

— Impact of a plant-based diet on behavioural and physiological traits in sea bass (—

Replacing aquaculture feeds based on fisheries-derived resources with plant-based diets could be a relevant strategy to improve the sustainability of aquaculture. Recent studies on sea bass have shown that the total and early replacement of marine products by plant products would have a moderate effect on fish growth and body lipid content. Whether a plant-based diet impacts behavioural and physiological traits possibly linked to fish welfare, is not known, however. Here, we studied the effect of a totally plant-based diet introduced at an early stage of sea bass development on self-feeding behaviour, learning ability in a T-maze and stress biomarkers. We first compared learning processes in self-feeding conditions, between naive fish fed a plant-based diet (PBF) and fish fed a classic marine diet (MF). Then, we tested fish individually in a T-maze to compare the two feed groups for swimming activity, exploration and the ability to learn to discriminate between two two-dimensional objects associated with a reward. Blood physiological variables, including stress indicators (cortisol and glucose concentrations), were also determined. We did not find any indications of differences in self-feeding behaviour between PBF and MF in the first 30 days. A second experiment showed similar swimming activities in both fish categories. The "no-choice" percentage was high in both fish categories (~60%), but all the fish moved preferentially toward the reward. Their first turns indicated an ability to discriminate between two two-dimensional objects to complete a simple task. However, the high percentage of "no-choice" responses in both fish categories could have rendered the results non significant. The T-maze test procedure induced the production of high concentrations of cortisol, indicating acute stress in fish of both groups during testing. Plasma cortisol concentration was higher in MF than PBF, suggesting that the plant-based diet may affect the short-term release of cortisol. This study provides the first insight into the impact of a plant-based diet on sea bass behavioural traits, and confirms the effect of this diet on cortisol release in response to stress. Overall, in this first experiment, we did not find any major impact of a plant-based diet on sea bass behavioural traits, which is an interesting point for the development potential of such a sustainable aquaculture strategy.

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