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ABSTRACT
BOOK

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T15 EFFECT OF COTTONSEED PROTEIN CONCENTRATE ON THE PHYSICAL QUALITY OF LOW-STARCH EXTRUDED FLOATING AQUATIC FEED

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Abstract: Cottonseed protein concentrate (CPC) is a high-quality fish meal substitute and has been proven to have excellent nutritional properties for fish. However, the processing characteristics of CPC and its influence on the physical quality of extruded pellet feed is still unclear. This study investigated the effects of fishmeal, cottonseed protein concentrate and soybean protein concentrate on the physical quality of extruded aquatic feed and established a correlation model by using mixture design method. Obtained the optimal protein source combination for producing low-starch (6.45 %) extruded floating feed through optimization. The cottonseed protein concentrate significantly increased the expansion ratio and maximum oil absorption, and reduced the hydration time and oil leakage of feed pellets ($P < 0.05$). Fishmeal was conducive to the formation of smooth and uniform surface and high durability of pellets, but reduced the expansion ratio, maximum oil absorption, and extended the hydration time of feed ($P < 0.05$). Soybean protein concentrate improved the hardness, durability and reduced the water solubility of the feed, but it also led to a longer hydration time and higher oil leakage ($P < 0.05$). Fishmeal and soybean protein concentrate have obvious incompatibility during extrusion process because of the phase separation. The surface of the feed pellets processed by mixing 50% fishmeal+ 50% soybean protein concentrate was rough, and the internal structure of pellet was loose, which directly led to lower hardness (17.6 N), durability (96.5 %) and higher water solubility (12.3 %) and oil leakage (12.6 %). Cottonseed protein concentrate has better extrusion processing properties than fishmeal and soybean protein concentrate, which can significantly improve the physical quality of low-starch floating aquatic feed. Combined with animal nutrition requirements and model optimization analysis, it was determined that 40 % fishmeal + 60 % cottonseed protein concentrate was the best protein source combination for producing low-starch (6.45 %) extruded floating feed.

T16 PERFORMANCE OF DIETS BASED ON ALTERNATIVE PROTEIN SOURCES FOR RAINBOW TROUT (*ONCORHYNCHUS MYKISS*) IN RECIRCULATING AQUACULTURE SYSTEMS

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With the general aims of controlling waste production and increasing efficiency in recirculating aquaculture system (RAS), this study compared growth performance, diet digestibility, and faeces characteristics in rainbow trout (*Oncorhynchus mykiss*) fed four diets including fish meal (FM) as the main protein source or partially replacing FM with three alternative protein meals, i.e. poultry by-product meal (PBM), hydrolysed feather meal (HFM) and rapeseed meal (RM). A total of 1020 fish ($17.2 \text{ g} \pm 7.50 \text{ g}$) were randomly distributed into twelve experimental RAS units (3 tanks per treatment, 85 fish per tank) and fed during 94 days with diets including 30% FM (diet FM, control), or 18% FM and 17% PBM (diet PBM), or 20% FM and 8% HFM (diet HFM), or 18% FM and 8% HFM and 6% RM (diet HFM+RM). Good structural integrity (DORIS test: 0.91%) and low oil leakage (<1.5%) were found for all diets, while the lowest water turbidity ($2.7 \text{ vs. } 12.7 \text{ mg L}^{-1}$; $P < 0.05$) at 15 minutes after feed administration was recorded for HFM diet. Fish specific growth rate (2.16 \% d^{-1} , on average) and feed conversion ratio (1.05) were not affected by the dietary treatment, whereas carcass yield was higher in fish fed FM diet compared to the other diets ($77.2 \text{ \% vs. } 74.8 \text{ \%}$; $P < 0.05$). Apparent digestibility of lipids ($77.5 \text{ \% vs. } 61.2 \text{ \%}$; $P < 0.001$) and of main fatty acids ($P < 0.001$) was higher in fish fed FM and PBM compared to the other diets, whereas no differences were found for protein digestibility (on average 80.4%). The rate of faeces retained by a 0.5 mm-diameter sieve was lower in fish fed PBM diet compared to the other diets ($67.4 \text{ \% vs. } 70.0 \text{ \%}$; $P < 0.05$), i.e. PBM diet generated larger particles of faeces. As for waste production in RAS, the replacement of FM with PBM is worth of further investigation given the positive effects on nutrient digestibility and faeces particle size. Regarding production costs, FM diet was the most expensive both in

terms of feed (921 €/ton) and fish live weight production (0.95 €/kg), whereas HFM+RM diet was the cheapest one (feed cost: 821 €/ton; fish production: 0.87 €/kg).

T17

FIRST STEP OF UTILIZING EUGLENA GRACILIS POWDER IN DIET FOR RED SEABREAM (PAGRUS MAJOR)

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Microalgae have shown great potential to be used as alternative ingredients for aquafeeds. A unicellular photosynthetic flagellate *Euglena gracilis* appears to be a promising candidate as a feed ingredient given its high protein content, nevertheless little is known about its availability for fish diet. The aim of the present study was to investigate the effectiveness of *Euglena* powder as a protein and lipid source in the feed for red seabream.

The control diet (30% fishmeal, 10% fish oil) was modified by replacing 50% or 100% of the fishmeal by *Euglena* powder. Thereafter, 50% of the fish oil in the diets were replaced by rapeseed oil to prepare six iso-nitrogenous and iso-lipidic test diets (CP 42.5%, CL 18%). Duplicated groups of juvenile red seabream (2.6g mean weight) were fed on those experimental diets for 12 weeks to near satiation.

The diet groups replaced 50% fishmeal with *Euglena* powder showed no significant difference in growth with the control diet group, without adverse effect of reduced fish oil in the diets. However, 100% replacement of fishmeal with *Euglena* powder induced the lowest growth, lipid content in fish body and diet digestibility. The n-3 LC-PUFA contents were decreased in the diet groups whose fish oil formulation in the diet was reduced. These results suggest that the *Euglena* powder can serve as an effective protein source for red seabream diet and thus can be used as a partial substitute for fishmeal.