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A MULTIDISCIPLINARY APPROACH TO INVESTIGATE BIOLOGICAL EFFECTS ON INTESTINE PHYSIOLOGY AND APPETITE STIMULUS IN RAINBOW TROUT *Onchorhynchus mykiss* FED DIETS WITH GRADED LEVELS OF INSECT MEAL AND POULTRY BY-PRODUCT MEAL

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One of the most critical issues that threatens the sustainability and the further development of intensive carnivorous species aquaculture is its dependency on aquafeed ingredients such as fishmeal (FM) and fish oil (FO). Due to ecological and economic implications, the desirable goal of the feed industry is to replace these ingredients with more sustainable ones. Over the last two decades plant proteins and vegetable oils have been widely used in aquafeed, because they are readily available on the feed market and cost-effective. However, "veggie" diets show some disadvantages, possibly affecting fish welfare and are often in direct competition with human nutrition. Recently, research has been focused on insect meal (IM) and poultry by-product meal (PBM) as ingredients for aquafeed formulation. These ingredients have a low environmental impact and show proper nutritional qualities for fish culture. The present study investigated the physiological effects on these new ingredients (*Hermetia illucens* meal and PBM) during rainbow trout (*Onchorhynchus mykiss*) culture. Specifically, six different dietary treatments were formulated: one control diet based on vegetable ingredients (C Veg); one fish meal based diet (C Fish); one diet with a 30% substitution of vegetable proteins with IM (IM130); one with 60% of substitution with IM (IM160); one with 60% of substitution with PBM (PBM160); one combined diet with 50% PBM and 10% IM (PBM150+HM110). Feeding trials were carried out until fish triplicated their initial weight. A multidisciplinary approach was applied to study the dietary effects on intestine immune/inflammatory response and on appetite stimulus. Beside a traditional histological and biomolecular approach, Fourier Transform Infrared Spectroscopy (FTIR) was adopted as a new methodology to characterize the macromolecular composition of intestine mucosa. Histology on intestine did not show inflammatory events in medium and hind traits in none of the experimental groups apart a slight increase in mucous cells in trout's medium intestine fed IM diets. FTIR analysis on intestine samples provided interesting information on mucosal layer composition of the different experimental groups and showed as the nutrients transport in the intestine varied in relation of the experimental diets. RT-PCR showed an increase in the expression of genes involved in the activation of immune system related genes in medium intestine of C Fish, PBM130 and PBM160 groups. Moreover, an increased expression of genes involved in the inflammatory cascade was observed in medium intestine of C Veg. No significant differences among the experimental groups were detected about signals involved in appetite. These results suggest that the tested alternative ingredients are suitable for trout culture.

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