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Effect of dietary bovine lactoferrin on growth, haematology and non-specific immune response in rainbow trout (*Oncorhynchus mykiss)*

Samad Rahimnejad[1], Naser Agh[2], MohammadReza Kalbassi[1] & Sanaz Khosravi[3]

[1]Department of Fisheries, Faculty of Marine Sciences, Tarbiat Modares University, Noor, Iran

[2]Department of Aquaculture, Artemia and Aquatic Animals Research Institute, Urmia University, Urmia, Iran

[3]Department of Marine Biology, Faculty of Marine Sciences, Tarbiat Modares University, Noor, Iran

Correspondence: Samad Rahimnejad, Jeju National University, Department of Marine Life Sciences, Jeju-Du, Jeju 690-756, Korea. E-mail address: srn2003@gmail.com

Abstract

The aim of this study was to investigate the effect of dietary lactoferrin (Lf) on growth, haematology and non-specific immune response of rainbow trout *Oncorhynchus mykiss* (Walbaum). Fish were fed an experimental diet containing 0 (as control), 50, 100, 200 and 400 mg Lf kg^{-1} diet twice daily for 8 weeks and sampled at 2, 4, 6 (immune function and growth), and 8 weeks (immune function, haematology and growth). Statistical analyses revealed no significant effects of dietary Lf on growth performance (specific growth rate, weight gain, feed conversion ratio, feed intake and condition factor) or haematological parameters (red and white blood cell count, haemoglobin, haematocrit, serum iron and total iron binding capacity [TIBC]). Among the serum non-specific immune parameters, lysozyme activity increased significantly in fish fed 100, 200, or 400 mg Lf kg^{-1} feed for 8 weeks, whereas haemolytic complement activity increased in fish fed 100 and 400 mg Lf kg^{-1} diet after 6 weeks. The antiprotease activity increased in groups fed 100, 200 or 400 mg Lf kg^{-1} diet after 8 weeks. However, no significant effect was observed on serum peroxidase level. It can be concluded that feeding of rainbow trout on the diet supplemented with 100 mg kg^{-1} or higher for 8 weeks enhances the non-specific immune response.

Keywords: Lactoferrin, growth, haematology, non-specific immune, rainbow trout *Oncorhynchus mykiss* (Walbaum)

Introduction

Aquaculture is the fastest growing animal-producing sector now supplying nearly 50% of the world's food fish. In commercial culture, fish are reared in intensive systems, and such conditions often negatively affect the fish immune system and can increase susceptibility to disease (Kajita, Sakai, Atsuta & Kobayashi 1990; Rottmann, Francis-Floyed & Durborow 1992). However, few options, other than the limited use of antibiotics, are available to culturists in managing disease outbreaks once they occur. Antibiotics have several harmful side effects, such as the development of antibiotic resistant strains of pathogens and the risks of antibiotic residues in the environment and in cultured species meant for human consumption (Anderson 1992; Bagni, Archetti, Amadori & Marino 2000; Nakanishi, Kiryu & Ototake 2002; Kumari & Sahoo 2006; Sahu, Das, Mishra, Pradhan & Sarangi 2007). Therefore, a prerequisite for aquaculture to prosper in the future is to minimize the use of antibiotics in controlling fish disease outbreaks (Gudding, Lillehaug & Evensen 1999; Wu, Yuan, Shen, Tang, Gong, Li, Sun, Huang & Han 2007). Prevention of fish disease through stimulation of the immune system is considered a promising approach in aquaculture (Ardo, Yin, Xu, Varadi, Szigeti, Jeney & Jeney 2008). Although vaccine use for disease prevention can be effective, vaccination only provides resistance against specific pathogens through enhancement of the specific immune system (Ardo *et al.* 2008). Furthermore, effective vaccines may not be available