



Combination of Organic Zinc, Chromium and Selenium on Growth Performance and Immune Response of Red Tilapia (*Oreochromis spp.*)

Rawiwan Limwachirakhom^{1,3}, Srinoy Chumkam² and Orapint Jintasataporn^{*1}

¹Department of Aquaculture, Faculty of Fisheries, Kasetsart University, Bangkok, Thailand

²Faculty of Agriculture Technology, Valaya Alongkorn Rajabhat University, Pathum Thani, Thailand

³Nutrition Improvement Company, Nonthaburi, Thailand

*Corresponding author, E-mail: ffiora@ku.ac.th

Abstract

Red Tilapia (*Oreochromis spp.*) is a freshwater fish that is important for the economy of Thailand. However, the production cost is wide variation due to the climate and environmental conditions, which result in sudden death in red tilapia or contagious disease. To improve the quality of live fish and immunity for preventing disease in red tilapia, dietary trace elements that have a significant impact on immune functions, disease resistance, and controlling stress in fish must be considered. Minerals such as Chromium (Cr), Zinc (Zn), and Selenium (Se) are the three essential microminerals according to the important role in nutritional and physiological response in fish. This present study is designed to investigate the effects of combination organic trace mineral supplementation on growth performance and immunity. This study is assigned in CRD with 3 treatments and 4 replicates. Three diets supplemental with different organic minerals on top are applied to the fish; a) Control without trace mineral supplementation, b) T1 diet of 300 ppb Chromium-L-Methionine combined with 60 ppm Zinc amino acid complex, and c) T2 diet of 300 ppb Chromium-L-Methionine combined with 500 ppb Selenomethionine. Thirty-four red tilapia with an initial mean weight of 190 ± 12 gram/fish are randomly distributed to each cage in a freshwater pond, with a total of 12 cages. During the 8-week feeding trial, the fish are weighed every 2 weeks, and their blood samples are collected for studying the immune response. The results show that red tilapia fed with a combination of Chromium-L-Methionine combination and Zinc amino acid complex in T1 has significantly higher ($P < 0.05$) final weight (586.58 ± 22.91 g/fish), weight gain (394.07 ± 25.91 g/fish), and average daily gain (7.04 ± 0.46 g/fish), followed by T2, which has higher growth performance compared to the control diet without organic trace minerals added. Meanwhile, the combination of Chromium-L-methionine and Selenomethionine in T2 show a significantly higher level of antioxidative stress enzymes ($P < 0.05$), glutathione peroxidase (GSH-Px) at 9.65 ± 2.21 nmol, compared with the control diet (6.71 ± 0.33 nmol). Therefore, a combination of Chromium-L-Methionine and Zinc amino acid complex enhances red tilapia growth performance and feed utilization. Focusing on the antioxidative stress enzyme activity, a combination of Chromium-L-Methionine and Selenomethionine improves the immune response, especially glutathione.

Keywords: red tilapia, immunity, organic trace minerals, growth performance, antioxidative stress enzymes