



Literature Review : Benefits of The Essential Oil Content in Green Betel Leaves (*Piper Betle L*) as Anti-Bacterial

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ABSTRACT

Green betel leaf is a traditional medicine that contains essential oils and components consisting of kavicol, phenol, hydroxycavicol and several derivatives which act as antibacterials. The essential oil content in green betel leaves has anti-bacterial activity against various types of bacteria with a measure of its inhibitory power. The method used by researchers is literature review or literature review. The aim of this research is to determine the benefits of the essential oil content in green betel leaves (*Piper betle L*) as an anti-bacterial. The solutions used in several studies to extract essential oil content are; Aquades, Phenol, Methanol, Aquades, N-Hexane, Ethanol, and Ethylacetate, NaCl 0.85%, Ethanol 96%, Aquadest, Ethanol, DMSO 20%, and ethylacetate, which are used to inhibit bacteria. There are a number of factors that can influence literature review research regarding the benefits and essential oil content of green betel leaves (*piper betle L*).

Keywords: antibacterial, essential oils, *Piper betle L*

I. INTRODUCTION

Betel is a green plant with heart-shaped leaves. This plant from the Piperaceae family originates from South Asian countries such as India, Nepal, Bangladesh and Sri Lanka. They are also widespread in Malaysia, Thailand, Taiwan, and Indonesia (Pratiwi & Muderawan, 2016) . The names for Indonesian betel are betel (English), paan (Indian), and phlu (Thailand). This plant can be cultivated because of its antiseptic and wound healing properties (Jayarambabu, N., Kumari, BS, Rao, KV, & Prabhu, 2014) . Green betel (*Piper betle Linn.*), a member of the Piperaceae tribe, has been used by Indonesians for a long time (Munawaroh, 2018). Betel leaf essential oil ranges from 1-4.2%, as well as phenolic compounds and their derivatives such as hydroxy kavicol, cavibetol, estargiol, eugenol, methyleneugenol, carvacrol, terpenes, sesquiterpenes, phenylpropanes, and tannins (Agusta et al., 2010).

Several researchers have investigated green betel plants as antibacterial. According to Shetty and (Shetty & Vijayalaxmi, 2012) , green betel leaves have tannins, saponins and flavonoids which act as antimicrobials and antiseptics. Betel leaves can grow in various types of soil, including fertile soil and medium structure.

The essential oil content of green betel leaves, which consists of phenol and several derivatives, such as euganol and kavikol, is responsible for its antibacterial effect (Ibrahim, 2013a). Green betel leaves can be used by the public because of their antibacterial properties.

They can be used as potential antioxidants and antibacterials against *Staphylococcus epidermidis* (Januarti et al., 2019) . Even pathological vaginal discharge in teenagers can be reduced by boiling betel leaves (Wulandari, 2021) .

By considering the potential benefits of betel leaves that have been described above, the aim of this literature review is to collect several articles that discuss the essential oil content of Green Betel Leaves (*Piper Betle L*) as antibacterial.

II. METHODS

The type of research carried out in this research is a literature study or literature review. The literature review method is a kind of analysis in an article review to be studied based on identification, evaluation and synthesis of the works of researchers and practitioners obtained from various sources such as journals, books, the internet or other libraries. The writing of this literature review is a qualitative research using a non-experimental, descriptive design using electronic-based accredited/indexed Scopus and Sinta such as Google Scholar.

III. RESULTS AND DISCUSSION

From the results of this research which was carried out by means of a literature review, namely by collecting data from official sources on Google Scholar as many as 10 articles which will be used as an overview of this literature review which has been recognized with a 10 year limit (2014 - 2024). The article is summarized in the following table:

Table 1. Antibacterial activity in several studies of green betel leaves

No.	Ingredients/ Extracts	Solution	Types of Bacteria	Research result	Reference
1.	Ethanol and essential oil of green betel leaves	Aquades	<i>Methicillin Resistant Staphylococcus aureus</i> (MRSA)	Based on research results, betel leaf essential oil inhibits the growth of MRSA more than green betel ethanol extract.	(Nisyak & Haqqo, 2022)
2.	Green betel leaf essential oil	Phenol	<i>Escherichia coli</i>	The research results showed that the (inhibition zone obtained from the average results of all treatments: 0.3 gram, 6 mm, 0.5 gram, 10.5 mm, 0.7 gram, 10.76 mm, 1 gram, 16 mm , control (+) 27 mm and control (-) The results obtained prove that green betel leaves are antibacterial to inhibit the growth of <i>Escherichia coli</i> bacteria	(Pinatik et al., 2017)
3.	Green betel leaf essential oil	Methanol, Aquades, N-Hexane, Ethanol, and Ethylacetate	<i>Streptococcus mutans</i>	The research results show that the active fraction is N-hexane which has value MIC 1.25 mg/ml against <i>Streptococcus mutans</i> bacteria. Based on statistical test results, ciprofloxacin is still more effective when compared with N-hexane fraction against <i>Streptococcus mutans</i>	(Jayarambabu, N., Kumari, BS, Rao, KV, & Prabhu, 2014)

				bacteria with p value < 0.05	
4.	Green betel leaves	NaCl 0.85%, Ethanol 96%, Aquadest	<i>Proteus mirabilis</i>	The 96% ethanol extract of green betel leaves (Piper betle L.) showed greater inhibitory power in inhibiting the growth of Proteus mirabilis bacteria.	(Tjahjani & Lestari, 2022)
5.	Green betel leaf essential oil	Ethanol	<i>Enterococcus faecalis</i>	Betel leaf extract with a concentration of 5% and 15% can inhibit the growth of Enterococcus faecalis bacteria in tooth root canals. There is a difference in antibacterial effect between betel leaf extract with concentrations of 5% and 15%. Where the ability of betel leaf extract with a concentration of more than 15% optimal in inhibiting the growth of Enterococcus Faecalis bacteria compared to betel leaf extract with a concentration of 5%	(Tjahjani & Lestari, 2022)
6.	Essential oils and green betel leaves and lime juice	DMSO 20%	<i>Staphylococcus. a and E. coli</i>	The use of betel leaves and lime as natural ingredients for making disinfectants has proven to be effective in inhibiting the spread of pathogens, killing pathogens, eradicating viruses, germs and fungi. The compound elements contained in these two natural ingredients function as natural antiseptics against several pathogens, such as Staphylococcus aureus, Bacillus sp., Escherichia coli, and Salmonella Rafi.	(Mustam et al., 2022)
7.	Green Betel Leaves	ethylacetate	<i>Staphylococcus epidermis</i>	Green betel leaf ethylacetate extract contains antibacterial compounds which consists of phenolic compounds and their derivatives. This research aims to determine activity antibacterial ethylacetate extract of green betel leaves against S. epidermidis bacteria. Green betel is extracted using ethyl acetate solvent and tested its inhibitory activity against S.epidermis bacteria	(Kursia et al., 2016)

				using the agar diffusion method. The results showed the inhibitory power of the extract at a concentration of 3% and 5%, namely 9.8 and 15 mm. The results showed that ethyl acetate extract had activity antibacterial against <i>S.epidermidis</i> in the moderate-strong category	
8.	Turified green betel leaf extract	n-hexane	<i>Propioni bacterium acnes</i>	Purified extract of green siri leaves (EPS) has the ability to inhibit the growth of <i>P. acnes</i> bacteria. Each concentration variation of EPS produces an obstacle zone diameter of 7.01; 8.92; 13.28; and 21.08 mm. Positive control is able to produce the diameter of the resistance zone, whereas negative control is not able to produce the diameter of the obstacle zone.	(R. et al., 2014)

Betel leaf is a plant that is often used as traditional medicine. Green betel leaves are known to have antibacterial activity, this statement is in line with research (Ibrahim, 2013b) which suggests that the antibacterial effect of green betel plants is due to the essential oil content of green betel leaves whose main components consist of phenol and several derivatives including euganol and kavikol which efficacious as an antibacterial. Antibacterial is a substance. Several articles reviewed in the table above state that:

- a. Research shows that, when compared with ethanol extract from green betel, betel leaf essential oil inhibits the growth of Methicillin-Resistant *Staphylococcus aureus* (MRSA) bacteria better. This suggests that the active components of betel leaf essential oil combat MRSA more strongly than the ethanol extract from green betel. Therefore, betel leaf essential oil can be a better alternative for treating bacteria that are resistant to conventional antibiotics.
- b. The results showed that the antibacterial activity of green betel leaves stopped the growth of *Escherichia coli* bacteria. Using 0.3 grams of green betel leaves produces an inhibition zone of 6 mm, 0.5 grams produces an inhibition zone of 10.5 mm, 0.7 grams produces an inhibition zone of 10.76 mm, and 1 gram produces an inhibition zone of 16 mm. . On the other hand, the inhibition zone was not found in the negative control. These results indicate that green betel leaves can act as an antibacterial for *Escherichia coli*.
- c. The results showed that the N-hexane fraction from green betel leaves had resistance to *Streptococcus mutans* bacteria of 1.25 mg/ml. However, statistical tests showed that ciprofloxacin was better than the N-hexane fraction in stopping the growth of *Streptococcus mutans* bacteria, with a p value <0.05. These results indicate that, although the N-hexane fraction has antibacterial activity, ciprofloxacin is still better in fighting infections caused by *Streptococcus mutans*.
- d. The results of this study indicate that 96% ethanol extract from green betel leaves (*Piper betle* L.) has a better ability to stop the growth of *Proteus mirabilis* bacteria than other

methods. These findings indicate that the ethanol extract of green betel leaves has strong antibacterial power to combat *Proteus mirabilis* bacterial infections.

- e. According to research, betel leaf extract with concentrations of 5% and 15% each has the ability to stop the growth of *Enterococcus faecalis* bacteria in tooth root canals. The results showed that betel leaf extract with a concentration of 15% had a better antibacterial effect than betel leaf extract with a concentration of 5%. This shows that betel leaf extract with a concentration of 15% has a better ability to stop bacterial growth.
- f. The use of betel leaves and lime as natural ingredients to make disinfectants has been proven effective in preventing the spread of pathogens, killing pathogens, and killing viruses, germs and fungi. The research results show that the combination of compounds from these two natural ingredients can be a natural antiseptic that is effective against pathogens such as *Staphylococcus aureus*, *Bacillus* sp., *Escherichia coli*, and *Salmonella* Rafi.
- g. Antibacterial compounds consisting of phenol compounds and their derivatives are found in ethylacetate extract of green betel leaves. This study investigated the antibacterial properties of green betel leaf ethylacetate extract against *Staphylococcus epidermidis* bacteria. Green betel was extracted with ethyl acetate solvent, and its inhibitory properties against *S. epidermidis* bacteria were tested using the agar diffusion method. The results showed that green betel leaf ethyl acetate extract had an inhibitory power of 9.8 mm at a concentration of 3% and 15 mm at a concentration of 5%, which shows that this extract has moderate to strong antibacterial activity against *S. epidermidis*.
- h. It was shown that purified green betel leaf extract (EPS) could stop the growth of *Propionibacterium acnes* bacteria. The inhibition zones had diameters of 7.01 mm, 8.92 mm, 13.28 mm, and 21.08 mm, respectively. Positive control can produce a larger inhibitory zone diameter, while negative control does not produce an inhibitory zone diameter at all. These results indicate that EPS has strong antibacterial power against *P. acnes* bacteria.

IV. CONCLUSION

Based on a literature review, it was found that the essential oil content in green betel leaves has anti-bacterial activity against various bacteria with a measure of its inhibitory power. The solution used in several studies to extract essential oil content is; Aquades, Phenol, Methanol, Aquades, N-Hexane, Ethanol, and Ethylacetate, NaCl 0.85%, Ethanol 96%, Aquadest, Ethanol, DMSO 20%, and ethylacetate, which are used to inhibit bacteria. There are a number of factors that can influence in a literature review research regarding the benefits and content of essential oils in green betel leaves (*piper betle* L) as antibacterials. Due to the limitations of researchers who only took a few articles related to types of bacteria, it is hoped that in future research they can take several types of bacteria.

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