

INTISARI

Duckweed merupakan tanaman air yang memiliki kemampuan tinggi dalam menyerap nutrisi seperti nitrogen (N) dan fosfor (P), sehingga banyak dimanfaatkan sebagai agen fitoremediasi untuk mengurangi eutrofikasi di perairan. *Duckweed* diketahui berasosiasi dengan berbagai bakteri endofit yang berpotensi sebagai *Plant Growth-Promoting Bacteria* (PGPB). Penelitian ini bertujuan untuk (1) mengeksplorasi keragaman komunitas bakteri endofit dari *duckweed*, (2) mengetahui keterkaitan keragaman komunitas bakteri endofit dalam *duckweed* dengan kondisi fisikokimia, dan (3) mengidentifikasi bakteri endofit yang berpotensi sebagai PGPB *duckweed*. Penelitian dilakukan dengan mengumpulkan sampel *duckweed* dari delapan lokasi sepanjang Kali Opak yang mewakili gradasi kondisi lingkungan hulu–hilir. Analisis kualitas air meliputi pengukuran suhu, pH, DO, nitrat, amonia, dan fosfat. DNA total endofit diekstraksi dan dianalisis menggunakan teknologi *Shotgun metagenomic sequencing*, *Oxford Nanopore Technology* (ONT). Data dianalisis untuk mengetahui keragaman serta komposisi taksonomi dari tingkat filum hingga spesies. Prediksi fungsi dilakukan menggunakan FAPROTAX. Hasil penelitian menunjukkan bahwa keragaman bakteri endofit meningkat dari hulu ke hilir, sejalan dengan meningkatnya suhu, fosfat, dan amonia. Analisis PCoA dan envfit menegaskan bahwa suhu merupakan faktor lingkungan paling berpengaruh dalam membentuk struktur komunitas mikroba. Komposisi taksonomi memperlihatkan perbedaan signifikan antar lokasi dan antar jenis *duckweed*, dengan munculnya *site-specific microbial signatures*. Berdasarkan komposisi dan pendekatan literatur, empat spesies berhasil diidentifikasi sebagai kandidat utama PGPB, yaitu *Burkholderia pyrrocinia*, *Exiguobacterium indicum*, *Nonomuraea roseola*, dan *Nostoc mirabile*, yang memiliki potensi fungsi seperti fiksasi nitrogen, pelarutan fosfat, produksi hormon tumbuh, dan toleransi stres.

Kata kunci: eutrofikasi, *duckweed*, bakteri endofit, PGPB

ABSTRACT

Duckweed is an aquatic plant with a high ability to absorb nutrients such as nitrogen (N) and phosphorus (P), making it widely used as a phytoremediation agent to reduce eutrophication in water bodies. Duckweed is known to be associated with various endophytic bacteria that have the potential as Plant Growth-Promoting Bacteria (PGPB). This research aims to (1) explore the diversity of endophytic bacterial communities from duckweed, (2) determine the relationship between the diversity of endophytic bacterial communities in duckweed and the physicochemical conditions and (3) identify endophytic bacteria from duckweed that have the potential to be Plant Growth Promoting Bacteria (PGPB). The research was conducted by collecting duckweed samples from eight locations along the Opak River, representing a gradient of upstream-downstream environmental conditions. Water quality analysis includes measuring temperature, pH, dissolved oxygen (DO), nitrates, ammonia, and phosphates. Total endophyte DNA was extracted and analyzed using shotgun metagenomic sequencing, Oxford Nanopore Technology (ONT). Data were analyzed to determine the diversity and taxonomic composition from the phylum to the species level. Function prediction was performed using FAPROTAX. The research results showed that the diversity of endophytic bacteria increased from upstream to downstream, in line with the increase in temperature, phosphate, and ammonia. PCoA and envfit analyzes confirm that temperature is the most influential environmental factor in shaping the structure of microbial communities. Taxonomic composition shows significant differences between locations and among duckweed species, with the emergence of site-specific microbial signatures. Based on the composition and literature approach, four species were successfully identified as the main candidates for PGPR, namely Burkholderia pyrrocinia, Exiguobacterium indicum, Nonomuraea roseola, and Nostoc mirabile, which have potential functions such as nitrogen fixation, phosphate solubilization, growth hormone production, and stress tolerance.

Keyword: eutrophication, duckweed, endophytic bacteria, PGPB