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Alkaloid Compounds from Mahogany Seeds: Isolation and Antimicrobial Activity

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ABSTRACT

Alkaloid is one of the secondary metabolites compound in mahogany seeds. This study aims to determine the antimicrobial activity of alkaloid compounds from mahogany seeds against Escherichia coli (E.coli) and Bacillus cereus (B.cereus). Isolation of alkaloid compounds done step by step. First, the maceration using n-hexane, then with methanol. The methanol extract was dissolved in Oxalic acid and diethyl ether, then separated. The acid solution was added 10 % ammonia solution, $CHCl_3$, then separated. The $CHCl_3$ extract was containing primary, secondary, and tertiary alkaloid. The base phase was containing quartenery alkaloid. The testing of antimicrobial activity of flavonoid compounds using the absorption method. The results showed that the antimicrobial activity of alkaloid compounds from mahogany seeds shows the inhibitory activity and provide no clear zone against bacteria E.coli and 15,05 mm to the bacteria B.cereus. Based on the results of the study, it can be concluded that alkaloid compounds from mahogany seeds have antimicrobial activity against B.cereus.

Keywords :*antimicrobial, alkaloid, mahogany seeds, E.coli, B.cereus*

INTRODUCTION

Mahagony seeds (*Swietenia macrophylla*, King)) is one of the traditional medicine which has many benefits. Existing research shows that mahogany seeds contain compounds that have antidiabetic activity, usually used as well as insecticides, larvicides, nematicides, antipyretic, fungicides, antimicrobials and antioxidants (Nurcahyanti and Timothy, 2011). Chemical constituents in mahogany seeds are alkaloids, saponins, flavonoids, (Mursiti 2009; Dhulgande et al., 2010; Babu & Sarma, 2011).

Several studies have been done on testing the antimicrobial power of some plants, among other things is basil. Atikah (2013) conducted research on antimicrobial activity test phase basil leaf extract n-hexane, ethyl acetate phase and the phase of 70% ethanol and 70% ethanol phase that shows antimicrobial activity S.aureus and C.albicans with agar diffusion method and dilution liquid, However the study did not report the active compounds that have antimicrobial activity. Results of other studies say that basil chloroform extract can inhibit the bacteria Shigella dysenteriae and methanol extract can inhibit microbe Klebsiella pneumoniae, Salmonella paratyphy and S.aureus with Inhibitory Regional Diameter (DDH) respectively 10 mm, 9 mm, and 7 mm, but does not mention the concentration used to test the antimicrobial activity (Devi et al., 2010).

Based on these studies it can be concluded that the part of the basil plant that often tested the activity of antimicrobial is part of basil leaves, whereas according to Gupta and Prakash (2005) not only the basil leaves just that contain secondary metabolites such as essential oils, but part of the basil plant such as trunks also contain secondary metabolites that may also have antimicrobial activity. So far have not found a research report stating about power test the antimicrobial activity on the stem of alkaloid from mahogany seeds against S.aureus and E.coli bacteria.

METHODS

Isolation of alkaloid compounds done step by step. First, the maceration using n-hexane, then with methanol. The methanol extract was dissolved in Oxalic acid and diethyl ether, then separated. The acid solution was added 10 % ammonia solution, $CHCl_3$, then separated. The CHCl3 extract was containing primary, secondary, and tertiary alkaloid. The base phase was containing quartenery alkaloid. The testing of antimicrobial activity of alkaloid compounds using the absorption method. Antimicrobial activity test using the absorption method is a modification of the order and that has been done by Aiyelaagbe et al. (2008) and Widiana (2012). Nutrient medium so as to be used as a medium for bacterial growth is provided by heating NA back,

then poured into a sterile petri dish aseptically. The bacteria are grown on medium NA by entering 1 mL of bacterial culture medium in NA then averaged over the surface of the agar medium.

Paper discs with a diameter of 6 mm is dipped into isolated compounds were each concentration 10 mg/mL, 25 mg/mL, 50 µg/mL, 100 µg/mL, then allowed to stand for 1 hour, then placed on a saucer solder containing bacteria sterile. Negative controls using paper discs were dipped in distilled water, whereas the positive control using a paper disc dipped in wipol. The entire cup solder containing seeding bacteria were incubated for 12 hours at a temperature of 37 ^{o}C in reverse, then observed and measured the inhibition of bacterial growth in the area around the paper disc, followed by calculating the area.

RESULTS AND DISCUSSION

Mahogany seed extraction includes several stages of sample preparation and extraction process. The methanol extract of mahogany seeds obtained 10,7% in the form of a brown powder with a distinctive aroma and taste very bitter. Qualitative test results showed that the methanol extract of mahogany seeds contain secondary metabolites are alkaloids, flavonoids and saponins, and is consistent with the results of Mursiti's study (2009). There were containing alkaloid compounds

Testing the antimicrobial activity of alkaloid compounds of mahogany seeds using two bacterias, E. coli and B.cereus with absorption method. Controls used in this method is a negative control (distilled water) and positive control (wipol). The test results showed that the methanol extract at a concentration of 10 mg/mL, 25 mg/mL, 50 µg/mL, 100 µg/mL showed activity against bacteria B.cereus but not for E. coli, It is known by the diameter of the visible area of inhibition around the paper disc. The diameter of inhibitory regions experienced an increase means that the higher the concentration, the greater the concentration of active ingredient that serves as an antibacterial, so the ability to inhibit bacterial growth B.cereus also getting bigger. While in the test against E.coli showed no inhibition. According Dzidic et al., (2008) states that one of the mechanisms of bacterial resistance is inaktifikasi antibiotics by producing enzymes. One enzyme that can menginaktifikasi antibiotics are β-glukoronidase. E. coli is a bacteria that is capable of producing β-glukoronidase that allegedly active compound in methanol extract mahogany seeds can be described by β-glukoronidase into other compounds that are not toxic for the bacteria. Baiano & Barners (2009) says no obstruction at all against E. coli because of the capsule casing on some strains of E. coli that can cause ethanol extract the active compounds are lipophilic basil stems can not bind to the cell wall.

Higher levels of bioactive compounds that are generally bactericidal (lethal microbes) and a lower level usually is bacteriostatic (inhibits growth, not lethal microbes) (Binadja et al., 2012). This is consistent with research Khumaisah et al., (2011) which states that basil is less susceptible to E. coli and Shigella sonnei, but effectively inhibit Salmonella bacteria sonnei. This is caused by the bacterium Salmonella sonnei thought to have lower metabolic activity so slow to mensistesis ribosomal protein that antibacterial agents can freely enter and activity may be hampered. Data inhibitory activity by measuring the diameter of inhibitory regions (DDH) is presented in Table 1.

Table 1. Diameter inhibitory region (mm) mahogany seeds methanol extract against E. coli and B.cereus

Sample	Diameter (mm)					
	Escherichia coli			*Bacillus cereus*		
	100%	50%	25%	100%	50%	25%
D1	0	0	0	15,00	13,00	10,00
D2	0	0	0	15,25	13,00	10,50
D3	0	0	0	15,00	13,00	11,00
Average	0	0	0	15,05	13,00	10,50
Controle(+)						
D1	35,10	35,16	35,16	51,33	51,33	51,33
D2	35,50	35,50	35,50	51,00	51,00	51,00
D3	35,30	35,33	35,33	52,00	52,00	52,00
Average	35,30	35,33	35,33	51,44	51,44	51,44
Controle (-)	0	0	0	0	0	0

The results showed that the inhibition of the ethanol extract was higher against S. aureus bacteria (gram-positive bacteria) as compared with E.coli bacteria (gram-negative) value indicated by inhibition area diameter. This is due to differences in the sensitivity of bacteria to antibacterial influenced by the structure wall del bacteria. Gram-positive bacteria tend to be more sensitive to the antibacterial because of the structure of the cell wall of gram-positive bacteria is simpler than the structure of the cell wall of gram-negative bacteria, making it easier for antibacterial compounds to enter the cell structure of the cell wall of gram-positive bacteria gram (Pramuningtyas, 2009).

CONCLUSION

Based on the research that has been done, it can be concluded that the antimicrobial activity of alkaloid compounds from mahogany seed with 100% concentration gives the largest clear zone where inhibition of E.coli bacteria higher than B.cereus.

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