**Biomedical Journal of Indonesia**
Journal Homepage: https://www.jurnalkedokteranunsri.id/index.php/BJI/index

# Comparison of Inhibition Zones Between Butterfly Pea Flower *(Clitoria ternatea)* and Lemongrass *(Cymbopogon citrarus)* Against *Streptococcus mutans* and *Staphylococcus aureus*

**Steven Martin Haditio[1*], Zulfan Muttaqin[1], Lina Hadi[1]**

[1]Dentistry Education, Faculty of Dentistry, Universitas Prima Indonesia

**ARTICLE INFO**

**Keywords:**
Butterfly Pea Flower,
Lemongrass Flower,
Streptococcus Mutans,
Staphylococcus Aureus

***Corresponding author:**
Steven Martin Haditio

E-mail address:
steven.haditio@gmail.com

All authors have reviewed and approved the final version of the manuscript.

https://doi.org/10.32539/BJI.v7i2.313

**ABSTRACT**

This study aims to determine the comparison of the inhibition zone between the extract of butterfly pea flower and lemongrass, against the bacteria streptococcus mutans and staphylococcus aureus. The samples that will be used in this research are streptococcus mutans and staphylococcus aureus bacteria. Data analysis used normality test and statistical test was performed using ANOVA analysis test and post hoc test. The results showed that there was no difference in the inhibition zone of butterfly pea flower extract against streptococcus mutans bacteria and lemongrass extract against streptococcus mutans. There was difference in the inhibition zone between butterfly pea flower extract against staphylococcus aureus bacteria and lemongrass extract against staphylococcus aureus bacteria. Butterfly pea flower extract has a good inhibition zone in staphylococcus aureus bacteria. Lemongrass extract has the same inhibition zone against both types of bacteria

## 1. Introduction

Oral and dental problems often occur in the general public, both adults and children. Based on basic health research or RisKesDas 2018, 57.6% of all people in Indonesia experience dental and oral health problems with 93% of children being the majority of people in Indonesia who experience dental and oral health problems. In 2018, RisKesDas also recorded 45.3% cases of caries teeth and 14% cases of abscess [1].

The orthodontic appliance consists of several components, namely brackets and molar tubes, archwires, and auxiliaries, where brackets and molar tubes are components that attach to the crown of teeth[2].This part of the orthodontic appliance causes food debris to stick to the tooth surface and is difficult to clean so that very suitable for the growth of bacteria. With orthodontic conditions that are difficult to clean, patients often develop caries in the teeth and periodontal diseases such as periodontal abscesses.

Dental caries is a disease that occurs in the hard tissue of teeth consisting of enamel, dentin, and cementum which is caused by various factors, including host / host, substrate / diet, agent / microorganism and time[3]. The host factor, which is the host to caries is teeth, caries easily attacks the rough surface area of the teeth, pits and fissures. The substrate factor contains carbohydrates containing sucrose which causes tooth decay, sucrose produces a substrate for the formation of acid for bacteria. Microorganism factors where there is dental plaque

which is a collection of colonized and soft microorganisms that grow if the teeth and mouth are not kept clean, bacteria that are often found are streptococcus mutans which are acidogenic and asiduric in nature. The time factor after eating, the pH of the mouth will decrease and after some time, the pH of the mouth will return to normal due to the saliva buffer within 2 hours where the inorganic minerals attached to the teeth will dissolve[4].

The formation of caries starts from plaque on the teeth which has the potential to cause disease in the hard tissues of the teeth. In plaque, there are streptococcus mutans bacteria which will metabolize cariogenic food debris, especially sucrose, glucose, fructose and maltose from carbohydrates. The results of metabolism form acids that damage the teeth that play a role in activities. When the pH on the tooth surface is decreasing, it causes a demineralization process that causes enamel damage and forms caries[4].

Periodontal abscess is a local infection of bacteria that occurs in the periodontium tissue. Abscesses often occur in patients who often have periodontitis problems, periodontitis abscesses most often occur on the lateral side of the tooth root. The periodontal abscess shows swelling, reddish color, shiny gingiva, shaped like a dome, can be fused at one point or a fistula. If the abscess is not treated immediately, it will result in tooth loss, fever, dehisration, swelling quickly, trismus, severe pain, difficulty speaking and swallowing. Abscesses can quickly spread and affect systemic conditions if treatment is not done immediately[5].

An abscess is formed from a collection of active or dead polymorphonuclear (PMN) in the wall of the periodontal socket. PMN secretes enzymes that can damage cells and tissue components that produce fluid or pus. An inflammatory reaction will occur and produce intra and extra cell edema, and destroy the leukocytes. The reduced defense in the tissue causes an infection where bacteria enter the soft tissue to start forming an abscess[5]. Abscesses can occur in all tissues of the oral cavity, the most common abscesses in the oral cavity are periapical abscesses and periodontal abscesses. The bacteria that cause periodontal abscesses are staphylococcus aureus. The country of Indonesia is known for its abundant spices, so it often uses plants that have health benefits, including oral health[6]. Telang flowers (Clitoria ternatea) and lemongrass (cyambopogon citratus) have many benefits, one of which is antibacterial, both of which contain flavonoids and saponins that inhibit bacterial growth.

Flavonoid compounds function to form complex compounds with extracellular proteins that inhibit the formation of cell membranes and denature bacterial cell proteins which cause bacteria to become defective. Saponin compounds can increase the susceptibility of cell membranes so that cells are unstable and result in cell death[7].

This study aims to determine the health benefits of telang flowers, with the results of the study that there is an inhibition zone of 7 mm of streptococcus mutans with water and 8 mm of staphylococcus aureus with the same solvent. To determine the test for the antibacterial activity of citronella flowers on the growth of the Streptococcus mutans bacteria with a 50% concentration resulting in an inhibition zone of 17.3 mm. To determine the antimicrobial effect of certain bacteria, the results of research with a concentration of 100 mg / ml of lemongrass extract obtained an inhibition zone of 17mm[8]. Based on the above research, the authors are interested in researching "the comparison of telang flower extract with lemongrass extract against streptococcus mutans and staphylococcus aureus" by equalizing the treatment and concentration of telang flower extract and lemongrass flower extract against streptococcus mutans and staphylococcus aureus bacteria, where in previous studies do separate research and use different methods. Researchers hope that this research can provide additional knowledge for the wider community about the use of plants that are often and easily obtained to maintain oral health in daily use.

## 2. Method

This type of research is in the form of experimental research. The location of the research was carried out at the Prima Indonesia University Laboratory of the

Faculty of Medicine. The research implementation is scheduled for February 2021. The samples to be used in the study are Streptococcus mutans and Staphylococcus aureus bacteria. The research data were obtained by measuring the inhibition zone of bacterial growth on the disc using a caliper or other measuring instrument. The data that has been obtained will be carried out statistical tests with ANOVA analysis test and post hoc test where to determine changes in the average value in each group.

**Research procedure**

The process of making the extraction of telang and lemongrass flowers consists of several stages, namely as follows: Enter the dried telang and lemongrass flowers into the macerator, add 70% ethanol solution with a ratio of 5 : 1, soak for 24 hours with a little stirring, the solution has been soaked then filtered using sterile gauze to produce macerate, the remaining dregs are then squeezed back 1x, evaporate the extract of the telang flower and lemongrass using a rotary evaporator with a temperature of $78^0$C then do the residue using a water bath with a temperature of $<65^0$C to produce ethanol extract dilute the extract obtained before using distilled water to a concentration of 100%, 75%, 50%, and 25%.

## 3. Results

Based on the results of the normality test that has been carried out, the p-value of telang flower extract against streptococcus mutans is p = 0.759 ( p > 0.05), for the telang flower extract against staphylococcus aureus bacteria, namely p = 0.692 (p > 0.05) , lemongrass extract against streptococcus mutans bacteria, namely p = 0.667 (p > 0.05), and lemongrass extract against staphylococcus aureus bacteria p = 0.993 (p > 0.05). Due to the p value > 0.05 with this provision, in this study the data used were normally distributed. Data analysis can be continued by using one way ANOVA and post hoc statistical tests.

The results of the oneway ANOVA test p-value = 0.125 (p > 0.05) for the telang flower extract against the Streptococcus mutans bacteria and the lemongrass extract against the Streptococcus mutans bacteria, which means that there is no significant difference in the inhibition zone between the telang flower extract and the bacteria. streptococcus mutans and lemongrass extract against staphylococcus aureus bacteria. p-value = 0.000 (p <0.05) for telang flower extract against staphylococcus aureus bacteria and lemongrass extract against staphylococcus aureus bacteria, which means that there is a significant difference in the inhibition zone between telang flower extract against staphylococcus aureus bacteria and lemongrass extract against staphylococcus aureus bacteria. staphylococcus aureus bacteria.

From the results of the study it can be stated that there is no difference in the inhibition zone of telang flowers against streptococcus mutans and lemongrass extract against streptococcus mutans bacteria, then there is a difference in the inhibition zone between the telang flower extract against staphylococcus aureus bacteria and lemongrass extract against staphylococcus aureus bacteria.

From the results of the ANOVA test that has been carried out in the study, we can see the results, for the p-value of telang flower extract against Streptococcus mutans, the value is 0.049 (p <0.05) for the p-value of flower telang against Staphylococcus aureus, the value is 0.000 (p <0.05) which indicates that the flower telang has an inhibitory power against Staphylococcus aureus bacteria.

For the p-value of lemongrass extract against Streptococcus mutans bacteria, the value is 0.000 (p <0.05) with this value, so lemongrass has an inhibitory power against Streptococcus mutans bacteria, for the p-value of lemongrass against Staphylococcus aureus bacteria, the value is 0.000 ( p <0.05) which states that lemongrass has an inhibitory power against Staphylococcus aureus bacteria.

## 4. Discussion

This study aims to determine the comparison of the inhibition zone between the extract of telang flower and lemongrass against the bacteria Streptococcus mutans and staphylococcus aureus in orthodontic users. The results showed that there was no difference in the

inhibition zone of telang flowers against streptococcus mutans and lemongrass extract against streptococcus mutans bacteria, then there was a difference in the inhibition zone between the telang flower extract against the staphylococcus aureus bacteria and the lemongrass extract against the staphylococcus aureus bacteria.

Then from the results of the p value that has been obtained we can see that for the telang flower extract has a good inhibition zone in the Staphylococcus Aureus bacteria, this can be seen from the p value which states that the p value for the telang flower extract against the Staphylococcus Aureus bacteria The value was smaller than the p value of the telang flower extract against Streptococcus mutans bacteria.

For the inhibition zone of lemongrass extract, we see that the p value between lemongrass extract against Streptococcus mutans bacteria and lemongrass extract against Staphylococcus Aureus bacteria has the same p value, which means that lemongrass extract has the same inhibition zone for both types of bacteria. This research is in line with Ulfayani's research[9] which states that lemon grass juice has antibacterial activity which can inhibit the growth of Streptococcus mutans bacteria. The same research was also carried out by Susana[3], where the results stated that lemongrass leaf extract had an inhibitory power against the growth of Streptococcus mutans bacteria.

Several previous studies have examined the efficacy of telang flowers, such as research conducted by Kun Sri Budiasih[10] which said that telang flowers have many pharmacological properties, including as antioxidants, antimicrobials, anticancer, anti-inflammatory, analgesic, antipyretic, antidiabetic, anticide, and potential for composition. central nervous system (Central Nervous System). The potential as a medicinal ingredient is supported by phytochemical studies which found the active ingredients such as tannins, plobatin, saponins, triterpenoids, phenols, flavonoids, alkaloids, anthraquinones, anthocyanins, flavonol glycosides, steroids, essential oils and stigmas-4-ene-3.6-dion. These various pharmacological potentials need to be studied and researched as part of developing the potential of Indonesia's biological resources.

## 5. Conclusion

There was no difference in the inhibition zone of telang flowers against streptococcus mutans bacteria and lemongrass extract against streptococcus mutans. There were differences in the inhibition zone between the telang flower extract against the staphylococcus aureus bacteria and the lemongrass extract against the staphylococcus aureus bacteria. Telang flower extract has a good inhibition zone in Staphylococcus aureus bacteria. Lemongrass extract has the same inhibition zone against both types of bacteria.

## 6. References


1. Basic Health Research (Riskesdas) (2018). Ministry of Health Research and Development Agency of the Republic of Indonesia in 2018.
2. Nyoman, S.P. Putu, I.A. Sari. K. 2018 The caries status of non-dentistry students using fixed orthodonics at Udayana University. E-ISSN: 2549-0109
3. Susana, A.F. Jane, W. Michael, A.L. 2017. Test the inhibition of lemongrass leaves against the growth of Streptococcus mutans. Journal of e-GIGI (Eg), Volume 5 Number 1, January - June 2017.
4. Listriana. 2017 the relationship between brushing teeth and toothpaste containing herbs to decrease the debris score in patients with the dental clinic of An-Nias Palembang, JPP (Palembang Health Journal) Volume 12 No. 1 June 2017.
5. Arni, I.D. 2017 Treatment of Patients with Periodontal Faculty of Dentistry, Hasanuddin University
6. Sartika, WL. Damajanty, H.C. Bernart, S.P. 2015 Test the effectiveness of lime juice (citrus aurantifolia S) on the growth of staphylococcus aureus bacteria in vitro, pharmaceutical scientific journal - UNSRAT vol. 4 No. 4 November 2015 ISSN 2302 - 2493.
7. Zwista, Y.D. Asikin, N. Triana, H. 2015 Antibacterial and biofilm inhibitory effects of

lemongrass extract (Cymbopogon nardus L.) against Streptococcus mutans bacteria.

8. Umar.M. *Phytochemical Analysis and antimicrobial effect of lemon grass (cymbopogon citratus) obtained from zaria, kaduna state, nigeria.* 1(2):1-8, 2016, Article no.JOCAMR.26783.
9. Ulfayani. M, Alfi.S. 2017. Test the antibacterial activity of lemongrass leaves against the growth of Streptococcus mutans bacteria. KLOROFIL Vol.3 No. 2, 2019: 15-19.
10. Kun Sri Budiasih. 2017 Study of the pharmacological potential of telang flowers. UNY Faculty of Mathematics and Natural Sciences seminar room, 14 October 2017.