DIETARY INCLUSION OF SARDINE COOKING WATERS: IMPACT ON APPETITE REGULATION, GROWTH AND SENSORY PROPERTIES OF EUROPEAN SEABASS

Daniela Resende [abcde]*, Cristina Velasco [a], Maria J. Pereira [f], Tiago Sá [a], Célia Rocha [de], Luís M. Cunha [d], Rui C. Lima [e], Carla Brazinha [f], Manuela Pintado [c], Luisa M.P. Valente [ab]

[a] CIIMAR/CIMAR-LA, Universidade do Porto, Terminal de Cruzeiros do Porto de Leixões, Av. General Norton de Matos, S/N, 4450-208 Matosinhos, Portugal
[b] ICBAS, Universidade do Porto, Rua Jorge de Viterbo Ferreira, 228, 4050-313 Porto, Portugal
[c] CBQF – Laboratório Associado, Escola Superior de Biotecnologia, Universidade Católica Portuguesa, Rua Diogo Botelho 1327, 4169-005 Porto, Portugal
[d] GreenUPorto/INOV4Agro & DGAOT, Faculdade de Ciências da Universidade do Porto, 4169-007 Porto, Portugal
[e] Sense Test Lda., R. Zeferino Costa 341, 4400-345 Vila Nova de Gaia, Portugal
[f] LAQV/REQUIMTE, Department of Chemistry, NOVA School of Science and Technology, FCT NOVA, Universidade NOVA de Lisboa, 2829-516, Caparica, Portugal
*Presenting author. Email: danielaresende@outlook.com

Introduction

Plant-based ingredients have been considered suitable options for replacing marine-based ones in aquafeeds (Naylor et al., 2021), but this may compromise diet palatability (Geurden et al., 2013), potentially affecting fish growth and flesh quality. To overcome this, feed attractants have been suggested. These compounds, like alcohols, aldehydes, and organic acids, were reported to stimulate intake in mammals (Chen et al., 2017; Takács et al., 2018). They can be obtained from agri-food by-products, within a circular economy framework. One example is the 9 m^3 liquid waste generated by the canning industry per tonne of canned fish (Ferraro et al., 2013). The objective of this work was to extract aromas from the effluent waters of a canning industry and incorporate them in plant-based diets for European seabass. The aim was to evaluate their potential to modulate intake, growth and fillet organoleptic characteristics.

Materials and methods

Sardine cooking wastewaters were collected and either used directly (CW-A) or after processing by vacuum distillation (VD-A) or liquid/liquid extraction with soybean oil (LLE-A). Although the resulting extracts had different chemical profiles, the most abundant compound in all fractions was the 1-penten-3-ol. This was hence selected as marker and extracts containing 2 µg/g of this compound were incorporated in isolipidic and isoproteic diets (CW, VD and LLE) for European seabass. A non-supplemented diet was used as control (CTRL). Each diet was assigned to triplicate fish groups (initial weight 95.7 ± 13.5 g), hand-fed twice daily until apparent satiation in a recirculating saltwater system at 21 °C. After 18 weeks, growth performance and nutrient utilisation were evaluated. Flesh colour and texture were assessed instrumentally and by sensory

analysis using a consumer panel. Moreover, the expression of neuropeptides involved in feed intake regulation (neuropeptide y – *npy*, agouti-related peptide – *agrp2*, cocaine and amphetamine-related transcript – *carpt2* and pro-opiomelanocortin – *pomca*) in the brain was analysed. Metabolites in plasma and liver of fish were also quantified.

Results and Conclusions

Fish fed LLE displayed a significantly higher voluntary feed intake than those fed the CW diet, although neither differed from CTRL. LLE also resulted in increased feed conversion ratio. Final weight, whole-body composition, and nutrient gain were similar among diets. The expression of intake-regulating neuropeptides was not significantly affected by diets, but a slight upregulation of the orexigenic *npy* was observed for the LLE diet. In addition, fish fed this diet displayed the lowest plasmatic glucose and highest hepatic glucose and triglycerides values, although the remaining metabolites (lactate, non-esterified fatty acids, cholesterol and glycogen) were unaffected. Thus, the changes in feed intake are probably due to a combined effect of the homeostatic (nutrient-driven) and hedonic (pleasure-driven) regulation. No differences were found in skin or muscle colour among treatments. Despite a lower hardness in fillets of fish fed LLE when compared to those fed CTRL, no significant differences were perceived by the sensory panel; global liking of samples was similar among treatments, being all generally well accepted. Additionally, the samples' taste and odour were characterized as "characteristic fish" and "soft" for all treatments. Overall, results suggest that aromas from sardine cooking wastewaters can modulate feed intake, but further optimization of either the processing and/or incorporation levels seems required to maximize their effectiveness as feed intake stimulants for application in aquafeeds.

References

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