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Production of Advanced-Size Fingerlings of Tilapia *Oreochromis niloticus* during the Winter Season in Cages and a Low-Cost Recirculating Aquaculture System (RAS) in Cox's Bazar, The Southeastern Part of Bangladesh

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Production of advanced-size tilapia during the winter season is more critical for creating a higher market value and growing tilapia farming in subtropical regions and there was scarcity of large size fingerlings after the winter season. The cultivation of advanced-size tilapia can indeed contribute to the surplus of the production within a limited period. However, temperature drops during winter are significant challenges. The present study aims to determine the optimum stocking densities to produce advanced size tilapia in two different systems: a low-cost recirculating aquaculture system (RAS) and a traditional cage system. Tilapia fingerlings of 10 ± 1.04 g were stocked at three densities (R1, C1 = 200; R2, C2 = 150; R3, C3 = 100 fish/m³) and a novel feeding technique was employed using 30% protein sinking feed delivered in hanging pouch compromising the variable cost. The study was conducted for 98 days during the winter season in the southeastern part of Bangladesh. Final total weight, survival rate, specific growth rate, weight gain, feed conversion ratio (FCR), water quality parameters (dissolved oxygen, temperature, pH, salinity, TAN, NO2, NO3), energy and water consumption, land use, labor requirements and overall profitability were measured.

The stocking densities at the beginning of the experiment were R1, C1 = 2.1±0.1; R2, C2 = 1.6 ± 0.2; R3, C3 = 1.04 ± 0.2 kg/m³and at the end of the experiment reaching individual fish densities R1 = 7.31, R2 = 5.61, R3 = 4.67, C1 = 8.46, C2 = 7.41, and C3 = 4.54 kg/m³. Results indicated that the highest total weight gain found in the R1 (RAS) and C1 (cage) treatment and the survival rates increased as stocking density increased. The R3 group within the RAS system had the lowest FCR value, it is statistically significant different from other treatments ($P < 0.05$). On the other hand, in the cage system, although FCR found lower than the RAS system, the differences across stocking densities were not statistically significant ($P > 0.05$). The RAS system sustained stable water quality at higher stocking densities, whereas the cage system required 89% more water. The land footprint was more efficient in the RAS system, while labor time was considerably similar. It can be concluded that both the RAS and cage systems are feasible to produce advanced-size tilapia during winter. The RAS system is particularly suitable for farmers with limited land, whereas the cage system is advantageous for those with access to ponds. The most effective stocking density within the RAS system was R3 (100 fish/m³) based on the criteria of average fish size and FCR, while C1 (200 fish/m³) proved most efficient in the cage system for total weight gain and fish grading.

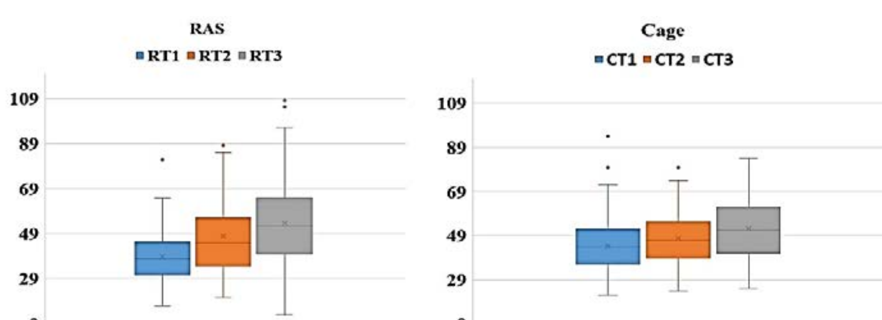

Figure 1: Final weight (g) and grading of tilapia (*Oreochromis niloticus*) cultured in RAS and cage system for 98 days during winter season in cox's Bazar, Bangladesh.