

Establishing the optimal adenosine 5'-monophosphate level for hybrid striped bass *Morone chrysops* × *Morone saxatilis*: Effects on growth performance, nutrient digestibility, and immune modulation during acute and chronic stress

ABSTRACT

Five separate feeding trials were conducted with juvenile hybrid striped bass to evaluate the effects of dietary adenosine 5'-monophosphate (AMP) on growth performance, innate immunity, digestibility, digestive enzyme activity, and physiological responses after acute and chronic stress challenges. For all trials, a basal diet was formulated principally from soybean meal, soy protein concentrate, and fishmeal to contain 40% crude protein, 10% lipid, and 2.5 kcal estimated digestible energy g⁻¹. The experimental diets were prepared for the dose-response trial by supplementing AMP to the basal diet at six graded levels (0, 0.25, 0.5, 0.75, 1.5 and 2.0% of dry weight) at the expense of cellulose. Based on weight gain and protein retention responses after 8 weeks of feeding, the minimum requirement was estimated in a two-slope broken line model to be 0.46% and 0.34% of dry diet, respectively. Therefore, a diet supplemented with 0.5% AMP was evaluated against the basal dietary treatment in the four follow-up trials. The subsequent digestibility trial (4-week) showed that dietary AMP at 0.5% significantly ($P < 0.05$) improved apparent digestibility coefficient for organic matter and energy. Nevertheless, after 8 weeks of feeding, there were no significant interaction effects on the digestive enzymes trypsin, lipase, amylase, alkaline and acid phosphatases due to diet (basal and 0.5% AMP), intestinal section (anterior and posterior), or sampling time (10 h after and 20 h post prandial). In the acute-stress challenge trial, fish fed the diet with 0.5% AMP for 6 weeks had significant ($P < 0.05$) enhancement of innate immunity as reflected in the activity of plasma anti-protease at 0.5 and 1 h post-stress challenge (air exposure). A subsequent chronic stress trial, in which fish were cultured in 15 ppt salinity for 4 weeks, showed that plasma lysozyme activity and anti-protease activity were significantly immunosuppressed in fish fed the basal diet compared to those fed the diet supplemented with AMP at 0.5%. In addition, blood glucose was significantly higher in fish fed the basal diet; whereas, no statistical significance was detected in weight gain, plasma cortisol, hematocrit, or osmolality between both dietary treatments. To conclude, this study demonstrated that an exogenous supply of AMP at 0.5% of diet enhanced growth response of juvenile hybrid striped bass, enhanced their protein retention and increased digestibility coefficients for organic matter and energy. Furthermore, dietary AMP at 0.5% of dry weight showed capabilities to modulate immune responses under stressful conditions through enhancement of innate immunity and resistance to stress-induced immunosuppression.

Keyword: Nucleotide; Acute-stress; Chronic-stress; Immunity; Digestibility; Growth performance