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ABSTRACT BOOK



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(7099) The effect of photoperiod stimulation in smoltification on salmon health and production, a common garden lifetime study

Introduction: Successful smoltification in norwegian salmon aquaculture is crucial for optimal fish health, welfare, and further production at sea. traditionally, smoltification is induced by simulating the natural framework of seasonal photoperiodic changes, exposing salmon to a “winter signal” (12 hours of light and 12 hours of darkness (ld12:12)) for 5-7 weeks. currently, there is no gold standard or best practice guidelines for smolt production, and many producers maintain a constant light regime throughout smoltification (ld24:0) to primarily avoid a reduction in growth during this period. this study aims to compare two smoltification regimes and investigate the effects of photoperiod stimulation during smoltification on atlantic salmon in a longitudinal study.

Methodology: At vaccination, 80.000 salmon were separated, fin clipped, and exposed to a ld12:12 light regime for 6 weeks. simultaneously, another 80.000 salmon were placed in a neighboring tank and maintained at ld24:0. at seawater transfer, both groups were moved to the same unit in a common-garden setup and produced until harvest.we examined smoltification status, growth metrics, heart morphology, nephrocalcinosis, serology, and expression profiles of key genes involved in growth, smoltification, and immune response.

Results: Our results show that the ld24:0 salmon had higher growth rates during the freshwater and early seawater phases, while the ld12:12 salmon demonstrated a quicker recovery after seawater transfer and higher growth rates in mid to late production. smoltvision analysis indicated that the ld12:12 regime accelerated gill osmoregulatory gene expression, although smolt status was satisfactory in both groups at transfer. gene expression analysis suggests that the winter signal influences expression profiles of numerous genes, particularly those related to smoltification and pituitary adaptation to marine environments. Plasma analyses support these findings, showing that the winter signal causes an initial reduction in thyroid hormones, followed by a sustained increase and elevated t3/t4 ratios after the termination of the winter signal. no significant differences were observed in immune-related gene expression. however, the ld24:0 salmon exhibited a markedly higher mortality trend in the early seawater phase, a significantly higher prevalence of aberrant cardiac morphology, and increased trends towards greater severity of nephrocalcinosis.

Conclusion: Our results indicate that a preparatory winter signal significantly influences salmon physiology and health both immediately and over time, particularly in terms of gene expression, welfare, and production-related metrics such as growth and mortality.

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