A comparison of diurnal dynamics of water quality parameters in Nile tilapia (Oreochromis niloticus, Linnaeus, 1758) monoculture and polyculture with African sharp tooth catfish (Clarias gariepinus, Burchell, 1822) in earthen ponds.

Author Amon P. Shoko, Samwel M. Limbu, Hillary D. J. Mrosso, Yunus D. Mgaya

Abstract

The overall performance of an aquaculture system is partly determined by its water quality parameters. Poor water quality stresses and adversely affects fish growth causing low production, profit and product quality. Diurnal dynamics of water quality parameters were investigated in Nile tilapia (Oreochromis niloticus) monoculture and polyculture with Clarias gariepinus in earthen ponds. Dissolved oxygen, temperature and pH were measured and monitored for 24 h. Water samples for nutrient analysis were collected from the middle of ponds in triplicate at about 30–35 cm below the water surface using a plastic bottle. Nitrite–nitrogen (NO_2–N), nitrate–nitrogen (NO_3–N), unionised ammonia (NH_3–N), soluble reactive phosphorus and free carbon dioxide were analysed following standard methods and procedures. The results show that dissolved oxygen concentrations during the past midnight and pre-dawn hours were significantly lower than the levels in the morning and afternoon hours (ANOVA, $F = 45.709$, $P < 0.05$) which is dangerous to the life of the cultured fishes. The levels of unionised ammonia and temperature were higher and lower, respectively, than the acceptable levels for optimum growth of O. niloticus and C. gariepinus. Nitrite–nitrogen, nitrate–nitrogen, pH, soluble reactive phosphorus and free carbon dioxide were within the recommended limits for fish growth in aquaculture. Growth parameters, feed conversion ratio and survival rate were not significantly different between culture systems ($P > 0.05$). Fish yield was relatively higher in polyculture (45.74 ± 0.44 tons/ha) than monoculture (30.77 ± 0.54 tons/ha). During fish farming, optimum fish growth and hence economic benefits can be accrued by devoting some efforts on monitoring the fish pond water at regular intervals. This quality assurance process will ensure that fish farmers produce fish with maximum growth and yield without polluting pond water and the surrounding environment.

Key Word Aquaculture, Fish pond management, Monoculture, Polyculture, Pond water quality dynamics