

ORIGINAL ARTICLE

# The effect of *Pediococcus acidilactici* on the gut microbiota and immune status of on-growing red tilapia (*Oreochromis niloticus*)

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## Abstract

**Aim:** To assess *Pediococcus acidilactici* as a dietary supplement for on-growing red tilapia (*Oreochromis niloticus*).

**Methods and Results:** Tilapia were fed either a control diet or control diet supplemented with *Ped. acidilactici* at 10<sup>7</sup> CFU g<sup>-1</sup> for 32 days. *Ped. acidilactici* colonized the intestinal tract and significantly affected the intestinal microbial communities. PCR-DGGE revealed direct antagonism of gastric *Ped. acidilactici* with an endogenous uncultured bacterium during a period of reverting to nonsupplemented feeding. Light microscopy revealed that gut integrity and leucocyte levels were unaffected by *Ped. acidilactici*; however, blood leucocyte levels and serum lysozyme activity were elevated after 14-days' feeding. No significant improvements in growth performance were observed at the end of the trial (day 32), but survival was significantly higher in the probiotic group.

**Conclusions:** The study demonstrates that oral supplementation of *Ped. acidilactici* modulates intestinal bacterial communities in on-growing red tilapia and also stimulates some aspects of the nonspecific immune response.

**Significance and Impact of the study:** To our knowledge this is the first study assessing the effects of probiotics on the gut microbiota of tilapia using culture-independent methods. Such methods are crucial to understand the mechanisms which underpin and mediate host benefits.

## Introduction

Over the past decade, new initiatives towards the assessment and appraisal of probiotic applications have demonstrated a range of benefits in fish (Carnevali *et al.* 2004, 2006; Panigrahi *et al.* 2004, 2005, 2007; Picchiatti *et al.* 2007, 2009) including tilapia *Oreochromis niloticus* (Lara-Flores *et al.* 2003; El-Haroun *et al.* 2006; Pirarat *et al.* 2006; Shelby *et al.* 2006; Taoka *et al.* 2006; Aly *et al.* 2008a,b; Wang *et al.* 2008). These studies provide a basis of the effects on health parameters and growth perfor-

mance. However, our understanding of the mechanisms involved in mediating these responses is limited because many studies have lacked investigations of the gut microbiota or have employed culture-dependent methods. We must have a clear understanding on the effects of probiotics on the indigenous gut microbiota to begin to understand the underlying mechanisms which result in host benefits.

*Pediococcus acidilactici*, a lactic acid bacteria (LAB), has recently been reported to alleviate vertebral column compression syndrome, elevate blood leucocyte levels,