DIETARY PROTEIN SOURCE HAS MAJOR IMPACT IN GROWTH PERFORMANCE OF GILTHEAD SEABREAM LARVAE

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Introduction

The improvement of microdiets for fish larvae has been a major challenge in past years. Besides their tremendous growth rates, fish larvae have an immature digestive system at early developmental stages and a progressive metamorphic process that suggests special nutritional requirements [1]. It is therefore essential to provide fish larvae with easy and/or quickly metabolizable protein sources. While fish meal is well recognized as the reference protein source for juvenile and adult fish, its proteins maybe too complex for easy digestion in fish larvae [2]. Moreover, there is a trend for replacement of fish meal by plant protein-rich ingredients, but these may be deficient in some micronutrients present in marine ingredients or contain anti-nutritional factors [3]. Therefore this study aimed to study the effect of three protein sources: fish meal, squid meal and a mixture of vegetable protein concentrates, on gilthead seabream larvae performance and digestive function.

Materials and methods

Gilthead seabream larvae were obtained from natural spawnings of GIA (Grupo de Investigación en Acuicultura (GIA), University of Las Palmas de Gran Canaria (ULPGC, Spain) broodstock. Larvae were reared in tanks of 2000 L until they reached 19 days after hatching (DAH), fed rotifers (*Brachinous plicatilis*) enriched with DHA Protein Selco® (INVE, Dendermond, Belgium). At 19 DAH and with an average total length of 5.3 mm and dry body weight of 122 µg, larvae were randomly distributed in 9 experimental tanks of 200 L set in a flow-through system at a density of 10 larvae L^{-1}. Larvae were fed one of the experimental diets in triplicates for 21 days. Diets were manually supplied fourteen times per day each 45 min from 9:00 to 19:00. Light intensity of 1700 lx and a light/dark cycle of 12:12 h. Water was continuously aerated (125 ml min^{-1}) attaining 6.4 ± 1 ppm dissolved O_2. Average water temperature and pH along the trial were 18.8 ± 2.0 °C and 7.85, respectively.

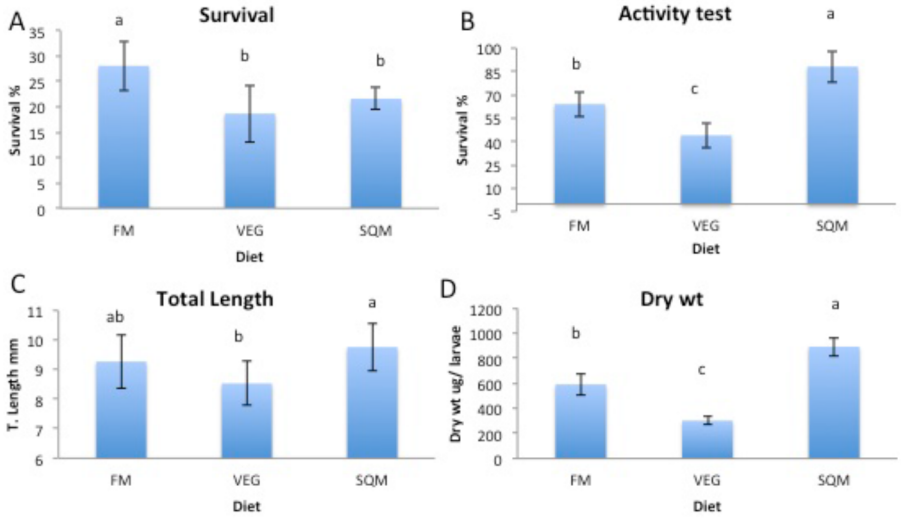

Fig. 1. Survival (A), Survival after activity test (B), Total Length (C) and Dry weight (D) of gilthead seabream larvae at 41 days after hatching and feed on three alternative feeding regimes.

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Three isonitrogenous, isolipidic and isoenergetic microdiets were prepared at SPAROS Lda by low-shear extrusion. The main change in the formulation of the three diets was the main protein sources in each: fish meal, squid meal or a mixture of vegetable protein concentrates. Other ingredients common in the three diets were protein hydrolisates, taurine, gelatin, fish oil, olive oil, krill oil, soy lecithin, vitamin & mineral premixes.

Dry weight, total length, survival and survival after activity test (chasing) were assessed at the end of the experimental period. Larvae were also sampled for expression of genes related to digestive enzymes, and for gut and liver histology.

Results

Gilthead seabream fed on the squid meal-based diet showed a considerable higher growth compared to the other to diets (see Fig. 1), while the vegetable –based diet was clearly the worst in terms of growth performance. However, regarding survival rate the fish meal –based diet performed best, with the two other diets showing similar results. Survival after the activity test followed the pattern described for growth, with the squid meal and the vegetable –based diets, performing best and worst, respectively.

Conclusions

The squid meal seems to be the best protein source of the three tested in what concerns growth performance of gilthead seabream larvae. However, fish meal seems to make larvae more robust. This may be due to the presence of some micronutrient(s) in fish meal, and absent in squid meal and the vegetable mixture. Gilthead seabream larvae do not perform well with the mixture of vegetable protein concentrates used in this study, likely due to a deficiency in one or more micronutrients present in marine ingredients.

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