

EFFECT OF PERACETIC ACID ADDITION ON GEOSMIN AND 2-METHYL ISOBORNEOL LEVELS IN RAINBOW TROUT *Oncorhynchus mykiss* RAISED IN RECIRCULATING AQUACULTURE SYSTEM (RAS)

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An indoor pilot-scale recirculating aquaculture system (RAS) consists of ten 500 L units, separate water treatment and quality control systems. Recirculating water is treated in mechanical and biological units, including waste feed collector, swirl separator and drum filter (60 μm mesh size), two up-flow fixed-bed and two moving bed bioreactors (4 x 150 L). Dissolved carbon dioxide is removed from the water by packed aeration tower with pH adjustment at 6.16.8 by adding NaOH solution to compensate for the alkalinity loss due to nitrification.

In this experiment, tank units were randomly divided into four groups with juvenile rainbow trout and employed for four months. In the beginning, there were 50 fish in each tank, increasing in weight to 411 ± 43 g during the experiment. PAA was applied to the pump sumps 2.2 mg PAA L⁻¹ solution per day for 0, 1, 2 or 4 times per week.

Geosmin (GSM) and 2-methyl isoborneol (MIB) were extracted from the sample matrix by headspace solid phase extraction (HSSPME). 1 g of fish fillet was placed in a 10 mL HS vial with saturated NaCl (aq) solution. The method of standard addition was used to construct calibration curves for quantification of GSM and MIB. Sealed sample vial was placed in a water bath at 60 °C. A needle and a DVB/CAR/ PDMS fiber were kept for 30 minutes to complete the extraction before introducing the fiber directly into the gas chromatograph-mass spectrometry (GC-MS).

Separation and quantification of GSM and MIB in circulation water and in rainbow trout flesh was performed with GC-MS equipment by Agilent 6890 series/5973 N GC/MSD system with a Phenomenex Zebron ZB-5MSi capillary column (30 m x 0.25 mm x 0.25 μm). The temperature of the oven started at 45 °C for 3 min. and increased 30 °C min⁻¹ to achieve 300 °C (total time 14.5 min). Selected ion monitoring (SIM) mode was used for the detection of GSM and MIB with base peak areas of m/z 95 and m/z 112 were used for the quantification of GSM and MIB.

The concentrations in rainbow trout fillet (Figure 1) range on average between <LOD and 10.7 ng g⁻¹ for GSM and <LOD and 9.3 ng g⁻¹ for MIB. Generally, the average concentrations of both GSM and MIB decrease with increasing number of PAA additions per week but were insufficient to entirely inhibit the formation of off-flavor compounds. Additionally, the fish had developed an unusually thick layer of mucus and slime on the skin surface in units of PAA addition. This may have been due to PAA-induced irritation of fish skin and changes in the circulating water conditions.

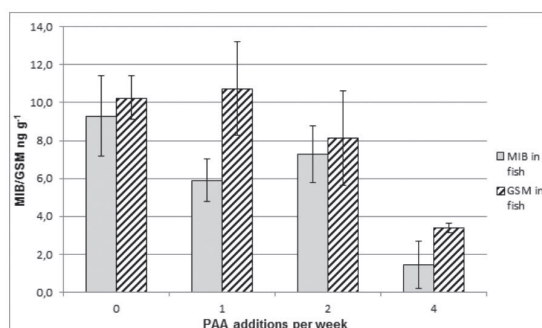


Figure 1. Concentrations of GSM and MIB (ng g⁻¹) in rainbow trout fillet after addition of PAA solution 0, 1, 2, or 4 times per week.