

DAFTAR PUSTAKA

- Afoakwa, E.O., Quao, J., Takrama, J., Budu, A.S., Saalia, F.K., (2012). Changes in total polyphenols, o-diphenols and anthocyanin concentrations during fermentation of pulp pre-conditioned cocoa (*Theobroma cacao*) beans. *International Food Research Journal*. 19(3): 1071-1077. <https://www.worldcocoafoundation.org/wp-content/uploads/files/mf/afoaka2012.pdf>
- Afoakwa, E.O., Budu, A.S., Mensah-brown, H., dan Felix, J. (2014). Changes in biochemical and physico-chemical qualities during drying of pulp preconditioned and fermented cocoa (*Theobroma cacao*) beans. *Journal of Nutritional Health and Food Science* 2(3): 1-8. Doi: <http://dx.doi.org/10.15226/jnhfs.2014.00121>
- Agyirifo, D.S.; Wamalwa, M.; Otwe, E.P.; Galyuon, I.; Runo, S.; Takrama, J.; Ngeranwa, J. (2019). Metagenomics analysis of cocoa bean fermentation microbiome identifying species diversity and putative functional capabilities. *Heliyon*, 5, e02170.
- Apriyanto, M., Sutardi, Harmayani, E. dan Supriyanto (2016b). Perbaikan proses fermentasi biji kakao non fermentasi dengan penambahan biakan murni *Saccharomyces cerevisiae*, *Lactobacillus lactis*, dan *Acetobacter aceti*. *Agritech* 36(4): 410–415.
- Apriyanto, M., Sutardi, Supriyadi, dan E. Harmayani. 2017. Fermentasi biji kakao kering menggunakan *Saccharomyces cerevisiae*, *Lactobacillus lactis*, *Acetobacter aceti*. *Agritech* 37:302-311. DOI: 10.22146/agritech.17113.
- Apriyanto, M., Riono, Y., & Rujiah, R. (2020). Pengaruh populasi mikroba pada re-fermentasi terhadap kualitas biji kakao tanpa fermentasi. *AGRITEKNO: Jurnal Teknologi Pertanian*, 9(2), 64-71.
- Aris, S., Jumiono Aji. (2020). Faktor-faktor pasca panen yang mempengaruhi mutu kakao. *Jurnal Ilmiah Pangan* vol 2(2).
- Asrul, A. (2009). Populasi jamur mikotoksigenik dan kandungan aflatoxin pada beberapa contoh biji kakao (*Theobroma cacao* L.) asal Sulawesi Tengah. *Agroland: Jurnal Ilmu-ilmu Pertanian*, 16(3).
- Acevedo-Rodríguez, P. & Strong, M.T. (2012). Catalogue of seed plants of the West Indies. Smithsonian Contributions to Botany 98: 1-1192.
- Aulia, R., Bahri, S., & Ananda, M. (2020). Fermentasi kelapa parut bebas protein dengan aspergillus niger untuk menghasilkan lipase. *kovalen: jurnal riset kimia*, 6(1), 45-52.

- Babatope, B. (2005). Rheology of cocoa-pod husk aqueous system. Part-I: steady state flow 742 behavior. *Rheologica Acta*, 45(1), 72-76.
- Beckett, S. T. (2008). *The science of chocolate* (2nd ed.). London: Royal Society of Chemistry Paperbacks.
- Bernaert, H., I. Blondeel, L. Allegaert, and T. Lohmueller. 2012. Industrial Treatment of Cocoa in Chocolate Production: Health Implications. In *Chocolate and Health*, edited by R. Paoletti, A. Poli, A. Conti, and F. Vissoli, 17–32. Italia: Springer.
- Bonvehí, J. S., and F.V. Coll. 1997. Evaluation of bitterness and astringency of polyphenolic compounds in cocoa powder. *Food Chemistry* 60 (3): 365–70. doi:10.1016/S0308- 8146(96)00353-6
- Buamah, R., Dzogbefia, D.P. and Oldham, J.H. (1997). Pure yeast culture fermentation of cocoa (*Theobroma cacao* L): effect on yield of sweatings and cocoa bean quality. *World Journal of Microbiology & Biotechnology* 13, 457-462.
- Bulandari S (2016). Pengaruh Produksi Kakao terhadap Pertumbuhan Ekonomi di Kabupaten Kolaka Utara. Doctoral dissertation. Universitas Islam Negeri Alauddin Makassar.
- Camu, N., De Winter, T., Verbrugghe, K., Cleenwerck, I., Vandamme, P., Takrama, JS., Vancanneyt, M. & De Vuyst, L. (2007). Dynamics and biodiversity of populations of lactic acid bacteria and acetic acid bacteria involved in spontaneous heap fermentations of cocoa beans in Ghana. *Appl. Environ. Micob.* 73: 1809–1824.
- Camu, N., De Winter, T., Addo, S.K., Takrama, J.S., Bernaert, H., De Vuyst, L., (2008a). Fermentation of cocoa beans: influence of microbial activities and polyphenol concentrations on the flavour of chocolate. *Journal of the Science of Food and Agriculture*. 88, 2288–2297.
- Campos JR, Buendia H BE, Avila IO, Cervantes EL, and Flores MEJ. 2011. Dynamic of volatile and non-volatile compounds in cocoa(*Theobroma cacao* L.) during fermentation and drying process using principal component analysis. *Journal Food Research International*. 44 (2011). 250-258.
- Caligiani, A., M. Cirlini, G. Palla, R. Ravaglia, and M. Arlorio. 2007. GC-MS Detection of Chiral Markers in Cocoa Beans of Different Quality and Geographic Origin. *Chirality* 19 (4): 329–34. doi:10.1002/chir.20380.
- Chagas Junior, G. C. A., Ferreira, N. R., Andrade, E. H. D. A., Nascimento, L. D. D., Siqueira, F. C. D., & Lopes, A. S. (2021). Profile of volatile compounds of on-farm fermented and dried cocoa beans inoculated

with *Saccharomyces cerevisiae* KY794742 and *Pichia kudriavzevii* KY794725. *Molecules*, 26(2), 344.

Chagas Junior, G.C.A.; Ferreira, N.R.; Lopes, A.S. (2021). The microbiota diversity identified during the cocoa fermentation and the benefits of the starter cultures use: An overview. *International Journal of Food Science. Technology*. 56, 544–552.

Chotineeranat S, Rungtiva W, Kuakoon P, Pathama C, Pipat V and Klanarong S. (2010). Effect of calcium ion on ethanol.

Clementz, A. L., Aimaretti, N. R., Manuale, D., Codevilla, A., & Yori, J. C. (2015). Optimization of ethanol fermentation from discarded carrots using immobilized *Saccharomyces cerevisiae*. *International Journal of Energy and Environmental Engineering*, 6, 129–135.

Corcuera, L. A., S. Amézqueta, L. Arbillaga, A. Vettorazzi, S. Touriño, J. L. Torres, and A. López de Cerain. 2012. A Polyphenol-Enriched Cocoa Extract Reduces Free Radicals Produced by Mycotoxins. *Food and Chemical Toxicology* 50 (3–4). Elsevier Ltd: 989– 95. doi:10.1016/j.fct.2011.11.052.

Crafaack, M., Mikkelsen, M.B., Saerens, S., Knudsen, M., Blennow, A., Lowor, S., Takrama, J., Swiegers, J.H., Petersen, G.B., Heimdal, H., Nielsen, D.S., 2013. Influencing cocoa flavour using *Pichia kluyveri* and *Kluyveromyces marxianus* in a defined mixed starter culture for cocoa fermentation. *International Journal of Food Microbiology*. 167, 103–116.

Daniel, H.M.; Vrancken, G.; Takrama, J.F.; Camu, N.; de Vos, P.; de Vuyst, L. (2009). Yeast diversity of Ghanaian cocoa bean heap fermentations. *FEMS Yeast Res.* 9, 774–783.

De Vuyst, L. & Weckx, S. (2016) The cocoa bean fermentation process: from ecosystem analysis to starter culture development. *Journal of Applied Microbiology*, 121, 5–17.

Direktorat Jenderal Perkebunan. 2019. Statistika Perkebunan Indonesia 2017-2019 kakao. Ditjenbun, Kementerian Pertanian. Jakarta

Ditjenbun. (2016). Statistik perkebunan Indonesia komoditas kakao 2015-2017. Kementan, Jakarta.

Dujon, B.A., Louis, E.J., (2017). Genome diversity and evolution in the budding yeasts (*Saccharomycotina*). *Genetics* 206, 717–750.

Fadhli, H., Kusdiyantini, E., & Nurhayati, N. (2019). Karakterisasi morfologi, biokimia, dan uji enzimatis isolat khamir buah apel (*Malus domestica*

Borkh.) yang berpotensi menghasilkan bioetanol. *Jurnal Biologi Tropika*, 2(2), 62-73.

Figueroa-Hernández, C.; Mota-Gutierrez, J.; Ferrocino, I.; Hernández-Estrada, Z.J.; González-Ríos, O.; Cocolin, L.; Suárez-Quiroz, M.L. The challenges and perspectives of the Selection of starter cultures for fermented cocoa beans. *International Journal of Food Microbiology*. 2019, 301, 41–50.

Gutiérrez-Ríos, H. G., Suárez-Quiroz, M. L., Hernández-Estrada, Z. J., Castellanos-Onorio, O. P., Alonso-Villegas, R., Rayas-Duarte, P., & González-Ríos, O. (2022). Yeasts as producers of flavor precursors during cocoa bean fermentation and their relevance as starter cultures: a review. *Fermentation*, 8(7), 331.

Haryadi, dan Supriyanto. (2001). *Bahan Ajaran Pengolahan Kakao Menjadi Bahan Pangan*. Yogyakarta : Pau Pangan Dan Gizi Universitas Gadjah Mada.

Jati, M., Selamat, J., Wahyudi, T., & Putriani, N. (2006). Effects of alkali concentration and conching temperature on flavour, hardness and colour of chocolate. *Pelita Perkebunan a Coffee and Cocoa Research Journal*, 22(2).

Júniora, P.C.G., A.S.L.Vagner Bezerra dos Santosa, J.P.I. de Souza, J.R.S.Pinaa, G.C.A.C.Júniorc, andP.S.B. Marinhoa. (2020). Determination of theobromine and caffeine in fermented and unfermented Amazonian cocoa (*Theobroma cacao L.*) beans using square wave voltammetry after chromatographic separation. *Food Control* 108:106887. DOI: 10.1016/j.foodcont.2019.106887

Heriyawan, A. (2015). Perbaikan proses fermentasi biji kakao kering jemur dengan penambahan kanji yang tepat, Fakultas Pertanian Universitas Gadjah Mada.

Hernani, T. Hidayat, danI. Mulyawanti. (2019). The usage of dried starter for re-fermentation of unfermented cocoa beans the usage of dried starter for re-fermentation of unfermented cocoa beans. *International Conference on Agriculture Postharvest Handling and Processing* 309:1-7. DOI: 10.1088/1755-1315/309/1/012061.

Ho, V.T.T., Zhao, J., Fleet, G., (2014). Yeasts are essential for cocoa bean fermentation. *International Journal of Food Microbiology*. 174, 72–87.

Holzapfel WH. (2002). Appropriate starter culture technologies for small-scalefermentation in developing countries. *International Journal of Food Microbiology*.75: 197-212.

Jamili, N. A. Y., & Susilowati, P. E. (2014). Enhancement of cocoa quality by the indigenous yeast *Candida tropicalis* KLK4 through cocoa bean

- fermentation. *Journal: journal of advances in biotechnology*, 4(1).
- Jinap, S. & P.S. Dimick (1991). Effect of roasting on acidic characteristics of cocoa beans. *Journal of the Science of Food Agriculture*, 54, 317–321.
- Kadow, D., Niemenak, N., Rohn, S., Lieberei, R., (2015). Fermentation-like incubation of cocoa seeds (*Theobroma cacao L.*) – reconstruction and guidance of the fermentation process. *LWT - Food Science Technology*. 62, 357–361.
- Karinawantika, E. I.. 2015. Karakteristik Fisik dan Kimia Biji Kakao Hasil Fermentasi Dalam Wadah Karung Plastik di Pusat Penelitian Kopi dan Kakao Indonesia
- Koné, M.K.; Guéhi, S.T.; Durand, N.; Ban-Koffi, L.; Berthiot, L.; Tachon, A.F.; Brou, K.; Boulanger, R.; Montet, D. (2016). Contribution of predominant yeasts to the occurrence of aroma compounds during cocoa bean fermentation. *Food Research International*. 89, 910–917.
- Kustyawati, M. E., & Setyani, S. (2012). Pengaruh penambahan inokulum campuran terhadap perubahan kimia dan mikrobiologi selama fermentasi coklat. *Jurnal Teknologi & Industri Hasil Pertanian*, 13(2), 73-84.
- López-Cruz, R., Ragazzo-Sánchez, J. A., & Calderón-Santoyo, M. (2020). Microencapsulation of *Meyerozyma guilliermondii* by spray drying using sodium alginate and soy protein isolate as wall materials: a biocontrol formulation for anthracnose disease of mango. *Biocontrol Science and Technology*, 30(10), 1116-1132.
- Mahardika, E. L. (2015). *Karakteristik Fisiko Kimia Biji Kakao (Theobroma cacao L.) Hasil Variasi Jenis Ukuran dan Wadah Fermentasi di Pusat Penelitian Kopi dan Kakao Indonesia*. Skripsi S1. Fakultas Teknologi Pertanian Universitas Jember, Jember.
- Martono, B. (2014). *Karakteristik morfologi dan kegiatan plasma nutrional tanaman kakao*. IAARD Press.
- Manalu, R. (2019). pengolahan biji kakao produksi perkebunan rakyat untuk meningkatkan pendapatan petani [processing of smallholder plantations cocoa production to increase farmers income]. *Jurnal Ekonomi & Kebijakan Publik*, 9(2), 99-112.
- Misnawi, E. Suharyanto, Mulato, S., Widjotomo. (2002). *Pengolahan Coklat*. (Edisi 02). Fatemta IPB: Bogor.
- Meersman, E., Steensels, J., Mathawan, M., Wittox, P.-J., Saels, V., Struyf, N., Bernaert, H., Vrancken, G., Verstrepen, K.J., (2013). Detailed analysis of the microbial population in Malaysian spontaneous cocoa pulp fermentations reveals a core and variable microbiota. *PLoS One* 8, 1–10.

- Moreira, I.M.V.; Vilela, L.F.; Santos, C.; Lima, N.; Schwan, R.F. (2013). Volatile compounds and protein profiles analyses of fermented cocoa beans and chocolates from different hybrids cultivated in Brazil. *Food Research International*, 109, 196–203.
- Mota-Gutierrez, J.; Botta, C.; Ferrocino, I.; Giordano, M.; Bertolino, M.; Dolci, P.; Cannoni, M.; Cocolin, L. (2018). Dynamics and biodiversity of bacterial and yeast communities during fermentation of cocoa beans. *Appl. Environment Microbiology*, 84, e01164-18.
- Mudanifah dan W. H. Susanto. (2008). *Proses Pembuatan Kombucha Murbei (Morus alba L.) (Kajian Jenis Gula dan Lama Fermentasi)*.
- Mulato, S. dan S. Widjotomo, 2003. *Teknik Budidaya dan Pengolahan Hasil Tanaman Kakao*. Pusat Penelitian Kopi dan Kakao Indonesia. Jember.
- Nababan P, 2019. Pengaruh pemberian pupuk kandang sapi dan pupuk npk terhadap pembibitan tanaman kakao.abd el-naby, s.k.m. (2000). effect of banana compost as organic manure on growth, nutrients status, yield and fruit quality of maghrabi banana. *Assiut Journal Agriculture Science*. (EGY), 31(3): 101-114
- Nielsen, D.S. (2006). *The Microbiology of Ghanaian Cocoa Fermentations*. Denmark: Department of Food Science, Food Microbiology the Royal Veterinary and Agricultural University.
- Nielsen, D.S.; Hønholt, S.; Tano-Debrah, K.; Jespersen, L. Yeast populations associated with Ghanaian cocoa fermentations analysed using denaturing gradient gel electrophoresis (DGGE). *Yeast* 2005, 22, 271–284.
- Noor-Soffalina, S. S., Jinap, S., Nazamid, S., & Nazimah, S. A. H. (2009). Effect of polyphenol and ph on cocoa maillard-related flavour precursors in a lipidic model system. *International Journal of Food Science and Technology*, 44(1), 168–180.
- Oracz, Joanna, and Ewa Nebesny. 2016. “Antioxidant properties of cocoa beans (*Theobroma cacao L.*): influence of cultivar and roasting conditions.” *International Journal of Food Properties* 19 (6): 1242–58. <https://doi.org/10.1080/10942912.2015.1071840>.
- Patty, A. (2019). Analisis Sifat Fisik Biji Kakao Pada Berbagai Metode Fermentasi Dan Konsentrasi Fermipan. *Jurnal Hutan Pulau-Pulau Kecil*, 3(1), 13-24.
- Passos, F.M.L., A.S. Lopez, and D.O. Silva. (1984). Aeration and its influence on the mikrobial sequence in cacao fermentation in Bahia, with emphasis on lactic acid bacteria. *Journal of Food Science*. 49: 1470-1476.

- Pereira, G. V., Alvarez, J. P., Neto, D. P. D. C., Soccol, V. T., Tanobe, V. O., Rogez, H., & Soccol, C. R. (2017). Great intraspecies diversity of *Pichia kudriavzevii* in cocoa fermentation highlights the importance of yeast strain selection for flavor modulation of cocoa beans. *Lwt*, 84, 290-297. <https://doi.org/10.1016/j.lwt.2017.05.073>
- Pereira, Ana Paula M., Henrique A. Stellari, Leonardo F. Vilela, Rosane F. Schwan, and Anderson S. Sant'Ana. (2020). "Dynamics of *Geobacillus Stearothermophilus* and *Bacillus Cereus* Spores Inoculated in Different Time Intervals during Simulated Cocoa Beans Fermentation." *Lwt* 120 (December 2019): 108941. <https://doi.org/10.1016/j.lwt.2019.108941>.
- Pokorný, J., N. Yanishlieva, and M. Gordon. (2001). Antioxidants in Food: Practical Applications. London: Woodhead Publishing.
- Rahmadi, A., Y. Yunus, M. Ulfah, K. P. Candra, and S. Suwasono. (2020). "Microorganism population, theobromine, antioxidant, and FTIR analysis of samarinda cocoa bean fermented with *Saccharomyces cerevisiae* and *Acetobacter aceti*." *Food Research* 4 (6): 1912–20. [https://doi.org/10.26656/fr.2017.4\(6\).178](https://doi.org/10.26656/fr.2017.4(6).178).
- Rannes, A. W. S., & Handoko, Y. A. (2021). Perbandingan kualitas fermentasi biji kakao dengan penambahan kultur campur dan kultur tunggal *lactobacillus brevis* comparison of the quality of cocoa bean fermentation with the addition of mixed and single cultures of *Lactobacillus brevis*. *Jurnal Teknik Pertanian Lampung Vol*, 10(4), 537-547.
- Sabahannur, St., Mursalim., Asrul L.O. dan Mariyati Bilang. (2015). Use of high performance liquid chromatography (hplc) for theanalysis of amino acid of sulawesi and local clone cocoa bean fermentation, *Journal of Food Research*. 4(4):120-126.
- Semuel. F.K., (2013). Pengaruh fermentasi biji kakao kering non fermentasi terhadap Indeks fermentasi. Tesis, Fakultas Teknologi Pertanian UGM.
- Santos, D. S., R. P. Rezende, T. F. Dos Santos, E. d. L. S. Marques, A. C. R. Ferreira, A. B. d. C. e Silva, C. C. Romano, D. W. da Cruz Santos, J. C. T. Dias, and J. D. T. Bisneto. (2020). Fermentation in fine cocoa type Scavina: Change in standard quality as the effect of use of starters khamir in fermentation. *Food Chemistry*.
- Sanny, A. P. (2022). *Pengaruh Metode Ekstraksi Maserasi dan Soxhletasi Biji Coklat Terhadap Aktivitas Anti Jamur (Theobroma cacao L.) Candida albicans* (Doctoral dissertation, Universitas dr. SOEBANDI).
- Santoso, Y. P. (2014). *Perubahan Kadar Lemak dan Aktivitas Antioksidan Selama Fermentasi Spontan Pada Biji Kakao (Theobroma cacao L.)* (Doctoral dissertation, Unika Soegijapranata Semarang).

- Schwan, R.F. (1998). Cocoa fermentations conducted with a defined microbial cocktail inoculum. *Journal of Microbiology*. 14: 1477-1483.
- Senanayake, M., R.J. Errol, and K.A. Buckle. (1996). Effect of different mixing intervals on the fermentation of cocoa beans. *Journal of Science Food and Agriculture*. 74: 42-48.
- Septianti, E., J. Langkong, N.K. Sukendar, and A.P. Hanifa. (2020). Characteristic quality of pinrang's cocoa beans during fermentation used styrofoam containers. Canrea Journal: *Food Technology, Nutritios, and Culinary* Vol. 3: 10-25.
- Shadkami, F., Estevez, S., dan Helleur, R. (2009). Analysis of catechins and condensed tannins by thermally assisted hydrolysis/methylation-GC/MS and by a novel two step methylation. *Journal of Analytical and Applied Pyrolysis*, Vol. 85(1-2): 54-65.
- Shahidi, F. (2005). Nutraceuticals and Functional Foods in Health Promotion and Disease Risk Reduction. *Acta Horticulture* 6: 13–24.
- SNI 2323-2008. (2008). Standar Nasional Indonesia Biji Kakao. Jakarta: Dewan Standarisasi Nasional.
- Sukmawati, D., Nurkhasanah, S., Afifah, Z. N., Al Husna, S. N., Widowati, R., El Enshasy, H., & Dailin, D. J. (2021). Metagenomic-based approach for the analysis of yeast diversity associated with amylase production in lai (*Durio kutejensis*). *Journal of Pure and Applied Microbiology*, 15(1), 75-90.
- Sukmawati, D., Arman, Z., Hasanah, R., Balqis, M., Setiawan, A., Tafrijiyah, F., & Dailin, D. J. (2021). Application of yeasts isolated from fermented cocoa beans for biocontrol of pathogenic mold in chocolate fruit. *International Journal of Physics: Conference Series* (Vol. 1869, No. 1, p. 012042). IOP Publishing.
- Suzuki T, Miyamae Y, Ishida I. (1991). Variation of colony morphology and chromosomal rearrangement in *Candida tropicalis* pK233. *Journal Genetics and Microbiology* 137, 7.
- Supriyanto., Haryadi, B. Rahardjo, dan D. W. Marseno. (2006). Aktivitas antioksidan ekstrak polifenol kasar dari kakao hasil penyangraian menggunakan eneji gelombang Mikro. *Jurnal Teknologi dan Industri Pangan* Vol XVII (3): 176-182.
- Steffan P, Vazquez. J A, Boikov D, Xu C, Sobel. J D, Akins R A. (1997). Identification of *Candida* species by randomly amplified polymorphic DNA fingerprinting of colony lysates. *Journal Clin Microbiology* 35,

2031–2039.

- Umrah, U., Al Idrus, M., & Mutmainah, M. (2023). Eksplorasi cendawan jamur kontaminan pada biji kakao kering (*Theobroma cacao L.*). *Agroland: Jurnal Ilmu-ilmu Pertanian*, 30(1), 25-34.
- Utami, R. R. (2018). Antioksidan biji kakao: pengaruh fermentasi dan penyangraian terhadap perubahannya (ulasan). *Jurnal Industri Hasil Perkebunan*, 13(2), 75-85.
- Widianto, D., Pramita, A. D., dan Wedhastri, S. (2013). Perbaikan proses fermentasi biji kakao kering dengan penambahan tetes tebu, khamir, dan bakteri asam, *Jurnal Tekno sains*. 3(1):1-80.
- Wood,G.A.R. dan Lass, R.A., 2001. Cocoa. series 4th. Blackwell science. London.
- Winarno, F.G. (1993). *Pangan, Gizi, Teknologi dan Konsumsi*. PT. Gramedia Pustaka Utama, Jakarta.
- Wiratakusumah, A., Subarna, M. Arpah, Dahrulsyah, dan S.I. Budiwati, (1992). *Peralatan dan Unit Proses Peralatan*. Pusat Antar Universitas Pangan dan Gizi – Institut Pertanian Bogor, Bogor
- Yang et al., (2022). Rapid determinationof the roasting degree of cocoa beans by extreme learning mechine (elm) base imaging analyse. *Journal of agricultur and food research* 10 (2022)100437.
- Yuliani F., Fauzana G., (2020). Pemanfaatan kakao sebagai antioksidan alami. *Journal of Multidisciplinary Research and Development*. Vol 2(4).