

3. Bölüm

YETİŞTİRİCİLİKTE SAĞLIK YÖNETİMİ

İbrahim DEMİRKALE¹

GİRİŞ

Akuakültür çalışmalarında bakteri, virüs, parazit ve protozoa dahil olmak üzere birçok patojenik mikroorganizma tarafından oluşturulan hastalık problemleri mortaliteye sebep olduğundan ekonomik kayıplara yol açmaktadır (Idowu ve diğerleri, 2013, Roberts,2010). Hastalığın ortaya çıkışını engelleyici tedbir ve önlemlerin alınması oldukça önem arz etmektedir. Çünkü hastalıklara karşı ilaç uygulamaları hem iş gücü hem de ekonomik girdilere sebebiyet vermektedir. Bu durumun önüne geçilebilmesi için hastalıklar ile mücadele-den çok hastalığın işletmeye girmemesi için gerekli önlemlerin alınması çalışmalarına ve önlemlerine ağırlık vermek gerekmektedir. Bu önlemler kısaca sıralanacak olursa:

- Akuakültür ortamında giren suyun patojen içermemesi,
- İnsan eli ile patojen girişinin engellenmesi,
- Uygun doz ve kimyasal ile gerekli dezenfeksiyon işlemlerinin yapılması,
- Balık türüne göre değişmekle birlikte çevre koşullarının düzenlenmesi,
- Hastalıklardan arı balık bireylerinin seçimi,
- Uygun yem ve iyi bir bakım, şeklinde sıralanabilir.

¹ Doç. Dr., Çukurova Üniversitesi Su Ürünleri Fakültesi, idemirkale@cu.edu.tr

Bir diğer tedavi ve koruma yöntemi olarak ifade edilebilecek olan yöntem ise aşılama. Aşılama hastalık ortaya çıkmadan önce koruma sağlamak için yapılmaktadır. Özellikle Covid 2019 pandemisi döneminde aşılamanın önemi insanlar tarafından anlaşılmış ve büyük bir farkındalık oluşmuştur. Farklı yöntemler ile geliştirilen aşılar, balıklara aşılama veya immersiyon (daldırma) yöntemi ile uygulanmaktadır. Ülkemizde uygulanmakta olan aşıları kısaca sıralayacak olursak:

- İnaktif *Vibrio ordalii*
- İnaktif *Pasteurella piscicida-Vibrio anguillarum*
- Canlı *Pasteurella piscicida-Vibrio anguillarum*
- İbrogen 2
- Alfa Inject2000
- Alfa Deep TM 2000
- İnaktif *Yersinia ruckerii*

Yetiştiricilik ortamında yetiştirilen türe özgü uygun koşulların sağlanması sağlıklı birey yetiştirmenin ön koşuludur. Optimum koşulların sağlanmasında en önemli noktalar; su kalitesi (çözünmüş oksijen, su sıcaklığı, pH vb), türsel özelliğe bağlı doğru rasyonlanmış kaliteli yemle doğru besleme, stok yoğunluğunun yetiştiricilik sistemi göz önüne alınarak doğru belirlenmesi ve stres koşullarının mümkün olduğunca sifıra indirgenmesidir. Bunlara ek olarak patojen temasının kesilmesi yetiştiricilikte yapılabilecek en güzel koruma ve kontrolü sağlamaktır.

KAYNAKLAR

- Abou-Okada, M., AbuBakr, H. O., Hassan, A., Abdel-Radi, S., Aljuaydi, S. H., Abdel-salam, M. ve diğerleri (2021). Efficacy of Acriflavine for controlling parasitic diseases in farmed Nile tilapia with emphasis on fish health, gene expression analysis, oxidative stress, and histopathological alterations. *Aquaculture*, 541, 736791.
- Abrunhosa, J., Sindeaux-Neto, J. L., Santos, Á. K. D., Hamoy, I. ve Matos, E. (2017). *Myxobolus marajoensis* sp. n. (Myxosporidia: Myxobolidae), parasite of the freshwater catfish *Rhamdia quelen* from the Brazilian Amazon region. *Revista Brasileira de Parasitologia Veterinária*, 26(4), 465-471.
- Abu-Elala, N. M., Attia, M. M., Abd-Elsalam, R. M., Gamal, A. ve Younis, N. A. (2021). Peracetic acid treatment of *Ichthyophthirius multifiliis* (Ciliophora: Ichthyophthiriidae) and *Trichodina* spp. reduces the infection by *Aeromonas hydrophila* and improves survival in Nile tilapia (*Oreochromis niloticus*). *Aquaculture*, 538, 736591.

- Al-Jubouri, M. O., Al-Niaeem, K. S. ve Taher, M. M. (2017). Clinical diagnosis of some diseases and parasites infected common carp (*Cyprinus carpio*) cultivated in floating cages at Babylon province. In *Euph. J. Agric. Sci.(Second Vet. Conf.)* (pp. 229-244).
- Al-Niaeem, K. S. K. (2006). Infection distribution of fish parasites in Basrah Province and pathological effects of *Saprolegnia* sp. and its susceptibility to some plant extracts (Yüksek lisans tezi). Thesis Coll. Agric., Univ.
- Aloo, P. A. (2001). Occurrence of larval *Contraecaecum* (Nematoda: Heterocheilidae) in three teleostean species from Lake Naivasha, Kenya. *East African J. Sci.*, 3: 1-12.
- Al-Salim, N.K.; Khamees, N.R. ve Al-Niaeem, K.S. (2008). Histopathological effects in the common carp *Cyprinus carpio* experimentally infected with *Saprolegnia* sp. *JKAU Mar. Sci.*, 19: 1-19.
- Anonim, (2021). Erişim adresi: https://www.akuamaks.com/files/files/akuamaks%20e-catalog_2019-m.pdf
- Arkush, K. D. ve Hedrick, R. P. Development of Monoclonal Antibodies Against Channel Catfish Virus, the Causative Agent of Channel Catfish Virus Disease IAAAM Archive.
- Ariel, E. ve Owens, L. (1997). Epizootic mortalities in tilapia *Oreochromis mossambicus*. *Dis. Aquat. Org.* 29, 1-6.
- Arthur, J. R. ve Te, B. Q. (2006). *Checklist of the parasites of fishes of Viet Nam* (No. 369). Rome: FAO.
- Arumugam, U., Stalin, N., & Rebecca, G. P. (2017). Isolation, molecular identification and antibiotic resistance of *Enterococcus faecalis* from diseased Tilapia. *Int. J. Curr. Microbiol. Appl. Sci.* 6(6), 136-146.
- Ashraf, U.; Yuanan, L. U.; Li, L.; Junfa, Y.; Min, W. ve Xueqin, L. (2016). Spring viraemia of carp virus: recent advances. *J. Gen. Virol.*, 97: 1037-1051.
- Aydoğdu, A., Yıldırımhan, H. S. ve Altunel, F. N. (2002). İznik (Bursa) gölünde yaşayan yayın balığı (*Silurus glanis* L.)'nın Helminth faunası üzerine bir araştırma. *Türkiye Parazitoloji Dergisi*, 26(2), 216-220.
- Bahri, F., Nadjib, M., Prasetya, M. ve Decamp, O. (2009). Cost effective pangasius culture in Lampung. *Aqua Culture Asia Pacific*, 5(5), 38-39.
- Barson, M. (2004). The occurrence of *Contraecaecum* sp. larvae (Nematoda: Anisakidae) in the catfish *Clarias gariepinus* from Lake Chivero, Zimbabwe. *Onderstepoort J. Vet. Res.* 71:35-39.
- Bromage, E. S., Thomas, A. ve Owens, L. (1999). *Streptococcus iniae*, a bacterial infection in barramundi *Lates calcarifer*. *Diseases of aquatic organisms*, 36(3), 177-181.
- Cai, S.H., Wu, Z.H., Jian, J.C., Lu, Y.S. ve Tang, J.F. (2012). Characterization of pathogenic *Aeromonas veronii* bv. *veronii* associated with ulcerative syndrome from Chinese longsnout catfish *Leiocassis longirostris* Gunther). *Braz. J. Microbiol.* 43, 382-388.
- Cengizler, İ., 2006. Balık Hastalıkları. Nobel Kitabevi.s.133)
- Charo-Karisa, H., Ali, S. E., Marijani, E., Ibrahim, N. A., Trinh, T. Q., Chadag, M. V. ve Benzie, J. A. (2021). Genetic parameters for black spot disease (diploptostomia-

- sis) caused by *Uvulifer* sp. infection in Nile tilapia (*Oreochromis niloticus* L.). *Aquaculture*, 532, 736039.
- Chitmanat, C., Tongdonmuan, K. ve Nunsong, W. (2005). The use of crude extracts from traditional medicinal plants to eliminate *Trichodina* sp. in tilapia (*Oreochromis niloticus*) fingerlings. *Songklanakarın J. Sci. Technol.*, 27(Suppl 1), 359-364.
- Crumlish, M., Dung, T.T., Turnbull, J.F., Ngoc, N.T.N. ve Ferguson, H.W. (2002). Identification of *Edwardsiella ictaluri* from diseased freshwater catfish, *Pangasius hypophthalmus* (Sauvage), cultured in the Mekong Delta, Vietnam. *Journal of Fish Diseases* 25(12) 733-736.
- De Groof, A., Guelen, L., Deijs, M., van der Wal, Y., Miyata, M., Ng, K. S. Ve diğerleri. (2015). A novel virus causes scale drop disease in *Lates calcarifer*. *PLoS Pathog.*, 11(8),
- Dong, H. T., Nguyen, V. V., Le, H. D., Sangsuriya, P., Jitrakorn, S., Saksmerprom, V. ve diğerleri. (2015). Naturally concurrent infections of bacterial and viral pathogens in disease outbreaks in cultured Nile tilapia (*Oreochromis niloticus*) farms. *Aquaculture*, 448, 427-435.
- Dong, H. T., Jitrakorn, S., Kayansamruaj, P., Pirarat, N., Rodkhum, C., Rattanojpong, T. ve diğerleri. (2017b). Infectious spleen and kidney necrosis disease (ISKND) outbreaks in farmed barramundi (*Lates calcarifer*) in Vietnam. *Fish & shellfish immunology*, 68, 65-73.
- Dixon, P.F. ve Longshaw, C.B. (2005). Assessment of commercial test kits for identification of Spring viraemia of carp virus. *Dis. Aquat. Organ.*, 67: 25-29.
- El Deen, A. I. N. ve Razin, A. M. (2009). Application of Some Medicinal Plants to Eliminate *Trichodina* sp. in Tilapia (*Oreochromis niloticus*). *Report and Opinion*, 12(17), 1.
- Eli, A.; Briyai, O.F. ve Abowei, J.F.N. (2011). A review of some fungi infection in African fish saprolegniasis, dermal mycoses, branchiomyces infections, systemic mycoses and dermocyctidium. *Asian J. Med. Sci.*, 3(5): 198-205.
- Figueiredo, H.C., Klesius, P.H., Arias, C.R., Evans, J., Shoemaker, C.A., Pereira, D.J. ve diğerleri. (2005). Isolation and characterization of strains of *Flavobacterium columnare* from Brazil. *J. Fish Dis.* 28, 199-204.
- Fijan, N. (1999). Spring viraemia of carp and other viral diseases and agents of warm-water fish. In: *Fish Diseases and Disorders 3: Viral, bacterial and fungal infections*, Woo P.T.K. and Bruno D.W., eds. CAB International, New York, USA, 177-244.
- Hamzah, J. A., Abdulkarim, M. F. ve Khaled, M. (2017). Diagnosis of parasitic diseases of fish cages (*Cyprinus carpio*) in the Al Furat River Bridge of Mussayab in Babylon Province. *Kufa J. Veter. Med. Sci.*, 8 (1): 90-93.
- He, M; Yan, X. C. ve Liang, Y. (2014). Evolution of the viral hemorrhagic septicemia virus: Divergence, selection and origin. *Mol. Phylogenet. Evol.*, 77:34-40.
- Hershberger, P. K., Gregg, J. L. ve Grady, C. A. (2011). Passive immunization of Pacific herring against viral hemorrhagic septicemia. *J. Aquat. Anim. Health*, 23:140-147.

- Hoffman, G. L. (2019). Miscellaneous Fishes: Parasites of Ornamental, Tropical, and Brackish Water to Marine Fishes. In *Parasites of North American Freshwater Fishes* (pp. 403-408). Cornell University Press.
- Idowu, S. O. (2013). *Encyclopedia of corporate social responsibility* (Vol. 21). N. Capaldi, L. Zu, & A. D. Gupta (Eds.). New York: Springer.
- Kayansamruaj, P., Pirarat, N., Hirono, I. ve Rodkhum, C. (2014a). Increasing of temperature induces pathogenicity of *Streptococcus agalactiae* and the up-regulation of inflammatory related genes in infected Nile tilapia (*Oreochromis niloticus*). *Vet. Microbiol.* 172, 265–271.
- Kayansamruaj, P., Pirarat, N., Katagiri, T., Hirono, I. ve Rodkhum, C. (2014b). Molecular characterization and virulence gene profiling of pathogenic *Streptococcus agalactiae* populations from tilapia (*Oreochromis* sp.) farms in Thailand. *J. Vet. Diagn. Invest.* 26, 488–495.
- Koyun, M., Ulupinar, M., ve Mart, A. (2015). First Record of *Lernaea cyprinacea* L. 1758 (Copepoda: Cyclopoida) on *Cyprinion macrostomus* Heckel, 1843 from Eastern Anatolia, Turkey. *Biharean Biologist*, 9(1), 44-46.
- Lakra, W. S. ve Singh, A. K. (2010). Risk analysis and sustainability of *Pangasianodon hypophthalmus* culture in India. *Aquaculture Asia*, 15(1), 34-37.
- Li, Y. ve Cai, S.H. (2011). Identification and pathogenicity of *Aeromonas sobria* on tail-rot disease in juvenile tilapia *Oreochromis niloticus*. *Curr. Microbiol.* 62, 623–627.
- Li, H., Luo, L., Zhou, Y., Ling, H., Yang, Q. ve Qi, D. (2020). Dietary administration of *Enterococcus faecalis* affects the growth, disease resistance and immune function of tilapia (*Oreochromis niloticus*). *Aquaculture Reports*, 18, 100440.
- Latremouille, D.N. (2003). Fin erosion in aquaculture and natural environments. *Reviews in Fisheries Science*, 11(4): 315-335
- Lom, J., Dyková, I. ve Shaharom, F. (1990). *Microsporidium arthuri* n. sp., parasite of *Pangasius sutchi* (Pangasiidae, Siluroidea) in South-East Asia. *Diseases of aquatic Organisms*, 8(1), 65-67.
- Masud, S., Pandey, A. ve Paniprasad, K. (2004). Outbreak of infection in an ornamental catfish, *Pangasius sutchi*. *Fishery Management*, 181.
- Martins, M. L., Mouriño, J. L. P., Amaral, G. V., Vieira, F. N., Dotta, G., Jatobá, A. M. B., ve diğerleri. (2008). Haematological changes in Nile tilapia experimentally infected with *Enterococcus* sp. *Brazilian Journal of Biology*, 68(3), 657-661.
- McGrogan, D.G., Ostland, V.E., Byrne, P.J. ve Ferguson, H.W. (1998). Systemic disease involving an iridovirus like agent in cultured tilapia, *Oreochromis niloticus* L.—a case report. *J. Fish Dis.* 21, 149–152.
- Mifsud, C. ve Rowland, S. J. (2008). Use of salt to control ichthyophthiriosis and prevent saprolegniosis in silver perch, *Bidyanus bidyanus*. *Aquaculture Research*, 39(11), 1175-1180.
- Molnár, K., Székely, C., Mohamed, K. ve Shaharom-Harrison, F. (2006). Myxozoan pathogens in cultured Malaysian fishes. I. Myxozoan infections of the sutchi catfish *Pangasius hypophthalmus* in freshwater cage cultures. *Diseases of aquatic organisms*, 68(3), 209-218.

- Muroga, K.; Yasunobu, H. Okada, N. Ve Masumura, K. (1990). Bacterial enteritis of cultured flounder *Paralichthys olivaceus* larvae. *Dis. Aquat. Org.*, 9: 121-125.
- Nadirah, M., Ruhil, H.H., Jalal, K.C. ve Najiah, M. (2012). Occurrence of *Plesiomonas shigelloides* cultured red hybrid tilapia (*Oreochromis niloticus*) from tropical rivers, east coast Malaysia. *Pak. J. Biol. Sci.* 15, 600–603.
- Nahar, S., Rahman, M. M., Ahmed, G. U. ve Faruk, M. A. R. (2016). Isolation, identification, and characterization of *Aeromonas hydrophila* from juvenile farmed pangasius (*Pangasianodon hypophthalmus*). *International Journal of Fisheries and Aquatic Studies*, 4(4), 52-60.
- Nguyen, V. V., Dong, H. T., Senapin, S., Kayansamruaj, P., Pirarat, N., Rung-Ruangkijkrui, T., ... & Rodkhum, C. (2020). Synergistic infection of *Ichthyophthirius multifiliis* and *Francisella noatunensis* subsp. *orientalis* in hybrid red tilapia (*Oreochromis* sp.). *Microbial Pathogenesis*, 147, 104369.
- Nguyen, H. V. ve Campet, M. (2009). Study on common diseases in farmed *Pangasius* in the Mekong Delta. *Aqua Culture Asia Pacific*, 5(4), 22-24.
- Nurhajati, J., Aryantha, I. N. P. ve Indah, D. G. (2012). The curative action of *Lactobacillus plantarum* FNCC 226 to *Saprolegnia parasitica* A3 on catfish (*Pangasius hypophthalmus* Sauvage). *International Food Research Journal*, 19(4).
- Olivares-Fuster, O., Klesius, P.H., Evans, J. ve Arias, C.R. (2008). Molecular typing of *Streptococcus agalactiae* isolates from fish. *J. Fish Dis.* 31, 277–283.
- Özdemir, G., Çelik, E. Ş., Yılmaz, S., Gürkan, M. ve Kaya, H. (2016). Histopathology and blood parameters of bogue fish (*Boops boops*, Linnaeus 1758) parasitized by *Ceratomyxa oestroides* (Isopoda: Cymothoidae). *Turkish Journal of Fisheries and Aquatic Sciences*, 16(3), 585-596.
- Quy, P. V., Yılmaz, B. H. Ve Yıldız, H. Y. 2(021). In vitro Antiparasitic Activity of Ginger (*Zingiber officinale*) Bulb and Pomegranate (*Punica granatum*) Peel Against Monogenean Fish Parasite, *Dactylogyrus* sp. *Acta Aquatica Turcica*, 17(1), 56-63.
- Pasnik, D. J., Evans, J. J. ve Klesius, P. H. (2009). Fecal strings associated with *Streptococcus agalactiae* infection in Nile tilapia, *Oreochromis niloticus*. *Open Vet. Sci. J.*, 3: 6-8.
- Rahman, M.M. ve Chowdhury, M.B.R. (1999). Incidence of ulcer disease in African catfish (*Clarias gariepinus* Burchell) and trial for its chemotherapy. *Bangladesh J. Fish. Res.*, 3(2): 193-200.
- Rehulka, J., Petras, P., Marejkova, M., Aldova, E., 2015. *Vibrio cholera* non-O1/non-O139 infection in fish in the Czech Republic. *Vet. Med.- Czech* 60, 16–22.
- Roberts, R. J. (2001). *Fish Pathology*. Third edition. W. B. Saunders, 472 p.
- Roberts, I. G. (2010). *Agreement and head movement: Clitics, incorporation, and defective goals* (Vol. 59). MIT Press.
- Rodkhum, C., Kayansamruaj, P. ve Pirarat, N. (2011). Effect of water temperature on susceptibility to *Streptococcus agalactiae* serotype Ia infection in Nile tilapia *Oreochromis niloticus* (L.). *Thai J. Vet. Med.* 41, 309–314.
- Saint-Erne, N. (2010). Diagnostic techniques and treatments for internal disorders of Koi (*Cyprinus carpio*). *The veterinary clinics of North America. Exotic animal practice*, 13(3), 333-347.

- Sathish, S., Chidambaram, P., Uma, A. ve Yuvarajan, P. (2021). Prevalence of parasites in tilapia farms and their management practices in Tamil Nadu, India.
- Senderovich, Y., Izhaki, I. ve Halpern, M. (2010). Fish as reservoirs and vectors of *Vibrio cholerae*. PLoS One 5, e8607. <http://dx.doi.org/10.1371/journal.pone.0008607>.
- Shoemaker, C. A., Klesius, P. H. ve Evans, J. J. (2000,). Diseases of tilapia with emphasis on economically important pathogens. In *Proceedings of the 5th International Symposium on tilapia Aquaculture*.
- Singh, A. K. ve Lakra, W. S. (2012). Culture of *Pangasianodon hypophthalmus* into India: impacts and present scenario. *Pakistan journal of biological Sciences*, 15(1), 19.
- Supriyadi, H., Komarudin, O. ve Slembrouck, J. (1998). Preliminary study of the source of *Aeromonas hydrophila* infection on *Pangasius hypophthalmus* larvae. In *The Biological diversity and aquaculture of clariid and Pangasid Catfishes in South East Asia. Proceedings of The Mid-Term Workshop of The "Catfish Asia Project" Cantho, Vietnam* (pp. 219-222).
- Tabanez, J. A. B. (2019). *Acompanhamento de uma produção aquícola de Sparus aurata e Dicentrarchus labrax e ensaio experimental da prevalência e incidência parasitária de Caligus minimus em Dicentrarchus labrax* (Doctoral dissertation).
- Taher, M.M.; Al-Dubakel, A.Y. ve Saleh, J.H. (2013). Effects of stocking density of common carp cultivated in floating cages on mortality ratio of spring viraemia of carp and use some chemotherapeutic control. *Basrah J. Agric. Sci.*, 26 (1): 86-96. (In Arabic).
- Talpur, A. D., Ikhwanuddin, M. ve Bolong, A. M. A. (2013). Nutritional effects of ginger (*Zingiber officinale* Roscoe) on immune response of Asian sea bass, *Lates calcarifer* (Bloch) and disease resistance against *Vibrio harveyi*. *Aquaculture*, 400, 46-52.
- Treves-Brown, K. M. (2013). *Applied fish pharmacology* (Vol. 3). Springer Science & Business Media.
- Xu, D. H., Shoemaker, C. A. ve Zhang, D. (2015). Treatment of *Trichodina* sp reduced load of *Flavobacterium columnare* and improved survival of hybrid tilapia. *Aquaculture Reports*, 2, 126-131.
- Yalınkılıç, H. S., 2016. Balık Hastalıklarında Aşı Kullanımı. *Türkiye Klinikleri J Vet Sci Pharmacol Toxicol-Special Topics*, 2(1), 38-46.
- Yavuzcan, H., Korkmaz, A. S. ve Zencir, O. (2003). The infection of tench (*Tinca tinca*) with *Ligula intestinalis* plerocercoids in Lake Beyşehir (Turkey). *Bull. Eur. Ass. Fish Pathol.*, 23: 223-227.
- Yustiati, A., Kundari, D. F., Suryana, A. A. ve Suryadi, I. B. B. (2019). Effectiveness of potassium diformate addition to feed to improve immune system of *Pangasius* (*Pangasianodon hypophthalmus*) that challenged by *Aeromonas hydrophila*. *World Scientific News*, 134(2), 86-100.