Combination of Logistic and Modified Monod Functions to Study Microcystis aeruginosa Growth Stimulated by Fish Feed

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**Abstract:** The ecological health of aquaculture water is threatened by wasted fish feed and herbicides. In order to study the effect of prometryn and fish feed on *Microcystis aeruginosa* growth based on Monod and Logistic functions, four different concentrations of prometryn (0, 50, 100 and 200 μg·L-1) and two different dosages of fish feed (0.075 g, 0.15 g; d<0.85 mm) were added into the culture medium, and the fish feed was the source of nitrogen and phosphorus in the MII medium. Results showed that [*Microcystis*](file:///C%3A%5CUsers%5C360Downloads%5CYoudao%5CDict%5C6.3.69.8341%5Cresultui%5Cframe%5Cjavascript%3Avoid%280%29%3B)[*aeruginosa*](file:///C%3A%5CUsers%5C360Downloads%5CYoudao%5CDict%5C6.3.69.8341%5Cresultui%5Cframe%5Cjavascript%3Avoid%280%29%3B) growth can be fitted well by Logistic and modified Logistic functions with 0~200 μg·L-1 prometryn (*R2*=0.981~0.998 and *R2*=0.989~0.999, respectively). With the same concentration of prometryn, the maximum algae density (*Nmax*) of [*Microcystis*](file:///C%3A%5CUsers%5C360Downloads%5CYoudao%5CDict%5C6.3.69.8341%5Cresultui%5Cframe%5Cjavascript%3Avoid%280%29%3B)[*aeruginosa*](file:///C%3A%5CUsers%5C360Downloads%5CYoudao%5CDict%5C6.3.69.8341%5Cresultui%5Cframe%5Cjavascript%3Avoid%280%29%3B) calculated by both Logistic and modified Logistic functions increased with increasing dosage of fish feed and with the same dosage of fish feed, *Nmax* declined with increasing concentrations of prometryn. Inhibition of prometryn on algae growth stimulated by fish feed is of double concentration-dependence, inhibition rates (*I*) are lower in 0.15 g fish feed medium than 0.75 g ones generally, implying that more nutrients can alleviate the stress caused by prometryn on algae. Derived formula for the specific growth rate, growth rate and inhibition rate using modified Logistic function agreed reasonably well with measured data. Jointly application of modified Monod and Logistic functions can better describe the relationship between specific growth rates and nutrients concentrations compared to combination of Monod and Logistic functions. In addition, equations for describing variations of nutrients concentrations (PO43--P and NH4+-N) with time were also derived based on both modified Monod and Logistic functions, which agree reasonably well with the measured data. In sum, the combination of modified Monod and Logistic functions provides a promising and robust method in studying algal growth stimulated by fish feed in incubator experiments.

**Key words:** Modified Logistic function; Modified Monod function; Prometryn; Microcystis aeruginosa; Fish feed