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EFFECTS OF SAGO-BASED (*Metroxylon sagu*) CARBOHYDRATE ON GROWTH PERFORMANCE AND BLOOD PLASMA COMPOSITIONS OF NILE TILAPIA, *Oreochromis niloticus* (LINNAEUS, 1758) JUVENILES

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Abstract: Six diets were formulated with three levels of protein, P(22%, 26% and 30%), and two levels of sago starch as source of carbohydrates, C(38% and 44%). The diets were fed to triplicate groups of tilapia, *Oreochromis niloticus*, juveniles (mean weight 4.61 ± 0.04 g), to apparent satiation twice daily for 12 weeks. Fish fed the 38% sago starch diet have a higher ($P < 0.05$) growth than the 44% sago starch and control diets. The whole body proximate compositions were significantly ($P < 0.05$) affected by the 38% and 44% dietary sago starch level among all diets. Fish fed with 38% sago starch diets have a higher ($P < 0.05$) glucose concentration in plasma than those fed with diet containing the 44% group diets. Higher ($p < 0.05$) triglyceride plasma were observed in fish fed with the 44% level diets, compared with the other diets. Two-way ANOVA results confirmed that the interaction between protein and carbohydrate has a significant ($p < 0.05$) influenced on growth performance, whole-body proximate compositions and blood plasma compositions. The study revealed the ability of *O. niloticus* juveniles to spare protein by carbohydrate at the level of 38 % sago starch.

Keywords: Sago starch, tilapia, growth, blood plasma.

Introduction

Tilapia is an omnivorous fish of the family *Cichlidae* (Sklan, *et al*., 2004; Qiang, *et al*., 2014), which includes more than 100 species under three genera; *Oreochromis*, *Sarotherodon* and *Tilapia* (Ridha, 2006; Wang & Lu, 2016). Tilapia cultures have been recognised as economically important and the fish is one of the most cultured fish in the world. Currently, tilapia is the second most farmed fish in the world after carps, with global production estimated to be around 6.3 million tonnes in 2018 (FAO, 2019) and expected to reach 7.3 million tonnes by 2030 (FAO, 2013). The global tilapia market is valued at about US$11.7 billion in 2017 and is estimated to reach US$13.4 billion by the end of 2025, which is mounting at a CAGR of 1.8% during the period. Nile tilapia (*Oreochromis niloticus*) cultures are the most dominant culture farm among the tilapia species (El-Sayed & Kawanna, 2007), and the species has a greater demand for larvae and juveniles (Ribeiro *et al*., 2018). In the aquaculture field, the success and sustainability of culture farms depend on the provision of nutritionally balanced, environmentally friendly and economically viable artificial feeds. Generally, the feed preparation diet is a principal factor that increases the growth and production of the reared fish in an aquaculture (Thankur *et al*., 2004; Liti *et al*., 2005; Abdel-Tawwab *et al*., 2007). However, the high cost and short supply of protein source (fish meal) in feed production is the main problem faced by the aquaculture industry (Sayed *et al*., 2018).

Protein is a macronutrient that is essential to build and repair damaged tissues and for general body maintenance. It is a vital nutrient and is considered the most expensive component in fish diet. The optimum level of protein used in fish diet is crucial to prevent the amino acid