

Diversity and the Composition of Fatty Acids of Lipolytic Bacteria Isolated from Soil and Aquatic Sediment in a Forest and on an Oil Palm Plantation

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Abstrak

Keragaman dan Komposisi Asam Lemak Bakteri Lipolitik Isolat Asal Tanah dan Sedimen Perairan Wilayah Hutan dan Perkebunan Sawit. Bakteri spesifik dalam hutan dan perkebunan kelapa sawit adalah bakteri lipolitik. Enzim-enzim dari bakteri lipolitik telah diaplikasikan di agro-akuakultur, makanan, deterjen, farmasi, industri susu, dan biodiesel-biokerosin. Penelitian bertujuan memberikan informasi keragaman bakteri lipolitik asal tanah dan sedimen perairan di areal hutan dan perkebunan kelapa sawit, dan komposisi asam lemaknya. Sampel tanah berasal dari tanah lapisan atas hutan dataran rendah dan perkebunan kelapa sawit dan sedimen air tawar di dekat situs tersebut. Hutan tersebut terletak di Taman Nasional Bukit Duabelas dan perkebunan kelapa sawit sekitarnya di Kabupaten Sarolangun, Jambi, Indonesia. Sebanyak 22 isolat terpilih dari tiga puluh dua isolat bakteri lipolitik yang tumbuh pada media selektif lipolitik, terdiri dari 11 isolat dari tanah lapisan atas dan 11 isolat dari sedimen air di hutan dan daerah perkebunan. Isolat-isolat bakteri diidentifikasi berdasarkan analisis gen 16S rRNA. Hasil identifikasi menunjukkan isolat-isolat tersebut terdiri atas lima genera yaitu Burkholderia, Cupriavidus, Serratia, Acinetobacter, dan Kurthia. Pada pohon filogenetik yang dibangun menggunakan metode maximum likelihood isolat-isolat tersebut terdistribusi ke dalam tiga grup, yaitu grup Burkholderia-Cupriavidus, grup Serratia-Acinetobacter, dan grup Kurthia. Hasil analisis kromatografi gas (GC-FID) menunjukkan bahwa enzim lipolitik yang dihasilkan bakteri-bakteri tersebut terdiri atas berbagai asam lemak. Beberapa isolat bakteri menghasilkan asam lemak esensial, seperti asam lemak: linoleat, linolenat, arakidonat, eikosapentanoat (EPA), dan dokosaheksanoat (DHA).

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The specific bacteria in forests and on oil palm plantations are lipolytic bacteria. Their enzymes have been applied in the agro-aquaculture, food, detergent, pharmaceutical, dairy, and biodiesel-biokerosene industries. This study describes the diversity of cultivable lipolytic bacteria from soil and aquatic sediment in a forest and on an oil palm plantation and their fatty acid products. Soil samples used in this research were obtained from topsoil in a lowland forest and on an oil palm plantation and from sediments in fresh water near these sites. The forest is located in Bukit Duabelas National Park, and the oil palm plantation is near the forest in Sarolangun District, Jambi Province, Indonesia. Twenty-two isolates of lipolytic bacteria were selected from 32 isolates grown in lipolytic selective medium. The 22 consisted of 11 isolates from topsoil and 11 from aquatic sediment from the forest and plantation area. These isolates were identified by 16S rRNA-sequence data analysis. Taxonomically, they belonged to five genera: Burkholderia, Cupriavidus, Serratia, Acinetobacter, and Kurthia. The maximum likelihood tree showed that they are phylogenetically distributed in three clusters. They were clustered into three groups: the Burkholderia-Cupriavidus group, the Serratia-Acinetobacter group, and the Kurthia group. Their lipolytic enzymes formed various fatty acids after analysis by gas chromatography-flame ionization detector (GC-FID). Some isolates formed essential fatty acids, such as linoleic, linolenic, arachidonic, eicosapentanoic acid (EPA), and docosahexanoic acid

(DHA).</i>