

DAFTAR PUSTAKA

- (1) Hocking, M. B. Vanillin: Synthetic Flavoring from Spent Sulfite Liquor. *J. Chem. Educ.* **1997**, 74 (9), 1055.
- (2) Imarc. Vanilla and Vanillin Market: Global Industry Trends, Share, Size, Growth, Opportunity and Forecast 2019-2024 Description
<https://www.imarcgroup.com/vanilla-vanillin-market> (accessed Jan 3, 2020).
- (3) BPS. *Buletin Statistik Perdagangan Luar Negeri Impor Desember 2018*; BPS RI: Jakarta, 2019.
- (4) Clark, G. S. Vanillin. A Profile: An Aroma Chemical. *Perfum. Flavorist* **1990**, 15 (March/April), 45–54.
- (5) Krings, U.; Berger, R. g. Biotechnological Production of Flavours and Fragrances. *Appl. Microbiol. Biotechnol.* **1998**, 49, 1–8.
- (6) Gallage, N. J.; Møller, B. L. Vanillin – Bioconversion and Bioengineering of the Most Popular Plant Flavor and Its De Novo Biosynthesis in the Vanilla Orchid. *Mol. Plant* **2015**, 8 (1), 40–57. <https://doi.org/10.1016/j.molp.2014.11.008>.
- (7) Hansen, E. H.; Møller, B. L.; Kock, G. R.; Büchner, C. M.; Kristensen, C.; Jensen, O. R.; Okkels, F. T.; Olsen, C. E.; Motawia, M. S.; Hansen, J. De Novo Biosynthesis of Vanillin in Fission Yeast (*Schizosaccharomyces Pombe*) and Baker's Yeast (*Saccharomyces Cerevisiae*). *Appl. Environ. Microbiol.* **2009**, 75 (9), 2765–2774.
- (8) Priefert, H.; Rabenhorst, J.; Steinbüchel, A. Biotechnological Production of Vanillin. *Appl. Microbiol. Biotechnol.* **2001**, 56 (3–4), 296–314. <https://doi.org/10.1007/s002530100687>.
- (9) BPS. *Buletin Statistik Perdagangan Luar Negeri Ekspor Menurut HS, Desember 2018*; BPS RI: Jakarta, 2019.
- (10) Soleh, F. A.; Kimia, P. I.; Bahan, K. B. Perspektif Industri Atsiri Dan Aroma INDONESIA Dalam Peta Dunia There Is Nothing Permanent except Change — Heraclitus. In *perspektif industri atsiri dan aroma INDONESIA dalam peta Dunia*; 2018.
- (11) Koeduka, T.; Fridman, E.; Gang, D. R.; Vassão, D. G.; Jackson, B. L.; Kish, C. M.; Orlova, I.; Spassova, S. M.; Lewis, N. G.; Noel, J. P.; et al. Eugenol and Isoeugenol, Characteristic Aromatic Constituents of Spices, Are Biosynthesized via Reduction of a Coniferyl Alcohol Ester. *Proc. Natl. Acad. Sci. U. S. A.* **2006**, 103 (26), 10128–10133. <https://doi.org/10.1073/pnas.0603732103>.

- (12) Akbar, A. Penapisan Bakteri Dari Limbah Spent Bleaching Earth Sebagai Agen Biotransformasi Isoeugenol Menjadi Vanilin, Universitas Andalas, 2019.
- (13) Banerjee, G.; Chattopadhyay, P. Vanillin Biotechnology: The Perspectives and Future. *J. Sci. Food Agric.* **2019**, *99* (2), 499–506.
<https://doi.org/10.1002/jsfa.9303>.
- (14) WEBSTER, T. M. New Perspectives on Vanilla. *Cereal Foods World* **1995**, *40*, 198–200.
- (15) Iekhsan, O.; Jaya, V.; Mustafa, M. A.; Rais, M. M. Antitoxin Compounds from the Plant Extracts of Ipomea Pes-Caprae (L.) R. Br. In *8th FAOBMB Congress. Kuala Lumpur*, 1998; p 20.
- (16) Walton, N. J.; Narbad, A.; Faulds, C.; Williamson, G. Novel Approaches to the Biosynthesis of Vanillin. *Curr. Opin. Biotechnol.* **2000**, *11* (5), 490–496.
- (17) Hopp, R. Some Highlights of H&R Research: A Review of Nearly 120 Years of Research at Haarmann & Reimer. *Recent Dev. flavour Fragr. Chem. VCH Publ. Weinheim, Ger.* **1993**, *14*.
- (18) Bauer, K.; Garbe, D.; Surburg, H. *Common Fragrance and Flavor Materials: Preparation, Properties and Uses*; John Wiley & Sons, 2008.
- (19) Davidonis, G.; Knorr, D. Callus Formation and Shoot Regeneration in Vanilla Planifolia. *Food Biotechnol.* **1991**, *5* (1), 59–66.
<https://doi.org/10.1080/08905439109549791>.
- (20) Zhao, L.-Q.; Sun, Z.-H.; Zheng, P.; Zhu, L.-L. Biotransformation of Isoeugenol to Vanillin by a Novel Strain of Bacillus Fusiformis. *Biotechnol. Lett.* **2005**, *27* (19), 1505–1509.
- (21) Serra, S.; Fuganti, C.; Brenna, E. Biocatalytic Preparation of Natural Flavours and Fragrances. *TRENDS Biotechnol.* **2005**, *23* (4), 193–198.
- (22) Han, D.; Ryu, J. Y.; Lee, H.; Hur, H. G. Bacterial Biotransformation of Phenylpropanoid Compounds for Producing Flavor and Fragrance Compounds. *J. Korean Soc. Appl. Biol. Chem.* **2013**, *56* (2), 125–133.
<https://doi.org/10.1007/s13765-013-3025-9>.
- (23) Dubnau, D.; Smith, I.; Morell, P.; Marmur, J. Gene Conservation in Bacillus Species. I. Conserved Genetic and Nucleic Acid Base Sequence Homologies. *Proc. Natl. Acad. Sci. U. S. A.* **1965**, *54* (2), 491.
- (24) Woese, C. R. Bacterial Evolution. *Microbiol. Rev.* **1987**, *51* (2), 221.
- (25) Kang, Y. J.; Cheng, J.; Mei, L. J.; Hu, J.; Piao, Z.; Yin, S. X. Multiple Copies of 16S RRNA Gene Affect the Restriction Patterns and DGGE Profile Revealed

- by Analysis of Genome Database. *Microbiology* **2010**, 79 (5), 655–662.
- (26) Ellermann, M.; Carr, J. S.; Fodor, A. A.; Arthur, J. C.; Carroll, I. M. Chapter 2 - Characterizing and Functionally Defining the Gut Microbiota: Methodology and Implications; Floch, M. H., Ringel, Y., Allan Walker, W. B. T.-T. M. in G. P., Eds.; Academic Press: Boston, 2017; pp 15–25.
<https://doi.org/https://doi.org/10.1016/B978-0-12-804024-9.00002-1>.
- (27) Kamble, A.; Sawant, S.; Singh, H. 16S Ribosomal RNA Gene-Based Metagenomics: A Review. *Biomed. Res. J.* **2020**, 7 (1), 5–11.
https://doi.org/10.4103/BMRJ.BMRJ_4_20.
- (28) Rahman, M. T.; Uddin, M. S.; Sultana, R.; Moue, A.; Setu, M. Polymerase Chain Reaction (PCR): A Short Review. *Anwer Khan Mod. Med. Coll. J.* **2013**, 4 (1), 30–36. <https://doi.org/10.3329/akmmcj.v4i1.13682>.
- (29) Raven, P. H.; Johnson, G. B. *Biology*, 6th ed.; McGraw-Hill Company: New York, 2002.
- (30) Garibyan, L.; Avashia, N. Polymerase Chain Reaction. *J. Invest. Dermatol.* **2013**, 133 (3), 1–4. <https://doi.org/10.1038/jid.2013.1>.
- (31) VanGuilder, H. D.; Vrana, K. E.; Freeman, W. M. Twenty-Five Years of Quantitative PCR for Gene Expression Analysis. *Biotechniques* **2008**, 44 (5), 619–626. <https://doi.org/10.2144/000112776>.
- (32) Voytas, D. Agarose Gel Electrophoresis. *Curr. Protoc. Immunol.* **1992**, 2 (1), 10.4.1-10.4.8. <https://doi.org/https://doi.org/10.1002/0471142735.im1004s02>.
- (33) Green, M. R.; Sambrook, J. Analysis of DNA by Agarose Gel Electrophoresis. *Cold Spring Harb. Protoc.* **2019**, 2019 (1), 6–15.
<https://doi.org/10.1101/pdb.top100388>.
- (34) Kirkpatrick, F. H. Overview of Agarose Gel Properties. 1990, pp 9–22.
- (35) Lee, P. Y.; Costumbrado, J.; Hsu, C. Y.; Kim, Y. H. Agarose Gel Electrophoresis for the Separation of DNA Fragments. *J. Vis. Exp.* **2012**, No. 62. <https://doi.org/10.3791/3923>.
- (36) Green, M. R.; Sambrook, J. Agarose Gel Electrophoresis. *Cold Spring Harb. Protoc.* **2019**, 2019 (1), 87–94. <https://doi.org/10.1101/pdb.prot100404>.
- (37) Sharp, P. A.; Sugden, B.; Sambrook, J. Detection of Two Restriction Endonuclease Activities in Haemophilus Parainfluenzae Using Analytical Agarose--Ethidium Bromide Electrophoresis. *Biochemistry* **1973**, 12 (16), 3055–3063. <https://doi.org/10.1021/bi00740a018>.
- (38) Lozano-Sánchez, J.; Borrás-Linares, I.; Sass-Kiss, A.; Segura-Carretero, A.

- Chromatographic Technique: High-Performance Liquid Chromatography (HPLC)*; 2018. <https://doi.org/10.1016/b978-0-12-814264-6.00013-x>.
- (39) Slack, G. C.; Snow, N. H. HPLC Sample Preparation. *Sep. Sci. Technol.* **2007**, *8*, 237–268. [https://doi.org/10.1016/S0149-6395\(07\)80014-6](https://doi.org/10.1016/S0149-6395(07)80014-6).
- (40) França, L. T. C.; Carrilho, E.; Kist, T. B. L. A Review of DNA Sequencing Techniques. *Q. Rev. Biophys.* **2002**, *35* (2), 169–200. <https://doi.org/10.1017/S0033583502003797>.
- (41) Haldar, S. *Bioinformatics Methods: Application toward Analyses and Interpretation of Experimental Data*; Elsevier Inc., 2019. <https://doi.org/10.1016/B978-0-12-817497-5.00001-X>.
- (42) Harwood, J. C.; Phear, G. A. Direct Sequencing of PCR Products. *Methods Mol. Biol.* **1996**, *58*, 403–412. <https://doi.org/10.1385/0-89603-402-x:403>.
- (43) Zhang, P.; Seth, A.; Fernandes, H. *Other Post-PCR Detection Technologies*; Elsevier Inc., 2014. <https://doi.org/10.1016/B978-0-12-386456-7.07707-8>.
- (44) Pribelski, A. D.; Korobeynikov, A. I.; Lapidus, A. L. *Sequence Analysis*; 2018; Vol. 1–3. <https://doi.org/10.1016/B978-0-12-809633-8.20106-4>.
- (45) Polyanovsky, V. O.; Roytberg, M. A.; Tumanyan, V. G. Comparative Analysis of the Quality of a Global Algorithm and a Local Algorithm for Alignment of Two Sequences. *Algorithms Mol. Biol.* **2011**, *6* (1), 25. <https://doi.org/10.1186/1748-7188-6-25>.
- (46) Rucci, E.; Garcia, C.; Botella, G.; De Giusti, A.; Naiouf, M.; Prieto-Matías, M. An Energy-aware Performance Analysis of SWIMM: Smith–Waterman Implementation on Intel’s Multicore and Manycore Architectures. *Concurr. Comput. Pract. Exp.* **2015**, *27* (18), 5517–5537.
- (47) Katoh, K.; Standley, D. M. MAFFT Multiple Sequence Alignment Software Version 7: Improvements in Performance and Usability. *Mol. Biol. Evol.* **2013**, *30* (4), 772–780.
- (48) Kumar, S.; Filipski, A. Multiple Sequence Alignment: In Pursuit of Homologous DNA Positions. *Genome Res.* **2007**, *17* (2), 127–135.
- (49) Li, Y. H.; Sun, Z. H.; Zheng, P. Determination of Vanillin, Eugenol and Isoeugenol by RP-HPLC. *Chromatographia* **2004**, *60* (11–12), 709–713. <https://doi.org/10.1365/s10337-004-0440-4>.
- (50) Singh, A.; Mukhopadhyay, K.; Ghosh Sachan, S. Biotransformation of Eugenol to Vanillin by a Novel Strain *Bacillus Safensis* SMS1003. *Biocatal. Biotransformation* **2019**, *37* (4), 291–303.

- <https://doi.org/10.1080/10242422.2018.1544245>.
- (51) Shimoni, E.; Ravid, U.; Shoham, Y. Isolation of a *Bacillus* Sp. Capable of Transforming Isoeugenol to Vanillin. *J. Biotechnol.* **2000**, *78* (1), 1–9. [https://doi.org/10.1016/S0168-1656\(99\)00199-6](https://doi.org/10.1016/S0168-1656(99)00199-6).
- (52) Zhao, L. Q.; Sun, Z. H.; Zheng, P.; He, J. Y. Biotransformation of Isoeugenol to Vanillin by *Bacillus Fusiformis* CGMCC1347 with the Addition of Resin HD-8. *Process Biochem.* **2006**, *41* (7), 1673–1676. <https://doi.org/10.1016/j.procbio.2006.02.007>.
- (53) Chowdhury, A. Pyrosequencing-An Alternative to Traditional Sanger Sequencing Fakruddin and Abhijit Chowdhury Institute of Food Science and Technology (IFST),. **2009**, *8* (1), 14–20.
- (54) Stackebrandt, E.; Goebel, B. M. Taxonomic Note: A Place for DNA-DNA Reassociation and 16S RRNA Sequence Analysis in the Present Species Definition in Bacteriology. *Int. J. Syst. Bacteriol.* **1994**, *44* (4), 846–849. <https://doi.org/10.1099/00207713-44-4-846>.
- (55) Stackebrandt, E.; Jonas, E. Taxonomic Parameters Revisited: Tarnished Gold Standards. *Microbiol. Today* **2006**, *33*, 152–155.
- (56) Clarridge 3rd, J. E. Impact of 16S RRNA Gene Sequence Analysis for Identification of Bacteria on Clinical Microbiology and Infectious Diseases. *Clin. Microbiol. Rev.* **2004**, *17* (4), 840–862. <https://doi.org/10.1128/CMR.17.4.840-862.2004>.
- (57) Kadakol, J. C.; Kamanavalli, C. M. Biodegradation of Eugenol by *Bacillus Cereus* Strain PN24. *E-Journal Chem.* **2010**, *7* (S1), S474–S480.
- (58) Kumar, S.; Stecher, G.; Li, M.; Knyaz, C.; Tamura, K. MEGA X : Molecular Evolutionary Genetics Analysis across Computing Platforms. **2018**, *35* (May), 1547–1549. <https://doi.org/10.1093/molbev/msy096>.
- (59) Saitou, N.; Nei, M. The Neighbor-Joining Method: A New Method for Reconstructing Phylogenetic Trees. *Mol. Biol. Evol.* **1987**, *4* (4), 406–425. <https://doi.org/10.1093/oxfordjournals.molbev.a040454>.
- (60) Kimura, M. A Simple Method for Estimating Evolutionary Rates of Base Substitutions through Comparative Studies of Nucleotide Sequences. *J. Mol. Evol.* **1980**, *16* (2), 111–120. <https://doi.org/10.1007/BF01731581>.