

# Combinatory effects of dietary Inulin and *Enterococcus faecium* in Benni, *Mesopotamichthys sharpeyi* on some hematological parameters, Serum biochemical and resistance to environmental stress

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## Abstract

This study has been carried in order to determine the effect of dietary combinatory probiotic and prebiotic on some hematological parameters, serum biochemical and resistance to environmental stresses of Benni (*Mesopotamichthys sharpeyi*) juveniles. 600 fish with initial average weight of  $3.83 \pm 0.2$  g were stocked in 15 tanks. Five dietary treatments included treatment 1 (control) which was fed with basal commercial diet only and the other treatments 2 to 5 containing 0.5, 1, 1.5 and 2 g *Enterococcus faecium* ( $5 \times 10^{11}$  CFU/KG) and Inulin per kg of diets, respectively. The experimental trail was carried out in triplicate for a period of 60 days. Experimental fish were fed (3% body wet weight) daily at 08:00, 13:00 and 18:00. The results of the present study demonstrated that the significantly increased the hematological parameters among the treatments. The hematocrit and white blood cells were increased with increasing by combinatory dietary levels. However, the red blood cells and hemoglobin were decreased. In addition, total protein and globulin indices significantly increased with increasing dietary levels. However, cholesterol and triglyceride levels of experimental fish decreased among treatments. The results of environmental stresses (thermal, salinity and pH stress) showed that resistance and survival rate of fish were significantly higher in the treatments with higher dietary probiotic and prebiotic than the control treatment. The present study revealed that the best results for *M. sharpeyi* juveniles were achieved at 1.5 g to 2 per kg dietary *Enterococcus faecium* ( $5 \times 10^{11}$  CFU/KG) and Inulin based on improved of hematological parameters, serum biochemical composition and resistance against the environmental stresses.

**Key words:** *Mesopotamichthys sharpeyi*, *Enterococcus faecium*, Inulin, Environmental stress

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## References

- Ahmadi, K.; Vosoghi, A.; Mirvaghefi, A.R.; Ataee Mehr, B. and Banaee, M. (2010). Effect of extraction of *Silybum marianum* on some non-specific immunogenic factors of rainbow trout (*Oncorhynchus mykiss*). *Journal of Marine Biology*, 2(7): 19-26.
- Alishahi, M. and Mesbah, M. (2012). Effects of *Viscum album* and *Nigella sativa* extracts on survival rate, growth factors and resistance to *Aeromonas hydrophila* infection in gold fish *Carassius auratus*. *Journal of Veterinary Research*, 67(3): 285-290.
- Andrews, C.; Exell, A. and Carrington, N. (2011). *The manual of fish health: everything you need to know about aquarium fish, their environment and disease prevention*. Interpet Publishing, P: 208.
- Bahrami Babahydari, S.; Dorafshan, S.; Paykan-heyrati, F.; Mahboobi Soofiani, N. and Vahabi, M.R. (2013). Effect of dietary wood betony, *Stachys lavandulifolia vahl* extract on growth performance, some hematological and biochemical parameters of common carp, *Cyprinus carpio*. *Iranian Journal of Fisheries Science*, 14 (4): 805-817.
- Banaee, M.; Mirvaghefi, A.R.; Rafiee, Gh. and Sorda, G.A. (2010). Effect of silymarin on blood biochemical factors of rainbow trout (*Oncorhynchus mykiss*). *Journal of Fisheries (Iranian Journal of Natural Resources)*, 4: 271-286.
- Beit Sayah, Kh.; Chelemale Dezfolinezhad, M.; Mesbah, M. and Asgari Sari, E. (2012). Effect of different levels of vitamin C on blood factors in *Barbus Grus*. *Journal of Veterinary Research*, 4(14): 1-9.
- Burr, G.; Gatlin, D. and Ricke, S. (2005). Microbial ecology of the gastrointestinal tract of fish and the potential application of prebiotics and probiotics in finfish aquaculture. *Journal of the World Aquaculture society*, 36(4): 425-436.
- Donaldson, E.M. (1981). Pituitary-interrenal axis as an indicator of stress in fish. *Stress and fish*. Academic Press, New York, Pp: 11-47.
- Eaton, T.J. and Gasson, M.J. (2001). Molecular screening of *Enterococcus virulence* determinants and potential for genetic exchange between food and medical isolates. *Applied and environmental microbiology*, 67(4): 1628-1635.
- Ekanem, J.T.Y. and Usuf, O.K. (2008). Some biochemical and haematological effects of black seed (*Nigella sativa*) oil on Trypanosoma brucei-infected rats. *African Journal of Biotechnology Research*, 7(2): 153-157.
- Esmaili, M.; Jaefarian, H.; Akrami, R. and Porabbasali, M. (2011). Effectiveness of *Huso huso* extracted bacillus on resistance and biochemical factors of common carp larvae (*Cyprinus carpio*). *Journal of Veterinary Research*, 2(8): 15-24.
- Fanouraki, E.; Divanach, P. and Pavlidis, M. (2007). Baseline values for acute and chronic stress indicator in sexually immature red porgy (*Pagrus pagrus*). *Aquaculture*, 265(1-9): 294-304.
- Faramarzi, M.; Kiaalvandi, A. and Iranshahi, F. (2011). The effect of probiotics on growth performance and body composition of common carp (*Cyprinus carpio*). *Journal of animal and veterinary advances*, 10(18): 2408-2413.
- Feldman, B.F.; Zinkl, J.G. and Jain, N.C. (2000). *Schalm's Veterinary Hematology*. (5th ed.) Lippincott Williams & Wilkins viruse. Philadelphia, USA, Pp: 1120-1124.
- Floyd, R.F. (2009). *Stress-its role in fish disease*. Institute of Food and Agriculture Sciences, University of Florida. Pp: 109-144.
- Ghodratizadeh, S.; Ghodratizadeh, S.; Farhoudi, M. and Habibian, R. (2011). Effect of addition of *Saccharomyces cerevisiae* and *Bacillus subtilis* in diet on selected hematological and biochemical parameters in common carp (*Cyprinus carpio*). *Word journal of fish and marine sciences*, 3: 96-99.
- Harikrishnan, R.; Balasundaram, C.; Kim, M.C.; Kim, J.S.; Han, Y.J. and Heo, M.S. (2009). Innate immune response and disease resistance in *Carassius auratus* by triherbal solvent extracts, *Fish and Shellfish Immunology*, 27: 508-515.

- Havsteen, B.H. (2002). The biochemistry and medical significance of the flavonoids. *Pharmacology and Therapeutics*, 96(2-3): 67-202.
- Hoseinifar, S.H.; Mirvaghefi, A.; Merrifield, D.L.; Amiri, B.M.; Yelghi, S. and Bastami, K.D. (2011). The study of some haematological and serum biochemical parameters of juvenile beluga (*Huso huso*) fed oligofructose. *Fish Physiology and Biochemistry*, 37(1): 91-96.
- Houston, A.H. (1990). Blood and circulation. In: Schreck CB, Moyle PB (eds) *Methods in fish biology*. American Fisheries Society. Bethesda, Maryland, Pp: 273-335.
- Irianto, A. and Austin, B. (2002). Probiotics in aquaculture. *Journal of Fish Disease*, 25: 633-642.
- Jha, A.K.; Pal, A.K. and Sahu, P. (2007). Haemato- immunological responses to dietary yeast RNA, w-3 fatty acid and b-carotene in *Catla catla* juveniles. *Fish and Shellfish Immunology*, 23(5): 917-927.
- Johnson, A.M.; Rohlf, E.M. and Silvrman, L.M. (1999). Proteins. In: Burtis C.A., Ashwood E.R. Editors. *Tietz textbook of clinical chemistry*. 3<sup>rd</sup> ed. Philadelphia: W.B. Saunders Company, Pp: 477-540.
- Kazemi, R.; Pordehghani, M.; Yousefi, Y.; Yarmohammaddi, M. and Nasri, M. (2010). Physiology of aquatic circulatory system and applied hemodynamics. *Bazargan Publishing House, Rasht*, P: 194.
- Klare, I.; Konstabel, C.; Badstübner, D.; Werner, G. and Witte, W. (2003). Occurrence and spread of antibiotic resistances in *Enterococcus faecium*. *International Journal of Food Microbiology*, 88(2-3): 269-290.
- Kökdil, G.; Tamer, L.; Ercan, B.; Çelik, M. and Atik, U. (2006). Effects of *Nigella orientalis* and *N. segetalis* fixed oils on blood biochemistry in rats. *Phytotherapy Research*, 20(1): 71-75.
- Kosha, A.; Asgarian, F.; Chati, H.V. and Geli, V.S. (2006). Study of steroids bonded protein- (SBP) in white fish (*Rutilus frisii kutum*) with an emphasis on 17 beta estradiol. *Iranian Journal of Fisheries Sciences*, 6(2): 92-104.
- Kubilay, A. and Ulukoy, G. (2002). The effects of acute stress on rainbow trout (*Oncorhynchus mykiss*). *Turkish Journal of Zoology*, 26: 249-254.
- Kumar, S.; Sahu, N.P.; Pal, A.K.; Choudhury, D.; Yengkokpam, S. and Mukherjee, S.C. (2005). Effect of dietary carbohydrate on haematology, respiratory burst activity and histological changes in *Labeo rohita* juveniles. *Fish & Shellfish Immunology*, 19: 331-344.
- Kunlee, Y. and salminen, S. (2009). *Hand book of probiotics and prebiotics*. Published by John Wiley & Sons, Inc., Hoboken, New Jersey Published simultaneously in Canada, Pp: 111-123.
- Liu, K.F.; Chiu, C.H.; Shiu, Y.L. and Cheng, W. (2010). Effects of the probiotic, *Bacillus subtilis* E20, on the survival, development, stress tolerance, and immune status of white shrimp, *Litopenaeus vannamei* larvae. *Fish & Shellfish Immunology*, 28(5-6): 837-844.
- Lin, S.H.; Mao, S.H.; Guan, Y.; Luo, L.; Luo, L. and Pan, Y. (2012). Effects of dietary chitosan oligosaccharides and *Bacillus coagulans* on the growth, innate immunity and resistance of koi (*Cyprinus carpio koi*). *Aquaculture* 342: 36-41.
- Mehrabi, Z.; Firouzbaksh, F. and Jafarpour, A. (2011). Effects of dietary supplementation of synbiotic on growth performance, serum biochemical parameters and carcass composition in rainbow trout (*Oncorhynchus mykiss*) fingerlings. *Journal of Animal physiology and Animal nutrition*, 96(3): 474-481.
- Merrifield, D.L.; Dimitroglou, A.; Foey, A.; Davies, S.J.; Baker R.T.M. and Bøggwald, J. (2010). The current status and future focus of probiotic and prebiotic applications for salmonids. *Aquaculture*, 302(1-2): 1-18.
- Minabi, Kh.; Zakeri, M.; Mousavi, S.M. and Minabi, E. (2013). The effects of feeding frequency and water temperature on growth, nutrition and biochemical parameters of Beni. *Iranian Veterinary Journal*, 9(1): 85-94.
- Moriarty, D.J.W. (1998). Control of luminous *Vibrio* species in penaeid aquaculture pond. *Aquaculture*, 164 (1-4): 351-8.
- Morris, M.W. and Davey, F.R. (1996). Basic examination of blood. In: Henry JB (ed). *Clinical diagnosis and management by laboratory methods*, 19th edn. WB Saunders, Philadelphia, USA, Pp: 549-593.
- Nafisi Bahabadi, M. (2006). *A practical guide to rainbow trout culture*. Hormozgan University Publications, Hormozgan, Pp: 22-31.

- Nayak, S.K.; Swain, P. and Mukherjee, S.C. (2007). Effect of dietary supplementation of probiotic and vitamin C on the immune response of Indian major carp (*Labeo rohita*). *Fish and Shellfish Immunology*, 23(4): 892-896.
- Nikoskelainen, S.; Ouwehand, A.C.; Bylund, G.; Salminen, S. and Lilius, E.M. (2003). Immuneenhancement in rainbow trout (*Onchorhynchus mykiss*) by potential probiotic bacteria (*Lactobacillus rhamnosus*). *Fish & Shell fish Immunology*, 15(5): 443-452.
- Roberts, R.J. (2001). *Fish Pathology*. Saunders, London, P: 472.
- Sharifuzzaman, S.M. and Austin, B. (2009). Influence of probiotic feeding duration on disease resistance and immune parameters in rainbow trout. *Fish & Shellfish immunology*, 27(3): 440-445.
- Tackaert, W.; Albei, P.; Leger, P. and Sorgeloos, P. (1989). Stress resistance as a criterion to evaluate quality of post larval shrimp reared under different feeding procedures. In: Proceeding, III Simposio Brasil erio sorbe Cultivo de Camaro, Vol. 1.MCR Aquaculture; Jodo Pesoa; Brazil, Pp: 393-403.
- Taras, D.; Vahjen, W. and Macha, M. (2006). Performance, diarrhea incidence, and occurrence of *Escherichia coli* virulence genes during long-term administration of a probiotic *Enterococcus faecium* strain to sows and piglets. *Journal of Animal Science*, 84(3): 608-617.
- Tatina, M.; Bahmani, M.; Soltani, M.; Abtani, B. and Gharibkhani, M. (2010). Effects of different levels of dietary vitamins C and E on some of hematological and biochemical parameters of Sterlet (*Acipenser ruthenus*). *Journal of Fisheries & Aquatic Science* 5(1): 1-11.
- Thrall, M.A. (2004). *Veterinary haematology and clinical chemistry*. Lippincott Williams and Wilkins, USA, Pp: 247-402.
- Vazquez-Juarez, R.C.; Gomez-Chiarri, M.; Barrera-Saldaña, H.; Hernandez-Saavedra, N.; Dumas, S. and Ascencio, F. (2005). Evaluation of DNA vaccination of spotted sand bass (*Paralabrax maculatofasciatus*) with two major outer-membrane protein-encoding genes from (*Aeromonas veronii*). *Fish & shellfish immunology*, 19(2): 153-163.
- Vulevic, J.; Rastall, R.A. and Gibson, G.R. (2004). Developing a quantitative approach for determining the in vitro prebiotic potential of dietary oligosaccharides. *FEMS Microbiology Letters*, 236(1): 153-159.
- Wang, Y.B.; Tian, Z.Q.; Yao, J.T. and Li, W.f. (2008). Effect of probiotics *Enterococcus faecium*, on tilapia (*Oreochromis niloticus*) growth performance and immune response. *Aquaculture*, 277(3): 203-207.
- Yar-Ahmadi, P.; Moradi, N. and Ghyasvandi, N. (2014). The effect of dietary supplemented with Synbiotic (Biomim IMBO®) on growth performance, carcass composition, hematological and serum biochemical parameters of common carp (*Cyprinus carpio* Linnaeus, 1758, Cyprinidae). *Journal of Chemical, Biological and Physical Sciences*, 4(3): 2129-2139.
- Ye, J.D.; Wang, K.; Li, F.D. and Sun, Y.Z. (2011). Single or combined effects of fructo- and mannan oligosaccharide supplements and *Bacillus clausii* on the growth, feed utilization, body composition, digestive enzyme activity, innate immune response and lipid metabolism of the Japanese flounder (*Paralichthys olivaceus*). *Aquaculture Nutrition*, 17(4): 902-911.
- Yousefian, M.; Sheikholeslami, M.; Amiri A. and Kor, D. (2010). Serum biochemical parameter of male, immature and female Persian sturgeon (*Acipenser persicus*). *Australian Journal Basic and Applied Research*, 5: 476-481.
- Zhang, Q.; Tan, B.; Mai, K.; Zhang, W.; Ma, H. and Ai, Q. (2011). Dietary administration of *Bacillus* (*B. licheniformis* and *B. subtilis*) and isomaltooligosaccharide influences the intestinal microflora, immunological parameters and resistance against *Vibrio alginolyticus* in shrimp, *Penaeus japonicus* (Decapoda: Penaeidae). *Aquaculture Research*, 42(7): 943-952.