ABSTRAK

ANALISIS MORFOLOGI LIMBAH KULIT UDANG HASIL BIODEGRADASI SECARA FERMENTASI PADAT OLEH *ACTINOMYCETES* YANG BERASAL DARI BIOTA LAUT

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Penelitian dan pengembangan teknik analisis secara mikroskopi khususnya pada bidang biomaterial semakin meningkat. Penelitian ini bertujuan menganalisis permukaan menggunakan *Scanning Electron Microscopy* (SEM) dan instrumen pendukung lainnya pada proses biodegradasi limbah kulit udang melalui proses fermentasi padat dalam menghasilkan produk turunannya yang dapat diaplikasikan sebagai antifungi. *Actinomycetes* diisolasi dari biota laut (*sponge* dan *tunicate)* yang diambil dari perairan Buleleng, Bali dan Oluhuta Gorontalo dan diremajakan menggunakan media koloid kitin agar. Identifikasi *actinomycetes* dilakukan berdasarkan analisis filogenetik. Limbah kulit udang diperoleh dari Gudang Lelang Teluk, Bandar Lampung. Skrining *actinomycetes* penghasil enzim kitinase dilakukan dengan Teknik difusi agar. Fermentasi dilakukan dengan menggunakan solid state fermentasi dengan media kulit udang. Hasil degradasi kulit udang diamati menggunakan teknik SEM. Sedangkan produk hasil degradasi dianalisis menggunakan metode *High Pressure Liquid Chromatography* (HPLC). Berdasarkan hasil skrining zona bening, *actinomycetes* 18D36A1, 18D36A2, dan 19C38A1 berpotensi menghasilkan kitinase. Hasil analisis filogenetik menunjukkan bahwa isolat 18D36A1 merupakan *actinomycetes* genus *Pseudonocardia* dengan nama *Pseudonocardia antitumoralis* 18D36A1 (LC578481), dan isolat 18D36A2 ini yang mengindikasikan sebagai spesies baru *Micrococcus*, sedangkan isolat 19C38A1 ini dikenal sebagai *Kocuria palustris* dengan nama *Kocuria palustris* 19C38A1 (LC659429). Hasil pengamatan morfologi kulit udang teramati proses degradasi meningkat dari hari ke 1 sampai dengan hari ke 4 disertai dengan peningkatan pertumbuhan *actinomycetes*. Analisis lebih lanjut menggunakan HPLC mengindikasikan hasil degradasi kulit udang membentuk oligomer (*chitooligosaccharide*) dan monomer (*glucosamine*). Selanjutnya hasil uji bioaktifitas hasil degradasi isolat 18D36A1 mengindikasikan

bahwa COS memiliki sifat menghambat pertumbuhan antifungi. Berdasarkan data tersebut dapat disimpulkan bahwa aplikasi teknik SEM sangat membantu dalam penentuan potensi suatu *actinomycetes* dalam mendegradasi kulit udang menjadi produk turunannya berupa monomer (*glucosamine*) dan oligomer (*chitooligosaccharide*). Hasil informasi yang didapat dari penelitian ini tentunya dapat dimanfaatkan sebagai dasar pengembangan kajian *actinomycetes* untuk aplikasi riset *bioengineering* dan teknologi fermentasi dalam skala produksi

Kata kunci: *actinomycetes*, biodegradasi, COS, glukosamin, SEM.

ABSTRACT

MORPHOLOGICAL ANALYSIS OF SHRIMP SHELL WASTE BIODEGRADATION RESULTS BY SOLID FERMENTATION BY ACTINOMYCETES FROM MARINE BIOTA

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Research and development of microscopic analysis techniques, especially in the field of biomaterials, is increasing. This study aims to analyze the surface using Scanning Electron Microscopy (SEM) and other supporting instruments in the process of biodegradation of shrimp shell waste through a solid fermentation process in producing derivative products that can be applied as antifungals. *Actinomycetes* were isolated from marine biota (sponge and tunicate) taken from the waters of Buleleng, Bali and Oluhuta Gorontalo and rejuvenated using colloidal chitin agar media. Identification of *actinomycetes* was carried out based on phylogenetic analysis. Shrimp shell waste was obtained from the Teluk Auction Warehouse, Bandar Lampung. Screening of chitinase-producing *actinomycetes* was carried out using the agar diffusion technique. Fermentation was carried out using solid state fermentation with shrimp shell media. The results of shrimp shell degradation were observed using the SEM technique. Meanwhile, the degradation products were analyzed using the High Pressure Liquid Chromatography (HPLC) method. Based on the clear zone screening results, *actinomycetes* 18D36A1, 18D36A2, and 19C38A1 have the potential to produce chitinase. The results of the phylogenetic analysis showed that isolate 18D36A1 is an *actinomycetes* of the genus *Pseudonocardia* with the name *Pseudonocardia antitumoralis* 18D36A1 (LC578481), and isolate 18D36A2 indicates a new species of *Micrococcus*, while isolate 19C38A1 is known as *Kocuria palustris* with the name *Kocuria palustris* 19C38A1 (LC659429). The results of observations of shrimp shell morphology observed that the degradation process increased from day 1 to day 4 accompanied by an increase in the growth of *actinomycetes*. Further analysis using HPLC indicated that the results of shrimp shell degradation formed monomers (glucosamine) and oligomers (chitooligosaccharide). Furthermore, the results of the bioactivity test results from the degradation of isolate 18D36A1 indicated that COS had antifungal growth inhibiting properties. Based on these data it can be concluded

that the application of SEM techniques is very helpful in determining the potential of an *actinomycetes* in degrading shrimp shells into their derivative products as monomers (glucosamine) and oligomers (chitooligosaccharide). The results of the information obtained from this research can certainly be used as a basis for developing *actinomycetes* studies for bioengineering research applications and fermentation technology on a production scale.

Keywords: *actinomycetes*, biodegradation, COS, glucosamine, SEM.