



DAFTAR PUSTAKA

- Abdel-Tawwab, M., and M. Wafeek. 2017. Fluctuations in water temperature affected waterborne cadmium toxicity: hematology, anaerobic glucose pathway, and oxidative stress status of Nile tilapia, *Oreochromis niloticus* (L.). Aquaculture. 477: 106-111.
- Adelina, A., F. Feliatra, Y.I. Siregar, I. Suharman, and N.A. Pamukas. 2019. Fermented chicken feathers using *Bacillus subtilis* to improve the quality of nutrition as a fish feed material. IOP Conference Series: Earth and Environmental Science (Vol. 348, No. 1, p. 012008).
- Américo-Pinheiro, J.H.P., C. da Cruz, M.M. Aguiar, N.H. Torres, L.F.R. Ferreira, and J. G. Machado-Neto. 2019. Sublethal effects of imidacloprid in hematological parameters of tilapia (*Oreochromis niloticus*). Water, Air, & Soil Pollution. 230: 1-7.
- Amri, K dan K. Khairuman. 2007. Budidaya Ikan Nila Secara Intensif. Agomedia Pustaka, Jakarta.
- Anderson, D.P. and A.K. Siwicki. 1993. Basic hematology and serology for fish health programs. Paper presented in second symposium on diseases in Asian Aquaculture "Aquatic Animal Health and The Environment". Phuket, Thailand. 25-29th October 1993.
- Arifiati, D., K. Farkha, dan D.P. Anugerah. 2022. Ikan Nila (*Oreochromis niloticus*). Media Nusa Creative (MNC Publishing).
- Association of Official Analytical Chemists (AOAC). 2019. Official Method of Analysis 950.02 Moisture in Meat by Oven Drying. In Official Methods of Analysis (20th ed.). AOAC International, Gaithersburg, MD.
- Baratawidjaja, K. G. 2002. Imunologi Dasar. Balai Penerbit FKUI, Jakarta.
- Bbole, I., C. Mumba, N. Mupenda, and A.S. Kefi. 2016. Analysis of growth performance and haematological parameters of *Oreochromis niloticus* fed on a varying diet of *Moringa oleifera* Lam. Leaf meal as an additive protein source. International Journal of Fisheries and Aquaculture. 8(11): 105-111.
- BPS. 2022. Produksi Daging Ayam Ras Pedaging. <https://www.bps.go.id/id/statistics-table/2/NDg4IzI=/produksi-daging-ayam-ras-pedaging-menurut-provinsi.html>. Diakses tanggal 9 Maret 2024.
- Chirumbolo, S. 2012. State of the art review about basophil research in immunology and allergy: Is the time right to treat these cells with the respect they deserve? Blood Transfusion. 10(2): 148–164.
- Colletti, A., S. Li, M. Marengo, S. Adinolfi, and G. Cravotto. 2021. Recent advances and insights into bromelain processing, pharmacokinetics and therapeutic uses. Applied Sciences. 11(18): 8428.



Craig, S.R., L.A. Helfrich, D. Kuhn, and M.H. Schwarz. 2017. Understanding fish nutrition, feeds, and feeding. Virginia Tech. 420-256.

Dailami, M., A. Rahmawati, D. Saleky, and A.H.A. Taha. 2021. Ikan Nila. Penerbit Brainy Bee, Indonesia.

Dalmo, R., and J. Bøgwald. 2022. Innate Immunity. In: K. Buchmann and C.J. Secombes (Eds.). Principles of Fish Immunology, From Cells and Molecules to Host Protection. Springer Nature Switzerland AG, Cham. 31–103.

Dawood, M. A., F.I. Magouz, F. M. Mansour, A.A. Saleh, A.M.E. Asely, S.E. Fadl, H.A. Ahmed., K. Al-Ghanim, S. Mahboob, and F. Al-Misned. 2020. Evaluation of yeast fermented poultry by-product meal in Nile tilapia (*Oreochromis niloticus*) feed: Effects on growth performance, digestive enzymes activity, innate immunity, and antioxidant capacity. Frontiers in veterinary science. 6(516): 1-9.

Dawood, M.A.O., A.A. Amer, A. H. Gouda, and M. S. Gewaily. 2023. Interactive effects of cyclical fasting, refeeding, and dietary protein regimes on the growth performance, blood health, and intestinal histology of Nile tilapia (*Oreochromis niloticus*). 573(2023): 1-11.

Dotta, G., J.L.P. Mouríño, A. Jatobá, R.E.B. Morán, C. Pilati, and M.L. Martins. 2011. Acute inflammatory response in Nile tilapia fed probiotic *Lactobacillus plantarum* in the diet. Acta Scientiarum. Biological Sciences. 33(3): 239-246.

Ekawati, A.W., A. Yuniarti., and Marsoadi. Chicken feather silage meal as a fish meal protein source replacement in feed formula of pomfret (*Collossoma macropomum*). Reseach Journal of Life Science. 3(02): 98-108.

Endraswari, L.P.M., C. Nunik, dan Y.L. Salnida. 2021. Fortifikasi Pakan Ikan dengan Tepung Rumput Laut *Glacilaria* sp. pada Budidaya Ikan Nila (*Oreochromis niloticus*). Jurnal Kelautan 14(2021): 70-81.

Gunanti, M., P.D. Wulansari, and K. Kinzella. 2019. The erythrocyte and leucocyte profile of saline tilapia (*Oreochromis niloticus*) in a cultivation system with nanobubbles. In IOP Conference Series: Earth and Environmental Science (Vol. 236, No. 1, p. 012089)

Ha, M.S., K. W. Lee, J. Kim, A. Yun, H. S. Jeong, M.J. Lee, S. Baek, S.H. Cho., K.W. Kim., S.G. Lim., B.J. Lee., S.W. Hur., M. Son, and Lee, S. 2021. Dietary substitution effect of fish meal with chicken by-product meal on growth, feed utilization, body composition, haematology and non-specific immune responses of olive flounder (*Paralichthys olivaceus*). Aquaculture Nutrition. 27(2): 315-326.

Hartika, R., M. Mustahal, dan A.N. Putra. 2014. Gambaran darah ikan nila (*Oreochromis niloticus*) dengan penambahan dosis prebiotik yang berbeda dalam pakan. Jurnal Perikanan dan Kelautan. 4(4): 259-267.

Helmiati S., Rustadi., A. Isnansetyo., and Zuprizal. 2021. The replacement of fish meal with fermented Moringa leaves meal and its effect on the immune response of red tilapia (*Oreochromis sp.*). IOP Conf. Series: Earth and Environmental Science 919 (2021) 012057. 26 Mei. 1-11



Hernawati, R.D., T. Triyanto, dan M. Murwantoko. 2013. Study of the effects of carboxymethyl chitosan on the non-specific defense system in the carp (*Cyprinus Carpio*). Jurnal Sain Veteriner. 31(1):66-78.

Hodar, A. R., R.J. Vasava, D.R. Mahavadiya, and N.H. Joshi. 2020. Fish meal and fish oil replacement for aqua feed formulation by using alternative sources: a review. Journal of Experimental Zoology India. 23(1).

Howlader, S., K.R. Sumi, S. Sarkar, S.M. Billah, M.L. Ali, J. Howlader, and M. Shahjahan. 2023. Effects of dietary replacement of fish meal by soybean meal on growth, feed utilization, and health condition of stinging catfish, *Heteropneustes fossilis*. Saudi journal of biological sciences. 30(3): 103601.

Huda, S., S. Sulhadi., dan M.P. Aji. 2016. Pembuatan dan Karakterisasi Pelet Ikan dari Bulu Ayam. Prosiding Seminar Nasional Fisika. 5(2016): 65-68.

Irianto, A. 2005. Patologi ikan teleostei. Gadjah Mada University Press, Yogyakarta.

Isnansetyo, A., A. Fikriyah., N. Kasanah., and Murwantoko. 2016. Non-specific immune potentiating activity of fucoidan from a tropical brown algae (Phaeophyceae), *Sargassum cristaefolium* in tilapia (*Oreochromis niloticus*). Aquacult Int. 24(2016): 465-477.

Isnansetyo, A., H.M. Irpani, T.A. Wulansari, dan N. Kasanah. 2014. Oral administration of alginate from a tropical brown seaweed, *Sargassum* s., to enhance non-specific defense in walking catfish (*Clarias* sp.). Aquacultura Indonesiana. 15(1):14-20.

Kayansamruaj, P., N. Areechon, and S. Unajak. 2020. Development of fish vaccine in Southeast Asia: A challenge for the sustainability of SE Asia aquaculture. Fish & Shellfish Immunology. 103(2020): 73-87.

KKP. 2021. Produksi Perikanan. <https://statistik.kkp.go.id/home.php?m=total&i=2# panel-footer>. Diakses tanggal 9 Maret 2024.

Kordi, M.G.H. 2013. Budidaya Ikan Konsumsi di Air Tawar. Lily Publisher, Yogyakarta.

Kordon, A. O., A. Karsi, and L. Pinchuk. 2018. Innate Immune Responses in Fish: Antigen Presenting Cells and Professional Phagocytes. Turkish Journal of Fisheries and Aquatic Sciences. 18:1123-1139.

Kresno, S.B. 2013. Imunologi: Diagnosis dan prosedur laboratorium. Edisi kelima. Badan Penerbit Fakultas Kedokteran UI, Jakarta.

Kuebutornye, F.K., E.D. Abarike, and Y. Lu. 2019. A review on the application of *Bacillus* as probiotics in aquaculture. Fish & shellfish immunology. 87: 820-828.

Kuswoyo, T., Isnansetyo, A., Husni, A., and Istiqomah, I. 2023. Sodium alginate from padina australis modulates innate immune and immune gene expression in red tilapia (*Oreochromis* sp.). Jurnal Ilmiah Perikanan dan Kelautan. 15(1).

Li, P., Y.L. Yin, D. Li, S.W. Kim, and G. Wu. 2007. Amino acids and immune function. British Journal of Nutrition, 98(2), 237-252.



- Liu, T., T. Han, J. Wang, T. Liu, P. Bian, Y. Wang, and X. Cai. 2021. Effects of replacing fish meal with soybean meal on growth performance, feed utilization and physiological status of juvenile redlip mullet *Liza haematocheila*. Aquaculture Reports. 20: 100756.
- Magnadóttir, B. 2006. Innate immunity of fish (overview). Fish Shellfish Immunol. 20(2006): 137–151.
- Mangalisu, A., dan A. Permatasari. 2019. Optimalisasi Antioksidan Daging Ayam Kampung Unggul Sinjai (Akusi) Denganmarinasi Bubuk Kulit Nanas (*Ananas comosus* (L.) Merr). AGOVITAL: Jurnal Ilmu Pertanian. 4(2): 81-87.
- Manzoor, Z., A. Nawaz. H. Mukhtar, and I. Haq. 2016. Bromelin: Methods of extraction, purification and therapeutic applications. Brazilian Archives of Biology and Technology. 59(2016): 1-16.
- Megarani, D. V., A.B. Hardian, D. Arifianto, C.M. Santosa, and S.I. Salasia. 2020. Comparative morphology and morphometry of blood cells in zebrafish (*Danio rerio*), common carp (*Cyprinus carpio carpio*), and tilapia (*Oreochromis niloticus*). Journal of the American Association for Laboratory Animal Science. 59(6): 673-680.
- Mohammady, E.Y., A.M. Aboseif, M.R. Soaudy, E.A. Ramadan, and M.S. Hassaan. 2023. Appraisal of fermented wheat bran by *Saccharomyces cerevisiae* on growth, feed utilization, blood indices, intestinal and liver histology of Nile tilapia, *Oreochromis niloticus*. Aquaculture 575: 739755.
- Mousavi, S., S. Bereswill, and M.M. Heimesaat. 2019. Immunomodulatory and antimicrobial effects of vitamin C. European Journal of Microbiology and Immunology. 9(3): 73-79.
- Mulia, D.S., A. Husein., dan J. R. Wuliandari. 2021. Kandungan Asam Amino Tepung Bulu Ayam yang Difermantasi dengan *Bacillus licheniformis* B2560 dan *Bacillus subtilis* Sebagai Bahan Baku Pakan Ikan. Sainteks. 18(2): 155-167.
- Mulia, D.S., R.T. Yuliningsih, H. Maryanto, dan C. Purbomartono. 2016. Pemanfaatan limbah bulu ayam menjadi bahan pakan ikan dengan hidrolisis *Bacillus subtilis*. Jurnal Manusia dan lingkungan. 23(1): 49-57.
- Nanda, R. F., R. Bahar, D. Syukri, N.N.A. Thu, and A. Kasim. 2020. A review: Application of bromelain enzymes in animal food products. Andalasian International Journal of Agriculture and Natural Sciences (AIJANS). 1(01): 33-44.
- Nguyen, L., M.S. Salem, G.P. Salze, H. Dinh, and D.A. Davis .2020. Optimizing amino acid balance in diets for Nile tilapia *Oreochromis niloticus*. Aquaculture, 515, 734566.
- Oluwalola, O. I., O.A. Fagbenro, and O.T. Adebayo. 2020. Haematological and serum biochemical profiles of Nile tilapia, *Oreochromis niloticus* from different culture enclosures. International Journal of Fisheries and Aquatic Studies. 8(3): 489-493.



- Osman, A. G., A.G. Gadel-Rab, F.A. Mahmoud, H.S. Hamed, M.M. Elshehaby, A.E. Ali, and W. Kloas. 2019. Blood characteristics and tissue histology of Nile Tilapia (*Oreochromis Niloticus Niloticus*) fed a diet containing cheese skipper (*Piophila casei*) Larvae. J Food Nutr Res. 25(3): 219-228.
- Playfair, J.H. and B.M. Chain. 2009. Immunology: At a glance imunologi, 9th ed. Blackwell Publishing, UK.
- Poli, M. A., M.A. Martins, S.A. Pereira, G.F.A. Jesus, M.L. Martins, J.L.P. Mourão, and F. do Nascimento Vieira. 2021. Increasing stocking densities affect hematological parameters of Nile tilapia reared in an integrated system with Pacific white shrimp using biofloc technology. Aquaculture. 536: 736497.
- Puastuti, W. 2007. Teknologi pemrosesan bulu ayam dan pemanfaatannya sebagai sumber protein pakan ruminansia. Makalah Balai Penelitian Ternak. Bogor.
- Py C. R. Elizondo-Gonzalez, and A. Pena-odriguez. 2022. Compensatory growth: fitness cost in farmed fish and crustaceans. Rev. Aquatic. 14(3): 1389-1417.
- Rachmawati, D., and I. Samidjan. 2019. The effects of chicken feather silage substitution for fish meal in the diet on growth of saline tilapia fingerlings (*Oreochromis niloticus*). In IOP Conference Series: Earth and Environmental Science (Vol. 246, No. 1, p. 012015).
- Rahmaningsih, S. 2018. Hama & Penyakit Ikan. Deepublish, Yogyakarta.
- Rahmawati, Y., K. Kismiyati., M. Lamid. 2022. Efek Enzim Bromelin dari Bonggol Nanas Terhadap Efisiensi Pakan dan Patologi Anatomi pada Ikan Mas (*Cyprinus carpio*) yang Diinfestasi *Argulus japonicus*. Proceedings Series on Physical & Formal Sciences. 4(2022): 467-474.
- Rauta, P.R., B. Nayak., and S. Das. 2012. Immune System and Immune Responses in Fish and Their Role in ComparativeImmunity Study: A Model for Higher Organisms. Immunology Letters. 148(2012): 23-33.
- Rulli, M. M., L.B. Villegas, C.S. Barcia, C, and V.L. Colin. 2021. Bioconversion of sugarcane vinasse into fungal biomass protein and its potential use in fish farming. Journal of Environmental Chemical Engineering. 9(5): 106136.
- Rutherford, S. M. 201. Methodology for determining degree of hydrolysis of proteins in hydrolysates: a review. Journal of AOAC International. 93(5): 1515-1522.
- Saanin, M. 1984. Taksonomi dan Kunci Identifikasi Ikan Vol I dan II. Bina Cipta, Jakarta.
- Salasia, S.I.O., D. Sulanjari, dan A. Ratnawati.2001. Studi Hematologi Ikan Air Tawar. Jurnal Biologi. 2: 710-723.
- Saravanan, K., and Dhurai, B. 2012. Exploration on the amino acid content and morphological structure in chicken feather fiber. Journal of Textile and Apparel, Technology and Management, 7(3): 1-6
- Sharma, G. and Vimal, A. 2023. Bromelain: an enzyme expanding its horizon from food to pharmaceutical industry. Current Pharmaceutical Biotechnology. 24(14): 1715-1726.



- Smith, N.C., M.L. Rise, and S.L. Christian. 2019. A comparison of the innate and adaptive immune systems in cartilaginous fish, ray-finned fish, and lobe-finned fish. *Frontiers in Immunology* 10: 1–23.
- Sompayrac, L., 2016. How the Immune System Works (The How It Works Series). 5th ed. John Wiley & Sons, West Sussex.
- Standar Nasional Indonesia. 2006. Pakan Buatan untuk Ikan Nila (*Oreochromis* spp.) pada Budidaya Intensif Nomor 01-7242-2006.
- Standar Nasional Indonesia. 2009. Produksi ikan nila (*Oreochromis niloticus Bleeker*) kelas pembesaran di kolam air tenang. SNI 7550:2009.
- Tesfaye, T., B. Sithole, D. Ramjugernath, V. Chunilall. 2017. Valorisation of chicken feathers: characterization of chemical properties. *Waste Manage.* 68 (2017): 626-635.
- Tias, E.P.A.N., M.G. Wicaksono, A.F. Salsabila, and K.A.D. Prabowo. 2022. Potential bromelain pinapple extract to breaker tempe protein as organic MSG. *Abian Jurnal of Health and Applied Science.* 1(3): 11-21.
- Uribe, C., H. Folch, R. Enriquez, and G. Moran. 2011. Innate and adaptive immunity in teleost fish: A Review. *Veterinarni Medicina.* 56(10): 486–503.
- Utomo, I. P., M.N. Kholis, dan W.P. Luketsi. 2023. Hidrolisis enzimatik gelatin tulang ayam dengan menggunakan enzim bromelin. *Prosiding Sains dan Teknologi.* 2(1): 292-296.
- Varilla, C., M. Marcone, L. Paiva, and J. Baptista. 2021. Bromelain, a group of pineapple proteolytic complex enzymes (*Ananas comosus*) and their possible therapeutic and clinical effects. A summary. *Foods.* 10(10): 2249.
- Wu, L., L. Li, A. Gao, J. Ye, and J. Li. 2023. Antimicrobial roles of phagocytosis in teleost fish: Phagocytic B cells vs professional phagocytes. *Aquaculture and Fisheries.* xx:1-10.
- Yang, Y., M. Chen, Z. Wu, D. Zhang, H. Lin, X. Wei, B. Han, Z. Guo, and J. Ye. 2023. Capsular polysaccharide mediates *Streptococcus agalactiae* to resist Nile tilapia macrophage phagocytosis. *Aquaculture.* 573:1-12.
- Yilmaz, E. 2019. Effects of dietary anthocyanin on innate immune parameters, gene expression responses, and ammonia resistance of Nile tilapia (*Oreochromis niloticus*). *Fish & Shellfish Immunology.* 93: 694-701.
- Yu, X., Z. Wu, J. Guo, Y. Fu, K. Luo, Y. Guo, ... and K. Mai. 2022. Replacement of dietary fish meal by soybean meal on growth performance, immunity, anti-oxidative capacity and mTOR pathways in juvenile abalone *Haliotis discus hannai* Ino. *Aquaculture.* 551: 737914.
- Zhong, Y.F., C. M. Shi, Y. Zhou, Y. J. Chen, S. M. Lin, and R. J. Tang. 2020. Optimum dietary fiber level could improve growth, plasma biochemical indexes and liver function of largemouth bass, *Micropterus salmoides*. *Aquaculture.* 518: 734661.