

REFERENCES

- Al-Karaki G, McMichael B, Zak J (2004) Field response of wheat to arbuscular mycorrhizal fungi and drought stress. *Mycorrhiza* 14: 263–269.
- Anderson IC, Campbell CD, Prosser JI (2003) Potential bias of fungal 18S rDNA and internal transcribed spacer polymerase chain reaction primers for estimating fungal biodiversity in soil. *Environmental Microbiology* 5: 36–47.
- Azcon-Aguilar C, Jaizme-Vega MC, Calvet C (2002) The Contribution of Arbuscular Mycorrhizal Fungi for Bioremediation. In: Mycorrhizal Technology in Agriculture. From Genes to Bioproducts, Gianinazzi S, Schuepp H, Barea JM, Haselwandter K (eds.) Birkhauser Verlag, Berlin, pp: 187–197.
- Bai C, He X, Tang H, Shan B, Zhao L (2009) Spatial distribution of arbuscular mycorrhizal fungi, glomalin and soil enzymes under the canopy of *Astragalus adsurgens* Pall. in the Mu Us sandland, China. *Soil Biology and Biochemistry* 41: 941–947.
- Barden A, Anak NA, Mulliken T, Song M (2000) Heart of the Matter: Agarwood use and Trade and CITES Implementation for *Aquilaria malaccensis*. Traffic International, Cambridge.
- Barto EK, Antunes PM, Stinson K, Koch AM, Klironomos JN, Cipollini D (2011) Differences in arbuscular mycorrhizal fungal communities associated with sugar maple seedlings in and outside of invaded garlic mustard forest patches. *Biological Invasions* 13: 2755–2762.
- Bécard G, Fortin JA (1988) Early events of vesicular–arbuscular mycorrhiza formation on Ri T-DNA transformed roots. *New Phytologist* 108: 211–218.

- Becerra A, Cabello M, Chiarini F (2007) Arbuscular mycorrhizal colonization of vascular plants from the Yungas forests, Argentina. *Annals of Forest Science* 64: 765–772.
- Bever JD, Morton JB, Antonovics J, Schultz PA (1996) Host-dependent sporulation and species diversity of arbuscular mycorrhizal fungi in a mown grassland. *Journal of Ecology* 84: 71–82.
- Biermann B, Linderman RG (1983) Use of vesicular-arbuscular mycorrhizal roots, intraradical vesicles and extraradical vesicles as inoculum. *New Phytologist* 95: 97–105.
- Boonlue S, Surapat W, Pukahuta C, Suwanarit P, Suwanarit A, Morinaga T (2012) Diversity and efficiency of arbuscular mycorrhizal fungi in soils from organic chili (*Capsicum frutescens*) farms. *Mycoscience* 53: 10–16.
- Brodie E, Edwards S, Clipson N (2003) Soil fungal community structure in a temperate upland grassland soil. *FEMS Microbiology Ecology* 45: 105–114.
- Brundrett M (2004) Diversity and classification of mycorrhizal associations. *Biological Reviews* 79: 473–495.
- Brundrett M, Abbott LK, Jasper DA (1999) Glomalean mycorrhizal fungi from tropical Australia: Comparison of the effectiveness and specificity of different isolation procedures. *Mycorrhiza* 8: 305–314.
- Brundrett M, Bouger N, Dell B, Grove T, Malajczuk N (1996) Working with mycorrhizas in forestry and agriculture. ACIAR Monograph, Canberra.
- Brundrett M, Melville L, Peterson L (1994) Practical methods in mycorrhiza research. Mycologue Publications, Waterloo.
- Calvet C, Pera J, Barea JM (1993) Growth response of marigold (*Tagetes erecta* L.) to inoculation with *Glomus mosseae*, *Trichoderma aureoviride* and *Pythium ultimum* in a peat-perlite mixture. *Plant and Soil* 148: 1–6.

- Cavagnaro TR, Gao LL, Smith FA, Smith SE (2001) Morphology of arbuscular mycorrhizas is influenced by fungal identity. *New Phytologist* 151: 469–475.
- Chabot S, Bécard G, Piché Y (1992) Life cycle of *Glomus intraradix* in root organ culture. *Mycologia* 84: 315–321.
- Chandra S, Kehri HK (2009) Biotechnology of VA Mycorrhiza: Indian Scenario. New India Publishing Agency, New Delhi.
- Charoenpakdee S, Phosri C, Dell B, Lumyong S (2010) The mycorrhizal status of indigenous arbuscular mycorrhizal fungi of physic nut (*Jatropha curcas*) in Thailand. *Mycosphere* 1: 167–181.
- Chen CR, Cheng YJ, Shieh CJ, Siang HD, Chang CMJ (2013) Oil production from De-shelled *Aquilaria crassna* seeds using supercritical carbon dioxide extraction. *Journal of the American Oil Chemists' Society* 90: 9–16.
- CITES (2004) Amendments to Appendices I and II of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES). Thirteenth meeting of the conference of the parties, Bangkok, Thailand, 3–14 October, pp 1–9.
- Clapp JP, Young JPW, Merryweather JW, Fitter AH (1995) Diversity of fungal symbionts in arbuscular mycorrhizas from a natural community. *New Phytologist* 130: 259–265.
- Cooper RA (1984) Metabolism of methylglyoxal in microorganisms. *Annual Review of Microbiology* 38: 49–68.
- Cruz AF, Horii S, Ochiai S, Yasuda A, Ishii T (2008) Isolation and analysis of bacteria associated with spores of *Gigaspora margarita*. *Journal of Applied Microbiology* 104: 1711–1717.
- Daniell TJ, Husband R, Fitter AH, Young JPW (2001) Molecular diversity of arbuscular mycorrhizal fungi colonising arable crops. *FEMS Microbiology Ecology* 36: 203–209.

- Declerck S, Risede JM, Delvaux B (2002) Greenhouse response of micropropagated bananas inoculated with *in vitro* monoxenically produced arbuscular mycorrhizal fungi. *Scientia Horticulturae* 93: 301–309.
- Declerck S, Stullu DG, Plenchette C (1998) Monoxenic culture of the intraradical forms of *Glomus* sp. isolated from a tropical ecosystem: a proposed methodology for germplasm collection. *Mycologia* 90: 579–585.
- Deenik JL, Diarra A, Uehara G, Campbell S, Sumiyoshi Y, Antal MJ Jr (2011) Charcoal ash and volatile matter effects on soil properties and plant growth in an acid ultisol. *Soil Science* 176: 336–345.
- Deenik J, McCellan T, Uehara G, Antal MJ Jr, Campbell S (2010) Charcoal volatile matter content influences plant growth and soil nitrogen transformations. *Soil Science Society of America Journal* 74: 1259–1270.
- Dhar PP, Mridha MAU (2012) Arbuscular mycorrhizal associations in different forest tree species of Hazarikhil forest of Chittagong, Bangladesh. *Journal of Forest Research* 23: 115–122.
- Dickie IA, FitzJohn RG (2007) Using terminal restriction fragment length polymorphism (T-RFLP) to identify mycorrhizal fungi: a methods review. *Mycorrhiza* 17: 259–270.
- Dickson S (2004) The *Arum-Paris* continuum of mycorrhizal symbioses. *New Phytologist* 163: 187–200.
- Dodd JC, Arias I, Koomen I, Hayman DS (1990) The management of populations of vesicular arbuscular mycorrhizal fungi in acid-infertile soils of a savanna ecosystem. I. The effect of pre-cropping and inoculation with VAM-fungi on plant growth and nutrition in the field. *Plant and Soil* 122: 229–240.
- Doner LW, Bécard G (1991) Solubilization of gellan gels by chelation of cations. *Biotechnology Techniques* 5: 25–28.

- Doubková P, Vlasáková E, Sudová R (2013) Arbuscular mycorrhizal symbiosis alleviates drought stress imposed on *Knautia arvensis* plants in serpentine soil. *Plant and Soil* 370: 149–161.
- Douds DDJr (1994) Relationship between hyphal and arbuscular colonization and sporulation in a mycorrhiza of *Paspalum notatum* Flugge. *New Phytologist* 126: 233–237.
- Douds DDJr (1997) A procedure for the establishment of *Glomus mosseae* in dual culture with Ri T-DNA-transformed carrot roots. *Mycorrhiza* 7: 57–61.
- Douds DDJr (2002) Increased spore production by *Glomus intraradices* in the split-plate monoxenic culture system by repeated harvest, gel replacement, and resupply of glucose to the mycorrhiza. *Mycorrhiza* 12: 163–167.
- Douds DDJr, Galvez L, Janke RR, Wagoner P (1995) Effect of tillage and farming system upon populations and distribution of vesicular-arbuscular mycorrhizal fungi. *Agriculture, Ecosystems and Environment* 52: 111–118.
- Douds DDJr, Nagahashi G, Hepperly PR (2010) Production of inoculum of indigenous AM fungi and options for diluents of compost for on-farm production of AM fungi. *Bioresource Technology* 101: 2326–2330.
- Douds DDJr, Nagahashi G, Pfeffer PE, Kayser WH, Reider C (2005) On-farm production and utilization of mycorrhizal fungus inoculum. *Canadian Journal of Plant Science* 85: 15–21.
- Douds DDJr, Nagahashi G, Pfeffer PE, Reider C, Kayser WM (2006) On-farm production of AM fungus inoculum in mixtures of compost and vermiculite. *Bioresource Technology* 97: 809–818.
- Douds DDJr, Nagahashi G, Reider C, Hepperly PR (2008) Choosing a mixture ratio for the on-farm production of AM fungus inoculum in mixtures of compost and vermiculite. *Compost Science and Utilization* 16: 52–60.

- Douds DD, Schenck NC (1991) Germination and hyphal growth of VAM fungi during and after storage in soil at five matric potentials. *Soil Biology and Biochemistry* 23: 177–183.
- Driver JD, Holben WE, Rillig MC (2005) Characterization of glomalin as a hyphal wall component of arbuscular mycorrhizal fungi. *Soil Biology and Biochemistry* 37: 101–106.
- Dugassa DG, Grunewaldt-Stöcker G, Schönbeck F (1995) Growth of *Glomus intraradices* and its effect on linseed (*Linum usitatissimum* L.) in hydroponic culture. *Mycorrhiza* 5: 279–282.
- Dupré de Boulois H, Voets L, Delvaux B, Jakobsen I, Declerck S (2006) Transport of arbuscular mycorrhizal fungi to *Medicago truncatula* under *in vitro* conditions. *Environmental Microbiology* 8: 1926–1934.
- Egerton-Warburton LM, Johnson NC, Allen EB (2007) Mycorrhizal community dynamics following nitrogen fertilization: a cross-site test in five grasslands. *Ecological Monographs* 77: 527–544.
- Elmes RP, Mosse B (1984) Vesicular-arbuscular endomycorrhizal inoculum production II Experiments with maize (*Zea mays*) and other hosts in nutrient flow culture. *Canadian Journal of Botany* 62: 1531–1536.
- Emran M, Gispert M, Pardini G (2012) Patterns of soil organic carbon, glomalin and structural stability in abandoned Mediterranean terraced lands. *European Journal of Soil Science* 63: 637–649.
- Eskandari A, Danesh YR (2010) Study of life cycle of arbuscular mycorrhizal fungus *Glomus intraradices* using in vitro culturing technique. *Journal of Phytology* 2: 69–75.
- Estrada-Luna AA, Davies FTJr (2003) Arbuscular mycorrhizal fungi influence water relations, gas exchange, abscisic acid and growth of micropropagated chile ancho pepper (*Capsicum annuum*) plantlets during acclimatization and post-acclimatization. *Journal of Plant Physiology* 160: 1073–1083.

- Estrada-Luna AA, Davies FTJr, Egilla JN (2000) Mycorrhizal fungi enhancement of growth and gas exchange of micropropagated guava plantlets (*Psidium guajava* L.) during *ex vitro* acclimatization and plant establishment. *Mycorrhiza* 10: 1–8.
- Fitzsimons MS, Miller RM, Jastrow JD (2008) Scale-dependent niche axes of arbuscular mycorrhizal fungi. *Oecologia* 158: 117–127.
- Fonseca HMAC, Berbara RLL (2008) Does *Lunularia cruciata* form symbiotic relationships with either *Glomus proliferum* or *G. intraradices*? *Mycological Research* 112: 1063–1068
- Fonseca HMAC, Berbara RLL, Pereira ML (2006) *Lunularia cruciata*, a potential *in vitro* host for *Glomus proliferum* and *G. intraradices*. *Mycorrhiza* 16: 503–508.
- Gamborg OL, Wetter LR (1975) In Plant Tissue Culture Methods; Gamborg OL, Wetter LR (eds.) National Research Council of Canada, Saskatoon, Canada pp 1–10.
- Gaur A (1997) Inoculum production technology development of vesicular-arbuscular mycorrhizae. Ph.D. Thesis, Department of Botany, University of Delhi, Delhi-India.
- Gaur A, Adholeya A (2002) Arbuscular-mycorrhizal inoculation of five tropical fodder crops and inoculum production in marginal soil amended with organic matter. *Biology and Fertility of Soils* 35: 214–218.
- Gaur A, Adholeya A, Mukerji KG (2000) On-farm production of VAM inoculum and vegetable crops in marginal soil amended with organic matter. *Tropical Agriculture* 77: 21–26.
- Gazey C, Abbott KK, Robson AD (1993) VA mycorrhizal spores from 3 species of *Acaulospora*—germination, longevity and hyphal growth. *Mycological Research* 97: 785–790.
- Gerdemann JW, Nicolson TH (1963) Spores of mycorrhizal Endogone species extracted from soil by wet sieving and decanting. *Transaction of the British Mycological Society* 46: 235–244.

Gerdemann JW, Trappe JM (1974) *Endogonaceae* in the Pacific Northwest. *Mycologia memoir* 5: 1–76.

Gherbawy Y, Voigt K (2010) Molecular Identification of Fungi. Springer-Verlag, Berlin.

Gianinazzi S, Schüepp H, Barea JM, Haselwandter K (2002) Mycorrhizal Technology in Agriculture: From Genes to Bioproducts. Birkhäuser Verlag, Basel.

Gianinazzi S, Vosátka M (2004) Inoculum of arbuscular mycorrhizal fungi for production systems: science meets business. *Canadian Journal of Botany* 82: 1264–1271.

Giovannetti M, Mosse B (1980) An evaluation of technique for measuring vesicular–arbuscular mycorrhizae infection in roots. *New Phytologist* 84: 489–500.

Giovannetti M, Schubert A, Cravero MC, Salutini L (1988) Spore production by the vesicular–arbuscular mycorrhizal fungus *Glomus monosporum* as related to host species, root colonization and plant growth enhancement. *Biology and Fertility of Soils* 6: 120–124.

Gollotte A, van Tuinen D, Atkinson D (2004) Diversity of arbuscular mycorrhizal fungi colonizing roots of the grass species *Agrostis capillaries* and *Lolium perenne* in a field experiment. *Mycorrhiza* 14: 111–117.

Gonzalez JM, Ortiz-Martinez A, Gonzalez-Delvalle MA, Laiz L, Saiz-Jimenez C (2003) An efficient strategy for screening large cloned libraries of amplified 16S rDNA sequences from complex environmental communities. *Journal of Microbiological Methods* 55: 459–463.

Goto BT, Silva GA, Magna DAA, Silva DKA, Souza RG, Ferreira ACA, Jobim K, Mello CMA, Vieira HEE, Maia LC, Oehl F (2012) *Intraornatosporaceae* (*Gigasporales*), a new family with two new genera and two new species. *Mycotaxon* 119: 117–132.

- Govindarajulu M, Pfeffer PE, Jin HR, Abubaker J, Douds DD, Allen JW, et al. (2005) Nitrogen transfer in the arbuscular mycorrhizal symbiosis. *Nature* 435: 819–823.
- Grant CA, Bittman S, Montreal M, Plenchette C, Morel C (2004) Soil and fertilizer phosphorus: Effects on plant P supply and mycorrhizal development. *Canadian Journal of Plant Science* 85(1): 3–14.
- Grant CA, Flaten DN, Tomasiewicz DJ, Sheppard SC (2001) The importance of early season P nutrition. *Canadian Journal of Plant Science* 81: 211–224.
- Guadarrama P, Castillo-Arguero S, Ramos-Zapata J, Camargo-Ricalde SL, Alvarez-Sanchez J (2008) Propagules of arbuscular mycorrhizal fungi in a secondary dry forest of Oaxaca, Mexico. *Revista de biología tropical* 56: 269–277.
- Gundale MJ, DeLuca TH (2007) Charcoal effects on soil solution chemistry and growth of *Koeleria macrantha* in the ponderosa pine/ Douglas-fir ecosystem. *Biology and Fertility of Soils* 43: 303–311.
- Habte M (2000) Mycorrhizal fungi and plant nutrition. In: Silva JA, Uchida R (eds) Plant Nutrient Management in Hawaii's Soils, Approaches for Tropical and Subtropical Agriculture. College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa, pp 127–131.
- Habte M, Miyasaka SC, Matsuyama DT (2001) Arbuscular mycorrhizal fungi improve early forest-tree establishment. In: Horst WJ et al. (eds) Plant nutrition–Food Security and Sustainability of Agro-ecosystems. Kluwer Academic Publishers, Dordrecht, pp 644–645.
- Hall T (1999) BioEdit: a user-friendly biological sequence alignment editor and analysis program for Windows95/98/NT. *Nucleic Acids Symposium Series* 41: 95–98.

- Hampl V, Pavláček A, Flegl J (2001) Construction and bootstrap analysis of DNA fingerprinting-based phylogenetic trees with a freeware program FreeTree: Application to trichomonad parasites. *International Journal of Systematic and Evolutionary Microbiology* 51: 731–735.
- Hardie K (1985) The effect of removal of extraradical hyphae on water uptake by vesicular-arbuscular mycorrhizal plants. *New Phytologist* 101: 677–684.
- Harley JL, Smith SE (1983) Mycorrhizal Symbiosis, Academic Press, New York.
- Hart MM, Reader RJ (2002) Taxonomic basis for variation in the colonization strategy of arbuscular mycorrhizal fungi. *New Phytologist* 153: 335–344.
- Hassan SED, Boon E, St-Arnaud M, Hijri M (2011) Molecular biodiversity of arbuscular mycorrhizal fungi in trace metal-polluted soils. *Molecular Ecology* 20: 3469–3483.
- Hawkins HJ, George E (1997) Hydroponic culture of the mycorrhizal fungus *Glomus mosseae* with *Linum usitatissimum* L., *Sorghum bicolor* L. and *Triticum aestivum* L. *Plant and Soil* 196: 143–149.
- Helgason T, Daniell TJ, Husband R, Fitter AH, Young JPW (1998) Ploughing up the wood-wide web? *Nature* 394: 431.
- Helgason T, Fitter AH (2009) Natural selection and the evolutionary ecology of the arbuscular mycorrhizal fungi (Phylum *Glomeromycota*). *Journal of Experimental Botany* 60: 2465–2480.
- Helgason T, Fitter AH, Young JPW (1999) Molecular diversity of arbuscular mycorrhizal fungi colonising *Hyacinthoides nonscripta* (bluebell) in a seminatural woodland. *Molecular Ecology* 8: 659–666.
- Hepper CM, Smith GA (1976) Observations on the growth of Endogone spores. *Transactions of the British Mycological Society* 66: 189–194.
- Hoagland DR, Arnon DI (1950) The water-culture method for growing plants without soil. *California Agricultural Experiment Station, Circular* 347: 1–32.

- Houba VJG, Van Der Lee JJ, Novozamsky I, Wallinga J (1988) Determination of phosphorus. Department of Soil Science and Plant Nutrition, Wageningen Agricultural University. Netherlands, pp 1–10.
- Hung LL, Sylvia DM (1988) Production of vesicular arbuscular mycorrhizal fungus inoculum in aeroponic culture. *Applied and Environmental Microbiology* 54: 353–357.
- Ijdo M, Cranenbrouck S, Declerck S (2011) Methods for large-scale production of AM fungi: past, present, and future. *Mycorrhiza* 21: 1–16.
- INVAM Newsletter 3 (1993) Properties of infective propagules at the suborder level (*Glomineae* versus *Gigasporineae*). <http://invam.caf.wvu.edu/articles/propagules.htm>. Accessed 9 July 2012.
- Jaizme-Vega MC, Rodríguez-Romero AS, Marín Hermoso C, Declerck S (2003) Growth of micropropagated bananas colonized by root-organ culture produced arbuscular mycorrhizal fungi entrapped in Ca-alginate beads. *Plant and Soil* 254: 329–335.
- Jansa J, Mozafar A, Anken T, Ruh R, Sanders IR, Frossard E (2002) Diversity and structure of AMF communities as affected by tillage in a temperate soil. *Mycorrhiza* 12: 225–234.
- Jarstfer AG, Sylvia DM (1995) Aeroponic culture of VAM fungi. In: Mycorrhiza: structure, function, molecular biology and biotechnology Varma A, Hock B (eds) Springer, Heidelberg, pp 427–441.
- Jeong-Hoon S, Yong-Yi C, Toyoki K, Kee-Yoeup P (2000) Influence of *in vitro* growth conditions on photosynthetic competence and survival rate of *Rehmannia glutinosa* plantlets during acclimatization period. *Plant Cell, Tissue and Organ Culture* 61: 135–142.

- Johnson D, Vandenkoornhuyse PJ, Leake JR, Gilbert L, Booth RE, Grime JP, Young JPW, Read DJ (2004) Plant communities affect arbuscular mycorrhizal fungal diversity and community composition in grassland microcosms. *New Phytologist* 161: 503–515.
- Joshee N, Mentreddy SR, Yadav AK (2007) Mycorrhizal fungi and growth and development of micropropagated *Scutellaria integrifolia* plants. *Industrial Crops and Products* 25: 169–177.
- Juge C, Samson J, Bastien C, Vierheilig H, Coughlan A, Piché Y (2002) Breaking dormancy in spores of the arbuscular mycorrhizal fungus *Glomus intraradices*: a critical cold-storage period. *Mycorrhiza* 12: 37–42.
- Kanakadurga VV, Manoharachary D, Rama Rao P (1990) Occurrence of endomycorrhizal fungi in teak. In: Bagyaraj DJ, Manjunath A. (eds) Mycorrhizal symbiosis and plant growth. University of Agricultural Sciences, Bangalore, pp 17.
- Kaosa-ard A (1998) Management of teak plantations: Overview of problems in teak plantation establishment. FAO Corporate Document Repository <http://www.fao.org/docrep/005/ac773e/ac773e08.htm>. Accessed 9 August 2013.
- Kapoor R, Sharma D, Bhatnagar AK (2008) Arbuscular mycorrhizae in micropropagation systems and their potential applications. *Scientia Horticulturae* 116: 227–239.
- Karandashov V, Nagy R, Wegmüller S, Amrhein N, Bucher M (2004) Evolutionary conservation of a phosphate transporter in the arbuscular mycorrhizal symbiosis. *Proceedings of the National Academy of Sciences* 101: 6285–6290.
- Kjoller R, Rosendahl S (2000) Detection of arbuscular mycorrhizal fungi (*Glomales*) in roots by nested PCR and SSCP (single stranded conformation polymorphism). *Plant and Soil* 226: 189–196.

- Kobayashi S (2004) Landscape rehabilitation of degraded tropical forest ecosystems, Case study of the CIFOR/Japan project in Indonesia and Peru. *Forest Ecology and Management* 201: 13–22.
- Koffi MC, Enrique de la Providencia I, Elsen A, Declerck S (2009) Development of an *in vitro* culture system adapted to banana mycorrhization. *African Journal of Biotechnology* 8: 2750–2756.
- Kollert W, Cherubini L (2012) Teak resources and market assessment 2010. FAO Planted Forests and Trees Working Paper FP/47/E, Rome
- Komaki Y, Nakano A, Kato H, Uehara Y (2002) Utilization of chaff charcoal for medium of flower bed seedlings and its effect on the growth and quality of Madagascar Periwinkle (*Catharanthus roseus*) seedlings. *Japanese Society of Soil Science and Plant Nutrition* 73(1): 49–52.
- Kowalchuk GA, Gerards S, Woldendorp JW (1997) Detection and characterisation of fungal infections of *Ammophila arenaria* (marram grass) roots by denaturing gradient gel electrophoresis of specifically amplified 18S rDNA. *Applied and Environmental Microbiology* 63: 3858–3865.
- Kowalchuk GA, Souza F, Ad van Veen JA (2002) Community analysis of arbuscular mycorrhizal fungi associated with *Ammophila arenaria* in Dutch coastal sand dunes. *Molecular Ecology* 11: 571–581.
- Krüger M, Krüger C, Walker C, Stockinger H, Schüßler A (2012) Phylogenetic reference data for systematics and phylotaxonomy of arbuscular mycorrhizal fungi from phylum to species-level. *New Phytologist* 193: 970–984.
- Krüger M, Stockinger H, Krüger C, Schüßler A (2009) DNA-based species level detection of Glomeromycota: one PCR primer set for all arbuscular mycorrhizal fungi. *New Phytologist* 183: 212–223.
- Lee J, Lee S, Young JPW (2008) Improved PCR primers for the detection and identification of arbuscular mycorrhizal fungi. *FEMS Microbiology Ecology* 65: 339–349.

- Liang Z, Drijber RA, Lee DJ, Dwiekat IM, Harris SD, Wedin DA (2008) A DGGE-cloning method to characterize arbuscular mycorrhizal community structure in soil. *Soil Biology and Biochemistry* 40: 956–966.
- Liu RJ, Wang FY (2003) Selection of appropriate host plants used in trap culture of arbuscular mycorrhizal fungi. *New Phytologist* 115: 495–501.
- Lovelock CE, Andersen K, Morton JB (2003) Arbuscular mycorrhizal communities in tropical forests are affected by host tree species and environment. *Oecologia* 135: 268–279.
- Ma WK, Siciliano SD, Germida JJ (2005) A PCR-DGGE method for detecting arbuscular mycorrhizal fungi in cultivated soils. *Soil Biology and Biochemistry* 37: 1589–1597.
- Maiti D, Barnwal MK, Singh RK, Variar M (2009) A new protocol for on-farm production of arbuscular mycorrhizal mass inoculum of rainfed upland rice. *Indian Phytopathology* 62: 31–36.
- Meier R, Charvat I (1992) Gemination of *Glomus mosseae* spores: procedure and ultrastructural analysis. *International Journal of Plant Sciences* 153: 541–549.
- Millner PD, Kitt DG (1992) The Beltsville method for soilless production of vesicular–arbuscular mycorrhizal fungi. *Mycorrhiza* 2: 9–15.
- Mohammad A, Khan AG, Kuek C (2000) Improved aeroponic culture of inocula of arbuscular mycorrhizal fungi. *Mycorrhiza* 9: 337–339.
- Morte A, Lovisolo C, Schubert A (2000) Effect of drought stress on growth and water relations of the mycorrhizal association *Helianthemum almeriense-Terfezia claveryi*. *Mycorrhiza* 10: 115–119.
- Morton JB (1993) Problems and solutions for the integration of glomalean taxonomy, systematic biology, and the study of endomycorrhizal phenomena. *Mycorrhiza* 2: 97–109.

- Morton JB, Benny GL (1990) Revised classification of arbuscular mycorrhizal fungi (*Zygomycetes*): a new order, *Glomales*, two new suborders, *Glomineae* and *Gigasporineae*, and two new families, *Acaulosporaceae* and *Gigasporaceae*, with an emendation of *Glomaceae*. *Mycotaxon* 37: 471–491.
- Morton JB, Bentivenga SP, Bever JD (1995) Discovery, measurement, and interpretation of diversity in arbuscular endomycorrhizal fungi (*Glomales*, *Zygomycetes*). *Canadian Journal of Botany* 73: S25–S32.
- Morton JB, Redecker D (2001) Two new families of *Glomales*, *Archaeosporaceae* and *Paraglomaceae*, with two new genera *Archaeospora* and *Paraglomus*, based on concordant molecular and morphological characters. *Mycologia* 93: 181–195.
- Mosse B (1959) The regular germination of resting spores and some observations on the growth requirements of an *Endogone* sp. causing vesicular–arbuscular mycorrhiza. *Transactions of the British Mycological Society* 42: 273–286.
- Mosse B, Hepper CM (1975) Vesicular–arbuscular infections in root–organ cultures. *Physiological Plant Pathology* 5: 215–233.
- Mugnier J, Mosse B (1987) Vesicular–arbuscular mycorrhizal infection in transformed root-inducing T-DNA roots grown axenically. *Phytopathology* 77: 1045–1050.
- Mummey DL, Rillig MC (2006) The invasive plant species *Centaurea maculosa* alters arbuscular mycorrhizal fungal communities in the field. *Plant and Soil* 288: 81–90.
- Mummey DL, Rillig MC (2007) Evaluation of LSU rRNA-gene PCR primers for analysis of arbuscular mycorrhizal fungal communities via terminal restriction fragment length polymorphism analysis. *Journal of Microbiological Methods* 70: 200–204.
- Mummey DL, Rillig MC (2008) Spatial characterization of arbuscular mycorrhizal fungal molecular diversity at the submetre scale in a temperate grassland. *FEMS Microbiology Ecology* 64: 260–270.

- Mummey DL, Rillig MC, Holben WE (2005) Neighbouring plant influences on arbuscular mycorrhizal fungal community composition as assessed by T-RFLP analysis. *Plant and Soil* 271: 83–90.
- Muyzer G, Dewaal EC, Uitterlinden AG (1993) Profiling of complex microbial populations by denaturing gradient gel-electrophoresis analysis of polymerase chain reaction-amplified genes-coding for 16S ribosomal-RNA. *Applied Environmental Microbiology* 59: 695–700.
- Nandakwang P, Elliott S, Dell B, Teaumroong N, Lumyong S (2008) Arbuscular mycorrhizal status of indigenous tree species used to restore seasonally dry tropical forest in Northern Thailand. *Research Journal of Microbiology* 3: 51–61.
- Oehl F, da Silva GA, Goto BT, Maia LC, Sieverding E (2011a) *Glomeromycota*: two new classes and a new order. *Mycotaxon* 116: 365–379.
- Oehl F, Sieverding E, Ineichen K, Mäder P, Wiemken A, Boller T (2009) Distinct sporulation dynamics of arbuscular mycorrhizal fungal communities from different agroecosystems in long-term microcosms. *Agriculture, Ecosystems and Environment* 134: 257–268.
- Oehl F, Sieverding E, Palenzuela J, Ineichen K, Alves da Silva G (2011b) Advances in *Glomeromycota* taxonomy and classification. *IMA Fungus* 2(2): 191–199.
- Öpik M, Moora M, Liira J, Koljalg U, Zobel M, Sen R (2003) Divergent arbuscular mycorrhizal fungal communities colonize roots of *Pulsatilla* spp. in boreal Scots pine forest and grassland soils. *New Phytologist* 160: 581–593.
- Öpik M, Moora M, Liira J, Zobel M (2006) Composition of root colonizing arbuscular mycorrhizal fungal communities in different ecosystems around the globe. *Journal of Ecology* 94:778–790.

Orwa C, Mutua A, Kindt R, Jamnadass R, Anthony S (2009) Agro-forest tree Database: A reference and selection guide version 4.0. <http://www.worldagroforestry.org/sites/treedbs/treedatabases.asp>. Accessed 24 April 2013.

Osoguchi T (2002) Domestication of *Aquilaria crassna* tree in *Hevea brasiliensis* plantation, Huai Raeng – Khlong Peed watershed, Trat province, eastern Thailand. Dissertation, Kasetsart University

Page RDM (1996) TreeView: An application to display phylogenetic trees on personal computers. *Computer Applications in the Biosciences* 12: 357–358.

Pandey J, Ganesan K, Jain RK (2007) Variations in T-RFLP profiles with differing chemistries of fluorescent dyes used for labeling the PCR primers. *Journal of Microbiological Methods* 68: 633–638.

Parniske M (2008) Arbuscular mycorrhiza: the mother of plant root endosymbioses. *Nature Reviews Microbiology* 6: 763–775.

Peterson B (1997) *Thymelaeaceae*. pp. 226-245 In T. Santisuk, and K. Larsen (eds) Flora of Thailand 6 (3) The Forest Herbarium, Royal Forest Department, Bangkok, Thailand.

Phillips JM, Hayman DS (1970) Improved procedures for clearing roots and staining parasitic and vesicular-arbuscular mycorrhizal fungi for rapid assessment of infection. *Transactions of the British Mycological Society* 55: 157–160.

Pietikäinen A, Kytöviita MM, Husband R, Young JPW (2007) Diversity and persistence of arbuscular mycorrhizas in a low-Arctic meadow habitat. *New Phytologist* 176: 691–698.

Porcel R, Ruiz-Lozano JM (2004) Arbuscular mycorrhizal influence on leaf water potential, solute accumulation, and oxidative stress in soybean plants subjected to drought stress. *Journal of Experimental Botany* 55: 1743–1750.

- Purin S, Filho OK, Sturmer SL (2006) Mycorrhizae activity and diversity in conventional and organic apple orchards from Brazil. *Soil Biology and Biochemistry* 38: 1831–1839.
- Rai MK (2001) Current advances in mycorrhization in micropropagation. *In Vitro Cellular and Developmental Biology-Plant* 37: 158–167.
- Rajan SK, Reddy BJD, Bagyaraj DJ (2000) Screening of arbuscular mycorrhizal fungi for their symbiotic efficiency with *Tectona grandis*. *Forest Ecology and Management* 126: 91–95.
- Ramanwong K (1998) Species diversity of vesicular-arbuscular mycorrhizal fungi of teak (*Tectona grandis* Linn.f.) and their effects on growth of teak seedlings. Dissertation, Kasetsart University.
- Rani A, Dhungana HN, Sharma GS (1995) Occurrence of vesicular-arbuscular mycorrhizal fungi in forest nursery seedlings in Assam. In: Adholeya A, Singh S (eds.) *Mycorrhiza: Biofertilizers for the Future*. TERI, New Delhi, pp 62–64.
- Redecker D, Schüßler A, Stockinger H, Stürmer SL, Morton JB, Walker C (2013) An evidence-based consensus for the classification of arbuscular mycorrhizal fungi (*Glomeromycota*). *Mycorrhiza* 23: 515–531.
- Render C, Weißhuhn K, Kellner H, Buscot F (2006) Rationalizing molecular analysis of field-collected roots for assessing diversity of arbuscular mycorrhizal fungi: to pool, or not to pool, that is the question. *Mycorrhiza* 16: 525–531.
- Rillig MC (2004) Arbuscular mycorrhizae, glomalin, and soil aggregation. *Canadian Journal of Soil Science* 84: 355–363.
- Rillig MC, Mumme DL (2006) Mycorrhizas and soil structure. *New Phytologist* 171: 41–53.
- Rillig MC, Ramsey PW, Morris S, Paul EA (2003) Glomalin, an arbuscular-mycorrhizal fungal soil protein, responds to land-use change. *Plant and Soil* 253: 293–299.

- Rillig MC, Steinberg PD (2002) Glomalin production by an arbuscular mycorrhizal fungus: a mechanism of habitat modification. *Soil Biology and Biochemistry* 34: 1371–1374.
- Rillig MC, Wright SF, Nichols KA, Schmidt WF, Torn MS (2001) Large contribution of arbuscular mycorrhizal fungi to soil carbon pools in tropical forest soils. *Plant and Soil* 233: 167–177.
- Ruiz-Lozano JM (2003) Arbuscular mycorrhizal symbiosis and alleviation of osmotic stress: New perspectives for molecular studies. *Mycorrhiza* 13: 309–317.
- Safir GR, Coley SC, Siqueira JO, Carlson PS (1990) Improvement and synchronization of VA mycorrhiza fungal spore germination by short-term cold storage. *Soil Biology and Biochemistry* 22: 109–111.
- Santos-Gonzalez JC, Finlay RD, Tehler A (2007) Seasonal dynamics of arbuscular mycorrhizal fungal communities in roots in a seminatural grassland. *Applied and Environmental Microbiology* 73(17): 5613–5623.
- Sarre A, Ma HO (2004) The prospects for plantation teak. *ITTO Tropical Forest Update* 14: 6 – 7.
- Schenck NC, Pérez Y (1990) Manual for the Identification of VA Mycorrhizal Fungi. 3rd edn: Gainesville, FL: Synergistic Publications.
- Schoch CL, Seifert KA, Huhndorf S, Robert V, Spouge JL, Levesque CA, Chen W, Fungal Barcoding Consortium (2012) Nuclear ribosomal internal transcribed spacer (ITS) region as a universal DNA barcode marker for Fungi. *Proceedings of the National Academy of Sciences of the United States of America* 109: 6241–6246.
- Schüßler A (2000) *Glomus claroideum* forms an arbuscular mycorrhiza-like symbiosis with the hornwort *Anthoceros punctatus*. *Mycorrhiza* 10: 15–21.
- Schüßler A, Schwarzott D, Walker C (2001) A new fungal phylum, the *Glomeromycota*: phylogeny and evolution. *Mycological Research* 105(12): 1413–1421.

Schüßler A, Walker C (2010) The *Glomeromycota*: A species list with new families and new genera (Libraries at the Royal Botanic Garden Edinburgh, Edinburgh, UK; The Royal Botanic Garden Kew, Kew, UK; Botanische Staatssammlung Munich, Munich, Germany; and Oregon State University, Corvallis, Oregon, pp 1–56.

Sieverding E (1991) Vesicular-arbuscular mycorrhiza management in tropical agrosystems. Eschborn: Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH.

Singh SS, Tiwari SC, Dkhar MS (2003) Species diversity of vesicular-arbuscular mycorrhizal (VAM) fungi in Jhum fallow and natural forest soils of Arunachal Pradesh, north eastern India. *Tropical Ecology* 44(2): 207–215.

Singh BK, Nazaries L, Munro S, Anderson IC, Campbell CD (2006) Use of multiplex-terminal restriction fragment length polymorphism for rapid and simultaneous analysis of different components of the soil microbial community. *Applied Environmental Microbiology* 72: 7278–7285.

Simon L, Lalonde M, Bruns TD (1992) Specific amplification of 18S fungal ribosomal genes from vesicular–arbuscular endomycorrhizal fungi colonising roots. *Applied and Environmental Microbiology* 58: 291–295.

Smit E, Leeflang P, Glandorf B, Van Elsas JD, Wernars K (1999) Analysis of fungal diversity in the wheat rhizosphere by sequencing of cloned PCR-amplified genes encoding 18S rRNA and temperature gradient gel electrophoresis. *Applied and Environmental Microbiology*, 65: 2614–2621.

Smith S, Read D (1997) Mycorrhizal symbiosis. Academic Press, London.

Sparks DL, Page AL, Helmke PA, Loepert RH, Soltanpour PN, Tabatabai MA, Johnston CT, Sumner ME (1996) Methods of soil analysis part 3, Chemical Methods. Soil Science Society of America and American Society of Agronomy, Wisconsin.

- St-Arnaud M, Hamel C, Vimard B, Caron M, Fortin JA (1996) Enhanced hyphal growth and spore production of the arbuscular mycorrhizal fungus *Glomus intraradices* in an *in vitro* system in the absence of host roots. *Mycological Research* 100: 328–332.
- Stockinger H, Walker C, Schüßler A (2009) ‘*Glomus intraradices* DAOM197198’, a model fungus in arbuscular mycorrhizal research, is not *Glomus intraradices*. *New Phytologist* 183: 1176–1187.
- Strullu D G and Romand C 1986 Méthode d’obtention d’endomycorhizes à vésicules et arbuscules en conditions axéniques. *Comptes Rendus de l’Académie des Sciences* 303: 245–250.
- Stürmer SL, Filho OK, de Queiroz MH, de Mendonça MM. 2006. Occurrence of arbuscular mycorrhizal fungi in soils of early stages of a secondary succession of Atlantic Forest in South Brazil. *Acta Botanica Brasilica* 20(3): 513–521.
- Swaminathan C, Srinivasan VM (2006) Influence of microbial inoculants on seedling production in teak (*Tectona grandis* L.f.). *Journal of Sustainable Forestry* 22(3): 63–76.
- Swofford DL (2002) PAUP* Phylogenetic analysis using parsimony (*and other methods). version4b10. Sunderland. MA: Sinauer Associates
- Sylvia DM, Fuhrmann JJ, Hartel PG, Zuberer DA (2005) Mycorrhizal symbioses. Principles and applications of soil microbiology. Second edition. Pearson Prentice Hall. New Jersey. USA.
- Sylvia DM, Schenck NC (1983) Application of superphosphate to mycorrhizal plants stimulates sporulation of phosphorus-tolerant vesicular–arbuscular mycorrhizal fungi. *New Phytologist* 95: 655–661.
- Tabin T, Arunachalam A, Shrivastava K, Arunachalam K (2009) Effect of arbuscular mycorrhizal fungi on damping-off disease in *Aquilaria agallocha* Roxb. seedlings. *Tropical Ecology* 50(2): 243–248.

- Talukdar NC, Germida JJ (1993) Propagation and storage of vesicular–arbuscular mycorrhizal fungi isolated from Saskatchewan agricultural soils. *Canadian Journal of Botany* 71(10): 1328–1335.
- Talukdar NC, Thakuria D (2001) Diversity and importance of vesicular-arbuscular mycorrhizal fungi in teak (*Tectona grandis*) and gomar (*Gmelina arborea*) plantations of Assam. In: Varma RV, Bhat KV, Murlidharan EM, Sharma JK (eds.) Tropical forestry research: Challenges in the new millennium. Proceeding of the International Symposium. Kerala Forest Research Institute (KFRI), Peechi, pp 177–182.
- Tamuli P, Boruah P (2002) Vesicular-abuscular mycorrhizal (VAM) association of agarwood tree in Jorhat District of the Brahmatputra Valley. *Indian Forester* 128: 991–994.
- Tennant D (1975) A test of a modified line intersect method of estimating root length. *Journal of Ecology* 63: 995–1001.
- Thapar HS, Khan SN (1988) Seasonal frequency of *Endogone* spores in new-forest soils. In: Khosla PK, Sehgal RN (eds.) Trends in Tree Sciences. Indian Society of Tree Scientists, Solan, pp 161–162.
- Toljander JF, Santos-González JC, Tehler A, Finlay RD (2008) Community analysis of arbuscular mycorrhizal fungi and bacteria in the maize mycorrhizosphere in a long-term fertilization trial. *FEMS Microbiology Ecology* 65: 323–338.
- Turjaman M, Tamai Y, Santoso E, Osaki M, Tawaraya K (2006) Arbuscular mycorrhizal fungi increased early growth of two nontimber forest product species *Dyera polyphylla* and *Aquilaria filaria* under greenhouse conditions. *Mycorrhiza* 16: 459–464.
- Urgiles N, Loján P, Aguirre N, Blaschke H, Günter S, Stimm B, Kottke I (2009) Application of mycorrhizal roots improves growth of tropical tree seedlings in the nursery: a step towards reforestation with native species in the Andes of Ecuador. *New Forest* 38: 229–239.

- Vainio EJ, Hantula J (2000) Direct analysis of wood-inhabiting fungi using denaturing gradient gel electrophoresis of amplified ribosomal DNA. *Mycological Research* 104: 927–936.
- van Aarle IM, Olsson PA, Soderstrom B (2002) Arbuscular mycorrhizal fungi respond to the substrate pH of their extraradical mycelium by altered growth and root colonization. *New Phytologist* 155: 173–182.
- Vandenkoornhuyse P, Ridgway KP, Watson IJ, Duck M, Fitter AH, Young JPW (2003) Co-existing grass species have distinctive arbuscular mycorrhizal communities. *Molecular Ecology* 12: 3085–3095.
- van der Heijden MGA, Wiemken A, Sanders IR (2003) Different arbuscular mycorrhizal fungi alter coexistence and resource distribution between co-occurring plant. *New Phytologist* 157: 569–578.
- Venkataraman MN, Borthakur R, Singh HD (1985) Occurrence of endotrophic mycorrhizal fungus in agarwood plant *Aquilaria agallocha* (Roxb). *Current Science* 54: 928.
- Verma RK, Jamaluddin (1995) Association and activity of Arbuscular mycorrhizae of Teak (*Tectona grandis*) in Central India. *Indian Forester* 21:533-539.
- Voets L, de la Providencia IE, Fernandez K, IJdo M, Cranenbrouck S, Declerck S (2009) Extraradical mycelium network of arbuscular mycorrhizal fungi allows fast colonization of seedlings under *in vitro* conditions. *Mycorrhiza* 19: 347–356.
- Voets L, Dupré de Boulois H, Renard L, Strullu DG, Declerck S (2005) Development of an autotrophic culture system for the *in vitro* mycorrhization of potato plantlets. *FEMS Microbiology Letters* 248: 111–118.
- Wang GM, Sibley DP, Tinker PB, Walker C (1993) Effects of pH on arbuscular mycorrhiza 1. Field observations on the long-term liming experiments at Rothamsted and Woburn. *New Phytologist* 124: 465–472.

- Walker C (1992) Systematics and taxonomy of the arbuscular endomycorrhizal fungi (*Glomales*)—a possible way forward. *Agronomie* 12: 887–897.
- Walker C, Sanders FE (1986) Taxonomic concepts in the *Endogonaceae*: III. The separation of *Scutellospora* gen. nov. from *Gigaspora* Gerd. & Trappe. *Mycotaxon* 27: 169–182.
- Walker C, Trappe JM (1993) Names and epithets in the *Glomales* and *Endogonales*. *Mycological research* 97: 339–344.
- Watanarojanaporn N, Boonkerd N, Wongkaew S, Prommanop P, Teaumroong N (2011) Selection of arbuscular mycorrhizal fungi for citrus growth promotion and *Phytophthora* suppression. *Scientia Horticulturae* 128: 423–433.
- Wolfe BE, Mumme DL, Rillig MC, Klironomos JN (2007) Small-scale spatial heterogeneity of arbuscular mycorrhizal fungal abundance and community composition in a wetland plant community. *Mycorrhiza* 17: 175–183.
- Wright SF, Franke-Snyder M, Morton JB, Upadhyaya A (1996) Time-course study and partial characterization of a protein on hyphae of arbuscular mycorrhizal fungi during active colonization of roots. *Plant and Soil* 181: 193–203.
- Wright SF, Starr JL, Paltineanu IC (1999) Changes in aggregate stability and concentration of glomalin during tillage management transition. *Soil Science Society of America Journal* 63: 1825–1829.
- Wright SF, Upadhyaya A (1996) Extraction of an abundant and unusual protein from soil and comparison with hyphal protein of arbuscular mycorrhizal fungi. *Soil Science* 161: 575–586.
- Wright SF, Upadhyaya A (1998) A survey of soils for aggregate stability and glomalin, a glycoprotein produced by hyphae of arbuscular mycorrhizal fungi. *Plant and Soil* 198: 97–107.
- Wu CG, Liu YS, Hung LL (1995) Spore development of *Entrophospora kentinensis* in an aeroponic system. *Mycologia* 87: 582–587.

Yokoyama K, Tateishi T, Marumoto T, Saito M (2002) A molecular marker diagnostic of a specific isolate of an arbuscular mycorrhizal fungus, *Gigasporu margarita*. *FEMS Microbiology Letter* 212: 171–175.

Young (2012) A molecular guide to the taxonomy of arbuscular mycorrhizal fungi *New Phytologist* 193: 823–826.

Youpensuk S, Rerkasem B, Dell B, Lumyong S (2005) Effects of arbuscular mycorrhizal fungi on a fallow enriching tree (*Macaranga denticulata*). *Fungal Diversity* 18: 189–199.

Youpensuk S, Piwpueak W, Rerkasem B (2012) Effects of arbuscular mycorrhizal fungi on resistance to *Phytophthora parasitica* of citrus seedlings and on growth of Thai honey tangerine scions on citrus rootstocks. *African Journal of Biotechnology* 11: 11400-11406.

Zézé A, Hosny M, Gianinazzi-Pearson V, Dulieu H (1996) Characterization of a highly repeated DNA sequence (SC1) from the arbuscular mycorrhizal fungus *Scutellospora castanea* and its use as a diagnostic probe in planta. *Applied Environmental Microbiology* 62: 2443–2448.

Zézé A, Sulistyowati E, Ophel-Keller K, Barker S, Smith S (1997) Intersporal genetic variation of *Gigaspora margarita*, a vesicular arbuscular mycorrhizal fungus, revealed by M13 minisatellite-primed PCR. *Applied and Environmental Microbiology* 63: 676–678.

LIST OF PUBLICATIONS

1. Chaiyasen A, Young JPW, Teaumroong N, Gavinlertvatana P, Lumyong S. 2014. Characterization of arbuscular mycorrhizal fungus communities of *Aquilaria crassna* and *Tectona grandis* roots and soils in Thailand plantations. PLOS ONE 9(11): e112591.



ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved