

DAFTAR PUSTAKA

- Afoakwa, E. O. 2014. *Cocoa Production and Processing Technology*. CRC Press. New York.
- Agustika, D. K., Hidayat, S. N., Kuwat, T., Iliescu, D. D. dan Leeson, M. S. 2020. Steady-state response feature extraction optimization to enhance electronic nose performance. *International Conference on Electrical Engineering, Computer Science and Informatics*. Yogyakarta. <https://doi.org/10.23919/EECSI50503.2020.9251887>.
- Anggriawan, R.Y. 2019. Studi Penentuan Kadar Nikotin pada Rokok Elektronik Menggunakan E-Nose dengan Kemometrik sebagai Analisisnya. *Skripsi*. Fakultas Matematika dan Ilmu Pengetahuan Alam. Yogyakarta.
- Anonim. 2022. *Tango FT-NIR Spectrometer*. <https://www.bruker.com/en/products-and-solutions/infrared-and-raman/ft-nir-spectrometers/tango-ft-nir-spectrometer.html>. Diakses tanggal 12 Oktober 2022.
- Ardiansyah, D.E.T. 2015. Klasifikasi Kopi Lokal menggunakan Hidung Elektronik dengan Analisa Metode Multivarian. *Skripsi*. Fakultas Matematika dan Ilmu Pengetahuan Alam. Universitas Gadjah Mada. Yogyakarta.
- Arshak, K. Moore, E., Lyons, G.M., Harris J. dan Clifford, S. 2004. A review of gas sensors employed in electronic nose applications. *Sensor Review*, 24(2): 181–198. <https://doi.org/10.1108/02602280410525977>.
- Badan Pusat Statistik. 2021. *Statistik Kakao Indonesia 2020*. Badan Pusat Statistik. Jakarta.
- Badan Standarisasi Nasional Indonesia. 2009. *SNI 3748:2009 Lemak Kakao*. Jakarta: Badan Standarisasi Nasional Indonesia.
- Badan Standarisasi Nasional Indonesia. 2010. *SNI 2323:2008/Amd1:2010 Biji Kakao*. Jakarta: Badan Standarisasi Nasional Indonesia.
- Choopun, S., Hongstith, N., dan Wongrat, E. (2012). Metal-Oxide Nanowires for Gas Sensors. *Intech*, 2-24. <http://dx.doi.org/10.5772/54385>.
- Ding, A., Zhu, M., Qian, X., Shi, L., Huang, H., dan Xiong, G. 2020. Effect of fatty acids on the flavor formation of fish sauce. *Lebensmittel-Wissenschaft und -Technologie*, 134. <https://doi.org/10.1016/j.lwt.2020.110259>.
- Firmawati, N. dan Kuwat, T., 2016. Kelayakan Teknologi Electronic Nose untuk Mendeteksi Urin yang Mengandung Metadon dengan Menggunakan Principal Component Analysis (PCA). *Jurnal Ilmu Fisika (JIF)*, 8(1): 45-51. <https://doi.org/10.25077/jif.8.1.45-51.2016>.
- Francis, F.J. 1999. *Wiley Encyclopedia of Food Science and Technology*. Wiley-Interscience. New York.
- Gunstone, F. D. 2002. *Food Applications of Lipids*. CRC Press. Florida.
- Guo, X., Wang, Y., Lu, S., Wang, J., Fu, H., dan Gu, B. 2021. Monitoring quality changes in dry-cured mutton ham during processing. *Journal of Food Processing and Preservation*, 45(4). <https://doi.org/10.1111/jfpp.15349>.
- Gutierrez-Osuna, R. 2004. Signal Conditioning and Preprocessing. *Handbook of Machine Olfaction*, 105–132.
- Hasrini, R.F. dan Wardayanie, N. I. A. 2020. Perbandingan Karakteristik Antara Cocoa Butter Alternative (CBA) dengan Lemak Kakao untuk

- Pengembangan Standar Nasional Indonesia. *Jurnal Standardisasi*, 22(3): 189-198. <http://dx.doi.org/10.31153/js.v22i3.838>.
- Hidayat, S. N. 2015. Aplikasi Sistem Larik Sensor Gas untuk Identifikasi Profil Aroma Tempe Selama Proses Fermentasi. *Tesis*. Fakultas Matematika dan Ilmu Pengetahuan Alam. Universitas Gadjah Mada. Yogyakarta.
- Hidayat, S. N., Julian, T., Dharmawan, A. B., Puspita, M., Chandra, L., Rohman, A., Julia, M., Rianjanu, A., Nurputra, D. K., Kuwat, T. dan Wasisto, H. S. 2022. Hybrid learning method based on feature clustering and scoring for enhanced COVID-19 breath analysis by an electronic nose. *Artificial Intelligence In Medicine*, 129: 1-13. <https://doi.org/10.1016/j.artmed.2022.102323>.
- Hidayat, S. N., Rusman, A., Julian, T., Triyanan, K., Veloso, A. C.A. dan Peres, A. M. 2019. Electronic Nose Coupled with Linear and Nonlinear Supervised Learning Methods for Rapid Discriminating Quality Grades of Superior Java Cocoa Beans. *International Journal of Intelligent Engineering and Systems*, 12(6): 167-176. <https://doi.org/10.22266/ijies2019.1231.16>.
- Hidayat, S. N., Triyanan, K., Fauzan, I., Julian, T., Lelono, D., Yusuf, Y., Ngadiman, N., Veloso, A. C. A. dan Peres, A. M. 2019. The Electronic Nose Coupled with Chemometric Tools for Discriminating the Quality of Black Tea Samples in Situ. *Chemosensors*, 7(29):1-45. <https://doi.org/10.3390/chemosensors7030029>.
- Hines, E. L., Boilot, P., Gardner, J. W. dan Gongora, M. A. 2002. Pattern Analysis for Electronic Noses. *Handbook of Machine Olfaction*. Wiley-VCH Verlag GmbH & Co. KGaA. Berlin.
- Inca, Widodo, T. W. dan Lelono, D. 2018. Klasifikasi Teh Hijau dan Teh Hitam Tambi-Pagilaran dengan Metode Principal Component Analysis (PCA) Menggunakan E-Nose. *International Journal of Electronics and Instrumentations Systems*, 8(1): 61-72. <https://doi.org/10.22146/ijeis.28718>.
- JEOL Solutions for Innovation. 2020. *GC-MS Analysis of Cocoa Butter Triglycerides*. <https://www.jeolusa.com/RESOURCES/Analytical-Instruments/Documents-Downloads/gc-ms-analysis-of-cocoa-butter-triglycerides>. Diakses tanggal 14 Oktober 2022.
- Jo, D., Kim, G.R., Yeo, S.H., Jeong, Y.J., Noh, B.S. dan Kwon, J.H. 2013. Analysis of aroma compounds of commercial cider vinegars with different acidities using SPME/GC-MS, electronic nose, and sensory evaluation. *Food Sci. Biotechnol*, 22(6): 1559–1565.
- Johnson, R.R., dan Wichern, D.A. 2007. *Applied Multivariate Statistical Analysis*. New Jersey: Pearson Prentice Hall.
- Jolliffe, I. T. dan Cadima, J. 2016. Principal Component Analysis: A review and recent developments. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*. 374(2065):1-16. <https://doi.org/10.1098/rsta.2015.0202>.
- Kalit, M. T., Buntic, I., Morone, G., Delas, I. dan Kalit, S. 2016. The content of free fatty acids in relation to electronic nose sensors responses and sensory

- evaluation of cheese in a lamb skin sack (Sir iz mišine) throughout ripening. *Mljekarstvo*, 66(1): 26-33. <https://doi.org/10.15567/mljekarstvo.2016.0103>.
- Kementrian Perindustrian. 2021. *Kinerja Industri Pengolahan Kakao Kian Manis*. <https://www.kemenperin.go.id/artikel/22965/Kinerja-Industri-Pengolahan-Kakao-Kian-Manis>. Diakses tanggal 14 Oktober 2022.
- Ketaren, S. 1986. *Pengantar Teknologi Minyak dan Lemak Pangan*. Jakarta: UI Press.
- Khairy, H. L., Saadoon, A. F., Zzaman, W., Yang, T. A. dan Easa, A. M. 2018. Identification of flavor compounds in rambutan seed fat and its mixture with cocoa butter determined by SPME-GCMS. *Journal of King Saud University – Science*, 30: 316-323. <https://doi.org/10.1016/j.jksus.2017.03.001>.
- Kljusuric, J. G., Mihalev, K., Becic, I., Polovic, I., Georgieva, M., Djakovic, S. dan Kurtanek, Z. 2016. Near-Infrared Spectroscopic Analysis of Total Phenolic Content And Antioxidant Activity Of Berry Fruits. *Food Technology and Biotechnology Journal*, 54(1).
- Lee, S. M., Lim, H. J., Chang, J. W., Hurh, B. dan Kim, Y. 2018. Investigation on the Formations of Volatile Compounds, Fatty Acids and γ -lactones in White and Brown Rice during Fermentation. *Food Chemistry*, 269: 347–354. <https://doi.org/10.1016/j.foodchem.2018.07.037>.
- Lelono, D. dan Kuwat, T., 2019. Suhu Pemanas Sampel Optimal Untuk Klasifikasi Teh Hitam Menggunakan Electronic Nose. *Indonesian Journal of Electronics and Instrumentation Systems (IJEIS)*, 9(1): 45-54. <https://doi.org/10.22146/ijeis.39683>.
- Lengkey, L. C. E. C. H., Budiastara, I. W., Seminar, K. B. dan Purwoko, B. S. 2013. Model Pendugaan Kandungan Air, Lemak dan Asam Lemak Bebas pada tiga provenan Biji Jarak Pagar (*Jatropha curcas* L) Menggunakan Spektroskopi Inframerah Dekat dengan Metode Partial Least Square (PLS). *Jurnal Litri*, 19(14): 203-211.
- Lipp, M., Simoneau, C., Ulberth, F., Anklam, E., Crews, C., Brereton, P., de Greyt, W., Schwack, W. dan Wiedmaier, C. 2001. Composition of Genuine Cocoa Butter and Cocoa Butter Equivalents. *Journal of Food Composition and analysis*, 14(4): 399-408. <https://doi.org/10.1006/jfca.2000.0984>.
- Liu, C., Yang, S. dan Deng, L. 2015. Determination of internal qualities of Newhall navel oranges based on NIR spectroscopy using machine learning. *Journal of Food Engineering*, 161:16–23
- Maarse, 1991. *Volatile Compounds in Foods and Beverages*. Marcel Dekker inc. New York-Basel-Hongkong.
- Mardiantono, Budiastara, I. W. dan Sutrisno. 2022. Prediksi Kandungan Kimia Kopra Dengan FT-Nir Spectroscopy Menggunakan PLS. *Jurnal Keteknikan*, 10(2) 87-97. <https://doi.org/10.19028/jtep.10.2.87-97>.
- Mishra, S. P., Sarkar, U., Taraphder, S., Datta, S., Swain, D. P., Saikhom, R., Panda, S. dan Laishram, M. 2017. Multivariate Statistical Data Analysis Principal Component Analysis (PCA). *International Journal of Livestock Research*, 7(5): 60-78. <https://doi.org/10.5455/ijlr.20170415115235>.
- Mohsenin NM. 1984. *Electromagnetic Radiation Properties of Food and Agricultural Products*. New York: Gordon and Breach Science Publisher.

- Mulato, S. dan Sukrisno, W. 2008. *Panduan Lengkap Kakao: Manajemen Agribisnis dari Hulu hingga Hilir*. Jakarta: Penebar Swadaya.
- Nelly. 2021. Penerapan Feature Extraction Berbasis Window dan Simulated Annealing untuk Meningkatkan Kinerja Electronic Nose dalam Mengklasifikasi Jenis Madu. *Skripsi*. Fakultas Matematika dan Ilmu Pengetahuan Alam. Univeritas Gadjah Mada. Yogyakarta.
- Noorhidayah, R., Musthafa, M. B. dan Sisno. 2021. Spectroskopi Fourier Transform Near Infrared (FTIR) Asam Humat dari Kompos Kotoran Ayam dengan Biodekomposer Berbeda. *Jurnal Ilmu Tanah dan Lingkungan*., 23(1): 38-43. <http://dx.doi.org/10.29244/jitl.23.1.38-43>.
- Novita, D.D., Sesunan, A. B., Telaumbanua, M., Triyono, S. dan Saputra, T. W. 2021. Identifikasi Jenis Kopi Menggunakan Sensor E-nose dengan Metode Pembelajaran Jaringan Syaraf Tiruan Backpropagation. *Jurnal Ilmiah Rekayasa Pertanian dan Biosistem*, 9(1): 205-217. <https://doi.org/10.29303/jrpb.v9i2.241>.
- Nugroho, S. 2008. *Statistika Multivariat Terapan*. Bengkulu: UNIB Press.
- Ortega, B. N., Arroyo, J., Walk C., Castanares, N., Canet, E. dan Smith, A. 2022. Near infrared reflectance spectroscopy as a tool to predict non-starch polysaccharide composition and starch digestibility profiles in common monogastric cereal feed ingredients. *Animal Feed Science and Technology*. 282. <https://doi.org/10.1016/j.anifeedsci.2022.115214>.
- Ozdemir, I. S., Daga, C., Ozinanc, G., Sucsorana, O. dan Ertas, E. 2018. Quantification of sterols and fatty acids of extra virgin olive oils by FT-NIR spectroscopy and multivariate statistical analyses. *LWT - Food Science and Technology*, 91. <https://doi.org/10.1016/j.lwt.2018.01.045>.
- Patel, H. K. 2014. *The Electronic Nose: Artificial Olfaction Technology*. Springer. New Delhi.
- Pranata, A. W. 2021. *Aplikasi Volatilomik Berbasis SPME-GC-MS untuk Autentikasi Daging dan Bakso Sapi*. Institut Pertanian Bogor.
- Pratama, R. I., Rostini, I. dan Rochima, E. Profil asam amino, asam lemak dan komponen volatil ikan gurame segar (*Osphronemus gouramy*) dan kukus. *Jurnal Pengolahan Hasil Perikanan Indonesia*, 21(2): 218-231.
- Purnomo, M. H. dan Muntasa, A. 2010. *Konsep Pengolahan Citra Digital dan Ekstraksi Fitur*. Yogyakarta: Graha Ilmu.
- Puspita, M. 2020. Klasifikasi Sosis Berdasarkan Asal Daging Menggunakan Hidung Elektronik yang dikopel dengan Kemometrik. *Tesis*. Fakultas Matematika dan Ilmu Pengetahuan Alam. Univeritas Gadjah Mada. Yogyakarta.
- Radi, Rivai, M., dan Purnomo, M. H. 2016. Study on Electronic-Nose based Quality Monitoring System for Coffee under Roasting. *Journal of Circuits, Systems and Computers*, 25(10): 1-19. <https://doi.org/10.1142/S0218126616501164>.
- Rahmani, I. N., Lelono, D. dan Kuwat, T. 2018. Klasifikasi Kakao Berbasis e-nose dengan Metode Neuro Fuzzy. *Indonesian Journal of Electronics and Instrumentation Systems*. 8(1): 49-60. <https://doi.org/10.22146/ijeis.25512>.

- Ramlah, S. dan Alfrida L. S. 2018. Karakteristik dan Citarasa Cokelat Putih dari Lemak Kakao Non Deodorisasi dan Deodorisasi. *Jurnal Industri Hasil Perkebunan*, 13(2): 117-128. <http://dx.doi.org/10.33104/jihp.v13i2.4188>.
- Resconi, V.C., Bueno, M., Escudero, A., Magalhaes, D., Ferreira, V. dan Campo, M.M. 2018. Ageing and retail display time in raw beef odour according to the degree of lipid oxidation. *Food Chem.* 242: 288–300. <https://doi.org/10.1016/j.foodchem.2017.09.036>.
- Rivai, M. 2007. Pengaruh Principle Component Analysis Terhadap Tingkat Identifikasi Neural Network pada Sistem Sensor Gas. *Jurnal Telkomnika*, 5(3): 159-167. <http://doi.org/10.12928/telkomnika.v5i3.1360>.
- Rohan, T. A. dan Steward, T. 1967. The Precursors of Chocolate Aroma: Production of Free Amino Acids during Fermentations of Cocoa Beans. *Journal of Food Science*, 32: 395-398. <https://doi.org/10.1111/j.1365-2621.1967.tb09693.x>.
- Sakti, A. P. 2021. Optimasi Support Vector Machine pada Electronic Nose untuk Klasifikasi Vanili Sintetis yang Terkonfirmasi oleh Pengujian Organoleptik. *Skripsi*. Fakultas Matematika dan Ilmu Pengetahuan Alam. Univeritas Gadjah Mada. Yogyakarta.
- Santosa B. 2007. *Data Mining (Teori dan Aplikasi)*. Yogyakarta: Graha Ilmu.
- Sesanti, R. E. 2021. Deteksi Aroma Teh Hitam Ortodoks dengan Variasi Suhu Penyimpanan Menggunakan Electronic Nose. *Tesis*. Fakultas Matematika dan Ilmu Pengetahuan Alam. Univeritas Gadjah Mada. Yogyakarta.
- Sidou, L. F. dan Borges, E. M. 2020. Teacing Principal Component Analysis Using a Free and Open Source Software Program and Exercises Applying to Real-World Examples. *Journal of Chemical Education*, 97: 1666-1676. <http://dx.doi.org/10.1021/acs.jchemed.9b00924>.
- Smith, L. I. 2002. *A tutorial on Principal Components Analysis*. http://www.sccg.sk/~haladova/principal_components.pdf. Diakses tanggal 15 Oktober 2022.
- Sumardjo, D. 2009. *Pengantar Kimia: Buku Panduan Kuliah Mahasiswa Kedokteran dan Program Strata 1 Fakultas Bioeksakta*. Jakarta: Penerbit Buku Kedokteran EGC.
- Susanti, C. M., Sugiharto, R., Setyani, S. dan Subeki. 2014. Pengaruh Jumlah Pelarut Etanol dan Suhu Fraksinasi terhadap Karakteristik Lemak Kakao Hasil Ekstraksi Non Alkalized Cocoa Butter Powder. *Jurnal Teknologi Industri dan Hasil Pertanian*, 19(2): 307-319. <http://dx.doi.org/10.23960/jtihp.v19i3.307%20-%20319>.
- Susanto, F. X. 1994. *Tanaman Kakao Budidaya dan Pengolahan Hasil*. Yogyakarta: Kanisius.
- Telaumbanua, M., Novita, D. D., Triyono, S., Saragih, C. 2021. Tipe Chamber dan Posisi Sensor E-nose untuk Mendeteksi Aroma Biji Kopi Robusta menggunakan Mikrokontroler. *Jurnal Ilmiah Rekayasa Pertanian dan Biosistem*, 9(1): 84-95. <https://doi.org/10.29303/jrpb.v9i1.237>.
- Toku, A.B. 2016. *Effect of different fermentation duration and drying methods on the quality of cocoa bean oil*. Kumasi: Kwame Nkrumah University of Science and Technology.

- Varmuza K. 2001. *Applied Chemometrics: From Chemical Data to Relevant Information. 1st Conference on Chemist*, 3 Maret. Cairo.
- Wahyudi, E. 2020. Identifikasi Tingkat Kesegaran Ikan Nila di Pasar Colombo Yogyakarta Berbasis Electronic Nose dan Principle Component Analysis. *Skripsi*. Fakultas Teknologi Pertanian. Univeritas Gadjah Mada. Yogyakarta.
- Wahyudi, T., Pujiyanto, dan T. R. Panggabean, 2008. *Panduan Lengkap Kakao*. Jakarta: Penebar Swadaya.
- Wang, Y., Wang, H., Wu, Y., Xiang, H., Zhao, Y., Chen, S., Qi, B. dan Li, L. 2022. Insights into lipid oxidation and free fatty acid profiles to the development of volatile organic compounds in traditional fermented golden pomfret based on multivariate analysis. *LWT – Food Science and Technology*, 171. <https://doi.org/10.1016/j.lwt.2022.114112>.
- Wang, Z., Dou, R., Yang, R., Cai, K., Li, C. dan Li, W. 2021. Changes in Phenols, Polysaccharides and Volatile Profiles of Noni (*Morinda citrifolia* L.) Juice during Fermentation. *Molecules*, 26(2604): 1-15. <https://doi.org/10.3390/molecules26092604>.
- Yan, J., Guo, X., Duan, S., Jia, P., Wang, L., Peng, C. dan Zhang, S. 2015. Electronic Nose Feature Extraction Methods: A review. *Sensors (Switzerland)*, 15(11), 27804–27831. <https://doi.org/10.3390/s151127804>.
- Yu, H., Wang, Y., dan Wang, J. 2009. Identification of Tea Storage Times by Linear Discrimination Analysis and Back-Propagation Neural Network Techniques Based on the Eigenvalues of Principal Components Analysis of E-Nose Sensor Signals. *Sensors*, 9: 8073-8082. <https://doi.org/10.3390/s91008073>.
- Zhong, J. dan Wang, X. 2019. *Evaluation Technologies for Food Quality*. Woodhead Publishing. Cambridge.
- Zyzelewicz, D., Budryn, G., Krysiak, W., Oracz, J., Nebesny, E. dan Bojczuk, M. 2014. Influence of roasting conditions on fatty acid composition and oxidative changes of cocoa butter extracted from cocoa bean of Forastero variety cultivated in Togo. *Food Research International*, 63: 328-343. <http://dx.doi.org/10.1016/j.foodres.2014.04.053>.