

## REFERENCES

- Abdel-Tawwab, M. & Ahmad, M. H., 2009. Live Spirulina (*Arthrospira platensis*) as A Growth and Immunity Promoter for Nile Tilapia, *Oreochromis niloticus* (L.), Challenged with Pathogenic *Aeromonas hydrophila*. *Aquaculture Research*, 40(9), pp. 1037-1046.
- Adebayo, O. T., Fagbenro, O. A., Ajayi, C. B. & Popoola, O. M., 2007. Normal Haematological Profile of *Parachanna obscura* As A Diagnostic Tool in Aquaculture. *Int. J. Zool. Res.*, 3, pp. 193–199.
- Adel, M., Yeganeh, S., Dadar, M., Sakai, M. & Dawood, M. A., 2016. Effects of Dietary *Spirulina platensis* on Growth Performance, Humoral and Mucosal Immune Responses and Disease Resistance in Juvenile Great Sturgeon (*Huso huso* Linnaeus, 1754). *Fish & Shellfish Immunology*, 56, pp. 436-444.
- Akinrotimi, O. A., Bekibele, D. O. & Orokotan, O. O., 2011. Select Hematological Values of The African Catfish (*Clarias gariepinus*) Raised in A Water Recirculating Aquaculture System. *International Journal of Recirculating Aquaculture*, 12, pp. 1-12.
- An, H.-J., Rim, H.-K., Jeong, H.-J., Hong, S.-H., Um, J.-Y. & Kim, H.-M., 2010. Hot Water Extracts of *Chlorella vulgaris* Improve Immune Function in Protein-deficient Weanling Mice and Immune Cells. *Immunopharmacology and Immunotoxicology*, 32(4), pp. 585–592.
- Arteaga-Quico, C., Mariano-Astocondor, M. & Aquino-Ortega, R., 2020. Dietary Supplementation with *Chlorella peruviana* Improve the Growth and Immune Response of Rainbow Trout *Oncorhynchus mykiss* Fingerlings. *Aquaculture*, 533, p. 736117.
- Babak, N., Reza, I. M. & Ali, S., 2012. Effects of *Rheum rebis* Extract on the Blood Parameters and Responses of *Rutilus frisii* Kutum under Heat Stress. *Global Veterinaria*, 8(3), pp. 222-228.
- Becker, W., 2004. Microalgae in Human and Animal Nutrition. In *Handbook of microalgal culture: biotechnology and applied phycology* (Vol. 312). Wiley Online Library.
- Blaxhall, P. C. & Daisley, K. W., 1973. Routine Haematological Methods for Use with Fish Blood. *Journal of Fish Biology*, 5(6), pp. 771-781.
- Choi, W. Y., Kang, D. H. & Lee, H. Y., 2013. Enhancement of Immune Activation Activities of *Spirulina maxima* Grown in Deep-sea Water. *International Journal of Molecular Sciences*, 14(6), pp. 12205-12221.
- Chu, W. L., Van Quynh, L. & Radhakrishnan, A. K., 2013. Effect of Spirulina (*Arthrospira*) Supplementation on The Immune Response to Tetanus Toxoid Vaccination in A Mouse Model. *Journal of Dietary Supplements*, 10(3), pp. 229-240.
- Fazio, F., 2018. Fish Hematology Analysis as An Important Tool of Aquaculture: A Review. *Aquaculture*, 500, pp. 237-242.

- Finamore, A., Palmery, M., Bensehaila, S. & Peluso, I., 2017. Antioxidant, Immunomodulating, and Microbial-modulating Activities of The Sustainable and Ecofriendly Spirulina. *Oxidative Medicine and Cellular Longevity*, 20(1), p. 2017.
- Gogoi, S., Mandal, S. & Patel, A., 2017. Effect of Dietary *Wolffia arrhiza* and *Spirulina platensis* on Growth Performance and Pigmentation of Queen loach *Botia dario* (Hamilton, 1882). *Aquaculture Nature*, 1, pp.1-7.
- Gupta, S. K., Jha, A. K., Pal, A. K. & Venkateshwarlu, G., 2007. Use of Natural Carotenoids for Pigmentation in Fishes. *Natural Products and Radiance*, 6(1), pp. 46–49.
- Hayashi, O., Katoh, T. & Okuwahi, Y., 1994. Enhancement of Antibody Production in Mice by Dietary *Spirulina platensis*. *Journal of Nutritional Science and Vitaminology*, 40(5), pp. 431-441.
- Hess, C. & Schifferli, J. A., 2003. Immune Adherence Revisited: Novel Players in An Old Game. *Physiology*, 18(3), pp. 104-108.
- Hirahashi, T., Matsumoto, M., Hazeki, K., Saeki, Y., Ui, M. & Seya, T., 2002. Activation of The Human Innate Immune System by Spirulina: Augmentation of Interferon Production and NK Cytotoxicity by Oral Administration of Hot Water Extract of *Spirulina platensis*. *International Immunopharmacology*, 2(4), pp. 423-434.
- Hughes, D. A., 1999. Effects of Dietary Antioxidants on The Immune Function of Middle-aged Adults. *Proceedings of the Nutrition Society*, 58(1), pp. 79-84.
- Ibrahem, M. D., Mohamed, M. F. & Ibrahim, M. A., 2013. The Role of *Spirulina platensis* (*Arthrospira platensis*) in Growth and Immunity of Nile tilapia (*Oreochromis niloticus*) and Its Resistance to Bacterial Infection. *Journal of Agricultural Science*, 5(6), pp. 109-117.
- Ivanc, A., Hasković, E., Jeremić, S. & Dekić, R., 2005. Hematological Evaluation of Welfare and Health of Fish. *Praxis veterinaria*, 53(3), pp. 191-202.
- Joel, O. F. & Amajuoyi, C. A., 2010. Determination of The Concentration of Ammonia That Could Have Lethal Effect on Fish Pond. *ARPN Journal of Engineering and Applied Sciences*, 5(2), pp. 1-5.
- Jung, F., Krüger-Genge, A., Waldeck, P. & Küpper, J. H., 2019. *Spirulina platensis*, A Super Food?. *Journal of Cellular Biotechnology*, 5(1), pp. 43-54.
- Kapoor, R. & Mehta, U., 1992. Iron Bioavailability from *Spirulina platensis*, Whole Egg and Whole Wheat. *Indian Journal of Experimental Biology*, 30(10), pp. 904-907.
- Khani, M., Soltani, M., Mehrjan, M. S., Foroudi, F. & Ghaeni, M., 2017. The Effect of *Chlorella vulgaris* (Chlorophyta, Volvocales) Microalga on Some Hematological and Immune System Parameters of Koi Carp (*Cyprinus carpio*). *Iranian Journal of Ichthyology*, 4(1), pp. 62-68.
- Kim, J. H. & Kang, J. C., 2017. Toxic Effects on Bioaccumulation and Hematological Parameters of Juvenile Rockfish *Sebastodes schlegelii* Exposed to Dietary Lead (Pb) and Ascorbic Acid. *Chemosphere*, 176, pp. 131-140.

- Kim, J. H., Kim, S. K. & Kim, J. H., 2018. Bio-floc Technology Application in Flatfish *Paralichthys olivaceus* Culture: Effects on Water Quality, Growth, Hematological Parameters, and Immune Responses. *Aquaculture*, 495, pp. 703-709.
- Kim, S. S., Shin, S. J., Han, H. S., Kim, J. D. & Lee, K. J., 2015. Effects of Dietary *Spirulina platensis* on Innate Immunity and Disease Resistance Against *Edwardsiella tarda* in Olive Flounder *Paralichthys olivaceus*. *The Israeli Journal of Aquaculture-Bamidgeh*, 65, p. 1152.
- Kim, S., Rahimnejad, S., Kim, K. W., Lee, B. J. & Lee, K. J., 2013. Effects of Dietary Supplementation of Spirulina and Quercetin on Growth, Innate Immune Responses, Disease Resistance against *Edwardsiella tarda*, and Dietary Antioxidant Capacity in The Juvenile Olive Founder *Paralichthys olivaceus*. *Fisheries Aquatic Science*, 16(1), pp. 1-8.
- Kiron, V., Sørensen, M., Huntley, M., Vasanth, G. K., Gong, Y., Dahle, D. & Palihawadana, A. M., 2016. Defatted Biomass of The Microalga, *Desmodesmus* sp., Can Replace Fishmeal in The Feeds for Atlantic Salmon. *Frontiers in Marine Science*, 3, p. 67
- Koníčková, R., Vanková, K., Vaníková, J., Vánová, K., Muchová, L., Subhanová, I., Zadinová, M., Zelenka, J., Dvorák, A., Kolár, M. & Strnad, H., 2014. Anti-cancer Effects of Blue-green Alga *Spirulina platensis*, A Natural Source of Bilirubin-like Tetrapyrrolic Compounds. *Annals of Hepatology*, 13(2), pp. 273-283.
- Li, M., Wu, W., Zhou, P., Xie, F., Zhou, Q. & Mai, K., 2014. Comparison Effect of Dietary Astaxanthin and *Haematococcus pluvialis* on Growth Performance, Antioxidant Status and Immune Response of Large Yellow Croaker *Pseudosciaena crocea*. *Aquaculture*, 434, pp. 227-232.
- Lin, K. -H., Lin, K. -C., Lu, W. -J., Thomas, P. -A., Jayakumar, T. & Sheu, J. -R., 2015. Astaxanthin, A Carotenoid, Stimulates Immune Responses by Enhancing IFN- $\gamma$  and IL-2 Secretion in Primary Cultured Lymphocytes *in Vitro* and *ex Vivo*. *International Journal of Molecular Sciences*, 17(1), pp. 1-10.
- Liu, Z., Lu, S. K., Lu, Y., Tan, X., Zhang, X., Yang, M., Zhang, F., Li, Y. & Quan, C., 2015. Transdifferentiation of Human Hair Follicle Mesenchymal Stem Cells into Red Blood Celss by OCT4. *Stem Cells International*, 2015, pp. 1-16.
- Løbner, M., Walsted, A., Larsen, R., Bendtzen, K. & Nielsen, C. H., 2008. Enhancement of Human Adaptive Immune Responses by Administration of A High-molecular-weight Polysaccharide Extract from The Cyanobacterium *Arthrospira platensis*. *Journal of Medicinal Food*, 11(2), pp. 313-322.
- Markou, G. & Nerantzis, E. 2013. Microalgae for High-value Compounds and Biofuels Production: A Review with Focus on Cultivation under Stress Conditions. *Biotechnology Advances*, 31(8), pp. 1532–1542.
- Morera, D. & MacKenzie, S. A., 2011. Is There A Direct Role for Erythrocytes in The Immune Response?. *Veterinary research*, 42(1), pp. 1-8.
- Nemoto-Kawamura, C., Hirahashi, T., Nagai, T., Yamada, H., Katoh, T. & Hayashi, O., 2004. Phycocyanin Enhances Secretary IgA Antibody Response and Suppresses Allergic IgE Antibody Response in Mice Immunized with Antigen-

- entrapped Biodegradable Microparticles. *Journal of Nutritional Science and Vitaminology*, 50(2), pp. 129-136.
- Norousta, R. & Mousavi-Sabet, H., 2013. Comparative Characterization of Blood Cells and Hematological Parameters between The Immature Caspian Vimba (*Vimba vimba*). *AACL Bioflux*, 6(3), pp. 232- 240.
- Oh, S. T., Zheng, L., Kwon, H. J., Choo, Y. K., Lee, K. W., Kang, C. W. & An, B. K., 2015. Effects of Dietary Fermented *Chlorella vulgaris* (CBT) on Growth Performance, Relative Organ Weights, Cecal Microflora, Tibia Bone Characteristics, and Meat Qualities in Pekin Ducks. *Asian-Australasian Journal of Animal Sciences*, 28(1), pp. 95-101.
- Okorie-Kanu, C. O. & Unakalamba, N. J., 2015. Normal Haematological and Blood Biochemistry Values of Cultured *Clarias gariepinus* in Southeast, Nigeria. *Comparative Clinical Pathology*, 24(6), pp. 1445-1450.
- Oluyemi, K. G., Adeparusi, E. A. & Olanrewage, J., 2008. Basic Hematological Parameters in African catfish, *Clarias gariepinus* (Burchell, 1822) Fed Ascorbic Acid Supplemented Diets. *Res. J. Anim. Sci.*, 2, pp. 17-21.
- Park, J. S., Chyun, J. H., Kim, Y. K., Line, L. L. & Chew, B. P., 2010. Astaxanthin Decreased Oxidative Stress and Inflammation and Enhanced Immune Response in Humans. *Nutrition & Metabolism*, 7(18), pp. 1-10.
- Passantino, L., Altamura, M., Cianciotta, A., Patruno, R., Tafaro, A., Jirillo, E. & Passantino, G. F., 2002. Binding and Engulfment of *Candida albicans* by Erythrocytes of Rainbow Trout (*Salmo gairdneri* Richardson). *Immunopharmacology and Immunotoxicology*, 24(4), pp. 665-678.
- Passantino, L., Massaro, M. A., Jirillo, F., Di Modugno, D., Ribaud, M. R., Di Modugno, G., Passantino, G. F. & Jirillo, E., 2007. Antigenically Activated Avian Erythrocytes Release Cytokine-like Factors: A Conserved Phylogenetic Function Discovered in Fish. *Immunopharmacology and Immunotoxicology*, 29(1), pp. 141-152.
- Pradhan, S. C., Patra, A. K. & Pal, A., 2014. Hematological and Plasma Chemistry of Indian Major Carp, *Labeo rohita* (Hamilton, 1822). *Journal of Applied Ichthyology*, 30(1), pp. 48-54.
- Promya, J., Traichaiyaporn, S. & Deming, R., 2008. Phytoremediation of Kitchen Wastewater by *Spirulina platensis* (Nordstedt) Geiteler: Pigment Content, Production Variable Cost and Nutritional Value. *Maejo International Journal of Science and Technology*, 2(1), pp. 159-171.
- Pugh, N., Ross, S. A., ElSohly, H. N., ElSohly, M. A. & Pasco, D. S., 2001. Isolation of Three High Molecular Weight Polysaccharide Preparations with Potent Immunostimulatory Activity from *Spirulina platensis*, *Aphanizomenon flos-aquae* and *Chlorella pyrenoidosa*. *Planta Medica*, 67(8), pp. 737-742.
- Raja, R. & Hemaiswarya, S., 2010. *Microalgae and Immune Potential*. Berlin: Springer.
- Raji, A. A., Alaba, P. A., Yusuf, H., Bakar, N. H. A., Taufek, N. M., Muin, H., Alias, Z., Milow, P. & Razak, S. A., 2018. Fishmeal Replacement with *Spirulina*

- platensis* and *Chlorella vulgaris* in African catfish (*Clarias gariepinus*) Diet: Effect on Antioxidant Enzyme Activities and Haematological Parameters. *Research in Veterinary Science*, 119, pp. 67-75.
- Raji, A. A., Junaid, Q. O., Oke, M. A., Taufek, N. H. M., Muin, H., Bakar, N. H. A. & Razak, S. A. 2019. Dietary *Spirulina platensis* and *Chlorella vulgaris* Effects on Survival and Haemato-immunological Responses of *Clarias gariepinus* juveniles to *Aeromonas hydrophila* infection. *Aquaculture, Aquarium, Conservation & Legislation*, 12(5), 1559-1577.
- Rasool, M., Sabina, E. P. & Lavanya, B., 2006. Anti-inflammatory Effect of *Spirulina fusiformis* on Adjuvant-induced Arthritis in Mice. *Biological Pharma Bulletin*, 29, pp. 2483-2487.
- Rodak, B. F., Fritsma, G. A. & Doig, K., 2007. *Hematology: Clinical Principles and Applications*. Missouri: Saunders Elsevier.
- Rodriguez, M. F., Wiens, G. D., Purcell, M. K. & Palti, Y., 2005. Characterization of Toll-like Receptor 3 Gene in Rainbow Trout (*Oncorhynchus mykiss*). *Immunogenetics*, 57(7), pp. 510-519.
- Saberi, A., Zorriehzahra, M. J., Emadi, H., Kakoolaki, S. & Fatemi, S. M. R., 2017. Effects of *Chlorella vulgaris* on Blood and Immunological Parameters of Caspian Sea Salmon (*Salmo trutta caspius*) Fry Exposed to Viral Nervous Necrosis (VNN) Virus. *Iranian Journal of Fisheries Sciences*, 16(2), pp. 494-510.
- Safi, C., Zebib, B., Merah, O., Pontalier, P. Y. & VacaGarcia, C., 2014. Morphology, Composition, Production, Processing and Applications of *Chlorella vulgaris*: A Review. *Renewable and Sustainable Energy Reviews*, 35, pp. 265–278.
- Samah, R., Rasha, M. & Ashraf, A., 2017. Efficacy of *Spirulina platensis* Diet Supplements on Disease Resistance and Immune-related Gene Expression in *Cyprinus carpio* L. Exposed to Herbicide Atrazine. *Fish & Shellfish Immunology*, 67, pp. 119-128.
- Santosa, B., 2009. Aktifitas Hematopoiesis Akibat Suplementasi Tawas dan Seng pada Tikus (*Rattus norvegicus*). *Jurnal Kesehatan*, 2(1), pp. 41-49.
- Santosa, B., 2015. Variasi Dosis Suplementasi Zn Memperbaiki Hematopoiesis pada Tikus yang Terpajan Plumbum (Pb). *University Research Colloquium*, 1(1), pp. 37-45.
- Sayed, A. H. & Fawzy, M. A., 2014. Effect of Dietary Supplementation of *Spirulina platensis* on the Growth and Haematology of the Catfish *Clarias gariepinus*. *Journal of Advances in Biology*, 5(2), pp. 626-635.
- Schmit, C. J., Blazer, V. S., Dethloff, G. M., Tillitt, D. E., Gross, T. S., Bryant Jr, W. L., DeWeese, L. R., Smith, R. W., Goede, T. M., Bortish. & Kubiak, T. J., 1999. *Assessing the Exposure of Fish to Environmental Contaminants. Information and Technology Report USGS/BRO-1999-0007*. US. Geological Survey, Biological Resources Division. Columbia MO, p. 547.
- Simanjuntak, S. B. I., 2020. The Discontinuous Feeding Effects of *Chlorella vulgaris* Supplemented Feed on the Gourami Body Composition. In *IOP Conference*

*Series: Earth and Environmental Science* (Vol. 593, No. 1, p. 012018). IOP Publishing.

- Simanjuntak, S. B. I., Wibowo, E. S., Indarmawan., 2018. Impact of Feed Containing Different Levels of Diets Supplementation *Spirulina platensis* on Growth, Haematological, Body Composition and Biochemical Parameters of Gurami (*Osteobrama gouramy*). *Turkish Journal of Fisheries and Aquatic Science*, 18(5), pp. 681-690.
- Simanjuntak, S. B. I., Yuwono, E. & Rachmawati, F. N., 2006. Pengaruh Penyuplemen *Spirulina* dalam Pakan terhadap Hematologis Ikan Nilem (*Osteochilus hasselti* C. V.). *Jurnal Pembangunan Pedesaan*, 6(2), pp. 82-88.
- Soltani, M., Khosravi, A. R., Asadi, F. & Shokri, H., 2012. Evaluation of Protective Efficacy of *Spirulina platensis* in Balb/C Mice with Candidiasis. *Journal de Mycologie Médicale*, 22(4), pp. 329-334.
- Taqwa, F. H., Yulisman., Sasanti, A. D., Fitriani, M., Muslim. & Apriadi, D., 2015. Pemanfaatan Limbah Rumah Makan untuk Pakan Ikan Lele di UPR Mitra Cambai Prabumulih. *Jurnal Pengabdian Sriwijaya*, 3(2), pp. 251-256.
- Teas, J. & Irhimeh, M. R., 2012. Dietary Algae and HIV/AIDS: Proof of Concept Clinical Data. *Journal of Applied Phycology*, 24(3), pp. 575-582.
- Turchini, G. M., Torstensen, B. E. & Ng, W. K., 2009. Fish Oil Replacement in Finfish Nutrition. *Reviews in Aquaculture*, 1(1), pp. 10-57.
- Velten, S., Neumann, C., Bleyer, M., Gruber, E., Hanuszewska, M., Przybylska, B. & Liebert, F., 2018. Effects of 50 Percent Substitution of Soybean Meal by Alternative Proteins from *Hermetia illucens* or *Spirulina platensis* in Meat Type Chicken Diets with Graded Amino Acid Supply. *Open Journal of Animal Sciences*, 8, pp. 119-136.
- Worden, F. P., Cooney, K. A., Deininger, M. W. & Khoriaty, R. N., 2018. *Hematology Board Review*. Berlin: Springer Publishing Company.
- Yeganeh, S., Teimouri, M. & Amirkolaie, A. K., 2015. Dietary Effects of *Spirulina platensis* on Hematological and Serum Biochemical Parameters of Rainbow Trout (*Oncorhynchus mykiss*). *Research in Veterinary Science*, 101, pp. 84-88.
- Yulinda, E., 2012. Analisis Finansial Usaha Pemberian Ikan Lele Dumbo (*Clarias gariepinus*) di Kelurahan Lembar Sari Kecamatan Rumbai Pesisir Kota Pekanbaru Provinsi Riau. *Jurnal Perikanan dan Kelautan*, 17(1), pp. 38-55.
- Zhang, C., 1994. The Effects of Polysaccharide and Phycocyanin from *Spirulina platensis* Variety on Peripheral Blood and Hematopoietic System of Bone Marrow in Mice. In *Second Asia-Pacific Conference on Alga Biotechnology*, pp. 25-27.
- Zurawski, G. & de Vries, J. E., 1994. Interleukin 13, An Interleukin 4-like Cytokine That Acts on Monocytes and B Cells, but Not on T Cells. *Immunology today*, 15(1), pp. 19-26.