

ABSTRACT

Traditional method of aquaculture relies heavily on the standard guidelines for raising fish. However, with excessive use of various inputs to sustain intensification of culture the dynamics of an aquaculture pond it has become difficult to follow the defined rules and sustain production. An attempt has been made in this study, to evaluate the nutrient dynamics of an intensive Indian major carp culture system by developing a water quality model. Therefore, field experiments were carried out for quantification of the various nutrients generated in an intensively cultured in four lined aquaculture pond. Three species of carps, namely Catla (*Catla catla*), Rohu (*Labeo rohita*) and Mrigal (*Cirrhinus mrigala*) were raised in small ponds of 150 m² area. It was observed from the experiments carried out that the variations in nutrient concentrations do not follow any particular pattern. The water quality parameters obtained from the experiments were used to simulate a nutrient dynamics model developed for this purpose.

The simulation as well as experimental studies revealed that the concentrations of various nutrients are interdependent. Calibration and validation of the model based on datasets obtained from the field experiments yielded high coefficient of determination and prediction efficiency for all the physico-chemical and fish growth variables except for nitrite, revealing its suitability in predicting the various nutrients in the pond system. In order to ascertain the important factors influencing the pond dynamics, sensitivity analysis was also carried out. The model was found to be highly sensitive with variation of total ammonia nitrogen diffusion rate, half saturation constant for nitrogen uptake, sediment respiration rate, sediment nitrogen mineralization rate, anabolic and catabolic exponent of fish, phytoplankton death rate and phytoplankton respiration.

Keywords: sediment respiration rate, anabolic and catabolic exponent, phytoplankton death rate, phytoplankton respiration.