

Review of: "The Growth Performance of Nile Tilapia (*Oreochromis Niloticus*) Fed Low-Cost Fish Feeds Formulated From Fish By-Products, Fishery By-Catch and Pig Blood-Meal"

Margaret Aanyu

Potential competing interests: No potential competing interests to declare.

Manuscript title: The Growth Performance of Nile Tilapia (*Oreochromis Niloticus*) Fed Low-Cost Fish Feeds Formulated From Fish By-Products, Fishery By-Catch and Pig Blood-Meal.

Overall comment: The authors carried out an interesting study addressing a present challenge in the aquaculture fish feed sub-sector. They set quite a satisfactory experimental design, but I have reservations about the very unusual slow/poor growth rate of the fish after 11 weeks and the high FCR. Thus, I recommend rejecting the manuscript.

Specific Comments on each section of the manuscript:

Abstract:

- a. The common name of *Oreochromis niloticus* (i.e., Nile tilapia) needs to be mentioned in the first sentence.
- b. State the volume of water in the aquaria.
- c. This weight needs to be corrected **00.6** ± 0.02g. In brackets, state whether it is ± standard deviation or ± standard error.
- d. The authors need to mention which growth performance parameters were assessed and which ones showed significant differences. Just stating that growth performance was assessed is not scientifically informative.
- e. State the duration of the study.
- f. There is repetition in the following sentences: Growth performance of fish was highest in fish fed with 100% by-catch. Significant differences ($p < 0.05$) in growth performance of *Oreochromis niloticus* subjected to different feed treatments were reported. Fish fed with 100% by-catch and 100% by-products diets showed higher growth performance than those fed with other feed types.

- g. Consider dropping the redundant sentences in the whole text.
- h. There is no mention of nutrient utilization efficiency parameters that were investigated.
- i. This study showed that the inclusion of by-catch and by-products at 100% could replace **fish feed** in the Nile tilapia diet. Replace the bold words with fishmeal.
- j. The first sentence of the abstract should include an element of cost of feed because the second last sentence in the abstract states the least cost diet.

Key words: I recommend that the authors limit the number of words in the title used as key words; rather, they should find more key words from the text (e.g., background information). This will increase the ability for readers to find your article.

Introduction

- a. Correct this sentence: This development in global fish supply from aquaculture has increased the demand for fish feed resources, especially for **high quality protein and high-quality lipid** feed resources such as fish meal and fish oil (Naylor et al. 2009). See the bold words and correct with:high quality protein and lipid feed resources.
- b. Generally, there are a number of redundant words in the sentences. Carefully look out for them and please consider dropping them.
- c. Write in full: >90%.
- d. Re-phrase this sentence: Selection of ingredients for the formulation of fish feed is very crucial and these ingredients should be cheap and available in the local market (Zamal et al. 2009). Note that it is not only cost of feed ingredients that matters, but also the nutritional, sensory (palatability) and physical qualities matter.
- e. You need to state why you are supporting semi intensive aquaculture
- f. Drop the word However in this sentence: with the continued decline in capture fisheries production, there is need to improve and boost aquaculture production so as to meet the ever-increasing demand for fish and fish products.
- g. Drop this sentence: In this study, we demonstrate that using cheap and locally available fish products is perhaps one of the most realistic options.
- h. Take this sentence, "The hypothesis is that these feed formulations will adequately meet the protein requirements for fish just as commercial feeds but at substantially lower cost" to be the last in the paragraph that begins with ...although the aquaculture industry.....:
- i. This text should come in paragraph 2 or at most paragraph 3 "*Oreochromis niloticus* is the main species that is farmed successfully in Zimbabwe. It is favoured because of its fast growth rate, high resistance to diseases, ability to survive at low oxygen levels and ability to feed on wide range of foods (Azaza et al. 2010). In addition, the species can also tolerate higher dietary fibre and carbohydrate concentrations than most other cultured fish species (El-Sayed and Teshima 1992)".

- j. I suggest that the authors move this text to the materials and methods section, i.e., In this experiment, growth, survival, feed intake, protein efficiency ratio, and feed conversion ratio were measured in fish fed with various formulated diets.

Study Area

I suggest that this section is re-organized as follows:

a) Let the beginning sentence be: The **fish** feeding experiment was **carried out** at the University of Zimbabwe Department of Biological Sciences, in Harare, Zimbabwe. Harare is in Agro-ecological region IIA. This area is situated on the Highveld plateau of Zimbabwe with a subtropical highland climate. The average annual temperature is 17.95 °C, and the average annual rainfall is about 825 mm.

Include the words above in bold black font.

State the duration of the fish feeding experiment.

b) Take this text under the experimental design, i.e.: The experiment was carried out in a greenhouse so as to maintain constant temperatures.

c) Take the text below to the sub-section on *Diet Formulation, Preparation and Composition, i.e.* Feed preparation was done at the University Lake Kariba Research Station (ULKRS) in Kariba, Mashonaland West Province, Zimbabwe. Kariba is found within Agro-ecological region V, and the mean annual rainfall is below 650 mm. Temperature averages are between 20°C and 27°C.

Subsection on Experimental Setup and Design

This text needs to be corrected with full stops and by starting sentences with a capital letter, i.e., feed was fed to the fish in the form of pellets at 5 % body weight twice a **day**. The experiment was **carried out** for a period of 11 weeks. **To** ascertain whether there were any statistical differences in the growth performance of fish fed formulated feeds and commercial feed.

Replace the word "done" with "carried out."

The authors also need to state whether they were using a follow-through system to a recirculation aquaculture system. In addition, what was the water flow rate for each aquaria tank?

Subsection on Water Source and Water Quality Parameters

The values of each water quality parameter that was measured need to be stated under this sub-section.

Subsection on Microbiological Sample Collection and Analysis

Under this section, include a table showing the total coliforms and *Escherichia coli* that were found in by-products, by-catch, and pig blood meal.

Subsection on Diet Formulation, Preparation and Composition

The subsection on feed ingredients should be infused into the subsection of Diet Formulation, Preparation and Composition

I recommend that the authors include a table showing feed formulations for each of the 8 test diets/feeds, i.e., showing the proportions of each feed ingredient used in each of the 8 feed formulations.

Subsection on Proximate Analysis

In this section, the authors are advised to present the actual proximate analysis results for the 8 experimental fish feeds.

Measurement of Biological Parameters

State the model of the digital scale, its precision, and the city where it was made.

Make sure that these growth performance indices are also mentioned in the abstract.

Results

Proximate composition of individual feed ingredients, proximate composition of experimental feed, including the energy level, should be presented using the materials and methods section as stated above.

Similarly, values for the water quality parameters should be presented under the materials and methods section.

The results section should only present data for the variables that the study set out to investigate, i.e., growth performance indices, feed intake, FCR, nutrient utilization efficiency, cost of the 8 experimental fish feeds.

Subsection on Total Feed Intake and Feed Utilization

The best FCR of 4.9 was actually bad/poor. This implies that the feed was not efficiently utilized by the fish for growth.

Figure 1: Show the error bars.

The growth rate of the fish was quite low, from about 1g to 2.11-2.87g in 11 weeks! There could have been a problem in this experiment that affected the growth of the fish more than just temperature. How long did the fish grow at temperatures below 24 °C?

Fish at this early development stage grow fast as long as all the environmental conditions and nutritional requirements are

kept within the optimal conditions for the fish species. The FCR is also suggesting that there were some unfavorable conditions for the fish apart from temperature.

Discussion

The results for proximate analysis of the feed ingredients and feeds do not form the core objective(s) of the study; rather, the authors should focus the discussion straight on growth performance indices/parameters, nutrient utilization efficiency, and cost of the feed because this is what the study was set out to investigate.

Hence, I recommend that the authors drop paragraph one or summarize the text in paragraph one to two short sentences.

The discussion also lacks a strong comparison with the findings of other authors. In addition, the authors are advised to discuss how the growth performance relates to feed/nutrient utilization efficiency, and also how FCR relates to cost per kilogram of the feed to show what would be spent on each type of feed to grow the fish to a standard weight, e.g., one kilogram weight gain.