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Novel prebiotics from agricultural by-products and probiotic as alternative strategies for synthetic antibiotics in culturing of Nile tilapia, *Oreochromis niloticus*

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Abstract:

Four experiments were carried out with the use of Nile tilapia fingerlings (average weight ranged from 16.57 to 20.91 g fish⁻¹). A Completely Randomized Design (CRD) with three or four replications was used. In the first experiment, different concentrations of watermelon rind powder (WMRP): [0 (Diet 1- Control), 20 (Diet 2), 40 (Diet 3), 80 (Diet 4), and 160 g kg⁻¹ (Diet 5) WMRP] were administered to determine the optimal concentration for the Nile tilapia growth and well-being. The results indicated that 40 g kg⁻¹ WMRP was the optimum dose for growth performance, immune response, and disease resistance of Nile tilapia. In the second experiment, different concentrations of pineapple peel powder (PAPP): 0, 5, 10, 20, and 40 g kg⁻¹ 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 PAPP significantly stimulated SGR, FCR, skin mucus and serum immunology, as well as disease resistance, relative antioxidant and immune gene expression. In the third experiment, the optimal concentration of WMRP (40 g kg⁻¹) was combined with a 10⁸ cfu g⁻¹ *L. plantarum*. The results showed that, fish fed with diet 40 g kg⁻¹ WMRP or 10⁸ cfu g⁻¹ *L. plantarum* singular or combined had significantly higher SGR, feed conversion ratio (FCR), skin mucus, and serum immunities, as well as disease resistance against *Streptococcus agalactiae*. In the fourth experiment, the optimal concentration of the PAPP (10 g kg⁻¹) was then combined with a 10⁸ cfu g⁻¹ *L. plantarum*. It showed that the diet of 10 g kg⁻¹ CDXOS and 10⁸ cfu g⁻¹ of *L. plantarum* applied as a single or combined significantly enhanced growth performance, skin mucus and serum immunities, as well as disease resistance against *S. agalactiae*. The results inferred that WMRP, PAPP, and when applied as single or combined significantly improved growth performance, immune response, gene expression, and disease resistance of the Nile tilapia fish.

Keywords: Watermelon rind; Pineapple peel; *Lactobacillus plantarum*; Nile tilapia; *Streptococcus agalactiae*