

MINISTRY OF EDUCATION

FEDERAL INSTITUTE OF EDUCATION, SCIENCE AND TECHNOLOGY OF CEARÁ -

IFCE ARACATI CAMPUS

THE EFFECT OF STOCKING DENSITY ON THE ZOOTECHNICAL PERFORMANCE OF NILE TILAPIA, *Oreochromis niloticus*, DURING THE FRY STAGE IN ASSOCIATION WITH THE APPLICATION OF A PRODUCT THAT STIMULATES THE MICROORGANISMS THAT CONSUME ORGANIC MATTER IN WATER

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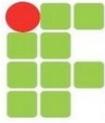
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ABSTRACT: This study aimed to verify the effect of stocking density on the development of Nile tilapia (*Oreochromis niloticus*) and evaluate the behaviour of the physical and chemical parameters of the water with the application of **Biocelerator 500®**, a compound that consists of inorganic nanoparticles that stimulate the activity of microorganisms that consume organic matter in water. The experiments were executed in concrete tanks while the fish were in the fry stage. The tilapias were fed four times per day (08:00; 11:00; 13:00; and 16:00) at an initial rate of 16% of the biomass of the fish, reduced later to 8% of the biomass, using a commercial feed containing 40% and 35% raw protein, respectively.

The feeding rate was adjusted fortnightly according to the updated data of the average weights of the fish. The experimental design that was adopted was completely randomized and had a 5 x 3 factorial arrangement. A 4mL dose of the Biocelerator 500® was applied daily, in accordance with the results of a previous experiment, in each 3 m³ (3x1x1m) farming tank, with three repetitions each. The tanks were adapted with artificial aeration 24 hours per day and did not have anti-bird screens. Fifteen concrete tanks were used in which the stocking densities of the animals were manipulated as follows: 25; 50; 75; 100 e 125 fish m⁻³, that is, 75; 150; 225; 300 and 375 fish in each tank, corresponding to treatments T25; T50; T75; T100 and T125, respectively.

The fish, which had already been sexually reversed to male, were acquired from the Centro de Pesquisas Ictiológicas (Center for Ichthyological Research) Rodolpho Von Ihering at the Departamento Nacional de Obras Contra as Secas - DNOCS (National Department of Works to Combat Drought), which is located in the municipality of Pentecoste, in the state of Ceará. The fish had initial weights and lengths of 1.09±0.49 g and 3.71±0.63 cm. The study was undertaken at the José William Bezerra e Silva Pisciculture Centre at the Instituto Federal de Educação, Ciência e Tecnologia do Ceará (Federal Institute of Education, Science and Technology of Ceará) - IFCE, Aracati Campus.

This experiment had a duration of 70 days and occurred during the fry stage of the fish. Fifty percent of the water of the tanks was replaced once per week, which did not involve the syphoning of the bottom of the tanks for the removal of organic matter. The growth of the animals was measured fortnightly, in which a sample of approximately 25% of the stocked fish was collected from the cultivation tanks with the aid of a net. This sample of fish provided data, such as their average weights and lengths, which were obtained using a digital semi-analytical balance and an ichthyometer, respectively.



The parameters survival rates, final biomass generated, average daily weight gain and apparent feed conversion ratio were also determined at the end of the experiment for each level of treatment. It should be noted that it rained on certain days during the cultivation of the fish, which reduced the amount of daily feeding. Researchers noted that the fish developed best under the conditions in which a stocking density of 25 fish m⁻³ (T25) was adopted.

These animals attained final average weights and lengths of 29.47±10.16 g and 11.32±1.21 cm, respectively, followed by the treatment in which a stocking density of 50 fish m⁻³ (T50) was chosen, for which the fish had final average weights and lengths of 26.95±8.24 g and 11.18±1.19 cm, respectively. However, when higher stocking densities were adopted, the results obtained were similar: 23.20±8.66 g and 10.64±1.31 cm; 22.55±6.19 g and 10.28±0.89 cm; and 21.85±10.85 g and 9.98±1.53 cm for the treatments in which stocking densities of 100; 75 and 125 fish m⁻³ (T100; T75 e T125, respectively) were chosen.

These results demonstrated the efficiency of Biocelerator 500® in helping to digest the organic matter when higher stocking densities are used in pisciculture. Regarding the average daily weight gains that were recorded, the results followed a similar trend, as reflected in these values: 0.41±0.102 day⁻¹; 0.37±0.103 day⁻¹; 0.32±0.108 day⁻¹; 0.31±0.073 day⁻¹; and 0.30±0.139 day⁻¹, respectively. Researchers also noted that higher survival rates were recorded amongst the fish that were placed in the treatment in which a stocking density of 25 fish m⁻³ (95.33±0.94%) was adopted, followed by treatments T75; T50; T100 and T125, which returned survival rates of 94.67±0.53%; 93.33±1.89%; 87.17±0.24% and 76.67±0.19%, respectively.

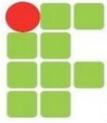
These results demonstrated that higher fish mortality rates are associated with higher stocking densities; albeit, the treatment in which a stocking density of 75 fish m⁻³ stands out as being the second-best result achieved. The largest final biomass was recorded for the treatment that featured the highest stocking density, treatment T125, which resulted in a total of 6.28±1.082 kg. The final biomasses of the remaining densities decreased in order as follows: 6.07±0.390 kg; 4.82±0.781; 3.77±0.043 and 2.23±0.147, respectively.

Lastly, regarding the apparent feed conversion ratio, the best result was recorded for treatment T25 (1.83±0.122), followed by T50 (2.00±0.031), T75 (2.09±0.050), T100 (2.09±0.160) and that of treatment T125, which yielded a result of 2.47±0.268, indicative of the greater use of feed associated with the highest stocking density (Table 1).

As such, the study results demonstrated the effectiveness of Biocelerator 500® in in the reduction of organic matter in the water, thereby improving the development of the fish in the lowest stocking density experimental condition, i.e., 25 fish m⁻³ (T25). However, as larger stocking densities were experimented with, the results were similar, mainly with respect to the final average weights and lengths and average daily weight gains.

In conclusion, one may note the degradation of the organic matter at the bottom of the tank in which the Biocelerator 500® was applied, which also demonstrates the reduction of organic matter in the water.

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) for the fish upon completion of the cultivation (fry stage) with the application of an enzyme that stimulates the degradation of organic matter, at differing stocking densities. The figures are expressed as averages ± standard deviations.



Treatment	S (%)	B (kg)	W (g)	L (cm)	ADWG (g day ⁻¹)	AFC
T25	95.33±0.94	2.23±0.147	29.47±10.16	11.32±1.21	0.41±0.102	1.83±0.122
T50	93.33±1.89	3.77±0.043	26.95±8.24	11.18±1.19	0.37±0.103	2.00±0.031
T75	94.67±0.53	4.82±0.781	22.55±6.19	10.28±0.89	0.31±0.073	2.09±0.050
T100	87.17±0.24	6.07±0.390	23.20±8.66	10.64±1.31	0.32±0.108	2.09±0.160
T125	76.67±0.19	6.28±1.082	21.85±10.85	9.98±1.53	0.30±0.139	2.47±0.268

KEYWORDS: fry stage, zootechnical performance *Oreochromis niloticus*.