Is dried Spirulina suitable as a sole source of feed for the feeding onset of the estuarine tilapia Sarotherodon melanotheron heudelotii?

INTRODUCTION

Faced the rapid world-wide expansion of aquaculture and the renunciation of natural resources, to find alternatives to fishmeal and oil issued from wild for fish feed, became a real challenge. Microalgae are often pointed out as good candidates especially as substrate to fishmeal, and among them, spirulina (Arthrospira platensis), a cyanobacterium, is characterized by a high protein content and digestibility, and lacks anti-nutritional factor7. These algae are also relatively easy to produce, industrially or handmade by fish farmers themselves, especially in tropical countries.

In this experiment, we have chosen to test this spirulina as a sole source of feed for the Sarotherodon melanotheron heudelotii. This species is an euryhaline tilapia, which grows correctly in all types of salinity6, and is therefore pointed to match another important challenge, i.e., the global change responsible of the rapid raise of salinity in tropical countries. Previous studies showed that juveniles and adults of S. melanotheron could be only fed with dried spirulina without deleterious effect, though growth was lower than commercial feed5, and that Nile tilapia (O. niloticus) larvae accepted fresh raw spirulina from the onset of feeding6.

Our aim here, was to experiment if the S. melanotheron larvae could be fed with only dried spirulina from the onset of feeding and to 40-day-old post fertilisation (DPF).

MATERIALS & METHODS

Spirulina diet (S group) All eggs were produced in RIN, harvested by membrane technology, shaped into spaghetti, and dried at 65°C during 24 hours.

Control diet (C group) The commercial pellet was Biomar INCOO plus-Tilapia. All pellets were manually grinded then sieved to obtain two ranges of size: ≤0.16 mm & 0.16<ø≤0.6mm.

Biological material and rearing design SAR larvae were obtained from natural spawning, and distributed in 6 aquarium (3 litres each; 52 larvae per tank; 1 triplicate per feed). Fresh water was supplied in recirculating system, temperature maintained at 28.6°C, dissolved oxygen at 6.26ppt, pH at 8.46, light intensity 230 lux. Photoperiod was 12D:12N, and light was at 6.26ppt, pH at 8.46, light intensity 230 lux. Photoperiod was 12D:12N, and light intensity 230 lux. Circadian Figure 2.

Feeding strategy Feeding started at DPF (larvae mean weight = 160±0.2 mg) Feed was manually distributed 4 times a day (base during week ends).

All individuals were weighted at the age of 57, 34, 32 and 40 day-old. They were also length at day 40.

RESULTS AND DISCUSSION

All fish have accepted the dry spirulina pellets from the onset of feeding, and at the end of the experiment (40 DPF), the following features were observed:

- Survival rates were similar in both treatments (92%)
- No body deformity was observed in any groups
- The mean weight of fry fed with spirulina was almost 5 times smaller than that of controls (1.66±0.06 versus 7.44±0.72 g). A higher coefficient of variation slightly higher from 35.65% versus 26.6±0.79% (Fig. 1) with a mean coefficient of variation slightly higher from 35.65% versus 26.6±0.79% (Fig. 1) with a mean condition index (Weight / Length2) was also lower than controls (1.50±2.3 versus 3.74±1.3).
- The proximate composition analysis revealed that the spirulina fed by have a global energy content 11% lower (51.7 versus 57.1±10/00 g of dry matter), a moisture content 6% lower (88.2% versus 72.1%), and the following differences (Fig. 3):
  - Ash: -32%  
  - Lipids: -7%  
  - Proteins: -17%  
  - Carbohydrates: -68%  
- The fatty acids (FA) analysis showed that (Fig. 4):
  - Among the unsaturated FA, monounsaturated one’s were dominant, and mainly represented by u-9 in both type of fry
  - Among the polyunsaturated FA, the ratio u-3/s-6 was drastically depressed in the spirulina fed fry (1.6 versus 1.1).

This preliminary study suggests that it is possible to use dried spirulina to start feed estuarine tilapia larvae, and to rear them in the early stage without effects on mortality and deformities but with a major negative impact on growth compared to the performances obtained with a standard diet. Body composition shows higher amount of saturated fatty acids and lower amount of u-3 polyunsaturated fatty acids probably reflecting the presence of fish oil in the standard diet. It would be interesting to in further investigations to investigate if a shift of the diet (from spirulina to commercial diet after a few days of use) would correct these defects.

REFERENCES