

**SYSTEMATIC REVIEW: UJI AKTIVITAS ANTI BAKTERI EKSTRAK  
BUAH ANDALIMAN (*ZANTHOXYLUM sp*)**

**SKRIPSI**

**Oleh**

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**FAKULTAS KEDOKTERAN**

**UNIVERSITAS ISLAM SUMATERA UTARA**

**MEDAN**

**2023**

**SYSTEMATIC REVIEW: UJI AKTIVITAS ANTI BAKTERI EKSTRAK  
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**SKRIPSI**

**Diajukan Sebagai Salah Satu Syarat Kelulusan Menjadi Sarjana Kedokteran**

**Oleh**

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**FAKULTAS KEDOKTERAN**

**UNIVERSITAS ISLAM SUMATERA UTARA**

**MEDAN**

**2023**



**LEMBAR PERSETUJUAN**

Hasil Penelitian dengan judul:

**SYSTEMATIC REVIEW: UJI AKTIVITAS ANTI BAKTERI EKSTRAK  
BUAH ANDALIMAN (*ZANTHOXYLUM sp*)**

Yang dipersiapkan oleh:

**AMIRAH NAHDIA BATUBARA**

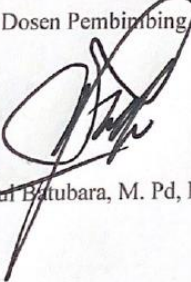
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Ekstrak Buah Andaliman (*Zanthoxylum sp*)

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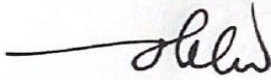
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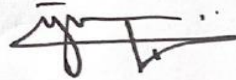
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## KATA PENGANTAR

Assalamu'alaikum Wr. Wb

Alhamdulillah, puji syukur saya panjatkan kepada Tuhan Yang Maha Esa, karena atas berkat dan rahmat-Nya, serta para keluarga dan sahabat saya. Berkat bantuan dan dorongan yang telah membantu terselesainya skripsi dengan judul **“SYTEMATIC REVIEW: UJI AKTIVITAS ANTI BAKTERI EKSTRAK BUAH ANDALIMAN (*ZANTHOXYLUM sp*)”**. Skripsi ini disusun sebagai salah satu syarat untuk memperoleh gelar Sarjana Kedokteran di Program Studi Pendidikan Dokter Fakultas Kedokteran Universitas Islam Sumatera Utara. Terima kasih sebesar-besarnya semua pihak atas bantuan dan dorongan semangat bagi penulis terutama kepada:

1. Dr. H. Yanhar Jamaluddin, M.A.P, selaku Rektor Fakultas Kedokteran Universitas Islam Sumatera Utara yang telah memberikan kesempatan kepada saya untuk mengikuti pendidikan program sarjana di Fakultas Kedokteran Universitas Islam Sumatera Utara.
2. dr. H. Indra Janis, MKT, selaku Dekan Fakultas Kedokteran Universitas Islam Sumatera Utara yang telah memberikan kesempatan kepada saya untuk mengikuti pendidikan program sarjana di Fakultas Kedokteran Universitas Islam Sumatera Utara.
3. dr. Irma Yanti Rangkuti, M. Si, selaku Ka Prodi Fakultas Kedokteran Universitas Islam Sumatera Utara yang telah memberikan kesempatan kepada saya untuk mengikuti pendidikan program sarjana di Fakultas Kedokteran Universitas Islam Sumatera Utara.
4. dr. Saiful Batubara, M. Pd, MKM, selaku Dosen Pembimbing yang telah banyak meluangkan waktu, tenaga, dukungan, dan masukan yang berharga dalam penyusunan skripsi ini.
5. Dosen Pembanding I yaitu dr. Surya Akbar, M.Med. Ed dan Dosen Pembanding II yaitu dr. Ichwan Alamsyah Lubis, M. Biomed yang telah meluangkan waktu

dan bersedia memberikan masukan dan kritikan yang membangun penyusunan skripsi ini.

6. Bapak dan Ibu Dosen, Staf dan Karyawan Program Studi Pendidikan Dokter Fakultas Kedokteran Universitas Islam Sumatera Utara, yang telah banyak membantu dalam menuntut ilmu dan menjalankan praktikum dan labskill selama perkuliahan.
7. Khusus Kepada Ibu Dermi Faisah Nasution, Ayah Arlianto Batubara, dan Saudara-saudara saya yang telah memberikan semangat, dukungan moril maupun materil, dan terima kasih untuk doa-doanya, sehingga saya bisa menyelesaikan perkuliahan dan menyusun skripsi ini dengan baik.
8. Kepada sahabat-sahabat terbaik saya Nadhilah Umarah Syandra, Shindy Mustika Wangsa, dan Syalsabillah Thalha, yang telah membantu saya baik dalam waktu dan tenaga yang diberikan.
9. Seluruh teman-teman angkatan 2019 Fakultas Kedokteran Universitas Islam Sumatera Utara yang tidak dapat saya sebutkan karena telah banyak membantu dalam skripsi ini.

Penulis menyadari bahwa skripsi ini masih jauh dari kesempurnaan. Oleh karena itu, saran dan kritik yang bersifat membangun demi perbaikan dimasa yang akan datang sangat penulis harapkan. Tidak ada kata yang pantas diberikan, selain balasan dari Tuhan Yang Maha Esa untuk kemajuan kita bersama. Akhirnya penulis mengharapkan skripsi ini dapat bermanfaat bagi perkembangan ilmu pengetahuan di masa yang akan datang.

Medan, 15 Januari 2023

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## DAFTAR ISTILAH/SINGKATAN

DC	: de Candolle
WHO	: <i>World Health Organization</i>
DNA	: <i>Deoxyribonucleic Acid</i>
RNA	: <i>Ribonucleic Acid</i>
KHM	: Kadar Hambat Minimum
MIC	: <i>Minimum Inhibitory Concentration</i>
DDH	: Diameter Daya Hambat

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**LEMBAR PENGESAHAN**  
**JUDUL SKRIPSI**



Judul : Studi literatur Uji Aktivitas Anti Bakteri  
Ekstrak Buah Andaliman (Zanthoxylum  
acanthopodium DC.)

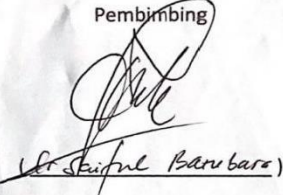
Tujuan Umum : Untuk mengetahui gambaran umum  
terkait publikasi efek Anti Bakteri Ekstrak Buah  
Andaliman (Zanthoxylum acanthopodium DC.).

Tujuan Khusus : 1. Mengidentifikasi jumlah artikel publikasi efek  
Anti Bakteri ekstrak andaliman.  
2. Mengidentifikasi metode dan hasil penelitian  
efek Anti Bakteri Ekstrak buah Andaliman.


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**Lampiran 3 Surat Keabsahan Daftar Pustaka**

	<b>UNIVERSITAS ISLAM SUMATERA UTARA</b>
	<b>FAKULTAS KEDOKTERAN</b>
	<b>PROGRAM STUDI PENDIDIKAN KEDOKTERAN</b>
	KAMPUS : JL. STM NO. 77 MEDAN KAMPUS JL. SM RAJA NO. 2A MEDAN – 20212 TELP. (061) 4572733, 4143491, 4142993, FAX. 061 – 4142495

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**SURAT PERNYATAAN KEABSAHAN DAFTAR PUSTAKA**

Saya yang bertanda tangan dibawah ini telah memeriksa kebenaran daftar pustaka yang digunakan oleh :

Nama Mahasiswa : Amirah Hafidha Bahubara

NPM : 7106011051


Judul Skripsi : Systematic Review Uji Aktifitas Anti Bakteri  
Ekstrak Buah Arabidopsis (ZinkKerajutan sp)

\_\_\_\_\_

\_\_\_\_\_

Demikian pernyataan ini disampaikan, atas kerjasamanya diucapkan terima kasih.

Dosen Pembimbing Skripsi

  
Dr Raifur Bahubara, M.P.

## Lampiran 4 Lembar Persetujuan Revisi Proposal

LEMBAR PERSETUJUAN

Proposal Penelitian dengan judul:


**SYSTEMATIC REVIEW Uji AKTIVITAS ANTI BAKTERI EKSTRAK  
BUAH ANDALIMAN (*ZANTHOXYLUM sp*)**

Yang dipersiapkan oleh :


**AMIRAH NAHIDIA BATUBARA**  
71190811051

Proposal Penelitian ini telah diperiksa dan disetujui untuk  
dilanjutkan ke lahan penelitian  
Medan, 27 Juli 2022

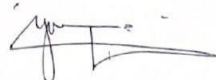
Disetujui,  
Dosen Pembimbing

  
(dr. Saiful Batubara, M.Pd, M. Kes)

Pembanding I

  
(dr. Surya Akbar, MMed)

Pembanding II

  
(dr. Ichwan Alamsyah Lubis, M. Biomed)

i



## Lampiran 5 Surat Keterangan Layak Etik



**UNIVERSITAS ISLAM SUMATERA UTARA**  
**FAKULTAS KEDOKTERAN**  
**BAGIAN ETHICAL CLEARANCE**  
 KAMPUS JL. STM NO.77 MEDAN  
 KAMPUS JL. SM. RAJA NO.2A MEDAN - 20212  
 TELP. (061) 42778962

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**KETERANGAN LAYAK ETIK**  
*DESCRIPTION OF ETHICAL EXEMPTION*  
**"ETHICAL EXEMPTION"**

No.325/EC/KEPK.UISU/XI/2022

Protokol penelitian versi 1 yang diusulkan oleh :  
*The research protocol proposed by*

**Peneliti utama** : Amirah Nahdia Batubara  
*Principal In Investigator*

**Nama Institusi** : Universitas Islam Sumatera Utara  
*Name of the Institution*

Dengan judul:  
*Title*


**"Systematic Review Uji Aktivitas Anti Bakteria Ekstrak Buah Andaliman (Zanthoxylum sp)"**  
*"Systematic Review of Anti-Bacterial Activity Test of Andaliman Fruit Extract (Zanthoxylum sp)"*

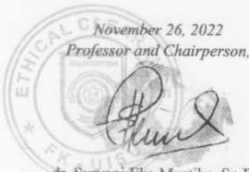
Dinyatakan layak etik sesuai 7 (tujuh) Standar WHO 2011, yaitu 1) Nilai Sosial, 2) Nilai Ilmiah, 3) Pemerataan Beban dan Manfaat, 4) Risiko, 5) Bujukan/Eksploitasi, 6) Kerahasiaan dan Privacy, dan 7) Persetujuan Setelah Penjelasan, yang merujuk pada Pedoman CIOMS 2016. Hal ini seperti yang ditunjukkan oleh terpenuhinya indikator setiap standar.

*Declared to be ethically appropriate in accordance to 7 (seven) WHO 2011 Standards, 1) Social Values, 2) Scientific Values, 3) Equitable Assessment and Benefits, 4) Risks, 5) Persuasion/Exploitation, 6) Confidentiality and Privacy, and 7) Informed Consent, referring to the 2016 CIOMS Guidelines. This is as indicated by the fulfillment of the indicators of each standard.*

Pernyataan Laik Etik ini berlaku selama kurun waktu tanggal 26 November 2022 sampai dengan tanggal 26 November 2023.

*This declaration of ethics applies during the period November 26, 2022 until November 26, 2023.*





November 26, 2022  
*Professor and Chairperson,*  
 dr. Suryani Eka Mustika, Sp.PA

## Lampiran 6 Penelusuran Jurnal

The screenshot displays a Google Scholar search interface. The browser address bar shows the URL: [scholar.google.com/scholar?hl=id&as\\_sdt=0%2C5&as\\_ylo=2012&as\\_yhi=2022&q=aktivitas+antibakteri+andaliman&oiq=d=gs\\_asd&t=16...](https://scholar.google.com/scholar?hl=id&as_sdt=0%2C5&as_ylo=2012&as_yhi=2022&q=aktivitas+antibakteri+andaliman&oiq=d=gs_asd&t=16...)

The search results page shows a list of articles. The first article is titled "Analisa Akti Pseudomonas...". The second article is titled "Uji Aktivitas acanthopodium Secara In Vitro". The third article is titled "UJI AKTIVITAS (Zanthoxylum acanthopodium) Dan ...".

The "Penelusuran lanjutan" (Advanced Search) dialog box is open, showing the following search criteria:

- Temukan artikel dengan semua kata: "Zanthoxylum sp" "antibakteri"
- dengan frasa yang sebenarnya: [Empty field]
- dengan minimal satu kata: [Empty field]
- tanpa kata: [Empty field]
- di tempat kata saya muncul:  di manapun dalam artikel,  dalam judul artikel
- Kembalikan artikel yang ditulis oleh: [Empty field]
- Kembalikan artikel yang dipublikasikan di: [Empty field]
- Kembalikan artikel tertanggal antara: 2012 -- 2022

The search results page shows a list of articles. The first article is titled "Analisa Akti Pseudomonas...". The second article is titled "Uji Aktivitas acanthopodium Secara In Vitro". The third article is titled "UJI AKTIVITAS (Zanthoxylum acanthopodium) Dan ...".

The fourth article is titled "POTENSI EKSTRAK TUMBUHAN ANDALIMAN (Zanthoxylum acanthopodium DC.) SEBAGAI ANTIBAKTERI Staphylococcus aureus".

## Lampiran 7 Jurnal 1

OPEN ACCESS Freely available online

PLOS ONE

**Structure-Activity Relationship of Benzophenanthridine Alkaloids from *Zanthoxylum rhoifolium* Having Antimicrobial Activity**

Luciana de C. Tavares<sup>1</sup>, Graciane Zanon<sup>1</sup>, Andréia D. Weber<sup>1</sup>, Alexandre T. Neto<sup>1</sup>, Clarice P. Mostardeiro<sup>2</sup>, Ivana B. M. Da Cruz<sup>2,3</sup>, Raul M. Oliveira<sup>2</sup>, Vinicius Ilha<sup>1</sup>, Ionara I. Dalcol<sup>1,2</sup>, Ademir F. Morel<sup>1\*</sup>

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**Abstract**

*Zanthoxylum rhoifolium* (Rutaceae) is a plant alkaloid that grows in South America and has been used in Brazilian traditional medicine for the treatment of different health problems. The present study was designed to evaluate the antimicrobial activity of the stem bark crude methanol extract, fractions, and pure alkaloids of *Z. rhoifolium*. Its stem bark extracts exhibited a broad spectrum of antimicrobial activity, ranging from 12.5 to 100 µg/mL using bioautography method, and from 125 to 500 µg/mL in the microdilution bioassay. From the dichloromethane basic fraction, three furoquinoline alkaloids (1–3), and nine benzophenanthridine alkaloids (4–12) were isolated and the antimicrobial activity of the benzophenanthridine alkaloids is discussed in terms of structure-activity relationships. The alkaloid with the widest spectrum of activity was cheleythrine (10), followed by avicine (12) and dihydrocheleythrine (4). The minimal inhibitory concentrations of cheleythrine, of 1.50 µg/mL for all bacteria tested, and between 3.12 and 6.25 µg/mL for the yeast tested, show this compound to be a more powerful antimicrobial agent when compared with the other active alkaloids isolated from *Z. rhoifolium*. To verify the potential importance of the methylenedioxy group (ring A) of these alkaloids, cheleythrine was selected to represent the remainder of the benzophenanthridine alkaloids isolated in this work and was subjected to a demethylation reaction giving derivative 14. Compared to cheleythrine, the derivative (14) was less active against the tested bacteria and fungi. Kinetic measurements of the bacteriolytic activities of cheleythrine against the bacteria *Bacillus subtilis* (Gram-positive) and *Escherichia coli* (Gram-negative) were determined by optical density based on real time assay, suggesting that its mechanism of action is not bacteriolytic. The present study did not detect hemolytic effects of cheleythrine on erythrocytes and found a protective effect considering the decrease in TBARS and AOPP (advanced oxidized protein products) levels when compared to the control group.

**Citation:** Tavares LC, Zanon G, Weber AD, Neto AT, Mostardeiro CP, et al. (2014) Structure-Activity Relationship of Benzophenanthridine Alkaloids from *Zanthoxylum rhoifolium* Having Antimicrobial Activity. PLoS ONE 9(5): e97000. doi:10.1371/journal.pone.0097000

**Editor:** Mark J. van Raaij, Centro Nacional de Biotecnología – CSIC, Spain

**Received:** December 17, 2013; **Accepted:** April 15, 2014; **Published:** May 13, 2014

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**Funding:** The authors thank CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico) and FAPERGS (Fundação de Amparo à Pesquisa do Estado do Rio Grande do Sul-PRONEX) for financial support for this work. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

**Competing Interests:** The authors have declared that no competing interests exist.

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**Introduction**

Many studies have underlined the importance and use of plants as a source of antimicrobial agents [1]. In this context, plants of the genus *Zanthoxylum* (Rutaceae), which encompasses about 250 species distributed throughout the world, have been of great importance. Among these, *Zanthoxylum rhoifolium* (syn. *Fagara rhoifolium*), native to South America (Brazil, Uruguay, Paraguay and Argentina) has been used in Brazilian traditional medicine for the treatment of many different health problems [2–4]. In French Guiana, *Z. rhoifolium* has been used as an antimalarial treatment [5]. These plants are known to be a rich source of natural products, mainly alkaloids and lignans. Some of these alkaloids, including the benzophenanthridines and furoquinolines, display a variety of biological activities, such as antitumor [6–11], antimicrobial [12], anti-inflammatory [13–15] and antiparasitic [16–18] activity.

In previous studies of our research team on the crude extract of *Z. rhoifolium*, the isolation and structural elucidation of a number of alkaloids have been reported, including zanthoxyline, nitidine, oxyntidine and skimmianine [19]. We have also reported the antibacterial activity of the crude MeOH extract, aqueous extract, acid and basic fractions of *Z. rhoifolium* by disc diffusion method [20] and of some isolated alkaloids by the TLC bioassay bioautography method [21]. More recently, our research team reported the presence of several benzophenanthridine alkaloids with interesting antitumor activities from the same source [22]. Because many diseases that are widespread among underprivileged and indigenous populations, such as fever, stomach upset and respiratory diseases, among others, can be caused by fungi and bacteria, this study investigated the antimicrobial activities of the crude methanol extract, fractions obtained from this extract and purified compounds from the stem bark of *Z. rhoifolium* collected in Rio Grande do Sul, Brazil, were initially screened by

PLOS ONE | [www.plosone.org](http://www.plosone.org) 1 May 2014 | Volume 9 | Issue 5 | e97000

## Lampiran 8 Jurnal 2



Unit Penelitian dan Pengabdian Masyarakat  
Fakultas Kedokteran Universitas Muhammadiyah Sumatera Utara

**UJI AKTIVITAS ANTIBIOTIK EKSTRAK BUAH ANDALIMAN  
(*Zanthoxylum acanthopodium* DC) TERHADAP PERTUMBUHAN  
BAKTERI *Staphylococcus aureus* SECARA *IN VITRO***

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**Abstrak**

**Latar belakang.** *Staphylococcus aureus* merupakan flora normal yang diperkirakan 20-75% ditemukan pada saluran pernapasan atas, muka, tangan, rambut dan vagina. Infeksi bakteri ini dapat menimbulkan penyakit dengan tanda-tanda yang khas, yaitu peradangan dan tampak sebagai jerawat, infeksi dan inflamasi folikel rambut dan pembentukan abses. Di antara organ yang sering diserang oleh bakteri *Staphylococcus aureus* adalah kulit yang mengalami luka. Buah Andaliman (*Zanthoxylum acanthopodium* DC) memiliki efek antibiotik terhadap bakteri gram positif. Flavonoid pada buah Andaliman diketahui dapat menghambat bakteri *Staphylococcus aureus*. **Tujuan.** Penelitian ini bertujuan untuk mengetahui aktivitas antibiotik ekstrak buah Andaliman terhadap pertumbuhan bakteri *Staphylococcus aureus*. **Metode.** Penelitian ini menggunakan metode eksperimental. Teknik yang digunakan dalam mengukur aktivitas antibiotik adalah metode difusi cakram. **Hasil.** Dari hasil penelitian menunjukkan bahwa ekstrak buah Andaliman (*Zanthoxylum acanthopodium* DC) dengan konsentrasi 8%, 6%, 4% dan 2% menghasilkan rata-rata diameter zona bening masing-masing yaitu 13,2 mm, 11,30 mm, 10,24 mm, 8,29 mm sedangkan diameter zona bening sefotaksim yaitu 27,67 mm dan akuades tidak diperoleh zona bening. **Kesimpulan.** Ekstrak buah Andaliman dengan konsentrasi 8% memiliki zona bening tertinggi terhadap pertumbuhan bakteri *S.aureus*. Efek antibiotik ekstrak buah Andaliman seluruh konsentrasi tidak berbeda nyata sedangkan sefotaksim dengan ekstrak buah Andaliman seluruh konsentrasi memiliki daya hambat yang nyata.

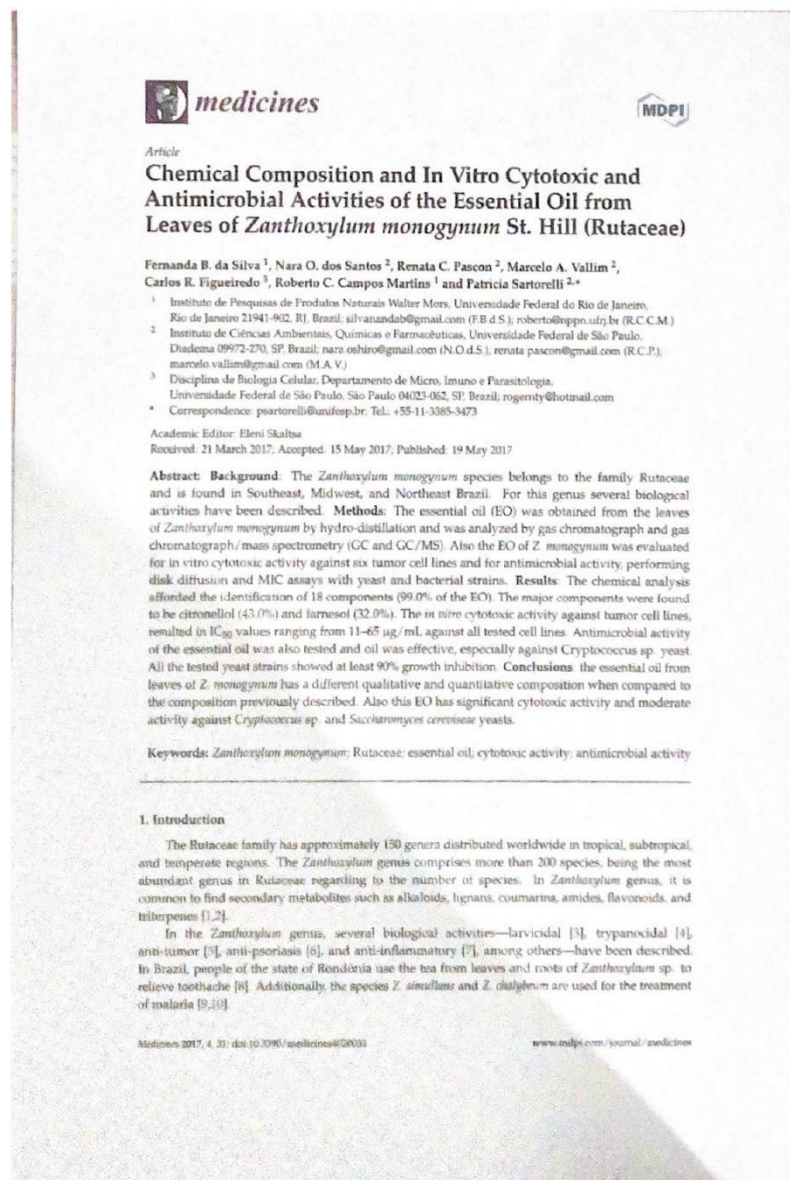
**Kata kunci:** *Staphylococcus aureus*, Ekstrak buah Andaliman

**Abstract**

**Background.** *Staphylococcus aureus* is a normal flora that estimated 20-75% found in the upper respiratory tract, face, hands, hair and vaginal. This bacterial infection can cause diseases with distinctive signs, namely inflammation, infection and abscess formation. Among the organs which are often attacked by the bacteria *Staphylococcus aureus* are skin injuries. Andaliman fruit (*Zanthoxylum*



## Lampiran 9 Jurnal 3



## Lampiran 10 Jurnal 4

International Conference on Agriculture, Environment, and Food Security IOP Publishing  
IOP Conf. Series: Earth and Environmental Science 122 (2018) 012089 doi:10.1088/1755-1315/122/1/012089

### The extraction of antimicrobials component of andaliman (*Zanthoxylum acanthopodium* DC.) and its application on catfish (*Pangasius sutchi*) fillet

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**Abstract.** Andaliman (*Zanthoxylum acanthopodium* DC.) is a well known wild species in North Sumatera and used for seasoning in Batak's traditional cuisine. This study was aimed to examine the phytochemical constituents of andaliman fruit extracts after simple macerated in water, methanol, ethyl acetate and hexane using qualitative phytochemical analysis, and to determine its potential antimicrobial activity against *Staphylococcus aureus*, *Escherichia coli* and *Salmonella sp* by using agar well diffusion method and minimum inhibitory concentration (MIC). Phytochemicals such as alkaloids, flavonoid, glycosides, saponins, tannins, triterpene/steroid and glycoside anthraquinones were detected in the methanol extracts, but steroids and glycoside anthraquinones were absent in the ethyl acetate extract. The ethyl acetate extracts showed maximum zone of inhibition and minimum inhibitory concentration against all the experimental microorganisms. The minimum zone of inhibition was determined in hexane extracts showing less antimicrobial activity against all the experimental microorganisms. The MIC of the ethyl acetate extracts was 0,5% w/v for all tested bacteria. Application of ethyl acetate extracts of andaliman fruits showed effective for catfish (*Pangasius Sutchi*) fillet stored in refrigerator (5 °C) for 3 days.

#### 1. Introduction

Andaliman (*Zanthoxylum acanthopodium* DC.) fruits is known as the Batak society spicy and used to eliminate the smell of fish and raw meat. They are wildy grown in Tapanuli, North Sumatera at 1500 meters above sea level [1] at a temperature of 15-18 °C [2,3]. The fruits shape are like pepper, small round, green, but becomes black when they are dry. The fruits contain aromatic compounds with a bitter taste and produce the effect of thrilling sensation on taste buds and cause the tongue felt numb. Wijaya [4] found that citronellal and limonen were the most impacting compounds on the aroma of andaliman, but  $\beta$ -myrcene, (*z*)- $\beta$ -ocimene, linalool,  $\beta$ -citronellol,neral, geraniol, geranial, geranyl acetate, unknown compound, and a sesquiterpene were also contributing to andaliman's fresh citrus and warm sweet-peppery aroma. It had been reported to has an anti-inflammatory activity [5] and antioxidant activity [6]. Based on Cahyana and Mardiana [7], andaliman has an antimicrobial activity.

## Lampiran 11 Jurnal 5

Jurnal Ilmu dan Teknologi Pangan  
Vol. 8, No. 3, 257-266, September 2019

ISSN : 2527-8010 (*ejournal*)

**DAYA HAMBAT EKSTRAK BUAH ANDALIMAN (*Zanthoxylum acanthopodium* DC)  
DALAM ETIL ASETAT TERHADAP PERTUMBUHAN *Escherichia coli***  
Inhibition of Andaliman Fruit Extract (*Zanthoxylum acanthopodium* DC) in Ethyl Acetate Against  
The Growth of *Escherichia coli*.

Fitri Maria Clarensia Sitanggang<sup>1)</sup>, Agus Selamat Duniaji<sup>2)</sup>, I Desak Putu Kartika Pratiwi<sup>2)</sup>

<sup>1)</sup>Mahasiswa Program Studi Ilmu dan Teknologi Pangan, Fakultas Teknologi Pertanian, Unud

<sup>2)</sup>Dosen Program Studi Ilmu dan Teknologi Pangan, Fakultas Teknologi Pertanian, Unud  
PS Ilmu dan Teknologi Pangan, Fakultas Teknologi Pertanian, Universitas Udayana,  
Kampus Bukit Jimbaran, Badung-Bali

**Abstract**

This study aims to determine the Minimum Inhibitory Concentration (MIC) of andaliman fruit extract (*Zanthoxylum acanthopodium* DC) in ethyl acetate against the growth of *Escherichia coli* bacteria. The design of this study used an experimental method with 10 extract concentrations for MIC testing, namely 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% and 100% with 2 repetitions so that they were obtained 20 experimental units. The variables observed were the formation of clear zones, namely the inhibition produced by the presence of antimicrobial activity from andaliman fruit extract in ethyl acetate against the growth of *Escherichia coli*. Data from research results are presented in the form of tables, figure and discussed descriptively. Andaliman fruit extracts in ethyl acetate have varying inhibitory forces, namely at the concentrations of concentrations of 10% to 20% was 0.65 mm to 3.15 mm with weak inhibition categories, concentrations of 30% to 50% was 5.25 mm to 6, 60 mm in the moderate inhibition category and concentrations of 60% to 100% showed strong inhibition categories with inhibition diameters of 7.20 mm to 9.60 mm. Minimum Inhibitory Concentration (MIC) for the growth of *Escherichia coli* was at the concentration of 60% with a clear zone diameter of 7.2 mm with a strong category.

**Keywords :** *Andaliman fruit, Escherichia coli, antibacterial.*

**PENDAHULUAN**

Andaliman merupakan rempah asli dari Sumatera Utara yang disebut sebagai *the golden spice from North Sumatera*. Tanaman ini ditemukan tumbuh liar di daerah Tapanuli dan dimanfaatkan sebagai rempah pada masakan adat Batak Angkola dan Batak Mandailing. Buah andaliman dipakai sebagai bumbu penyedap masakan yang memberikan rasa pedas dan aroma yang khas (Katzner, 2004). Andaliman telah lama dipergunakan oleh suku batak sebagai campuran masakan untuk berbagai jenis makanan, seperti ikan mas arsik, natinombur, dan saksang. Masakan yang menggunakan buah andaliman

dengan cara ekstraksi. Parhusip (2006) mengekstrak buah andaliman menggunakan metode maserasi dengan pelarut etil asetat mampu melarutkan banyak kelompok senyawa seperti alkaloid, flavonoid, terpenoid, saponin, dan steroid. Ekstrak etil asetat juga menghasilkan komponen berbau tajam, komponen itu diduga golongan triterpenoid.

Triterpenoid merupakan golongan terpenoid yang mempunyai aktivitas antioksidan yang sangat bermanfaat bagi kesehatan dan berperan penting untuk mempertahankan mutu produk pangan dari berbagai kerusakan seperti ketengikan,



## Lampiran 12 Jurnal 6

### UJI AKTIVITAS ANTIMIKROBA EKSTRAK ANDALIMAN (*Zanthoxylum acanthopodium* DC.) PADA *Staphylococcus aureus*

Al Muzafri

Fakultas Pertanian, Program Studi Agroteknologi, Universitas Pasir Pengaraian

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#### ABSTRAK

Indonesia merupakan Negara yang kaya akan rempah-rempah. Rempah-rempah mengandung senyawa-senyawa bioaktif yang dapat berfungsi sebagai antioksidan dan antimikroba, sehingga dapat dimanfaatkan sebagai antimikroba alami dan bias diaplikasikan pada berbagai produk pangan. Andaliman (*Zanthoxylum acanthopodium* DC) merupakan salah satu tumbuhan rempah yang banyak terdapat di daerah Kabupaten Toba Samosir dan Tapanuli Utara, Sumatera Utara. Ekstrak andaliman digunakan sebagai antimikroba. Proses ekstraksi komponen antimikroba pada andaliman dengan menggunakan metode maserasi dengan 4 jenis pelarut (Air, Metanol, Etil-Asetat, Heksana). Ekstrakan daliman yang diperoleh diuji fitokimia lalu diuji pada Bakteri *Staphylococcus aureus*. Senyawa aktif seperti flavanoid, saponin dan tanin yang terdapat pada ekstrak andaliman mampu menghambat pertumbuhan *Staphylococcus aureus*.

*Keyword: Andaliman, Antimikroba, Staphylococcus aureus*

#### PENDAHULUAN

Indonesia Negara yang kaya akan rempah-rempah. Rempah-rempah merupakan sebagai bahan yang dikeringkan, dan merupakan bagian dari tanaman baik dalam bentuk utuh atau potongan, serta lebih berfungsi sebagai bahan penyedap rasa dibandingkan untuk meningkatkan nilai gizi suatu pangan (Mawadah, 2009). Andaliman (*Zanthoxylum acanthopodium* DC)

selain itu kulit, akar dan daun secara tradisional dimanfaatkan sebagai obat untuk menyembuhkan sakit perut, sakit gigi, batuk, rematik dan sakit pinggang. Andaliman memiliki beberapa aktivitas biologis seperti larvasida, anti inflamasi, analgesik, antimikroba, antioksidan dan antijamur (Negi dkk, 2011).

Andaliman mengandung senyawa flavonoid yang mempunyai aktivitas antioksidan yang sangat bermanfaat bagi



## Lampiran 13 Jurnal 7

## Antimicrobial activity of Mamica de Porca (*Zanthoxylum rhoifolium* Lam) Extract against Gram-positive and Negative bacteria

Nelita Gonçalves Faria de Bessa<sup>1,3\*</sup>, Ananda Brenda Rossi<sup>1</sup>, Rafael Paiva  
 Carvalhaes<sup>1</sup>, Caio Túlio Vale Frazão<sup>1</sup>, Miréia Aparecida Bezerra Pereira<sup>2</sup>

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<sup>2</sup>Farmacia course, UAP - Unidade de Apoio a Pesquisa em Produtos Naturais-UnirG, Universidade de Gurupi, Doutoranda em Produção vegetal-UFT, pesquisadora colaboradora, Av. Bahia, St. Leste, Gurupi-TO, 77410-290, Brazil

<sup>3</sup>UAP - Unidade de Apoio a Pesquisa em Produtos Naturais-UnirG, Universidade de Gurupi, Doutor. Pesquisador Coordenador, Av. Bahia, St. Leste, Gurupi-TO, 77410-290, Brazil. Tel. 015 63 3612 7602

\*Corresponding Author

**Abstract**— Mamica de porca (*Zanthoxylum rhoifolium* Lam., Rutaceae) is a native medicinal plant of occurrence in the Brazilian Cerrado Biome, the most diverse and rich savannas worldwide. It is present in the states such as Tocantins, Roraima, Amapá, Pará, Amazonas, Acre, and Rondônia. The leaves are used to treatment of microbial infections and parasitic diseases, conferring alternative for health promotion and recovery. However, little is known about the action against Gram-positive and negative bacteria, expanding the knowledge about the potential of the antibacterial. To analyze the antimicrobial activity of leaf crude extract of *Z. rhoifolium* L. from the standard strains Gram-positive *Staphylococcus aureus* and Gram-negative *Escherichia coli*. The ethanolic extract was obtained in the Natural Products Laboratory (UAP) of the University UnirG, Gurupi-TO, Brazil, allotted to Muller Hinton Agar plates, in triplicate, inoculated with bacterial strains Standard American Type Culture Collection (ATCC): Gram-Positive *S. aureus* ATCC<sup>®</sup> 29213 and Gram-Negative *E. coli* ATCC<sup>®</sup> 25922 with the technique of wells for depositing 50 µL saline (negative control) and extract, with Gentamicin<sup>®</sup> on disk 10µg for positive control. The plates were incubated in a greenhouse at 35 ± 1 °C for 24 hours, microbiology laboratory, measuring the diameter of the growth inhibition halos. The crude leaf extract of *Z. rhoifolium* showed biological activity against Gram-positive bacteria *S. aureus* and Gram-negative *E. coli*, with moderately sensitive response and growth inhibition halos ranging from 14 to 16mm and 10 to 10.3mm, respectively. The antimicrobial potential of the crude leaf

extract *Z. rhoifolium* was checked against microorganisms of different cellular structures, expanding the possibilities of antimicrobial action, especially Gram-negative bacteria, being identified for other medicinal species.

**Keywords**— Medicinal Plants, Antibacterial Agents, Natural Products.

### I. INTRODUCTION

The medicinal plants traditionally used confer an alternative for health promotion and recovery, recommended the safe and effective use according to the World Health Organization and National Policy of Medicinal Plants and Phytotherapy. Considering the chemical and biological diversity of Brazil, this review highlights the Brazilian natural products that were successfully used to develop new products and the value of secondary metabolites from Brazilian biodiversity with potential application for new products and technologies [1]. The therapeutic properties are attributed to the presence of bioactive constituents, many of which are employed in the development of drug production [2]. Although research in the field of complementary and alternative medicine has revealed the mechanisms of action and efficacy of this type of treatment, many extracts vegetables yet comply with research to be properly used for therapeutic purposes [3]. This is one of the ways to the rational use of this drug alternative antimicrobial therapy and combating bacterial multidrug resistance, a worldwide problem that persists in the area of hospital health.

## Lampiran 14 Jurnal 8

**BIODIVERSITAS**  
Volume 21, Number 9, September 2020  
Pages: 4147-4154

ISSN: 1412-033X  
E-ISSN: 2085-4722  
DOI: 10.13057/biodiv/d210928

## Antibacterial, cytotoxicity and metabolite profiling of crude methanolic extract from andaliman (*Zanthoxylum acanthopodium*) fruit

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EVAN HANSEL FREDERICK<sup>1,2</sup>, ALDI PRATAMA WIJAYA<sup>1,2</sup>, EMMY SYAFITRI<sup>1</sup>, KINDI FARABI<sup>4</sup>,  
SHUN SAITO<sup>7</sup>, YASUHIRO IGARASHI<sup>7</sup>

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Manuscript received: 21 July 2020. Revision accepted: 15 August 2020.

**Abstract.** Sibero MT, Siswanto AP, Frederick EH, Wijaya AP, Syafitri E, Farabi K, Murwani R, Saito S, Igaras Y. 2020. Antibacterial, cytotoxicity and metabolite profiling of crude methanolic extract from andaliman (*Zanthoxylum acanthopodium*) fruit. *Biodiversitas* 21: 4147-4154. The local community in North Sumatra has utilized andaliman fruit (*Zanthoxylum acanthopodium*) as spices for traditional cuisines because it has a unique flavor. Information on the antimicrobial activity of *Z. acanthopodium* fruit against aquaculture pathogens and its bioactivity against leukemia cell lines are limited. The purposes of this study were to evaluate the antimicrobial activity of *Z. acanthopodium* fruit against *Tenacibaculum maritimum*, *Vibrio alginolyticus*, *V. anguillarum*, *V. harveyi* that are known as pathogens in aquaculture; to determine cytotoxic property against murine P388 leukemia cells; and to characterize its metabolites profile. The sample was extracted using methanol by the maceration method. Antibacterial assay was conducted by Kirby-Bauer disc diffusion method; while cytotoxicity assay using the XTT method. Proximate analysis showed that *Z. acanthopodium* fruit contained 63.41% of moisture, 24.73% of crude fiber, 9.81% of crude protein, 6.90% of ash, and 2.55% of crude fat. Several phytochemical components were detected, such as alkaloid, flavonoid, tannin, triterpenoid, and steroid. The GC/MS analysis indicated the presence of various compounds from terpenoid and terpenes derivatives. This study indicated that *Z. acanthopodium* fruit was not potential as antibacterial agents against the aquaculture pathogens; however, the methanol extract showed cytotoxic potential with IC<sub>50</sub> 19.14 µg/mL against murine P388 leukemia cells.

**Keywords:** Andaliman, cytotoxicity, leukemia, terpenes, *Zanthoxylum*

### INTRODUCTION

The genus *Zanthoxylum* is a member of the Rutaceae family, with 225 species found in pantropic countries (Appelthans et al. 2018). In Indonesia, *Zanthoxylum acanthopodium*, known as *andaliman* or *tuba* (in Karones language), is a species that grows in North Sumatra, Indonesia. This plant was reported to grow in Dairi, North Tapanuli, Sidikalang, Simalungun, Sumbul, and several districts around Lake Toba (Siregar 2003; Sinaga et al. 2015; Asbur and Khairunnisyah 2018; Junaedi and Nurlaeni 2019; Saragih and Arsita 2019). *Z.*

*acanthopodium* essential oils due to volatile compounds such as β-myrcene, limonene, and citronellal (Wijaya et al. 2019). Previous studies showed the potency of *Z. acanthopodium* as an antioxidant, antibacterial against human pathogens, anti-inflammatory, and antiacne (Julistiono et al. 2018; Wijaya et al. 2019). The potency of *Z. acanthopodium* against breast (T47D and 4T1), and cervical cancer cell (HeLa) lines were reported previously (Rosidah et al. 2019; Satria et al. 2019; Syari et al. 2019). However, its potency against leukemia cancer cells has not been determined yet. Leukemia is one of the five types of cancer that causes the highest mortality in Indonesia

## Lampiran 15 Jurnal 9

ALOTROP, Jurnal Pendidikan dan Ilmu Kimia, 4(2): 133-139 (2020)

p-ISSN 2252-8075  
e-ISSN 2615-2819

	<p style="text-align: center;"><b>POTENSI EKSTRAK TUMBUHAN ANDALIMAN (<i>Zanthoxylum acanthopodium</i> DC.) SEBAGAI ANTIBAKTERI <i>Staphylococcus aureus</i></b></p> <p style="text-align: center;">Oma Sepriani<sup>1*</sup>, Nurhamidah<sup>2</sup>, Dewi Handayani<sup>3</sup>  <sup>1,2,3</sup>Pendidikan Kimia, Jurusan PMIPA FKIP, Universitas Bengkulu            *email : <a href="mailto:omasepriani@yahoo.com">omasepriani@yahoo.com</a></p>	 Open Journal Systems				
						

**ABSTRACT**

The aims of this study is to determine the secondary metabolite compounds in Roots, stem bark, leaves and fruit of Andaliman (*Zanthoxylum acanthopodium* DC), and determine the most potent part of Andaliman plant extract in inhibiting the growth of *Staphylococcus aureus* bacteria. Andaliman plant taken in Simarpingan, Sipaholon village sub district of North Sumatra. Part of the Andaliman plant are cleaned, cut into small pieces and then dried and mashed, samples that have been finely phytochemically tested and extracted. Testing of secondary metabolite compound by doing phytochemical screening of roots, stem bark, leaves and fruit of Andaliman, alkaloid test using meyers reagent, terpenoid test and steroid using TLC plate with eluent *n*-hexana : ethyl acetate with ratio 6:4, flavonoid test using solution HCl and Mg band, saponin test using soap test, tannin test using ferro (III) chloride solution. Test of antibacterial activity using disc diffusion method. Phytochemical results showed that all parts of the plant andaliman contain secondary metabolite compounds namely alkaloids, flavonoids, terpenoids, tannins and also saponins. The result of antibacterial activity test of leaf extract of leaf and leaf which has the most potential as antibacterial of *S.aureus* is bark. Because it able to inhibit *S.aureus* growth with 11 mm inhibition zone at concentration  $5 \times 10^4$  ppm, which is included in the strong category. In addition to skin of andaliman leaf stem is also potential as an antibacterial with a 10 mm inhibition zone at concentration  $5 \times 10^4$  ppm, which is included in the medium category.

**Keywords:** Andaliman, Profile of Phytochemicals, Antibacterial, *Staphylococcus aureus*

**ABSTRAK**

Penelitian ini bertujuan untuk menentukan senyawa metabolit sekunder pada akar, kulit batang, daun dan buah Andaliman (*Zanthoxylum acanthopodium* DC), dan menentukan bagian dari ekstrak tumbuhan Andaliman yang paling berpotensi dalam menghambat pertumbuhan bakteri *Staphylococcus aureus*. Tumbuhan Andaliman diambil di desa Simarpingan kecamatan Sipaholon Sumatera Utara. Bagian dari tumbuhan Andaliman dibersihkan, dipotong kecil-kecil kemudian dikering dan dihaluskan, sebagian sampel yang telah halus dilakukan uji fitokimia dan diekstraksi. Pengujian senyawa metabolit sekunder dengan melakukan skrining fitokimia terhadap akar, kulit batang, daun dan buah Andaliman, uji alkaloid menggunakan pereaksi meyers, uji terpenoid dan steroid menggunakan plat KLT dengan eluen *n*-heksana : etil asetat dengan perbandingan 6 : 4, uji flavonoid menggunakan larutan HCl dan pita Mg, uji saponin menggunakan uji sabun, uji tanin menggunakan larutan besi (III) klorida. Uji aktivitas antibakteri menggunakan metode difusi cakram. Hasil uji fitokimia menunjukkan bahwa seluruh bagian dari tumbuhan andaliman mengandung senyawa metabolit sekunder yaitu alkaloid, flavonoid, terpenoid, tanin dan juga saponin. Hasil uji aktivitas antibakteri ekstrak kulit batang dan daun yang paling berpotensi sebagai antibakteri *S.aureus* adalah kulit batang karena mampu menghambat pertumbuhan bakteri *S.aureus* dengan zona hambat 11 mm pada konsentrasi  $5 \times 10^4$  ppm, yang termasuk kategori kuat. Selain kulit batang daun andaliman juga berpotensi sebagai antibakteri dengan zona hambat sebesar 10 mm pada konsentrasi  $5 \times 10^4$  yang termasuk kategori sedang.

**Kata Kunci :** Andaliman, Profil Fitokimia, Antibakteri, *Staphylococcus aureus*

**PENDAHULUAN**

Indonesia adalah negara yang memiliki sumber daya alam yang melimpah, dimana sumber daya alam itu terdiri dari tumbuhan, hewan, mineral

spesies dari 30.000 spesies yang berasal dari hutan Indonesia. Salah satu tumbuhan yang terdapat di hutan Indonesia berpotensi sebagai obat adalah Andaliman. Tumbuhan Andaliman (*Zanthoxylum acanthopodium*



## Lampiran 16 Jurnal 10

Hindawi  
Journal of Tropical Medicine  
Volume 2020, Article ID 2803063, 7 pages  
<https://doi.org/10.1155/2020/2803063>



## Research Article

## In Vitro Antibacterial Activities of Methanolic Extracts of Fruits, Seeds, and Bark of *Zanthoxylum armatum* DC

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Received 11 February 2020; Revised 5 May 2020; Accepted 15 May 2020; Published 4 June 2020

Academic Editor: Sukla Biswas

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Crude methanolic extracts of fruits, seeds, and bark of *Zanthoxylum armatum* were investigated in vitro for antimicrobial activities against 9 different bacterial strains: *Bacillus subtilis*, *Enterococcus faecalis*, *Proteus vulgaris*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *Shigella dysenteriae*, *Staphylococcus aureus*, methicillin-resistant *Staphylococcus aureus* (MRSA), and *Staphylococcus epidermidis* using agar well diffusion method, and the MBC values were determined. Only 5 bacteria, i.e., *Bacillus subtilis*, *Enterococcus faecalis*, MRSA, *Staphylococcus aureus*, and *Staphylococcus epidermidis* exhibited antibacterial properties against the different extracts. The fruit and seed extracts showed activities against 5 bacteria, while the bark extract was active against 2 bacteria only (MRSA and *Staphylococcus aureus*). *Staphylococcus aureus* was found to be more susceptible for all the extracts compared to other strains. The maximum ZOI of 20.72 mm was produced by fruits (wild) and 18.10 mm (cultivated) against *Staphylococcus aureus*. Likewise, the least ZOI of 11.73 mm was produced by seeds (wild) and 11.29 mm (cultivated) against *Escherichia faecalis*. Similarly, the lowest MBC value of 0.78 mg/mL was obtained for fruit extracts against MRSA, 1.56 mg/mL for fruits, seeds, and bark extracts against *Bacillus subtilis*, MRSA, and *Staphylococcus aureus*, and highest value of 50 mg/mL for fruits and seeds extracts against *S. epidermidis*. The fruits, seeds, and bark extracts of *Z. armatum* exhibited remarkable antibacterial properties against different pathogenic bacteria causing several diseases, which suggests the potential use of this plant for treating different bacterial diseases such as skin infection, urinary tract infection, dental problems, diarrhea, and dysentery.

### 1. Introduction

Among the 8 species of *Zanthoxylum* (family Rutaceae) found in Nepal, *Zanthoxylum armatum* DC. is one of the most common spice plants with many medicinal values. Commonly known as timur, it is a subdeciduous aromatic shrub or small tree up to 6 m high. It is found in hot valleys of subtropical to temperate Himalayas (Kashmir to Bhutan), northeast India and Pakistan, Laos, Myanmar, Thailand

diseases, which may result in undesirable side effects and serious medical problems [3, 4]. The indiscriminate use of commercial antimicrobials has also resulted in the development of multiple drug resistance. This has urged researchers to identify or extract natural antimicrobials from natural sources with less health severity [5]. Plants are the potential source of novel antimicrobial agents [6, 7]. Herbal medicinal practice, which uses plant sources to cure various infectious diseases, is also getting popularity these days. A

## Lampiran 17 Jurnal 11

### Effectiveness of The Antibacterial Activity of n-Hexane Andaliman (*Zanthoxylum Acanthopodium* DC) Extract Against *Bacillus subtilis*, *Salmonella typhi*, and *Staphylococcus aureus*

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**Abstract** Infection caused by bacteria is a problem found in various countries, including Indonesia. Different pathogenic bacteria become resistant to some antibiotics. One way to inhibit the activity of these bacteria is to study natural materials that have antibacterial activity. One of the natural ingredients that have these activities is andaliman. It evidenced by the results of the analysis that the diffusion test of Andaliman extract discs uses two types of solvents: n-hexane and ethyl acetate. In the inhibition zone diameter of three types of bacteria, namely: *Salmonella typhi*, *Bacillus subtilis* and *Staphylococcus aureus* and for the antibacterial test several variations of concentration of andaliman extract were used, namely: 12.5, 25, 50, and 75%, the best results for n extract -hexane at a level of 50%, namely: 26.7 mm for the best ethyl acetate extract at a concentration of 75%, 21.5 mm, both of the *Staphylococcus aureus* bacteria. These results indicate that andaliman extract is useful as an antibacterial.


#### 1. Introduction

Nowadays, more and more infections found that Indonesian attack people[1]. The disease is a common health problem suffered by the community due to the growth of microorganisms, one of which is pathogenic bacteria. The bacteria that cause the most cases of infection in the city are pathogenic bacteria of the species *Staphylococcus aureus* (*S. aureus*) and *Escherichia coli* (*E. coli*)[2].

Indonesia has an extraordinary biodiversity, which is 40,000 plant species of that number. 1,300 of which used as traditional medicine. Based on this potential, conventional Indonesian medicinal products can be widely developed, for example, like herbal medicine, standardized herbal medicine or phytopharmaca. One of the typical plants in Indonesia that have medicinal properties is andaliman which grows in the Tapanuli region[3].

Traditionally, andaliman fruit widely used as an aromatic ingredient, tonic, appetite stimulant, stomach-ache medicine, and diarrhoea[4]. Indian society uses andaliman fruit to treat paralysis and various skin diseases, such as boils and leprosy. Andaliman fruit also used as a spice in North Sumatra, especially North Tapanuli. Plants of the genus *Zanthoxylum* contain many phenol hydroquinone, flavonoids, steroids / triterpenoids, tannins, glycosides, essential oils, alkaloids, coumarin, lignans, amides and terpenes[5].

Based on the research of A Muzafri, et al. in 2018 about "The extraction of antimicrobials component of andaliman (*Zanthoxylum acanthopodium* DC.) Moreover, its application on catfish

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## Lampiran 18 Jurnal 12

DOI: 10.30829/jumantik.v6i3.8866

## Research Article

**Potensi Bakteri Endofit Andaliman (*Zanthoxylum acanthopodium* DC.) dalam Menghambat Bakteri Penyebab Infeksi pada Manusia**Debie Rizqoh<sup>1\*</sup>, Wulan Okta Kumala<sup>2</sup>, Sipriyadi<sup>3</sup>, Besly Sinuhaji<sup>4</sup>, Oktoviani<sup>5</sup><sup>1</sup>Departemen Mikrobiologi dan Imunologi Fakultas Kedokteran dan Ilmu Kesehatan Universitas Bengkulu<sup>2</sup>Program Studi S1 Kedokteran Fakultas Kedokteran dan Ilmu Kesehatan Universitas Bengkulu<sup>3</sup>Departemen Mikrobiologi Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Bengkulu<sup>4</sup>Bagian Patologi Klinik, Rumah Sakit Harapan Doa, Kota Bengkulu<sup>5</sup>Departemen Farmakologi Fakultas Kedokteran dan Ilmu Kesehatan Universitas Bengkulu**Abstract**

*Endophytic bacteria are a beneficial bacteria that live in plant tissue. Several studies have shown that certain endophytic bacteria can produce secondary metabolites that have health effects. The andaliman (*Zanthoxylum acanthopodium* DC.) have several properties, one of which is as antibacterial against pathogenic bacteria. The most common bacterial infections in humans are caused by commensal bacteria in the body such as *Escherichia coli* and *Staphylococcus aureus*. This study used a qualitative data collection method with the type of experimental laboratory research to isolate the endophytic bacteria andaliman which had been tested against the pathogenic bacteria *Escherichia coli* and *Staphylococcus aureus*. The initial stage were isolation of endophytic bacteria and observation of colony characteristics, after obtaining isolates with different colony characteristics, a Gram stain test and a antagonist test for pathogenic bacteria were carried out. In this study, 252 colonies grew and there were 85 isolates with different colony characteristics. From all the isolates, there were two isolates that could inhibit the growth of *Escherichia coli* and seventeen isolates that could inhibit the growth of *Staphylococcus aureus*.*

*Keywords: Andaliman, Endophytic bacteria, Escherichia coli, Staphylococcus aureus*

**Pendahuluan**

Penyakit infeksi masih menjadi salah satu masalah kesehatan yang utama. Menurut Badan Kesehatan Dunia (*World Health Organization - WHO*), sekitar 83% kematian

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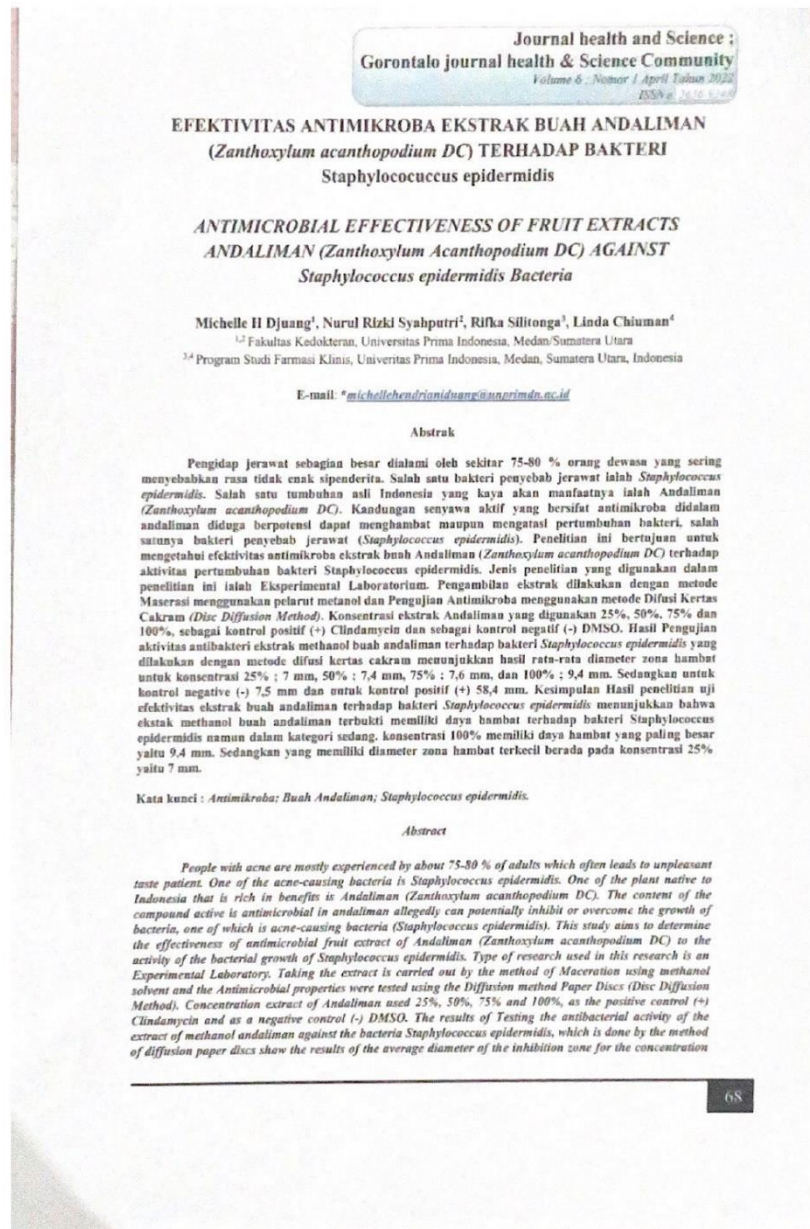
Submitted: 15-02-2021 Revised: 13-04-2021

Accepted: 17-07-2021 Published: 12-08-2021

disebabkan oleh penyakit infeksi, kelahiran dan kondisi gizi yang didapatkan oleh anak-anak (WHO, 2015). Berdasarkan hasil Riset Kesehatan Dasar (2018) oleh Kemenkes RI prevalensi untuk penyakit infeksi di Indonesia dapat dilihat dari beberapa data yang terlapor yaitu Infeksi Saluran Pernapasan Atas (ISPA) sebesar 4,4%, malaria sebesar 0,4%, pneumonia sebesar 2,0%, diare pada balita sebesar 12,3% dan diare yang terdiagnosis tenaga kesehatan sebesar 6,8%. Sebagian besar



## Lampiran 19 Jurnal 13



## Lampiran 20 Jurnal 14

KESANS : International Journal Of Health and Science  
e-ISSN : 2808-7178, p-ISSN : 2808-7380  
Web : <http://kesans.nfa.institute.com/index.php/kesans/index>

**KESANS**  
International Journal of Health and Science

**Testing of Andaliman Extract (Zanthoxylum Acanthopodium Dc) With 4 Types of Solutions (Ethyl Acetate, Aquades, Methanol, And Hexane) on Growth of Bacteria Escherichia Coli**

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**Article Information**  
Submitted: 03 January 2022  
Accepted: 10 January 2022  
Online Publish: 20 January 2022

**Abstrack**  
In general, this study aims to see whether Andaliman extract is able to inhibit the growth of Escherichia coli microorganisms: the first step in this research is the extraction of Andaliman with 4 types of solvents (equates solvents, methanol, ethyl acetate, n-hexane). In the second stage, phytochemical tests were carried out on the andaliman extract to see the content of the active compounds in the andaliman extract, in the andaliman extract the active compounds were found to be alkaloids, steroids, and free-form triterpenes, saponins, tannins, flavonoids, and glycosides. The third stage of this study was the zone activity test inhibit andaliman extract on Escherichia Coli assay on bay leaf extract using blank disc paper. The extract solution that has been diluted with a concentration of 25%, 50%, 75%, 100%. Andaliman extract with an ethyl-acetate solvent with a concentration of 100% has the greatest inhibition on the growth of Escherichia coli with dimensions of 19.15 mm, while the has the smallest inhibition of hexane solvent with a concentration of 25% at 5.80 mm.

**Keywords:** Andaliman; Escherichia Coli; Ethyl Acetate; Aquades; Methanol; Hexane;

**How to Cite**  
Al Muzafri, Ria Karno: Testing Of Andaliman Extract (Zanthoxylum Acanthopodium Dc) With 4 Types of Solution (Ethyl Acetate, Aquades, Methanol, And Hexane) On Growth of Bacteria Escherichia Coli/Vol. 1, No. 4, January 2022  
DOI: <https://doi.org/10.30998/kj.v1i4.50>  
2808-7178  
Rita Institute

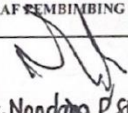
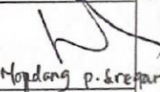

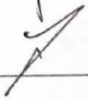
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e-ISSN/p-ISSN  
Publish by





### Lampiran 22 Lembar Mengikuti Seminar Proposal


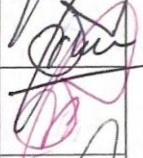


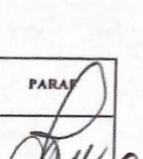
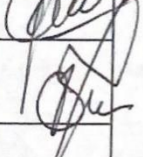
#### MENGIKUTI SEMINAR PROPOSAL

NO	TANGGAL	PEMAKALAH	JUDUL	PARAF PEMBIMBING
1.	9/8-22	Nurjannah Br Ritonga	Hubungan Posisi duduk pada aktivitas sehari- hari dengan terjadinya GBP pada Mahasiswa	 (dr. Nondang P. Siregar, M.Sc.)
2	7/8-22	Nachita Umarah Syandra	Hubungan Posisi duduk Mahasiswa FK USU pada kegiatan sehari-hari dan dipaparkan terjadinya karies	 (dr. Nondang P. Siregar, M.Sc.)
3	22/8-22	Shindy	Hubungan Pengaruh terhadap Pem- paparan dan status gizi bayi 6-24 bulan di Pw. Medan Utara	
4.	24/8-22	Syahrul Kholik Thalha	Hubungan Lama Lama gigit dengan penyebaran virus pada mahasiswa FK USU angkatan 2019	

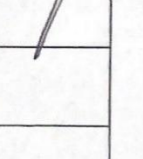
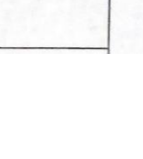
### Lampiran 23 Lembar Kegiatan Bimbingan Hasil Penelitian

**LEMBAR KEGIATAN BIMBINGAN HASIL PENELITIAN**

Dosen Pembimbing : dr. Saiful Bahubun, M.pd


TANGGAL	MATERI DISKUSI	KETERANGAN	PARAF
24 Agustus 2022	Revisi Proposal		
8 September 2022	Revisi Proposal		
26 September 2022	Konferensi BAB 4		
27 Oktober 2022	Konferensi BAB 4		
10 November 2022	Revisi BAB 4		
4 Desember 2022	Konferensi BAB 5		

TANGGAL	MATERI DISKUSI	KETERANGAN	PARAF
7 Desember 2022	Konferensi BAB 5		
9 Desember 2022	Acc. Seminar Hasil		

**Lampiran 24 Lembar Mengikuti Seminar Hasil Penelitian**

MENGIKUTI SEMINAR HASIL PENELITIAN

NO	TANGGAL	PEMAKALAH	JUDUL	PARAF PEMBIMBING
	10/ 12 2022	Ridkiz Annisa	Hubungan dukungan keluarga dengan kepatuhan minum obat	

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