DAFTAR PUSTAKA

Abdelhafez, A. A., Li, J., & Abbas, M. H. H. (2014). Feasibility of biochar manufactured from organic wastes on the stabilization of heavy metals in a metal smelter contaminated soil. *Chemosphere*, *117*(1), 66–71. https://doi.org/10.1016/j.chemosphere.2014.05.086

Adji, S. S., Sunarsih, D., & Hamda, S. (2008). Pencemaran Logam Berat dalam Tanah dan Tanaman serta Upaya Menguranginya. *Seminar Nasional Kimia XVIII*, 1–19. http://repository.ut.ac.id/id/eprint/7289

Ahmad, R. Z. (2018). Mycoremediation to Remove Heavy Metal Pollution in Post-Mining Areas for Farmland Utilization. *Indonesian Bulletin of Animal and Veterinary Sciences*, *28*(1), 41. https://doi.org/10.14334/wartazoa.v28i1.1785

Alaboudi, K. A., Ahmed, B., & Brodie, G. (2019). Effect of biochar on Pb, Cd and Cr availability and maize growth in artificial contaminated soil. *Annals of Agricultural Sciences*, *64*(1), 95–102. https://doi.org/10.1016/j.aoas.2019.04.002

Ali, M. (2012). *Tinjauan Proses Bioremediasi Melalui Pengujian Tanah Tercemar Minyak* (M. E. Prof. Dr. Ir. Mukhtasor (ed.); Cetakan I). Surabaya UPN "Veteran" Jawa Tmur.

Alloway, B. J. (1995). *Heavy Metals in Soils. Blackie Academic and Professional, Chapman and Hall*. https://doi.org/https://doi.org/10.1007/978-94-011-1344-1

Alloway, B. J. (2012). Heavy metals in soils. *Heavy Metals in Soils*, *22*. https://doi.org/10.1016/s0165-9936(96)90032-1

Angraeni, D. S. (2017). *Kemampuan Bioakumulasi Logam Berat Timbal (Pb) Berdasarkan Waktu Paparanya Oleh Bakteri Endapan Sedimen Perairan Sekitar Rumah Susun Kota Makassar*. http://repositori.uin-alauddin.ac.id/11948/

Atafar, Z., Mesdaghinia, A., Nouri, J., Homaee, M., Yunesian, M., Ahmadimoghaddam, M., & Mahvi, A. H. (2010). Effect of fertilizer application on soil heavy metal concentration. *Environmental Monitoring and Assessment*, *160*(1–4), 83–89. https://doi.org/10.1007/s10661-008-0659-x

Atkinson, C. J., Fitzgerald, J. D., & Hipps, N. A. (2010). Potential mechanisms for achieving agricultural benefits from biochar application to temperate soils: A review. *Plant and Soil*, *337*(1), 1–18. https://doi.org/10.1007/s11104-010-0464-5

Atmojo, S. W. (2003). Peranan Bahan Organik Terhadap Kesuburan Tanah dan Upaya Pengelolaannya. *Peranan Bahan Organik Terhadap Kesuburan Tanah Dan Upaya Pengelolaannya*, 10. Ilmu Kesuburan Tanah Fakultas Pertanian Universitas Sebelas Maret

Aziz, muhammad abdul. (2015). Aktivitas mikroba tanah sebagai parameter kesuburan tanah pada pertanian organik dan konvensional. *Skripsi*. Departemen Ilmu Tanah Dan Sumberdaya Lahan Fakultas Pertanian Institut Pertanian Bogor

Badriyah, L. (2015). Biodegradasi Plastik Oleh Mikroorganisme Air Sampah Dalam Kolom Winogradsky. In *Tugas akhir*. Sepuluh Nopember Institute of Technology.

Bahig, E., Aly, E. A., Khaled, A. A., & Amel, K. A. (2008). Isolation, characterization and application of bacterial population from agricultural soil at Sohag Province, Egypt. *Malaysian Journal of Microbiology*, *4*, 42–50. https://doi.org/10.21161/mjm.11808

Balitbang. (2018). Metode analisis mikrobiologi. *Www.Litbang.Deptan.Go.Id*.

Bolan, S., Hou, D., Wang, L., Hale, L., Egamberdieva, D., Tammeorg, P., Li, R., Wang, B., Xu, J., Wang, T., Sun, H., Padhye, L. P., Wang, H., Siddique, K. H. M., Rinklebe, J., Kirkham, M. B., & Bolan, N. (2023). The potential of biochar as a microbial carrier for agricultural and environmental applications. *Science of the Total Environment*, *886*(April), 163968. https://doi.org/10.1016/j.scitotenv.2023.163968

Burns, R. G., DeForest, J. L., Marxsen, J., Sinsabaugh, R. L., Stromberger, M. E., Wallenstein, M. D., Weintraub, M. N., & Zoppini, A. (2013). Soil enzymes in a changing environment: Current knowledge and future directions. *Soil Biology and Biochemistry*, *58*, 216–234. https://doi.org/10.1016/j.soilbio.2012.11.009

Cheng, S., Chen, T., Xu, W., Huang, J., Jiang, S., & Yan, B. (2020). Application research of biochar for the remediation of soil heavy metals contamination: A review. *Molecules*, *25*(14), 1–21. https://doi.org/10.3390/molecules25143167

Chojnacka, K. (2010). Biosorption and bioaccumulation - the prospects for practical applications. *Environment International*, *36*(3), 299–307. https://doi.org/10.1016/j.envint.2009.12.001

Clausen, C. A. (2000). Isolating metal-tolerant bacteria capable of removing copper, chromium, and arsenic from treated wood. *Waste Management and Research*, *18*(3), 264–268. https://doi.org/10.1034/j.1399-3070.2000.00128.x

Cui, L., Li, L., Zhang, A., Pan, G., Bao, D., & Chang, A. (2011). Biochar amendment greatly reduces rice CD uptake in a contaminated paddy soil: A two-year field experiment. *BioResources*, *6*(3), 2605–2618. https://doi.org/10.15376/biores.6.3.2605-2618

Das, S. K., & Varma, A. (2010). Role of Enzymes in Maintaining Soil Health. *Role of Enzymes in Maintaining Soil Health*, *September*, 25–42. https://doi.org/10.1007/978-3-642-14225-3_2

Delia, N., Djatmiko, H. A., & Prihatiningsih, N. (2018). Eksplorasi, Identifikasi Dan Uji Bakteri Antagonis Bacillus sp. dari Rizosfer Jagung Terhadap Bakteri Layu Stewart 1). *Optimalisasi Sumberdaya Lokal Untuk Mewujudkan Kedaulatan Pangan*, 191–201.

Dewi Widyantika, S., & Prijono, S. (2019). Pengaruh Biochar Sekam Padi Dosis Tinggi Terhadap Sifat Fisik Tanah dan Pertumbuhan Tanaman Jagung Pada Typic Kanhapludult. *Jurnal Tanah Dan Sumberdaya Lahan*, *06*(01), 1157–1163.

Dick, W. A., Cheng, L., & Wang, P. (2000). Soil acid and alkaline phosphatase activity as pH adjustment indicators. *Soil Biology and Biochemistry*, *32*(13), 1915–1919. https://doi.org/10.1016/S0038-0717(00)00166-8

Ding, Y., Liu, Y., Liu, S., Li, Z., Tan, X., Huang, X., Zeng, G., Zhou, L., & Zheng, B. (2016). Biochar to improve soil fertility. A review. *Agronomy for Sustainable Development*, *36*(2). https://doi.org/10.1007/s13593-016-0372-z

Dove, N. C., Arogyaswamy, K., Billings, S. A., Botthoff, J. K., Carey, C. J., Cisco, C., Deforest, J. L., Fairbanks, D., Fierer, N., Gallery, R. E., Kaye, J. P., Lohse, K. A., Maltz, M. R., Mayorga, E., Pett-Ridge, J., Yang, W. H., Hart, S. C., & Aronson, E. L. (2020). Continental-scale patterns of extracellular enzyme activity in the subsoil: An overlooked reservoir of microbial activity. *Environmental Research Letters*, *15*(10). https://doi.org/10.1088/1748-9326/abb0b3

Dwi Lestari, N., & Nugraha Aji, A. (2020). Pengaruh Kompos Dan Biochar Terhadap Fitoremediasi Tanah Tercemar Kadmium Dari Lumpur Lapindo Menggunakan Kangkung Darat. *Jurnal Tanah Dan Sumberdaya Lahan*, *7*(1), 167–176. https://doi.org/10.21776/ub.jtsl.2020.007.1.21

Erfandi, D., & Juarsah, I. (2013). Teknologi Pengendalian Pencemaran Logam Berat Pada Lahan Pertanian. *Konservasi Tanah Menghadapi Perubahan Iklim*, *2011*, 159.

Farida, A. N., & Dalyla, D. (2016). Peran Bakteri Bacillus cereus dan Pseudomonas Putida Dalam Bioremediasi Logam Berat (Fe , Cu , dan Zn) Pada Tanah Tercemar Minyak Bumi. *Skripsi*, 88.

Fellet, G., Marmiroli, M., & Marchiol, L. (2014). Elements uptake by metal accumulator species grown on mine tailings amended with three types of biochar. *Science of the Total Environment*, *468–469*(September), 598–608. https://doi.org/10.1016/j.scitotenv.2013.08.072

García, C., & Hernández, T. (1997). Biological and biochemical indicators in derelict soils subject to erosion. *Soil Biology and Biochemistry*, *29*(2), 171–177. https://doi.org/10.1016/S0038-0717(96)00294-5

Ghaly, A. E., & Mahmoud, N. S. (2006). Optimum Conditions for Measuring Dehydrogenase Activity of Aspergillus niger using TTC. *American Journal of Biochemistry and Biotechnology*, *2*(4), 186–194. https://doi.org/10.3844/ajbbsp.2006.186.194

Gianfreda, L., Rao, M. A., Sannino, F., Saccomandi, F., & Violante, A. (2002). Enzymes in soil: Properties, behavior and potential applications. *Developments in Soil Science*, *28*(PART 2), 301–327. https://doi.org/10.1016/S0166-2481(02)80027-7

Gil-Sotres, F., Trasar-Cepeda, C., Leirós, M. C., & Seoane, S. (2005). Different approaches to evaluating soil quality using biochemical properties. *Soil Biology and Biochemistry*, *37*(5), 877–887. https://doi.org/10.1016/j.soilbio.2004.10.003

Göthberg, A., Greger, M., Holm, K., & Bengtsson, B.-E. (2004). Influence of Nutrient Levels on Uptake and Effects of Mercury, Cadmium, and Lead in Water Spinach. *Journal of Environment Quality*, *33*(4), 1247. https://doi.org/10.2134/jeq2004.1247

Gu, C. (2016). Evaluation of α-Amylase and α-Glucosidase Inhibitory Activity of Flavonoids. *International Journal of Food and Nutritional Science*, *2*(6), 1–6. https://doi.org/10.15436/2377-0619.15.042

Gul, S., Whalen, J. K., Thomas, B. W., Sachdeva, V., & Deng, H. (2015). Physico-chemical properties and microbial responses in biochar-amended soils: Mechanisms and future directions. *Agriculture, Ecosystems and Environment*, *206*, 46–59. https://doi.org/10.1016/j.agee.2015.03.015

Hamzah, A., Kusuma, Z., Utomo, W. H., & Guritno, B. (2011). Siam weed (Chromolaena odorata L.) for phytoremediation of artisanal gold mine tailings. *Journal of Tropical Agriculture*, *50*, 88–91.

Hamzah, Amir, Indri Hapsari, R., & Priyadarshini, R. (2017). The potential of wild vegetation species of Eleusine indica L., and Sonchus arvensis L. for phytoremediation of Cd-contaminated soil. *Journal of Degraded and Mining Lands Management*, *04*(03), 797–805. https://doi.org/10.15243/jdmlm.2017.043.797

Hamzah, Amir, & Priyadarshini, R. (2019). Remediasi Tanah Tercemar Logam Berat. In *Gastronomía ecuatoriana y turismo local.* (Vol. 1, Issue 69).

Haney, R. L., Kiniry, J. R., & Johnson, M. V. V. (2010). Soil microbial activity under different grass species: Underground impacts of biofuel cropping. *Agriculture, Ecosystems and Environment*, *139*(4), 754–758. https://doi.org/10.1016/j.agee.2010.10.003

Hatmanti, A. (2000). Pengenalan Bacillus spp. *Oseana*, *XXV*(1), 31–41.

He, L., Zhong, H., Liu, G., Dai, Z., Brookes, P. C., & Xu, J. (2019). Remediation of heavy metal contaminated soils by biochar: Mechanisms, potential risks and applications in China. *Environmental Pollution*. https://doi.org/10.1016/j.envpol.2019.05.151

Herlambang, S., Yudhiantoro, D., Gomareuzzaman, M., & Lestari, I. (2019). Buku Ajar Biochar Amandemen Tanah Dan Mitigasi Lingkungan. *Lembaga Penelitian Dan Pengabdian Kepada Masyarakat UPN Veteran Yogyakarta*, 88.

Hermita Putri, O., Rahayu Utami, S., & Kurniawan, S. (2019). Soil Chemical Properties in Various Land Uses of UB Forest. *Jurnal Tanah Dan Sumberdaya Lahan*, *06*(01), 1075–1081. https://doi.org/10.21776/ub.jtsl.2019.006.1.6

Hidayat, B. (2015). Remediasi Tanah Tercemar Logam Berat Dengan Menggunakan Biochar (Soil Remediation Contaminated With Heavy Metals Biochar). *Pertanian Tropik (Tropical Agriculture)*, *2*(1), 51–61. http://202.0.107.5/index.php/tropik/article/view/10101

Himayati, Q. (2019). Analisis kandungan logam berat (Pb, Cd, Cu, Fe) pada air permukaan di rawa pening kabupaten Semarang Jawa Tengah. *Encephale*, *53*(1), 59–65.

Hotta, K., Kim, C. Y., Fox, D. T., & Koppisch, A. T. (2010). Siderophore-mediated iron acquisition in Bacillus anthracis and related strains. *Microbiology*, *156*(7), 1918–1925. https://doi.org/10.1099/mic.0.039404-0

Houben, D., Evrard, L., & Sonnet, P. (2013). Beneficial effects of biochar application to contaminated soils on the bioavailability of Cd, Pb and Zn and the biomass production of rapeseed (Brassica napus L.). *Biomass and Bioenergy*, *57*, 196–204. https://doi.org/10.1016/j.biombioe.2013.07.019

Husen, E., Saraswati, R., & Simanungkalit, R. D. . (2007). *Soil Biological Analysis Methods*. Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian, Bogor 16123, Jawa Barat.

Husson, O. (2013). Redox potential (Eh) and pH as drivers of soil/plant/microorganism systems: A transdisciplinary overview pointing to integrative opportunities for agronomy. *Plant and Soil*, *362*(1–2), 389–417. https://doi.org/10.1007/s11104-012-1429-7

Indriyasari, E. (2021). *Identifikasi Bakteri Bacillus sp. Sebagai Pengurai Bahan Pencemar Organik Air Limbah Domestik di Pulau Kodingareng Kota Makassar* (Vol. 3, Issue 2). Universitas Hasanuddin.

Ippolito, J. A., Laird, D. A., & Busscher, W. J. (2012). Environmental Benefits of Biochar. *Journal of Environmental Quality*, *41*(4), 967–972. https://doi.org/10.2134/jeq2012.0151

Jayanti rusyda. (2014). *Abstrak uji kemampuan bakteri*. *Iii*. https://repository.its.ac.id/82007/1/3310100024-Undergraduate_Thesis.pdf

Johannes Lehmann. (2007). Bio-Energy in the Black. *Frontiers in Ecology and the Environment*, *5*(September), 381–387. http://www.jstor.org/stable/20440704%0Ahttp://about.jstor.org/terms%0Ahttp://discovery.ucl.ac.uk/1322126/

Joseph, S., Husson, O., Graber, E. R., Van Zwieten, L., Taherymoosavi, S., Thomas, T., Nielsen, S., Ye, J., Pan, G., Chia, C., Munroe, P., Allen, J., Lin, Y., Fan, X., & Donne, S. (2015). The electrochemical properties of biochars and how they affect soil redox properties and processes. *Agronomy*, *5*(3), 322–340. https://doi.org/10.3390/agronomy5030322

Juhaeti, T., Syarif, F., & Hidayati, N. (2004). Inventarization of potential plant for phytoremediation on degraded land and water mined. *Biodiversitas Journal of Biological Diversity*, *6*(1), 31–33. https://doi.org/10.13057/biodiv/d060106

Kannan, R., Ganesan, M., Govindasamy, C., Rajendran, K., Sampathkumar, P., & Kannan, L. (2011). Tissue concentration of heavy metals in seagrasses of the Palk Bay, Bay of Bengal. *International Journal of Ecology & Environmental Sciences*, *2*(1), 145–153. https://doi.org/10.6088/ijes.00202010016

Komárek, M., Vaněk, A., & Ettler, V. (2013). Chemical stabilization of metals and arsenic in contaminated soils using oxides - A review. *Environmental Pollution*, *172*, 9–22. https://doi.org/10.1016/j.envpol.2012.07.045

Kunito, T., Saeki, K., Goto, S., Hayashi, H., Oyaizu, H., & Matsumoto, S. (2001). Copper and zinc fractions affecting microorganisms in long-term sludge-amended soils. *Bioresource Technology*, *79*(2), 135–146. https://doi.org/10.1016/S0960-8524(01)00047-5

Kurniasari, L. (2010). Pemanfaatan Mikroorganisme Bahan Baku Biosorben Logam. *Pemanfaatan Mikroorganisme Dan Limbah Pertanian Sebagai Bahan Baku Biosorben Logam Berat*, *6*(2), 5–8.

Kurniawan, A. (2019). *Dasar-Dasar Analisis Kualitas Lingkungan*.

Kusumaningtyas, A. S., Cahyono, P., & Suntari, R. (2015). Pengaruh Tinggi Muka Air Tanah Terhadap pH, Eh, Fe, Al dd , Mn dan P Terlarut Pada Tanaman Nanas Klon Gp3 Di Ultisol. *Jurnal Tanah Dan Sumberdaya Lahan*, *2*(1), 103–109. http://jtsl.ub.ac.id

Kyuma, K. (2004). Paddy soil science. *Kyoto University Press and Trans Pasific Press, Tokyo and Melbourne*, *April*, ,280p. https://doi.org/10.1111/j.1365-2389.2004.00694.x

Laela Nurida, N., Dariah, A., Rachman Peneliti Badan Litbang Pertanian di Balai Penelitian Tanah, A., Tentara Pelajar, J., & Barat, J. (2013). Peningkatan Kualitas Tanah dengan Pembenah Tanah Biochar Limbah Pertanian Improving Soil Quality by Using Agricultural-Waste Biochar as a Soil Conditioner I N F O R M A S I A R T I K E L. *Jurnal Tanah Dan Iklim*, *37*(2), 69–78. http://ejurnal.litbang.pertanian.go.id/index.php/jti/article/view/11250

Li, Q., Chai, L., Wang, Q., Yang, Z., Yan, H., & Wang, Y. (2010). Bioresource Technology Fast esterification of spent grain for enhanced heavy metal ions adsorption. *Bioresource Technology*, *101*(10), 3796–3799. https://doi.org/10.1016/j.biortech.2010.01.003

Liao, D., Zhang, C., Li, H., Lambers, H., & Zhang, F. (2020). Changes in soil phosphorus fractions following sole cropped and intercropped maize and faba bean grown on calcareous soil. *Plant and Soil*, *448*(1–2), 587–601. https://doi.org/10.1007/s11104-020-04460-0

Lu, H., Zhang, W., Yang, Y., Huang, X., Wang, S., & Qiu, R. (2012). Relative distribution of Pb2+ sorption mechanisms by sludge-derived biochar. *Water Research*, *46*(3), 854–862. https://doi.org/10.1016/j.watres.2011.11.058

Lumbanraja, P. (2018). Sekolah Pascasarjana Universitas Sumatera Utara-Medan. *Mikroorganisme Dalam Bioremediasi*, *September*, 1–20.

Madigan, Martinko, Stahl, & Clark. (2012). Brock Biology Of Microorganisms. In *Pearson Education, Inc., publishing as Benjamin Cummings, 1301 Sansome Street, San Francisco, CA 94111*. (3rd ed., Vols. s3-XII, Issue 310). https://doi.org/10.1093/nq/s3-XII.310.469-a

Makoi J., & Patrick. (2008). Selected soil enzymes: Examples of their potential roles in the ecosystem. *African Journal of Biotechnology*, *7*(3), 181–191. https://doi.org/10.5897/AJB07.590

Mambu, S. M. (2014). Soil Dehydrogenase Activity: a Comparison Between the Ttc and Int Method. a Review. *Jurnal Ilmiah Sains*, *14*(2), 87. https://doi.org/10.35799/jis.14.2.2014.5937

Marista, E., Khotimah, S., & Linda, R. (2013). *Bakteri Pelarut Fosfat Hasil Isolasi dari Tiga Jenis Tanah Rizosfer Tanaman Pisang Nipah (Musa paradisiaca var . nipah) di Kota Singkawang*. *2*(2), 93–101.

Maroeto, M., Priyadarshini, R., Siswanto, S., Idhom, M., & Santoso, W. (2022). Study on the Potential of Forest Areas in Aspects of Land Fertility In Wonosalam District, Jombang Regency. *Nusantara Science and Technology Proceedings*, *2022*, 22–30. https://doi.org/10.11594/nstp.2022.2004

Martell, A. E., & Hancock, R. D. (1996). *Metal Complexes in Aqueose Solution*.

Maulana, A., & Mursiti, S. (2017). Bioremediasi Logam Pb pada Limbah Tekstil dengan Staphylococcus aureus dan Bacillus subtilis. *Indonesian Journal of Chemical Science*, *6*(3), 256–261.

McCord, J. M. (2000). The evolution of free radicals and oxidative stress. *American Journal of Medicine*, *108*(8), 652–659. https://doi.org/10.1016/S0002-9343(00)00412-5

Meryandini, A., Widosari, W., Maranatha, B., Sunarti, T. C., Rachmania, N., & Satria, H. (2009). Isolasi Bakteri Selulolitik Dan Karakterisasi Enzimnya. *Makara Journal of Science*, *13*(1), 33–38. https://doi.org/10.7454/mss.v13i1.369

Moorthy, K., Lavanya, V., Malarvizhi, A., Arul Sheeba Malar, S., Bharathy, G., Arjunan, S., Gnanendra, T. S., & Thajuddin, N. (2010). Isolation of soil bacteria for bioremediation of hydrocarbon contamination. *Biosciences Biotechnology Research Asia*, *7*(2), 901–906.

Mukrin, Yusran, & Toknok, B. (2019). Populasi Fungi Dan Bakteri Tanah Pada Lahan Agroforestri. *J. Forest Sains*, *16*(2), 77–84.

Mulyati, Baharudin, A. B., Tejowulan, S., & Muliatiningsih. (2014). Penggunaan biochar limbah pertanian sebagai pembenah tanah (Soil Ameliorant) untuk meningkatkan produktivitas lahan pada tanaman kedelai. *Seminar Nasional: Pengelolaan Lahan Terdegradasi*, *Mataram.*

Nariratih, I., Damanik, M., & Sitanggang, G. (2013). Ketersediaan Nitrogen Pada Tiga Jenis Tanah Akibat Pemberian Tiga Bahan Organik Dan Serapannya Pada Tanaman Jagung. *Jurnal Online Agroekoteknologi*, *1*(3), 479–488.

Ndruru, J. I., Nelvia, N., & Adiwirman, A. (2018). Pertumbuhan Padi Gogo pada Medium Ultisol dengan Aplikasi Biochar dan Asap Cair. *Jurnal Agroteknologi*, *9*(1), 9. https://doi.org/10.24014/ja.v9i1.3736

Nguyen, T. T. N., Xu, C. Y., Tahmasbian, I., Che, R., Xu, Z., Zhou, X., Wallace, H. M., & Bai, S. H. (2017). Effects of biochar on soil available inorganic nitrogen: A review and meta-analysis. *Geoderma*, *288*, 79–96. https://doi.org/10.1016/j.geoderma.2016.11.004

Notohadiprawiro, T. (2006). Sawah dalam tata guna lahan. *Senat Mahasiswa Fakultas Pertanian UPN Yogyakarta*, 1–9. Ilmu Tanah Universitas Gadjah Mada

Novandi, Hayati, R., & Zahara, T. A. (2014). Remediasi Tanah Tercemar Logam Timbal (Pb) Menggunakan Tanaman Bayam Cabut (Amaranthus tricolor L.). *Jurnal Teknologi Lingkungan Lahan Basah*, *2*(1), 1–10. https://doi.org/10.26418/jtllb.v2i1.5565

Noviana, L., & Raharjo, B. (2019). Viabilitas Rhizobakteri Bacillus sp. DUCC-BR-K1.3 pada media pembawa tanah gambut disubstitusi dengan padatan limbah cair industri rokok. *Bioma*, *11*(1), 30–39.

Novita, Yuliani, & Purnomo, T. (2012). Penyerapan Logam Timbal (Pb) dan Kadar Klorofil Elodea canadensis pada Limbah Cair Pabrik Pulp dan Kertas. *LenteraBio*, *1*(1), 1–8.

Oladele, S., Adeyemo, A., Awodun, M., Ajayi, A., & Fasina, A. (2019). Effects of biochar and nitrogen fertilizer on soil physicochemical properties, nitrogen use efficiency and upland rice (Oryza sativa) yield grown on an Alfisol in Southwestern Nigeria. *International Journal of Recycling of Organic Waste in Agriculture*, *8*(3), 295–308. https://doi.org/10.1007/s40093-019-0251-0

Park, J. H., Choppala, G. K., Bolan, N. S., Chung, J. W., & Chuasavathi, T. (2011). Biochar reduces the bioavailability and phytotoxicity of heavy metals. *Plant and Soil*, *348*(1–2), 439–451. https://doi.org/10.1007/s11104-011-0948-y

Parnes, R. (2013). Soil Fertility: A Guide to Organic and Inorganic Soil Amendments. *J. Soil Fertility*, 188. http://www.nofa.org/soil/html/calcium.php

Paz-Ferreiro, J., Lu, H., Fu, S., Méndez, A., & Gascó, G. (2014). Use of phytoremediation and biochar to remediate heavy metal polluted soils: A review. *Solid Earth*, *5*(1), 65–75. https://doi.org/10.5194/se-5-65-2014

Paz-Ferreiro, J., Trasar-Cepeda, C., Leirós, M. C., Seoane, S., & Gil-Sotres, F. (2007). Biochemical properties of acid soils under native grassland in a temperate humid zone. *New Zealand Journal of Agricultural Research*, *50*(4), 537–548. https://doi.org/10.1080/00288230709510321

Perdana, J. (2012). Uji Resistensi dan Uji Biodegradasi Logam Berat (Pb, Zn, dan Hg) oleh Isolat Bakteri Lumpur Pantai Kenjeran. *Universitas Airlangga*, *4*(3), 2003–2005.

Prasetiyo, Y., Hidayat, B., & Bintang, S. (2020). Karakteristik Kimia Biochar Dari Beberapa Biomassa Dan Metode Pirolisis. *Agrium*, *23*(1), 17–21. https://jurnal.umsu.ac.id/index.php/agrium/article/view/5653

Puja, I. N., & Atmaja, I. D. A. (2018). Kajian Status Kesuburan Tanah untuk Menentukan Pemupukan Spesifik Lokasi Tanaman Padi. *Agrotrop*, *8*(1), 1–10. https://doi.org/https://doi.org/10.24843/AJoAS.2018.v08.i01.p01

Purwani, J., & Subowo, G. (2013). Aktivitas Dehidrogenase Tanah Tanaman Kedelai Dengan Perlakuan Pupuk Kimia Dan Pupuk Hayati. Dehydrogenase Activity of Soybean Plant Soil under the Treatment of Chemical Fertilizer and Biofertilizer. *Balai Penelitian Tanah*, 563–569.

Raj, K., Sardar, U. R., Bhargavi, E., Devi, I., Bhunia, B., & Tiwari, O. N. (2018). Advances in exopolysaccharides based bioremediation of heavy metals in soil and water: A critical review. *Carbohydrate Polymers*, *199*(March), 353–364. https://doi.org/10.1016/j.carbpol.2018.07.037

Report, T. (2015). Aktivitas Enzim Dehidrogenase pada Tanah. *Mahasiswa Jurusan Tanah, Fakultas Pertanian, Universitas Gadjah Mada.*, *2*(MARCH 2014), 0–21.

Roy, M., & Mcdonald, L. M. (2015). Metal Uptake in Plants and Health Risk Assessments in Metal-Contaminated Smelter Soils. *Land Degradation and Development*, *26*(8), 785–792. https://doi.org/10.1002/ldr.2237

Sa'dah, N., Halim, A., & Zaitun, Z. (2022). Pengaruh Penggunaan Biochar Embedded Terhadap Pertumbuhan Dan Hasil Tanaman Selada Merah (Lactuca sativa var.red rapids). *Jurnal Ilmiah Mahasiswa Pertanian*, *7*(2), 39–46. https://doi.org/10.17969/jimfp.v7i2.20072

Sadhu, S., Saha, P., Sen, S. K., Mayilraj, S., & Maiti, T. K. (2013). Production, purification and characterization of a novel thermotolerant endoglucanase (CMCase) from Bacillus strain isolated from cow dung. *SpringerPlus*, *2*(1), 1–10. https://doi.org/10.1186/2193-1801-2-10

Saijo, & Susilo, D. E. H. (2021). Upaya Peningkatan Hasil Panen Terong Ungu Di Lahan Berpasir. *Prosiding Seminar Nasional Lingkungan Lahan Basah*, *6*(3), 1–7.

Sannino, F., & Gianfreda, L. (2001). Pesticide influence on soil enzymatic activities. *Chemosphere*, *45*(4–5), 417–425. https://doi.org/10.1016/S0045-6535(01)00045-5

Santi, L. P., & Goenadi, D. H. (2010). Pemanfaatan bio-char sebagai pembawa mikroba untuk pemantap agregat tanah Ultisol dari Taman Bogo-Lampung. *Menara Perkebunan*, *78*(2), 52–60.

Sardans, J., & Peñuelas, J. (2005). Drought decreases soil enzyme activity in a Mediterranean Quercus ilex L. forest. *Soil Biology and Biochemistry*, *37*(3), 455–461. https://doi.org/10.1016/j.soilbio.2004.08.004

Singleton, P., & Sainsbury, D. (2004). *Dictionary of Microbiology and Molecular Biology* (3rd Editio, Issue 1). John Wiley & Sons Ltd., The Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ, England.

Siregar, S. R., Zuraida, & Zuyasna. (2017). Pengaruh Kadar Air Kapasitas Lapang Terhadap Pertumbuhan Beberapa Genotipe M3 Kedelai (Glycine max L. Merr). *Jurnal Floratek*.

Skiba, U. (2008). Denitrification Denitrification Further Reading. *Encyclopedia of Ecology*, 866–871.

Spokas, K. A., Cantrell, K. B., Novak, J. M., Archer, D. W., Ippolito, J. A., Collins, H. P., Boateng, A. A., Lima, I. M., Lamb, M. C., McAloon, A. J., Lentz, R. D., & Nichols, K. A. (2012). Biochar: A Synthesis of Its Agronomic Impact beyond Carbon Sequestration. *Journal of Environmental Quality*, *41*(4), 973–989. https://doi.org/10.2134/jeq2011.0069

Stevenson, F. J. (2009). *Humus Chemistry: Genesis, Composition, Reactions* (2nd Editio). John Wiley and Sons. https://www.wiley.com/en-us/Humus+Chemistry%3A+Genesis%2C+Composition%2C+Reactions%2C+2nd+Edition-p-9780471594741

Subhani, A., Changyong, H., Zhengmiao, X., Min, L., & El-ghamry, A. M. (2001). Impact of Soil Environment and Agronomic Practices on Microbial/Dehydrogenase Enzyme Activity in Soil. A Review. *Pakistan Journal of Biological Sciences*, *4*(3), 333–338. https://doi.org/10.3923/pjbs.2001.333.338

Sujana, I. P. (2014). *Rehabilitasi Lahan Tercemar Limbah Garmen Dengan Pemberian Biochar* [Universitas Udayana]. https://e-perpus.unud.ac.id/repositori/disertasi?nim=1190471003

Sukartono, & Utomo, W. . (2012). Peranan Biochar Sebagai Pembenah Tanah Pada Pertanaman Jagung Di Tanah Lempung Berpasir (Sandy Loam) Semiarid Tropis Lombok Utara. *Jurnal Buana Sains*, *12*(1), 91–98.

Sukaryorini, P., Fuad, A. M., & Santoso, S. (2016). Pengaruh Macam Bahan Organik Terhadap Ketersedian Amonium (NH +), C-ORGANIK Dan Populasi Mikroorganisme Pada Tanah Entisol. *Plumula*, *5*(2), 99–106.

Sumarno, S., Purwanto, P., & Rakhmawati, S. (2018). Kajian Faktor Penyebab Kerusakan Tanah dalam Memproduksi Biomassa di Kecamatan Padas Kabupaten Ngawi. *Agrotechnology Research Journal*, *2*(1), 35–40. https://doi.org/10.20961/agrotechresj.v2i1.19980

Sunaryanto, R. (2017). Bioremediasi Hidrokarbon Minyak Bumi Menggunakan Isolat Indigenous. *Prosiding Seminar Nasional Inovasi Teknologi*, 147–153.

Sustawan, G., Satrawidana, I. D. K., & Wiratini, N. M. (2016). Analisis Logam Pb dan Cd pada Tanah Perkebunan Sayur di Desa Pancasari. *Jurnal Wahana Matematika Dan Sains*, *9*(2), 44–51. https://ejournal.undiksha.ac.id/index.php/JPM/article/view/12652/0

Syachroni, S. H. (2020). Kajian Beberapa Sifat Kimia Tanah Pada Tanah Sawah Di Berbagai Lokasi Di Kota Palembang. *Sylva: Jurnal Ilmu-Ilmu Kehutanan*, *8*(2), 60. https://doi.org/10.32502/sylva.v8i2.2697

Syamsidar, N. (2016). Analisis Kandungan Logam Berat Pada Tanah Pembuangan Limbah Industri Non-Pangan Di Kabupaten Gowa. In *Skripsi*. Jurusan Biologi, Fakultas Sains dan Teknologi, UIN Alauddin Makassar.

Tabatabai, M. A. (2018). Soil Enzymes. *Biokimia Tanah, Institut Pertanian Bogor*, *January*, 775–833. https://doi.org/10.2136/sssabookser5.2.c37

Taberima, S. (2004). Peranan Mikroorganisme dalam Mengurangi Efek Toksik pada Tanah Terkontaminasi Logam Berat. *Makalah Falsafah Sains, PPs 702*, 1–21. https://doi.org/10.13140/RG.2.1.3798.3764

Tian, Q., Chen, J., Zhang, H., & Xiao, Y. (2006). Study on the modified triphenyl tetrazolium chloride - Dehydrogenase activity (TTC-DHA) method in determination of bioactivity in the up-flow aerated bio-activated carbon filter. *African Journal of Biotechnology*, *5*(2), 181–188.

Tomczyk, A., Sokołowska, Z., & Boguta, P. (2020). Biochar physicochemical properties: pyrolysis temperature and feedstock kind effects. *Reviews in Environmental Science and Biotechnology*, *19*(1), 191–215. https://doi.org/10.1007/s11157-020-09523-3

USDA. (2003). Pastureland Soil Quality - Introduction. *USDA Natural Resources Conservation Service, July*.

Utobo dan Tewari L. (2015). Soil Enzymes As Bioindicators Of Soil Ecosystem Status. *Applied Ecology and Environmental Research*, *13*(1), 85–97. https://doi.org/10.15666/aeer/1301

UU Republik Indonesia No 32. (2009). Hukum Baku Mutu Lingkungan. *Baku Mutu Lingkungan Berdasarkan Undang- Undang Nomor 32 Tahun 2009 Tentang Perlindungan Dan Pengelolaan Lingkungan Hidup (UU 32/2009) Dan Rujukan Lain*, *2*(1), 1–8.

Veiga, M., & Baker, R. (2004). *Protocols for environmental and health assessment of mercury released by Artisanal and Small Scale Miners. Report to the Global Mercury Project: Removal of barriers to introduction of cleaner Artisanal Gold Mining and extraction technologies, GEF/UNDP/UNI*.

Voets, L., De Boulois, H. D., Renard, L., Strullu, D. G., & Declerck, S. (2005). Development of an autotrophic culture system for the in vitro mycorrhization of potato plantlets. *FEMS Microbiology Letters*, *248*(1), 111–118. https://doi.org/10.1016/j.femsle.2005.05.025

Wang, H., Ren, T., Feng, Y., Liu, K., Feng, H., Liu, G., & Shi, H. (2020). Effects of the Application of Biochar in Four Typical Agricultural Soils in China. *Journal Agronomy*, *10*(351).

Widowati, E. (2022). *Analisis Air Limbah Industri Kertas pada PT Pindo Deli Pulp and Paper Mills 2 Karawang* [Institut Pertanian Bogor]. https://sv.ipb.ac.id/

Widyasari, N. L., & Wiratama, I. G. N. M. (2021). Studi Teknik Bioremediasi Tanah Tercemar Logam Berat dengan Menggunakan Eco-Enzyme. *Jurnal Ecocentrism*, *1*(2), 88–95.

Widyati, E. (2013). Pentingnya Keragaman Fungsional Organisme Tanah Terhadap Produktivitas Lahan. *Tekno Hutan Tanaman*, *6*(1), 29–37.

Wolinska, A., & Stepniewsk, Z. (2012). Dehydrogenase Activity in the Soil Environment. *Dehydrogenases, Institute of Biotechnology, Lublin, Poland.*, *8*, 183–210. https://doi.org/10.5772/48294

Wróbel, M., Sliwakowski, W., Kowalczyk, P., Kramkowski, K., & Dobrzynski, J. (2023). Bioremediation of Heavy Metals by the Genus Bacillus. *International Journal of Environmental Research and Public Health Review*, *20*(4964), 1–17. https://doi.org/https://doi.org/10.3390/ijerph20064964

Wulandari, S., Dewi Nila Fitri, & Suwondo, S. (2005). Identifikasi Bakteri Pengikat Timbal (Pb) pada Sedimen di Perairan Sungai Siak. *Jurnal Biogenesis*, *1*(2), 62–65.

Xu, Y., Li, J., Hua, D., & Guo, Z. (2019). Remediation effect of biochar-plant on heavy metal contaminated soil in mining area. *IOP Conference Series: Earth and Environmental Science*, *300*(5). https://doi.org/10.1088/1755-1315/300/5/052039

Yang, F., Wang, B., Shi, Z., Li, L., Li, Y., Mao, Z., Liao, L., Zhang, H., & Wu, Y. (2021). Immobilization of heavy metals (Cd, Zn, and Pb) in different contaminated soils with swine manure biochar. *Environmental Pollutants and Bioavailability*, *33*(1), 55–65. https://doi.org/10.1080/26395940.2021.1916407

Yosephine, I. O., Sakiah, S., & Siahaan, E. A. L. (2020). Pemberian Beberapa Jenis Biochar Terhadap C-Organik dan N-Total Pada Pertumbuhan Bibit Kelapa Sawit. *Agrosains : Jurnal Penelitian Agronomi*, *22*(2), 79. https://doi.org/10.20961/agsjpa.v22i2.42154

Yu, X., Li, Y., Zhang, C., Liu, H., Liu, J., Zheng, W., Kang, X., Leng, X., Zhao, K., Gu, Y., Zhang, X., Xiang, Q., & Chen, Q. (2014). Culturable heavy metal-resistant and plant growth promoting bacteria in V-Ti magnetite mine tailing soil from Panzhihua, China. *PLoS ONE*, *9*(9). https://doi.org/10.1371/journal.pone.0106618

Yunita, M., Hendrawan, Y., & Yulianingsih, R. (2015). Analisis Kuantitatif Mikrobiologi Pada Makanan Penerbangan (Aerofood ACS) Garuda Indonesia. *Jurnal Keteknikan Pertanian Tropis Dan Biosistem*, *3*(3), 237–248.

Zhang, N., He, X. D., Gao, Y. B., Li, Y. H., Wang, H. T., Ma, D., Zhang, R., & Yang, S. (2010). Pedogenic Carbonate and Soil Dehydrogenase Activity in Response to Soil Organic Matter in Artemisia ordosica Community. *Pedosphere*, *20*(2), 229–235. https://doi.org/10.1016/S1002-0160(10)60010-0