

BAB V

KESIMPULAN DAN SARAN

5.1. Kesimpulan

1. Perbedaan proporsi teh hitam-stevia memberikan pengaruh nyata terhadap aktivitas antioksidan minuman teh hitam-stevia dalam kemasan botol plastik.
2. Perbedaan suhu penyimpanan memberikan pengaruh nyata terhadap aktivitas antioksidan minuman teh hitam-stevia dalam kemasan botol plastik.
3. Penurunan total fenol, total flavonoid, kemampuan menangkal radikal bebas, dan kemampuan reduksi ion besi minuman teh hitam-stevia pada suhu ruang adalah 39,16-49,82%, 45,05-62,45%, 51,67-58,57%, 38,06-51,48%.
4. Penurunan total fenol, total flavonoid, kemampuan menangkal radikal bebas, dan kemampuan reduksi ion besi minuman teh hitam-stevia pada suhu *refrigerator* adalah 35,63-47,73%; 20,71-51,09%; 49,64-55,94%; 32,94-45,95%.
5. Interaksi proporsi teh hitam-stevia dan suhu penyimpanan memberikan pengaruh nyata terhadap aktivitas antioksidan minuman teh hitam-stevia dalam kemasan botol plastik.

5.2. Saran

Perlu dilakukan penelitian untuk mengetahui jenis kemasan dan suhu penyimpanan yang sesuai.

DAFTAR PUSTAKA

- Abou-Arab, E. A. and F. M. Abu-Salem 2010. Evaluation of Bioactive Compounds of *Stevia rebaudiana* Leaves and Callus, *African Journal of Food Science* Vol. 4 (10): 627-634.
- Agustiningsih, A. Wildan, dan Mindaningsih. 2010. Optimasi Cairan Penyari pada Pembuatan Ekstrak Daun Pandan Wangi (*Pandanus amaryllifolius Roxb*) secara Maserasi terhadap Kadar Fenolik dan Flavonoid Total, *Momentum*. 6 (2):36-41.
- Aliyu, A.B., M.A. Ibrahim, A.M. Musa, T. Bulus, and A.O. Oyewale. 2011. Phenolics Content and Antioxidant Capacity of Extracts and Fractions of *Vernonia blumeoides* (Asteraceae), *International Journal of Biological Chemistry*. 5:352-359.
- Anggraini, T. dan Neswati. 2010. Evaluasi Mutu dan Waktu Kadaluarsa Sirup Teh dari Jumlah Seduh Berbeda, *Artikel Ilmiah*, Fakultas Teknologi Pertanian, Universitas Andalas. <http://dokumen.tips/documents/tuty-anggraini-stp-mp-laporan.html>. (29 Oktober 2016).
- Argawal, V., A. Kochhar, and R. Sachdeva. 2010. Sensory and Nutritional Evaluation of Sweet Milk Products Prepared Using Stevia Powder for Diabetics. *Studies on Ethno-Medicine*, 4 (1):9-13.
- Astawan, M. 2008. *Khasiat Warna-Warni Makanan*. Jakarta: PT. Gramedia Pustaka Utama, hal 23.
- Balittri, J.T. 2013. Kandungan Senyawa Kimia pada Daun Teh (*Camellia sinensis*), *Warta Penelitian dan Pengembangan Tanaman Industri*. 19 (3):12-16.
- Bhagwat, S., G.R. Beecher, D.B. Haytowitz, J.M. Holden, J. Dwyer, J. Peterson, S.E. Gebhardt, A.L. Eldridge, S. Agarwal, and D.A. Balentine. 2003. *Flavonoid Composition of Tea: Comparison of Black and Green Teas*. http://www.vitamor.com/IFT2003_TeaFlav.pdf (5 September 2016).
- Badan Pengawas Obat dan Makanan RI. 2007. Informatorium Obat Nasional Indonesia, Badan Pengawas Obat dan Makanan Republik Indonesia: Jakarta.

- Chatsuthipong, V. and C. Muanprasat. 2009. Stevioside and Related Compounds: Therapeutics Benefits Beyond Sweetness, *Elsevier Journal of Pharmacology and Therapeutics*. 12:41-54.
- Dasgupta, A. and K. Klein. 2014. *Antioxidants in Food, Vitamins and Supplements Prevention and Treatment of Disease*. USA: Elsevier, p. 19-28.
- Edhisambada. 2011. *Metode Folin-Ciocalteu*.
<https://edhisambada.wordpress.com/2011/02/18/metode-folin-ciocalteu/> (29 Oktober 2016).
- Effendi, D.S., M. Syakir., M. Yusron, Wiratno. 2010. *Budidaya dan Pasca Panen Teh*. Bogor: Pusat Penelitian dan Perkembangan Perkebunan, http://perkebunan.litbang.pertanian.go.id/wpcontent/uploads/2011/02/perkebunan_budidaya_teh.pdf (29 Oktober 2016), hal. 3-4.
- Esmaeili, A.K., R.M. Taha., S. Mohajer, and B. Banisalam. 2015. Antioxidant Activity and Total Phenolic and Flavonoid Content of Various Solvent Extracts from *In Vivo* and *In Vitro* Grown *Trifolium pretense* L. (Red Clover), *Biology Medical Research International*. <http://www.hindawi.com/journals/bmri/2015/643285/> (29 Oktober 2016).
- Figlewicz, D.P., G. Ioannou, J. Bennett Jay, S. Kittleson, C. Savard, C.L. Roth. 2009. Effect of Moderate Intake of Sweeteners on Metabolic Health in The Rat. *Physiology Behavior*. 98:618-624.
- Gardjito, M. dan D. Rahadian. 2011. *Teh*. Yogyakarta: Kanisius, hal. 26-62.
- Ghanta S., A. Banerjee, A. Poddar, and S. Chattopadhyay. 2007. Oxidative DNA Damage Preventive Activity and Antioxidant Potential of *Stevia Rebaudiana* (Bertoni) Bertoni, A natural sweetener. *Journal Agriculture Food Chemistry*. 55 (26):10962-10967.
- Graham, H.N. 1992. Green Tea Composition, Consumption, and Polyphenol Chemistry, *Preventive Medicine*. 21:334–350.
- Gupta, E., S. Purwar, S. Sundaram, and G.K. Rai. 2013. Nutritional and Therapeutic Values of *Stevia rebaudiana*: A Review, *Journal of Medicinal Plants Research*. 7 (46):3343-3353.
- Harbowy, M.E. and D.A. Balentine. 1997. Tea Chemistry, *Critical Reviews in Plant Science*. 16 (5):415-480.

- Hermani, M., K. R. Alias. 2005. *Tanaman Berkhasiat Antioksidan*. Jakarta: Penebar Swadaya, hal.
- Jahan, I. A., M. Mostafa, H. Hossain, I. Nimmi, A. Sattar, A. Alim, and S. M. I. Moeiz. 2010. Antioxidant Activity of Atevia rebaudiana Bert. Leaves from Bangladesh, *Bangladesh Pharmaceutical Journal* 13(2): 67-75.
- Jain, N. K., M. A. Siddiqi., and J. H. Weisburger. 2006. *Protective Effects of Tea on Human Health*. USA: GAB International, p. 140.
- Jayanthi, P. and P. Lalitha. 2011. Reducing Power of The Solvent Extracts of Eichhornia crassipes (Mart) Solms, *International Journal of Pharmacy and Pharmaceutical Sciences*. 3(3):126-128.
- Juliandini, N.T. 2014. Kajian Pengaruh Konsentrasi Sukrosa dan Konsentrasi Teh (*Camelia sinensis*) Terhadap Minuman Teh dalam Kemasan, *Skripsi S-1*. Bandung: Universitas Pasundan. <http://digilib.unpas.ac.id/download.php?id=3582> (15 September 2016).
- Juneja, L.R., M.P. Kapoor, T. Okubo, T.P. Rao. 2013. *Green Tea Polyphenols Neutrical of Modern Life*. New York: CRC Press.
- Koleva, I.I, T.A. van Beek, J.P.H. Linssen, A. Groot, and L.N. Evstatieva. 2002. Screening of Plant Extracts for Antioxidant Activity: A Comparative Study on Three Testing Methods, *Phytochem Analysis*. 13 (1):8–17.
- Kuncahyo, I. 2007. Uji Aktivitas Antioksidan Ekstrak Belimbing Wuluh (*Averrhoa bilimbi*, L.) Terhadap 1,1-diphenyl-2-Picrylhidrazyl (DPPH).Yogyakarta : D-III Teknologi Farmasi Fakultas Teknik Universitas Setia Budi.
- Kuroda, Y. and Y. Hara. 2004. *Health Effects of Tea and Its Cathechins*. New York: Kluwer Academic, p. 11.
- Kusumaningati, R.W. 2009. Analisa Kandungan Fenol Total Jahe (*ZingiberofficinaleRoscoe*) Secara *In vitro*.*Skripsi S-1*. Fakultas Kedokteran Universitas Indonesia. www.lontar.ui.ac.id (19 Oktober 2015).
- Lemus-Mondaca, R., Gálvez, A.V., Bravo, L.Z., and Ah-Hen, Kong. 2012. *Stevia Rebaudiana* Bertoni, Source of A High-Potency Natural

- Sweetener: A Comprehensive Review on The Biochemical, Nutritional and Functional Aspects, *Food Chemistry*.132:1121-1132.
- Madan, S., Sayeed Ahmad, G.N. Singh, K. Kohli, Y. Kumar, R. Singh, and M. Garg. 2010. Stevia rebaudiana (Bert.) Bertoni-A Review, *Indian Journal of Natural Product and Resources*.1 (3):267-286.
- Mar'in, A.P., Y.A. Shlyapnikov, A.Zh. Mahkamov, and A.T. Dzhalilov. 1992. Antagonism Between Phenolic Antioxidants and An Organic Acid (Abstracts), *Polymer Degradation and Stability*. 36(1): 1-4.
- Marxen, K., K.H. Vanselow, S. Lippemeier, R. Hintze, A. Ruser, and U-P. Hansen. 2007. Determination of DPPH Radical Oxidation Caused by Methanolic Extract of Some Microalgal Species by Linear Regression Analysis of Spectrophotometric Measurements, *Sensor*. 7:2080-2095.
- McDonald, P.D. Prenzler, M. Antolovich, and K. Robads. 2001. Phenolic Content and Antioxidant Activity of Olive Extracts, *Food Chemistry* 73: 73-84.
- Michałowicz, J., W. Duda. 2007. Phenol-Sources and Toxicity, Polish J. Environ. Stud. 16(3): 347-362.
- Mitchell, H. 2006. *Sweeteners and Sugar Alternatives in Food Technology*. UK: Blackwell Publishing, Ltd. p.342-345.
- Molyneux, P. 2004. The Use of The Stable Free Radical Diphenylpicrylhydrazyl (DPPH) for Estimating Antioxidant Activity, *Songklanakarin Journal of Science and Technology* 26(2): 211-219.
- Muhammad, T. 1983. *Pengukuran Derajat Kemanisan Gula Stevia dari Ekstraksi dengan Soxlet*. Bogor: Fakultas Teknologi Pertanian, Institut Pertanian Bogor dalam <http://dokumen.tips/documents/tugas-4-ekstraksi-stevia.html>. (15 September 2016) hal. 5-11.
- Nielsen, S. S. 2010. Food Analysis 4th ed, USA: Springer. <https://student.cc.uoc.gr/uploadFiles/184%CE%A7%CE%97%CE%9C068/Compositional%20Analysis%20of%20foods%20%20Food%20Analysis%20-%20S.S.%20Nielsen.pdf> (25 Mei 2017).
- Noor, E. dan F. Isdianti. 2013. Ultrafiltrasi Aliran Silang Untuk Pemurnian Gula Stevia, *Jurnal Teknologi Industri Pertanian*. 21 (2):73-80.

- Pallab, K., K.B. Tapan, K.P. Tapas, and K. Ramen. 2013. Estimation of Total Flavonoids Content (TFC) and Antioxidant Activities of Methanolic Whole Plant Extract of *Biophytum sensitivum* Linn, *Journal of Drug Delivery and Therapeutics*. 3 (4):33-37.
- Pazil, S.N.B.T. 2009. Perbandingan Aktifitas Antioksidan Ekstrak Daging Pisang Raja (*Musa AAB ‘Pisang Raja’*) dengan Vitamin A, Vitamin C, dan Katekin Melalui Penghitungan Bilangan Peroksida. *Skripsi S-1*, Fakultas Kedokteran. Universitas Indonesia.
- Pereira, V. P., Knor, F. J., Vellosa, J. C. R., and Beltrame, F. L. 2014. Determination of Phenolic Compounds and Antioxidant Activity of Green, Black, and White Tea of *Camellia sinensis* (L.) Kuntze, Theaceae. *Revista Brasilerira de Plantas Medicinais*. 16(3): 490-498.
- Pokorny, J., N. Yanishlieva, and M. Gordon. 2001. *Antioxidants in Food Pratical Applications*. New York: Woodhead Publishing Limited, p. 42-44.
- Preedy, V.R. 2012. *Caffeine Chemistry, Analysis, Functions and Effects*. Croydon, UK: The Royal Society of Chemistry, <https://books.google.co.id/books?id=HHGxK357LoIC&pg=PR4&lpg=PR4&dq=Caffeine+Chemistry.+Analysis.+Functions+and+Effects.+Croydon&source=bl&ots=rUNDrGjhPE&sig=j3qpdGplzG7eOXXpMqLXVF3AVco&hl=id&sa=X&ved=0ahUKEwj5oNqKrevRAhURT48KHY0qD0MQ6AEIIzAA#v=onepage&q=Caffeine%20Chemistry%20Analysis%20Functions%20and%20Effects.%20Croydon&f=false> (21 November 2016) hal 54-67.
- Preedy, V. R. 2013. *Tea in Health and Disease Prevention*. USA: Elsevier, p. 42-56; 80-87; 92-100.
- Rohdiana, D. 2009. *Teh ini Menyehatkan Telaah Ilmiah Populer*. Bandung: Alfabeta. hal. 9-17, 41-49, 70-74.
- Rorong, J. A., Sudiarso, B. Prasetya, J. P. Mandang, dan E. Suryanto. 2012. Analisis Fitokimia Limbah Pertanian Daun Cengklik (*Eugenia aromatic*) Sebagai Biosensitizer untuk Fotoreduksi Besi, *Prosiding Seminar Nasional Kimia Unesa*, Surabaya, 25 Februari 2012.
- Ruiz, J. C. R., Y. B. M. Ordóñez, A. M. Basto, and M. R. S. Campos. 2015. Antioxidant Capacity of Leaf Extracts from Two *Stevia rebaudiana* Bertoni Varieties Adapted to Cultivation in Mexico, *Nutricion Hospitalaria* 31(3): 1163-1170.

- Rukmana, H.R. 2003. *Budi Daya Stevia*. Yogyakarta: Kanisius, hal. 12, 30.
- Sandhiutami, N. 2013. Antioxidant Activity Test and Determination of Phenolic and Flavonoid Contents from Buah Merah (*Pandanus conoideus* LAM). http://dosen.univpancasila.ac.id/dosenfile/201021105813695040372_6May2013.pdf (21 November 2016).
- Sayuti, K., dan R. Yenrina. 2015. Antioksidan Alami dan Sintetik. Padang: Andalas University Press, hal.52. http://repository.unand.ac.id/23714/1/Kesuma%20Sayuti_Antioksidan%20Alami%20dan%20Sintetik%20OK.pdf (14 Januari 2017).
- Senthilkumar, S., P. Vasanthakumar, G. Thirumalaisamy, P. Sasikumar, M. Siva and R. Sureshkumar. 2015. Analysis of Feed Particle Fineness, *International Journal of Science, Environment and Technology*, 4 (4): 934–937.
- Setyamidjaja, D. 2000. *Teh Budi Daya dan Pengolahan Pasca Panen*. Kanisius: Yogyakarta, p. 122-140.
- Shock, C. 1982. *Experimental Cultivation of Reabudi's Stevia in California* (122). University of California. Davis: Agricultural Experiment Station. p. 250-258.
- Siah, W.M., H. Faridah, M.Z. Rahimah, S.M. Tahir, and D.M. Zain. 2011. Effects of Packaging Materials and Storage on Total Phenolic Content and Antioxidant Activity of *Centella asiatica* Drinks, *Journal of Tropical Agriculture and Food Science*. 39(1):1-7.
- Sigma Aldrich, 2013. Stevioside Analytical Standard, terdapat di dalam <http://www.sigmaaldrich.com/catalog/product/fluka/50956?lang=en®ion=ID> (28 November 2016).
- Sigma Aldrich, 2013. Rebaudioside A, terdapat di dalam <http://www.sigmaaldrich.com/catalog/product/sigma/01432?lang=en®ion=ID> (28 November 2016).
- Silalahi, J. 2006. *Makanan Fungsional*. Yogyakarta: Kanisius, p. 48-49.
- Sompong, R., S. Siebenhandl-Ehn, G. Linsberger-Martin, and E. Berghofer. 2011. Physicochemical and Antioxidative Properties of Red and Black Rice Varieties From Thailand, China and Sri Lanka, *Food Chemistry*. 124:132-140.

- Sulchan, M., dan E. Nur. 2007. Keamanan Pangan Kemasan Plastik dan Styrofoam, *Majalah Kedokteran Indonesia*. 57 (2):55.
- Suryohudoyo, P. 1993. *Oksidan, Antioksidan, dan Radikal Bebas*. <https://mhanafi123.files.wordpress.com/2012/07/oksidan-anti-oksidan-dan-radikal-bebas.pdf> (15 September 2016).
- Tapas, A. R., D. M. Sakarkar, and R. B. Kakde. 2008. Flavonoids as Nutracuetica;s: A Review, *Tropical Journal of Pharmaceutical Research* 7(3): 1089-1099.
- Thomas, J., and M. Glade. 2010. Stevia: It,s Not Just About Calories. *The Open Obesity Journal*, 2:101-109.
- Vesania, M.B. 2016. Pengaruh Penambahan Bubuk Daun *Stevia rebaudiana* (Bertoni) terhadap Komposisi Fitokimia dan Aktivitas Antioksidan Minuman Teh Hitam, *Skripsi S-1*, Fakultas Teknologi Pertanian UKWMS, Surabaya. <http://repository.wima.ac.id/id/eprint/6893> (29 Oktober 2016).
- Widyawati, P. S. 2011. Aktivitas Antioksidan Ekstrak Metanolik Daun Beluntas (*Pluchea indica* Less) dan Fraksinya serta Kemampuan Mencegah Warmed Over Flavor pada Daging Itik yang telah Dipanaskan, *Disertasi S-3*, Institus Pertanian Bogor, Bogor.
- Wijaya, A.P.H. 2002. Pembuatan Sirup Teh Hijau (Green Tea) Rendah Kalori, *Skripsi S-1*. Bogor: Institut Pertanian Bogor. <http://repository.ipb.ac.id/bitstream/handle/123456789/14773/A02apw.pdf?sequence=2> (29 Oktober 2016).
- Winarsi, H. 2007. *Antioksidan Alami dan Radikal Bebas*. Yogyakarta: Kanisius, p. 11-20.
- Winarti, S. 2006. *Minuman Kesehatan*. Surabaya: Tribus Agrisarana, hal. 5.
- Windono, T., Hendrajaya, K., Nurfatmawati, H., dan Soraya. 2001. Uji Peredam Radikal Bebas terhadap *1,1-Diphenyl-2-Picrylhydrazyl* (DPPH) dari Ekstrak Kulit Buah dan Biji Anggur (*Vitis vinifera* L.) Probolinggo Biru dan Bali. *Artikel Penelitian Artocarpus*. 1:34-43.
- Wuryantoro, H., dan W.H. Susanto. 2014. Penyusunan Standard Operating Procedures Industri Rumah Tangga Pangan Pemanis Alami Instan Sari Stevia (*Stevia Rebaudiana*), *Jurnal Pangan dan Agroindustri*. 2 (3):76-87.

- Yamaguchi, T., Takamura, H., Matoba, T., and Terao. 1998. HPLC Method for Evaluation of The Free Radical-Scavenging Activity of Foods by Using *1,1,-Diphenyl-2-Picrylhydrazyl*, *Bioscience. Biotechnology. Biochemistry.* 62:1201–1204.
- Yu, L. 2008. *Wheat Antioxidants*. New Jersey: John Wiley & Sons, Inc., p:31.
- Zhen, Y. S. 2002. *Tea Bioactivity and Therapeutic Potential*. New York: Taylor and Francis, p. 5-42.
- Zukiewicz-Koc, W. and J. Kalbarczyk.2007. Influence of Storage on The Quality of Natural Antioxidants in Fruit Beverages, *Polish Journal of Food and Nutrition Sciences*. 57(2):223-225.