

## DAFTAR PUSTAKA

- Abdelwahab, N., W. Rabie and F. Mohamed. 2023. Fabrication and characterization of novel biocomposite based on *Sargassum vulgare* for controlling sugar beet root diseases. *Chemical and Biological Technologies in Agriculture*, 10: 1-13.
- Achmadi, R. dan A. Arisandi. 2021. Perbedaan distribusi alga coklat (*Sargassum sp.*) di Perairan Pantai Srau dan Pidakan Kabupaten Pacitan. *Juvenil*, 2(1): 25-31.
- Andini D., Zainuddin, M. Jalaluddin, Fitriani, U. Balqis, N. Asmilia dan Hamdan. 2017. Sebaran sel goblet pada usus lele lokal (*Clarias batrachus*). *Jurnal Ilmiah Mahasiswa Veteriner*, 1(2): 299-304.
- Andriamanantoanina, H. and M. Rinaudo. 2010. Characterization of the alginate from Mive madagascan Brown Algae. *Carbohydrat. Polym.*, 82(3): 555–560.
- Andriani, R., Syahrudin, M. Sayuti, dan S.I. Gubali. 2022. Kandungan protein kasar, serat kasar dan energi formulasi ransum burung puyuh petelur yang ditambahi tepung daun kelor (*Moringa oleifera lam.*). *Gorontalo Journal of Equatorial Animals*, 1(2): 93–98.
- Anggadiredja, J.T., A. Zalnika, H. Purwato, dan S. Istini. 2008. Rumput laut, pembudidayaan, pengolahan dan pemasaran komoditas perikanan potensial. Penebar Swadaya: Jakarta.
- Ariani, F., L. Yunita, N.T. Dewi. N.M.W. Sukanty, W.D. Isasih. 2023. Ekstraksi alginat dari rumput laut coklat (*Phaeophyceae*) dan pemanfaatannya sebagai pengemulsi (*emulsifier*) pada produk pangan. *Nutriology*, 4(1): 12-19.
- Assan, D., F.K.A. Kuebutornye, V. Hlordzi, H. Chen, J. Mraz, U.F. Mustapha, & E.D. Abarike. 2022. Effects of probiotics on digestive enzymes of fish (finfish and shellfish). *Biochemistry and Molecular Biology*, 257: 1-1-7.
- Association of Official Analytical and Chemistry. 2007. Official Methods of Analysis. 18th ed. Marylan: Association of Official Analytical Chemists Inc.
- Barbu, A., M.B. Neamțu, M. Zăhan, and V. Mireșan. 2020. Trends in Alginate based Films and Membranes for Wound Healing. *Rom Biotechnol Lett*, 25(4): 1683–1689.
- Basmal, J., B.S.B. Utomo., Tazwir., Murdinah., T. Wikanta., Marraskuranto dan R. Kusumawati. 2013. Membuat alginat dari rumput laut *Sargassum*. Balai Besar Penelitian dan Pengembangan Pengolahan Produk dan Bioteknologi Kelautan dan Perikanan, Kerja Sama dengan Penebar Sawadaya, Jakarta. 92.
- Bavel, N.V., A.M. Lewrenz, T. Issler, L. Pang, M. Anikovskiy and E.J. Prenner. 2023. Synthesis of alginate nanoparticles using hydrolized and enzyme-digested alginate using the ionic gelation and water-in-oil emulsion method. *Polymers*, 15(5): 1-12.
- Belitz, H.D. and Grosch, W. 2004. Food Chemistry. Second Edition. Springer. p. 284–286.

- Blankenhorn, S. U. 2007. Seaweed farming and artisanal fisheries in an Indonesian seagrass bed Complementary or competitive usages?. *Exchange Organizational Behavior Teaching Journal*, 2: 118.
- Büyükdeveci, M. E., I. Cengizler, J.L. Balcázar, & I. Demirkale. 2023. Effects of two host-associated probiotics *Bacillus mojavensis* B191 and *Bacillus subtilis* MRS11 on growth performance, intestinal morphology, expression of immunerelated genes and disease resistance of Nile tilapia (*Oreochromis niloticus*) against *Streptococcus iniae*. *Developmental & Comparative Immunology*, 138: 1-11.
- Charurvedi and P. Dave. 2012, Microscopy in Nanotechnology, Formatex, 946-952.
- Dawood, M.A.O., M.S. Gewaily, A.A. Soliman, M. Shukry, A.A. Amer, E.M. Younis, A.A. Abdel-Warith, H.V. Doan, A.H. Saad, M. Aboubakr, H.M.R. Abdel-Latif and S.E. Fadl. 2020. Marine-derived chitosan nanoparticles improved the intestinal histo-morphometrical features in association with the health and immune response of grey mullet (*Liza ramada*). *Marine drugs*, 18(611): 1-16.
- Delashoub, M., I. Pousty, and S.M.B. Khojasteh. 2010. Histology of bighead carp (*Hypophthalmichthys nobilis*) intestine. *Journal of Global Veterinary*, 5(6): 302-306.
- Erian, V., Zainuddin dan U. Balqis. 2018. Gambaran luas permukaan vili usus ikan lele local (*Clarias batrachus*) jantan dewasa. *JIMVET*, 2(3): 283-287.
- Froese, R. and P. Daniel. eds. 2011. Species of *Clarias* in Fishbase. Versi Desember 2011.
- Gaffar, M.A., M.K. Zaman, M.S. Islam, M. Islam, M.K. Hossain, & S.I.M. Shahrar. 2023. Effects of probiotics on growth, survival, and intestinal and liver morphometry of Gangetic mystus (*Mystus cavasius*). *Saudi Journal of Biological Science*, 30(1) :1-10.
- Gangadoo, S., D. Stanley, R.J. Hughes, R.J. Moore, and J. Chapman. 2016. Nanoparticles in feed: Progress and prospects in poultry research. *Trends in Food Science & Technology*, 58: 115- 126.
- García, M., N. Victory, A. Navarro-Sempere and Y. Segovia. 2019. Students' Views on Difficulties in Learning Histology. *Anatomical Sciences Education*, 12(5): 541–549.
- Gurunathan, S. 2015. Biologically synthesized silver nanoparticles enhances antibiotic activity against G-negative bacteria. *J. Ind. Eng. Chem*, 29: 217–226
- Grau, A., S. Crespo, M.C. Sarasquete, M.L. Gonzales de Canales. 1992. The digestive tract of the amberjack *Seriola dumerili*, Risso: a light and scanning electron microscope study. *J Fish Biol*, 41: 287–303.
- Hafezieh, M., D. Ajdari, A. Ajdehakosh Por, and S.H. Hosseini. 2014. Using Oman Sea *Sargassum illicifolium* meal for feeding white leg shrimp *Litopenaeus vannamei*. *Iranian Journal of Fisheries Sciences*, 13(1), 73–80.

- Hasibuan, F.E.B. dan B.J. Kolondam. 2017. Interaksi antara microbiota usus dan system kekebalan tubuh manusia. *Jurnal Ilmiah Sains*, 17(1): 35-42.
- Hasnain, M.S., E. Jameel, B. Mohanta, A.K. Dhara, S. Alkahtani, and A.K. Nayak. 2020. Alginates: Sources, Structure, and Properties. *Alginates in Drug Delivery*, 1–17. Academic Press.
- Hoang, T.C., A.J. Cole, R.K. Fotedar, M.J. O’Leary, M.W. Lomas and S. Roy. 2016. Seasonal changes in water quality and *Sargassum* biomass in southwest Australia. *Marine Ecology Progress Series*, 551: 63-79.
- Ijaz, I., E. Gilani, A. Nazir, and A. Bukhari. 2020. Detail review on chemical, physical and green synthesis, classification, characterizations and applications of nanoparticles. *Green Chemistry Letters and Reviews*, 13(3): 223-245.
- Ikpegbu, E., U.C. Nlebedum, and C.S. Ibe. 2014. The histology and mucin histochemistry of the farmed juvenile african catfish digestive tract (*Clarias gariepinus* B). *Studia Universitatis “Vasile Goldis”, Seria Stiintele Vietii*, 24(1):125-131.
- Irfandi, A., C.D. Iskandar, Zainuddin, D. Masyitha, Fitriani and Hamny. 2019. Histological of tractus digestivus of domestical catfish (*Clarias batracus*). *Jurnal Medika Veterinaria*, 13(2): 219-227.
- Iskandar, R., dan S. Fitriadi. 2017. Analisa proksimat pakan hasil olahan pembudidaya ikan di Kabupaten Banjar Kalimantan Selatan, *Zira’ah*, 42(1): 65 – 68.
- Isnansetyo, A., H.M. Irpani., T.A. Wulansari and N. Kasanah. 2014. Oral administration of alginate from a tropical Brown Seaweed *Sargassum* sp. to enhance non-specific defense in Walking Catfish (*Clarias* sp.). *Aquacultura Indonesiana*, 15: 49-55.
- Just, P.N., M.J. Slater, C. Muller and B. Kollner. 2024. Effects of two delivery matrix components alginate and polyethylene glycol, on the intestinal tract and inflammatory response of juvenile rainbow trout (*Oncorhynchus mykiss*, Walbaum). *J. World Aquac Soc*, 55: 202-222.
- Jores K, Mehnert W, Drecusler M, Bunyes H, Johan C, MAdler K. 2004. Investigation on the stricter of solid lipid nanopartuicles and oil-loaded solid nanoparticles by photon correlation spectroscopy,field flow fractionasition and transmission electron microscopy. *J Control Release*, 17: 217–27.
- Joudeh, N., and D. Linke. 2022. Nanoparticle classification, physicochemical properties, characterization, and applications: A comprehensive review for biologists. *Journal of Nanobiotechnology*, 20: 262.
- Khan, M. I., M. Shafique, and M. Hussain. 2021. Histological changes in the intestinal morphology of fish fed with dietary supplements. *Aquaculture Research*, 52(4): 1567-1579.
- Kiernan, J.A. 1990. *Histological and Histochemical Methods: Theory and Practice*. 2<sup>th</sup>ed. Pergamon Press, Oxford.

- Kordi, M. dan H. Ghufran. 2010. Panduan Lengkap Memelihara Ikan Air Tawar. Yogyakarta: Lily Publisher.
- Li, B., F. Lu, X. Wei and R. Zhao. 2008. Fucoidan: structure and bioactivity. Review Molecules, 13: 1671-1695.
- Lee, S., K. Katya, A. Hamidoghli, J. Hong, D.J. Kim, and S.C. Bai. 2018. Synergistic effects of dietary supplementation of *Bacillus subtilis* WB60 and mannanoligosaccharide (MOS) on growth performance, immunity, and disease resistance in Japanese eel, *Anguilla japonica*. *Fish Shellfish Immunology*, 83: 283-291.
- Lokollo, F.F. dan R.D. Hukubun. 2022. Jenis alga coklat penghasil alginat di Pulau Ambon. *Jurnal Laut Pulau: Hasil Penelitian Kelautan*, 1(1): 1-10.
- Løvmo, S.D., M.T. Speth, U. Repnik, E.O. Koppang, G.W. Griffiths and J.P. Hildahl. 2017. Translocation of nanoparticles and *Mycobacterium marinum* across the intestinal epithelium in zebrafish and the role of the mucosal immune system. *Developmental and Comparative Immunology*, 67: 508-518.
- Luis, A.I.S., E.V.R. Campos, and J.L. Oliveira. 2021. Ecotoxicity evaluation of polymeric nanoparticles loaded with ascorbic acid for fish nutrition in aquaculture. *J. Nanobiotechnol.*
- Manik, R.R.D.S., E. Handoco, L.O. Tambunan, J. Tambunan dan S. Sitompul. 2022. Sosialisasi pembenihan ikan lele (*Clarias sp.*) dengan menggunakan pemijahan semi buatan di Desa Aras Kabupaten Batu Bara. *Mattawang: Jurnal Pengabdian Masyarakat*, 3(1): 47-51.
- Marappan, G., P. Beulah, R.D. Kumar, S. Muthuvel, and P. Govindasamy. 2017. Role of nanoparticles in animal and poultry nutrition: Modes of action and applications in formulating feed additives and food processing. *International Journal of Pharmacology*, 13(7): 724-731.
- Matteucci, F., R. Giannantonio, F. Calabi. 2018. Deployment and exploitation of nanotechnology nanomaterials and nanomedicine. AIP Conference Proceedings.
- Mitchell, M.A. and A.J. Carlisle. 1992. The effects of chronic exposure to elevated environmental temperature on intestinal morphology and nutrient absorption in the domestic fowl (*Gallus domesticus*). *Comparative Biochemistry and Physiology Part A: Physiology*, 101(1): 137-142.
- Moawad, U.K., A.S. Awaad, and M.G. Tawfik. 2017. Histomorphological, histochemical, and ultrastructural studies on the stomach of the adult african Catfish (*Clarias gariepinus*). *Kournal of Microscopy and Ultrastructure*, 155- 166.
- Moe, S.T., K.I. Draget, G. Skjak-Braek and O. Smidsrod. 1996. Alginates. Dalam: A.M. Stephen (Ed). *Food Polysaccharides and Their Applications*, 230-265. Marcell Dekker Inc., New York.

- Mornaten, B. 2019. Studi kerapatan dan keragaman jenis makro algae pada perairan Desa Jikumerasa, Kabupaten Buru. *Scie Map J*, 2: 73-85.
- Mubasheera, M. G., & Prasad, H. M. G. 2021. Medicinal use of a brown seaweed ancient algae *Sargassum polycystum*: a review. *Clinical Medicine and Health Research Journal*, 1(2): 29-37
- Mudiarti, L., D. Setiyowati, N. Kursistiyanto dan N. Alimin. 2023. Pengaruh penambahan alginat dalam pakan terhadap performa pertumbuhan dan efisiensi pemanfaatan pakan udang vannamei (*Litopenaeus vannamei*). *Media Akuatika*, 8(1): 13-19.
- Murti, F.A.U., M.N. Latifah, I. Istiqomah, S. Helmiati, A. Isnansetyo, R. Novriadi, and A.S. Kamarudin. 2023. Intestinal enzymes and lactic acid bacteria of red tilapia (*Oreochromis sp.*) fed black soldier fly (*Hermetia illucens*) larvae and probiotics. *Aquacultura Indonesia*, 24(1): 20 – 29.
- Nasir, M., dan M. Khalil. 2016. Pengaruh penggunaan beberapa jenis filter alami terhadap pertumbuhan, sintasan, dan kualitas air dan pemeliharaan ikan mas (*Cyprinus carpio*). *Jurnal Aquatic*, 3(1): 33-39.
- Ndumuye, E., T.M. Langi, M.I.R. Taroreh. 2022. Karakteristik kimia tepung Muate (*Pteridophyta filicinae*) sebagai pangan tradisional masyarakat Pulau Kimaam. *Jurnal Agroteknologi Terapan*, 3(2): 261-268.
- Nelson, J.S. 2006. *Fishes of the World*. John Wiley & Sons, Inc.
- Nemeth, Z., I. Csoka, R.S. Jazani, B. Sipos, H. Haspel, G. Kozma, Z. Konya and D.G. Dobo. 2022. Quality by design-driven zeta potential optimisation study of liposomes with charge imparting membrane additives. *Pharmaceutics*, 14(9): 1-25.
- Nigel, C., Syafriadiman dan N.A. Pamukas. 2024. Pengaruh biomassa eceng gondok (*Eichhornia crassipes*) terhadap perubahan parameter kimia air gambut kolam ikan ikan lele local (*Clarias batrachus*). *South East Asian Aquaculture*, 1(2): 34-45.
- Nur, A.F., A. Monica, N. Rasyita, Rifky, Hardiansyah dan Saridawati. 2024. Analisa terhadap realisasi anggaran pada peternakan lele di Rangkas Bitung. *Socius: Jurnal Penelitian Ilmu-Ilmu Sosial*, 1(10): 281-287.
- Pasanda, O.S.R., A. Azis, Sulistiawati dan Tri S. 2020. Ekstraksi rumput laut (*Sargassum sp.*) dengan ultrasonik menghasilkan natrium alginat. In: *Prosiding Seminar Nasional Hasil Penelitian & Pengabdian Kepada Masyarakat*, 28-33.
- Pawar, S.N. and K.J. Edgar. 2012. Alginate derivatization: a review of chemistry, properties and applications. *Biomaterials*, 33: 3279-3305.
- Peatman, E., M. Lange, H. Zhao and B.H. Beck. 2015. Physiology and immunology of mucosal barriers in catfish (*Ictalurus spp.*) *Tissue barriers*, 3(4): e1068907.
- Peters, R.J.B., H. Bouwmeester, S. Gottardo, V.Amenta, M. Arena, P. Brandhoff, H.J.P. Marvin, A. Makine, F.B. Moniz, L.Q. Pseudo, H. Rauscher, R. Schoonjans, Undas

- A.K., Vettori M.V., S. Weigel, and K. Aschberger. 2016. Nanomaterials for products and application in agriculture, feed and food. *Trends in Food Science & Technology*, 54: 155-164.
- Pundir, C. 2015. *Enzyme nanoparticles Preparation, characterisation, properties and applications, micro-nano technologies series*. Elsevier.
- Puspita, D., S. Palimbong, N.L. Pratamaningtyas dan K.P.A. Nugroho. 2017. Analisis proksimat berbagai jenis kacang-kacangan yang tumbuh di Pulau Timor-NTT. In Prosiding Seminar Kejuangan Teknik Kimia-UPN. Yogyakarta.
- Putriyana, R.S., I. Abdulah, I. Purwaningsih dan L. Silvia. 2018. Sintesis natrium alginat dari *Sargassum sp.* dengan proses *leaching*. *Prosiding Industrial Research Workshop and National Seminar*, 9: (89-93).
- Ratucoreh, C.Y., and B. Retnoaji. 2018. The growth and histology structure of Indonesian eel (*Anguilla bicolor bicolor* McClelland, 1844) fed with microalgae. *AIP Conference Proceedings*, 2002(1): 1 – 8.
- Ratulangi, M. Junaidi dan B.D.H Setyono. 2022. Performa pertumbuhan ikan lele (*Clarias sp.*) pada budidaya teknologi microbubble dengan padat tebar yang berbeda. *Journal Perikanan*, 12(4): 544-554.
- Renya, R.R., A.V. Samrot, S.S. Kumar, V. Mohanavel, A. Karthick, V.K. Chinnaiyan, D. Umopathy and M. Muhibbullah. 2022. Bioactive potential of brown algae. *Adsorption Science & Technology*, 1-13.
- Rustadi. 2018. *Manajemen Akuakultur Tawar*. Gadjah Mada University Press, Yogyakarta
- Saanin, H. 1984. *Taksonomi dan Kunci Identifikasi Ikan*. Bandung (ID): Binacipta.
- Sahara, R., V.E. Herawati, dan A. Sudaryono. 2015. Pengaruh penambahan tepung alga coklat (*Sargassum Sp.*) dalam pakan terhadap pertumbuhan dan efisiensi pemanfaatan pakan benih lele (*Clarias sp.*). *Journal of Aquaculture Management and Technology*, 4(2): 1– 8.
- Sanger, G., B.E. Kaseger, L.K. Rarung, and L. Damongilala. 2018. Potensi beberapa jenis rumput laut sebagai bahan pangan. *J. Pengolah. Has. Perikan. Indones.*, 21(2): 208–217.
- Sedjati, S., E. Supriyantini, A. idlo dan N. Soenardjo. 2018. Kandungan pigmen total fenolik dan aktivitas antioksidan. *Jurnal Kelautan Tropis*, 21(2): 137-144.
- Sembiring, H., N.P.P. Wijayanti dan D.A.A. Pebriani. 2024. Efektivitas pemberian vitamin terhadap pertumbuhan dan kelangsungan hidup ikan lele (*Clarias sp.*). *Jurnal Biologi Udayana*, 28(2): 224-235.

- Setyoko, H. dan B. Utami. 2016. Isolasi dan karakterisasi enzim selulase cairan rumen sapi untuk hidrolisis biomassa. *Proceeding Biology Education Conference*, 13(1): 863-867.
- Shao-Wei, Z., S. QingChao, & C. XueHao. 2016. Effect of dietary antimicrobial peptidessurfactin supplementation on parameters of intestinal health indices of genetically improved farmed tilapia (*Oreochromis niloticus*). *Acta Hydrobiologica Sinica*, 40(4): 823–829.
- Shi, Y., D.Y. Ma, and S.W.S.W. Zhai. 2020. Revealing the difference of intestinal microbiota composition of cultured European eels (*Anguilla anguilla*) with different growth rates. *Israeli Journal of Aquaculture*, 72: 1-12.
- Singh, P.K. 2016. Use of nano feed additives in livestock feeding. *International Journal of Livestock Research*, 6(1): 1-14.
- SNI 6484.1. 2014. Ikan Lele Dumbo (*Clarias sp.*) Bagian 1: Induk. Badan Standarisasi Nasional.
- SNI 8122. 2015. Pembesaran Ikan Lele (*Clarias sp.*) Intensif dengan Sistem Pergantian Air. Badan Standarisasi Nasional.
- Su, X., D. Ji, J. Yao, Y. Zou, and M. Yan. 2022. Comparative analysis of intestinal characteristics of largemouth bass (*Micropterus salmoides*) and intestinal flora with different growth rates. *Fishes*, 7(65): 1-13.
- Subaryono. 2010. Modifikasi alginat dan pemanfaatan produknya. *Squalen*, 5(1): 1-7.
- Sudarmadji, S., B. Haryono, dan Suhardi. 1997. *Prosedur Analisa untuk Bahan Makanan dan Pertanian*. Yogyakarta: Liberty.
- Supriyatna, A., D. Amalia, A.A. Jauhari, dan D. Holydazlah. 2015. Aktivitas enzim amylase, lipase dan protease dari larva *Hermetia illucens* diberi pakan jerami padi. *Jurnal Kajian Islam, Sains dan Teknologi*, 9(2): 1979-8911.
- Tillman, A.D., H. Hartadi, S. Reksohadiprodjo, S. Prawirokusumo, dan S. Lebdoesoekojo. 1998. *Ilmu Makanan Ternak Dasar*. Gadjah Mada University Press. Yogyakarta.
- Widanarni, T. Nopitawati, and D. Jusadi. 2015. Screening of probiotic bacteria candidates from gastrointestinal tract of pacific white shrimp *Litopenaeus vannamei* and their effect on the growth performances. *Research Journal of Microbiology*, 10 (4): 145-157.
- Xu, W., K. Huang, W. Jin, D. Luo, H. Liu, and Y. Li. 2018. Catalytic and anti-bacterial properties of biosynthesized silver nanoparticles using native inulin. *RSC Adv*, 8: 28746–28752.
- Zandanel, C., G. Ponchel, M. Noiray and C. Vauthier. 2021. Nanoparticles facing the gut barrier: Retention or mucosal absorption? Mechanism and dependency to nanoparticle characteristics. *International Journal of Pharmaceutics*, 609: 1-20.

Zhang, M & C. Wu. 2020. The relationship between intestinal goblet cells and the immune response. *Bioscience Report*, 40: 1-11.

Zhou, F.L. 2020. Analysis of Difference in Morphological Structure and Enzyme Activity on Different Parts of Black Carp Intestine. Master's Thesis, Shanghai Ocean University, Shanghai, China.