

DAFTAR PUSTAKA

- Agriopoulou, S., E. Stamatelopoulou., M. Sachadyn-Krol, and T. Varzakas. 2020. Lactic acid bacteria as antibacterial agents to extend the shelf lif of fresh and minimally processed fruits and vegetables: Quality and safety aspects. *Microorganisms*. 8(6):1-23.
- Agustina, Y., R. kartika, dan A. S. Panggabean. 2015. Pengaruh variasi waktu fermentasi terhadap kadar laktosa, lemak, pH dan keasaman pada susu sapi yang difermentasi menjadi yogurt. *Jurnal Kimia Mulawarman*. 12(2).
- Anggraini L, 2020. Isolasi Karakterisasi dan Identifikasi Bakteri Asam laktat (BAL) Asal pangan Fermentasi Sumatera Barat Penghasil Gamma Aminobutyric (GABA) Dan Aplikasinya Dalam Menurunkan Stres pada Broiler. Disertasi. Fakultas Pertanian. Universitas Andalas, Padang.
- AOAC. 2005. *Official Method of Analysis*. 18th ed. AOAC International, Gaithersburg, MD.
- Aritonang, N. S. 2009. *Susu dan Teknologi*. Swagati Press. Cirebon.
- Ayag, N., E. Dagdemir, and Adnan Hayaloglu, A. 2022. Comparison of γ -aminobutyric acid and free amino acid contents of some common varieties of Turkish cheeses. *Int. Dairy J.* 128.
- Badan Standardisasi Nasional. 2011. *Standar Mutu Susu Segar No. 3141.1:2011*. Jakarta.
- Barla, F., K. Takashi. T. Naoko, M. Hiroshi, K. Takane, K. Hidehiko, M. Toshihide, S. Tetsuya, T. Atsushi, and E. Toshiki. 2016. The Gamma aminobutyric Acid-Producing Ability Under Low pH conditions of Lactic Acid Bacteria Isolated from Traditional Fermented Foods of Ishikawa Prefecture, Japan, with A Strong Ability to Produce. *Biotechnol Rep.* 10: 105-110.
- Bonomi, C. G., V. De Lucia, C. Motta, G. Koch, and A. Martorana. 2020. Effects of homotaurine on DLPFC disarray in MCI and the role of GABA. *Alzheimers Demen.* 16(9).
- 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. *Front. Psychol.* 6:1520.
- Cagno, R.D., F. Mazzacane, C.G. Rizzello, M. De-Angelis, G. Giuliana, M. Meloni, B. De-Servi, and M. Gobetti. 2010. Synthesis of γ -aminobutyric Acid (GABA) by *Lactobacillus plantarum* DSM19463: Functional Grape Must Beverage and Dermatological Applications. *Appl. Microbiol. Biotechnol.* 86: 731-741.
- Chen, L., J. Alcazar., T. Yang., Z. Lu, and Y. Lu. 2018. Optimized cultural conditions of functional yogurt for γ -aminobutyric acid augmentation using response surface methodology. *J. Dairy Sci.* 101:10685-10693.
- Cho Y.R., J.Y. Chang, and H.C. Chang. 2007. Production of gamma-aminobutyric acid (GABA) by *Lactobacillus Buchneri* isolated from kimchi and its neuroprotective effect on neuronal cells. *J. Microbiol. Biotechnol.* 17:104-109.

- Codex Alimentarius Commission. 2003. Standart for fermented milk. 2, 6–16. Rome, Italy: World Health Organization dan Food and Agriculture Organization of the United Nations.
- Cui, Y., K. Miao., S. Niyaphorn and X. Qu. 2020. Production of gamma-animobutyric acid from lactic acid bacteria: A systematic review. *Int. J. Mol. Sci.* 21.
- Dhakal, R., K. Vivek, Baipai, and K. H. Baek. 2012. Production of GABA (γ – Aminobutyric Acid) by microorganisms: A review. *Braz. J. Microbiol.* 43(4): 1230-1241.
- Esmaeili, A. and K. Ghaed. 2010. GABA receptors as novel drug targets for treatment of mental disorders. *J. Paramed. Sci.* 1: 50-61.
- Ganguli, A. 2011. Evaluation of λ -Aminobutyric Acid Production by Indigenously Isolated Lactid Acid Bacteria. Departemen of Biotechnology and Environmental Sciences. Thapar University Patiala, India.
- Gao, S., K. Chang., G. Ding., H. Wu., Y. Chen., M. Jia., X. Liu., S. Wang., Y. Jin., H. Pan, and H. Li. 2019. Genomic insights into a robust gamma aminobutyric acid producer *Lactobacillus brevis* CD0817. *AMB Express.* 9:72.
- García-Burgos, M., J. Moreno-Fernandez., M. J. Alferez., J. Díaz-Castro, and I. Lopez-Aliaga, I. 2020. New perspectives in fermented dairy products and their health relevance. *J. Funct. Foods.* 72.
- Handayani, Rini., Sulistiani, dan N. Setianingrum. 2016. Identifikasi produksi gaba dari kultur bakteri asam laktat (BAL) dengan metode TLC. *Pros Sem Nas Masy Biodiv Indon.* 2(2): 208-213.
- Hayakawa, K., Y. Ueno, S. Kawamura, R. Taniguchi, and K. Oda. 1997. Production of γ -aminobutylic acid by lactic acid bacteria. *J. Ferment. Bioeng.* 84:179.
- Huang, J., L. Mei, H. Wu, and D. Lin. 2007. Biosynthesis of γ -aminobutyric acid (GABA) Using Immobilized whole Cells of *Lactobacillus brevis*. *World J. Microbiol. Biotechnol.* 23: 865-871.
- Hudec, J., L. Kobida., M. Canigova., M. Lacko-Bartosova., O. Lozek, and P. Chlebo. 2015. Production of gamma-aminobutyric acid by microorganisms from different food sources. *J. Sci. Food Agric.* 95(6): 1190-1198.
- Jannah, A.M., A.M. Legowo, Y.B. Pramono, A.N. Al-Baarri dan S.B. Abduh. 2014. Total bakteri asam laktat, ph, keasaman, citarasa dan kesukaan yoghurt drink dengan penambahan ekstrak buah belimbing. *J. apl. teknol. pangan.* 3(2): 7-11.
- Jena, R and P. K. Choudhury. 2024. Lactic acid bacteria in fermented dairy foods: Gamma aminobutyric acid (GABA) production and its therapeutic implication. *Food Bioscience.* 62.
- Jurášková D., S.C. Ribeiro, and C. C. G. Silva. 2022. Exopolysaccharides produced by lactic acid bacteria: From biosynthesis to health-promoting properties. *Foods.* 11: 156.
- Khalid, K. 2011. An Overview of Lactic Acid Bacteria. *Int. J. Biosci.* 1(3): 1-17.

- Kim, J. Y., Lee, M. Y., Ji, G. E., Lee, Y. S., and Hwang, K. T. 2009. Production of gamma-aminobutyric acid in black raspberry juice during fermentation by *Lactobacillus brevis* GABA100. *Int. J. Food Microbiol.* 130(1):12-16.
- Komatsuzaki, N., J. Shima., S. Kawamoto., H. Momose, and K. Kimura. 2005. Production of γ amino Butyric Acid (GABA) by *Lactobacillus paracasei* Isolated from Traditional Fermented Foods. *Food Microbiol.* 22: 497-504.
- Kusmiyati, N., T. D. Wahyuningsih, and W. Widodo. 2018. Prebiotic effect of inulin extract from dahlia tubers (*Dahlia Pinnata* L.) on the growth performance of intestinal origin *Lactobacillus casei* AP. *Pak. J. Nutr.* 17(8): 405-410.
- Li, H., D. Gao, Y. Cao. and H. Xu. 2008. A High γ -Aminobutyric Acid Producing *Lactobacillus Brevis* Isolated from Chinese Traditional Paocai. *Ann. Microbiol.* 58(4): 649-653.
- Li, H., T. Qiu, G. Huang, and Y. Cao. 2010. Production of Gamma-aminobutyric Acid by *Lactobacillus brevis* NCL912 Using Fedbatch Fermentation. *Microb. Cell Fact.* 9: 85.
- Li, P., F. Ma., M. Sun, and Y. Tuo. 2023. Yeast with proteolytic properties improves the characteristics of commercial starter fermented milk. *Food Sci. Technol.* 1:11.
- Lu, X., C. Xie, and Z. Gu. 2009. Optimisation of fermentative parameters for GABA enrichment by *Lactococcus lactis*. *Czech. J. Food Sci.* 27(6): 433-442.
- Luo, H., Z. Liu., F. Xie., M. Bilal., L. Liu., R. Yang, and Z. Wang. 2021. Microbial production of gamma-aminobutyric acid: Applications, state-of-the-art achievements, and future perspectives. *Crit. Rev. Biotechnol.* 41(4): 491-512.
- Masanahayati, D. S., T. Setyawardani, dan A. H. D. Raharjo. 2022. Pengaruh penambahan sumber protein yang berbeda terhadap viskositas, sineresis dan WHC yoghurt susu kambing. Halaman 366-373 di Prosiding Seminar Teknologi dan Agribisnis Peternakan IX. Fakultas Peternakan Universitas Jendral Soedirman, Purwokerto.
- Meutia, N., T. Rizalsyah., S. Ridha, dan M. K. Sari. 2016. Residu antibiotika dalam air susu segar yang berasal dari peternakan di wilayah aceh besar. *J. Ilmu Ternak Univ. Padjadjaran.* 16(1).
- Miskiyah. 2011. Study of indonesian national standart for liquid milk in Indonesia. *Jurnal Standarisasi.* 13(1): 1-7.
- Miura, D., Y. Ito., A. Mizukuchi., M. Kise., H. Aoto, and K. Yagasaki. 2006. Hypercholesterolemic action of pre germinated brown rice in hepatoma-bearing rats. *Life Sci.* 79: 259-264
- Mustika, S., S. Yasni, dan Suliantari. 2019. Pembuatan yughurt susu sapi segar dengan penambahan puree ubi jalar ungu. *J. Pendidik. Teknol. Kejuruan.* 2(3):97-101
- Niaz, K., E. Zaplatic, and J. Spoor. 2018. Extensive monosodium glutamat: a treat to public health?. *EXCLI J.* 17:273-278.
- Nomura, M., H. Kimoto, Y. Someya, S. Furukawa, and I. Suzuki. 1998. Production of γ -Aminobutyric Acid by Cheese Starter During Cheese ripening. *J. Dairy Sci.* 81: 1486-1491.

- Oka, B., M. Wijaya dan Kardiman. 2017. Karakterisasi kimia susu sapi perah di kabupaten sinjai. J. pendidik. teknol. pertan. 3:195-202.
- Park, K.B and S.S. Oh. 2007. Production and characterization of GABA rice yogurt. Food Sci. Biotech. 14: 518-522.
- Pereira, P. C. 2014. Milk nutritional composition and its role in human health. Nutrition. 30(6): 619-627.
- Purwadi, L. E., H. Radiati., R. D. Evanuarini, dan Andriana. 2017. Penanganan Hasil Ternak. UB Press, Malang.
- Ray, B. 2004. Fundamental Food Microbiology. CRS Press, Florida.
- Rizzello C.G., A. Cassone., R.D.I. Cagno, and M. Gobbetti. 2008. Synthesis of angiotensin i-converting enzyme (ace)-inhibitory peptides and γ -aminobutyric acid (GABA) during sourdough fermentation by selected lactic acid bacteria. J. Agric. Food Chem. 56: 6936-6943.
- Sahab, N. R.M., E. Subroto., R. L. Balia, and G. L. Utama. 2020. γ -Aminobutyric acid found in fermented foods and beverages: current trends. Heliyon. 6.
- Seid, R., N. Cairns., N. Singewald., S.T. Kaehler, and G. Lubec. 2001. Differences between GABA levels in alzheimer's disease and down syndrome with alzheimer-like neuropathology. Naunyn Schmiedeberg's Arch. Pharmacol. 363: 139-145.
- Seo, M. J., Y. D. Nam, and S. L. Park. 2013. γ -Aminobutyric acid pro duction in skim milk co-fermented with *Lactobacillus brevis* 877G and *Lactobacillus sakei* 795. Food Sci. Biotechnol. 22:751–755.
- Setiawati, S. N. 2008. Dampak penggunaan monosodium glutamat terhadap kesehatan lingkungan. J. Orbith 4(3): 453-459.
- Setyaningsih, D., A. Apriyantono dan M. P. Sari. 2010. Analisis Sensori untuk Industri Pangan dan Agro. IPB Press, Bogor.
- Siragusa S., M. Angelis, R.D. De-Cagno., C.G. Rizzello, R. Coda, and M. Gobbetti. 2007. Synthesis of γ -aminobutyric acid by lactic acid bacteria isolated from a variety of italian cheeses. Appl. Environ. Microbiol. 7283-7290.
- Sudarmadji, S., B. Haryono dan Suhardi. 2003. Analisa Bahan Makanan dan Pertanian. Liberty, Yogyakarta.
- Sun, T. S., Zhao, S. P., Wang, H. K., Cai, C. K., Chen, Y. F, and Zhang, H. P. 2009. ACE-inhibitory activity and gamma-aminobutyric acid content of fermented skim milk by *Lactobacillus helveticus* isolated from Xinjiang koumiss in China. Eur Food Res Technol. 228:607-612.
- Takagi, H., K. Kozuka., K. Mimura., S. Nakano, and S. Ito. 2022. Design of a full consensus glutamate decarboxylase and its application to GABA biosynthesis. ChemBioChem. 23(8).
- Thongsepee, N., P. Martviset., P. Chantree., P. Sornchuer., K. Sangpairoj., P. Prathaphan. J. Ruangtong, and S. Hiranyachattada. 2022. Daily consumption of monosodium glutamat pronounced hypertension and altered renal excretory function in normotensive and hypertensive rats. Heliyo.8.

- Ueno. H. 2000. Enzymatic and structural aspects on glutamate decarboxylase. J. Mol. Catal. B Enzym. 10:67-79.
- Villegas, J. M., L. Brown, G. S. Giori, and E. Hebert. 2016. Optimization of batch culture conditions for GABA production by *Lactobacillus brevis* CRL 1942, isolated from quinoa sourdough. Lebensm. Wiss. Technol. 67:22–26.
- Widodo, W., A. O. Denta., S. Sunarti, and D. Haltrich. 2021. Milk fermented with *Lactobacillus casei* Strain AP Improves lipid profiles in obese Indonesian adults. Preprints.org 2021, 2021080385.
- Widodo, W., A. P. S. A. S. Sukarno., E. Wahyuni, and Nurliyani. 2019a. The effect of different starter cultures of *Lactobacillus paracasei* M104 and *Pediococcus pentosaceus* M103 on the physicochemical and mikrobial qualities of fermented goat milk. JITEK. 14(2): 70-77.
- Widodo. 2017. Bakteri Asam Laktat Strain Lokal: Isolasi sampai Aplikasi sebagai Probiotik dan Starter Fermentasi Susu. UGM Press, Yogyakarta.
- Widodo. 2021. Bioteknologi Industri susu. UGM Press, Yogyakarta.
- Widodo, W., H. R. P. Kusumaningrum., H. Wihadmadyatami, and A. L. Wicaksana. 2023. Milk fermented with *Pediococcus acidilactici* strain BE improves high blood glucose levels and pancreatic beta-cell function in diabetic rats. Food Sci. Anim. Resour. 43(1):170-183.
- Widodo, W., P. A. Harsinta, A. S. Sukarno, and A. Nurrochmad. 2019b. Antidiabetic effect of milk fermented using intestinal probiotics. Nutrition and Food Science. 49(6):1063-1074.
- Widodo., Indratiningsih., Nurliyani., E. Wahyuni, and T. T. Taufiq. 2016. Isolation and identification of goat milk-derived *Lactobacillus paracasei* M104 and *Pediococcus pentosaceus* M103 and their potential use as starter culture for fermentation. J. microbiol. Biotechnol. Food sci. 05(04):374-377.
- Widodo., N. S. Anindita., T. T. Taufiq, and T. D. Wahyuningsih. 2012. Identification of *Pediococcus acidilactici* strains isolated from feces of Indonesian infants with in vitro capability to consume prebiotic inulin and to adhere on mucus. Indones. J. Biotechnol. 17: 132-143.
- Widodo., N. S. Anindita., T. T. Taufiq, and T. D. Wahyuningsih. 2014. Evaluation of two lactobacillus strains as probiotics with emphasis in utilizing prebiotic inulin as energy source. Int. J. Microbiol. 5: 33-40.
- Widodo., R. Handaka., E. Wahyuni, and T. T. Taufiq. 2017. The quality of fermented milk produced using intestinal-origin lactic acid bacteria as starters. Int. Food Res. J. 24. 2371-2376.
- Widyawati, R., O. R. P. A. Mussa., M. D. W. Pratama, dan Roeswandono. 2020. Perbandingan kadar lemak dan berat jenis susu sapi perah friensian holstein (FH) di bendul merisi, surabaya (dataran rendah) dan nongkojajar, pasuruan (dataran tinggi). Jurnal Vitek Bidang Kedokteran Hewan. Vol. 10.
- Wu, Q., H. M. Tun., Y. S. Law., E. Khafipour, and N.P. Shah. 2017. Common distribution of gad operon in *Lactobacillus brevis* and its gadA contributes to efficient GABA synthesis toward cytosolic near-neutral pH. Frontiers in Microbiology. 8:206.

- Yang, S. Y., F. X. Lu., Z.X. Lu., X.M. Bie., Y. Jiao., L. J. Sun, and B. Yu, B. 2008. Production of gamma-aminobutyric acid by *Streptococcus salivarius* subsp. *thermophilus* Y2 under submerged fermentation. *Amino Acids*. 34: 473-478.
- Yilmaz-Ersan, L., T. Ozcan., A. Akpinar-Bayizit and S. Sahin. 2018. Comparison of Antioxidant Capacity of Cow and Ewe Milk Kefirs. *J. Dairy Sci*. 101(5):3788-3798.
- Yudonegoro, R. J., Nurwantoro dan D. W. Harjanti. 2014. Kajian kualitas susu segar dari tingkat peternak sapi perah, tempat pengumpulan susu dan koperasi unit desa jatinom di kabupaten klaten. *Animal Agriculture Journal*. 3(2):323-333.
- Zakaria, Y. 2009. Pengaruh jenis susu dan persentase starter yang berbeda terhadap kualitas kefir. *Agripet* 9(1): 26-30.
- Zamanpour. S., R.Rezvani., A. J. Isfahani and A. Afshari. 2023. Isolation and some basic characteristics of lactic acid bacteria from beetroot (*Beta vulgaris* L.) - A preliminary study. *Canrea J*. 6(1):42-56.
- Zheng, J., L. Ruan, M. Sun, and M. Ganzle. 2025. A genomic view of *Lactobacilli* an *Pediococci* demonstrates that phylogeny matches ecology and physiology. *Appl. Environ. Microbiol*. 81: 7233-7234.