Plagiarism Checker X Originality Report

Similarity Found: 8%

Date: Wednesday, February 24, 2021
Statistics: 183 words Plagiarized / 2317 Total words
Remarks: Low Plagiarism Detected - Your Document needs Optional Improvement.

/

INTRODUCTION The Citrus (Linn) family of Rutaceae, aromatic green shrubs and small tree plants have an important role in India's medicine. Scientifically this plant is known as Aurantium maximum Burm. Ex Rumph, Citrus aurantium L. Var grandis L., Citrus decumana L, Citrus grandis Osbeck & Citrus pamplemos. Citrus grandis Osbeck is a plant spread in India, China, Indonesia, US, Thailand, and others. The orange tree is about 16 to 50 feet tall. Oranges are native to Malayu and East India. Widespread in China, Japan, Philippines, Indonesia, US, and Thailand1,2. Citrus maxima L. or grapefruit is a plant commonly known as Papanus, spread throughout India. The bark and roots of C. maxima contain ß-sitosterol, an acridone alkaloid.

Essential oils from the leaves and fruits of C. maxima, which are still raw, contain limonin, nerolol, neryl acetate, and geraniol3. This plant contains vitamin C as well as other citrus plants and is usually used as fruit for consumption. On the other hand, this plant has been used in medicine, such as sedatives for nervous disorders, cough spasms, hemorrhagic diseases, and epilepsy. It is said to be appetizing, cardiac stimulant, and antitoxic properties4. Citrus maxima fruit also contains high amounts of polyphenol compounds such as hesperidin, naringin, caffeic acid, p-Coumaric acid, ferulic acid, and vanillic acid3,5.

Gas Chromatography-Mass Spectrophotometry (GC-MS) is a chemical tool widely used to analyze compounds in medicinal plants such as essential oils, fatty acids, hydrocarbons, lipids, and others. This method is simple, sensitive, and effective in separating the mixture's components6,7. Besides, GC-MS is a reliable tool for identifying bioactive compounds8. Research on C. maxima with GC-MS has previously been conducted. Other studies on C. maxima showed that it has antibacterial activity with essential oils, namely a-pinene, myrcene, limonene, germacrene, and ß-asarone compounds9. Some studies also said that the C.

maxima rind extract has chemical compounds such as the flavonoid group, which has several biological activities, including antioxidants10,11. In another study, it was said that the essential oil of C. maxima rind contains essential oils such a-pinene, myrcene, limonene, germacrene, ß-asarone and has antimicrobial activity against the bacteria Escherichia coli and Staphylococcus aureus9. However, no studies have identified the chemical compound content of the ethanol and ethyl acetate fraction of C. maxima rind. Therefore, this study aims to identify the chemical compounds of the ethanol and ethyl acetate fraction of C.

maxima rind based on data from the analysis using GC-MS. MATERIALS AND METHODS Materials The material used in the study was C. maxima rind, which was obtained from the Bantul Regency, Yogyakarta. The determination was carried out at the Department

of Pharmaceutical Biology, Faculty of Pharmacy, Universitas Gadjah Mada. The chemicals used were ethanol (JT-Baker), ethyl acetate (JT-Baker), and chloroform (Merck). The tools used were ovens (Memmert), analytical scales (Sartorius), Thin Layer Chromatography (TLC) plates (Merck), silica gel GF 60, capillary tubes, chambers, UV lamps (254 and 366 nm), GC/MS (Shimadzu), and a set of column chromatography equipment.

Methods Material preparation The C. maxima rind (Figure 1) was sorted, washed, and dried at 50°C in a drying oven for six hours12; then, the sample size was reduced using a machine to produce dry simplicia in 20 mesh to increase the touch surface area of the solvent absorption area. Furthermore, the sample was macerated using ethanol and ethyl acetate as solvents. Fractionation was carried out using column chromatography with a stationary phase of silica gel GF 60 and mobile phases of ethyl acetate, chloroform, and ethanol.

The fractionation result was identified using a TLC plate to see the fractionation result profile. / a b Figure 1. Fruit (a) and rind (b) of C. maxima GC-MS analysis A sample solution of 1 µL was injected into GC-MS-QP2010 SE, which had a capillary column with a length of 30 mm, a diameter of 0.25 mm, and a thickness of 0.25 µm. Helium carrier gas at a flow rate of 1 mL/min with a split ratio of 1 : 50.

The pre-programmed oven temperature was 150°C and stored isothermal for five minutes, the rate of increase was 10°C/minute, and the temperature was increased to 250°C for five minutes. Compound identification Interpretation of the GC-MS mass spectrum was performed using the Wiley 7.0 database. The spectrum of components compared to the Wiley 7.0 data library. The identification of chemical compounds was confirmed based on the peak area and retention time. RESULTS AND DISCUSSION Maceration results obtained ethanol fraction (EF) and ethyl acetate fraction (EAF) of C. maxima rind.

The fractionation results of EF were obtained four fractions with Rf value of EF1 (0.36; 0.44; 0.58; 0.74; 0.9; and 0.98), Rf value of EF2 (0.36), Rf value of EF3 (0.36), while the fractionation results of ethyl acetate extract were obtained six fractions with Rf value of EAF1 (0.47; 0.63; 0.7; and 0.8), Rf value of EAF2 (0.18; 0.28; 0.47; 0.63; and 0.72), Rf value of EAF3 (0.28; 0.47; 0.63; and 0,72), Rf value of EAF4 (0.28; 0.47; and 0.72), Rf value of EAF5 (0.28), and Rf value of EAF6 (0.28). The fractionated TLC profiles were shown in Figure 2, while Rf values for EF and EAF were shown in Tables I and II, respectively. a b Figure 2.

TLC profile of EF (a) and EAF (b) Table I. Rf value of EF No. _Rf value _ _ _EF1 _EF2 _EF3 _EF4 _ _1 _0.36 _0.36 _0.36 _- _ _2 _0.44 _- _- _- _ _3 _0.58 _- _- _- _ _4 _0.74 _- _- _- _ _5

_0.9 _- _- _- _ _6 _0.98 _- _- _- _ _ Table II. Rf value of EAF No. _Rf value _ _ _EAF1 _EAF2 _EAF3 _EAF4 _EAF5 _EAF6 _ _1 _0.47 _0.18 _0.28 _0.28 _0.28 _0.28 _ _2 _0.63 _0.28 _0.47 _0.47 _- _- _ _3 _0.7 _0.47 _0.63 _0.72 _- _- _ _4 _0.8 _0.63 _0.72 _- _- _- _ _5 _- _0.72 _- _- _- _- _ _The selection of isolate fractions to be used in the GC-MS analysis was carried out based on the number of stains or spots representing all stains or spots in each fraction and the degree of separation from the TLC profile.

The fraction of the isolate selected in the ethanol fraction was fraction number 1 (EF1), while the isolate selected in the ethyl acetate fraction was fraction number 2 (EAF2). The isolates EF1 and EAF2 were identified by GC-MS. The chromatogram results of the GC-MS analysis of the EF1 and EAF2 fractions of the grapefruit rind extract could be seen in Figures 3 and 4, respectively. The identification of the components of chemical compounds in EF1 and EAF2 was carried out by comparing the mass spectrum fragmentation patterns with the fragmentation patterns of the reference compounds using the Wiley 7.0 data bank.

The major chemical compounds identified by GC-MS in EF1 (Table III) were ß-copaen-4-a-ol (11.66%); pentadecanoic acid (3.08%); hexadecanoic acid (5.72%); tetradecanoic acid (6.66%); dotriacontane (3.79%); osthol (12.33%); 7-methoxy-8-(2-oxo-3-methylbutyl)coumarin (32.77%); furfural (3.95%); 6-(2,3-dihydroxy-3-methylbutyl)-7-methoxycoumarin (10.18%); and 6-(iodomethyl)-5-methyl-4-oxahexanolide (9.86%). Meanwhile, the major chemical compounds identified by GC-MS in EAF2 (Table IV) were 1-octadecanol (7.75%); decane (3.97%); tetracosane (2.49%); hexacosane (3.07%), and 1,2-benzenedicarboxylic acid, (2-ethylhexyl) ester (82.71%).

The results of the compound component analysis showed that the compound with the largest percentage was 7-methoxy-8-(2-oxo-3-methylbutyl) coumarin of 32.77% in the EF1 fraction, while in the EAF2 fraction the largest content was 1,2-benzenedicarboxylic acid, (2-ethylhexyl) ester equal to 82.71%.

/ Figure 3. GC-MS chromatogram of EF1 / Figure 4. GC-MS chromatogram of EAF2 Table III. The results of the GC-MS analysis of the chemical components of EF1 No _Retention Time (minutes) _% Content _Molecular Weight (g/mol) _Molecular Formula _Compound _2D Structure _ _1 _9.82 _11.66 _220 _C15H24O _ß-Copaen-4-a-ol _/ _ _2 _12.38 _3.08 _270 _C17H34O2 _Pentadecanoic acid _/ _ _3 _12.755 _5.72 _284 _C18H32O2 _Hexadecanoic acid _/ _ _4 _13.105 _6.66 _256 _C16H32O2 _Tetradecanoic acid _/ _ _5 _14.720 _3.79 _338 _C32H66 _Dotriacontane _/ _ _6 _14.793 _12.33 _244 _C15H16O3 _Osthol _/ _ _7 _15.804 _32.77 _260 _C15H16O4 _7-methoxy-8-(2-oxo-3-methylbutyl)coumarin _/ _ _8 _16.3 _3.95 _260 _C11H10O3 _Furfural _/ _ _9 _18.105 _10.18 _278 _C15H18O5 _6-(2,3-Dihydroxy-3-methylbutyl)-7-methoxycoumarin _/ _ _10 _18.535 _9.86 _270 _C7H11IO3 _6-(iodomethyl)-5-methyl-4-oxahexanolide _/ _ _ Table IV.

The results of the GC-MS analysis of the chemical components of EAF2 No _Retention Time (minutes) _% Content _Molecular Weight (g/mol) _Molecular Formula _Compound _2D Structure _ _1 _11.885 _7.75 _270 _C18H38O _1-Octadecanol _/ _ _2 _13.607 _3.97 _278 _C20H38 _Decane, 5,6-bis(2,2-dimethylpropylidene)- _/ _ _3 _17.193 _2.49 _338 _C24H50 _Tetracosane _/ _ _4 _18.573 _3.07 _366 _C26H54 _Hexacosane _/ _ _5 _19.646 _82.71 _390 _C24H38O4 _1,2-benzenedicarboxylic acid, (2-ethylhexyl) ester _/ _ _

From the results of GC-MS analysis, it was found that some of the compounds identified were derived from fat, sesquiterpenes, and coumarin.

This plant group had several biological activities. EF1 and EAF2 fraction metabolite content had many isolates with various biological activities such as antimicrobial, antioxidant, antifungal, and anti-inflammatory. Some of the component compounds' biological activities from the EF1 and EAF2 fractions are presented in Tables V and VI. Table V. Bioactivity of compounds identified in the EF1 No. _Compound _Biological Activity _ _1 _ß-Copaen-4-a-ol _Antimicrobials13 _ _2 _Pentadecanoic acid _Antibacterial14 _ _3 _Hexadecanoic acid _Antioxidants15 _ _4 _Tetradecanoic acid _Antifungal, Antioxidant14 _ _5 _Dotriacontane _Antimicrobial16, antioxidant17 _ _6 _Osthol _Antioxidant, anti-inflammatory18 _ _7 _7-Methoxy-8-(2-oxo-3-methylbutyl)coumarin _Antioxidants10 _ _8 _Furfural _Antityrosinase, antimicrobial19 _ _9 _6-(2,3-Dihydroxy-3-methylbutyl)-7-methoxycoumarin _Antimicrobials20 _ _ Table VI.

Bioactivity of compounds identified in the EAF2 No. _Compound _Biological Activity _ _1 _1-Octadecanol _Antibacterial, antifungal, anti-larval21 _ _2 _Tetracosane _Antioxidants22 _ _3 _Hexacosane _Antimicrobial23 _ _4 _1,2-Benzenedicarboxylic acid, (2-ethylhexyl) ester _Antimicrobial, Antifouling21 _ _ The many types of plants that exist require scientists to carry out phytochemical screening to identify the content of compounds in medicinal plants used by the public for treatment.

The search for active compounds in plants was then examined to determine their biological and pharmacological activity so that they could be used to be developed as materials for new drug discovery. CONCLUSION In this study, ten compounds were found in the ethanol fraction and five compounds in the ethyl acetate fraction of C. maxima rind. Citrus maxima rind could be used as a source for developing new medicinal substances requiring clinical testing to assess their effectiveness.

ACKNOWLEDGMENT Thanks to the Ministry of Research, Technology and Higher Education of the Republic of Indonesia and Gadjah Mada University for providing funding through the PTUPT Research Grant with contract number 2332/UN1-P.III/DIT-LIT/LT/2017 given to Dr.rer.nat. Raden Rara Endang Lukitaningsih, S.Si., M.Si., Apt. REFERENCES National Institute of Science Communication and Information Resources – Council of Scientific and Industrial Research. The Wealth of India - An Encyclopedia of India's Raw Material Resources. II (B) edition. New Delhi, India: National Institute of Science Communication and Information Resources – Council of Scientific and Industrial Research; 1988. Khare CP.

Indian Medicinal Plants, An Illustrated Dictionary. 1st edition. New York, US: Springer-Verlag New York; 2007. Xu G, Liu D, Chen J, Ye X, Ma Y, Shi J. Juice components and antioxidant capacity of citrus varieties cultivated in China. Food Chem. 2008;106(2):545-51. doi:10.1016/j.foodchem.2007.06.046 Arias BÁ, Ramón-Laca L. Pharmacological properties of citrus and their ancient and medieval uses in the Mediterranean region. J Ethnopharmacol. 2005;97(1):89-95. doi:10.1016/j.jep.2004.10.019 Ani PN, Abel HC. Nutrient, phytochemical, and antinutrient composition of Citrus maxima fruit juice and peel extract. Food Sci Nutr. 2018;6(3):653-8. doi:10.1002/fsn3.604 Marston A. Role of advances in chromatographic techniques in phytochemistry. Phytochemistry. 2007;68(22-24):2786-98.

doi:10.1016/j.phytochem.2007.08.004 Lal C, Verma LR. Use of certain bio-products for insect-pest control. Indian J Tradit Knowl. 2006;5(1):79-82. Yamunadevi M, Wesely EG, Johnson M. Chromatographic finger print analysis of steroids in Aerva lanata L by HPTLC technique. Asian Pac J Trop Biomed. 2011;1(6):428-33. doi:10.1016/S2221-1691(11)60094-4 Saputra KA, Puspawati NM, Suirta IW. Kandungan Kimia Minyak Atsiri dari Kulit Buah Jeruk Bali (Citrus maxima) serta Uji Aktivitas Antibakteri Terhadap Staphylococcus aureus dan Escherichia coli. Jurnal Kimia J Chem. 2017;11(1):58-62. doi:10.24843/JCHEM.2017.v11.i01.p10 Khan NH, Qian CJ, Perveen N. Phytochemical screening, antimicrobial and antioxidant activity determination of citrus maxima peel. Pharm Pharmacol Int J. 2018;6(4):279-85. doi:10.15406/ppij.2018.06.00187 Zulbayu LOMA.

Uji Aktivitas Antiaging dan Antibakteri Ekstrak Etanol dan Etil Asetat Kulit Buah Jeruk Bali (Citrus maxima L.) Secara In Vitro. Yogyakarta, Indonesia: Universitas Gadjah Mada; 2017. Available from: http://etd.repository.ugm.ac.id/penelitian/detail/128679 Rahman NFA, Shamsudin R, Ismail A, Shah NNAK. Effects of post-drying methods on pomelo fruit peels. Food Sci Biotechnol. 2016;25(Suppl 1):85-90. doi:10.1007/s10068-016-0102-y Liolios C, Laouer H, Boulaacheb N, Gortzi O, Chinou I. Chemical composition and antimicrobial activity of the essential oil of Algerian Phlomis bovei De Noé subsp. Bovei. Molecules. 2007;12(4):772-81. doi:10.3390/12040772 Mujeeb F Bajpai P, Pathak N.

Phytochemical evaluation, antimicrobial activity, and determination of bioactive components from leaves of Aegle marmelos. Biomed Res Int. 2014;2014:497606. doi:10.1155/2014/497606 Suryowati T, Rimbawan R, Damanik RM, Bintang M, Handharyani E. Identifikasi Komponen Kimia Dan Aktivitas Antioksidan Dalam Tanaman Torbangun (Coleus amboinicus Lour). Jurnal Gizi dan Pangan. 2015;10(3):217-24. doi:10.25182/jgp.2015.10.3.%25p Ibrahim NA, Musa SK, Yassin SM, Abuniama NH, Awadalkareem S, Osama A, et al. Chemical Composition and Antimicrobial Activity of Essential Oil of Belpharis linariifolia. Int J Sci Technol Soc. 2017;5(4):62-6.

doi:10.11648/j.ijsts.20170504.12 Soosairaj S, Dons T. Bio-active compounds analysis and characterization in Ethanolic plant extracts of Justicia tranquebariensis L. (Acanthaceae) – using GC-MS. Int J Chemtech Res. 2016;9(7):260-5.

Shokoohinia Y, Jafari F, Mohammadi Z, Bazvandi L, Hosseinzadeh L, Chow N, et al. Potential Anticancer Properties of Osthol: A Comprehensive Mechanistic Review. Nutrients. 2018;10(1):36. doi:10.3390/nu10010036 Chai WM, Liu X, Hu YH, Feng HL, Jia LY, Guo YJ, et al. Antityrosinase and antimicrobial activities of furfuryl alcohol, furfural and furoic acid. Int J Biol Macromol. 2013;57:151-5. doi:10.1016/j.ijbiomac.2013.02.019 Sharma RK, Negi DS, Gibbons S, Otsuka H. Chemical and antibacterial constituents of Skimmia anquetelia. Planta Med. 2008;74(2):175-7. doi:10.1055/s-2008-1034281 Gnanashree G, Sirajudeen PM.

Determination of bioactive compounds in ethanolic extract of Caralluma indica using GC-MS technique. J Pharmacogn Phytochem. 2018;7(6):1675-7. Paudel MR, Chand MB, Pant B, Pant B. Assessment of Antioxidant and Cytotoxic Activities of Extracts of Dendrobium crepidatum. Biomolecules. 2019;9(9):478. doi:10.3390/biom9090478 Rukaiyat M, Garba S, Labaran S. Antimicrobial activities of hexacosane isolated from Sanseveria liberica (Gerome and Labroy) plant. Adv Med Plant Res. 2015;3(3):120-5.

INTERNET SOURCES:

<1% - https://ayushvedah.com/druginfo.php?drugid=393
<1% - https://www.researchgate.net/publication/223850210_Liberation_and_separation_of_phenolic_compounds_from_citrus_mandarin_peels_by_microwave_heating_and_its_effect_on_antioxidant_activity
<1% - https://www.researchgate.net/publication/45504865_Application_of_selected_ion_monitoring_to_the_analysis_of_triacylglycerols_in_olive_oil_by_high_temperature-gas_chromatographymass_spectrometry
<1% - https://www.herbactive.co.uk/abc-daily-herbal-powder-complete-herb-list/
<1% - https://www.sciencedirect.com/science/article/pii/S0309174019306023
<1% - https://assets.thermofisher.com/TFS-Assets/CMD/posters/PN-10410-ISC2014-Helium-Carrier-Gas-PN10410-EN.pdf
<1% - https://www.researchgate.net/publication/261070113_Compound_identification_in_GC-

MS_by_simultaneously_evaluating_the_mass_spectrum_and_retention_index
<1% -
https://idoc.pub/documents/device-electronics-for-integrated-circuits-3rd-edition-1-zpnxp6o8delv
<1% -
https://www.researchgate.net/publication/261730816_Chemical_Composition_and_Antiproliferative_Activity_of_Supercritical_Extract_of_Citrus_grandis_L_Osbeck_Fruits_from_Korea
<1% -
https://www.researchgate.net/publication/260428716_Biological_activities_of_selected_polyphenol-rich_fruits_related_to_immunity_and_gastrointestinal_health
<1% - https://www.sciencedirect.com/science/article/pii/S0924224416303533
<1% -
https://issuu.com/skyinsititute/docs/international_journal_of_scientific_867af7142f485d
1% - https://jurnal.ugm.ac.id/TradMedJ/article/view/59194
1% -
https://garuda.ristekbrin.go.id/journal/view/199?issue=Vol.%2010%20No.%203%20(2015)
1% - http://www.sphinxsai.com/2016/ch_vol9_no7/1/(260-265)V9N7CT.pdf
1% - https://www.frontiersin.org/articles/10.3389/fimmu.2020.00703/full
1% - https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0190305