Respons Pertumbuhan Tanaman dan Profil Metabolit Eksudat Akar Planlet Anggrek Phalaenopsis â€˜Mount
Lipâ€™ Pasca Inokulasi Bakteri Endofit Bacillus sp. EA22
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

RESPONS PERTUMBUHAN TANAMAN DAN PROFIL METABOLIT EKSUDAT AKAR PLANLET ANGGREK *Phalaenopsis* 'Mount Lip' Pasca Inokulasi Bakteri Endofit *Bacillus* sp. EA22

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INTISARI

Bakteri endofit berpotensi dimanfaatkan sebagai bakteri pemacu pertumbuhan tanaman, tetapi keberhasilan interaksinya dengan tanaman dipengaruhi oleh kemampuan berasosiasi dengan akar dan respons terhadap eksudat akar. Penelitian ini bertujuan mengevaluasi respons pertumbuhan planlet *Phalaenopsis* 'Mount Lip' terhadap variasi durasi inokulasi bakteri endofit EA22, mengamati indikasi kolonisasi bakteri pada akar, serta mengkarakterisasi senyawa organik eksudat akar. Planlet diinokulasi dengan EA22 melalui perendaman selama 30 menit, 1 jam, dan 2 jam, dengan planlet tanpa inokulasi sebagai kontrol. Pertumbuhan akar dan daun diamati selama 28 hari, asosiasi bakteri dengan akar diamati menggunakan scanning electron microscopy (SEM), dan profil metabolit eksudat akar dianalisis menggunakan LC-HRMS. Perlakuan 1 jam menunjukkan respons pertumbuhan tertinggi, dengan 60% planlet membentuk akar baru dan 40% membentuk daun baru. Pengamatan SEM pada akar planlet yang diinokulasi menunjukkan struktur berbentuk batang yang konsisten dengan morfologi bakteri dan tidak teramati pada area kontrol yang diperiksa. Analisis LC-HRMS menghasilkan 24 metabolit yang dianotasi secara putatif ke dalam beberapa kelompok, termasuk asam organik, turunan asam amino, asam lemak, fenolik, alkaloid, peptida, vitamin, flavonoid, dan nukleosida. EA22 juga menunjukkan kecenderungan pertumbuhan/pergerakan lebih besar ke arah eksudat akar dibandingkan tanpa eksudat. Hasil penelitian menunjukkan adanya asosiasi antara EA22 dan akar *Phalaenopsis* 'Mount Lip' serta potensi EA22 sebagai bakteri pemacu pertumbuhan, meskipun konfirmasi kolonisasi spesifik dan mekanisme interaksinya masih memerlukan pendekatan molekuler.

Kata Kunci: anggrek, PGPB, endofit, kolonisasi, eksudat.

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GROWTH RESPONSES AND ROOT EXUDATE METABOLITE PROFILES OF *Phalaenopsis* 'Mount Lip' PLANTLETS FOLLOWING INOCULATION WITH ENDOPHYTIC *Bacillus* sp. EA22

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ABSTRACT

Endophytic bacteria have the potential to be used as plant growth-promoting bacteria; however, successful plant bacterium interactions depend on their ability to associate with roots and respond to root exudates. This study aimed to evaluate the growth responses of *Phalaenopsis* 'Mount Lip' plantlets to different inoculation durations with endophytic bacterium EA22, observe indications of bacterial colonization on roots, and characterize the organic compounds present in root exudates. Plantlets were inoculated with EA22 by immersion for 30 minutes, 1 hour, and 2 hours, while uninoculated plantlets served as controls. Root and leaf growth were observed over 28 days, bacterial association with roots was examined using scanning electron microscopy (SEM), and root exudate metabolite profiles were analyzed using liquid chromatography–high-resolution mass spectrometry (LC-HRMS). The 1-hour immersion treatment showed the highest growth response, with 60% of plantlets producing new roots and 40% producing new leaves. SEM observations revealed rod-shaped structures consistent with bacterial morphology on the roots of inoculated plantlets, whereas such structures were not observed in the examined control areas. LC-HRMS analysis yielded 24 putatively annotated metabolites belonging to several groups, including organic acids, amino acid derivatives, fatty acids, phenolic compounds, alkaloids, peptides, vitamins, flavonoids, and nucleosides. EA22 also exhibited a greater growth or movement response toward root exudates than in the absence of root exudates. These findings indicate an association between EA22 and *Phalaenopsis* 'Mount Lip' roots and suggest its potential as a plant growth-promoting bacterium. However, specific confirmation of colonization and further investigation of the underlying interaction mechanisms using molecular approaches are still required.

Keywords: orchid, PGPB, endophytic bacteria, colonization, root exudates.