

REFERENCES

- Achala, B.S. 1992. Quantitative determination of minerals in Indian coal by X-ray diffraction. *Fuel*. 71: 346–348.
- Aguirre, A., M. Vallejo-Marín, E.M. Piedra-Malagón, R. Cruz-Ortega and R. Dirzo. 2009. Morphological variation in the flowers of *Jacaratia mexicana* A. DC. (Caricaceae), a subdioecious tree. *Plant Biol*. 11: 417-424.
- Ahmad, F., I. Ahmad and M.S. Khan. 2006. Screening of free-living rhizospheric bacteria for their multiple plant growth promoting activities. *Microbial. Res*. 36:1-9.
- Akinci, S., T. Buyukkeskin, A. Eroglu and B.E. Erdogan. 2009. The effect of humic acid on nutrient composition in broad bean (*Vicia faba* L) Roots. *Not Sci Biol*. 1: 81–87.
- Akinremi, O.O., R.L. Janzen, R.L. Lemke and F.J. Larney. 2000. Response of canola, wheat and green beans to leonardite additions. *Can. J. Soil Sci*. 80: 437-443.
- Alfredo, P.M., B. Pilar, M. Engracia, C. Francisco, J. Petra and S. Michael. 2005. Microbial community structure and function in a soil contaminated by heavy metals: effects of plant growth and different amendments. *Soil Biology and Biochemistry*. 38: 327–341.
- Ali, E., K. Saltali, N. Eryigit and F. Uysal. 2007. The effect of leonardite application on climbing bean (*phaseolus vulgaris* L.) yield and some soil properties. *Faculty of Agriculture. Gaziosmanpasa University, TR-60240 Tokat, Turkey Journal of Agronomy*. 6(3): 480-483
- Alken, G.R. 1985. Humic substances in soil sediment and water. New York. John Wiley and Son. 3: 80-91.
- Anonymous. 2010. Humic and fulvic acids: The black gold of agriculture. (On-line). Available: <http://www.humintech.com/pdf/humicfulvicacids.pdf>. (November, 19, 2015).
- Antosovs, M., A. Strapkova, G. Nosalova and T. Turcan. 2008. Exogenous irritant-induced airway hyperreactivity and inhibition of soluble guanylyl cyclase. *Biol Res Nurs*. 10(2): 93–101. 27

- Antošová B., J. Novák, J. Kozler, J. Kubíček and I. Kimmerová. 2007. Methodic for testing biological activities of humic substances in higher plants, pp. 191–203.
- Arancon, N.Q., S. Lee, C.A. Edwards and R. Atiyeh. 2002. Effects of humic acids derived from cattle, food and paper-waste vermicomposts on growth of greenhouse plants. *Pedobiol.* 47: 741-744.
- Arif, M., K. Ali, F. Munsif, A. Ahmad, W. Ahmad and K. Naveed. 2012. Effect of biochar, FYM and nitrogen on weeds and maize phenology. *Pak. J. Weed Sci. Res.* 18(4): 475-484.
- Ayuso M., T. Hernandez, C. Garcia and J. Pascual. 1996. Stimulation of barley growth and nutrient absorption by humic substances originating from various organic materials. *Biores. Technol.* 57: 251-257.
- Bailey, B.A., H. Bae, M.D. Strem, D.P. Roberts, S.E. Thomas, J. Crozier, G.J. Samuels, L.-Y. Choi and K.A. Holmes. 2006. Fungal and plant gene expression during the colonization of cacao seedlings by endophytic isolates of four *Trichoderma* species. *Planta.* 224: 1449-1464.
- Bais, H.P., T.L. Weir, L.G. Perry, S. Gilroy and J.M. Vivanco. 2006. The role of root exudates in rhizosphere interactions with plants and other organisms. *Annual Review of Plant Biology.* 57: 233–266.
- Barrow, J.R. 2003. Atypical morphology of dark septate fungal root endophytes of *Bouteloua* in arid southwestern USA rangelands. *Mycorrhiza.* 13: 239–247.
- Barton, L. and L.A. Schipper. 2001. Regulation of nitrous oxide emissions from soils irrigated with dairy farm effluent. *J. Environ.Qual.* 30:1881–1887.
- Bever, J.D. 2003. Soil community feedback and the coexistence of competitors: conceptual framework and empirical tests. *Ecol.* 85: 561–573.
- Bhat, M. and S. Bhat, 1997. *Biotechnol. Adv.* 15: 583.
- Bhattacharjee, S., L.-Y. Lee, H. Oltmanns, H. Cao, Veena, J. Cuperus and S.B. Gelvin. 2008. AtImpa-4, an *Arabidopsis* importin α isoform, is preferentially involved in *Agrobacterium*-mediated plant transformation. *Plant Cell* 20: 2661–2680
- Birk, D. 1989. Coal Minerals: Quantitative and descriptive SEM-EDX analysis. *J. Coal. Qual.* 8: 55–62.
- Bish, D.L. and J.E. Post. 1993. Quantitative mineralogical analysis using Rietveld full-pattern fitting method. *Am. Mineral.* 78: 932–940.

- Bottomley, W.B. 1917. Some effects of organic-promotion substances (auximones) on the growth of *Lema minor* in mineral cultural solutions. *Proc R Soc Lond Ser B Biol Sci* 89: 481–505.
- Bouis, H.E. 1993. Measuring the sources of growth in rice yield: Are growth rates declining in Asia. *Food Research Institute Studies*. 22 (3): 115-119.
- Bremner JM. 1965. Organic Forms of Nitrogen. In: Black CA, editor. *Methods of Soil*. Madison: American Society of Agronomy. pp. 1238–1255.
- Brookes P.C., A. Landman, G. Pruden and D.S. Jenkinson. 1985. Chloroform fumigation and the release of soil nitrogen: a rapid direct extraction method for measuring microbial biomass nitrogen in soil. *Soil Biology and Biochemistry*. 17: 837-842.
- Brownell, J.R., O. Nordstrom, I. Marihart, and G. Jorgensen. 1987. Crop responses from two new Leonardite extracts. *Sci.Total Environ*. 62: 492-499.
- Brundrett, M. C. and B. Kendrick. 1987. The relationship between the ash bolete (*Boletinus meruloides*) and an aphid parasitic on ash tree roots. *Symbiosis*. 3: 315-319.
- Brundrett, M. C. and B. Kendrick. 1988. The mycorrhizal status, root anatomy, and phenology of plants in a sugar maple forest. *Can. J. Bot*. 66: 1153-1173.
- Brundrett, M. C. and Kendrick, B. 1990a. The roots and mycorrhizas of herbaceous woodland plants I. Quantitative aspects of morphology. *New Phytol*. 14: 457-468.
- Brundrett, M. C. and Kendrick, B. 1990b. The roots and mycorrhizas of herbaceous woodland plants II. Structural aspects of morphology. *New Phytol*. 114: 469-479.
- Brundrett, M. C., G. Murase, G. and Kendrick, B. 1990. Comparative anatomy of roots and mycorrhizae of common Ontario trees. *Can. J. Bot*. 68: 551-578.
- Buncha Thanaboonsombut. 2544. educational materials, techniques Flags Discovery Application, Technology Association. (Thailand - Japan), Bangkok.
- Burdick, E.M. 1965. Commercial humates for agriculture and the fertilizer industry. *Economic Botany*. 19 (2): 152 – 156.
- Callaway, R.M., G.C. Thelen, S. Barth, P.W. Ramsey and J.E. Gannon. 2004. Soil fungi alter interactions between the invader *Centaurea maculosa* and North American natives. *Ecology*. 85: 1062–1071.

- Canellas, L.P., F.L. Olivares and F.A.R. Okorokova. 2002. Humic acids isolated from earthworm compost enhance root elongation, lateral root emergence and plasma membrane H^{+} -ATPase activity in maize roots. *Plant Physiol.* 130: 1951–1957.
- Canellas, L.P., L.R.L. Teixeira Junior, L.B. Dobbss, C.A. Silva, L.O. Medici, D.B. Zandonadi and A.R. Façanha. 2008. Humic acids cross interactions with root and organic acids. *Ann Appl Biol.* 153: 157–166.
- Canellas, L.P. 2010. Chemical composition and bioactivity properties of size-fractions separated from a vermicompost humic acid. *Chemosphere.* 78: 457-466.
- Carman, K.M., M. Maurer, J.M. Yegian, P. Dardess, J. McGee, M. Evers. 2010. Evidence that consumers are skeptical about evidence-based health care. *Health Aff. Millwood.* 29: 1400–1406.
- Caron, J., C.R. Espindola and D.A. Angers. 1996. Soil structural stability during rapid wetting: Influence of land use on some aggregate properties. *Soil Sci. Soc. Am.* 60: 901-908.
- Carvalhais, L.C., P.G. Dennis, D. Fedoseyenko, M.R. Hajirezaei, R. Boriss and N. von Wirén. 2011. Root exudation of sugars, amino acids, and organic acids by maize as affected by nitrogen, phosphorus, potassium, and iron deficiency. *Plant Nutr. Soil Sc.* 174 (679): 3-11.
- Cassman, K.G., S.K. De Datta and D.C. Olk. 1995. Yield decline and the nitrogen economy long-term experiments on continuous irrigated rice systems in the tropics. In *Soil management: experimental basis for sustainability and environmental quality* (ed. R. Lal and B.A. Stewart). Boca Raton: Lewis CRC. pp. 181-222.
- Cassman, K.G., G.C. Gines, M.A. Dizon, M.I. samson and J.M. Alcantara. 1996. Nitrogen-use efficiency in tropical lowland rice systems: contributions from indigenous and applied nitrogen. *Field crops Res.* 47: 1-12.
- Chadwick, O.A., W.D. Nettleton and G.J. Staidl. 1995. Soil polygenesis as a function of quaternary climate change, Northern Great Basin, U.S.A. *Geoderma* 68: 1–26.
- Chen, Y. and T. Aviad. 1990. Effects of humic substances on plant growth. In: *MacCarthy, P., C.E. Clapp, R.L. Malcolm and P.R. Bloom (eds.). Humic Substances in Soil and Crop Sciences: Selected Readings, ASA and SSSA, Madison.* pp. 161-186.

- Chron'a'kova', A., D. Elhottova', S. Maly' and V. Kris'tu'fek. 2004. Approaches applied in study of soil microbial diversity in brown coal post-mining chronosequences. *Phytopedon* 3:35–39.
- Chuasavathi, T. and V. Treloges. 2001. An improvement of Yasothon soil fertility (Oxic Paleustults) using municipal fermented organic compost and *Panicum maximum* TD 58 grass. *Pakistan. Biol Sci.* 4 (8): 968-972.
- Cooper WE Jr. 1998. Evaluation of the swab and related tests as a bioassay for assessing responses by squamate reptiles to chemical stimuli. *Journal of Chemical Ecology* 24: 841-866.
- Costacurta, A. and J. Vanderleyden. 1995. Synthesis of phytohormones by plant-associated bacteria. *Crit. Rev. Microbiol.* 21: 1–18.
- Deborah, P.D. and P. Burba. 1999. Extraction kinetics and molecular size fractionation of humic substances from two Brazilian soils. *Brazilian Chemical Society.* 10(2): 146-152.
- Department of Agriculture. 2005. Fertilizer analysis. Section of fertilizer analysis. Division of Agricultural Chemistry. Department of Agriculture. Ministry of Agriculture and Cooperatives. Bangkok. 52 p.
- Dudley, N., A. Belokurov, O. Borodin, L. Higgins-Zogib, M. Hockings, L. Lacerda and S. Stolton. 2004. Are protected areas working. An analysis of forest protected areas by WWF. WWF International, Gland, Switzerland.
- Ece A., K. Saltali, N. Eryigit and F. Uysal. 2007. The effects of leonardite applications on climbing bean (*Phaseolus vulgaris* L.) yield and soil properties. *Agron.* 6: 480–483.
- Edwards, D.R. and T.C. Daniel. 1992. Environmental impacts of on-farm poultry waste disposal- A review. *Bioresource Technology.* 41:9-33.
- Eghball, B., D. Ginting, and J.E. Gilley. 2004. Residual effects of manure and compost applications on corn production and soil properties. *Agron. J.* 96:442-447.
- Eilers, W.E., R. MacKay, L. Graham and A. Lefebvre. 2010. Environmental Sustainability of Canadian Agriculture: Agri-Environmental Indicator Report Series – Report #3. Agriculture and Agri-Food Canada, Ottawa (in press).
- El-Razek, E.A., A.S.E. Abd-Allah and M.M.S. Saleh. 2012. Yield and fruit quality of Florida Prince peach trees as affected by foliar and soil applications of humic acid. *Applied Sci. Res.* 8(12): 5724-5729.

- Eyheraguibel, B., J. Silvestre and P. Morard. 2008. Effects of humic substances derived from organic waste enhancement on the growth and mineral nutrition of maize. *Bioresour. Technol.* 99:4206-4212. (On-line). Available: <http://dx.dio.org/10.1016/j.biortech. 2007 .08.082>; PMID: 17962015. (January, 20, 2015).
- FAO/UNDP/UNEP/World Bank. 1997. Land Quality Indicators and Their Use in Sustainable Agriculture and Rural Development. (On-line). Available: <http://www.fao.org/docrep/w4745e/w4745e00.HTM> (October 6, 2013)
- Fava, F. and A. Piccolo. 2002. Effects of humic substances on the bioavailability and aerobic biodegradation of polychlorinated biphenyls in a model soil. *Biotechnol Bioeng.* 77:204–211.
- Fernandez-Escobar, R., M. Benlloch, D. Barranco, A. Duenas and J.A. Guterrez Ganán. 1996. Response of Olive Trees to Foliar Application of Humic Substances Extracted from Leonardite. *Scientia Horticulturae.* 66 (3-4):191-200.
- Flaig, W., B. Nagar, H. Söchtig and Tietjen. 1977. C. Organic materials and soil productivity. Rome: Food and Agriculture Organization of the United Nations.
- Flinn, J.C. and S.K. De Datta. 1984. Trends in irrigated rice yields under intensive cropping at Philippine research stations. *Field Crop Research.* 30: 1599-1603.
- Fong, S.S. and L. Seng. 2007. A comparative evaluation on the oxidative approaches for extraction of humic acids from low rank coal of Mukah, Sarawak. *Brazilian Chemical Society.* 18(1): 34 – 40.
- Fong, S.S., L. Seng, W.N. Chong, J. Asing, M. Faizal, M. Nor, A. Satirawaty and M. Pauzana. 2006. Characterization of the coal derived humic acids from Mukah, Sarawak as soil conditioner. *Journal of the Brazilian Chemical Society.* 17 (3): 582 – 587.
- Franché, C., K. Lindstrom and C. Elmerich. 2009. Nitrogen fixing bacteria associated with leguminous and non-leguminous plants. *Plant Soil.* 321: 35-59.
- Fredrickson, L.K., D.L. Balkwill, G.R. Drake, M. F. Romine, D.B. Ringelberg and D.C. White. 1995. Aromatic-degrading *Sphingomonas* isolates from the deep subsurface. *Appl Environ Microbiol.* 61: 1917-1922.
- Funakawa, S., J. Yanai, Y. Hayashi, T. Hayashi, T. Watanabe, C. Noichana, T. Panitkasate, R. Katawatin, T. Kosaki and E. Nawata. 2006. Soil organic matter

- dynamics in a sloped sandy cropland of northeast Thailand with special reference to the spatial distribution of soil properties. *Jpn. J. Trop. Agr.* 50: 199-207.
- Gaigher, J.L. 1983. Quantitative X-ray diffraction for the determination of minerals in South African coal production samples. *Spec. Publ. Geol. Soc. S. Afr.* 7: 163–168.
- Garcia, D., J. Cegarra and M. Abad. 1996. A comparison between alkaline and decomplexing reagents to extract humic acids from low rank coals. *Fuel Processing Technology.* 48: 51 – 60.
- Gernier-Sillarn, E. and S. Harigenth. 2004. Humic substances in peats (Sumatra, Indonesia). *Analisis.* 27(5): 405 – 408.
- Giannouli, A., S. Kalaitzidis, G. Siavalas, A. Chatziapostolou, K. Christanis, S. Papazisimou, C. Papanicolaou and A. Foscolos. 2009. Evaluation of Greek low-rank coals as potential raw material for the production of soil amendments and organic fertilizers. *International Journal of Coal Geology.* 77(3-4): 383-393.
- Gholami, A., S. Shahsavani and S. Nezarat. 2009. The effect of plant growth promoting rhizobacteria (PGPR) on germination, seedling growth and yield of maize. *WASET.* 49: 19-24.
- Glick, BR. 1995. The enhancement of plant growth by free-living bacteria. *Can J Microbiol.* 41: 109–117.
- Glick B.R. and Y. Bashan. 1999. Genetic manipulation of plant growth-promoting bacteria to enhance biocontrol of phytopathogens. *Biotechnol Adv.* 15: 353–378.
- Gordon, S.A. and R.P. Weber. 1951. Colorimetric estimation of indole-acetic acid. *Plant Physiology.* 26: 192-195.
- Gravois, K.A. and R.S. Helms. 1992. Path analysis of rice yield and yield components as affected by seeding rate. *Agron. J.* 84: 1-4.
- Grunig, L.A., J.E. Grunig and D.M. Dozier. 2002. Excellent public relations and effective organizations: A study of communication management in three countries. Mahwah, NJ: Lawrence Erlbaum Associates.
- Gyaneshwar, P., G.N. Kumar, L.J. Parekh and P.S. Poole. 2002. Role of soil microorganisms in improving P nutrition of plants. *Plant Soil.* 245: 83-93.
- Halil, Y., S. Hayati, M.K. Gullap, L. Anastasios and G. Adem. 2011. Application of cattle manure, zeolite and leonardite improves hay yield and quality of annual ryegrass

- (*Lolium multiflorum* Lam.) under semiarid conditions. *Australian Journal Crop Science*. 5(8): 926-931.
- Hartemink, A.E. 2003. Soil fertility decline in the tropics: With the case studies on plantation. ISRIC-CABI Publishing, Wallingford.
- Hatami, S., H.A. Alikhani, H.N. Besharati, M. Salehrastin, Afrousheh, and Yazdani Jahromi. 2008. Investigation on aerobic cellulolytic bacteria in some of north forest and farming soils. *Biotechnology and Bioengineering Symposium*. 5: 193-219.
- Hart, S.C., J.M. Stark, E.A. Davidson and M.K. Firestone. 1994. Nitrogen mineralization, immobilization, and nitrification. In: Weaver, R.L. (Ed.), *Methods of Soil Analysis, Part 2*. Soil Sci. Soc. Am., Madison.
- Hart, S. D. 2003. Violence risk assessment: An anchored narrative approach. In M. Vanderhallen, G. Vervaeke, P. J. Van Koppen, and J. Goethals (Eds.), *Much ado about crime: Chapters on psychology and law* (pp. 209–230). Brussels: Uitgeverij Politeia NV
- He, K., L. Song, L.W. Cummings, J. Goldman, R.L. Huganir and H.K. Lee. 2009. Stabilization of Ca^{2+} -permeable AMPA receptors at perisynaptic sites by GluR1-S845 phosphorylation. *Proc Natl Acad Sci. U S A*. 106: 20033–20038.
- Henao, J. and C.A. Baanante. 1999. Nutrient depletion in the agricultural soils of Africa. International Food Policy Research Initiative. 2020 Vision, Brief No. 62.
- Hirzel, J., and I. Walter. 2008. Availability of nitrogen, phosphorous and potassium from poultry litter and conventional fertilizers in a volcanic soil cultivated with silage corn. *Chilean J. Agric. Res*. 68: 264-273.
- Hoffman, G.L., D.J. Nikols, S. Stuhel and R.A. Wilson. 1993. Humalite, Alberta's Form of Leonardite, Retread Resources Ltd., Available: <http://retreadresources.com/ResourceHumalite.html>. (January, 5, 2015).
- Hussain, N., G. Hassan, A. Ghafoor and G. Sarwar. 1998. Bio-amelioration of sandy clay loam saline sodic soil. *Proc. 6th Intl. Micro-Irrigation Congress*, March 8-10, 1998, Florida, 293-300.
- Ihsanullah, D. and A.A. Bakhshwain. 2013. Effect of humic acid on growth and quality of maize fodder production. *Pakistan J. Bot*. 45: 21-25.

- John, R.D., J.D. Frank, A.H. Vincent and D.R. Earhart. 1998. Evaluating leonardite as a crop growth enhancer for turnip and mustard greens, Duction. Paper 10. FAO, Rome. 564-567.
- Kalaichelvi, K., C. Chinnusamy and A. Swaminathan. 2006. Exploiting the natural resource-lignite humic acid in agriculture A review. *Agric. Rev.* 27 (4): 276-283.
- Kalra, Y.P. 1998. Handbook of Reference Methods for Plant Analysis. CRC Press. Boca Rotan. FL. USA.
- Katkat, AV., H. Celik, M.A. Turan and B.B. Asik. 2009. Effects of soil and foliar applications of humic substances on dry weight and mineral nutrients uptake of wheat under calcareous soil conditions. *Aust J Basic Appl Sci.* 3: 1266–1273.
- Karnwal, A. 2009. Production of Indol acetic acid by fluorescent *Pseudomonas* in the presence of L-Tryptophan and Rice root exudates. *Journal of Plant Pathology.* 91: 61-63.
- Karthikeyan, K., M.A. Thirunarayan and P. Krishnan. 2010. Coexistence of blaOXA-23 with blaNDM-1 and armA in clinical isolates of *Acinetobacter baumannii* from India. *J Antimicrob Chemother* 65: 2253–2254.
- Khan, J.A. and R.M. Bhatnagar. 1977. Studies on Sulubilization of insoluble phosphate microorganism. Part I Sulubilization of Indian phosphate rock by *Aspergillus niger* and *Penicillium* sp. *Fert. Tech.* 14 (4): 329-333.
- Klironomos, J.N. and M.M. Hart. 2002. Colonization of roots by arbuscular mycorrhizal fungi using different sources of inoculum. *Mycorrhiza* 12: 181-184.
- Kloepper, J.W., J. Leong, M. Teintze and M.N. Schroth. 1980. *Pseudomonas* siderophores: A mechanism explaining disease-suppressive soils. *Curr Microbiol.* 4:317–320.
- Kohanowski, N.N. 1970. Leonardite in North Dakota. *North Dakota Quarterly.* 38: 36-42.
- Kumar, V. and N. Narula. 1999. Solubilization of inorganic phosphates and growth emergence of wheat as affected by *Azotobacter chroococcum*. *Biol. Fertil. Soil,* 28: 301-305.
- Laker, M. C. 1993. Human-Induced Soil Degradation in Africa. Proceedings of the National Veld Trust Jubilee Conference, Pretoria, pp. 76–86.
- Lal, R., 1998. Soil erosion impact on agronomic productivity and environment quality. *Crit Rev Plant Sci.* 17: 319 – 464

- Larijani, B.A. and S. J. Hoseini. 2012. Comparison of integrated chemical and organic fertilizer management on rice growth and yield under system of rice intensification (SRI). *Intl. J. Agron. Plant. Prod.* 3 (S): 726-731.
- Limtong, P. 2012. Status and priorities of soil management in Thailand. Global soil partnership, technical workshop on “Managing Living Soils” FAO HQ, Rome, Italy, 5 December, 2012.
- Liu, Y.C., Y.J. Wang and S.N. Wu. 2008. The mechanisms of propofol-induced block on ion currents in differentiated H9c2 cardiac cells. *Eur J. Pharmacol.* 590: 93-98.
- Liu, C., 1998. Effects of humic substances on creeping bentgrass growth and stress tolerance. Ph.D. Thesis. Philosophy Department of Crop Science. North Carolina State University. Raleigh.
- Liu, J.Y., W.K. Versaw, N. Pumplin, S.K. Gomez, L.A. Blaylock and M.J. Harrison. 2008. Closely related members of the *Medicago truncatula* PHT1 phosphate transporter gene family encode phosphate transporters with distinct biochemical activities. *Journal of Biological Chemistry*. 283: 24673–24681.
- Mackowiak, C., P. Grossl and B. Bugbee. 2001. Beneficial effects of humic acid on micronutrient availability to wheat. *Soil Sci. Soc. Am. J.* 65 (6): 1744-1750.
- Madanoglu, M., K. Lee and G. Castrogiovanni. 2011. Franchising and firm financial performance among U.S. restaurants. *Journal of Retailing*. 1-12.
- Masson-Boivin, C., E. Giraud, X. Perret and J. Batut. 2009. Establishing nitrogen-fixing symbiosis with legumes: how many rhizobium recipes. *Trends Microbiol.* 17: 458–466.
- Maksimov, I.V., R.R. Abizgil'dina and L.I. Pusenkova. 2011. Plant growth promoting rhizobacteria as alternative to chemical crop protectors from pathogens (Review) *Appl Biochem Microbiol.* 47: 333–345.
- Mandile, A.J. and A.C. Hutan. 1995. *Int. J. Coal. Geol.* 28: 51–69.
- Martinez-Tarazona, M.R., J.M. 1995. Quantitative X-ray diffraction analysis of mineral and organic phases in organic-rich rocks Palacios and J.M.D. Tascon. 1990. SEM-EDX characterization of inorganic constituents of brown coals. *Inst. Phys. Conf. Ser.* 98: 327–330.
- Mellado Caballero, J., P. Estrada-de los Santos, P. Mavingui, B. Cournoyer, F. Fontaine and J. Balandreau. 2002. AN-2-fixing Endophytic Burkholderia sp. AN - 2 -

- fixing endophytic *Burkholderia* sp. Associated with maize plants cultivated in Mexico. Canadian Journal of Microbiology. 48: 285-294.
- Mohammadipour, E., A. Golchin, J. Mohammadi, N. Negahdar and M. Zarchini. 2012. Improvement fresh weight and aerial part yield of marigold (*Calendula officinalis* L.) by humic acid. Annals of Biol. Res. 3(11): 5178-5180.
- Mummey D.L. and M.C. Rillig. 2006. The invasive plant species *Centaurea maculosa* alters arbuscular mycorrhizal fungal communities in the field. Plant and Soil. 288: 81-90.
- Murashima, K., T. Nishimura, Y. Nakamura, J. Koga and T. Moriya. 2002. Enzyme Microb. Technol. 30: 319.
- Mutluru Sridevi and Konada Veera Mallaiah. 2007. Bioproduction of indole acetic acid by *Rhizobium* strains isolated from root nodules of green manure crop. *Sesbania sesban* (L.) Merr. Iranian journal of biotechnology. 5 (3): 178-182.
- Nardi, S., D. Pizzeghello, A. Muscolo and A. Vianello. 2002. Physiological effects of humic substances in plant growth. Soil Biol. Biochem. 34 (11): 1527-1536.
- Nguyen, B.V., D.C. Olk and K.G. Cassman. 2004. Nitrogen mineralization from humic acid fractions in rice soils depends on degree of humification. Soil Sci. Soc. Am. J. 68: 1278–1284.
- Nielsen, P.L., J. Sullivan and M.G. Shepherd, 1997. Biochem. 65: 33.
- Novak, J., J. Kozler, P. Janos, J. Cezikova, V. Tokarova and L. Madronova. 2001. Humic acids from coals of the North-Bohemian coal field: I. Preparation and characterization. Reactive and Functional Polymers. 47: 101 – 109.
- Noble, A.D., G.P. Gillman and S. Ruaysoongnern. 2000. A cation exchange index for assessing degradation of acid soil by further acidification under permanent agriculture in the tropics. Eur. J. Soil Sci. 51: 233-243.
- Nunan, N., M. A. Morgan and M. Herlihy. 1998. Ultraviolet absorbance (280 nm) of compounds released from soil during chloroform fumigation as an estimate of the microbial biomass. Soil Biol. Biochem. 30: 1599-1603.
- O'Connor, B.H. and M.D. Raven. 1988. Application of the Rietveld refinement procedure in assaying powdered mixture. Pow. Diff. 3: 2–6.
- Ogut, M., Er. Fatih and N. Kandemir. 2010. Phosphate solubilization potentials of soil *Acinetobacter* strains. Biol. Fert. Soils. 46: 707–715.

- Okon, Y. and R. Itzigsohn. 1995. The development of Azospirillum as a commercial inoculant for improving crop yields. *Biotechnol Adv.* 13: 415–424.
- Olayinka, A. and A. Adebayo. 1985. The effects of methods of application of saw dust on plant growth nutrients uptake and soil chemical properties. *Plant and soil.* 85: 47-56.
- Orhan, E., A. Esitken, S. Ercisli, M. Turan and F. Sahin. 2006. Effects of plant growth promoting rhizobacteria (PGPR) on yield, growth and nutrient contents in organically growing raspberry. *Sci. Hortic.* 111: 38–43.
- Ozbayoglu, G. and M.E. Ozbayoglu, 2006. *Fuel*, 85: 545
- Pal A., 1998a. Photoinitiated gold sol generation in aqueous Triton X-100 and its analytical application for spectrophotometric determination of gold. *Talanta.* 46: 583–587.
- Pal A., 1998b. Photochemical formation of gold nanoparticles in aqueous Triton X-100 and its application in SERS spectroscopy. *Curr. Sci.* 74: 14–16.
- Peix, A., A.A. Rivas-Boyer, P.F. Mateos, C. Rodríguez-Barrueco, E. Martí'nez-Molina and E. Vela'zquez. 2001. Growth promotion of chickpea and barley by a phosphate solubilizing strain of *Mesorhizobium mediterraneum* under growth chamber conditions. *Soil Biol Biochem.* 33: 103–110.
- Pettit, R. E. 2004. Organic matter, humus, humate, humic acid, fulvic acid and humin: Their importance in soil fertility and plant health. (Online). Available: <http://www.humate.info/main page.htm> (November, 19, 2016).
- Pertuit, A.J., J.B. Jerry, Jr. Dudley and J.E. Toler. 2001. Leonardite and fertilizer levels influence tomato seedling growth. *Hortsci.* 5(36): 913–915.
- Phongpan, S., and A.R. Mosier. 2003. Effect of crop residue management on nitrogen dynamics and balance in a lowland rice cropping system. *Nutr. Cycling Agroecosyst.* 66:133–142.
- Piccolo, A., R. Rausa and G. Cetano. 1992. Characteristics of molecular size fractions of humic substances derived from oxidized coal. *Chemosphere.* 24:1381-1387.
- Pikovskaya, R.I. 1948. Mobilization of phosphorus in soil connection with the vital activity of some microbial species. *Microbiologiya.* 17: 362–370.
- Pochadom, S., S. Khaokaew, P. Sooksamiti, K. Jutamanee and G. Landrot. 2013. Chemical characterizations of Leonardite from Lignite Mine for Agricultural

- Applications: Kasetsart University, Faculty of Science, Natural Resources and Environment., York, 51(1): 243-249.
- Postma, D., F. Larsen, N.T. Minh Hue, M. Thanh Duc, P.H. Viet, P.Q. Nhan and S. Jessen 2007. Arsenic in groundwater of the Red River floodplain. Vietnam: controlling geochemical processes and reactive transport modeling. *Geochim. Cosmochim. Acta*, 71: 5054–5071.
- Querol, X., A. Alastuey, J.S. Chinchon, J.L. Fernandez-Turiel and A. Lopez-Soler. 1993. Determination of pyritic sulphur and organic matter contents in Spanish subbituminous coals by X-ray power diffraction. *International Journal of Coal Geology*. 22: 279–293.
- Ramanathan, A.L., G. Singh, J. Majunder, A.C. Samal, R. Chahuan, R.K. Ranjan, K. Rajkumar and S.C. Santra. 2008. A study of microbial diversity and its interaction with nutrients in the sediment of Sunder ban mangrove. *Indian Journal of Marine Science*, 37: 159-165.
- Ramamoorthy, V., R. Viswanathan, T. Raguchander and R. Samiyappan. 2001. Induction of systemic resistance by plant growth promoting rhizobacteria in crop plant against pests and diseases. *Crop Prot.* 20: 1-11.
- Ramos, B., Jose A. Lucas Garcia, Agustin Probanza, M. Luisa Barrientos and F. Javier Gutierrez Manero. 2003. Alterations in the rhizobacterial community associated with European alder growth when inoculated with PGPR strain *Bacillus licheniformis*. *Environmental and Experimental Botany*. 49: 161–68.
- Ratanaprommanee, C. and A. Shutsrirung. 2014 Chemical Properties and Potential Use in Agriculture of Leonardite from Different Sources in Thailand www.hu.ac.th/Symposium2014/proceedings/data/3409/3409-4.pdf. (October, 5, 2015).
- Ratanaprommanee, C. and A. Shutsrirung. 2016. Chemical properties and potential use in agriculture of leonardite from different sources in Thailand. The 5th National and International Hatyai Conference. May 16, 2016. Abstract Book: pp 1236-1246.
- Ratanaprommanee, C., K. Chinachanta, F. Chaiwan and A. Shutsrirung. 2017. Chemical characterization of leonardite and its potential use as soil conditioner and plant

- growth enhancement., Asia Pacific Journal of Science and Technology. 22:(1) (in press).
- Rietveld, H.M. 1967. Acta Cryst. 22, 151-152.
- Rodryiguez, H. and R. Fraga. 1999. Phosphate solubilizing bacteria and their role in plant growth promotion. Biotechnol. Adv. 17 (4-5): 319-339.
- Ruaysoongnern, S. and D.N. Andrew. 2002. Soil degradation under long-term rice production in Northeast Thailand. Paper presented in the 2nd Seminar on Technical National Agricultural System, Kosa Hotel, Khon Kaen Province, August 26-27, 2002. Thailand. p. 90-105.
- Saleth, R.M., A. Inocencio, A. Noble, S. Ruaysoongnern. 2009. Economic gains of improving soil fertility and water holding capacity with clay application: The impact of soil remediation research in Northeast Thailand. Colombo, Sri Lanka: International Water Mangement Institute. 38p. (IWMI Research Report 130).
- Sanchez, P.A., K.D. Shepperd, M.J. Soule, F.M. Place, R.J. Buresh, N. Anne-Marie, A.U. Mokwunye, F.R. Kwesiga, C.G. Ndiritu and P.L. Woomer. 1997. Soil fertility replenishment in Africa: an investment in natural resource capital. In R.J. Buresh, P.A. Sanchez and F. Calhoun (eds.). Replenishing Soil Fertility in Africa. Soil Science Society of America. Special Publication no. 51.
- Saravanakumara, D., C. Vijayakumarc, N. Kumarb and R. Samiyappan. 2007. PGPR-induced defense responses in the tea plant against blister blight disease. Crop Prot. 26: 556–565.
- Saharan, B. S. and V. Nehra. 2011. Assessment of Plant growth promoting attributes of cotton (*Gossypium hirsutum*) rhizosphere isolates and their potential as bio-inoculants. J. Environ. Res. Dev. 5(3): 575-583.
- Sahrawat K. L. 2005. Fertility and organic matter in submerged rice soils. Current Science. 88 (5): 735-739.
- Sanli, A., T. Karadogan and M. Tonguc. 2013. Effects of leonardite applications on yield and some quality parameters of potatoes (*Solanum tuberosum* L.). Turkish Journal of Field Crops. 18(1): 20-26.
- Schulein, M. 1997. Enzymatic properties of cellulases from *Humicola insolens*. Biotechnol 57: 71–81.

- Serenella, N., D. Pizzeghello, A. Muscolo and A. Vianello. 2002. Physiological effects of humic substances on higher plants. *Soil. Biol. Biochem.* 34: 1527-1536.
- Shah, M., Fischer, G. and van Velthuisen, H. (2008) Food Security and Sustainable Agriculture. The Challenges of Climate Change in Sub-Saharan Africa. Laxenburg: International Institute for Applied Systems Analysis.
- Sharpe, J., L. Lettice, J. Hecksher Sorensen, M. Fox, R. Hill and R. Krumlauf. 1999. Identification of sonic hedgehog as a candidate gene responsible for the polydactylous mouse mutant Sasquatch. *Curr. Biol.* 9:97–100.
- Shutsrirung, A. 2008a. Potential of organic fertilizer in baby corn yield improvement. Final report. Thailand Research Fund (TRF). 98 p.
- Shutsrirung, A. 2008b. Soil fertility. Faculty of Agriculture, Chiang Mai University, Chiang Mai, Thailand. 253 p.
- Shutsrirung, A. 2010. Research and development of bio-seedling media organic substrate and pelleted bio-organic fertilizer. Final report. Highland Research and Development Institute (Public organization). 65 p.
- Shutsrirung A., C. Ratanaprommanee, K. Chinachanta, 2016. Chemical and biological properties of leonardite and application for growth enhancement of rice. Final Report. Pumpkin Tools Corporation Co., Ltd. 181 p.
- Simandl, G.J., K.D. Hancock, B. Callaghan, S. Paradis and R. Yorke-Hardy. 2001. Klinker Precious Opal Deposit, South Central British Columbia, Canada - Field Observations and Potential Deposit-Scale Controls; British Columbia Ministry of Energy and Mines, Geological Fieldwork 1996. pp 321-327.
- Singh, R. D. and D.V. Yadav. 1986. Evaluation of low grade rock phosphate composted with some agricultural wastes for use in a crop rotation. *Agri. Wastes.* 18(1): 73-79.
- Sivakumar, K., L. Devarajan, K. Dhanasekaran, D. Venkatakrishnan and U. Surendran. 2007. Effect of humic acid on the yield and nutrient uptake of rice. *International Journal on Rice.* 44 (3): 277 – 279.
- Somchan, N. and A. Shutsrirung. 2014. Leonardite Quality Improvement for Soil Amendment. *KMUTT Research and Development Journal.* 37:1 33-43.

- Spaccini, R., A. Piccolo, P. Conte, G. Haberhauer and M.H. Gerzabek. 2002. Increased soil organic carbon sequestration through hydrophobic protection by humic substances. *Soil Biol Biochem.* 34:1839–1851.
- Spaepen, S., J. Vanderleyden and R. Remans. 2007. Indole-3-acetic acid in microbial and microorganism-plant signaling. *FEMS Microbiol. Rev.* 31: 425–448.
- Steel, R.G.D., J.H. Torrie and D.A. Deekey, 1997. Principles and procedures of statistics: a biometrical approach, 3rd ed., McGraw Book Co. Inc., New York.
- Stehlickova, L., M. Svab, L. Wimmerova and J. Kozler. 2009. Intensification of phenol biodegradation by humic substances. *Int Biodeter Biodegr.* 63: 923–927
- Stevenson, F.J. 1982. *Humus Chemistry*. Wiley-Interscience, New York.
- Stevenson, F.J. 1979. Humates – facts and fantasies on their value as commercial soil amendment. *Crops Soils.* 31: 14–16.
- Stevenson, F.J. 1994. *Humus Chemistry: Genesis, Composition, Reactions*. Wiley and Sons, New York.
- Suwanarit, A., N. Lekhasoontharakorn and J. Rungchunag. 1999. A study on green manuring technique for sustainable maize production. In: Sustainable agriculture possibility and direction. Proceedings 2nd Asia-Pacific Conference Sustainable Agriculture, 18-20, Phitsanulok, Thailand.
- Sylvia, D.M., P.G. Hartel, J. Furrhmann and D. Zuberer. 2005. Principles and applications of soil microbiology. 2nd Edn., Prentice Hall Inc., Upper Saddle River, New Jersey .
- Taylor, S. E. 1991. Asymmetrical effects of positive and negative events – the mobilization minimization hypothesis. *Psychol. Bull.* 1, 67–85.
- Tien, T.M., M.H. Gaskin, D.H. Hubbel. 1979. Plant growth substances produced by *A. brasilense* and their effect on the growth of pearl millet (*Pennisetum americanum* L.). *Appl. Environ. Microbiol.* 37: 1016–1024.
- Tsavkelova, E.A., S.Y. Klimova, T.A. Cherdynitseva and A.I. Netrusov. 2006. Microbial producers of plant growth stimulators and their practical use: a review. *Appl. Biochem. Micro.* 42: 117–126.
- Van Grunsven, R.H.A., F. Bos, B.S. Ripley, C.M. Suehs and E.M. Veenedaal. 2009. Release from soil pathogens plays an important role in the success of invasive

- Carpobrotus in the Mediterranean. South African Journal of Botany. 75: 172–175.
- Van der Heijden, M.G.A., T.R. Scheublin and A. Brader. 2003. Taxonomic and functional diversity in arbuscular mycorrhizal fungi is there any relationship. New Phytologist. 164: 201–204.
- Vance, E.D., P.C. Brookes and D.S. Jenkinson. 1987. Microbial biomass measurements in forest soils: the use of the chloroform fumigation-incubation method in strongly acid soils. Soil Biology Biochemistry. 19: 691-702.
- Vaughan, D. and D. J. Linehan. 1976. The growth of wheat plants in humic acid solutions under axenic conditions. Plant and Soil. 44: 445-499.
- Vaughan, D. 1974 A possible mechanism for humic acid action on cell elongation in root segments of *Pisum sativum* under aseptic conditions. Soil Biology Biochemistry. 6: 241-247.
- Vaughan, D., R.E. Malcom and B.G. Ord. 1985. Influence of humic substances on biochemical processes in plants. In: Vaughan D, Malcom RE, eds. *Soil organic matter and biological activity*. Dordrecht, Germany: Martinus Nijhoff/ Dr W Junk, Publishers. 77–108.
- Vlčková Z., L. Grasset, B. Antošová, M. Pekař and J. Kučerík. 2009. Lignite pretreatment and its effect on biostimulative properties of respective lignite humic acids. Soil Biol Biochem. 41:1901–1984.
- Von Wandruszka, R. and G. Trans. 2000. Humic acids: Their detergent qualities and potential uses in pollution remediation.
- Walkley, A. and I. A. Black. 1934. An examination of Degtjareff method for determining soil organic matter and a proposed modification of the chromic acid titration method. Soil Sci. 37: 29-37.
- Walker, T.S., H.P. Bais, E. Grotewold, J.M. Vivanco. 2003. Root exudation and rhizosphere biology. Plant Physiol. 132: 44–51.
- Walinga, I., W. van Vark, V.J.G. Houba, and J.J. van der Lee. 1989. Plant analysis procedure. Part 7. Department of Soil Science and Plant Nutrition. Wageningen Agricultural University. 197-200.

- Wang B, and Y.L. Qiu. 2006. Phylogenetic distribution and evolution of mycorrhizas in land plants. *Mycorrhiza*. 16: 299–363.
- Ward, C.R. 1989. Minerals in bituminous coals of the Sydney Basin (Australia) and Illinois basin (USA). *Int. J. Coal Geol.* 13: 455–479.
- Ward, C.R. 1991. Mineral matter in low-rank coals and associated strata of the Mae Moh basin, northern Thailand. *Int. J. Coal Geol.* 17: 69–63.
- Ward, C.R. 1992. Mineral matter in Triassic and Tertiary low-rank coals from South Australia. *Int. J. Coal Geol.* 20: 185–208.
- Ward, C.R. and J.C. Pylor. 1996. Quantitative mineralogical analysis of coals from the Callide basin, Queensland, Australia using X-ray diffractometry and normative interpretation. *Int. J. Coal. Geol.* 30: 211–229.
- Ward, C.R., D.A. Soeasr, C.A. Booth, I. Staton and L.W. Gurba. 1999. Mineral matter and trace elements in coals of the Gunnedah Basin. New South Wales. Australia. *Int. J. Coal. Geol.* 40: 281–308.
- Ward, C.R., C.E. Matulis, J.C. Pylor and L.S. Dale. 2001. Quantification of mineral matter in Argonne Premium Coals using interactive Rietveld-based X-ray diffraction. *Int. J. Coal. Geol.* 46: 67–82.
- Ward, C.R. 2002. Analysis and significance of mineral matter in coal seams. *Int. J. Coal Geol.* 50: 135–168.
- Weishampel, P.A. and B.L. Bedford. 2006. Wetland dicots and monocots differ in colonization by arbuscular mycorrhizal fungi and dark septate endophytes. *Mycorrhiza*. 16: 495–502.
- Weiss, B., et al. 1983. Processing of yeast mitochondrial RNA: involvement of intramolecular hybrids in splicing of cob intron 4 RNA by mutation and reversion. *Cell*. 33(1):195-202
- Wertz, D.L. and L.W. Collins. 1998. Using X-ray methods to evaluate the combustion sulphur minerals and graphitic carbon in coals and ashes. *Am. Chem. Soc. Div. Fuel. Chem.* 33: 247–252.
- Wolfe B.E. and J.N. Klironomos. 2005. Breaking new ground: soil communities and exotic plant invasion. *BioScience* 55: 477–487.
- Xu, C., J. He, H. Jiang, L. Zu, W. Zhai, S. Pu and G. Xu. 2009. Direct effect of glucocorticoids on lipolysis in adipocytes. *Mol Endocrinol.* 23: 1161–1170.

- Yazdani, M., M.A. Bahmanyar, H. Pirdashti and M.A. Esmaili. 2009. Effect of Phosphate solubilization microorganisms (PSM) and plant growth promoting rhizobacteria (PGPR) on yield and yield components of Corn (*Zea mays L.*). Proc. World Acad. Science. Eng. Technol. 37: 90-92.
- Yuttasak, C., P. Sooksamiti, W. Naksata and O. Arquetopanyo. 2014. Kinetic and mechanism of arsenic ions removal by adsorption on leonardite char as low cost adsorbent material. Chil. Chem. Soc. 59 (1)
- Zandonadi, D.B., L.P. Canellas and A.R. Façanha. 2007. Indolacetic and humic acids induce lateral root development through a concerted plasmalemma and tonoplast H^+ -pumps activation. Planta. 225: 1583-1595.
- Zeledo'n-Toruno, ZC., C. Lao-Luque, F.X.C. de las Heras and M. Sole-Sardans. 2007. Removal of PAHs from water using an immature coal (leonardite). Chemosphere. 67 (3): 505–512.
- Zoraida, C., N.T. Zeledo, F. Conxita Lao-Luque. 2007. Removal of PAHs from water using an immature coal (leonardite). Science direct. 67: 505–512.