Hydrogen sulfide production from fish organic waste

Letelier-Gordo, Carlos O.; Aalto, Sanni L.; Suurnäkki, Suvi

Published in:
5th NordicRAS Workshop on Recirculating Aquaculture Systems Berlin, Germany, 7-8 October 2019: Book of Abstracts.

Publication date:
2019

Document Version
Publisher's PDF, also known as Version of record

Hydrogen sulfide production from fish organic waste

Carlos O. Letelier-Gordo[1]*, Sanni L. Aalto[1,2], Suvi Suurnäkki[2]

[1]DTU Aqua, Technical University of Denmark, Hirtshals, Denmark; [2]Department of Biological and Environmental Science, University of Jyväskylä, Finland

Abstract

The production of hydrogen sulfide (H_2S) has become a new challenge in marine land-based recirculating aquaculture systems (RAS). H_2S is a toxic gas that causes massive fish mortality even at low concentrations, and additional serious odour problems in the surroundings. It is a bacterial by-product originating from the degradation of organic matter in sulfur-rich waters e.g. marine waters with sulfate concentrations.

In order to develop methods to hinder H_2S production in marine land-based RAS, more information on the H_2S production conditions and microbiology is needed. This study followed the production of H_2S from rainbow trout (*Oncorhynchus mykiss*) organic waste under different salinities (0, 5, 10, 15, 25 and 35 ppt) in anaerobic mixed reactors, and examined the microbial community as well as abundance of sulfate reducing bacteria (SRB).

The results showed that H_2S formation increased with salinity, the maximal concentration being 23.1 ± 8.2 mg H_2S/L at 0 ppt and 153.9 ± 34.1 mg H_2S/L at 35 ppt. Similarly, the H_2S production rates increased from 5.6 ± 0.2 to 26.4 ± 12.7 mg of H_2S produced per day with increasing salinity. The H_2S concentrations normalized with total chemical oxygen demand (TCOD) ranged between 0.76 - 7.21 mg H_2S per gram of TCOD, being significantly lower in 0 ppt treatment than in higher salinities, where no differences were found.

The overall microbial community, measured in experiment 2, changed gradually in time and between salinities, phyla Fusobacteria and Bacteroidetes being more abundant in 35 ppt reactors than in other reactors. The common SRB were found only in 0 and 5 ppt reactors, while in 10 ppt and 35 ppt reactors, H_2S production was driven by novel currently unidentified SRB groups.

The presented study is an important finding contributing to fill up essential knowledge gaps, providing a reliable quantifiable method for H_2S measurements and new information for understanding H_2S production in aquaculture systems.

Acknowledgments: This work originated from the BONUS call 2015: Blue Baltic – BONUS CLEANAQ project, supported by BONUS (Art 185) and funded jointly by the EU and Innovation Fund Denmark.

**colg@aqua.dtu.dk*