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The Utilization of Sodium Bicarbonate, Calcium Carbonate or Hydroxide in Biofloc System: Water Quality, Growth Performance and Oxidative Stress of Nile Tilapia (*Oreochromis niloticus*)

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Abstract

In *biofloc technology* (BFT) systems, nutrient cycling for microorganisms takes place. This results in minimal or null water exchange. The sum of fish biomass and microorganisms favors alkalinity consumption and, consequently, pH reduction. It is in this context that the present study evaluates alkalinity and pH maintenance using sodium bicarbonate (NaHCO_3), calcium carbonate (CaCO_3) or calcium hydroxide ($\text{Ca}(\text{OH})_2$) on BFT during a Nile tilapia (*Oreochromis niloticus*) nursery. In this study, 25 fishes/tank was distributed in nine experimental units (useful vol. 37.5 L) and the performance was evaluated at 60 days. During the assay, the temperature, oxygen and pH were maintained within the ideal range levels for Nile tilapia growth. All alkalizing compounds were able to pH and alkalinity correction, but when using NaHCO_3 , the alkalinity and pH were more elevated than the other treatments. Furthermore, at the beginning these assay, the total ammonia (TAN; $\text{NH}_3 + \text{NH}_4^+$) and NO_2^- -N accumulate and it caused a peak, but mostly experiment remained to very low levels because of the total nitrification activity, resulting in NO_3^- -N accumulation. Because the non water exchange, at the final experiment the ion Na^+ accumulate when utilized NaHCO_3 , resulting in level similar to brackish water. While using CaCO_3 or $\text{Ca}(\text{OH})_2$, the Ca^{2+} ion accumulate, resulting in extremely hard water. Despite this, the fish survival was similar between treatments (about 80%). Moreover, the final weight, daily growth rate and net yield for NaHCO_3 and $\text{Ca}(\text{OH})_2$ they were higher than CaCO_3 treatment. This may have been because of the higher total suspended solids (TSS) and lower protein content of the bioflocs in this treatment. In order to assess the possible physiologic alterations of the fish associated with the production system, the hematocrit, glycemia and plasmatic osmolality were evaluated. Furthermore, the antioxidant capacity against peroxy radicals (ACAP), lipid peroxidation (LPO) and catalase (CAT) and superoxide dismutase (SOD) activities on the gills and liver were also evaluated. There were no differences in biochemical/physiological parameters when the different alkalizing compounds were utilized. The results demonstrate that the use of sodium bicarbonate,

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