

Growth Performance, Hemato-Immunological Responses, and Digestive Enzyme Activities in Silvery-Black Porgy (*Sparidentex hasta*) Fed Dietary Bovine Lactoferrin

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Abstract An 8-week study was conducted to evaluate three different diets supplemented with bovine lactoferrin (LF) at 0 (control), 800, and 1200 mg LF kg⁻¹ diet on somatic growth, hemato-immunological parameters, antioxidant status, and digestive enzyme activities in silvery-black porgy (*Sparidentex hasta*) juveniles. Fish fed the 800 mg LF kg⁻¹ diet had higher growth performance and feed utilization parameters than the other groups. Hematological and liver antioxidant parameters were not affected by dietary LF supplementation. Fish fed the 800 mg LF kg⁻¹ diet had higher plasma lysozyme activity values than the other groups. Total protease activity was higher in fish fed LF-supplemented diets than the control group. Results indicated that diet supplemented with 800 mg kg⁻¹ for 8 weeks enhanced somatic growth performance, lysozyme activity, and proteolytic digestive enzyme activities in *S. hasta*, as well as improving feed efficiency parameters like the protein efficiency and feed conversion ratios.

Keywords Feed utilization · Immunostimulants · Non-specific immune response · Antioxidant status · Sparidae

Introduction

The use of antibiotics in controlling infection diseases in the aquaculture industry has several undesirable side effects such as threatening public health and environment safety through their bioaccumulation in aquatic animals, as well as inducing acquired drug resistance that may result in the development of antibiotic-resistant strains of pathogenic microorganisms [1]. In this regard, the replacement of antibiotics with environmentally friendly and efficient biological agents is a prerequisite for a prosperous and sustainable aquaculture industry. Immunostimulants as harmless, environmentally safe and bio-friendly agents have become one of the most promising applied feed additives in aquafeeds as alternative treatments for antibiotics, since they have been reported to control pathogens by activating the immune system of farmed aquatic animals [2]. Different classes of immunostimulants such as polysaccharides (i.e., β -glucans and chitosan), herbal extracts (i.e., essential oils), vitamins (i.e., vitamin C and E) and carotenoids, probiotics and their secondary metabolites, prebiotics, hormones (thyroxin), and biological factors (i.e., lectin, lactoferrin, and bactericidal peptides) have been proved that not only can induce potent immune responses and disease resistance but can also promote growth performance in the host [1, 3].

Lactoferrin (LF) is an 80 kDa iron-binding glycoprotein, which is a part of the transferrin protein family that is found in high concentrations in mammal's exocrine secretions such as the mucus, saliva, and milk, as well as in specific granules of polymorphonuclear immunocytes [4].

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