



DAFTAR PUSTAKA

- Abdelmoneim, T. S., Moussa, T. A. A., Almaghrabi, O. A., Alzahrani, H. S., & Abdelbagi, I. (2014). Increasing plant tolerance to drought stress by inoculation with arbuscular mycorrhizal fungi. *Life Science Journal*, 11(1), 10–17.
- Abdullah, Sofyan, Musa, Y., & Feranita, H. (2005). Perbanyak jamur mikoriza arbuskular (JMA) pada berbagai varietas jagung (*Zea mays* L.) dan pemanfaatannya pada dua varietas tebu (*Saccharum officinarum* L.). *J. Sains & Teknologi*, 5(1), 12–20.
- Adam, F., Balakrishnan, S., & Wong, P.-L. (2006). Rice Husk Ash Silica As a Support Material for Ruthenium Based Heterogenous Catalyst. *Journal of Physical Science*, 17(2), 1–13.
- Adhikari, A., Lee, K. E., Khan, M. A., Kang, S. M., Adhikari, B., Imran, M., Jan, R., Kim, K. M., & Lee, I. J. (2020). Effect of Silicate and Phosphate Solubilizing Rhizobacterium Enterobacter ludwigii GAK2 on *Oryza sativa* L. under Cadmium Stress. *Journal of Microbiology and Biotechnology*, 30(1), 118–126. <https://doi.org/10.4014/jmb.1906.06010>
- Agrios, G. (2005). Plant Pathology 5th Edition. In *San Diego: Academic Press*.
- Ahmad, A., Afzal, M., Ahmad, A. U. H., & Tahir, M. (2013). Effect of foliar application of silicon on yield and quality of rice (*Oryza sativa* L.). *Cercetari Agronomice in Moldova*, 46(3), 21–28. <https://doi.org/10.2478/v10298-012-0089-3>
- Ahmed, M., Fayyaz-ul-Hassen, Qadeer, U., & Aqeel Aslam, M. (2011). Silicon application and drought tolerance mechanism of sorghum. *African Journal of Agricultural Research*, 6(3), 594–607.
- Akila, R., Rajendran, L., Harish, S., Saveetha, K., Raguchander, T., & Samiyappan, R. (2011). Combined application of botanical formulations and biocontrol agents for the management of *Fusarium oxysporum* f. sp. *cubense* (Foc) causing Fusarium wilt in banana. *Biological Control*, 57(3), 175–183. <https://doi.org/https://doi.org/10.1016/j.bioc.2011.02.010>
- Akintokun, A. K., Akande, G. A., Akintokun, P. O., Popoola, T. O. S., & Babalola, A. O. (2007). Solubilization of insoluble phosphate by organic acid-producing fungi isolated from Nigerian soil. *International Journal of Soil Science*, 2(4), 301–307. <https://doi.org/10.3923/ijss.2007.301.307>
- Alam, MZ, Hoque MA, Ahammed GJ, 2019. Arbuscular Mycorrhizal Fungi, Selenium, Sulfur, Silica-Gel and Biochar Reduce Arsenic Uptake in Plant Biomass and Improve Nutritional Quality in *Pisum sativum*. *BioRxiv*.
- Al-Askar, A. A., & Rashad, Y. M. (2010). Arbuscular mycorrhizal fungi: A biocontrol agent against common bean *Fusarium* root rot disease. *Plant Pathology Journal*, 9(1), 31–38. <https://doi.org/10.3923/ppj.2010.31.38>
- Al Momany A, A. H. G. (2015). Effect of Four Mycorrhizal Products on *Fusarium* Root Rot on Different Vegetable Crops. *Journal of Plant Pathology & Microbiology*, 6(2). <https://doi.org/10.4172/2157-7471.1000255>
- Arista, Y., Wijaya, K. A., & Slameto. (2015). Morfologi dan Fisiologi Dua Varietas Tebu (*Saccharum officinarum* L.) Sebagai Respon Pemupukan Silika. *Berkala Ilmiah Pertanian*, 1(1), 1–5.
- Armechin, R. B., Cosico, W. C., & Badayos, R. B. (2011). Characterization of the Different Abaca-Based Agro-Ecosystems in Leyte, Philippines. *Journal of Natural Fibers*, 8(2), 111–125. <https://doi.org/10.1080/15440478.2011.576114>
- Ashtiani, F. A., Kadir, J., Nasehi, A., Rahaghi, S. R. H., & Sajili, H. (2012). Effect of silicon on rice blast disease. In *Pertanika Journal of Tropical Agricultural Science* (Vol. 35, Issue SUPPL., pp. 1–12).
- Asniah, A., Widodo, W., & Wiyono, S. (2013). POTENSI CENDAWAN ASAL TANAH PERAKARAN BAMBU SEBAGAI ENDOFIT DAN AGEN BIOKONTROL

PENYAKIT AKAR GADA PADA TANAMAN BROKOLI. Jurnal Hama Dan Penyakit Tumbuhan Tropika, 13(1), 61–68.
<https://doi.org/10.23960/j.hptt.11361-68>

Balakhnina, T., & Borkowska, A. (2013). Effects of silicon on plant resistance to environmental stresses: Review. In *International Agrophysics* (Vol. 27, Issue 2, pp. 225–232). <https://doi.org/10.2478/v10247-012-0089-4>

Balliu, A., Sallaku, G., & Rewald, B. (2015). AMF inoculation enhances growth and improves the nutrient uptake rates of transplanted, Salt-stressed tomato seedlings. *Sustainability (Switzerland)*, 7(12), 15967–15981. <https://doi.org/10.3390/su71215799>

Bande, M. B., Grenz, J., Asio, V. B., & Sauerborn, J. (2013). Morphological and physiological response of Abaca (*Musa textilis* var. Laylay) to shade, irrigation and fertilizer application at different stages of plant growth. *Int J Agric Sci*, 3(2), 157–175. https://www.researchgate.net/profile/Jan-Grenz/publication/327388068_Morphological_and_physiological_response_of_Abaca_Musa_textilis_var_Laylay_to_shade_irrigation_and_fertilizer_application_at_different_stages_of_plant_growth/links/60bf41a8458515218f9fa3

Bande, M. M., Grenz, J., Asio, V. B., & Sauerborn, J. (2013). Fiber yield and quality of abaca (*Musa textilis* var. Laylay) grown under different shade conditions, water and nutrient management. *Industrial Crops and Products*, 42, 70–77. <https://doi.org/https://doi.org/10.1016/j.indcrop.2012.05.009>

Barea, J.-M., Pozo, M. J., Azcon, R., & Azcon-Aguilar, C. (2005). Microbial co-operation in the rhizosphere. *Journal of Experimental Botany*, 56(417), 1761–1778. <https://doi.org/10.1093/jxb/eri197>

Barker, A. V., & Pilbeam, D. J. (2007). *Handbook of Plant Nutrition*, 1st edition. In CRC Press.

Bastasa, G. N., & Baliad, a a. (2005). Biological control of Fusarium wilt of abaca (*Fusarium Oxysporum*) with Trichoderma and yeast. *Philippine Journal of Crop Science*, 30(August), 29–37. <https://www.cabi.org/gara/FullTextPDF/2005/20053176286.pdf>

Begum, N., Qin, C., Ahanger, M. A., Raza, S., Khan, M. I., Ashraf, M., Ahmed, N., & Zhang, L. (2019). Role of Arbuscular Mycorrhizal Fungi in Plant Growth Regulation: Implications in Abiotic Stress Tolerance. In *Frontiers in Plant Science* (Vol. 10). <https://doi.org/10.3389/fpls.2019.01068>

Bélanger, R. R., Benhamou, N., & Menzies, J. G. (2003). Cytological evidence of an active role of silicon in wheat resistance to powdery mildew (*Blumeria graminis* f. sp. *tritici*). *Phytopathology*, 93(4), 402–412. <https://doi.org/10.1094/PHYTO.2003.93.4.402>

Bi, Y., Tian, S. P., Guo, Y. R., Ge, Y. H., & Qin, G. Z. (2006). Sodium silicate reduces postharvest decay on hami melons: Induced resistance and fungistatic effects. *Plant Disease*, 90(3), 279–283. <https://doi.org/10.1094/PD-90-0279>

Bledzki, A. K., Mamun, A. A., & Faruk, O. (2007). Abaca fibre reinforced PP composites and comparison with jute and flax fibre PP composites. *eXPRESS Polymer Letters*, 1(11), 755–762. <https://doi.org/10.3144/expresspolymlett.2007.104>

Blilou, I., Bueno, P., Ocampo, J. A., & Garcia-Garrido, J. M. (2000). Induction of catalase and ascorbate peroxidase activities in tobacco roots inoculated with the arbuscular mycorrhizal *Glomus mosseae*. *Mycological Research*, 104(6), 722–725. <https://doi.org/10.1017/S0953755629900204X>

Blilou, I., Ocampo, J. A., & García-Garrido, J. M. (2000). Induction of Ltp (lipid transfer protein) and Pal (phenylalanine ammonia-lyase) gene expression in rice roots colonized by the arbuscular mycorrhizal fungus *Glomus mosseae*. *Journal of Experimental Botany*, 51(353), 1969–1977. <https://doi.org/10.1093/jexbot/51.353.1969>



- Bolan, N. S. (1991). A critical review on the role of mycorrhizal fungi in the uptake of phosphorus by plants. In *Plant and Soil* (Vol. 134, Issue 2, pp. 189–207). <https://doi.org/10.1007/BF00012037>
- Bonilla, N., Gutiérrez-Barranquero, J. A., De Vicente, A., & Cazorla, F. M. (2012). Enhancing soil quality and plant health through suppressive organic amendments. *Diversity*, 4(4), 475–491. <https://doi.org/10.3390/d4040475>
- Brundrett, M. (1991). Mycorrhizas in Natural Ecosystems. *Advances in Ecological Research*, 21(C), 171–313. [https://doi.org/10.1016/S0065-2504\(08\)60099-9](https://doi.org/10.1016/S0065-2504(08)60099-9)
- Brundrett, M. (2004). Diversity and classification of mycorrhizal associations. In *Biological Reviews of the Cambridge Philosophical Society* (Vol. 79, Issue 3, pp. 473–495). <https://doi.org/10.1017/S1464793103006316>
- Brundrett, M., Boughey, N., Dell, B., Grove, T., & Malajczuk, N. (1996). *Working with mycorrhizas in forestry and agriculture* (Vol. 32). Australian Centre for International Agricultural Research Canberra.
- Buddenhagen, I. (2009). Understanding strain diversity in *Fusarium oxysporum* f. sp. *cubense* and history of introduction of “tropical race 4” to better manage banana production. *Acta Horticulturae*, 828, 193–204. <https://doi.org/10.17660/ActaHortic.2009.828.19>
- Bukhori, M. R., Khastini, R. O., & Maryani, N. (2020). Studi Awal Pemberian Mikoriza untuk Mengendalikan Penyakit Layu Fusarium Pisang. *Leuit (Journal of Local Food Security)*, 1(2), 71. <https://doi.org/10.37818/leuit.v1i2.10015>
- Butler, D. (2013). Fungus threatens top banana. In *Nature* (Vol. 504, Issue 7479, pp. 195–196). <https://doi.org/10.1038/504195a>
- CABI. (2020). *Fusarium oxysporum* f.sp. *cubense* tropical race 4 (TR4). CABI. <https://www.cabi.org/isc/datasheet/59074053>
- CABI. (2021). *Fusarium oxysporum* f.sp. *cubense* (Panama disease of banana). CABI. <https://www.cabi.org/isc/datasheet/24621>
- Carver, T. L. W., Zeyen, R. J., & Ahlstrand, G. G. (1987). The relationship between insoluble silicon and success or failure of attempted primary penetration by powdery mildew (*Erysiphe graminis*) germlings on barley. *Physiological and Molecular Plant Pathology*, 31(1), 133–148. [https://doi.org/10.1016/0885-5765\(87\)90012-9](https://doi.org/10.1016/0885-5765(87)90012-9)
- Catford, J. G., Staehelin, C., Lerat, S., Piché, Y., & Vierheilig, H. (2003). Suppression of arbuscular mycorrhizal colonization and nodulation in split-root systems of alfalfa after pre-inoculation and treatment with Nod factors. *Journal of Experimental Botany*, 54(386), 1481–1487. <https://doi.org/10.1093/jxb/erg156>
- Cavins, T., Marek, S., & Kamenidou, S. (2010). *Impact Of Silicon On Plant Growth*. <http://www.greenhousemanagementonline.com/gmpro-0610-silicon-plant-growth.aspx>
- Chanchal Malhotra, C., Kapoor, R., & Ganjewala, D. (2016). Alleviation of abiotic and biotic stresses in plants by silicon supplementation. *Scientia*, 13(2), 59–73. <https://doi.org/10.15192/pscp.sa.2016.13.2.5973>
- Chandrakala, C., Voleti, S. R., Bandeppa, S., Sunil Kumar, N., & Latha, P. C. (2019). Silicate Solubilization and Plant Growth Promoting Potential of Rhizobium Sp. Isolated from Rice Rhizosphere. *Silicon*, 11(6), 2895–2906. <https://doi.org/10.1007/s12633-019-0079-2>
- Chandrasekhar, S., Pramada, P. N., Raghavan, P., Satyanarayana, K. G., & Gupta, T. N. (2002). Microsilica from rice husk as a possible substitute for condensed silica fume for high performance concrete. *Journal of Materials Science Letters*, 21(16), 1245–1247. <https://doi.org/10.1023/A:1016598818321>
- Cheng, C., Liu, F., Sun, X., Tian, N., Mensah, R. A., Li, D., & Lai, Z. (2019). Identification of *Fusarium oxysporum* f. sp. *cubense* tropical race 4 (Foc TR4) responsive miRNAs in banana root. *Scientific Reports*, 9(1), 13682. <https://doi.org/10.1038/s41598-019-50130-2>



- Chittoor, J. M., Leach, J. E., & White, F. F. (1997). Differential Induction of a Peroxidase Gene Family During Infection of Rice by *Xanthomonas oryzae* pv. *oryzae*. *Molecular Plant-Microbe Interactions®*, 10(7), 861–871. <https://doi.org/10.1094/MPMI.1997.10.7.861>
- CHOPRA, G., NANDNI, S. R., & WATI, L. (2021). ISOLATION AND EVALUATION OF SILICATE SOLUBILIZING BACTERIA FOR PLANT GROWTH PROMOTING TRAITS. *Asian Journal of Microbiology, Biotechnology & Environmental Sciences Paper*, 23(3), 440–445. https://www.envirobiotechjournals.com/article_abstract.php?aid=11659&iid=335&jid=1
- Cuenca, G., & Lovera, M. (2010). Seasonal variation and distribution at different soil depths of arbuscular mycorrhizal fungi spores in a tropical sclerophyllous shrubland. *Botany*, 88(1), 54–64. <https://doi.org/10.1139/B09-100>
- Currie, H. A., & Perry, C. C. (2007). Silica in plants: Biological, biochemical and chemical studies. *Annals of Botany*, 100(7), 1383–1389. <https://doi.org/10.1093/aob/mcm247>
- Daniels, B., & Skipper, H. (1982). Methods for the recovery and quantitative estimation of propagules from soil. Methods and Principles of Mycorrhizal Research. In *The American Phytopathological Society* (pp. 29–36).
- Dicko, M. H., Gruppen, H., Traore, A. S., Voragen, A. G. J., Berkel, V., & H, W. J. (2006). Review: Phenolic Compounds and Related Enzymes as Determinants of Sorghum for Food Use. *Biotechnology and Molecular Biology Reviews*, 1(April), 21–38. <http://works.bepress.com/dicko/15%5Cnhttp://works.bepress.com/cgi/viewcontent.cgi?article=1014&context=dicko%5Cnhttp://works.bepress.com/dicko/15/>
- Dita, M. A., Waalwijk, C., Buddenhagen, I. W., Souza, J. T., & Kema, G. H. J. (2010). A molecular diagnostic for tropical race 4 of the banana fusarium wilt pathogen. *Plant Pathology*, 59(2), 348–357. <https://doi.org/10.1111/j.1365-3059.2009.02221.x>
- Dizon, T. O., Damasco, O. P., Lobina, I. T., Pinili, M. S., Lalusin, A. G., & Natsuaki, K. T. (2012). Induction of putative resistant lines of abaca (*Musa textilis* nee) to banana bunchy top virus and banana bract mosaic virus through in vitro mutagenesis. *J ISSAAS*, 18(1), 87–99. https://www.researchgate.net/profile/Fadil-Galawat/publication/288277469_Profit_efficiency_in_rice_production_in_brunei_darussalam_A_stochastic_frontier_approach/links/6045d0bf92851c077f243af2/Profit-efficiency-in-rice-production-in-brunei-darussalam-A-st
- Djajadi. (2013). Silika (Si): Unsur Hara Penting dan Menguntungkan bagi Tanaman Tebu (*Saccharum officinarum* L.). *Perspektif*, 12(1), 47–55.
- Djajadi, D., Hidayati, S. N., Syaputra, R., & Supriyadi, S. (2016). PENGARUH PEMUPUKAN Si CAIR TERHADAP PRODUKSI DAN RENDEMEN TEBU/Effect of Liquid Si Fertilizer on Yield and Commercial Can e Content of Sugarcane. *Jurnal Littri*, 22(4), 176–181. <https://doi.org/10.21082/littri.v22n4.2016.176-181>
- Dodd, J. C. (2000). The Role of Arbuscular Mycorrhizal Fungi in Agro- and Natural Ecosystems. *Outlook on Agriculture*, 29(1), 55–62. <https://doi.org/10.5367/000000000101293059>
- Dong, X., Xiong, Y., Ling, N., Shen, Q., & Guo, S. (2014). Fusaric acid accelerates the senescence of leaf in banana when infected by Fusarium. *World Journal of Microbiology and Biotechnology*, 30(4), 1399–1408. <https://doi.org/10.1007/s11274-013-1564-1>
- Edison, Riska, & Hermanto, C. (2012). Penyakit Layu Fusarium pada Tanaman Pisang di Provinsi NAD: Sebaran dan Identifikasi Isolat Berdasarkan Analisis Vegetative Compatibility Group. *Jurnal Hortikultura*, 22(2), 165–172. <https://doi.org/10.21082/jhort.v22n2.2012.p165-172>



- Etesami, H. (2018). Can interaction between silicon and plant growth promoting rhizobacteria benefit in alleviating abiotic and biotic stresses in crop plants? In *Agriculture, Ecosystems and Environment* (Vol. 253, pp. 98–112). <https://doi.org/10.1016/j.agee.2017.11.007>
- Etesami, H., & Adl, S. M. (2020). Can interaction between silicon and non-rhizobial bacteria benefit in improving nodulation and nitrogen fixation in salinity-stressed legumes? A review. In *Rhizosphere* (Vol. 15). <https://doi.org/10.1016/j.rhisph.2020.100229>
- Etesami, H., & Jeong, B. R. (2018). Silicon (Si): Review and future prospects on the action mechanisms in alleviating biotic and abiotic stresses in plants. In *Ecotoxicology and Environmental Safety* (Vol. 147, pp. 881–896). <https://doi.org/10.1016/j.ecoenv.2017.09.063>
- Falk, K. L., Tokuhisa, J. G., & Gershenson, J. (2007). The effect of sulfur nutrition on plant glucosinolate content: Physiology and molecular mechanisms. In *Plant Biology* (Vol. 9, Issue 5, pp. 573–581). <https://doi.org/10.1055/s-2007-965431>
- FAO. (2020). *Abaka: Future Fibres*. <http://www.fao.org/economic/futurefibres/fibres/abaka0/en/>
- Fauteux, F., Rémus-Borel, W., Menzies, J. G., & Bélanger, R. R. (2005). Silicon and plant disease resistance against pathogenic fungi. In *FEMS Microbiology Letters* (Vol. 249, Issue 1, pp. 1–6). <https://doi.org/10.1016/j.femsle.2005.06.034>
- Ferry, Y., & Rusli, R. (2014). Pengaruh Dosis Mikoriza Dan Pemupukan Npk Terhadap Pertumbuhan Dan Produksi Kopi Robusta Di Bawah Tegakan Kelapa Produktif. *Jurnal Penelitian Tanaman Industri*, 20(1), 27. <https://doi.org/10.21082/jlitri.v20n1.2014.27-34>
- Fortuna, P., Citernesi, A. S., Morini, S., Vitagliano, C., & Giovannetti, M. (1996). Influence of arbuscular mycorrhizae and phosphate fertilization on shoot apical growth of micropropagated apple and plum rootstocks. *Tree Physiology*, 16(9), 757–763. <https://doi.org/10.1093/treephys/16.9.757>
- Fortunato, A. A., Rodrigues, F. Á., Baroni, J. C. P., Soares, G. C. B., Rodriguez, M. A. D., & Pereira, O. L. (2012). Silicon Suppresses Fusarium Wilt Development in Banana Plants. *Journal of Phytopathology*, 160(11–12), 674–679. <https://doi.org/10.1111/jph.12005>
- Galli, U., Meier, M., & Brunold, C. (1993). Effects of Cadmium on Non-Mycorrhizal and Mycorrhizal Norway Spruce Seedlings [*Picea abies* (L.) Karst.] and Its Ectomycorrhizal Fungus *Laccaria laccata* (Scop. ex Fr.) Bk. & Br.: Sulphate Reduction, Thiols and Distribution of the Heavy Metal. *The New Phytologist*, 125(4), 837–843. <http://www.jstor.org/stable/2558352>
- Gamasari, E. P., Prihantoro, I., & Ridla, M. (2022). Efektivitas Level Dosis Fungi Mikoriza Arbuskula (FMA) Pada Hasil Produksi Tanaman Jagung (*Zea mays* L.) Sebagai Hijauan Pakan. *Jurnal Ilmu Nutrisi Dan Teknologi Pakan*, 20(1), 1–6. <https://doi.org/10.29244/jintp.20.1.1-6>
- Gandjar, I., & Rifai, M. A. (1999). *Pengenalan kapang tropik umum*. Yayasan Obor Indonesia.
- García-Bastidas, F., Ordóñez, N., Konkol, J., Al-Qasim, M., Naser, Z., Abdelwali, M., Salem, N., Waalwijk, C., Ploetz, R. C., & Kema, G. H. J. (2014). First Report of *Fusarium oxysporum* f. sp. *cubense* Tropical Race 4 Associated with Panama Disease of Banana outside Southeast Asia. *Plant Disease*, 98(5), 694. <https://doi.org/10.1094/PDIS-09-13-0954-PDN>
- Garg, N., & Chandel, S. (2010). Arbuscular mycorrhizal networks: Process and functions. A review. In *Agronomy for Sustainable Development* (Vol. 30, Issue 3, pp. 581–599). <https://doi.org/10.1051/agro/2009054>
- Ghag, S. B., Shekhawat, U. K. S., & Ganapathi, T. R. (2015). Fusarium wilt of banana: biology, epidemiology and management. *International Journal of Pest Management*, 61(3), 250–263. <https://doi.org/10.1080/09670874.2015.1043972>



- Ghanbari-Malidareh, A. (2011). Silicon application and nitrogen on yield and yield components in rice (*Oryza sativa L.*) in two irrigation systems. *World Academy of Science, Engineering and Technology*, 74, 88–95.
- Gianinazzi-Pearson, V., & Gianinazzi, S. (1984). The physiology of vesicular-arbuscular mycorrhizal roots. *Plant and Soil*, 71(1–3), 197–209. <https://doi.org/10.1007/BF02182655>
- Gomes, F. B., Moraes, J. C. de, Santos, C. D. dos, & Goussain, M. M. (2005). Resistance induction in wheat plants by silicon and aphids. *Scientia Agricola*, 62(6), 547–551. <https://doi.org/10.1590/s0103-90162005000600006>
- Greger, M., Landberg, T., and Vaculík, M. (2018). Silicon influences soil availability and accumulation of mineral nutrients in various plant species. *Plants* 7:41. doi: 10.3390/plants7020041
- Guével, M. H., Menzies, J. G., & Bélanger, R. R. (2007). Effect of root and foliar applications of soluble silicon on powdery mildew control and growth of wheat plants. *European Journal of Plant Pathology*, 119(4), 429–436. <https://doi.org/10.1007/s10658-007-9181-1>
- Hadisudarno, P. (1990). Prospek pemanfaatan mikoriza v-a sebagai salah satu pilihan untuk pengolahan tanah bermasalah hara Phosphor. In *Makalah Seminar Nasional Pengolahan Tanah Bermasalah*.
- Hadiwiyono, H. (2010). Tanah Supresif dalam Praktik Pengelolaan Penyakit Tumbuhan. *Sains Tanah-Journal of Soil Science and Agroclimatology*, 7(1), 31–40. <https://jurnal.fp.uns.ac.id/index.php/tanah/article/viewFile/50/46>
- Hajiboland, R., Moradtalab, N., Aliasgharzad, N., Eshaghi, Z., & Feizy, J. (2018). Silicon influences growth and mycorrhizal responsiveness in strawberry plants. *Physiology and Molecular Biology of Plants*, 24(6), 1103–1115. <https://doi.org/10.1007/s12298-018-0533-4>
- Han, J., Xia, D., Li, L., Sun, L., Yang, K., & Zhang, L. (2009). Diversity of culturable bacteria isolated from root domains of moso bamboo (*Phyllostachys edulis*). *Microbial Ecology*, 58(2), 363–373. <https://doi.org/10.1007/s00248-009-9491-2>
- Handayanto, E., Hairiah, K., Nuraini, Y., Prasetyo, B., & Aini, F. K. (2006). *Biologi Tanah*. Fakultas Pertanian. Universitas Brawijaya. Malang.
- Hapsoh. (2008). *Pemanfaatan fungi mikoriza arbuskula pada budidaya kedelai di lahan kering*. Universitas Sumatra Utara.
- Harjanti, R. A., Tohari, & Utami, S. N. H. (2014). Pengaruh takaran pupuk nitrogen dan silika terhadap pertumbuhan awal (*Saccharum officinarum L.*) pada inceptisol. *Vegetalika*, 3(3), 35–44.
- Harrier, L. A., & Watson, C. A. (2004). The potential role of arbuscular mycorrhizal (AM) fungi in the bioprotection of plants against soil-borne pathogens in organic and/or other sustainable farming systems. In *Pest Management Science* (Vol. 60, Issue 2, pp. 149–157). <https://doi.org/10.1002/ps.820>
- Hasanah, U., Purnomowati, P., & Dwiputrantri, U. (2017). PENGARUH INOKULASI MIKORIZA VESIKULA ARBUSKULA (MVA) CAMPURAN TERHADAP KEMUNCULAN PENYAKIT LAYU FUSARIUM PADA TANAMAN TOMAT (*Solanum lycopersicum*). *Scripta Biologica*, 4(1), 31. <https://doi.org/10.20884/1.sb.2017.4.1.382>
- Hassan, M. N., Afghan, S., & Hafeez, F. Y. (2010). Suppression of red rot caused by *Colletotrichum falcatum* on sugarcane plants using plant growth-promoting rhizobacteria. *BioControl*, 55(4), 531–542. <https://doi.org/10.1007/s10526-010-9268-z>
- Hayasaka, T., Fujii, H., & Ishiguro, K. (2008). The role of silicon in preventing appressorial penetration by the rice blast fungus. *Phytopathology*, 98(9), 1038–1044. <https://doi.org/10.1094/PHYTO-98-9-1038>
- Hazarika, P., Biswas, S. C., & Dutta, D. (2015). 10. ARBUSCULAR MYCORRHIZAL FUNGI ASSOCIATION IN HOMESTEAD BAMBOO SPECIES OF ASSAM_



UNIVERSITAS
GADJAH MADA

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INDIA By P. HAZARIKA_ SC BISWAS AND D. DUTTA. *LIFE SCIENCES LEAFLETS*, 60, 87-to.
<https://petsd.org/ojs/index.php/lifesciencesleaflets/article/view/796>

Heckman, J. (2013). Silicon: A beneficial substance. *Better Crops*, 97(4), 14–16.
Heliyanto, B., Marjani, U. S., Budi, S., & DI, K. (1995). Eksplorasi plama nutfah abaca di daerah Lampung Selatan. *Buletin Tembakau Dan Serat* (4), 1, 7–9.

Henriet, C., Draye, X., Oppitz, I., Swennen, R., & Delvaux, B. (2006). Effects, distribution and uptake of silicon in banana (*Musa spp.*) under controlled conditions. *Plant and Soil*, 287(1–2), 359–374. <https://doi.org/10.1007/s11104-006-9085-4>

Hermanto, C., Sutanto, A., Jumjunidang, Edison, H. S., Daniells, J. W., O'Neill, W. T., Sinohin, V. G. O., Molina, A. B., & Taylor, P. (2011). Incidence and distribution of Fusarium wilt disease of banana in Indonesia. *Acta Horticulturae*, 897, 313–322. <https://doi.org/10.17660/ActaHortic.2011.897.43>

Heyne, K. (1987). *Tumbuhan berguna Indonesia Jilid 1*. Terjemahan Badan Litbang Kehutanan, Departemen Kehutanan.

Hidayati, Triwikantoro, Faisal, H., & Sudirman. (2009). Sintesis dan Karakterisasi Bahan Komposit. *Seminar Nasional Pascasarjana IX – ITS*.

Hirsch, A. M., & Kapulnik, Y. (1998). Signal transduction pathways in mycorrhizal associations: Comparisons with the Rhizobium-legume symbiosis. In *Fungal Genetics and Biology* (Vol. 23, Issue 3, pp. 205–212). <https://doi.org/10.1006/fgb.1998.1046>

Hodson, M. J., White, P. J., Mead, A., & Broadley, M. R. (2005). Phylogenetic variation in the silicon composition of plants. *Annals of Botany*, 96(6), 1027–1046. <https://doi.org/10.1093/aob/mci255>

Imron, M., Suryanti, S., & Sulandari, S. (2015). PERANAN JAMUR MIKORIZA ARBUSKULAR TERHADAP PERKEMBANGAN PENYAKIT DAUN KERITING KUNING CABAI (THE ROLE OF VESICULAR ARBUSKULAR MYCORRHIZA ON DISEASE SEVERITY OF PEPPER YELLOW LEAF CURL DISEASE). *Jurnal Perlindungan Tanaman Indonesia*, 19(2), 94. <https://doi.org/10.22146/jpti.17251>

INFO. (2020). Abaka. INFO. <https://naturalfibersinfo.org>

Ishii, T. (1996). Utilisation of vesicular-arbuscular mycorrhizal fungi in citrus orchards. *Proc. Int. Soc. Citriculture*, 777–780.

Iswati, R. (2012). Pengaruh dosis formula pgpr asal perakaran bambu terhadap pertumbuhan tanaman tomat (*Solanum Lycopersicum* syn). *Jurnal Agroteknologi*, 1(1), 9–12. <https://ejurnal.ung.ac.id/index.php/JATT/article/view/486>

Jayatri, H. N., Sumardiyono, C., & Wibowo, A. (2018). Race and Virulence Determination of *Fusarium oxysporum* f. sp. *cubense* Isolates from Sidomulyo Village of Bantul, Yogyakarta. *Jurnal Perlindungan Tanaman Indonesia*, 22(1), 72. <https://doi.org/10.22146/jpti.26283>

Ji Su, H.-. (1986). Fusarial Wilt of Cavendish Bananas in Taiwan. *Plant Disease*, 70(9), 814. <https://doi.org/10.1094/pd-70-814>

Jones, D. R. (1995). The Characterization of Isolates of *Fusarium oxysporum* f. sp. *Cubense* from Asia. *Info Musa*, 4(2), 3–4.

Joseph, M. H., Dhargave, T. S., Deshpande, C. P., & Srivastava, A. K. (2015). Microbial solubilisation of phosphate: *Pseudomonas* versus *Trichoderma*. *Annals of Plant and Soil Research*, 17(3), 227–232.

Mukerji, K.G., C. Manoharachary, & Chamola, B. P. (2002). Techniques in Mycorrhizal Studies. In *Techniques in Mycorrhizal Studies*. <https://doi.org/10.1007/978-94-017-3209-3>

Kalaiponmani, K, Thangavelu, R, Varun, G. (2017). Optimization of protein isolation and preliminary comparative proteomics of pathogenic *Fusarium oxysporum* f. sp. *cubense* (p-Foc) and non-pathogenic *Fusarium oxysporum* (np-Fo). *Plant*



- Kang, S.-M., Waqas, M., Shahzad, R., You, Y.-H., Asaf, S., Khan, M. A., Lee, K.-E., Joo, G.-J., Kim, S.-J., & Lee, I.-J. (2017). Isolation and characterization of a novel silicate-solubilizing bacterial strain *Burkholderia eburnea* CS4-2 that promotes growth of japonica rice (*Oryza sativa* L. cv. Dongjin). *Soil Science and Plant Nutrition*, 63(3), 233–241. <https://doi.org/10.1080/00380768.2017.1314829>
- Kanto, T. (2002). Research of silicate for improvement of plant defense against pathogens in Japan. *Abstract of Second Silicon in Agriculture Conference*, 2002.
- Kauss, H., Seehaus, K., Franke, R., Gilbert, S., Dietrich, R. A., & Kröger, N. (2003). Silica deposition by a strongly cationic proline-rich protein from systemically resistant cucumber plants. *The Plant Journal*, 33(1), 87–95. <https://doi.org/https://doi.org/10.1046/j.1365-313X.2003.01606.x>
- Khafiz, S., Uswati, & Indrawati., A. (2018). Peningkatan Pertumbuhan Bibit Pisang Barang dengan Aplikasi Fungi Mikoriza Arbuskular. *Agrotekma*, 2(2), 2548–7841. <https://ojs.uma.ac.id/index.php/agrotekma/article/view/1627/1560>
- Khan, A. G. (2004). Mycotrophy and Its Significance in Wetland Ecology and Wetland Management. In *Wetlands Ecosystems in Asia* (pp. 95–114). <https://doi.org/10.1016/b978-044451691-6/50010-7>
- Khan, M. N., Sarwar, A., Bhutto, S., & Wahab, M. F. (2010). Physicochemical Characterization of the Strawberry Samples on Regional Basis Using Multivariate Analysis. *International Journal of Food Properties*, 13(4), 789–799. <https://doi.org/10.1080/10942910902894914>
- Khoiriyah, A. N. (2021). Pengaruh pemberian pupuk organik dengan media tanah rhizosfer bambu terhadap pertumbuhan dan hasil sawi hijau (*Brassica juncea* L) [Universitas Islam Negeri Maulana Malik Ibrahim. Malang]. <http://etheses.uin-malang.ac.id/33293/>
- Kim, S. G., Kim, K. W., Park, E. W., & Choi, D. (2002). Silicon-Induced Cell Wall Fortification of Rice Leaves: A Possible Cellular Mechanism of Enhanced Host Resistance to Blast. *Phytopathology®*, 92(10), 1095–1103. <https://doi.org/10.1094/PHYTO.2002.92.10.1095>
- Kiswanti, D., Suryanti, S., & Sumardiyono, C. (2010). Identifikasi dan Virulensi *Fusarium oxysporum* f. sp. *cubense* RAS 4. *Jurnal Perlindungan Tanaman Indonesia*, 16(1), 28–32. <https://doi.org/10.22146/jpti.11748>
- Kristiawati, Y., Sumardiyono, C., & Wibowo, A. (2014). Uji pengendalian penyakit layu fusarium pisang (*Fusarium Oxysporum F.Sp. Cubense*) dengan asam fosfit dan aluminium-fosfit. *Jurnal Perlindungan Tanaman Indonesia*, 18(2), 103–110.
- Kumar, M., & Kumar, D. (2011). Comparative study of pulping of banana stem. *Int. J. Fibre Text. Res*, 1(1), 1–5.
- Lakitan, B. (2012). *Dasar-Dasar Fisiologi Tumbuhan*. Raja grafindo persada. Jakarta.
- Leatham, J., Pareja, L., Salazar, W., & Bocardo, C. (2000). Economic factors affecting the production of abaca in Ecuador. *Texas A&M University, Texas*.
- Lee, K. E., Adhikari, A., Kang, S. M., You, Y. H., Joo, G. J., Kim, J. H., Kim, S. J., & Lee, I. J. (2019). Isolation and characterization of the high silicate and phosphate solubilizing novel strain *Enterobacter ludwigii* GAK2 that promotes growth in rice plants. *Agronomy*, 9(3). <https://doi.org/10.3390/agronomy9030144>
- Lestari, E. G. (2013). PEMBENTUKAN GALUR UNGGUL TANAMAN MELALUI PENINGKATAN KERAGAMAN GENETIK DENGAN METODE VARIASI SOMAKLONAL. *Pengembangan Inovasi Pertanian*, 6(2), 53–61. <http://ejurnal.litbang.pertanian.go.id/index.php/pip/article/view/2102>
- Li, C., Chen, S., Zuo, C., Sun, Q., Ye, Q., Yi, G., & Huang, B. (2011). The use of GFP-transformed isolates to study infection of banana with *Fusarium oxysporum* f. sp. *cubense* race 4. *European Journal of Plant Pathology*, 131(2), 327–340.



- Li, X., Zeng, R., & Liao, H. (2016). Improving crop nutrient efficiency through root architecture modifications. *Journal of Integrative Plant Biology*, 58(3), 193–202. <https://doi.org/10.1111/jipb.12434>
- Li, Z., & Kobayashi, M. (2004). Plantation future of bamboo in China. *Journal of Forestry Research*, 15(3), 233–242. <https://doi.org/10.1007/bf02911032>
- Liang, Y. C., Sun, W. C., Si, J., & Römheld, V. (2005). Effects of foliar- and root-applied silicon on the enhancement of induced resistance to powdery mildew in *Cucumis sativus*. *Plant Pathology*, 54(5), 678–685. <https://doi.org/https://doi.org/10.1111/j.1365-3059.2005.01246.x>
- Litbang. (2020). *Pisang Abaka Dukung Industri Berbahan Baku Serat Alam*. Litbang. <https://www.litbang.pertanian.go.id/info-teknologi/4046/>
- Ma, J. F., & Yamaji, N. (2006). Silicon uptake and accumulation in higher plants. In *Trends in Plant Science* (Vol. 11, Issue 8, pp. 392–397). <https://doi.org/10.1016/j.tplants.2006.06.007>
- Maffei, G., Miozzi, L., Fiorilli, V., Novero, M., Lanfranco, L., & Accotto, G. P. (2014). The arbuscular mycorrhizal symbiosis attenuates symptom severity and reduces virus concentration in tomato infected by Tomato yellow leaf curl Sardinia virus (TYLCSV). *Mycorrhiza*, 24(3), 179–186. <https://doi.org/10.1007/s00572-013-0527-6>
- Maharadingga. (2009). *Efektivitas Beberapa Isolat Fungi Mikoriza Arbuskula (FMA) dalam Menekan Perkembangan Penyakit Layu Fusarium pada Bibit Pisang Kultivar Kepok*. Universitas Andalas. Padang.
- Mak, C., Mohamed, A. A., Liew, K. W., & Ho, Y. W. (2004). Early screening technique for Fusarium wilt resistance in banana micropropagated plants. *Banana Improvement: Cellular, Molecular Biology, and Induced Mutations. Proceedings of a Meeting Held in Leuven, Belgium, 24-28 September 2001*, 219–227.
- Makarim, A. K. (2007). Silikon: Hara Penting pada Sistem Produksi Padi. *Iptek Tanaman Pangan*, 2(2), 195–204.
- Maleva, M., Borisova, G., Koshcheeva, O., & Sinenko, O. (2017). Biofertilizer based on silicate solubilizing bacteria improves photosynthetic function of *Brassica juncea*. *AGROFOR International Journal*, 2(3), 13–19. <https://doi.org/10.7251/AGRENG1703013M>
- Manila, R., & Nelson, R. (2013). Nutrient uptake and promotion of growth by Arbuscular Mycorrhizal Fungi in Tomato and their role in Bio-protection against the tomato wilt pathogen. *Journal of Microbiology and Biotechnology Research*, 3(4), 42–46.
- Margaretha, M. (2011). Eksplorasi Dan Identifikasi Mikoriza Indigen Asal Tanah Bekas Tambang Batubara [Exploration and Identification of Indigenous Mycorrhiza of Ex-coal Mining Soil]. *Berita Biologi*, 10(5), 641–647. <https://www.neliti.com/publications/68267/eksplorasi-dan-identifikasi-mikoriza-indigen-asal-tanah-bekas-tambang-batubara-e#cite>
- Marlina, S., & Kausa, C. M. F. (2012). Kemampuan Fungi Mikoriza Arbuskula (FMA) dalam Menekan Perkembangan *Colletotrichum capsici* Penyebab Antraknosa pada Cabai Merah (*Capsicum annum L.*). *Jurnal Penelitian Universitas Jambi: Seri Sains*, 12(2).
- Marschner, H., & Dell, B. (1994). Nutrient uptake in mycorrhizal symbiosis. *Plant and Soil*, 159(1), 89–102. <https://doi.org/10.1007/BF00000098>
- Marschner, P. (2012). Marschner's Mineral Nutrition of Higher Plants. In *Marschner's Mineral Nutrition of Higher Plants: Third Edition*. Elsevier. <https://doi.org/10.1016/C2009-0-63043-9>
- Maryani, N., Lombard, L., Poerba, Y. S., Subandiyah, S., Crous, P. W., & Kema, G. H. J. (2019). Phylogeny and genetic diversity of the banana Fusarium wilt pathogen *Fusarium oxysporum* f. sp. *cubense* in the Indonesian centre of origin.



- Studies in Mycology*, 92, 155–194. <https://doi.org/10.1016/j.simyco.2018.06.003>
- Mathesius, U. (2008). Goldacre paper: Auxin: At the root of nodule development? In *Functional Plant Biology* (Vol. 35, Issue 8, pp. 651–668). <https://doi.org/10.1071/FP08177>
- Matsubara, Y., Ohba, N., & Fukui, H. (2001). Effect of arbuscular mycorrhizal fungus infection on the incidence of fusarium root rot in asparagus seedlings. *Journal of the Japanese Society for Horticultural Science*, 70(2), 202–206. <https://doi.org/10.2503/jjshs.70.202>
- Meena, V. D., Dotaniya, M. L., Coumar, V., Rajendiran, S., Ajay, Kundu, S., & Subba Rao, A. (2014). A case for silicon fertilization to improve crop yields in tropical soils. In *Proceedings of the National Academy of Sciences India Section B - Biological Sciences* (Vol. 84, Issue 3, pp. 505–518). <https://doi.org/10.1007/s40011-013-0270-y>
- Mitani, N., & Jian, F. M. (2005). Uptake system of silicon in different plant species. *Journal of Experimental Botany*, 56(414), 1255–1261. <https://doi.org/10.1093/jxb/eri121>
- Molina, A. B., Fabregar, E., Sinohin, V. G., Yi, G., & Viljoen, A. (2009). RECENT OCCURRENCE OF FUSARIUM OXYSPORUM F. SP. CUBENSE TROPICAL RACE 4 IN ASIA. *Acta Horticultae*, 828, 109–116. <https://doi.org/10.17660/ActaHortic.2009.828.10>
- Molina, A. B., Williams, R. C., Hermanto, C., Suwanda, K. B., & Kokoa, P. (2010). Final report: mitigating the threat of banana Fusarium wilt: understanding the agroecological distribution of pathogenic forms and developing disease management strategies. *ABN*, 34, 864–955. <https://agris.fao.org/agris-search/search.do?recordID=AU2019A01327>
- Moradtalab, N., Hajiboland, R., Aliasgharzad, N., Hartmann, T. E., & Neumann, G. (2019). Silicon and the Association with an Arbuscular-Mycorrhizal Fungus (*Rhizophagus clarus*) Mitigate the Adverse Effects of Drought Stress on Strawberry. *Agronomy*, 9(1), 1–22. <https://doi.org/10.3390/agronomy9010041>
- Moreno, L. O. (2001). Plant characters, fiber quality & cytology of 4 abaca varieties & 11 hybrids. *Philippine Journal of Crop Science*, 26(2), 21–27. <https://www.cabdirect.org/cabdirect/abstract/20093019290>
- Mosse, B. (1981). *Vesicular-arbuscular mycorrhiza research for tropical agriculture*. Hawaii Institute of Tropical Agriculture and Human Resources, College of
- Mostert, D., Molina, A. B., Daniells, J., Fourie, G., Hermanto, C., Chao, C. P., Fabregar, E., Sinohin, V. G., Masdek, N., Thangavelu, R., Li, C., Yi, G., Mostert, L., & Viljoen, A. (2017). The distribution and host range of the banana Fusarium wilt fungus, *Fusarium oxysporum* F. Sp. Cubense, in Asia. *PLoS ONE*, 12(7). <https://doi.org/10.1371/journal.pone.0181630>
- Mwaikambo, L. (2006). Review of the history, properties and application of plant fibres. *African Journal of Science and Technology*, 7(2), 120–133. https://www.researchgate.net/publication/284760719_Review_of_the_history_properties_and_application_of_plant_fibres
- Nasir, N., Jumjunidang, & Riska. (2005). Deteksi dan Pemetaan Distribusi Fusarium oxysporum f. sp. Cubense pada Daerah Potensial Pengembangan Agribisnis Pisang di Indonesia. *Jurnal Hortikultura*, 15(1), 50–57. <http://ejurnal.litbang.pertanian.go.id/index.php/jhort/article/view/961>
- Naureen, Z., Aqeel, M., Hassan, M. N., Gilani, S. A., Bouqellah, N., Mabood, F., Hussain, J., & Y. Hafeez, F. (2015). Isolation and Screening of Silicate Bacteria from Various Habitats for Biological Control of Phytopathogenic Fungi. *American Journal of Plant Sciences*, 6(18), 2850–2859. <https://doi.org/10.4236/ajps.2015.618282>
- Naureen, Z., Hafeez, F. Y., Hussain, J., Al Harrasi, A., Bouqellah, N., & Roberts, M. R. (2015). Suppression of incidence of Rhizoctonia solani in rice by siderophore



- producing rhizobacterial strains based on competition for iron. *European Scientific Journal*, 11(3). <https://eujournal.org/index.php/esj/article/view/4997>
- Naureen, Z., Price, A. H., Wilson, M. J., Hafeez, F. Y., & Roberts, M. R. (2009). Suppression of rice blast disease by siderophore-producing bioantagonistic bacterial isolates isolated from the rhizosphere of rice grown in Pakistan. *Crop Prot*, 28(12), 1052–1060. <https://doi.org/10.1016/j.cropro.2009.08.007>
- Nicholson, R. L., & Hammerschmidt, R. (1992). Phenolic compounds and their role in disease resistance. *Annual Review of Phytopathology*. Vol. 30, 369–389. <https://doi.org/10.1146/annurev.py.30.090192.002101>
- Nurlaili, R. A., Rahayu, Y. S., & Dewi, S. K. (2020). Pengaruh Mikoriza Vesikular Arbuskular (MVA) dan Silika (Si) terhadap Pertumbuhan Tanaman Brassica juncea pada Tanah Tercemar Kadmium (Cd). *LenteraBio : Berkala Ilmiah Biologi*, 9(3), 185–193. <https://doi.org/10.26740/lenterabio.v9n3.p185-193>
- Nurmala, T., Yuniarti, A., & Syahfitri, N. (2016). Pengaruh berbagai dosis pupuk silika organik dan tingkat kekerasan biji terhadap pertumbuhan dan hasil tanaman hanjeli pulut (*Coix lacryma-Jobi* L.) genotip 37". *Kultivasi*, 15(2). <https://doi.org/10.24198/kultivasi.v15i2.11896>
- NURUDEEN, S., & ABDULKARIM, S. A. (2014). CHARACTERIZATION OF SODIUM SILICATE PREPARED FROM KANKARA KAOLIN. *Nigerian Journal of Scientific Research*, 13(1), 72. https://www.researchgate.net/publication/303688751_CHARACTERIZATION_OF_SODIUM_SILICATE_PREPARED_FROM_KANKARA_KAOLIN#:~:text=A morphous silica obtained from kaolin, of commercial sodium silicate respectively.
- Ocfemia, G. O. (1930). Bunchy-top of abacá or manila hemp I. A study of the cause of the disease and its method of transmission. *American Journal of Botany*, 17(1), 1–18. <https://doi.org/10.2307/2446376>
- Ordoñez, N., García-Bastidas, F., Laghari, H. B., Akkary, M. Y., Harfouche, E. N., al Awar, B. N., & Kema, G. H. J. (2015). First Report of *Fusarium oxysporum* f. sp. *cubense* Tropical Race 4 Causing Panama Disease in Cavendish Bananas in Pakistan and Lebanon. *Plant Disease*, 100(1), 209. <https://doi.org/10.1094/PDIS-12-14-1356-PDN>
- OTGR. (2016). *The Biology of Musa L. (Banana)*. Australian Government Office of the Gene Technology Regulator, Australia. https://www.ogtr.gov.au/sites/default/files/files/2021-06/the_biology_of_musa_l_banana.pdf
- Oye Anda, C. C., Opfergelt, S., & Declerck, S. (2016). Silicon acquisition by bananas (c.v. Grande Naine) is increased in presence of the arbuscular mycorrhizal fungus *Rhizophagus irregularis* MUCL 41833. *Plant and Soil*, 409(1–2), 77–85. <https://doi.org/10.1007/s11104-016-2954-6>
- Parihar, M., Meena, V. S., Mishra, P. K., Rakshit, A., Choudhary, M., Yadav, R. P., Rana, K., & Bisht, J. K. (2019). Arbuscular mycorrhiza: a viable strategy for soil nutrient loss reduction. In *Archives of Microbiology* (Vol. 201, Issue 6, pp. 723–735). <https://doi.org/10.1007/s00203-019-01653-9>
- Pedai, T., Hadisutrisno, B., & Priyatmojo, A. (2015). UTILIZATION OF ARBUSCULAR MICORRHIZAL FUNGI TO CONTROL FUSARIUM WILT OF TOMATOES (PEMANFAATAN JAMUR MIKORIZA ARBUSKULAR UNTUK MENGENDALIKAN LAYU FUSARIUM PADA TOMAT). *Jurnal Perlindungan Tanaman Indonesia*, 19(2), 89. <https://doi.org/10.22146/jpti.17255>
- Peera, S. K. P. G., Balasubramaniam, P., & Mahendran, P. P. (2016). Effect of silicate solubilizing bacteria and fly ash on silicon uptake and yield of rice under lowland ecosystem. *Journal of Applied and Natural Science*, 8(1), 55–59. <https://doi.org/10.31018/jans.v8i1.746>
- Pegg, K. G., Moore, N. Y., & Sorensen, S. (1993). Fusarium wilt in the Asian Pacific region. *International Symposium on Recent Developments in Banana Cultivation*



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PENGENDALIAN PENYAKIT LAYU FUSARIUM PADA PISANG ABAKA DENGAN RIZOSFER BAMBU,
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technology'. (Eds RV Valmayor, SC Hwang, RC Ploetz, SW Lee, VN Roa) Pp, 255–314.

- Pegg, K. G., Moore, N. Y., & Sorenson, S. (1994). Variability in populations of *Fusarium oxysporum* f. sp. *cubense* from the Asia/Pacific region. *The Improvement and Testing of Musa: A Global Partnership. Proceedings of the First Global Conference of the International Musa Testing Program*, 70–82. <https://cgospace.cgiar.org/bitstream/handle/10568/104303/282.pdf?sequence=3&isAllowed=y#page=66>
- Pegg, K. G., Shivas, R. G., Moore, N. Y., & Bentley, S. (1995). Characterization of a unique population of *Fusarium oxysporum* f.sp. *cubense* causing Fusarium wilt in Cavendish bananas at Carnarvon, Western Australia. *Australian Journal of Agricultural Research*, 46(1), 167–178. <https://doi.org/10.1071/AR9950167>
- Peter, J. K., & Pandey, N. (2014). Bioprospecting phosphate solubilisation and PGP Activities of native strains of *Pseudomonas aeruginosa* and *Pseudomonas fluorescens* from Bamboo (*Bambusa bambusa*) rhizosphere. *International Journal of Research*, 1(4), 702–717. https://www.researchgate.net/profile/Jyotsna-Peter/publication/277114389_Bioprospecting_Phosphate_Solubilisation_and_PGP_Activities_of_Native_Strains_of_Pseudomonas_Aeruginosa_and_Pseudomonas_Fluorescens_from_Bamboo_Bambusa_Bamboo_Rhizosphere/links/5561a6
- Peterson, R. L., Massicotte, H. B., & Melville, L. H. (2004). *Mycorrhizas: anatomy and cell biology*. NRC Research Press.
- PFI. (2019). *Philippine Abaka Helps in Global Environment Conservation*. GOVPH. <https://philfida.da.gov.ph/index.php/archived-articles/19-philippine-abaca-helps-in-global-environment-conservation>
- Pfleger, F. L., & Linderman, R. G. (1994). *Mycorrhizae and plant health*. St. Paul, Minnesota: APS Press.,
- Phillips, K. A., Skirpan, A. L., Liu, X., Christensen, A., Slewinski, T. L., Hudson, C., Barazesh, S., Cohen, J. D., Malcomber, S., & McSteen, P. (2011). Vanishing tassel2 Encodes a Grass-Specific Tryptophan Aminotransferase Required for Vegetative and Reproductive Development in Maize. *The Plant Cell*, 23(2), 550–566. <https://doi.org/10.1105/tpc.110.075267>
- Ploetz, R. C. (1990). Population biology of *Fusarium oxysporum* f.sp. *cubense*. In *Fusarium wilt of banana*. (pp. 63–76).
- Ploetz, R. C. (1994). Fusarium wilt and IMTP Phase II. *The Improvement and Testing of Musa: A Global Partnership.* (DR Jones, Ed.). INIBAP, Montpellier, France, 57–69. https://www.bioversityinternational.org/fileadmin/user_upload/online_library/publications/pdfs/282.pdf#page=53
- Ploetz, R. C. (2000). Panama Disease: A Classic and Destructive Disease of Banana. *Plant Health Progress*, 1(1). <https://doi.org/10.1094/php-2000-1204-01-hm>
- Ploetz, R. C. (2006). Fusarium Wilt of Banana Is Caused by Several Pathogens Referred to as *Fusarium oxysporum* f. sp. *cubense*. *Phytopathology®*, 96(6), 653–656. <https://doi.org/10.1094/PHYTO-96-0653>
- Ploetz, R. C. (2015a). Fusarium wilt of banana. In *Phytopathology* (Vol. 105, Issue 12, pp. 1512–1521). <https://doi.org/10.1094/PHYTO-04-15-0101-RVW>
- Ploetz, R. C. (2015b). Management of Fusarium wilt of banana: A review with special reference to tropical race 4. *Crop Protection*, 73, 7–15. <https://doi.org/10.1016/j.cropro.2015.01.007>
- Ploetz, R. C. (2019). *Fusarium wilt*. In *Handbook of Diseases of Banana, Abacá and Enset* (D. R. Jones (ed.)). Wallingford: CABI Publishing.
- Powel, C. L., & Bagyaraj, D. J. (1984). VA Mycorrhiza. CRC Press. Inc. Boca Raton, Florida.
- Pozo, M. J., & Azcón-Aguilar, C. (2007). Unraveling mycorrhiza-induced resistance.



- In *Current Opinion in Plant Biology* (Vol. 10, Issue 4, pp. 393–398).
<https://doi.org/10.1016/j.pbi.2007.05.004>
- Prasad, R., Bhola, D., Akdi, K., Cruz, C., KVSS, S., Tuteja, N., & Varma, A. (2017). Introduction to mycorrhiza: Historical development. In *Mycorrhiza - Function, Diversity, State of the Art: Fourth Edition* (pp. 1–7). https://doi.org/10.1007/978-3-319-53064-2_1
- Prasasti, O. H., & Purwani, K. I. (2013). Pengaruh mikoriza Glomus fasciculatum terhadap pertumbuhan vegetatif tanaman Kacang Tanah yang terinfeksi patogen Sclerotium rolfsii. *Jurnal Sains Dan Seni ITS*, 2(2), 2337–3520. http://ejurnal.its.ac.id/index.php/sains_seni/article/view/3624
- Pratama, Y., Wibowo, A., Widiaستuti, A., Subandiyah, S., Widinugraheni, S., & Rep, M. (2018). Evaluation of Some Specific Primer Sets Development for Detecting Fusarium oxysporum f. sp. cubense Tropic Race 4 (Foc TR4) Originating from Indonesia. *Jurnal Perlindungan Tanaman Indonesia*; Vol 22, No 1 (2018), 22(2), 82–90. <https://doi.org/10.22146/jpti.25037>
- PSA. (2020). *Major Non-Food and Industrial Crops Quarterly Bulletin*. <https://psa.gov.ph/content/major-non-food-and-industrial-crops-quarterly-bulletin>
- Puhalla, J. E. (1985). Classification of strains of Fusarium oxysporum on the basis of vegetative compatibility . *Canadian Journal of Botany*, 63(2), 179–183. <https://doi.org/10.1139/b85-020>
- Purnomo, E., & Mukarlina, R. (2017). Uji Antagonis Bakteri Streptomyces spp. terhadap Jamur Phytophthora palmivora BBK01 Penyebab Busuk Buah pada Tanaman Kakao. *Jurnal Protobiont*, 6(2), 1–7. <https://doi.org/10.26418/protobiont.v6i2.20795>
- PURWATI, R. D., BUDI, U. S., & SUDARSONO, S. (2007). Penggunaan Asam Fusarat Dalam Seleksi in Vitro Untuk Resistensi Abaka Terhadap Fusarium Oxysporum F.sp. Cubense. *Industrial Crops Research Journal*, 13(2), 64–72. <https://doi.org/10.21082/littri.v13n2.2007.%p>
- Ranganathan, S., Suvarchala, V., Rajesh, Y. B. R. D., Srinivasa Prasad, M., Padmakumari, A. P., & Voleti, S. R. (2006). Effects of silicon sources on its deposition, chlorophyll content, and disease and pest resistance in rice. *Biologia Plantarum*, 50(4), 713–716. <https://doi.org/10.1007/s10535-006-0113-2>
- Rao, G. B., & Susmitha, P. (2017). Silicon uptake, transportation and accumulation in Rice. *J Pharmacogn Phytochem*, 6(6), 290–293. <https://www.phytojournal.com/archives/2017/vol6issue6/PartE/6-5-385-299.pdf>
- Rao, N. S. S. (1995). *Soil microorganisms and plant growth*. (Issue Ed. 3). Science Publishers, Inc.
- Raturi, G., Sharma, Y., Rana, V., Thakral, V., Myaka, B., Salvi, P., Singh, M., Dhar, H., & Deshmukh, R. (2021). Exploration of silicate solubilizing bacteria for sustainable agriculture and silicon biogeochemical cycle. *Plant Physiology and Biochemistry*, 166, 827–838. <https://doi.org/10.1016/j.plaphy.2021.06.039>
- Richmond, K. E., & Sussman, M. (2003). Got silicon? The non-essential beneficial plant nutrient. In *Current Opinion in Plant Biology* (Vol. 6, Issue 3, pp. 268–272). [https://doi.org/10.1016/S1369-5266\(03\)00041-4](https://doi.org/10.1016/S1369-5266(03)00041-4)
- Rini, M. V., Pertiwi, K. O., & Saputra, H. (2017). SELEKSI LIMA ISOLAT FUNGI MIKORIZA ARBUSKULAR UNTUK KELAPA SAWIT (*Elaeis guineensis* Jacq.) DI PEMBIBITAN. *Jurnal Agrotek Tropika*, 5(3). <https://doi.org/10.23960/jat.v5i3.1820>
- Rodrigues, F. A., & Datnoff, L. E. (2005). Silicon and rice disease management. *Fitopatologia Brasileira*, 30(5), 457–469. <https://doi.org/10.1590/s0100-41582005000500001>
- Rohit, S., Ram, C. R., & Akhilesh, K. P. (2010). Evidence of antagonistic interactions between rhizosphere and mycorrhizal fungi associated with *Dendrocalamus*

strictus (Bamboo). *Journal of Yeast and Fungal Research*, 1(7), 112–117.
<http://www.academicjournals.org/JYFR%0D>

Romaní AM, Fischer H, Mille-Lindblom C, Tranvik LJ (2006) Interactions of bacteria and fungi on decomposing litter: differential extracellular enzyme activities. *Ecology* 87:2559–2569

Sachin, D. (2009). Effect of Azotobacter chroococcum (PGPR) on the Growth of Bamboo *Bambusa* bamboo and Maize (*Zea mays*) Plants. *Biofrontiers*, 1(1), 37–46.

Safari, S., Soleimani, M. J., & Zafari, D. (2012). Effects of silicon pretreatment on the activities of defense-related enzymes in cucumber inoculated with *Fusarium oxysporum*. *Advances in Environmental Biology*, 6(12), 4001–4007.

Sahebi, M., Hanafi, M. M., Siti Nor Akmar, A., Rafii, M. Y., Azizi, P., Tengoua, F. F., Nurul Mayzaitul Azwa, J., & Shabanimofrad, M. (2015). Importance of silicon and mechanisms of biosilica formation in plants. In *BioMed Research International* (Vol. 2015). <https://doi.org/10.1155/2015/396010>

SANTI, L. P., & GOENADI, D. H. (2017). Solubilization of silicate from quartz mineral by potential silicate solubilizing bacteria. *E-Journal Menara Perkebunan*, 85(2), 95–104.

Sari, A. T., Suedy, S. W. A., & Haryanti, S. (2017). Pengaruh pupuk nanosilika terhadap pertumbuhan dan produksi tanaman kapas (*Gossypium hirsutum* L. Var. Kanesia 8). *Jurnal Akademika Biologi*, 6(2), 75–83.
<https://ejournal3.undip.ac.id/index.php/biologi/article/view/19544>

Sauer, D., Saccone, L., Conley, D. J., Herrmann, L., & Sommer, M. (2006). Review of methodologies for extracting plant-available and amorphous Si from soils and aquatic sediments. In *Biogeochemistry* (Vol. 80, Issue 1, pp. 89–108). <https://doi.org/10.1007/s10533-005-5879-3>

Setyo-Budi, U., Purwati, R. D., Hartati, S., & Kangiden, D. I. (1990). Pelestarian dan karakterisasi plasma nutfah abaca. *Laporan Hasil Penelitian Balittas*.

Shaul, O., David, R., & Sinvani, G. (2001). Plant defence response during arbuscular mycorrhiza symbiosis. Current advances in mycorrhizae research. In *The American Phytopathological Society St Paul Minnesota* (pp. 61–68).

Sheng, X. F. (2005). Growth promotion and increased potassium uptake of cotton and rape by a potassium releasing strain of *Bacillus edaphicus*. *Soil Biology and Biochemistry*, 37(10), 1918–1922. <https://doi.org/10.1016/j.soilbio.2005.02.026>

Sheng, X. F., Zhao, F., He, L. Y., Qiu, G., & Chen, L. (2008). Isolation and characterization of silicate mineral-solubilizing *Bacillus globisporus* Q12 from the surfaces of weathered feldspar. *Canadian Journal of Microbiology*, 54(12), 1064–1068. <https://doi.org/10.1139/W08-089>

Shi, Z. Y., Zhang, L. Y., Li, X. L., Feng, G., Tian, C. Y., & Christie, P. (2007). Diversity of arbuscular mycorrhizal fungi associated with desert ephemerals in plant communities of Junggar Basin, northwest China. *Applied Soil Ecology*, 35(1), 10–20. <https://doi.org/10.1016/j.apsoil.2006.06.002>

Shoebitz, M., Ribaudo, C. M., Pardo, M. A., Cantore, M. L., Ciampi, L., & Curá, J. A. (2009). Plant growth promoting properties of a strain of *Enterobacter ludwigii* isolated from *Lolium perenne* rhizosphere. *Soil Biology and Biochemistry*, 41(9), 1768–1774. <https://doi.org/10.1016/j.soilbio.2007.12.031>

Sianipar, H., Munir, E., & Delvian, D. (2016). PENGURANGAN AKUMULASI TIMBAL (Pb) DENGAN MEMANFAATKAN MIKORIZA ARBUSKULA DAN TANAMAN BELIMBING WULUH (*Averrhoa bilimbi*) JABON (*Anthocephalus cadamba*) PETAI (*Parkia speciosa*). *JURNAL BIOSAINS*, 2(3), 133. <https://doi.org/10.24114/jbio.v2i3.4955>

Sieverding, E. (1991). Vesicular–arbuscular mycorrhiza management in tropical agrosystems. In *Eschborn: Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)* (Issue 1991, p. 371).



UNIVERSITAS
GADJAH MADA

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Sievert, E. P. (2009). *The Story of Abaca: Manila hemp's transformation from textile to marine cordage and specialty paper*. Ateneo de Manila University Press.

Simanungkalit, R. D. M., Suriadikarta, D. A., Saraswati, R., Setyorini, D., & Hartatik, W. (2006). *Pupuk organik dan pupuk hayati* (p. 14). Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian.

Smith, S. E., Jakobsen, I., Grønlund, M., & Smith, F. A. (2011). Roles of arbuscular mycorrhizas in plant phosphorus nutrition: Interactions between pathways of phosphorus uptake in arbuscular mycorrhizal roots have important implications for understanding and manipulating plant phosphorus acquisition. *Plant Physiology*, 156(3), 1050–1057. <https://doi.org/10.1104/pp.111.174581>

Smith, S. E., & Read, D. J. (1997). Growth and carbon economy of VA mycorrhizal plants. *Mycorrhizal Symbiosis*, 105–125.

Smith, S. E., & Read, D. J. (2010). *Mycorrhizal symbiosis*. Academic press.

Soares, A. C. F., Martins, M. A., Mathias, L., & Freitas, M. S. M. (2005). Arbuscular mycorrhizal fungi and the occurrence of flavonoids in roots of passion fruit seedlings. *Scientia Agricola*, 62(4), 331–336. <https://doi.org/10.1590/s0103-90162005000400005>

Soenartiningsih. (2011). Infeksi Jamur Mikoriza Arbuskular Berdampak Dalam Meningkatkan Ketahanan Tanaman Jagung. *Seminar Dan Pertemuan Tahunan XXI PEI, PFI Komda Sulawesi Selatan Dan Dinas Perkebunan Pemerintah Provinsi Sulawesi Selatan*. <https://www.scribd.com/doc/262020286/INFEKSI-JAMUR-MIKORIZA-ARBUSKULAR-BERDAMPAK-DALAM-MENINGKATKAN-ketahanan-tanaman-jagung-pdf>

Soenartiningsih. (2013). Potensi cendawan mikoriza arbuskular sebagai media pengendalian penyakit busuk pelepas pada jagung. *IPTEK Tanaman Pangan*, 8, 48–53.

Soesanto, L., & Rahayuniati, R. F. (2009). PENGIMBASAN KETAHANAN BIBIT PISANG AMBON KUNING TERHADAP PENYAKIT LAYU FUSARIUM DENGAN BEBERAPA JAMUR ANTAGONIS. *Jurnal Hama Dan Penyakit Tumbuhan Tropika*, 9(2), 130–140. <https://doi.org/10.23960/j.hppt.29130-140>

Solaiman, M. Z., & Hirata, H. (1995). Effect of indigenous arbuscular mycorrhizal fungus and root effect on soil aggregation. *Soil Sci. Soc. Am. J.*, 57, 77–81.

Steinkellner, S., Lendzemo, V., Langer, I., Schweiger, P., Khaosaad, T., Toussaint, J. P., & Vierheilig, H. (2007). Flavonoids and strigolactones in root exudates as signals in symbiotic and pathogenic plant-fungus interactions. In *Molecules* (Vol. 12, Issue 7, pp. 1290–1306). <https://doi.org/10.3390/12071290>

Stover, R. H. (1962). Fusarial wilt (Panama disease) of bananas and other Musa species. *Fusarial Wilt (Panama Disease) of Bananas and Other Musa Species.*, 117. <https://www.cabdirect.org/cabdirect/abstract/19621605371>

Stover, R. H., & Buddenhagen, I. W. (1986). Banana breeding: polyploidy, disease resistance and productivity. *Fruits*, 41(3), 175–191. <https://revues.cirad.fr/index.php/fruits/article/view/34918>

Suharno, & Santosa. (2005). Pertumbuhan tanaman kedelai [Glycine max (L.) merr.] Yang diinokulasi jamur mikoriza, legin dan penambahan seresah daun matoa [Pometia pinnata Forst.] Pada tanah berkapur= The Growth of Soybean [Glycine Max (L.) Merr.]. *Sains Dan Sibernetika*, 18(3), 367–378. <https://repository.ugm.ac.id/17511/>

Suleman, D., Sani, A., Ambardini, S., Arfa Yanti, N., & Dirvamena, B. (2019). Isolasi dan identifikasi kapang pelarut phosphate dari rizosfer gadung (*Dioscorea hispida* Dennst) dan bambu (*Dendrocalamus asper*). *Jurnal Berkala Penelitian Agronomi*, 7(2), 119. <http://ojs.uho.ac.id/index.php/agronomi/article/view/10564/7431>

Sulyanti. (2006). Potensi Cendawan Mikoriza Arbuskula (CMA) Dalam Meningkatkan Ketahanan Tanaman Pisang Terhadap Infeksi Fusarium oxysporum f.sp



- Sumardiyono, C., Suharyanto, Suryanti, Rositasari, P., & Dwi, C. Y. (2015). Deteksi pengimbasan ketahanan terhadap penyakit layu fusarium dengan asam fusarat. *Perlindungan Tanaman Indonesia*, 19(1), 40–44.
- Sumardiyono, C., Widayastuti, S. M., & Assi, Y. (2001). Pengimbasan Ketahanan Pisang terhadap Penyakit Layu Fusarium dengan Pseudomonas fluorescens. *Prosiding Kongres Nasional XVI Dan Seminar Ilmiah Perhimpunan Fitopatologi Indonesia*, 257–259.
- Suryono Benito Heru Purwanto, Heri, A. P. (2013). Pengaruh Pemupukan Kalium Klorida dan Natrium Silikat Terhadap Umur Pajang Bunga Potong Kembang Kertas (*Zinnia elegans* Jacq.). *Vegetalika*, 2(1). <https://doi.org/10.22146/veg.1616>
- Susanti, W. I., Widayastuti, R., & Wiyono, S. (2015). Peranan Tanah Rhizosfer Bambu sebagai Bahan untuk Menekan Perkembangan Patogen Phytophthora palmivora dan Meningkatkan Pertumbuhan Bibit Pepaya. *Peranan Tanah Rhizosfer Bambu Sebagai Bahan Untuk Menekan Perkembangan Patogen Phytophthora Palmivora Dan Meningkatkan Pertumbuhan Bibit Pepaya*, 39(2), 65–74. <https://doi.org/10.21082/jti.v39n2.2015.65-74>
- Suswati, Indrawaty, A., & Friardi. (2015). Aktivitas Enzim Peroksidase Pisang Kepok Dengan Aplikasi Glomus Tipe 1. *J. HPT Tropika*, 15(2), 141–151.
- Swastiningrum, A. (2015). Mekanisme Jamur Mikoriza arbuskular dalam menekan perkembangan penyakit pada bibit tebu. In *Universitas Gadjah Mada*. Universitas Gadjah Mada, Yogyakarta.
- Syahri, R., Djajadi, D., Sumarni, T., & Nugroho, A. (2016). Pengaruh Pupuk Hijau (*Crotalaria juncea* L.) Dan Konsentrasi Pupuk Nano Silika Pada Pertumbuhan Dan Hasil Tebu Setelah Umur 9 Bulan. *Jurnal Produksi Tanaman*, 4(1). <https://doi.org/10.21176/protan.v4i1.262>
- Takahashi, E. (2002). An introduction to the silicon research in Japan. *Proc. Second Silicon in Agriculture Conf., Silicon in Agriculture Organising Comm. & Japanese Soc. Soil Sci. & Plant Nut.*, Tsuruoka, Japan, 6–14.
- Talanca, A. H., & Adnan, A. M. (2005). Mikoriza dan manfaatnya pada tanaman. *Prosiding Seminar Ilmiah Dan Pertemuan Tahunan PEJ Dan PFJ Komda Sulawesi Selatan*, 311, 315.
- Talanca, H. (2010). Status Cendawan Mikoriza Vesikular Arbuskular (MVA) Pada Tanaman. *Prosiding Pekan Serealia Nasional*, 1(1), 353–357. <http://balitsereal.litbang.pertanian.go.id/wp-content/uploads/2016/12/p45.pdf>
- Taribuka, J., Wibowo, A., M Widayastuti, S., & Sumardiyono, C. (2017). Potency of six isolates of biocontrol agents endophytic Trichoderma against fusarium wilt on banana. *Journal of Degraded and Mining Lands Management*, 4(2), 723–731. <https://doi.org/10.15243/jdmlm.2017.042.723>
- Trianto, & Sumantri, G. (2003). Pengembangan Trichoderma harzianum untuk pengendalian OPT Pangan dan Hortikultura. *Makalah. Lab. PHPT Wilayah Semarang*.
- Trisilawati, O., Towaha, J., & Daras, U. (2012). Pengaruh mikoriza dan pupuk NPK terhadap pertumbuhan dan produksi jambu mete muda. *Jurnal Tanaman Industri Dan Penyegar*, 3(1), 91–98.
- Tu, Z. H., Chen, L. H., Yu, X. X., & Zheng, Y. S. (2013). Effect of bamboo plantation on rhizosphere soil enzyme and microbial activities in coastal ecosystem. *Journal of Food, Agriculture and Environment*, 11(3–4), 2333–2338.
- Tuheteru, F. D. (2003). Aplikasi asam humat terhadap sporulasi CMA dari bawah tegakan alami sengon. In *Skripsi. Bogor: Program Sarjana, Institut Pertanian Bogor*.
- Upadhyaya, H., Panda, S. K., Bhattacharjee, M. K., & Dutta, S. (2010). Role of Arbuscular Mycorrhiza in Heavy Metal Tolerance in Plants: Prospects for



- Utobo, E. B., Ogbodo, E. N., & Nwogbaga, A. C. (2011). Techniques for extraction and quantification of arbuscular mycorrhizal fungi. *Libyan Agriculture Research Center Journal International*, 2(2), 68–78. [https://www.idosi.org/larcji/2\(2\)11/5.pdf](https://www.idosi.org/larcji/2(2)11/5.pdf)
- Vanderplank, J. E. (2012). *Disease resistance in plants*. Elsevier.
- Vasantha, N., Saleena, L. M., & Anthoni Raj, S. (2012). Silicon in day today life. In *World Applied Sciences Journal* (Vol. 17, Issue 11, pp. 1425–1440).
- Vasantha, N., Saleena, L. M., Anthoni Raj, S., Rom, S., Biootech, V., Vijay, D. R., & Pvt, B. (2013). Evaluation of media for isolation and screening of silicate solubilising bacteria. *International Journal of Current Research*, 5(2), 3–5.
- Vasantha, N., Saleena, L. M., & Raj, S. A. (2018). Silica Solubilization Potential of Certain Bacterial Species in the Presence of Different Silicate Minerals. *Silicon*, 10(2), 267–275. <https://doi.org/10.1007/s12633-016-9438-4>
- Vermeire, M.-L., Kablan, L., Dorel, M., Delvaux, B., Risède, J.-M., & Legrèvre, A. (2011). Protective role of silicon in the banana-Cylindrocladium spathiphylli pathosystem. *European Journal of Plant Pathology*, 131(4), 621. <https://doi.org/10.1007/s10658-011-9835-x>
- Vijayapriya, M., & Muthukkaruppan, S. M. (2010). Isolation and screening of silicate solubilizing bacteria and its biocontrol nature against Pyricularia oryzae. *International Journal of Recent Scientific Research*, 4, 87–91. <http://www.recentscientific.com/isolation-and-screening-silicate-solubilizing-bacteria-and-its-biocontrol-nature-against-pyricularia>
- Vlot, A. C., Dempsey, D. A., & Klessig, D. F. (2009). Salicylic acid, a multifaceted hormone to combat disease. *Annual Review of Phytopathology*, 47, 177–206. https://web.archive.org/web/20190224000542id_/http://pdfs.semanticscholar.org/4f74/d739a0f6f84de583ca1bc16a8f737815d6ba.pdf
- Waite, B. H. (1963). Wilt of Heliconia spp. caused by Fusarium oxysporum f. cubense race 3. *Tropical Agriculture*, 40(4).
- Wang, L., Cai, K., Chen, Y., & Wang, G. (2013). Silicon-mediated tomato resistance against Ralstonia solanacearum is associated with modification of soil microbial community structure and activity. *Biological Trace Element Research*, 152(2), 275–283. <https://doi.org/10.1007/s12011-013-9611-1>
- Wang, W., Yu, Z., Zhang, W., Shao, Q., Zhang, Y., Luo, Y., Jiao, X., & Xu, J. (2014). Responses of rice yield, irrigation water requirement and water use efficiency to climate change in China: Historical simulation and future projections. *Agricultural Water Management*, 146, 249–261. <https://doi.org/10.1016/j.agwat.2014.08.019>
- Wardhika, C. M. (2016). Potensi Jamur Mikoriza Arbuskular Unggul Dalam Peningkatan Pertumbuhan Dan Kesehatan Bibit Tebu (*Saccharum officinarum* L.). *Ilmu Pertanian (Agricultural Science)*, 18(2), 84. <https://doi.org/10.22146/ipas.9088>
- Wibowo, A., Santosa, A. T., Subandiyah, S., Hermanto, C., & Taylor, M. F. P. (2013). Control of fusarium wilt of banana by using Trichoderma harzianum and resistant banana cultivars. *Acta Horticultae*, 975, 173–178. <https://doi.org/10.17660/actahortic.2013.975.18>
- Wibowo, A., Suryanti, & Sumardiyono, C. (2001). Patogenisitas 6 Isolat Fusarium oxysporum f. sp. cubense Penyebab Penyakit Layu Fusarium pada Pisang. *Kongres XVI Dan Seminar Nasional PFI. Institut Pertanian Bogor*.
- Wibowo, A., Utami, S. N. H., Subandiyah, S., Somala, M. U. A., Pattison, A., Forsyth, L., & Molina, A. (2014). The effect of silica and manure addition into suppressive and conducive soil on the incidence of fusarium wilt disease of banana. *Acta Horticultae*, 1026, 55–60. <https://doi.org/10.17660/ActaHortic.2014.1026.5>
- Wicaksono, M. I., Rahayu, M., & Samanhudi, S. (2014). PENGARUH PEMBERIAN MIKORIZA DAN PUPUK ORGANIK TERHADAP PERTUMBUHAN BAWANG



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- PUTIH. *Caraka Tani: Journal of Sustainable Agriculture*, 29(1), 35.
<https://doi.org/10.20961/carakatani.v29i1.13310>
- Widyantoro, A., Hadiwiyono, Subagiya. (2020). Short Communication: Biological control of *Fusarium* wilt on banana plants using biofertilizers. *Biodiversitas*, 21(5), 2119-2123. doi:10.13057/biodiv/d210540
- Wijaya, K. A., Prawoto, A. A., & Ihromi, S. (2009). Induksi ketahanan tanaman kakao terhadap hama penggerek buah kakao dengan aplikasi silika. *Pelita Perkebunan*, 25(3), 184–198.
- Yang, C., Liang, Y., Qiu, D., Zeng, H., Yuan, J., & Yang, X. (2018). Lignin metabolism involves *Botrytis cinerea* BcGs1- induced defense response in tomato. *BMC Plant Biology*, 18(1). <https://doi.org/10.1186/s12870-018-1319-0>
- Yukamgo, E., & Yuwono, W. (2007). Peran Silikon Sebagai Unsur Bermanfaat Pada Tanaman Tebu. *Ilmu Tanah Dan Lingkungan*, 7(2), 103–116.
- Yulianti, T., Wijayanti, K. S., Suhara, C., Setyobudi, U., & Murtojo, M. (2019). Ketahanan Delapan Klon Abaka (*Musa textilis*) Terhadap *Fusarium oxysporum* F sp. cubesence. *Buletin Tanaman Tembakau, Serat & Minyak Industri*, 11(1), 1. <https://doi.org/10.21082/btsm.v11n1.2019.1-7>
- Yusriadi, Y., Pata'dungan, Y. S., & Hasanah, U. (2018). Kepadatan dan keragaman spora fungi mikoriza arbuskula pada daerah perakaran beberapa tanaman pangan di lahan pertanian Desa Sidera. *Agroland: Jurnal Ilmu-Ilmu Pertanian*, 25(1), 64–73.
<http://jurnal.untad.ac.id/jurnal/index.php/AGROLAND/article/view/10312>
- Zamora-ChacónP, A., Martínez-HernándezP, M. D. J., & del Rocío Torres-PelayoP, V. (2019). Species of Fungi and Bacteria Associated With the Genus *Bambusa*: A Review. *International Journal of Innovative Science, Engineering & Technology*, 6(5), 30–35. https://ijiset.com/vol6/v6s5/IJISET_V6_I5_05.pdf
- Zhang, L., Guo, Y., Wang, Y. Y., Tang, W., & Zheng, S. J. (2017). Protoplasts transformation and gene knockout system of *Fusarium oxysporum* f. sp. *cubense* TR4. *Acta Phytopathologica Sinica*, 47(2), 1–6.
<https://doi.org/10.13926/j.cnki.apps.000039>
- Zhang, Y., Chen, F. S., Wu, X. Q., Luan, F. G., Zhang, L. P., Fang, X. M., Wan, S. Z., Hu, X. F., & Ye, J. R. (2018). Isolation and characterization of two phosphate-solubilizing fungi from rhizosphere soil of moso bamboo and their functional capacities when exposed to different phosphorus sources and pH environments. *PLoS ONE*, 13(7). <https://doi.org/10.1371/journal.pone.0199625>
- Zhou, G., Meng, C., Jiang, P., & Xu, Q. (2011). Review of Carbon Fixation in Bamboo Forests in China. *Botanical Review*, 77(3), 262–270.
<https://doi.org/10.1007/s12229-011-9082-z>
- Zhou, X., Shen, Y., Fu, X., & Wu, F. (2018). Application of sodium silicate enhances cucumber resistance to *Fusarium* wilt and alters soil microbial communities. *Frontiers in Plant Science*, 9. <https://doi.org/10.3389/fpls.2018.00624>