

**ANALISIS METAGENOMIK KONSORSIUM BAKTERI ASIDOFILIK
DI KAWASAN KAWAH IJEN BANYUWANGI DENGAN
METODE *NEXT GENERATION SEQUENCING***

SKRIPSI



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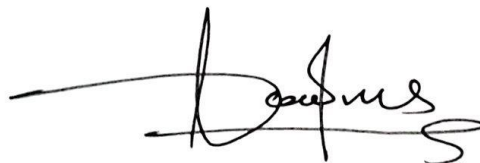
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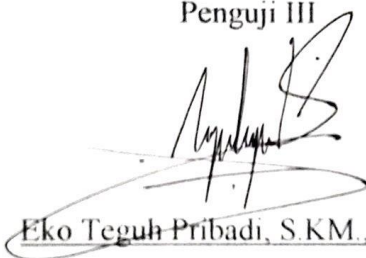
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ABSTRAK

ANALISIS METAGENOMIK KONSORSIUM BAKTERI ASIDOFILIK DI KAWASAN KAWAH IJEN BANYUWANGI DENGAN METODE *NEXT GENERATION SEQUENCING*

Kawah Ijen merupakan danau asam alami terbesar di dunia yang terletak di bagian timur pulau Jawa, Indonesia dengan pH mencapai $< 0,3$. Kondisi kawah yang asam menjadi habitat yang cocok bagi bakteri asidofilik. Bakteri asidofilik merupakan jenis bakteri yang hidup pada habitat dengan pH rendah. Bakteri tersebut berpotensi dalam kemajuan bioteknologi di masa depan. Pengaplikasian bakteri asidofilik diantaranya yakni pemanfaatan enzim *acidstable* pada industri pangan, pembangkit listrik, bioremediasi, serta *bioleaching* pertambangan logam. Tiap spesies bakteri asidofilik memiliki potensi tersendiri dalam pemanfaatan, sehingga perlu dilakukan identifikasi konsorsium bakteri asidofilik agar diketahui berbagai macam jenis spesies beserta tiap potensinya. Penerapan teknik metagenomik pada proses identifikasi taksa bakteri dinilai cepat dan efisien serta mampu mengetahui interaksi komunitas mikroba terhadap kondisi lingkungan secara ekologis. Penerapan teknologi *Next Generation Sequencing* (NGS) pada uji metagenomik menghasilkan *throughput* yang tinggi terhadap perolehan gen 16S konsorsium bakteri asidofilik. Penelitian ini bertujuan untuk mengetahui ragam taksa konsorsium bakteri asidofilik di kawasan Kawah Ijen beserta potensi taksa dominan yang diperoleh pada tiap lokasi penelitian. Penelitian ini tergolong penelitian observasional dengan metode analisis data berupa diversitas alpha, taksonomi, beserta kelimpahan bakteri yang diperoleh pada tiga lokasi sampling, yakni KI1, KI2, BPW. Hasil penelitian memperlihatkan bahwa bakteri genus *Pseudomonas*, *Phyllobacterium*, dan *Ralstonia* memiliki persentase kelimpahan tertinggi pada tiga lokasi penelitian. Data diversitas alpha menunjukkan lokasi KI2 memiliki indeks keanekaragaman terbaik dibanding KI1 dan BPW. Potensi dominan pada penelitian ini berupa pemanfaatan bakteri asidofilik sebagai agen denitrifikasi nitrat, bioremediasi logam, serta pengurangan kontaminasi senyawa hidrokarbon berbahaya seperti halnya *Polinuclear Aromatic Hydrocarbon* (PAHs).

Kata Kunci: Kawah Ijen, Bakteri Asidofilik, NGS, Diversitas Alpha

ABSTRACT

METAGENOMIC ANALYSIS OF ACIDOPHILIC BACTERIAL CONSORTIUM FROM THE IJEN CRATER AREA, BANYUWANGI, USING NEXT GENERATION SEQUENCING METHOD

Ijen Crater is the world's largest natural acid lake located in the eastern part of Java Island, Indonesia, with a pH reaching < 0.3 . Acidic conditions of the crater create a suitable habitat for acidophilic bacteria. Acidophilic bacteria, thriving in low pH environments, hold significant potential for future biotechnological advancements. Applications of acidophilic bacteria include the utilization of acid-stable enzymes in the food industry, power plants, bioremediation, and bioleaching in metal mining. Each species of acidophilic bacteria possesses unique potential applications, emphasizing the need for the identification of acidophilic bacterial consortia to understand various species and their respective potentials. Application of metagenomic techniques in bacterial taxonomic identification is deemed rapid and efficient, capable of revealing microbial community interactions with the environment ecologically. The implementation of Next Generation Sequencing (NGS) technology in metagenomic testing yields high throughput for obtaining 16S gene data from acidophilic bacterial consortia. This research aims to explore the taxonomic diversity of acidophilic bacterial consortia in the Ijen Crater area, along with the potential of dominant taxa obtained at each research location. Classified as observational research, the study utilizes data analysis methods encompassing alpha diversity, taxonomy, and bacterial abundance from three sampling locations: KI1, KI2, and BPW. The research findings indicate that bacteria of the genera *Pseudomonas*, *Phyllobacterium*, and *Ralstonia* have the highest abundance percentages at all three research locations. Alpha diversity data show that location KI2 exhibits the best diversity index compared to KI1 and BPW. The dominant potential identified in this research includes the utilization of acidophilic bacteria as denitrification agents for nitrate, bioremediation of metals, and reduction of hazardous hydrocarbon compound contamination, such as *Polinuclear Aromatic Hydrocarbon* (PAHs).

Keywords: Ijen Crater, Acidophilic Bacteria, NGS, Alpha Diversity

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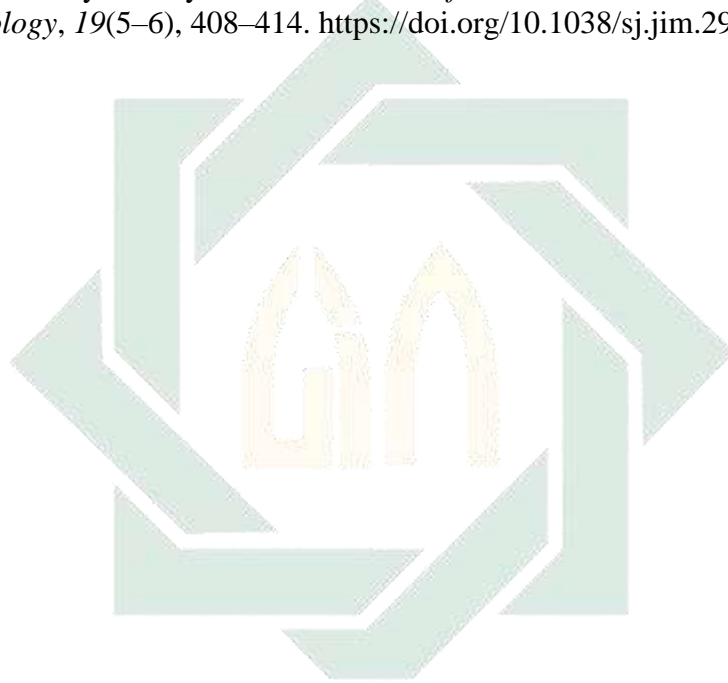
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