muta'allimin	= 2015 - 2019
SMAT Darul Muta'allimin	= 2019 - 2022
Poltekkes Kemenkes Tasikmalaya	= 2023 - 2026