



Use of protected forms of sodium butyrate benefit the development and intestinal health of Nile tilapia during the sexual reversion period



Gabriel F.A. Jesus^{a,*}, Scheila A. Pereira^a, Marco S. Owatari^a, Kennya Addam^a, Bruno C. Silva^b, Fabio C. Sterzelecki^c, Juliet K. Sugai^d, Lucas Cardoso^a, Adolfo Jatobá^e, José L.P. Mouriño^a, Mauricio L. Martins^a

^a AQUOS - Aquatic Organisms Health Laboratory, Aquaculture Department, Federal University of Santa Catarina (UFSC), Rod. Admar Gonzaga 1346 CEP 88040-900, Florianópolis, SC, Brazil

^b EPAGRI - Company of Agricultural Research and Rural Extension of Santa Catarina, Rod. Antônio Heil, 6800. CEP 88318-112, Itajaí, SC, Brazil

^c LAPMAR - Marine Fisheries Laboratory, Aquaculture Department, Federal University of Santa Catarina (UFSC), Servidão Beco dos Coroas, 503. CEP 88061-600, Florianópolis, SC, Brazil

^d Applied Enzymology Laboratory - Department of Biochemistry, Center for Biological Sciences, Federal University of Santa Catarina (UFSC), Campus Universitário Prof. Dr. João David Ferreira Lima - Trindade. CEP 88 010-970, Florianópolis, SC, Brazil

^e Aquaculture Laboratory, Federal Institute Catarinense - Campus Araquari, BR 280 - km 27. CEP 89245-000, Araquari, SC, Brazil

ARTICLE INFO

Keywords:

Organic salts
Intestinal health
Digestive enzymes
Histology
Oreochromis niloticus

ABSTRACT

The aim of the present study was to verify the effect of sodium butyrate in protected and unprotected forms at two different concentrations of diet inclusion (0.25% or 0.5%) on the digestive enzyme's activity, integrity and structure of the intestinal tract and liver, in juveniles of *Oreochromis niloticus*, during the period of sexual reversion. In the experimental period, 3150 newly hatched post-larvae were randomly distributed in 21 experimental units of 100 L, divided into six treatments and one control, with three replicates each. The treatments were: fish fed with feed without supplementation (Control); fed with pure Na-butyrate (Pure_{0.25%} and Pure_{0.5%}), fed with palm oil-protected Na-butyrate (Oil_{0.25%} and Oil_{0.5%}) and fed with protected Na-butyrate with buffer solution (Buffer_{0.25%} and Buffer_{0.5%}). At the end of the experimental period, a decrease in alkaline protease activity was observed in the Oil_{0.25%}, Oil_{0.5%} and Buffer_{0.5%} groups when compared to the control. Fish fed Buffer_{0.5%} supplemented diet for 28 days had a longer length, perimeter and villus area of the anterior region of the intestinal tract when compared to Pure_{0.25%}. The Control, Pure_{0.25%} and Oil_{0.5%} groups had a reduction in villus width when compared to the other groups. In the posterior region, the group Oil_{0.25%} had a longer villus length when compared to the Pure_{0.25%} and Control, in addition to a greater area of villi when compared to the same groups and also to the Oil_{0.5%}. In this same intestinal portion, the Buffer_{0.5%} presented greater perimeter of intestinal villi when compared to the Control and Pure_{0.25%}. The Pure_{0.25%} and Buffer_{0.25%} presented higher number of goblet cells per villi when compared to Oil_{0.5%}. The control group and those supplemented with sodium butyrate, in the different concentrations and forms, presented the intact intestine and without the presence of lesions. Regarding the liver, the Pure_{0.5%} group presented the highest macrosteatosis indexes when compared to the Control group, besides a higher necrosis index when compared to the Pure_{0.25%}. Thus, it can be observed that the supplementation of protected forms of sodium butyrate in the diet of juvenile Nile tilapia during the period of sexual reversion was effective in maintaining intestinal health, because Oil_{0.5%} contributed to the intestinal health of the animals, and the Oil_{0.25%}, Buffer_{0.25%} and Buffer_{0.5%}, increased the development of the intestine.

1. Introduction

Analyzing the current scenario of global expansion aquaculture, the use of alternative strategies to reduce the use of antibiotics in animal

production has become a reality. Food additives such as organic acids and their salts are potential substitutes for the use of antibiotics as growth promoters and animal health. Studies report the ability of acids and their organic salts to increase growth parameters, health

* Corresponding author.

E-mail addresses: gabriel.faj@hotmail.com, gabrielfaj@gmail.com (G.F.A. Jesus).

<https://doi.org/10.1016/j.aquaculture.2019.02.018>

Received 4 January 2019; Received in revised form 7 February 2019; Accepted 8 February 2019

Available online 08 February 2019

0044-8486/ © 2019 Elsevier B.V. All rights reserved.