

BIOFLOC TECHNOLOGY FOR NILE TILAPIA: A MASS BALANCE ANALYSIS OF CARBON, NITROGEN, AND PHOSPHORUS

Tainara L. da Silva Blatt¹, André L. Watanabe², Celso C. Buglione Neto², Alex J. da Silva Cardoso¹, Hamilton Hisano^{1*}

¹Embrapa Meio Ambiente

²Iaipu Binacional

*hamilton.hisano@embrapa.br

Sustainable aquaculture focuses on environmentally friendly production to meet current demands for food production without depleting natural resources. Biofloc technology (BFT) system supports this goal by minimizing or eliminating water exchange. This study evaluates the mass balance of Nile tilapia reared in BFT system using total carbon (TC), total nitrogen (TN), and total phosphorus (TP). To calculate the mass balance of TC, TN, and TP, the input of nutrients was considered from the supply water, the initial biomass of fish, and the feed-diet during the experimental period of 70 days. The output of nutrients was determined based on the amounts retained within the final fish biomass and those present in the effluent. The mass balance analysis revealed a high level of nutrient retention within the fish biomass, with minimal nutrient losses to the aquatic environment.

Table 1. Nutrient mass balance in Nile tilapia cultured in a BFT system.

	Total Carbon (TC)		Total nitrogen (TN)		Total phosphorus (TP)	
	Mean \pm SD (kg) ¹	% ²	Mean \pm SD (kg) ¹	% ²	Mean \pm SD (g) ¹	% ²
Input						
Initial water + replacement	0.36 \pm 0.06	2.30 \pm 0.23	0.09 \pm 0.02	4.93 \pm 0.76	0.12 \pm 0.03	0.03 \pm 0.01
Feed	14.75 \pm 0.85	94.35 \pm 0.18	1.56 \pm 0.09	88.36 \pm 0.54	399.84 \pm 23.06	89.26 \pm 0.27
Fish initial biomass	0.52 \pm 0.02	3.35 \pm 0.09	0.12 \pm 0.00	6.71 \pm 0.23	47.96 \pm 1.79	10.72 \pm 0.27
Total input	15.63 \pm 0.92	100.00	1.77 \pm 0.11	100.00	447.92 \pm 24.68	100.00
Output						
Effluent (final water + solids)	2.58 \pm 0.38	34.32 \pm 3.07	0.67 \pm 0.07	44.84 \pm 3.00	194.92 \pm 11.35	45.53 \pm 1.33
Fish final biomass	4.91 \pm 0.35	65.68 \pm 3.07	0.83 \pm 0.02	55.16 \pm 3.00	233.49 \pm 18.95	54.47 \pm 1.33
Total output	7.49 \pm 0.62	100.00	1.50 \pm 0.06	100.00	428.42 \pm 30.30	100.00
Unaccounted portion	8.15 \pm 0.31		0.27 \pm 0.17		19.50 \pm 9.85	
Retention rate (%)		29.74 \pm 1.42		45.38 \pm 2.76		46.34 \pm 1.72

¹ Mean values \pm standard deviation (SD) of inputs and outputs of carbon (in kg), nitrogen (in kg), and phosphorus (in g) considering the three units of production; ² Percentage based on average values of the three units of production.