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THE EFFECT OF STOCKING DENSITY ON TILAPIA PISCICULTURE DURING THE NURSERY PHASE WHILE APPLYING AN INORGANIC NANOPARTICLE-BASED PRODUCT THAT STIMULATES THE ACTIVITY OF MICROORGANISMS THAT CONSUME ORGANIC MATTER

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ABSTRACT: This study had the purpose of evaluating the farming of tilapia during the nursery phase at two different stocking densities while also applying an inorganic nanoparticle-based product that stimulates the activity of the microorganisms that consume and reduce organic matter in the water. The Nile tilapia (*Oreochromis niloticus*) were cultivated over a period of 41 days in two breeding ponds that were filled with groundwater at the Agrícola Famosa farm, which is located in the municipality of Icapuí, in the state of Ceará, approximately 230 kilometres from the capital city of Fortaleza. These GIFT (Genetically Improved Farmed Tilapia) were purchased from Fazenda Aquabel in the district of Icaraí de Amontada, in the state of Ceará.

The fish were put into two plastic tarp lined breeding ponds, each of which had a useful volume of 600 m^3 that were filled with 500 m^3 of water. The fish had initial average weights and lengths of 2.5±0.2 g and 5.2±0.5 cm, respectively. They were fed at a daily rate of 8% of their biomass, eight times per day; this rate was then reduced to 5.5% of their biomass, six times per day. The fish were fed with a nutritionally balanced, extruded aquafeed containing 40% raw protein that was thrown directly onto the surface of the water.

The experiment consisted of two levels of treatment at two different stocking densities: 80,000 and 38,000 fish, equalling 160 fish/m3 and 76 fish/m^3, which were logged as treatments 1 and 2 (T1 and T2), respectively. During the cultivation of the animals, a product was added to the breeding ponds to aid in the reduction of the organic matter in the water. Known as ***Biocelerator 500®,*** this product is a colourless, aqueous solution of inorganic nanoparticles which was applied in Treatment 1 at a dosage of 200mL/day, five days per week.

At the end of the experiment, a sample of the fish was collected with a net from each of the breeding ponds (each with their own level of the treatment design) in order to measure their final average weights and lengths, which were determined using a digital semi-analytical balance and an ichthyometer, respectively. The zootechnical performance indicator parameters of the Nile tilapia (*Oreochromis niloticus*) for the two levels of treatment, which were determined at the end of the breeding cycle, were the following: final average weight, final average length, survival rate, final biomass, average daily weight gain and apparent feed conversion ratio.

Study results showed that the fish developed more fully under lower stocking density conditions (Treatment 2), in which the values for final average weight, final average length, survival rate, final biomass, average daily weight gain and apparent feed conversion ratio were 19.98±8.27 g; 10.37±2.72 cm; 99.27%; 1,586.73 kg; 0.41 g/day and 0.74, respectively, as compared to 38.62±11.78 g; 15.76±3.15 cm; 99.94%; 1,586.73 kg; 0.84 g/day and 0.51, respectively (Table 1).

These results illustrate the efficiency of Biocelerator 500® in the cultivation of the fish under conditions of greater stocking density, mainly with respect to the parameters final biomass and water quality, since Biocelerator 500® was able to maintain the level of dissolved oxygen in the breeding ponds, making it possible to increase the stocking density, which, in turn, increased productivity levels.

The lower average weight of the fish in Treatment 1, in the lower stocking density scenario, may be related to the greater degree of competition among the fish for food within the same breeding environment due to the greater amount of fish present. It should be noted that on a previous occasion at this very farm, other attempts at greater stocking density were undertaken with other products, but these projects had to be aborted in order to avoid the high rates of mortality amongst the fish, since the demand for frys required for the fingerling and growing-out stages is quite significant, making it necessary to have a large quantity of them as well as the need to increase the stocking density.

Table 1 below shows survival rate (S), final biomass (B), final average weight (W), final average length (L), average daily weight gain (ADWG) and apparent feed conversion (AFC) of the fish upon completion of the growth cycle when the stocking density was experimentally manipulated during the nursery phase. The figures are expressed as averages. The final average weights (W) and the final average lengths (L) are expressed as the average ± the standard deviations that arose from the individual measurement of the fish.

Treatment	S (%)	B (kg)	W (g)	L (cm)	ADWG (g/day)	AFC
T1 (160 fish/m^3)	99,27	1586,73	19,98±8,27	10,37±2,72	0,41	0,74
T2 (76 fish/m^3)	99,94	1467,82	38,62±11,78	15.76±3.15	0,84	0,51

KEYWORDS: stocking density, production, Nile tilapia.