PROJECT: EXPO, DISINFECT
SYSTEM: RAS
PARTNERS: Nofima, NTNU, Freshwater Institute
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CtrlAQUA

Use of ozone in brackish water RAS: Benefits and risks for post-smolt Atlantic salmon

HYPOTHESIS:

The application of ozone improves the rearing environment and does not affect the health and welfare of Atlantic salmon in brackish water RAS.

DURATION: 2018-2021

FISH SIZE TESTED: 100 G

SALINITY TESTED: Brackish water (12 ppt)

HIGHLIGHTS:

- The dose-response study revealed that higher ozone doses, particularly at 425 mV and higher, resulted in significant mortality. This impact was associated with substantial ozone-induced gill damage that might have affected respiration and ion regulation.
- ≤ 350 mV is likely the safe oxidation-reduction potential threshold value for Atlantic salmon post-smolts in brackish water. This concentration was in the same range as the safe ozone dose for many farmed fish.
- Long-term application of ozone in brackish water RAS corroborated that ≤ 350 mV was the safe dose for salmon post-smolt.
- This safe dose provided a rearing environment favourable for salmon post-smolt, especially that gill health was slightly improved in the system with ozonation. Other indicators showed that health and welfare of salmon post-smolts were not significantly affected by continuous ozonation.
- Ozone lower than 350 mV can be used to improve the rearing conditions for Atlantic salmon post-smolt in brackish water, without measurable total residual oxidant TRO production.
- However, the safe threshold must be considered appropriately during application because there is a mortality risk at higher doses.

RECOMMENDATIONS:

- 350 mV is the upper safe threshold for ozone use in Atlantic salmon brackish water RAS.

READ MORE:

Aguilar-Alarcon, P., Zherebker, A., Rubekina, A., Shirshin, E., Simonsen, M.A., Kolarevic, J., Lazado, C.C., Nikolaev, E.N., Asimakopoulos, A.G., Mikkelsen, Ø. 2022. Impact of ozone treatment on dissolved organic matter in land-based recirculating aquaculture systems studied by Fourier transform ion cyclotron resonance mass spectrometry. Science of the Total Environment. 843:157009.

Lazado, C.C., Osório, J., Stiller, K.T., Reiten, B.K., Kolarevic, J., Johansen, L.H. 2021. Consequences of continuous ozonation on the health and welfare of Atlantic salmon post-smolts in brackish water RAS. Aquatic Toxicology. 238, 105935.

Stiller, K.T., Kolarevic, J., Lazado, C.C., Gerwins, J., Good, C., Summerfelt, S.T., Mota, V.C., Espmark, Å.M.O. 2020. The effects of ozone on Atlantic salmon post-smolt in brackish water – establishing welfare indicators and thresholds. International Journal of Molecular Sciences. 21:5109.

The factsheet is ready for commercial implementation