PENGARUH PEMANFAATAN TEKNOLOGI BIOFLOK UNTUK MEMPERBAIKI KUALITAS AIR PADA BUDIDAYA IKAN NILA (*Oreochromis niloticus*) DENGAN TINGKAT KONTAMINASI MIKROPLASTIK YANG BERBEDA

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ABSTRACT

The Effect of Biofloc Technology Utilization on Water Quality Improvement in Nile Tilapia (Oreochromis niloticus) Aquaculture Under Different Levels of Microplastic Contamination

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The global increase in plastic production has led to microplastic contamination in aquatic environments, including fish farming systems. Microplastics (<5 mm) pose potential risks to fish health and human safety through the food chain. Nile tilapia (*Oreochromis niloticus*), a major aquaculture commodity in Indonesia, is vulnerable to microplastic exposure, which can affect water quality and fish productivity. Biofloc technology is considered effective in improving water quality through microbial activity; however, its interaction with microplastics remains underexplored. This study aims to analyze the utilization of biofloc in enhancing water quality and mitigating the effects of microplastics in Nile tilapia cultivation. The research was conducted using four treatments: control (without biofloc/microplastics), biofloc only, and biofloc combined with microplastic contamination at 30 µg/L and 300 µg/L. Water quality parameters (ammonia, nitrite, nitrate, phosphate, sulfate) were measured every 7 days over a 35-day period. Fish samples were analyzed for protein content, total nitrogen, and microplastic presence using UV-Vis spectrophotometry, FTIR, microscopy, and ANOVA statistical analysis. Results indicated water quality ranges as follows: ammonia (0.294–0.583 mg/L), nitrite (0.009–0.073 mg/L), nitrate (1.823–16.672 mg/L), phosphate (0.110–0.668 mg/L), and sulfate (0.520–9.700 mg/L). Fish production performance showed Average Daily Growth (ADG) between 1.814–2.918 g/fish/day and Survival Rate (SR) between 83.529–95.000%. Microplastics were detected in the intestines (1.667–9 particles/g) and muscle tissue (0–0.25 particles/g), dominated by black fragments ≤50 µm composed of polyamide (PA), polyethylene (PE), and PET polymers. Risk indices (PHI, PLI, PERI) indicated hazard levels ranging from low to high. This study confirms that biofloc is effective in improving water quality and tilapia productivity; however, high microplastic contamination reduces system effectiveness and poses risks to fish health. Optimizing water quality management and monitoring microplastics in feed and the aquaculture environment is essential for sustainable fish farming.

***Keywords**: Biofloc, microplastics, water quality, nile tilapia, aquaculture.*