Abstract

Project Code : MRG5980127

Project Title: The use of prebiotics (from corncobs and *Cordyceps militaris* **mushroom) and probiotics as alternative strategies for antibiotics in culturing of tilapia,** *Oreochromis niloticus*

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Project Period: 2 years

1. Abstract:

Four experiments were carried out with the use of Nile tilapia fingerlings (average weight ranged from 4.97 to 37.28 g fish^{-1}). A Completely Randomized Design (CRD) with three or four replications was used. In the first experiment, different concentrations of *C. militaris* spent mushroom substrate (SMS): [0 (T1- Control), 5 (T2), 10 (T3), 20 (T4) and 40 g kg^{-1} (T5) SMS] were administered to determine the optimal concentration for the Nile tilapia growth and well-being. The results indicated that 10 g kg^{-1} SMS was the optimum dose for growth performance, immune response, and disease resistance of Nile tilapia. In the second experiment, the optimal concentration of SMS (10 g kg^{-1}) was combined with a 10^8 cfu g^{-1} *L. plantarum* (as a probiotic). The results of the showed that, fish fed with diet 10 g kg^{-1} SMS or 10^8cfu g^{-1}*L.plantarum* had significantly better SGR, feed conversion ratio (FCR), skin mucus and serum immunology, as well as disease resistance against *Streptococcus agalactiae*. In the third experiment, different concentrations of corn cob derived xylooligosaccharide (CDXOS): 0, 5, 10, and 20 g kg^{-1} CDXOS were supplemented to determine the optimal concentration for growth and immunity of the Nile tilapia. The results showed that diet administration of 10 g kg^{-1} CDXOS significantly stimulated SGR, FCR, skin mucus and serum immunology, as well as disease resistance. In the fourth experiment, the optimal concentration of the CDXOS (10 g kg^{-1}) was then combined with a 10^8 cfu g^{-1} *L. plantarum*. It showed that the diet of

10 g kg^{-1} CDXOS and 10^8 cfu g^{-1} of *L. plantarum* applied as a single or combined significantly enhanced growth performance, skin mucus and serum immunology, as well as disease resistance against *S. agalactiae*. The results inferred that those prebiotics and *L. plantarum*(probiotic) when applied as single or combined together significantly improved growth performance, fish immunity and disease resistance of the Nile tilapia fish.

Keywords (3-5 words): *Cordyceps militaris*; Xylooligosaccharide; *Lactobacillus* plantarum; Nile tilapia; *Streptococcus agalactiae*

2. Executive summary

2.1 Introduction to the research problem and its significance

Tilapia is the second most important farmed fish world-wide and its production has quadrupled over the past decade because of its suitability for aquaculture, marketability and stable market prices (Wang and Lu, 2015). In Thailand, tilapias is the one of important cultured fish species with the production of an approximately of 0.9 million tonnes (FAO, 2012, Site, 2013). It has been reported that about 30% of fish production was obtained intensive cages culture on rivers or irrigation canals (Rico *et al.*, 2014). Tilapia cultured under such open environment are highly vulnerable to stress produced by water quality fluctuations and can easily be infected by naturally occurring microorganisms (Rico *et al.*, 2014). Bacterial infection such as *Streptococcus* spp. and other bacteria (e.g. *Aeromonas* spp., *Pseudomonas* spp., and *Vibro* spp.) has been reported to be the main causes of mortality in caged culture (Rico and Van den Brink, 2014). Chemotherapeutic and antibiotics have been commonly used to control the risk of disease in tilapia farms (Tiengtam *et al.*, 2015). However, abuse of antibiotics can lead to the development of antibiotic-resistant bacterial strains (Le *et al.*, 2005), environmental hazards (Rico *et al.*, 2012), food safety problems (Heuer *et al.*, 2009, Sapkota *et al.*, 2008, Zhang *et al.*, 2014) and decline in human resistance to pathogens (Wu *et al.*, 2013). Therefore, it is necessary to develop alternative strategies to antibiotics that could be used for better growth performance, disease control and subsequently improve production in intensive fish production systems in a sustainable manner (Gabriel *et al.*, 2015). Prebiotics and probiotics being considered as an alternative strategy to prevent and control pathogens in aquaculture (Dimitroglou *et al.*, 2011, Guzman-Villanueva *et al.*, 2014).