

ORL-EM&P-05

Analysis of Growth Performance, Muscle Quality, and Off-Flavor Compounds in Grass Carp *Ctenopharyngodon idella* Cultured in In-Pond Raceway System (IPRS) and Traditional Pond

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The In-Pond Raceway System (IPRS) is gaining popularity for its effectivity in facility management and reduction of pond pollution. In traditional pond culture (TPC), water quality degradation over time poses a significant challenge, especially for grass carp (*Ctenopharyngodon idella*), which negatively affect the production and product quality. IPRS offers a practical solution to this problem, as it mitigates water eutrophication, enhances the pond environment, and results in high-quality fish. This study compared the growth performance and muscle quality of grass carp in TPC and IPRS systems from July to October. The stocking densities were 32 fish/m³ for IPRS and 675 fish/ha for TPC. Various water quality parameters were observed to increase over the culture period in both systems. While the hepatosomatic index, viscero-somatic index, and condition factor were statistically similar in both systems, grass carp showed higher growth performance in TPC (Figure 1). However, the crude lipid content in IPRS-reared fish was significantly higher (p<0.05).

Non-significant differences were evident in muscle physico-chemical characteristics, such as pH, water-holding capacity (WHC), hardness, and chewiness between the two systems. The concentrations of the off-flavor compounds 2-methylisoborneol (2-MIB) in the muscle of grass carp raised in both IPRS and TP gradually, reaching up to 0.41 µg/kg and 0.44 µg/kg, respectively, as the fish grew in size and length (Figure 2). By the end of the experiment, the 2-MIB concentrations in the fish muscle were significantly higher (p<0.05) compared to the initial stages. Despite the high stocking density in IPRS, the impact on the nutrient composition and textural quality of grass carp muscle was minimal. Additionally, the off-flavor in IPRS-reared fish had a lesser effect (p>0.05) on the aesthetic quality of the flesh compared to TPC as the culture period progressed.

In conclusion, this study suggested that IPRS produced good muscle quality in grass carp, with lower effects of off-flavor compounds compared to TPC.



Figure 1. In-pond raceway systems and traditional pond culture

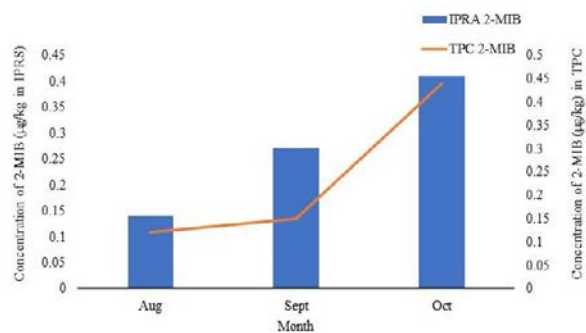


Figure 2. 2-MIB concentrations in fish flesh in In-pond raceway systems and traditional pond culture