



DAFTAR PUSTAKA

- Abdurachman, A. A., Dariah, & A. Mulyani. 2008. Strategi dan teknologi pengelolaan lahan kering mendukung pengadaan pangan nasional. *Jurnal LitbangPertanian*. 27(2) : 43-49
- Acharya, T. P., M. S., Reiter, G. Welabum, & R. A. Arancibia. 2020. Nitrogen uptake and use efficiency in sweet basil production under low tunnels. *HortScience*. 55(1): 429–435.
- Agostini, T.S., R. F. Vieira, H. R. Bizzo, D. Silveira, & M. A. Gimenes. 2012. Chapter 8: Secondary Metabolites. pp.131–164. In Dhanarasu, Sasikumar (Eds) Biochemistry, Genetics, and Molecular Biology "Chromatography and Its Applications"
- Ahmed, A. , E. Tantawy, M. S. Hend, & H. Amal. 2023. Utilization of some organic wastes as growing media for improving plant, growth and chemical compositions in madagascar periwinkle. *Scientific Journal of Agricultural Sciences*. 5(3) : 38 – 51.
- Alhverdizadeh, S & D. Elham. 2023. Effect of humic acid and vermicompost on some vegetative indices and proline content of catharanthus roseous under low water stress. *Environment and Water Engineering*. 9(1): 141 – 152.
- Ali, M. 2015. Pengaruh dosis pemupukan NPK terhadap produksi dan kandungan Capsaicin pada buah tanaman cabe rawit (*Capsicum frutescens* L.). *Jurnal Agrosains Karya Kreatif dan Inovatif*. 2(2):171 – 178.
- Alista, F. A. & Sumarno. 2021. Analisis permeabilitas tanah lapisan atas dan bawah di lahan kopi robusta. *Jurnal Tanah dan Sumberdaya Lahan*. 8(2) : 493 – 504.
- Allohverdi, T. K. M. Amar, R. Poritosh, & M. Manjusri. 2021. A review on current status of biochar uses in agriculture. *Molecules* 26: 1–17.
- Apulina, A. 2019. Study of physical and chemical inceptisol soil characteristic on produced rubber plantation with several of vegetations that grow in PTPN III Sarang Giting. *J.Rekayasa Pangan dan Pertanian*. 7(2) : 104 – 110.
- Arafat, Y., N. Kusumarini, & Syekhfani. 2016. Pengaruh pemberian zeolit terhadap efisiensi pemupukan fosfor dan pertumbuhan jagung manis di Pasuruan, Jawa Timur. *Jurnal Tanah dan Sumberdaya Lahan*. 3(1). 319 – 327.
- Arora, R., M. Poonam, K. M. Ajay, M. Archna, C. M. Govil, & P. S. Ahuja. 2017. Anticancer alkaloids of *Catharanthus roseus*: transition from traditional to modern medicine. *Researchgate*: 292–312. DOI: 10.5005/jp/books/11166_21.
- Aruna, M.S., M. S. Prabha, N. S. Priya, & R. Nadendla. 2015. *Catharanthus roseus*: ornamental plant is now medicinal boutique. *Journal of Drug Delivery and Therapeutics*, 5(3): 1–4. <https://doi.org/10.22270/jddt.v5i3.1095>.
- Aslam, M. A., I. Aziz, S. H. Shah, S. Muhammad, M. Latif, & A. Khalid. 2021. Effects of biochar and zeolite integrated with nitrogen on soil characteristics, yield and quality of maize (*Zea Mays* L.). *Pak. J. Bot*. 53(6): 2047–2057.



- Aslani, P., M. Davari, M. A. Mahmoodi, F. Hosseinpanahi, & N. Khaleghpanah. 2021. Effect of Zeolite and Nitrogen on Some Basic Soil Properties and Wheat Yield in Potato-Wheat Rotation. *Agricultural Engineering - Scientific Journal of Agriculture*. 44(1): 97–119.
- Aziz, A. T., Bondok, M. E. Walaa, Mousa, M. S. Asmaa, & M. Khalil. 2022. Phenotypical, physiological and molecular assessment of drought tolerance of five Egyptian teosinte genotypes. *Plant-Environment Interactions*. 17(1) : 656 – 673.
- Badan Pusat Statistik. 2019. *Analisis Komoditas Pertanian: Sektor Pertanian, Industri dan Pertambangan*. BPS RI.
- Balai Penelitian Tanah. 2009. Analisis Kimia Tanah, Tanaman, Air, dan Pupuk. Balai Penelitian Tanah. Bogor.
- Banna, M. Z. & A. Widiastini. 2021. The potential of bacteria from bamboo in producing Indole Acetic Acid (IAA). *Agrosaintek*. 5(1): 72 – 80. DOI: <https://doi.org/10.33019/agrosainstek.v5i1.233>.
- Basuki & K. S. Vega. 2019. Efektivitas dolomit dalam mempertahankan ph tanah Inceptisol perkebunan tebu Blimbing Djatiroto. *Buletin Tanaman Tembakau, Serat dan Minyak Industri*. 11(2): 58 – 64.
- Bates, L.S., R. P. Waldren, & I. D. Teare. 1973. Rapid determination of free proline water stress studies. *Plant Soil* 39: 205–207.
- Bouremani, N., C. S. Hafsa, S. Allaoua, C. B. Ali, L. Lenka, N. Faizah, B. Oleg, & B. Lassaad. 2023. Plant Growth-Promoting Rhizobacteria (PGPR): A rampart against the adverse effects of drought stress. *Water*. 15(3): 418 <https://doi.org/10.3390/w15030418>.
- Carmo, D. L. D., L. B. D. Lima, & C. A. Silva. 2016. Soil fertility and electrical conductivity affected by organic waste rates and nutrient inputs. *Revista Brasileira De Ciência Do Solo*. 40.
- Chen, J., L. Liu, Z. Wang, Y. Zhang, H. Sun, & S. Song. 2020. Nitrogen fertilization increases root growth and coordinates the root–shoot relationship in cotton. *Front. Plant Sci.* 11. doi: 10.3389/fpls.2020.00880
- Christianson, J. A., D. J. Llewellyn, E. S. Dennis, & I. W. Wilson. 2010. Global Gene Expression Responses to Waterlogging in Roots and Leaves of Cotton (*Gossypium hirsutum* L.). *Plant and Cell Physiology*. 51(1): 21–37. <https://doi.org/10.1093/pcp/pcp163>.
- Deng, R., L. Ziyu, S. Xulan, & Z. Shengzuo. 2022. Effects of biochar application pyrolyzed at different temperatures on soil properties, growth and leaf secondary metabolite accumulation in *Cyclocarya paliurus*. *Forest*. 13(10): 1572. <https://doi.org/10.3390/f13101572>.
- Dewi, U.K. & R. S. Tyas. 2009. Efek rebusan daun tapak dara pada dosis dan frekuensi yang berbeda terhadap kerusakan dan akumulasi glikogen pada hepar mencit (*Mus musculus*). *Bioma* 11(1): 1–5.
- Dhillon, J., C. Del, B. Figueiredo, E. Nambi, & W. Raun. 2018. Soil organic carbon, total nitrogen, and soil pH, in a long-term continuous winter wheat (*Triticum aestivum* L.) Experiment. *Communications in Soil Science and Plant Analysis*. 12: 1 – 12.



- Dhyani, P., Q. Cristina, S. Eshita, B. Amit, S. Priyanka, C. A. Dharam, S. Jayad, O. Anca, M. Ileana, C. Daniela, & C. William. 2022. Anticancer potential of alkaloids: a keyemphasis to colchicine, vinblastine, vincristine, vindesine, vinorelbine and vincamine: review. *Cancer Cell International* 22: 1–20.
- Ding, Y., Y. Liu, W. Wu, D. Shi, M. Yang, Z. Zhong. 2010. Evaluation of biochar effects on nitrogen retention and leaching in multi-layered soil columns. *Water, Air, Soil Pollut.* 213 (1), 47e55.
- Djaenudin, D., H. Marwan, H. Subagjo, & A. Hidayat. 2011. Petunjuk Teknis Evaluasi Lahan Untuk Komoditas Pertanian. Balai Besar Litbang Sumberdaya Lahan Pertanian. Bogor
- Dullah, I.C., Sulandjari, & Supriyono. 2019. Abiotic stress and biofertilizer on the *Pereskia bleo* (Kunth) Dc. against growth, proline, and antioxidant. *Jurnal Science and Agroclimatology* 16(1): 36–45.
- Elgami, N. M., B. Adel, Heba, Shehata, & T. A. Magdi. 2022. Effective microorganisms improve growth, nutrients uptake, normalized difference vegetation index, photosystem ii, and essential oil while reducing canopy temperature in water-stressed *Salvia sclarea* plants. *Hindawi*. <https://doi.org/10.1155/2022/1767347>.
- Fahmi, A., Syamsudin, N. H. U. Sri., & R. Bostang. 2010. The effect of interaction of nitrogen and phosphorus nutrients on maize (*Zea mays* L.) grown in regosol and latosol soils. *Berita Biologi*. 10(3): 297 – 305.
- Fauzi, I., Sulistryawati & T. P. Retno. 2021. The effect of nitrogen fertilizer dosage on growth and results palm plants (*Brassica juncea* L.) samhong king variety. *Jurnal Agroteknologi Merdeka Pasuruan*. 5(2): 37 – 43.
- Frerier, D. R. 2014. *Biokimia: Lippincott's Illustrated Review*. Edisi Keenam. Binarupa Aksara. Tangerang Selatan.
- Firmansyah, I & N. Sumarni. 2013. Effect of N fertilizer dosages and varieties on soil pH, soil total-N, N uptake, and yield of shallots (*Allium ascalonicum* L.) varieties on entisols-Brebes Central Java. *J.hort.* 23(4) : 358 – 364.
- Foth, D. 2010. *Fundamentals of Soil Science*. John Wiley & and Sons. New York.
- Fowler, M. W. 1983. *Comercial Application And Economic Aspects of Mass Plant Cell Culture*. In: *Plant Biotechnology*. Mantell Smith, H. Cambridge University Press. London.
- Gao, Y., F. Zheng, V. W. Lukas, B. Nanhi, D. Da, F. Bert, M. Jun, Fangbai, C. Feng, & W. Hallong. 2020. A critical review of biochar-based nitrogen fertilizers and their efects on crop production and the environment. *Biochar* 4 : 36 – 55.
- Ghorbani, M., A. Hossein, & A. Sepideh. 2019. Effects of rice husk biochar on selected soil properties and nitrate leaching in loamy sand and clay soil. *International Soil and Water Conservation Research*. 7(3): 258 – 265. <https://doi.org/10.1016/j.iiswcr.2019.05.005>.
- Ghorbani, M., E. Amirahmadi, P. Konvalina, J. Moudry, J. Barta, M. Kopecky, R. I. Teodorescu, & R. D. Bucur. 2022. Comparative influence of *biochar* and zeolite on soil hydrological indices and growth characteristics of corn (*Zea Mays* L.). *J. Water*. 14(21): 3506.



- Ghosh, U.K., M. N. Islam, Siddiqui, X. Cao, & M. A. R. Khan. 2021. Proline, a multifaceted signalling molecule in plant responses to abiotic stress: understanding the physiological mechanisms. *Plant Biology* 24(2): 227–239.
- Glaser, B., J. Lehmann, & W. Zech. 2002. Ameliorating physical and chemical properties of highly weathered soils in the tropics with charcoal: a review. *Biol Fertil Soils* 35: 219–230.
- Gunawan, N. Wijayanto, & S. W. Budi. 2019. Karakteristik sifat kimia tanah dan status kesuburan tanah pada agroforestri tanaman sayuran berbasis *Eucalyptus* Sp. *Jurnal Silvikultur Tropika*. 10(2) : 58 – 64.
- Hadir, S., T., Gaiser, H. Hüging, M. Athmann, D. Pfarr, R. Kemper. 2021. Sugar beet shoot and root phenotypic plasticity to nitrogen, phosphorus, potassium and lime omission. *Agriculture*. 11(21). doi: 10.3390/agriculture11010021
- Hale S. E., V. Alling, V. Martinsen, J. Mulder, G. D. Breedveld, & G. Cornelissen. 2013. The Sorption and Desorption of PHospHate-P, Ammonium-N and Nitrate-N in Cacao Shell and Corn Cob Biochars. *Chemosphere* 91 (2013) 1612–1619.
- Han, Y., Q. Chenchen, X. Hu, P. Wang, D. Wan, P. Cai, P. Chen, Q. Huang, & X. Rong. 2021. Warming and humidification mediated changes of DOM composition in an Alfisol. *Science of Total Environment* 805: 1–9.
- Hanudin, E. 2000. *Pedoman Analisis Kimia Tanah (Dilengkapi dengan Teori, Prosedur dan Keterangan)*. Jurusan Tanah, Fakultas Pertanian. Universitas Gadjah Mada. Yogyakarta.
- Hardjowigeno, S. 2003. *Klasifikasi Tanah dan Pedogenesis*. Akademika Pressindo. Jakarta.
- Haryati, U. 2014. Karakteristik fisik tanah kawasan budidaya sayuran dataran tinggi hubungannya dengan strategi pengelolaan lahan. *Jurnal Sumberdaya Lahan*. 8(2): 125 – 138.
- Hashemabadi, D., S. Fatemeh, K. Behzad, & H. A. Mohammad. 2018. Organic N fertilizer, rhizobacterial inoculation and fungal compost improve nutrient uptake, plant growth and the levels of vindoline, ajmalicine, vinblastine, catharanthine and total alkaloids in *Catharanthus roseus* L. *Folia Hort.* 30(2) : 203 – 213.
- Hassan, F. A. S., E. Ali, A. Gaber, M. I. Fetouh, & R. Mazrou. 2021. Chitosan nanoparticles effectively combat salinity stress by enhancing antioxidant activity and alkaloid biosynthesis in *Catharanthus roseus* (L.) G. Don. *Plant Physiology and Biochemistry*. 162: 191 – 200.
- Hassan, R. A., A. H. Amira, & A. E. E. Azza. 2009. Effect of Nitrogen and potassium fertilization on Growth, Yield, and Alkaloidal Content of Periwinkle (*Catharanthus roseus* L G. Don). *Medicinal and Aromatic Plant Science and Biotechnology*. 3(1) : 24 – 26.
- Havlin, J. L., S. L. Tisdale, W. L. Nelson, & J. D. Beaton. 2019. *Soil Fertility and Fertilizer: An Introduction to Nutrient Management*. India: Pearson India Education Service Pvt. Ltd.
- Hien, T.T., T. Toshiki, T. Tomoyuki, & S. Yoshiyuki. 2020. Enhancing soil water holding capacity and provision of a potassium source via optimization



of the pyrolysis of bamboo biochar. *Biochar.* 1–11.
<https://doi.org/10.1007/s42773-020-00071-1>.

Hua, L., W. Wu, Y. Liu, M.B. McBride, & Y. Chen. 2009. Reduction of nitrogen loss and Cu and Zn mobility during sludge composting with bamboo charcoal amendment. *Environmental Science and Pollution Research* 16: 1–9.

Hutapea, S. 2015. Utilization Of Rubber Seed Shells And Epicarp Wastes As Activated Biochar. *Journal Of Chemistry and Material Research*. Vol 7.

Iskandar, N. N & Irawati. 2016. Vinblastine and vincristine production on madagascar periwinkle (*Catharanthus roseus* (L.) G. Don) callus culture treated with polyethylene glycol. *Makara Journal of Science*. 20(1) : 7 – 16.

Ismail, M. & A. B. Basri. 2011. *Pemanfaatan Biochar untuk Perbaikan Kualitas Tanah*. Balai Pengkajian Teknologi Pertanian (BPTP) Aceh.

Jakli, M. H., & T. Merle. 2019. Critical leaf magnesium thresholds and the impact of magnesium on plant growth and photo-oxidative defense: a systematic review and meta-analysis from 70 years of research. *Plant Nutrition*. 10(1) : 1 – 15.

Jayaraj, A.J., U. Jothi, G. Thiagarajan, & T. Sivakumar. 2019. Evaluation of antimicrobial activity and phytochemicals analysis of whole plant extract of *Vinca rosea*. *Asian Jounal of Phamaceutical and Clinical Research* 12(8): 132–136.

Kadhim, A. A., A. H. Ahad, A. Sawsan, & L. Abdul. 2020. Effect of biofertilizer and chitosan on medicinal active compounds of salty stressful vinca plants. *Plant Archives*. 20(2) : 116 – 125.

Kakanga, C. J. R., S. A. Nio, S. Parluhutan. 2017. Rasio akar:tajuk tanaman padi lokal sulawesi utara yang mengalami cekaman banjir dan kekeringan pada fase vegetatif. *Bioslogos*. 7(1): 17 – 22.

Kamariah, N. 2022. Respons pertumbuhan jagung ungu (*Zea mays* L.) pada berbagai cekaman salinitas. *Jurnal Ilmu Pertanian*. 10(1): 125 – 134.

Karhu, K., S. Kalu, A. Seppanen, B. Kitzler, & E. Virtanen. 2021. Potential of biochar soil amendments to reduce n leaching in boreal field conditions estimated using the resin bag method. *Agriculture, Ecosystems and Environment*. 316(1): 1 – 10.

Khalid, S, Badaruddin, & K. Syarifuddin. 2022. Analisis tingkat bahaya erosi di das kintap bagian hilir Kabupaten Tanah Laut. *Jurnal Sylva Scientiae* . 5(3): 437 – 446.

Kolega, S., B. M. Moreno, V. Buffagni, L. Lucini, F. Valentinuzzi, M. Maver, T. Mimmo. Y. Pii, & S. Cesco. 2020. Nutraceutical profiles of two hydroponically grown sweet basil cultivars as affected by the composition of the nutrient solution and the inoculation with *Azospirillum brasiliense*. *Frontiers in Plant Science*, 11(1): 1–17.

Kumar, V., K. Surya, Shikha, & K. Achin. 2016. Morphological and pedological features of Alfisols. *Agriways* 4(2): 159– 167.

Kurepa, P. & A. S. Jan. 2022. Auxin/cytokinin antagonistic control of the shoot/root growth ratio and its relevance for adaptation to drought and nutrient deficiency stresses. *Journal International of Molecular Science*. 23(1): 1 – 15. <https://doi.org/10.3390/ijms23041933>.



- Kurniasari, L., E. R. Palupi, Y. Hilman, & R. Rosliani. (2020). Peningkatan Mutu Benih Botani Bawang Merah (*Allium cepa* var. *ascalonicum*) Melalui Aplikasi Pupuk Fosfor dan Kalium di Daerah Dataran Rendah. Agriprima : *Journal of Applied Agricultural Sciences*. 4(2), 106–118.
- Kusumawati, A. 2012. Pengaruh Pemberian Mg dan Fe terhadap kandungan viteksikarpin daun legundi (*Vitex trifolia*) pada tiga ordo tanah. *Tesis*. UGM. Yogyakarta.
- Lakitan B, 2007. *Fisiologi Pertumbuhan dan Perkembangan Tanaman*. Raja Grafindo Persada. Jakarta.
- Larasani, I & Violita. 2021. Prolin sebagai indikator ketahanan tanaman terhadap cekaman kekeringan. *Semnas Bio Universitas Negeri Padang*. 10(1): 1728 – 1739. ISSN : 2809-8447.
- Łata B., 2007. Cultivation, mineral nutrition and seed production of *Catharanthus roseus* (L.) G. Don in the temperate climate zone. *Phytochem*. 6: 403 – 411.
- Li, D., M. K. Manu, V. Sunita, W. C. Jonathan, & Wong. 2023. Role of tobacco and bamboo *biochar* on food waste digestate co-composting: Nitrogen conservation, greenhouse gas emissions, and compost quality. *Waste Management*. No. 156: 44 – 54. <https://doi.org/10.1016/j.wasman.2022.10.022>.
- Li, X., A. Neupane, N. Abdoulmomumine, J. M. Debruyn, F. R. Walker, & S. Jagadamma. 2021. Co-Application of *biochar* and nitrogen fertilizer reduced nitrogen losses from soil. *Plos One*.16(3):. 1–17.
- Lopez, G, H. A. Seyed, A. Wulf, A. Miriam, E. Frank, G. Thomas, I. G. Martina, K. Timo, P. Johanes. Nutrient deficiency effects on root architecture and root-toshoot ratio in arable crops. *Frontiers in Plant Science*. 1(1): 1 – 18. doi: 10.3389/fpls.2022.1067498.
- Maas, A., P. Yudoyono, Masyhuri, C. Sumardiyono, & T. Yuwono. 2018. *Pengantar Ilmu Pertanian*. Gadjah Mada University Press. Yogyakarta.
- Maftuah, E., & D. Nursyamsyi. 2015. Potensi Berbagai bahan Organik Rawa Sebagai Sumber *Biochar*. *Jurnal Biodiv*. 1(4):776-781.
- Maleki, A., J. Sabam, & F. Shekari. 2010. Inheritance of proline content inbread wheat (*Triticum aestivum* L.) under rainfed conditions. *Journal of Food, Agriculture and Environment* 8(1): 155–157.
- Manurung, H., W. Kustiawan, I. W. Kusuma, & Marjenah. 2019. Pengaruh cekaman kekeringan terhadap pertumbuhan dan kadar flavonoid total tumbuhan tabat barito (*Ficus deltoidea* Jack). *Jurnal Hortikultura Indonesia* 10(1): 55–62.
- Marco, M. V., M. Pedro, M. Clara, C. J. Maria, J. M. Joan, & J. G. Francisco. 2020. Effects of *Biochar* Application in a Sorghum Crop under Greenhouse Conditions: Growth Parameters and Physicochemical Fertility. *Agronomy*. 10(104): 1 – 17.
- Mautuka, Z. A., M. Astriana, & K. Martasiana. 2022. Pemanfaatan *biochar* tongkol jagung guna perbaikan sifat kimia tanah lahan kering. *Jurnal Ilmiah Wahana Pendidikan*. 8(1): 201 – 208.
- Meena, M., K. Divyanshu, S. Kumar, P. Swapnil, A. Zehra, & V. Shukla. 2019. Regulation of L-proline biosynthesis, signal transduction, transport,



accumulation and its vital role in plants during variable environmental conditions. *Heliyon*. 10.1016/j.heliyon.2019.e02952.

- Meena, R.S., L. Rattan, & S. Y. Gulab. 2020. Long-term impacts of topsoil depth and amendments on soil physical and hydrological properties of an Alfisol in central Ohio, USA. *Geoderma* 363: 1–11.
- Mishra, J. N. & K. V. Navneet. 2017. A brief study on *Catharanthus roseus*: a review. *International Journal of Research in Pharmacy and Pharmaceutical Sciences* 2(2): 20–23.
- Mujib, A., A. Ilah, J. Aslam, S. Fatima, Z. H. Siddiqui, & M. Maqsood. 2012. *Catharanthus roseus* alkaloids: application of biotechnology for improving yield. *Plant Growth* 68: 111–127.
- Naeem, M., A. Tariq, M. Mohammad, & A. Khan. 2017. *Catharanthus roseus : Current research and future prospects*. Germany. Springer.
- Napitupulu, D & L. Winarno. 2010. Pengaruh pemberian pupuk N dan K terhadap pertumbuhan dan produksi bawang merah. *J.Hort.* 20(1): 27-35.
- Naz, S., H. Rukhama, A. Farah, & I. Saiqa. 2015. Evaluation of antimicrobial activity of extracts of in vivo and in vitro grown *Vinca rosea* L. (*Catharanthus roseus*) against pathogens. *Pak. J. Pharm. Sci.* 28(3): 849– 853.
- Nikita, S., R. Rayal, K. Lakhera, & D. M. Tripathi. 2023. Impact of seasonal dynamics on physicochemical profiles of river water in Himalayan Regions with special reference to the River Mandakini in Uttarakhand. *Journal of Experimental Zoology India* . 26(1): 1073 – 1077.
- Nurcahya, I., V. T. Manik, N. I. Matira, D. Natawijaya, & Sudartini. 2022. Pertumbuhan tanaman ginseng jawa (*Talinum paniculatum* G.) yang dipengaruhi volume penyiraman. *Jurnal Ilmiah Pertanian*. 10(2) : 180 – 186.
- Nurmalasari, I. R. 2018. Kandungan asam amino prolin dua varietas padi hitam pada kondisi cekaman kekeringan. *Gontor Agrotech Journal*. 4(1): 28 – 37.
- Osman, M. E. H., A. M. Abo-Shady, & M. M. F. El-Nagar. 2020. Treatment of broad bean seeds with algal suspensions to study their effects on certain growth and yield parameters. *Journal of Environmental Sciences*. 49(1): 1 – 7. <https://doi.org/10.21608/joese.2020.147760>.
- Pakpahan, T. E., H. Taufiq, & M. Eva. 2020. Aplikasi biochar dan pupuk kandang terhadap budidaya bawang merah di tanah Inceptisol kebun percobaan Politeknik Pembangunan Pertanian Medan. *Agrica Ekstensia*. 14(1): 49 – 54.
- Palupi E.R & Dedywiryanto. 2008. Kajian karakter ketahanan terhadap cekaman kekeringan pada beberapa genotipe bibit-bibit kelapa sawit. *Bul. Agron* 36(1): 24 – 32.
- Pan, Q., N. R. Mustafa, K. Tang, Y. H. Choi, & R. Verpoorte. 2016. Monoterpenoid indole alkaloids biosynthesis and its regulation in *Catharanthus roseus*: a literature review from genes to metabolites. *Phytochemistry Reviews*, 15(2): 221–250. <https://doi.org/10.1007/s11101-015-9406-4>.
- Pane I. E., T. Sabrina, & A. Lubis. 2018. Perbaikan sifat kimia tanah Inceptisol serta pertumbuhan kedelai akibat pemberian kompos diperkaya cangkang telur dan zeolit. *Jurnal Agroekoteknologi FP USU*. 6(2): 379 – 388.



Patel, J., K. Deepesh, C. Babita, A. Dolly, K. J. Rajesh, & T. Bhakti. 2022. Differential physio-biochemical and metabolic responses of peanut (*Arachis hypogaea L.*) under multiple abiotic stress conditions. *Molecular Science*. 23(2): 660 – 670. <https://doi.org/10.3390/ijms23020660>.

Paul, A. E. 2016. The nature and dynamics of soil organic matter: Plant inputs, microbial transformations, and organic matter stabilization. *Soil Biology and Biochemistry*. 98(1) : 109 – 126.

Pohan, S. D., Amrizal, D. P. Wina, S. Cicik, & P. Hendro. 2018. Respon fisiologis tumbuhan tapak dara (*Catharanthus roseus* (L) G. Don) terhadap cekaman kekeringan dan salinitas. *Seminar Nasional Biologi FMIPA Universitas Negeri Medan*. Sumatra Utara.

Prakongkep, N., R. Gilkes, W. Wisawapipat, P. Leksungnoen, & C. Kerdchana. 2020. Effects of biochar on properties of tropical sandy soils under organic agriculture. *Journal of Agricultural Science*. 13 (1): 1–17.

Prasetya, A. 2020. Pengaruh pemberian naungan dan biochar bambu terhadap kandungan kuarsentin tanaman sambung nyawa pada tanah Inceptisol, Banguntapan, Yogyakarta. *Tesis*. UGM. Yogyakarta.

Purba, D., Supriyadi, H. Guchi. 2016. Hubungan Ca dan Mg dengan produksi kelapa sawit di kebun PT.Buana Estate Kabupaten Langkat. *Agroteknologi*. 4(4) 2255 – 2261.

Purwanto, W. R. Bambang, & Tarjoko. 2019. Perubahan karakter biokimia dan fisiologi tanaman kacang hijau pada berbagai kondisi cekaman kekeringan. *Kultivasi*. 18(1):827-836.

Putra, I. A & H. Hanum. 2018. Kajian antagonisme hara K, Ca, dan Mg pada tanah Inceptisol yang diaplikasikan pupuk kandang, dolomit dan pupuk KCl terhadap pertumbuhan jagung manis (*Zea mays saccharata L.*). *Journal of Islamic Science and Technology*. 4(1): 55 – 62.

Putri, H., U. Rahayu, & S. Kurniawan. 2019. Soil chemical properties in various land uses of UB Forest. *Jurnal Tanah dan Sumberdaya Lahan*. 6(1) : 1075– 1081.

Putri, V.I., Mukhlis, & B. Hidayat. 2017. Application of some type biochar for repairing the chemical properties of ultisol and the growth of corn plants. *Jurnal Agroekoteknologi FP USU*. 5(4): 824 – 828.

Rachim, D. A. 2007. *Dasar-Dasar Genesis Tanah*. Departemen Ilmu Tanah dan Sumber Daya Lahan Fakultas Pertanian. Institut Pertanian Bogor. Bogor.

Rahma., S. Yusran, & H. Umar. 2014. Sifat kimia tanah pada berbagai tipe penggunaan lahan di Desa Bogo Kecamatan Palolo Kabupaten Sigi. *Warta Rimba*. 2(1): 88-95.

Rai, V., K. T. Pramod, & K. Sayyada. 2014. Effect of chromium on antioxidant potential of *Catharanthus roseus* varieties and production of their anticancer alkaloids: vincristine and vinblastine. *Biomed Research International* 1–10. <http://dx.doi.org/10.1155/2014/934182>.

Rajamuddin, U.A, & I. Sanusi. 2014. Morphological characteristics and soil



classification of Inceptisol at some land system in the Jeneponto District of South Sulawesi. *J. Agroland*. 21 (2) : 81 – 85

Rani, V., K. Vipul, M. Ramawatar, K. J. Shreyans, & B. Devilal. 2023. Impact of nitrogen levels on the growth and medicinal properties of periwinkle (*Catharanthus roseus*) in an Inceptisol of Varanasi, India. *International Journal of Plant & Soil Science*. 35(19) : 954 – 962.

Resman, A.S., H. S. Syamsul, & Bambang. 2006. Kajian beberapa sifat kimia dan fisika Inceptisol pada toposekuen lereng selatan gunung merapi kabupaten sleman. *Jurnal Ilmu Tanah dan Lingkungan*. 6 (2):101-108.

Saida, Puspitasari, & Aminah. 2022. Uji aktivitas bakteri penambat nitrogen dan penghasil IAA dari rizosfer tanaman kedelai (*Glycine max L.*). *Jurnal Agrotek*. 6(1): 68 – 74.

Salawati, M. Basir, I. Kadekoh, & A. R. Thaha. 2016. Potency of rice husk biochar on modifyingsoil pH, CEC, C-Organic and available P in wetland rice of Inceptisols. *Agroland*. 23(2) : 101 – 109.

Salehi, L. S. Y & A. H. Bakhshayeshan. 2016. Drought stress in plants : causes , consequences , and tolerance. In *Drought Stress Tolerance in Plants*. 1(1) : 1–16. https://doi.org/10.1007/978-3-31928899-4_1

Salisbury, F. B & C. W. Ross. 1992. *Fisiologi Tumbuhan*. ITB Press. Bandung.

Sampaio, I. M. G., M. Guimarães, A. D. Rabelo, C. Viana, S. Dos, & F. G. A. Machado. 2021. Productive and physiological responsesof basil to nitrogen fertilization. *J. Horticultura Brasileira*. 39(3): 335–340.

Sanchez, G.M., J .A. Alburquerque, & M. A. Sanchez. 2015. Biochar accelerates organic matter degradation and enhances N mineralisation during composting of poultry manure without a relevant impact on gas emissions. *Bioresour Technol*. 192: 272–279.

Santosa, 1990. *Fisiologi Tumbuhan: Metabolisme dan Pertumbuhan pada tumbuhan tingkat tinggi*. Fakultas Biologi UGM. Yogyakarta.

Sari, D. N., Y. Priyana, & M. Cholil. 2016. Analisis Penggunaan Lahan Tahun 2013 terhadap Ketersediaan Air di Sub Daerah Aliran Sungai Blongkeng. *Skripsi*. Universitas Muhammadiyah Surakarta. Surakarta.

Sarif, P., A. Hadid, & I. Wahyudi. 2015. Pertumbuhan dan hasil tanaman sawi (*Brassicace Juncea L.*) akibat pemberian berbagai dosis pupuk urea. *Jurnal Agrotekbis*. 3(5): 585 – 591.

Schneider, H., J. Yang, K. Brown, & J. Lynch. 2021. Nodal root diameter and node number in maize (*Zea mays L.*) interact to influence plant growth under nitrogen stress. *Plant Direct*. 5(3). 3 – 10. <https://doi.org/10.1002/pld3.310>.

Selvarajh, G., Y. C. Huck, M .D. Norhafizah, S. Palsan, & N. H. M. Siti. 2021. Improving soil nitrogen availability and rice growth performance on a tropical acid soil via mixture of rice husk and rice straw biochars. *Applied Science*. No. 11(108): 1 – 18. <https://dx.doi.org/10.3390/app11010108>.

Simansky V., A. Hor, & S. Bordoloi. 2022. Improving the soil physical properties and relationships between soil properties in arable soil of contrasting texture



enhancement using *biochar* substrates: Case study in Slovakia. *Geoderma*. 28. E00443.

Singh, R., T. Ajay, H. S. Viswanath, P. Durga, & S. Kumar. 2022. Rhizo-deposit and their role in rhizosphere interactions among the plant, microbe and other ecological components for crop management. *Rhizosphere Eco-system for Agricultural Sustainability*. 28: 403 – 426.

Skouteris, G., D. Saroj, P. Melidis, F. I. Hai, & S. Ouki. 2015. The effect of activated carbon addition on membrane bioreactor processes for wastewater treatment and reclamation—a critical review. *Bioresour. Technol.* 185 : 399 – 410.

Slama, S., A. Bouchereau, T. Flowers, C. Abdelly, & A. Savouré. 2015. Diversity, distribution and roles of osmoprotective compounds accumulated in halophytes under abiotic stress. *Ann Botany* 115: 433–447.

Solimandarabi, M. J., H. Davood, Z. Fatemeh. 2017. The effect of potassium biofertilizer and chemical fertilizer on quantitative and qualitative traits of periwinkle (*Catharanthus roseus* Cv. 'Acillata'). *Journal of Ornamental Plants*. 7(4) : 123 – 222.

Souri, M. K., M. Naiji, & M. H. Kianmehr. 2019. Nitrogen Release Dynamics of a Slow Release Urea Pellet and Its effect on Growth, Yield, and Nutrient Uptake of Sweet Basil (*Ocimum basilicum* L.). *Journal of Plant Nutrition*. 42(6): 604–614.

Steiner, C, G. T. Wenceslau, L. Johannes, N. Thomas, L. Jeferson, M. Vasconcelos, E. Winfried, H. Blum, & Z. Wolfgang. 2007. Long term effects of manure, charcoal and mineral fertilization on crop production and fertility on a highly weathered Central Amazonian upland soil. *Plant Soil*. 291 : 275 – 290.

Subroto & A. Yusran. 2005. *Kesuburan dan Pemanfaatan Tanah*. Bayumedia. Malang.

Sudirja, R., B. Joy, A. Yuniarti, E. Trinurani, E. Mulyani, & A. Mushfiqh. 2017. Beberapa sifat kimia tanah Inceptisol dan hasil kedelai (*Glycine max* L.) akibat pemberian bahan amelioran. *Prosiding Seminar Hasil Penelitian Tanaman Aneka Kacang dan Umbi*. Padajaran. Bandung.

Sudjana, B. 2014. Pengaruh biochar dan NPK majemuk terhadap biomas dan serapan nitrogen di daun tanaman jagung (*Zea mays*) pada tanah typic dystrudepts. *Jurnal Ilmu Pertanian dan Perikanan* 3: 63–66.

Sukarman, I. Darmawati, & D. Rusmin. 2000. Karakter morfologi dan fisiologi tapak dara (*Vinca rosea* L.) pada beberapa cekaman air. *Jurnal Litiri* 6(2): 50–55.

Supriyo, H & D. Prehaten. 2014. Kandungan unsur hara dalam daun jati yang baru jatuh pada tapak yang berbeda. *Jurnal Ilmu Kehutanan*. 8(2): 108 – 116.

Supriyono, K. S. Pertiwi, Sulandjari, D. Purnomo, & B. Pujiasmanto. 2023. The use of ZA and SP 36 fertilizer on growth and yield of red ginger (*Zingiber officinale* var. *Rubrum*). IOP Conf. Series: *Earth and Environ. Sci.* 1162(1): 0–10. <https://doi.org/10.1088/1755-1315/1162/1/012013>.



- Supriyono, Zakiyyah JR, Sulistyo TD, Pujiasmanto B. 2021. The impact of ZA substitution with organic fertilizer through red ginger's growth and yield in mixed cropping with maize and cassava. IOP Conf Series: Earth and Environ Sci. 905(1): 0–7. <https://doi.org/10.1088/1755-1315/905/1/012038>
- Suryani, I. 2014. Kapasitas Tukar Kation (KPK) berbagai kedalaman tanah pada areal konversi lahan hutan. *Jurnal Agrisistem*. 10(2) : 18 – 24.
- Suwarti, N. Iriani, & M. S. Pabbage. 2013. Seleksi Plasma Nutfah Jagung terhadap Cekaman Genangan Air. *Seminar Nasional Inovasi Teknologi Pertanian*. 116 – 132.
- Swandari, T., M. I. Rohmat, & S. Sri. 2023. Growth of zamia leaf cuttings (*Zamioculcas zamiifolia*) with the application of auxin hormone and foliar fertilizer on water media. *Jurnal Budidaya Pertanian*. 19(1): 39 – 47.
- Szabados, L. & A. Savouré. 2010. Proline: a multifunctional amino acid. *Trends Plant Sci*. 15: 89–97.
- Tan, K.H. 2000. *Environmental Soil Science*. Marcel Dekker. New York
- Tando, E. 2018. Review: Upaya efisiensi dan peningkatan ketersediaan nitrogen dalam tanah serta serapan nitrogen pada tanaman padi sawah (*Oryza sativa* L.). *Buana Sains*. 18 (2). 15 – 22.
- Tjay, H. Tan, & R. Kirana. 2007. *Obat-Obat Penting Khasiat, Penggunaan dan Efek-Efek Sampingnya*, Edisi Keenam. 269-271. PT. Elex Media Komputindo. Jakarta.
- Triadiawarman, D., A. Dhani, & K. Joko. 2022. Peran unsur hara makro terhadap pertumbuhan dan hasil bawang merah (*Allium cepa* L.). *Agrifor*. 21(1) : 27 – 33.
- Uchti, R. U. 2021. Pengaruh berbagai dosis biochar sekam padi dan pupuk phonska terhadap pertumbuhan tanaman nilam (*Pogostemon cablin* Benth). *Thesis*. Universitas Andalas. Sumatra Barat.
- Uke, K.H.Y., H. Barus, & I. S. Madauna. 2015. Pengaruh ukuran umbi dan dosis kalium terhadap pertumbuhan dan hasil produksi bawang merah (*Allium ascalonicum* L.) Varietas Lembah Palu. *Arotekbis*. 3(6): 22 – 29.
- Uzma, K., J. Urifi, & A. K. Fareed. 2023. Chapter five - Role of mineral nutrients in biological nitrogen fixation. *Sustainable Plant Nutrition*. 12(2) : 87-106. <https://doi.org/10.1016/B978-0-443-18675-2.00004-3>.
- Wang, C., J. Yahui, C. Xuesong, Y. Le, C. Feiran, L. Jing, Y. Hanyue, W. Zhenzu, & X. Baoshan. 2022. carbon dots improve nitrogen bioavailability to promotethe growth and nutritional quality of soybeans under drought stress. *ACSNano*. 16: 12415 – 12424.
- Wang, Y. 2021. Mobilization of recalcitrant phosphorus from soil using citric acid wastewater. *Environtment Earth Scince*. 80(4) : 1 – 10.
- Watiniash. 2012. *Praktek Baik Budidaya Tanaman Tapak Dara (Catharanthus roseus* L.). Universitas Udayana. Bali.
- Widiowati, Asnah & Sutoyo. 2012. Pengaruh penggunaan *biochar* dan pupuk kaliumterhadap pencucian dan serapan kalium pada tanaman jagung. *Buana Sains*.12(1): 83 – 90.



- Widyasunu, P., R. Muhammad, S. Prasmadji, Y. Ahadiyat, F. M. Maria, & P. Makna. 2023. Study on soil sulfur, organic-c and nitrogen, nutrient content of rice and fertilization recommendation in the downstream serayu sub watershed area in Kesugihan District, Cilacap Regency. 10.2991/978-94-6463-128-9_27.
- Winarso, S. 2005. Kesuburan Tanah Dasar Kesehatan dan Kualitas Tanah. Gava Media. Yogyakarta.
- Wulandari, C., W. Y. Nasih, G. P. Yudhistira, & L. Sri. 2023. Improving basil productivity in coastal sandy soil Yogyakarta by balanced Urea-ZA (N- S) fertilizers and application of soil amendment to increase fertilization effectiveness. *Agricultural Science*. 8(2): 121 – 132.
- Yan, Y., L. Xing, C. Zhang, L. Lijuan, B. Gao, & M. Li. 2021. Research progress on antibacterial activities and mechanisms of natural alkaloids: a review. *Antibiotics* 10(3): 1–30.
- Youssef M and M. A. Eissa. 2017. Comparison between organic and inorganic nutrition for tomato. *Journal of Plant Nutrition*. 40(13): 1900–07. <https://doi.org/10.1080/01904167.2016.1270309>.
- Yuniarti, A., E. Solihin, & A. T. A. Putri. 2020. Aplikasi pupuk organik dan N, P, K terhadap pH tanah, P-tersedia, serapan P, dan hasil padi hitam (*Oryza sativa* L.) pada Inceptisol. *Jurnal Kultivasi*. 19 (1). 14 – 22.
- Zhang, B., F. Beibei, H. Iram, Yutao, M. Ruonan, Y. Chung, Guan, C. Shili, C. Shihao, & L. Guoxue. 2021. Effects of bamboo biochar on nitrogen conservation during co-composting of layer manure and spent mushroom substrate. *Environmental Technology* 3: 1–10.
- Zhang, J., H. Deyi, S. Zhenghao, O. David, J. Fei, P. Sheizen, S. K. Yong, C. W. Daniel, Tsang, S. Nanathi, Bolan, S. Daniel. 2020. Effects of excessive impregnation, magnesium content, and pyrolysis temperature on MgO-coated watermelon rind biochar and its lead removal capacity. *Environmental Research*.183(1). 512 – 524.
- Zhang, L., E. Y. Lim, K. C. Loh, J. T. Lee, Y. Shen, Y. Wang, Y. Dai, & Y. W. Tong. 2020. Biochar enhanced thermophilic anaerobic digestion of food waste: focusing on biochar particle size, microbial community analysis and pilot-scale application. *Energy Convers* <https://doi.org/10.1016/j.enconman.2020.112654>.
- Zomorrodi, N., R. N. Abdolhossein, M. Sadegh, F. Hassan, Nikolaos, & F. Dimitrios. 2022. Efficiency of sodium and calcium chloride in conferring cross-tolerance to water deficit in periwinkle. *Horticulturae*. 8(11): 1091 – 1100. <https://doi.org/10.3390/horticulturae8111091>.
- Zomorrodi, N., R. N. Abdolhossein, M. Sadegh, F. Hassan, T. Georgios, & F. Dimitrios. 2022. Potency of titanium dioxide nanoparticles, sodium hydrogen sulfide and salicylic acid in ameliorating the depressive effects of water deficit on periwinkle ornamental quality. *Horticulturae*. 8(8): 675. <https://doi.org/10.3390/horticulturae8080675>.