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Extraction of Pipper Betle L. and Formulation of Herbal Propolis Mouthwash

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ABSTRACT

Betel leaf (*Pipper Betle L.*) is a climbing plant that has many benefits. Betel leaves have long been used for fever therapy, cough, stomach cramps, anti-allergic, wound healing, antimicrobial, and antiproliferative. Extraction of betel leaves with green solvent requires optimization of the extraction time and percentage of betel leaves with water. Betel and propolis extracts need to be formulated to become an herbal propolis mouthwash. The purpose of this research (1). Getting the best time and percentage of betel leaves in the extraction into betel extract formulated to make herbal propolis mouthwash. (2). Getting the best formula for variations in the percentage of propolis in herbal propolis mouthwash, (3). Conduct a selectivity test to obtain the results of mouthwash as an antibiotic. Based on the results of this research with a comparison of the heating time of betel leaf extraction. Betel leaf extraction was carried out by the infusion method, and the extract was distilled with variations in the percentage of betel leaves of 2.5%, 5%, 7.5%, 10%, 12.5% , and 50% compared with water. The best heating time results for the **best** betel leaf extraction, based on the yield of betel leaf extraction and pH were 60 minutes. For the optimum betel leaf extraction results at a betel leaf concentration of 50%. Getting a yield value of 40% and pH 4.55 at an extraction time of 60 minutes. The research is still ongoing by conducting a test of the inhibition of Staphylococcus Aureus bacteria in herbal propolis mouthwash with variations in the percentage of propolis of 0%, 2.5%, and 5%.In the blank without the addition of propolis it does not inhibit bacteria *Staphylococcus Aureus*, the addition of 2.5% and 5% propolis to the herbal propolis mouthwash formula has been proven to inhibit bacteria *Staphylococcus Aureus.*

Introduction

Betel leaf is a climbing plant that has many benefits. Betel leaf has long been used for fever therapy, cough, stomach cramps, anti-allergic, wound healing, antimicrobial, and antiproliferative. The development of green solvent is also something that needs to be followed up. Betel leaf contains phenol, which acts as an antimicrobial so that it can inhibit the growth of microbes such as Staphylococcus Aureus, Salmonella Thyposa, and various others so that betel leaf extract can be used as a solvent [1-5]. Betel leaf commodities that are not difficult to find make this plant in demand in its use, especially as a medicine. In addition to betel leaves containing Tannin and Flavonoids, which play a role in preventing bacterial growth, they also contain phenol so that betel leaf extraction needs to be done as an alternative to bioalcohol contained in betel leaves [6-8].

Propolis commodity is the result of the utilization of by-products from beekeeping. Propolis has many benefits, one of which is the antioxidants in propolis can accelerate the formation of new tissue so that it is used for wound treatment. The reaction that occurs between Antioxidants and Antimicrobials can produce natural antibiotics that can reduce the use of antibiotics [9-15].

The urgency of this research is the need for a herbal mouthwash formulation combining betel leaf extract and propolis. Extraction of betel leaves with water is a green solvent in obtaining betel extract in the formulation of herbal mouthwash combined with propolis. To obtain the betel leaf extract is to measure the yield of the extract. Betel leaves are

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extracted using an extractor with a ratio of 1: 1 between betel leaves and water. so that the measurement of the extraction time scale can be obtained so that the yield of the extract can be measured and the optimum yield of betel leaf extraction can be determined. Betel leaves have benefits as antimicrobials that can inhibit microbial growth. One of them is Staphylococcus A. This bacteria is commonly found in the mouth so that it damages dental and oral health. Propolis is a commodity that has a high antioxidant value in its use as a wound healing medicine [16-18]. The best application in maintaining dental and oral health is with mouthwash. Therefore, the need for propolis concentrations that are used effectively for mouthwash that can be tested include 2.5%, 5% 7.5%, 10% and 12.5%. The combination of flavonoids in betel leaves and propolis as an antioxidant can form antibiotics.

Methods

This research was conducted at the Laboratory of Chemical Engineering, Engineering and Tu Faculty, Universitas Muhammadiyah Jakarta. Pbacterial inhibition test Staphylococcus Aureus method ISO 7218:2024 was conducted at Tuv Nord Indonesia Laboratory, Cikarang, Indonesia.

The flow chart of the research procedure is presented in **Figure 1 and 2**.

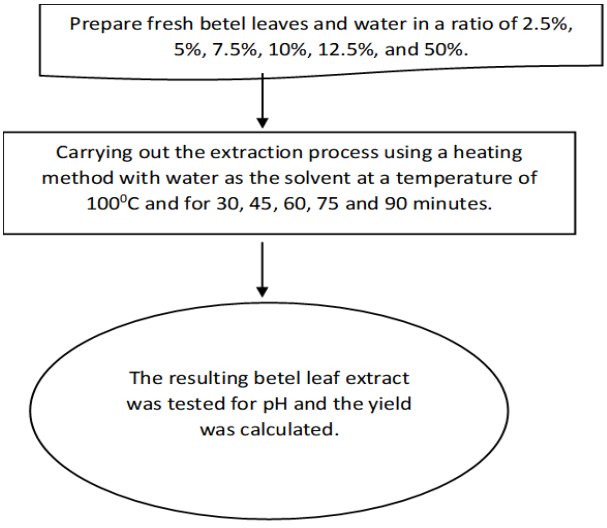

Figure 1. Flowchart of the Green Solvent Extraction Process of Betel Leaves

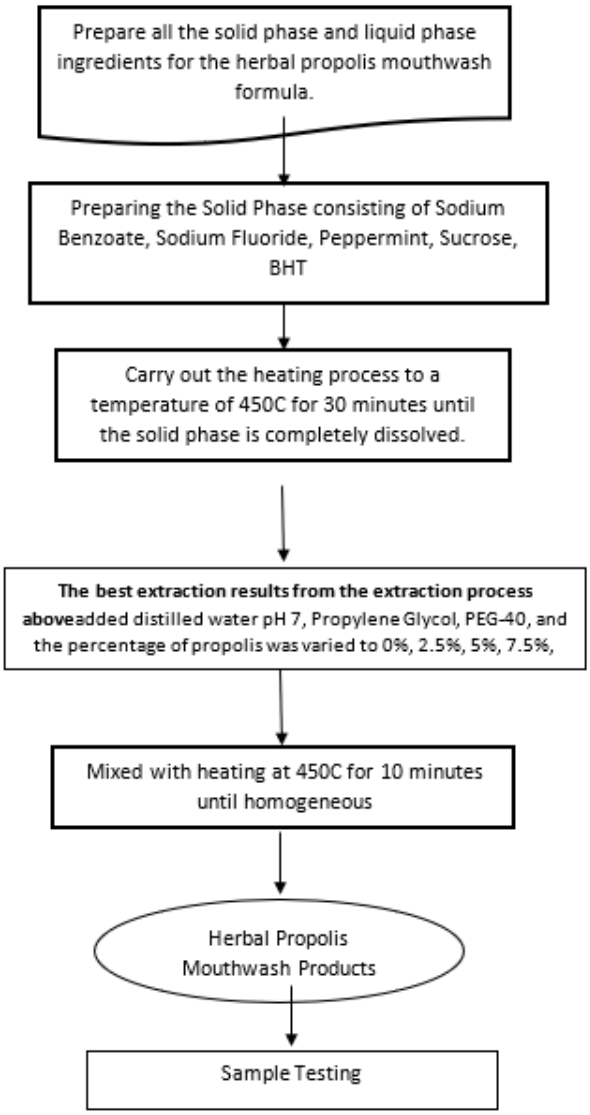

Figure 2. Flowchart of the Process of Making Herbal Propolis Mouthwash

Results and Discussions

Optimization of betel leaf extraction time

Betel leaf extraction was carried out using the infusion extraction method, which was directly distilled using an extractor. Researchers tested the effect of the length of extraction time on the resulting yield. Researchers used various concentrations of betel leaves in the extraction, namely 2.5%, 5%, 7.5%, 10%, 12.5% , and 50%. This means that in 100 grams of water, there are 2.5 grams of betel leaves. For extraction needs, a minimum of 500 mL is needed (**Table 1**).

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Table 1. Percentage, Weight of betel leaves and Weight of water.

Concentration (%)	Betel leaf weight (grams)	Water weight (grams)
2.5	12.5	500
5	25	500
7.5	37.5	500
10	50	500
12.5	62.5	500
1:1	500	500

So betel leaf extraction was carried out using an extractor with time observation for 30, 45, 60, 75, 90 minutes. The research was conducted by observing the amount of extract obtained with a comparison of extraction time, then the following data were obtained.

Extraction Time, Extract Volume, pH, and Yield at 2.5% concentration

Table 2. Extraction Time, Extract Volume, pH, and Yield at 2.5% concentration

Extraction Time (minutes)	Extract Volume (mL)	pH	Yield (%)
30	40	4.20	8
45	55	4.20	11
60	115	4.50	23
75	80	4.26	16
90	20	3.28	4

The effect of extraction time on the yield and pH of the Piper betle I betel leaf extract with a water ratio of 2.5% is presented in the following **Figure 3-4**.

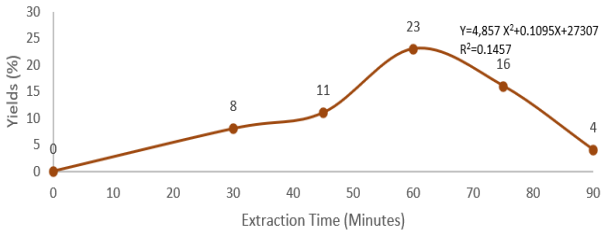

Figure 3. Effect of Extraction Time on Betel Leaf Extraction Yield at a betel leaf concentration of 2.5%

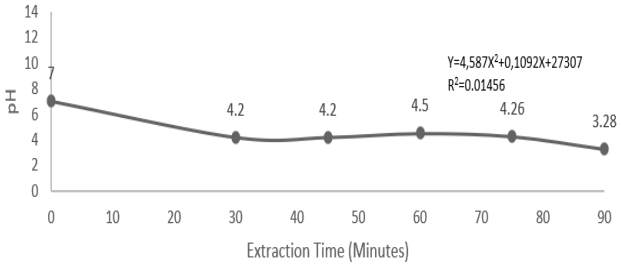

Figure 4. Effect of extraction time on the pH of the extraction results at a betel leaf concentration of 2.5%

Based on the results of the research, the extraction volume was obtained with an extraction time variable of 0 minutes, 30 minutes, 45 minutes, 60 minutes, 75 minutes, and 90 minutes. The results of the extraction volume were 0 mL, 45 mL, 60 mL, 160 mL, 110 mL, 30 mL. The yield and pH produced with the same extraction time obtained yield results of 0%, 9%, 12%, 32%, 22% and 6. The observed pH was 7, 4.2, 4.2, 4.5, 4.3, 4.1.

Extraction Time, Extract Volume, pH and Yield at 5% concentration

Table 3. Extraction Time, Extract Volume, pH and Yield at 5% concentration

Extraction Time (minutes)	Extract Volume (mL)	pH	Yield (%)
30	45	4.20	9
45	60	4.20	12
60	160	4.55	32
75	110	4.30	22
90	30	4.18	6

The effect of extraction time on the yield and pH of the Piper betle leaf extract with a water ratio of 5% is presented in the following **Figure 5-6**.

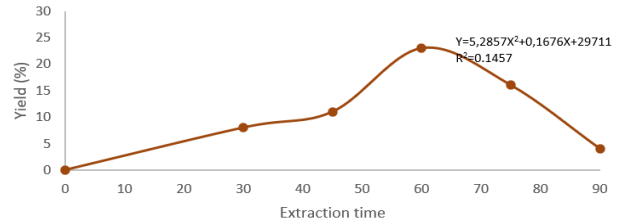

Figure 5. Effect of Extraction Time on Betel Leaf Extraction Yield at 5% Betel leaf concentration

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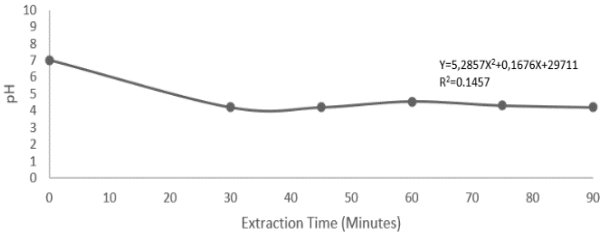

Figure 6. Effect of Extraction Time on the pH of Betel Leaf Extract at a betel leaf concentration of 5%

Based on the results of the research, the extraction point obtained the extraction volume carried out with the extraction time variable for 0 minutes, 30 minutes, 45 minutes, 60 minutes, 75 minutes, and 90 minutes. The results of the extraction volume were 0 mL, 45 mL, 60 mL, 170 mL, 100 mL, 35 mL. The yield and pH produced with the same observation time obtained yield results of 0%, 9%, 12%, 34%, 20% and 7. The observed pH was produced at 7, 4.2, 4.2, 4.5, 4.3, 4.2.

Extraction Time, Extract Volume, PH and Yield at 7.5% concentration

Table 4. Extraction Time, Extract Volume, pH and Yield at 7.5% concentration

Extraction Time (minutes)	Extraction Volume (mL)	pH	Yield (%)
30	45	4.20	9
45	60	4.20	12
60	170	4.55	34
75	100	4.30	20
90	35	4.20	7

The effect of extraction time on the yield and pH of the Piper betle I betel leaf extract with a water ratio of 7.5% is presented in the following **Figure 7-8**.

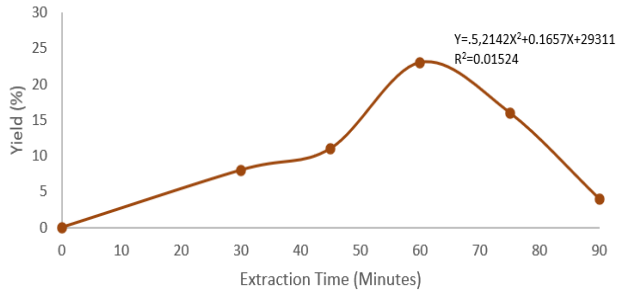

Figure 7. Effect of Extraction Time on the Yield of Pipper Betle L Betel Leaf Extraction with a water ratio of 7.5%

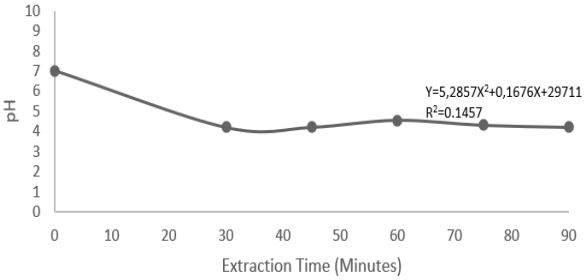

Figure 8. Effect of Extraction Time on the pH of Pipper Betle L Betel Leaf Extract with a water ratio of 7.5%

Based on the results of the research, the extraction point obtained the extraction volume carried out with the extraction time variable for 0 minutes, 30 minutes, 45 minutes, 60 minutes, 75 minutes, and 90 minutes. The results of the extraction volume were 0 mL, 45 mL, 60 mL, 160 mL, 110 mL, 30 mL. The yield and pH produced with the same observation time obtained yield results of 0%, 9%, 12%, 32%, 22% and 6. The observed pH was produced at 7, 4.2, 4.2, 4.5, 4.3, 4.1.

Extraction Time, Extract Volume, PH and Yield at 10% concentration

Table 5. Extraction Time, Extract Volume, pH and Yield at 10% concentration

Extraction Time (minutes)	Extraction Volume (mL)	pH	Yield (%)
30	40	4.18	8
45	75	4.20	15
60	175	4.55	35
75	115	4.35	23
90	45	4.20	9

The effect of extraction time on the yield and pH of the Piper betle I betel leaf extract with a water ratio of 10% is presented in the following **Figure 9-10**.

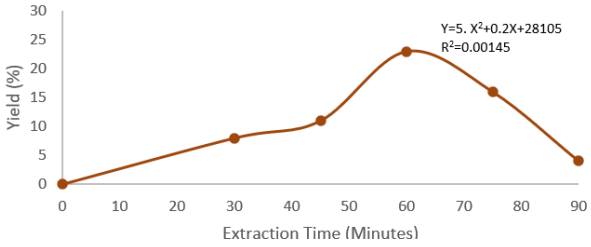

Figure 9. Effect of Extraction Time on the Yield of Pipper Betle L Betel Leaf Extraction with a water ratio of 10%.

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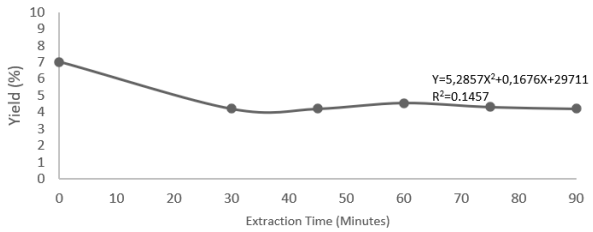

Figure 10. Effect of Extraction Time on the pH of Pipper Betle L Betel Leaf Extract with a water ratio of 10%

Based on the results of the research, the extraction point obtained the extraction volume carried out with the extraction time variable for 0 minutes, 30 minutes, 45 minutes, 60 minutes, 75 minutes, and 90 minutes. The results of the extraction volume were 0 mL, 40 mL, 75 mL, 175 mL, 115 mL, 45 mL. The yield and pH produced with the same observation time obtained yield results of 0%, 8%, 15%, 35%, 23% and 9%. The observed pH was 7; 4.18; 4.2; 4.5; 4.3; 4.2.

Extraction Time, Extract Volume, PH and Yield at 12.5% concentration

Table 6. Extraction Time, Extract Volume, pH and Yield at 12.5% concentration

Extraction Time (minutes)	Extraction Volume (mL)	pH	Yield (%)
30	45	4.20	9
45	70	4.20	14
60	180	4.55	36
75	100	4.35	20
90	50	4.20	10

The effect of extraction time on the yield and pH of the Piper betle I betel leaf extract with a water ratio of 12.5% is presented in the following **Figure 11-12**.

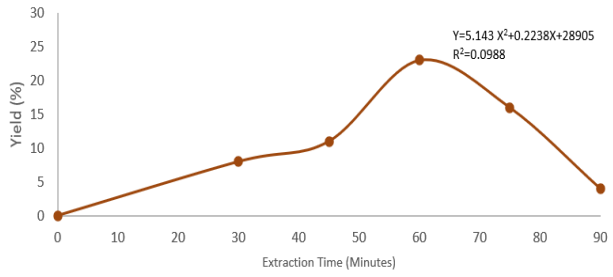

Figure 11. Effect of Extraction Time on the Yield of Pipper Betle L Betel Leaf Extraction with a water ratio of 12.5%

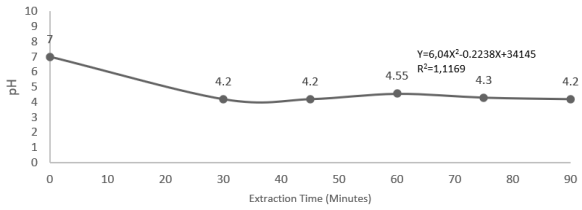

Figure 12. Effect of Extraction Time on the pH of Pipper Betle L Betel Leaf Extract with a water ratio of 12.5%

Based on the results of the research conducted by the researcher, the extraction point obtained the extraction volume carried out with the extraction time variable for 0 minutes, 30 minutes, 45 minutes, 60 minutes, 75 minutes, and 90 minutes. The results of the extraction volume were 0 mL, 45 mL, 70 mL, 180 mL, 100 mL, 50 mL. The yield and pH produced with the same observation time obtained yield results of 0%, 9%, 14%, 36%, 20% and 10%. The observed pH was 7; 4.3; 4.2; 4.5; 4.3; 4.2.

Extraction Time, Extract Volume, PH and Yield at 50% concentration

Table 7. Extraction Time, Extract Volume, pH and Yield at 50% concentration

Extraction Time (minutes)	Extraction Volume (mL)	pH	Yield (%)
30	40	4.30	8
45	80	4.20	16
60	200	4.70	40
75	115	4.20	23
90	55	4.20	11

The graph shows the effect of Extraction Time on the yield and pH of the Piper betle l betel leaf extract with a water ratio of 50% as follows **Figure 13-14**.

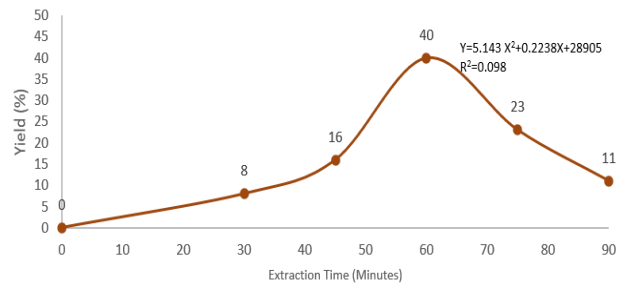

Figure 13. Effect of Extraction Time on the Yield of Pipper Betle L Betel Leaf Extraction with a water ratio of 50%.

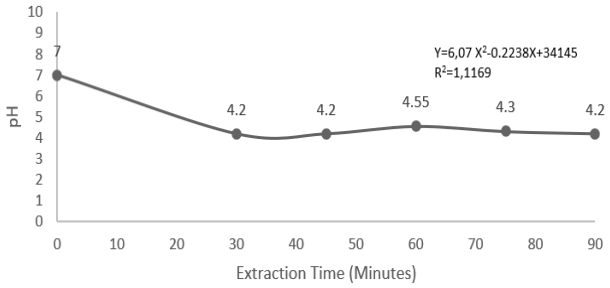

Figure 14. Effect of Extraction Time on the pH of Pipper Betle L Betel Leaf Extract with a water ratio of 50%.

Based on the results of the research, the extraction point obtained the extraction volume carried out with the extraction time variable for 0 minutes, 30 minutes, 45 minutes, 60 minutes, 75 minutes, and 90 minutes. The results of the extraction volume were 0 mL, 40 mL, 80 mL, 200 mL, 115 mL, 55 mL. The yield and pH produced with the same observation time obtained yield results of 0%, 9%, 14%, 36%, 20% and 10%. The observed pH was 7, 4.3, 4.2, 4.5, 4.3, 4.2.

After observing the extraction of betel leaves with the value of the yield results with the infusion method extraction, the highest yield percentage was obtained at a water ratio of 50% with an extraction time of 60 minutes which resulted in betel leaf extraction (pipper betle L) with a pH of 4.5. With this best yield, the research was continued by determining the phenol content listed at 40% more specifically with qualitative and quantitative tests of the presence of phenol and flavonoids in betel leaves (Pipper Betle L).

Flavonoid Test Results

Qualitative test in determining the presence of flavonoids in betel leaves was carried out to ensure the presence of flavonoids in betel leaves 12.5% w/v. This test was carried out by testing the extraction of 10 mL and then dissolved with ethanol with a ratio of betel leaf extract (pipper betle l) to ethanol 1:1. After that, Magnesium and hydrochloric acid were added. The presence of flavonoids is indicated if the extract is yellow.

Figure 15. Qualitative test for the presence of flavonoids

The basic formula of mouthwash (Table 8-9)

Table 8. Basic formula of mouthwash (Propolis 0%)

No.	Component	Percentage (%)
1	Purified Water	Add 250 mL
2	Betel leaf	10 mL with a ratio of 50% extraction time 60 minutes
3	PEG-40 Hydrogenated Castor Oil	0.5%
4	Propolis Extract	0%
5	Peppermint	0.15%
6	Propylene Glycol	0.1%
7	Sucrose	0.2%
8	Sodium Benzoate	1.7%
9	BHT	0.03%
10	Sodium Fluoride	0.15%

In the application of propolis as a phenol compound that plays a role in inhibiting bacterial growth, with the addition of 0% propolis, the color of the mouthwash is much paler and the pH is at 5.80.

Table 9. Basic formula of mouthwash (Propolis 2.5%)

No	Name	Percentage (%)
1	Purified Water	Add 250 mL
2	Betel leaf	10% mL with a ratio of 50% extraction time 60 minutes
3	PEG-40 Hydrogenated	0.5%

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	Castor Oil	
4	Propolis Extract	2.5%
5	Peppermint	0.15%
6	Propylene Glycol	0.1%
7	Sucrose	0.2%
8	Sodium Benzoate	1.7%
9	BHT	0.03%
10	Sodium Fluoride	0.15%

In the application of propolis as a phenol compound that plays a role in inhibiting bacterial growth, the addition of 2.5% propolis makes the color of the mouthwash more concentrated, indicated by a change in the color of the solution to light brown. The pH of the solution becomes 6.03.

Bacterial inhibition test results

In the bacterial inhibition test *Staphylococcus Aureus.* Testing was carried out at the KAN TUV NORD Indonesia certified laboratory, Cikarang with the following results. The test was carried out on the addition of 0%, 2.5%, and 5% propolis. The method used is ISO 7218:2024. In the blank without the addition of propolis, it does not inhibit bacteria *Staphylococcus Aureus*; the addition of 2.5% and 5% propolis to the herbal propolis mouthwash formula has been proven to inhibit bacteria *Staphylococcus Aureus.*

Conclusions

Based on the results of this research with a comparison of the extraction time of the extraction of Pipper Betle L. betel leaf. Betel leaf extraction was carried out using the infusion method, and the extract was distilled with variations in the percentage of betel leaves of 2.5%, 5%, 7.5%, 10%, 12.5% , and 50% compared with water. The best extraction time results for the best betel leaf extraction were based on the yield of betel leaf extraction and pH were 60 minutes. For the optimum betel leaf extraction results at a betel leaf concentration of 50%. Getting a yield value of 40% and pH 4.55 at an extraction time of 60 minutes. The research is still ongoing by conducting a test of the inhibition of Staphylococcus Aureus bacteria in herbal propolis mouthwash with variations in the percentage of propolis of 0%, 2.5%, and 5%.In the blank without the addition of propolis it does not inhibit bacteria *Staphylococcus Aureus*; the addition of 2.5% and 5% propolis to the herbal propolis mouthwash formula has been proven to inhibit bacteria *Staphylococcus Aureus.*

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References

[1] Alamsyah, Yenita, Utmi Arma, and Rizq Hidayat. 2021. “Obat Herbal Rebusan Daun Sirih (Piper Betlelinn) Sebagai Obat Kumur Terhadap Kesehatan Rongga Mulut Di Masa Pandemi Covid-19 (Scoping Review).” *MENARA Ilmu* XV (02): 109–16.

[2] Candrasari, Anika, M. Amin Romas, and Ovi Rizky Astuti. 2011. “UJI DAYA ANTIMIKROBA EKSTRAK ETANOL DAUN SIRIH MERAH (Piper Crocatum Ruiz & Pav.) TERHADAP PERTUMBUHAN Staphylococcus Aureus ATCC 6538, Eschericia Coli ATCC 11229 DAN Candida Albicans ATCC 10231 SECARA IN VITRO.” *Biomedika* 5 (1): 9–16. https://doi.org/10.23917/biomedika.v4i1.258

[3] Caroline, Caroline, Esa Bella, Tri Erri Astoeti, Abdul Gani Soulisa, Yenny Pragustine, and Deviyanti Pratiwi. 2023. “Pelatihan Pemanfaatan Propolis Dalam Menjaga Kesehatan Gigi Pada Warga Lansia Rt 001/011 Pamulang.” *Jurnal Kreativitas Pengabdian Kepada Masyarakat (PKM)* 6 (4): 1344–53. https://doi.org/10.33024/jkpm.v6i4.8877.

[4] Demas, Ghina Beta. 2021. “Pengaruh Lama Perendaman Dalam Larutan Propolis Sebagai Bahan Desinfektan Terhadap Perubahan Warna Basis Gigi Tiruan Termoplastik Nilon GHINA BETA DEMAS, Dr. Drg. Endang Wahyuningtyas, M.S., Sp.Pros(K).; Drg. Heriyanti Amalia Kusuma, S. U., Sp.P” 2 (2020): 30–33.

[5] Dinyanti, Shinta, Roedy Budirahardjo, and Raditya Nugroho. 2020. “Perbedaan PH, Viskositas Dan Volume Saliva Setelah Berkumur Dengan Obat Kumur Sintetik Yang Mengandung Chlorhexidine Dan Larutan Propolis Pada Anak Usia 11-12 Tahun.” *Pustaka Kesehatan* 7 (3): 158. https://doi.org/10.19184/pk.v7i3.10715.

[6] H.Hanapi, Rizkya Roswati, Alisya Nabila Agustin, Tita Ruhdiana, Selviani Eka Suci, Wanda Indriyani, and Neni Sri Gunarti. 2022. "Potensi Propolis Sebagai Antibakteri : Review Jurnal." *Jurnal Buana Farma* 2 (4): 17–24. https://doi.org/10.36805/jbf.v2i4.601.

[7] Haryanti, Sri, Riski Danira Larasati, and Harini Agusta. 2020. "Optimasi Waktu Maserasi Dan Konsentrasi Ekstrak Daun Sirih Hijau (Piper Betle Linn) Dalam Pembuatan Gel Antiseptik Kulit." *Konversi* 9 (2): 17–24. https://jurnal.umj.ac.id/index.php/konversi/article/view/8655/5099.

[8] Hasanah, Nur, Fenita Purnama Sari Indah, Dede Anggraeni, Nurwulan Adi Ismaya, and Lela Kania Rahsa Puji. 2020. "Perbandingan Formulasi Dan Uji Stabilitas Fisik Sediaan Gel Ekstrak Lidah Buaya (Aloe Vera) Dengan Perbedaan Konsentrasi." *Edu Masda Journal* 4 (2): 132. https://doi.org/10.52118/edumasda.v4i2.104

[9] Milah, Nihayatul, Siti Harnina Bintari, and Dewi Mustikaningtyas. 2016. "Pengaruh Konsentrasi Antibakteri Propolis Terhadap Pertumbuhan Bakteri Streptococcus Pyogenes Secara In Vitro." *Life Science* 5 (2): 95–99. http://journal.unnes.ac.id/sju/index.php/UnnesJLifeSci.

[10] Mubarak, Zaki, Santi Chismirina, and Hafizah Humairah Daulay. 2016. "AKTIVITAS ANTIBAKTERI EKSTRAK PROPOLIS ALAMI DARI SARANG LEBAH TERHADAP PERTUMBUHAN Enterococcus Faecalis." *Journal Of Syiah Kuala Dentistry Society* 1 (2): 175–86.

[11] Mufrod, Suwaldi, and Subagus Wahyuono. 2016. "Patch Ekstrak Daun Sirih (Piper Betle L): Pengaruh Penambahan Release Enhancer Substances Terhadap Sifat Fisikokimia Dan Aktivitas Antibakteri." *Majalah Farmaseutik* 12 (2): 431–42.

[12] Noviyanty, Yuska, Farmasi Al-fatah Bengkulu, Analis Kesehatan, and Harapan Bangsa. 2021. "Oceana Biomedicina Journal." *Oceana Biomedicina Journal* 4 (1): 38–52.

[13] Pangesti, Rizki Dwi, Edy Cahyono, and Ersanghono Kusumo. 2017. "Indonesian Journal of Chemical Science Perbandingan Daya Antibakteri Ekstrak Dan Minyak Piper Betle L . Terhadap Bakteri Streptococcus Mutans." *Indonesian Journal of Chemical Science* 6 (3): 291–99.

[14] Saeed, Muhammad Ali, Abdul Khabeer, Muhammad Ali Faridi, and Ghulam Makhdoom. 2021. "Effectiveness of Propolis in Maintaining Oral Health: A Scoping Review." *Canadian Journal of Dental Hygiene* 55 (3): 167–76.

[15] Santos, Vagner Rodrigues, Elizete Maria Rita Pereira, João Luís Duval Cândido Da Silva, Fernando Freitas Silva, Mariana Passos De Luca, Efigênia Ferreira E. Ferreira, and Telma Campos Medeiros Lorentz. 2011. "Clinical Evidence of the Efficacy of a Mouthwash Containing Propolis for the Control of Plaque and Gingivitis: A Phase II Study." *Evidence-Based Complementary and Alternative Medicine* 2011. https://doi.org/10.1155/2011/750249.

[16] Suarantika, Farendina, Vinda Maharani Patricia, and Hanifa Rahma. 2023. "Optimasi Proses Ekstraksi Daun Sirih Hijau (Piper Betle L.) Yang Memiliki Aktivitas Antioksidan Berdasarkan Penggunaan Secara Empiris." *Jurnal Ilmiah Medicamento* 9 (1): 16–21. https://doi.org/10.36733/medicamento.v9i1.5253.

[17] Sudiana, I Ketut, Walida Pangestuti, and Wahyuni Tri Lestari. 2006. "Propolis Dan Silver Sufadiazin 1 % (Comparison Of The Effectiveness Between Propolis And Silver Sulfadiazine 1 % On Burn Wound Healing) I Ketut Sudiana *, Walida Pangestuti *, Wahyuni Tri Lestari *." *Jurnal Ners* 4 (2): 128–38.

[18] Sutopo, Tri, Rochmadina Suci Bestari, and Retno Sintowati. 2016. "The Effect of the 70% Ethanol Extract of Betel Leaf (Piper Betle L.) on Bleeding Time in Mice Swiss Webster Strain." *Biomedika* 8 (2): 1–8.