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Protected forms of sodium butyrate improve the growth and health of Nile tilapia fingerlings during sexual reversion

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ABSTRACT

The present study evaluated the effect of pure and protected sodium butyrate with palm oil and buffered solution supplemented in the diet of Nile tilapia *Oreochromis niloticus* on the performance parameters, hematological parameters and disease resistance during sexual reversion. Initially, the minimum inhibitory concentration (MIC) of sodium butyrate (Na-butyrate) against *Aeromonas hydrophila* or *Streptococcus agalactiae* under three different pH to determine the concentration of inclusion of Na-butyrate in the diet were analyzed. After that a total of 3150 newly hatched post-larvae were distributed in 21 tanks with 100 L of capacity on six treatments and one control, in triplicate: fish fed unsupplemented diet (control); fish fed Na-butyrate supplemented diet (Pure $_{0.25\%}$ and Pure $_{0.5\%}$); fish fed Na-butyrate coated with palm oil (Oil $_{0.25\%}$ and Oil $_{0.5\%}$) and fish fed Na-butyrate coated with buffered solution (Buffer $_{0.25\%}$ and Buffer $_{0.5\%}$). After 28 days of feeding, zootechnical parameters, hematological parameters and resistance against *A. hydrophila* were verified. The MIC results showed that Na-butyrate had a better inhibitory effect *in vitro* at pH 6 and 6.6 than at pH 7, regardless of the microorganism. The addition of Na-butyrate at different concentrations and forms did not influence the sexual reversal process of tilapia. Yield and biomass gain showed an increment in fish fed Buffer $_{0.5\%}$ and Oil $_{0.5\%}$. Moreover, fish fed Oil $_{0.5\%}$ had a better feed conversion ratio than the other groups. An increase in the red blood cells (RBC) and monocytes were observed in fish fed Buffer $_{0.5\%}$ and Oil $_{0.25\%}$ when compared to control group, while those fed Pure $_{0.25\%}$ and Oil $_{0.5\%}$ showed the lowest monocytes number when compared to Buffer$_{0.5\%}$ and Oil$_{0.25\%}$. After challenge by immersion in *A. hydrophila* solution, no difference was found among the treatments for 14 days of observation, except for the nonchallenged fish that showed no mortality ensuring the effectiveness of the experimental infection. The use of coated Na-butyrate either in buffer or oil showed to be feasible to improve the zootechnical parameters of Nile tilapia during the sexual reversion period.

1. Introduction

The use of salts of organic acids is a preventive alternative in the maintenance of the health of cultured fish, because of its actions in the gastrointestinal tract, inhibiting the growth of pathogenic bacteria, mainly Gram-negative, aiding in the digestion and absorption of nutrients, besides exerting beneficial effects on animal performance (Hossain et al., 2007; Defoirdt et al., 2009).

In tilapia farming, one of the main ways to disseminate diseases through crops is the insertion of fish carrying pathogens, often with no clinical signs. After sexual reversion phase that consists in one of the most critical stages in tilapia production cycle, the fingerlings are marketed to different production units and can spread the pathogens to different regions. Therefore, the use of tools to improve the nutritional quality and animal health during sexual reversion is fundamental for sustainable aquaculture and productive chain.

In aquaculture, studies using organic acids or their salts in aquatic animals are recent (Silva et al., 2013, 2016). According to Ng and Koh (2017) the most investigated organic acids in aquaculture is citric acid and its salts and formic acid and its salts.

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