

Interactive effects of salinity and complete fishmeal replacement on growth, food consumption, and gene expression of hepatic IGF-I, IGF-II and growth hormone receptors in Nile tilapia, *Oreochromis niloticus* (L.)

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Abstract

A 12-week feeding trial was conducted using Nile tilapia, *Oreochromis niloticus* (L.) to evaluate the interactive effects of fishmeal replacement and salinity on growth, feed utilization efficiencies and relative expression of growth related genes. Two iso-nitrogenous and iso-energetic diets were prepared (32% protein). The control diet included 15% fishmeal (FM diet) and fishmeal component in non-fishmeal diet (NFM) was eliminated by a mixture of poultry by-product meal, high protein distillers dried grains and distillers dried grains with soluble. The NFM diet was supplemented with DL-methionine and L-lysine. Duplicated group of fish with initial mean weight of 6 g, reared in four salinity levels (0, 4, 8 and 12 g/L) were fed one of the two diets twice a day to near satiety. At the end of the experiment, growth, feed utilization efficiency and expression of growth related genes were compared. The specific growth rate (SGR), mean feed intake (MFI) and feed conversion ratio (FCR) were not affected by the diets while salinity effects were significant. The fish in the 4 g/L salinity showed the highest SGR and MFI while fish in the 0 g/L treatment showed the lowest FCR. Relative expression of hepatic IGF-I and IGF-II was regulated by salinity but not by the diet. Expression of growth hormone receptor gene was not affected by either diet or salinity. The present findings provide evidence for the possibility of total fishmeal replacement in saline waters (0–12 g/L) without compromising growth, feed utilization and body composition of Nile tilapia.

KEYWORDS

amino acids, fatty acids, fishmeal, gene expression, salinity

1 | INTRODUCTION

Tilapia has become one of the fastest growing and economically important groups of fish in global aquaculture (El-Sayed, Mansour, & Ezzat, 2005). The ability of tilapia to tolerate a wide range of salinities has attracted the attention of fish farmers and now tilapia culture is expanding to brackish water and seawater (El-Sayed, Mansour, & Ezzat, 2003; El-Sayed et al., 2005; Kamal & Mair, 2005; Yan, Wang, & Zhao, 2013). Among the different species of tilapia,

Nile tilapia (*Oreochromis niloticus*) has received a great deal of attention because of its high growth rate and adaptability to different culture methods and conditions (Pullin & Lowe-McConnell, 1982). Thus, Nile tilapia is recognized as the most important farmed tilapia in the world (El-Sayed et al., 2003, 2005).

Similar to other vertebrates, growth and development of fish is controlled by internal factors, such as neuro-endocrine regulators, as well as by environmental factors such as temperature and salinity (Bœuf & Payan, 2001; Rubio, Sánchez-Vázquez, & Madrid, 2005).