

## DAFTAR PUSTAKA

- Aditya, Neeraj, J.N. Bhatia, A. N. Yadav. 2025. a comprehensive review on multifunctional bioactive properties of elm oyster mushroom *Hypsizyugus ulmarius* (Bull.) redhead (Agaricomycetes): current research, challenges and future trends. *Heliyon*, 11, e41418.
- Angelini, P., G.A. Flores, G. Cusumano, R. Venanzoni, R.M. Pellegrino, G. Zengin, S.C.D. Simone, L. Menghini, and C. Ferrante. 2023. Bioactivity and metabolomic profile of extracts derived from mycelial solid cultures of *Hypsizyugus marmoreus*. *Microorganisms*, 11(10) : 2552.
- Cai, M., Lin, Y., & Luo, Y. (2015). Production of protease by *Hypsizyugus marmoreus* and its application in hydrolyzing proteins. *Journal of Food Science and Technology*, 52(9) : 6005–6012.
- Chancaroonpong, C., Hsieh, P. C., Sheu, S. C. 2012. Enzyme production and growth of *Aspergillus oryzae* on soybean koji fermentation. *Procedia – Social and Behavioral Sciences*, 2, 57-61.
- Chen, Y., H. Liu, and R. Zhang. 2020. salt tolerance mechanisms of edible fungi and their application in fermented food production. *Journal of Applied Microbiology*, 129(6) : 1558-1571.
- Devanthi, P.V.P., dan K. Gkatzionis. 2019. soy sauce fermentation: microorganisms, aroma formation, and process modification. *Food Research International*, 120 : 364-374.
- Diez-Simon, C., Eichelsheim, C., Mumm, R., Hall, R. D. 2020. Chemical and sensory characteristics of soy sauce : a review. *Journal of Argicultural and Food Chemistry*, 68, 11612-11630.
- Giang, N.T.N., T.V. Khai, and N.M. Thuy. 2022. Optimization of amylase and protease production from oyster mushroom koji (*Pleurotus spp.*) using response surface methodology. *Journal of Applied Biology & Biotechnology*, 10(1) : 54-61.
- Ginting, E., & R. Yulifianti. 2014. kualitas dan preferensi industri terhadap kecap dari varietas unggul kedelai hitam. *Prosiding Seminar Hasil Penelitian Tanaman Aneka Kacang dan Umbi* (pp.452-465). Malang: Balai Penelitian Tanaman Aneka Kacang dan Umbi.
- Guinard, J.X., and Souchard, A. 1996. Sensory determinants of consumer acceptance of dairy and meat products. *Food Quality and Preference*, 7(3-4), 209-221.
- He, X., P. Rong, H. Liu, B. Gan, D. Wu, H. Li, and R. Gan. 2022. co-fermentation of edible mushroom by-products with soybeans enhances nutritional values, isoflavone aglycones, and antioxidant capacity of douchi koji. *Foods*, 11 : 2943.
- Hendarto, D. R., A.P. Handayani, E. Esterelita, and Y.A. Handoko. 2019. mekanisme biokimiawi dan optimalisasi *Lactobacillus bulgaricus* dan *Streptococcus thermophilus* dalam pengolahan yoghurt yang berkuallitas. *Jurnal Sains Dasar*, 8(1) : 13-19.
- Intiaj, A., S. Sultana, J. Hossain, S.A. Rahman, and S. Ohga. 2016. performance of vegetative growth and artificial fruit body formation of *Hypsizyugus marmoreus* in Bangladesh. *J. Fac. Agr., Kyushu Univeristy*, 61(2) : 257-262.

- Ito, K., and A. Matsuyama. 2021. koji molds for Japanese soy sauce brewing : characteristics and key enzymes. *Journal of Fungi*, 7 : 658.
- Jeong, S. W., Yeo, H. J., Ha, N., Kim, K. J., Seo, K. S., Jin, S. W., Koh, Y. W., Jeong, H. G., Park, C. H., and Im, S. B. 2024. Metabolite profiles and biological activities of different phenotypes of beech mushrooms (*Hypsizygus marmoreus*). *Foods*, 13(20), 3325.
- Ji, C., Petchkongkae, A., Ruth, S., Wu, D., Elliott, C. 2024. The crucial importance of soy sauce authenticity : global trade, adulteration risk, and analytical challenges. *Trends in Food Science & Technology*, 152, 104666.
- Kala, K., W. Pajak, K. Sułkowska-Ziaja, A. Krakowska, J. Lazur, M. Fidurski, K. Marzec, P. Zieba, A. Fijałkowska, A. Szewczyk, and B. Muszynska. 2022. *Hypsizygus marmoreus* as a source of indole compounds and other bioactive substances with health-promoting activities. *Molecules*, 27 : 8917.
- Kamphuis, C.B.M., Jansen, T., Mackenbach, J.P., and van Lenthe, F.J. 2015. Perceptions of taste and price of food items among Dutch adults differ by gender and socioeconomic status. *Public Health Nutrition*, 18(5), 877-884.
- Kieliszek, M., K. Pobiega, K. Piwowarek, and A.M. Kot. 2021. Characteristics of the proteolytic enzymes produced by lactic acid bacteria. *Molecules*, 26 : 1-15.
- Kiliroong, M.R.B., H. Wael, A. Smith, and S. Wael. 2021. viscosity and organoleptic test of gude bean soy sauce (*Cajanus cajan* L.). *Bioedupat*, 1(2) : 71-78.
- Kim, D. Y., K.J. Ho, S.H. Seung. 2022. Improving the quality of fermented soybean products using low-frequency airborne ultrasonicated koji. *Food Science and Technology*, 168(1) : 3936.
- Liang, Y., L. Pan, and Y. Lin. 2009. analysis of extracellular proteins of *Aspergillus oryzae* grown on soy sauce koji. *Bioscience, Biotechnology & Biochemistry*, 73(1) : 192-195.
- Lioe, H. N., Apriyantono, A., Takara, K., Wada, K., and Yasuda, M. 2006. An updated review of soy sauce : manufacturing, composition, and possible health benefits. *Journal of Agricultural and Food Chemistry*, 52(14), 4847-4854.
- Lusihanne, C. B., M. Andriana, and F. M. K. Sari. 2023. the biochemistry and physical changes in koji fermentation by *Aspergillus oryzae* in sweet soy sauce making. *Tropical Microbiome Journal*, 1(1) : 35-46.
- Macchione, M.M., C.W. Merheb, E. Gomes, R. da Silva. 2008. Protease production by different thermophilic fungi. *App Biochem Biotechnol*, 146 : 223-230.
- Madonna, S. 2014. Produksi enzim amilolitik dari *Bacillus megaterium* menggunakan variasi kadar pati sagu (*Metroxylon* sp.). *Al-Kaunyah Jurnal Biologi*, 7(1) : 22-27.
- Miranda, H.P., E.L.L. Sumulong, and A.P. Medalla. 2015. Cultural and antibacterial studies of *Hypsizygus tessulatus* (Buna-shimeji). *International Journal of Microbiology*, 1(3).
- Oosone, S., A. Kashiwaba, N. Yanagihara, J. Yoshikawa, Y. Kashiwagi, and K. Maehashi. 2020. The role of amilolytic and proteolytic enzyme activities of vegetables, fruits, and edible fungi in flavor enhancement during cooking. *International Journal of Gastronomy and Food Science*, 22, 100264.

- Pangestika, L.M.W., H.N. Lioe, D.R. Adawiyah, S. Suliantari, G. Melzer, and B. Weinreich. 2021. penggunaan ekstrak khamir sebagai nutrisi tambahan pada fermentasi moromi kecap kedelai. *Jurnal Teknologi Pertanian*, 22(1) : 1-12.
- Pescuma, M., Hébert, E. M., Mozzi, F., & Font de Valdez, G. (2010). Functional fermented whey-based beverage using lactic acid bacteria. *International Journal of Food Microbiology*, 141(1–2) : 73–81.
- Pratiwi, R.F., R. Utami, dan E. Nurhartadi. 2012. Pengaruh lama fermentasi moromi terhadap viskositas, kadar protein terlarut, aktivitas antioksidan, dan sensori kecap bungkil wijen putih sangrai dan non sangrai. *Jurnal Teknologi Hasil Pertanian*, 5(2) : 96-105.
- Purkan, P., N.N. Laila, and S. Sumarsih. 2017. *Lactobacillus bulgaricus* sebagai probiotik guna peningkatan kualitas ampas tahu untuk pakan cacing tanah. *Jurnal Kimia Riset*, 2(1) : 1-9.
- Sharma, R., P. Garg, P. Kumar, S.K. Bhatia, and S. Kulshrestha. 2020. Microbial fermentation and its role in quality improvement of fermented foods. *Fermentation*, 6(106) : 1-20.
- Singracha, P., N. Niamsiri, W Visessanguan, S. Lertsiri, and A. Assavanig. 2017. application of lactic acid bacteria and yeasts as starter cultures for reduced-salt soy sauce (moromi) fermentation. *LWT-Food Science and Technology*, 78 : 181-188.
- Suganthi, C., Mohanasrinivasan, V., & Manoharan, M. (2011). Amylase production by *Bacillus cereus* in solid state fermentation. *Journal of Applied Pharmaceutical Science*, 1(5) : 112–117.
- Sugitomo, M., H. Takahashi, and K. Takahashi. 2010. protease activities of *Aspergillus sojae* in soy sauce fermentation. *Journal of Bioscience and Bioengineering*, 110(1) : 63-67.
- Suhartono, S., and W. Artika. 2017. Isolasi dan uji aktivitas protease dari aktinobakteri isolat lokal (AKJ-09) Aceh. *Jurnal Bioleuser*, 1(3) : 116-120.
- Surianti, H. Tandipayuk, and S. Aslamyah. 2020. Fermentasi tepung ampas tahu dengan cairan mikroorganisme mix sebagai bahan paku pakan. *Jurnal Agrokompleks*, 9(1) : 9-15.
- Taveira, J.C., K.M.V. Nogueira, D.L.G. de Oliveira, and R.N. Silva. 2021. Fermentation : humanity’s oldest biotechnological tool. *Earth and Its Resources*, 9 : 1-7.
- Tian, Y., Y. Chen, X. Tong, S. Hou, M. Zhao, and Y. Feng. 2023. Flavor differences of soybean and defatted soybean fermented soy sauce and its correlation with the enzyme profiles of the kojis. *J Sci Food Agric*, 103 : 606-615.
- Tong, J., G. Li, X. Liu, and X. Zheng. 2025. insight into the fermentation mechanism of umami taste in traditional Chinese soybean paste : A review. *LWT*, 224, 117896.
- Vihinen, M., and P. Mantsala. 1989. microbial amylolytic enzymes. *Critical Reviews in Biochemistry and Molecular Biology*, 24(4) : 329-418.
- Voidarou, C., M. Antoniadou, G. Rozus, A. Tzora, I. Skoufos, T. Varzakas, A. Lagiou, and E. Bezirtzoglou. 2020. Fermentative foods : microbiology, biochemistry, potential human health benefits and public health issues. *Foods*, 10(69) : 1-22.
- Wang, L., Qu, W., Xu, Y., Xia, S., Xue, Q., Jiang, X., Liu, H., Xue, C., and Wen, Y. 2024. Developing a high-umami, low-salt soy sauce through accelerated

- moromi fermentation with *Corynebacterium* and *Lactiplantibacillus* strains. *Foods*, 13, 1386.
- Yee, C.S., M.N.A. Sohedein, O.P. Suan, A.W.W. Loen, M.H.A. Rahim, S. Soumaya, Z. Ilham, and W.A.A.I. Wan-Mohtar. 2021. the production of functional  $\square$ -aminobutyric acid Malaysian soy sauce koji and moromi using the trio of *Aspergillus oryzae* NSK, *Bacillus cereus* KBC, and the newly identified *Tetragenococcus halophilus* KBC in liquid-state fermentation. *Future Foods*, 4 : 100055.
- Zhang, L., Y. Bao, H. Chen, J. Huang, and Y. Xu. 2020. Functional microbiota for polypeptide degradation during hypertonic moromi-fermentation of pixian broad bean paste. *Foods*, 9, 930.
- Zhang, X., Z Liu, B. Kang, Y. Huang, C. Fu, W. Li, Q. Wu, Z. Liu, D. Li, C. Wang, and N. Xu. 2021. effect of *Lactobacillus plantarum* or *Enterococcus faecalis* as co-inoculants with *Aspergillus sojae* in koji making in the physicochemical properties of soy sauce. *Food Chemistry*, 87 : 714-727.
- Zhao, L. 2021. influence of mixed fungal cultures on flavor development and salt concentration in koji fermentation. *International Journal of Food Microbiology*, 338, 108986.



UNIVERSITAS  
GADJAH MADA

**Aktivitas Amilolitik, Proteolitik Ekstrak Kasar Koji dan Moromi serta Profil Kualitas Fisikokimia pada Fermentasi Kecap dengan Penambahan *Hypsizygus sp.*, dan *Lactobacillus bulgaricus***  
Fadlilah Rahma Julianty, Sari Darmaswi, S.Si., M.Biotech, Ph.D.

Universitas Gadjah Mada, 2025 | Diunduh dari <http://etd.repository.ugm.ac.id/>