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The Effect of Substituting Fish Meal on Threonine Requirement in Diets for Nile Tilapia (*Oreochromis niloticus*) Derived by an N-Utilisation-Model

KAY BENKENDORFF, FRANK LIEBERT

Georg-August-Universität Göttingen, Institute for Animal Physiology and Animal Nutrition, Germany

Abstract

This study reflects a further step to adapt a physiological based N-utilization-model to growing fish by comparing the threonine requirement calculated for threonine efficiency from fishmeal (FM) and soybean meal (SBM).

After logarithmization of the basic function the requirement of the limiting amino acid (LAA) can be calculated depending on actual $PD_{max}T$ (genotype), utilization rate of $PD_{max}T$ (growth performance) and efficiency of the LAA (bc^{-1}).

$$(1) x_{LAA} = [\ln PD_{max}T - \ln(PD_{max}T - y)] : 16bc^{-1}$$

Where:

$$x_{LAA} = \text{daily LAA-intake} / BW_{kg}^{0.67} \text{ (mg)}$$

$$PD_{max}T = \text{maximum of theoretical capacity for daily N-deposition} + NMR / BW_{kg}^{0.67} \text{ (mg)}$$

$$y = \text{daily N-deposition} + NMR / BW_{kg}^{0.67} \text{ (mg)}$$

b = slope of the curve (= protein quality)

c = dietary concentration of LAA (g / 16 g N)

$$NMR = \text{N-maintenance requirement} / BW_{kg}^{0.67} \text{ (mg)}$$

Based on our actual results about $PD_{max}T$ a growth trial was conducted with male Nile-Tilapia (mean BW = 12.6 g) assigned to 30 tanks (25 fishes/tank) in a recirculating unit. 6 semi-purified, isonitrogenous diets (31–32 % CP; 14–15 MJ ME/kg), designed to be limiting in threonine (= LAA), were applied for 56 days. Protein deposition was determined based on the whole body composition of representative animals.

Depending on level of performance, the calculated threonine requirement data vary over a wide range. For a fixed level of daily N-deposition a lower efficiency of threonine (SBM) requires an increased threonine uptake in order to achieve similar growth comparing to a feed protein with a high efficiency of threonine (FM). The results indicate a lower threonine requirement, mainly under extensive production regimes and inclusion of threonine sources with high amino acid efficiency.

Keywords: Tilapia, amino acid requirement, amino acid utilisation, threonine