

DAFTAR PUSTAKA

- Abbasi, F., Fakhurun-Nisa, T., Liu, J., Luo, X., and Abbasi, I.H.R. 2019. Low digestibility of phytate phosphorus, their impacts on the environment, and phytase opportunity in the poultry industry. *Environ Sci Pollut Res* 26: 9469–9479. <https://doi.org/10.1007/s11356-018-4000-0>.
- Abdalla, A., Ayyash, M. M., Olaimat, A. N., Osaili, T. M., Al-Nabulsi, A. A., Shah, N. P., and Holley, R. A. 2021. Exopolysaccharides as Antimicrobial Agents: Mechanism and Spectrum of Activity. *Frontiers in Microbiology* 12: 664395. <https://doi.org/10.3389/FMICB.2021.664395>
- Abd-El-Hack, M.E., Alagawany, M., Arif, M., Emam, M., Saeed, M., Saeed, M., Arain, M.A., Siyal, F.A., Patra, A.K., Elnesr, S.S., and Khan, R.U. 2018. The uses of microbial phytase as a feed additive in poultry nutrition – a review. *Annals of Animal Science*. 18(3): 639–658. <https://doi.org/10.2478/AOAS-2018-0009>.
- Abd-El-Hack, ME., El-Saadony, MT., Shafi, ME., Qattan, SY., Batiha, GE., Khafaga, AF., Abdel-Moneim, AE., and Alagawany, M. 2020. Probiotics in poultry feed: A comprehensive review. *J. Anim. Physiol. Anim. Nutr* 104: 1835-1850. <https://doi.org/10.1111/jpn.13454>.
- Abd El latif, M., and Omar, M.M. 2023. Productive performance, digestibility, blood parameters and intestine microbiology of broiler chicks affected by prebiotic, probiotic and synbiotic addition. *Egyptian Poultry Science Journal*. 43(2): 217–237. <https://doi.org/10.21608/epsj.2023.304305>.
- Abubakr, M.A.S., and Al-Adiwish, W.M. 2017. Isolation and Identification of Lactic Acid Bacteria from Different Fruits with Proteolytic Activity. *International Journal of Microbiology and Biotechnology* 2(2): 58. <https://doi.org/10.11648/J.IJMB.20170202.12>.
- Addala, M.S., and Gudipati M. 2023. Resistant Starch and Amylolytic Enzymes from Human Gastrointestinal Microflora-a Review. *Trends in Carbohydrate Research* 15(1).
- Adedokun, S., Pescatore, A., Ford, M., Ao, T., and Jacob, J. 2018. Investigating the effect of dietary calcium levels on ileal endogenous amino acid losses and standardized ileal amino acid digestibility in broilers and laying hens. *Poult. Sci* 97: 131–139.
- Aguilar-Rivera, C., Hume, M.E., and Klotz-Ceberio, B.F. 2016. Efecto inhibitorio de sobrenadantes de un cultivo de exclusión competitiva sobre el crecimiento de algunos patógenos intestinales. *Revista Mexicana De Ingenieria Quimica* 15(2): 379–389. <https://doi.org/10.24275/RMIQ/BIO1064>.
- Ahmad, R., Yu, Y.H., Hsiao, F.S.H., Su, C.H., Liu, H.C., Tobin, I., Zhang, G., Cheng, Y.H. 2022. Influence of Heat Stress on Poultry Growth

Performance, Intestinal Inflammation, and Immune Function and Potential Mitigation by Probiotics. *Animals* 12: 2297. <https://doi.org/10.3390/ani12172297>.

- Ahmed, Z., Vohra, M.S., Khan, M.N., Ahmed, A., and Khan, T.A. 2019. Antimicrobial role of *Lactobacillus* species as potential probiotics against enteropathogenic bacteria in chickens. *JIDC* 13(2): 130-136.
- Akintola, A.I., Oyediji, O., Adewale, I.O., and Bakare, M.K. 2019. Production and physicochemical properties of thermostable, crude cellulose from *Enterobacter cloacae* IP8 isolatd from plant leaf litters of *Lagerstroemia indica* Linn. *Journal of Microbiology, Biotechnology and Food Sciences* 8(4): 989-994. <https://doi.org/10.15414/jmbfs.2019.8.4.989-994>.
- Aktas, B., Wolfe, T.J.D., Tandee, K., Safdar, N., Darien, B.J. and Steele, J.L. 2015. The effect of *Lactobacillus casei* 32G on the mouse cecum microbiota and innate immune response is dose and time-dependent. *PLoS One* 10: e0145784.
- Alagawany, M., Abd El-Hack, M.E., Farag, M.R., Sachan, S., Karthik, K., and Dhama, K. 2018. The use of probiotics as eco-friendly alternatives for antibiotics in poultry nutrition. *Environ. Sci. Pollut. Res* 25: 10611–10618.
- Al-Fatah, M.A. 2020. Probiotic Modes of Action and Its Effect on Biochemical Parameters and Growth Performance in Poultry. *Iran. J. Appl. Anim. Sci* 10: 9–15.
- Alimohamadi, K., Taherpour, K., Ghasemi, H.A., and Fatahnia, F. 2014. Comparative effects of using black seed (*Nigella sativa*), cumin seed (*Cuminum cyminum*), probiotic or prebiotic on growth performance, blood haematology and serum biochemistry of broiler chicks. *J Anim Physiol Anim Nutr* 98(3):538–46. <https://doi.org/10.1111/jpn.12115>.
- Alizadeh, M., Munyaka, P., Yitbarek, A., Echeverry, H., and Rodriguez-Lecompte, J.C. 2017. Maternal antibody decay and antibody-mediated immune responses in chicken pullets fed prebiotics and synbiotics. *Poult. Sci* 96: 58–64.
- Al-Khalaifa, H., Al-Nasser, A., Al-Surayee, T., Al-Kandari, S., Al-Enzi, N., Al-Sharrah, T., Ragheb, G., Al-Qalaf, S., and Mohammed, A. 2019. Effect of dietary probiotics and prebiotics on the performance of broiler chickens. *Poult Sci* 98(10): 4465-4479. doi: 10.3382/ps/pez282.
- Allen, A., and Flemström, G. 2005. Gastroduodenal mucus bicarbonate barrier : protection against acid and pepsin. *Am. J. Physiol. Cell Physiol* 288: C1–C19. Doi: 10.1152/ajpcell.00102.2004.
- Almeida-Paz, I.C.deL., de-Lima Almeida, I.C., de La Vega, L.T., Milbradt, E.L., Borges, M.R., Chaves, G.H.C. and Andreatti Filho, R.L. 2019. Productivity and Well-Being of Broiler Chickens Supplemented With Probiotic. *The Journal of Applied Poultry Research* 28: 930-942. doi:10.3382/japr/pfz054

- Amaretti, A., di-Nunzio, M., Pompei, A., Raimondi, S., Rossi, M., Bordoni, A. 2013. Antioxidant properties of potentially probiotic bacteria: in vitro and in vivo activities. *Appl Microbiol Biotechnol* 97(2):809-17. doi: 10.1007/s00253-012-4241-7.
- Ameen, Q.H., Mohammed, M.A., Ameen, S.H., and Alsaadi, S.A. 2023. The Requirements of Chickens for Nutritional Compounds for Growth. An advanced Nutritional outlook 14(3):17-33. <https://doi.org/10.58928/ku23.14303>.
- Anastasio, M., Pepe, O., Cirillo, T., Palomba, S., Blaiotta, G., and Villan, F. 2010. Selection and use of phytate-degrading LAB to improve cereal-based products by mineral solubilization during dough fermentation. *Journal of Food Science* 75: 28–35. <https://doi.org/10.1111/j.1750-3841.2009.01402.x>.
- Andr s, E., Lorenzo-Villalba, N., Terrade, J.-E., and M ndez-Bail n, M. 2024. Fat-Soluble Vitamins A, D, E, and K: Review of the Literature and Points of Interest for the Clinician. *Stomatology* 13(13): 3641. <https://doi.org/10.3390/jcm13133641>
- Anee, I.J., Alam, M.S., Begum, R., and Shahjahan, R. 2021. The role of probiotics on animal health and nutrition. *The Journal of Basic and Applied Zoology* 82(1):52. DOI:10.1186/s41936-021-00250-x.
- Angelescu, I.-R., Zamfir, M., Ionetic, E.-C., & Grosu-Tudor, S. (2024). The Biological Role of the S-Layer Produced by *Lactobacillus helveticus* 34.9 in Cell Protection and Its Probiotic Properties. *Fermentation*. 10(3): 150. <https://doi.org/10.3390/fermentation10030150>.
- Angelin J and Kavitha M. 2020. Exopolysaccharides from probiotic bacteria and their health potential. *International Journal of Biological Macromolecules*. 162: 853-865. <https://doi.org/10.1016/j.ijbiomac.2020.06.190>.
- Angel, R., Tamim, N.M., Applegate, T.J., Dhandu, A.S., and Ellestad, L.E. 2002. Phytic Acid Chemistry: Influence on Phytin-Phosphorus Availability and Phytase Efficacy¹. *The Journal of Applied Poultry Research* 11(4): 471–480. doi:10.1093/japr/11.4.471.
- Angmo, K., Kumari, A., Savitri, and Bhalla, T.C. 2016. Probiotic characterization of lactic acid bacteria isolated from fermented foods and beverage of Ladakh. *LWT-Food Sci. Technol* 66: 428-435. doi:10.1016/j.lwt.2015.10.057.
- Anjani, L., Yunianto, V.D., Suthama, N., and Krismiyo, L. 2025. Intestinal Morphology, Protein Digestibility, and Broiler Performance Fed Encapsulated Dahlia Tuber Extract and *Bacillus subtilis*. *Tropical Animal Science Journal* 48(4): 338-346. <https://doi.org/10.5398/tasj.2025.48.4.338>
- Anwar, H., and Rahman, Z.U. 2016. Efficacy of protein, symbiotic and probiotic supplementation on production performance and egg quality characteristics in molted layers. *Trop. Anim. Health Prod* 48: 1361–1367.

- Apata, D. 2008. Growth performance, nutrient digestibility and immune response of broiler chicks fed diets supplemented with a culture of *Lactobacillus bulgaricus*. J Sci Food Agric 88(7):1253-1258. doi:10.1002/jsfa.3214.
- Arifin, Z., Gunam, I.B.Q., Antara, N.S., and Setiyo, Y. 2019. Isolasi Bakteri Selulolitik Pendegradasi Selulosa dari Kompos. Jurnal Rekayasa dan Manajemen Agroindustri 7(1):30-37.
- Aritonang, SN., Roza, E., and Sandra, 2. 2020. Short Communication: Application of bacteriocin from *Lactobacillus plantarum* SRCM 1 004 34 strain isolated from okara as a natural preservative in beef sausage. Biodiversitas 21(5): 2240-2245.
- Asghar, S., Arif, M., Nawaz, M., Muhammad, K., Ali, M. A., Ahmad, M. D., and Nazir, J. 2016. Selection, characterisation and evaluation of potential probiotic *Lactobacillus* spp. isolated from poultry droppings. Beneficial Microbes 7(1): 35–44. doi:10.3920/bm2015.0020.
- Ashraf, R., and Shah, N.P. 2014. Immune system stimulation by probiotic microorganisms. Crit. Rev. Food Sci. Nutr 54: 938–956. doi: 10.1080/10408398.2011.619671.
- Askelson, T.E., Campasino, A., Lee, J.T., and Duong, T. 2014. Evaluation of phytate-degrading *Lactobacillus* culture administration to broiler chickens. Appl Environ Microbiol 80(3):943-50. doi: 10.1128/AEM.03155-13.
- Awad, W.A., Bohm, J., Razzazi-Fazeli, E., Ghareeb, K., and Zentek, J. 2006. Effect of addition of a probiotic microorganism to broiler diets contaminated with deoxynivalenol on performance and histological alterations of intestinal villi of broiler chickens. Poult Sci 85(6): 974-979. doi:10.1093/ps/85.6.974.
- Aziz, G., Nawaz, M., Anjum, A.A., Yaqub, T., Mansuruddin, A., Nazir, J., Khan, S.U., and Aziz K. 2015. Isolation and characterization of phytase producing bacterial isolates from soil. Journal of Animal and Plant Sciences 25(3):771-776.
- Badarinath, V., Raghavendra, P., Halami, and Prakash, M. 2010. Characterization of lactic acid bacteria isolated from okara for probiotic properties. International journal of probiotics and prebiotics 5: 149.
- Bagenal, T.B. 1978. Aspects of Fish Fecundity. Ecology of Fresh Water Fish Production. Black, Well Scientific Publications. Oxford.
- Balla, A., Silini, A., Cherif-Silini, H., Bouket, A.C., Boudechicha, A., Luptakova, L., Alenezi, F.N., and Belbahri, L. 2022. Screening of cellulolytic bacteria from various ecosystems and their cellulases production under multi-stress conditions. Catalysts 12(7):769. DOI: 10.3390/catal12070769.
- Bangar, S.P., Suri, S., Trif, M. and Ozogul, F. 2022. Organic acids production from lactic acid bacteria: A preservation approach. Food Biosci 46: 101615.

- Bao, L., Shi, B., and Shi, Y.B. 2020. Intestinal homeostasis: a communication between life and death. *Cell and Bioscience* 10(1): 1–3. <https://doi.org/10.1186/S13578-020-00429-9>
- Barszcz, M. 2024. Poultry nutrition. *Physical Sciences Reviews* 9(2): 611–650. <https://doi.org/10.1515/psr-2021-0122>
- Basnet, J., Eissa, M.A., Yanes Cardozo, L.L., Romero, D.G., and Rezq, S. 2024. Impact of Probiotics and Prebiotics on Gut Microbiome and Hormonal Regulation. *Gastrointestinal Disorders* 6(4): 801–815. <https://doi.org/10.3390/gidisord6040056>
- Bedford, M.R. 2000. Exogenous enzymes in monogastric nutrition their current value and future benefits. *Anim. Feed Sci. Technol* 86: 113.
- Begley, M., Hill, C., and Gahan, C.G.M. 2006. Bile salt hydrolase activity in probiotics. *Appl Environ Microbiol* 72(3): 1729–1738.
- Belguesmia, Y., Choiset, Y., Prévost, H., Dalgarrondo, M., Chobert, J., and Drider, D. 2010. Partial purification and characterization of the mode of action of enterocin S37: a bacteriocin produced by *Enterococcus faecalis* S37 isolated from poultry feces. *J. Environ. Public Health* 10: 1–8. doi: 10.1155/2010/986460.
- Bergey, D.H., and Buchanan, R.E. 1974. *Bergey's manual of determinative bacteriology*. 8TH edition. Williams & Wilkins Co.
- Bermudez-Brito, M., Plaza-Díaz, J., Muñoz-Quezada, S., Gómez-Llorente, C., and Gil, A. 2012. Probiotic mechanisms of action. *Ann Nutr Metab* 61: 160–174. doi: 10.1159/000342079.
- Bhagat, D., Slathia, P. S., Raina, N., and Sharma, P. 2019. Production of phytase from *Lactobacillus paracasei* strain and its probiotic profile. *Indian Journal of Experimental Biology* 57(11): 839.
- Bhati, N, Shreya, and Sharma, A.K. 2020. Cost effective cellulase production, improvement strategies, and future challenges. *J Food Process Eng* e13623. <https://doi.org/10.1111/jfpe.13623>.
- Bimrew, A. 2014. Effect of common feed enzymes on nutrient utilization of monogastric animals. *Int J Biotechnol Mol Biol Res* 5(4): 27–34. <https://doi.org/10.5897/ijbmbr2014.0191>.
- Biswas, A.K., Junaid, N., Kumawat, M., Qureshi, S., and Mandal, A.B. 2019. Influence of dietary supplementation of probiotics on intestinal histomorphometry, blood chemistry and gut health status of broiler chickens. *South African Journal of Animal Science* 48(5): 968–976. <https://doi.org/10.4314/SAJAS.V48I5.17>
- Bogucka, J., Ribeiro, D.M., Ribeiro, D.M., Bogusławska-Tryk, M., Dankowiakowska, A., Roberto da Costa, R.P., and Bednarczyk, M. 2019. Microstructure of the small intestine in broiler chickens fed a diet with

- probiotic or synbiotic supplementation. *Journal of Animal Physiology and Animal Nutrition* 103(6): 1785–1791. <https://doi.org/10.1111/JPN.13182>
- Bohn, L., Meyer, A.S. and Rasmusse, S.K. 2008. Phytate: impact on environment and human nutrition. A challenge for molecular breeding. *J Zhejiang Univ Sci B* 9(3):165-91. doi: 10.1631/jzus.B0710640.
- Badan Pusat Statistik (BPS). Statistik Impor dan Konsumsi Kedelai Indonesia 2024-2025.
- Borthakur, I., Devi, R.P., Karthikeyan, S., Ramesh, D., and Murugananthi, D. 2024. Microbial Cellulase Production: Current Technologies and Future Prospects. *J Pure Appl Microbiol* 18(4): 2188-2204. doi:10.22207/JPAM.18.4.08
- Boyadzhieva, I., Berberov, K., Atanasova, N., Krumov, N., and Kabaivanova. L. 2025. Isolation, Purification and In Vitro Characterization of a Newly Isolatd Alkalophilic Phytase Produced by the *Halophile Cobetia marina* Strain 439 for Use as Animal Food Supplement. *Fermentation* 11(1): 39. <https://doi.org/10.3390/fermentation11010039>
- Bradford, M.M. 1976. A Rapid and sensitive method for the quantitation of microgram quantities of protein utilizing the principle of protein-dye binding. *Anal Biochem* 72: 284-254.
- Buckley, A., and Turner, J.R. 2018. Cell Biology of Tight Junction Barrier Regulation and Mucosal Disease. *Cold Spring Harb. Perspect. Biol* 10: a029314.
- Burke, R.W., Diamondstone, B.I., Velapoldi, R.A., and Menis, O. 1974. Mechanisms of the Liebermann-Burchard and Zak color reactions for cholesterol. *Clin Chem.* 20(7):794-81.
- Bustos, A.Y., Valdez, G.F.D., Fadda, S. and Taranto, M.P. 2018. New insights into bacterial bile resistance mechanisms: the role of bile salt hydrolase and its impact on human health. *Int. Food Res. J* 112: 250-262.
- Callaway, T.R., Edrington, T.S., Anderson, R.C., Harvey, R.B., Genovese, K.J., and Kennedy, C.N. 2008. Probiotics, prebiotics and competitive exclusionfor prophylaxis against bacterial disease. *Anim. Health Res. Rev* 9: 217–225. doi: 10.1017/S1466252308001540.
- Cappucino, J.G dan Sherman, N. 1987. *Microbiology. A Laboratory Manual*. California : The Benjamin/Cummings Publishing Company, Inc.
- Carding, S., Verbeke, K., Vipond, D.T., Corfe, B.M., and Owen, L.J. 2015. Dysbiosis of the gut microbiota in disease. *Microb Ecol Health Dis* 26: 26191.
- Carlson, J., and Slavin, J.L. 2016. Health benefits of fibre, prebiotics and probiotics: a review of intestinal health and related health claims. *Quality Assurance and Safety of Crops and Foods* 8(4): 539–553. <https://doi.org/10.3920/QAS2015.0791>

- Carter, A., Adams, M., La Ragione, R.M., and Woodward, M.J. 2017. Colonisation of poultry by *Salmonella Enteritidis* S1400 is reduced by combined administration of *Lactobacillus salivarius* 59 and *Enterococcus faecium* PXN-33. *Vet. Microbiol* 199: 100–107. doi: 10.1016/j.vetmic.2016.12.029.
- Chai, X., Wen, J., Long, H., Ren, W., Zhang, X., Huang, A., and Xie, Z. 2022. The probiotic effects, dose, and duration of lactic acid bacteria on disease resistance in *Litopenaeus vannamei*. *Aquac. rep* 26: 101299.
- Chaucheyras-Durand, F. and Durand, H. 2010. Probiotics in animal nutrition and health. *Beneficial Microbes* 1: 3-9.
- Chauhan, A., and Singh, R. 2019 Probiotics in aquaculture: a promising emerging alternative approach. *Symbiosis*, 77: 99–113.
- Chen, F., Zhu, L., and Qiu, H. 2017. Isolation and probiotic potential of *Lactobacillus salivarius* and *Pediococcus pentosaceus* in specific *patogen* free chickens. *Brazilian Journal of Poultry Science* 19(2): 325–332. DOI: <http://dx.doi.org/10.1590/1806-9061-2016-0413>.
- Chen, H., Liu, W., Zhang, H., Yan, Y., Chen, M., Ding, X., Zhang, C., Jiang, R., and Wang, Z. 2024. Effects of *Bacillus subtilis* KG109 on Growth Performance, Carcass Quality, Serum Indicators, Intestinal Morphology, and Digestive Enzymes in Broilers. *Animals*. 14(24): 3650. <https://doi.org/10.3390/ani14243650>.
- Chen, W., and Xu, D. 2023. Phytic acid and its interactions in food components, health benefits, and applications: A comprehensive review. *Trends in Food Science and Technology* 141: 104201. <https://doi.org/10.1016/j.tifs.2023.104201>
- Chichlowski, M., Croom, W.J., Edens, F.W., McBride, B.W., Qiu, R., Chiang, C.C., Daniel, L.R., Havenstein, G.B., and Koci, M.D. 2007. Microarchitecture and Spatial Relationship Between Bacteria and Ileal, Cecal, and Colonic Epithelium in Chicks Fed a Direct-Fed Microbial, PrimaLac, and Salinomycin. *Poult. Sci* 86: 1121–1132.
- Chikindas, M.L., Weeks, R., Drider, D., Chistyakov, V.A., and Dicks, L.M.T. 2018. Functions and emerging applications of bacteriocins. *Curr. Opin. Biotechnol* 49: 23-28. doi: 10.1016/j.copbio.2017.07.011.
- Choi, J.Y., Kong, B.C., Bowker, B., Zhuang, H., and Kim, W.K. 2023. Nutritional Strategies to Improve Meat Quality and Composition in the Challenging Conditions of Broiler Production: A Review. *Animals* 13(8): 1386. <https://doi.org/10.3390/ani13081386>
- Choi, S.B., Lew, L.C., Yeo, S.K., Nair Parvathy, S., and Liong, M.T. 2015. Probiotics and the BSH-related cholesterol lowering mechanism: A Jekyll and Hyde scenario. [Research Support, Non-U.S. Gov't Review]. *Critical Reviews in Biotechnology* 35(3): 392–401. <http://dx.doi.org/10.3109/07388551.2014.889077>.

- Chowdhury, N., Goswami, G., Boro, R. C., and Barooah, M. 2021. A pH-Dependent Gene Expression Enables *Bacillus amyloliquefaciens* MBNC to Adapt to Acid Stress. *Current Microbiology* 78(8): 3104–3114. <https://doi.org/10.1007/S00284-021-02573-Y>.
- Ciptaan, G., Mirnawati and Djulardi, A. 2021. Utilization of Fermented Soy-Milk Waste with *Aspergillus ficuum* in Broiler Ration. *IOP Conf. Series: Earth and Environmental Science* 709(2021): 012044. doi:10.1088/1755-1315/709/1/012044.
- Ciptaan, G., Mirnawati, Martaguri, I., Fajrona, K., and Srifani, A. 2024. Enhancing the quality and nutrient content of soybean milk waste as poultry feed through fermentation with *Bacillus subtilis*. *International Journal of Veterinary Science* 13(2): 154-159. <https://doi.org/10.47278/journal.ijvs/2023.076>
- Collado, M.C., Gueimonde, M., and Salminen, S. 2010. Probiotics in adhesion of *patogens*: mechanisms of action. In: Watson RR, Preedy VR, editors. *Bioactive Foods in Promoting Health*. Elsevier. p. 353–70. doi: 10.1016/B978-0-12-374938-3.00023-2 .
- Cotter, P.D and Hill, C. 2003. Surviving the acid test: responses of gram positive bacteria to low pH. *Microbiol. Mol. Biol. Rev* 67: 429-453.
- Cramer, T.A., Kim, H.W., Chao, Y., Wang, W., Cheng, H.W., and Kim, Y.H.B. 2018. Effects of probiotic (*Bacillus subtilis*) supplementation on meat quality characteristics of breast muscle from broilers exposed to chronic heat stress. *Poult Sci* 97(9):3358-3368. doi: 10.3382/ps/pey176.
- Dadwal, A., Sharma, S., and Satyanarayana, T. 2019. Diversity in Cellulose-Degrading Microbes and Their Cellulases: Role in Ecosystem Sustainability and Potential Applications. In: Satyanarayana, T., Das, S., Johri, B. (eds) *Microbial Diversity in Ecosystem Sustainability and Biotechnological Applications*. Springer, Singapore. p 375-402. https://doi.org/10.1007/978-981-13-8487-5_15.
- Daodu, A.A., Olumuyide, G.D., and Edemhanria, L. 2020. Isolation of extracellular phytase producing lactic acid bacteria from the gastro intestinal tract of poultry birds. *Online J. Anim. Feed Res* 10(3): 144-149. DOI: <https://dx.doi.org/10.36380/scil.2020.ojaf20>
- David, L.S., Anwar, M.N., Abdollahi, M.R., Bedford, M.R., and Ravindran, V. 2023. Calcium Nutrition of Broilers: Current Perspectives and Challenges. *Animals* 13(10): 1590. <https://doi.org/10.3390/ani13101590>
- David, L.S., Abdollahi, M.R., Bedford, M.R. and Ravindran, V. 2020. Effect of age and dietary crude protein content on the apparent ileal calcium digestibility of limestone in broiler chickens. *Anim. Feed Sci. Technol* 263: 114468.

- Davy, P., and Vuong, Q.V. 2020. Soy Milk By-product: Its Composition and Utilisation. Food Reviews International 1:23. doi:10.1080/87559129.2020.1855191.
- de Rauglaudre, T., Méda, B., Fournel, S., and Létourneau-Montminy, M.P. 2025. Quantification of the effect of reducing dietary crude protein in broiler chickens on nitrogen flows and litter characteristics by meta-analysis. Animal 4: 100104. <https://doi.org/10.1016/j.anopes.2025.100104>.
- de Souza, B.M.S., Borgonovi, T.F., Casarotti, S.N., Todorov, S.D. and Penna, A.L.B. 2019. *Lactobacillus casei* and *Lactobacillus fermentum* strains isolated from mozzarella cheese: Probiotic potential, safety, acidifying kinetic parameters and viability under gastroin-testinal tract conditions. Probiotics Antimicrob. Proteins 11(2): 382-396.
- Deka, D., Bhargavi, P., Sharma, A., Goyal, D., Jawed, M., and Goyal, A. 2011. Enhancement of Cellulase Activity from a New Strain of *Bacillus subtilis* by Medium Optimization and Analysis with Various Cellulosic Substrates. Enzyme Research 2011: 1–8. doi:10.4061/2011/151656.
- Delgado, S., Sánchez, B., Margolles, A., Ruas-Madiedo, P., and Ruiz, L. 2020. Molecules Produced by Probiotics and Intestinal Microorganisms with Immunomodulatory Activity. Nutrients 12: 391.
- Demissie, M.S., Legesse, N.H., and Tesema, A.A. 2024. Isolation and characterization of cellulase producing bacteria from forest, cow dung, Dashen brewery and agro-industrial waste. PLoS ONE 19(4): e0301607. <https://doi.org/10.1371/journal.pone.0301607>
- Den, B.G., Eunen, K., Groen, A.K., Venema, K., Reijngoud, D.J., and Bakker, B.M. 2013. The role of short-chain fatty acids in the interplay between diet, gut microbiota, and host energy metabolism. J Lipid Res 54(9):2325–2340.s
- Deng, Z., Han, D., Wang, Y., Wang, Q., Yan, X., Wang, S., Liu, X., Song, W., and Ma, Y. 2021. *Lactobacillus casei* protects intestinal mucosa from damage in chicks caused by *Salmonella pullorum* via regulating immunity and the Wnt signaling pathway and maintaining the abundance of gut microbiota. Poult. Sci. J 100(8): 101283.
- Depawole, R.R. dan Sudarma, M.A. 2020. Pengaruh pemberian level protein berbeda terhadap performans produksi itik umur 2-10 minggu di Sumba Timur. Jurnal Sain Peternakan Indonesia 15:320-326. Doi:10.31186/jspi.id.15.3.320-326.
- Derakhshan, M., Ghasemian, S.O., and Ahangaran, M.HH. 2023. The effects of probiotic and phytase on growth performance, biochemical parameters and antioxidant capacity in broiler chickens. Vet Med Sci 00:1-7.
- Dewanti, R and Wong, A,C. 1995. Influence of Culture Conditions on Biofilm Formation by *Escherichia coli* O157:H7. International Journal of Food Microbiology 26: 147-164. doi:10.1016/0168-1605(94)00103-D.

- Dewiyanti, I., Darmawi, D., Muchlisin, Z.A., Helmi, T.Z., Arisa, I.I., Rahmiati, R., Destri, E., and Fanisha, S. 2024. Characteristic and activity of cellulolytic bacteria isolated from mangrove soil in Northern Coast of Aceh Province, Indonesia. *Biodiversitas* 23(12): 6587-6599. DOI: 10.13057/biodiv/d231258.
- Dewiyanti, I., Darmawi, D., Muchlisin, Z.A., and Helmi, T.Z. 2024. Analyzing cellulolytic bacteria diversity in mangrove ecosystem soil using 16 svedberg ribosomal ribonucleic acid gene. *Global Journal of Environmental Science and Management* 10(1): 51-68. DOI: 10.22034/gjesm.2024.01.05.
- Dhavale, V., Shimpi, T., Koli, V., Kamble, R., and Patil, S.B. 2020. Bio enzymes from organic waste. *Journal of Emerging Technologies and Innovative Research* 7(8): 196–200.
- Dittoe, D.K., Ricke, S.C., and Kiess, A.S. 2018. Organic acids and potential for modifying the avian gastrointestinal tract and reducing *patogens* and disease. *Front. Vet. Sci* 5: 216.
- Djularidi, A., Harnentis, Amizar, R., dan Mirnawati. 2022. Respon Broiler terhadap Penggunaan Ampas Susu Kedelai Fermentasi dengan *Aspergillus ficuum* dalam Ransum. *Jurnal Peternakan Indonesia* 24(3):326-335.
- Dobrzyński, J., Wróbel, B., and Górska, E.B. 2022. Cellulolytic Properties of a Potentially Lignocellulose-Degrading *Bacillus* sp. 8E1A Strain Isolated from Bulk Soil. *Agronomy* 12(3): 665. <https://doi.org/10.3390/agronomy12030665>
- Dono, N.D., Indarto, E., dan Soeparno. 2017. Penggantian Bungkil Kedelai dengan Ampas Susu Kedelai dalam Pakan: Pengaruhnya pada Kinerja Pertumbuhan dan Kualitas Daging Ayam Broiler. *Jurnal Peternakan Indonesia* 19(2): 54-49.
- Dordević, D., Jančíková, S., Vítězová, M., and Kushkevych, I. 2020. Hydrogen sulfide toxicity in the gut environment: Meta-analysis of sulfate-reducing and lactic acid bacteria in inflammatory processes. *J Adv Res* 27: 55-69. <https://doi.org/10.1016/j.jare.2020.03.003>.
- Drider, D., and Rebuffat, S. 2011. Prokaryotic Antimicrobial Peptides: From Genesto Applications. New York, NY: Springer. doi: 10.1007/978-1-4419-7692-5.
- Du, L., Chen, W., Wang, J., Huang, L., Zheng, Q., Chen, J., Wang, L., Cai, C., Zhang, X., and Wang, L. 2023. Beneficial Effects of *Bacillus amyloliquefaciens* D1 Soy Milk Supplementation on Serum Biochemical Indexes and Intestinal Health of Bearded Chickens. *Microorganisms* 11: 1660. <https://doi.org/10.3390/microorganisms11071660>
- Duan, A., Ju, A., Zhang, Y., Qin, Y., Xue, L., Ma, X., Luan, W., and Yang, S. 2021. The Effects of In Ovo Injection of Synbiotics on the Early Growth

Performance and Intestinal Health of Chicks. *Frontiers in Veterinary Science* 8: 658301. <https://doi.org/10.3389/FVETS.2021.658301>

- Ehrlich A.M., Pacheco, A.R., Pacheco, A.R., Henrick, B.M., Henrick, B.M., Taft, D.H., Taft, D.H., Xu, G., Huda, M.N., Huda, M.N., Mishchuk, D., Goodson, M.L., Slupsky, C.M., Slupsky, C.M., Barile, D., Barile, D., Lebrilla, C.B., Stephensen, C.B., and Raybould, H.E. 2020. Indole-3-lactic acid associated with Bifidobacterium-dominated microbiota significantly decreases inflammation in intestinal epithelial cells. *BMC Microbiology* 20(1): 357. <https://doi.org/10.1186/S12866-020-02023-Y>
- Eko, P.M., Afolabi, K.D., and Enyenihi, G.E. 2020. Growth Performance, Carcass Quality, Organ Weights and Haematology of Broilers Fed Graded Dietary Levels of Turmeric (*Curcuma longa* l) Powder as Feed Additive. *Animal and Veterinary Sciences* 8(3): 65. <https://doi.org/10.11648/J.AVS.20200803.14>.
- El-Hack, A.M.E., Mahgoub, S.A., Alagawany, M., and Ashour, E.A. 2017. Improving productive performance and mitigating harmful emissions from laying hen excreta via feeding on graded levels of corn DDGS with or without *Bacillus subtilis* probiotic. *J. Anim. Physiol. Anim. Nutr* 101: 904–913.
- Elshagabee, F.M., Bockelmann, W., Meske, D., Vrese, M., Walte, H.G., and Schrezenmeir, J. 2016. Ethanol production by selected intestinal microorganisms and lactic acid bacteria growing under different nutritional conditions. *Front. Microbiol* 7:47. doi: 10.3389/fmicb.2016.00047.
- Fajrih, N., Suthama, N., and Yunianto, V.D. 2014. Body Resistance and Productive Performances of Crossbred Local Chicken Fed Inulin of Dahlia Tubers. *Media Peternakan*. 37(2): 108-114 DOI: 10.5398/medpet.2014.37.2.108.
- Fadda, M.E., Mossa, V., Deplano, M., Pisano, M.B. and Cosentino, S. 2017. In vitro screening of Kluyveromyces strains isolated from Fiore Sardo cheese for potential use as probiotics. *LWT Food Sci. Technol.* 75: 100–106.
- Falah, F., Vasiee, A., Behbahani, B.A., Yazdi, F.T., Moradi, S., Mortazavi, S.A. and Roshanak, S. 2019. Evaluation of adherence and anti-infective properties of probiotic *Lactobacillus fermentum* strain 4–17 against *Escherichia coli* causing urinary tract infection in humans. *Microb. Pathog* 131: 246–253.
- Farid, W., Masud, T., Sohail, A., Ahmad, N., Naqvi, S.M.S., Khan, S., Ali, A., Khalifa, S.A., Hussain, A., Ali, S., Saghir, M., Siddeeg, A. and Manzoor, M.S. 2021. Gastrointestinal transit tolerance, cell surface hydrophobicity, and functional attributes of *Lactobacillus acidophilus* strains isolated from Indigenous Dahi. *Food Sci. Nutr* 9: 4689-5332.

- Fathi, M.M., Ebeid, T.A., Al-Homidan, I., Soliman, N.K., and Abou-Emera, O.K. 2017. Influence of probiotic supplementation on immune response in broilers raised under hot climate. *Br. Poult. Sci* 58: 512–516.
- Fatiqin, A., Novita, R., dan Apriani, I. 2019. Pengujian *Salmonella* dengan Menggunakan Media SSA dan *E. coli* Menggunakan Media Emba pada Bahan Pangan. *Jurnal Indobiosains* 1(1).
- Feng, Y., Wang, Y., Wang, P., Huang, Y. and Wang, F. 2018. Short-chain fatty acids manifest stimulative and protective effects on intestinal barrier function through the inhibition of NLRP3 inflammasome and autophagy. *Cell. Physiol. Biochem* 49: 190-205.
- Fernandez, F., Hinton, M., and Van Gils, B. 2002. Dietary mannanoligosaccharides and their effect on chicken caecal microflora in relation to *Salmonella enteritidis* colonisation. *Avian Pathol* 31(1): 49–58.
- Filippovich, S.Y., Isakova, E.P., Gessler, N.N., and Deryabina, Y.I. 2023. Advances in immobilization of phytases and their application. *Bioresour Technol* 379:129030. doi: 10.1016/j.biortech.2023.129030.
- Fisinin, V.I., Lukashenko, V.S., Saleeva, I.P., Laptev, G.y., Ilina, L.A., Volik, V.G., Ismailova, D.Y. 2019. The effects of feed additives based on the hydrolysates of keratin and collagen-containing waste material on the intestinal of microbiota and productivity parameters in broiler chicks (*Gallus gallus* L.). *Agricultural biology* 54(2): 291-303. doi: 10.15389/agrobiology.2019.2.291eng.
- Flint, H.J., Scott, K.P., Duncan, S.H., Louis, P., and Forano, E. 2012. Microbial degradation of complex carbohydrates in the gut. *Gut Microbes* 3(4): 289–306.
- Flores, C., Williams, M., Pieniazek, J., Dersjant-Li, Y., Awati, A., and Lee, J.T. 2016. Direct-fed microbial and its combination with xylanase, amylase, and protease enzymes in comparison with AGPs on broiler growth performance and foot-pad lesion development. *J. Appl. Poult. Res* 25: 328–337.
- Foley, M.H., O’Flaherty, S., Barrangou, R. and Theriot, C.M. 2019. Bile salt hydrolases: Gatekeepers of bile acid metabolism and host-microbiome crosstalk in the gastrointestinal tract. *PLoS Pathog* 15: e1007581.
- Fontana, L., Bermudez-Brito, M., Plaza-Diaz, J., Muñoz-Quezada, S., and Gil, A. 2013. Sources, isolation, characterisation and evaluation of probiotics. *Br. J. Nutr* 109: S35–S50. doi:10.1017/S0007114512004011. PMID:23360880.
- Forkus, B., Ritter, S., Vlysidis, M., Geldart, K., and Kaznessis, Y. N. 2017. Antimicrobial probiotics reduce *Salmonella enterica* in turkey gastrointestinal tracts. *Scientific Reports* 7: 40695.
- Forte, C., Moscati, L., Acuti, G., Mugnai, C., Franciosini, M. P., and Costarelli, S. 2016. Effects of dietary *Lactobacillus acidophilus* and *Bacillus subtilis* on

laying performance, egg quality, blood biochemistry and immune response of organic laying hens. *J. Anim. Physiol. Anim. Nutr* 100: 977–987. doi: 10.1111/jpn.12408.

- Fossi, T.B., Akwanwi, M.C., Takop, G.N., Bille, Y.E., and Wanji, S. 2017. Phytic acid degradation by selected *Lactobacilli* isolated from fruits and vegetables and their potential as probiotics. *Eur J Biotechnol Biosci* 4(7): 34–41.
- Fry, J.P., Mailloux, N.A., Love, D.C., Milli, M.C., and Cao, L. 2018. Feed conversion efficiency in aquaculture: do we measure it correctly? *Environ. Res. Lett* 13: 024017. doi: 10.1088/1748-9326/aaa273.
- Fu, Z., Akula, S., Thorpe, M. and Hellman, L. 2021. Marked difference in efficiency of the digestive enzymes pepsin, trypsin, chymotrypsin, and pancreatic elastase to cleave tightly folded proteins. *J. Biol. Chem* 402(7): 861–867.
- Fukuda, K. 2017. Is it feasible to control *patogen* infection by competitive binding of probiotics to the host?. *Virulence* 8:1502–1505. doi: 10.1080/21505594.2017.1382798.
- Fushimi, T., Suruga, K., Oshima, Y., Fukihar, M., Tsukamoto, Y., and Goda, T. 2006. Dietary acetic acid reduces serum cholesterol and triacylglycerols in rats fed a cholesterol-rich diet. *Br J Nutr* 95(5): 916–924.
- Gaggia, F., Mattarelli, P., and Biavati, B. 2010. Probiotics and prebiotics in animal feeding for safe food production. *Int. J. Food Microbiol* 141:S15–S28.
- Ganai, A.M., Haq, Z., Beigh, Y.A., and Sheikh, G. 2019. Bypass nutrient technology with recent advances for enhancing animal production: A review. *Journal of Pharmacognosy and Phytochemistry*. 8: 269–275.
- Gangadharan, D., Jose, A., and Nampoothiri, K.M. 2020. Recapitulation of stability diversity of microbial α -amylases. *Amylase* 4(1): 11–23. <https://doi.org/10.1515/AMYLASE-2020-0002>
- Gao, Y., Bian, W., Fang, Y., Du, P., Liu, X., Zhao, X., and Li, F. 2022. α -Glucosidase Inhibitory Activity of Fermented Okara Broth Started with the Strain *Bacillus amyloliquefaciens* SY07. *Molecules* 27(3):1127. <https://doi.org/10.3390/molecules27031127>
- Garcia-Gutierrez, E., Mayer, M. J., Cotter, P. D., and Narbad, A. 2019. Gut microbiota as a source of novel antimicrobials. *Gut Microbes* 10(1): 1–21. <https://doi.org/10.1080/19490976.2018.1455790>.
- Geng, S., Zhang, Y., Cao, A., Liu, Y., Di, Y., Li, J., Lou, Q., and Zhang, L. 2022. Effects of Fat Type and Exogenous Bile Acids on Growth Performance, Nutrient Digestibility, Lipid Metabolism and Breast Muscle Fatty Acid Composition in Broiler Chickens. *Animals* 12(10): 1258. <https://doi.org/10.3390/ani12101258>

- Getachew, T. 2016. A Review on effects of probiotic supplementation in poultry performance and cholesterol levels of egg and meat. *Journal of World Poultry Research* 6(61): 31–36.
- Ghadiri, E., Naghavi, N. S., and Ghaedi, K. 2021. Gene Production and Characterization of *Bacillus Subtilis* Cellulase Collected from Central-Northern Iran Forests 91(3): 543–548. <https://doi.org/10.1007/S40011-021-01241-2>.
- Gomar Guarner, F., Sanders, M. E., Szajewska, H., Cohen, H., Eliakim, R., Herrera-deGuise, C., Karakan, T., Merenstein, D., Piscoya, A., Ramakrishna, B., Salminen, S., and Melberg, J. 2024. World Gastroenterology Organisation Global Guidelines: Probiotics and Prebiotics. *Journal of Clinical Gastroenterology* 58(6): 533–553. <https://doi.org/10.1097/mcg.0000000000002002>.
- Goswami, K., DekaBoruah, H. P., and Saikia, R. 2021. Production of cellulase by *Novosphingobium* sp. Cm1 and its potential application in lignocellulosic waste hydrolysis. *Preparative Biochemistry and Biotechnology* 52(6): 724–735. <https://doi.org/10.1080/10826068.2021.1989698>
- Grases, F., Prieto, R.M., and Costa-Bauzá, A. 2017. Dietary Phytate and Interactions with Mineral Nutrients (pp. 175–183). Springer, New York, NY. https://doi.org/10.1007/978-1-4939-6566-3_12
- Grozina, A.A. 2014. Gut microbiota of broiler chickens influenced by probiotics and antibiotics as revealed by T-RFLP and RT-PCR. *Agricultural Biology*. 6: 46-58. doi: 10.15389/agrobiology.2014.6.46eng.
- Guder, DG., and Khrisna, M.S.R. 2019. Isolation and Characterization of Potential Cellulose Degrading Bacteria from Sheep Rumen. *J Pure Appl Microbiol*. 13(3): 1831-1839.
- Gudisa, A., and Yenasew, A. 2022. Isolation, Identification, and Biochemical Characterization of Lactic Acid Bacteria from Okara. *Food Science and Quality Management*. 117.
- Gulmez, M., Gulmez, N., Bingol, S., Deprem, T., and Tasci, S.K. 2021. The Effect of Dietary Inclusion of Probiotics on Growth and Intestinal Morphology of Broiler Chickens. *Journal of World's Poultry Research* 9(1): 24-31. <https://dx.doi.org/10.36380/jwpr.2019.3>.
- Guo, J., Ma, Z., Gao, J., Zhao, J., Wei, L., Liu, J., and Xu, N. 2019. Recent advances of pH homeostasis mechanisms in *Corynebacterium glutamicum*. *World J. Microbiol. Biotechnol* 35(12): 192.
- Gu, Y., Qin, X., Zhou, G., Wang, C., Mu, C., Liu, X., Zhong, W., Xu, X., Wang, B., Jiang, K., Liu, J., and Cao, H. (2022). *Lactobacillus rhamnosus* GG supernatant promotes intestinal mucin production through regulating 5-HT4R and gut microbiota. *Food and Function*, 13(23), 12144–12155. <https://doi.org/10.1039/d2fo01900k>

- Hadisaputro, W., and Harimurti, S. 2015. Probiotics in poultry. *Journal of microbiology monographs* 29: 1–21. DOI:<https://doi.org/10.1007/978-3-319-23183-9>.
- Halimatunnisroh, R., Yudiarti, T., dan Sugiharto. 2017. Jumlah Coliform, BAL dan Total Bakteri Usus Halus Ayam Broiler yang Diberi Kunyit (*Curcuma domestica*). *Jurnal Peternakan Indonesia* 19(2): 79-84.
- Hall, B.G. 2001. *Phylogenetic trees made easy: a howto manual for molecular biologists*. Sunderland: Sinaeur Associates, Inc.
- Handa, V., Sharma, D., Kaur, A., and Arya, S.K. 2020. Biotechnological applications of microbial phytase and phytic acid in food and feed industries. *Biocatalysis and Agricultural Biotechnology* 25: 101600. <https://doi.org/10.1016/J.BCAB.2020.101600>.
- Han, H., Choi, J. K., Park, J., Im, H. C., Han, J. H., Huh, M. H., and Lee, Y.B. 2021. Recent innovations in processing technologies for improvement of nutritional quality of soymilk. *CyTA - Journal of Food* 19(1): 287–303. doi:10.1080/19476337.2021.189382.s
- Han, S., Lu, Y., Xie, J., Fei, Y., Zheng, G., Wang, Z., Liu, J., Lv, L., Ling, Z., Berglund, B., Yao, M. and Li, I. 2021. Probiotic Gastrointestinal Transit and Colonization After Oral Administration: A Long Journey. *Front. cell. infect. microbiol* 11: 609722.
- Han, X., Bertzbach, L.D. and Veit, M. 2019. Mimicking the passage of avian influenza viruses through the gastrointestinal tract of chickens. *Vet. Microbiol* 239: 108462.
- Haque, N., Hossain, A., Kumar, M., Kumar, V., and Tyagi, A.K. 2012. Phytase : Their biochemistry, physiology and application in poultry. *International Journal of Livestock. Research* 2(2): 30–41.
- Hardiansyah, M.Y., Musa, Y., and Jaya, A.M. 2020. Identification of Plant Growth Promoting Rhizobacteria from Thorny Bamboo Rhizosphere with 3% KOH Gram Test and Gram Staining Test. *International Journal of Applied Biology* 4(2).
- Hardiningsih, R., and T. Yulinery Napitupulu RNR. 2006. Isolation and test the resistance of some isolates of lactobacilli at low pH. *Biodiversity*. 7 (1): 15-17.
- Hardy, H., Harris, J., Lyon, E., Beal, J., and Foey, A.D. 2013. Probiotics, prebiotics and immunomodulation of gut mucosal defences: homeostasis and immunopathology. *Nutrients* 5: 1869–1912. doi: 10.3390/nu5061869.
- Harimurti, S., dan Endang, S. 2009. Morfologi Usus Ayam Broiler yang Disuplementasi dengan Probiotik Strain Tunggal dan Campuran. *Agritech: Jurnal Fakultas Teknologi Pertanian UGM*. 29(3): 179-183. doi:10.22146/agritech.9705.

- Harnentis, H., Marlida, Y., Nur, Y.S., Wizna, W., Santi, M.A., Septiani, N., Adzitey, F. and Huda, N. 2020. Novel probiotic lactic acid bacteria isolated from indigenous fermented foods from West Sumatera, Indonesia. *Vet. World* 13(9): 1922–1927.
- Harp, J.R., Saito, H.E., Bourdon, A.K., Reyes, J., Arias, C.A., Arias, C.A., Campagna, S.R., and Fozo, E.M. 2016. Exogenous fatty acids protect *Enterococcus faecalis* from daptomycin-induced membrane stress independently of the response regulator LiaR. *Applied and Environmental Microbiology*. 82(14): 4410–4420. <https://doi.org/10.1128/AEM.00933-16>
- Hasanah, A., dan Hartoyo, B. 2023. Effects of Encapsulated Fermeherbafit in Feed Towards Blood and Meat Cholesterol Levels of Broiler Chicken. *Jurnal Ilmiah Ilmu-Ilmu Peternakan* 26(1): 36-45. DOI: 10.0.87.165/jiip.v26i1.24547.
- He, T., Long, S., Mahfuz, S., Wu, D., Wang, X., Wei, X., and Piao, X. 2019. Effects of Probiotics as Antibiotics Substitutes on Growth Performance, Serum Biochemical Parameters, Intestinal Morphology, and Barrier Function of Broilers. *Animals* 9: 985.
- Hejdysz, M., Wiaz, M., Józefiak, D., Kaczmarek, S., and Rutkowski, A. 2012. The use of selected organic acids and their mixtures in the feeding of fattening chickens. *Sci. Ann. Pol. Soc. Anim. Prod* 8: 59–68.
- Hidalgo-Cantabrana, C., Sánchez, B., Milani, C., Ventura, M., Margollesa, A. and Ruas-Madiedo, P. 2014. Genomic Overview and Biological Functions of Exopolysaccharide Biosynthesis in *Bifidobacterium* spp. *Appl. Environ. Microbiol* 80(1).
- Hidayat, C. 2015. Reducing Abdominal Fat Deposition in Broiler Through Feeding Management. *Indonesian Bulletin of Animal and Veterinary Sciences* 25(3): 125–134. <https://doi.org/10.14334/WARTAZOA.V25I3.1157>
- Hidayat, C. 2017. Utilization of Phytase to Overcome Phytic Acid in Broiler Diet. *Wartazoa* 26(2): 057–068. <https://doi.org/10.14334/WARTAZOA.V26I2.1326>
- Hikmat, N., Kurniawan, W., dan Syamsuddin. 2020. Bobot Potong, Persentase Karkas Dan Lemak Abdominal Ayam Broiler Yang Diberi Gula Aren Dalam Air Minum. *JIPHO (Jurnal Ilmiah Peternakan Halu Oleo)* 2(4): 420-426. DOI: 10.56625/jipho.v2i4.16933.
- Hill, D., Sugrue, I., Tobin, C., Hill, C., Stanton, C. and Ross, R.P. 2018. The *Lactobacillus casei* group: History and health related applications. *Front. Microbiol* 9: 2107.
- Hmani, H., Daoud, L., Jlidi, M., Jalleli, K., Ali, M.B., Brahim, A.H., Bargui, M., Dammak, A., and Ali, M.B. 2017. A *Bacillus subtilis* strain as probiotic in poultry: selection based on in vitro functional properties and enzymatic potentialities. *J Ind Microbiol Biotechnol* 44(8): 1157–1166.

- Hossain, Md. A., Ahammed, Md. A., Sobuj, S. I., Shifat, S. K., and Somadder, P. D. 2021. Cellulase Producing Bacteria Isolation, Screening and Media Optimization from Local Soil Sample. *American Journal of Microbiological Research* 9(3): 62–74. <https://doi.org/10.12691/AJMR-9-3-1>
- Hu, P.L., Yuan, Y.H., Yue, T.L. and Guo, C.F. 2018. Bile acid patterns in commercially available oxgall powders used for the evaluation of the bile tolerance ability of potential probiotics. *PLoS ONE* 13: e0192964.
- Huang, Y., Wang, Y., Shang, N., and Li, P. 2023. Microbial Fermentation Processes of Lactic Acid: Challenges, Solutions, and Future Prospects. *Foods* 12(12): 2311; <https://doi.org/10.3390/foods12122311>.
- Huligere, S.S., Chandana-Kumari, V.B., Alqadi, T., Kumar, S., Cull, C.A., Amachawadi, R.G., and Ramu, R. 2023. Isolation and characterization of lactic acid bacteria with potential probiotic activity and further investigation of their activity by α -amylase and α -glucosidase inhibitions of fermented batters. *Front Microbiol* 13:1042263. doi: 10.3389/fmicb.2022.1042263.
- Humer, E., Schwarz, C., and Schedle, K. 2014. Phytate in pig and poultry nutrition. *J Anim Physiol Anim Nutr* 99:605–625. doi:10.1111/jpn.12258.
- Hu, Z., Zhi, Z., Zhang, H., Zhou, J., Cui, M., Zhang, J., Xue, D., and Liu, X. 2025. Isolation and Identification of Duck Intestinal Probiotics and Their Effects on the Production and Immune Performance of Pekin Ducks. *Biomolecules*. 15: 1217. <https://doi.org/10.3390/biom15091217>
- Hou, Q., Ye, L., Liu, H., Huang, L., Yang, Q., Turner, J., Turner, J., and Yu, Q. 2018. *Lactobacillus* accelerates ISCs regeneration to protect the integrity of intestinal mucosa through activation of STAT3 signaling pathway induced by LPLs secretion of IL-22. *Cell Death and Differentiation* 25(9): 1657–1670. <https://doi.org/10.1038/S41418-018-0070-2>
- Hussain, H., Maikaji, F. S., and Salihu, M. B. 2023. Effect of Substrate Concentration and Temperature for Bio-Enzyme Production Using *Enterococcus faecalis* Isolated from Waste Dump Soil in Sokoto Metropolis, Nigeria. *Journal of Applied Science and Environmental Management* 27(4): 665–671. <https://doi.org/10.4314/jasem.v27i4.4>.
- Hutabarat, M.R.T., Pahlevy, R.I., Abdurrahman, F., Sibit, D., Lokapirnasari, W.P, Soepranianondo, K., dan Ardianto. 2020. Studi Pemberian Bakteri Asam Laktat (BAL) terhadap Persentase Lemak Abdominal dan Berat Karkas Ayam Pedaging yang Diinfeksi *E.coli*. *Jurnal Peternakan Indonesia* 22(1):21–28.
- Idiawati, N., Harfinda, E. M., and Arianie, L. 2015. Produksi Enzim Selulase oleh *Aspergillus niger* pada Ampas Tahu. *Jurnal Natur Indonesia*, 16(1): 1-9.
- Idowu, P.A., Mpofu, T.J., Magoro, A.M., Modiba, M.C., Nephawe, K.A., and Mtileni, B. 2025. Impact of probiotics on chickengut microbiota,

immunity, behavior, and productive performance—a systematic review. *Front. Anim. Sci.* 6:1562527.

- Ifa, W.E., Belgaroui, N., Sayahi, N., Ghazala, I., and Hanin, M. 2024. Phytase-producing rhizobacteria enhance barley growth and phosphate nutrition. *Front. Sustain. Food Syst* 8:1432599. doi: 10.3389/fsufs.2024.1432599.
- Iheanacho, G.C., Iwuji, T.C., Ogamba, M.C., and Odunfa, O.A. 2022. Relationship Between Live Weight, Internal Organs, and Body Part Weights of Broiler Chickens. *Malaysian Animal Husbandry Journal*: 2(2): 64-66.
- Imamudin, Atmomarsono, U., dan Nasoetion, M.H. 2012. Pengaruh Berbagai Frekuensi Pemberian Pakan pada Pembatasan Pakan terhadap Produksi Karkas Ayam Broiler. *Animal Agricultural Journal* 1(1):87–98.
- Ingelmann, C.J., Witzig, M., Möhring, J., Schollenberger, M., Kühn, I. and Rodehutschord, M. 2019. Phytate degradation and phosphorus digestibility in broilers and turkeys fed different corn sources with or without added phytase. *Poultry Science* 98: 912-922. <https://doi.org/10.3382/ps/pey438>.
- Iryos, A.R., Mirnawati, Harnentis, Srifani, A., and Yanti, G. 2025. Effectiveness of *Lactobacillus fermentum* CMUL-54 and *Lactobacillus fermentum* B978 as probiotic candidates producing mannanase, cellulase and protease activities for poultry. *Online J. Anim. Feed Res* 15: 117–125.
- Jacela, J.Y., Frobose, H.L., DeRouchey, J.M., Tokach, M.D., Dritz, S.S., Goodband, R.D., and Nelssen, J.L. 2010. Amino acid digestibility and energy concentration of high-protein corn dried distillers grains and high-protein sorghum dried distillers grains with solubles for swine. *J. Anim. Sci* 88 (11): 3617-3623. <https://doi.org/10.2527/jas.2010-3098>.
- Jadhav, K., Katoch, S., Sharma, V.K., and Mane, B.G. 2015. Probiotics in Broiler Poultry Feeds: A Review. *J. Anim. Nutr. Physiol* 1: 4–16.
- Jäger, R., Purpura, M., Farmer, S., Cash, H.A. and Keller, D. 2018. Probiotic *Bacillus coagulans* GBI-30, 6086 improves protein absorption and utilization. *Probiotics Antimicrob. Proteins* 10: 610–615.
- Jazi, V., Foroozandeh, A.D., Toghyani, M., Dastar, B., Rezaie Koochaksaraie, R., and Toghyani, M. 2018. Effects of *Pediococcus acidilactici*, mannan-oligosaccharide, butyric acid and their combination on growth performance and intestinal health in young broiler chickens challenged with *Salmonella typhimurium*. *Poult. Sci* 97: 2034–2043.
- Jeni, R.E., Dittoe, D.K., Olson, E.G., Lourenco, J., Corcionivoschi, N., Ricke, S.C., and Callaway, T.R. 2021. Probiotics and potential applications for alternative poultry production systems. *Poultry Science* 100(7): 101156. doi:10.1016/j.psj.2021.101156
- Jennifer, V., and Thiruneelakandan, G. 2015. Enzymatic Activity of Marine *Lactobacillus* Species from South East Coast of India. 2(1), 5.

- Jeong, G.J., Khan, F., Tabassun, N., Cho, K.J. and Kim, Y.M. 2023. Controlling biofilm and virulence properties of Gram-positive bacteria by targeting wall teichoic acid and lipoteichoic acid. *Int. J. Antimicrob. Agents* 62: 106941.
- Jha, R., and Mishra, P. 2021. Dietary fiber in poultry nutrition and their effects on nutrient utilization, performance, gut health, and on the environment: a review. *J Animal Sci Biotechnol* 12: 51. <https://doi.org/10.1186/s40104-021-00576-0>.
- Jha, R., Das, R., Oak, S., and Mishra, P. 2020. Probiotics (Direct-Fed Microbials) in Poultry Nutrition and Their Effects on Nutrient Utilization, Growth and Laying Performance, and Gut Health: A Systematic Review. *Animals* 10(10): 1863. <https://doi.org/10.3390/ani10101863>.
- Jiang, T., Li, H.S., Han, G.G., Singh, B., Kang, S.K., Bok, J.D., Kim, D.D., Hong, Z.S., Choi, Y.J., Cho, C.S. 2017. Oral delivery of probiotics in poultry using pH-sensitive tablets. *J. Microbiol. Biotechnol* 27: 739–746.
- Jones, S.E., Paynich, M.L., Kearns, D.B. and Knight, K.L. 2014. Protection from intestinal inflammation by bacterial exopolysaccharides. *J. Immunol* 192: 4813-4820.
- Jose, N.M., Bunt, C.R., and Hussain, A.M. 2015. Comparison of microbiological and probiotic characteristics of *Lactobacilli* isolats from dairy food products and animal rumen contents. *Microorganisms* 3:198–212. <https://doi.org/10.3390/microorganisms3020198>.
- Ju, A., Duan, A., Zhang, Y., Qin, Y., Xue, L., Ma, X., Luan, W. and Yang, S. 2021. The construction of recombinant *Lactobacillus casei* expressing hemagglutinin-neuraminidase protein and its immune response in chickens. *Microb. Pathog* 158: 105091.
- Judkins, T.C., Archer, D.L., Kramer, D.C., and Solch, R.J. 2020. Probiotics, Nutrition, and the Small Intestine. *Current Gastroenterology Reports* 22(1): 2. <https://doi.org/10.1007/S11894-019-0740-3>.
- Junior, V.D.T., Genova, J.L., Kim, S.W., Saraiva, A., Rocha, G.C. 2024. Carbohydrases and Phytase in Poultry and Pig Nutrition: A Review beyond the Nutrients and Energy Matrix. *Animals* 14: 226. <https://doi.org/10.3390/ani14020226>
- Kaewarsar, E., Chaiyasut, C., Lailerd, N., Makhamrueang, N., Peerajan, S. and Sirilun, S. 2023. Effects of Synbiotic *Lactocaseibacillus paracasei*, *Bifidobacterium breve*, and Prebiotics on the Growth Stimulation of Beneficial Gut Microbiota. *Foods* 12(20): 3847.
- Kajfasz, J.K., and Quivey, R.G. 2011. Responses of Lactic Acid Bacteria to Acid Stress (pp. 23–53). Springer, Boston, MA. https://doi.org/10.1007/978-0-387-92771-8_2
- Kant, R. and Broadway, A.A. 2015. The Benefits of Consuming Soya Milk- A Review. *Trends in Biosciences* 8(5): 1159-1162.

- Karaman, K., Sagdic, O., and Durak, M. Z. 2018. Use of phytase active yeasts and lactic acid bacteria isolated from sourdough in the production of whole wheat bread. *LWT - Food Science and Technology* 91: 557-567. <https://doi.org/10.1016/j.lwt.2018.01.055>.
- Karim, R., Mahmud, M. N., and Hakim, M. A. 2017. Production of Bacteriocin Like Substances as Antipathogenic Metabolites by *Staphylococcus warneri* Isolated from Healthy Human Skin. *Journal of Microbiology Research* 5(3): 40–48. <https://doi.org/10.13189/UJMR.2017.050302>
- Kaur, R., and Kaur, S. 2022. Exploration of phytate-mineralizing bacteria with multifarious plant growth-promoting traits. *BioTechnologia (Pozn)* 29: 103(2):99-112. doi: 10.5114/bta.2022.116204.
- Keravuo, J., Lauraeus, M., Nurminen, P., Kalkkinen, N., and Apajalahti, J. 1998. Isolation, Characterization, Molecular Gene Cloning, and Sequencing of a Novel Phytase from *Bacillus subtilis*. *Applied and Environmental Microbiology* 64(4): 2079-2085.
- Khabiroy, A., Khaziakhmetov, F., Kuznetsov, V., Tagirov, H., Rebezov, M., Andreyeva, A., Basharov, A., Yessimbekov, Z. and Ayaz, M. 2020. Effect of Normosil Probiotic Supplementation on the Growth Performance and Blood Parameters of Broiler Chickens. *Indian Journal of Pharmaceutical Education and Research* . 54 (4):1046-1055.
- Khalila, R., Fitri L, and Suhartono. 2020. Isolation and Characterization of Thermophilic Bacteria as Cellulolytic Enzyme Producer from the Hot Spring of Ie Seuum Aceh Besar, Indonesia. *Microbiology Indonesia* 14(1): 25-33. DOI: 10.5454/mi.14.1.4.
- Khatun, A., Chowdhury, S.D. and Roy, B.C. 2022. Effects of Feeding Multi-Strain Probiotics and Multi-Enzymes to Broilers on Growth Performance, Intestinal Morphology and Cost Effectiveness of Production. *Advances in Animal and Veterinary Sciences*. 10(2):389-396. DOI:10.17582/journal.aavs/2022/10.2.389.396.
- Khazn, I., Nawaz, M., Anjum, A.A., Ahmad, M.D., Mehmood, A., Rabbani, M., Mustafa, A., and Ali, M.A. 2020. Effect of Indigenous Probiotics on Gut Morphology and Intestinal Absorption Capacity in Broiler Chicken Challenged with *Salmonella enteritidis*. *Pakistan J. Zool* 52(5): 1825-1831. DOI: <https://dx.doi.org/10.17582/journal.pjz/20190518090547>.
- Khurajog, B., Disastra, Y., Lawwyne, L.D., Sirichokchatchawan, W., Niyomtham, W., Yindee, J., Hampson, D.J. and Prapasarakul, N. 2023. Selection and evaluation of lactic acid bacteria from chicken feces in Thailand as potential probiotics. *PeerJ* 4: 11:e16637.
- Khushboo, Karnwal A and Malik T. 2023. Characterization and selection of probiotic lactic acid bacteria from different dietary sources for development of functional foods. *Front. Microbiol* 14:1170725. doi: 10.3389/fmicb.2023.117072

- Kiczorowska, B., Samolińska, W., Al-Yasiry, A.R.M., Kiczorowski, P., and Winiarska-Mieczan, A. 2017. The natural feed additives as immunostimulants in monogastric animal nutrition – a review. *Ann. Anim. Sci* 17: 605–625. doi: 10.1515/aoas-2016- 0076.
- Kiela, P.R., and Ghishan, F.K. 2016. Physiology of Intestinal Absorption and Secretion. *Best Practice and Research in Clinical Gastroenterology* 30(2), 145–159. <https://doi.org/10.1016/J.BPG.2016.02.007>
- Kim, D.H. and Austin, B. 2008. Characterization of probiotic *Carnobacteria* isolated from rainbow trout (*Oncorhynchus mykiss*) intestine. *Lett Appl Microbiol* 47:141–7.
- Kim, T.W., and Lei, X.G. 2005. An improved method for a rapid determination of phytase activity in animal feed. *J. Anim. Sci* 83:1062–1067.
- Kinstler, S.R., Wong, E.A., Hofacre, C.L., Lee, M.D., Hoerr, F.J., Jones, M., and Maurer, J.J. 2024. Subclinical Necrotic Enteritis Impacts Developmental Notch and Wnt Signaling and Intestinal Morphology in the Small Intestine of Broiler Chickens. *Avian Diseases* 68(4). <https://doi.org/10.1637/aviandiseases-d-24-00018>.
- Kizerwetter-Swida M., and Binek, M. 2009. Protective effect of potentially probiotic *Lactobacillus* strain on infection with *pathogenic* bacteria in chickens. *Pol J Vet Sci* 12(1): 15-20.
- Kleerebezem, M., and Vaughan, E.E. 2020. Probiotic bacteria: mechanisms and applications. *Annual Review of Food Science and Technology* 11: 123-141. <https://doi.org/10.1146/annurev-food-032519-051840>
- Knudsen, K. 2014. Fiber and nonstarch polysaccharide content and variation in common crops used in broiler diets. *Poultry Science* 93(9): 2380-2393. <https://doi.org/10.3382/ps.2014-03902>.
- Koga, N., Hosomi, T., Zwama, M., Jirayupat, C., Yanagida, T., Nishino, K., and Yamasaki, S. 2020. Identification of Genetic Variants via Bacterial Respiration Gas Analysis. *Front. Microbiol* 11:581571. doi: 10.3389/fmicb.2020.581571
- Kornegay, ET. 2001. Digestion of phosphorus and other nutrients: the role of phytases and factors influencing their activity. In: Bedford MR, Partridge GG (eds) *Enzymes in farm animal nutrition*. Cab Publishing: Wallingford. p 432.
- Krishnaswamy, V.G., Sridharan R., Kumar, PS., and Fathima, M.J. 2022. Cellulase enzyme catalyst producing bacterial strains from vermicompost and its application in low-density polyethylene degradation. *Chemosphere*. 288(2): 132552. <https://doi.org/10.1016/j.chemosphere.2021.132552>.
- Krismiyanto, L., Yunianto, V. D., Suthama, N., and Amanusa, A. 2023. Effect of Adding Palm Kernel Meal Extract to Rations Using Microparticle Protein Sources On Fatty Meat and Carcass Weight of Broiler Chicken. *Bantara*

- Krysiak, K., Konkol, D., and Korczyński, M. 2021. Overview of the Use of Probiotics in Poultry Production. *Animals* 11(6):1620. <https://doi.org/10.3390/ani11061620>.
- Kumar, M., Kumar, A., Nagpal, R., Mohania, D., Behare, P., Verma, V., Kumar, P., Poddar, D., Aggarwal, P.K., Henry, C.J., Jain, S., and Yadav, H. 2010. Cancer-preventing attributes of probiotics: an update. *Int J Food Sci Nutr* 61(5):473–496.
- Kumar, M., Nagpal, R., Hemalatha, R., Yadav, H., and Marotta, F. 2016. Probiotics and Prebiotics for Promoting Health: Through Gut Microbiota. Academic press. (pp. 75–85). <https://doi.org/10.1016/B978-0-12-802189-7.00006-X>
- Kumar, V., and Sinha, A.K. 2018. General aspects of phytases. *Enzymes in Human and Animal Nutrition*. Academic Press. 53–72. doi:10.1016/b978-0-12-805419-2.00003-4
- Lata, S., Rostogi S., Kapoor A., and Imran M. 2013. Optimization of culture conditions for the production of phytase from *Aspergillus heteromorphous* MTCC 10685. *International Journal of Advanced Biotechnology and Research* 4(2): 224-235.
- Lathief, A., and Alphonsa, M.W. 2024. Bioactive Potential of Probiotic Bacteria-A Comprehensive Review. *Food Science and Engineering* 10(4). <https://doi.org/10.37256/fse.5220244592>
- Lawalata, H.J., Kumajas, J., Tengker, S.M., Runtuwene, K.M., Hasani, R.S., and Weken, M.M. 2023. Lactic Acid Bacteria as an Exopolysaccharides (EPS) Producing Starter from Pakoba Fruit (*Syzygium* sp.), Endemic Species at Minahasa, North Sulawesi. *J Pure Appl Microbiol* 17(4):2536-2546. doi: 10.22207/JPAM.17.4.51.
- Lebeer, S., Bron, P.A., Marco, M.L., van Pijkeren, J.P., Motherway, M.O., Hill, C., and Klaenhammer, T. 2018. Identification of probiotic effector molecules: Present state and future perspectives. *Curr. Opin. Biotechnol* 49: 217–223.
- Lebeer, S., Vanderleyden, J., and De Keersmaecker, S.C.J. 2010. Host interactions of probiotic bacterial surface molecules: comparison with commensals and *patogens*. *Nat. Rev. Microbiol* 8: 171.
- LeBlanc, J.G., Chain, F., Martín, R., Bermúdez-Humarán, L.G., Courau, S., and Langella, P. 2017. Beneficial effects on host energy metabolism of short-chain fatty acids and vitamins produced by commensal and probiotic bacteria. *Microb Cell Factories* 16:79
- LeBlanc, J.G., Milani, C., de Giori, G.S., Sesma, F., van Sinderen, D., and Ventura, M. 2013. Bacteria as vitamin suppliers to their host: a gut microbiota perspective. *Curr Opin Biotechnol* 24(2): 160–168.

- Lee, F.H., Wan, S.Y., Foo, H.L., Loh, T.C., Mohamad, R.R.A., and Idrus, Z. 2019. Comparative Study of Extracellular Proteolytic, Cellulolytic, and Hemicellulolytic Enzyme Activities and Biotransformation of Palm Kernel Cake Biomass by Lactic Acid Bacteria Isolates from Malaysian Foods. *Molecular Sciences* 20(20): 4979. <https://doi.org/10.3390/ijms20204979>.
- Lee, N.K., Lee, E.K. and Paik, H.D. 2013. Potential probiotic properties of phytase-producing *Lactobacillus salivarius* FC113. *Annals of Microbiology* 63: 555-560.
- Lee, D.K., Park, S.Y., Jang, S., Baek, E.H., Kim, M.J., Huh, S.M., Choi, K.S., Chung, M.J., Kim, J.E., Lee, K.O., and Ha, N.J. 2011. The Combination of Mixed Lactic Acid Bacteria and Dietary Fiber Lowers Serum Cholesterol Levels and Fecal Harmful Enzyme Activities in Rats. *Archives of Pharmacal Research* 34(1): 23–29. <https://doi.org/10.1007/S12272-011-0102-7>
- Lee, D., Gan, A.X., Xia, X., Toh, K.Q.X., Chan, G., Jung, S.H., and Kim, J.E. 2022. Biovalorized Okara Consumption Improves Gut Metabolites by Modulating Gut Microbiome: A Randomized Controlled Crossover Trial. *Current Developments in Nutrition* 6: 1017. <https://doi.org/10.1093/cdn/nzac069.022>
- Lei, X.G., Weaver, J.D., Mullaney, E., Ullah, A.H., and Azain, M.J. 2013. Phytase, a new life for an "old" enzyme. *Annu Rev Anim Biosci* 1:283-309. doi: 10.1146/annurev-animal-031412-103717.
- Lei, X.G., and Porres, J.M. 2003. Phytase enzymology, applications, and biotechnology. *Biotechnology Letters* 25: 1787–1794.
- Leo, V.V., Leo, V.V., Ramesh, N., and Singh, B. 2019. Microorganisms as an Efficient Tool for Cellulase Production: Availability, Diversity, and Efficiency (pp. 45–61). Elsevier. <https://doi.org/10.1016/B978-0-444-64223-3.00004-7>
- Letort, C. and V. Juillard. 2001. Development of a Minimal Chemically Defined Medium for the Exponential Growth of *Streptococcus thermophiles*. *Journal of Applied Microbiology* 91: 1023-1029.
- Liebing, E., Krug, S. M., Neurath, M. F., Siegmund, B., and Becker, C. 2024. Wall of Resilience: How the Intestinal Epithelium Prevents Inflammatory Onslaught in the Gut. *Cellular and Molecular Gastroenterology and Hepatology*. 101423. <https://doi.org/10.1016/j.jcmgh.2024.101423>
- Li, F., Xie, Y., Gao, X., Shan, M., Sun, C., Niu, Y.D., and Shan, A. 2020. *Electronic Journal of Biotechnology* 48: 29-35. <https://doi.org/10.1016/j.ejbt.2020.09.001>.
- Li, Q., Wan, G., Peng, C., Xu, L., Yu, Y., Li, L., and Li, G. 2020. Effect of probiotic supplementation on growth performance, intestinal morphology, barrier integrity, and inflammatory response in broilers subjected to cyclic heat stress. *Anim Sci J* 91(1): e13433. doi: 10.1111/asj.13433.

- Li, Y., Huang, Y., Liang, H., Wang, W., Li, B., Liu, T., Huang, Y., Zhang, Z., Qin, Y., Zhou, X., Wang, R., and Huang, T. 2023. The roles and applications of short-chain fatty acids derived from microbial fermentation of dietary fibers in human cancer. *Frontiers in Nutrition* 10. <https://doi.org/10.3389/fnut.2023.1243390>
- Liao, S.F., and Nyachoti, C.M. 2017. Using probiotics to improve swine gut health and nutrient utilization. *Anim. Nutr* 3:331–343.
- Lin, D., Ning, H., Liu, Y., Qin, W., Liu, J., and Loy, D.A. 2025. Mechanism of promoting okara insoluble to soluble dietary fiber by high-pressure homogenization-microbial fermentation. *Bioresour Technol.* 416: 131774. doi: 10.1016/j.biortech.2024.131774.
- Lin, J., Sahin, O., Michel, L.O., and Zhang, Q. 2003. Critical role of multidrug efflux pump CmeABC in bile resistance and in vivo colonization of *Campylobacter jejuni*. *Infect Immunity* 71: 4250–4259.
- Liu, Y., Wang, J.m and Wu, C. 2022. Modulation of Gut Microbiota and Immune System by Probiotics, Pre-biotics, and Post-biotics. *Front. Nutr* 8:634897. doi: 10.3389/fnut.2021.634897
- Liu, Y., Li, Y., Yu, X., Tian, F., Zhao, J., Zhang, H., Zhai, Q. and Chen, W. 2021. Physiological characteristics of *Lactobacillus casei* strains and their alleviation effects against inflammatory bowel disease. *J. Microbiol. Biotechnol.*, 31(1): 92–103.
- Liu, H., Lu, H., Wang, Y., Chenyun, He, Z., and Dong, H. 2024. Unlocking the power of short-chain fatty acids in ameliorating intestinal mucosal immunity: a new porcine nutritional approach. *Frontiers in Cellular and Infection Microbiology* 14. <https://doi.org/10.3389/fcimb.2024.1449030of>.
- Liu, L., Li, Q., Yajin, Y., and Guo, A. 2021. Biological Function of Short-Chain Fatty Acids and Its Regulation on Intestinal Health of Poultry. *Frontiers in Veterinary Science* 8: 736739. <https://doi.org/10.3389/FVETS.2021.736739>
- Liu, W., Chen, M., Duo, L., Wang, J., Guo, S., Sun, H., Menghe, B., and Zhang, H. 2020. Characterization of potentially probiotic lactic acid bacteria and bifidobacteria isolated from human colostrum. *J Dairy Sci* 103(5): 4013–4025.
- Liu, W.J., Chen, Y.F., Kwok, L.Y., Li, M.H., Sun, T., Sun, C.L., Wang, X.N., Dan, T., Menghebilige., Zhang, H.P. and Sun, T.S. 2013. Preliminary Selection for Potential Probiotik Bifidobacterium Isolated Subjects of Different Chinese Ethnic Group and Evaluation of Their Fermentation and Storage Characteristics in Bovine Milk. *J Dairy Sci* 96: 6807–6817.
- Lokapirnasari, W.P., Al Arif, M.A., Maslachah, L., Chandra, E.H., Utomo, G.S. M., and Yulianto, A.B. 2022. Effect of Combination of Probiotics and *Moringa oleifera* Leaf Extract on Nutrients Intake in Ducks. *Jurnal Medik Veteriner* 5(2): 241– 246.

- Lokapirnasari, W.P., Anggun, R., dan Hana, E. 2025. Potensi Penambahan Bakteri Asam laktat *Lactobacillus casei* dan *Lactobacillus rhamnosus* terhadap Konsumsi ransum dan Konversi Pakan Ayam Pedaging. *Agro Veteriner* 5(1): 43–49.
- Lone, A., Mottawea, W., Mottawea, W., Mehdi, Y., and Hammami, R. 2021. Bacteriocinogenic probiotics as an integrated alternative to antibiotics in chicken production - why and how? *Critical Reviews in Food Science and Nutrition* 1–17. <https://doi.org/10.1080/10408398.2021.1932722>
- Long, S.L., Gahan, C.G.M. and Joyce, S.A. 2017. Interactions between gut bacteria and bile in health and disease. *Mol Aspects Med* 56: 54–65.
- López-Mondéjar, R., Zühlke, D., Becher, D., Riedel, K., and Baldrian, P. 2016. Cellulose and hemicellulose decomposition by forest soil bacteria proceeds by the action of structurally variable enzymatic systems. *Scientific Reports* 6(1): 25279. <https://doi.org/10.1038/SREP25279>
- Luise, D., Bosi, P., Raff, L., Amatucci, L., Viridis, S., and Trevisi, P. 2022. *Bacillus* spp. Probiotic Strains as a Potential Tool for Limiting the Use of Antibiotics, and Improving the Growth and Health of Pigs and Chickens. *Frontiers in Microbiology* 13: 801827. doi: 10.3389/fmicb.2022.801827.
- Lu, J., Mao, Y., Ma, T., Liu, X., Cheng, X., Bai, Y. X., and Li, S. 2023. Screening and genome analysis of lactic acid bacteria with high exopolysaccharide production and good probiotic properties. *Food Bioscience* 56: 103211. <https://doi.org/10.1016/j.fbio.2023.103211>
- Lynd, L.R., Paul, J.W., Willem, H., and Isak, S.P. 2002. Microbial Cellulose: Fundamentals and Biotechnology. *Microbiol and Molecul Biol Reviews* 66(3): 506-577.
- Ma, B., De, W., Chen, X., Wang, Q., Zhang, T., Wen, R., Yang, M., Li, C., Lei, C., and Wang, H. 2024. Dietary α -linolenic acid supplementation enhances resistance to *Salmonella Typhimurium* challenge in chickens by altering the intestinal mucosal barrier integrity and cecal microbes. *Microbiological Research* 285: 127773. <https://doi.org/10.1016/j.micres.2024.127773>.
- Madhvi, and Shah H. 2024. Screening and molecular characterization of phytase producer from north Gujarat region. *Journal of Applied Biology and Biotechnology* 12(3): 146-152. DOI: 10.7324/JABB.2024.172285.
- Maeda, H., Zhu, X., Suzuki, S., Suzuki, K., and Kitamura, S. 2004. Structural characterization and biological activities of an exopolysaccharide kefiran produced by *Lactobacillus kefiranofaciens* WT-2B(T). *J Agric Food Chem* 52(17): 5533– 5538.
- Maiorka, A., Silva, A., Santín, E., Bruno, L.D.G., Boleli, I.C., and Macari, M. 2022. Effect of Broiler Breeder Age on the Intestinal Mucosa Development of the Embryos at 20 Days of Incubation. *Revista Brasileira*

- Mai-Prochnow, A., Clauson, M., and Hong, J. 2016. Gram positive and Gram negative bacteria differ in their sensitivity to cold plasma. *Sci Rep* 6: 38610. <https://doi.org/10.1038/srep38610>
- Ma, K., Chen, W., Lin, X.Q., Liu, Z., Wang, T., Zhang, J.B., Zhang, J.G., Zhou, C., Gao, Y.X., Du, C., and Yang, Y. 2023. Culturing the Chicken Intestinal Microbiota and Potential Application as Probiotics Development. *International Journal of Molecular Sciences* 24(3): 3045. <https://doi.org/10.3390/ijms24033045>
- Maki M.L., Broere M., Leung K.T., and Qin W. 2011. Characterization of some efficient cellulase producing bacteria isolated from paper mill sludges and organic fertilizers. *Int. J. Biochem. Mol. Biol* 2(2):146–54.
- Makled, M.N., Eldeeb, M.A., Abouelezz, K., Amen, O., and Habib, M. 2023. Impacts of probiotics with or without organic acids as dietary supplements on growth performance, carcass quality, digestibility, intestinal development, and gut microbiota of broiler chicks. *Tropical and Subtropical Agroecosystems* 26(3). <https://doi.org/10.56369/tsaes.4693>.
- Maldonado, G.C., Cazorla, S.I., Lemme Dumit, J.M., Vélez, E., and Per-digón, G. 2019. Beneficial effects of probiotic consumption on the immune system. *Annals of Nutrition and Metabolism* 74: 115–124. <https://doi.org/10.1159/000496426>.
- Malik, W.A., and Javed, S. 2024. Enhancement of cellulase production by cellulolytic bacteria SB125 in submerged fermentation medium and biochemical characterization of the enzyme. *International Journal of Biological Macromolecules* 263: 130415. <https://doi.org/10.1016/j.ijbiomac.2024.130415>.
- Maragkoudakis, P.A., Zompopoulou, G., Miaris, C., Kalantzopoulos, C., Pot, B., and Tsakalido, E. 2006. Probiotic potentials of *Lactobacillus* strains isolated from dairy products. *Intl Dairy J* 16: 189–99.
- Marchwińska, K. and Gwiazdowska, D. 2022. Isolation and probiotic potential of lactic acid bacteria from swine feces for feed additive composition. *Arch. Microbiol* 204: 61.
- Marcin, A., Levkut, M., Revajova, V., and Soltysova, B. 2012. Impact of Dietary Intake of Oregano Essential Oil on Parameters of Digestion and Caecal Microflora of Broiler Chickens. *Folia Veterinaria* 56(1): 53-59.
- Marcin, A., Nad, P., Bujnak, L., Skalicka, M., and Samudovska, H.A. 2023. Amylolytic and Cellulolytic Activities, The Digestibility of Dry Matter of Broiler Chickens After Feed Intake of Humic Substances. *Folia Veterinaria* 67(1): 15-23. DOI: 10.2478/fv-2023-0002.

- Maresca, D., Zotta, T., and Mauriello, G. 2018. Adaptation to Aerobic Environment of *Lactobacillus johnsonii/gasseri* Strains. *Front. Microbiol* 9:157. doi: 10.3389/fmicb.2018.00157
- Markovic, M.A., and Brubaker, P.L. 2019. The roles of glucagon-like peptide-2 and the intestinal epithelial insulin-like growth factor-1 receptor in regulating microvillus length. *Scientific Reports* 9(1): 13010. <https://doi.org/10.1038/S41598-019-49510-5>.
- Marma, M.S., Chakroborty, K., Lee, J.M., Rahman, Z., and Rafiquzzaman, S.M. 2025. Characterization and Enzymatic Assay of Cellulase-Producing Probiotic Bacteria Isolated from Traditional Fermented Bamboo of Bangladesh. *Hayati Journal of Biosciences*. 32(2): 547–560. <https://doi.org/10.4308/hjb.32.2.547-560>
- Martínez, E.A., Babot, J.D., Lorenzo-Pisarello, M.J., Apella, M.C., and Chaia, A.P. 2016. Feed supplementation with avian *Propionibacterium acidipropionici* contributes to mucosa development in early stages of rearing broiler chickens. *Benef. Microbes* 7: 687–698.
- Martoni, C.J., Labbe, A., Ganopolsky, J.G., Prakash, S. and Jones, M.L. 2015. Changes in bile acids, FGF-19 and sterol absorption in response to bile salt hydrolase active *L. reuteri* NCIMB 30242. [Clinical Trial Research Support, Non-U.S. Gov't]. *Gut Microbes* 6(1): 57-65.
- Mazumder, M.A. and Begum, A.A. 2016. Soymilk as source of nutrient for malnourished population of developing country: A review. *International Journal of Advanced Scientific and Technical Research* 6(5).
- Mehmood, A., Baneen, U., Zaheer, A., Wasim Sajid, M., Hussain, A., Saleem, S., Sajid, M.W., Hussain, A., Saleem, S., Yousafi, Q., Rashid, H., Riaz, H., Ihsan, A., Jamil, F., Sajjad, Y., Zahid, N., Anjam, M.S., Arshad, M., Mirza, Z., Karim, S., Rasool, M. 2019. Physical and chemical mutagens improved *Sporotrichum thermophile* strain ST20 for enhanced Phytase activity. *Saudi Journal of Biological Sciences* doi:10.1016/j.sjbs.2019.07.006
- Messaoudi, S., Manai, M., Kergourlay, G., Prévost, H., Connil, N., Chobert, J.M., and Dousset, X. 2013. *Lactobacillus salivarius*: Bacteriocin and probiotic activity. *Food Microbiol* 36: 296–304.
- Meyer, M.M., Fries-Craft, K.A., and Bobeck, E.A. 2020. Composition and inclusion of probiotics in broiler diets alter intestinal permeability and spleen immune cell profiles without negatively affecting performance1. *J. Anim. Sci* 98: 383.
- Mhone, A.L., Makumi, A., Odaba, J., Guantai, L., Gunathilake, K.M.D., Loignon, S., Ngugi, C.W., Akhwale, J.K., Moineau, S. and Svitek, N. 2022. *Salmonella Enteritidis* Bacteriophages Isolated from Kenyan Poultry Farms Demonstrate Time-Dependent Stability in Environments Mimicking the Chicken Gastrointestinal Tract. *Viruses* 14: 1788.

- Mishra, U., Kumari, S., Fatima, B., and Singh, A. 2024. Isolation, characterization and optimization of extracellular phytase producing *Bacillus amyloliquefaciens* AUPPB02. *International Journal of Current Microbiology and Applied Sciences* 13(4). <https://doi.org/10.20546/ijcmas.2024.1304.007>.
- Mishra, B., and Jha, R. 2019. Oxidative stress in the poultry gut: potential challenges and interventions. *Front Vet Sci* 6:60.
- Mishra, S., and Acharya, S. 2021. A Brief Overview on Probiotics: The Health Friendly Microbes. *Biomed Pharma Journal* 14(4). <https://doi.org/10.13005/bpj/2285>
- Mitchell, C., Fredricks, D., Agnew, K., and Hitti, J. 2015. Hydrogen peroxide-producing lactobacilli are associated with lower levels of vaginal interleukin-1 β , independent of bacterial vaginosis. *Sex. Transm. Dis* 42: 358–363. doi: 10.1097/OLQ.0000000000000298.
- Mohammad, S.M., Mahmud-Ab-Rashid, N. and Zawawi, N. 2021. Probiotic properties of bacteria isolated from bee bread of stingless bee *Heterotrigona itama*. *J. Apic. Res.*, 60(1): 172-187.
- Mohanty, D., Misra, S., Mohapatra, S., and Sahu, P. S. 2018. Prebiotics and synbiotics: Recent concepts in nutrition. *Food Bioscience* 26: 152–160. <https://doi.org/10.1016/J.FBIO.2018.10.008>
- Mohsen, A.T. and Al-Mahdawi, R.S.R. 2021. Effect of diet supplementation with mixtures of organic trace minerals on productive performance of broiler chicks. *Plant Archives* 21: 1877–1881. <https://doi.org/10.51470/PLANTARCHIVES.2021.V21.S1.303>
- Montazan, R., Moravej, H., Zaghari, M., and Taheri, H. 2011. A note on the effects of a combination of an enzyme complex and probiotic in the diet on performance of broiler chickens. *Ir. J. Agric. Food Res* 50: 249–254.
- Monteagudo-Mera, A., Rastall, R. A., Gibson, G. R., Charalampopoulos, D. and Chatzifragkou, A. 2019. Adhesion mechanisms mediated by probiotics and prebiotics and their potential impact on human health. *Appl. Microbiol. Biotechnol* 103(16): 6463–6472.
- Mookiah, S., Sieo, C.C., Ramasamy, K., Abdullah, N., and Ho, Y.W. 2014. Effects of dietary prebiotics, probiotic and synbiotics on performance, caecal bacterial populations and caecal fermentation concentrations of broiler chickens. *Journal of the Science of Food and Agriculture* 94(2): 341-348. <https://doi.org/10.1002/jsfa.6365>.
- Motawe, H.F.A., El-Shinnawy, A.M., El-Afifi, T.M., Hashem, N.A., and Zaid, A.A. 2012. Utilization of Okara Meal as a Source of Plant Protein in Broiler Diets. *J. Animal and Poultry Prod* 3(3): 127-136.
- Mulaw, G., Tessema, T.S., Muleta, D. and Tesfaye, A. 2019. In vitro evaluation of probiotic properties of lactic acid bacteria isolated from some traditionally fermented Ethiopian food products. *Int. J. Microbiol* 19: 7179514.

- Münste, E., and Hartmann, P. 2025. The Role of Short-Chain Fatty Acids in Metabolic Dysfunction-Associated Steatotic Liver Disease and Other Metabolic Diseases. *Biomolecules* 15(4): 469. <https://doi.org/10.3390/biom15040469>
- Murtiyaningsih, H., dan Hazmi, M. 2017. Isolasi dan Uji Aktivitas Selulase pada Bakteri Selulolitik Asal Tanah Sampah. *Agritrop* 15(2).
- Murugesan, G.R., and Persia, M.E. 2015. Influence of a direct-fed microbial and xylanase enzyme on the dietary energy uptake efficiency and performance of broiler chickens: Feed additives on broiler energy metabolism. *J. Sci. Food Agric* 95: 2521–2527.
- Naeem, M., and Bourassa, D.V. 2025. Probiotics in Poultry: Unlocking Productivity Through Microbiome Modulation and Gut Health. *Microorganisms* 13(2): 257. <https://doi.org/10.3390/microorganisms13020257>
- Nahm, K. H. 2007. Efficient phosphorus utilization in poultry feeding to lessen the environmental impact of excreta. *Worlds Poultry Science Journal* 63(4): 625–654. <https://doi.org/10.1017/S0043933907001663>.
- Nair, M.S., Amalaradjou, M.A. and Venkitanarayanan, K. 2017. Antivirulence properties of probiotics in combating microbial *patogenesis*. *Adv. Appl. Microbiol* 98: 1-29.
- Nam, T.V.B., Anh, L.H., Loc, H.T., Trang, C.T.H., Thiet, N., Lan, L.T.T., Diep, T.H., Xuan, N.H., and Ngu, N.T. 2022. Effects of probiotic (*Lactobacillus plantarum* and *Bacillus subtilis*) supplementation on mortality, growth performance, and carcass characteristics of native Vietnamese broilers challenged with *Salmonella Typhimurium*. *Veterinary World* 15(9): 2302–2308
- Nambiar, R.B., Sellamuthu, P.S., Perumal, A.B., Sadiku, E.R., Phiri, G. and Jayaramudu, J. 2018. Characterization of an exopolysaccharide produced by *Lactobacillus plantarum* HM47 isolatd from human breast milk. *Process Biochem* 73: 15–22.
- National Research Council (NRC). 1994. Nutrient Requirement of Poultry. National Academy of Science. Washington DC, New York Revised. Paper 176.
- Neveling, D.P., and Dicks, L.M.T. 2021. Probiotics: an Antibiotic Replacement Strategy for Healthy Broilers and Productive Rearing. *Probiotics and Antimicrobial Proteins* 13(1): 1–11. <https://doi.org/10.1007/S12602-020-09640-Z>
- Niewold, T.A. 2007. The Nonantibiotic Anti-Inflammatory Effect of Antimicrobial Growth Promoters, the Real Mode of Action? A Hypothesis. *Poult. Sci* 86: 605–609.
- Nishimura, J. 2014. Exopolysaccharides produced from *Lactobacillus delbrueckii* subsp. *bulgaricus*. *Adv Microbiol* 4(14): 1017–1020.

- Nishi, H., Uchida, K., Saito, M., Yamanaka, T., Nagata, H., Tomoshige, H., Miyata, I., Ito, K., Toyoshima, Y., Takahashi, S., Hakuno, F., and Takenaka, A. 2022. Essential Amino Acid Intake Is Required for Sustaining Serum Insulin-like Growth Factor-I Levels but Is Not Necessarily Needed for Body Growth. *Cells* 11(9): 1523. <https://doi.org/10.3390/cells11091523>
- Niyibituronsa, M., Onyango, A.N., Gaidashova, S., Imathiu, S., Uwizerwa, M., Ochieng, E.P., Ng'ang'a, F., Birungi, J., Ghimire, S., and Harvey, J. 2018. The effect of different processing methods on nutrient and isoflavone content of soymilk obtained from six varieties of soybean grown in Rwanda. *Food Sci Nutr* 7: 457-464.
- Noferdima, Lisna dan Damayanti, Y. 2018. Penggunaan Tepung *Azolla microphilla* dan Selulase dalam Ransum terhadap Tampilan Produksi dan Nilai Ekonomis Itik Lokal Kerinci Jantan. *Pastura* 8(1):20-25.
- Nouredini, H., and Dang, J. 2009. Degradation of Phytates in Distillers' Grains and Corn Gluten Feed by *Aspergillus Niger* Phytase. *Applied Biochemistry and Biotechnology* 159(1):11-23.
- NRC. 1994. Nutrient Requirement of Poultry. Washington: National Academy Press.
- Nuobariene, L., Cizeikiene, D., Gradzeviciute, E., Hansen, Å. S., Rasmussen, S. K., Juodeikiene, G., and Vogensen, F. K. 2015. Phytase-active lactic acid bacteria from sourdoughs: Isolation and identification. *LWT - Food Science and Technology* 63(1): 766–772. doi:10.1016/j.lwt.2015.03.018.
- Obianwuna, U., Wang, J., Zhang, H., Qi, G., Qiu, K., and Wu, S. 2023. Recent Trends on Mitigative Effect of Probiotics on Oxidative-Stress-Induced Gut Dysfunction in Broilers under Necrotic Enteritis Challenge: A Review. *Antioxidants* 12(4): 911. <https://doi.org/10.3390/antiox12040911>.
- Oh, A., Dalir, E.B.M., and Oh, D.H. 2018. Screening for potential probiotic bacteria from Korean fermented soybean paste: In vitro and *Caenorhabditis elegans* model testing. *LWT* 88: 132–138. <https://doi.org/10.1016/j.lwt.2017.10.007>.
- Oliveira, A.S., Weinberg, Z.G., Ogunade, I.M., Cervantes, A.P., Arriola, K.G., Jiang, Y., Kim, D., Li, X., Gonçalves, M.C., and Vyas, D. 2017. Meta-analysis of effects of inoculation with homofermentative and facultative heterofermentative lactic acid bacteria on silage fermentation, aerobic stability, and the performance of dairy cows. *Journal of Dairy Science* 100 (6): 4587-4603.
- Ogbuewu, I. P., Mabelebele, M., Sebola, N. A., and Mbajiorgu, C. 2022. *Bacillus* Probiotics as Alternatives to In-feed Antibiotics and Its Influence on Growth, Serum Chemistry, Antioxidant Status, Intestinal Histomorphology, and Lesion Scores in Disease-Challenged Broiler Chickens. *Frontiers in Veterinary Science* 9. <https://doi.org/10.3389/fvets.2022.876725>.

- Olasehinde, O., and Aderemi, F. 2024. Effects of probiotic *Enterococcus faecium* and raw, fermented and sprouted pearl millet based diets on performances, carcass traits, hematological and biochemical indices of broiler chickens. *Online Journal of Animal and Feed Research*. 15(4): 53-60. <https://doi.org/10.51227/ojafr.2024.7>.
- Olowomofe, T.O., Babalola, T.F., Oluyide, O.O., and Adeyanju, A. 2019. Isolation, Screening and Molecular Identification of Cellulose-degrading Bacteria from Paper and Pulp Mill Dumpsites. 5(3): 77. <https://doi.org/10.11648/J.FEM.20190503.12>.
- Ozcelik, S., Kuley, E. and Ozogul, F. 2016. Formation of lactic, acetic, succinic, propionic, formic and butyric acid by lactic acid bacteria. *LWT-Food Sci Technol* 73: 536-542.
- Padilo, L.P., Agoltsov, V.A., Kalabekov, A.A., and Kalabekov, M.I. 2024. The use of antibacterial drugs in poultry farming. *Научная Жизнь* 19(2): 314–323. <https://doi.org/10.35679/1991-9476-2024-19-2-314-323>.
- Palai, S., Derecho, C.M.P., Kesh, S.S., Egbuna, C., and Onyeike, P.C. 2020. Prebiotics, Probiotics, Synbiotics and Its Importance in the Management of Diseases. In: Egbuna, C., Dable Tupas, G. (eds) *Functional Foods and Nutraceuticals*. Springer, Cham.
- Pangsri, P. 2015. Application of the Multi Criteria Decision Making Methods for Project Selection. *Universal Journal of Management* 3(1): 15–20. <https://doi.org/10.13189/UJM.2015.030103>.
- Parasar, B. and Chang, P.V. 2022. Chapter Four - BSH-TRAP: Bile salt hydrolase tagging and retrieval with activity-based probes. *Meth. Enzymol* 664: 85-102.
- Park, Y.H., Hamidon, F., Rajangan, C., Soh, K.P., Gan, C.Y., Lim, T.S., Abdullah, W.N.W., and Liong, M.T. 2016. Application of Probiotics for the Production of Safe and High-quality Poultry Meat. *Food Sci. Anim. Resour.* 36: 567–576.
- Pasquina-Lemonche, L., Burns, J., Turner, R. D., Kumar, S., Tank, R., Mullin, N., Wilson, J.S., Chakrabarti, B., Bullough, P.A., Foster, S.J. and Hobbs, J. K. 2020. The architecture of the Gram-positive bacterial cell wall. *Nature* 582(7811): 294–297.
- Pellissery, A.J., Vinayamohan, P.G., Amalaradjou, M.A.R. and Venkitanarayanan, K. 2020. Spoilage bacteria and meat quality. *Meat Quality Analysis* 307–334.
- Penha-Filho, R.A.C., Díaz, S.J.A., Fernando, F.S., Chang, Y.F., Andreatti, R.L., and Junior, A.B. 2015. Immunomodulatory activity and control of *Salmonella Enteritidis* colonization in the intestinal tract of chickens by *Lactobacillus* based probiotic. *Vet. Immunol. Immunopathol* 167: 64–69. doi:10.1016/j.vetimm.2015.06.006.

- Pereira, R., Bortoluzzi, C., Durrer, A., Fagundes, N.S., Pedroso, A.A., Rafael, J.M., de Lima Perim, J.E., Zavarize, K.C., Napy, G.S., and Andreote, F.D. 2019. Performance and intestinal microbiota of chickens receiving probiotic in the feed and submitted to antibiotic therapy. *J. Anim. Physiol. Ani. Nutr* 103: 72–86.
- Pérez-López, E., Cela, D., Costabile, A., Mateos-Aparicio, I., and Rupérez, P. 2016. *In vitro* fermentability and prebiotic potential of soyabean Okara by human faecal microbiota. *British Journal of Nutrition* 116(6): 1116–1124. <https://doi.org/10.1017/S0007114516002816>.
- Perim FDS, da Silva WJ, de Souza DO, Ulhoa CJ, Rezende CF, Dos Santos LF, Dos Santos FR, Silva FG, Minafra CS. 2024. Effects of the Addition of *Trichoderma reesei* Cellulase to Broiler Chicken Diets for a 21-Day Period. *Animals (Basel)* 14(10):1467. doi: 10.3390/ani14101467.
- Pertiwi, H., and Mahendra, M.Y.N. 2021. Probiotic *Lactobacillus* sp. Improved Performance of Broiler Chicken: A Review. *Systematic Reviews in Pharmacy* 12(3): 829–834. <https://doi.org/10.31838/SRP.2021.3.116>
- Petti, C.A., C.R. Polage and P. Schreckenberger. 2005. The Role of 16S rRNA Gene Sequencing in Identification of Microorganisms Misidentified by Conventional Methods. *Journal of Clinical Microbiology* 12(43): 6123–6125.
- Pizolotto, W., Costa, M. M., Gasperin, N. Z., Rodrigues, L. B., dos Santos, L. R., and Pilotto, F. 2024. Economic and productive performance of broilers subjected to quantitative feed restriction. *Acta Veterinaria Brasilica*. 18(2): 173–178. <https://doi.org/10.21708/avb.2024.18.2.12410>
- Poberezhets, A., Chudak, R., Kupchuk, I., Yaropud, V, dan Rutkevych, V. 2021. Effect of Probiotic Supplement on Nutrient Digestibility and Production Traits on Broiler Chicken. *Journal of Agricultural Science* 2: 296–302. DOI: 10.15159/jas.21.28.
- Poghosyan, D.G., and Rybalko, M.N. 2024. Productive qualities in broiler chickens depending on the protein and metabolic energy level in compound feeds. *Niva Povolž'â*. 1(69). <https://doi.org/10.36461/np.2024.69.1.018>.
- Poonam, R.A., Saharan, R., Chaudhary, T., Makkar, K., Rani, R., and Srivastava, V. 2022. Bacterial Flora of Vegetables Collected from the Supermarket and Vegetable Market. *International Journal of Tropical Disease and Health* 43(13): 11–19. <https://doi.org/10.9734/ijtdh/2022/ v43i133>
- Poorghasemi, M., Chamani, M., Mirhosseini, S.Z., Sadeghi, A.A., Seidavi, A. 2018. Effect of probiotic and different sources of fat on performance, carcass characteristics, intestinal morphology and ghrelin gene expression on broiler chickens. *Kafkas Univ Vet Fak Derg* 24 (2): 169–178. DOI: 10.9775/ kvfd.2017.18433

- Prajapati, M., and Shah, H. 2022. Impacts and Industrial Applications of Phytic Acid and Phytase. *J Pure Appl Microbiol* 16(4):2292-2302. <https://doi.org/10.22207/JPAM.16.4.16>.
- Pratama, H.S., Lokapirnasari, W.P., Soeharsono, S., Al-Arif, M.A., Harijani, N., and Hidanah, S. 2021. Effect of Probiotics *Bacillus subtilis* on Feed Efficiency and Egg Mass of Laying Hens. *Jurnal Medik Veteriner* 4(1): 37–41.
- Qin, D., Ma, Y., Wang, Y., Hu, X., and Yu, L. 2022. Contribution of *Lactobacilli* on Intestinal Mucosal Barrier and Diseases: Perspectives and Challenges of *Lactobacillus casei*. *Reproductive and Developmental Biology* 12(11): 1910. <https://doi.org/10.3390/life12111910>
- Qiu, K., Wang, X., Zhang, H., Wang, J., Qi, G., and Wu, S. 2022. Dietary Supplementation of a New Probiotic Compound Improves the Growth Performance and Health of Broilers by Altering the Composition of Cecal Microflora. *Biology* 11(5): 633. <https://doi.org/10.3390/biology11050633>.
- Qu, M., Liu, Y., Zhang, G., Xue, S.J., Fan, H., Wang, Y., and Yu, S. 2017. Identification and characterization of soybean dreg soluble dietary fibre by combination of extrusion pre-treatment and enzymatic modification. *Food Quality and Safety*. 1(2): 153–160 doi:10.1093/fqs/fyx014.
- Quinteiro-Filho, W.M., Brisbin, J.T., Hodgins, D.C., and Sharif, S. 2015. *Lactobacillus* and *Lactobacillus* cell-free culture supernatants modulate chicken macrophage activities. *Res Vet Sci* 103:170–1753.
- Quinto, E.J., Jiménez, P., Caro, I., Tejero, J., Mateo, J., Gírbés, T. 2014. Probiotic Lactic Acid Bacteria: A Review. *Food and Nutrition Sciences* 5: 1765-1775.
- Rahaman, M.M., Hossain, M.N., Das, N.C., Ahmed, M.M., and Hoque, M. 2020. Potential Thermotolerant *Lactobacilli* Isolatd from Chicken Gastrointestinal Tract for Probiotic Use in Poultry Feeds. *Bangladesh Journal of Microbiology* 36(2): 63–68. <https://doi.org/10.3329/BJM.V36I2.45529>
- Ramadhanti, N., Melia, S., Hallyward, J., and Purwati, E.. 2021. Characteristics of lactic acid bacteria isolatd from palm sugar from West Sumatra, Indonesiaand their potential as a probiotic. *Biodiversitas* 22(5): 2610-2616.
- Ran, T., Gomaa, W. M. S., Shen, Y. Z., Saleem, A. M., Yang, W. Z., and McAllister, T. A. 2019. Use of naturally sourced feed additives (*lactobacillus* fermentation products and enzymes) in growing and finishing steers: Effects on performance, carcass characteristics and blood metabolites. *Animal Feed Science and Technology* 254: 114190.
- Rajput, D.S., Zeng, D., Khalique, A., Rajput, S.S., Wang, H., Zhao, Y., Sun, N., and Ni, X. 2020. Pretreatment with probiotics ameliorate gut health

and necrotic enteritis in broiler chickens, a substitute to antibiotics. *AMB Express* 10(1). DOI:10.1186/s13568-020-01153-w.

Rasyaf, M. 1994. *Beternak Ayam Pedaging*. Jakarta: Penebar Swadaya.

Rauf, U., Khan, A., Khan, A., Imran, M., Ahmad, M. A., Shams, M., ŞAHİN, T., Khan, M. A., Ali, H., and Rahman, H. 2024. Uses of Various Previotics and Probiotics on Griwth Performance of Broiler. *Biological and Clinical Sciences Research Journal* 1: 1035. <https://doi.org/10.54112/bcsrj.v2024i1.1035>

Ravindran, V. 2013. Feed enzymes: The science, practice, and metabolic realities. *The Journal of Applied Poultry Research* 22(3): 628-636. DOI:10.3382/japr.2013-00739.

Ray, B. 2004. *Fundamental Food Microbiology*, Third Edition. Florida : CRC Press LLC Boca Raton.

Rehman, A., Arif, M., Sajjad, N., Al-Ghadi, M.Q., Alagawany, M., El-Hack M.E.A., and Swelum, A. 2020. Dietary effect of probiotic and prebiotic on broiler performance, carcass and immunity. *Poultry Science* 99(12): 6946-6953. doi:10.1016/j.psj.2020.09.043.

Reuben, R.C., Roy, P.C., and Sarkar, S.L. 2019. Isolation, characterization, and assessment of lactic acid bacteria toward their selection as poultry probiotics. *BMC Microbiol* 19: 253.

Reuben, R.C., Roy, P.C., and Sarkar, S.L. 2019. Isolation, characterization, and assessment of lactic acid bacteria toward their selection as poultry probiotics. *BMC Microbiol* 19: 253. <https://doi.org/10.1186/s12866-019-1626-0>.

Ribeiro, M.C.O., Vandenberghe, L.P.S., Spier, M.R., Paludo, K.S., Soccol, C.R. and Soccol, V.T. 2014. Evaluation of probiotic properties of *Pediococcus acidilactici* B14 in association with *Lactobacillus acidophilus* ATCC 4356 for application in a soy based aerated symbiotic dessert. *Braz Arch Biol Technol* 57(5): 755–765.

Ribeiro, S.C., Stanton, C., Yang, B., Ross, R.P., and Silva, C.C. 2018. Conjugated linoleic acid production and probiotic assessment of *Lactobacillus plantarum* isolatd from Pico cheese. *LWT* 90: 403–411. <https://doi.org/10.1016/j.lwt.2017.12.065>.

Ricke, S.C. 2003. Perspectives on the use of organic acids and short chain fattyacids as antimicrobials. *Poult. Sci* 82: 632–639. doi: 10.1093/ps/82.4.632.

Rinttilä, T., and Apajalahti, J. 2013. Intestinal microbiota and metabolites—Implications for broiler chicken health and performance1. *The Journal of Applied Poultry Research* 22(3): 647–658. <https://doi.org/10.3382/JAPR.2013-00742>

- Ripon, M.R., Rashid, M.H., Rahman, M.M., Ferdous, M.F., Arefin, M.S., and Sani, A.A. 2019 Dose-dependent response to phytobiotic supplementation in feed on growth, hematology, intestinal pH, and gut bacterial load in broiler chicken. *J Adv Vet Anim Res* 6(2): 253–9. <https://doi.org/10.5455/javar.2019.f341>.
- Riza, H., Wizna., Rizal, Y., dan Yusrizal. 2015. Peran Probiotik dalam Menurunkan Amonia Feses Unggas. *Jurnal Peternakan Indonesia*. 17(1).
- Rizwanuddin, S., Kumar, V., Naik, B., Singh, P., Mishra, S., Rustagi, S., Kumar, V. 2023. Microbial phytase: Their sources, production, and role in the enhancement of nutritional aspects of food and feed additives. *Journal of Agriculture and Food Research* 12: 100559. <https://doi.org/10.1016/j.jafr.2023.100559>.
- Robinson, P. 2015. Enzymes: principles and biotechnological applications. *Essays Biochem* 15(59): 1–41.
- Rocha, A.G., Dilkin, P., Montanhini, N.R., Schaefer, C., Mallmann, C.A. 2022. Growth performance of broiler chickens fed on feeds with varying mixing homogeneity. *Vet Anim Sci* 17:100263. doi: 10.1016/j.
- Rodjan, P., Soisuwan, K., Thongprajukaew, K., Theapparat, Y., Khongthong, S., Jeenkeawpieam, J., and Salaeharae, T. 2017. Effect of organic acids or probiotics alone or in combination on growth performance, nutrient digestibility, enzyme activities, intestinal morphology and gut microflora in broiler chickens. *J Anim Physiol Anim Nutr* 102(2): e931-e940. DOI: 10.1111/jpn.12858.
- Rossi, E., Roza, E., Sofyan, Y., Aritonang, S.N., and Purwati, E. 2018. Characterization of Probiotics Properties of *Lactobacillus* from Solid Waste of Soy Milk Production. *Asian Jr. of Microbiol. Biotech. Env. Sc* 20(3):718-724.
- Rostami, H., and Giri, A. 2013. An overview on microbial phytase and its biotechnological applications. *International Journal of Advanced Biotechnology and Research* 4:62-71.
- Ruas-Madiedo, P., Gueimonde, M., Margolles, A., ReyesGavilán, C.G., and Salminen, S. 2006. Exopolysaccharides produced by probiotic strains modify the adhesion of probiotics and enteropathogens to human intestinal mucus. *J Food Prot* 69(8): 2011–2015.
- Ruiz, L., Margolles, A. and Sanchez, B. 2013. Bile resistance mechanisms in *Lactobacillus* and *Bifidobacterium*. *Front Microbiol* 4: 396.
- Russo, P., Pia, M., Fiocco, D., Capozzi, V., Drider, D., and Spano, G. 2017. International journal of food microbiology *Lactobacillus plantarum* with broadantifungal activity: a promising approach to increase safety and shelf-lifeof cereal-based products. *Int. J. Food Microbiol* 247: 48–54. doi: 10.1016/j.ijfoodmicro.2016.04.027.

- Rwubuzizi, R., Kim, H., Holzapfel, W.H., and Todorov, S.D. 2023. Beneficial, safety, and antioxidant properties of lactic acid bacteria: A next step in their evaluation as potential probiotics. *Heliyon* 9(4): e15610. <https://pubmed.ncbi.nlm.nih.gov/37151672/>
- Rychlik, I. 2020. Composition and Function of Chicken Gut Microbiota. *Animals* 10: 103. doi:10.3390/ani10010103.
- Sachan, R.S.K., Devgon, I., Wani, A.K., Akhtar, N., Mir, T.G., Wani, A.W., and Prakash, A. 2023. Factors Affecting Composition and Diversity of Gut Microbiota: A Disease Hallmark 17–29. <https://doi.org/10.1002/9781119904786.ch3>.
- Saini, A., Aggarwal, N.K., and Yadav, A. 2017. Isolation and Screening of Cellulose Hydrolyzing Bacteria from Different Ecological Niches. *Bioengineering and Bioscience* 5(1):7–13. DOI:10.13189/bb.2017.050102.
- Salam, M.A., Islam, M.A., Paul, S.I., Rahman, M.M., Rahman, M.L., Islam, F., Rahman, A., Shaha, D.C., Alam, M.S., and Isla, T. 2021. Gut probiotic bacteria of *Barbonymus gonionotus* improve growth, hematological parameters and reproductive performances of the host. *Scientific Reports* 11: 10692. <https://doi.org/10.1038/s41598-021-90158-x>.
- Salim, J. H. 2017. Efektifitas Penggunaan Ramuan Herbal Cair Terhadap Pertambahan Bobot Badan, Konsumsi Ransum, dan Konversi Ransum Pada Ayam Broiler dengan Pemberian Dosis yang Berbeda. *Jurnal Ilmu dan Industri Peternakan* 3(3), 299–310.
- Salleh, N.S., Fairus, A.H.A., Zahary, N.M., Raj, B.N. and Jalil, M.A. 2019. Unravelling the Effects of Soluble Dietary Fibre Supplementation on Energy Intake and Perceived Satiety in Healthy Adults: Evidence from Systematic Review and Meta-Analysis of Randomised-Controlled Trials. *Foods* 8:15. <https://doi.org/10.3390/foods8010015>.
- Sanam, M.U.E., Detha, A.I.R., and Rohi, N.K. 2022. Detection of antibacterial activity of lactic acid bacteria, isolated from Sumba mare's milk, against *Bacillus cereus*, *Staphylococcus aureus*, and *Escherichia coli*. *J Adv Vet Anim Res.* 9(1):53–58.
- Sandi, S., R. Palupi, dan Amyesti. 2011. Pengaruh penambahan ampas tahu dan dedak fermentasi terhadap usus dan lemak abdomen ayam broiler. *Agrinak* 2(1): 1–5.
- Sanger, F., Coulson, A.R. 1978. The use of thin acrylamide gels for DNA sequencing. *FEBS Lett* 87:107–110. 10.1016/0014-5793(78)80145-8.
- Sanger, F., Nicklen, S., and Coulson, A.R. 1977. DNA sequencing with chain-terminating inhibitors. *Proc Natl Acad Sci USA* 74:5463–5467. 10.1073/pnas.74.12.5463.
- Santoso, I., Fadhillah, Q.G., Maryanto, A.E., Dwiranti, A., Wang, P., Al-Rais, M.F., and Ira M.S. 2024. Characteristics of isolatd lactic acid bacilli bacteria from black glutinous rice (*Oryza sativa* L.) tapai and its

antimicrobial activity in mung bean (*Vigna radiata* L.) milk. Kuwait Journal of Science 51: 100161. <https://doi.org/10.1016/j.kjs.2023.12.001>.

Sarangi, N.R., Babu, L.K., Kumar, A., Pradhan, C.R., Pati, P.K., and Mishra, J.P. 2016. Effect of dietary supplementation of prebiotic, probiotic, and synbiotic on growth performance and carcass characteristics of broiler chickens. Veterinary World 9(3): 313-319.

Saraniya, A., and Jeevaratnam, K. 2012. Molecular Characterization of Bacteriocinogenic Lactobacillus Species from Fermented Uttapam Batter. Biosciences Biotechnology Research Asia 9: 417-421. <http://dx.doi.org/10.13005/bbra/1017>.

Sarkhel, S., and Roy, A. 2022. Phytic acid and its reduction in pulse matrix: Structure–function relationship owing to bioavailability enhancement of micronutrients. Journal of Food Process Engineering 45(5). <https://doi.org/10.1111/jfpe.14030>

Sarwar, G., Wu Xiao, C., and Cockell, K.A. 2012. Impact of antinutritional factors in food proteins on the digestibility of protein and the bioavailability of amino acids and on protein quality. Brit. J. Nutr 108: S315–S332.

Satimah, S., Yunianto, V.D., dan Wahyuno, F. 2019. obot Relatif dan Panjang Usus Halus Ayam Broiler yang Diberi Ransum Menggunakan Cangkang Telur Mikropartikel dengan Suplementasi Probiotik *Lactobacillus* sp. Jurnal Sain Peternakan Indonesia 14(4): 396-403. DOI: <https://doi.org/10.31186/jspi.id.14.4.396-403>

Seddik, H.A., Bendali, F., Gancel, F., Fliss, I., Spano, G., and Drider, D. 2017. *Lactobacillus plantarum* and its probiotic and food potentialities. Probiotics Antimicrob. Proteins 9: 111–122. doi: 10.1007/s12602-017-9264-z.

Šefcová, M.A., Ortega-Paredes, D., Larrea-Álvarez, C.M., Mina, I., Guapás, V., Ayala-Velasteguí, D., Leoro-Garzón, P., Molina-Cuasapaz, G., Vinueza-Burgos, C., Revajová, V., Larrea-Álvarez, M. 2023. Effects of *Lactobacillus fermentum* Administration on Intestinal Morphometry and Antibody Serum Levels in *Salmonella*-Infantis-Challenged Chickens. Microorganisms 11(2):256. doi: 10.3390/microorganisms11020256.

Sekh, N., and Karki, D. 2022. Dietary Fiber in Poultry Nutrition in the Light of Past, Present, and Future Research Perspective: A Review. Open Journal of Animal Sciences. 12: 662-687. <https://doi.org/10.4236/ojas.2022.124046>.

Selle, P. H., and Ravindran, V. 2007. Microbial phytase in poultry nutrition. Anim. Feed Sci. Technol 35: 141.

Selvamohan, T., Ramadas, V., Kishore, S. 2012. Antimicrobial activity of selected medicinal plants against some selected human *patogenic* bacteria. Adv. Appl. Sci. Res 3(5):3374-3381.

- Shaikh, N.M., Patel, A.A., Mehta, S.A., and Patel, N.D. 2013. Isolation and Screening of Cellulolytic Bacteria Inhabiting Different Environment and Optimization of Cellulase Production. *Universal Journal of Environmental Research and Technology* 3(1): 39-49.
- Shamsuzzaman, M., Dahal, R.H., Kim, S., and Kim, J. 2023. Genome insight and probiotic potential of three novel species of the genus *Corynebacterium*. *Front. Microbiol* 14: 1225282. doi: 10.3389/fmicb.2023.1225282
- Shang, Y., Kumar, S., Oakley, B. and Kim, W.K. 2018. Chicken Gut Microbiota: Importance and Detection Technology. *Front. Vet. Sci* 5: 254.
- Sharma, K., Pooranachithra, M., Balamurugan, K., and Goel, G. 2019. Probiotic mediated colonization resistance against *E. coli* infection in experimentally challenged *Caenorhabditis elegans*. *Microb Pathog* 127: 39–47. doi: 10.1016/j.micpath.2018.11.041.
- Sharma, N., Angural, S., Rana, M., Puri, N., Kondepudi, K.K., and Gupta N. 2020. Phytase producing lactic acid bacteria: Cell factories for enhancing micronutrient bioavailability of phytate rich foods. *Trends in Food Science and Technology* 19: 1-12.
- Sharma, R., Garg, P., Kumar, P., Bhatia, S.K. 2020. Microbial Fermentation and Its Role in Quality Improvement of Fermented Foods. *Fermentation* 6: 106.
- Shehata, A.A., Yalçın, S., Latorre, J.D., Basiouni, S., Attia, Y.A., Abd El-Wahab, A., Visscher, C., El-Seedi, H. R., Huber, C., Hafez, H. M., Eisenreich, W., and Tellez-Isaias, G. 2022. Probiotics, Prebiotics, and Phytogetic Substances for Optimizing Gut Health in Poultry. *Microorganisms* 10(2): 395.
- Shen, Z., Lin, L., Zhai, Z., Liang, J., Chen, L., Hao, Y., and Zhao, L. 2023. bglG Regulates the Heterogeneity Driven by the Acid Tolerance Response in *Lactobacillus paracasei* L9. *Foods*. 12(21): 3971 <https://doi.org/10.3390/foods12213971>.
- Sherman, P.M., Ossa, J.C., and Johnson-Henry, K. 2009. Unraveling mechanisms of action of probiotics. *Nutrition Clinical Practice* 21: 10–14. <https://doi.org/10.1177/0884533608329231>.
- Shi, C., Lv, X., Liu, M. C.-C., He, L., Zhang, T., Qiao, Y., Hao, J., Wang, G., Cui, Y., Qu, H., Zhang, C., Yang, G., Zhang, J., Kang, X., and Han, J. 2022. High Doses of Phytase Alleviate the Negative Effects of Calcium and Phosphorus Imbalance on Growth Performance and Bone Mineralization in Broiler Chickens. *Brazilian Journal of Poultry Science* 24(4). <https://doi.org/10.1590/1806-9061-2021-1568>
- Shokryazdan, P., Jahromi, M.F., Liang, J.B., Ramasamy, K., Sieo, C.C., and Ho, Y.W. 2017. Effects of a *Lactobacillus salivarius* mixture on performance, intestinal health and serum lipids of broiler chickens. *PLoS ONE* 12(5): e0175959.

- Shroyer, N.F., and Kocoshis, S.A. 2011. Anatomy and Physiology of the Small and Large Intestines. In *Pediatric Gastrointestinal and Liver Disease*; Elsevier: Amsterdam, The Netherlands. pp. 324–336.e2. ISBN 978-1-4377-0774-8.
- Shukla, N., Tripathi, A., Tiwari, A., and Sharma, K. C. 2024. Probiotics in dairy farming: A holistic approach to animal nutrition. *International Journal of Advanced Biochemistry Research* 8(5): 360–373. <https://doi.org/10.33545/26174693.2024.v8.i5sf.1206>
- Sibbald, I.R. 1975. The effect of intake on metabolized energy value with adult roasters. *Journal of Poultry Science* 54: 130-145.
- Singh, H., Bansala, M.K., Kumar, J., Somnath, Kumar, R., and Ali, N. 2021. Effect of feeding probiotics on body weight gain and economics importance in broiler chicks. *Journal of Entomology and Zoology Studies* 9(2): 187-191.
- Singh, A.K., and Kim, W.K. 2021. Effects of Dietary Fiber on Nutrients Utilization and Gut Health of Poultry: A Review of Challenges and Opportunities. *Open Access Journal* 11(1): 181. <https://doi.org/10.3390/ANI11010181>
- Singh, A., Kaur, N., and Dhaliwal, S.S. 2022. Functional characterization of probiotic bacteria isolated from traditional fermented foods. *Frontiers in Microbiology* 13: 845678. <https://doi.org/10.3389/fmicb.2022.845678>
- Singh, S., Kaur, N., and Singh, J. 2021. Cellulase production by *Bacillus* species and their applications: A review. *Applied Microbiology and Biotechnology* 105(3): 1033–1045. <https://doi.org/10.1007/s00253-020-11044-7>
- Singh, S., Singh, S., Sharma, P., and Sharma, D. 2017. Isolation, Identification and Molecular Characterization of Phytase Producing Bacteria, *Pseudomonas* Sp. aazad. *Journal of Pure and Applied Microbiology* 11(4): 1845–1850. <https://doi.org/10.22207/JPAM.11.4.24>
- Singh, V.P. 2018. Recent approaches in food bio-preservation-a review. *OpenVet. J* 8: 104–111. doi: 10.4314/ovj.v8i1.16.
- Singleton, and Sainsbury. 2006. *Dictionary of Microbiology and Molecular Biology* 3rd Edition. John Wiley and Sons, Sussex, England.
- Sirisopapong, M., Shimosato, T., Okrathok, S. and Khempaka, S. 2023. Assessment of lactic acid bacteria isolated from the chicken digestive tract for potential use as poultry probiotics. *Anim Biosci* 36(8): 1209-1220.
- Sissons, J.W. 1989. Potential of probiotic organisms to prevent diarrhea and promote digestion in farm animals-a review. *J Sci Food Agric* 49(1):1-13. doi:10.1002/jsfa.2740490102.

- Skenderidis, P., Mitsagga, C., Lampakis, D., Petrotos, K. and Giavasis, I. 2019. The Effect of Encapsulated Powder of Goji Berry (*Lycium barbarum*) on Growth and Survival of Probiotic Bacteria. *Microorganisms* 8(1): 57.
- Sonnenburg, J.L., Xu, J., Leip, D.D., Chen, C.H., Westover, B.P., Weatherford, J., Buhler, J.D., and Gordon, J.I. 2005. Glycan foraging in vivo by an intestine-adapted bacterial symbiont. *Science*. 307(5717): 1955–1959.
- Sorathiya, K.K., Choubey, M., Patel, V.R., Vahora, S.G. and Jadhav, M.D. 2022. Counteracting the Phytic Acid through Phytase Supplementation in Broiler Production: A Review. *Asian Journal of Research in Biosciences*. 4(2): 116-121.
- Souii, A., Guesmi, A., Ouertani, R., Cherif, H., Chouchane, H., Cherif, A., and Neifar, M. 2020. Carboxymethyl Cellulase Production by Extremotolerant Bacteria in Low-Cost Media and Application in Enzymatic Saccharification of Stevia Biomass. *Waste and Biomass Valorization* 11(5): 2111–2122. <https://doi.org/10.1007/S12649-018-0496-2>
- Soumeh, E.A., Cedeno, A.D.R.C., Niknafs, S., Bromfield, J., and Hoffman, L.C. 2021. The Efficiency of Probiotics Administrated via Different Routes and Doses in Enhancing Production Performance, Meat Quality, Gut Morphology, and Microbial Profile of Broiler Chickens. *Animals (Basel)* 11(12): 3607. doi: 10.3390/ani11123607.
- Souza, C.S., Vieites, F.M., Justino, L.R., Lima, M.F., Chaves, A.S., Cardoso, V.S., Sousa, F.D.R., Costa, T.F., Minafra, C.S., and Lima, C.A.R. 2020. Importância da saúde intestinal em frangos de corte. *Research, Society and Development* 9(3): 86932475. <https://doi.org/10.33448/RSD-V9I3.2475>
- Souza, D.O., Ulhoa, C.J., Silva, W.J., Rodrigues, D.R., Bonifácio, N.P., Santos, F.R.D., Silva, F.G., and Minafra, C.S. 2023. Evaluation of the Addition of Humicola Grisea Cellulase to Broiler Chicken Rations for a 21-Day Period. *Poultry* <https://doi.org/10.3390/poultry2040035>
- Srifani, A., Mirnawati, Marlida, Y., Rizal, Y. and Nurmiati. (2023). Isolation and Characterization of Cellulolytic Lactic Acid Bacteria from Soymilk Waste as Probiotic Candidates for Broiler. *Int. J. Vet. Sci* 13(1): 108-114.
- Stancu, C.S., Toma, L., and Sima, A.V. 2012. Dual role of lipoproteins in endothelial cell dysfunction in atherosclerosis. *Cell Tissue Res* 349(2): 433–446.
- Steel, R.G.D., and Torrie, J.H. 1991. Prinsip dan Prosedur Statistika. PT Gramedia Pustaka Utama, Jakarta.
- Stefanello, C., Rosa, D. P. da, Dalmoro, Y. K., Segatto, A. L. A., Vieira, M. S., Moraes, M. L. de, and Santin, E. 2020. Protected Blend of Organic Acids and Essential Oils Improves Growth Performance, Nutrient Digestibility, and Intestinal Health of Broiler Chickens Undergoing an Intestinal Challenge. *Frontiers in Veterinary Science* 6: 491. <https://doi.org/10.3389/FVETS.2019.00491>.

- Subagiyo, Margino, S., Triyanto, Wetyati, WA. 2015. Pengaruh pH, Suhu Dan Salinitas Terhadap Pertumbuhan dan Produksi Asam Organik Bakteri Asam Laktat Yang Diisolasi Dari Intestinum Udang Penaeid. Ilmu Kelautan 20(4): 187-194.
- Suciati, P., Tjahjaningsih, W., Masithah, E.D., dan Pramono H. 2016. Aktivitas Enzimatis Isolat Bakteri Asam Laktat dari Saluran Pencernaan Kepiting Bakau (*Scylla Spp.*) Sebagai Kandidat Probiotik. Jurnal Ilmiah Perikanan Dan Kelautan 8(2): 94 -108.
- Suharsono, 1976. Respon Ayam Pedaging Terhadap Berbagai Kondisi Lingkungan. Universitas Padjajaran, Bandung.
- Sumarsih, S., Sulistiyanto, B., Sutrisno, C., dan Rahayu, ES. 2012. Peran Porbiotik Bakteri Asam Laktat terhadap Produktivitas Unggas. Jurnal Litbang Provinsi Jawa Tengah 10(1).
- Sumengen, M., Dincer, S., and Kaya, A. 2013. Production and Characterization of Phytase from *Lactobacillus plantarum*. Food Biotechnology 27(2): 105–118. doi:10.1080/08905436.2013.781507.
- Suresh, S., and Radha, K.V. 2015. Effect of a mixed substrate on phytase production by *Rhizopus oligosporus* MTCC 556 using solid state fermentation and determination of dephytinization activities in food grains. Food Sci Biotechnol 24: 551–559.
- Svihus, B. 2014. Function of the Digestive System. J Appl Poult Res 23(2): 306–14.
- Swallah, M.S., Fan, H., Wang, S., Hansong, Y., and Piao, C. 2021. Prebiotic Impacts of Soybean Residue (Okara) on Eubiosis/Dysbiosis Condition of the Gut and the Possible Effects on Liver and Kidney Functions. Molecules 26(2): 326. <https://doi.org/10.3390/MOLECULES26020326>
- Syahid, A., Prasetya, S.B., and Aini, L.Q. 2020. Physical and chemical characteristics during com-posting on different types of compost materials, Eurasia J. Biosci 14: 7921–7928.
- Tabashsum, Z., Peng, M., Alvarado-Martinez, Z., Aditya, A., Bhatti, J., Romo, P.B., Young, A. and Biswas, D. 2020. Competitive reduction of poultry-borne enteric bacterial *patogens* in chicken gut with bioactive *Lactobacillus casei*. Sci. Rep 10(1): 16259.
- Tang, X., Liu, X., and Liu, H. 2021. Effects of Dietary Probiotic (*Bacillus subtilis*) Supplementation on Carcass Traits, Meat Quality, Amino Acid, and Fatty Acid Profile of Broiler Chickens. Front. Vet. Sci. 8:767802. doi: 10.3389/fvets.2021.767802.
- Tangvarasittichai, S. 2015. Oxidative stress, insulin resistance, dyslipidemia and type 2 diabetes mellitus. World J Diabetes 6(3):456–480.

- te Pas, M.F.W., Borg, R., Buddiger, N.J.H. et al. 2020. Regulating appetite in broilers for improving body and muscle development – A review. *J Anim Physiol Anim Nutr*.104: 1819–1834. <https://doi.org/10.1111/jpn.13407>.
- Tebyanian, H., Bakhtiari, A., Karami, A., and Kariminik, A. 2017. Antimicrobial activity of some *Lactobacillus* species against intestinal *pathogenic* bacteria. *International Letters of Natural Sciences* 65: 10–15. <https://doi.org/10.18052/WWW.SCIPRESS.COM/ILNS.65.10>
- Tejeda, O.J., and Kim, W.K. 2020. The effects of cellulose and soybean hulls as sources of dietary fiber on the growth performance, organ growth, gut histomorphology, and nutrient digestibility of broiler chickens. *Poultry Science* 99(12): 6828-6836.
- Temiraev, V.H., Baeva, A.A., Vityuk, L.A., Mamukaev, M.N., Yurina, N.A., Ktsoeva, Bobyleva, L.A., Zagaraeva, E.F., Kokov, T.N., Vologirova, F.A. 2020. Effect of probiotics on digestive metabolism in growing and laying poultry birds. *J. Livestock Sci* 11: 33-39. doi. 10.33259/JLivestSci.2020.33-39.
- Than, W.W., Maw, S.S., and Htun, R. 2022. Isolation and Characterization of Potential Lactic Acid Producing Bacteria from Fermented Fruit Juice. *Asean Journal on Science and Technology for Development* 39(1):7-12. <https://doi.org/10.29037/ajstd.759>
- Tillman, A.D., Hartadi, H., Reksohadiprodjo, S., Prawirokusumo, S., Lebdoesoekojo, S. 1989. *Ilmu Makanan Ternak Dasar*. Yogyakarta: UGM Press.
- Tokarčíková K, Cobanovřá K, Takáčsová M, Barszcz M, Taciak M, Tu'snio A, and Greřáková L. 2022. Trace Mineral Solubility and Digestibility in the Small Intestine of Piglets Are Affected by Zinc and Fibre Sources. *Agriculture* 12: 517. <https://doi.org/10.3390/agriculture12040517>.
- Tokatli M, Gulgor G, Elmaci S.B, Isleyen N.A. and Ozcelik F. 2015. *In vitro* properties of potential probiotic Indigenous lactic acid bacteria originating from traditional pickles. *Biomed. Res. Int.*, 2015: 315819.
- Tong, S.Y., Davis, J.S., Eichenberger, E., Holland, T.L., Fowler, V.G. 2015. *Staphylococcus aureus* infections: epidemiology, pathophysiology, clinical manifestations, and management. *Clin Microbiol Rev.* 28(3):603-61.
- Torok, V.A., Ophel-Keller, K., Loo, M., and Hughes, R.J. 2008. Application of methods for identifying broiler chicken gut bacterial species linked with increased energy metabolism. *Appl. Environ. Microbiol* 74:783–791.
- Torres-Maravilla, E., Lenoir, M., Mayorga-Reyes, L., Allain, T., Sokol, H., Langella, P. 2016. Identification of novel antiinflammatory probiotic strains isolated from pulque. *Appl. Microbiol. Biotechnol* 100(1): 385–396. doi:10.1007/s00253-015-7049-4.
- Tran, X.T., Vu, T.H., Ha, T.T., Nguyen, T.H., Hoang, T.H., Le, D.H., Dong, Q.V., Nguyen, N.T., and Nguyen, T.T.M. 2021. Screening bile salt

- hydrolase activity of *Lactobacillus* isolated from Vietnamese human origins. *Tạp Chí Công Nghệ Sinh Học* 20(3): 527–536. <https://doi.org/10.15625/1811-4989/17056>.
- Tsega, K.T., Maina, J.K., and Tesema, N.B. 2019. Probiotics and Poultry Gut Microflora. *Journal of World's and Poultry Research* 9(4):217-223. <https://dx.doi.org/10.36380/jwpr.2019.27>.
- Tsega, KT., Maina, K.J. and Tesema, N.B. 2023. Characterization of potential probiotics *Lactobacillus* species isolatd from the gastrointestinal tract of Rhode Island Red (RIR) chicken in Ethiopia. *Heliyon* 9: e17453.
- Umam, MK., Prayogi, HS., Nurgiartiningsih, VM. 2017. The performance of broiler rearing in system stage floor and double floor. *JHIP* 24(3):79-87.
- Urgessa, O.E., Koyamo, R., Dinka, H., Tefese, K., and Gemed, M.T. 2024. Review on Desirable Microbial Phytases as a Poultry Feed Additive: Their Sources, Production, Enzymatic Evaluation, Market Size, and Regulation. *International Journal of Microbiology* 2024: 400374. <https://doi.org/10.1155/2024/9400374>.
- Utama, C.S., Zuprizal, Z., Hanim, C., dan Wihandoyo, W. 2018. Isolasi dan Identifikasi Bakteri Asam Laktat Selulolitik yang Berasal dari Jus Kubis Terfermentasi. *Jurnal Aplikasi Teknologi Pangan* 7(1).
- Uzun B, Taiwo M, Syidanova A, Ozsahin D.U, and Ozsahin D.U. 2021. The Technique For Order of Preference by Similarity to Ideal Solution (TOPSIS). (pp. 25–30). Springer, Cham. https://doi.org/10.1007/978-3-030-64765-0_4.
- Varestagani, A., and Dahlan, I. 2014. Influence of Dietary Fiber Levels on Feed Utilization and Growth Performance in Poultry. *Journal of Animal Production Advances* 4(6):422-429.
- Vastano, V., Salzillo, M., Siciliano, R.A., Muscariello, L., Sacco, M., and Marasco, R. 2014. The E1 beta-subunit of pyruvate dehydrogenase is surface-expressed in *Lactobacillus plantarum* and binds fibronectin. *Microbiol Res* 169: 121–7. doi: 10.1016/j.micres.2013.07.013.
- Verma, V., Rao, L., and Srivastava, N. 2021. Molecular structure and function of cellulases (pp. 19–38). Elsevier. <https://doi.org/10.1016/B978-0-12-821882-2.00016-8>
- Vieco-Saiz, N., Belguesmia, Y., Raspoet, R., Auclair, E., Gancel, F., Kempf, I., and Drider, D. 2019. Benefits and Inputs From Lactic Acid Bacteria and Their Bacteriocins as Alternatives to Antibiotic Growth Promoters During Food-Animal Production. *Front. Microbiol* 10:57. doi: 10.3389/fmicb.2019.00057
- Vijayalakshmi, S., Adeyemi, D. E., Choi, I. Y., Sultan, G., Madar, I. H. and Park, M.K. 2020. Comprehensive in silico analysis of lactic acid bacteria for the selection of desirable probiotics. *LWT–Food Sci and Technol.*, 130: 109617.

- Vila, B., Esteve-Garcia, E., and Brufau, J. 2010. Probiotic microorganism, 100 years of innovation and efficacy; modes of action. *World's Poultry Science Journal* 66: 369–380
- Vimal, J., Venu, A., and Joseph J. 2016. Isolation and identification of cellulose degrading bacteria and optimization of the cellulase production. *International Journal of Research in Biosciences* 5(3): 58-67.
- Vinderola, C.G., And J.A. Reinheimer. 2003. Lactic acid starter and probiotic bacteria: a comparative "in vitro" study of the probiotic characteristics and biological barrier of resistance. *Food Research International*. 36: 859-904.
- Walita, K.Z., Tanganyika, J., Mussah, S.R. 2017. Effect of Sex, type of feed and age at slaughter on carcass yield characteristics of japanese quails (*cortunix japonica*) in Malawi. *Int J Avian & Wildlife Biol.* 2(2): 50-53. DOI: [10.15406/ijawb.2017.02.00015](https://doi.org/10.15406/ijawb.2017.02.00015)
- Wallis, Y., and Morrell, N. 2011. Automated DNA sequencing. *Methods Mol Biol* 688:173–185. 10.1007/978-1-60761-947-5_12.
- Walton, K. D., Mishkind, D., Riddle, M. R., Tabin, C. J., and Gumucio, D. L. 2018. Blueprint for an intestinal villus: Species-specific assembly required. *Wiley Interdisciplinary Reviews-Developmental Biology*, 7(4). <https://doi.org/10.1002/WDEV.317>.
- Wang, B., Gong, L., Zhou, Y., Tang, L., Zheng, Z., Wang, Q., Zou, P., Yu, D. and Li, F. 2021. Probiotic *Paenibacillus polymyxa* 10 and *Lactobacillus plantarum* 16 enhance growth performance of broilers by improving the intestinal health. *Animal Nutrition*. 7: 829-840.
- Wang, B., Wu, Q., Yu, S., Lu, Q., Lv, X., Zhang, M., Kan, Y., Wang, X., Zhu, Y., Wang, G., and Wang, Q. 2022. Host-derived *bacillus* spp. as probiotic additives for improved growth performance in broilers. *Poultry Science* 102(1): 102240.
- Wang, C., Chang, T., Yang, H., and Cui, M. 2015. Antibacterial mechanism of lactic acid on physiological and morphological properties of *Salmonella Enteritidis*, *Escherichia coli* and *Listeria monocytogenes*. *Food Control* 47: 231-236.
- Wang, C., Ren, X., Yu, C., Wang, J., Wang, L., Zhuge, X. and Liu, X. 2020. Physiological and Transcriptional Responses of *Streptomyces albulus* to Acid Stress in the Biosynthesis of ϵ -Poly-L-lysine. *Front. Microbiol* 11: 1379.
- Wang, G., Yu, H., Feng, X., Tang, H., Zhiqiang, X., Xia, Y., Ai, L., and Song, X. 2021. Specific bile salt hydrolase genes in *Lactobacillus plantarum* AR113 and relationship with bile salt resistance. *Lwt - Food Science and Technology* 145: 111208. <https://doi.org/10.1016/J.LWT.2021.111208>.
- Wang, H., Ni, X., and Liu, L. 2017. Controlling of growth performance, lipid deposits and fatty acid composition of chicken meat through a probiotic, *Lactobacillus johnsonii* during subclinical *Clostridium perfringens*

infection. *Lipids Health Dis* 16: 38. <https://doi.org/10.1186/s12944-017-0408-7>.

- Wang, J., Sayeed ur Rehman, T., Hussain, M. A., and Duan, Y. 2022. Editorial: Nutritional Management for the Energy Metabolism in Animals. *Frontiers in Veterinary Science* 9. <https://doi.org/10.3389/fvets.2022.900736>.
- Wang, J, Wu, Z., Wang, S., Wang, X., Zhang, D., Wang, Q., Lin, L., Wang, G., Guo, Z. and Chen, Y. 2022. Inhibitory effect of probiotic *Bacillus* spp. isolatd from the digestive tract of *Rhynchocypris lagowskii* on the adhesion of common *patogenic* bacteria in the intestinal model. *Microb. Pathog* 169: 105623.
- Wang, J., and Ji, H. 2018. Influence of Probiotics on Dietary Protein Digestion and Utilization in the Gastrointestinal Tract. *Current Protein and Peptide Science* 20(2): 125–131. <https://doi.org/10.2174/1389203719666180517100339>
- Wang, L., Lin, Z., Ali, M., Zhu, X., Zhang, Y., Li, S., Li, K., Kebzhai, F. and Li, J. 2023. Effects of lactic acid bacteria isolated from Tibetan chickens on the growth performance and gut microbiota of broiler. *Front. Microbiol* 14: 1171074.
- Wang, L., Liu, C., Chen, M., Ya, T., Huang, W., and Gao, P. 2015. A novel *Lactobacillus plantarum* strain P-8 activates beneficial immune response of broiler chickens. *Int. Immunopharmacol* 29: 901–907. doi: 10.1016/j.intimp.2015.07.024.
- Wang, N., Wu, W., Pan, J., and Long M. 2019. Detoxification strategies for zearalenone using microorganisms: A review. *Microorganisms* 7: 208. <https://doi.org/10.3390/microorganism7070208>.
- Wang, X., Chang, P., and Zhang, X. 2022. Probiotics Regulate Gut Microbiota: An Effective Method to Improve Immunity. *Molecules* 26(19): 6076. <https://doi.org/10.3390/molecules26196076>.
- Wang, Y., and Gu, Q. 2010. Effect of probiotic on growth performance and digestive enzyme activity of Arbor Acres broilers. *Research in Veterinary Science* 89(2): 163–167. doi:10.1016/j.rvsc.2010.03.009
- Wati, AK., Zuprizal, Kustantinah, Indarto, E., Dono, ND., dan Wihandoyo. 2018. Performan Ayam Broiler dengan Penambahan Tepung Daun Calliandra calothyrsus dalam Pakan. *Sains Peternakan* 16 (2):74-49.
- Wealleans, A.L., Walsh, M.C., Romero, L.F., and Ravindran, V. 2017. Comparative effects of two multi-enzyme combinations and a *Bacillus* probiotic on growth performance, digestibility of energy and nutrients, disappearance of non-starch polysaccharides, and gut microflora in broiler chickens. *Poult Sci* 93(12): 4287–4297.
- Weitkunat, K., Schumann, S., Petzke, K. J., Blaut, M., Loh, G., and Klaus, S. 2015. Effects of dietary inulin on bacterial growth, short-chain fatty acid production and hepatic lipid metabolism in gnotobiotic mice. *The Journal*

- Wickramasuriya, S.S., Park, I., Lee, K., Lee, Y., Kim, W.H., Nam, H., and Lillehoj, H.S. 2022. Role of Physiology, Immunity, Microbiota, and Infectious Diseases in the Gut Health of Poultry. *Vaccines* 10(2): 172. <https://doi.org/10.3390/vaccines10020172>.
- Widawati, S., Ikhwan, A. Z. N., and Sudiana, I. M. 2022. Phytase activity of phytase-producing bacteria isolated from mangrove sediment. *IOP Conference Series* 976(1): 012041. <https://doi.org/10.1088/1755-1315/976/1/012041>
- Widiawati, Mariani, J., Muharlien, M., and Osfar S. (2018). Efek Penggunaan Probiotik dan Tepung Kunyit (*Curcuma domestica* Val.) pada Pakan Terhadap Performa Broiler. *Jurnal Ternak Tropika* 19(2): 105–110.
- Wilson, DB. 2011. Microbial diversity of cellulose hydrolysis. *Curr Opin Microbiol* 14(3): 259–63. <https://doi.org/10.1016/j.mib.2011.04.004> PMID:21531609.
- Winastri, N.L.A.P., Muliasari, H., and Hidayati, E. 2015. Antibacterial activity of juice and decoction of calincing (*Oxalis corniculata* L.) leaves against *Streptococcus mutans*. *Berita Biol.* 19(1): 223–230.
- Woese, C.R., Kandler, O., and Wheelis, M.L. 1990. Towards a natural system of organisms: proposal for the domains Archaea, Bacteria, and Eucarya. *Proc Natl Acad Sci USA* 87:4576–4579. 10.1073/pnas.87.12.4576.
- Woyengo, T. A. and Nyachoti, C. M. 2011. Review: Supplementation of phytase and carbohydrases to diets for poultry. *Can. J. Anim. Sci* 91: 177192.
- Woyengo, T.A., Weihrauch, D., and Nyachoti, C.M. 2012. Effect of dietary phytic acid on performance and nutrient uptake in the small intestine of piglets. *J. Anim. Sci* 90: 543549.
- Wróblewska, P., Hikawczuk, T., Sierżant, K., Wiliczkievicz, A., and Szuba-Trznadel, A. 2022. Effect of Oat Hull as a Source of Insoluble Dietary Fibre on Changes in the Microbial Status of Gastrointestinal Tract in Broiler Chickens. *Animals* 12(19): 2721. <https://doi.org/10.3390/ani12192721>
- Wu, C., Zhang, J., Du, G., and Chen, J. 2013. Heterologous expression of *Lactobacillus casei* RecO improved the multiple-stress tolerance and lactic acid production in *Lactococcus lactis* NZ9000 during salt stress. *Bioresour Technol* 143:238–241
- Xu, J., Zhang, K., Lin, Y., Li, M., Wang, X., Yu, Q., Sun, H., Cheng, Q., Xie, Y., Wang, C., Li, P., Chen, C., Yang, F., and Zheng. Y. 2022. Effect of cellulase and lactic acid bacteria on the fermentation quality, carbohydrate conversion, and microbial community of ensiling oat with different moisture contents. *Front. Microbiol* 13:1013258. doi: 10.3389/fmicb.2022.1013258.

- Xu, C., Wei, F., Yang, X., Feng, Y., Liu, D. and Hu, Y. 2022. *Lactobacillus salivarius* CML352 Isolatd from Chinese Local Breed Chicken Modulates the Gut Microbiota and Improves Intestinal Health and Egg Quality in Late-Phase Laying Hens. *Microorganisms* 10: 726.
- Xu, Q., Zhai, Z., Zhai, Z., An, H., Yang, Y., Yin, J., Wang, G., Ren, F. Z., and Hao, Y. 2019. The MarR Family Regulator BmrR Is Involved in Bile Tolerance of *Bifidobacterium longum* BBMN68 via Controlling the Expression of an ABC Transporter. *Applied and Environmental Microbiology* 85(3). <https://doi.org/10.1128/AEM.02453-18>
- Yalçın, S., Eser, H., and Yalçın, S. 2016. Effects of Probiotics on Performance, Carcass Yield and Internal Organs in Broilers. *Journal of Pediatric Gastroenterology and Nutrition* 63. <https://doi.org/10.1097/01.MPG.0000489635.40751.4B>
- Yalçın, S., Eser, H., Yalçın, S., and Yalçın, S.S. 2016. Effects of probiotics on some blood parameters and serum IgG in broilers. *J Pediatr Gastr Nutr* 63(1S): S57.
- Yaneisy, G.H., Tania, P.S., Ramón, B., José, L., Balcázar, J.R., and Nicoli, J.M.S. 2016. Isolation, characterization and evaluation of probiotic lactic acid bacteria for potential use in animal production. *Res Vet Sci*108:125–132. <https://doi.org/10.1016/j.rvsc.2016.08.009>.
- Yanestria, S.M., Rahmaniar, R.P., Wibisono, F.J., and Effendi, M.H. 2019. Detection of invA gene of Salmonella from milkfish (*Chanos chanos*) at Sidoarjo wet fish market, Indonesia, using polymerase chain reaction technique. *Veterinary World* 12(1):170:175.
- Yang, J., Qin, K., Wang, Q., and Yang, X. 2024. Deciphering the nutritional strategies for polysaccharides effects on intestinal barrier in broilers: Selectively promote microbial ecosystems. *Int J Biol Macromol* 264(2):130677. doi: 10.1016/j.ijbiomac.2024.130677.
- Yang, E., Fan, L., Jiang, Y., Doucette, C., and Fillmore, S. 2012. Antimicrobial activity of bacteriocin-producing lactic acid bacteria isolatd from cheeses andyogurts. *AMB Express* 2:48. doi: 10.1186/2191-0855- 2-48
- Yang, Y., Khoo, W.J., Zheng, Q., Chung, H.J. and Yuk, H.G. 2014. Growth temperature alters Salmonella Enteritidis heat/acid resistance, membrane lipid composition and stress/virulence related gene expression. *Int. J. Food Microbiol* 172: 102–109.
- Yan, Q., Yan, Q., Zhang, S., Li, S., Wang, G., Zhang, A., Jin, T., Zhang, Y., Lv, Q., Xiao, M., Sun, Y., Xiang, L., Cui, S., Li, R., Ma, X., Wang, C., Tian, X., Duan, X., Xin, Y. and Ma, Y. 2021. Cultivation and Genomic Characterization of the Bile Bacterial Species From Cholecystitis Patients. *Frontiers in Microbiology* 12: 739621. <https://doi.org/10.3389/FMICB.2021.739621>.

- Yasmin, I., Saeed, M., Khan, W.A., Khaliq, A., Chughtai, M.F.J and Iqbal, R. 2020. In vitro probiotic potential and safety evaluation (Hemolytic, Cytotoxic Activity) of *Bifidobacterium* strains isolated from raw camel milk. *Microorganisms* 8(3): 354. <https://doi.org/10.3390/microorganisms8030354>.
- Ye, L., Wen, Y., Li, J., and Zhang, J. 2022. Dual Role of Indoles Derived From Intestinal Microbiota on Human Health. *Frontiers in Immunology* 13: 903526. <https://doi.org/10.3389/fimmu.2022.903526>
- Ye, Y., Li, Z., Wang, P., Zhu, B., Zhao, M., Huang, D., Ye, Y., Ding, Z., Li, L., Wan, G., Wu, Q., Song, D., and Tang, Y. 2021. Effects of probiotic supplements on growth performance and intestinal microbiota of partridge shank broiler chicks. *PeerJ* 9: e12538. doi: 10.7717/peerj.12538.
- Yeboah, P.J., Ibrahim, S.A., and Albert, K. 2023. A Review of fermentation and the nutritional requirements for effective growth media for lactic acid bacteria. *Food Science and Applied Biotechnology* 6(2): 215-240. <https://doi.org/10.30721/fsab2023.v6.i2.269>.
- Yegani, M., and Korver DR. 2008. Factors affecting intestinal health in poultry. *Poult Sci* 87(10): 2052-2063. doi: 10.3382/ps.2008-00091.
- Yi, Z., Li, X., Luo, W. *et al.* 2018. Feed conversion ratio, residual feed intake and cholecystokinin type A receptor gene polymorphisms are associated with feed intake and average daily gain in a Chinese local chicken population. *J Animal Sci Biotechnol*. 9: 50. <https://doi.org/10.1186/s40104-018-0261-1>.
- Yoon, C., Na, C.S., Park, J.H., Han, S.K., Nam, Y.M., and Kwon, J.T. 2004. Effect of feeding multiple probiotics on performance and fecal noxious gas emission in broiler chicks. *Korean J Poult Sci* 31(4): 229-235.
- Yuan, F., Yin, S., Xu, Y., Xiang, L., Wang, H., Li, Z., Fan, K., and Pan, G. 2021. The Richness and Diversity of Catalases in Bacteria. *Front. Microbiol*. 12:645477. doi: 10.3389/fmicb.2021.645477
- Yulianto, A.B., Lokapirnasari, W.P., Najwan, R., Wardhani, H.C., Rahman, N.F., Huda, K., and Ulfah, N. 2020. Influence of *Lactobacillus casei* WB 315 and crude fish oil (CFO) on growth performance, EPA, DHA, HDL, LDL, cholesterol of meat broiler chickens. *Iranian Journal of Microbiology* 12(2): 148-155.
- Yulianto, A.B., Suwanti, L.C., Widiyatno, T.V., Suwarno, Yunus, M., Tyasningsih, W., Hidanah, S., Sjoefjan, O., and Lokapirnasari, W.P. 2021. Probiotic *Pediococcus pentosaceus* ABY 118 to Modulation of ChIFN- γ and ChIL-10 in Broilers Infected by *Eimeria tenella* Oocyst. *Veterinary Medicine International* 2021: 1473208. <https://doi.org/10.1155/2021/1473208>.
- Yu, Y., Xu, Y., Li, L., Chen, S., An, K., Yu, Y., and Xu, Z.L. 2023. Isolation of lactic acid bacteria from Chinese pickle and evaluation of fermentation

characteristics. LWT Food Science and Technology 180: 114627.
<https://doi.org/10.1016/j.lwt.2023.114627>.

- Zaghari, M., Sarani, P., and Hajati, H. 2020. Comparison of two probiotic preparations on growth performance, intestinal microbiota, nutrient digestibility and cytokine gene expression in broiler chickens. Journal of applied animal research 48(1): 166-175.
<https://doi.org/10.1080/09712119.2020.1754218>
- Zengin, M., Eseceli, H., Kalaydzhev, G., and Sur, A. 2024. Effects of Different Doses of Probiotic Supplementation to Diet on Performance, Organ Weight, and Some Blood Parameters in Broilers. Balıkesir Sağlık Bilimleri Dergisi 13(3): 497-504.
<https://doi.org/10.53424/balikesirsbd.1452840>.
- Zhang C, Hao E, Huang CX, Liu G, Chen H, Wang D, Shi L, Xuan F, and Chen YF. 2023. Dietary Fiber Level Improve Growth Performance, Nutrient Digestibility, Immune and Intestinal Morphology of Broilers from Day 22 to 42. Animals 13(7): 1227. <https://doi.org/10.3390/ani13071227>
- Zhang J, Liu M, Xu J, Qi Y, Zhao N. and Fan M. 2019. First Insight into the Probiotic Properties of Ten *Streptococcus thermophilus* Strains Based on In Vitro Conditions. Curr. Microbiol. 77(3): 343–352.
- Zhang, L., Zhang, R., Jia, H., Zhu, Z., Li, H., & Ma, Y. 2021. Supplementation of probiotics in water beneficial growth performance, carcass traits, immune function, and antioxidant capacity in broiler chickens. *Central European Journal of Biology*, 16(1), 311–322. <https://doi.org/10.1515/BIOL-2021-0031>
- Zhang, S.J., Shen, J., Chen, X., and Zhang, J. 2023. Isolation of an Acidophilic Cellulolytic Bacterial Strain and Its Cellulase Production Characteristics. Agriculture 13(7): 1290. <https://doi.org/10.3390/agriculture13071290>
- Zhang, S., Wang, Z., Shen, J., Chen, X., and Zhang, J. 2023. Isolation of an Acidophilic Cellulolytic Bacterial Strain and Its Cellulase Production Characteristics. Agriculture 13: 1290. <https://doi.org/10.3390/agriculture13071290>
- Zhen, W., Shao, Y., Gong, X., Wu, Y., Geng, Y., Wang, Z., and Guo, Y. 2018. Effect of dietary *Bacillus coagulans* supplementation on growth performance and immune responses of broiler chickens challenged by *Salmonella enteritidis*. Poult. Sci 97: 2654–2666.
- Zhitnitsky, D., Rose, J., and Lewinson, O. 2017. The highly synergistic, broadspectrum, antibacterial activity of organic acids and transition metals. Sci. Rep 7: 44554. doi: 10.1038/srep44554.
- Zhu, J., Sun, Y., Zhang, S., Li, H., Liu, Z., and Yi, J. 2024. Unraveling the Genetic Adaptations in Cell Surface Composition and Transporters of *Lactiplantibacillus plantarum* for Enhanced Acid Tolerance. Journal of

Agricultural and Food Chemistry. 72(10): 5368–5378
<https://doi.org/10.1021/acs.jafc.3c09292>

Zhu, Y., Liu, X., Wang, Y., Liu, L., Wang, Y., Zhao, G., Wen, J., and Cui, H. 2022. Genome-Wide Association Study Revealed the Effect of rs312715211 in ZNF652 Gene on Abdominal Fat Percentage of Chickens. *Biology* 11(12): 1849. <https://doi.org/10.3390/biology11121849>

Ziarat, M.M., Kermanshahi, H., Mogaddam, H.N., and Heravi, R.M. 2020. Performance of an *Escherichia coli* phytase expressed in *Lactococcus lactis* on nutrient retention, bone traits and intestinal morphology in broiler chickens. *Journal of Animal Physiology and Animal Nutrition* 104(3): 909–917. <https://doi.org/10.1111/JPN.13332>

Zommara, M., El-Ghaish, S., Haertle, T., Chobert, J. and Ghanimah, M. 2023. Probiotic and technological characterization of selected *Lactobacillus* strains isolated from different Egyptian cheeses. *BMC Microbiol* 23: 160.

Zulfidin, Rossi, E., dan Ali, A. 2018. Viabilitas Bakteri Asam Laktat yang diisolasi dari Ampas Susu Kedelai terhadap Asam Klorida dan Garam Empedu. *JOM Faperta UR* 5.

