MORPHOLOGICAL, BIOCHEMICAL, AND MOLECULAR IDENTIFICATION OF SPONGE ASSOCIATED BACTERIA AND ITS ENZYMATIC ACTIVITY

KAYLA FELISHA PUSPITASARI

DEPARTMENT OF MARINE SCIENCE AND TECHNOLOGY
FACULTY OF FISHERIES AND MARINE SCIENCES
BOGOR AGRICULTURAL INSTITUTE
BOGOR
2025

STATEMENT REGARDING THESIS AND SOURCE OF INFORMATION AND COPYRIGHT ASSIGNMENT

I hereby declare that the thesis with the title "Morphological, Biochemical, and Molecular Identification of Sponge Associated Bacteria and Its Enzymatic Activity" is my work under the direction of the supervisor and has not been submitted in any form to any university. Sources of information derived or cited from published or unpublished works of other authors have been mentioned in the text and listed in the Bibliography at the end of this thesis.

I hereby transfer the copyright of my paper to Bogor Agricultural University.

Bogor, July 2025

Kayla Felisha Puspitasari
C5401211802

ABSTRAK

KAYLA FELISHA PUSPITASARI. Identifikasi Morfologi, Biokimia, dan Molekuler dari Bakteri yang Berasosiasi dengan Spons dan Aktivitas Enzimatis. Dibimbing oleh MEUTIA SAMIRA ISMET dan RHESI KRISTIANA.

Spons laut merupakan sumber dan inang yang mengesankan bagi genera aktinomisetes yang baru dan tidak umum, dan penargetan genera ini di masa depan dapat mengarah pada penemuan senyawa baru. Oleh karena itu, penelitian mengenai potensi aktinomisetes yang berasosiasi dengan spons laut sangat diperlukan. Penelitian ini bertujuan untuk mengisolasi bakteri yang berasosiasi dengan spons, mengidentifikasi bakteri aktinomisetes dari spons laut dengan mofologi, uji molekuler biokimia, dan skrining lebih lanjut untuk mengetahui potensi enzimatiknya. Berdasarkan hasil dari dua medium yang berbeda, jumlah koloni bakteri yang diisolasi dengan medium ISP-2 lebih rendah dibandingkan dengan medium AIA. Hasil dari uji enzimatik menunjukkan bahwa isolat bakteri RI.AI.146 memiliki karakteristik aktinomisetes dan memiliki potensi untuk menghasilkan enzim dan menghidrolisis selulosa dan amilase. Berdasarkan identifikasi molekuler, isolat RI.AI.146 memiliki kemiripan yang tinggi dengan *Bacillus cereus*, sedangkan berdasarkan uji morfologi dan biokimia, isolat ini memiliki karakteristik bakteri dengan genus *Streptomyces*.

Kata kunci: aktivitas enzimatik, aktinomiset, identifikasi molekuler, spons laut, uji biokimia

ABSTRACT

KAYLA FELISHA PUSPITASARI. Morphological, Biochemical, and Molecular Identification of Sponge-Associated Bacteria and Its Enzymatic Activity. Supervised by MEUTIA SAMIRA ISMET and RHESI KRISTIANA.

Marine sponges are a valuable and an impressive host for new and uncommon actinomycete genera, and targeting these genera in the future could lead to the discovery of novel compounds. Therefore, research into the potential of actinomycetes associated with marine sponges is necessary to determine the potential of sponge-associated bacteria. This research aims to isolate actinomycetes sponge-associated bacteria, identify actinomycetes bacteria from marine sponges with morphological, molecular, biochemical assays, and further screen for their enzymatic potential. The result shows the number of bacterial colonies isolated with ISP-2 medium was lower compared to AIA medium. The result from the enzymatic assays reveals that the bacterial isolate RI.AI.146 has the potential to produce enzymes and hydrolase cellulose and amylase. Based on molecular identification, the isolate RI.AI.146 has high similarity with *Bacillus cereus*, whereas based on morphological and biochemical tests, the isolate has characteristics of *Streptomyces* sp.

Keywords: actinomycetes, biochemical test, enzymatic activity, marine sponge, molecular identification

MORPHOLOGICAL, BIOCHEMICAL, AND MOLECULAR IDENTIFICATION OF SPONGE ASSOCIATED BACTERIA AND ITS ENZYMATIC ACTIVITY

KAYLA FELISHA PUSPITASARI

Undergraduate final task submitted to
The Marine Science and Technology
In partial fulfillment of the requirements
for the degree of Bachelor's

DEPARTMENT OF MARINE SCIENCE AND TECHNOLOGY
FACULTY OF FISHERIES AND MARINE SCIENCES
BOGOR AGRICULTURAL INSTITUTE
BOGOR
2025

External, Non-Supervisory of Examiners in the Undergraduate Final Task Exam:

1 Nadya Cakasana, S.Kel., M.Si.
2 Ir. Endang Sunarwati Srimariana, M.Si.

Title of of Undergraduate Thesis : Morphological, Biochemical, and Molecular Identification of Sponge Associated Bacteria and Its Enzymatic Activity

Name : Kayla Felisha Puspitasari

Student ID : C5401211802

Approved by

1st supervisor:
Dr. Meutia Samira Ismet, S.Si., M.Si.

2nd supervisor:
Dr. Rhesi Kristiana, S.Pi., M.Si.

Acknowledged by

Head of Marine Science and Technology Department:
Dr. Syamsul Bahri Agus, S.Pi., M.Si.
NIP 197207262005011002

Exam date: 12th June 2025

Completion date:

PREFACE

The author would like to praise and thank Allah *subhanahu wa ta'ala* for all gifts so that this final assignment was successfully completed. The theme chosen for the final assignment which was carried out in the month of February 2024 until May 2025, with the title "Morphological, Biochemical, and Molecular Identification of Sponge Associated Bacteria and Enzymatic Activity". This research is a continuation of research internship from MERO Foundation. The author would also like to express sincere gratitude to:

1. Dr. Meutia Samira Ismet, S.Si., M.Si. as first supervisor, and Dr. Rhesi Kristiana, S.Pi., M.Si. as second supervisor for their unwavering support, guidance, and valuable insights throughout the entire project.
2. RIIM Project and MERO Foundation for the opportunity to work on this project the provision of resources that have greatly contributed to this research.
3. Hilman Haris, Pupu Puspitasari, Keisha Puspitasari, Kharisa Puspitasari, and Purbasari for their unwavering support and love for the author.
4. Farhan Ramadhan for the encouragement and patience throughout this thesis journey, the unwavering support has been a constant source of motivation.
5. Dr. Rahul Mehrotra, Fadillaisyia Putri, Kharisma Halisah, and Ayu Trisnayanthi, for their continuous guidance, encouragement, and expertise. The authors were grateful for the knowledge and skills authors have gained under their mentorship.
6. Pierre, Eva, and Dinni have been actively helping the author and are involved in this research during authors internship at MERO Foundation.
7. Ainnun F. Khairriyah, author's bestfriend, classmate, lab-mate, who always encourage and accompanied author throughout this undergraduate thesis journey.
8. Microbe-mates Syfa, Fionna, Najaf, and Jessica, who have always patiently listened, motivate authors through ups and downs in the lab.
9. Sabina Laily, Rizkyah Zahra, and Krisanda Sekar, for being the best sisters, bestfriend for authors.
10. Yudika, Fafa, Joachim, and Ravel author's classmates.
11. Maira, Fida and Farel authors bestfriend since highschool
12. *Odonthanthias randalii* 58

Hopefully, this scientific work will be useful for those in need and for the advancement of science.

Bogor, July 2025

Kayla Felisha Puspitasari

TABLE OF CONTENTS