

## DAFTAR PUSTAKA

- Abdolshahi, A., Majd, M.H., Rad, J.S., Taheri, M., dan Shabani, A. 2015, Choice of solvent extraction technique affects fatty acid composition of pistachio (*Pistacia vera L.*) oil, *Journal of food science and technology*, **52**: 2422–242.
- Abdullah, S., Mudalip, S.K.A., Shaarani, S.Md., dan Pi, N.A.C. 2010, Ultrasonic Extraction of Oil from *Monopterus albus*: Effects of Different Ultrasonic Power, Solvent Volume and Sonication Time, *Journal of Applied Sciences*, **10**: 2713–2716.
- Ackman, R.G. 1982, *Fatty Acid Composition in Fish Oil*, Academic Press, London.
- Afolabi, H.K., Mudalip, S.K.A., dan Alara, O.R. 2018, Microwave-assisted extraction and characterization of fatty acid from eel fish (*Monopterus albus*), *Beni-Suef University Journal of Basic and Applied Sciences*, **7**: 465–470.
- Aliaño-González, M.J., Ferreiro-González, M., Espada-Bellido, E., Palma, M., dan F. Barbero, G. 2019. A Screening Method Based on Headspace-Ion Mobility Spectrometry to Identify Adulterated Honey, *Sensors*, **19**: 1621.
- Ano, A.A.R.R., Koffi, E.N., Kassi, B.B., dan AninAtchibri, L.O. 2019, Effect Of Solvent And Press Extractions On Physicochemical Properties Of Oil Extracted From Dacryodesedulis Fruit, *Asian Journal of Science and Technology*, **10**: 9559–9964.
- AOAC, 2006, *Official Methods of Analysis of AOAC International*, 18<sup>th</sup> edition, AOAC International, Washington DC.
- AOAC, 2016, *Official Methods of Analysis of AOAC International*, AOAC, USA.
- AOCS, 2005, *The Official Methods and Recommended Practices of the AOCS*, 5<sup>th</sup> edition, American Oil Chemist, USA.
- Arifianto, T.B. 2014, 'Karakterisasi Bahan dan Optimasi Esktraksi Minyak Ikan dari by-product Ikan Patin (*Pangasius hypophthalmus*)', *Tesis*, M.Sc. Institut Pertanian Bogor, Bogor.
- Armenta, S., Garrigues, S., dan de la Guardia, M. 2007, Determination of edible oil parameters by near infrared spectrometry, *Analytica Chimica Acta*, **596**: 330–337.
- Babcock, R.E., Clausen, E.C., Popp, M., dan Schulte, W.B. 2007, 'Yield Characteristics of Biodiesel Produced from Chicken Fat-Tall Oil Blended Feedstocks', *Completion Report Project*, Mack-Blackwell Rural Transportation Center: Fayetteville, USA.

- Ballabio, D. dan Todeschini, R.. 2009, Multivariate classification for qualitative analysis, dalam: *In. D. W.Sun (Ed). Infrared Spectroscopy for Food Quality Analysis and Control*. Elsevier, London, hal. 83–104.
- Basheer, A.S., Siddiqui, A., Paudel, Y.N., Hassan, Md.Q., Imran, Mohd., Najmi, A.K., dkk. 2017, Hepatoprotective and antioxidant effects of fish oil on isoniazid-rifampin induced hepatotoxicity in rats, *PharmaNutrition*, **5**: 29–33.
- Ben Haoua, K. dan Lanez, T. 2018. Evaluation of the antioxidant activity of potatoes by radical scavenging activity Using  $O_2^-$  and DPPH, *Journal of Fundamental and Applied Sciences*, **10**: 168.
- Besbes, S., Blecker, C., Deroanne, C., Lognay, G., Drira, N.E., dan Attia, H., 2004. Quality Characteristics and Oxidative Stability of Date Seed Oil During Storage. *Food Science and Technology International*, **10**: 333–338.
- Biancarosa, I., Espe, M., Bruckner, C.G., Heesch, S., Liland, N., Waagbø, R., dkk., 2017. Amino acid composition, protein content, and nitrogen-to-protein conversion factors of 21 seaweed species from Norwegian waters. *Journal of Applied Phycology*, **29**: 1001–1009.
- Bisenius, S., Neuhaus, H., Effkemann, S., Heemken, O., Bartelt, E., Lang, T., dkk., 2020. Composition of herring and cod fillets from the North and the Baltic Sea – Detecting added water. *Food Control*, **107**: 106766.
- Brereton, R.G., 2003. *Chemometrics: Data Analysis for the Laboratory and Chemical Plant*. John Wiley & Sons., Inggris.
- Brown, M.E., 1988. Differential thermal analysis (DTA) and differential scanning calorimetry (DSC)., dalam: *In Introduction to Thermal Analysis*. Springer, Dordrecht, hal. 23–49.
- Caponio, F., Summo, C., Pasqualone, A., dan Gomes, T., 2011. Fatty acid composition and degradation level of the oils used in canned fish as a function of the different types of fish. *Journal of Food Composition and Analysis*, **24**:1117–1122.
- Carrera, C., Ruiz-Rodríguez, A., Palma, M., dan Barroso, C.G., 2012. Ultrasound assisted extraction of phenolic compounds from grapes. *Analytica Chimica Acta*, **732**:100–104.
- Cavanna, D., Zanardi, S., Dall’Asta, C., dan Suman, M., 2019. Ion Mobility Spectrometry coupled to Gas Chromatography: a rapid tool to assess eggs freshness. *Food chemistry*, **271**:691–696.

- Cebula, D.J. dan Smith, K.W., 1992. Differential Scanning Calorimetry of Confectionery Fats: Part II- Effects of Blends and Minor Components, *Journal of the American Oil Chemists' Society*, **69**:992-998.
- Che Man, Y.B., Syahriza, Z.A., Rohman, A., dan Oliver, J.R., 2010. Chapter 1 - Fourier transform infrared (FTIR) spectroscopy: development, techniques, and application in the analyses of fats and oils, dalam: *Fourier Transform Infrared Spectroscopy*. Nova Science Publishers, New York, hal. 1–36.
- Chemat, F., Rombaut, N., Sicaire, A.-G., Meullemiestre, A., Fabiano-Tixier, A.-S., dan Abert-Vian, M. 2017, Ultrasound assisted extraction of food and natural products. Mechanisms, techniques, combinations, protocols and applications. A review. *Ultrasonics Sonochemistry*, **34**:540–560.
- Chiavaro, E., Vittadini, E., Rodriguez-Estrada, M.T., Cerretani, L., dan Bendini, A., 2008. Differential scanning calorimeter application to the detection of refined hazelnut oil in extra virgin olive oil. *Food Chemistry*, **110**:248–256.
- Chimsook, T. dan Wannalangka, W., 2015. Effect of Microwave Pretreatment on Extraction Yield and Quality of Catfish Oil in Northern Thailand. *MATEC Web of Conferences*, **35**: 04001.
- Christy, A.A., Kasemsumran, S., Du, Y., dan Ozaki, Y., 2004. The Detection and Quantification of Adulteration in Olive Oil by Near-Infrared Spectroscopy and Chemometrics. *Analytical Sciences*, **20**:935–940.
- Clark, J.M., Daum, K.A., dan Kalivas, J.H., 2003. Demonstrated Potential of Ion Mobility Spectrometry for Detection of Adulterated Perfumes and Plant Speciation. *Analytical Letters*, **36**:215–244.
- Clodoveo, M.L., Durante, V., dan La Notte, D., 2013. Working towards the development of innovative ultrasound equipment for the extraction of virgin olive oil. *Ultrasonics Sonochemistry*, **20**:1261–1270.
- Codex, 1999. 'Codex Standard for Named Vegetable Oils (CODEX-STAN 210 - 1999)', URL: <http://www.fao.org/3/y2774e/y2774e04.html> (diakses tanggal 22/07/2021)
- Codex, 2017. 'Standard for Fish Oils CXS FOR 329-2017', URL: [www.codexalimentarius.org](http://www.codexalimentarius.org) (diakses tanggal 22/3/2019).
- Cohn, J.S., 2002. Oxidized fat in the diet, postprandial lipaemia and cardiovascular disease. *Current Opinion in Lipidology*, 13:19–24.
- Connor, W.E., 2000. Importance of n–3 fatty acids in health and disease, *The American journal of clinical nutrition*, **71**:171S-175S.

- Contreras, M. del M., Arroyo-Manzanares, N., Arce, C., dan Arce, L., 2019. HS-GC-IMS and chemometric data treatment for food authenticity assessment: Olive oil mapping and classification through two different devices as an example. *Food Control*, **98**:82–93.
- Costa, D. dos S.V. dan Bragagnolo, N., 2017. Development and validation of a novel microwave assisted extraction method for fish lipids: Novel microwave assisted extraction method for fish lipids. *European Journal of Lipid Science and Technology*, **119**: 1600108.
- Criado-García, L., Arce, L., dan Valcárcel, M., 2016. Solid phase extraction to enhance sensitivity when headspace-gas chromatography-ion mobility spectrometer is used: determination of phenol in environmental samples. *Analytical Methods*, **8**:5388–5397.
- Da Porto, C., Porretto, E., dan Decorti, D., 2013. Comparison of ultrasound-assisted extraction with conventional extraction methods of oil and polyphenols from grape (*Vitis vinifera* L.) seeds. *Ultrasonics Sonochemistry*, **20**: 1076–1080.
- Dzah, C.S., Duan, Y., Zhang, H., Wen, C., Zhang, J., Chen, J., dan Ma, H., 2020. The effects of ultrasound assisted extraction on yield, antioxidant, anticancer and antimicrobial activity of polyphenol extracts: A review. *Food Bioscience*, **35**: 1-9
- Eiceman, G.A., 2002. Ion-mobility spectrometry as a fast monitor of chemical composition. *Trends in Analytical Chemistry*, **21**: 259–275.
- Eiceman, G.A., Lee, G., Menlyadiev, M., Fowler, P.E., Pasupuleti, D., Holopainen, S., dkk., 2019. Tandem Mobility Spectrometry at Ambient Pressure, dalam: *Comprehensive Analytical Chemistry*. Elsevier, hal. 23–50.
- Elzey, B., Pollard, D., dan Fakayode, S.O., 2016. Determination of adulterated neem and flaxseed oil compositions by FTIR spectroscopy and multivariate regression analysis. *Food Control*, **68**: 303–309.
- Emwas, A.-H.M., Al-Talla, Z.A., Yang, Y., dan Kharbatia, N.M., 2015. Gas Chromatography–Mass Spectrometry of Biofluids and Extracts, dalam: Bjerrum, J.T. (Editor), *Metabonomics, Methods in Molecular Biology*. Springer New York, New York, NY, hal. 91–112.
- Espada-Bellido, E., Ferreiro-González, M., Carrera, C., Palma, M., Barroso, C.G., dan Barbero, G.F., 2017. Optimization of the ultrasound-assisted extraction of anthocyanins and total phenolic compounds in mulberry (*Morus nigra*) pulp. *Food Chemistry*, **219**: 23–32.
- Eskilsson, C. S., dan Björklund, E., 2000. Analytical-scale microwave-assisted extraction. *Journal of Chromatography*, **902**:227-250

- Fadzlillah, N.A., Che Man, Y.B., dan Rohman, A., 2014. FTIR Spectroscopy Combined with Chemometric for Analysis of Sesame Oil Adulterated with Corn Oil. *International Journal of Food Properties*, **17**: 1275–1282.
- Fang, Y.-R., Yeh, Y., dan Liu, H.-S., 2018. A novel strategy of biodiesel production from wet microalgae by direct saponification–esterification conversion (DSEC). *Journal of the Taiwan Institute of Chemical Engineers*, **83**: 23–31.
- Ferrari, C., Angiuli, M., Tombari, E., Righetti, M.C., Matteoli, E., dan Salvetti, G., 2007. Promoting calorimetry for olive oil authentication. *Thermochimica Acta*, **459**: 58–63.
- Ferreiro-González, M., Espada-Bellido, E., Guillén-Cueto, L., Palma, M., Barroso, C.G., dan Barbero, G.F., 2018. Rapid quantification of honey adulteration by visible-near infrared spectroscopy combined with chemometrics. *Talanta*, **188**: 288–292.
- Flores, G., Ruiz del Castillo, M.L., Herraiz, M., dan Blanch, G.P., 2006. Study of the adulteration of olive oil with hazelnut oil by on-line coupled high performance liquid chromatographic and gas chromatographic analysis of filbertone. *Food Chemistry*, **97**: 742–749.
- Forgács, E. dan Cserhádi, T., 2003. Gas chromatography, dalam: *Food Authenticity and Traceability*. Elsevier, hal. 197–217.
- Gabelica, V. dan Marklund, E., 2018. Fundamentals of ion mobility spectrometry. *Current Opinion in Chemical Biology*, **42**: 51–59.
- Garrido-Delgado, R., Eugenia Muñoz-Pérez, Ma., dan Arce, L., 2018. Detection of adulteration in extra virgin olive oils by using UV-IMS and chemometric analysis. *Food Control*, **85**: 292–299.
- Gedi, M.A., Bakar, J., dan Mariod, A.A., 2015. Optimization of supercritical carbon dioxide (CO<sub>2</sub>) extraction of sardine (*Sardinella lemuru* Bleeker) oil using response surface methodology (RSM). *Grasas y Aceites*, **66**: e074.
- Gerhardt, N., Birkenmeier, M., Sanders, D., Rohn, S., dan Weller, P., 2017. Resolution-optimized headspace gas chromatography-ion mobility spectrometry (HS-GC-IMS) for non-targeted olive oil profiling. *Analytical and Bioanalytical Chemistry*, **409**: 3933–3942.
- Gerhardt, N., Birkenmeier, M., Schwolow, S., Rohn, S., dan Weller, P., 2018. Volatile-Compound Fingerprinting by Headspace-Gas-Chromatography Ion-Mobility Spectrometry (HS-GC-IMS) as a Benchtop Alternative to <sup>1</sup>H NMR Profiling for Assessment of the Authenticity of Honey. *Analytical Chemistry*, **90**: 1777–1785.

- Ghobadi, S., Akhlaghi, M., Shams, S., dan Mazloomi, S.M., 2018. Acid and Peroxide Values and Total Polar Compounds of Frying Oils in Fast Food Restaurants of Shiraz, Southern Iran. *International Journal of Nutrition Sciences*, **1**: 25–30.
- Gill, S.S. dan Tuteja, N., 2010. Reactive oxygen species and antioxidant machinery in abiotic stress tolerance in crop plants. *Plant Physiology and Biochemistry*, **48**: 909–930.
- Gómez-Ordóñez, E. dan Rupérez, P., 2011. FTIR-ATR spectroscopy as a tool for polysaccharide identification in edible brown and red seaweeds. *Food Hydrocolloids*, **25**: 1514–1520.
- Goula, A.M., 2013. Ultrasound-assisted extraction of pomegranate seed oil – Kinetic modeling. *Journal of Food Engineering*, **117**: 492–498.
- Granato, D., Katayama, F.C.U., dan Castro, I.A., 2010. Assessing the association between phenolic compounds and the antioxidant activity of Brazilian red wines using chemometrics. *LWT - Food Science and Technology*, **43**: 1542–1549.
- Grob, R.L. dan Barry, E.F., 2004. *Modern Practice of Gas Chromatography*. John Wiley & Sons, New York.
- Guil-Guerrero, J.L., Venegas-Venegas, E., Rincón-Cervera, M.Á., dan Suárez, M.D., 2011. Fatty acid profiles of livers from selected marine fish species. *Journal of Food Composition and Analysis*, **24**: 217–222.
- Guillén, M.D. dan Cabo, N., 1997. Characterization of edible oils and lard by fourier transform infrared spectroscopy. Relationships between composition and frequency of concrete bands in the fingerprint region. *Journal of the American Oil Chemists' Society*, **74**: 1281–1286.
- Guillén, M.D. dan Cabo, N., 1999. Usefulness of the Frequency Data of the Fourier Transform Infrared Spectra To Evaluate the Degree of Oxidation of Edible Oils. *Journal of Agricultural and Food Chemistry*, **47**: 709–719.
- Gülçin, İ., Elmastaş, M., dan Aboul-Enein, H.Y., 2012. Antioxidant activity of clove oil – A powerful antioxidant source. *Arabian Journal of Chemistry*, **5**: 489–499.
- Guntarti, A., Rohman, A., Martono, S., dan Yuswanto, A., 2017. Authentication of Wild Boar Meat in Meatball Formulation Using Differential Scanning Calorimetry and Chemometrics, *Journal of Food and Pharmaceutical Sciences*, **5**: 8-12.

- Gurdeniz, G. dan Ozen, B., 2009. Detection of adulteration of extra-virgin olive oil by chemometric analysis of mid-infrared spectral data. *Food Chemistry*, **116**: 519–525.
- Gutte, K.B., Sahoo, A.K., dan Ranveer, R.C., 2015. Effect of ultrasonic treatment on extraction and fatty acid profile of flaxseed oil. *OCL*, **22**: D606.
- Hashim, R.B., Jamil, E.F., Zulkipli, F.H., dan Daud, J.M., 2015. Fatty Acid Compositions of Silver Catfish, *Pangasius* sp. Farmed in Several Rivers of Pahang, Malaysia. *Journal of Oleo Science*, **64**: 205–209.
- Hastarini, E., 2012. 'Karakteristik Minyak Ikan dari Limbah Pengolahan Filet Ikan Patin Siam (*Pangasius hypophthalmus*) dan Patin Jambal (*Pangasius djambal*)', *Disertasi*, Dr., Institut Pertanian Bogor, Bogor.
- Hayati, I.N., Man, Y.B.C., Tan, C.P., dan Aini, I.N., 2005. Monitoring peroxide value in oxidized emulsions by Fourier transform infrared spectroscopy. *European Journal of Lipid Science and Technology*, **107**: 886–895.
- Hof, M., 2005. Basics of Optical Spectroscopy, dalam: Gauglitz, G. dan Vo-Dinh, T. (Editor), *Handbook of Spectroscopy*. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, FRG, hal. 37–47.
- Hu, K., Huyan, Z., Geng, Q., dan Yu, X., 2019. Rapid Determination of Acid Value of Edible Oils via FTIR Spectroscopy Using Infrared Quartz Cuvette. *Journal of Oleo Science*, **68**: 121–129.
- Huang, D., Ou, B., dan Prior, R.L., 2005. The Chemistry behind Antioxidant Capacity Assays. *Journal of Agricultural and Food Chemistry*, **53**: 1841–1856.
- Indriyani, L., 2015. 'Karakterisasi dan Autentikasi Minyak Daging Buah Alpukat (*Persea Americana* Mill.) Menggunakan Differential Scanning Calorimetry dan Analisis Multivariat', *Disertasi*, Dr., Universitas Gadjah Mada, Yogyakarta.
- Innis, S.M., 2000. Essential fatty acids in infant nutrition: lessons and limitations from animal studies in relation to studies on infant fatty acid requirements, *The American journal of clinical nutrition*, **71**:238S-244S
- Irnawati, Riyanto, S., Martono, S., dan Rohman, A., 2019. The employment of FTIR spectroscopy and chemometrics for authentication of pumpkin seed oil from sesame oil. *Food Research*, **4**: 42–48.
- Isnani, A.N., 2013. 'Ekstraksi dan Karakterisasi Minyak Ikan Patin yang diberi Pakan Pellet dicampur Probiotik', *Skripsi*, Universitas Jember, Jember.

- Izzati, I.N., Zainab, H., Nornadhiratulhusna, M., Hann, Y.C., Syairah, A.S.K., dan Farzana, S.A., 2018. Extraction and Production of Omega-3 from UniMAP Puyu (Jade Perch) and Mackarel. *IOP Conference Series: Materials Science and Engineering*, **318**: 012018.
- Jalili, F., Jafari, S.M., Emam-Djomeh, Z., Malekjani, N., dan Farzaneh, V., 2018. Optimization of Ultrasound-Assisted Extraction of Oil from Canola Seeds with the Use of Response Surface Methodology. *Food Analytical Methods*, **11**: 598–612.
- Janporn, S., Ho, C.-T., Chavasit, V., Pan, M.-H., Chittrakorn, S., Ruttarattanamongkol, K., dkk., 2015. Physicochemical properties of Terminalia catappa seed oil as a novel dietary lipid source. *Journal of Food and Drug Analysis*, **23**: 201–209.
- Jemai, H., El Feki, A., dan Sayadi, S., 2009. Antidiabetic and Antioxidant Effects of Hydroxytyrosol and Oleuropein from Olive Leaves in Alloxan-Diabetic Rats. *Journal of Agricultural and Food Chemistry*, **57**: 8798–8804.
- Jiang, J., Dou, X., Zhang, L., Mao, J., Yu, L., Ma, F., dkk., 2020. Rapid authentication of sesame oil using ion mobility spectrometry and chemometrics. *Oil Crop Science*, **5**: 161–165.
- Jiang, X., Li, S., Xiang, G., Li, Q., Fan, L., He, L., dkk., 2016. Determination of the acid values of edible oils via FTIR spectroscopy based on the OH stretching band. *Food Chemistry*, **212**: 585–589.
- Jicha, G.A. dan Markesbery, W.R., 2010. Omega-3 fatty acids: potential role in the management of early Alzheimer's disease. *Clinical interventions in aging*, **5**: 45.
- Kamini, 2017. 'Produksi Dan Peningkatan Mutu Minyak Ikan Dari Lemak Jeroan Hasil Sampung Industri Pengolahan Patin Siam (Pangasius hypophthalmus)', *Tesis*, M.S. Institut Pertanian Bogor, Bogor.
- Karakaya, S. dan Şimşek, Ş., 2011. Changes in Total Polar Compounds, Peroxide Value, Total Phenols and Antioxidant Activity of Various Oils Used in Deep Fat Frying. *Journal of the American Oil Chemists' Society*, **88**: 1361–1366.
- Kemit, N., Widarta, I.W.R.W., dan Nociamitri, K.A., 2017. Pengaruh Jenis Pelarut dan Waktu Maserasi terhadap Kandungan Senyawa Flavonoid dan Aktivitas Antioksidan Ekstrak Daun Alpukat (*Persea americana* mill). *Jurnal Ilmu dan Teknologi Pangan*, **5**: 130–141.
- Khan, M.K., Abert-Vian, M., Fabiano-Tixier, A.-S., Dangles, O., dan Chemat, F., 2010. Ultrasound-assisted extraction of polyphenols (flavanone glycosides) from orange (*Citrus sinensis* L.) peel. *Food Chemistry*, **119**: 851–858.

- Klaypradit, W., Kerdpiboon, S., dan Singh, R.K., 2011. Application of Artificial Neural Networks to Predict the Oxidation of Menhaden Fish Oil Obtained from Fourier Transform Infrared Spectroscopy Method. *Food and Bioprocess Technology*, **4**: 475–480.
- Koley, T.K., Singh, S., Khemariya, P., Sarkar, A., Kaur, C., Chaurasia, S.N.S., dkk., 2014. Evaluation of bioactive properties of Indian carrot (*Daucus carota* L.): A chemometric approach. *Food Research International*, **60**: 76–85.
- Kordi, M.G.H.K., 2010. *Budidaya Ikan Patin di Kolam Terpal*. Penerbit Andi, Yogyakarta.
- Kottelat, M. dan Whitten, T., 1993. *Freshwater Fishes of Western Indonesia and Sulawesi*. Periplus Editions, Hongkong.
- Kumalaningsih, S., 2006. *Antioksidan alami: penangkal radikal bebas*. Trubus Agrisarana, Surabaya.
- Lavine, B. dan Workman, J., 2008. Chemometrics. *Analytical Chemistry*, **80**: 4519–4531.
- Lee, J., Lee, H., Kang, S., dan Park, W., 2016. Fatty Acid Desaturases, Polyunsaturated Fatty Acid Regulation, and Biotechnological Advances. *Nutrients*, **8**: 23.
- Li, B., Wang, H., Zhao, Q., Ouyang, J., dan Wu, Y., 2015a. Rapid detection of authenticity and adulteration of walnut oil by FTIR and fluorescence spectroscopy: A comparative study. *Food Chemistry*, **181**: 25–30.
- Li, B., Wang, H., Zhao, Q., Ouyang, J., dan Wu, Y., 2015b. Rapid detection of authenticity and adulteration of walnut oil by FTIR and fluorescence spectroscopy: A comparative study. *Food Chemistry*, **181**: 25–30.
- Li, H., Ma, X., Wang, S., dan Song, X., 2013. Production of sophorolipids with eicosapentaenoic acid and docosahexaenoic acid from *Wickerhamiella domercqiae* var. *sophorolipid* using fish oil as a hydrophobic carbon source. *Biotechnology Letters*, **35**: 901–908.
- Li, H., Pordesimo, L., dan Weiss, J., 2004. High intensity ultrasound-assisted extraction of oil from soybeans. *Food Research International*, **37**: 731–738.
- Li, X., Cao, J., Bai, X., dan Zhang, F., 2018. Chemical composition and thermal properties of Tilapia oil extracted by different methods. *International Journal of Food Properties*, **21**: 1575–1585.
- Liang, N. dan Kitts, D., 2014. Antioxidant Property of Coffee Components: Assessment of Methods that Define Mechanisms of Action. *Molecules*, **19**: 19180–19208.

- Liedtke, S., Seifert, L., Ahlmann, N., Hariharan, C., Franzke, J., dan Vautz, W., 2018. Coupling laser desorption with gas chromatography and ion mobility spectrometry for improved olive oil characterisation. *Food Chemistry*, **255**: 323–331.
- Linder, M., Fanni, J., dan Parmentier, M., 2005. Proteolytic Extraction of Salmon Oil and PUFA Concentration by Lipases. *Marine Biotechnology*, **7**: 70–76.
- Liu, Lingyi, Hu, C., Liu, Lianliang, Zhang, S., Chen, K., dan He, D., 2017. Rapid detection and separation of olive oil and *Camellia* oil based on ion mobility spectrometry fingerprints and chemometric models: Rapid separation of olive oil and *Camellia* oil by IMS. *European Journal of Lipid Science and Technology*, **119**: 1500463.
- Maggio, R.M., Cerretani, L., Barnaba, C., dan Chiavaro, E., 2012. Application of Differential Scanning Calorimetry-Chemometric Coupled Procedure to the Evaluation of Thermo-Oxidation on Extra Virgin Olive Oil. *Food Biophysics*, **7**: 114–123.
- Mahyuddin, K., 2010. *Panduan Lengkap Agribisnis Patin*. PT Niaga Swadaya.
- Mansor, T.S.T., Che Man, Y.B., dan Shuhaimi, M., 2012. Employment of Differential Scanning Calorimetry in Detecting Lard Adulteration in Virgin Coconut Oil. *Journal of the American Oil Chemists' Society*, **89**: 485–496.
- Manthey-Karl, M., Lehmann, I., Ostermeyer, U., dan Schröder, U., 2016. Natural Chemical Composition of Commercial Fish Species: Characterisation of Pangasius, Wild and Farmed Turbot and Barramundi. *Foods*, **5**: 1-14.
- Medina, A.L., da Silva, M.A.O., de Sousa Barbosa, H., Arruda, M.A.Z., Marsaioli, A., dan Bragagnolo, N., 2015. Rapid microwave assisted extraction of meat lipids. *Food Research International*, **78**: 124–130.
- Miller, J.N. dan Miller, J.C., 2005. *Statistics and Chemometrics for Analytical Chemistry*. Pearson Education, Essex.
- Miller, J.N. dan Miller, J.C., 2010. *Statistics and Chemometrics for Analytical Chemistry*, 6<sup>th</sup> edition. Prentice Hall, Harlow.
- Mohammadpour, H., Sadrameli, S.M., Eslami, F., dan Asoodeh, A., 2019. Optimization of ultrasound-assisted extraction of *Moringa peregrina* oil with response surface methodology and comparison with Soxhlet method. *Industrial Crops and Products*, **131**: 106–116.
- Molla, R., Asaduzzaman, A.K.M., Mia, A.R., Zeb, A., dan Uddin, S., 2015. Extraction and Characterization of Oil and Lecithin from Boal (Wallago attu) Fish. *Journal of Food and Nutrition Research*, **3**: 661-666.

- Mudalip, S.K.A., Yunus, R.M., Embong, A., Abdullah, S., Sulaiman, S.Z., dan Man, R.C., 2010. 'Extraction of fish oil from *Parexocoetus brachypterus* (flying fish) via soxhlet extraction method', . Dipresentasikan pada Regional Seminar on Science, Technology and Social Sciences Ms Garden Kuantan, hal. 7.
- Nisa, F. Z., Probosari, E., dan Fitranti, D. Y., 2017. Hubungan asupan omega-3 dan omega-6 dengan kadar trigliserida pada remaja 15-18 tahun, *Disertasi*, Dr, Universitas Diponegoro, Semarang.
- Oktavianawati, I., Andinata, D., Isnaeni, A.N., dan Winata, I.N.A., 2014. 'Characteristics of Fish Oil from Patin Fish (*Pangasius Djambal*) Extracted By Dry and Wet Rendering Methods', *Proceeding of International Seminar on Science and Technology*, pp. 103-106.
- Orsat, V. dan Routray, W., 2017. Microwave-Assisted Extraction of Flavonoids, dalam: *Water Extraction of Bioactive Compounds*. Elsevier, hal. 221–244.
- Ortega-Ortega, M. de los A., Cruz-Cansino, N. del S., Alanís-García, E., Delgado-Olivares, L., Ariza-Ortega, J.A., Ramírez-Moreno, E., dkk., 2017. Optimization of Ultrasound Extraction of Cactus Pear (*Opuntia ficus indica*) Seed Oil Based on Antioxidant Activity and Evaluation of Its Antimicrobial Activity. *Journal of Food Quality*, **2017**: 1–9.
- Otto, M., 2007. Chemometrics: Statistic and Computer Application, dalam: *Analytical Chemistry 2nd and Enlarged Edition*. Wiley-VCH GmnH & Co., Weinheim.
- Ozulku, G., Yildirim, R.M., Toker, O.S., Karasu, S., dan Durak, M.Z., 2017. Rapid detection of adulteration of cold pressed sesame oil adulterated with hazelnut, canola, and sunflower oils using ATR-FTIR spectroscopy combined with chemometric. *Food Control*, **82**: 212–216.
- Pak, C.S., 2005. Stability and quality of fish oil during typical domestic application. *Final Project. Wonsan University of fisheries Kangwon Province, DPR of Korea*.
- Panagan, A.T., Yohandini, H., dan Gultom, J.U., 2011. Analisis kualitatif dan kuantitatif asam lemak tak jenuh omega-3 dari minyak ikan patin (*Pangasius pangasius*) dengan metoda kromatografi gas. *Jurnal Penelitian Sains*, **14**:38-42 .
- Park, J.R. dan Lee, D.-S., 2003. Detection of Adulteration in Olive Oils Using Triacylglycerols Compositions by High Temperature Gas Chromatography. *Bulletin of the Korean Chemical Society*, **24**: 527–530.

- Pavia, D.L. (Editor), 2009. *Introduction to Spectroscopy*, 4th ed. ed. Brooks/Cole, Cengage Learning, Belmont, CA.
- Popović, B.M., Štajner, D., Ždero, R., Orlović, S., dan Galić, Z., 2013. Antioxidant characterization of oak extracts combining spectrophotometric assays and chemometrics. *The Scientific World Journal*, **2013**:1-8 .
- Putri, S.P., Jumhawan, U., dan Fukusaki, 2015. Application of GC/MS and GC/FID-based metabolomics for authentication of Asian palm civet coffee (Kopi Luwak). *Journal of Bioscience and Bioengineering*, **120**: 33–41.
- Ramalhos, M.J., Paíga, P., Morais, S., Rui Alves, M., Delerue-Matos, C., dan Oliveira, M.B.P.P., 2012. Lipid content of frozen fish: Comparison of different extraction methods and variability during freezing storage. *Food Chemistry*, **131**: 328–336.
- Reid, L.M., O'Donnell, C.P., dan Downey, G., 2006. Recent technological advances for the determination of food authenticity. *Trends in Food Science & Technology*, **17**: 344–353.
- Revelou, p.K., Xagoraris, M., Alexandropoulou, A., dan Kanakis, C.D., 2021. Chemometric Study of Fatty Acid Composition of Virgin Olive Oil from Four Widespread Greek Cultivars. *Molecules*, **26**: 1-13
- Rohman, A. dan Che Man, Y.B., 2011. The use of Fourier transform mid infrared (FT-MIR) spectroscopy for detection and quantification of adulteration in virgin coconut oil. *Food Chemistry*, **129**: 583–588.
- Rohman, A. dan Che Man, Y.B., 2013. Application of FTIR Spectroscopy for Monitoring the Stabilities of Selected Vegetable Oils During Thermal Oxidation. *International Journal of Food Properties*, **16**: 1594–1603.
- Rohman, A. dan Che Man, Y.B.C., 2010. Fourier transform infrared (FTIR) spectroscopy for analysis of extra virgin olive oil adulterated with palm oil. *Food Research International*, **43**: 886–892.
- Rohman, A. dan Man, Y.B.C., 2011. Palm oil analysis in adulterated sesame oil using chromatography and FTIR spectroscopy. *European Journal of Lipid Science and Technology*, **113**: 522–527.
- Rohman, A. dan Man, Y.B.C., 2012. The chemometrics approach applied to FTIR spectral data for the analysis of rice bran oil in extra virgin olive oil. *Chemometrics and Intelligent Laboratory Systems*, **110**: 129–134.
- Rohman, A., Riyanto, S., Sasi, A.M., dan Yusof, F.Mohd., 2014. The use of FTIR spectroscopy in combination with chemometrics for the authentication of red fruit (*Pandanus conoideus* Lam) oil from sunflower and palm oils. *Food Bioscience*, **7**: 64–70.

- Rohman, A. dan Sumantri, 2013. *Analisis makanan*. UGM PRESS, Yogyakarta.
- Rohman, A., Triyasmono, L., Riyanto, S., dan Andina, L., 2015. Rapid Determination of Saponification Value in Red Fruit Oil by Infrared Spectroscopy and Partial Least Square Calibration. *Research Journal of Medicinal Plant*, **9**: 442–448.
- Rojas, R., Castro-López, C., Sánchez-Alejo, E.J., Niño-Medina, G., dan Martínez-Ávila, G.C.G., 2016. Phenolic Compound Recovery from Grape Fruit and By- Products: An Overview of Extraction Methods, dalam: Morata, A. dan Loira, I. (Editor), *Grape and Wine Biotechnology*. InTech.
- Romía, M.B. dan Bernàrdez, M.A., 2009. Chapter 3 - Multivariate Calibration for Quantitative Analysis, dalam: *Infrared Spectroscopy for Food Quality Analysis and Control*. Elsevier, Burlington, hal. 51–82.
- Rosady, S. D., 2013. Peran Asam Lemak Omega 3 Terhadap Hipertrigliseridemia Pada Penderita HIV/AIDS. *Ebers Papyrus*, **19**: 126-145
- Routray, W., dan Orsat, V., 2012. Microwave-Assisted Extraction of Flavonoids: A Review. *Food and Bioprocess Technology*. **5**:409-424
- Rubio-Rodríguez, N., de Diego, S.M., Beltrán, S., Jaime, I., Sanz, M.T., dan Rovira, J., 2012. Supercritical fluid extraction of fish oil from fish by-products: A comparison with other extraction methods. *Journal of Food Engineering*, **109**: 238–248.
- Ruiz-Samblás, C., González-Casado, A., Cuadros-Rodríguez, L., dan García, F.P.R., 2010. Application of selected ion monitoring to the analysis of triacylglycerols in olive oil by high temperature-gas chromatography/mass spectrometry. *Talanta*, **82**: 255–260.
- Sahena, F., Zaidul, I.S.M., Jinap, S., Yazid, A.M., Khatib, A., dan Norulaini, N.A.N., 2010. Fatty acid compositions of fish oil extracted from different parts of Indian mackerel (*Rastrelliger kanagurta*) using various techniques of supercritical CO<sub>2</sub> extraction. *Food Chemistry*, **120**: 879–885.
- Sallet, D., Souza, P.O., Fischer, L.T., Ugalde, G., Zobot, G.L., Mazutti, M.A., dkk., 2019. Ultrasound-assisted extraction of lipids from *Mortierella isabellina*. *Journal of Food Engineering*, **242**: 1–7.
- Samaram, S., Mirhosseini, H., Tan, C.P., Ghazali, H.M., Bordbar, S., dan Serjouie, A., 2015. Optimisation of ultrasound-assisted extraction of oil from papaya seed by response surface methodology: Oil recovery, radical scavenging antioxidant activity, and oxidation stability. *Food Chemistry*, **172**: 7–17.

- Sanchez-Prado, L., Garcia-Jares, C., dan Llompart, M., 2010. Microwave-assisted extraction: Application to the determination of emerging pollutants in solid samples. *Journal of Chromatography A*, **1217**: 2390–2414.
- Sasongko, H., Efendi, N.R., Budihardjo, A., Farida, Y., Amartiwi, T., Rahmawati, A.A., dkk., 2017. Solvent and extraction methods effects on the quality of eel (*Anguilla bicolor*) oil. *Journal of Physics: Conference Series*, **795**: 012021.
- Sathivel, S., Prinyawiwatkul, W., Negulescu, I.I., dan King, J.M., 2008. Determination of Melting Points, Specific Heat Capacity and Enthalpy of Catfish Visceral Oil During the Purification Process. *Journal of the American Oil Chemists' Society*, **85**: 291–296.
- Schumm, D.E., 1993. *Intisari Biokimia*. Binarupa Aksara, Jakarta Barat.
- Semchyshyn, H.M., 2014. Reactive Carbonyl Species In Vivo : Generation and Dual Biological Effects. *The Scientific World Journal*, **2014**:1–10.
- Shahidi, F. dan Zhong, Y., 2010. Lipid oxidation and improving the oxidative stability. *Chemical Society Reviews*, **39**: 4067.
- Sicaire, A.-G., Vian, M.A., Fine, F., Carré, P., Tostain, S., dan Chemat, F., 2016. Ultrasound induced green solvent extraction of oil from oleaginous seeds. *Ultrasonics Sonochemistry*, **31**: 319–329.
- Singh, P., Andola, H.C., Rawat, M.S.M., Pant, G.J.N., dan Purohit, 2011. Fourier transform infrared (FT-IR) spectroscopy in an overview. *Res J Med Plant*, **5**:127–135.
- Smeriglio, A., Galati, E.M., Monforte, M.T., Lanuzza, F., D'Angelo, V., dan Circosta, C., 2016. Polyphenolic Compounds and Antioxidant Activity of Cold-Pressed Seed Oil from Finola Cultivar of *Cannabis sativa* L.: Polyphenolic Compounds and Antioxidant Activity of FHSO. *Phytotherapy Research*, **30**: 1298–1307.
- Snow, N.H. dan Slack, G.C., 2002. Head-space analysis in modern gas chromatography. *TrAC Trends in Analytical Chemistry*, **21**: 608–617.
- Stuart, B.H., 2004. *Infrared Spectroscopy: Fundamentals and Applications*. John Wiley & Sons, Amerika.
- Sun, X., Jin, Z., Yang, L., Hao, J., Zu, Y., Wang, W., dkk., 2013. Ultrasonic-Assisted Extraction of Procyanidins Using Ionic Liquid Solution from *Larix gmelinii* Bark. *Journal of Chemistry*, **2013**: 1–9.
- Syahriza, Z.A., Man, Y.B.C., Selamat, J., dan Bakar, J., 2005. Detection of lard adulteration in cake formulation by Fourier transform infrared (FTIR) spectroscopy. *Food Chem*, **92**: 365–371.

- Taghvaei, M., Jafari, S.M., Assadpoor, E., Nowrouzieh, S., dan Alishah, O., 2014. Optimization of microwave-assisted extraction of cottonseed oil and evaluation of its oxidative stability and physicochemical properties. *Food Chemistry*, **160**: 90–97.
- Tan, C.P. dan Che Man, Y.B., 2000. Differential scanning calorimetric analysis of edible oils: Comparison of thermal properties and chemical composition. *Journal of the American Oil Chemists' Society*, **77**: 143–155.
- Tan, C.P. dan Che Man, Y.B., 2002. Differential scanning calorimetric analysis of palm oil, palm oil based products and coconut oil: effects of scanning rate variation. *Food Chemistry*, **76**: 89–102.
- Tan, C.X., Gun Hean, C., Hamzah, H., dan Ghazali, H.M., 2018. Optimization of ultrasound-assisted aqueous extraction to produce virgin avocado oil with low free fatty acids. *Journal of Food Process Engineering*, **41**: e12656.
- Tatke, P. dan Jaiswal, Y., 2011. An Overview of Microwave Assisted Extraction and its Applications in Herbal Drug Research. *Research Journal of Medicinal Plants*, **5**: 21–31.
- Thammapat, P., Raviyan, P., dan Siriamornpun, S., 2010. Proximate and fatty acids composition of the muscles and viscera of Asian catfish (*Pangasius bocourti*). *Food Chemistry*, **122**: 223–227.
- Tian, L., Zeng, Y., Zheng, X., Chiu, Y., dan Liu, T., 2019. Detection of Peanut Oil Adulteration Mixed with Rapeseed Oil Using Gas Chromatography and Gas Chromatography–Ion Mobility Spectrometry. *Food Analytical Methods*, **12**: 2282–2292.
- Tiwari, B.K., O'Donnell, C.P., dan Cullen, P.J., 2009. Effect of sonication on retention of anthocyanins in blackberry juice. *Journal of Food Engineering*, **93**: 166–171.
- Tobiszewski, M. dan Namieśnik, J., 2012. Direct chromatographic methods in the context of green analytical chemistry. *TrAC Trends in Analytical Chemistry*, **35**: 67–73.
- Topkafa, M., Kara, H., dan Sherazi, S.T.H., 2015. Evaluation of the Triglyceride Composition of Pomegranate Seed Oil by RP-HPLC Followed by GC-MS. *Journal of the American Oil Chemists' Society*, **92**: 791–800.
- Tubino, M. dan Aricetti, J.A., 2013. A green potentiometric method for the determination of the iodine number of biodiesel. *Fuel*, **103**: 1158–1163.
- Ueno, H., Yamakura, S., Arastoo, R.S., Oshima, T., dan Kokubo, K., 2014. Systematic Evaluation and Mechanistic Investigation of Antioxidant Activity

of Fullerenols Using  $\beta$ -Carotene Bleaching Assay. *Journal of Nanomaterials*, **2014**: 1–7.

V. González de Peredo, A., Vázquez-Espinosa, M., Espada-Bellido, E., Jiménez-Cantizano, A., Ferreiro-González, M., Amores-Arrocha, A., dkk., 2018. Development of New Analytical Microwave-Assisted Extraction Methods for Bioactive Compounds from Myrtle (*Myrtus communis L.*). *Molecules*, **23**: 1-16.

Vázquez-Espinosa, M., González de Peredo, A.V., Ferreiro-González, M., Barroso, C.G., Palma, M., Barbero, G.F., dkk., 2019a. Optimizing and Comparing Ultrasound- and Microwave-Assisted Extraction Methods Applied to the Extraction of Antioxidant Capsinoids in Peppers. *Agronomy*, **9**: 1-18.

Vázquez-Espinosa, M., V. González de Peredo, A., Ferreiro-González, M., Carrera, C., Palma, M., F. Barbero, G., dkk., 2019b. Assessment of Ultrasound Assisted Extraction as an Alternative Method for the Extraction of Anthocyanins and Total Phenolic Compounds from Maqui Berries (*Aristotelia chilensis (Mol.) Stuntz*). *Agronomy*, **9**:1-17.

Vegneshwaran VR, D.D., 2014. Investigation on Oil Extraction Methods and its Influence on Omega-3 Content from Cultured Salmon. *Journal of Food Processing & Technology*, **5**:1-13.

Vieira, S.A., Zhang, G., dan Decker, E.A., 2017. Biological Implications of Lipid Oxidation Products. *Journal of the American Oil Chemists' Society*, **94**: 339–351.

Vilkhu, K., Mawson, R., Simons, L., dan Bates, D., 2008. Applications and opportunities for ultrasound assisted extraction in the food industry — A review. *Innovative Food Science & Emerging Technologies*, **9**: 161–169.

Vongsak, B., Sithisarn, P., Mangmool, S., Thongpraditchote, S., Wongkrajang, Y., dan Gritsanapan, W. 2013. Maximizing total phenolics, total flavonoids contents and antioxidant activity of Moringa oleifera leaf extract by the appropriate extraction method. *Industrial Crops and Products*, **44**: 566-571.

Wang, K., Yuan, Y., Han, S., dan Yang, H., 2018. Application of attenuated total reflectance Fourier transform infrared (ATR-FTIR) and principal component analysis (PCA) for quick identifying of the bitumen produced by different manufacturers. *Road Materials and Pavement Design*, **19**: 1940–1949.

Wang, L. dan Weller, C.L., 2006. Recent advances in extraction of nutraceuticals from plants. *Trends in Food Science & Technology*, **17**: 300–312.

Wang, X., Yang, S., He, J., Chen, L., Zhang, J., Jin, Y., dkk., 2019. A green triple-locked strategy based on volatile-compound imaging, chemometrics, and

- markers to discriminate winter honey and sapium honey using headspace gas chromatography-ion mobility spectrometry. *Food Research International*, **119**: 960–967.
- Winarsi, H., 2007. *Antioksidan Alami Dan Radikal, Potensi dan Aplikasinya dalam Kesehatan*. Kanisius, Yogyakarta.
- Windarsih, A., Irnawati, Putri, A.R., Riyanto, S., dan Rohman, A., 2020. *Karakterisasi Minyak Dan Lemak*, 1st ed. Pustaka Pelajar, Yogyakarta.
- Wulandari, N., Muchtadi, T.R., dan Budijanto, S., 2011. Sifat Fisik Minyak Sawit Kasar dan Korelasinya dengan Atribut Mutu. *jurnal Teknologi dan Industri Pangan*, , **XXII**: 8.
- Yu, X., Du, S., Voort, F.R. van de, Yue, T., dan Li, Z., 2009. Automated and Simultaneous Determination of Free Fatty Acids and Peroxide Values in Edible Oils by FTIR Spectroscopy Using Spectral Reconstitution. *Analytical Sciences*, **25**: 627–632.
- Zhang, L., Shuai, Q., Li, P., Zhang, Q., Ma, F., Zhang, W., dkk., 2016a. Ion mobility spectrometry fingerprints: A rapid detection technology for adulteration of sesame oil. *Food Chemistry*, **192**: 60–66.
- Zhang, L., Shuai, Q., Li, P., Zhang, Q., Ma, F., Zhang, W., dkk., 2016b. Ion mobility spectrometry fingerprints: A rapid detection technology for adulteration of sesame oil. *Food Chemistry*, **192**: 60–66.
- Zhang, Z.-S., Wang, L.-J., Li, D., Jiao, S.-S., Chen, X.D., dan Mao, Z.-H., 2008. Ultrasound-assisted extraction of oil from flaxseed. *Separation and Purification Technology*, **62**: 192–198.
- Zhao, S., Kwok, K., dan Liang, H., 2007. Investigation on ultrasound assisted extraction of saikosaponins from Radix Bupleuri. *Separation and Purification Technology*, **55**: 307–312.
- Zhong, J., Wang, Y., Yang, R., Liu, X., Yang, Q., dan Qin, X., 2018. The application of ultrasound and microwave to increase oil extraction from Moringa oleifera seeds. *Industrial Crops and Products*, **120**: 1–10.
- Zhong, Y., Madhujith, T., Mahfouz, N., dan Shahidi, F., 2007. Compositional characteristics of muscle and visceral oil from steelhead trout and their oxidative stability. *Food Chemistry*, **104**: 602–608.
- Zhou, J., Zhang, L., Li, Q., Jin, W., Chen, W., Han, J., dkk., 2018. Simultaneous Optimization for Ultrasound-Assisted Extraction and Antioxidant Activity of Flavonoids from Sophora flavescens Using Response Surface Methodology. *Molecules*, **24**:1-15.

Zzaman, W., Suseno, S.H., Nadiah, W.A., dan Tajul, A.Y., 2014. Fatty Acid Profile and Antioxidant Capacity of Muscle and by Product Oil from Selected Fresh Water Fish. *Food Science and Technology*, **3**: 41–46.