Dynamic of nitrifying bacteria on biofilter during acclimatization period

Surachet Burut-Archanai[1,2,*], Sorawit Powtongsook[1,2] and Sanit Piyapattanakorn[1]

[1] Center of Excellence for Marine Biotechnology, Department of Marine Science, Faculty of Science, Chulalongkorn University, Bangkok 10330
[2] Marine Biotechnology Research Team, Integrative Aquaculture Biotechnology Research Group, National Center for Genetic Engineering and Biotechnology (BIOTEC), 113 Thailand Science Park, Phahonyothin Road, Khlong Nueng, Khlong Luang, Pathum Thani 12120
* Correspondence: surachet.bur@biotec.or.th

Abstract: Recirculating aquaculture system (RAS) is environmentally friendly, less water consumption and wastewater discharging technology. Zero water discharging in RAS leads to accumulation of all substances in the system including toxic nitrogen compounds, ammonia, and nitrite, from animal excreta and bacterial decomposition. Detoxification of those compounds in RAS is commonly performed through nitrification biofilter. The biofilter functions as oxidizer, converting ammonia to nitrite, and nitrite to nitrate, via nitrifying bacteria on the biofilter. However, acclimatization of biofilter is time-consuming step, practically takes 2 – 3 months. Understanding of bacterial community during biofilter acclimatization might reduce the time for RAS start up. The high throughput DNA sequencing technique was used to reveal the dynamic of bacterial community on biofilter during acclimatization period (7 weeks). The biofilter sample was weekly analyzed and founded that the dominant phyla were Proteobacteria, Bacteroidetes, and Nitrospirae since first week of acclimatization. Nitrifying bacteria comprising of *Nitrosomonadaceae* and *Nitrospiraceae* families were dominantly over 51 % of total bacteria at third week of acclimatization. The abundance of potentially pathogenic *Vibrionaceae* was decreased by time and it was absent after sixth week of acclimatization. Based on this study, the biofilter should be acclimatized at least 6 weeks.

Keywords: Nitrification biofilter; nitrifying bacteria; biofilter acclimatization

Funding: This research was funded by the Ratchadapisek Sompoch Endowment Fund, Chulalongkorn University (GCE 6101223004-1).