

DAFTAR PUSTAKA

- Abdelazez, A., H. Abdelmotaal., S.E. Evivie., S. Melak., F.F. Jia., M.H. Khoso., dan X.C. Meng. 2018. Screening potential probiotic characteristics of *Lactobacillus brevis* strains in vitro and intervention effect on Type I diabetes in vivo. *BioMed Research International*, 2018, 1–20. doi: 10.1155/2018/7356173
- Afgani, C.A., I. Nairfana., D.S. Saputri., L. Azis., B. Manguntungi, dan S. Amrullah. 2021. Karakteristik masin udang rebon (*Acetes indicus*), makanan tradisional fermentasi khas Sumbawa. *Jurnal Ilmu dan Teknologi Pangan* 7(1): 795-803. doi: 10.29303/profood.v7i1.155
- Anggraini, L., Y. Marlida., W. Wizna., J. Jamsari, and M. Mirzah. 2019. Optimization of Nutrient Medium for *Pediococcus acidilactici* DS15 to Produce GABA. *Jornal of World's Poultry Research* 9(3): 139-146. doi: 10.36380/jwpr.2019.17
- Annisa, S., I. Musfiroh, dan L. Indriati. 2020. Perbandingan metode analisis instrumen HPLC dan UHPLC: Article Review. *Farmaka* 17(3): 189-197
- Axelsson, L. 1998. Lactic acid bacteria: Classification and physiology. In *Lactic Acid Bacteria: Microbiological and Functional Aspects*. Marcel Dekker, Inc., New York.
- Ayivi, R.D., R. Gyawali., A. Krastanov., S.O. Aljaloud., M. Worku., R. Tahergorabi., R. C. da Silva, dan S.A. Ibrahim. 2020. Lactic Acid Bacteria: Food Safety and Human Health Applications. *Dairy* 1: 202-232. doi 10.3390/dairy1030015
- Barrett, E. R.P. Ross., P.W. O'Toole., G.F. Fitzgerald, dan C. Stanton. 2012. Gamma-Aminobutyric acid production by culturable bacteria from the human intestine. *Journal of Applied Microbiology* 113: 411-417. doi: 10.1111/j.1365-2672.2012.05344.x
- Behnoush, B., A. Sheikhezadi., E. Bazmi., A. Fattahi., E. Sheikhezadi, dan S.H.S. Anary. 2015. Comparison of UHPLC and HPLC in Benzodiazepines Analysis of Postmortem Samples. A Case–Control Study. *Medicine* 94(14): 640-647. Doi: 10.1097/MD.0000000000000640
- Binh, T. T. T., Ju, W.-T., Jung, W.-J., dan Park, R.D. 2014. Optimization of γ -amino butyric acid production in a newly isolated *Lactobacillus brevis*. *Biotechnology Letters*, 36(1), 93–98. doi: 10.1007/s10529-013-1326-z.

- Boonstra, E., R. de Kleijn., L.S. Colzato., A. Alkemade., B. U. Forstmann., and S. Nieuwenhuis. 2015. Neurotransmitters as food supplements: the effects of GABA on brain and behavior. *Frontiers in Psychology* 6(1520): 1-6. doi: 10.3389/fpsyg.2015.01520
- Bryan, F.L. 1992. Hazard analysis Critical Control Point Evaluation: A guide to identifying hazards and assesing risk associated with food preparation and storage. Geneva, World Health Organization.
- Cagno, R.D., F. Mazzacane., C. G. Rizzello., M.D. Angelis., G. Giuliani., M. Meloni., B. D. Servi, dan M. Gobetti. 2010. Synthesis of γ -aminobutyric acid (GABA) by *Lactobacillus plantarum* DSM19463: functional grape must beverage and dermatological applications. *Applied Microbiology and Biotechnology* 86: 731-741. doi: 10.1007/s00253-009-2370-4
- Cellot, G dan Cherubini, E. 2014. GABAergic signaling as therapeutic target for autism spectrum disorders. *Frontiers in Pediatrics* 70 (2): 1-11
- Chen, W., Xu, W., dan Zheng, X. 2015. A *Lactobacillus plantarum* strain newly isolated from chinese sauerkraut with high γ -aminobutyric acid productivity and its culture conditions optimization. *Metallurgical and Mining Industry*, 7(9), 388–393.
- Choi, J.W., S.S. Yim., S.H Lee., T.J. Kang., S.J. Park. Dan K.J. Jeong. 2015. Enhanced production of gamma-aminobutyrate (GABA) in recombinant *Corynebacterium glutamicum* by expressing glutamat decarboxylase active in expanded pH range. *Microbial Cell Factories* 14(21): 1-11. doi: 10.1186/s12934-015-0205-9
- Cho, S. Y., Park, M. J., Kim, K. M., Ryu, J. H., dan Park, H. J. 2011. Production of high γ -aminobutyric acid (GABA) sour kimchi using lactic acid bacteria isolated from Mukeunjee kimchi. *Food Science and Biotechnology*, 20(2), 403–408. doi: 10.1007/s10068-011-0057-y.
- Chuang, C.Y., Y.C. Shi., H.P. You., Y.H. Lo., dan T.M. Pan. 2011 Antidepressant Effect of GABA-Rich Monascus-Fermented Product on Forced Swimming Rat Model. *Journal of Agricultural and Food Chemistry* 59: 3027-3035
- Cotter, P.D. and C. Hill. 2003. Surviving the acid test: Response of Gram-positive bacteria to low pH. *Microbiology and Molecular Biology Reviews* 67(3): 429-454
- Cryan, J.F. and K. Kaupmann. 2005. Don't worry 'B' happy! : a role for GABA B receptors in anxiety and depression. *Trends in Pharmacological Science* 26(1): 36-43. doi: 10.1016/j.tips.2004.11.004

- Cui, Y., K. Miao., S. Niyaphorn, dan X. Qu. 2020. Production of Gamma-Aminobutyric Acid from Lactic Acid Bacteria: A Systematic Review. *International Journal of Molecular Sciences* 21(995): 1-21. doi: 10.3390/ijms21030995
- Darma, C.S. 2021. Karakteristi Fisik dan Sensoris Keju yang Difermentasi dengan Kultur Starter Lokal (*Lactobacillus plantarum* Kita-3). Fakultas Teknologi Pertanian. Universitas GADjah Mada, Yogyakarta
- Dhakar, R., V.K. Bajpai, dan K.H. Baek. 2012. Production of GABA (γ -Aminobutyric Acid) by Microorganisms: A Review. *Brazilian Journal of Microbiology*: 1230-1241. doi: 10.1590/S1517-83822012000400001
- D'Este, M., M. A. Morales, dan I. Angelidaki. 2018. Amino acids production focusing on fermentation technologies—A review. *Biotechnology Advances* 36: 14-25. doi: 10.1016/j.biotechadv.2017.09.001
- Diana, M., J. Quilez, and M. Rafecas. 2014. Gamma-aminobutyric acid as a bioactive compound in foods: a review. *Journal of Functional Foods* 10: 407-420. doi: 10.1016/j.lwt.2013.11.027
- Diez-Gutierrez, L., L. S. Vicente., L. J. R. Baron., M. D. C. Villaran, dan M. Chavarri. 2020. Gamma-aminobutyric acid and probiotics: Multiple health benefits and their future in the global functional food and nutraceuticals market. *Journal of Functional Foods* 64: 1-14. doi: doi.org/10.1016/j.jff.2019.103669
- Dong, X., P.J. Quinn, dan X. Wang. 2011. Metabolic engineering of *Escherichia coli* and *Corynebacterium glutamicum* for the production of L-threonine. *Biotechnology Advances* 29: 11-23. doi: 10.1016/j.biotechadv.2010.07.009
- Edgar, R.C. 2004. MUSCLE: multiple sequence alignment with high accuracy and high throughput. *Nucleic Acid Research* 32(5): 1792-1797. doi: 10.1093/nar/gkh340
- Elfita, L. 2014. Analisis profil protein dan asam amino sarang burung walet (*Collocalia Fuchiphaga*) asal Painan. *J. Sains Farmasi & Klinik* 1(1): 27-37. doi: 10.29208/jsfk.2014.1.1.22
- Feehily, C. dan K.A.G. Karatzas. 2012. Role of glutamat metabolism in bacterial responses towards acid and other stresses. *Journal of Applied Microbiology* 14: 11-24. doi: 10.1111/j.1365-2672.2012.05434.x

- Freudl, R. 2017. Beyond amino acids: Use of the *Corynebacterium glutamicum* cell factory for the secretion of heterologous proteins. *Journal of Biotechnology* 258: 101-109. doi: 10.1016/j.jbiotec.2017.02.023
- Galli, V., M. Venturi., E. Mari., S. Guerrini, dan L. Granchi. 2022. Gamma-aminobutyric acid (GABA) production in fermented milk by lactic acid bacteria isolatd from spontaneous raw milk fermentation. *International dairy Journal* 127: 1-10. doi: 10.1016/j.idairyj.2021.105284
- Harahap, I.A., M. Mariyatun., P. N. Hasan., F. H. Pamungkaningtyas., J. Widada., T. Utami., M. N. Cahyanto., M. Juffrie., A. Dinoto., S. Nurfiani., E. Zulaichah., I. N. Sujaya., E. S. Rahayu. 2021. Recovery of Indigenous probiotic *Lactobacillus plantarum* Mut-7 on healthy Indonesian adults after consumption of fermented milk containing these bacteria. *Journal of Food Science and Technology* 58(9): 3525-3532. doi: 10.1007/s13197-021-05046-z
- Hong Le, P., N. Parmentier., T.T. Le., dan K. Raes. 2021. Evaluation of using a combination of enzymatic hydrolysis and lactic acid fermentation for γ -aminobutyric acid production from soymilk. *Food Science and Technology* 142: 1-9. doi: 10.1016/j.lwt.2021.111044
- Huang, C.Y., W.W. Kuo., H.F. Wang., C.J. Lin., Y.M. Lin., J.L. Chen., C.H. Kuo., P.K. Chen, and J.Y. Lin. 2014. GABA tea ameliorates cerebral cortex apoptosis and autophagy in streptozotocin-induced diabetic rats. *Journal of Functional Foods* 6: 534-544. doi: 10.1016/j.jff.2013.11.020
- Hussin, F.S., S.Y. Chay., A. S. M. Hussin., W.Z.W. Ibadullah., B.J. Muhialdin., M.S.B. Ghani, dan N. Saari. 2021. GABA enhancement by simple carbohydrates in yoghurt fermented using novel, self-cloned *Lactobacillus plantarum* Taj-Apis362 and metabolomics profiling. *Scientific Reports* 11(9417): 1-12
- Inoue, K., Shirai, T., Ochiai, H., Kasao, M. K., Hayakawa, K., Kasao, M. K., & Sansawa, H. 2003. Blood-pressure-lowering effect of a novel fermented milk containing gamma-aminobutyric acid (GABA) in mild hypertensives. *European Journal of Clinical Nutrition*, 57(3), 490–495. doi: 10.1038/sj.ejcn.1601555.
- Jacoeb, A.M., Nurjanah., dan L.A.B. Lingga. 2012. Karakteristik protein dan asam amino daging rajungan (*Portunus pelagicus*) akibat pengukusan. *J. Pengolahan Hasil Perikanan Indonesia* 15(2): 156-163. doi: 10.17844/jphpi.v15i2.6207
- Kamil, R.Z., A. Murdiati., M. Juffrie, and E.S. Rahayu. 2022. Gut Microbiota Modulation of Moderate Undernutrition in Infants through Gummy

Lactobacillus plantarum Dad-13 Consumption: A Randomized Double-Blind Controlled Trial. *Nutrients* 14 (1049): 1-19. doi: 10.3390/nu14051049

Kang, X., J. Xiao., X. Huang, dan Z. Gu. 2006. Optimization of dansyl derivatization and chromatographic conditions in the determination of neuroactive amino acids of biological samples. *Clinica Chimica Acta* 366: 352-356. doi: 10.1016/j.cca.2005.11.011

Kim, M.J. dan K.S. Kim. 2012. Isolation and Identification of γ -Aminobutyric acid (GABA)-producing Lactic Acid Bacteria from Kimchi. *Journal of The Korean Society for Applied Biological Chemistry* 55: 777-785. doi: 10.1007/s00284-020-02000-8

Kim, E., H.C. Chang., H.Y. Kim. 2020. Complete Genome Sequence of *Lactobacillus plantarum* EM, A Putative Probiotic Strain with the Cholesterol-Lowering Effect and Antimicrobial Activity. *Current Microbiology* 77: 1871-1882. doi: 10.1007/s00284-020-02000-8

Kırmılioğlu, G.Y. da Y. Yazan. 2016. Determination of gamma-aminobutyric acid by HPLC: its application to polymeric nanoparticles and stability studies. *International Journal of Development Research* 6(6): 8277-8282

Kleerebezem, M., J. Boekhorst., R. van Kranenburg., D. Molenaar., O.P. Kuipers., R. Leer., R. Tarchini., S.A. Peters., H.M. Sandbrink., M.W. Fiers., W. Stiekema., R.M. Lankhorst., P.A. Bron., S.M. Hoffer., M.N. Groot., R. Kerkhoven., M. de Vries., B. Ursing., W.M. de Vos., and R.J. Siezen. 2003. Complete genome sequence of *Lactobacillus plantarum* WCFS1. *Proc Natl Acad Sci USA* 18(100): 1990 – 1995. doi: 10.1073/pnas.0337704100

Ko, C, Y., H.T.V. Lin., dan G. J. Tsai. 2013. Gamma-aminobutyric acid production in black soybean milk by *Lactobacillus brevis* FPA 3709 and the antidepressant effect of the fermented product on a forced swimming rat model. *Process Biochemistry* 48: 559-568

Komatsuzaki, N., J. Shima., S. Kawamoto., H. Momose, dan T. Kimura. 2005. Production of γ -aminobutyric acid (GABA) by *Lactobacillus paracasei* isolatd from traditional fermented foods. *Food Microbiology* 22: 497-504. doi: 10.1016/j.fm.2005.01.002

Kook, M.C., M.J Seo., C.I. Cheigh., Y.R. Pyun., S.C. Cho, and H. Park. 2010. Enhanced Production of γ -Aminobutyric Acid Using Rice Bran Extracts by *Lactobacillus sakei* B2-16. *Journal of Microbiology and Biotechnology* 20(4):763-766. doi: 10.4014/jmb.0911.11016

- Laroute, V., R. Mazzoli., P. Loubiere., E. Pessione, dan M. C. Bousquet. 2021. Environmental Conditions Affecting GABA Production in *Lactococcus lactis* NCDO 2118. *Microorganism* 9, 122
- Lee, S.J., H.S. Jeon., J.Y. Yoo, dan J.H. Kim. 2021. Some Important Metabolites Produced by Lactic Acid Bacteria Originated from Kimchi. *Foods* 10(2148): 1-20. doi: 10.3390/foods10092148
- Li, H. dan Y. Cao. 2010. Lactic acid bacterial cell factories for gamma-aminobutyric acid. *Amino Acids* 39: 1107-1116. doi: 10.1007/s00726-010-0582-7
- Lim, H.S., I.T. Cha., S.W. Roh., H.H. Shin, dan M.J. Seo. 2017. Enhanced Production of Gamma-Aminobutyric Acid by Optimizing Culture Conditions of *Lactobacillus brevis* HYE1 Isolatd from Kimchi, a Korean Fermented Food. *Journal of Microbiology and Biotechnology* 27(3): 450-459. doi: 10.4014/jmb.1610.10008
- Lim, H. S., Seo, D. H., Cha, I. T., Lee, H., Nam, Y. D., dan Seo, M. J. 2018. Expression and characterization of glutamate decarboxylase from *Lactobacillus brevis* HYE1 isolated from kimchi. *World Journal of Microbiology and Biotechnology*, 34(3): 1–10. doi: 10.1007/s11274-018-2427-6.
- Lin, Q. 2013. Submerged fermentation of *Lactobacillus rhamnosus* YS9 for γ -aminobutyric acid (GABA) production. *Brazilian Journal of Microbiology* 44(1): 183-187. doi: 10.1590/S1517-83822013000100028
- Lin, Q., Li, D., dan Qin, H. 2017. Molecular cloning, expression, and immobilization of glutamate decarboxylase from *Lactobacillus fermentum* YS2. *Electronic Journal of Biotechnology*, 27, 8–13. doi: 10.1016/j.ejbt.2017.03.002
- Lin, X., Y. Xia., Y. Yang., G. Wang., W. Zhou, and L. Ai. 2020. Probiotic characteristics of *Lactobacillus plantarum* AR113 and its molecular mechanism of antioxidant. *Food Science and Technology* 126: 1-8. doi: 10.1016/j.lwt.2020.109278
- Liputo, S.A., S. Berhimpon, dan F. Fatimah. 2013. Analisa nilai gizi serta komponen asam amino dan asam lemak dari nugget ikan nike (*Awaous melanocephalus*) dengan penambahan tempe. *J. Chemistry Progress* 6(1): 38-44. doi: 10.35799/cp.6.1.2013.2070
- Luo, H., Z. Liu., F. Xie., M. Bilal., L. Liu., R. Yang, dan Z. Wang. 2021. Microbial production of gamma-aminobutyric acid: applications, state-of-the-art

achievements, and future perspectives. *Critical Reviews in Biotechnology* 41(4): 491-512. doi: 10.1080/07388551.2020.1869688

Luwidharto J.C.N., E.S. Rahayu., D.A. Suroto., R. Wikandari., A. Ulfah, dan T. Utami. 2022. Effects of *Spirulina platensis* Addition on Growth of *Lactobacillus plantarum* Dad 13 and *Streptococcus thermophilus* Dad 11 in Fermented Milk and Physicochemical Characteristics of the Product. *Applied Food Biotechnology* 9(3): 205-216

Mayo B., T. Aleksandrak-Piekarczyk., M. Fernandez., M. Kowalczyk., P. Alvarez-Martin., J. Bardowski. 2010. Updates in the metabolism of lactic acid bacteria. In: *Biotechnology of lactic acid Bacteria novel applications*. Blackwell Publishing, New Jersey. doi: 10.1002/9781118868386

Meidistria T.R., L. Sembiring., E.S. Rahayu., N. Haedar, dan Z. Dwyana. 2020. Survival of *Lactobacillus plantarum* dad 13 in probiotic cheese making. *IOP Conf. Series: Earth and Environmental Science* 575: 1-8

Mine, Y., E. Li-Chan, and B. Jiang. 2010. *Bioactive Proteins and Peptides as Functional Foods and Nutraceuticals*. Blackwell Publishing, United States.

Mohler, H. 2012. The GABA system in anxiety and depression and its therapeutic potential. *Neuropharmacology* 62: 42-53. doi: 10.1016/j.neuropharm.2011.08.040

Muloiwa, M., S.N. Byakika, dan M. Dinka. 2020. Comparison of unstructured kinetic bacterial growth models. *South African Journal of Chemical Engineering* 33: 141-150. doi: 10.1016/j.sajce.2020.07.006

Nejati, F., Rizzello, C. G., Di Cagno, R., Sheikh-Zeinoddin, M., Diviccaro, A., Minervini, F., dan Gobetti, M. 2013. Manufacture of a functional fermented milk enriched of Angiotensin-I Converting Enzyme (ACE)-inhibitory peptides and γ -amino butyric acid (GABA). *LWT - Food Science and Technology*, 51(1), 183–189. doi: 10.1016/j.lwt.2012.09.017.

Nomura, M., I. Nakajima., Y. Fujita., M. Kobayashi., H. Kimoto., I. Suzuki, dan H. Aso. 1999. *Lactococcus lactis* contains only one glutamate decarboxylase gene. *Microbiology* 145: 1375-1380

Otaru, N., K. Ye., D. Mujezinovic., L. Berchtold., F. Constancias., F.A. Cornejo., A. Krzystek., T. de Wouters., C. Braegger., C. Lacroix, and B. Pugin. 2021. GABA Production by Human Intestinal *Bacteroides* spp.: Prevalence, Regulation, and Role in Acid Stress Tolerance. *Frontiers in Microbiology* 12: 1-14. doi: 10.3389/fmicb.2021.656895

- Overbeek, R., R. Olson., G.D. Pusch., G.J. Olsen., J.J. Davis. T. Disz., R.A. Edwards., S. Gerdes., B. Parrello., M. Shukla., V. Vonstein., A.R. Wattam., F. Xia, and R. Stevens. 2014. The SEED and the Rapid Annotation of microbial genomes using Subsystems Technology (RAST). *Nucleic Acids Research* 42: 206-214. doi: 10.1093/nar/gkt1226
- Pais, F.S.M., P.C. Ruy., G. Oleivera, dan R.S. Coimbra. 2014. Assessing the efficiency of multiple sequence alignment programs. *Algorithms for Molecular Biology* 9(4): 1-8
- Paliwal, V., S.C. Raju., A. Modak., P.S. Phale, dan H.J. Purohit. 2014. *Pseudomonas putida* CSV86: A Candidate Genome for Genetic Bioaugmentation. *PLoS ONE* 9(1): 1-12. doi: 10.1371/journal.pone.0084000
- Pamungkaningtyas, F.H., Mariyatun., R. Z. kamil., R. H. Setyawan., P.N. Hasan., D.V. Wiryo hanjoyo., S. Nurfiani., E. Zulaichah., I. S. Utami., T. Utami, dan ES. Rahayu. 2018. Sensory Evaluation of Yogurt-like Set and Yogurt-like Drink Produced by Indigenous Probiotic Strains for Market Test. *Indonesian Food and Nutrition Progress* 15(1): 1-10. doi: 10.22146/ifnp.31010
- Park, S.J., D. H. Kim., H. J. Kang., M. Shin., S.Y. Yang., J. Yang., Y. H. Jung. 2021. Enhanced production of γ -aminobutyric acid (GABA) using *Lactobacillus plantarum* EJ2014 with simple medium composition. *Food Science and technology* 137: 1-7. doi: 10.1016/j.lwt.2020.110443
- Pervez, M.T., M. E. Babar., A. Nadeem., M. Aslam., A.R. Awan., N. Aslam., T. Hussain., N. Naveed., S. Qadri., U. Waheed, dan M. Shoaib. 2014. Evaluating the Accuracy and Efficiency of Multiple Sequence Alignment Methods. *Evolutionary Bioinformatics* 10: 205-217. doi:10.4137/EBO.S19199
- Phuengjayaem, S., N. Kuncharoen., A. Booncharoen., B. Ongpipattanakul, dan S. Tanasupawat. 2020. Genome analysis and optimization of γ -aminobutyric acid (GABA) production by lactic acid bacteria from plant materials. *The Journal of General and Applied Microbiology* 67(4): 1-26. doi: 10.2323/jgam.2020.10.002
- Putranto, W.S., M.T. Suhartono., H.D. Kusumaningrum., P.E. Giriwono, dan A.Z. Mustopa. 2020. A novel rennin like protease from *Lactobacillus plantarum* 1.13 isolatd from Indonesian fermented meat (Bakasam). *Biocatalysis and Agricultural Biotechnology* 29: 1-6. doi: 10.1016/j.bcab.2020.101818
- Rahayu, E.S. 2003. Lactic acid bacteria in fermented foods of Indonesian origin. *Agritech* 23(2): 75-84. doi: 10.22146/agritech.13515

- Rahayu, E.S., A. Yogeswara., T. Utami., dan Suparmo. 2011. Indigenous Probiotic Strains of Indonesia and Their Application for Fermented Food. The 12th ASEAN FOOD CONFERENCE 2011. p.400-404
- Rahayu, E.S., A. Yogeswara., Mariyatun., L. Windiarti., T. Utami, dan K. Watanabe. 2015. Molecular characteristics of indigenous probiotic strains from Indonesia. International Journal of Probiotics and Prebiotics 10 (4): 1-8
- Rahayu ES., M. Mariyatun., N.E.P. Manurung., P.N. Hasan., P. Therdtatha., R. Mishima., H. Komalasari., N.A. Mahfuzah., F.H. Pamungkaningtyas., W.K. Yoga., D.A. Nurfiana., S.Y. Liwan., M. Juffrie., A.E. Nugroho., T. Utami. 2021. Effect of probiotic *Lactobacillus plantarum* Dad-13 powder consumption on the gut microbiota and intestinal health of overweight adults. World Journal of Gastroenterol 27(1): 107-128. doi: 10.3748/wjg.v27.i1.107
- Rahmah, R.A. 2016. Validasi Metode Analisis Glukosamin Hidroklorida dengan Derivatisasi Phenyl Isothiocyanate (PITC) dan Aplikasinya pada Penetapan Glukosamin dalam Dispersi Nanopartikel Kitosan secara Kromatografi Cair Kinerja Tinggi. Fakultas Kedokteran dan Ilmu Kesehatan. Universitas Islam Negeri Syarif Hidayatullah, Jakarta. (Skripsi)
- Rissman, R.A. dan W.C. Mobley. 2011. Implications for treatment: GABAA receptors in aging, Down syndrome and Alzheimer's disease. Journal of Neurochemistry 117: 613-622. doi: 10.1111/j.1471-4159.2011.07237.x
- Sa, D.H., J. Y. Park., S.J. Jeong., K. W. Lee., dan J.H. Kim. 2015. Characterization of Glutamat Decarboxylase (GAD) from *Lactobacillus sakei* A156 Isolatd from Jeot-gal. J. Microbiol. Biotechnol 25(5): 696-703
- Sanchart, C., O. Rattanaporn., D. Haltrich., P. Phukpattaranont, and S. Maneerat. 2017. *Lactobacillus futsaii* CS3, a New GABA-Producing Strain Isolatd from Thai Fermented Shrimp (Kung-Som). Indian J. Microbiol 57(2): 211-217. doi: 10.1007/s12088-016-0632-2
- Salazar, C., J. M. Armenta, dan V. Shulaev. 2012. An UPLC-ESI-MS/MS Assay Using 6-Aminoquinolyl-NHydroxysuccinimidyl Carbamate Derivatization for Targeted Amino Acid Analysis: Application to Screening of Arabidopsis thaliana Mutants. Metabolites 2: 398-428. doi: 10.3390/metabo2030398
- Sarasa, S.B., R. Mahendran., G. Muthusamy., B. Thankappan., D. R. F. Selta, dan J. Angayarkanni. 2020. A Brief Review on the Non-protein Amino Acid, Gamma-amino Butyric Acid (GABA): Its Production and Role in Microbes. Current Microbiology 77: 534-544. doi: 10.1007/s00284-019-01839-w
- Shan, Y., Man, C. X., Han, X., Li, L., Guo, Y., Deng, Y., dan Jiang, Y. J. 2015. Evaluation of improved γ -aminobutyric acid production in yogurt using

- Lactobacillus plantarum* NDC75017. *Journal of Dairy Science*, 98(4), 2138–2149. Doi: 10.3168/jds.2014-8698
- Sharafi, S dan L. Nateghi. 2020. Optimization of gamma-aminobutyric acid production by probiotic bacteria through response surface methodology. *Iranian Journal of Microbiology* 12(6): 584-591. doi: 10.18502/ijm.v12i6.5033
- Siragusa, S., M.D. Angelis., R.D. Cagno., C.G. Rizzello., R. Coda, dan M. Gobbetti. 2007. Synthesis of γ -aminobutyric acid by lactic acid bacteria isolat from a variety of Italian Cheeses. *Applied and Environmental Microbiology* 73(22): 7283-7290. doi: 10.1128/AEM.01064-07
- Sitaggang, M.T.A. 2021. Karakteristik Kimia Dan Viabilitas Sel Keju yang Difermentasi dengan Kultur Starter Lokal *Lactobacillus plantarum* Kita-3. Fakultas Teknologi Pertanian. Universitas GADjah Mada, Yogyakarta
- Soussan, C dan A. Kjellgren. 2016. The users of Novel Psychoactive Substances: Online survey about their characteristics, attitudes and motivations. *International Journal of Drug Policy* 32: 77-84. doi: 10.1016/j.drugpo.2016.03.007
- Suharna, S. 2012. Studi *In silico* Senyawa Turunan Flavonoid terhadap Penghambatan Enzim Tirosinase. Fakultas Ilmu Kesehatan. Universitas Islam Negeri Alauddin Makassar, Makassar (Skripsi)
- Suhud, F. 2015. Uji Aktivitas In-silico Senyawa Baru 1-Benzil-3-benzoilurea Induk dan Tersubstitusi sebagai Agen Antiproliferatif. *Jurnal Farmasi Indonesia* 7(4): 242-251
- Sumardjo, D. 2009. Pengantar Kimia: Buku Panduan Kuliah Mahasiswa Kedokteran dan Program Strata I Fakultas Eksakta. EGC, Jakarta
- Suprayitno, E. dan T.D. Sulistiyati. 2017. *Metabolisme Protein*. UB press, Malang.
- Syu, K.Y., C.L. Lin., H.C. Huang, dan J.K. Lin. 2008. Determination of Theanine, GABA, and Other Amino Acids in Green, Oolong, Black, and Pu-erh Teas with Dabsylation and High-Performance Liquid Chromatography. *Journal of Agricultural and Food Chemistry* 56: 7637-7643. doi: 10.1021/jf801795m
- Tajabadi, N., A. Ebrahimpour., A. Baradaran., R.A. Rahim., N.A. Mahyudin., M.Y.A. Manap., F.A. Bakar, and N. Saari. 2015. Optimization of γ -Aminobutyric Acid Production by *Lactobacillus plantarum* Taj-Apis362 from Honeybees. *Molecules* 20: 6654-6669. doi: 10.3390/molecules20046654

- Talkal, R., H. Tikariha, dan H. Purohit. 2018. An Approach to *In silico* Dissection of Bacterial Intelligence Through Selective Genomic Tools. *Indian Journal of Microbiology* 58(3): 278-286. doi: 10.1007/s12088-018-0726-0
- Tarek, M.E. Dan H.E. Mostafa. 2010. Screening of potential infants' *Lactobacilli* isolats for amino acids production. *African Journal of Microbiology Research* 4(4): 226-232.
- Tette, F.M., S. K. Kwofie, dan M.D. Wilson. 2022. Therapeutic Anti-Depressant Potential of Microbial GABA Produced by *Lactobacillus rhamnosus* Strains for GABAergic Signaling Restoration and Inhibition of Addiction-Induced HPA Axis Hyperactivity. *Current Issue in Molecular Biology* 44: 1434-1451. doi: 10.3390/cimb 44040096
- Tian, J., Lu, Y., Zhang, H., Chau, C. H., Dang, H. N., & Kaufman, D. L. (2014). Aminobutyric acid inhibits T cell autoimmunity and the development of inflammatory responses in a mouse Type 1 diabetes model. *The Journal of Immunology*, 173(8), 5298–5304. doi: 10.4049/jimmunol.173.8.5298.
- Toe, C.J., H.L. Foo., T.C. Loh., R. Mohamad., R.H. Rahim, dan Z. Idrus. 2019. Extracellular Proteolytic Activity and Amino Acid Production by Lactic Acid Bacteria Isolatd from Malaysian Foods. *International Journal of Molecular Science* 20 (1777): 1-22. doi: 10.3390/ijms20071777
- Tung, Y.T., B.H. Lee., C.F. Liu, dan T.M. Pan. 2011. Optimization of Culture Condition for ACEI and GABA Production by Lactic Acid Bacteria. *Journal of Food Science* 76(9): 585-591
- Wendisch, V.F., J.M.P. Jorge., F.P. Garcia, dan E. Sgobba. 2016. Updates on industrial production of amino acids using *Corynebacterium glutamicum*. *World Journal of Microbiology and Biotechnology* 32 (105): 1-10. doi: 10.1007/s11274-016-2060-1
- Woraharn, S., N. Lailerd., B.S. Sivamaruthi., W. Wangcharoen., S. Sirisattha, dan C. Chaiyasut. 2014. Screening and kinetics of glutaminase and glutamat decarboxylase producing lactic acid bacteria from fermented Thai foods. *Food Science and Technology* 34(4): 793-799. doi: 10.1590/1678-457X.6519
- Wu, N., J. Dempsey., P.M. Yehl., A. Dovletoglou., D. Ellison, dan J. Wyvratt. 2004. Practical aspects of fast HPLC separations for pharmaceutical process development using monolithic columns. *Analytica Chimica Acta* 523: 149-156. doi: 10.1016/j.aca.2004.07.069
- Wu, Q dan N. P. Shah. 2017. High g-aminobutyric acid production from lactic acid bacteria: Emphasis on *Lactobacillus brevis* as a functional dairy starter.

- Critical Reviews in Food Science and Nutrition 57(17): 3661-3672. doi: 10.1080/10408398.2016.1147418
- Wu, Z., P. Wang., D. Pang., X. Zeng., Y. Guo, dan G. Zhao. 2021. Effect of adzuki bean sprout fermented milk enriched in γ -aminobutyric acid on mild depression in a mouse model. Journal of Dairy Science 104(1): 78-92
- Xu, N., L. Wei., dan J. Liu. 2017. Biotechnological advances and perspectives of gamma-aminobutyric acid production. World Journal of Microbiology and Biotechnology 33(64): 1-11
- Yang, J., J.Lu., Q. Zhu., Y. Tao., Q. Zhu., C. Guo., Y. Fang., L. Chen., A.K. Koyande., S. Wang, and P. Show. 2021. Isolation and characterization of a novel *Lactobacillus plantarum* MMB-07 from traditional Suanyu for *Acanthogobius hasta* fermentation. Journal of Bioscience and Bioengineering 132(2): 161-166. doi: 10.1016/j.jbiosc.2020.12.016
- Yogeswara, A., T. Utami, dan E.S. Rahayu. 2015. Resistance of lactic acid bacteria isolatd from Indonesian fermented foods in simulated gastric juice and bile solution. J. Virgin 1(2): 134-141
- Yogeswara, I.B. A., S. Maneerat, dan D. Haltrich. 2020. Glutamat Decarboxylase from Lactic Acid Bacteria—A Key Enzyme in GABA Synthesis. Microorganism 8(1923): 1-24. doi: 10.3390/microorganisms8121923
- Yogeswara, I.B.A., S. Kittibunchakul., E.S. Rahayu., K.J Domig., D. Halyrich, dan T.H. Nguyen. 2021. Microbial Production and Enzymatic Biosynthesis of γ -Aminobutyric Acid (GABA) Using *Lactobacillus plantarum* FNCC 260 Isolatd from Indonesian Fermented Foods. Processes 9(22): 1-17. doi: 10.3390/pr9010022
- Yu, J., S. Ahn., K. Kim., K.C. Anolles., C. Lee., J. Kang., K. Cho., S. H. Yoon., D. K. Kang, and H. Kim. 2017. Comparative Genomic Analysis of *Lactobacillus plantarum* GB-LP1 Isolatd from Traditional Korean Fermented Food. Journal Microbiology Biotechnology 27(8): 1419-1427. doi: 10.4014/jmb.1704.04005
- Yu, P., Q. Ren., X. Wang, dan X. Huang. 2019. Enhanced biosynthesis of γ -aminobutyric acid (GABA) in *Escherichia coli* by pathway engineering. Biochemical Engineering Journal 141: 252-258. doi: 10.1016/j.bej.2018.10.025
- Yunes, R. A., Poluektova, E. U., Dyachkova, M. S., Klimina, K. M., Kovtun, A. S., Averina, O. V., & Danilenko, V. N. (2016). GABA production and structure of gadB/gadC genes in *Lactobacillus* and *Bifidobacterium* strains from

human microbiota. Anaerobe, 42, 197–204. Doi:
10.1016/j.anaerobe.2016.10.011

Yukawa, H. dan M. Inui. 2013. *Corynebacterium glutamicum*. Springer

Zarei, F., L. Nateghi., M. R. Eshaghi, dan M.E.T. Abadi. 2018. Optimization of Gamma-Aminobutyric Acid Production in Probiotics Extracted from Local Dairy Products in West Region of Iran using MRS broth and Whey Protein Media. *Applied Food Biotechnology* 5(4): 233-242. doi: 10.22037/afb.v5i4.22360

Zareian, M., A. Ebrahimpour., F.A. Bakar., A.J.S. Mohamed., B. Forghani., M. S.B. Ab-Kadir, and N. Saari. 2012. A Glutamic Acid-Producing Lactic Acid Bacteria Isolatd from Malaysian Fermented Foods. *International Journal of Molecular Sciences* 13: 5482-5497. doi:10.3390/ijms13055482

Zhang, Q., L. Zeng., X. Tan., J. Tang, dan W. Xiang. 2017. An Efficient γ -Aminobutyric Acid (GABA) Producing and Nitrite Reducing Ability of *Lactobacillus plantarum* BC114 Isolatd from Chinese Paocai. *Food Science and Technology Research* 23(5): 749-755. doi: 10.3136/fstr.23.749

Zhuang, K., Y. Jiang., X. Feng., Li, L., F. Dang., W. Zhang, dan C. Man. 2018. Transcriptomic response to GABA-producing *Lactobacillus plantarum* CGMCC 1.2437T induced by L-MSG. *PLoS ONE* 13(6): 1-18. doi: 10.1371/journal.pone.0199021