

UJI EFEKTIVITAS ANTI-MDR DAN IDENTIFIKASI SENYAWA METABOLIT SEKUNDER JAMUR ENDOFIT DAUN BELUNTAS (*Pluchea indica* (L.) Less.)

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INTISARI

Resistensi bakteri patogen terus meningkat akibat penyalahgunaan jangka panjang dari golongan obat yang sama. Oleh karena itu, dilakukan berbagai cara untuk mencari antibakteri baru termasuk menggali potensi jamur endofit tanaman obat. Penelitian ini bertujuan untuk mengetahui efektivitas jamur endofit dari daun beluntas (*Pluchea indica* (L.) Less.) sebagai anti-MDR pada *Methicillin-resistant Staphylococcus aureus*, MDR-*Escherichia coli*, MDR-*Klebsiella pneumoniae*, dan MDR-*Citrobacter freundii* dengan pendekatan *in vitro* dan *in silico*. Jamur endofit daun beluntas diisolasi dan diseleksi dengan uji difusi agar. Jamur endofit potensial dikarakterisasi dan diisolasi untuk dilakukan *sequencing*. Jamur tersebut diekstraksi menggunakan etil asetat, lalu dianalisis menggunakan LC-HRMS. Potensi anti-MDR diprediksi menggunakan *PASS Online* dan *Antibac-Pred*. Sebanyak 20 isolat jamur endofit berhasil diisolasi, dengan 11 isolat potensial menghasilkan zona hambat yang bervariasi pada semua bakteri uji. Jamur endofit efektif menghambat bakteri uji dengan kategori daya hambat relatif sedang-kuat yang berkisar antara 6,00-20,50 mm. Namun, efektivitas terhadap MDR-*C. freundii* relatif rendah karena daya hambat lemah atau tidak ada. Potensi anti-MDR terbesar dihasilkan oleh jamur D2.4 yang memiliki wujud mikroskopis dimorfik yaitu berbentuk hifa dan yeast. Sekuens jamur endofit D2.4 memiliki kecocokan yang tinggi dan berkerabat dekat dengan *Aureobasidium melanogenum*. Analisis hasil LC-HRMS menunjukkan bahwa ekstrak jamur D2.4 mengandung 310 senyawa, dengan 15 senyawa yang tergolong potensial. Senyawa yang diprediksi secara *in silico* memiliki aktivitas anti-MDR paling besar pada MRSA dan MDR-*E. coli* adalah *acridine-9(10H)-thione* yang termasuk golongan alkaloid dengan nilai *Antibac-Pred* sebesar 0,3614, sedangkan aktivitas anti-MDR pada MDR-*K. pneumoniae* dan MDR-*C. freundii* cenderung lemah pada sebagian besar senyawa. Oleh karena itu, dapat disimpulkan bahwa jamur endofit daun beluntas efektif untuk dijadikan sebagai anti-MDR pada MRSA, MDR-*E. coli*, dan MDR-*K. pneumoniae*.

KATA KUNCI: anti-MDR, beluntas, jamur endofit, LC-HRMS, uji difusi agar

ANTI-MDR EFFECTIVENESS TEST AND IDENTIFICATION OF SECONDARY METABOLITE COMPOUNDS FROM ENDOPHYTIC FUNGI OF BELUNTAS LEAVES (*Pluchea indica* (L.) Less.)

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ABSTRACT

The resistance of pathogenic bacteria continues to increase as a result of long-term misuse of the same drug classes. Therefore, various efforts have been made to discover new antibacterial agents, including exploring the potential of endophytic fungi from medicinal plants. This study aims to determine the effectiveness of endophytic fungi from beluntas leaves (*Pluchea indica* (L.) Less.) as anti-MDR agents against *Methicillin-resistant Staphylococcus aureus*, MDR-*Escherichia coli*, MDR-*Klebsiella pneumoniae*, and MDR-*Citrobacter freundii*, both *in vitro* and *in silico* approaches. Endophytic fungi from beluntas leaves were isolated and selected using the agar diffusion test. Potential endophytic fungi were characterized and isolated for sequencing. The fungi were extracted using ethyl acetate, then analyzed using LC-HRMS. Anti-MDR potential was predicted using PASS Online and Antibac-Pred. A total of 20 endophytic fungal isolates were obtained, with 11 potential isolates producing varying inhibition zones against all test bacteria. The endophytic fungi effectively inhibited the test bacteria with a moderate to strong relative inhibition category ranges from 6,00-20,50 mm. However, effectiveness against MDR-*C. freundii* was relatively low due to weak or no inhibitory activity. The strongest anti-MDR potential was shown by the D2.4 fungus isolate, which exhibited a dimorphic microscopic form, both hyphal and yeast-like. The sequence of the D2.4 endophytic fungus showed high similarity and was closely related to *Aureobasidium melanogenum*. LC-HRMS analysis revealed that the D2.4 fungal extract contained 310 compounds, with 15 compounds that are classified as potential. Compounds predicted *in silico* to have the highest anti-MDR activity against MRSA and MDR-*E. coli* were acridine-9(10H)-thione, classified as an alkaloid with an Antibacterial-Pred value of 0,3614, while the anti-MDR activity against MDR-*K. pneumoniae* and MDR-*C. freundii* was generally weak for most compounds. Therefore, it can be concluded that endophytic fungi from beluntas leaves are effective as anti-MDR agents against MRSA, MDR-*E. coli*, and MDR-*K. pneumoniae*.

KEYWORDS: agar diffusion test, anti-MDR, beluntas, endophytic fungi, LC-HRMS