

EXPLORING THE INFLUENCE OF SARDINE COOKING WATER EXTRACTS ON THE SHORT-TERM REGULATION OF FEED INTAKE IN EUROPEAN SEABASS

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Introduction

In fish, feed intake regulation is mediated by an interaction between homeostatic and hedonic signals (Soengas et al., 2018). The homeostatic control relates to biological needs regarding nutrients and energy (Soengas, 2021). On the other hand, the hedonic control is associated with reward-based routes, which are triggered by highly palatable food (Díaz-Rúa et al., 2022). Hedonic control may override homeostatic and maintain a drive to eat, due to the sensory pleasure felt by eating. Increasing the palatability of diets, such as those with high levels of plant-based ingredients, is therefore an important matter in aquaculture, as to achieve the best growth performance of fish. In addition, to evaluate the potential of a diet to affect the hedonic regulation of feed intake, long-term growth trials may be inadequate, since the need to maintain nutrient and energy homeostasis becomes more relevant over time. In parallel, the habituation effect to the diets occurs and masks the impact of diet palatability. Thus, studying feed intake stimulants, preferably obtained from by-products (considering a circular economy approach), on short-term trials may shed light on their impact on diet palatability and hedonic regulation of feed intake. In this work, we evaluated aromatic extracts from sardine cooking wastewaters as feed intake stimulants in plant-based diets for European seabass, focusing on the first feeding response towards the experimental diets.

Materials and methods

Sardine cooking wastewaters were collected and either tested directly (CW-A) or after vacuum distillation (VD-A) or after liquid/liquid extraction with soybean oil (LLE-A), resulting in distinct chemical profiles. The most abundant compound in the three extracts was 1-penten-3-ol, being thus chosen as marker and included at 2 µg/g in isolipidic and isoproteic diets (CW, VD, LLE). A practical plant-based diet (12.5% fishmeal and 4%

fish oil) without any supplementation was used as control. Each diet was assigned to six homogeneous groups of European seabass juveniles (96 g). Fish were sampled 2 and 6 hours after a single first meal distributed to apparent satiation. Metabolites including glucose, lactate, cholesterol and non-esterified fatty acids were quantified in the plasma. Additionally, the mRNA abundance of neuropeptides involved in the regulation of feed intake, namely neuropeptide Y (*npv*), agouti-related peptide (*agrp2*), cocaine and amphetamine-related transcript (*carpt2*) and pro-opiomelanocortin (*pomca*) was quantified in the hypothalamus and telencephalon.

Results and Conclusions

Feed intake after the first meal was significantly higher for the control diet than for the supplemented diets. No significant differences on plasma metabolites were observed. Although the expression of neuropeptides involved in feed intake regulation was statistically similar among diets and sampling points, LLE and VD diets displayed the lowest expression of the *agrp2* in the telencephalon, whilst LLE diet led to the highest expression of *pomca*, 2 hours after feeding.

The similar profile of plasma metabolites among diets suggests that the regulation of feed intake in the tested fish was driven more by hedonic factors, such as reward or pleasure-driven, rather than homeostatic factors, such as nutrient-driven. The slightly lower expression of orexigenic (inducing feed intake) neuropeptide *agrp2* in fish and higher expression of anorexigenic (suppressing feed intake) neuropeptide *pomca* may be regulating factors associated with decreased feed intake observed in fish fed LLE and CW diets, but other factors might have also contributed to such results. Overall, the sardine cooking wastewaters extracts, in the tested concentration, had no positive effect on the short-term feed intake response of European seabass, which suggests that feed palatability was not enhanced. Further optimization of the extracts' production process, and/or inclusion levels in diets should be considered in both short and long-term trials to improve effectiveness of the extracts as feed attractants.

References

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Acknowledgements: DR thanks FCT, SANFEED and Sense Test© for her PhD grant (PD/BDE/150524/2019). CIIMAR and GreenUPorto thank FCT funds (UIDB/04423/2020, UIDB/05748/2020). We thank ATLANTIDA-Platform for the monitoring of the North Atlantic Ocean and tools for the sustainable exploitation of the marine resources (NORTE-01-0145-FEDER-000040), supported by Norte Portugal Regional Operational Programme (NORTE 2020), under PORTUGAL 2020 Partnership Agreement and through European Regional Development Fund (ERDF).