Study on Toxigenic Cyanobacteria of Aquaculture Ponds in Thailand

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ABSTRACT

Proliferation of cyanobacteria is frequently encountered in natural eutrophicated lakes as well as in aquaculture ponds, since daily feeding contributes to the high nutrient loading for the intensive aquaculture. The extensive growth of cyanobacteria presents a considerable threat to human health because many species have the potential to produce cyanotoxin. *Microcystis*, in particular, is a typical bloom-forming cyanobacterial genus that produces a strong hepatotoxin microcystin. In this study, aquaculture ponds of catfish and tilapia in Thailand were surveyed to obtain the basic information on the occurrence of harmful cyanobacteria and cyanotoxins. This study provided two significant facets of information. One, from a viewpoint of the evaluation of the risk of cyanotoxins in aquaculture; the other, on the ecological study of toxigenic cyanobacteria at various environmental conditions. The relationship between the proliferation of toxigenic cyanobacteria and environmental conditions such as nutrients, temperature and kinds of cultured fish in aquaculture ponds were illuminated by mainly using conventional water quality analysis, quantitative real time PCR method (a molecular ecological method) and linear model analysis for the results.

The results were summarized as follows. In September and December of 2009 and March of 2010, 22 ponds for commercial farming of Nile tilapia (*Oreochromis niloticus*) and 17 ponds for hybrid catfish (*Clarias macrocephalus x C. gariepinus*) were surveyed in the provinces of Chiang Mai, Chiang Rai and Phayao. Fish species (tilapia or catfish) did not significantly affect the occurrence of toxigenic cyanobacteria. Actually, *mcyD* gene was detected in 8 tilapia ponds and 11 catfish ponds. Then microcystin analyzed by HPLC was detected in only 4 tilapia ponds and 6 catfish ponds. However, these differences between catfish pond and tilapia pond were not statistical significant. On the other hands, chl-a, as a surrogate of total biomass of phytoplankton, depended on both T-N and T-P. Then the concentration of chl-a in high temperature season (March) was higher than that in low temperature season (December). On the other hand, total cyanobacteria mainly depended on T-P, then it was found much in December than in March. The detection probability of *mcyD* in aquaculture ponds was explained by a logistic model, mainly with T-P. The probability in March was lower than that in December.

In further study, it is thought to find out the effect of temperature for the occurrence of toxigenic cyanobacteria and microcystin concentration from the view point of the risk analysis of global warming.