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Antibacterial Properties of Liquid Smoke from the Production of Cinnamonhow Purification and Concentration of Different

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Abstract: **This study aims to determine the antibacterial properties of liquid smoke cinnamon obtained from the purification and concentration of different liquid smoke. This study was carried out experimentally using a factorial experiment in a completely randomized design of 8 (eight) treatment purification with 7 (seven) the concentration of liquid smoke with 3 replicates in order to obtain 168 experimental units. The treatment of liquid smoke purification include purification by distillation temperature of 100 ± 10 ° C; purification by distillation temperature of 140 ± 10 ° C; purification using activated charcoal, purification using activated charcoal and zeolite mixture (50:50), purification by decantation for 1 day, 2 days and decantation 3 days. Treatment of liquid smoke concentration includes 0 ppm, 1 ppm, 10 ppm, 100 ppm, 500 ppm, 1000 ppm and 1500 ppm. Variables observed consisted of antibacterial properties such as measuring the diameter of the inhibition (DDH) to the microbe E. coli. The results showed the test results of variance showed that differences in the way of purification provides significant effect on inhibition as well as in different concentrations of liquid smoke while the combination treatment of purification with the concentration of liquid smoke no significant effect (P> 0.05) to the diameter of the inhibition. The diameter of inhibition in the treatment of liquid smoke purification of the E. coli bacteria is indicated by decantation liquid smoke purification treatment for 3 days amounted to 34.129 mm / ppb with a regression equation y = 1.1971 x + 16.014 and the value of r2 = 0.221. Furthermore, the diameter of the largest inhibition in the treatment of liquid smoke concentration cinnamon on E. coli bacteria is shown by the treatment of 1500 ppm of 44.08 mm / ppb with a regression equation Y = 0.0407 x + 3.299 and the value of r2 = 0.9958. Based on the antibacterial properties of the combination treatment purification by decantation three days with liquid smoke concentration of 1500 ppm produced the largest diameter of the inhibition of 94.723 ppb.mm.**

Keywords: **Purification, Concentration, Liquid Smoke Cinnamon, Antibacterial.**

1. INTRODUCTION

Cinnamon (*Cinnamomum burmannii*) is one of the traditional medicinal plants that have been studied useful ness long ago. Cinnamon can be used to cure canker sores, cough medicine, shortness of breath, stomach pain, diarrhea, flatulence, rheumatism, warm the stomach and as an anti-cancer [1]. The active compound responsible for the anti-cancer activity in cinnamon allegedly was active substance sinamaldehid [2].

Antibacterial agent is a compound that can kill or inhibit the growth of microorganisms. An antibacterial substance that has an activity of inhibiting (bacteriostatic) or kill the microbes (bakteriosida), particularly harmful microbe's humans [3] Microbes are a microscopic organism which among others consists of bacteria, fungi and viruses (4). In interaction with humans, there are microbes that are harmful. Examples of pathogenic bacteria Escherichia coli and coliform group of bacteria can cause gastrointestinal disease [4].

One of the efforts to fight the microbe is to use a liquid smoke that has antagonist properties (antimicrobial) as a bully or inhibiting the metabolism of other microbes. Liquid smoke that has antimicrobial capabilities can produce antimicrobial compounds. Antimicrobial compounds produced by liquid smoke such as phenols, carbonyls are compounds that are inhibiting the growth of bacteria. For self-defense and competition with other microbes in getting nutrition, habitat, oxygen, light and others The antimicrobial compounds can be classified as an antibacterial or antifungal [5].

Based on the research results [6] that the liquid smoke coconut shell bakeries capable of inhibiting the growth of Escherichia coli and Staphylococcus aureus. [7] also conducted research vinegar softwood, acacia and rubber for food products as a preservative fish, globe fish and catfish with a concentration of 10% can preserve fish for two months. Escherichia coli is one of the main species of gram-negative bacteria. Generally can cause various diseases when it goes into other organs or tissues. Escherichia coli bacteria can cause pneumonia, endocarditis, an infection of the wounds and abscesses in various organs. Rod-shaped bacteria is the main occupant of organisms in the colon, komensalisme live in the human body and is thought to play a role in the formation of vitamin K is important for blood clotting [8].

All kinds of wood distillate containing compounds that can be extracted as phenol derivatives which can inhibit the growth of microbes Liquid smoke of wood used as a preservative because of the similarity of chemical components contained in the distillate timber certain kinds of preservatives, where that act as preservatives is phenol and its derivatives. Efforts to provide added value from waste crop plantations that are still yet to receive optimal treatment such as cinnamon in the province of West Sumatra. Problems cinnamon liquid smoke produced still contain toxins that need their refining activities, in addition to the concentration also influential. To see the effectiveness of liquid smoke as a preservative then needs to be seen antibacterial properties. Based on the problem before it is necessary to do research on liquid smoke that has been purified cinnamon combined with the concentration of the antibacterial properties of Escherichia coli. The purpose of this study to determine the antibacterial properties of Escherichia coli from a combination of liquid smoke purification treatment with different concentrations of liquid smoke.

2. MATERIALS AND METHODS

Tools and instruments used in this study include tools laboratory glassware, test tube rack, aluminum foil, paper filter evaporator, vortex, desiccator, hot plate, aerator, oven. analytical scales, blenders, label paper, rulers, pencils, aluminum foil, plastic, filter paper, cotton, erlenmeyer flask, becker glass, measuring cups, funnels, test tubes, rod stirrer, pipette, glass bottles, bottle weighing, measuring cups , oven, glassware commonly used in the microbiology laboratory, a set of rotary vacuum evaporator, volume pipettes, micro-pipettes, ose, tweezers, perforator, autoclaves, and scales. and 1 set maker laboratory-scale liquid smoke [9].

Materials and chemical reagents used in this study is a waste of cinnamon that has taken the outer skin is obtained from the farmers cinnamon in Tanah Datar. distilled water, methanol, Nutrient Agar (NA) Nutrient Broth (NB), Escherichia coli ATCC 11778, KCl, milk, sugar and NaCl solution.

3. IMPLEMENTATION RESEARCH

Research methods:

This study was carried out experimentally using a factorial experiment in a completely randomized design of 8 (eight) treatment purification with 7 (seven) the concentration of liquid smoke with 3 replicates in order to obtain 168 experimental units. The treatment of liquid smoke purification include purification by distillation temperature of 100 ± 10 ° C; purification by distillation temperature of 140 ± 10°C; purification using activated charcoal, purification using activated charcoal and zeolite mixture (50:50), purification by decantation for 1 day, 2 days and decantation decantation 3 days. Treatment concentration of liquid smoke includes 0 ppm, 1 ppm, 10 ppm, 100 ppm, 500 ppm, 1000 ppm and 1500 ppm The data were analyzed by analysis of variance on the real level of 5%, if significantly different followed by Tukey's test at the significance level of 5 percent [10].

Implementation research:

Liquid smoke purification is done on raw materials cinnamon with pyrolysis temperature of 400 ± 10 ° C for standard sign issued by [11] and the toxicity of benzo (e) pirennya lower than the second most other raw materials. Activity purification performed on liquid smoke cinnamon on pyrolysis 400oC silenced once 1 week to precipitate Tar, after standing for 1 week followed by administration of the treatment purification by distillation at a temperature of 100 ± 10 ° C and 140 ± 10 ° C for 1 hour, filtering (absorption) using activated charcoal, activated charcoal mixture with zeolite (50:50) and zeolite and precipitation for 1,2 and 3 days. The stages of work carried out as follows:

a. Distillation:

In the process of distillation: a sample of liquid smoke cinnamon result of pyrolysis at temperatures of 400°C as much as 100 ml put in a distillation flask where the container where the distillation flask using oil as a good conductor of heat and kept heated using an electric heater. The distillation process is done when the temperature of the heating medium (oil) is already showing the desired temperature appropriate treatment that 100oC and 140oC. Interest distillation to take all factions and is set at a temperature of 100 ^{o}Cdan suhu140^{o}C. At each temperature treatment made three replications. Temperatures shown are the temperature of liquid smoke in the distillation flask. The steam is formed and into the coolant pipe behind (condenser) and the distillate is collected in a flask. In this purification process is obtained quality liquid smoke II quality. Liquid smoke results measured results further purification antibacterial properties.

b. Filtering (adsorption) using activated charcoal, mix AA + zeolite and zeolite:

Liquid smoke cinnamon result of the pyrolysis temperature of 400°C as much as 100 ml of activated carbon mixed with as much as 3.5% [12] conducted using the next funnel was shaken and allowed to stand for 15 minutes. The same activities carried on zeolite materials and a mixture of both ready-made, after settling 15 minutes filtered through Whatman filter paper No. 42. The result of the purification was done subsequently repeated 3 times and measured its antibacterial properties.

c. Precipitation:

Liquid smoke prepared cinnamon in a measuring cup of 100 ml each were then deposited / decantation for 1, 2 and 3 days is done with three replications. This treatment refers to the results of research [13]. We then measured the antibacterial properties.

d.Uji antibacterial using Kirby-Bauer disc [14], [15]. Includes the following stages:

1. Sterilization Equipment and Materials:

Sterilization is done in a manner appropriate to each tool. The tools will be washed and sterilized before dikerigkan first. Test tubes, beakers, erlenmeyer covered her mouth with cotton. Furthermore, in autoklap sterilized at a temperature of 121 oC. for 15 minutes. Penset, flumber ose needle sterilized with the Bunsen flame. Microbiological test work performed aseptically in a laminar air flow (LAF) previously sterilized with UV light and sprayed with 70% alcohol. Sterilization is done 2 hours before work and after work therein.

2. Making Media growth:

- Nutrient Agar (NA). Weighed 23 grams NA (nutrient agar) and diluted with 1 liter of distilled water and heated until everything was dissolved then sterilized in an autoclave at 121°C for 15 min at a pressure of 1 atm [16]. The composition of nutrient agar (g / l): meat extracts 1%, peptone 1%, and that 1.5% [17].

- Nutrient Broth (NB). Weighed 8 grams of NB and diluted with 1 liter of distilled water and heated until everything was dissolved then inserted into erlenmeyer, then sterilized in an autoclave at 121°C for 15 min at a pressure of 1 atm [18]. The composition of nutrient broth (g / l): lab LEMCO powder 1%, 2% yeast extract, peptone 5% and 5% NaCl.

3. Making test solution:

In determining the highest activity of liquid smoke is the result of a combination treatment of the raw material (coconut fiber, coconut shell and cinnamon) with temperature pyrolysis different (temperature of 100 ± 10 ° C; 200 ± 10 ° C; 300 ± 10 ° C; and 400 ± 10 ° C) at a concentration of smoke cait that different (0 ppm, 1 ppm 10 ppm, 100 ppm, 500 ppm, 1000 ppm and 1500 ppm.

4. Breeding Bacteria Test:

Test bacteria inoculated into 5 ml of nutrient agar slant using a sterile needle ose by way of scraping E.Coli. ATCC 11778 at the end of the needle ose media to slant nutrient agar, then incubated at 37 ° C subs 18-24 hours.

5. Preparation of the bacterial suspension:

Pure bacterial culture results from nurtrient agar (NA) tilted after diinokolasikan aged 18-24 hours at 37 ° C was inoculated 1 Ose in 10 ml. Nutrient Broth (NB) and subsequently diinkuasi at 37 ° C for 18-24 hours. After that the turbidity synchronized with a solution of 0.5 Me. Farland or proportional to the number of bacteria 1 x 108 CFU / ml (CFU: Colony Forming Unit) or 250-300 colonies on solid media. Furthermore, to obtain bacterial suspension containing 106 CFU / ml, is by taking 1 ml (from the tube containing 108 CFU / ml) was mixed with 9 ml of sterile 0.9% NaCl. Then we will get a bacterial suspension with a density of 107 CFU / ml. followed again by taking 1 ml again (from the tube containing 107 CFU / ml) to be mixed with 9 ml of sodium broth to obtain a suspension with a density of 106 CFU / ml [19], [20], [21].

6. Identifikasi bacteria with gram stain:

A total of one loop of bacteria on nutrient agar slant is fixed on a clean microscope slide. Spread of bacteria is added with gentian violet in a state of excess, then allowed one minute. Excess dye and then disposed of the slide is rinsed with running water. Mixture dried over fire spritus. After drying excess Lugol preparations added to the surface and allowed to stand for 1 minute. After 1 minute preparations in the rinse with water mengalir.Preparat rinsed with 90% alcohol until all the dye washed out and then washed with running water. Mixture flame dried over spritus. After drying excess safranin preparations added to the surface and allowed to stand for 45 seconds. Mixture washed with water and dried. Mixture added 1 drop of immersion oil and observed using Olympus CX21 microscope with magnification of 100 times [22] [23].

7. Testing for antibacterial activity by disc diffusion method:

Antibacterial activity test using methods that with the discs. Silender discs used sterile diameter of 7 mm. NA sterile liquid medium that is poured aseptically 20 ml in 9 cm diameter petri dish sterile until uniform, then allowed to freeze. Furthermore, the suspension of bacteria E Coli which has been standardized turbidity, dipped sterile cotton stick, wait a minute so that the liquid to seep into the cotton. Then stick lifted and squeezed by emphasizing a stick on the inner tube wall while playing around. Digore-scratched cotton sticks to the surface of media NA until the entire surface of the media closely covered with scratches. Media NA left for 5-15 minutes so that suspense bacteria seep into the agar. Then 100 mL of liquid smoke solution with a concentration of 0 ppm, 1 ppm, 10 ppm, 100 ppm, 500 ppm, 1000 ppm and 1500 ppm silender dropped on the discs. Incubated at 37 ° C for 18-24 hours, after incubated antibacterial happens is determined by measuring the diameter of inhibitory regions (DDH) growth using calipers. [24], [18,] [25].

Experimental design:

The study was conducted using a completely randomized design (CRD) factorial 8 X 7 with 3 replicates in order to obtain 186 experimental units. A factor is a way of purification that consists of 8 (eight) treatment (purification distillation temperature of 100oC, 140^{o}C temperature distillation, purification activated charcoal, activated charcoal with zeolite (50:50), zeolite, purification precipitation 1 day, 2 days and 3 days) and factor B is the concentration asapcair consists of 7 (seven) of liquid smoke concentration is 0 ppb, 1 ppb, 10 ppb, 100 ppb, 500 ppb, 1000 ppb and 1500 ppb. Parameters measured were measuring the diameter of the wells formed by the treatment given. Furthermore, the data were analyzed by the analysts of variance 5%, significantly different if followed by Tukey's test 5% [26].

4. RESULTS AND DISCUSSION

Antibacterial test using agar diffusion method:

a. Impact purification liquid smoke cinnamon against Inhibitory Power Diameter (DDH mm / ppb) Antibacterial E. Coli:

In the test results of variance showed that differences in the way of purification provides significant effect on inhibition as well as in different concentrations while the combination treatment purification method with liquid smoke concentration no significant effect (P> 0.05) to the diameter of the inhibition. The results of antibacterial activity test liquid smoke cinnamon purified in different ways against E. coli bacteria can be seen in Table 1 below.

Table.1: Summary of average antibacterial liquid smoke cinnamon in a manner different purification of the E. coli bacteria by a method that diffusion.

Purification liquid smoke	Diameter inhibition (mm/ppb)	Regresi equation
1. Destillation 100 ±10^{o}C	16.373 ± 8.5 bc	y = 1,1971 x+16,014 r^2 = 0,221
2. Destillation 140 ±10^{o}C	20.41 ± 9.6 bc	
3. Activated charcoal filtering (AA) : 3,5%	26.055 ± 10.1 ab	
4 Activated charcoal filtering (AA) + Zeolit (Z) comparison 50:50 as much us 3,5%	19.924 ± 7.7 bc	
5. Zeolit (Z) filtering : 3,5%	13.831 ± 9.8 c	
6. The deposition for 1 day	19.924 ± 7.7 bc	
7. The deposition for 2 day	20.56 ± 8.7 bc	
8. The deposition for 3 day	34.129 ± 10.7 a	

* Different superscript letters in columns averaging showed significant difference (P <0.05)

Based on data from Table 1 that purification by precipitation for 3 days giving a figure inhibition of the largest diameter of 34.129 mm / ppb while the smallest diameter of inhibition contained in filtration purification treatment using zeolite This means the decantation treatment for 3 days to have the greatest ability to inhibit the growth of bacteria compared with other purification. According to [27] suggests the antibacterial strength determination are as follows: diameter of 20 mm or more barrier means very strong, 10-20 mm diameter barrier means strong, medium and 5-10 mm mean diameter of 5 mm or less barriers mean weak. This means purification with activated charcoal, deposition for 2 days and 3 days have anti-bacterial strength is very strong, while the purification others have strong antibacterial powers.

Based on the regression equation y = 1,1971x + 16.014 R2 = 0.221 was obtained. This means that the purification method does not show a strong relationship (weak) to the diameter of the inhibition (DDH) E.Coli. The antimicrobial activity typically involves complex mechanisms such as inhibition of cell wall synthesis, cell membranes, nucleic acid and protein and nucleic acid metabolism inhibition [28]. Furthermore, the antibacterial activity of plant extracts venom can be attributed not only to a single bioactive principle but also on the reaction with other compounds [29]. Some phytochemicals have been studied have a specific activity. The chemical structures of the antimicrobial agent found in higher plants usually have secondary metabolites such as flavonoids [30], terpens [31], terpenoids [32], [33] and phenolic acids [34].

b. Pengaruh concentration of liquid smoke cinnamon against Inhibitory Power Diameter (DDH mm / ppb) Antibacterial E. Coli:

The results of antibacterial activity test liquid smoke cinnamon with different concentrations of liquid smoke to the E. coli bacteria can be seen in table 2 below.

Table.2: Activities average antibacterial liquid smoke cinnamon with different concentrations of liquid smoke to the bacteria E. coli with that diffusion method.

Liquid Smoke Consentration	Diameter inhibition (mm/ppb)	Regresi equation
1. 0 ppm	0 ± 0 d	Y = 0.0407 x + 3,299
2. 1 ppm	3.93 ± 6.8 d	R2 = 0,9958
3. 10 ppm	4.90 ± 6.8 d	
4. 100 ppm	9.03 ± 7.5 d	
5. 500 ppm	23.42 ± 10.3 c	
6. 1000 ppm	44.45 ± 15.4 b	
7. 1500 ppm	64.08 ± 17.2 a	

* Different superscript letters in columns averaging showed significant difference (P <0.05)

Based on data from Table 2 shows the concentration of 1500 ppm liquid smoke showed the greatest inhibition diameter of 64.08 mm / ppb. This means that at a concentration of 1500 ppm liquid smoke showed strong capability in inhibiting the development of E. coli bacteria. This is presumably due to the concentration of the concentration of liquid smoke that has the capability of doing menghambatan effective against E. coli bacterial growth. According to [27] suggests the determination of antibacterial strength at different concentrations of liquid smoke to the above data ranging 1-100 ppm concentration of liquid smoke are categorized as moderate antibacterial strength, while the liquid smoke concentration 500-1500 ppm has antibacterial strength is strong enough.

Based on the regression equation Y = 0.0407 x + 3,299 with a value of R2 = 0.9958. This suggests that the difference in the concentration of liquid smoke has a strong relationship to the diameter of the inhibition (DDH) E.Coli .. It is alleged by the higher concentration of liquid smoke means conditions increasingly concentrated liquid smoke that will be more effective in inhibiting the growth of bacteria and in using the diffusion method test pitting. Diffusion method using the sinks more sensitive than the way the disc or discs. The presence of the main elements of this method depends on the samples tested may be smaller mixed with microbial diffusion of substances into the order of the filter paper disk [35].

c. Effect of purification and concentration of liquid smoke cinnamon against Inhibitory Power Diameter (DDH mm / ppb) Antibacterial E. Coli:

To see the effect of purification with different concentrations of liquid smoke to the diameter of the inhibition of E. coli bacteria can be shown in Table 3, below.

Table.3: Activities average antibacterial liquid smoke cinnamon in a manner different purification and concentration difference against E.Coli with methods that diffusion.

Purification method	Consentration (ppb)	Diameter Inhibition (DDH) mm/ppb	Regresi equation
Destillation 100 ±10°C	0	0.0000 ± 0,00 a	Y = 0 ; r2 = #N/A
	1	3.9250 ± 6,80 a	Y = -7E -16x + 3,925 r^2 = -7E -16
	10	3.9250± 6,80 a	Y = 0.0935x + 4.4857 r2 = 0,0159
	100	7.850± 6,80 a	Y = 0.05358x + 6,6163 r2 = 0,1168
	500	16.233± 8,34 a	Y = 1,5388x + 16,494 r2 = 0,1513
	1000	25.643± 14,14 a	Y = 3,7101x + 27.755 r2 = 0,3422
	1500	57.043± 17,28 a	Y = 2,5014x + 52,819 r2 = 0,1729
Destilation 140 ±10°C	0	0.0000 ± 0,00 a	Y = 0 ; r2 = #N/A
	1	3.9250± 6,80 a	Y = -7E -16x + 3,925 r^2 = -7E -16
	10	7.8500± 6,80 a	Y = 0.0935x + 4.4857 r2 = 0,0159
	100	7.8500± 6,80 a	Y = 0.05358x + 6,6163 r2 = 0,1168
	500	25.643± 7,70 a	Y = 1,5388x + 16,494 r2 = 0,1513
	1000	40.558± 15,70 a	Y = 3,7101x + 27.755 r2 = 0,3422
	1500	57.043 ± 17,28 a	Y = 2,5014x + 52,819 r2 = 0,1729
Activated charcoal filtering (AA)	0	0.0000± 0,00 a	Y = 0 ; r2 = #N/A
	1	3.9250± 6,80 a	Y = -7E -16x + 3,925 r^2 = -7E -16
	10	3.9250± 6,80 a	Y = 0.0935x + 4.4857 r2 = 0,0159
	100	12.298± 12,57a	Y = 0.05358x + 6,6163 r2 = 0,1168
	500	30.092± 14,14 a	Y = 1,5388x + 16,494 r2 = 0,1513
	1000	57.043± 17,28 a	Y = 3,7101x + 27.755 r2 = 0,3422
	1500	75.098± 18,85 a	Y = 2,5014x + 52,819 r2 = 0,1729
Filtering AA + Z	0	0.0000± 0,00 a	Y = 0 ; r2 = #N/A
	1	3.9250± 6,80 a	Y = -7E -16x + 3,925 r^2 = -7E -16
	10	3.9250± 6,80 a	Y = 0.0935x + 4.4857 r2 = 0,0159
	100	7.8500± 6,80 a	Y = 0.05358x + 6,6163 r2 = 0,1168
	500	20.6720± 8,61 a	Y = 1,5388x + 16,494 r2 = 0,1513
	1000	40.558± 15,70 a	Y = 3,7101x + 27.755 r2 = 0,3422
	1500	62.538± 10,42 a	Y = 2,5014x + 52,819 r2 = 0,1729
Filtering Zeolit (Z)	0	0.0000± 0,00 a	Y = 0 ; r2 = #N/A
	1	3.9250± 6,80 a	Y = -7E -16x + 3,925 r^2 = -7E -16

	10	3.9250± 6,80 a	Y = 0.0935x + 4.4857 r2 = 0,0159
	100	3.9250± 6,80 a	Y = 0.05358x + 6,6163 r2 = 0,1168
	500	7.8500± 7,70 a	Y = 1,5388x + 16,494 r2 = 0,1513
	1000	30.615± 16,32 a	Y = 3,7101x + 27.755 r2 = 0,3422
	1500	46.577± 25,37 a	Y = 2,5014x + 52,819 r2 = 0,1729
The deposition for 1 day	0	0.0000± 0,00 a	Y = 0 ; r2 = #N/A
	1	3.9250± 6,80 a	Y = -7E -16x + 3,925 r^2 = -7E -16
	10	3.9250± 6,80 a	Y = 0.0935x + 4.4857 r2 = 0,0159
	100	7.8500± 6,80 a	Y = 0.05358x + 6,6163 r2 = 0,1168
	500	20.672± 7,70 a	Y = 1,5388x + 16,494 r2 = 0,1513
	1000	40.558± 15,70 a	Y = 3,7101x + 27.755 r2 = 0,3422
	1500	62.538± 10,42 a	Y = 2,5014x + 52,819 r2 = 0,1729
The deposition for 2 day	0	0.0000± 0,00 a	Y = 0 ; r2 = #N/A
	1	3.9250± 6,80 a	Y = -7E -16x + 3,925 r^2 = -7E -16
	10	3.9250± 6,80 a	Y = 0.0935x + 4.4857 r2 = 0,0159
	100	7.8500± 6,80 a	Y = 0.05358x + 6,6163 r2 = 0,1168
	500	25.4630± 14,14 a	Y = 1,5388x + 16,494 r2 = 0,1513
	1000	45.5300± 9,52 a	Y = 3,7101x + 27.755 r2 = 0,3422
	1500	57.0430± 17,28 a	Y = 2,5014x + 52,819 r2 = 0,1729
The deposition for 3 day	0	0.0000± 0,00 a	Y = 0 ; r2 = #N/A
	1	3.9250± 6,80 a	Y = -7E -16x + 3,925 r^2 = -7E -16
	10	7.8500± 6,80 a	Y = 0.0935x + 4.4857 r2 = 0,0159
	100	16.747± 16,74 a	Y = 0.05358x + 6,6163 r2 = 0,1168
	500	40.558± 15,70 a	Y = 1,5388x + 16,494 r2 = 0,1513
	1000	75.098± 18,85 a	Y = 3,7101x + 27.755 r2 = 0,3422
	1500	94.723± 20,42 a	Y = 2,5014x + 52,819 r2 = 0,1729

Information : * Different superscript letters in columns averaging showed significant difference (P <0.05)

The results of well test liquid smoke cinnamon purification by decantation for 3 days at a concentration of 1500 ppb combination against E. coli bacteria indicates a broad zone of greatest inhibition of 94.723 mm / ppm means a very strong anti-bacterial powers. Based on the regression equation that purification by decantation for 3 days resulted in the inhibition of the nature diameter (DDH), the largest compared with other purification. In regression line that combined treatment showed a way of purifying the average weak. It is indicated by the low value of R^2. This means purification with liquid smoke concentration does not have a relationship with the diameter of the inhibition of E coli. According to [27]suggests the antibacterial strength determination are as follows: diameter of 20 mm or more barrier means very strong, 10-20 mm diameter barrier means strong, medium and 5-10 mm mean diameter of 5 mm or less barriers mean

weak. Based on the results of liquid smoke in a manner different purification strongly inhibits bacteria such as Escherichia coli test. Diameter of the inhibition produced by decantation purification liquid smoke for 3 days at a concentration of 1500 ppb significantly different with inhibition zone generated by liquid smoke cinnamon by decantation 2 days at the same concentration, as well as onwards to other treatments. Broad zones of inhibition in control no inhibition zone since without the granting of liquid smoke showed inhibition zone were not significantly different with other treatments. Differences in the antibacterial activity can be caused by differences in the content of phenolic compounds owned by liquid smoke as a result of the refining activity.

Liquid smoke cinnamon in a manner different purification have different capabilities in inhibiting the growth of bacteria, it is suspected because of the active compounds in the liquid smoke has been different because of mistreatment purification. In addition, it is also likely caused by the resistance of bacteria to the bioactive substance, active substance concentration and the amount of inoculum bacteria or bacterial density test. In addition, it was found the treatment of purification with low concentrations that are less effective in inhibiting bacteria, due to the diffusion of active ingredients in a medium that is slow and low concentration of the active substance, so that the extract could not inhibit bacterial optimally [36].

The mechanism of inhibition of bacterial growth by terpenoid compounds suspected terpenoid compounds will react with Porin (transmembrane protein) on the outer membrane of the bacterial cell wall polymers form a bond so strong that cause damage Porin [37]. Damage to Porin which is the exit of the entry of the substance, would reduce the permeability of bacterial cell walls that would result in a bacterial cell would be a lack of nutrients so that bacterial growth is inhibited or die [37].

According[38]. said cell walls of gram-negative bacteria have a chemical makeup is more complicated or complex than the cell wall of gram-positive bacteria. This poses a major hurdle for antimicrobial materials to be able to penetrate. Although it contains less peptidoglycan, but beyond that there are still three layers of polymers, namely lipoprotein, outer membrane and lipopolysaccharide. Outer membrane serves to prevent leakage of periplasmic proteins and protects cells from bile salts and the enzyme hydrolysis cell's environment. Pori protein in the outer membrane causing the membrane permeable to solutes with low molecular weight, but for substances that have a high molecular weight, such as antibiotics are relatively slow to penetrate.

5. CONCLUSION

1. The diameter of the greatest inhibition in the treatment of liquid smoke purification of the E. coli bacteria is indicated by decantation liquid smoke purification treatment for 3 days amounted to 34.129 mm / ppb with a regression equation y = 1.1971 x + 16.014 and the value of r2 = 0.221.

2. Diameter greatest inhibition in the treatment of liquid smoke concentration cinnamon on E. coli bacteria is shown by the treatment of 1500 ppm of 44.08 mm / ppb with a regression equation Y = 0.0407 x + 3.299 and the value of r2 = 0.9958.

3. The antibacterial properties combined treatment purification by decantation three days with liquid smoke concentration of 1500 ppm produced the largest diameter of the inhibition of 94.723 ppb.mm.

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