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37 Antioxidant and antibacterial activities of ethanolic extract of sintok lancang (Cinnamomum javanicum Blume) from Central Kalimantan Susi NOVARYATIIN 1* , Syahrida D ARDHANY 1 , Muhammad T RAHMAN 1 , Muhammad D MUTTAWALI 1 , Hikmah HIKMAH 1 , Elin TRI 1 , Fahruddin ARFIANTO 2 , Nanang HANAFI 3 1 Department of Pharmacy, Faculty of Health Sciences, Muhammadiyah University of Palangkaraya, Palangka Raya,Indonesia 2 Department of Agrotechnology, Faculty of Agriculture and Forestry, Muhammadiyah University of Palangkaraya, Palangka Raya, Indonesia 3 Department of Forestry, Faculty of Agriculture and Forestry, Muhammadiyah University of Palangkaraya, Palangka Raya, Indonesia *Corresponding Author: E-mail: susi_novaryatiin@yahoo.com ORCIDs: Susi Novaryatiin: 0000-0003-0696-6546 Syahrida D Ardhany: 0000-0002-8606-8991 Muhammad T Rahman: 0000-0002-0293-0469 Muhammad D Muttawali: 0000-0002-0885-2959 Hikmah Hikmah: 0000-0002-5221-0419 Elin Tri: 0000-0002-1817-2279 Fahruddin Arfianto: 0000-0002-1405-5403 Nanang Hanafi: 0000-0003-2933-8788 (Received 30 May 2022, Accepted 26 Oct 2022) Acta Pharm. Sci. Vol 61:(1), 2023 DOI: 10.23893/1307-2080.APS6103 ABSTRACT The C. javanicum Blume a plant can founded Central - antan.

research to out total alkaloids, and compounds to the and activity ethanol extract the of C. javanicum . antioxidant was by dif - ferent DPPH FRAP. alkaloids, and content were µg equivalent/mg, µg equiva - lent/mg, 42.89±0.77 µg equivalent/mg, The 50 of was ppm equivalent the method 968.38±22.25 µmol C. javanicum extract antibacterial against the three bacteria tested, with the inhibition zones in the range of 3.17±0.90 - mm. can stated the extract the of C. javani- cum has potential activity, the activity classified as weak activity. 38 Keywords: Cinnamomum javanicum DPPH , FRAP , me - dicinal plant INTRODUCTION Free are for central in physiological - tions well their in variety diseases.

accumulation of radicals the produces stress, has reported to associated various such neurodegenerative diabetes mellitus, respiratory diseases, cardiovascular diseases, coronary heart diseases, rheumatoid arthritis, the development of cataracts, inflammatory dis - eases, disorders, and cancers 1-3 . play an important role in neutralizing free radicals 3 . In the of species many is major in therapy continuously researchers to new Recently, of newly antibacterial agents derived natural or derivatives. remedies are one of the most important sources of natural antibacterial agents 1 . The anti - microbial was related the of metabolites of terpenes, alkaloids in plant 2 . there a to new, and sources natural - dant and antibacterial compounds.

Cinnamomum (Family is genus for fragrant and This has than species are in America, Australasia, Southeast Commercial sold spices are C. verum , C. cassia , C. burmannii , C. zeylanicum , and C. loureiroi 4 . Sintok (Cinnamomum javanicum Blume) a plant Central Kalimantan, this found Mungku Forest an - tional managed the of University Palangkaraya the Nature (BNF). Sintok lancang was used for various diseases such as treating abdominal pain, wounds, and diabetes mellitus. There not much on C. javanicum from regarding its use an and agent. of studies done C. javanicum from showed the and extracts had activity 5 .

antibacterial of essential of C. ja- vanicum found Borneo investigated the dilution which that inhibition S. aureus with and values 39 was µg/mL 500 µg/mL, 4 . studies that the extract C. javanicum leaves Central had high for activity tested DPPH FRAP 6 . However, studies the activity these extracts C. javanicum stem Central have conducted. study was from previous with aim to the total number of flavonoid, alkaloid, and tannin compounds and to evaluate the antioxidant antibacterial of ethanolic of of C. ja- vanicum .

study help explore potential Indonesian plants as natural antioxidants and antibacterial agents. METHODOLOGY Plant material C. javanicum collected Mungku Forest an - tional managed the of Muhammadiyah of Palangkaraya the Nature (BNF). collected material identified Dr. Hendrian, (Indonesian of - ences, Center Plant and Gardens, Indonesia) with the document number B-833/IPH.3./KS/VII/2020. Preparation of Cinnamomum javanicum extract The of C. javanicum were in oven 45 The stems were by grinder then using ethanol room temperature. is continuous in the sol - vent continuously by new 7 . The is from the by a evaporator.

yield of extracts is by 8 : of extract Weight the plant material) x 100% Phytochemical qualitative screening The extract C. javanicum was screened phyto - chemicals such as alkaloids, flavonoids, saponins, tannins, and steroids 9-12 . Total alkaloids content Ten of C. javanicum were and dissolved 10 of ethanol. absorbance one of extract measured a -

trophotometer 272 The used the curve caf - feine 13 . Total alkaloid content is expressed as µg alkaloids per mg of extract. 40 Total flavonoids content Five of C. javanicum extract weighed then in mL ethanol. mL the was in volumetric and mL of 3 (2% and mL acetic (5% were After the was for min 14 . solution was - ured with a spectrophotometer at 412 nm.

The standard used for the calibration curve quercetin 15 . Total content expressed µg flavonoids per mg of extract. Total tannins content A total of 30 mg of sample was weighed and placed in a 10 mL volumetric flask. Add the mL standard 3.0 vanillin and mL concentrated The was for min 15-16 . was measured a Vis at nm. standard for the curve catechin 17 . tannin is as µg tannins per mg extract. Antioxidant activity by DPPH assay A mM solution prepared the was at 512 nm. The resulting absorbance of the DPPH solution is the absorbance con - trol. The stem extract of C. javanicum (sample) was first dissolved in methanol with variant of 20, 40, ppm. mL 0.4

DPPH solution was added in a 5 mL volumetric flask, and then 4 mL of sample solutions different were The mixture placed 25 for min, absorbance measured 512 18 . cal - culation the inhibition DPPH effect used - ing to the following formula: 39 Total alkaloids content Ten mg of C. javanicum extract were weighed and then dissolved in 10 mL of ethanol. The absorbance of one mL of the extr act was measured with a spectrophotometer at 272 nm. The standard used for the calibration curve was caffeine 13. Total alkaloid content is expressed as µg alkaloids per mg of extract.

Total flavonoids content Five mg of C. javanicum extract were weighed and then dissolved in 10 mL of ethanol. One mL of the extract was placed in the volumetric flask, and one mL of AlCl 3 (2% b/v) and 8 mL of acetic acid (5% v/v) were added. After mixing, the solution was incubated for 20 min 14. The solution absorbance was measured with a spectrophotometer at 412 nm. The standard used for the calibration curve was quercetin15. Total flavonoid content is expressed as µg of flavonoids per mg of extract. Total tannins content A total of 30 mg of sample was weigh ed and placed in a 10 mL volumetric flask. Add to the 0.5 mL catechin standard solution, 3.0 mL vanillin 4% and 1.5

mL concentrated HCl. The mixture was incubated for 10 min15-16. Absorbance was measured with a UV Vis spectrophotometer at 498 nm. The standard used for the calibration curve was catechin 17. Total tannin content is expressed as µg tannins per mg extract. Antioxidant activity by DPPH assay A 0.4 mM DPPH solution was prepared and the absorbance was measured at 512 nm. The resulting absorbance of the DPPH solution is the absorbance control. The stem extract of C. javanicum (sample) was first dissolved in methanol with five variant concentrations of 10, 20, 30, 40, 50 ppm. One mL

of 0.4 mM DPPH solution was added in a 5 mL volumetric flask, and the n 4 mL of sample solutions of different concentrations were added.

The prepared mixture was placed at 25 °C for 30 min, the absorbance was measured at 512 nm 18. The calculation of the percent inhibition or DPPH scavenging effect was used according to the following formula: ??????????????? ????????????????????????????????? ???? ??????????????? % = (???? - ????) ???? ???? 100% Where A was the absorbance of DPPH solution and B was the absorbance of sample solution19-20. Antioxidant activity by FRAP assay Sample (0.2 g) dissolved with ethanol in a 10 mL volumetric flask.

Two mL of sample solution were added to 3 mL of FRAP reagent in a test tube, followed by incubation for 16 minutes. Absorbance was Where was absorbance DPPH and was absorbance sample solution 19-20 . Antioxidant activity by FRAP assay Sample g) with in 10 volumetric Two of sample were to mL FRAP in test followed by for minutes. was with UV spec - trophotometer at 595 nm. Antioxidant activity expressed in µmol trolox/g 19-21 . 41 Antibacterial activity test The activity determined disc method four variant 1%, 10%, 15% three strains: Cutibacterium acnes/C. acnes (ATCC Staphylococcus epidermidis/S. epidermidis (ATCC and Staphylococcus aureus/S. aureus (ATCC 25923).

mL McFarland standard prepared sterilized The suspension of bacteria was prepared by diluting the colonies of bacteria in a normally saline and turbidity adjusted 1-2x10 8 CFU/ mL on 0.5 A cotton was in standardized of and to on agar 22 . discs immersed the extract C. javanicum and then placed on the plates. A disc immersed in 1% clindamycin gel (positive control) also on plate. plates incubated the - bic for h 37 A was to the of the inhibition zone of each extract and positive controls. RESULTS AND DISCUSSION Extraction yield One thousand two hundred grams of C. javanicum were extracted into 60.29 g of Based yield C. javanicum extraction 5.03%. The value to number secondary that cap - tured during extraction 8 .

Qualitative phytochemical screening Phytochemical screening of C. javanicum stem by using the following standard methods 9-10 . results the qualitative of C. javanicum stem the of using reagents 11 , us - ing the Shinoda test 12 , tannins, saponins, and steroids (Table 1). Table 1. The qualitative phytochemical of ethanolic extract of C. javanicum stem Phytochemical compound Result Alkaloids + Flavonoids + Tannins + Saponins + Steroids + 42 Total alkaloids, flavonoids, and tannins content C. javanicum was by method. alkaloids, - vonoids, tannins were by protocols, the results 32.81 0.77 µg equivalent/mg, ± µg equivalent/mg, 42.89 0.77 µg equivalent/mg, (Ta - ble 2). The total flavonoid content is the largest compared to the total alkaloids and content. addition, total flavonoids, tannins of C.

javanicum stem extract this were than total content the extract the of C. javanicum in previous studies 6 . Phenolics flavonoids commonly in parts the This compound a of metabolites up a group polyphenols can free and lipid 23 . antioxidant from sources with and contents 24 . Therefore, the measurement of phenol and flavonoid content can be used as a basis for rapid screening of antioxidant activities 1 . Table 2. Total alkaloids, flavonoids, and tannins content of ethanolic extract of C. javanicum stem Sample Assay Ethanolic extract of C. javanicum Total Alkaloid (µg caffeine equivalent/mg) 32.81 ± 0.77 Total Flavonoid (µg quercetin equivalent/mg) 126.96 ± 3.17 Total Tannin (µg catechin equivalent/mg) 42.89 ± 0.77 Antioxidant activity DPPH FRAP were to the activity C. javanicum The activity showed the 50 of was ± ppm equivalent the method was 968.38 ± 22.25 µmol trolox/g (Table 3). 43 Table 3.

Antioxidant activity of ethanolic extract of C. javanicum stem Sample Assay Ethanolic extract of C. javanicum Quercetin DPPH (IC50 ppm) 20.63 ± 0.82 6.98 FRAP (µmol trolox/g) 968.38 ± 22.25 - According some the activity the meth - od was classified by IC 50 as very strong (< 50 ppm), strong (50-100 ppm), mod - erate ppm), low 150 19,25 , the activity with FRAP was as low (< µmol/g), FRAP µmol/g), FRAP µmol/g), FRAP µmol/g) very FRAP 400 µmol/g) 26 . low value extract concentration, to 50% DPPH radicals) strong antioxidant 27 . ethanolic of C. javanicum is in the very strong antioxidant activity (20.63 ± 0.82 ppm) and very high FRAP (968.38 22.25 µmol The activity this was - ter in previous where ethanolic of C. javanicum leaves very antioxidant (26.99 0.27 and high (779.73 19.66 µmol 6 . compared the - dant activity of C.

javanicum leaves and bark study conducted in Malaysia with the method ppm 197.4 5 , C. javanicum in especially Central Kalimantan gives better antioxidant activity. DPPH a free with electrons throughout the and widely to the radical capacity of variety samples 28 . DPPH is on electron and atom reactions. reduction absorbance DPPH caused antioxidants due a between antioxidant and the radical, which results in radical scavenging by hydrogen donation. This is visualized as purple-to-yellow discoloration.

The advantage of the DPPH test is it simple, and Although DPPH is its sensitivity can be affected by several factors, such as solvent type, reaction time, temperature, freshness DPPH 1,29 , the test a - specific, colorimetric related the concentration the present. FRAP is typical based electron transfer, measures reduction ferric (Fe 3+)-ligand to the (Fe 2+); by in media. limitation of FRAP is tendency precipitate, suspensions, color 44 the cuvette. Therefore, the timing of FeCl 3 addition is essential to prevent error interpretation. the or assay simple, fast, and requires no specialized equipment 29 . Antibacterial activity In study, antibacterial test performed C.

javanicum ex - tract clindamycin Clindamycin used a control it is lincosamide used treat streptococcal, staphy - lococcal with in vitro activity a variety anaerobic bacteria, including Bacteroides fragilis as well as some Staphylococ- cus 30 . is known be of antibiotics to acne 31 . diameters the of produced the gel C.acnes , S. epidermidis, and S. aureus 34.17 2.48 28.87 0.75 mm, and 29.53 ± 1.06 mm, respectively (Table 4). Table 4. Antibacterial activity of ethanolic extract of C. javanicum stem Materials Concentration (%) Inhibition zone diameter (mm) (mean±SD; n=3) C. acnes S. epidermidis S. aureus Clindamycin gel 1 34.17 ± 2.48 28.87 ± 0.75 29.53 ± 1.06 Ethanolic extract of C. javanicum stem 1 4.20 ± 1.58 7.47 ± 3.87 4.33 ± 0.38 5 5.10 ± 1.02 7.53 ± 1.80 4.80 ± 0.28 10 4.00 ± 1.80 7.33 ± 0.38 4.03 ± 1.03 15 3.17 ± 0.90 8.90 ± 1.50 5.83 ± 0.76 This showed C. javanicum extract effective the bacteria and inhibition was the of ± - ± mm 1). highest activity found C.

ja- vanicum extract S. epidermidis, with zone of ± mm, ± mm, ± mm 8.90 1.50 at - trations 1%, 10% 15% 4). antibacterial of extract can be divided into three levels: weak activity (inhibition zone less than 12 moderate (inhibition 12-20 and activity - hibition zone greater than 20 mm) 32 . 45 43 Table 4. Antibacterial activity of ethanolic extract of C. javanicum stem Materials Concentration (%) Inhibition zone diameter (mm) (mean±SD; n=3) C. acnes S. epidermidis S. aureus Clindamycin gel 1 34.17 ± 2.48 28.87 ± 0.75 29.53 ± 1.06 Ethanolic extract of C. javanicum stem 1 4.20 ± 1.58 7.47 ± 3.87 4.33 ± 0.38 5 5.10 ± 1.02 7.53 ± 1.80 4.80 ± 0.28 10 4.00 ± 1.80 7.33 ± 0.38 4.03 ± 1.03 15 3.17 ± 0.90 8.90 ± 1.50 5.83 ± 0.76 This study showed that C.

javanicum extract was effective against the three bacteria tested and its inhibition zone was in the range of 3.17 ± 0.90 - 8.90 ± 1.50 mm (Figure 1). The highest antibacterial activity was found for C. javanicum extract against S. epidermidis, with inhibition zone diameters of 7.47 ± 3.87 mm, 7.53 ± 1.80 mm, 7.33 ± 0.38 mm and 8.90 ± 1.50 mm at concentrations of 1%, 5%, 10% and 15% (Table 4). The antibacterial activity of the extract can be divided into three levels: weak activity (inhibition zone less than 12 mm), moderate activity (inhibition zone 12 -20 mm) and strong activity (inhibition zone greater than 20 mm)32. Figure 1.

Antibacterial activity of ethanolic extract of C. javanicum stem against C. acnes (a), S. epidermidis (b), and S. aureus (c) It can be concluded that the ethanol extract of the stem of C. javanicum has high potential antioxidant activity, but the antibacterial activity is classified as weak activity. The inhibition zones produced in this study fall on the concentration of extrac t of 10%. Further studies are needed to identify the factor that affects the rise and fall of the inhibition zone. In addition, negative control must be used in further study. CONFLICT OF INTEREST The authors declare no conflict of interest. Figure 1.

Antibacterial activity of ethanolic extract of C. javanicum stem against C. acnes (a), S. epidermidis (b), and S. aureus (c) It be that ethanol of stem C. javanicum has high antioxidant but antibacterial is as weak The zones in study on concen - tration extract 10%. studies needed identify factor affects the rise and fall of the inhibition zone. In addition, negative control must be used in further study. CONFLICT OF INTEREST The authors declare no conflict of interest. FUNDING SOURCES This research was funded by an internal grant from Muhammadiyah University of and by RisetMu batch from Dikti - litbang PP Muhammadiyah for publication. 46 REFERENCES 1.

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