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DAFTAR PUSTAKA

Abdallah, E. M., Alhatlani, B. Y., de Paula Menezes, R., & Martins, C. H. G. (2023). Back to Nature: Medicinal Plants as Promising Sources for Antibacterial Drugs in the Post-Antibiotic Era. *Plants*, *12*(17), 3077. https://doi.org/10.3390/PLANTS12173077/S1

Abers, M., Schroeder, S., Goelz, L., Sulser, A., St. Rose, T., Puchalski, K., & Langland, J. (2021). Antimicrobial activity of the volatile substances from essential oils. *BMC Complementary Medicine and Therapies*, *21*(1), 124. https://doi.org/10.1186/S12906-021-03285-3

Abushaheen, M. A., Muzaheed, Fatani, A. J., Alosaimi, M., Mansy, W., George, M., Acharya, S., Rathod, S., Divakar, D. D., Jhugroo, C., Vellappally, S., Khan, A. A., Shaik, J., & Jhugroo, P. (2020). Antimicrobial resistance, mechanisms and its clinical significance. *Disease-a-Month*, *66*(6), 100971. https://doi.org/10.1016/J.DISAMONTH.2020.100971

Ahmad, W., Jantan, I., & Bukhari, S. N. A. (2016). *Tinospora crispa* (L.) Hook. f. & Thomson: A review of its ethnobotanical, phytochemical, and pharmacological aspects. *Frontiers in Pharmacology*, *7*(MAR), 183360. https://doi.org/10.3389/FPHAR.2016.00059/TEXT

Akber, M. A., Cui, Y., Zhang, J., & Fang, X. (2025). Genomics of plant-associated fungi: Research progress and highlights in forage crops. *Plant Science*, *359*, 112624. https://doi.org/10.1016/J.PLANTSCI.2025.112624

Akiva, E., Brown, S., Almonacid, D. E., Barber, A. E., Custer, A. F., Hicks, M. A., Huang, C. C., Lauck, F., Mashiyama, S. T., Meng, E. C., Mischel, D., Morris, J. H., Ojha, S., Schnoes, A. M., Stryke, D., Yunes, J. M., Ferrin, T. E., Holliday, G. L., & Babbitt, P. C. (2014). The Structure–Function Linkage Database. *Nucleic Acids Research*, *42*(D1), D521–D530. https://doi.org/10.1093/NAR/GKT1130

Alhakami, H., Mirebrahim, H., & Lonardi, S. (2017). A comparative evaluation of genome assembly reconciliation tools. *Genome Biology*, *18*(1), 93-. https://doi.org/10.1186/S13059-017-1213-3

Ali, L., Karki, S., Boorgula, G. D., Mekakda, A., Cagle-White, B., Bhattarai, S.,

UNIVERSITAS
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Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Beaudoin, R., Blakeney, A., Singh, S., Srivastava, S., & Abdelaziz, M. H. (2025). A mechanistic understanding of the effect of *Staphylococcus aureus* VraS histidine kinase single point mutation on antibiotic resistance. *BioRxiv*, 2025.01.06.631495. https://doi.org/10.1101/2025.01.06.631495

Amaeze, N. R., Okechukwu, A. C., Bisiriyu, H., Ekweli, O. A., & Umeokoli, B. (2026). Marine endophytic fungi from mangroves: Chemical diversity, biosynthetic pathways, and therapeutic potential. *Scientific African*, *31*, e03123. https://doi.org/10.1016/J.SCIAF.2025.E03123

Andreson, R., Puurand, T., & Remm, M. (2006). SNPmasker: automatic masking of SNPs and repeats across eukaryotic genomes. *Nucleic Acids Research*, *34*(suppl_2), W651–W655. https://doi.org/10.1093/NAR/GKL125

Anggraeni, A. S., Windarsih, A., Warmiko, H. D., Rohman, A., Suratno, Styawan, A. A., & Widarti, A. (2026). Non-targeted metabolomics analysis of *Curcuma rhizomes* species from different origins using LC-orbitrap HRMS combined with chemometrics. *Biochemical Systematics and Ecology*, *124*, 105140. https://doi.org/10.1016/J.BSE.2025.105140

Asgari, B., & Zare, R. (2010). Two new species of *Preussia* from Iran. *Nova Hedwigia*, *90*(3–4), 533–548. https://doi.org/10.1127/0029-5035/2010/0090-0533

Balouiri, M., Sadiki, M., & Ibnsouda, S. K. (2016). Methods for in vitro evaluating antimicrobial activity: A review. *Journal of Pharmaceutical Analysis*, *6*(2), 71–79. https://doi.org/10.1016/J.JPHA.2015.11.005

Barata-Antunes, C., Alves, R., Talaia, G., Casal, M., Gerós, H., Mans, R., & Paiva, S. (2021). Endocytosis of nutrient transporters in fungi: The ART of connecting signaling and trafficking. *Computational and Structural Biotechnology Journal*, *19*, 1713–1737. https://doi.org/10.1016/J.CSBJ.2021.03.013

Bernaola-Galván, P., Carpena, P., Gómez-Martín, C., & Oliver, J. L. (2023). Compositional Structure of the Genome: A Review. *Biology*, *12*(6), 849. https://doi.org/10.3390/BIOLOGY12060849/S1

Bhowmick Melvin Weinstein, T. P., Bhowmick, T., P Weinstein, Á. M., & Weinstein, M. P. (2020). Microbiology of Meropenem-Vaborbactam: A Novel

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Carbapenem Beta-Lactamase Inhibitor Combination for *Carbapenem-Resistant Enterobacterales* Infections. *Infectious Diseases and Therapy*, *9*(4), 757–767. https://doi.org/10.1007/S40121-020-00350-1

Birlutiu, V., & Birlutiu, R. M. (2025). An Overview of the Epidemiology of Multidrug Resistance and Bacterial Resistance Mechanisms: What Solutions Are Available? A Comprehensive Review. *Microorganisms, 13*(9), 2194. https://doi.org/10.3390/MICROORGANISMS13092194

Blin, K., Shaw, S., Steinke, K., Villebro, R., Ziemert, N., Lee, S. Y., Medema, M. H., & Weber, T. (2019). AntiSMASH 5.0: Updates to the secondary metabolite genome mining pipeline. *Nucleic Acids Research*, *47*(W1), W81–W87. https://doi.org/10.1093/nar/gkz310

Böhme, K., Calo-Mata, P., Barros-Velázquez, J., & Ortea, I. (2019). Recent applications of omics-based technologies to main topics in food authentication. *TrAC - Trends in Analytical Chemistry*, *110*, 221–232. https://doi.org/10.1016/j.trac.2018.11.005

Borodušķe, A., Ķibilds, J., Fridmanis, D., Gudrā, D., Ustinova, M., Seņkovs, M., & Nikolajeva, V. (2023). Does peptide-nucleic acid (PNA) clamping of host plant DNA benefit ITS1 amplicon-based characterization of the fungal endophyte community? *Fungal Ecology*, *61*, 101181. https://doi.org/10.1016/J.FUNECO.2022.101181

Brigatti, K. W. (2021). Introduction to concepts of genetics and genomics. *Genomics of Rare Diseases: Understanding Disease Genetics Using Genomic Approaches*, 1–15. https://doi.org/10.1016/B978-0-12-820140-4.00009-0

Chassagne, F., Samarakoon, T., Porras, G., Lyles, J. T., Dettweiler, M., Marquez, L., Salam, A. M., Shabih, S., Farrokhi, D. R., & Quave, C. L. (2021). A Systematic Review of Plants With Antibacterial Activities: A Taxonomic and Phylogenetic Perspective. *Frontiers in Pharmacology*, *11*, 586548. https://doi.org/10.3389/FPHAR.2020.586548/FULL

Chaudhary, A., Das, R., Mehta, K., & Mehta, D. K. (2024). Indian herb *Tinospora cordifolia* and *Tinospora species*: Phytochemical and therapeutic application. *Heliyon*, *10*(10), e31229. https://doi.org/10.1016/J.HELIYON.2024.E31229

Chen, G., Lin, Q., Zeng, L., & Zou, Y. (2020). Mining lycodine-type alkaloid

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

biosynthetic genes and genetic markers from transcriptome of Lycopodiastrum casuarinoides. *Chinese Herbal Medicines*, *12*(2), 133–141. https://doi.org/10.1016/J.CHMED.2020.03.001

Cheng, J. T., Cheng, J. T., Cao, F., Cao, F., Chen, X. A., Chen, X. A., Li, Y. Q., Li, Y. Q., Mao, X. M., & Mao, X. M. (2020). Genomic and transcriptomic survey of an endophytic fungus *Calcarisporium arbuscula* NRRL 3705 and potential overview of its secondary metabolites. *BMC Genomics, 21*(1), 424-. https://doi.org/10.1186/S12864-020-06813-6

Chi, S., She, G., Han, D., Wang, W., Liu, Z., & Liu, B. (2016). Genus Tinospora: Ethnopharmacology, Phytochemistry, and Pharmacology. *Evidence-Based Complementary and Alternative Medicine*, *2016*(1), 9232593. https://doi.org/10.1155/2016/9232593

Cho, M., Choi, E., Lee, S. J., Choi, S., Kim, I., Shin, D., Kim, W., Hur, J. S., Kim, J. H., Rhee, J. S., & Park, H. (2025). Whole-genome sequence of the lichen-forming fungus *Cetrariella delisei* reveals an expanded repertoire of biosynthetic gene clusters. *Genomics*, *117*(6), 111131. https://doi.org/10.1016/J.YGENO.2025.111131

Choque, E., Klopp, C., Valiere, S., Raynal, J., & Mathieu, F. (2018). Whole-genome sequencing of *Aspergillus tubingensis* G131 and overview of its secondary metabolism potential. *BMC Genomics, 19*(1), 200-. https://doi.org/10.1186/S12864-018-4574-4

Christiansen, J. V., Isbrandt, T., Petersen, C., Sondergaard, T. E., Nielsen, M. R., Pedersen, T. B., Sørensen, J. L., Larsen, T. O., & Frisvad, J. C. (2021). Fungal quinones: diversity, producers, and applications of quinones from *Aspergillus, Penicillium, Talaromyces, Fusarium,* and *Arthrinium. Applied Microbiology and Biotechnology, 105*(21), 8157–8193. https://doi.org/10.1007/S00253-021-11597-0

Collemare, J., & Seidl, M. F. (2019). Chromatin-dependent regulation of secondary metabolite biosynthesis in fungi: is the picture complete? *FEMS Microbiology Reviews*, *43*(6), 591–607. https://doi.org/10.1093/FEMSRE/FUZ018

Coté, H., Boucher, M.-A., Pichette, A., & Legault, J. (2017). Anti-Inflammatory, Antioxidant, Antibiotic, and Cytotoxic Activities of *Tanacetum vulgare* L.

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Essential Oil and Its Constituents. *Medicines,* *4*(2), 34. https://doi.org/10.3390/MEDICINES4020034

Das, A., & Ruhal, R. (2025). Potential of plants-based alkaloids, terpenoids and flavonoids as antibacterial agents: An update. *Process Biochemistry*, *150*, 94–120. https://doi.org/10.1016/J.PROCBIO.2025.01.003

Das, S. K., Patra, J. K., & Thatoi, H. (2016). Antioxidative response to abiotic and biotic stresses in mangrove plants: A review. *International Review of Hydrobiology*, *101*(1–2), 3–19. https://doi.org/10.1002/IROH.201401744;CTYPE:STRING:JOURNAL

De Lima Morais, D. A., Fang, H., Rackham, O. J. L., Wilson, D., Pethica, R., Chothia, C., & Gough, J. (2011). SUPERFAMILY 1.75 including a domain-centric gene ontology method. *Nucleic Acids Research*, *39*(suppl_1), D427–D434. https://doi.org/10.1093/NAR/GKQ1130

Déjardin, A., Laurans, F., Arnaud, D., Breton, C., Pilate, G., & Leplé, J. C. (2010). Wood formation in Angiosperms. *Comptes Rendus Biologies*, *333*(4), 325–334. https://doi.org/10.1016/J.CRVI.2010.01.010

Del Sorbo, G., Schoonbeek, H. J., & De Waard, M. A. (2000). Fungal Transporters Involved in Efflux of Natural Toxic Compounds and Fungicides. *Fungal Genetics and Biology*, *30*(1), 1–15. https://doi.org/10.1006/FGBI.2000.1206

Delli Ponti, R., Marti, S., Armaos, A., & Tartaglia, G. G. (2017). A high-throughput approach to profile RNA structure. *Nucleic Acids Research*, *45*(5), e35–e35. https://doi.org/10.1093/NAR/GKW1094

Demeni, P. C. E., Betote, P. H. D., Dadji Foko, G. A., Assam Assam, J. paul, Biabi A Bite, M. F., Tchamgoue, E. N., Efange, N. M., Lenta, B. N., Ayong, L., & Nyegue, M. A. (2025). Morphological and molecular characterization of endophytic fungi isolated *Alstonia boonei* De Wild. *Scientific African*, *27*, e02550. https://doi.org/10.1016/J.SCIAF.2025.E02550

Dzotam, J. K., Simo, I. K., Bitchagno, G., Celik, I., Sandjo, L. P., Tane, P., & Kuete, V. (2018). In vitro antibacterial and antibiotic modifying activity of crude extract, fractions and 3′,4′,7-trihydroxyflavone from *Myristica fragrans* Houtt against MDR Gram-negative enteric bacteria. *BMC Complementary and Alternative Medicine*, *18*(1), 15. https://doi.org/10.1186/S12906-018-2084-1

UNIVERSITAS
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Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Eisvand, P., & Mehrabi-Koushki, M. (2025). *Additional new species of Preussia from forest trees in Iran*. https://doi.org/10.1007/s10482-025-02064-1

Eljounaidi, K., & Lichman, B. R. (2020). Nature's Chemists: The Discovery and Engineering of Phytochemical Biosynthesis. *Frontiers in Chemistry*, *8*, 596479. https://doi.org/10.3389/FCHEM.2020.596479/TEXT

Elsherbiny, E. A., Omar, S. A., & Bennett, J. W. (2025). Application of fungal volatile organic compounds for enhancing plant growth and controlling plant pathogens. *Fungal Biology*, *129*(5), 101606. https://doi.org/10.1016/J.FUNBIO.2025.101606

Enerijiofi, K. E., Akapo, F. H., & Erhabor, J. O. (2021). GC–MS analysis and antibacterial activities of *Moringa oleifera* leaf extracts on selected clinical bacterial isolates. *Bulletin of the National Research Centre, 45*(1), 179-. https://doi.org/10.1186/S42269-021-00640-9

Faller, A. C., Ragupathy, S., Shanmughanandhan, D., Zhang, Y., Lu, Z., Chang, P., Swanson, G., & Newmaster, S. G. (2019). DNA Quality and Quantity Analysis of *Camellia sinensis* Through Processing from Fresh Leaves to a Green Tea Extract. *Journal of AOAC INTERNATIONAL*, *102*(6), 1798–1807. https://doi.org/10.1093/JAOAC/102.6.1798

Fathoni, A., Hudiyono, S., Budianto, E., Cahyana, A. H., Ilyas, M., & Agusta, A. (2022). Evaluation of Antibacterial Activity, Total Phenolic and Flavonoid Contents of Extracts of Endophytic Fungi Associated with *Tinospora crispa* (L.) Hook. f. & Thomson. *International Journal on Advanced Science, Engineering and Information Technology*, *12*(5), 1728–1735. https://doi.org/10.18517/IJASEIT.12.5.14816

Fathoni, A., Hudiyono, S., Cahyana, A. H., Ilyas, M., Purnaningsih, I., & Agusta, A. (2023). Anticandidal and antioxidant potencies of endophytic fungi associated with *Tinospora crispa*. *Biodiversitas Journal of Biological Diversity*, *24*(5), 2547–2555. https://doi.org/10.13057/BIODIV/D240506

Fatima, A., Abbas, M., Nawaz, S., Rehman, Y., Rehman, S. ur, & Sajid, I. (2024). Whole genome sequencing (WGS) and genome mining of *Streptomyces* sp. AFD10 for antibiotics and bioactive secondary metabolites biosynthetic gene clusters (BGCs). *Gene Reports*, *37*, 102050.

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

https://doi.org/10.1016/J.GENREP.2024.102050

Fedoroff, N. V. (2012). Transposable elements, epigenetics, and genome evolution. *Science*, *338*(6108), 758–767. https://doi.org/10.1126/SCIENCE.338.6108.758;REQUESTEDJOURNAL:JOURNAL:SCIENCE;CTYPE:STRING:JOURNAL

Feleciano, D. R., Arnsburg, K., & Kirstein, J. (2016). Interplay between redox and protein homeostasis. *Worm*, *5*(2), e1170273. https://doi.org/10.1080/21624054.2016.1170273

Feng, X.-L., Zhang, R.-Q., Wang, D.-C., Dong, W.-G., Wang, Z.-X., Zhai, Y.-J., Han, W.-B., Yin, X., Tian, J., Wei, J., Gao, J.-M., & Qi, J. (2023). Genomic and Metabolite Profiling Reveal a Novel *Streptomyces* Strain, QHH-9511, from the Qinghai-Tibet Plateau . *Microbiology Spectrum*, *11*(1). https://doi.org/10.1128/SPECTRUM.02764-22;ISSUE:ISSUE:DOI

Fernández, R., Edgecombe, G. D., & Giribet, G. (2018). Phylogenomics illuminates the backbone of the Myriapoda Tree of Life and reconciles morphological and molecular phylogenies. *Scientific Reports*, *8*(1). https://doi.org/10.1038/S41598-017-18562-W

Fouotsa, H., Mbaveng, A. T., Mbazoa, C. D., Nkengfack, A. E., Farzana, S., Iqbal, C. M., Marion Meyer, J. J., Lall, N., & Kuete, V. (2013). Antibacterial constituents of three Cameroonian medicinal plants: *Garcinia nobilis, Oricia suaveolens* and *Balsamocitrus camerunensis. BMC Complementary and Alternative Medicine, 13*(1), 81-. https://doi.org/10.1186/1472-6882-13-81

Fraley, A. E., & Sherman, D. H. (2020). Enzyme evolution in fungal indole alkaloid biosynthesis. *FEBS Journal*, *287*(7), 1381–1402. https://doi.org/10.1111/FEBS.15270;REQUESTEDJOURNAL:JOURNAL:17424658;WGROUP:STRING:PUBLICATION

Gaget, V., Humpage, A. R., Huang, Q., Monis, P., & Brookes, J. D. (2017). Benthic cyanobacteria: A source of cylindrospermopsin and microcystin in Australian drinking water reservoirs. *Water Research*, *124*, 454–464. https://doi.org/10.1016/J.WATRES.2017.07.073

Gao, Y., Xu, Y., Dong, Z., Guo, Y., Luo, J., Wang, F., Yan, L., & Zou, X. (2025). Endophytic Fungal Diversity and Its Interaction Mechanism with Medicinal

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Plants. *Molecules,* *30*(5), 1028. https://doi.org/10.3390/MOLECULES30051028

Gaulton, A., Bellis, L. J., Bento, A. P., Chambers, J., Davies, M., Hersey, A., Light, Y., McGlinchey, S., Michalovich, D., Al-Lazikani, B., & Overington, J. P. (2012). ChEMBL: a large-scale bioactivity database for drug discovery. *Nucleic Acids Research*, *40*(D1), D1100–D1107. https://doi.org/10.1093/NAR/GKR777

Ghaffari, F., Ebadi, M., & Mollaei, S. (2023). Isolation and molecular identification of endophytic fungi associated with *Ziziphora tenuior* L. and their biological potential. *South African Journal of Botany*, *161*, 358–364. https://doi.org/10.1016/J.SAJB.2023.08.024

Ghosh, S., Nandi, S., & Basu, T. (2022). Nano-Antibacterials Using Medicinal Plant Components: An Overview. *Frontiers in Microbiology*, *12*, 768739. https://doi.org/10.3389/FMICB.2021.768739/FULL

Gontijo, J. B., Valverde Firmino, G., Mandro, J. A., Miranda Reis, A. L., Bieluczyk, W., Feitosa Fernandes, J. C., Barbosa de Camargo, P., Mazza Rodrigues, J. L., Mui Tsai, S., & Vidal-Torrado, P. (2025). An effective DNA extraction protocol optimized for tropical swamp peat samples. *Microbiology Spectrum*, *14*(1). https://doi.org/10.1128/SPECTRUM.01373-25

Gonzalez-Menendez, V., Martin, J., Siles, J. A., Gonzalez-Tejero, M. R., Reyes, F., Platas, G., Tormo, J. R., & Genilloud, O. (2017). Biodiversity and chemotaxonomy of *Preussia* isolates from the Iberian Peninsula. *Mycological Progress, 16*(7), 713–728. https://doi.org/10.1007/S11557-017-1305-1

Guevara-Araya, M. J., Vilo, C., Urzuá, A., & González-Teuber, M. (2020). Differences in community composition of endophytic fungi between above- and below-ground tissues of *Aristolochia chilensis* in an arid ecosystem. *Revista Chilena de Historia Natural,* *93*(1), 3-. https://doi.org/10.1186/S40693-020-00091-Y

GUO, L. F., LIU, G. R., & LIU, L. (2020). Caryophyllene-type sesquiterpenoids and α-furanones from the plant endophytic fungus *Pestalotiopsis theae*. *Chinese Journal of Natural Medicines*, *18*(4), 261–267. https://doi.org/10.1016/S1875-5364(20)30032-7

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GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Gurevich, A., Saveliev, V., Vyahhi, N., & Tesler, G. (2013). QUAST: quality assessment tool for genome assemblies. *Bioinformatics*, *29*(8), 1072–1075. https://doi.org/10.1093/BIOINFORMATICS/BTT086

Haft, D. H., Selengut, J. D., Richter, R. A., Harkins, D., Basu, M. K., & Beck, E. (2013). TIGRFAMs and Genome Properties in 2013. *Nucleic Acids Research*, *41*(D1), D387–D395. https://doi.org/10.1093/NAR/GKS1234

Hakim, S. S., Budi, S. W., & Turjaman, M. (2015). Phosphate Solubilizing and Antifungal Activity of Root Endophyte Isolated from *Shorea leprosula* Miq. and *Shoreal selanica* (DC) Blume. *Jurnal Manajemen Hutan Tropika*, *21*(3), 138–147. https://doi.org/10.7226/JTFM.21.3.138

Handayani, I., Saad, H., Ratnakomala, S., Lisdiyanti, P., Kusharyoto, W., Krause, J., Kulik, A., Wohlleben, W., Aziz, S., Gross, H., Gavriilidou, A., Ziemert, N., & Mast, Y. (2021). *Mining Indonesian Microbial Biodiversity for Novel Natural Compounds by a Combined Genome Mining and Molecular Networking Approach*. https://doi.org/10.20944/PREPRINTS202105.0308.V1

Hardoim, P. R., van Overbeek, L. S., Berg, G., Pirttilä, A. M., Compant, S., Campisano, A., Döring, M., & Sessitsch, A. (2015). The Hidden World within Plants: Ecological and Evolutionary Considerations for Defining Functioning of Microbial Endophytes. *Microbiology and Molecular Biology Reviews : MMBR*, *79*(3), 293. https://doi.org/10.1128/MMBR.00050-14

Harwood, T. V., Treen, D. G. C., Wang, M., de Jong, W., Northen, T. R., & Bowen, B. P. (2023). BLINK enables ultrafast tandem mass spectrometry cosine similarity scoring. *Scientific Reports*, *13*(1), 13462-. https://doi.org/10.1038/s41598-023-40496-9

Hasan, A. M., Uno, W. D., & Baruwadi, S. (2020). The potential of isolates endophytic fungi from the leaves of henna plant (*Lawsonia inermis*) toward the growth of *Candida albicans* and *Staphylococcus aureus*. *IOP Conference Series: Earth and Environmental Science*, *589*(1), 012037. https://doi.org/10.1088/1755-1315/589/1/012037

Hasanah, U., Rohaeti, E., Batubara, I., Syafitri, U. D., Heryanto, R., Ridwan, T., Yuliana, N. D., & Rafi, M. (2026). LC-HRMS- and TLC-based metabolomics

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

for the identification and authentication of *Sida rhombifolia. Journal of Chromatography B*, *1268*, 124834. https://doi.org/10.1016/J.JCHROMB.2025.124834

Hashem, A. H., Attia, M. S., Kandil, E. K., Fawzi, M. M., Abdelrahman, A. S., Khader, M. S., Khodaira, M. A., Emam, A. E., Goma, M. A., & Abdelaziz, A. M. (2023). Correction to: Bioactive compounds and biomedical applications of endophytic fungi: a recent review. *Microbial Cell Factories*, 22, 1, (107). https://doi.org/10.1186/s12934-023-02131-0

Haque, E., Bari, M. S., Khandokar, L., Anjum, J., Jantan, I., Seidel, V., & Haque, M. A. (2023). An updated and comprehensive review on the ethnomedicinal uses, phytochemistry, pharmacological activity and toxicological profile of *Tinospora crispa* (L.) Hook. f. & Thomson. *Phytochemistry Reviews,* 22, 211–273.

He, T., Li, H., & Zhang, X. (2017). Deep-Sea Hydrothermal Vent Viruses Compensate for Microbial Metabolism in Virus-Host Interactions. *MBio*, *8*(4), **8**(4), e00893-17. https://doi.org/10.1128/MBIO.00893-17

He, T., Li, X., Flores-Vallejo, R. del C., Radu, A. M., van Dijl, J. M., & Haslinger, K. (2025). The endophytic fungus *Cosmosporella* sp. VM-42 from Vinca minor is a source of bioactive compounds with potent activity against drug-resistant bacteria. *Current Research in Microbial Sciences*, *8*, 100390. https://doi.org/10.1016/J.CRMICR.2025.100390

Himika Devi, S., Saikia, N., Amargeeth, S., Belljoy Donshiew, E., Author, C., & Himika Devi, D. (2025). Phytochemical Analysis Of Medicinal Plants With Antibacterial Properties. *EPH-International Journal of Biological & Pharmaceutical Science*, *11*(1), 18–23. https://doi.org/10.53555/EIJBPS.V11I1.60

Hıdayat, A., Susılowati, A., Rachmat, H. H., Yulıta, K. S., Rahayu, L. M., & Faulına, S. A. (2026). Exploring endophytic fungal diversity in *Dipterocarpus species* (Dipterocarpaceae) from Indonesian forests. *Heliyon*, *12*(6), e44785. https://doi.org/10.1016/J.HELIYON.2026.E44785

Hong, E. L., Sloan, C. A., Chan, E. T., Davidson, J. M., Malladi, V. S., Strattan, J. S., Hitz, B. C., Gabdank, I., Narayanan, A. K., Ho, M., Lee, B. T., Rowe, L.

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

D., Dreszer, T. R., Roe, G. R., Podduturi, N. R., Tanaka, F., Hilton, J. A., & Cherry, J. M. (2016). Principles of metadata organization at the ENCODE data coordination center. *Database*, *2016*. https://doi.org/10.1093/DATABASE/BAW001

Hoult, J. R. S., & Payá, M. (1996). Pharmacological and biochemical actions of simple coumarins: Natural products with therapeutic potential. *General Pharmacology: The Vascular System*, *27*(4), 713–722. https://doi.org/10.1016/0306-3623(95)02112-4

Hsiang, T., & Baillie, D. L. (2010). Recent progress, developments, and issues in comparative fungal genomics. *Canadian Journal of Plant Pathology*, *26*(1), 19–30. https://doi.org/10.1080/07060660409507108

Hung, R., Lee, S., & Bennett, J. W. (2015). Fungal volatile organic compounds and their role in ecosystems. *Applied Microbiology and Biotechnology*, *99*(8), 3395–3405. https://doi.org/10.1007/S00253-015-6494-4/METRICS

Ibrahim, A., Tanney, J. B., Fei, F., Seifert, K. A., Cutler, G. C., Capretta, A., Miller, J. D., & Sumarah, M. W. (2020). Metabolomic-guided discovery of cyclic nonribosomal peptides from *Xylaria ellisii* sp. nov., a leaf and stem endophyte of Vaccinium angustifolium. *Scientific Reports, 10*(1), 4599-. https://doi.org/10.1038/s41598-020-61088-x

James, D., Mathew, S. K., St, A. B., & Ct, R. A. (2015). *Research Article Antagonistic Activity of Endophytic Microorganisms Against Bacterial Wilt Disease of Tomato*. *4*, 399–404.

Jensen, K., Panagiotou, G., & Kouskoumvekaki, I. (2015). NutriChem: a systems chemical biology resource to explore the medicinal value of plant-based foods. *Nucleic Acids Research*, *43*(D1), D940–D945. https://doi.org/10.1093/NAR/GKU724

Jensen, P. R. (2016). Natural Products and the Gene Cluster Revolution. *Trends in Microbiology*, *24*(12), 968–977. https://doi.org/10.1016/j.tim.2016.07.006

Jeon, S. M. (2016). Regulation and function of AMPK in physiology and diseases. *Experimental and Molecular Medicine*, *48*(7), e245–e245. https://doi.org/10.1038/EMM.2016.81;TECHMETA

Jha, P., Kaur, T., Chhabra, I., Panja, A., Paul, S., Kumar, V., & Malik, T. (2023).

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Endophytic fungi: hidden treasure chest of antimicrobial metabolites interrelationship of endophytes and metabolites. *Frontiers in Microbiology*, *14*, 1227830. https://doi.org/10.3389/FMICB.2023.1227830/FULL

Jiang, Y., Wu, J., Kawagishi, H., Jiang, C., Zhou, Q., Tong, Z., Tong, Y., & Wang, P. (2022). Study on Secondary Metabolites of Endophytic Fungus, *Aspergillus fumigatus,* from *Crocus sativus* L. Guided byUHPLC-HRMS/MS-Based Molecular Network. *International Journal of Analytical Chemistry*, *2022*(1), 7067665. https://doi.org/10.1155/2022/7067665

Jigjiddorj, E. A., Maidarjav, A., Byambasuren, B., & Nyamgerel, D. (2024). Identification, Antimicrobial and Plant Growth Promoting Activities of Endophytic Fungi Associated with Cynomorium songaricum Rupr., a Traditional Medicinal Plant in Mongolia. *Diversity*, *16*(2), 122. https://doi.org/10.3390/D16020122/S1

Jin, H., Yang, X., Lu, D., Li, C., Yan, Z., Li, X., Zeng, L., & Qin, B. (2015). Phylogenic diversity and tissue specificity of fungal endophytes associated with the pharmaceutical plant, *Stellera chamaejasme* L. revealed by a cultivation-independent approach. *Antonie van Leeuwenhoek, 108*(4), 835–850. https://doi.org/10.1007/S10482-015-0538-8

Jones, P., Binns, D., Chang, H. Y., Fraser, M., Li, W., McAnulla, C., McWilliam, H., Maslen, J., Mitchell, A., Nuka, G., Pesseat, S., Quinn, A. F., Sangrador-Vegas, A., Scheremetjew, M., Yong, S. Y., Lopez, R., & Hunter, S. (2014). InterProScan 5: Genome-scale protein function classification. *Bioinformatics*, *30*(9), 1236–1240. https://doi.org/10.1093/bioinformatics/btu031

Ju, Y., Wang, X., Guan, T., Peng, D., & Li, H. (2016). Versatile glycoside hydrolase family 18 chitinases for fungi ingestion and reproduction in the pinewood nematode *Bursaphelenchus xylophilus*. *International Journal for Parasitology*, *46*(12), 819–828. https://doi.org/10.1016/J.IJPARA.2016.08.001/REFERENCES

Kalyani, P., Botsa, S. M., Divya Laxmi, K. V., & Anil, S. (2023). Optimization of cultural conditions for biomass and antibacterial metabolite production by *Aspergillus fumigatus* strain MF1. *Hybrid Advances*, *2*, 100016. https://doi.org/10.1016/J.HYBADV.2022.100016

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Kamunkar, A. K., & Nischitha, R. (2025). Exploring endophytic fungi from Cynodon dactylon: GC–MS profiling and biological activity. *Fungal Genetics and Biology*, *176*, 103959. https://doi.org/10.1016/J.FGB.2024.103959

Karlsson, M., Stenlid, J., & Lindahl, B. (2016). Functional differentiation of chitinases in the white-rot fungus *Phanerochaete chrysosporium*. *Fungal Ecology*, *22*, 52–60. https://doi.org/10.1016/J.FUNECO.2016.04.004

Keller, N. P., Turner, G., & Bennett, J. W. (2005). Fungal secondary metabolism — from biochemistry to genomics. *Nature Reviews Microbiology, 3*(12), 937–947. https://doi.org/10.1038/nrmicro1286

Khan, A. L., Asaf, S., Khan, A. R., Al-Harrasi, A., Al-Rawahi, A., & Lee, I. J. (2016). First draft genome sequencing of indole acetic acid producing and plant growth promoting fungus Preussia sp. BSL10. *Journal of Biotechnology*, *225*, 44–45. https://doi.org/10.1016/J.JBIOTEC.2016.03.025

Kjærbølling, I., Vesth, T., & Andersen, M. R. (2019). Resistance Gene-Directed Genome Mining of 50 *Aspergillus Species*. S*ystems*, *4*(4). https://doi.org/10.1128/MSYSTEMS.00085-19;WGROUP:STRING:PUBLICATION

Klein, R. D., & Hultgren, S. J. (2020). Urinary tract infections: microbial pathogenesis, host–pathogen interactions and new treatment strategies. *Nature Reviews Microbiology, 18*(4), 211–226. https://doi.org/10.1038/s41579-020-0324-0

Kumar, V., & Prasher, I. B. (2022). Antimicrobial potential of endophytic fungi isolated from Dillenia indica L. and identification of bioactive molecules produced by *Fomitopsis meliae* (Undrew.) Murril. *Natural Product Research*, *36*(23), 6064–6068. https://doi.org/10.1080/14786419.2022.2043855

Kusmiati, K., Fanani, A., Nurkanto, A., Purnaningsih, I., Mamangkey, J., Ramadhani, I., Nurcahyanto, D. A., Simanjuntak, P., Afiati, F., Irawan, H., Puteri, A. L., Ewaldo, M. F., & Juanssilfero, A. B. (2024). Profile and in silico analysis of metabolite compounds of the endophytic fungus *Alternaria alternata* K-10 from *Drymoglossum piloselloides* as antioxidants and antibacterials. *Heliyon*, *10*(6), e27978. https://doi.org/10.1016/J.HELIYON.2024.E27978

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Kute, P. M., Soukarieh, O., Tjeldnes, H., Trégouët, D. A., & Valen, E. (2022). Small Open Reading Frames, How to Find Them and Determine Their Function. *Frontiers in Genetics*, *12*, 796060. https://doi.org/10.3389/FGENE.2021.796060/FULL

Lagarde, A., Jargeat, P., Roy, M., Girardot, M., Imbert, C., Millot, M., & Mambu, L. (2018). Fungal communities associated with *Evernia prunastri, Ramalina fastigiata* and *Pleurosticta acetabulum*: Three epiphytic lichens potentially active against Candida biofilms. *Microbiological Research*, *211*, 1–12. https://doi.org/10.1016/J.MICRES.2018.03.006

Leal, A. L. A. B., Bezerra, C. F., Confortin, C., da Silva, L. E., Marinho, E. M., Marinho, M. M., Vasconcelos, M. A., da Silva, T. G., Marinho, E. S., Teixeira, A. M. R., Coutinho, H. D. M., Barreto, H. M., & dos Santos, H. S. (2021). Chemical composition and potentiating action of Norfloxacin mediated by the essential oil of *Piper caldense* C.D.C. against *Staphylococcus aureus* strains overexpressing efflux pump genes. *Archives of Microbiology*, *203*(7), 4727–4736. https://doi.org/10.1007/S00203-021-02393-5

Lee, J. Y., Kong, M., Oh, J., Lim, J. S., Chung, S. H., Kim, J. M., Kim, J. S., Kim, K. H., Yoo, J. C., & Kwak, W. (2021). Comparative evaluation of Nanopore polishing tools for microbial genome assembly and polishing strategies for downstream analysis. *Scientific Reports*, *11*(1), 20740-. https://doi.org/10.1038/s41598-021-00178-w

Letunic, I., Doerks, T., & Bork, P. (2012). SMART 7: recent updates to the protein domain annotation resource. *Nucleic Acids Research*, *40*(D1), D302–D305. https://doi.org/10.1093/NAR/GKR931

Li, C.-X., Liu, L., Zhang, T., Luo, X.-M., Feng, J.-X., & Zhao, S. (2022). Three-Dimensional Genome Map of the Filamentous Fungus *Penicillium oxalicum*. *Microbiology Spectrum*, *10*(3), e02121-21. https://doi.org/10.1128/SPECTRUM.02121-21

Li, J., Ma, X., Guo, S., Hou, C., Shi, L., Zhang, H., Zheng, B., Liao, C., Yang, L., Ye, L., He Li, X. J., Ma, X., Guo, S., Shi, L., Zhang, H., Yang, L., He, X., Hou, C., Liao, C., … Ye, L. (2020). A Hydrophobic-Interaction-Based Mechanism Triggers Docking between the SARS-CoV-2 Spike and

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Angiotensin-Converting Enzyme 2. *Global Challenges*, *4*(12), 2000067. https://doi.org/10.1002/GCH2.202000067

Li, S., Zhang, M., Zhai, Y., Zhao, Y., Zhao, M., Liu, L., Zhong, F., Wang, Z., & Li, S. (2026). Evaluation of the antibacterial and antioxidant potential of the endophytic fungus EFY14 from *Cannabis sativa* L. leaves through metabolomics and molecular docking. *Natural Product Research*, 1–9. https://doi.org/10.1080/14786419.2025.2609961

Lin, Q., Xu, Z., Li, M., Wang, Y., & Li, L. (2022). Spatial differences in *Casuarina equisetifolia* L. endophyte community structure. *Annals of Microbiology 2022 72:1*, *72*(1), 28-. https://doi.org/10.1186/S13213-022-01685-5

Liu, M., Jiang, Q., Wang, B., Li, X., Pei, Y., Tan, H., Li, Y., Guo, X., Tu, J., Li, J., Shi, X., & Xia, X. (2026). Bioactive metabolites from the endophytic fungus *Epicoccum sorghinum* QA-20 isolated from *Artemisia argyi* with antibacterial activity against aquaculture pathogens and antioxidant potential. *Industrial Crops and Products*, *241*, 122751. https://doi.org/10.1016/j.indcrop.2026.122751

Loman, N. J., Quick, J., & Simpson, J. T. (2015). A complete bacterial genome assembled de novo using only nanopore sequencing data. *Nature Methods*, *12*(8), 733–735. https://doi.org/10.1038/nmeth.3444

Lu, H., Wei, T., Lou, H., Shu, X., & Chen, Q. (2021). A Critical Review on Communication Mechanism within Plant-Endophytic Fungi Interactions to Cope with Biotic and Abiotic Stresses. *Journal of Fungi 2021, Vol. 7, Page 719*, *7*(9), 719. https://doi.org/10.3390/JOF7090719

Lu, J., & Salzberg, S. L. (2020). SkewIT: The Skew Index Test for large-scale GC Skew analysis of bacterial genomes. *PLoS Computational Biology*, *16*(12), e1008439. https://doi.org/10.1371/JOURNAL.PCBI.1008439

Lu, Y. Y., Noble, W. S., & Keich, U. (2024). A BLAST from the past: revisiting blastp's E-value. *Bioinformatics*, *40*(12). https://doi.org/10.1093/BIOINFORMATICS/BTAE729

Manni, M., Berkeley, M. R., Seppey, M., Simão, F. A., & Zdobnov, E. M. (2021). BUSCO Update: Novel and Streamlined Workflows along with Broader and Deeper Phylogenetic Coverage for Scoring of Eukaryotic, Prokaryotic, and

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Viral Genomes. *Molecular Biology and Evolution*, *38*(10), 4647–4654. https://doi.org/10.1093/MOLBEV/MSAB199

Mapperson, R. R., Kotiw, M., Davis, R. A., & Dearnaley, J. D. W. (2013). The Diversity and Antimicrobial Activity of *Preussia* sp. Endophytes Isolated from Australian Dry Rainforests. *Current Microbiology*, *68*(1), 30–37. https://doi.org/10.1007/S00284-013-0415-5

Martínez-Soto, D., & Ruiz-Herrera, J. (2017). Functional analysis of the MAPK pathways in fungi. *Revista Iberoamericana de Micología*, *34*(4), 192–202. https://doi.org/10.1016/J.RIAM.2017.02.006

Martins, F., Pereira, J. A., Bota, P., Bento, A., & Baptista, P. (2016). Fungal endophyte communities in above- and belowground olive tree organs and the effect of season and geographic location on their structures. *Fungal Ecology*, *20*, 193–201. https://doi.org/10.1016/J.FUNECO.2016.01.005

Massimo, N. C., Nandi Devan, M. M., Arendt, K. R., Wilch, M. H., Riddle, J. M., Furr, S. H., Steen, C., U'Ren, J. M., Sandberg, D. C., & Arnold, A. E. (2015). Fungal Endophytes in Aboveground Tissues of Desert Plants: Infrequent in Culture, but Highly Diverse and Distinctive Symbionts. *Microbial Ecology*, *70*(1), 61–76. https://doi.org/10.1007/S00248-014-0563-6

Maumus, F., & Quesneville, H. (2016). Impact and insights from ancient repetitive elements in plant genomes. *Current Opinion in Plant Biology*, *30*, 41–46. https://doi.org/10.1016/J.PBI.2016.01.003

McLellan, L. K., & Hunstad, D. A. (2016). Urinary Tract Infection: Pathogenesis and Outlook. *Trends in Molecular Medicine*, *22*(11), 946–957. https://doi.org/10.1016/j.molmed.2016.09.003

Mi, H., Muruganujan, A., & Thomas, P. D. (2013). PANTHER in 2013: modeling the evolution of gene function, and other gene attributes, in the context of phylogenetic trees. *Nucleic Acids Research*, *41*(D1), D377–D386. https://doi.org/10.1093/NAR/GKS1118

Mishra, S., Srivastava, A., Singh, A., Pandey, G. C., & Srivastava, G. (2024). An overview of symbiotic and pathogenic interactions at the fungi-plant interface under environmental constraints. *Frontiers in Fungal Biology*, *5*, 1363460. https://doi.org/10.3389/FFUNB.2024.1363460/FULL

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
Zahrotin Saleha, Wahyu Aristyaning Putri, S.Si., M.Sc., Ph.D ; Prof. Rina Sri Kasiamdari, S.Si, Ph.D.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Mollaei, S., Khanehbarndaz, O., Gerami-Khashal, Z., & Ebadi, M. (2019). Molecular identification and phytochemical screening of endophytic fungi isolated from *Lithospermum officinale* L. roots: A new source of shikonin. *Phytochemistry*, *168*, 112116. https://doi.org/10.1016/J.PHYTOCHEM.2019.112116

Nagarajan, K., Ibrahim, B., Bawadikji, A. A., Lim, J. W., Tong, W. Y., Leong, C. R., Khaw, K. Y., & Tan, W. N. (2021). Recent Developments in Metabolomics Studies of Endophytic Fungi. *Journal of Fungi*, *8*(1), 28. https://doi.org/10.3390/JOF8010028

Nazir, A., Puthuveettil, A. R., Hussain, F. H. N., Hamed, K. E., & Munawar, N. (2024). Endophytic fungi: nature's solution for antimicrobial resistance and sustainable agriculture. *Frontiers in Microbiology*, *15*, 1461504. https://doi.org/10.3389/FMICB.2024.1461504/TEXT

Noh, H. J., Cho, H. U., & Kim, S. H. (2025). *Preussia jejuensis* sp. nov., P. *koreensis* sp. nov., and *P. isomera,* Coprophilous Fungi Isolated from Horse Dung in Seopjikoji, Jeju Island in the Republic of Korea. *Mycobiology*, *53*(2), 200–213. https://doi.org/10.1080/12298093.2025.2455214

Oide, S., & Turgeon, B. G. (2020). Natural roles of nonribosomal peptide metabolites in fungi. *Mycoscience*, *61*(3), 101–110. https://doi.org/10.1016/J.MYC.2020.03.001

Otzen Bagger, F., Borgwardt, L., Sand Jespersen, A., Reimer Hansen, A., Bertelsen, B., Kodama, M., & Cilius Nielsen, F. (2024). REVIEW Open Access Whole genome sequencing in clinical practice. *BMC Medical Genomics*, *17*, 39. https://doi.org/10.1186/s12920-024-01795-w

Ouchari, L., Boukeskasse, A., Bouizgarne, B., & Ouhdouch, Y. (2019). Antimicrobial potential of actinomycetes isolated from the unexplored hot Merzouga desert and their taxonomic diversity. *Biology Open*, *8*(2). https://doi.org/10.1242/BIO.035410/2134

Parks, V. R., & Torres, D. A. (2023). Yield Gel via Quantitative Gel Electrophoresis. *Methods in Molecular Biology*, *2685*, 129–147. https://doi.org/10.1007/978-1-0716-3295-6_9/SAVE-RESEARCH

Pearson, W. R. (2013). An introduction to sequence similarity ("homology")

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

searching. *Current Protocols in Bioinformatics*, *42*(SUPPL.42), 3.1.1-3.1.8. https://doi.org/10.1002/0471250953.BI0301S42;JOURNAL:JOURNAL:1934340X;WGROUP:STRING:PUBLICATION

Pedruzzi, I., Rivoire, C., Auchincloss, A. H., Coudert, E., Keller, G., De Castro, E., Baratin, D., Cuche, B. A., Bougueleret, L., Poux, S., Redaschi, N., Xenarios, I., & Bridge, A. (2013). HAMAP in 2013, new developments in the protein family classification and annotation system. *Nucleic Acids Research*, *41*(D1), D584–D589. https://doi.org/10.1093/NAR/GKS1157

Perez de Souza, L., Alseekh, S., Scossa, F., & Fernie, A. R. (2021). Ultra-high-performance liquid chromatography high-resolution mass spectrometry variants for metabolomics research. *Nature Methods, 18*(7), 733–746. https://doi.org/10.1038/s41592-021-01116-4

Petersen, C., Sørensen, T., Westphal, K. R., Fechete, L. I., Sondergaard, T. E., Sørensen, J. L., & Nielsen, K. L. (2022a). High molecular weight DNA extraction methods lead to high quality filamentous ascomycete fungal genome assemblies using Oxford Nanopore sequencing. *Microbial Genomics*, *8*(4), 000816. https://doi.org/10.1099/MGEN.0.000816/CITE/REFWORKS

Petersen, C., Sørensen, T., Westphal, K. R., Fechete, L. I., Sondergaard, T. E., Sørensen, J. L., & Nielsen, K. L. (2022b). *High molecular weight DNA extraction methods lead to high quality filamentous ascomycete fungal genome assemblies using Oxford Nanopore sequencing*. https://doi.org/10.1099/mgen.0.000816

Petrini, O., Hake, U., & Dreyfuss, M. M. (1990). An Analysis of Fungal Communities Isolated from Fruticose Lichens. *Mycologia*, *82*(4), 444–451. https://doi.org/10.1080/00275514.1990.12025907

Pezzatti, J., Boccard, J., Codesido, S., Gagnebin, Y., Joshi, A., Picard, D., González-Ruiz, V., & Rudaz, S. (2020). Implementation of liquid chromatography–high resolution mass spectrometry methods for untargeted metabolomic analyses of biological samples: A tutorial. *Analytica Chimica Acta*, *1105*, 28–44. https://doi.org/10.1016/j.aca.2019.12.062

Prastiyanto, M. E. (2021). *View of Seeds extract of three Artocarpus species: Their in-vitro antibacterial activities against multidrug-resistant (MDR)*

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Escherichia coli isolates from urinary tract infections (UTIs). *Biodiversitas Journal of Biological Diversity*, 22(10), 4356–4362. https://doi.org/10.13057/biodiv/d221028

Prastiyanto, M. E., Iswara, A., Khairunnisa, A., Sofyantoro, F., Siregar, A. R., Mafiroh, W. U., Setiawan, J., Nadifah, F., Wibowo, A. T., & Putri, W. A. (2024). Prevalence and antimicrobial resistance profiles of multidrug-resistant bacterial isolates from urinary tract infections in Indonesian patients: A cross-sectional study. *Clinical Infection in Practice*, *22*, 100359. https://doi.org/10.1016/J.CLINPR.2024.100359

Prismantoro, D., Chua, K. O., Teo, K. W. E., Chan, R., Jefferson, T. A., Suhaimi, N. S. M., Mispan, M. S., Miranti, M., & Doni, F. (2025). Whole genome sequence data of *Trichoderma yunnanense* strain TM10, a plant growth-promoting fungus and biocontrol agent. *Data in Brief*, *58*, 111283. https://doi.org/10.1016/J.DIB.2025.111283

Prostak, S. M., Velle, K. B., & Fritz-Laylin, L. K. (2025). Frog-killing chytrid fungus deploys different strategies to regulate intracellular pressure in developmental states that have or lack a cell wall. *Current Biology*, *35*(22), 5572-5581.e6. https://doi.org/10.1016/J.CUB.2025.10.013

Punta, M., Coggill, P. C., Eberhardt, R. Y., Mistry, J., Tate, J., Boursnell, C., Pang, N., Forslund, K., Ceric, G., Clements, J., Heger, A., Holm, L., Sonnhammer, E. L. L., Eddy, S. R., Bateman, A., & Finn, R. D. (2012). The Pfam protein families database. *Nucleic Acids Research*, *40*(D1), D290–D301. https://doi.org/10.1093/NAR/GKR1065

Putri, A. F., Utomo, D. H., Tunjung, W. A. S., & Putri, W. A. (2024). Analysis of the anti-Alzheimer potential of bioactive compounds from *Citrus hystrix* DC. peel, leaf, and essential oil by network pharmacology. *Heliyon*, *10*(13), e33496. https://doi.org/10.1016/j.heliyon.2024.e33496

Putu Ariantari, N., Putu Yogi Astara Putra, I., Prasanthi Swarna Putri, W., Agung Padma Suari, A., Widyani Astuti, K., & Pharmawati, M. (2026). *Draft genome sequence of endophytic fungus Fusarium proliferatum ZO-L2-4 isolated from Ginger and analysis of its secondary metabolite biosynthetic potential*. *16*(04), 275–287. https://doi.org/10.7324/JAPS.2026.234783

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Rafi, M., Karomah, A. H., Septaningsih, D. A., Trivadila, Rahminiwati, M., Prama Putri, S., & Iswantini, D. (2022). LC-MS/MS based metabolite profiling and lipase enzyme inhibitory activity of *Kaempferia angustifolia* Rosc. with different extracting solvents. *Arabian Journal of Chemistry*, *15*(11), 104232. https://doi.org/10.1016/j.arabjc.2022.104232

Razali, N. M., Cheah, B. H., & Nadarajah, K. (2019). Transposable Elements Adaptive Role in Genome Plasticity, Pathogenicity and Evolution in Fungal Phytopathogens. *International Journal of Molecular Sciences 2019, Vol. 20, Page 3597*, *20*(14), 3597. https://doi.org/10.3390/IJMS20143597

Richard Beaulieu, S., Ribéreau-Gayon, A., Devèze, T., Forbes, S. L., & Germain, H. (2025). Molecular identification of fungi associated with advanced decomposition at a human taphonomy facility in Canada. *Forensic Science International*, *370*, 112451. https://doi.org/10.1016/J.FORSCIINT.2025.112451

Rokas, A., Mead, M. E., Steenwyk, J. L., Raja, H. A., & Oberlies, N. H. (2020). Biosynthetic gene clusters and the evolution of fungal chemodiversity. *Natural Product Reports*, *37*(7), 868–878. https://doi.org/10.1039/C9NP00045

Rowaiye, A., Ibeanu, G. C., Bur, D., Nnadi, S., Morikwe, U., Ogugua, A. J., & Chukwudi, C. U. (2025). Phyto-molecules show potentials to combat drug-resistance in bacterial cell membranes. *Microbial Pathogenesis*, *205*, 107723. https://doi.org/10.1016/J.MICPATH.2025.107723

Roy, K., & Bandyopadhyay, A. (2026). Draft genome dataset of Xylaria sp. KR-3U isolated from leaves of the medicinal plant *Catharanthus roseus. Data in Brief*, *65*, 112543. https://doi.org/10.1016/J.DIB.2026.112543

Saini, P., Gangwar, M., Kalia, A., Singh, N., & Narang, D. (2016). Isolation of endophytic actinomycetes from *Syzygium cumini* and their antimicrobial activity against human pathogens. *Journal of Applied and Natural Science*, *8*(1), 416–422. https://doi.org/10.31018/JANS.V8I1.809

Sánchez-Vallet, A., Tian, H., Rodriguez-Moreno, L., Valkenburg, D. J., Saleem-Batcha, R., Wawra, S., Kombrink, A., Verhage, L., de Jonge, R., van Esse, H. P., Zuccaro, A., Croll, D., Mesters, J. R., & Thomma, B. P. H. J. (2020). A secreted LysM effector protects fungal hyphae through chitin-dependent

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

homodimer polymerization. *PLoS Pathogens*, *16*(6 June). https://doi.org/10.1371/JOURNAL.PPAT.1008652

Santana, J. E. G., Oliveira-Tintino, C. D. de M., Alencar, G. G., Siqueira, G. M., Almeida-Bezerra, J. W., Viana Rodrigues, J. P., Pinheiro Gonçalves, V. B., Nicolete, R., Tintino, S. R., Coutinho, H. D. M., & Silva, T. G. da. (2024). Liposomal nanoformulations with trans-caryophyllene and caryophyllene oxide: do they have an inhibitory action on the efflux pumps NorA, Tet(K), MsrA, and MepA? *Chemico-Biological Interactions*, *393*, 110945. https://doi.org/10.1016/J.CBI.2024.110945

Saxena, S., Dufossé, L., Deshmukh, S. K., Chhipa, H., & Gupta, M. K. (2024). Endophytic Fungi: A Treasure Trove of Antifungal Metabolites. *Microorganisms*, *12*(9), 1903. https://doi.org/10.3390/MICROORGANISMS12091903

Sethi, M., Prasher, I. B., Kapila, S., Kumar, V., Sabharwal, H., Secrain, S., Pannu, A., Dogra, N., Sharma, S., & Tsewang, T. (2025). Exploring the diversity of endophytic fungi in liverwort *Plagiochasma appendiculatum* Lehm. & Lindenb. and investigating them for their extracellular enzymatic activities and antibacterial properties. *South African Journal of Botany*, *185*, 399–411. https://doi.org/10.1016/J.SAJB.2025.07.017

Shalaby, M. A. W., Dokla, E. M. E., Serya, R. A. T., & Abouzid, K. A. M. (2020). Penicillin binding protein 2a: An overview and a medicinal chemistry perspective. *European Journal of Medicinal Chemistry*, *199*, 112312. https://doi.org/10.1016/J.EJMECH.2020.112312

Shanmugam, Y., chokkalingam, D., Gopinath, G. raj, Moses, A. christopher, Thanikachalam, P. V., MS, P., & Bharathy, P. (2025). Plant-based phytochemicals as antibiotic alternatives for gangrene: a Sustainable approach to infection management. *Sustainable Chemistry for Climate Action*, *6*, 100089. https://doi.org/10.1016/J.SCCA.2025.100089

Sharif, S., & Yadav, A. K. (2025). Bacterial biofilm and its role in antibiotic resistance. *The Microbe*, *7*, 100356. https://doi.org/10.1016/J.MICROB.2025.100356

Sharma, R., Amin, H., Galib, & Prajapati, P. K. (2015). Antidiabetic claims of

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Tinospora cordifolia (Willd.) Miers: Critical appraisal and role in therapy. *Asian Pacific Journal of Tropical Biomedicine*, *5*(1), 68–78. https://doi.org/10.1016/S2221-1691(15)30173-8

Shelest, E. (2017). Transcription factors in fungi: TFome dynamics, three major families, and dual-specificity TFs. *Frontiers in Genetics*, *8*(MAY), 257259. https://doi.org/10.3389/FGENE.2017.00053/TEXT

Shin, J., Kim, J. E., Lee, Y. W., & Son, H. (2018). Fungal Cytochrome P450s and the P450 Complement (CYPome) of *Fusarium graminearum*. *Toxins, 10*(3), 112. https://doi.org/10.3390/TOXINS10030112

Shurigin, V., Alaylar, B., Davranov, K., Wirth, S., Bellingrath-Kimura, S. D., Egamberdieva, D., Shurigin, V., Alaylar, B., Davranov, K., Wirth, S., Bellingrath-Kimura, S. D., & Egamberdieva, D. (2021). Diversity and biological activity of culturable endophytic bacteria associated with marigold (*Calendula officinalis* L.). *AIMS Microbiology, 7*(3), 336–353. https://doi.org/10.3934/MICROBIOL.2021021

Sibero, M. T., Sahara, R., Syafiqoh, N., & Tarman, K. (2017). Antibacterial Activity Of Red Pigment Isolated From Coastal Endophytic Fungi Against Multi-Drug Resistant Bacteria. *BIOTROPIA*, *24*(2), 161–172. https://doi.org/10.11598/BTB.2017.24.2.725

Sigrist, C. J. A., De Castro, E., Cerutti, L., Cuche, B. A., Hulo, N., Bridge, A., Bougueleret, L., & Xenarios, I. (2013). New and continuing developments at PROSITE. *Nucleic Acids Research*, *41*(D1), D344–D347. https://doi.org/10.1093/NAR/GKS1067

Simão, F. A., Waterhouse, R. M., Ioannidis, P., Kriventseva, E. V., & Zdobnov, E. M. (2015). BUSCO: assessing genome assembly and annotation completeness with single-copy orthologs. *Bioinformatics*, *31*(19), 3210–3212. https://doi.org/10.1093/BIOINFORMATICS/BTV351

Singh, B., Nathawat, S., Sharma, R. A., Singh, B., Nathawat, S., & Sharma, R. A. (2020). Ethnopharmacological and phytochemical attributes of Indian *Tinospora species*: A comprehensive review. *Arabian Journal of Chemistry*, *14*(10), 103381. https://doi.org/10.1016/J.ARABJC.2021.103381

Singh, R., Chandel, S., Rav, S., Anmol, Aggarwal, G., Singh, D., & Sharma, U.

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GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

(2026). A hyphenated approach of chemical profiling, anti-bacterial assays, and molecular docking to validate the traditionally claimed anti-bacterial (Krimiroga) potential of Cyperus rotundus L. *Microbial Pathogenesis*, *211*, 108220. https://doi.org/10.1016/J.MICPATH.2025.108220

Sofi, F. A. (2026). Coumarin as a privileged natural product scaffold towards the development of antibacterial agents targeting ESKAPE pathogens. *European Journal of Medicinal Chemistry*, *309*, 118735. https://doi.org/10.1016/J.EJMECH.2026.118735

Strobel, G. (2018). The Emergence of Endophytic Microbes and Their Biological Promise. *Journal of Fungi*, *4*(2), 57. https://doi.org/10.3390/JOF4020057

Strobel, G. A., Dirkse, E., Sears, J., & Markworth, C. (2001). Volatile antimicrobials from *Muscodor albus*, a novel endophytic fungus. *Microbiology*, *147*(11), 2943–2950. https://doi.org/10.1099/00221287-147-11-2943/CITE/REFWORKS

Sui, H. Y., Weil, A. A., Nuwagira, E., Qadri, F., Ryan, E. T., Mezzari, M. P., Phipatanakul, W., & Lai, P. S. (2020). Impact of DNA Extraction Method on Variation in Human and Built Environment Microbial Community and Functional Profiles Assessed by Shotgun Metagenomics Sequencing. *Frontiers in Microbiology*, *11*, 536420. https://doi.org/10.3389/FMICB.2020.00953/TEXT

Swandiny, G. F., Priyanto, J. A., Dzumalex, A. R., Filaila, E., Prastya, M. E., Lotulung, P. D. N., Megawati, Darmawan, A., Okselni, T., Indarto, & Primahana, G. (2025). Antibacterial and antibiofilm potential of cytosporone D-an octaketide produced by endophytic fungi *Diaporthe* sp. associated with the medicinal plant kratom (*Mitragyna speciosa* Korth.). *Biocatalysis and Agricultural Biotechnology*, *70*, 103884. https://doi.org/10.1016/J.BCAB.2025.103884

Swetha, T. K., Subramenium, G. A., Kasthuri, T., Sharumathi, R., & Pandian, S. K. (2021). 5-hydroxymethyl-2-furaldehyde impairs *Candida albicans* - *Staphylococcus epidermidis* interaction in co-culture by suppressing crucial supportive virulence traits. *Microbial Pathogenesis*, *158*, 104990. https://doi.org/10.1016/J.MICPATH.2021.104990

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Takashima, T., Sunagawa, R., Uechi, K., & Taira, T. (2020). Antifungal activities of LysM-domain multimers and their fusion chitinases. *International Journal of Biological Macromolecules*, *154*, 1295–1302. https://doi.org/10.1016/J.IJBIOMAC.2019.11.005

Tamura, K., & Nei, M. (1993). Estimation of the number of nucleotide substitutions in the control region of mitochondrial DNA in humans and chimpanzees. *Molecular Biology and Evolution*, *10*(3), 512–526. https://doi.org/10.1093/OXFORDJOURNALS.MOLBEV.A040023

Tamura, K., Stecher, G., & Kumar, S. (2021). MEGA11: Molecular Evolutionary Genetics Analysis Version 11. *Molecular Biology and Evolution*, *38*(7), 3022–3027. https://doi.org/10.1093/molbev/msab120

Tan, A., Abecasis, G. R., & Kang, H. M. (2015). Unified representation of genetic variants. *Bioinformatics*, *31*(13), 2202–2204. https://doi.org/10.1093/BIOINFORMATICS/BTV112

Tang, K. W. K., Millar, B. C., & Moore, J. E. (2023). Antimicrobial Resistance (AMR). *British Journal of Biomedical Science*, *80*, 11387. https://doi.org/10.3389/BJBS.2023.11387

Tianqiao, S., Xiong, Z., You, Z., Dong, L., Jiaoling, Y., Junjie, Y., Mina, Y., Huijuan, C., Mingli, Y., Xiayan, P., Zhongqiang, Q., Yan, D., Rongsheng, Z., & Yongfeng, L. (2021). Genome-Wide Identification of Zn2Cys6 Class Fungal-Specific Transcription Factors (ZnFTFs) and Functional Analysis of UvZnFTF1 in *Ustilaginoidea virens*. *Rice Science*, *28*(6), 567–578. https://doi.org/10.1016/J.RSCI.2021.03.001

Toure, S., Millot, M., Ory, L., Roullier, C., Khaldi, Z., Pichon, V., Girardot, M., Imbert, C., & Mambu, L. (2022). Access to Anti-Biofilm Compounds from Endolichenic Fungi Using a Bioguided Networking Screening. *Journal of Fungi*, *8*(10), 1012. https://doi.org/10.3390/JOF8101012/S1

Truong, V. L., Bae, Y. J., Rarison, R. H. G., Bang, J. H., Park, S. Y., & Jeong, W. S. (2023). Anti-Inflammatory and Antioxidant Activities of Lipophilic Fraction from Liriope platyphylla Seeds Using Network Pharmacology, Molecular Docking, and In Vitro Experiments. *International Journal of Molecular Sciences*, *24*(19), 14958.

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

https://doi.org/10.3390/IJMS241914958/S1

Tsai, M. H., Lin, L. C., Hsu, J. F., Lai, M. Y., Huang, H. R., Chiang, M. C., & Lu, J. J. (2019). Rapid identification of invasive fungal species using sensitive universal primers-based PCR and restriction endonuclease digestions coupled with high-resolution melting analysis. *Journal of Microbiology, Immunology and Infection*, *52*(5), 728–735. https://doi.org/10.1016/J.JMII.2019.06.001

Tuerdibieke, M., Tian, X., An, X., Feng, Y., & Liu, W. (2024). Isolation and identification of endophytic fungi from *Alhagi sparsifolia* Shap. and their antibacterial activity. *Heliyon*, *10*(19), e39003. https://doi.org/10.1016/J.HELIYON.2024.E39003

Tuncay, F. O. (2025). Comprehensive LC-HRMS and ATR-FTIR characterization of bioactive metabolites from *Crataegus persimilis* "prunifolia" fruit: Antidiabetic, neuroprotective, and antioxidant potentials supported by multivariate analysis. *Biocatalysis and Agricultural Biotechnology*, *69*, 103813. https://doi.org/10.1016/J.BCAB.2025.103813

Ullah, H., Di Minno, A., Santarcangelo, C., Khan, H., & Daglia, M. (2021). Improvement of Oxidative Stress and Mitochondrial Dysfunction by β-Caryophyllene: A Focus on the Nervous System. *Antioxidants 2021, Vol. 10, Page 546*, *10*(4), 546. https://doi.org/10.3390/ANTIOX10040546

Usyk, M., Zolnik, C. P., Patel, H., Levi, M. H., & Burk, R. D. (2017). Novel ITS1 Fungal Primers for Characterization of the Mycobiome. *MSphere*, *2*(6), e00488-17. https://doi.org/10.1128/MSPHERE.00488-17

Uzma, F., Chowdappa, S., Roy, A., Adhoni, S. A., Ali, D., Sasaki, K., & Jogaiah, S. (2023). GC-MS-Guided Antimicrobial Defense Responsive Secondary Metabolites from the Endophytic *Fusarium solani* Isolated from *Tinospora cordifolia* and Their Multifaceted Biological Properties. *Applied Biochemistry and Biotechnology*, *196*(6), 3010–3033. https://doi.org/10.1007/S12010-023-04669-6

Vaidyanathan, R., Murugan Sreedevi, S., Ravichandran, K., Vinod, S. M., Hari Krishnan, Y., Babu, L. K., Parthiban, P. S., Basker, L., Perumal, T., Rajaraman, V., Arumugam, G., Rajendran, K., & Mahalingam, V. (2023). Molecular docking approach on the binding stability of derivatives of phenolic

UNIVERSITAS
GADJAH MADA
Potensi Antibakteri Fungi Endofit Brotowali (Tinospora crispa (L.) Hook.f. & Thomson.) terhadap Bakteri Multidrug-Resistant (MDR) melalui Integrasi Analisis Metabolomik dan Genomik
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acids (DPAs) with Human Serum Albumin (HSA): Hydrogen-bonding versus hydrophobic interactions or combined influences? *JCIS Open*, *12*, 100096. https://doi.org/10.1016/J.JCISO.2023.100096

Valdivieso-Ugarte, M., Gomez-Llorente, C., Plaza-Díaz, J., & Gil, Á. (2019). Antimicrobial, Antioxidant, and Immunomodulatory Properties of Essential Oils: A Systematic Review. *Nutrients*, *11*(11), 2786. https://doi.org/10.3390/NU11112786

Vanmathi Vidhyashini, S., Sharmila, R., Hussain, S., Trajkovska Petkoska, A., & Jeelani, P. G. (2026). Comparative bioactive compound profiling of endophytic fungi and their respective host plants for sustainable drug discovery. *Medicine in Microecology*, *28*, 100172. https://doi.org/10.1016/J.MEDMIC.2026.100172

Varela, M. F., Stephen, J., Lekshmi, M., Ojha, M., Wenzel, N., Sanford, L. M., Hernandez, A. J., Parvathi, A., & Kumar, S. H. (2021). Bacterial Resistance to Antimicrobial Agents. *Antibiotics, 10*(5), 593. https://doi.org/10.3390/ANTIBIOTICS10050593

Vasundhara, M., Kumar, A., & Reddy, M. S. (2016). Molecular approaches to screen bioactive compounds from endophytic fungi. In *Frontiers in Microbiology* (Vol. 7, Issue NOV). https://doi.org/10.3389/fmicb.2016.01774

Víglaš, J., & Olejníková, P. (2021). An update on ABC transporters of filamentous fungi – from physiological substrates to xenobiotics. *Microbiological Research*, *246*, 126684. https://doi.org/10.1016/J.MICRES.2020.126684

Vinale, F., Sivasithamparam, K., Zeilinger, S., & Gutiérrez, S. (2021). Fungal Secondary Metabolism. *Encyclopedia of Mycology, 1 (2*), 54–63. https://doi.org/10.1016/B978-0-12-819990-9.00031-7

Vingadassalon, N., Hennekinne, J. A., Nia, Y., Maurischat, S., Borowiak, M., Byrne, B., Dygico, L. K., Ciupescu, L., Guedes, H., Almeida, G., Rola, J., Bomba, A., Kibilds, J., Kubicova, Z., Mackiw, E., Kowalska, J., Romanó, A., Rojo, L. V., Romano, A., … Cavaiuolo, M. (2026). Impact of wet- and dry-lab workflows on genome assembly, typing and enterotoxin gene detection in whole-genome sequencing of foodborne *Staphylococcus aureus*. *International Journal of Food Microbiology*, *455*, 111761.

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GADJAH MADA
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https://doi.org/10.1016/J.IJFOODMICRO.2026.111761

Watanabe, T. (2010). Pictorial Atlas of Soil and Seed Fungi. In *Pictorial Atlas of Soil and Seed Fungi*. https://doi.org/10.1201/ebk1439804193

Wong, F., Krishnan, A., Zheng, E. J., Stärk, H., Manson, A. L., Earl, A. M., Jaakkola, T., & Collins, J. J. (2022). Benchmarking AlphaFold-enabled molecular docking predictions for antibiotic discovery. *Molecular Systems Biology*, *18*(9), e11081, . https://doi.org/10.15252/MSB.202211081

Wu, Z., Liu, D., Proksch, P., Guo, P., & Lin, W. (2014). Punctaporonins H–M: Caryophyllene-Type Sesquiterpenoids from the Sponge-Associated Fungus *Hansfordia sinuosae. Marine Drugs*, *12*(7), 3904–3916. https://doi.org/10.3390/MD12073904

Xu, K., Li, X. Q., Zhao, D. L., & Zhang, P. (2021). Antifungal Secondary Metabolites Produced by the Fungal Endophytes: Chemical Diversity and Potential Use in the Development of Biopesticides. *Frontiers in Microbiology*, *12*, 689527. https://doi.org/10.3389/FMICB.2021.689527/TEXT

Yan, Z., Jin, H., Yang, X., Xu, X., Hua, C., Dai, L., Huang, X., & Qin, B. (2025). Composition and diversity of microbial endophytes in roots, stems, and leaves of *Angelica sinensis* in three main planting areas. *South African Journal of Botany*, *180*, 305–314. https://doi.org/10.1016/J.SAJB.2025.03.024

Yang, D., Michel, L., Chaumont, J. P., & Millet-Clerc, J. (1999). Use of caryophyllene oxide as an antifungal agent in an in vitro experimental model of onychomycosis. *Mycopathologia*, *148*(2), 79–82. https://doi.org/10.1023/A:1007178924408

Zaferanloo, B., Bhattacharjee, S., Ghorbani, M. M., Mahon, P. J., & Palombo, E. A. (2014). Amylase production by *Preussia minima*, a fungus of endophytic origin: optimization of fermentation conditions and analysis of fungal secretome by LC-MS. *BMC Microbiology, 14*(1), 55-. https://doi.org/10.1186/1471-2180-14-55

Zardi-Bergaoui, A., Znati, M., Harzallah-Skhiri, F., & Jannet, H. Ben. (2019). Caryophyllene Sesquiterpenes from *Pulicaria vulgaris* Gaertn.: Isolation, Structure Determination, Bioactivity and Structure−Activity Relationship. *Chemistry & Biodiversity*, *16*(2), e1800483.

UNIVERSITAS
GADJAH MADA
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https://doi.org/10.1002/CBDV.201800483

Zhang, F., Cao, H., Si, H., Zang, J., Dong, J., Xing, J., & Zhang, K. (2024). FGCD: a database of fungal gene clusters related to secondary metabolism. *Database*, *2024*. https://doi.org/10.1093/DATABASE/BAAE011

Zhang, Q. W., Lin, L. G., & Ye, W. C. (2018). Techniques for extraction and isolation of natural products: a comprehensive review. *Chinese Medicine, 13*(1), 20. https://doi.org/10.1186/S13020-018-0177-X

Zhao, C., Feng, X. L., Wang, Z. X., & Qi, J. (2023). The First Whole Genome Sequencing of *Agaricus bitorquis* and Its Metabolite Profiling. *Journal of Fungi*, *9*(4), 485. https://doi.org/10.3390/JOF9040485/S1

Zuhri, U. M., Yuliana, N. D., Fadilah, F., Erlina, L., Purwaningsih, E. H., & Khatib, A. (2024). Exploration of the main active metabolites from *Tinospora crispa* (L.) Hook. f. & Thomson stem as insulin sensitizer in L6.C11 skeletal muscle cell by integrating in vitro, metabolomics, and molecular docking. *Journal of Ethnopharmacology*, *319*, 117296. https://doi.org/10.1016/J.JEP.2023.117296

Zwama, M., & Yamaguchi, A. (2018). Molecular mechanisms of AcrB-mediated multidrug export. *Research in Microbiology*, *169*(7–8), 372–383. https://doi.org/10.1016/J.RESMIC.2018.05.005