

DAFTAR PUSTAKA

- Adisarwanto, T. 2005. Kedelai. Penebar Swadaya, Jakarta.
- Adisarwanto, T. dan Wudianto, R. 1999. Meningkatkan Hasil Panen Kedelai di Lahan Sawah-Kering-Pasang Surut. Penebar Swadaya, Bogor.
- Afriyansyah, B. 2010. *Vermicomposting* oleh cacing tanah (*Eisenia fetida* dan *Lumbricus rubellus*) pada empat jenis *bedding*. Disertasi. Institut Pertanian Bogor.
- Aishah, R. M., J. Shamshuddin, C. I. Fauziah, A. Arifin, Q. A. Panhwar. 2018. *Adsorption-desorption characteristics of zinc and copper in oxisol and ultisol amended with sawage sludge*. *Journal Chem. Soc. Pak.* 40 (5) : 842-855.
- Aisyah, D. N., N. Kendarini, S. Ashari. 2018. Efektivitas PEG-600 sebagai media *osmoconditioning* dalam peningkatan mutu benih dan produksi kedelai (*Glycine max* L. Merr.). *Jurnal Produksi Tanaman.* 6 (7) : 1344-1353.
- Akhtar, K., W. Wang, G. Ren, A. Khan, Y. Feng, G. Yang. 2018. *Changes in soil enzymes, soil properties, and maize crop productivity under wheat straw mulching in Guanzhong, China*, *Soil and Tillage Research.* 182 : 94-102.
- Alattar, M. A., F. N. Alattar, R. Popa. *Effect of microaerobic fermentation and black soldier fly larvae foof scrap processing residues on the growth of corn plants (Zea mays)*. *Plant Science Today.* 3 (1) : 57-62.
- Amini, Z. 2019. Analisis pengembangan kedelai dengan menentukan kesesuaian lahan berbasis pada pola hujan di kabupaten Banyumas. *Jurnal Ilmu Indonesia.* 4 (2) : 162-217.
- Amran, M. B., N. K. E. Sari, D. A. Setyorini, Y. Wahyu, D. Widiani, D. Irnameria. 2015. Analisis kualitas tanah pantai Sawarna Kabupaten Lebak Provinsi Banten. *Prosiding Simposium Nasional Inovasi dan Pembelajaran Sains, Bandung.* 649-654.
- Ansyori, M. K., Y. S. Rahayu, U. Faizah. 2015. Vermikomposting menggunakan cacing tanah *Pheretima* sp. untuk meningkatkan kandungan unsur hara pada media tanam limbah padat industri kertas. *LenteraBio.* 4 (1) : 1-5.
- Arslan, M. 2016. *Evaluating of farmy ard manure applications on germination, seedling growth and certain hormone contents of silage maize (Zea mays L.) under salt (NaCl) stress*. *PSP.* 38 (4) : 147-154.
- Azarmi, R., M. T. Giglou, R. D. Taleshmikail. 2008. *Influence of vermicompost on soil chemical and physical properties in tomato (Lycopersicum esculentum) field*. *African Journal of Biotechnology.* 7 (14) : 2397-2401.

- Badruzzaman, D. Z., W. Juanda, Y. A. Hidayati. 2016. Kajian kualitas kascing *vermicomposting* dari campuran feses sapi perah dan jerami padi. *Jurnal Ilmu Ternak*. 16 (2) : 43-48.
- Balai Penelitian Tanah. 2009. Petunjuk Teknis Edisi 2 Analisis Kimia Tanah, Tanaman, Air, dan Pupuk. Balai Penelitian Tanah, Bogor.
- Baquy, M. A. A., J. Y. Li, C. Y. Xu, K. Mehmood, R. K. Xu. 2017. *Determination of critical pH and Al concentration of acidic ultisols for wheat and canola crops*. *Soil Earth*. 149-159.
- Bekele, A., K. Kibret, B. Bedadi, T. Balemi, M. Yli-Halla. 2018. *Effect of lime, vermicompost and chemical P fertilizer on yield of maize in Ebantu district, western highlands of Ethiopia*. *African Journal of Agricultural Research*. 13 (10) : 477-489.
- Berek, A. K., Hue N. V., Radovich, T. J. K., Ahmad, A. A. 2018. *Biochar improve nutrient retention capacity of highly weathered tropical soil*. *Preprints*. 1-16.
- Bertham, Rr. Y. H. 2002. Respon tanaman kedelai (*Glyvive max* (L.) Merrill) terhadap pemupukan fosfor dan kompos jerami pada tanah ultisol. *Jurnal-Jurnal Ilmu Pertanian Indonesia*. 4 (2) : 78-83.
- Bista, P., R. Ghimire, S. Machado, L. Pritchett. 2019. *Biochar effects on soil properties and wheat biomass vary with fertility management*. *Agronomy*. 9 (632) : 13-21.
- BSN. 2004. Spesifikasi Kompos dari Sampah Organik Domestik. Badan Standarisasi Nasional. 1-6.
- Cepeda, C. T., F. Gil-Sotres, M. C. Leirus. 2007. *Thermodynamic parameters of enzymes in grassland soil from Galivia, NW Spain*. *Soil Biology and Biochemistry*. 39 : 311-319.
- Chen, H., X. Yang, H. Wang, B. Sarkar, S. M. Shaheen, G. Gielen, N. Bolan, J. Guo, L. Che, H. Sun, J. Rinklebe. 2020. *Animal carcass and wood derived biochars improved nutrient bioavailability, enzyme activity, and plant growth in metal-phthalic acid ester co-contaminated soils : a trial for reclamation and improvement of degraded soils*. *Journal of Environmental Management*. 261 : 110246.
- Dewanto, F. G., J. J. M. R. Londok, R. A. V. Tuturoong, W. B. Kaunang. 2013. Pengaruh pemupukan anorganik dan organik terhadap produksi tanaman jagung sebagai sumber pakan. *Jurnal Zootek*. 32 (5) : 1-8.
- Dewi, I. L. 2018. Peranan Zeolit dan Mikoriza terhadap Serapan P Jagung (*Zea mays* L.) pada Ultisol. Fakultas Pertanian. Universitas Gadjah Mada. Skripsi.
- Dinesh, R., Dubey, R.P., Ganeshamurthy, A.N., P. Shyam. 2000. *Organic manuring in ricebased cropping system: effects on soil microbial biomass and selected enzyme activities*. *Current Science*. 79 : 12.

- Duck, W. A., L. Cheng, P. Wang. 2000. *Soil acid and alkaline phosphatase activity as pH adjustment indicators. Soil Biology and Biochemistry.* 32 : 1915-1919.
- Edwards, C. A., Domínguez, J., Arancon, N. Q. 2004. *The influence of vermicomposts on plant growth and pest incidence. Soil Zoology for Sustainable Development.* 397-420
- Eghball, B. Wienhold, Gilley, J. E., Eigenberg, R. A. 2002. *Mineralization of manure nutrients. Journal of Soil and Water Conservation.* 57 (6) : 470-474.
- Eivazi, F., M. A. Tabatai. 1977. *Phosphatases in soils. Soil Biol and Biochem.* 167-172.
- Ekenler, M., M. A. Tabatabai. 2003. *Responses of phosphatases and arylsulphatase in soils to liming and tillage systems. Journal Plant Nutrition Soil Sci.* 166 : 281- 290.
- Eswaran, H. and C. Sys. 1970. *An evaluation of the free iron in tropical andesitic soil. Pedologie* 20: 62–65.
- Fatahillah.2017. Uji penambahan berbagai dosis vermikompos cacing (*Lumbricus rubellus*) terhadap pertumbuhan vegetatif cabai rawit (*Capsicum frutescens* L.). *Jurnal Biotek* 5:191-195.
- Fitria, U., Zuraida, Ilyas. 2018. Pengaruh pemberian vermikompos terhadap perubahan beberapa sifat kimia ultisol. *Jurnal Ilmiah Mahasiswa Pertanian Unsyiah.* 3 (4) : 1416-1427.
- Fitriatin, B. N., A. Yuniarti, O. Mulyani, F. S. Fauziah, M. D. Tiara. 2009. Pengaruh mikroorganisme pelarut fosfat dan pupuk P terhadap P tersedia, aktivitas fosfatase, populasi mikroorganisme pelarut fosfat, konsentrasi P tanaman dan hasil padi gogo (*Oryza sativa*. L.) pada ultisol. *Jurnal Agrikultura.* 20 (3) : 1-15.
- Fitriatin, B. N., A. Yuniarti, O. Mulyani. 2011. Peningkatan P tanah dan produksi padi gogo melalui pemanfaatan pelarut fosfat penghasil fosfatase pada tanah marginal. *Jurusan Ilmu Tanah, Fakultas Pertanian, Universitas Padjadjaran.*
- Fitriatin, B. N., A. Yuniarti, T. Turmuktini, F. K. Ruswandi. 2014. *The effect of phosphate solubilizing microbe producing growth regulators on soil phosphate, growth and yield of maize and fertilizer efficiency on ultisol. Eurasian Journal of Soil Science.* 101-107.
- Fitriatin, B. N., Joy, B., T. Subroto. 2008. *The influence of organic phosphorus substrate on phosphatase activity of soil microbes. Proceeding of The International Seminar on Chemistry.* 663.
- Fitriatin, B. N., Reginawanti, H., P. Suryatmana. 2008. Aktivitas enzim fosfatase dan ketersediaan fosfat tanah pada sistem tumpang sari tanaman pangan dan jati (*Tectona grandis* L. F) setelah aplikasi pupuk hayati. *Jurnal Agrikultura.* 19 (3) : 161-167.
- Foth, D. H. 1984. *Fundamental of Soil Science. John Wiley and Sons, Inc, Singapore.*

- Fraser, S. D., D. H. Lynch, J. Gaiero, K. Khosla, K. E. Dunfield. 2016. *Quantification of bacterial non specific acid (phoc) and alkaline (phod) phosphatase genes in bulk and rhizosphere soil from organically managed soybean fields. Applied Soil Ecology.* 1-9.
- Fungo, B., J. Lehmann, K. Kalbitz, M. Thiongo, I. Okeyo, M. Tenywa, H. Neufeldt. 2017. *Aggregate size distribution in a biochar-amended tropical ultisol under conventional hand-hoe tillage. Soil and Tillage Research.* 165 : 190-197.
- Gamiz, B., K. Hall, K. A. Spokas, L. Cox. 2019. *Understanding activation effects on low-temperature biochar for optimization of herbicide sorption. Agronomy.*9 (588) : 23-38.
- Ghosh, S., A. J. Goswami, G. K. Ghosh, P. Pramanik. 2018. *Quantifying the relative role of phytase and phosphatase enzymes in phosphorus mineralization during vermicomposting of fibrous tea factory waste. Ecological Engineering.* 116 : 97-103.
- Giesler, R., T. Andresson, L. Lovgren, and P. Persson. 2005. *Phosphate Sorption in Alumunium-and Iron Rich-Humus Soils. SSSAJ* 69:77-86.
- Gikonyo, E. W., A. R. Zaharah, M. M. Hanafi, A. R. Anuar. 2010. *Comparison of soil phosphorus tests for assessing plant availability of phosphorus in an ultisol amended with water-soluble and phosphate rock sources. The Scientific World Journal.* 10 : 1679-1693.
- Hanafiah, K. A. 2005. *Dasar-Dasar Ilmu Tanah.* Rajawali Press, Jakarta.
- Hanum, C. 2013. *Pertumbuhan, hasil, dan mutu biji kedelai dengan pemberian pupuk organik dan fosfor. J. Agron. Indonesia.* 41 (3) : 209-214.
- Harahap, E., N. Aziza, A. Affandi. 2014. *Menentukan tekstur tanah dengan metode perasaan di lahan politani . Jurnal Nasional Ecpedon.* 2 (2) : 13-15.
- Hardjowigeno, S. 2003. *Ilmu Tanah.* Akademika. Presindo, Jakarta.
- Haridjaja, O., Y. Hidayat, L. S. Maryamah. 2010. *Pengaruh bobot isi tanah terhadap sifat fisik tanah dan perkecambahan benih kacang tanah dan kedelai. Jurnal Ilmu Pertanian Indonesia.* 15 (3) : 147-152.
- He, Z., S. G. Timothy, Wayne H. 2004. *Enzymatic hydrolysis of organic phosphorus in swine manure and soil. Journal Environment.* 33 : 367-372.
- Herviyanti., Ahmad, F., Sofyani, R., Darmawan, Gusnidar, Saidi, A. 2012. *Pengaruh pembeian bahan humat dari ekstrak batubara muda (Subbituminus) dan pupuk P terhadap sifat kimia ultisol serta produksi tanaman jagung (Zea Mays L.). Jurnal Solum.* 11 (1) : 15-24.

- Hidayat, H. K., Titin, S., Sudiarso. 2018. Pengaruh pupuk paitan (*Tithonia diversifolia*) dan NPK anorganik pada tanaman jagung (*Zea mays saccharata* Strut.). *Jurnal Produksi Tanaman*. 6 (5) : 775-782.
- Hong, C., S. Lu. 2018. *Does biochar affect the availability and chemical fractionation of phosphate in soils. Environmental Science and Pollution Research*. 1-10.
- Huang, J., Z. Yu., H. G., X. Yan, J. Chang, C. Wang, J. Hu, L. Zhang. 2017. *Chemical structures and characteristics of animal manures and compost during composting and assessment of maturity indices. Plos One*. 1-16.
- Hue, N. V., H. Ikawa, J. A. Silva. 1994. *Increasing plant-available phosphorus in a ultisol with a yard-waste compost. Commun. Soil. Sci. Plant. Anal.* 25 : 3291-3303.
- Jien, S. H., C. S. Wang. 2013. *Effects of biochar on soil properties and erosion potential in a highly weathered soil. Catena*. 110 : 225-233.
- Kalra, A., S. Shukla, R. Singh, R. K. Verma, M. Chandra, S. Singh, V. K. S. Tomar, A. Krishna, M. Zaim, G. Ram, S. Chand, D. D. Patra. 2012. *Contribution and assessment of recycled menthol mint vermicompost on productivity and soil quality in mint and mint-rice-wheat rotation : A case study. Renewable Agriculture and Food Systems*. 28 (3) : 212-219.
- Khadem, A., F. Raiesi. 2019. *Resonse of soil alkaline phosphatase to biochar amendmets : changes in kinetic and thermodynamic characteristics. Geoderma*. 337 : 44-54.
- Kumar, A., M. Dorodnikov, T. Splettstober, Y. Kuzyakov, J. Pausch. 2017. *Effect of maize roots on aggregate stability and enzyme activities in soil. Geoderma*. 306 : 50-57.
- Kumar, S., S. Chaudhuri, S. K. Maiti. 2015. *Soil phosphatase activity in natural and mined soil. Indian Journal of Environmental Protection*. 1-11.
- Kumari, J. A., P. C. Rao, G. Padmaja, M. Madhari. 2018. *Effect of temperature on soil enzyme acid phosphatase. International Journal of Current Microbiology and Applied Sciences*. 7 (9) : 2830-2845.
- Kurnia, T. D., E. Pudjihartati, L. T. Hasan. 2016. *Bio-priming benih kedelai Glycine max (L.) Merrill untuk meningkatkan mutu perkecambahan. Biota*. 1 (2) : 62-67.
- Kusumawati, N. 2011. *Evaluasi perubahan temperatur, ph dan kelembaban media pada pembuatan vermikompos dari campuran jerami padi dan kotoran sapi menggunakan Lumbricus rubellus. Inotek*. 15 (1): 45-56.
- Laird, D., F. Pierce, W. Baiqun, H. Robert, K. Douglas, 2010. *Biochar impact on nutrient leaching from a Midwestern agricultural soil. Journal Geoderma Elsevier B.V.* 436-442.

- Lan, W., M. Liu. 2008. *Preparation and properties of chitosan-coated NPK compound fertilizer with controlled-release and water-retention. Carbohydrate Polymers. 72:* 240–247.
- Latuponi, H., Dj. Shiddieq, A. Syukur, E. Hanudin. 2011. Pengaruh biochar dari limbah sagu terhadap pelindian nitrogen di lahan kering masam. *Jurnal Agronomika. 11 (2) :* 144-155.
- Latuponu, H. 2013. Pemanfaatan Biochar Limbah Sagu untuk Meningkatkan Ketersediaan N, P, K, Stok Karbon Tanah dan Hasil Tanaman Jagung di Ultisol. Disertasi Program Pasca Sarjana, Universitas Gadjah Mada.
- Latuponu, H., Dj. Shiddieq, A. Syukur, E. Hanudin. 2012. Pemanfaatan limbah sagu sebagai bahan aktif biochar untuk meningkatkan P tersedia dan pertumbuhan jagung di Ultisol. *Jurnal LPPM. 12 (2) :* 136-143.
- Lazcano, C., Arnold, J., Tato, A., Zaller, J.G. and Domínguez, J. 2009. *Compost and vermicompost as nursery pot components: Effects on tomato plant growth and morphology. Spanish Journal of Agricultural Research. 7 :* 944-951.
- Lazcano, C., P. Revilla. R. A. Malvar, J. Dominguez. 2011. *Yield and fruit quality of four sweet corn hybrids (Zea mays) under conventional and integrated fertilization with vermicompost. Journal Sci. Food Agriculture. 91 (1) :* 1244-1253.
- Lehmann J. 2007. *Bio-energy in the Black. The Ecological Society of America.*
- Liang, B., J. Lehmann, J.D. Solomon, J. Kinyangi, J. Grossman, B. O'Neill, J.O. Skjemstad, J. Thies, F.J. Luizã o, J. Petersen & E.G. Neves. 2006. *Black carbon increases cation exchange capacity in soils. Soil Sci. Soc. Am. J. 70 :* 1719-1730.
- Liu, C., H. Tian, H. Li, W. Xie, Z. Wang, M. Megharas, W. He. 2019. *The accuracy in the assessment of arsenic toxicity using soil alkaline phosphatase depends on soil water contents. Ecological Indicators. 102 :* 457-465.
- Maguire, R. O dan F. A. Agblevor. 2010. *Biochar in Agricultural Systems. College of Agriculture and Life Sciences, Virginia Polytechnic. Institute and State University.*
- Manaf, L. A., M. L. Jusoh, M. K. Yusof, T. H. Ismail, R. Harun, H. Juahir. 2009. *Influence of bedding material in vermicomposting process. International Journal of Biology. 1 (1) :* 81-91.
- Manh, V. H., C. H. Wang. 2014. *Vermicompost as an important component in substrate : effects on seedling quality and growth of Muskmelon (Cucumis melo L.). Procedia APCBEE. 8 (1) :* 32-40.
- Margiati, S., R. A. Wiralaga, M. Fitriana. 2014. Takaran beberapa bahan organik terhadap pertumbuhan dan produksi tanaman kedelai (*Glycine Max L. Merrill*) pada tanah ultisol. *Prosiding Semnas Lahan Suboptimal, Palembang. 170-178.*

- Marwanto. 2003. Hubungan antara kandungan lignin kulit benih dengan permeabilitas dan daya hantar listrik rendeman benih kedelai. *Jurnal Alta Agrosia*. 6 (2) : 51-54.
- Masud, M. M., L. J. Yu, X. R. Kou. 2014. *Use of alkaline slag and crop residue biochars to promote base saturation and reduce acidity of an acidic ultisol*. *Pedosphere*. 24 (6) : 791-798
- Mehmood, K., J. Li, J. Jiang, M. M. Masud, R. Xu. 2017. *Effect of low energy-consuming biochars in combination with nitrate fertilizer on soil acidity ameliorant and maize growth*. *Journal Soil Sediments*. 17 : 790-799.
- Mehmood, K., J. Y. Li, J. Jiang, R. Shi, Z. D. Liu, R. Xu. 2017. *Amelioration of an acidic ultisol by straw-derived biochars combined with dicyandiamide under application of urea*. *Environ. Sci. Pollut*. 24 : 6698-6709.
- Melsasail, L., V. R. Ch. Warouw, Y. E. B. Kamagi. 2019. Analisis kandungan unsur hara pada kotoran sapi di daerah dataran tinggi dan dataran rendah. *E-Journal Unsrat*. 1-14.
- Mengel. K., E. A. Kirkby. 1987. *Principles of Plant Nutrition*. *International Potash Institute, Switzerland*.
- Muktamar, Z., Lifia, T. Adiprasetyo. 2020. *Phosphorus availability as affected by the application of organic amendements in ultisols*. *Journal of Soil Science and Agroclimatology*. 17 (1) : 16-22.
- Mulat, T. 2005. *Membuat dan Memanfaatkan Kascing Pupuk Organik Berkualitas*. Agromedia Pustaka, Jakarta.
- Muzaiyanah, S., Subandi. 2016. *The role of organic matter for increasing soybean and cassava production on dry soil acid land*. *IPTEK Tanaman Pangan*. 16 (2) : 149-158.
- Nadeesha, L., Ukwattage, Y. Li. 2020. *Effect of biochar and coal fly ash soil amendments on the leaching loss of phosphorus in subtropical sandy ultisols*. *Water Air Soil Pollut*. 231 (56) : 1-10.
- Nannipieri, P., L. Gianoni, L. Landi, G. Renella. 2011. *Role of Phosphatase Enzymes in Soil*. *Departement of Plant, Soil, and Environmental Sciences, University of Firenze, Piazzale delle, Cascine, Italy*.
- Ndegwa P. M., Thompson S. A. 2001. *Integrating composting and vermikomposting in the treatmen and bioconversion of biosolids*. *Biores Technol*. 76 (1) :7-12.
- Notohadiprawiro, T. 1980. *Persoalan Tanah Masam dalam Pembangunan Pertanian di Indonesia*. *Repro, Ilmu Tanah, Universitas Gadjah Mada, Yogyakarta*.
- Novizan, 2002. *Petunjuk Pemupukan yang Efektif*. Agromedia Pustaka, Jakarta.

- Nurkhotimah. 2017. Pengaruh suhu dan pH terhadap aktivitas enzim fosfatase bakteri termofilik sungai Gendol pasca erupsi Merapi. *Jurnal Prodi Biologi*. 6 (8) : 465-472.
- Ogbomo, L. K. E., Osaigbovo, A. U., Kadiri I. H. 2017. *Influence of some animal manures on growth and yield of maize (Zea mays L.) under a humid ultisols environment. Journal of Organic Agriculture and Enviroment*. 5 (2) : 46-54.
- Parastesh, F., H. A. Alikhani, H. Etesami. 2019. *Vermicompost enriched with phosphate solubilizing bacterial provides plant with enough phosphorus in a sequential cropping under calcareous soil conditions. Journal of Cleaner Production*. 221 : 27-37.
- Prasetyo, B. H., D. A. Suriadikata. 2006. Karakteristik, potensi dan teknologi pengelolaan tanah ultisol untuk pengembangan pertanian lahan kering di Indonesia. *Jurnal Litbang Pertanian*. 25 (2) : 39-47.
- Putri, V. I., Mukhlis, Benny, H. 2017. Pemberian beberapa jenis biochar untuk memperbaiki sifat kimia tanah ultisol dan pertumbuhan tanaman jagung. *Jurnal Agroekoteknologi*. 5 (4) : 824-828.
- Rachman, I.A., S. Djuniwati, K. Idris. 2008. Pengaruh bahan organik dan pupuk npk terhadap serapan hara dan produksi jagung di inceptisol Ternate. *Jurnal Tanah dan Lingkungan*. 10 (1) : 7 – 13.
- Racioppi, M., M. Tartaglia, J. M. D. L. Rosa, M. Marra, E. L. Capel, M. Racco. 2019. *Response of ancient and modern wheat varieties to biochar application: effect on hormone and gene expression involved in germination and growth. Agronomy*. 10 (5) : 1-11.
- Rahmatullah, F. 2013. Potensi vermikompos dalam meningkatkan kadar N dan P pada pupuk dari limbah tikar pandan, pelepah pidang dan *sludge* IPAL PT. Djarum. Universitas Negeri Semarang. Semarang. Skripsi.
- Rao, S. 1994. Mikroorganisme Tanah Dan Pertumbuhan Tanaman. Ed 2. UI Press, Jakarta.
- Riwandi, M. Handajaningsih, Hasanudin. 2014. Teknik Budidaya Jagung dengan Sistem Organik di Lahan Marjinal. Unib Press, Universitas Bengkulu.
- Rohim, AM., Napoleon, A., Imanuddin, MS., Rossa, S. 2012. Pengaruh vermikompos terhadap perubahan kemasaman tanah (pH) dan P-tersedia tanah. *Eprints Sriwijaya University*. 1-11.
- Rouhi, H. R., A. A. Surki, F. S. Zadeh, R. T. Afshari, M. A. Aboutalebian, G. Ahmadvand. 2011. *Study of different priming treatments on germination traits of soybean seed lots. Notulae Scientia Biologicae*. 3 (1) : 101-108.
- Sadeghi, S. H., Z. Hazbavi, M. K. Harchegani. 2016. *Controllability of runoff and soil loss from plots treared by vinasse produced biochar. Science of The Total Environment*. 541 : 483-490.

- Salam, A. K. 1998. Peranan kadar air dan waktu inkubasi dalam penetapan aktivitas enzim fosfatase dalam tanah. *Jurnal Tanah Trop.* 6 : 129-134.
- Sallaku, G., I. Babaj, S. Kaciu, A. Balliu. 2009. *The influence of vermicompost on plant growth characteristics of cucumber (Cucumis sativus L.) seedlings under saline conditions. Journal of Food Agriculture and Environment.* 7 (3) : 869-872.
- Sandrawati, A., E. T. Sofyan, O. Mulyani. 2017. Pengaruh kompos sampah kota dan pupuk kandang sapi terhadap sifat kimia dan hasil tanaman jagung manis (*Zea mays saccharata*) pada fluventic eutrudepts asal Jatinangor Kabupaten Sumedang. Fakultas Pertanian, Universitas Padjajaran, Bandung.
- Santosa, E., R. C. B. Ginting. 2007. Metode Analisis Biologi Tanah. Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian, Bogor.
- Saparotka, B. 2002. *Phosphatase activity of eutric cambisols (upland, Sweeden) in relation to soil properties and farming systems. Acta Agriculturae Bohemica.* 33 (1): 18-24.
- Saparotka, N. 2003. *Phosphatase activities (ACP, ALP) in Agroecosystem Soils. Doctoral thesis. Swedish University of Agricultural Sciences. Uppsala.*
- Sargiman, G., dan T.W.S. Panjaitan. 2013. Pengaruh Penggunaan Pupuk Organik Hayati Terhadap Sifat Fisika Tanah di Kecamatan Pare Kabupaten Kediri. *Jurnal Agroknow.* 1 (1) : 7-12.
- Sari, M. N., Sudarsono, Darmawan. 2017. Pengaruh bahan organik terhadap ketersediaan fosfor pada tanah-tanah kaya Al dan Fe. *Buletin Tanah dan Lahan.* 1 (1) : 65-71.
- Sari, W. I., S. Fajriani, Sudiarso. 2016. Respon pertumbuhan tanaman jagung (*Zea mays saccharata* Sturt) terhadap penambahan berbagai dosis pupuk organik vermicompos dan pupuk anorganik. *Jurnal Produksi Tanaman.* 4 (1) : 57-62.
- Sato, S., Nicholas, B. C. 2005. *Influence of soil pH on inorganic phosphorus sorption and desorption in a humid brazilian ultisol. R. Bras. Ci. Solo.* 29 : 685-694.
- Schnitzer, M. 1991. *Soil organic matter. The next 75 years. Soil Sci. Am. J.,* 151:41-58.
- Setiawan, I. G. P., A. Niswati, K. Hendarto, S. Yusnaini. 2015. Pengaruh dosis vermicompos terhadap pertumbuhan tanaman pakcoy (*Brassica rapa* L.) dan perubahan beberapa sifat kimia tanah ultisol taman bogo. *Jurnal Agrotek.* 3 (1) : 170-173.
- Setiawati, M. R., Suryatmana, P., Hindersah, R., Fitriatin, B. N., Herdiyantoro, D. 2014. Karakterisasi isolat bakteri pelarut fosfat untuk meningkatkan ketersediaan P pada media kultur cair tanaman jagung (*Zea mays* L.). *Bionatura Jurnal Ilmu-Ilmu Hayati dan Fisik.* 16 (1) : 30-34.

- Setiawati, T. C., Paniman, A. M. 2008. Identifikasi dan kuantifikasi metabolit bakteri pelarut fosfat dan pengaruhnya terhadap aktivitas *Rhizoctonia solani* pada tanaman kedelai. *Jurnal Tanah Trop.* 13 (3) : 233-240.
- Shi, R. Y., Z. N. Hong, J. Y. Li, J. Jiang, M. A. Kamran, R. K. Xu, W. Qian. 2018. *Peanut straw biochar increases the resistance of two ultisols derived from different parent materials to acidification : a mechanism study.* *Journal of Environmental Management.* 210 : 171-179.
- Sianturi, S. M., Z. Mukhtar, M. Chozin. 2019. *Enhancing soil chemical properties and sweet corn growth by solid organic amendments in ultisol.* *Journal of Land Restoration.* 2 (1) : 1-8.
- Siregar, D. A., R. R. Lahay, N. Rahmawati. 2017. Respons pertumbuhan dan produksi kedelai (*Glycine max.* L. Merrill) terhadap pemberian biochar sekam padi dan pupuk P. *Jurnal Agroekoteknologi FP USU.* 5 (3) : 722-728.
- Situmeang, M., A. Purwantoro, S. Sulandari. 2014. Pengaruh pemanasan terhadap perkecambahan dan kesehatan benih kedelai (*Glycine max* (L.) Merrill). *Vegetalika.* 3 (3) : 27-37.
- Soil Survey Staff. 2003. *Keys to Soil Taxonomy.* USDA, Natural Research Conservation Service. Ninth Edition, Washington D. C.
- Song, D., L. Chen, S. Zhang, Q. Zheng, S. Ullah, W. Zhou, X. Wang. 2020. *Combined biochar and nitrogen fertilizer change soil enzyme and microbial activities in a 2-year field trial.* *European Journal of Soil Biology.* 99 : 103212.
- Spedding, T.A., C. Hamel, G.R. Mehuys, C.A. Madramootoo. 2003. *Soil microbial dynamics in maize-growing soil under different tillage and residue management systems.* *Soil Biology and Biochemistry.* 36 : 499-512.
- Sriyanti. 2017. Pengaruh pemerangkapan enzim alkalin fosfatase ke dalam silika dari abu sekam padi terhadap aktivitas enzimatisnya. *Jurnal Kimia Sains dan Aplikasi.* 20 (1) : 42-47.
- Stevenson, F.J. 1986. *Cycles of Soil Carbon, Nitrogen, Phosphorus, Sulfur, Micronutrient.*
- Sudaryono, A. Wijanarko, Suyamto. 2011. Efektivitas kombinasi amelioran dan pupuk kandang dalam meningkatkan hasil kedelai pada tanah Ultisol. *Penelitian Pertanian Tanaman Pangan.* 30 (1) : 43-52.
- Sujana, I. P., I Nyoman, L. S. P. 2015. Pengelolaan tanah ultisol dengan pemberian pembenah organik biochar menuju pertanian berkelanjutan. *Agrimeta.* 5 (9) : 1-69.
- Surya, J. A., Y. Nuraini, Widiyanto. 2017. Kajian porositas tanah pada pemberian beberapa jenis bahan organik di perkebunan kopi robusta. *Jurnal Tanah dan Sumberdaya Lahan.* 4 (1) : 463-471.

- Syahputra, E., Fauzi, Razali. 2015. Karakteristik sifat kimia sub grup tanah ultisol di beberapa wilayah Sumatera Utara. *Jurnal Agroekoteknologi*. 4 (1) : 1796-1803.
- Syahrudin, A. Wijaya, T. Butarbutar, W. Hartati, Ibrahim, M. Sipayung. 2018. Biochar yang diproduksi dengan tungku drum tertutup retort memberikan pertumbuhan tanaman yang lebih tinggi. *Jurnal Hut. Trop*. 2 (1) ; 49-58.
- Syukur, M., dan A. Rifianto. 2014. *Jagung*. Penerbar Swadaya, Jakarta.
- Tan, Kim H. 1982. *Principles of Soil Chemistry. The University of Georgia, Collage of Agruculture A Th*
- Taylor, S. 1993. *Dryland Salinity Introductory Extention Notes: Department of Conservation and Land Management. NSW*.
- Thao, H. T., T. George, T. Yamakawa, L. R. Widowati. 2008. *Effect of soil aggregate size on phosphorus extractability and uptake by rice (Oryza sativa L.) and corn (Zea mays L.) in two ultisols from the Philippines. Soil Science and Plant Nutrition*. 54 : 148-258.
- Triadiati, N., R. Mubarik, Y. Ramasita. 2013. Respon pertumbuhan tanaman kedelai terhadap *Bradyrhizobium japonicum* toleran masam dan pemberian pupuk di tanah masam. *Jurnal Agron. Indonesia*. 41 (1) : 24-31.
- Utomo, M., T. Sabrina, Sudarsono, J. Lambanraja, B. Rusman, Wawan. 2016. *Ilmu Tanah Dasa-Dasar dan Pengelolaan*. Kencana, Jakarta.
- Wan, Q., J. H. Yuan, R. K. Xu, X. H. Li. 2014. *Pyrolysis temperature influences ameliorating effects of biochars on acidic soil. Environ Soil Pollut*. 21 : 2486-2495.
- Wang, J., W. Niu, L. Guo, L. Liu, Y. Li, M. Dyck. 2017. *Drip irrigation with film mulch improves soil alkaline phosphatase and phosphorus uptakae. Agricultural Water Management*. 1-10.
- Wang, L., X. Pang, N. Li, K. Qi, J. Huang, C. Yin. 2020. *Effects of vegetation type, fine, and coarse roots on soil microbial communities and enzyme activities in eastern Tibetan plateau. Catena*. 194 : 104694.
- Whitelaw. 2000. *Growth promotion of plants inoculated with phosphate solubilizing fungi. Adv. Agron*. 69 : 99-151.
- Widawati, S. Sulasih. 2006. Populasi bakteri pelarut fosfat (BPF) di Cikaniki, Gunung Botol dan Ciptarasa, serta kemampuannya melarutkan P terikat di media pikovskaya padat. *Biodiversitas*. 7 (2) : 109-113.
- Widawati, S. Suliasih, A. Muharam. 2010. Pengaruh kompos yang diperkaya bakteri penambat nitrogen dan pelarut fosfat terhadap pertumbuhan tanaman kapri dan aktivitas enzim fosfatse dalam tanah. *Jurnal Hortikultura*. 20 (3) : 207-215.

- Wigena, I. G. P., J. Purnomo, E. Tuherkih, A. Saleh. 2006. Pengaruh pupuk “*slow release*” majemuk padat terhadap pertumbuhan dan produksi kelapa sawit muda pada xanthic hapludox di Merangin, Jambi. *Jurnal Tanah dan Iklim*. 24 : 1-11.
- Winarso, S. 2005. *Kesuburan Tanah Dasar Kesehatan dan Kualitas Tanah*. Gava Media, Yogyakarta.
- Yuniati, R. 2004. Penapisan galur kedelai *Glycine max* (L.) Merrill toleran terhadap NaCl untuk penanaman di lahan salin. *Makara Sains*. 8 (1) : 21-24.
- Yunita, S. R., Sutarno, E. Fuskhah. 2018. Respon beberapa varietas kedelai (*Glycine max*. L. Merrill) terhadap tingkat salinitas air penyiraman. *Jurnal Agro Complex*. 2 (1) : 43-51.
- Yuslisa, F. A. 2018. Pengaruh Vermikompos yang Diperkaya Batuan Fosfat terhadap Sifat Kimia Tanah, Pertumbuhan, dan Serapan Jagung di Alfisol, Pathuk, Gunung Kidul. Fakultas Pertanian. Universitas Gadjah Mada. Skripsi.
- Zarea, M. J., N. Karimi, E. M. Goltapeh, A. Ghalavand. 2011. *Effect of cropping systems and arbuscular mycorrhizal fungi on soil microbial activity and root nodule nitrogenase*. *Saudi Soc. Agric. Sci*. 10 : 109-120.
- Zhao, H. T., T. P. Li., Y. Zhang, J. Hu, Y. C. Bai, Y. H. Shan, F. Ke. 2017. *Effects of vermicompost amendment as a basal fertilizer on soil properties and cucumber yield and quality under continuous cropping conditions in a greenhouse*. *Journal Soil Sediments*. 17 : 2718-2730.
- Zheng, T., J. Yang, J. Zhang, C. Tang, K. Liao, Y. Liu. 2019. *Factors contributing to aggregate stability at different particle sizes in ultisols from southem China*. *Journal of Soils and Sediments*. 19 : 1342-1354.
- Zhi-dan F., Z. Li, C. Ping, D. Qing, P. Ting, S. Chun, W. Xiao-chun, L. Wei-guo, Y. Wen-yu, Y. Tai-wen. 2019. *Effect of maize-soybean relay intercropping on crop nutrient uptake and soil bacterial community*. *Journal of Integrative Agriculture*. 18 (9) : 2006-2018.
- Zhu, J., B. Qu, M. Li. 2017. *Phosphorus mobilization in the Yeyahu Wetland : phosphatase enzyme activities and organic phosphorus fractions in the rhizosphere soil*. *International Biodeterioration and Biodegradation*. 1-10.
- Zong, Y., Q. Xiao, S. Lu. 2016. *Acidity, water retentions, and mechanical physical quality of a strongly acidic ultisol amended with biochars derived from different feed stock*. *Journal Soil Sediments*. 16 : 177-190.
- Zong, Y., Y. Wang, Y. Sheng, C. Wu, S. Li. 2018. *Ameliorating soil acidity and physical properties of two contrasting texture ultisols with wastewater sludge biochar*. *Environmental Science and Pollution Research*. 1-9.