

DAFTAR PUSTAKA

- Abruzzi, R.C., Dedavid, B.A., Pires, M.J.R., and Ferrarini, F. 2013. Relationship between density and anatomical structure of different species of *Eucalyptus* and identification of preservative. *Materials Research*, 16(6): 1428-1438.
- Adi. D.S., Risanto. I., Damayanti. R., Rullyati. S., Dewi. L.M., Susanti. R., Dwianto. W., Hermiati. E., Watanabe. T. 2014. Exploration of unutilized fast growing wood species from secondary forest in Central Kalimantan: Study of fiber characteristic and wood density. *Procedia Environmental Sciences*, 20: 321-327.
- Ajala. O.O. 1997. *Evaluation of wood and fibre characteristics of Nigerian grown Pinus caribaea*, Department of Forest Resources Management, University of Ibadan, Ibadan, Nigeria.
- Ajuziogu. G. C., Nzekwe., U. and Chukwuma. H. I. 2010. Assessment of Suitability of Fibres of Four Nigerian Fruit Trees for Paper-Making, *Bio-Research*, Vol. 8, (2).
- Akachuku A.E., 1985. Intra-annual Variation in Wood Density in *Gmelina arborea* From X-ray Densitometry and its Relations With Rainfall. *Tree Ring Bull* 45, 43-55.
- Akgül. M., Tozluoglu. A. 2009. Some chemical and morphological properties of juvenile woods from beech (*F. orientalis* L.) and pine (*P. nigra* A.) plantations. *Trends in Applied Sciences Research* 4:116-125.
- Alves. E.S. dan V. Angyalossy-Alvonso. 2002. Ecological trends in the wood anatomy of some Brazilian species. 2. Axial parenchyma, rays and fibres. *IAWA Journal* 23: 391 - 418.
- Alarcon, A., Fichtler., E. LIcona, J., McDonald, I., Peña-Claros, M., Poorten, L., Sass-Klaassen, U. and Villegas, Z. 2010. The importance of wood traits and hydraulic conductance for the performance and life history strategies of 42 rainforest tree species. *New Phytologist*, 185, 481-492.
- Amidon. T.E. 1981. Effect of the wood properties of hardwoods on kraft paper properties. *Tappi* 64:123-126.
- Antonio. F., and Antwi-Bosiako. C. 2017. The Characteristics Of Fibres Within Coppiced And Non-Coppiced Rosewood (*Pterocarpus erinaceus* Poir.) and Their Aptness For Wood - And Paper - Based Products . *Pro Ligno* 13(2): 27-39.

- Agullar-Rodriguez, S., Terrazas, T., Lopez-Mata. 2006. Anatomical wood variation of *Buddleja cordata* (Buddlejaceae) along its natural range in Mexico. *Trees-Struct Funct* 20: 253-261.
- Arsad, E. 2013. Prospek kayu kualitas rendah dan kurang dikenal sebagai substitusi kayu komersial. *Jurnal Riset Industri Hasil Hutan*, 5(1), 45–53.
- Augspurger. C., Kelly.C.K. 1984. Pathogen mortality of tropical tree seedlings: experimental studies of the effects of dispersal distance, seedling density, and light conditions. *Oecologia* 61: 211-217.
- Awad. H., Herbette. S., Brunel. N. 2012. No trade-off between hydraulic and mechanical properties in several transgenic poplars modified for lignins metabolism. *Environmental and Experimental Botany* 77: 185–195.
- Awaku. F A. 1994. Anatomical properties of Afina [*Strombosia glaucescens*, var *Lucida* (J. Leonard)]. *Ghana Journal of Forestry*, Vol.1, 30-33.
- Bass. P. 1973. The wood anatomical range in *Ilex* (Aquifoliaceae) and its ecological and phylogenetic significance. *Blumea* 21: 193 – 258.
- Bass, P., E. Werker & A. Fahn. 1983. Some ecological trends in vessel characters. *IAWA Bull.* n.s. 4: 141 – 159.
- Bass, P. 1986. *Ecological patterns in xylem anatomy*. In: Th. J.Givnish (ed.), On the economy of plant form and function: 327 – 364.
- Bhat. K.V. 1994. *Physical and anatomical characteristic of wood of some less-known tree species of Kerala*, Kerala Forest Research Institute. Research Report 96, Peechi, Thrissur.
- Barajas-Morales, J. 1985. Wood structural differences between trees of two tropical forest in Mexico. *IAWA Bull.* n.s 6: 355 – 364.
- Barnett. J.and G. Jeronimidis. 2003. *Wood Quality and Its Biological Basis*. Blackwell Publishing Ltd.
- Barij. N., Stokes. A., Boogaard. T., Van Beek. R. 2007. Does growing on a slope affect tree xylem structure and water relation? *Tree Physiol* 27: 757-764.
- Bektas. I., Tutus. A., Eroglu. H.1999. A Study of The Suitability of Calabrian Pine (*Pinus brutia* Ten.) For Pulp and Paper Manufacture. *Turkish Journal of Agriculture and Forestry* 23(3):589 - 597.

- Benicio. J.R.W., Pires. E.F., Da Rosa. A.A.S., Spiekermann. R., Uhl. D. and Jasper. A. 2016. A new fossil Fabaceae wood from the Pleistocene Touro Passo formation of Rio Grande Do Sul. *Braz Fossil*, 72(3-4): 251-264.
- Bosoi, F., Patricia, S and MRT Boeger. 2010. Ecological Wood Anatomy of *Miconia sellowiana* (Melastomataceae) in Three Vegetation Types of Paraná State, Brazil. *IAWA Journal*, 31 (2): 179-190.
- Bouillet JP., Bernhard-Reservat. 2001. General Objectives and Sites. Di dalam: Bernhard-Reservat, F (eds): *Effect of Exotic Tree Plantations on Plant Diversity and Biological Soil Fertility in the Congo Savanna: With Special Reference to Eucalyptus*. Center for International Forestry Research. Bogor. Indonesia.
- Bowyer JL., R Shmulsky and JG Haygreen. 2003. *Forest Products and Wood Science: An Introduction*. Fourth Edition. Amer, Iowa, USA. Iowa State Press a Blackwell Publishing Company.
- Brea. M., Zamuner. A.B., Matheos. S.D., Iglesias. A. and Zucol, A. F. 2008. Fossil wood of the Mimosoideae from the early Paleocene of Patagonia. *Argentina Alcheringa*, 32: 427-441.
- Carlquist, S. 1989. Wood anatomy of *Cercidium* (Fabaceae), with emphasis on vessel wall sculpture. *Aliso*, 12(2): 235-255.
- Casey, P.J. 1980. *Pulp and Paper*. Vols. 1, 2 and 3rd ed. John Wiley and Sons, Ltd. New York.
- Chave. J., Coomes. D., Jansen. S., Lewis. S.L., Swenson. N.G., and Zanne. A. E. 2009. Towards a worldwide wood economic spectrum. *Ecology Letters*, 12: 351-366.
- Cepel, N. 1995. *Orman ekolojist*. Istanbul, Turkey. Istanbul University (in Turkish).
- Cornwell, W.K., DeNoyer, J.L. dan Preston, K.A. 2006. Wood density and vessel traits as distinct correlates of ecological strategy in 51 California coast range angiosperms, *New Phytologist*, 170, 807- 818.
- Cown, D.J. and Hutchison, J.D. 1983. Wood density as an indicator of the bending properties of *Pinus radiata* poles. *New Zealand Journal of Foestry Science*, 13(1): 87-99.
- Departemen Kehutanan. 2009. *Statistik Kehutanan Indonesia 2008*. Departemen Kehutanan, Jakarta.

- Decoux V., Varcin E., Leban J.M., 2004. Relations Between the Intra-ring Wood Density Assessed by X-ray Densitometry and Optical Anatomical Measurements in Conifers. Consequences for the cell apparent density determination. *Ann For Science* 61, 251-262.
- Dell B., Malajczuk N., Xu D., Grove TS. 2003. *Nutrient Disorders in Plantation Eucalyptus*. Australian Centre for International Agricultural Research, Canberra. Australia.
- Dutt. D., Tyagi. C.H. 2011. Comparison of various *Eucalyptus* species for their morphological, chemical, pulp and paper making characteristics. *Indian Journal of Chemical Technology* 18: 145-151.
- Edwin. P. and B. Ozarska. 2015. Bending properties of hardwood timbers from secondary forest in Papua New Guinea. *Journal of Tropical Forest Science*, 27(4): 456-461.
- EKI (Ensiklopedi Kehutanan Indonesia) dalam Suharnantono, Hendrat. 2011. Monitoring dan Evaluasi Jenis Tanaman Rimba Eksotik di KPH Kendal. Perhutani KPH Kendal 2011.
- Ekhuemelo. D.O. dan Udo. A.M. 2016. Investigation of variations in the fibre characteristics of *Moringa oleifera* (Lam) stem for pulp and paper production. *International Journal of Science and Technology* Vol 5 (1):
- Emerhi. E. A. 2012. Variations In Anatomical Properties Of *Rhizophora racemosa* (Leechm) And *Rhizophora harrisonii* (G. Mey) In A Nigerian Mangrove Forest Ecosystem. *International Journal of Forest, Soil and Erosion (IJFSE)*, 2012, 2 (2): 89-96.
- Esteban, L.G., Martin, J.A., de Palacios, P., Fernandes, F.G., and R. Lopez. 2010. Adaptive anatomy of *Pinus halepensis* trees from different Mediteranian environments in Spain. *Trees Struct Funct* 24, 19-30. doi: 10.1007/s00464-009-0375-3.
- Espinoza de Pernia, N and Melandri J.L. 2006. Wood anatomy of tribe Caesalpiniaie (Leguminosae, Caesalpiioideae) in Venezuela. *IAWA J*, 27: 99-114.
- Ezeibekwe. I. O., Okeke. S.E., Unamba. C. I. N., and Ohaeri. J. C. 2009. An Investigation into the Potentials of *Dactyladenia basteri*; *Dialum guineense*; and *Anthonota macrophyllia* for Paper Pulp Production. *Report and Opinion*, 1(4): 18-25
- Fengel. D., Wegener. G. 1995. *Kayu; Kimia, Ultrastruktur, Reaksi-reaksi*. Terjemahan. Yogyakarta: Gadjah Mada University Press.

- Fernandes. C., Gaspar. M.J., Jani Pires. J. Alves. A., Simões. R., Rodrigues. J.C., Maria Silva. M.A., Carvalho. A., Brito. A.J.E., and Lousada. J.L. 2017. Physical, chemical and mechanical properties of *Pinus sylvestris* wood at five sites in Portugal. *iForest*, 10, pp. 669-679. doi: 10.3832/ifor2254-010
- Filipescu. C.N., Lowell. E.C., Koppenaar. R., Mitchell. A.K. 2014. Modeling regional and climatic variation of wood density and ring width in intensively managed Douglas-fir. *Can J For Res* 44(3):220–229. doi:10.1139/cjfr-2013-0275
- Fisher. J.B., G. Goldstein., T.J. Jones., S. Cordell. 2007. Wood vessel diameter is related to elevation and genotype in the Hawaiian tree *Metrosideros polymorpha* (Myrtaceae). *Am J Bot* 94:709–715.
- FKKM (Forum Komunikasi Kehutanan Masyarakat). 2011. Status Kehutanan Masyarakat di Indonesia. *Jurnal Kehutanan Masyarakat* Vol. 3. No. 1.
- Fortunel, C., Ruelle, J., Beauchene, J., Fine, P.V.A., and Baraloto, C. 2014. Wood specific gravity and anatomy of branch and root in 113 Amazonian rainforest tree species across environmental gradients. *New Phytologist*, 202: 79-94. This article available at: www.newphytologist.com
- FPL (Forest Product Laboratory). 2010. Wood Handbook: *Wood as an engineering material*. Centennial Edition. United States Department of Agriculture Forest Service. Madison, Wisconsin.
- Frimpong-Mensah. F. 1992. *Wood quality variation in the trees of some endemic Tropical species*. In: Association pour la Reserche sur le bois en Larraiene (Ed) All Division 5 Conference “Forest Product” Working Session Vol. 1, Nancy, France.
- FWI/GFW. 2001. *Keadaan hutan Indonesia*. Forest Watch Indonesia dan Washington D.C. Global Forest Watch, Bogor, Indonesia.
- Gasson. P. and Wray. E.J. 2001. Wood anatomy of *Cyathostegia mathewsii* (Swartzieae, Papilionoideae, Leguminosae). *IAWA J*, 22(2): 193-199.
- Gerçek. Z., Merçev. N., Ansin. R., Ozkan. ZC., Terzioğlu. S., Serdar.B., Birtürk. T. 1998. Turkiyedeki Gürgen Yarpraklı Kayacık (*Ostrya carpinifolia* Scop) nin Ekolojik Odun Anatomisi. In: Kasnak Mesesi ve Türkiye Florasi Sempozyumu, Istanbul , Turkey pp. 302-316 (in Turkish).
- Gleason. SM., Butler. D.W., Ziemińska. K., Waryszak. P., Westoby. M. Stem xylem conductivity is key to plant water balance across Australian angiosperm species. *Functional Ecology*. 2012;26:343–352.

- Govorcin. S., Sinkovic. T., Trajkovic. 2003. Some physical and mechanical properties of beech wood grown in Croatia. *Wood Res-Slovakia* 48: 39-52.
- Guilley E., Mothe F., Nepveu G., 2003. A Procedure Based on Conditional Probabilities to Estimate Proportions and Densities of Tissues From X-ray Images of Samples. *IAWA Journal* 23: 235-252.
- Gutteridge, RC. 1997. *Senna siamea* (Lam.) Irwin et Barneby. In: Faridah Hanum, I. & van der Maesen, LJG (Editors) : *Plant Resources of South-East Asia No. 1 I*. Auxiliary plants. Backhuys Pub., Leiden, the Netherlands.
- Guyette, R.P. and Stambaugh, M. (2003). The age and density of ancient and modern oak wood in streams and sediments. *IAWA J.*24(4): 345-353.
- Hamdi. S. 2010. *Penggunaan kayu kelas kuat rendah dengan impregnasi bahan stabilisator untuk bahan baku dan mebel*. In Kumpulan hasil penelitian bidang kayu, rotan dan bamboo. Banjarbaru: Balai Riset dan Standardisasi Industri.
- Hammer. Ø., Harper, D.A.T and Ryan P. D. 2001. *PAST Program* 2.10. *Paleontologia Electronica* 4(1): 9 pp.
- Harrison. R.D., and T.Swinfield. 2015. Restoratioon of logged humid tropical forests: An experimental programme at Harapan Rainforest, Indonesia. *Trop. Conserv. Sci.* 8(1):4-16.
- Hassain. M.K. 1999. *Senna siamea – a widely used legume tree*. Fact sheet 99-04. FACT Net, Winrock International.
- Haygreen. J.G., Boowyer. J.L. 1996. *Forest Products and Wood Science; an Introduction*, IOWA State University Press/AMES, Pp. 1-484.
- Henry. M., Besnard. A., Asanté. W.A., Eshun. J., Adu-Bredu. S., Valentini. R., Bernoux. M., and Saint-André. L. 2010. Wood density, phytomass variations within and among trees, and allometric equations in tropical forest of Africa. *Forest Ecology and Management*, 260: -1375-1388.
- Hernández-Calderón. E., Méndez-Alonzo. R., Martínez-Cruz. J., González-Rodríguez. A. and Oyama. K. 2014. Altitudinal changes in tree leaf and stem functional diversity in a semi-tropical mountain. *Journal of Vegetation Science*, 25(4): 955–966.
- Hernandes. RE. Restrepo. G. 1995. Natural variation in wood properties of *Alnus acuminata* H.B.K grown in Colombia. *Wood Fiber Sci*, 27: 41-48.

- Heyne, K. 1987. *Tumbuhan Berguna Indonesia 2*. Yayasan Sarana Wana Jaya, Jakarta.
- Hickey. M., King. C. 2001. *The Cambridge Illustrated Glossary of Botanical Terms*. Cambridge University Press.
- HIGUCHI, Takayoshi. 1976. *Biochemical Aspects of Lignification and Heartwood Formation*. Wood research : Bulletin of the Wood Research Institute Kyoto University 59/60: 180-199.
- Hillis. WE. 1987. *Heartwood and Tree Exudates*. Springer, Berlin.
- Hudson. I., Wilson. L., Beveren. K.V. 1998. Vessel and fiber property variation in *Eucalyptus globules* and *E. nitens*: some preliminary results. *IAWA Journal* 19: 111-130.
- Hutter. R.W. 2001. *Agriculture Residues*. TAPPI 1997 non-wood fibre, short course notes update and expanded Sept 2001. www.aseanbiotechnology.info/scripts.
- Idu. M and Ijeomah. J. U. 2000. Wood anatomy of some savannah Fabaceae species: Dimensional variation in fibre and vessel element of *Daniellia oliverii* (Rolfe) Hutch & Dalz. *Indian Forester*. 126 (2): 149 – 153.
- Ishiguri. F., Eizawa. J., Saito. Y., Iizuka. K., Yokota. S., Priadi. D., Sumiasri. N. and Yoshizawa. N. 2007. Variation in the wood properties of *Paraserianthes falcataria* planted in Indonesia. *IAWA Journal*. 28: 339–348.
- Ishiguri. F., Hiraiwa. T., Iizuka. K., Yokota. S., Priadi. D., Sumiasri. N., Yoshiawa. N. 2009. Radial variation of anatomical characteristics in *Paraserianthes falcataria* planted in Indonesia. *IAWA Journal*, Vol. 30 (3): 343-352.
- Istikowati. W.T., Aiso. H., Sunardi., Sutiya. B., Ishiguri. F., Ohshima. Iizuka K., Yokota. S. 2016. Wood, chemical, of woods from less-utilized fast-growing tree species found naturally regenerated secondary forest in South Kalimantan, Indonesia. *Journal of Wood Chemistry and Technology* 36: 250-258.
- ITTO. 2009. *Strengthening the capacity of promote efficient wood processing technology in Indonesia* (Technical Report No. 7 International Tropical Timber Organization).
- Izekor. D. N. and Fuwape. J. A. 2011. Variations in the anatomical characteristics of plantation grown *Tectona grandis* wood in Edo State, Nigeria. *Arch. Appl. Sci. Res.*, 3 (1): 83-90.

- Jacobsen. A. L., Agenbag. L., Esler. K.J., Pratt, R. B., Ewer. F.W., Davis. S.D. 2007. Xylem density biomechanics and anatomical traits correlate with water stress in 17 evergreen shrub species of the Mediterranean-type climate region of South Africa. *Journal of Ecology* 95: 171-183.
- Jessica de cassia Tomasi, Luciano Denardi, Romulo Trevisan, Juliana Tramontina, Talita Baldin. 2015. *Description anatomical secondary xylem of Mimosa ramulosa* Benth (Fabaceae). Enciclopedia Biosfera, Centro Cientifico Conhecer – Goiania, v. 11 n.21; p 727-736.
- Jiménez-Noriega. P.M.S., Terrazas. T., López-Mata, L., Sánchez-González. A., and Vibrans. H. 2017. Anatomical variation of five plant species along an elevation gradient in Mexico City basin within the Trans-Mexican Volcanic Belt, Mexico. *Journal of Mountain Science*, 14(11): 22182-2199. This article available at: <https://doi.org/10.1007/s11629-017-4442-8>
- Jones. D. 2010. *Basic Guide to Identification of Hardwoods and Softwoods Using Anatomical Characteristics*. Copyright 2010 by Mississippi State University. Publication 2606 Extension Service of Mississippi State University, cooperating with U.S. Department of Agriculture. Published in furtherance of Acts of Congress, May 8 and June 30, 1914. Dr. Melissa Mixon, Interim Director.
- Kasmudjo. 2010. *Teknologi Hasil Hutan*. Yogyakarta. Cakrawala Media.
- Kaygin, B., Esnaf, S., and Aydemir, D. 2016. The effect of altitude difference on physical and mechanical properties of Scots Pine wood grown in Turkey - Sinop Province. *Drvna Industrija*. 67(4), 393-397.
- Kiaei. M. 2012. Effect of site and elevation on wood density and shrinkage and their relationship in *Carpinus betulus*. *For. Stud. China*, 14(3): 229-234. doi:10.1007/s11632-012-0310-3
- Kloster. A., S. Gneadinger, K.A-Rodrigues and C. Urban. 2015. New record of Fabaceae fossil woods from the Solimoes formation (Miocene), Acre Basin Amazon, Brazil. *Rev. Bras. Paleontol.* 18(3): 391-402.
- Koman. S. and Feher. S. 2015. Basic density of hardwood depending on age and site. *Wood Research*, 60(6): 907-912.
- Kord. B., Kialashaki. A., and Kord. B. 2010. The within-tree variation in the wood density and shrinkage, their relationship in *Populus euramericana*. *Turk J Agric For*, 34: 1211-126. doi:10.3906/tar-0903-14

- Korner. C. 2007. The use of altitude in ecological research. *Trends Ecol. Evol* 22: 569-574.
- Kpikpi. W.M., Sackey, I. 2012. *Gliricidia sepium* (Jacq.) Walp:Hardwood with potential for pulp and paper-making. *Canadian Journal of Pure & Applied Sciences* 2012; 6(2):1961-1966.
- Kristova. P, Kordsachia. O, Patt. R, and Daffaalla, S. 2006. Alkaline pulping of some Eucalypts from Sudan. *Bio resour.technol*, 97,535.
- KUKLiK, Petr. 2008. Handbook 1 – TIMBER STRUCTURES . *Wood Properties., Educational Materials for Designing and Testing of Timber Structures-TEMTIS.*, Leonardo da Vinci Pilot Project CZ/06/B/F/PP/168007., First Edition 2008.
- Lembang. M., dan Asdar. M. 2012. Beberapa sifat dasar dan kegunaan tiga jenis kayu kurang dikenal asal hutan alam di Sulawesi. *Jurnal Penelitian Hasil Hutan* 30(1): 27-39.
- Lembang. M., dan Asdar. M., dan Rullyati. S. 2013. Struktur anatomi, sifat fisik, dan mekanik kayu kambelu dan kanduruan dari hutan alam di Sulawesi Barat. *Jurnal Penelitian Hasil Hutan* 31(1): 27-35.
- Lens. F., James. L., Luteyn., E. Smets and S. Jansen. 2004. Ecological Trends in The Wood Anatomy of Vaccinioideae (Ericaceae s.l.). *Flora* 199: 309–319.
- Lens. F., Sperry. JS., Christman. MA., Chaat. B., Rabaey. D., Jansen. S. 2011. Testing hypotheses that link wood anatomy to cavitation resistance and hydrolic conductivity in the genus *Acer*. *New Phytologist* 190: 709-723.
- Liang, D. and Xin-ying, Z. 1989. The ecological wood anatomy of the Lilac ((*Syringa oblata* var. *girardii* Rehd.) in Taibai Mountain. *Acta Botanica Sinica*, 31(2): 95-102.
- Lima, I.L., Longui, E.L., Cerato, C., Freitas, M.L.M., Florsheim, S.M.B., Zanatto, A.C.S. 2015. Basic specific gravity and anatomy of *Peltophorum dubium* wood as a function of provenance and radial position. *Rev. Inst. Flor.* 27(1): 19-29.
- Lioret, L dan Martinez-Romero, E. 2005. Evolution y Filogenia. *de Rhizobium. Volume* 47 (1-2): 43-60.
- Liu. J., Noshiro. S. 2003. Lack of latitudinal trends in wood anatomy of *Dodonea viscosa* (Sapindaceae), a species with a worldwide distribution. *Am J Bot* 90: 532-539.

- Luchi. A.E. 2004. Anatomia do lenho de *Croton urucurana* Baill (Euphorbiaceae) de solos com diferentes niveis de umidade. *Braz. J. Bot.* 27: 271-280.
- Luchi, A.E., ICP. Silva., M.A. Moraes. 2005. Anatomia comparada do lenho de *Xylopia aromatica* (Lam) Mart. em areas de cerrado e de plantacao de *Pinus elliotti* Engelm. *Braz. J. Bot.* 28: 809-820.
- Luostarinen, K., Pikkarainen, L., Ikonen, V.K., Gerendiain, A.Z., Pulkkinen, P., and Peltola, H. 2017. Relationships of wood anatomy with growth and wood density in three Norway spruce clones of Finnish origin. *Canadian Journal of Forest Research*, 47(9): 1184-1192.
- LPHH. 1976. *Laporan Penelitian Hasil Hutan*. Lembaga Penelitian dan Pengembangan Hasil Hutan. Bogor. Indonesia.
- Maiti, R., Rodriquez, H.G. and Kumari, A. 2016. Wood density of ten native trees and shrubs and its possible relation with a few wood chemical compositions. *American Journal of Plan Sciences*, 7: 1192-1197. This article available at: <http://www.scirp.org/journal/ajps>
- Makino. K., Ishiguri. F., Wahyudi. I., Takashima. Y., Iizuka. K., Yokota. S., Yoshizawa. N. 2012. Wood properties of young *Acacia mangium* trees planted in Indonesia. *Forest Products Journal* 62: 102-106.
- Mandang. Y.I. dan I K.N. Pandit. 2002. *Seri Manual Pedoman Identifikasi Kayu Di Lapangan*. Bogor: Yayasan PROSEA Indonesia.
- Martawijaya. A., I. Kertasujana., Y.I. Mandang., S.A. Prawira., K. Kadir. 1989. *Atlas Kayu Indonesia*, jilid II. Badan Litbang Kehutanan, Departemen Kehutanan. Bogor.
- Martawijaya. A., I. Kertasujana., Kosasi. K. dan Prawira. S.A. 2005. *Atlas Kayu Indonesia* Jilid 1. Pusat Penelitian dan Pengembangan Hasil Hutan. Badan Penelitian dan Pengembangan Kehutanan. Departemen Kehutanan. Bogor Indonesia.
- Martinez-Cabrera HI, Jones C S, Espino S, Schenk HJ. 2009. Wood anatomy and wood density in shrubs: responses to varying aridity along transcontinental transects. *American Journal of Botany* 96: 1388–1398.
- Mansfield. S.D., Weineisen. H. 2007. Wood fiber quality and kraft pulping efficiencies of trembling aspen (*Populus tremuloides* michx.) clones. *J. Wood Chem. Technol* 27(3-4): 135-151.

- Meena. V.S. and Gupta. S. 2014. Wood anatomy of *Albizia procera* correlation between tropical and subtropical from different geographical zones of Indian Subcontinent. *Int J Sci Tech Res*, 3(5):1-18.
- Melandri. J.L., Espinoza de Pernia. 2009. Wood anatomy of tribe Detarieae and comparison with tribe Caesalpinieae (Leguminosae, Caesalpinioideae) in Venezuela. *Rev.Biol. Trop. Int. J. Trop. Biol. Vol. 57 (1-2): 303-319*.
- Metcalfe, C. R. 1989. *Ecological anatomy and morphology general survey*, p.126-152. In C. R. Metcalfe & Chalk (eds). *Anatomy of the dicotyledons. Wood structural and conclusion of the general introduction*. Oxford Science, Oxford. England.
- Miettinen J, Chenghuashin and SC Liew. 2011. Deforestation rates in insular Southeast Asia between 2000 and 2010. *Global Change Biology* 17, 2261-2270.
- Migneault. S., Koubaa. A., Erchiqui. F., Chaala. A., Englund. K., Krause. C and Wolcott. M. 2008. Effect of Fiber Length on Processing and Properties of Extruded Wood-Fiber/HDPE Composites. *Journal of Applied Polymer Science*, Vol. 110, 1085–1092.
- Mindawati. Nina., Rina. B., Hani. SN., A. S. Kosasih., Suhartati., Syofia. R., Ahmad. J. Encep. R., Yanto., R., 2010. *Sintesa Hasil Penelitian. Sivikultur Jenis Alternatif Penghasil Kayu Pulp*. Kementerian Kehutanan. Badan Penelitian dan Pengembangan Kehutanan. Pusat Penelitian dan Pengembangan Hutan Tanaman. Bogor.
- Miranda. I. and Pereira. H. 2015. Variation of wood and bark density and production in coppiced *Eucalyptus globulus* trees in a second rotation. *iForest*,9: 270-275. doi: 10.3832/ifor1442-008.
- Missanjo. E. and Matsumura. J. 2016. Wood density and mechanical properties of *Pinus kesiya* Royle ex Gordon in Malawi. *Forest*, 7(135): 1-10. doi:10.3390/f7070135
- Moya. R dan Mario T Fo. 2008. Variation in the wood structure of *Gmelina arborea* (Verbenaceae) trees at different ecological conditions in Costa Rica. *Revista de Biologia Tropical* v. 56, n. 2, p. 689 – 704.
- Muller-Landau. H.C. 2004. Interspecific and inter-site variation in wood specific gravity of tropical trees. *Biotropica* 36: 20–32.
- Mundotiya. A., Dash, R., Gupta. S. and Jani. C. 2016. Anatomy of family Mimosoideae from different geographical areas. *Int Res J Biol Sci*, 5(3):1-10.

- Nair., M.N.B., H.Y. Mohan Ram. 1990. Structure of wood and cambial variant in the stem of *Dalbergia paniculata* Roxb. *IAWA Bulletin* n.s., Vol.11 (4): 379-391.
- Naji. H.R., Sahri. M.H., Nobuchi. T., and Bakar. E.S. 2011. The effect of growth rate on wood density and anatomical characteristics of Rubber wood (*Havea brasiliensis* Muell. Arg.). *Scholars Research Library*, 1(2): 71-80. This article available at: www.scholarsresearchlibrary.com
- Napitupulu. B. 1995. *Kondisi Hara Tanah Pada Beberapa Jenis Vegetasi Hutan di Aek Nauli Sumatera Utara*. Thesis Program Pascasarjana. Institut Pertanian Bogor.
- Nawawi. D.S. 1997. *Pemasakan dan Pengujian Pulp*, Bahan Praktikum M.A. Pulp dan Kertas Bagian Persiapan 1. Jurusan Teknologi Hasil Hutan. Fakultas Teknologi Hasil Hutan. Fakultas Kehutanan. IPB Bogor.
- Niklas. K.J. 1992. *Plants biomechanics: an engineering approach to plant form and function*. University of Chicago Press, Chicago.
- Niklas. K.J., Spatz. H. 2010. Worldwide correlations of mechanical properties and green wood density. *American Journal of Botany* 97(10):1587–1594. doi:10.3732/ajb.1000150
- Nimz. H., Schmitt., Schwab., Wittmann., Wolf. 2005. "Wood" in *Ullmann's Encyclopedia of Industrial Chemistry* 2005, Wiley-VCH, Weinheim.
- Nock. C.A., Geihofer. D., Grabner. M., Baker. P.J., Bunyavejchewin. S., Hietz. P. 2009. Wood density and its radial variation in six canopy tree species differing in shade-tolerance in western Thailand. *Annals of Botany*, 104: 297-306. doi: 10.1093/aop/mcp118, available online at: www.aob.oxfordjournals.org
- Ogunkunle. A.T.J., Oladele. F.A. 2008. Structural dimensions and paper making potentials of the wood in some Nigerian species of *Ficus* L.(Moraceae). *Adv Nat Appl Sci* 2(3):103-111.
- Ogunkunle. A.T.J. 2010. A Quantitative Modelling of Pulp and Paper Making Suitability of Nigerian Hardwood Species. *Advances in Natural and Applied Sciences*, 4(1): 14-21.
- Olufunmilayo. O.D. 2013. Determination of pulp and paper making suitability indices of some Nigerian species of Leguminosae: Caesalpinoideae. *Academic Journal of Interdisciplinary Studies* Vol. 2 No. 13: 61-68.

- Oluwadare. A.O., Ashimiyu. O.S. 2007. The relationship between fiber characteristics and pulp- sheet properties of of *Leucaena leucocephala* (Lam). De Wit. *Middle-East Journal of Scientific Research* 2(2): 63-68.
- Oluwafemi. O.A. and S.O. Adegbenga. 2007. Preliminary report and utilization potential of *Gliricidia sepium* (Jacq.) Stud. for timber. *Research Journal of Forestry*, 1(2): 80-85.
- Osadare. A.O. 2001. *Basic Wood and Pulp Properties of Nigerian-grown Caribbean Pine (Pinus caribaea Morelet) and their Relationship with Tree Growth Indices*. Ph.D. Thesis, University of Ibadan, 347 pp.
- Ohshima. J., Yokota.S., Yoshizawa. N., and Ona.T. 2005. Examination of within-tree variations and the heights representing whole-tree values of derived wood properties for quasi-non-destructive breeding of *Eucalyptus camaldulensis* and *Eucalyptus globules* as quality pulpwood. *Journal of Wood Science*, vol. 51:102-111.
- Oskolski. A.A., Stepanova. A.V., Boatwright. F.S., Tilney. P.M. and van Wyk. B.E. 2014. A survey of wood anatomical characters in the tribe Crotalariaeae (Fabaceae). *S Afr J Bot*, 94(2014):155-165.
- Pandit. I K. N. dan H. Ramdan. 2002. *Anatomi Kayu: Pengantar Sifat Kayu sebagai Bahan Bangunan*. Bogor: Yayasan Penerbit Fakultas Kehutanan IPB Bogor.
- Parthama. Ida Bagus Putera. 2013. *Seribu Jenis Kayu Indonesia Belum Diidentifikasi*. Pustekolah. Diskusi Litbang Anatomi Kayu Indonesia. Botani Square Bogor.
- Pasaribu. R.A dan A.P.Tampubolon. 2007. *Status Teknologi Pemanfaatan Serat Kayu Untuk Bahan Baku Pulp*. Workshop Sosialisasi Program dan Kegiatan BPHPS Guna Mendukung Kebutuhan Riset Hutan Tanaman Kayu Pulp dan Jejaring Kerja. BPHPS Kuok (tidak dipublikasikan).
- Patel. R.N. 1995. Wood anatomy of the dicotyledons indigenous to New Zealand: 24. Fabaceae-subfam. Faboideae (part I). *New Zeal J Bot*, 33: 121-130.
- Pirralho M, Flores D, Sousa VB, Quilhó T, Knapic S, Pereira H. 2014. Evaluation on paper making potential of nine *Eucalyptus* species based on wood anatomical features. *Industrial Crops and Products* 54: 327-334.
- Pompa-García. M. and Venegas-González. A. 2016. Temporal variation of wood density and carbon in two elevational sites of *Pinus cooperi* in relation to climate response in Northern Mexico. *PLoS ONE*, 16(6):<https://doi.org/10.1371/journal.pone.0156782>

- PPR and I (Pulp and Paper Resources and Information). 2011. *Paper on the web*.
<http://www.paperonweb.blogspot.com/>
- Pratt. R.B., Jacobsen. A.L., Ewersa. F.W., Davis. S.D. 2007. Relationships among xylem transport, biomechanics and storage in stems and roots of nine *Rhamnaceae* species of the California chaparral. *New Phytologist* 174: 787–798.
- Preston. A.K., Cornwell. K.W., Denoyer. J.L. 2006. Wood density and vessels traits as distinct correlates of ecological strategy in 51 California coast range angiosperms. *New Phytol* 170: 807-818.
- Poore. MED., Fries. 1985. *The Ecological Effect of Eucalyptus*. F.A.O. Forestry Paper 59. FAO, Rome.
- Primack. R.B. 2006. *Essentials of Conservation Biologi*. Fourth edition. Sinauer Associates, Inc. Publishers. Sunderland. Massachusetts.
- Pujana. Roberto R., Hernan P. Burreiza., Mariana P. Silva., Graciela M. Tourn and Maria A. Castro. 2013. Comparative wood anatomy of vegetative organs (stem and rhizome) of *Sophora linearifolia* (Sophoreae, Papilionoideae, Leguminosae). *Biol. Soc. Argent. Bot.* 48 (3-4): 435-442.
- Rahman. M.M., Fujiwara. S., Kanagawa. Y. 2005. Variations in volume and dimensions of rays and their effect on wood properties of teak. *Wood and Fiber Science* 37: 497–504.
- Rajput. K. S. 2003. Structure of cambium and its derivatives in the compressed stem of *Cavalia ensiformis* (L.) DC. (Fabaceae). *Phyton* (Horn, Austria) 43 (1): 135-146.
- Rana R., Heyser R.L., Finkeldey R., Polle A. 2009. Functional anatomy of five endangered tropical timber wood species of the family Dipterocarpaceae. *Trees*, 23: 521-529.
- Rhee, S., Kitchener, D., Brown, T., Merrill, R., Dilts, R., and Tighe, S. (2004). *Report on Biodiversity and Tropical Forest in Indonesia*. Submitted in accordance with Foreign Assistance Act Section 118/119. February 20, 2004. USAID, Indonesia. pp. 316. This article available at:
pdf.usaid.gov/pdf_docs/Pnada949.pdf
- Romero. C., Bolker. B.M. 2008. Effect of stem anatomical and structural traits on responses to stem damage: an experimental study in the Bolivian Amazon. *Canadian Journal of Forest Research* 38: 611-618.

- Roque. R. M and Fo. T. M. 2007. Wood density and fiber dimensions of *Gmelina arborea* in fast growth trees in Costa Rica: relation to the growth rate. *Sistemasy Recursos Forestales* 16 (3): 267-276.
- Runkle. R.O.H. 1952. Pulp from tropical wood. Bundensanstalt fur Forst und Holzwirtschaft, *ReinbekBez.* Hamburg, pp 20-25.
- Sahney. M. and Vibhasa. 2015. Wood anatomy of *Butea Koenig* (Fabaceae). *Indian J Pl Sci*, 4(2): 46-51.
- Santini. N.S., Nele. S., Catherine. E. L. 2012. Variation in wood density and anatomy in a widespread mangrove species. *Trees*. DOI 10.1007/s00468-012-0729-0.
- Santiago. L.S., Goldstein. G., Meinzer. F.C., Fisher. J.B., Machado. K., Woodruff. D., Jones. T . 2004. Leaf photosynthetic traits scale with hydraulic conductivity and wood density in Panamanian forest canopy trees. *Oecologia* 140:543–550.
- Saribas. M., Yarman. O. 2009. Xylological study in Hackberry (*Celtis australis* L) growing naturally in Antalya-Kemer and Zonguldak-Devrek. *Journal of the Bartin Faculty of Forestry* 15: 1-15.
- Sass. E.J. 1958. *Botanical Microtechnique*, Third Editions. The Iowa State University Press. Amess Iowa.
- Schmid, R. 2009. Sonication and other improvements on Jeffrey's Technique for macerating wood. *Journal Stain Technology*, 57(5): 293-299. This article available at: <https://doi.org/10.3109/10520298209066726>
- Singh, M.K., Shaarma, M.B., and Sharma, C.L. 2013. Wood anatomical variation in some *Terminalia* species of Assam. *International Journal of Botany and Research*, 3(2): 13-18.
- Smook. G.A. 1994. *Handbook for pulp and paper technologist*. 2nd edition, Angus Wide Publications. Inc. Vancouver, B.C., Canada. Pp. 1-419.
- Soerianegara. I., RHMJ. Lemmens (eds). 2002. *Sumber Daya Nabati Asia Tenggara* 5(1): *Pohon penghasil kayu kayu perdagangan yang utama*. PROSEA-Balai Pustaka. Jakarta. ISBN 979-666-308-2. Hal. 283-289
- Sprent. J.I. 2001. Nodulation in Legumes. Royal Botanic Gardens, Kew. UK.
- Stepanova. A.V., Oskolski. A.A., Tilney. P.M. and van Wyk. B.E. 2013. Wood anatomy of the tribe Podalyrieae (Fabaceae, Papilionoideae): Diversity and evolutionary trends. *S Afr J Bot*, 89: 244-256.

- Štrelcová. K., Škvarenina. J., and Blaženec. M. 2007. *Basic density of wood in different forest type. Bioclimatology and Natural Hazard*, International Scientific Conference, Polána nad Detvou, Slovakia, September 17-20, 2007. This article available at: cbks.cz/SbornikPolana07/pdf/Premyslovska_et_al.pdf
- Suhartati. A., Junaedi. E., Nurrohman dan S. Iksan. 2009. *Eksplorasi Jenis Lokal Yang Berpotensi Untuk Penghasil Kayu Pulp*. Laporan Hasil Penelitian. Balai Penelitian Hutan Penghasil Serat. Bangkinang (Tidak Dipublikasi).
- Sungpalee.W., Itoh.A., Kanzaki. M., Sri-ngernyuang. K., Noguchi. H., Mizuno. T., Teejuntuk. S., Hara. M., Chai-udom. K., Ohkubo. T., Sahunalu. P., Dhanmanonda. P., Nanami. S., Yamakura. T., Sorn-ngai. A. 2009. Intra- and interspecific variation in wood density and fine-scale spatial distribution of stand-level wood density in a northern Thai tropical montane forest. *Journal of Tropical Ecology*, 25: 359-370.
- Syofyan, L., Maideliza, T., Syamsuardi, and Mansyurdin. 2017. Wood anatomy of Fabaceae tree species in tropical rainforest, West Sumatra, Indonesia. *Asian J. Sci. Technol.* 8(11): 6405-6411.
- Takeuchi. R. , Imam . W., Haruna. A., Futoshi.I., Wiwin. T. I., Tatsuhiko. O. , Jyunichi. O., Kazuya. I. and Shinso. Y. 2016. Wood properties related to pulp and paper quality in two *Macaranga* species naturally regenerated in secondary forests, Central Kalimantan, Indonesia. *TROPICS Vol. 25 (3):107-115*.
- ter Steege. H., and Hammond. D.S. 2001. Character convergence, diversity, and disturbance in tropical rain forest in Guyana. *Ecology* 82: 3197-3212.
- Topaloglu E., Nurgul AY., Lukman ALTUN., Bedri SERDAR. 2016. Effect of altitude and aspect on various wood properties of Oriental beech (*Fagus orientalis* Lipsky) wood. *Turk J of Agric For*, 40: 397-406. © TÜBİTAK doi:10.3906/tar-1508-95
- Tsoumis. G. 1991. *Science and Technology of Wood*. New York: Van Nostrand Reinhold.
- Tyree. M, Zimmermann. MH. 2002. *Xylem structure and the ascent of sap*. Springer –Verlag. New York.
- Venugopal. N, and M.G. Liangkuwang. 2007. Cambial activity and annual rhythm of xylem production of elephant apple tree (*Dylenia indica* Linn) in relation to phenology and climatic factor growing in sub-tropical wet forest of north-east India. *Trees Struct Funct* 21, 101-110. doi: 10.1007/a00468-006-0101-3

- Verburg. R., ter Steege. H., and Zagt. R. 2003. Long-term changes in Tropical tree diversity: Synthesis and implication management. 175-215.
- Vilalta. J.M., Prat.E., Oliveras.I., Pinol J. 2002. Xylem hydrolic properties of roots and stems of nine Mediteranean woody species. *Oecologia* 133: 19-29.
- Venbunrg. R.C., Eijk-Bos. 2003. Effect of selective logging on tree diversity, composition and plant functional type patterns in a Bornean rain forest. *J. Veg. Sci.* 14:99-110.
- Wahyono. J., Harbagung., Mindawati. N., Pratiwi., Bustomi. S. 2005. *Penentuan Daur Optimal Jenis Acacia mangium Willd.* Laporan Kerjasama Antara Badan Litbang Kehutanan Dengan PT. Arara Abadi.Pusat Penelitian dan Pengembangan Hutan dan Konservasi Alam, Bogor.
- Wahyudi. I., Okuyama. T., Hadi. Y.S., Yamamoto. H., Yoshida. M.,Watanabe. H. 1999. Growth stresses and strains in *Acacia mangium*. *Forest Products Journal* 49(2): 77-81.
- Wahyudi. I. 2013. *Hubungan Struktur Anatomi Kayu Dengan Sifat Kayu, Kegunaan dan Pengolahannya.* Makalah disampaikan pada Diskusi LitBang Anatomi Kayu Indonesia, Bogor 3-4 Juni 2013.
- Wang. T., Aitken. S.N., Rozenberg. P., and Millie. F. 2000. Selection for improved growth and wood density in ledgpole pine: effect on radial patterns of wood variation. *Wood and Fiber Science*, 32(4): 391-403.
- Wate. P.A., Chamshama. S.A.O., Mugasha. A.G. 2009. The survival, growth and wood basic densities of 14 year old *Eucalyptus camaldulensis* at Michafutene, Mozambique. *South Afr. For. J.* 186 (1): 19-27.
- Westoby. M., and Wright. I.J. 2006. Land-plant ecology on the basis functional traits. *Trends in Ecology and Evolution*, 21: 261-268.
- Wheeler. E.A., P. Gasson. and P. Bass. 1989. IAWA list of microscopic features for hard wood identification. *IAWA Bull.* N.s.10 (3): 219-332.
- Wheeler. EA., Bass P., Rodgers. S. 2007. Variations in dicot wood anatomy: a global analysis based on the Inside Wood database. *IAWA Journal* 28: 229–248.
- Widenhoeft, A.C., Regis, B.M. 2005. *Structure and function of wood.* In: *Handbook of Wood Chemistry and Wood Composites.* Ed. Rowell, R.M. CRC Press, Boca Raton, FL. pp. 9–32. Wilson, A.D. (2012) Application of a conductive polymer electro.

- Wiemann. M.C., Williamson. G.B. 1989. Radial gradients in the specific gravity of wood in some tropical and temperate trees. *Forest Science* 35: 197–210.
- Williamson, G.B. 1975). *Studies in secondary succession within forests*, Ph.D. Thesis, Indiana University, Bloomington.
- Woodcock. D and Shier. A. 2002. Wood specific gravity and its radial variations: the many ways to make a tree. *Trees – Structure and Function*, 16: 437-443.
- Wong, T.M. 2002. *A Dictionary of Malaysian Timbers*. Revised by S.C. Lim & R,C.K. Chung. Malayan Forest Record; No. 30. Forest Research Institute Malaysia. Printed in Malaysia by Percetakan Haji Jantan, Kuala Lumpur, Malaysia. pp.201.
- Wright. S.J., Kitajima. K, Kraft. N.J.B., Reich. P.B *et al.* 2010. Functional traits and the growth–mortality trade-off in tropical trees. *Ecology* 91: 3664–3674.
- Wu, S.-H., Chaw, S.-M., and Rejmánek, M., 2003. Naturalized Fabaceae (Leguminosae) species in Taiwan: the first approximation, *Botanical Bulletin of Academia Sinica*, Vol. 44, pp.59-66
- Xi. C., J. Zeng., T.Cui., Q. Chen and Y. Ma. 2016. Introduction, growth performances and ecological adaptabilities of Hongmu tree species (*Pterocarpus* spp.) in China. *Journal of Tropical Forest Science*, 28(3): 260-267.
- Xu. F., Zhong. X.C., Sun. R.C., and Lu. Q. 2006. Anatomical, ultrastructure and lignin distribution in cell wall of *Caragana korshinski*. *Industrial Crops and Products*, 24: 186-193.
- Yahya. R., Sugiyama. J., Silsia. D., Grill. J. 2010. Some anatomical features of an *Acacia* hybrid, *A. mangium* and *A. auriculiformis* grown in Indonesia with regard to pulp yield and paper strength. *Journal of Tropical Forest Science* 22: 343-351.
- Yilmaz, M., Serdar, B., Altun, R., and Usta, A. 2008. Relationships between environmental variable and wood anatomy of *Quercus pontica* C. Koch (Fagaceae). *Fresenius Environmental Bulletin*, 17(7b):902-910.
- Yusup. A., Danang S. Adi., Ika Wahyuni., Sukma S. Kusumah., Ratih Damayanti. 2013. anatomical characteristics and chemical properties of the branch-wood of *Schizolobium amazonicum* ducke species and its potential uses. *Journal of Forestry Research* Vol. 10 No. 2: 123-129

- Zeidler. A. 2012. Variation of wood density in Turkish hazel (*Corylus colurna* L.) grown in Czech Republic. *Journal of Forest Science*, 58(4): 145-151.
- Zeng. L ., Martinez-Cabrera. H. I. 2013. Wood anatomical correlates with theoretical conductivity and wood density across China: evolutionary evidence of the functional differentiation of axial and radial parenchyma. *Ann Bot*, 112(5): 927-935.
- Ziemińska. K., Butler. D., Gleason. S.M., Wright. I.J., and Westoby. M. 2013. Fiber wall and lumen fraction drive wood density variation across 24 Australian Angiosperms. *Aob Plants*, 5: plt046; doi:10.1093/aobpla/plt046
- Ziemińska. K., Westoby., M., and Wright. I.J. 2015. Broad anatomical variation within a narrow wood density range - A study of twig wood across 69 Australian Angiosperm. *PLoS ONE*, 10(4): e0124892.doi:10.1371/journal.pone.0124892
- Zimmer. K and Andreas. T. 2015. *Impact of early lignification of ray parenchyma cells on the treatability of Scots pine sapwood*. Proceedings IRG Annual Meeting (ISSN 2000-8953) © 2015 The International Research Group on Wood Protection IRG/WP 15-40706 The International Research Group On Wood Protection Section 4 Processes and properties
- Zobel. B.J. and J.P. Buijtenen. 1989. *Wood Variation: Its causes and control*. Springer-Verlag Berlin Heidelberg.
- Zoghi. Z., Azadfar. D., and Khazaecian. A. 2013. Study of altitude and selection on fiber biometry properties of *Fagus orientalis* Lipsky. *Nusantara Bioscience*, 5(1): 30-34.
- Zhu. J.Y., Vahey. D.W., and Scott. C.T. 2008. Some observations of wood densities in a Douglas-Fir Sample with suppression growth. *Wood and Fiber Science*, 40(2): 225-232.