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Threonine affects growth, digestion capacity and immunity of fish

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Blunt snout bream (*Megalobrama amblycephala*) is a major cultured freshwater fish with great consumer demand and high production in China (e.g. about 0.70 million tons in 2012). However, few nutritional studies have been reported about this species. Indeed, this study conducted a nine week feeding trial to investigate the effects of threonine (Thr) on the growth, digestion capacity and immunity of juvenile blunt snout bream. For this purpose, juvenile fish (in triplicates) were fed with five diets containing graded Thr levels (0.58, 1.08, 1.58, 2.08 or 2.58% of the diet) to apparent satiation four times daily. At the end of the feeding trial the growth of fish and development of digestive organs, activities of digestive, absorptive and antioxidant enzymes and immune responses elevated as dietary Thr levels increased up to 1.58% ($P<0.05$), and thereafter decreased in most cases. The relative gene expression levels of enzymes (digestive chymotrypsin, trypsin, amylase and lipase), brush-border (AKP, Na^+/K^+-ATPase and γ-GT) and antioxidant (Cu/Zn-SOD, Mn-SOD, CAT, GPx1 and GST), target of rapamycin (TOR) and insulin-like growth factor-I (IGF-I) were up-regulated and the highest values were observed with 1.58% Thr or 1.58 and 2.08% Thr, whereas the gene expression of eukaryotic translation initiation factor 4E-binding protein (4E-BP2) and tumor necrosis factor alpha (TNF-α) were down-regulated as Thr levels increased up to 1.58% and thereafter increased ($P<0.05$). The dietary Thr requirement for juvenile blunt snout bream was estimated to be 1.57% of the diet, corresponding to 4.62% of dietary protein. The overall results indicate that the optimum Thr level improved growth performance, digestion and antioxidant capacity and immune status of juvenile blunt snout bream. This study could provide an insight in studies of fish nutrition and shed light on specific molecular mechanisms, which is fundamental in developing complete commercial feed for sustainable aquaculture of cultured fish.

Biography

Habte-Michael Habte-Tsion has completed his BSc in Marine Biology & Fisheries at University of Asmara, Eritrea. From 2002-2011, he was working at different aquaculture activities including Seawater Farms Eritrea and he was part of an advanced aquaculture programs. From 2011-2016, he studied MSc and PhD at Nanjing Agricultural University. During his MSc and PhD studies, he was engaged in research of Fish Nutrition, especially the requirements and further molecular mechanisms that prove the metabolic and immune functions of protein-essential amino acids. He has published one academic book and 24 original articles in preeminent peer-reviewed scientific journals.

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