

BAB VI

KESIMPULAN DAN SARAN

6.1. Kesimpulan

1. Hasil penelitian menunjukkan bahwa penambahan bubuk ekstrak jahe emprit (P1; P2; P3; P4; P5; P6; dan P7) berpengaruh terhadap total fenol, total flavonoid, aktivitas antioksidan metode DPPH, dan kemampuan mereduksi ion besi minuman beluntas jahe. Kadar total fenol berkisar antara 219,375-322,188 mg GAE/L minuman beluntas jahe; kadar total flavonoid berkisar antara 167,464-199,518 mg CE/L minuman beluntas jahe; aktivitas antioksidan menangkalkan radikal bebas DPPH berkisar antara 253,392-271,585 mg GAE/L minuman beluntas jahe; dan kemampuan mereduksi ion besi berkisar antara 56,895-183,605 mg GAE/L minuman beluntas jahe.
2. Senyawa fitokimia yang teridentifikasi pada minuman beluntas jahe meliputi alkaloid, flavonoid, fenolik, triterpenoid, saponin, tanin, dan kardiak glikosida.
3. Perlakuan dengan penambahan bubuk ekstrak jahe emprit yang paling tepat agar dapat diperoleh aktivitas antioksidan minuman beluntas jahe tertinggi dengan metode DPPH adalah P2 sedangkan berdasarkan uji kemampuan mereduksi besi adalah P5.

6.2. Saran

1. Perlu dilakukan penelitian lebih lanjut untuk meningkatkan stabilitas warna dan kekeruhan minuman beluntas jahe dengan menambahkan *chelating agent* agar dapat mempertahankan aktivitas antioksidan karena adanya logam besi (Fe) dalam minuman beluntas jahe (sampel) yang bersifat tidak stabil sehingga dapat berubah warna dalam waktu yang singkat.

DAFTAR PUSTAKA

- Agustiningsih, A. Wildan, dan Mindaningsih. 2010. Optimasi Cairan Penyari pada Pembuatan Ekstrak Daun Pandan Wangi (*Pandanus amaryllifous* Roxb) secara Maserasi terhadap Kadar Fenolik dan Flavonoid Total. *Momentum* 6(2):36-41.
- Ahemd S. A. and E. M. Kamel. 2013. Phenolic Constituents and Biological Activity of The Genus *Pluchea*. *Der Pharma Chemica* 5(5):109-114.
- Alfian, R. dan H. Susanti. 2012. Penetapan Kadar Fenolik Total Ekstrak Metanol Kelopak Bunga Rosella Merah (*Hibiscus sabdariffa* Linn.) dengan Variasi Tempat Tumbuh secara Spektrofotometri. *Jurnal Ilmiah Kefarmasian* 2(1):73-80.
- Ali, B.H., G. Blunden, M.O. Tanira, and A. Nemmar. 2008. Some Phytochemical, Pharmacological, and Toxicological Properties of Ginger (*Zingiber officinale* Roscoe). A review of Recent Research. *Food and Chemical Toxicology* 46 : 409–420.
- Al-Temimi, A. and R. Choudhary. 2013. Determination of Antioxidant Activity In Different Kinds of Plants In Vivo And In Vitro By Using Diverse Technical Methods. *Journal Nutrition of Food Science* 3:1-9.
- Amic, D., D. Davidovic-Amic, D. Beslo, and N. Trinajsti. 2003. Structure-Radical Scavenging Activity Relationships of Flavonoids. *Croatica Chemica Acta* 76(1):56-61.
- Andarwulan, N., R. Batari, D.A. Sandrasari, B. Bolling, and H. Wijaya. 2010. Flavonoid Content and Antioxidant Activity of Vegetables from Indonesia. *Food Chemistry* 121:1231-1235.
- Anwar, F., M. Ali, A.L. Hussain, and M. Shahid. 2009. Antioxidant and Antimicrobial Activities of Essential Oil and Extracts of Fennel (*Foeniculum vulgare* Mill.) Seeds from Pakistan. *Journal Flavour and Fragrance* 24 : 170-176.
- AOAC. 2005. Method of Analysis. Washington: Assosiation of Official Analytical Chemistry. (979.12)

- Ardiansyah, L. Nuraida, dan N. Andarwulan. 2003. Aktivitas Antimikroba Ekstrak Daun Beluntas (*Pluchea indica* L.) dan Stabilitas Aktivitasnya pada Berbagai Konsentrasi Garam dan Tingkat pH. *Jurnal Teknologi dan Industri Pangan* 14(2):90-97.
- Badan Pusat Statistik. 2011. Statistik Tanaman Biofarmaka. Jakarta. Indonesia. 76 hlm. http://perkebunan.litbang.pertanian.go.id/wp-content/uploads/2014/06/perkebunan_perspektif_vol1222013_3_Ekwasita.pdf (14 Oktober 2015)
- Bartley, J. and A. Jacobs. 2000. Effects of Drying on Flavour Compounds in Australian-Grown Ginger (*Zingiber officinale*). *Journal of the Science of Food and Agriculture* 80:209–215.
- Benjelalai. 1984. *Pengantar Ilmu Pangan, Nutrisi, dan Mikrobiologi*. Yogyakarta : Gadjah- Mada University Press.
- Biswas, R. Dasgupta, A. Mitra, A. Roy, S.K. Dutta, P.K. Achari, B. Dastidar, and T.K. Chatterjee. 2005. Isolation, Purification, and Characterization of Four Pure Compounds from The Root Extract of *Pluchea indica* Less and The Potentiality of The Root Extract and The Pure Compounds for Antimicrobial Activity. *European Bulletin of Drug Research* 13:63-70.
- Biswas R. Dasgupta, A. Mitra, A. Roy, S.K. Dutta, P.K. Achari, B. Dastidar, and T.K. Chatterjee. 2007. Isolation of Pure Compound r/j/3 from *Pluchea indica* (L.) Less. and Its Anti-Amoebic Activities Against *Entamoeba histolytica*. *Phytomedicine* 14(7-8):534-547.
- Chaieb, I. 2010. Saponins as Insectisides. A review. *Tunisian Journal of Plant Protection* 5(1): 39-50.
- Chanda, S. and R. Dave. 2009. *In Vitro* Models for Antioxidant Activity Evaluation and Some Medicinal Plants Possessing Antioxidant Properties: An Overview. *African Journal of Microbiology Research* 3(13):981-996.
- Chang, C.C., M.H. Yang, H.M. Wen, and J.C. Chern. 2002. Estimation of Total Flavonoid Content in Propolis by Two Complementary Colorimetric Methods. *Journal of Food and Drug Analysis* 10:178–182.

- Chen, C., C.K. May, and C.T. Ho. 1986. High Performance Liquid Chromatographic Determination of Pungent Gingerol Compound of Ginger (*Zingiber officinale* Roscoe). *Journal of Food Science* 51(12):1364-1365
- Chen, J.C., J.Y Yeh, P.C. Chen, and C.K. Hsu. 2007. Phenolic Content and DPPH Radical Scavenging Activity of Yam-containing Surimi Gels Influenced by Salt and Heating. *Asian Journal of Health and Information Sciences* 2:1-11.
- Cole, G. A. 1983. *Text Book of Limnology Third Edition*. United States of America: Waveland Press Inc.
- Connell, D. and M. Sutherland. 1969. A Re-Examination of Gingerol, Shogaol and Zingerone, the Pungent Principles of Ginger (*Zingiber officinale* Roscoe). *Australian Journal of Chemistry* 22 : 1033–1043.
- Dalimartha, S. 1999. *Atlas Tumbuhan Obat Indonesia Jilid I*. Jakarta: Trubus Agriwidaya.
- Dalimartha, S. 2005. *Tanaman Obat di Lingkungan Sekitar*. Jakarta: Puspa Swara.
- Dalimartha, S. 2008. *Atlas Tumbuhan Obat Indonesia*. Jakarta: Trubus Agriwidaya.
- Denyer, C.V., P. Jackson, D.M. Loakes, M.R. Ellis, and D.A.B. Yound. 1994. Isolation of Antirhinoviral Sesquiterpenes from Ginger (*Zingiber officinale*). *Journal of Natural Products* 57 : 658-662.
- Dey, P. M. and J. B. Harborne. 1997. *Plant Biochemistry*. USA: Academic Press.
- Dorai, T. and B.B. Aggarwal. 2004. Antitumor Promoting Activities of Selected Pungent Phenolic Substances Present in Ginger. *Cancer Letter* 215: 129-140.
- Doughari, J.H. 2012. *Phytochemicals: Extraction Methods, Basic Structures and Mode of Action as Potential Chemotherapeutic Agents*. *Phytochemicals-A Global Perspective of Their Role in Nutrition and Health*, Dr. Venketeshwer Rao (Ed.). Croatia: Intech.

- El-Baroty, G.S., H. H. Abd El-Baky, R. S. Farag, and M. A. Saleh. 2010. Characterization of Antioxidant and Antimicrobial Compounds of Cinnamon and Ginger Essential Oils. *African Journal of Biochemistry Research* 4 : 167-174.
- Eze, J.I. and K.E. Agbo. 2011. Comparative Studies of Sun and Solar Drying of Peeled and Unpeeled Ginger. *American Journal of Scientific and Industrial Research* 2 : 136-143.
- Fauzi, F. 2011. Uji Efek Proteksi Fraksi Etil Asetat Ekstrak Metanol Rimpang Temu Giring (*Curcuma heyneana* Val.) terhadap Peningkatan Kadar Kolesterol Darah Tikus Jantan Galur Wistars yang diberi Diet Kolesterol Tinggi. *Skripsi S-I*. Yogyakarta: Fakultas Farmasi, Universitas Ahmad Dahlan Yogyakarta. <http://www.scribd.com/doc/72277194/Uji-Efek-Proteksi-Fraksi-Etil-Asetat-Ekstrak-Metanol-Rimpang-Temu-Giring-Curcuma-heyneana-Val-Terhadap-Peningkatan-Kadar-Kolesterol-Tikus-Putih-Jan> (14 Oktober 2015).
- Fennema, O.R. 1996. *Food Chemistry, Third Edition*. USA: Marcel Dekker, Inc.
- Fessenden, R.J. dan S.J. Fessenden. 1986. *Kimia Organik, Jilid 1. Edisi Ketiga* (Terjemahan Aloysius Hadyana Pudjaatmaka Ph.D). Jakarta : Erlangga
- Ficker, C., M.L. Smith, K. Akpagana, M. Gbeassor, J. Zhang, T. Durst, R. Assabgui, and J.T. Arnason. 2003. Bioassay-Guided Isolation and Identification of Antifungal Compounds from Ginger. *Phytotherapy Research* 17: 897-902
- Frutos, P., G. Hervás, F.J. Giráldez, and A.R. Mantecón. 2004. Tannins and Ruminant Nutrition. A Review. *Spanish Journal of Agricultural Research* 2(2):191-202.
- Gholib. 2008. Uji Daya Hambat Ekstrak Etanol Jahe Merah (*Zingiber officinale* var. *rubrum*) dan Jahe Putih (*Zingiber officinale* var. *amarum*) terhadap *Trichophyton mentagrophytes* dan *Cryptococcus neoformans*. *Prosiding Seminar Nasional Teknologi Peternakan dan Veteriner*, Bogor.

- Ginting, D.BR. 2011. Identifikasi Komponen Kimia Minyak Atsiri Rimpang Jahe Emprit (*Zingiber officinale* Rosc.) dan Uji Aktivitas Antibakteri, *Skripsi S-1*. Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Sumatera Utara, Medan. <http://repository.usu.ac.id/bitstream/123456789/25726/7/Cover.pdf> (14 Oktober 2015).
- Gupta, A. D., V. K. Bansal, V. Babu, and N. Maithil. 2013. Chemistry, Antioxidant and Antimicrobial Potential of Nutmeg (*Myristica fragrans* Houtt). *Journal of Genetic Engineering and Biotechnology*. 11:25-31.
- Halim, M.O. 2015. Pengaruh Proporsi Tepung Daun Beluntas (*Pluchea indica* Less) dan Teh Hitam terhadap Sifat Fisikokimia, Sifat Organoleptik, dan Aktivitas Antioksidan Produk Minuman, *Skripsi S-1*. Fakultas Teknologi Pertanian, UKWMS, Surabaya.
- Hanuraga, T. 2012. *Aneka Tanaman Herbal*. <http://kesehatan.gen22.net/2012/12/daun-beluntas-untuk-obat-nyeri-pinggang.html> (14 Oktober 2015).
- Hapsoh, H. Yaya, dan J. Elisa. 2008. *Budidaya dan Teknologi Pascapanen Jahe*. Jakarta : USU Press Art Design, Publishing & Printing.
- Harborne, J.B. 1996. *Metode Fitokimia*. Padmawinata, K. dan I. Soediro (Ed.). Bandung: Institut Teknologi Bandung.
- Harianto, I. 2015. Pengaruh Konsentrasi Tepung Daun Beluntas (*Pluchea indica* Less) terhadap Sifat Fisikokimia, Organoleptik, dan Aktivitas Antioksidan pada Minuman, *Skripsi S-1*. Fakultas Teknologi Pertanian, UKWMS, Surabaya.
- Hartanto, H. 2012. Identifikasi Potensi Antioksidan Minuman Cokelat dari Kakao Lindak (*Theobroma cacao* L.) dengan Berbagai Cara Preparasi: Metode Radikal Bebas 1,1-diphenyl-2-picrylhydrazil(DPPH). *Skripsi S-1*. Fakultas Teknologi Pertanian, UKWMS, Surabaya.
- Haryadi, D. 2012. Senyawa Fitokimia dan Sitotoksisitas Ekstrak Daun Surian (*Toona sinensis*) terhadap Sel Vero dan MCF-7. *Skripsi S-1*. Bogor: Fakultas Matematika dan Ilmu Pengetahuan Alam, Institut Pertanian Bogor, Bogor.

<http://repository.ipb.ac.id/handle/123456789/58619>. (14 Oktober 2015).

- Hassan, S. M., J. A. Byrd, A. K. Cartwright, and C. A. Bailey. 2010. Hemolytic and Antimicrobial Activities Differ Among Saponinrich Extracts from Guar, Quillaja, Yucca, and Soybean. *Applied Biochemistry Biotechnology* 162(4):1008-1017.
- Heim K.E., A.R. Tagliaferro, and D.J. Bobilya. 2002. Flavonoid: Chemistry, Metabolism, and Structure-Activity Relationship. *Journal Nutritional Biochemistry* 13:572-584.
- Heldt, H. W. 2005. *Plant Biochemistry*. UK: Elsevier.
- Hsieh, T.J., Z.T. Liu, C.Y. Chia, L.C. Chern, J.F. Lu, C.M. Chuang, Y.S. Mau, H.S. Chen, H.Y. Syu, and H.C. Chen. 2004. Protective Effect of Methyl Gallate from *Toona Sinensis* (Meliaceae) againsts Hydrogen Peroxide-Induced Oxidative Stress and DNA Damage in MDCK Cells. *Food Chemistry Toxicology* 42(5):843-50
- Ichikawa, T. 1994. *Functional Foods : Designer Foods, Pharmafoods, Nutraceuticals* (Edited by I. Goldberg). New York : Chapman & Hall. p. 453-467.
- Irawati, S. 2013. *Isolasi Alkaloid dari Daun Beluntas (Pluchea indica Less)*. <http://digilib.its.ac.id/isolasi-alkaloid-dari-daun-beluntaspluchea-indica-less-25630.html>. (15 Januari 2015).
- Jadmin. 2013. *Kandungan Kimia dan Manfaat Daun Beluntas untuk Kesehatan*. www.jepitjemuran.com (14 Oktober 2015).
- Jiang W, M.M. Lederman, P. Hunt, S.F. Sieg, K. Haley, B. Rodriguez, A. Landlay, J. Martin, E. Sinclair, A.I. Asher, S.G. Deeks, D.C. Douek, and J.M. Brenchley. 2009. Plasma Levels of Bacterial DNA Correlate with Immune Activation and the Magnitude of Immune Restoration in Person with Antiretroviral-Treated HIV Infection. *Journal of Infectious Diseases* 199: 1177-1185.
- Juniarti, D., Osmeli, dan Yuhernita. 2009. Kandungan Senyawa Kimia, Uji Toksisitas (*Brine Shrimp Lethality Test*) dan Antioksidan (1,1-diphenyl-2-picrilhydrazyl) dari Ekstrak Daun Saga (*Abrus precatorius* L.). *Makara Sains* 13(1):50-54.

- Kahkonen, M.P., A.I. Hopia, H.J. Vuorela, J.P. Rauha, K. Pihlaja, T.S. Kujala, and M. Heinonen. 1999. Antioxidant Activity of Plant Extracts Containing Phenolic Compounds. *Journal of Agriculture and Chemistry* 47 : 3954 – 3962
- Kardono, L.B.S. dan T.R. Dewi. 1998. Evaluasi Kandungan Antioksidan dan Senyawa Fenolik Dalam Rempah-Rempah Endemik Indonesia. *Prosiding Seminar Nasional Teknologi Pangan dan Gizi, Yogyakarta*. ISBN : 979- 95554-0-X.
- Khanbabaee, K. and T.V. Ree. 2001. Tannins: Classification and Definition. *Natural Product Reports* 18:641-649
- Kiay, N., E. Suryanto, L. Mamahit. 2011. Efek Lama Perendaman Ekstrak Kalamansi (*Citrus microcarpa*) terhadap Aktivitas Antioksidan Tepung Pisang Goroho (*Musa spp.*). *Chemistry Program* 4:27-33.
- Kim, E.C., J.K. Min, T.Y. Kim, S.J. Lee, H.O. Yang, S. Han, Y.M. Kim, and Y.G. Kwon. 2005. 6-Gingerol, a Pungent Ingredient of Ginger, Inhibits Angiogenesis in Vitro and in Vivo. *Biochemical and Biophysical Research Communications* 335: 300-308
- Koeswara, S. 1995. *Jahe dan Hasil Olahannya*. Jakarta : Pustaka Sinar Harapan.
- Kumar, S., D. Kumar, Manjusha, K. Saroha, N. Singh, and B. Vashishta. 2008. Antioxidant and Free Radical Scavenging Potential of *Citrullus colocynthis* (L.) Schrad. Methanolic Fruit Extract. *Acta Pharmaceutica* 58:215-220.
- Kumar, A. T. De, and A. K. Mishra. 2013. Oleandrin: A Cardiac Glycosides with Potent Cytotoxicity. *Pharmacognosy Reviews* 7(14):131-139.
- Kusuma, F.A. 2014. Perbedaan Jenis Pelarut terhadap Aktivitas Antioksidan Ekstrak Daun Beluntas (*Pluchea indica* Less) dengan Metode DPPH (2,2-difenil-1-pikrilhidrasil), *Skripsi S-1*. Fakultas Teknologi Pertanian, UKWMS, Surabaya.
- Kusumaningati, R.W. 2009. *Analisa Kandungan Fenol Total Jahe (Zingiber officinale Rosc.) secara in Vitro*. Jakarta : Fakultas Kedokteran UI.
- Langseth, L. 1995. *Oxidants, Antioksidants and Disease Prevention*. Belgium: ILSI Europe.

- Lantera, T. 2002. *Khasiat dan Manfaat Jahe Merah: Si Rimpang Ajaib*. Jakarta : AgroMedia Pustaka.
- Lapworth. 1917. *Gingerol*. <http://lib.ui.ac.id/file?file=digital/122949-S09069fk-Analisis%20kandungan-Literatur.pdf> (14 Oktober 2015)
- Le Marchand, L. 2002. Cancer Preventive Effects of Flavonoids. A review (dalam *Handbook of Plant Food Phytochemicals*, B. K. Tiwari, N. P. Brunton, and C. S. Brennan, Eds.). UK: John Wiley & Sons.
- Lee, H. S., S.S. Lim, G.J. Lim, J.S. Lee, E.J. Kim, and K.J. Hong. 2008. Antiviral Effect of Ingenol and Gingerol during HIV-1 Replication in MT4 Human T Lymphocytes. *Antiviral Research* 12:34-37.
- Leong, L.P. and G. Shui. 2002. An Investigation of Antioxidant Capacity of Fruits in Singapore Markets. *Food Chemistry* 76:69-75.
- Lugasi, A., J. Hovari, K.V. Sagi, and L. Biro. 2003. The Role of Antioxidant Phytonutrients in the Prevention of Diseases. *Acta Biologica Szegediensis* 47(1-4):119-125.
- Luger, P., M. Weber, N.X. Dung, P.H. Ngoc, D.T. Tuong, and D.D. Rang. 2000. The Crystal Structure of hop-17(21)-en-3 β -yl acetate of *Pluchea pteropoda* Hemsl. from Vietnam. *Crystal Research and Technology* 35(3):355-362.
- Magalhães, L.M., A.M. Segundo, S. Reis, and L.F.C.J. Lima. 2008. Methodological Aspects About *In Vitro* Evaluation of Antioxidant Properties. *Analytica Chimica Acta* 613(1):1-19.
- Maiza-Benabdesselam, F., S. Khentache, K. Bougoffa, M. Chibane, S. Adach, Y. Chapeleur, H. Max, and D. Laurain-Mattar. 2007. Antioxidant Activities of Alkaloid Extracts of Two Algerian Species of *Fumaria*: *Fumaria capreolata* and *Fumaria bastardii*. *Recors of Natural Products* 1:2-3 28-35.
- Mamoru, S., I. Atsushi, Y. Kazunori, S. Kazuhiko, A. Masaki, and H. Eikichi. 1984. Pharmacological Studies on Ginger. I. Pharmacological Action of Pungent Constituents, 6-Gingerol and 6-Shogaol. *Journal of Pharmacobio-Dynamics* 7: 836-848.
- Manju, V. and N. Nalini. 2005. Chemopreventive Efficacy of Ginger, a Naturally Occurring Anticarcinogen during the Initiation, Post

Initiation Stages of 1, 2 Dimethyl Hydrazine-Induced Colon Cancer. *Clinica Chimica Acta* 358: 60-67.

Markham, K. R. 1988. *Cara Mengidentifikasi Flavonoid*. Bandung : ITB

Marliana, S. D., V. Suryanti, dan Suyono. 2005. Skrining Fitokimia dan Analisis Kromatografi Lapis Tipis Komponen Kimia Buah Labu Siam (*Sechium edule* Jacq. Swartz.) dalam Ekstrak Etanol. *Biofarmasi* 3 (1). Pp. 26-31

Masuda, T., A. Jitoe, and T.J. Mabry. 1995. Isolation and Structure Determination of Cassumunarins A, B, C: New Anti-Inflammatory Antioxidants from a Tropical Ginger, *Zingible Cassumunar*. *Journal of the American Oil Chemists' Society* 72: 1053-1057

Masuda, T., J. Isobe, A. Jitoe, and N. Nakatani. 1992. Antioxidative Curcuminoids from Rhizomes of *Curcuma xanthorrhiza*. *Phytochemistry* 31 (10): 3645- 3647.

Masuda, Y., H. Kikuzaki, M. Hisamoto, and N. Nakatani. 2004. Antioxidant Properties of Ginger Related Compounds from Ginger. *Biofactors* 21: 293-296.

Mates, J.M., C.P. Gomez, and C.D.I. Nunez. 1999. Antioxidant Enzymes and Human diseases. *Journal of Clinical Biochemistry* 32:595-603.

McDonald, S., P.D. Prenzler, M. Antolovich, and K. Robards. 2001. Phenolic Content and Antioxidant Activity of Olive Extracts. *Food Chemistry* 73: 73-84.

McRae, J.M. and J.A. Kennedy. 2011. Wine and Grape Tannin Interactions with Salivary Proteins and Their Impact on Astringency: A Review of Current Research. *Molecules* 16:2348-2364.

Mensor, L.L., F.S. Menezes, G.G. Leitao, A.S. Reis, T.C. Santos, C.S. Coube, and S.G. Leitao. 2001. Screening of Brazilian Plant Extracts for Antioxidant Activity by the Use of DPPH Free Radical Method. *Pythotherapy Research* 15:127-130.

Miliauskas, G., P.R. Venskutonis, and T.A. Van Beek. 2004. Screening of Radical Scavenging Activity of Some Medicinal and Aromatic Plant Extracts. *Food Chemistry* 85, 231–237.

- Miller, H.E., F. Rigelhof, L. Marquart, A. Prakash, and M. Kanter. 2000. Antioxidant Content of Whole Grain Breakfast Cereals, Fruits and Vegetables. *Journal of The American College of Nutrition* 19(3):312S-319S.
- Miri, P., J. Bae, and D.S. Lee. 2008. Antibacterial Activity of [10]-gingerol and [12]-gingerol Isolated from Ginger Rhizome Against Periodontal Bacteria. *Phytotherapy Research* 22:1446-1449.
- Molyneux, P. 2004. The Use of Stable Free Radical *Diphenylpicrylhydrazyl* (DPPH) for Estimating Antioxidant Activity. *Journal Science Technology* 26(2):211-219.
- Mukherji, S.M., S.P. Singh, R.P. Kapoor, and R. Dass. 2012. *Organic Chemistry Volume II*. <http://www.newagepublishers.com/samplechapter/000569.pdf>. (14 Oktober 2015).
- Mustafa, T. and K.C. Srivastava. 1990. Ginger (*Zingiber officinale*) in Migraine Headache. *Journal of Ethnopharmacology* 29 : 267-273.
- Nurjanah, A. Abdullah, dan S. Sudirman. 2014. Aktivitas Antioksidan dan Komponen Bioaktif Kangkung Air (*Ipomoea aquatica* Forsk.). *Jurnal Inovasi dan Kewirausahaan* 3(1):68-75.
- Nio, K. O. 1989. Zat-zat Toksik yang secara Alamiah Ada pada Tumbuhan Nabati. *Cermin Dunia Kedokteran* No.58.
- Nursal, S. Wulandari, dan W.S. Juwita. 2006. Bioaktivitas Ekstrak Jahe (*Zingiber officinale* Roxb.) dalam Menghambat Pertumbuhan Koloni Bakteri *Escherichia coli* dan *Bacillus subtilis*. *Jurnal Biogenesis* 2(2):64-66.
- Oakenfull, D. 1981. Saponins in Food. A Review. *Food Chemistry* 7(1):19-40.
- Oyaizu, M. 1986. Studies on Product of Browning Reaction Prepared from Glucose Amine. Di dalam: Kardono, L. B. S. dan Dewi, R. T. 1998. Evaluasi Kandungan Antioksidan dan Senyawa Fenolik Dalam Rempah-rempah Endemik Indonesia. *Prosiding Seminar Nasional Teknologi Pangan dan Gizi, Yogyakarta*. ISBN : 979-95554-0-X.

- Paimin, F. B. dan Murhanato. 2008. *Budidaya, Pengelolaan, Perdagangan Jahe*. Jakarta : Penebar Swadaya.
- Pekal A. and K. Pyrzynska. 2013. Availability of Some Elements from Different Type of Teas. *Natural Product Journal* 3:4.
- Pokorny, J., N. Yanisliewa, and M. Gordon. 2001. *Antioxidants in Food: Practical Application*.
http://www.123foodscience.com/food_chemistry/Sources_of_natural_antioxidants.pdf (14 Oktober 2015).
- Prakash, A. 2001. Antioxidant Activity. *Medallion Laboratories: Analytical Progress* 19(2): 1-4.
- Pratt, D.E. and B.J.F. Hudson. 1990. Natural Antioxidant not Exploited Commercially. Di dalam: B.J.F. Hudson, eds. *Food Antioxidants*. London : Elsevier A. Science.
- Purseglove, J.W, E.G. Brown, C.L. Green, and S.R.J. Robbins. 1981. *Spices, Volume II*. New York : Longman Inc.
- Ragaei, S., T. Gamel, K. Seetharaman, and E.M. Abdel-Aal. 2013. Food Grains, (dalam *Handbook of Plant Phytochemicals: Sources, Stability and Extraction*, B. K. Tiwari, N. P. Bruntan, C. S. Brennan, Eds.). UK: John Wiley & Sons.
- Raharjo, I. dan S.F.A.J. Horsten. 2008. Tumbuhan Pantai *Pluchea indica* Less. *Medicinal and Poisonous Plants* 12(2):441-443.
- Rahayu, D.S., D. Kusriani, dan E. Fachriyah. 2009. Penentuan Aktivitas Antioksidan dari Ekstrak Etanol Daun Ketapang (*Terminalia catappa L*) dengan Metode 1,1-difenil-2-pikrilhidrazil (DPPH).
http://eprints.undip.ac.id/2828/1/JURNAL_DWI_SRI_RAHAJU.pdf
 f. (14 Oktober 2015).
- Ravindran, P.N. and B.K. Nirmal. 2005. *Ginger : The Genus Zingiber*. USA: CRC Press. P. 87-97.
- Rekha, C., G. Poornima, M. Manasa, V. Abhipsa, J. Pavithra Devi, H.T. Vijay Kumar, and T.R.P. Kekuda. 2012. Ascorbic Acid, Total Phenol Content and Antioxidant Activity of Fresh Juices of Four Ripe And Unripe Citrus Fruits. *Journal of Chemical Science Transactions* 1(2): 303-310.

- Rice-Evans, C.A., N.J. Miller, and G. Paganga. 1997. Antioxidant Properties of Phenolic Compounds. *Journal Trends in Plant Science* 2 (4).
- Roberts, M.F. and M. Wink. 1998. *Alkaloids: Biochemistry, Ecology, and Medicinal Applications*. New York: Plenum Press.
- Rohman, A. dan S. Riyanto. 2005. Daya Antioksidan Ekstrak Etanol Daun Kemuning (*Murraya paniculata* (L) Jack) secara in Vitro. *Majalah Farmasi Indonesia* 16(3):136-140.
- Rosiyana, A. 2012. Aktivitas Antioksidan dan Penghambatan α -Glukosidase Ekstrak dan Nanopartikel Ekstrak Kulit Kayu Mahoni (*Swietenia macrophylla* King). *Skripsi S-1*. Fakultas Matematika dan Ilmu Pengetahuan Alam IPB Bogor. repository.ipb.ac.id/bitstream/handle/123456789/59536/G12anr.pdf (15 Januari 2015).
- Rostiana, O., A. Abdullah, Taryono, dan A.E. Hadad. 1991. Jenis-jenis Tanaman Jahe. *Edisi Khusus Littro VII*(I):7-10.
- Rumiantin, R.O. 2011. Kandungan Fenol, Komponen Fitokimia dan Aktivitas Antioksidan Lamun *Enhalus acoroides*. *Skripsi S-1*. Fakultas Perikanan dan Ilmu Kelautan Institut Pertanian Bogor. repository.ipb.ac.id. (15 Januari 2015).
- Saroya, A.S. 2011. *Herbalism, Phytochemistry, and Ethnopharmacology*. USA: CRC Press.
- Satria, E. 2005. Potensi Antioksidan dari Daging Buah Muda dan Daging Buah Tua Mahkota Dewa [*Phaleria macrocarpa* (Scheff.) Boerl.] *Skripsi*. Bogor: Fakultas Matematika dan Ilmu Pengetahuan Alam, Institut Pertanian Bogor
- Schaller, H . 2003. Review the Role of Sterols in Plant Growth and Development. *Progress in Lipid Research* 42:163-175.
- Septiana, A.T. dan A. Asnani. 2012. Kajian Sifat Fisikokimia Ekstrak Rumpun Laut Coklat *Sargassum Duplicatum* Menggunakan berbagai Pelarut dan Metode Ekstraksi. *Agrointek* 6(1):22-28.

- Sermakkani, M. and V. Thangapandian. 2010. Phytochemical Screening for Active Compounds in *Pedaliium murex* L. *Journal Recruiters Research Science Technology* 2: 110-114.
- Setiaji, D. dan A. Sudarman. 2005. Ekstrak Daun Beluntas (*Pluchea indica* Less.) sebagai Obat Antistres pada Ayam Broiler. *Media Peternakan* 28(2):46-51.
- Setiawati, H. 2012. Kadar Antosianin dan Aktivitas Antioksidan Flake Beras Merah dan Beras Ketan Hitam dengan Variasi Suhu Perebusan. *Skripsi S-1*. Fakultas Teknologi Pertanian Universitas Katolik Widya Mandala Surabaya.
- Setyawan, A.D., 2002. Keragaman Varietas Jahe (*Zingiber officinale* Rosc.) berdasarkan Kandungan Kimia Minyak Atsiri. 2002. *BioSMART* 4(2): 48-54.
- Sharma, S.K. dan N. Goyal. 2011. Biological Studies of the Plants from Genus *Pluchea*. *Annals of Biological Research* 2(3):25-34.
- Shukri, M. A. M., C. Alan, and A. R. S. Noorzuarini. 2011. Polyphenols and Antioxidant Activities of Selected Traditional Vegetables. *Journal Tropical Agricultural and Food Science* 39(1):69-83.
- Simanjuntak, P., T. Parwati, L.E. Lenny, S. Tamat, dan R. Murwani. 2004. Isolasi dan Identifikasi Senyawa Antioksidan dari Ekstrak Benalu Teh, *Scurrula oortiana* (Korth) Danser (Loranthaceae). *Jurnal Ilmu Kefarmasian Indonesia* ISSN : 1693-1831, Vol. 2 No. 1.
- Singh, G., I.S. Kapoor, P. Singh, C.S. Heluani, M.P Lampasona, and C.A.N Catalan. 2008. Chemistry, Antioxidant and Antimicrobial Investigation on Essential Oil and Oleoresin of *Zingiber officinale*. *Food Chemistry Toxicology* 46: 3295-3302.
- Slavin, J. 2003. Why Whole Grains are Protective: Biological Mechanisms, (dalam *Handbook of Plant Food Phytochemicals*, B. K. Tiwari, N. P. Brunton, and C. S. Brennan, Eds.). UK: John Wiley & Sons.
- Struchkov Y.T. and S.L. Solenova. 1960. Steric Hindrance and The Conformation of Molecules. *Bulletin of the Academy of Sciences of the USSR, Division of Chemical Science* 9:94-98.

- Suekawa, M., A. Ishige, K. Yuasa, K. Sudo, M. Aburada, and E. Hosoya. 1984. Pharmacological Studies on Ginger. I. Pharmacological Actions of Pungent Constituents, (6)-gingerol and (6)-shogaol. *Journal Pharmacobiodynamics* 7:13-18.
- Sulastry, T. dan N. Kurniawati. 2010. Isolasi Steroid dari Ekstrak Metanol Daun Bluntas (*Pluchea Indica* L.). *Journal Chemical* 11(1):52-56.
- Sulistyaningsih. 2009. Potensi Daun Beluntas (*Pluchea indica* Less.) sebagai Inhibitor terhadap *Pseudomonas aeruginosa* Multi Resistant dan *Methicillin Resistant Stapylococcus aureus*. *Laporan Penelitian Mandiri*. Fakultas Farmasi Universitas Padjadjaran, Bandung. http://pustaka.unpad.ac.id/wp-content/uploads/2010/11/potensi_daun_beluntas.pdf (14 Oktober 2015)
- Surh, Y.J., K.K. Park, K.S. Chun, L. Lee, E. Lee, and S. Lee. 1999. Antitumor Promoting Activities of Selected Pungent Phenolic Substances Present in Ginger. *Journal of Environmental, Pathology, Toxicology, and Oncology* 18:131-139.
- Susetyarini, E. 2007. Pengaruh Dekok Daun Beluntas Terhadap LD 50 (Toksitas Akut) Tikus Putih Jantan (*Ratus norwegicus*). Malang: Universitas Muhammadiyah. http://researchreport.umm.ac.id/index.php/researchreport/article/viewFile/82/81_umm_scientific_journal.pdf (14 Oktober 2015).
- Syukur, C. dan Hernani. 2001. *Budidaya Tanaman Obat Komersial*. Jakarta: Penebar Swadaya.
- Tananuwong, K., and W. Tewaruth. 2010. Extraction and Application of Antioxidants from Black Glutinous Rice. Science direct ISSN 476-481. <http://www.elsevier.com/locate/lwt>. (15 Januari 2015)
- Tapas A., D.M. Sakarkar, and R.B. Kakde. 2008. Flavonoids as Nutraceuticals : A Review. *Tropical Journal of Pharmaceutical Research* 7(3):1089-1099.
- Tapsell, L.C., I. Hemphill, L. Cobiac, C.S. Patch, D.R. Sullivan, M. Fenech, S. Roodenrys, J.B. Keogh, P.M. Clifton, P.G. Williams, V.A. Fazio, and K.E. Inge. 2006. Health Benefits of Herbs and Spices: The Past,

- The Present, The Future. *Medical Journal of Australia* 185 (Suppl. 4), S4–S24.
- Tayfur, M., N. Karaagaoglu, S. Basoglu, and S.M. Mercanligil. 2013. Influence of Brewing Pots on Mineral Content of Black Tea Infusions. *Turkish Journal of Biochemistry* 38(1):57-62.
- Tejasari, F. R. Zakaria, and D. Sajuthi. Ginger (*Zingiber officinale* Rosc.). 2002. Root Bioactive Compounds Increased Cytolytic Response of Natural Killer (Nk) Cells Against Leucemic Cell Line K-562 In Vitro. <http://repository.usu.ac.id/bitstream/123456789/21988/2/.pdf> (15 Januari 2015).
- Tiong, S.H., C.Y. Looi, H. Hazni, A. Arya, M. Paydar, W.F. Wong, S.C. Cheah, M.R. Mustafa, and K. Awang. 2013. Antidiabetic and Antioxidant Properties of Alkaloids from *Catharanthus roseus* (L.) G. Don. *Molecules* 18:9770-9784.
- Tiwari, P., B. Kumar, M. Kaur, G. Kaur, and H. Kaur. 2011. Phytochemical Screening and Extraction. A Review. *International Pharmaceutica Scientia* 1(1):98-106.
- Tuminah, S. 2000. Radikal Bebas dan Antioksidan : Kaitannya dengan Nutrisi dan Penyakit. *Cermin Dunia Kedokteran* 128 : 49-50.
- Tursiman, P. Ardinarsih, dan R. Nofiani. 2012. Total Fenol Fraksi Etil Asetat dari Buah Asam Kandis (*Garcinia dioica* Blume). *Jurnal Kimia Khatulistiwa* 1(1):45-48.
- Ukieyanna, E. 2012. Aktivitas Antioksidan, Kadar Fenolik, dan Flavonoid Total Tumbuhan Suruhan (*Peperomia pellucida* L. Kunth). *Skripsi S-1*. Bogor: Departemen Biokimia IPB. <http://repository.ipb.ac.id/bitstream/handle/123456789/58960/G12eu k.pdf>. (14 Oktober 2015).
- Ulfa, N. M. 2010. *Daya Anti Bakteri Ekstrak Daun Beluntas (Pluchea indica L.) dalam berbagai Konsentrasi terhadap Bakteri E. coli secara In Vitro*. Fakultas Pendidikan MIPA IKIP Negeri Singaraja, Jurusan Biologi, Universitas Negeri Singaraja, Singaraja.
- Vermeris, W. and R. Nicholson. 2009. *Phenolic Compound Biochemistry*. USA: Springer.

- Wanasundara, P.K.J.P.D. and F. Shahidi. 2005. *Antioxidants: Science, Technology, and Applications*. USA: John Wiley & Sons, Inc.
- Wang, R., W. Ruijiang, and Y. Bao. 2009. Extraction of Essential Oils from Five Cinnamon Leaves and Identification of Their Volatile Compound Compositions. *Innovative Food Science Emerging Technology* 10: 289–292.
- Wang, W.H. dan Z.M. Wang. 2005. Studies of Commonly used Traditional Medicine-Ginger. *Zhongguo Zhong Yao Za Zhi* 30:1569–1573.
- WHO. 1999. *WHO Monographs on Selected Medical Plants. Volume 1*. Geneva: WHO. p. 77-85.
- Widyawati, P.S., C.H. Wijaya, P.S. Hardjosworo, dan D. Sajuthi. 2010. Pengaruh Ekstraksi dan Fraksinasi terhadap Kemampuan Menangkap Radikal Bebas DPPH (1,1-difenil-2-pikrilhidrazil) Ekstrak dan Fraksi Daun Beluntas (*Pluchea indica* Less). *Seminar Rekayasa Kimia dan Proses ISSN : 1411-4216*. Semarang : Universitas Diponegoro. C(18):1-7.
- Widyawati, P.S., C.H. Wijaya, P.S. Hardjosworo, dan D. Sajuthi. 2011. Evaluasi Aktivitas Antioksidatif Ekstrak Daun Beluntas (*Pluchea indica*) berdasarkan Perbedaan Ruas Daun. *Rekapangan Jurnal Teknologi Pangan* 5(1):1-14.
- Widyawati, P.S. C.H. Wijaya, P.S. Hardjosworo, and D. Sajuthi. 2013. Volatile Compounds of *Pluchea indica* Less and *Ocimum basillicum* Linn Essential Oil and Potency as Antioxidant. *HAYATI Journal Biosciences* 20(3):117-126.
- Widyawati, P.S., T.D.W. Budianta, F.A. Kusuma, dan E.L. Wijaya. 2014. Difference of Solvent Polarity to Phytochemical Content and Antioxidant Activity of *Pluchea indicia* Less Leaves Extracts. *International Journal of Pharmacognosy and Phytochemical Research* 6(4); 850-855.
- Widyawati, P.S., T.D.W. Budianta, F.A. Kusuma, dan E.L. Wijaya. 2015. Difference of Solvent Polarity to Phytochemical Content and Antioxidant Activity of *Pluchea indicia* Less Leaves Extracts. *International Journal of Pharmacognosy and Phytochemical Research* 6(4); 850-855.

- Winarsi, H. 2007. *Antioksidan Alami dan Radikal Bebas*. Yogyakarta: Kanisius.
- Winarti, S. 2006. *Minuman Kesehatan*. Surabaya : Trubus Agrisarana.
- Winarto, W.P. 2007. *Tanaman Obat Indonesia untuk Pengobatan Herbal*. Jakarta: Kryasari Herba Media. Hlm. 1 – 15.
- Yang, J.H., J.L. Mau, P.T. Ko, and L.C. Huang. 2000. Antioxidant Properties of Fermented Soybean Broth. *Food Chemistry* 71:249-254.
- Yaunatan, D.I. 2014. Perbedaan Jenis Pelarut terhadap Aktivitas Antidiabetik Ekstrak Daun Beluntas (*Pluchea indica* Less.), *Skripsi S-1*. Fakultas Teknologi Pertanian, UKWMS, Surabaya.
- Yuhernita dan Juniarti. 2011. Analisis Senyawa Metabolit Sekunder dari Ekstrak Metanol Daun Surian yang Berpotensi sebagai Antioksidan. *Makara Sains* 15(1):48-52.
- Yu, L.H., Y.H. Kuo, Y.L. Lin, and W. Chiang. 2009. Antioxidative Effect and Active Component from Leaves of Lotus (*Nelumbo nucifera*). *Journal of Agricultural and Food Chemistry* 57:6623-6629.
- Yuniarti, T. 2008. *Ensiklopedia Tanaman Obat Tradisional*. Yogyakarta: MedPress.
- Zarina, Z. and S.Y. Tan. 2013. Determination of Flavonoids in *Citrus grandis* (Pomelo) Peels and Their Inhibition Activity on Lipid Peroxidation in Fish Tissue. *International Food Research Journal* 20(1):313-317.
- Zhu, H., Y.Z. Wang, Y.X. Liu, Y.L. Xia, and T. Tang. 2010. Analysis of Flavonoids in *Portulaca oleracea* L. by UV-Vis Spectrophotometry with Comparative Study on Different Extraction Technologies. *Food Analytical Methods* 3(2):90-97.