INTERACTION BETWEEN DIETARY COMPOSITION AND SEASONAL TEMPERATURE CHANGES IN GILTHEAD SEA BREAM *Sparus aurata*: EFFECTS ON GROWTH, FAT DEPOSITION, PLASMA BIOCHEMISTRY, DIGESTIVE ENZYME ACTIVITY AND GUT BACTERIAL COMMUNITY

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Introduction

The optimization of feeding strategy in relation to the environmental condition needs further investigation in order to maximise performance, fish health and fish quality of Mediterranean farmed species. Environmental temperature during seasonal changes may affects fish metabolism, digestive enzymes activity and gut bacterial community which may exert an effect on performance and tissue composition (Couto et al., 2012; Guerreiro et al., 2016). Data relating interaction between different dietary protein and energy ratio and water temperature changes on digestion condition, gut bacterial community and fat deposition of gilthead seabream fed current aquafeed formulations are scarce. For this reason, the purpose of this study was to evaluate the effects of two dietary protein and dietary energy ratio (DP/DE) during temperature changes on growth, feed efficienc , fat deposition, plasma biochemistry, digestive enzyme activity and gut bacterial community of gilthead sea bream (*Sparus aurata*).

Material and Method

Two experimental practical extruded diets formulated with 15% fishmeal and with different protein energy ratio (44/16; 44/21, protein/lipid, %) were tested in triplicated fish groups of 30 individuals (initial weight: 67.5g) and raised at two different water temperatures (23 °C and 17°C) in the same recirculation system over 119 days. Fish were fed manually to visual satiation twice a day. After 58 days fish were exposed to a switch in temperature (fish kept at 23°C were transferred to 17°C and the fish kept at 17°C were transferred to 23°C, 23/17 and 17/23, respectively) while continued to receive the same diet in each group. Specific growth rate (SGR), feed intake (FI), feed conversion rate (FCR), somatometric indexes and nutritional indices were performed in the intermediate periods and at the end of the trial to assess growth performance during seasonal changes. At the same times digestive enzyme activity (n=9 per treatment), plasma biochemistry (n=9 per treatment), and gut microbial community by Next-generation sequencing were determined. Data were analysed by Two-way ANOVA followed by a Tukey's multiple comparison test. Differences among treatments were considered significant at $P < 0.05$.

Results

At the end of the trial no significant diet effect on final body weight and SGR were detected in fish firstly exposed to 23 °C (23/17) compared to those firstly exposed to 17 °C (17/23). Similarly, no significant differences in FI and FCR were observed. In the intermediate periods, low water temperature negatively influenced SGR, FI and FCR under both dietary treatments. In those periods similar ($P > 0.05$) growth and feed utilization were detected between diets in fish reared at the same temperature even if in the second intermediate periods (days 58-119 after the temperature changes), FI was higher ($P = 0.01$) in 44/16 diets compared to 44/21. No significant dietary effect on perivisceral fat and HSI was detected at the end of the trial. Fat index was significant reduced in fish firstly exposed to 23 °C (23/17) under both dietary regime while HSI showed an opposite trend.

Discussion and conclusion

This study provided novel insight on the effects of DP/DE ratio on fat deposition, digestion condition and gut bacterial community of gilthead sea bream fed in summer before entering winter and fed in winter before entering in spring. Preliminary results suggest that different dietary lipid level did not improve growth performance and feed efficiency during seasonal changes, while a reduction in water temperature from 23 to 17 °C reduced feed intake and feed utilization under both dietary regimes. The increase in dietary lipid level from 16 to 21% seems to not affect lipid deposition.

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Rerefences

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