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 10⁷ CFU g⁻¹ 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; Picchietti 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 performance. 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,