UNIVERSITAS
GADJAH MADA
**PENGARUH KLON BATANG ATAS TERHADAP SIFAT FISIOLOGIS, MORFOLOGIS, PERTUMBUHAN DAN KETAHANAN
KEKERINGAN BIBIT KAKAO (Theobroma cacao L.)**
FAKHRUSY ZAKARIYYA, Prof. Dr. Ir. Didik Indradewa, DIP. Agr. St.
Universitas Gadjah Mada, 2018 | Diunduh dari http://etd.repository.ugm.ac.id/

DAFTAR PUSTAKA

Abdoellah, S., Sudarsianto dan Sikusno, 1996. Tanggapan Bibit Kakao Lindak Terhadap Lengas Tanah Tersedia. *Pelita Perkebunan*, 12(3), 127-136.

Abdoellah, S. 1997. Ancaman cekaman air di musim kemarau panjang pada tanaman kopi dan kakao. Warta Pusat Penelitian Kopi dan Kakao, 13, 77-82.

Acheampoong, K., P. Hadley, dan A. J. Daymond. 2013. Photosynthetic Activity and Early Growth of Four Cacao Genotypes as Influenced by Differrent Shade Regimes Uner west African Dry and Wet Season Conditions. *Experimental Agriculture*, 49 (1), 31-42.

Ahmad, P., C. A. Jaleel, M. A. Salem, G, Nabi, S. Sharma. 2010. Roles of enzymatic and nonenzymatic antioxidants in plants during abiotic stress. *Crit Rev Biotechnol.*, 30(3):161-75.

Akram, N. A., F. Shafiq, dan M. Ashraf. 2017. Ascorbic Acid-A Potential Oxidant Scavenger and Its Role in Plant Development and Abiotic Stress Tolerance. *Front Plant Sci.,* 8: 613-620.

Alban, M. B. A. K. dan S. E. A. K. B. Hebbar. 2016. Morpho-physiological Criteria for Assessment of Two Month Old Cocoa (*Theobroma cacao* L.) Genotypes for Drought Tolerance. *Indian Journal Plant Physiology*, 21(1), 23-30.

Ali, M. A., A. Abbas, S. Niaz, M. Zulkiffal dan S. Ali. 2009. Morpho-physiological Criteria for Drought Tolerance in Sorghum (*Sorghum bicolor*) at Seedling and Post-anthesis Stages. *International Journal of Agriculture dan Biology,* 11 : 674-680.

Alexieva, V. I. Sergiev, S. Mapelli dan E. Karanov. 2001. The effect of drought and ultraviolet radiation on growth and stress markers in pea and wheat. *Plant, Cell and Environment,* 24 : 1337–1344.

Almeida, A. F. D., dan R. R. Valle. 2008. Ecophysiology of the Cacao Tree. *Brazillian Journal Plant Physiology*, 19(4), 425-448.

Almeida, J. D., W. Tezzara, dan A. Herrera. 2016. Physiological responses to drought and experimental water deficit and waterlogging of four clones of cacao (*Theobroma cacao* L.) selected for cultivation in Venezuela. *Agricultural Water Management* 171 : 80-88.

Anderson, C. M., dan B. D. Kohorn. 2001. Inactivation of Arabidopsis SIP1 leads to reduced levels of sugars and drought tolerance. *J. Plant Physiol.* 158 : 1215–1219.

UNIVERSITAS
GADJAH MADA
**PENGARUH KLON BATANG ATAS TERHADAP SIFAT FISIOLOGIS, MORFOLOGIS, PERTUMBUHAN DAN KETAHANAN
KEKERINGAN BIBIT KAKAO (Theobroma cacao L.)**
FAKHRUSY ZAKARIYYA, Prof. Dr. Ir. Didik Indradewa, DIP. Agr. St.
Universitas Gadjah Mada, 2018 | Diunduh dari http://etd.repository.ugm.ac.id/

Anita-sari, I. dan A. W. Susilo. 2012. Keberhasilan sambungan pada beberapa jenis batang atas dan famili batang bawah kakao (*Theobroma cocoa* L.). *Pelita Perkebunan*, 28(2), 72-81.

Anita-sari, I., A. W. Susilo, dan S. Mawardi. 2015. Seleksi dan Pemuliaan Kakao. In : T. Wahyudi, Misnawi, Pujiyanto (Ed.). Kakao (Sejarah, Botani, Proses Produksi, Pengolahan, dan Perdagangan. 1st Ed. Gadjah Mada University Press, Yogyakarta.

Anita-sari, I., A. W. Susilo, N. P. Sari, F. N. 'Aini, B. Setyawan, P. McMahon, dan P. Keane. 2017. Intensity of Vascular Streak Dieback in Different Cocoa Clones and Various Agro-Climatic Conditions. *Pelita Perkebunan*, 33 (1) : 1-9.

Ayegboyin, K.O., dan E. A. Akinrinde. 2016. Effect of Water Deficit Imposed during the early Development Phase on Photosynthesis of Cocoa (*Theobroma cacao* L.). *Agricultural Sciences*, 7, 11-19.

Bae, H., Kim, S. H., Kim, M. S., Sicher, R. C., Lary, D., Stream, M.D., Narajhan, S. dan Bailey, B.A. 2008. The Drought Response of *Theobroma cacao* (Cacao) and the Regulation of Genes Involved in Polyamine Biosynthesis by Drought and Other Stresses. *Plant Physiology and Biochemistry*, 46(2), 174-188.

Bae, H.,R. C. Sicher, M. S. Kim, S.H. Kim, M. D. Strem, R. L. Melnick, dan B. A. Bailey. 2009. The beneficial endophyte *Trichoderma hamatum* isolate DIS 219b promotes growth and delays the onset of the drought response in *Theobroma cacao*. *Experimental Botany* 60 (11) : 3279 – 3295.

Ballesta, M. C. M., C. Alcaraz-Lopez, B. Muries, C. Mota-Cadenas, M. Cavajal. 2010. Physiological aspects of rootstock–scion interactions. *Scientia Horticulturae* 127 112–118

Baligar, V., A. Almeida, D. Ahnert, E. Arévalo-Gardini, R. Goenaga, Z. He, M. Elson. 2017. Impact of Drought on Morphological, Physiological and Nutrient Use Efficiency of Elite Cacao Genotypes From Bahia-Brazil, Tarapoto-Peru And Puerto Rico-Usa. In International Symposium on Cocoa Research (ISCR), Lima, Peru, 13-17 November 2017.

Baon, J. B. 1988. Lahan-lahan yang cocok untuk kakao dan kopi. *Warta Penelitian Kopi dan Kakao*, 7, 17-20.

Baon, J.B. dan S. Abdoellah. 1997. Efisiensi Penggunaan Air Tanaman Kakao (*Theobroma cacao* L.) pada Musim Kemarau dan Pertumbuhannya Akibat Irigasi dan Pengolahan Tanah. Prosiding Seminar Nasional Pulang Kampus Alumni Fakultas Pertanian, Universitas Mataram, Mataram.

Baon, J. B., A. Prawoto, dan S. Abdoellah. 2001. Antisipasi Kemarau Panjang Tahun 2002 pada Usaha Perkebunan Kakao. *Warta Pusat Penelitian Kopi dan Kakao* 17(3): 220-236.

UNIVERSITAS
GADJAH MADA
**PENGARUH KLON BATANG ATAS TERHADAP SIFAT FISIOLOGIS, MORFOLOGIS, PERTUMBUHAN DAN KETAHANAN
KEKERINGAN BIBIT KAKAO (Theobroma cacao L.)**
FAKHRUSY ZAKARIYYA, Prof. Dr. Ir. Didik Indradewa, DIP. Agr. St.
Universitas Gadjah Mada, 2018 | Diunduh dari http://etd.repository.ugm.ac.id/

Bannister, P. 1976. *Introduction to Physiological Plant Ecology*. Blackwell, Oxford.

Bartley, B. D. G. 2005. *The Genetic Diversity of Cocoa and Its Utilization*. CABI Publishing, Cambridge.

Barret, F. dan T. Fourty. 1997. Estimation of leaf water content and specific leaf weight from reflectance and transmittance measurements. *Agronomie, EDP Sciences*, 17(9-10):455-464.

Bates , L., R. P. Waldren, dan R. P. I. D. Teare. 1973. Rapid determination of Free Proline for Water-Stress Studies. *Plant and Soil,* 39, 205-207.

Bauerle, T. L., W. L. Bauerle, M. Centinari. 2011. Shifts in xylem vessel diameter and embolisms in grafted apple trees of differing rootstock growth potential in response to drought. *Planta*, 234:1045–1054.

Brataningtyas, E. 2010. Pengaruh Cekaman Kekeringan terhadap Pertumbuhan Beberapa Klon Kakao. Skripsi. Universitas Jember, Jember.

Cahyani, T. A. 2012. Pengaruh Perlakuan Pupuk Bokashi terhadap Pertumbuhan Bibit Kakao (*Theobroma cacao* L.) pada Berbagai Kondisi Lengas Tanah. Skripsi. Universitas Jember, Jember.

Carr, M. K. V., dan G. Lockwoods. 2011. The Water Relations and Irrigation Requirements of Cocoa (*Theobroma cacao* L.): A Review. *Explanation Agriculture*, 47(4), 653-676.

Chaves, M. M., P. J. Maroco, dan J. S. Pereira. 2003. Understanding plant responses to drought — from genes to the whole plant. *Functional Plant Biology* 30, 239–264.

Chatterje, A. dan S. S. Solankey. 2014. Functional Physiology in Drought Tolerance of Vegetable Crops- An Approach to Mitigate Climate Change Impact, In M.L. Chaudhary, V.B. Patel, M.W. Siddiqui, S.S. Mahdi (Eds.). Climate Change: The Principles and Applications in Horticultural Science. CRC Press, USA.

Chibuike, G. U., dan A. J. Daymond. 2015. Mycorrhizae Inoculation Did Not Influence the Response of Cocoa Seedlings to Water Stress. *American-Eurasuan Journal Agriculture dan Environmental Science*, 15(5), 944-956.

Chun, O. K., D. Kim,dan C. Y. Kim. 2003. Superoxide Radical Scavenging Activity of the Major Polyphenols in Fresh Plums. *Journal. Agriculutural Food Chemistry,* 51 (27) : 8067 – 8072.

Coronel, G., M. Chang, dan A. Rodríguez-Delfín. 2009. Nitrate Reductase Activity and Chlorophyll Content in Lettuce Plants Grown Hydroponically and Organically. *Acta Horticulturae*, 843 :137-144.

Creellman, R.A., H.S. Mason, R.J. Bensen, J.S. Boyer dan J.E. Mullet. 1990. Water deficit and absisic acid causes differential inhibition of shoot versus root

UNIVERSITAS
GADJAH MADA
**PENGARUH KLON BATANG ATAS TERHADAP SIFAT FISIOLOGIS, MORFOLOGIS, PERTUMBUHAN DAN KETAHANAN
KEKERINGAN BIBIT KAKAO (Theobroma cacao L.)**
FAKHRUSY ZAKARIYYA, Prof. Dr. Ir. Didik Indradewa, DIP. Agr. St.
Universitas Gadjah Mada, 2018 | Diunduh dari http://etd.repository.ugm.ac.id/

growth in soybean seedling; analysisi of growth, sugar accumulation and gene expression. *Plant Cell* 92:205-214.

Dallaire, S., M. Houde, Y. Gagne, H.S. Saini. S. Boileau, N. Chevrier and f. Sarhan. 1994. ABA and Low Temperature Induce Freezing Tolerance via Distinct Regulatory Patways in Wheat. *Plant Cell Physiology* 35 (1) : 1-9.

Dalimunthe, R. R., Irsal, dan Meiriani. 2015. Respons Pertumbuhan Bibit Kakao (*Theobroma cacao* L.) terhadap Pemberian Pupuk Organik Vermikompos dan Interval Waktu Penyiraman Air pada Tanah Subsoil. *Agroteknologi*, 3(1), 188-197.

Dat, J., S. Vandenabeele, E. Vrabova, M. Van, D. Inze, F. van Breusegem. 2000. Dual action of the active oxygen species during plant stress responses. *Cell. Mol. Life. Sci*., 57: 779-795

David, M. 2008. Kajian ketahanan pada pertumbuhan awal beberapa klon kakao (*Theobroma cacao* L.) terhadap cekaman kekeringan. Tesis Universitas Sebelas Maret. Surakarta.

Daymond, A. J., P.J. Tricker, dan P. Hadley. 2009. Genotypic variation in photosynthetic and leaf traits in cocoa. In International Cocoa Research Conference, Bali, November 2009.

Dirjenbun. 2014. Produksi, Luas Areal, dan Produktivitas Perkebunan di Indonesia. Direktorat jendral Perkebunan. Jakarta.

Efendi, R. dan R. Azrai. 2010. Identifikasi Karakter Toleransi Cekaman Kekeringan Berdasarkan Respons Pertumbuhan dan Hasil Genotipe Jagung. *Widyariset*, 13(3) : 41 – 50.

Erwiyono, R. 2007. Penetapan penyebab kerusakan pertanaman kakao akibat musim kemarau. *Warta Pusat Penelitian Kopi dan Kakao Indonesia* 23 (3) : 131 – 141.

Farshadfar, E. dan J. Sutka. 2002. Screening Drought Tolerance Criteria in Maize. *Acta Agronomica Hungaria,* 50 (4) : 411 – 416.

Fernandez, G. C. J. 1992. Effective selection criteria for assessing stress tolerance: proceedings of the International Symposium on Adaptation of Vegetables and Other Food Crops in Temperature and Water Stress Tolerance, Asian Vegetable Research and Development Centre Taiwan, p. 257–270.

Fichot, R., F. Laurans, R. Monclus, A. Moreau, G. Pilate, F. Brignolas. 2009. Xylem anatomy correlates with gas exchange, water-use efficiency and growth performance under contrasting water regimes: evidence from *Populus deltoides* × *Populus nigra* hybrids. *Tree Physiology*, 29(12) : 1537–1549.

UNIVERSITAS
GADJAH MADA
**PENGARUH KLON BATANG ATAS TERHADAP SIFAT FISIOLOGIS, MORFOLOGIS, PERTUMBUHAN DAN KETAHANAN
KEKERINGAN BIBIT KAKAO (Theobroma cacao L.)**
FAKHRUSY ZAKARIYYA, Prof. Dr. Ir. Didik Indradewa, DIP. Agr. St.
Universitas Gadjah Mada, 2018 | Diunduh dari http://etd.repository.ugm.ac.id/

Fischer R. A., dan R. Maurer. 1978. Drought resistance in spring wheat cultivars, Grain yield response. *Australian Journal of Agricultural Research*, 29 : 897–907.

Foti, M. C. 2007. Antioxidant properties of phenols. *Journal of Parmacy dan Pharmacology*, 59: 1673–1685.

Gall, H. L., F. Philippe, J. Domon, F. Gillet, J. Pelloux dan C. Rayon. 2015. Cell Wall Metabolism in Response to Abiotic Stress. *Plants*, 4(1) : 112-166.

Galmés, J., J. M. Ochogavía, J. Gago, E. J. Roldán, J. Cifre dan M. A. Conesa. 2013. Leaf responses to drought stress in Mediterranean accessions of *Solanum lycopersicum*: anatomical adaptations in relation to gas exchange parameters. *Plant, Cell and Environment*, 36 : 920–935.

Gardner, F. P. ; R. B. Pearce dan R. L. Mitchell. 1991. *Fisiologi Tanaman Budidaya*. Terjemahan: Herawati Susilo. UI Press, Jakarta

Gomez, K.A. dan Gomez, A.A. 1995. Prosedur Statistik untuk Penelitian Pertanian. Edisi Kedua. Terjemahan : Endang Sjamsuddin dan Yustika S Baharsjah). Universitas Indonesia Press, Jakarta.

Gnanasiri, S. P. dan R. J. Joly. 1992. Solutes Contributing to Osmotiv Potentioal in Young versus Mature Leaves of Cacao Seedlings. *Plant Physiology* 139 (3) : 355-360.

Greathouse, D. C., W. M. Laetsch, dan. B.O. Phinney. 1971. The Shoot-Growth Rhythm of a Tropical Tree, *Theobroma cacao. American Journal of Botany* 58 (4) : 281-286.

Guimaraes, C.M., L. F. Stone, M. Lorieux, J. P. Oliveira, G. C. De O. Alencar,, R. A. A. Dias. 2010. Infrared thermometry for drought phenotyping of inter and intraspecific upland rice lines. *Revista Brasileira de Engenharia Agrícola e Ambiental*, 14:148-154.

Guimaraes, C. M., L. F. Stone, A. P. Castro, dan O. P. M. Junior. 2015. Physiological parameters to select upland rice genotypes for tolerance to water deficit. *Pesq. agropec. bras., Brasília*, 50(7) : 534-540.

Hakim, N., M. Y. Nyakpa, A. M. Lubis, S. G. Nugroho, M. R. Saul, M. A. Diha, G. B. Hong, dan H. H. Bailey. 1986. *Dasar-Dasar Ilmu Tanah*. Penerbit Universitas Lampung, Lampung.

Hameed, M., U. Mansoor, M. Ashraf, dan A. R. Rao. 2002. Variation in Leaf Anatomy in Wheat Germplasm from Varying Drought-Hit Habitats. *International Journal of Agriculture dan Biology,* 4(1) : 12-16.

Hamilton, E. W., and Heckathorn, S. A. (2001). Mitochondrial adaptations to NaCl. Complex I is protected by anti-oxidants and small heat shock proteins,

UNIVERSITAS
GADJAH MADA
**PENGARUH KLON BATANG ATAS TERHADAP SIFAT FISIOLOGIS, MORFOLOGIS, PERTUMBUHAN DAN KETAHANAN
KEKERINGAN BIBIT KAKAO (Theobroma cacao L.)**
FAKHRUSY ZAKARIYYA, Prof. Dr. Ir. Didik Indradewa, DIP. Agr. St.
Universitas Gadjah Mada, 2018 | Diunduh dari http://etd.repository.ugm.ac.id/

whereas complex II is protected by proline and betaine. *Plant Physiol.* 126, 1266–1274.

Hare, P. D., W. A. Cress dan V. J. Staden. 1999. Proline synthesis and degradation: a model system for elucidating stress-related signal transduction. *Journal of Experimental Botany,* 50 : 413–34

Haworth M., M. Centritto, A. Giovannelli, G. Marino, N. Proietti, D. Capitani, A. de Carlo, dan F. Loreto. 2017. Xylem morphology determines the drought response of two *Arundo donax* ecotypes from contrasting habitats. *Global Change Biology Bioenergy,* 9 : 119–131.

Hayat, S.,Q., M. N. Alyemeni, A. S. Wani, J. Pichtel, dan A. Ahmad. 2012. Role of proline under changing environments. *Plant Signal Behaviour,* 7(11): 1456–1466.

Hernandez, L. F. 2010. Leaf angle and light interception in sunflower (*Helianthus annuus* L.). Role of the petiole's mechanical and anatomical properties. *International Journal of Experimental Botany*, 79 : 109 – 115.

Hirayama, M., Y. Wada, H. Nemoto. 2006. Estimation of drought tolerance based on leaf temperature in upland rice breeding. *Breeding Science*, 56(1) : 47-54.

Holbrook, N.M., V.R. Shashidhar, R. A. James, dan R. Munns. 2002. Stomatal control in tomato with ABA-deficient roots: response of grafted plants to soil drying. *Journal of Experimental Botany* 53, 1503–1514.

Hoque, M. A., E. Okuma, M. N. Banu, Y. Nakamura, Y. Shimoishi, Y. Murata. 2007. Exogenous proline mitigates the detrimental effects of salt stress more than exogenous betaine by increasing antioxidant enzyme activities. *Journal of Plant Physiology*, 164 (5) :553–561.

Hopkins, R., J. Schmitt, dan J. R. Stinchcombe. 2008. A latitudinal cline and response to vernalization in leaf angle and morphology in Arabidopsis thaliana (Brassicaceae). *New Phytol*. 179(1):155-64.

Huan, L. K., H. C. Yee dan B. J. Wood. 1986. Irrigation of cocoa on coastal soils in Peninsular Malaysia. In Cocoa and Coconuts: Progress and Outlook, Kuala Lumpur, Incorporated Society of Planters, 117–132.

Hutcheon, W. V. 1977. Water relations and other factors regulating the seasonal periodicity and productivity of cocoa in Ghana. Proc. 5th International Cocoa Conference Ibadan, pp. 233 – 244.

ICCO. 2010. Impact of El Niño / La Niña Weather Events on The World Cocoa Economy. One hundred and forty-second meeting London, 13-17 September 2010.

UNIVERSITAS
GADJAH MADA
**PENGARUH KLON BATANG ATAS TERHADAP SIFAT FISIOLOGIS, MORFOLOGIS, PERTUMBUHAN DAN KETAHANAN
KEKERINGAN BIBIT KAKAO (Theobroma cacao L.)**
FAKHRUSY ZAKARIYYA, Prof. Dr. Ir. Didik Indradewa, DIP. Agr. St.
Universitas Gadjah Mada, 2018 | Diunduh dari http://etd.repository.ugm.ac.id/

Indradewa, D. 2002. Gatra Agronomis dan Fisiologis Pengaruh Genangan dalam Parit pada Tanaman Kedelai, (Disertasi), Universitas Gadjah Mada Yogyakarta, Indonesia.

Jacobsen, A. L., L. Agenbag, K. J. Esler, R. B. Pratt, F. W. Ewers, dan S. D. Davis. 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.

Juszczuk I, E. Malusa, dan A. M. Rychter. 2001. Oxidative stress during phosphate deficiency in roots of bean plants (*Phaseolus vulgaris* L.). *Plant Physiology* 158: 1299-1305.

Keil, A., M. Zeller, A. Wida, B. Sanim, dan R. Birner. 2008. What Determines Farmers Resilience Towards ENSO-related Drought? An Empirical Assessment in Central Sulawesi, Indonesia. *Climatic Change* 86: 291.

Keller, M. 2015*. The Science of Grapevines: Anatomy and Physiology*. Academic Press, Amerika Serikat.

Keles, Y. dan S. Unyayar. 2004. Responses of antioxidant defense system of *Helianthus annus* to absisic acid under drought and waterlogging. *Acta Physiol. Planta*, 26 : 149-156.

Kelly, J. W., R. A. Duursma, B. J. Atwell, D. T. Tissue dan B. E. Medlyn. 2016. Drought × CO_2 interactions in trees: a test of the low-intercellular CO_2 concentration (C_i) mechanism. *New Phytol.*, 209: 1600-1612

Kikuzaki, H., M. Hisamoto, K. Hirose, K. Akiyama, dan H. Taniguchi. 2002. Antioxidants Properties of Ferulic Acid and Its Related Compound. *Journal Agriculture and Food Chemistry,* 50 : 2161-2168.

Kondoh, S., H. Yahata, T. Nakashizuka, dan M. Kondoh. 2006. Interspecific variation in vessel size, growth and drought tolerance of broadleaved trees in semi-arid regions of Kenya. *Tree Physiology* 26:899–904.

Kummerow, J., M. Kummerow, dan W. S. Da Silva. 1982. Fine Root Growth Dynamics in Cacao (*Theobroma cacao* L.). *Plant Soil* 65, 193-201.

Lahive, F., P. Hadley, dan Daymond, A. 2018. The impact of elevated CO_2 and water deficit stress on growth and photosynthesis of juvenile cacao (*Theobroma cacao* L.). *Photosynthetica* 56 (3) : 911 – 920.

Lakitan, B. 2007. *Dasar-Dasar Fisiologi Tumbuhan*. Raja Grafindo Persada, Jakarta.

Levitt, J. 1972. *Responses of Plants to Environmental Stresses*. Academic Press: New York.

Lestari, E. G. 2006. Mekanisme Toleransi dan Metode Seleksi Tumbuhan yang Tahan Terhadap Cekaman Kekeringan. *Berita Biologi 8(3) :215 - 222*

UNIVERSITAS
GADJAH MADA
**PENGARUH KLON BATANG ATAS TERHADAP SIFAT FISIOLOGIS, MORFOLOGIS, PERTUMBUHAN DAN KETAHANAN
KEKERINGAN BIBIT KAKAO (Theobroma cacao L.)**
FAKHRUSY ZAKARIYYA, Prof. Dr. Ir. Didik Indradewa, DIP. Agr. St.
Universitas Gadjah Mada, 2018 | Diunduh dari http://etd.repository.ugm.ac.id/

Li, X., B. Schmid, F. Wang, dan C. E. T. Paine, Net Assimilation Rate Determines the Growth Rates of 14 Species of Subtropical Forest Trees. *PLoS ONE,* 11(3): e0150644.

Liang, X., L. Zhang, S. K. Natarajan, dan D. F. Becker. 2013. Proline Mechanisms of Stress Survival. *Antioxidant Redox Signal,* 19(9): 998–1011.

Luna, C. M., G. M. Pastori, S. Driscoll, K. Groten, S. Bernard dan C. H. Foyer. 2004. Drought controls on H2O2 accumulation, catalase (CAT) activity and CAT gene expression in wheat. *Journal of Experimental Botany* 56: 417-423.

Maheshwari R. dan R. S. Dubey.2009. Nickel induced oxidative stres and the role of antioxidant defense in rice seedlings. *Plant Growth Regulator***,** 59 : 37-49.

Maiti, R., P. Satya, D. Rajkumar, A. Ramaswamy. 2012. Anatomical adaptation for drought and waterlogging stress tolerance. In Maiti, R., Satya, P., Rajkumar, D., Ramaswamy, A. (Ed.). Crop plant anatomy. CABI, India.

Marklund, S., dan G. Marklund. (1974). Involvement of the superoxyde anion radical in the auto oxidation of pyrogallol and a convenient assay for superoxyde dismutase. *Europian Journal of Biochemistry,* 47:469-474.

Mommer, L. 1999. The Water Relations in Cacao (*Theobroma cacao* L.): Modelling Root Growth and Evapotranspiration. Thesis. Wageningen Agricultural University, Department of Theoretical Production Ecology, Belanda.

Moser, G., C. Leuschner, D Hertel, D. Holsher, M. Kohler, D. Leitner, B. Michalzik., E. Prihastanti, S. Tjitrosemito, dan L. Schwendenmann. 2010. Responses of Cocoa Trees (*Theobroma cacao*) to a 13 Month Desiccation Period in Sulawesi, Indonesia. *Agroforestry Systems*. 79(2), 171-187.

Murray, D. 1975. *The Botany of Cocoa*. In : G. A. R. Wood (Ed.). Cocoa. 3rd Ed. Longman, London.

Mwadzingeni, L., H. Shimelis, S. Tesfay, T. J. Tsilo. 2016. Screening of Bread Wheat Genotypes for Drought Tolerance Using Phenotypic and Proline Analyses. *Frontiers in Plant Science*, 7:1276.

Nagasuga, K., S. Uchida. H. Kaji, Y. Hayakawa, M. Kadowaki, A. Fukunaga, S. Nose, dan T. Umezaki. 2013. Water Condition Controls Inclination Angles of Leaflets and Petioles of Soybean (*Glycine max* L.). *Environmental Control in Biology*, 51 (2) : 79 – 84.

Nile, S. H., dan S. W. Park. 2013. Total phenolics, antioxidant and xanthine oxidase inhibitory activity of three colored onions (*Allium cepa* L.). *Front Life Science,* 7:224–228.

UNIVERSITAS
GADJAH MADA
**PENGARUH KLON BATANG ATAS TERHADAP SIFAT FISIOLOGIS, MORFOLOGIS, PERTUMBUHAN DAN KETAHANAN
KEKERINGAN BIBIT KAKAO (Theobroma cacao L.)**
FAKHRUSY ZAKARIYYA, Prof. Dr. Ir. Didik Indradewa, DIP. Agr. St.
Universitas Gadjah Mada, 2018 | Diunduh dari http://etd.repository.ugm.ac.id/

Nepstad, D. C., I. M. Tohver, D. Rav, dan P. Moutinho. 2007. Mortality of large trees and lianas following experimental drought in an Amazon Forest. *Ecology* 88 (9) : 2259 – 2269.

Nugroho, K. W. dan F. Yuliasmara. 2012. Penggunaan metode *scanning* untuk pengukuran luas daun kakao. *Warta Pusat Penelitian Kopi dan Kakao Indonesia* 24 (1) : 5-9.

Nobel, P.S., 1999. *Plant Physiology, Physiochemistrical and Environment*. 2nd ed. Academic Press. New San Diego.

Ofori, A., S. Konlan, M. A. Dadzie, dan F. M. Amoah. 2014. Genotypic Performance of Cocoa (*Theobroma cacao* L.) during Establishment under Natural Drought Stress. *Journal of Crop Improvement*, 28:804–824.

Olmstead, M. A., N. S. Lang, F. W. Ewers, dan S. A. Owens. 2006. Xylem Vessel Anatomy of Sweet Cherries Grafted onto Dwarfing and Nondwarfing Rootstocks. *Journal of the American Society for Horticultural Science*, 131(5) : 577-585.

Olson, M. E.,T. Anfodillo, J. A. Rosell, G. Petit, A. Crivellaro,S. Isnard, C. L. Gomez, L. O. Alvarado-Cardenas dan M. Castorena. 2014. Universal hydraulics of the flowering plants: vessel diameter scales with stem length across angiosperm lineages, habits and climates. *Ecology Letters*,17: 988–997.

Orchard, J., H. A. Collin, K. Hardwick, dan S. Isaac. 1994. Changes in morphology and measurement of cytokinin levels during the development of witches' brooms on cocoa. *Plant Pathology*, 43: 65-72.

Ouyang, W., P. C. Struik, X. Yin, dan J. Yang. 2017. Stomatal conductance, mesophyll conductance, and transpiration efficiency in relation to leaf anatomy in rice and wheat genotypes under drought. *Journal of Experimental Botany*, 68(18):5191–5205.

Oyekale, A. S. 2015. Climate hange induced occupational stress and reported morbidity among cocoa farmers in South-Western Nigeria. *Annals of Agricultural and Enviromental Medicine* 22 (2) : 357 – 361.

Ozman, R. , H. Ramba, dan A. Ling. 2017. Preliminary Assessment on Drought Tolerance Characteristics Of Some Malaysian Cocoa Planting Materials. In International Cocoa Symposium 2017, 18 – 20th, October 2017 Grand Sahid Jaya, Jakarta, Indonesia

Pranowo, D. dan E. Wardiana. 2016. Kompatibilitas lima klon unggul kakao sebagai batang atas dengan batang bawah progeni half-sib klon sulawesi 01. *Tanaman Industri dan Perkebunan* 3(1), 29–36

Prawoto, A. 2014. Pattern of Flushing, Cherelle Wilt, and Accuracy of Yield Forecasting of Some Cocoa Clones. *Pelita Perkebunan* 30 (2) : 100 – 114.

UNIVERSITAS
GADJAH MADA
**PENGARUH KLON BATANG ATAS TERHADAP SIFAT FISIOLOGIS, MORFOLOGIS, PERTUMBUHAN DAN KETAHANAN
KEKERINGAN BIBIT KAKAO (Theobroma cacao L.)**
FAKHRUSY ZAKARIYYA, Prof. Dr. Ir. Didik Indradewa, DIP. Agr. St.
Universitas Gadjah Mada, 2018 | Diunduh dari http://etd.repository.ugm.ac.id/

Prawoto, A. 2015. Pangkasan Tanaman Kakao. In : T. Wahyudi, Misnawi, Pujiyanto (Ed.). Kakao (Sejarah, Botani, Proses Produksi, Pengolahan, dan Perdagangan. 1st Ed. Gadjah Mada University Press, Yogyakarta.

Prihastanti, E. 2010 a. Kandungan Klorofil dan Pertumbuhan Semai Kakao (*Theobroma cacao* L.) pada Perlakuan Cekaman Kekeringan yang Berbeda. *Bioma* 12 (2) : 35 – 39.

Prihastanti, E. 2010 b. Perubahan nilai Hydraulic Conducance Akar Kakao (*Theobroma cacao* L.) dan Gliricidia sepium pada Cekaman Kekeringan. In Prosiding Pertemuan Ilmiah XXIV HFI Jateng dan DIY 270-274.

Prihastanti, E. 2010 c. Perubahan struktur pembuluh xilem akar kakao (*Theobroma cacao* L.) dan *Gliricidia sepium* pada Cekaman Kekeringan. *Bioma,* 12 (1) 24 -28.

Prihastanti, E. 2011. Luas daun spesifik, jumlah trikomata, dan kandungan kalium daun semai kakao (*Theobroma cacao* L.) pada kandungan air tanah berbeda. *Bioma* 13 (2) : 85 – 90.

Prihastanti, E., S. Tjitrosemito, D. Sopandi, dan I. Qoyim. 2015. Pertumbuhan *fineroot* kakao (*Theobroma cacao*) pada cekaman kekeringan selama 13 bulan di kawasan agroforestri dengan pohon pelindung utama gamal (*Gliricidia sepium*). In Prosiding Seminar Nasional Masyarakan Biodiversitas Indonesia 1 : 1683 – 1688.

Pujiyanto. 2015. Kesesuaian Lahan Kakao. In : T. Wahyudi, Misnawi, Pujiyanto (Ed.). Kakao (Sejarah, Botani, Proses Produksi, Pengolahan, dan Perdagangan. 1st Ed. Gadjah Mada University Press, Yogyakarta.

Rahardjo, P. 2010. Buku Pintar Budidaya Kakao. Pusat Penelitian Kopi dan Kakao, Agromedia Pustaka, Jakarta.

Roberts, S. K. dan B. N. Snowman. 2000. The effects of ABA on channel-mediated K^+ transport across higher plant roots. *Journal of Experimental Botany*, 51 : 1585 -1594.

Ryu, H. W., J. H. Lee, J. E. Kang, Y. M. Jin, K. H. Park. 2012. Inhibition of xanthine oxidase by phenolic phytochemicals from *Broussonetia papyrifera*. *Journal of the Korean Society for Applied Biological Chemistry*, 55 (5) : 587 – 594.

Purba, I. D., Irsal, dan J. Ginting. 2013. Tanggap pertumbuhan vegetatif bibit kakao (*Theobroma cacao* L.) dengan Pemberian Vermikompos dan air pada berbagai kapasitas lapang. *Agroteknologi* 2 (2) : 561 – 576.

Ranney, T. G., N. L. Bassuk.,dan T. H. Whitlow. 1991. Influence of Rootstock, Scion, and Water Deficit on Growth of “Colt” and “Meteor” Cherry Trees. *HortSciences* 26 (9) : 1204 – 1207.

Ranney, T. G. 1991. Comparative Drought Resistance Among Flowering Crab Apple (*Malus*) Scions. *Horticultural Science* 25 (6) : 747 -786.

UNIVERSITAS
GADJAH MADA
**PENGARUH KLON BATANG ATAS TERHADAP SIFAT FISIOLOGIS, MORFOLOGIS, PERTUMBUHAN DAN KETAHANAN
KEKERINGAN BIBIT KAKAO (Theobroma cacao L.)**
FAKHRUSY ZAKARIYYA, Prof. Dr. Ir. Didik Indradewa, DIP. Agr. St.
Universitas Gadjah Mada, 2018 | Diunduh dari http://etd.repository.ugm.ac.id/

Rada, F., R.E. Jaimez, C. Garcia-Nunez., A. Azocar, dan M. E. Ramirez. 2005. Water relations and gas exchange in *Theobroma cacao* var. Guasare under periods of water deficit. *Review Faculty Agronomy* 22 (2) : 2 – 9.

Razi, M. H. A. B. D., D. Kamariah, dan M. J. Noh. 1992. Growth, Plant Water Relation and Photosynthesis Rate of Youn *Theobroma cacao* as Influenced by Water Stress. *Pertanika*, 15 (2) 93 – 98.

Rhizopoulou, S. dan G. K. Psaras. 2003. Development and Structure of Drought-tolerant Leaves of the Mediterranean Shrub *Capparis spinosa* L. *Ann*. *Bot*., 92(3) : 377–383

Ringel P, J. Krausze, J. van den Heuve, U. Curth, A. J. Pierik, S. Herzog, R. R. Mendel, dan T. Kruse. 2013. Biochemical characterization of molybdenum cofactor-free nitrate reductase from *Neurospora crassa*. *Journal of Biology Chemistry,* 288 (20) : 14657-14671.

Riyayati, P. T. 2010. Uji ketahanan tiga macam klon bibit kakao terhadap berbagai kondisi cekaman kekeringan. Skripsi. Universitas Jember.

Sakiroh, I. Sobari, dan M. Herman. 2015. Teknologi Mengurangi Dampak Perubahan Iklim pada Kakao di Lahan Kering. *Sirinov*, 3 (2) : 55 – 66.

Salisbury, F.B. dan C. W. Ross. 1992. *Fisiologi Tumbuhan II*. Ed. 4. Terjemahan: D.R. Lukman dan Sumaryono. Penerbit ITB. Bandung.

Samuel, D., Ganesh, G., Yang, P. W., Chang, M. M., Wang, S. L., Hwang, K. C., et al. (2000). Proline inhibits aggregation during protein refolding. *Protein Sci.* 9, 344–352.

Santarosa, E., P. V. D. Souza, J. E. A. Mariath, dan G. V. Lourosa. 2015. Physiological Interaction between Rootstock-Scion: Effects on Xylem Vessels in Cabernet Sauvignon and Merlot Grapevines. *American Journal of Enology and Viticulture* 67 : 65-76.

Santos, I. C., A. F. Almeida, D. Anhert, A. S. Conceciao, C. P. Pirovani, J. L. Pires, R. R. Valle, dan V. C. Balligar. 2014. Molecular, Physiological and Biochemical Responses of Theobroma cacao L. Genotypes to Soil Water Deficit. *PLoS ONE* 9 (12) : 1 – 31.

Santos, E. A., A. F. Almeida, D. Ahnert, C. S. B. Bramco, R. R. Valle, dan V. C. Baligar. 2016. Diallel Analysis and Growth Parameters as Selection Tools for Drought Tolerance in Young *Theobroma cacao* Plants. *PloS ONE* 11 (8) : 1 – 22.

Santos, E. A., A. F. Almeida, M. C. S. Branco1, I. C. Santos, D. Ahnert, V. C. Baligar, R. R. Valle. 2018. Path analysis of phenotypic traits in young cacao plants under drought conditions. *PlosOne*, 1- 16.

Santoso, T. I., M. Miftahudin, Y. C. Sulistyaningsih, dan S. Wiyono. 2017. Analysis of Secondary Metabolites as Potential Phytoalexins, Their Secretion Sites

UNIVERSITAS
GADJAH MADA
**PENGARUH KLON BATANG ATAS TERHADAP SIFAT FISIOLOGIS, MORFOLOGIS, PERTUMBUHAN DAN KETAHANAN
KEKERINGAN BIBIT KAKAO (Theobroma cacao L.)**
FAKHRUSY ZAKARIYYA, Prof. Dr. Ir. Didik Indradewa, DIP. Agr. St.
Universitas Gadjah Mada, 2018 | Diunduh dari http://etd.repository.ugm.ac.id/

and Proposed Resistance Markers to Vascular Streak Dieback in *Theobroma cacao* L. *Pelita Perkebunan* 33 (1) : 10 – 23.

Srivastava, L. M. 2002. Plant, growth and development – hormones and environment. Elsevier Academic Press, San Diego.

Sass, J. E. 1951. *Botanical Microtechnique*. 2nd ed. Iowa (US) : Iowa State College Pr.

Schroth, G., P. Laderach, A. I. Martinez-Valle, C. Bunn, C, dan L. Jassogne. 2016. Vulnerability to Climate change of cocoa in West Africa : Patterns, Opprtunities and Limits to Adaptation. *Science of the Total Environment* 556 : 231 – 241.

Schwendenmann, L., E. Veldkamp, G. Moser, H. Dirk, M. Kohler, Y. Cloughs, dan S. Oliver. 2016. Effects of an experimental drought on the functioning of cacao Agroforestry system, Sulawesi, Indonesia. *Global Change Biologu,* 16, 1515 – 1530.

Setyawan, B., A. W. Susilo, I. Anita-sari, N. P. Sari. 2017. Perakitan Batang Bawah Unggul Kakao Toleran Kondisi Kering. *Laporan akhir tahun Pusat Penelitian Kopi dan Kakao Indonesia*.

Shevyakova, N. I., E. A. Bakulina, and V. Kuznetsov. 2009. Proline antioxidant role in the common ice plant subjected to salinity and paraquat treatment inducing oxidative stress. *Russian Journal of Plant Physiology*, 56(5), pp. 663-669.

Sharp, R. E. 2002. Interaction with ethylene: changing views on the role of abscisic acid in root and shoot growth responses to water stress. *Plant, Cell and Environment* 25, 211–222.

Singh, R.K. dan B. D. Chaudary. 1979. *Biometrical Methods in Quantitative Genetic Analysis*. Resived edition. Kalyani publisher. New Delhi. India.

Singh, V. K. dan S. Rajan. 2009. Changes in Photosynthetic Rate, Specific Leaf Weight and Sugar Contents in Mango (*Mangifera indica* L.). *The Open Horticulture Journal,* 2 *:* 40-43.

Siswanti, D. U. dan R. V. Agustin. 2014. Respons Fisiologis Padi (*Oryza sativa* L) “Segreng” dan “Menthik Wangi” terhadap Aplikasi Pupuk Organik Cair dan Dekomposer. *Jurnal Biogenesis*, 2 (2), 89 – 93.

Siswanto, H. 2010. Respon Laju Pertumbuhan dan Produksi Biomassa Tiga Klon Bibit Kakao (*Theobroma cacao* L.) pada Berbagai Kondisi Cekaman Kekeringan. Skripsi. Universitas Jember.

Soertani, S. dan Soenardjan.1984. *Pengalaman dalam musim kemarau panjang 1982 di PT.* Perkebunan XVIII. *Perkebunan Indonesia*. 19-28.

UNIVERSITAS
GADJAH MADA
**PENGARUH KLON BATANG ATAS TERHADAP SIFAT FISIOLOGIS, MORFOLOGIS, PERTUMBUHAN DAN KETAHANAN
KEKERINGAN BIBIT KAKAO (Theobroma cacao L.)**
FAKHRUSY ZAKARIYYA, Prof. Dr. Ir. Didik Indradewa, DIP. Agr. St.
Universitas Gadjah Mada, 2018 | Diunduh dari http://etd.repository.ugm.ac.id/

Souza, J. D., E. M. A. Silva, M. A. C. Filho, R. Morillon, D. Bonatto, F. Micheli, A. S. Gesteira. 2017. Different adaptation strategies of two citrus scion/rootstock combinations in response to drought stress. *PLoS ONE* 12 (5) :1-23.

Sudarmadji, S. 2010. *Analisa Bahan Makanan dan Pertanian*. Yogyakarta: Penerbit Liberty

Sun, X.P., H.L. Yan, X.Y. Kang, dan F.W. Ma. 2013. Growth, gas exchange, and water-use efficiency response of two young apple cultivars to drought stress in two scion-one rootstock grafting system. *Photosynthetica* 51 (3): 404-410.

Sulistyani, Y., S. Andrianto, N. Indraswati dan A. Ayucitra. 2011. Ekstraksi senyawa fenolik dari limbah kulit kacang tanah (*Arachis hypogea L*) sebagai antioksidan alami. *Teknik Kimia Indonesia,* 10 (3): 112-119.

Susilo, A. W. 2015 a. KW 641, klon harapan kakao tahan kering. *Warta Pusat Penelitian Kopi dan Kakao Indonesia*, 27(3) : 1-5.

Susilo, A. W. 2015 b. Botani, Keragaman Genetik, dan Pengelolaan Plasma Nutfah. In:T. Wahyudi, Misnawi, Pujiyanto (Ed.). Kakao (Sejarah, Botani, Proses Produksi, Pengolahan, dan Perdagangan. 1st Ed. Gadjah Mada University Press, Yogyakarta.

Susilo, A. W., P. Arisandy, I. Anita-Sari, dan R. Harimurti. 2016. Relationship Analysis Between Leaf-Stomata Characteristics with Cocoa Resistance to Vascular-Streak Dieback. *Pelita Perkebunan,* 32(1) : 10—21.

Tang, X.,He, Z., Dai, Y., Xiong, Y. L., Xie, M., Chen, J. 2010. Peptide Fractionation And Free Radical Scavenging Activity Of Zein Hydrolysate. *Agricultural Food Chemistry*, 58:587-593.

Tjitrosoepomo, G. 1988. *Taksonomi Tumbuhan (Spermatophyta)*. Gadjah Mada University Press, Yogyakarta.

Tombesi, S., R. S. Johnson, K. R. Day, dan T. M. de Jong. 2010. Relationships between xylem vessel characteristics, calculated axial hydraulic conductance and size-controlling capacity of peach rootstocks. *Annals of Botany*, 105: 327–331.

Vijn, I., dan S. Smeekens. 1999. Fructan: more than a reserve carbohydrate? *Plant Physiol.* 120, 351–360.

Wahyudi, T. dan Misnawi. 2015. Sejarah, Perkembangan Penelitian, dan Prospek Kakao. In : T. Wahyudi, Misnawi, Pujiyanto (Ed.). Kakao (Sejarah, Botani, Proses Produksi, Pengolahan, dan Perdagangan. 1st Ed. Gadjah Mada University Press, Yogyakarta.

UNIVERSITAS
GADJAH MADA
**PENGARUH KLON BATANG ATAS TERHADAP SIFAT FISIOLOGIS, MORFOLOGIS, PERTUMBUHAN DAN KETAHANAN
KEKERINGAN BIBIT KAKAO (Theobroma cacao L.)**
FAKHRUSY ZAKARIYYA, Prof. Dr. Ir. Didik Indradewa, DIP. Agr. St.
Universitas Gadjah Mada, 2018 | Diunduh dari http://etd.repository.ugm.ac.id/

Wang, H. H., T. Feng, X. X. Peng, M. L. Yan, P. L. Zhou dan X. K. Tang. 2009. Ameliorative Effects of Brassinosteroid on Excess Manganese- Induced Oxidative Stress in Zea mays L. Leaves. *Agricultural Sciences in China* 8:1063-1074.

Wang, H., J. Siopongco, L. J. Wade, dan A. Yamauchi. 2009. Fractal analysis on root systems of rice plants in response to drought stress. *Environ Exp Bot*, 65:338–34

Wessel, M. 1985. Shade and nutrition. In:G.A.R.Wood and R.A. Lass. Cocoa. Longman, London, pp. 166-194

Winarsi, H. 2007. *Antioksidan alami dan radikal bebas*. Kanisius, Yogyakarta.

Winaryo, A. Iswanto, dan H. Winarno. 1997. Kajian Penggunaan Tegangan Osmotik dan Kerapatan Stomata sebagai Kriteria Seleksi Klon Kakao Tahan Cekaman Air. *Pelita Perkebunan* 13(2): 63-70.

Wood, G. A. R. dan R. A. Lass. 1985. *Cocoa. 4th Edn.* Longman Group, Ltd. London. 620 pp.

Wu, L. J., Z. H. Li, M. H. Yang, dan P. L. Wang. 2015. Response of leaf anatomical characteristics of Cyclobalanopsis gilva seedlings to drought stress. *Journal of Applied Ecology*, 26(12) : 3619-3626.

Yuliasmara, F. 2015. Manajemen Pembibitan Kakao. In:T. Wahyudi, Misnawi, Pujiyanto (Ed.). Kakao (Sejarah, Botani, Proses Produksi, Pengolahan, dan Perdagangan. 1st Ed. Gadjah Mada University Press, Yogyakarta.

Zakariyya, F. dan F. Yuliasmara. 2015. Top Grafting Performance of Some Cocoa (Theobroma cacao L.) Clones as Affected by Scion Budwood Number. *Pelita Perkebunan* 31(3), 163—174.

Zakariyya, F., A.W. Susilo, N. Puspitasari, dan B. Setyawan. 2016. Kajian Ekofisiologi Tanaman Kakao Pada Kondisi Lahan Marjinal Kering. *Laporan akhir tahun Pusat Penelitian Kopi dan Kakao Indonesia*.

Zakariyya, F., B. Setiyawan, and A. W. Susilo. 2016. Stomatal, Proline, and Leaf Water Status Characters of Some Cocoa Clones (*Theobroma cacao* L.) on Prolonged Dry Season. *Pelita Perkebunan* 33 (1), pp. 109-117.

Zakariyya, F. 2017. Karakter morfologi perakaran beberapa semaian klon kakao asal biji. In Seminar, Ekspo dan Diskusi (SEEDs) Perbenihan Nasional 2017, Politeknik Negeri Jember.

Zakariyya, F. 2016. Menimbang Indeks Luas Daun Sebagai Variabel Penting Pertumbuhan Tanaman Kakao. *Warta,* 28(3) : 8 – 12.

UNIVERSITAS
GADJAH MADA
**PENGARUH KLON BATANG ATAS TERHADAP SIFAT FISIOLOGIS, MORFOLOGIS, PERTUMBUHAN DAN KETAHANAN
KEKERINGAN BIBIT KAKAO (Theobroma cacao L.)**
FAKHRUSY ZAKARIYYA, Prof. Dr. Ir. Didik Indradewa, DIP. Agr. St.
Universitas Gadjah Mada, 2018 | Diunduh dari http://etd.repository.ugm.ac.id/

Zanneti, L. V. , C. R. D. Milanez, V. N. Gama, M. A. G. Aguilar, C. A. S. Souza, E. Campostrini, T. M. Ferraz, dan F. A. M. M. A. Figueiredo. 2016. Leaf application of silicon in young cacao plants subjected to water deficit. *Pesq. agropec. bras.* 51(3): 215-223.

Zeevart, J.A.D dan R.A. Crellman. 1988. Metabolism and Physiology of Absisic Acid. *Annual Review Plant Physiology* 39: 43-50.

Zhang S. B., Y. Dai, G. Y. Hao, J. W. Li, X. W. Fu, dan J. L. Zhang. 2015. Differentiation of water-related traits in terrestrial and epiphytic *Cymbidium* species. *Front. Plant Sci.* 6:260.

Zuidema, P.A., P. A. Leffelaar, W. Gerritsma, L. Mommer, dan N. P. R. Anten. 2005. A physiological production model for cocoa (*Theobroma cacao*):model presentation, validation and application. *Agricultural System* 84: 195-225.