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Welfare and quality of farmed trout fed high plant protein diets.

1 Growth performance and quality traits

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ABSTRACT

This study was performed to evaluate the effects of high levels of inclusion of plant protein sources to replace fish meal in rainbow trout (*O. mykiss*) diets on growth performance and quality characteristics. Two isoproteic (44.8%) and isolipidic (19.6%) extruded diets were fed to eight groups of trout (IBW 106.6g) for 103 days. Diet FM, containing only fish meal as protein source, was used as control treatment and compared to diet PV80, where a plant protein mix (pea protein concentrate and wheat gluten) was included to replace 80% of fish meal protein. Growth performance (FBW: 318.5g; SGR: 1.06%) and feed to gain ratio (0.79) of the fish were not affected by dietary treatment ($p > 0.05$). Dry matter and protein ADCs, measured *in vivo* after stripping, resulted higher in fish fed the high vegetable protein diet relative to the fish meal one ($p < 0.05$). Trout fed diet PV80 were characterised by higher agility index (2.02 vs 1.72, $p < 0.05$), carcass yield (91.95 vs 91.18%, $p < 0.05$), lower hepatosomatic index (0.74 vs 1.07%, $p < 0.05$) and viscerosomatic index (8.04 vs 8.82%, $p < 0.05$) but higher mesenteric fat index (3.08 vs 2.88%, $p < 0.05$) relative to FM fed trout. No significant effect was observed in terms of fillet yield (59.28 vs 6.41%, $p < 0.05$). Feeding diet PV80 resulted in a significant reduction of fillet pH 48h *post mortem* (5.56 vs 6.44, $p < 0.05$) while no reduction was observed in fillet of trout fed the FM diet (6.56, $p > 0.05$). Higher dry matter (28.2 vs 26.8g/100g, $p < 0.01$) and hydroxyproline (0.79 vs 1.31mg/g, $p < 0.01$) content as a measure of total collagen, was observed in fillets of trout fed PV80 diet relative to the control ones. According to these data, also *post mortem* firmness measured by the Shear force of raw muscle resulted higher in fish fed the plant protein based diet (4.06 vs 3.30N, $p < 0.05$). The firmness reduction observed 48h *post mortem* (4.24 vs 2.95N, $p < 0.05$) resulted not affected by the dietary treatment. In summary, data show that even if the growth performance of rainbow trout fed a diet in which fish meal was largely replaced by high quality plant proteins resulted similar, some major quality traits such as dressing out, fillet composition and texture can be significantly affected by dietary treatment.

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