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Dietary organic acids blend alone or in combination with an essential oil on the survival, growth, gut/liver structure and de hemato-immunological in Nile tilapia *Oreochromis niloticus*

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Abstract

This study evaluated the effects of dietary supplementation of organic acids blend (OAB) alone or in combination with essential oil, *Lippia origanoides* (OAE) for Nile tilapia fed supplemented diets for 30 days. Fish (1.1 ± 0.04 g) were fed control (Control), or OAB 0.5% or OAB 0.5% + essential oil 0.125% (OAE) respectively. At the end of the experiment, samples were collected for de hemato-immunological, histological analysis of the intestine and liver, as well as microbiology of the intestine. The pH of the diets supplemented with OAB and OAE reduced 0.92 and 0.19 respectively. The growth and FCR were unaffected by the treatments, but survival was significantly higher in the OAB treatment. Fish fed the OAB diet showed reduced concentration of total heterotrophic bacteria and *Pseudomonas* sp. in the intestine. Increased glucose in fish fed OAB and high number of circulating monocytes in fish fed OAE diet were observed. The anterior intestine of fish fed OAE diet showed larger number of goblet cells and increased villi height. The diet supplemented with OAB, mainly, improved the intestinal health and survival of tilapia juveniles and can be used in juvenile production.

KEYWORDS

"salva de Marajó", Fish farming, fish health, de hemato-immunological indexes, intestinal histomorphometry

1 | INTRODUCTION

The preventive use of antibiotics for the control of bacterioses in aquaculture has led to the development of resistant bacteria and, consequently, to the reduction in their effectiveness for the treatment of bacterial diseases (Defoirdt, Sorgeloos, & Bossier, 2011). The use of disease control additives, such as salts of organic acids and essential oils, has been extensively studied in recent years to reduce the prophylactic use of antibiotics in aquaculture (Koh, Romano, Zahrah, & Ng, 2016). In addition, there is evidence indicating a possible transfer of antibiotic resistance genes from bacteria in the farming environment to human pathogens (Olson & Dinerstein, 2005; Poirel, Cattoir, & Nordmann, 2012; Watts, Schreier, Lanska, & Hale, 2017).

Organic acids are compounds with one or more carboxylic groups (–COOH) in their structure (Koh et al., 2016). There are three classes of organic acids. The short chain organic acids, which act to reduce the pH of the diet and also as a source of energy, include

