

DAFTAR PUSTAKA

- Abdelgawad, H., Saleh, A., Jaoni, S., Selim, S., Hasan, M., Wadaan, M., Shuikan, A., Mohamed, H. & Hozzein, W. 2019. Utilization of actinobacteria to enhance the production and quality of date palm (*Phoenix dactylifera* L.) fruits in a semi-arid environment. *Science of the Total Environment* 665:690–697
- Abdoulaye, S., Diedhiou, A., Thuita, M., Hafisi, M., Ouhdouch, Y., Gopalakrishnan, S. & Kousini, L. 2020. Exploiting Biological Nitrogen Fixation: A Route Towards a Sustainable Agriculture. *Plants*. 9.1011.
- Adzitey, F., Hudam N. & Ali, G. 2013. Molecular techniques for detecting and typing of bacteria, advantages and application to foodborne pathogens isolated from ducks. *3 Biotech*. 3:97-107
- Ahmad, S.J.; Abdul Rahim, M.B.H.; Baharum, S.N.; Baba, M.S. and Zin, N.M. 2017. Discovery of Antimalarial Drugs from Streptomyces Metabolites Using a Metabolomic Approach. *Journal of tropical medicine*. 2017: 2189814.
- Alef, R. M., Nannipieri & Trazar, C. 1995. *Phosphatase activity*. p. 335-344. In K. Alef & P. Nannipieri (Eds.) *Methods in Applied Soil Microbiology and Biochemistry*. Academic Press. Harcourt Brace & Co. Pub. London.
- Amos, G., Borsetto, C., Laskaris, P., Krsek, M., Berry, A., Newsham, K., Bado, L., Pearce, D., Vallin, C. & Wellington, E. 2015. Designing and Implementing an Assay for the Detection of Rare and Divergent NRPS and PKS Clones in European, Antarctic and Cuban Soils. *PLoS ONE* 10(9): e0138327.
- Armbrrecht, M. 2013. Detection of Contamination in DNA and Protein Samples by Photometric Measurements. *Appl Note*. 279:1-6
- Astuti, L., Muslichah, D., Suprihadi, A., Rukmi, I., Mulyani. N. & Sutisna, E. 2021. Karakterisasi bakteri diazotrof dan pengaruhnya terhadap pertumbuhan tanaman kedelai (*Glycine max* L. Merrill) *NICHE J Trop Bio*. 4(1):40-49
- Atikana, A., Ratnakomala, S., Nurzilah, I., Sari, M., Agnestania, A., Aisy, I., Untari, Fahrurrozi, Bintang, Sukmarini, L., Putra, L. & Lisdiyanti, P. 2021. Uncovering the potential of actinobacterium BLH 1-22 isolated from marine sediment as a producer of antibiotics. *IOP Conf. Series: Earth and Environmental Science* 948 (2021):012056
- Badan Penelitian dan Pengembangan Pertanian. 2015. *Sumber Daya Lahan Pertanian Indonesia Luas, Penyebaran, dan Potensi Ketersediaan*. IAARD Press. Jakarta. P 9-10
- Baig, K., Zahir, S. Arshad, M. & Cheema, M. 2010. Comparative efficacy of qualitative and quantitative methods for rock phosphate solubilization with phosphate solubilizing rhizobacteria. *Journal Soil and Environment*. 29(1):82-86
- Barea, M., Pozo, J., Azcón, R. & Azcón, C. 2005. Microbial Cooperation in The Rhizosphere. *J. Exp. Bot*. 56:1761–1778.
- Becerril, A., Alvarez, S., Brana, A., Rico, S., Diaz, M., Santamaria, R., Salas, J. & Mendez, C. 2018. Uncovering production of specialized metabolites by

- Streptomyces argillaceus*: Activation of cryptic biosynthesis gene clusters using nutritional and genetic approaches. *PLoS ONE* 13(5): e0198145.
- Belin, B., Busset, N., Giraud, E., Molinaro, A., Silipo, S. & Newman, D. 2018. Hopanoid lipids: from membranes to plant–bacteria interactions. *Nat Rev Microbiol.* 2018 May ; 16(5): 304–315
- Berlin/Heidelberg, Germany, 2005; Volume 3, p. 422. 160
- Bhardwaj, D., Ansari, M.W., Sahoo, R.K. *et al.* 2014. Biofertilizers function as key player in sustainable agriculture by improving soil fertility, plant tolerance and crop productivity. *Microb Cell Fact* **13**, 66.
- Borah, A., Hazarika, S. N., and Thakur, D. 2022. Potentiality of actinobacteriato combat against biotic and abiotic stresses in tea [*Camellia sinensis* (L) o. *kuntze*]. *J. Appl. Microbiol* 133 (4), 2314-2330.
- Boukhatem ZF, Merabet C and Tsaki H. 2022. Plant Growth Promoting Actinobacteria, the Most Promising Candidates as Bioinoculants? *Front. Agron.* 4:849911
- Buscot, F.; Varma, A. *Microorganisms in Soils: Roles in Genesis and Functions*; Springer Science Business Media:
- Carlier A, Fehr L, Pinto-Carbó M, Schäberle T, Reher R, Dessein S, König G, Eberl L. 2016. The genome analysis of Candidatus Burkholderia crenata reveals that secondary metabolism may be a key function of the Ardisia crenata leaf nodule symbiosis. *Environ Microbiol.* 18(8):2507-22.
- Carro, L., Nouioui, I., Sangal, V., Meier-Kolthoff, J.P., Trujillo, M.E., Montero-Calasanz, M. *et al.*, 2018. Genome-based classification of micromonosporae with a focus on their biotechnological and ecological potential. *Sci. Rep.* 8: 525
- Caulier S, Nannan C, Gillis A, Licciardi F, Bragard C, Mahillon J (2019) Overview of the antimicrobial compounds produced by members of the Bacillus subtilis group. *Front. Microbiol* 10:302.
- Chen F, Ma J, Yuan Q, Yu Z. 2023. Phosphate solubilizing microorganisms as a driving force to assist mine phytoremediation. *Front Bioeng Biotechnol.* 11:1201067
- Chen, X., Zhao, Y., Huang, S., Penuelas, J., Sardans, J., Wang, L & Zheng, B. 2024. Genome-based identification of phosphatesolubilizing capacities of soil bacterial isolates. *AMB Express.* 14:85
- Coelho, M., Marriel, I., Jenkins, S., Lanyon, C., Seldin, L. & Donnell, A. 2009. Molecular Detection and Quantification of *nifH* gene sequences in the rhizosphere of Sorghum (*Sorghum bicolor*) Sown with Two Levels of Nitrogen Fertilizer. *Applied Soil Ecology.* 4(42):48-53.
- Dahal B, NandaKafle G, Perkins L, Brözel VS. Diversity of free-Living nitrogen fixing Streptomyces in soils of the badlands of South Dakota. *Microbiol Res.* (2017) 195:31–9. doi: 10.1016/j.micres.2016.11.004
- Devi, R. & Thakur, R. 2018. Screening and identification of bacteria for plant
- Dhanasekaran D, Jiang Y. 2016. *Actinobacteria-Basis and Biotechnological Application*. London: IntechOpen p. 249–70.
- El Samak, M., Solyman, S.M., Hanora, A. 2018. Antimicrobial activity of bacteria isolated from Red Sea marine invertebrates. *Biotechnology Reports.* 19:75-84

- Elden, T. C. 2000. Effects of proteinase inhibitors and plant lectins on the adult alfalfa weevil (Coleoptera: Cuculionidae). *J. Entomol. Sci.* 35:62–69.
- Elias, F., Woyessa, D., Muleta, D. 2015. Phosphate Solubilization Potential of Rhizosphere Fungi Isolated from Plants in Jimma Zone, Southwest Ethiopia. *International Journal of Microbiology.* 2016
- FAO and ITPS. 2015. *Status of the World's Soil Resources (SWSR) – Main Report.* Food and Agriculture Organization of the United Nations and Intergovernmental Technical Panel on Soils, Rome, Italy
- Farrag, A., Mohamed, A., Elaasser, M. & Elbadry, M. 2022. A new trial for bioformation of antimicrobial agent controlling multi drug resistant microorganism. *Az. J. Pharm Sci.* 62:71-97
- Fay, P. Oxygen Relations of Nitrogen Fixation in Cyanobacteria. *Microbiol. Rev.* 1992, 56, 340–373.
- Franco-Correa, M., Quintana, A., Duque, C., Suarez, C., Rodríguez, M. X., Barea, J., M. 2010. Evaluation of actinomycete strains for key traits related with plant growth promotion and mycorrhiza helping activities. *Appl Soil Ecol.* 45:209-17.
- Fukuda, K., Ogawa, M., Taniguchi, H. & Saito, M. 2016. Molecular Approach to Studying Microbial Communities: Targeting 16S Ribosomal RNA Gene. *Journal of UOEH* 38(3):223-232.
- Gaby, D.H., Buckley, J.C., 2012. A comprehensive evaluation of PCR primers to amplify the nifH gene of nitrogenase. *PLoS One* 7 (7), e42149.
- Ghimire, G., Koirala, N. & Sohng, J. 2015. Activation of Cryptic hop Genes from *Streptomyces peucetius* ATCC 27952 Involved in Hopanoid Biosynthesis. *J. Microbiol. Biotechnol.* 25(5):658–661
- growth promoting traits from termite mound soil. *Journal of Pharmacognosy and Phytochemistry.* 7(2):1681-1686
- Gtari, M., Ghodhbane-Gtari, F., Nouioui, I., Beauchemin, N., Tisa, L., S. 2012. Phylogenetic perspectives of nitrogen fixing actinobacteria. *Arch Microbiol.* 194:3–11
- Gupta, R., Kumari, R., Sharma, S., Alzahrani, O., Noureldeen, A. & Darwish, H. 2022. Identification, characterization and optimization of phosphate solubilizing rhizobacteria (PSRB) from rice rhizosphere. *Saudi Journal of Biological Sciences.* 20(2022):35-42.
- Handayani, I., Saad, H., Ratnakomala, S., Lisdiyanti, P., Kusharyoto, W., Krause, J., Kulik, A., Wohlleben, W., Aziz, S., Gross. 2021. Mining Indonesian Microbial Biodiversity for Novel Natural Compounds by a Combined Genome Mining and Molecular Networking Approach. *Mar. Drugs.* 19, 316
- Hanke, W., Alenfelder, J., Liu, J., Gutbrod, P., Kehraus, S., Crusemann, M., Dormann, P., Kostenis, E., Scholz, M. & König, G. 2023. The Bacterial Gq Signal Transduction Inhibitor Fr900359 Impairs Soil-associated and Plant Pathogenic Nematodes. *Journal of Chemical Ecology.* 49(9-10):549-569.
- Hermes C, König GM, Crusemann M. 2021. The chromodepsins - chemistry, biology and biosynthesis of a selective Gq inhibitor natural product family. *Nat Prod Rep.* 38(12):2276-2292.
- HuY., Xia Y., Sun Q., Liu K., Chen X., Ge T., Zhu B., Zhu Z., Zhang B. & Su Y. 2018. Effects of long-term fertilization on phoD-harboring bacterial

- community in Karst soils. *Science of the Total Environment* Springer. 628(629):53–63
- Idris, A. B., Hassan, H. G., Ali, M. A., Eltaher, S. M., Idris, L. B., Alyaub, H. N., Abass, A. M., Ahmed, M. M., Ibrahim, M. M., Ibrahim, E. M. & Hassan, M. A. 2020. Molecular Phylogenetic Analysis of 16S rRNA Sequences Identified two Lineages of *Helicobacter pylori* Strains Detected from different regions in Sudan Suggestive of Differential Evolution. *International journal of Biology*. Article ID 8825718
- Iftime, D., Kulik, A., Hartner, T., Rohrer, S., Niedermeyer, J., Stegmann, E., Weber, T. & Wohlleben, W. 2016. Identification and activation of novel biosynthetic gene clusters by genome mining in the kirromycin producer *Streptomyces collinus* Tü 365. *J Ind Microbiol Biotechnol* 43:277–291
- Imade, Emmanuel & Babalola, Olubukola. 2021. Biotechnological utilization: the role of *Zea mays* rhizospheric bacteria in ecosystem sustainability. *Applied Microbiology and Biotechnology*. 105. 1-14.
- Jeong, J.-Y.; Lee, S.-H.; Yun, M.-R.; Oh, S.-E.; Lee, K.-H.; Park, H.-D. 2-Methylisoborneol (2-MIB) Excretion by *Pseudanabaena yagii* under Low Temperature. *Microorganisms* 2021, 9, 2486
- Joshi, S., Gangola, S. & Saghal, M. 2023. Functional characterization and molecular fingerprinting of potential phosphate solubilizing bacterial candidates from Shisham rhizosphere. *Nature*. 13:7003
- Katz, L., Baltz, R.H. 2016. Natural product discovery: Past, present, and future. *Journal of Industrial Microbiology and Biotechnology*. 43(2-3):155-76.
- Khamna, S., Yokota., A. & Lumyong, S. 2009. Actinomycetes isolated from medicinal plant rhizosphere soils: diversity and screening of antifungal compounds, indole-3-acetic acid and siderophore production. *World J. Microbiol Biotechnol*. 25:649-655
- Khamna, S., Yokota., A. & Lumyong, S. 2009. Indole-3-acetic acid production by *Streptomyces* sp. isolated from some Thai medicinal plant rhizospheresoils. *EurAsian Journal of BioSciences*. 4:23-32
- Khan, M. S., Parvaze, Z. & Wani, A. 2007. Role of Phosphate-Solubilizing Microorganism in Sustainable Agriculture – A Review. *Agronomy for Sustainable Development, Springer*. 27(1):29-43.
- Khan, M. S., Parvaze, Z. & Wani, A., *et al.* 2014. Phosphate Solubilizing Microorganism. *Springer International Publishing Switzerland*. Pp260-268.
- Koomsiri W, Inahashi Y, Leetanasaksakul K, Shiomi K, Takahashi YK, O Mura S, Samborsky M, Leadlay PF, Wattana-Amorn P, Thamchaipenet A, Nakashima T. 2018. Sarpeptins A and B, Lipopeptides Produced by *Streptomyces* sp. KO-7888 Overexpressing a Specific SARP Regulator. *J Nat Prod*. 82(8):2144-2151.
- Krishna, R., Ansari, W., Verma, J & Singh, M. 2019. Role of Plant Growth Promoting Microorganisms in Sustainable Agriculture and Nanotechnology. Elsevier. P40-46
- Kumar S., Suyal D. C., Yadav A., Shouche Y., Goel R. 2019. Microbial diversity and soil physiochemical characteristic of higher altitude. *PLoS ONE* 14(3)
- Lang, M., Zou, W., Chen, X., Zou, C., Zhang, W., Deng, Y., Zhu, F., Yu, P. & Chen, X. 2021. Soil Microbial Composition and *phoD* Gene

- Abundance Are Sensitive to Phosphorus Level in a Long-Term Wheat-Maize Crop System. *Front. Microbiol.* 11:605955
- Li JH, Oh J, Kienesberger S, Kim NY, Clarke DJ, Zechner EL, Crawford JM. 2020. Making and Breaking Leupeptin Protease Inhibitors in Pathogenic Gammaproteobacteria. *Angew Chem Int Ed Engl.* 59(41):17872-17880
- Li, C., Cao, P., Jiang, M., Sun, T., Shen, Y, et al. 2020. *Streptomyces oryziradicis* sp. nov., a novel actinomycete isolated from rhizosphere soil of rice (*Oryza sativa* L.). *Int J Syst Evol Microbiol.* 70:465–472.
- Li, M. S., Guo, R., Yu, F., Chen, X., Zhao, H. Y., Li, H. X., Wu, J. 2018. Indole-3-acetic acid biosynthesis pathways in the plant-beneficial bacterium *Arthrobacter pascens* ZZ21. *Int. J. Mol. Sci.*, 19, 443
- Li, Q., Chen, X., Jiang, Y., & Jiang, C. (2016). Morphological Identification of Actinobacteria. InTech. Pp63-70
- Lin, L., Xu, X. 2013. Indole-3-acetic acid production by endophytic Streptomyces sp. En-1 isolated from medicinal plants. *Curr Microbiol.* 67: 209e17.
- Liu, WT., Lamsa, A., Wong, W. et al. 2014. MS/MS-based networking and peptidogenomics guided genome mining revealed the stenothricin gene cluster in *Streptomyces roseosporus*. *J Antibiot* 67:99–104
- Liu, Z., Zhang, Y., Sun, J., Huang, W., Xue, C. & Mao, X. 2020. A Novel Soluble Squalene-Hopene Cyclase and Its Application in Efficient Synthesis of Hopene. *Front. Bioeng. Biotechnol.* 8:426.
- Long, J., Luo, W., Xie, J., Yuan, Wang, J., Kang, L., Li, Y., Zhang, Z., Hong, M. 2021. Environmental factors influencing phyllosphere bacterial communities in Giant Pandas' staple food bamboos. *Front Microbiol* 12: 748141
- Madhaiyan, M., Saravanan, V.S., See-Too, W. S, Volpiano, C.G, Sant' Anna, F.H., et al. Genomic and phylogenomic insights into the family Streptomycetaceae lead to the proposal of six novel genera. *Int. J. Syst. Evol. Microbiol.* 2022:72
- Mahyarudin, Rusmana, I. & Lestari, Y. 2015. Metagenomic of Actinomycetes Based on 16s rRNA and *nifH* Genes in Soil and Roots of Four Indonesian Rice Cultivars Using PCR-DGGE. *HAYATI Journal of Bioscience.* 22:113-121.
- McGill, W. B., Cole, C. V., 1981. Comparative aspects of cycling of organic C, N, S and P through soil organic matter. *Geoderma.* 26 (4), 267–286.
- Meier-Kolthoff, J. P., Auch, A. F., Klenk, H. P. & Göker, M. 2013. Genome sequence-based species delimitation with confidence intervals and improved distance functions. *BMC Bioinformatics.* 14:60.
- Moreau, R. A., and Hicks, K. B. 2001. Bacteriohopanetetrol and Related Compounds Useful for Modulation of Lipoxygenase Activity and AntiInflammatory Applications. US Patent 6117415B1. Washington, DC: US Department of Agriculture.
- Nagendran, S., Agrawal, S. S., Patwardhan, A. G. 2021. Eco-friendly association of plants and actinomycetes. In: Shrivastava N, Mahajan S, Varma A, editors. *Symbiotic Soil Microorganisms*. Cham: Springer. P 99–116.

- Nagul, E., McKelvie, I., Worsfold, P. & Kolev, S. 2015. The molybdenum blue reaction for the determination of orthophosphate revisited: Opening the black box. *Analytica Chimica Acta*. 2015:1-23
- Nannipieri, P., Giagnoni, L., Landi, L., Renella, G., 2011. Role of phosphatase enzymes in soil. *Phosphorus in Action*. Springer Berlin Heidelberg, pp. 215–243
- Nautiyal, C., S. 2006. An Efficient Microbial Growth Medium for Screening Phosphate Solubilizing Microorganism. *FEMS Microbiology Letters*. 170(1):265-270
- Nayak SK, Dash B, Nayak S, Mohanty S, Mishra BB. 2020. Chitinase producing soil bacteria: prospects and applications. *In: Frontiers in Soil and Environmental Microbiology*. Boca Raton, FL: CRC Press. pp. 289– 98
- Nouioui I, Klenk HP, Igual JM, Gulvik CA, Lasker BA, *et al.* *Streptacidiphilus bronchialis* sp. nov., a ciprofloxacin-resistant bacterium from a human clinical specimen; reclassification of *Streptomyces griseoplanus* as *Streptacidiphilus griseoplanus* comb. nov. and emended description of the genus *Streptacidiphilus*. *Int J Syst Evol Microbiol*. 2019;69:1047–1056.
- Novakova, R., Bistakova, J. & Kormanec, J. 2004. Characterization of the polyketide spore pigment cluster whiESa in *Streptomyces aureofaciens* CCM3239. *Arch Microbiol* 182:388–395
- Numponsak, T., Kumla, J., Suwannarach, N., Matsui, K. & Lumyong, S. 2018. Biosynthetic pathway and optimal conditions for the production of indole-3-acetic acid by an endophytic fungus, *Colletotrichum fructicola* CMU-A109. *PLoS ONE*. 13,
- Nurkanto, A. & Agustam A. 2015. Molecular Identification and Morpho-Physiological Characterization of Actinomycetes with Antimicrobial Properties. *Jurnal Biologi Indonesia*. 11(2):195-203.
- Olanrewaju, O., Ayilara, M., Ayangbenro, A. & Babalola, O. 2021. Genome Mining of Three Plant Growth-Promoting *Bacillus* Species from Maize Rhizosphere. *Applied Biochemistry and Biotechnology*. 193:3949-3969
- Pacios-Michelena, S., González, C. N. A, Alvarez-Perez, O., B, Rodriguez-Herrera, R., Chávez-González, M., Valdés, R., A., *et al.* 2021. Application of *Streptomyces* antimicrobial compounds for the control of phytopathogens. *Front Sustain Food Syst*. 5:696518
- Pan, L. & Cai, B. 2023. Phosphate-Solubilizing Bacteria: Advances in Their Physiology, Molecular Mechanisms and Microbial Community Effects Microorganism. 11:2904
- Pande, A., Pandey, P., Mehra, S., Singh, M. & Kaushik, S. 2017. Phenotypic and Genotypic Characterization of Phosphate Solubilizing Bacteria and Their Efficiency on the Growth of Maize. *Journal of Genetic Engineering and Biotechnology*. 15:37391
- Passari, A. K., Chandra, P., Zothanpuia, Mishra, V., Leo, V., Gupta, V., Kumar, B. & Singh, B. 2016. Detection of biosynthetic gene and phytohormone production by endophytic actinobacteria associated with *Solanum lycopersicum* and their plant-growth-promoting effect, *Research in Microbiology*. 167(8):692-705.
- Peterson, B. A, Haak, D. C., Nishimura, M., T, Teixeira, P., James, S., R., Dangl, J. L., *et al.* 2016. Genome-Wide Assessment of Efficiency and Specificity

- in CRISPR/Cas9 Mediated Multiple Site Targeting in Arabidopsis. *PLoS ONE* 11(9)
- Poralla, K., Muth, G. & Hartner, T. 2000. Hopanoids are formed during transition from substrate to aerial hyphae in *Streptomyces coelicolor* A3(2). *FEMS Microbiol. Lett* 189:93–95
- Ragot, S., Kertesz, M., Meszaros, E., Frossad, E. & Bunemann, E. 2017. Soil phoD and phoX alkaline phosphatase gene diversity responds to multiple environmental factors. *FEMS Microbiology Ecology*. 93(1):1-13
- Rao, S. 1982. *Biofertilizer in Agriculture*. Oxford and IBH Publishing Co. New Delhi.
- Romanya, Joan, Blanco-Moreno, José & Sans, F. 2017. Phosphorus mobilization in low-P arable soils may involve soil organic C depletion. *Soil Biology and Biochemistry*. 113. 250-259.
- Saif, Khan, M., S. 2014. *Phosphate Solubilizing Microorganisms*. Springer International Publishing. Switzerland. P 137-157
- Sakurai, M., Wasaki, J., Tomizawa, Y., Shinano, T., Osaki, M., 2008. Analysis of bacterial communities on alkaline phosphatase genes in soil supplied with organic matter. *J. Soil Sci. Plant Nutr*. 54 (1):62–71
- Salwan, R., Sharma, V. 2018. The role of actinobacteria in the production of industrial enzymes. In: Singh BP, Gupta VK, Pasari AK, editors. *New and Future Developments in Microbial Biotechnology and Bioengineering*. Amsterdam: Elsevier
- Shahid M, Singh BN, Verma S, Choudhary P, Das S, Chakdar H, *et al.* 2021. Bioactive antifungal metabolites produced by *Streptomyces amritsarensis* V31 help to control diverse phytopathogenic fungi. *Braz J Microbiol*.pp 1–13.
- Sharma M, Manhas RK. 2020. Purification and characterization of salvianolic acid B from *Streptomyces* sp. M4 possessing antifungal activity against fungal phytopathogens. *Microbiol Res* 237. 126478.
- Sharma, A., Diwevidi, V. D, Singh, S., Pawar, K. K., Jerman, M., Singh, L. B., *et al.* 2013. Biological control and its important in agriculture. *Int J Biotech Bioeng Res*. 4:175–80.
- Sharma, S. & Kumar, S. 2021. Fast and accurate bootstrap confidence limits on genome-scale phylogenies using little bootstrap. *Nature computational science*. 1:574-577
- Sharma, S. B., Sayyed, R. Z., Trivedi, M. H. & Gobi, T. A. 2013. Phosphate Solubilizing Microbes: Sustainable Approach for Managing Phosphorus Deficiency in Agricultural Soils. *SpringerPlus*. 2:587
- Silva, G. C., Kitano, I. T., Ribeiro, I. A. F. & Lacava, P.T. 2022. The Potential Use of Actinomycetes as Microbial Inoculants and Biopesticides in Agriculture. *Front. Soil Sci*. 2:833181
- Simanungkalit, M. & Suriadikarta, A. 2006. *Pupuk Organik dan Pupuk Hayati*. Balai Besar Penelitian dan Pengembangan Sumber Daya Lahan Pertanian. Bogor. pp 141-143.
- Singh DP, Patil HJ, Prabha R, Yandigeri MS, Prasad SR. Actinomycetes as potential plant growth-promoting microbial communities. In: Prasad R, Gill SS, Tuteja N, editors. *Crop Improvement Through Microbial Biotechnology*. Amsterdam: Elsevier (2018) p. 27–38.

- Singh, T. A., Passari, A.K., Jajoo, A., Bhasin, S., Gupta, V. K., Hashem, A., Alqarawi, A. A. & Abd_Allah, E. F. 2021. Tapping Into Actinobacterial Genomes for Natural Product Discovery. *Front. Microbiol.* 12:655620.
- Sousa, C., S., Soares, A., C., F. & Garrido, M., S. Characterization of Streptomyces with Potential to Promote Plant Growth and Biocontrol. *Sci. Agric.* 65(1):50-55.
- Souza, A., Fillia, V., Da Silva, J., Junior, M., Paiva, C., Coelho, A. & Lemos, L. 2023. Application of Bacillus spp. Phosphate-Solubilizing Bacteria Improves Common Bean Production Compared to Conventional Fertilization. *Plants.* 12:3827
- Stackebrandt, E., & Ebers, J. 2006. Taxonomic parameters revisited: Tarnished gold standards. *Microbiology Today.* 33:152–155.
- Suliasih & Widawati, S. 2020. Isolation of Indole Acetic Acid (IAA) Producing *Bacillus siamensis* from Peat and Optimization of the Culture Conditions for Maximum IAA Production. *IOP Conference Series: Earth and Environmental Science.* 572 012025
- Suliasih, Widawati, S. & Muharam, A. 2010. Aplikasi pupuk organik dan bakteri pelarut fosfat untuk meningkatkan pertumbuhan tanaman tomat dan aktivitas mikroba tanah. *Journal Hortikultura.* 20(3):241-246
- Swarnalakshmi, K., Senthilkumar, M. & Ramakrishnan, B. 2016. Plant Growth Promoting Actinobacteria. Singapore: Springer Science+Business Media. pp123-129
- Swarnalakshmi, K., Senthilkumar, M. & Ramakrishnan, B., 2016. *Plant Growth Promoting Actinobacteria.* Singapore: Springer Science Business Media. pp123-129
- Tamisier, M., Benamar, S. Raoult, D. & Fournier, P. 2015. Cautionary tale of using 16S rRNA gene sequence similarity values in identification of human-associated bacterial species. *International Journal of Systematic and Evolutionary Microbiology.* 65:1929–1934
- Tan, H., Barret, M., Mooij, M.J., Rice, O., Morrissey, J.P., Dobson, A., et al., 2013. Long-term phosphorus fertilisation increased the diversity of the total bacterial community and the phoD phosphorus mineraliser group in pasture soils. *Biol. Fertil. Soils.* 49(6): 661–672
- Tang, J., Li, Y., Zhang, L., Mu, J., Jiang, Y., Fu, H., Zhang, Y., Cui, H., Yu, X., Ye, Z. 2023. Biosynthetic Pathways and Functions of Indole-3-Acetic Acid in Microorganisms. *Microorganisms,* 11:2077
- Tareq, F. S., Lee, M. A., Lee, H. -S., Lee, J. -S., Lee, Y. -J., & Shin, H. J. (2014). Gageostatins A–C, Antimicrobial Linear Lipopeptides from a Marine *Bacillus subtilis*. *Marine Drugs,* 12(2), 871-885. <https://doi.org/10.3390/md12020871>
- Tookmanian, E., Belin, B., Saenz, J. & Newman, D. 2021. The role of hopanoids in fortifying rhizobia against a changing climate. *Environmental Microbiology.* 23(6):2906–2918
- Valla, A., R. Cartiel, D., L., Valla, B., Guillou, R., Andriamialisoa, R. & New Synthesis of Natural Carotene Isorenieratene (-Carotene) and its 3,3-Dimethoxy Analogue Labia, R.2003. New Synthesis of Natural Carotene Isorenieratene (-Carotene) and its 3,3Dimethoxy Analogue. *Helvetica Chimica Acta* 86:3314-3321

- Van bergeijk, D. A., Terlouw, B. R., Medema, M. H. & van Wezel, G. P. 2020. Ecology and genomics of Actinobacteria: new concepts for natural product discovery. *Nat. Rev. Microbiol.* 18:546-558.
- Velazquez, E., Barrueco, R. & Jana, B. 2007. Distribution pattern and role of phosphate solubilizing bacteria in the enhancement of fertilizer value of rock phosphate in aquaculture ponds: state-of-the-art. *First International Meeting on Microbial Phosphate Solubilization.* 229-238
- Vijayabharathi R, Kumari BR, Sathya A, Srinivas V, Abhishek R, Sharma HC, Gopalakrishnan S (2014) Biological activity of entomopathogenic actinomycetes against lepidopteran insects (Noctuidae: Lepidoptera). *Can J Plant Sci* 94:759–769
- Wagener, S., Volker, T., Spirt, S., Ernst, H. & Stahl, W. 2012. 3,30 - Dihydroxyisorenieratene and isorenieratene prevent UV-induced DNA damage in human skin fibroblasts. *Free Radical Biology and Medicines.* 53(3):457-463
- Wagi S, Ahmed A. 2019. Bacillus spp.: potent microfactories of bacterial IAA. *PeerJ.* 7:e7258
- Wahyudi, A., Priyanto, J. A., Afrista, R., Kurniati, D., Astuti, R. I. & Akhdiya, A. 2019. Plant Growth Promoting Activity of Actinomycetes Isolated from Soybean Rhizosphere. *OnLine Journal of Biological Sciences.* 19(1):1-8
- Walpola, B. C. & Kettiarachchi, R. 2020. Comparison of Qualitative and Quantitative Methods for Isolation of Phosphate Solubilizing Microorganisms. *PNAS Journal.* 115(18): E4255–E4263
- Walpola, B., C. & Hettiarachchi. 2020. Comparison of Qualitative and Quantitative Methods for Isolation of Phosphate Solubilizing Microorganisms. *Vidyodaya Journal of Science.* 23(2):14-22
- Wang, X., Zhou, H., Chen, H., Jing, X., Zheng, W., Li, R., Sun, T., Liu, J., Fu, J., Huo, L., Li, Y., Shen, Y., Ding, X., Muller, R., Bian, X. & Zhang, Y. 2018. Discovery of recombinases enables genome mining of cryptic biosynthetic gene clusters in Burkholderiales species.
- Weyens, N., van der Lelie D., Taghavi, S., Vangronsveld, J. 2019. Phytoremediation: plant-endophyte partnerships take the challenge. *Curr Opin Biotechnol.* 20(2):248-54
- Widawati, S. 2012. The Use of Plant Growth Promoting Rizobacteria (*Pseudomonas fluorescens* and *Serratia marcescens*) For Paddy Growth in High Salinity Ecosystem. *Seminar Nasional Biodiversitas IV, 15 September 2012.* Universitas Airlangga, Surabaya
- Widawati. 2014. *The effect of salinity to activity and effectivity phosphate solubilizing bacteria on growth and production of paddy.* Proceeding International Conference on Biological Science, Faculty of Biology, Universitas Gadjah Mada, Yogyakarta.
- Xu N, Tan G, Wang H, Gai X. 2016. Effect of biochar additions to soil on nitrogen leaching, microbial biomass and bacterial community structure. *Eur J Soil Biol* 74:1–8
- Xu, F., Wu, Y., Zhang, C., Davis, K., Moon, K., Bushin, L. & Seyedsayamdost, R. 2019. A Genetics-Free Method for High-Throughput Discovery of Cryptic Microbial Metabolites. *Nat Chem Biol.* 2019 February ; 15(2): 161–168
- YARA. 2022. *Fertilizer Industrial Handbook 2022.* YARA Handbook. USA. P 16.



Skrining dan Karakterisasi Molekuler Kemampuan Plant Growth Promoting Rhizobacteria (PGPR) Isolat

Aktonomisetes dari Tanah Hutan Lindung Sungai Wain, Kalimantan Timur

Izzuli Salamah Haris, Prof. Dr. Endah Retnaningrum, M.Eng

Universitas Gadjah Mada, 2025 | Diunduh dari <http://etd.repository.ugm.ac.id/>

Yarza, P. & Munoz. 2014. *Methods in microbiology*. Amsterdam: Academic Press. pp43-50

YKAN, 2021. Lembar Fakta Hutan Lindung Sungai Wain. Yayasan konservasi Alam Nusantara (YKAN). Jakarta. P 2-5.