ANTIBACTERIAL EFFECT OF PROTEIN HYDROLYSATES ISOLATED FROM GIANT AFRICAN SNAIL (*Achatina fulica)* AGAINST *Propionibacterium acnes*

DIVA AURORA MATAHARI

DEPARTMENT OF BIOLOGY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
IPB UNIVERSITY
BOGOR
2024

STATEMENT ABOUT UNDERGRADUATE THESIS, INFORMATION SOURCES, AND ACT OF SPILLING OVER COPYRIGHT

By this writing, I clarify that the undergraduate thesis entitled "Antibacterial Effect of Protein Hydrolysates Isolated from Giant African Snail (*Achatina fulica)* Against *Propionibacterium acnes*" is my own work under the supervision of the advising committee and has not been proposed for any institution. Copied infromation source of published and unpublished writing of other authors has been mentioned in the text and incorporated in the references at the end of this undergraduate thesis.

By this writing, I hand over the copyright of my undergraduate thesis to IPB University.

Bogor, August 2024

Diva Aurora Matahari
G3401201095

ABSTRAK

DIVA AURORA MATAHARI. Uji Aktivitas Antibakteri Hidrolisat Protein dari Bekicot (*Achatina fulica*) terhadap Bakteri *Propionibacterium acnes*. Dibimbing oleh NISA RACHMANIA MUBARIK dan TEERASAK E-KOBON.

Giant african snail atau bekicot (*Achatina fulica*) merupakan salah satu hama dan menjadi ancaman besar bagi pertanian, keanekaragaman hayati, dan ekosistem. Meskipun kerusakan ditimbulkan oleh spesies ini pada ekosistem, bekicot memiliki protein dan mukus yang bermanfaat bagi manusia. Protein *Achatina fulica* diduga memiliki peptida yang mengandung aktivitas antimikroba seperti mytimacin-AF dan achasin-AF. Penelitian ini bertujuan untuk mencari aktivitas antibakteri dari hidrolisat protein yang disintesis dari bekicot terhadap *Propionibacterium acnes*, bakteri yang memiliki peran penting dalam peradangan jerawat. Proses hidrolisis protein digunakan untuk mendegradasi dan menghasilkan protein dengan berbagai ukuran dan asam amino bebas. Hasil dari proses ini dapat menghasilkan berbagai bioaktivitas. Tiga replikasi hidrolisat protein *A. fulica* menunjukan aktivitas antibakteri terhadap *P. acnes* dengan hasil yang bervariasi. Presentase inhibisi terbesar dihasilkan dari replikasi ketiga hidrolisat protein sebesar 92 ± 4,8% terhadap *strain P. acnes* JB7. Inhibisi bakteri kemudian dilanjut dengan uji *minimum bactericidal concentration* (MBC) dengan konsentrasi 200-1.56 µg/ml dalam metode dilusi padat. Hasil uji MBC menunjukkan efek inhibisi terhadap *P. acnes* dalam rentang konsentrasi 12,5-1,56 µg/mL dengan nilai MBC 3,125 dan 1,54 µg/mL. Studi ini menunjukkan adanya peluang bagi hidrolisat protein dari *A. fulica* untuk diuji dan diteliti lebih lanjut pada pengaplikasian dalam industri medis atau perawatan kulit.

Kata kunci : *Lissachatina fulica*, *Cutibacterium acnes*, Hidrolisis, MBC,

ABSTRACT

DIVA AURORA MATAHARI. Antibacterial Effect of Protein Hydrolysated Isolated from Giant African Snail (*Achatina fulica*) Against *Propionibacterium acnes*. Supervised by NISA RACHMANIA MUBARIK and TEERASAK E-KOBON.

The giant African snail is one of the major threats to agriculture, biodiversity, and the ecosystem. Besides the severe damage this alien species has done to the ecosystem, the giant African snail has protein and beneficial mucus for humans. *Achatina fulica* protein is suspected of owning antimicrobial peptides or activities such as mytimacin-AF and achasin-AF. In this recent study, we aimed to focus on the antimicrobial activity of protein hydrolysate from giant African snails against *Propionibacterium acnes*, a bacteria that plays an important role in acne development. The protein hydrolysis process is a degradation process that produces a protein with diverse sizes and free amino acids. The results from this process can yield various bioactivities. Three replicates of *Achatina fulica* hydrolysate protein exhibited antimicrobial activity against *P. acnes*, with multiple results. A third sample of hydrolysate protein *A.fulica* produced the most significant percentage of inhibition in 92 ± 4,8% against *P. acnes* JB7. Inhibition of *P. acnes* was further observed for searching a minimum bactericidal concentration between 200-1,56 µg/mL in the agar dilution method. Furthermore, the results showed a strong inhibitory effect of *P. acnes* in the 12,5-1,56 µg/mL range with Minimum Bactericidal Concentration (MBC) at 3,125 and 1,56 µg/mL. This study demonstrates an opportunity for the hydrolysate protein from *A. fulica* to be tested and further examined for application in the medical or skincare industry.

Keywords: Lissachatina fulica, Cutibacterium acnes, Hydrolysis , MBC,

ANTIBACTERIAL EFFECT OF PROTEIN HYDROLYSATES ISOLATED FROM GIANT AFRICAN SNAIL (*Achatina fulica)* AGAINST *Propionibacterium acnes*

DIVA AURORA MATAHARI

An Undergraduate Thesis
Submitted in partial fulfillment to acquire
Bachelor of Science Degree
In The Field of Biology from Department of Biology

DEPARTMENT OF BIOLOGY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
IPB UNIVERSITY
BOGOR
2024

Examiner team for Undergraduate Thesis Defense:

1. Prof. Dr. Ir. Raden Roro Dyah Perwitasari, M. Sc.

Research Title : Antibacterial Effect of Protein Hydrolysates Isolated from Giant African Snail *(Achatina fulica)* Against *Propionibacterium acnes*
Name : Diva Aurora Matahari
Student ID : G3401201095

Approved by

Supervisior 1:
Dr. Dra. Nisa Rachmania Mubarik, M. Si

Digitally signed by: Nisa Rachmania
Date: 30 Jul 2024 22:40:42 WIB
Verify at disign.ipb.ac.id

Supervisior 2:
Asst. Prof. Teerasak E-Kobon, Ph.D

Digitally signed by Teerasak E-KOBON
Date: 2024.07.31 06:13:01 +07'00'

Acknowledged by

Head of Department Biology
Prof. Dr. Ir. Iman Rusmana M. Si
NIP 196507201991031002

Digitally signed by: Iman Rusmana
Date: 30 Jul 2024 18.12.41 WIB
Verify at disign.ipb.ac.id

Examination Date: 7 August 2024 Pass Date:

FOREWORDS

First of all, the author thanks Allah SWT, the Almighty God, for all the blessings and graces, for the opportunities and health in writing this undergraduate thesis entitled "Antibacterial Effect of Protein Hydrolysates Isolated from Giant African Snail *(Achatina fulica)* Against *Propionibacterium acnes"* so that can be completed correctly and on time. This undergraduate thesis was prepared in order to fulfill the requirements for obtaining a Bachelor of Science degree in the Department of Biology, Faculty of Mathematics and Natural Science, IPB University. The author is grateful for the opportunity to conduct this research through the Kasetsart University Exchange Program (KUEX) 2023.

Many parties assisted and guided the author in preparing this undergraduate thesis, especially the Department of Biology, IPB University, and the Department of Genetics, Kasetsart University. Therefore, the author would like to thank the supervisors, Mrs. Dr. Dra. Nisa Rachmania Mubarik, M.Si., and Mr. Asst. Prof. Teerasak E-Kobon, Ph.D., for their endless support and advice throughout the research. Thanks also presented to the Head of the Department of Biology, Mr. Dr. Ir. Iman Rusmana M. Si, The Examiner of this undergraduate thesis, and all the lecturers and staff in the Department of Biology, IPB University. The author would like to express gratitude to all the committee members of KUEX 2023 for their scholarship and support through this collaborative exchange program.

Another special gratitude was expressed to Ms. Khemrutai Sripath, Mr. Viroj Tachapuripunya, and the Laboratory TE4511 team for their endless support and laughter. Special thanks to the author's parents, Mr. Gunawan Wibisono and Mrs. Nurscecha, as well as sisters and family. The author also gives gratefulness to Ulum, Icha, Jongpil, Hana, Ané, Agathe, Rikuto, P'Thammon, P'Ten, and all Krissana International Dormitory friends and PPI Simpul Kasetsart for the constant encouragement and accompany. Big thanks also to Silva, Dhea, Litta, and all Panthera Hugo Biology 57 for their endless assistance and guidance. Last but not least, the author gives special appreciation to Hafizh Irsyad Fifatama for his accompany and endless warmth to the author until the last minute of her university life.

Hopefully, this undergraduate thesis will be helpful and increase knowledge for all the people who need it. With all sincerity, the author apologizes if there are any mistakes or weaknesses in this undergraduate thesis.

Bogor, August 2024

Diva Aurora Matahari

CONTENT

LIST OF TABLE

LIST OF FIGURE

APPENDIXES