O-090.

Yeast as a protein source with health beneficial properties in diets for smoltifying Atlantic salmon (*Salmo salar* L.)

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Abstract
Atlantic salmon (*Salmo salar* L.) as an anadromous fish undergoes a series of physiological, structural and functional changes in transition from freshwater (FW) to seawater (SW). Fish are more susceptible to stress, physical damage and infectious diseases leading to high mortality and significant economic loss for the aquaculture industry. Yeast produced from lignocellulosic biomass has the potential to serve as a high-quality protein source with health beneficial properties, especially during seawater transfer (SWT) period. In this study, we evaluated the effect of adding 25% *Candida utilis* (LYCC7549) yeast in diets for smoltifying salmon, on growth performance and overall health by using morphometry, immunohistochemistry, cytokine enzyme-linked immunosorbent assays (ELISA) and gene expression analysis during and after SWT. A control diet (Control) and a test diet containing 25% yeast (Yeast) were fed to Atlantic salmon for 4 weeks in FW and 4 weeks after transfer to SW. Our results showed that fish fed the Yeast diet during the whole period or during the FW or SW period achieved higher feed intake and higher growth rate than fish fed the Control diet. Morphometry and immunochemistry analysis of distal intestine (DI) showed that yeast modified immunosuppressive responses related to SW acclimation. A decrease in length of simple folds and in number of CD3 labelled cells in the simple folds of DI in fish fed Control diet was observed, while changes were not present in fish fed the Yeast diet. Yeast significantly decreased the secretion of protein level of cytokines in DI (IFNγ, TNFα, IL-1β, IL-8) and tended to decrease the expression of pro-inflammatory cytokines interleukin 1 beta (*Il1b*) and interleukin 8 (*Il8*) on transcriptomic level. Yeast also modulated the gene expression of aquaporin 8 (*aqp8ab*), superoxide dismutase (*sod1*) and major histocompatibility complex 1 (*mhc1)* in DI, suggesting immunomodulation in Yeast fed fish. These findings suggest that *Candida utilis* yeast is a promising protein source with functional properties in diets for smoltifying Atlantic salmon before and after SWT.
Keywords: Atlantic salmon, yeast, smoltification, immune response, histology

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Bee pollen addition in zebrafish diets and its effect on immune response and microbiota

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Abstract
Apitherapy is recognized from conventional until contemporary treatment methods. Bee pollen, a natural product with high nutritional properties is recommended as dietary supplement due to many immunostimulating functions as antioxidant, antimicrobial and anti-inflammatory potential. Zebrafish, *Danio rerio*, a widely used species as an experimental model for humans and animals research provides advances in many issues, including immunological investigations. The identification of mechanisms involved in fish immunological activity subjected to bee pollen supplementary treatment can provide important unknown information for the recommendation of this product in diets. Also, zebrafish larval stage is a critical moment due to high mortality rates related to immune challenges. Thus, the objective of our study is to better understand how bee pollen addition in zebrafish diets can influence adults and their offspring immunity. Wild-type zebrafish experiments and procedures were performed as approved by the Consejería de Agua, Agricultura, Ganadería y Pesca de la CARM (authorization number #A13170801). Fish diets containing flakes (3% body weight - BW) and live food, Artemia nauplii, were used as control and compared to fish receiving the same diet supplemented with bee pollen (3% BW) coming from northeastern Brazil. Fish diets were administered during 70 days and the animals were spawned weekly. At 3th and 5th week after diet started, zebrafish offspring with 72 hours post fertilization (hpf) were tested for neutrophil migration after tail wounding. Neutrophils were counted at site of injury at 15, 90 and 360 minutes post wounding (mpw). After diet administration period, intestines from a zebrafish group were collected to metagenomics analysis to compare microbiota between both feeding regime. Total RNA extraction from kidney and abdominal organs of another fish group were quantified for immune-related gene expression after Mucormycosis (*Mucor circinelloides*) intraperitoneal infection. Offspring of zebrafish supplemented with bee pollen presented higher ($P<0.05$) neutrophil migration at 360 mpw compared to offspring of fish fed with standard diets in both weeks' analysis. No changes where observed at initial times after larvae tail wound. Neutrophils are pivotal effector cells of innate immunity and can play an essential role in fish against immunological challenges. Bee pollen dietary supplementation may influence recruitment of these cells in zebrafish offspring. Data regarding metagenomics and gene expression analyzes are still being processed.
Keywords: Fish immunology; Natural products; Nutrition; Neutrophil; Metagenomics

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Impact of down-stream processing of bakers yeast (*Saccharomyses cerevisiae*) on immune responses in Atlantic salmon (*Salmo salar*)

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Abstract
The increased demand for high-quality feed ingredients for the aquaculture industry have turned microbial ingredients as viable sources of protein and lipids. However, limited information exist on the effect of different down-stream processing of microbial ingredients on digestibility and immune responses in fish. In the present study, a feeding trial was performed for 30 days using three different down-stream processing for yeast: spray drying, autolysis or cell crushing and the effect of these treatments on digestibility, immune stimulation and microbiota was evaluated.