

## COMMERCIAL AQUATIC DIETS AND WATER QUALITY

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### **Abstract**

Water quality is an important limitation of diet choice and feed amounts in ornamental aquaria. Advanced life support system technology (a.k.a. water treatment) allow aquaria to maintain proper water quality; however, addition of diet items to the water is regarded as a key component impacting water quality maintenance via the load presented to life support systems. Herein, we evaluated nutrient composition of three commercial diets and ran preliminary tests to compare their potential impact on water quality parameters.

We utilized three commercial diets (Mazuri, St. Louis, MO; Table 1): herbivore fish pellet diet (5E4R Aqua Herbi-Blend Pellet); carnivore fish pellet diet (5E4S Aqua Carni-Blend Pellet); and aquatic gel diet (5AB0 MTLs Aquatic Gel). Diets were immersed in deionized water (1 g dry matter / 100 mL; Table 2) for 3 hours, and water quality parameters were measured. A replicated cross-over design was utilized in two tanks (each diet tested 3 times per tank). Briefly, 8 g diet dry matter was weighed out and placed in a 1 mm sieve. The sieve was slowly immersed into an aquarium filled with 800 mL of deionized water. After 3 hours, the sieve was pulled out of the aquarium with all diet pieces and allowed to drain completely. Dried weight (dried at 105 C for 24-h) of the remaining pieces was recorded as percent of dry matter retained. Total ammonia nitrogen was measured via colorimetric assay according to the salicylate method (Method 8155, HACH, Loveland, CO) and read on a benchtop spectrophotometer (DR 6000, HACH, Loveland, CO). We measured pH prior to introducing diet to the water, and after diets had been immersed for 3 hours. Results are presented in Table 3.

The pH did not differ ( $P > 0.10$ ) from zero, nor was there any significant differences ( $P > 0.10$ ) between dietary treatment on pH at 3 hours (data not shown), or change in pH. These data indicate that no significant bacterial digestion of the diets occurred during the 3-h time frame. Aquatic gel had lower stability (i.e., 2% more DM was solubilized into the water after 3 hours). Additionally, the concentration of total ammonia as N was approximately 3 to 4 times higher in water exposed to aquatic gel compared to water exposed to the pelleted feed. This result is not surprising given the higher solubilization of the gel diet combined with the higher N load when compared to the pelleted diets. Concentration of N in these diets is lower than a majority of animal prey diet items commonly utilized in aquatic diets ( $75 \pm 15\%$  CP; Sullivan et al., 2015).

Fish diets can be high in protein ( $> 50\%$  DM) which introduces a high load of nitrogen into the system. Therefore, in closed systems, it is important to feed nutritionally balanced diets (all necessary calories, vitamins, minerals, etc.) while minimizing the total load on the life support system. Commercially produced complete diets, including some pellets and gel diets, provide the

opportunity for aquarists to feed a homogenous ration that provides the necessary nutrients uniformly throughout. Further experiments of commercial fish diets on water quality parameters, in aquarium housed fish are needed.

**Literature Cited**

Sullivan K, S Livingston, K Kerr, S Williams, and E Valdes. 2015. Common aquatic ingredient nutrient analyses: Balancing practical feeding with long term aquatic health. *Proceedings of the Nutrition Advisory Group to the AZA.*

**Table 1. Nutrient composition of three commercial aquatic fish diets.**

<b>Item</b>	<b>Carnivore Pellet</b>	<b>Aquatic Gel</b>	<b>Herbivore Pellet</b>
Dry Matter, %	92.3	22.6	94.2
Ash, % DM	13.3	11.3	10.8
Crude Protein, % DM	54.0	64.0	39.2
Crude Fat, % DM	10.0	16.7	9.6
Neutral Detergent Fiber, % DM	6.8	20.9	23.6
Acid Detergent Fiber, % DM	3.5	3.9	14.1
Starch, % DM	9.6	0.3	6.8
Simple Sugars, % DM	3.2	3.1	3.3
GE, kcal/g	4.844	5.364	4.721

**Table 2. Total nutrients introduced to each 800 mL system.**

<b>Item</b>	<b>Carnivore Pellet</b>	<b>Aquatic Gel</b>	<b>Herbivore Pellet</b>
As-Is, g	8.7	35.4	8.5
Dry Matter, g	8.0	8.0	8.0
Crude Protein, g	4.3	5.1	3.1

**Table 3. Parameters after immersion of commercial diets (8 g dry matter) in distilled water (800 mL) for 3 hours.**

<b>Item</b>	<b>Carnivore Pellet</b>	<b>Aquatic Gel</b>	<b>Herbivore Pellet</b>	<b>SEM</b>	<b>P-Value</b>
<i>Water</i>					
pH Change	0.246	0.018	-0.504	0.336	0.306
Nitrogen, Ammonia, mg/L	0.47 <sup>b</sup>	1.34 <sup>a</sup>	0.35 <sup>b</sup>	0.06	0.000
<i>Diet</i>					
Dry Matter Retained, %	83.2 <sup>a</sup>	81.0 <sup>b</sup>	83.3 <sup>a</sup>	0.29	0.000