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FAST GROWING GREATER AMBERJACK POST-LARVAE SEEM TO REQUIRE A HIGH ENERGY-HIGH PROTEIN DIET

L.E.C. Conceição[1], C. Navarro-Guillén[2], W. Pinto[1], I. Siguero[3], P. Urrutia[3], F.J. Moyano[4], and M. Yúfera[2]

[1] SPAROS Lda, Olhão, Portugal
[2] Instituto de Ciencias Marinas de Andalucía (ICMAN-CSIC), Puerto Real, Spain
[3] Futuna Blue España SL, El Puerto de Santa María, Spain
[4] Universidad de Almeria and CEI·MAR, Almería, Spain

Introduction

Fast growing species such as *Seriola* sp. have a high potential for aquaculture diversification. However, the industrial farming potential of such fast growing species is still limited by mass production of high quality juveniles. Although several commercial weaning diets exist with relatively high success for larvae of other marine fish species, additional challenges are posed to meet growth potential and energy requirements of fast-growing species. The very fast growth rates during the larval stage indicate these species may have particularly high protein and energy requirements and special diet properties may be necessary (Conceição et al., 2011; Hamre et al., 2013). In fact, most available commercial microdiets were developed in Europe and Japan targeting slower growing marine species.

This work evaluated a novel microdiet (HIGH) having simultaneously a very high protein and high lipid contents. This microdiet was compared with a current premium microdiet (COMM) for marine fish larvae, in a growth performance trial with greater amberjack (*S. dumerili*) post-larvae.

Materials and methods

The trial was performed at Futuna Blue España SL (El Puerto de Santa María, Spain) with greater amberjack post-larvae (0.507g initial body weight), originating from Futuna´s broodstock. Larvae were reared using live feed (copepods, rotifers and *Artemia*) until 33 days after hatching (DAH), according to Futuna´s commercial rearing protocols.

The growth performance trial compared two inert microdiets. One commercial diet with 57% crude protein and 15% crude lipid (COMM), and a novel microdiet (HIGH) developed for fast growing larvae (SPAROS Lda, Portugal) containing 64% crude protein and 18% crude lipid. The main ingredients in the COMM diet used were fish meal, wheat gluten, corn starch, fish oil, alfalfa protein concentrate, yeast, lecithin, and seaweed extract; in the HIGH diet the main ingredients were fish meal, squid meal, shrimp meal, pea protein concentrate, wheat gluten, fish protein solubles, krill oil, fish oil, and lecithin.

The trial was conducted in duplicate 7000-l tanks, in a recirculating system, each with 864 post-larvae at start. Diets were supplied continuously by automatic feeders and manually five times per day. Feeding was adjusted to guarantee always a slight excess of feed. Water oxygen levels were maintained at 86±4%, air saturation and water temperature at 26.8±0.6°C. Wet weight, total length and survival were assessed over a period of 45 days, until 78DAH. H&E histological preparations of liver, anterior and posterior intestine were assessed at 61DAH. Hepatic and intestinal lipid inclusions were quantified by morphometric techniques, and gut epithelial brush height was measured. Activities of the digestive enzymes: pepsin, trypsin, chymotrypsin, lipase, and amylase were also assayed at 61DAH.

Results

Greater amberjack fed on the HIGH microdiet growing larvae showed a 20% higher growth in wet weight compared to the control commercial microdiet, and a 13% lower FCR (See Fig. 1). Survival rates were around 75% after 45 days of trial, with mortalities being largely caused by cannibalism.

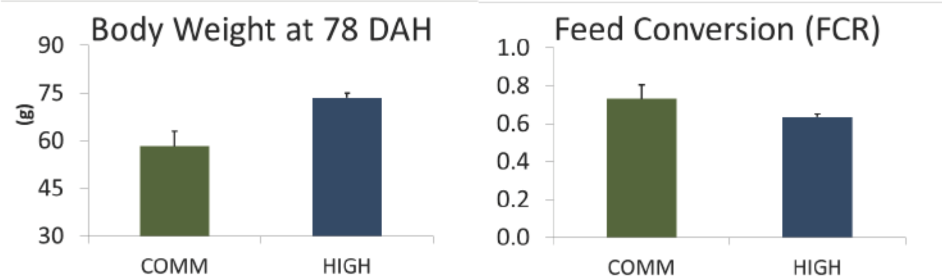

Fig. 1. Wet weight (g) (left) and feed conversion ratio (right) at the end of the trial (78DAH) of greater amberjack larvae feed the COMM and HIGH microdiets.

Histology of liver, anterior and posterior intestine showed no major alterations. Gut epithelial brush border height was similar between the two diets. However, liver displayed a higher level of lipid inclusions for the COMM diet than for HIGH diet. Moreover, posterior intestine presented a much higher level of lipid inclusions for the HIGH diet compared to COMM diet.

No significant differences for activities of pepsin, trypsin, lipase, and amylase were observed. However, chymotrypsin activity was significantly higher for the

COMM diet. This resulted also in a higher trypsin/chymotrypsin ratio for HIGH microdiet.

Discussion and conclusion

Greater amberjack performed considerably better in terms of both growth performance and feed conversion ratio when fed a novel microdiet developed for fast growing larvae, compared to a control commercial microdiet.

HIGH fish also showed better utilization of dietary lipids and protein as suggested by liver and intestinal morphometry and digestive enzymes activities, respectively. The higher accumulation of lipid inclusion in posterior intestine, together with lower liver lipid accumulation and the very good growth performance of greater amberjack, suggest that larvae of this species can process high dietary lipid levels, with obvious benefits. The lower Trypsin/Chymotrypsin ratio for COMM microdiet may indicate a deficiency in protein of this diet as suggested by Cara et al. (2007).

Together, these results support that larvae of greater amberjack, and likely other fast growing marine fish species, require high protein-high lipid microdiets. These results are consistent with recent results for meagre (Candeias-Mendes et al., 2016). The use of microdiets developed targeting slower growing marine species may lead to sub-optimal performances in fast growing larvae.

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