

## DAFTAR PUSTAKA

- Aini, L. N., Mulyono, & Hanudin, E. (2016). Mineral Mudah Lapuk Material Piroklastik Merapi dan Potensi Keharaannya Bagi Tanaman. *Planta Tropika: Journal of Agro Science*, 4(2), 84–94. <https://doi.org/10.18196/pt.2016.060.84-94>
- Alloway, B. J. (2008). *Micronutrient Deficiency in Global Crop Production*. Springer.
- Anggraito, Y. U., Susanti, R., Iswari, R. S., Yuniastuti, A., Lisdiana, WH, N., ... Bintari, S. H. (2018). *Metabolit Sekunder Dari Tanaman: Aplikasi Dan Produksi. Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Negeri Semarang*. Semarang: Universitas Negeri Semarang.
- Aqeel, U., Aftab, T., Khan, M. M. A., & Naeem, M. (2023). Regulation of essential oil in aromatic plants under changing environment. *Journal of Applied Research on Medicinal and Aromatic Plants*, 32, 1–13. <https://doi.org/10.1016/j.jarmap.2022.100441>
- Auld, D. S. (2009). The ins and outs of biological zinc sites. *BioMetals*, 22(1), 141–148. <https://doi.org/10.1007/s10534-008-9184-1>
- Badgujar, S. B., Patel, V. V., & Bandivdekar, A. H. (2014). *Foeniculum vulgare* Mill: A review of its botany, phytochemistry, pharmacology, contemporary application, and toxicology. *BioMed Research International*, 2014, 1–32. <https://doi.org/10.1155/2014/842674>
- Balittan. (2023). *Analisis Kimia Tanah, Tanaman, Air, Dan Pupuk. Petunjuk Teknis Edisi 3*. Kementerian Pertanian Republik Indonesia. Retrieved from <https://tanahpupuk.bsip.pertanian.go.id>
- Barak, P., & Helmke, P. A. (1993). The Chemistry of Zinc. In A. D. Robson (Ed.), *Zinc in Soils and Plants* (pp. 1–13). Kluwer Academic Publishers. [https://doi.org/10.1007/978-94-011-0878-2\\_1](https://doi.org/10.1007/978-94-011-0878-2_1)
- Batiha, G. E.-S., Beshbishy, A. M., Ikram, M., Mulla, Z. S., El-Hack, M. E. A., Taha, A. E., ... Elewa, Y. H. A. (2020). The Pharmacological Activity, Biochemical Properties, and Pharmacokinetics of the Major Natural Polyphenolic Flavonoid: Quercetin. *Foods*, 9, 1–16. <https://doi.org/10.3390/foods9030374>
- Bermawie, N., Ajjiah, N., & Rostiana, O. (2018). Karakterisasi Morfologi dan Mutu Adas (*Foeniculum vulgare* Mill). *Balai Penelitian Tanaman Rempah Dan Obat*, 13(2), 25–32.
- Böttger, A., Vothknecht, U., Bolle, C., & Wolf, A. (2018). Plant Secondary Metabolites and Their General Function in Plants (pp. 3–17). [https://doi.org/10.1007/978-3-319-99546-5\\_1](https://doi.org/10.1007/978-3-319-99546-5_1)
- Brunetti, C., Ferdinando, M. Di, Fini, A., Pollastri, S., & Tattini, M. (2013). Flavonoids as antioxidants and developmental regulators: Relative significance in plants and humans. *International Journal of Molecular Sciences*, 14(2), 3540–3555. <https://doi.org/10.3390/ijms14023540>
- Buntain, M., & Chung, B. (1994). Effects of Irrigation and Nitrogen on the Yield Components of Fennel (*Foeniculum Vulgare* Mill.). *Australian Journal of Experimental Agriculture*, 34(6), 845–849. <https://doi.org/10.1071/EA9940845>

- Buol, S. W., Southard, R. J., Graham, R. C., & McDaniel, P. A. (2011). *Soil Genesis and Classification: Sixth Edition. Soil Genesis and Classification: Sixth Edition* (1). West Sussex: John Wiley & Sons, Inc. <https://doi.org/10.1002/9780470960622>
- Cakmak, I., Öztürk, L., Karanlık, S., Marschner, H., & Ekiz, H. (1996). Zinc-efficient wild grasses enhance release of phytosiderophores under zinc deficiency. *Journal of Plant Nutrition*, 19(3–4), 551–563. <https://doi.org/10.1080/01904169609365142>
- Coban, F., Ozer, H., Ors, S., Sahin, U., Yildiz, G., & Cakmakci, T. (2018). Effects of deficit irrigation on essential oil composition and yield of fennel (*Foeniculum vulgare* Mill) in a high-altitude environment. *Journal of Essential Oil Research*, 30(6), 457–463. <https://doi.org/10.1080/10412905.2018.1496156>
- Dabbagh-Bazarbachi, H., Clergeaud, G., Quesada, I. M., Ortiz, M., O’Sullivan, C. K., & Fernández-Larrea, J. B. (2014). Zinc ionophore activity of quercetin and epigallocatechin-gallate: From hepa 1-6 cells to a liposome model. *Journal of Agricultural and Food Chemistry*, 62(32), 8085–8093. <https://doi.org/10.1021/jf5014633>
- David, A. V. A., Arulmoli, R., & Parasuraman, S. (2016). Overviews of Biological Importance of Quercetin: A Bioactive Flavonoid. *Pharmacognosy Reviews*, 10, 84–89. <https://doi.org/10.4103/0973-7847.194044>
- Erb, M., & Kliebenstein, D. J. (2020). Plant Secondary Metabolites as Defenses, Regulators, and Primary Metabolites: The Blurred Functional Trichotomy1[OPEN]. *Plant Physiology*, 184(1), 39–52. <https://doi.org/10.1104/PP.20.00433>
- Faizi, N., & Alvi, Y. (2023). *BIOSTATISTICS MANUAL FOR HEALTH RESEARCH: A Practical Guide to Data Analysis. Вестник Росздравнадзора* (Vol. 4). Academic Press.
- Fariduddin, Q., Saleem, M., Khan, T. A., & Hayat, S. (2022). Zinc as a Versatile Element in Plants: An Overview on Its Uptake, Translocation, Assimilatory Roles, Deficiency and Toxicity Symptoms. In S. T. Khan & A. Malik (Eds.), *Microbial Biofertilizers and Micronutrient Availability: The Role of Zinc in Agriculture and Human Health* (pp. 137–158). Switzerland: Springer. [https://doi.org/10.1007/978-3-030-76609-2\\_7](https://doi.org/10.1007/978-3-030-76609-2_7)
- Hanudin, E. (2011). Pendekatan Agrogeologi dalam Pemulihan Lahan Pertanian Pasca Erupsi Merapi. In D. P. Ariyanto, Komariah, & V. R. Cahyani (Eds.), *Upaya Pemulihan Lahan Akibat Erupsi Gunungapi* (pp. 3–22). Surakarta: Jurusan Ilmu Tanah Fakultas Pertanian UNS & Himpunan Ilmu Tanah Indonesia.
- Hasanah, M. (2004). Perkembangan Teknologi Budi Daya Adas (*Foeniculum vulgare* Mill.). *Jurnal Litbang Pertanian*, 23(4), 139–144.
- Havlin, J. (2005). *Soil fertility and fertilizers : an introduction to nutrient management*. Delhi: Pearson India Education Services Pvt. Ltd.
- Hosseini, E. S., Majidi, M. M., Ehtemam, M. H., & Hughes, N. (2023). Characterization of fennel germplasm for physiological persistence and drought recovery: Association with biochemical properties. *Plant Physiology and Biochemistry*, 194, 499–512. <https://doi.org/10.1016/j.plaphy.2022.11.037>

- Husna, P. A. U., Kairupan, C. F., & Lintong, P. M. (2022). Tinjauan Mengenai Manfaat Flavonoid pada Tumbuhan Obat Sebagai Antioksidan dan Antiinflamasi. *EBiomedik*, *10*(1), 76–83. <https://doi.org/10.35790/ebm.v10.i1.38173>
- Jan, R., Asaf, S., Numan, M., Lubna, & Kim, K. M. (2021). Plant secondary metabolite biosynthesis and transcriptional regulation in response to biotic and abiotic stress conditions. *Agronomy*. MDPI AG. <https://doi.org/10.3390/agronomy11050968>
- Jogawat, A., Yadav, B., Chhaya, Lakra, N., Singh, A. K., & Narayan, O. P. (2021). Crosstalk between phytohormones and secondary metabolites in the drought stress tolerance of crop plants: A review. *Physiologia Plantarum*, 1–27. <https://doi.org/10.1111/ppl.13328>
- Kaur, H., & Garg, N. (2021). Zinc toxicity in plants: a review. *Planta*, *253*(6), 1–28. <https://doi.org/10.1007/s00425-021-03642-z>
- Kochian, L. V. (1993). Zinc Absorption from Hydroponic Solutions by Plant Roots. In A. D. Robson (Ed.), *Zinc in Soils and Plants* (pp. 45–57). Kluwer Academic Publishers. [https://doi.org/10.1007/978-94-011-0878-2\\_4](https://doi.org/10.1007/978-94-011-0878-2_4)
- Kumari, S., Nazir, F., Maheshwari, C., Kaur, H., Gupta, R., Siddique, K. H. M., & Khan, M. I. R. (2024). Plant hormones and secondary metabolites under environmental stresses: Enlightening defense molecules. *Plant Physiology and Biochemistry*, *206*(August 2023), 1–18. <https://doi.org/10.1016/j.plaphy.2023.108238>
- Kusbiantoro, D., & Purwaningrum, Y. (2018). Pemanfaatan kandungan metabolit sekunder pada tanaman kunyit dalam mendukung peningkatan pendapatan masyarakat. *Kultivasi*, *17*(1), 544–549. <https://doi.org/10.24198/kultivasi.v17i1.15669>
- Longnecker, N. E., & Robson, A. D. (1993). Distribution and Transport of Zinc in Plants. In A. D. Robson (Ed.), *Zinc in Soils and Plants* (pp. 79–91). Kluwer Academic Publishers. [https://doi.org/10.1007/978-94-011-0878-2\\_6](https://doi.org/10.1007/978-94-011-0878-2_6)
- Majdoub, N., el-Guendouz, S., Rezgui, M., Carlier, J., Costa, C., Kaab, L. B. Ben, & Miguel, M. G. (2017). Growth, photosynthetic pigments, phenolic content and biological activities of *Foeniculum vulgare* Mill., *Anethum graveolens* L. and *Pimpinella anisum* L. (Apiaceae) in response to zinc. *Industrial Crops and Products*, *109*, 627–636. <https://doi.org/10.1016/j.indcrop.2017.09.012>
- Malhotra, S. K. (2012). *Fennel and fennel seed. Handbook of Herbs and Spices: Second Edition* (Second Edi, Vol. 2). Woodhead Publishing Limited. <https://doi.org/10.1533/9780857095688.275>
- Malidi, L. (2005). *Karakteristik Inceptisol pada toposekuen lereng selatan Gunung Merapi Kabupaten Sleman*. Universitas Gadjah Mada.
- Marschner, H. (1993). Zinc Uptake from Soils. In A. D. Robson (Ed.), *Zinc in Soils and Plants* (pp. 59–77). Kluwer Academic Publishers. [https://doi.org/10.1007/978-94-011-0878-2\\_5](https://doi.org/10.1007/978-94-011-0878-2_5)
- Mengel, K., Kirkby, E. A., Kosegarten, H., & Appel, T. (2001). *Principles of Plant Nutrition*. (K. Mengel, E. A. Kirkby, H. Kosegarten, & T. Appel, Eds.), *Principles of Plant Nutrition*. Dordrecht: Springer Netherlands. <https://doi.org/10.1007/978-94-010-1009-2>
- Mir, B. A., Khan, T. A., & Fariduddin, Q. (2015). 24-epibrassinolide and spermidine

modulate photosynthesis and antioxidant systems in *Vigna radiata* under salt and zinc stress. *International Journal of Advanced Research*, 3(5), 592–608. Retrieved from <http://www.journalijar.com>

- Mortvedt, J. J. J., & Gilkes, R. J. J. (1993). Zinc Fertilizers. In A. D. Robson (Ed.), *Zinc in Soils and Plants* (pp. 33–42). Kluwer Academic Publishers. <https://doi.org/10.1007/978-94-011-0878-2>
- Ninkuu, V., Zhang, L., Yan, J., Fu, Z., Yang, T., & Zeng, H. (2021, June 1). Biochemistry of terpenes and recent advances in plant protection. *International Journal of Molecular Sciences*. MDPI. <https://doi.org/10.3390/ijms22115710>
- Nurilmi, Achmad, M., & Suhardi. (2017). PendugaanLengas Tanah Inceptisol Pada Tanaman Hortikultura Menggunakan Citra Landsat 8. *Agritechno*, 10(2), 135–151.
- Park, J. S., & Lee, E. J. (2019). Waterlogging induced oxidative stress and the mortality of the Antarctic plant, *Deschampsia antarctica*. *Journal of Ecology and Environment*, 43(1), 1–8. <https://doi.org/10.1186/s41610-019-0127-2>
- Parmoon, G., Ebadi, A., Hashemi, M., Hawrylak-Nowak, B., Baskin, C., & Jahanbakhsh, S. (2022). Plant Growth Regulators Improve Grain Production and Water Use Efficiency of *Foeniculum vulgare* Mill. under Water Stress. *Plants*, 11(13), 1–14. <https://doi.org/10.3390/plants11131718>
- Pothitirat, W., Chomnawang, M. T., Supabphol, R., & Gritsanapan, W. (2009). Comparison of bioactive compounds content, free radical scavenging and anti-acne inducing bacteria activities of extracts from the mangosteen fruit rind at two stages of maturity. *Fitoterapia*, 80(7), 442–447. <https://doi.org/10.1016/j.fitote.2009.06.005>
- Rajabi, A., Ehsanzadeh, P., & Razmjoo, J. (2019). Partial Relief of Drought-Stressed Fennel (*Foeniculum vulgare* Mill.) in Response to Foliar-Applied Zinc. *Pedosphere*, 29(6), 752–763. [https://doi.org/10.1016/S1002-0160\(17\)60438-7](https://doi.org/10.1016/S1002-0160(17)60438-7)
- Rebey, I. B., Jabri-Karoui, I., Hamrouni-Sellami, I., Bourgou, S., Limam, F., & Marzouk, B. (2012). Effect of drought on the biochemical composition and antioxidant activities of cumin (*Cuminum cyminum* L.) seeds. *Industrial Crops and Products*, 36(1), 238–245. <https://doi.org/10.1016/j.indcrop.2011.09.013>
- Rifqiyati, N., Sulistiyawati, & Sunaini. (2016). Pengaruh Ekstrak Ethanol Daun Adas (*Foeniculum vulgare* Mill.) Pada Induk Tikus (*Rattus norvegicus*) Masa Laktasi Terhadap Pertumbuhan Anak. *Integrated Lab Journal*, 4(2), 199–206. Retrieved from <http://202.0.92.5/pusat/integratedlab/article/view/1134>
- Rini, D. S., Budiarjo, Gunawan, I., Agung, R. H., & Munazar, R. (2020). Mekanisme Respon Tanaman terhadap Cekaman Kekeringan. *Berita Biologi: Jurnal Ilmu-Ilmu Hayati*, 19(3B), 373–384.
- Rudani, K., Patel, V., & Prajapati, K. (2018). The Importance of Zinc in Plant Growth—a Review. *International Research Journal of Natural and Applied Sciences*, 5(2), 38–48. Retrieved from [www.aarf.asia](http://www.aarf.asia),
- Rusman, I. (2005). *Kajian sifat fisika, kimia dan beberapa aspek pengelolaan tanah pada toposekuen lereng selatan tanah abu volkan Merapi Kabupaten Sleman*. Universitas Gadjah Mada.

- Saleem, M. H., Usman, K., Rizwan, M., Jabri, H. Al, & Alsafran, M. (2022). Functions and strategies for enhancing zinc availability in plants for sustainable agriculture. *Frontiers in Plant Science*, 13(October 2022). <https://doi.org/10.3389/fpls.2022.1033092>
- Sharma, A., Patni, B., Shankhdhar, D., & Shankhdhar, S. C. (2013). Zinc – An Indispensable Micronutrient. *Physiol Mol Biol Plants*, 19(1), 11–20. <https://doi.org/10.1007/s12298-012-0139-1>
- Sharma, C. P. (2006). *Plant Micronutrients*. Plant Micronutrients. Science Publishers. <https://doi.org/10.1201/9781482280425>
- Shen, N., Wang, T., Gan, Q., Liu, S., Wang, L., & Jin, B. (2022). Plant flavonoids: Classification, distribution, biosynthesis, and antioxidant activity. *Food Chemistry*, 383, 1–13. <https://doi.org/10.1016/j.foodchem.2022.132531>
- Siddiqui, H., Singh, P., Arif, Y., Sami, F., Naaz, R., & Hayat, S. (2022). Role of Micronutrients in Providing Abiotic Stress Tolerance. In S. T. Khan & A. Malik (Eds.), *Microbial Biofertilizers and Micronutrient Availability: the Role of Zinc in Agriculture and Human Health* (pp. 115–136). Springer. [https://doi.org/10.1007/978-3-030-76609-2\\_6](https://doi.org/10.1007/978-3-030-76609-2_6)
- Simoen, S. (2001). Sistem Akuifer di Lereng Gunungapi Merapi Bagian Timur dan Tenggara: Studi kasus di kompleks mataair Sungsang Boyolali Jawa Tengah. *Majalah Geografi Indonesia*, 15(1), 1–16.
- Šola, I., Stić, P., & Rusak, G. (2021). Effect of flooding and drought on the content of phenolics, sugars, photosynthetic pigments and vitamin C, and antioxidant potential of young Chinese cabbage. *European Food Research and Technology*, 247(8), 1913–1920. <https://doi.org/10.1007/s00217-021-03759-1>
- Sousa, S. F., Lopes, A. B., Fernandes, P. A., & Ramos, M. J. (2009). The Zinc proteome: A tale of stability and functionality. *Dalton Transactions*, (38), 7946–7956. <https://doi.org/10.1039/b904404c>
- Staff, S. S. (2014). *Keys to Soil Taxonomy*. USDA (Twelfth). [https://doi.org/10.1007/978-1-4020-3995-9\\_269](https://doi.org/10.1007/978-1-4020-3995-9_269)
- Taiz, L., & Zeiger, E. (2002). *Plant Physiology*. Sinauer Associates, Inc.
- Vardavas, C. I., Majchrzak, D., Wagner, K. H., Elmadfa, I., & Kafatos, A. (2006). Lipid concentrations of wild edible greens in Crete. *Food Chemistry*, 99(4), 822–834. <https://doi.org/10.1016/j.foodchem.2005.08.058>
- Vongsak, B., Sithisarn, P., Mangmool, S., Thongpraditchote, S., Wongkrajang, Y., & Gritsanapan, W. (2013). Maximizing total phenolics, total flavonoids contents and antioxidant activity of Moringa oleifera leaf extract by the appropriate extraction method. *Industrial Crops and Products*, 44, 566–571. <https://doi.org/10.1016/j.indcrop.2012.09.021>
- Wilding, L. P., Smeck, N. E., & Hall, G. F. (1983). *PEDOGENESIS AND SOIL TAXONOMY: I. Concepts and Interactions*. *Developments in Soil Science* (Vol. 11). ELSEVIER SCIENCE PUBLISHERS B.V. [https://doi.org/10.1016/S0166-2481\(08\)70599-3](https://doi.org/10.1016/S0166-2481(08)70599-3)
- Yang, L., Yang, L., Yang, X., Zhang, T., Lan, Y., Zhao, Y., ... Yang, L. (2020). Drought stress induces biosynthesis of flavonoids in leaves and saikosaponins in roots of



Bupleurum chinense DC. *Phytochemistry*, 177, 1–12.  
<https://doi.org/10.1016/j.phytochem.2020.112434>

Yousaf, H. K., Shan, T., Chen, X., Ma, K., Shi, X., Desneux, N., ... Gao, X. (2018). Impact of the secondary plant metabolite Cucurbitacin B on the demographical traits of the melon aphid, *Aphis gossypii*. *Scientific Reports*, 8(1), 1–10. <https://doi.org/10.1038/s41598-018-34821-w>