AQUA 2018 - Meeting Abstract
698

MICROORGANISMS IN BIOFLOCS MAKE UNAVAILABLE PHOSPHATE, FIXED IN DIETARY PHYTATE, AVAILABLE FOR NILE TILAPIA

Marc Verdegem, Samara Hutting, Joost van Loo, Johan Schrama and Johan Verreth
Aquaculture and Fisheries
Department of Animal Sciences
P.O. Box 338, 6700AH Wageningen
Marc.Verdegem@wur.nl

Phytic acid is the principal storage form of phosphorus (P) in many plant tissues, especially in brans and seeds. Fish lack the intestinal digestive enzyme phytase, required to separate P from the phytate molecules. Because much of the total P in plant based ingredients used in fish diets is present in the form of phytate, diets high in plant ingredients are mostly P deficient. To address this deficiency, phytase is often included in plant-based diets to increase available P. Phytases are also widely distributed among microorganisms. The latter are present in high concentrations in biofloc systems. In aim of this project was to test if in biofloc systems fed a plant-based diet high in phytate but low in available P, Nile tilapia (*Oreochromis niloticus*) can retain more P than tilapia raised in clear water flow-through systems when fed the same diet.
Nile tilapia of approximately 60 grams were used. A 2x2 factorial design was applied, with diet (2 levels: diet with or without sufficient available P) and system (2 levels: flow through or bioflocs) as main factors. Per treatment, 20 fish were stocked in 70-L aquaria (3 replicates per treatment). To house the fish in the same size aquarium in biofloc as in flow-through tanks, in the latter the aquaria were linked to a separate 700-L biofloc tank (Figure 1). The water quality of the fish held in biofloc water was controlled through the addition of corn starch aiming to maintain a carbon to nitrogen ratio of 17-18.
Two diets were formulated, only differing in digestible available P. In flow-through tanks there was low mortality (2 - 5%). In biofloc tanks the mortality was zero. In flow-through tanks, on the High P diet, Nile tilapia grew faster than on the Low P diet ($P < 0.05$). The feed conversion ratio with the Low P diet was 1.89, compared to 1.45 with the High P diet ($P < 0.05$). Less P (g/kg dm) was present in whole fish in flow-through tanks with the Low P diet than with the High P diet, while the amount of P retained in biofloc tanks with the Low P diet was intermediate between the two flow-through treatments. In conclusion, in biofloc

systems Nile tilapia obtained more P from the Low P diet. To explain the high variation between replicate tanks in biofloc systems additional research is required.

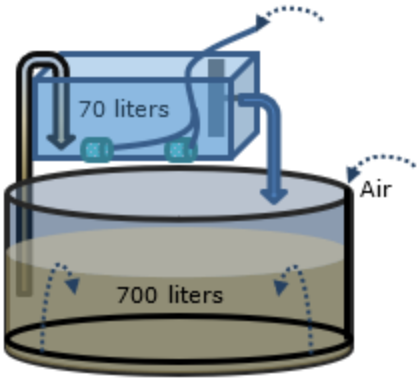

Figure 1 Biofloc system set-up. The water will be pumped from the 700-litre basin into a 70 litre aquarium on one side and leave through an airlift back into the basin from the other side of the aquarium. Each biofloc tank will be aerated and mixed by an aeration ring and each aquarium with 2 air stones

Ingredients	**g/kg**	
	High P diet	Low P diet
Total phosphorous	12.3	8.8
Digestible Phosphorous	7.1	3.5

		1-way ANOVA				2-way ANOVA		
	Unit	Bio LP	Bio HP	Flow LP	Flow HP	Diet	System	D x S
Dry matter	g/kg	284.43 ^{a}	285.93 ^{a}	276.87 ^{a}	274.48 ^{a}	0.889	**0.015**	0.546
Ash	g/kg dm	127.44 ^{b}	139.54 ^{bc}	114.32 ^{a}	140.16 ^{c}	**0.000**	**0.049**	**0.034**
Crude protein	g/kg dm	529.33 ^{a}	540.17 ^{a}	564.72 ^{ab}	582.98 ^{b}	**0.100**	**0.001**	0.648
Energy	kJ/g dm	25.23 ^{b}	24.25 ^{a}	25.27 ^{b}	24.59 ^{a}	**0.000**	0.205	0.292
Fat	g/kg dm	303.98 ^{a}	281.71 ^{a}	313.29 ^{a}	283.66 ^{a}	**0.008**	0.464	0.628
P	g/kg dm	21.62 ^{ab}	23.26 ^{b}	19.03 ^{a}	23.55 ^{b}	**0.001**	0.104	**0.050**

Proximate composition harvested Nile tilapia. Bio = biofloc; Flow = flow-through; LP = low P diet; HP = high P diet.

https://www.was.org/meetingabstracts/ShowAbstract.aspx?Id=104276