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DEVELOPMENT OF PRACTICAL DIETS FOR THE GROWTH AND SURVIVAL OF THE NILE TILAPIA *(OREOCHROMIS NILOTICUS)*

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ABSTRACT

In order to stabilize the price and supply of tilapia, improve the diet of tilapia, and save the livelihood of farmers across the nation, it is urgent to address the dependence on fish-based feed. The objective of this study is to create workable diets for Nile tilapia that reduce their reliance on fish-based products and find alternative sources of protein, while also fattening and enhancing growth development. This study aimed to answer the following questions, if the developed feed is effective in improving the growth of the Nile tilapia (Oreochromis niloticus) in terms of length and mass, which among the three treatments are the most effective in improving growth, and if there is a significant difference between treatments. To test the hypothesis that the feed developed from this study is effective in improving the growth of the Nile tilapia (Oreochromis niloticus) in terms of length and mass, an experiment was conducted, different treatments were made and applied to the tilapia, it is comprised of three treatments, treatment A with 66.7% (66.7g) golden apple snail, 10.65% (10.65g) Azolla (Azolla pinnata), 22.67% (22.67g) rice bran, treatment B with 66.6% (66.6g) golden apple snail, 10.3% (10.3g) kangkong (Ipomoea aquatica), 23.1% (23.1g)rice bran and treatment C fish feed (100g). The treatments were applied for 30 days. The results acquired were analyzed using one-way ANOVA in the SPSS software. The findings show that treatment B is the most effective treatment, but the three treatments have no significant difference in terms of mass and length.

Keywords: *Tilapa, Alternative sources of protein, Fish-based feed*

1. Introduction

The Nile tilapia, *Oreochromis niloticus*, Phylum chordata, class Actinopterygii, order cichliformes and family cichlidae is locally named “tilapia” or just tilapia. For the expanding population, the tilapia business provides vital income and an economical supply of protein. It is the Philippines most widely cultivated freshwater fish and is the second most important farmed fish in the Philippines produced in ponds, cages, and pens (Guerrero et al., 2018).

Fishmeal made from pelagic fish used to be the major dietary protein source in compounded feed for many important farmed species, but the limited amount available has resulted in massive research to identify alternative protein sources. The average levels of pelagic fishmeal in aquaculture feed have decreased substantially in the last decade and recent published results in the scientific literature show that it is possible to replace even more in diets both for carnivorous and herbivorous/omnivorous species. If the predicted low inclusion levels are reached in the next decade, there may be room for a relatively large increase in the total production of farmed fish and shellfish without any increased use of fishmeal. (Olsen et al. 2012)

This study is concerned with human and environmental factors such as overfishing and global warming, leading to the decline of fish catch and production of fish meal to be fed to cultured fish which could ultimately cause the decline of both farmed fish and wild fish affecting supply, destruction of livelihood and rising prices of aquaculture products.

It has been found out that these factors lead to the scarcity of fish and fishmeal supply locally and globally which is one of the main ingredients in producing commercial fish feed or in this case tilapia feed. We might lessen our reliance on fish meal as a fish feed while also producing an alternative fish feed that can increase tilapia development performance by reducing the amount of fish meal and introducing other more common sources of plant-based protein like kangkong and Azolla.

The researcher discovered that it may be able to reduce the reliance on fish-based feeds while potentially improving tilapia nutrition and growth by incorporating plant-based proteins into feeds. However, the growth performance has not been tested and the effectiveness of the feed relative to commercial fish feed is yet to be determined.

There is an urgent need to solve the dependency on fish-based feed in order to save the livelihood of farmers around the country, to stabilize the price and supply of tilapia and to improve the diet of tilapia, and thus the goal of this study is to develop practical diets for Nile tilapia decreasing it's dependency on fish-based products and to find alternative sources of protein, specifically, plant-based protein while also fattening and improving the growth development of Nile tilapia.

Statement of the Problem

Generally, this study aimed to determine the effectiveness of the developed feed in the growth and survival of Nile tilapia (*Oreochromis niloticus*).

Specifically, this study aimed to answer the following questions:

1. Is the developed feed effective in improving the growth and survival of Nile tilapia (*Oreochromis niloticus*)?
2. Is the developed feed effective in improving the growth of the Nile tilapia (*Oreochromis niloticus*) in terms of mass and length?
3. Which among the three treatments is most effective in the fattening and growth of the Nile tilapia (*Oreochromis niloticus*) in terms of mass and length?
4. Is there a significant difference between treatments A, B, and C in terms of mass and length?

Objectives of the Study

Generally, this study aimed to determine the effectiveness of the developed feed in the growth and survival of Nile tilapia (*Oreochromis niloticus*).

Specifically, this study aims to:

1. Determine whether the developed feed has an effect in the growth of the Nile tilapia (*Oreochromis niloticus*).
2. Determine if the developed feed has an effect in the growth of the Nile tilapia (*Oreochromis niloticus*) in terms of length and mass.
3. Determine which treatment is the most effective in the growth of the Nile tilapia (*Oreochromis niloticus*) in terms of mass and length.
4. Deteremine if there is a significant difference between the three treatments in the growth of the Nile tilapia (*Oreochromis niloticus*) in terms of mass and length.

Hypotheses of the Study

1. The developed feed is not effective in improving the growth and survival of the Nile tilapia (*Oreochromis niloticus*).
2. The developed feed is not effective in improving the growth and survival of the Nile tilapia, (*Oreochromis niloticus*) in terms of mass and length.

3. None among three treatments is more effective in the growth and survival of the Nile tilapia, (*Oreochromis niloticus*) in terms of mass and length.
4. There is no significant difference between the treatments A, B, and C in terms of mass and length.

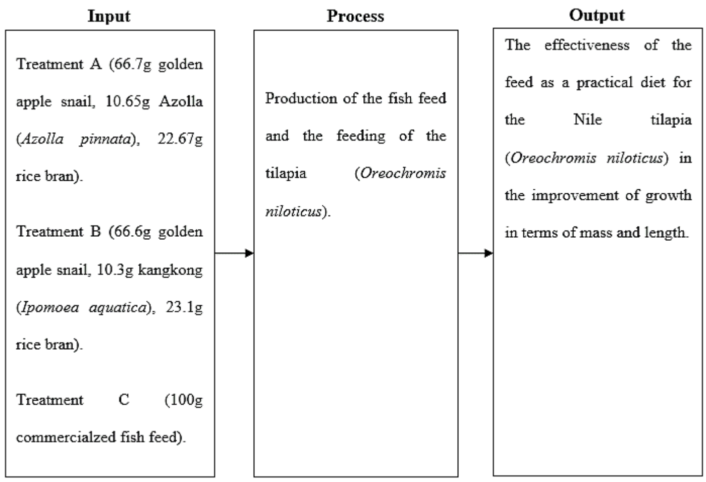
Theoretical Framework

Development of practical diets for the fattening and growth of Nile tilapia (*Oreochromis niloticus*), this study is supported by an article published by Eljhon D. Manuel, Regie B. Gutierrez, and Marissa C. Naorbe which states that diets with water spinach significantly improved the specific growth rate of the Nile tilapia (*Oreochromis niloticus*). The feed conversion ratio is also higher compared to that of commercially available feed. This information will be useful in determining possible ingredients to be used in the feed development. (Manuel et al., 2020)

This study is also supported by an article published by Noppawan Chimsung and Chutima Tantikitti which states that fish fed a diet containing minced GAS showed better growth performance and feed utilization than those of the control diet. The digestibility study indicated that fish utilized protein from snail meal either in a minced or fermented form much better than protein from fishmeal. It was concluded that snail meal is a potential protein source in sex-reversed red tilapia diets. (Chimsung et al., 2014)

Conceptual Framework

Figure 1. The relations between the variables



2. Literature Reviews

Water lettuce and water spinach as potential feed ingredients for Nile tilapia Oreochromis niloticus. Water spinach (*Ipomoea aquatica*) significantly improved the SGR. Based on the result, the *Ipomoea aquatica* could be included both in a simple or complex diet together with water lettuce (*Pistia stratiotes*). It took 30 days for *Oreochromis niloticus* to adjust to the introduced diets as reflected to their survival rate, but the FCR was higher when fed with the test diets compared to the recorded commercially fed tilapia. Overall, I. aquatica has an excellent performance for *Oreochromis niloticus* culture. (Manuel et al., 2020)

Fermented Golden Apple Snails as an Alternative Protein Source in Sex-Reversed Red Tilapia *(Oreochromis niloticus x O. mossambicus)* Diets. The golden apple snail (GAS) was introduced in the Philippines in 1980s as food for human and farm animals and later turned into a destructive invasive species especially in rice fields. The feasibility of the golden apple snail as an alternative protein source has been tested for tilapia, shrimp, and prawn. This study revealed that utilization of GAS meal with 45% crude protein (CP) as protein source for *Siganus guttatus* can replace or substitute fish meal for more than two months at a cheaper cost. For better results of formulated feeds, pre-mixed vitamins and minerals must be added. (Visca et al., 2018)

Walsh Medical Media: Journals: Open Access Journals. Journal of Aquaculture Research & Development. Among protein plant sources, Azolla seems to be good replacer of protein from expensive sources such as fish meal and fish oil depending on feeding habits of the fish species. It contains high crude protein content (13% to 30%) and essential amino acid (EAA) composition (rich in lysine) than most green forage crops and other aquatic macrophytes. A review was conducted on significance of Azolla meal as a protein plant source in finfish culture, mostly focus was on Tilapia species and family Cyprinidae. About 30 published online journal papers, from Research gate and Google scholar in aquaculture nutrition were reviewed. Among reviewed papers revealed that, the dietary Azolla supplementation at certain level have a positive effect on feed utilization and protein conversion ratio, mobilization and utilization of glycogenic amino acids, and growth performance. (Mosha, 2018)

The Effects of Fish Feed Supplemented with *Azolla Meal* on the Growth Performance, Digestive Enzyme Activity, and Health Condition of Genetically Improved Farmed Tilapia (*Oreochromis niloticus*). Azolla meal was included in fish feed at different levels (10%, 20%, and 30%) and was fed to genetically improved farmed tilapia (GIFT) for 90 days. The obtained results demonstrated that the final body weight, weight gain, and specific growth rate decreased significantly in fish fed 30% Azolla ($P<0.05$), while tilapia fed 10% and 20% did not differ significantly from those of the control ($P>0.05$). Feeding tilapia with Azolla resulted in normal hematological and biochemical functions, with insignificant differences for the measured parameters except for the red blood cell count, which significantly ($P<0.05$) increased in fish fed Azolla at 20% compared to the control, with no differences from that fed at 20% and 30%. (Dawood et al., 2020)

Fatty acids composition of Nile tilapia (*Oreochromis niloticus*) fingerlings fed diets containing different levels of water spinach (*Ipomoea aquatica*). Five diets containing 0%, 5%, 10%, 15% and 20% Ipomoea aquatica were formulated. The results indicated that 18 types of fatty acids with different saturation levels were detected. Total saturates, n-3 PUFAs, n-6 PUFAs in all the tissues were not significantly affected by the different levels of I. aquatica. Fish fed 10% diet recorded the highest level of muscle docosahexaenoic acid (DHA). The tissue composition of docosahexaenoic acid (DHA) was significantly higher than eicosapentaenoic acid (EPA). There was an increase in PUFAs with increased levels of I. aquatica. There was no significant difference ($P > 0.05$) in fatty acids in all the tissues. The study suggests that 20% dietary inclusion of I. aquatica resulted into high DHA in all tissues thus I. aquatica can be used to increase fatty acid. (Chepkiruiab et al., 2021)

3. Research Method

Research Design

The research design in this study was an experimental research design, it involves the development of feeds for the Nile tilapia (*Oreochromis niloticus*), using golden apple snail, (*Pomacea canaliculata*), Kangkong (*Ipomoea aquatica*), and Azolla, (*Azolla pinnata*) and rice bran. A Randomized Complete Block Design was used in this study, it is one where treatment combinations are assigned randomly to the experimental units within a block.

Tools and Materials

The tools that were used in this experiment are: scoop net, weighing scale (0.1 graduation), one (1) air compressor (45 watts), nine (9) aquariums (30.48cm x 30.48cmx 30.48 cm), buckets, blender, oven, two (2) baking trays, nine (9) plastic hinged cups, masking tape, ruler (12 in)., aquarium hose (5 meters). The materials that were used in the experiment are: golden apple snail (*Pomacea canaliculata*), rice bran, kangkong (*Ipomoea aquatica*), azolla (*Azolla pinnata*), and commercial feed.

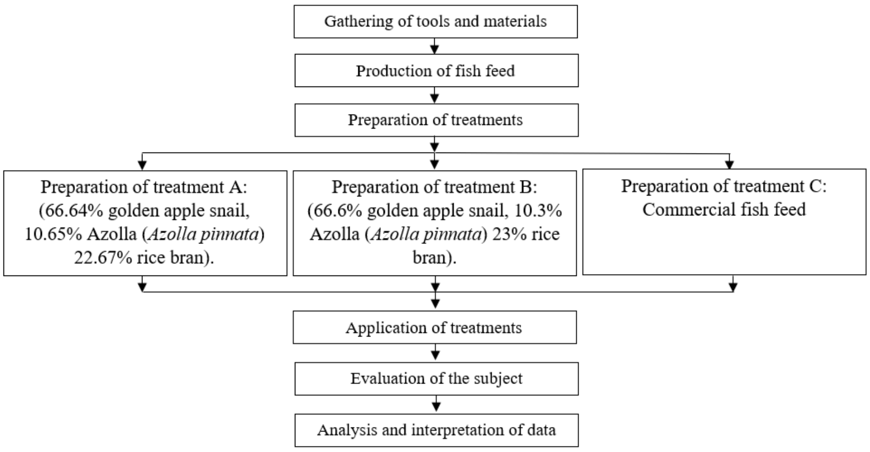
Gathering of tools and materials

The tools and materials that were used in this experiment were collected around Brgy. Dayao, Brgy. Milibili and Brgy. Cogon, Roxas City, Capiz. The live tilapias were sourced from a fish keeper located in Brgy. Cogon, Roxas City. Cooking equipment like oven, trays, rulers, buckets and weighing scale were collected from the researcher's residence. The golden apple snails were sourced from Brgy. Milibili. Rice bran and kangkong (*Ipomoea aquatica*) were bought from bagong lipunan trade center.

Figure 2. Gathering of tools and materials

Procedural Design

Figure 3. Procedural Design



Preparation of treatments

There was a total of three treatments, and all will be replicated three times.

Figure 4. Preparation of treatments

Making of the fish feed (Treatment A)

Azolla (*Azolla pinnata*) and golden apple snail had undergone drying until it became brittle. The dried ingredients were finely ground using a blender until fine particles of similar size were obtained. The ground ingredients were sieved using fine mesh nylon net and were then weighed or measured accurately to the desired amount. The ingredients were then mixed thoroughly and transferred to an oven where it was cooked for six hours at 75 o C. After the finished product were removed from the oven, they were cooled and packaged then stored at room temperature.

Figure 5. Making of the fish feed (Treatment A)

Making of the fish feed (Treatment B)

Kangkong (*Ipomoea aquatica*) and golden apple snail (*Pomacea canaliculata*) had undergone drying until it became brittle. The dried ingredients were finely ground using a blender until fine particles of similar size were obtained. The ground ingredients were sieved using fine mesh nylon net. The ingredients were weighed or measured accurately to the desired amount then the ingredients were mixed thoroughly, the mixture was then transferred to an oven and was cooked for six hours at 75 o C. After the finished product was removed from the oven, they were cooled and packaged then stored at room temperature.

Figure 6. Making of the fish feed (Treatment B)

Preparing treatment C

Commercialized feed was bought in bagong lipunan trading center. The commercialized feed was placed in a separate container.

Preparing the aquariums and tilapia (*Oreochromis niloticus*) fingerlings

Nine (9) aquariums measuring 30.48cm x 30.48cmx30,48 cm each was purchased from a local glazier stationed in Brgy. Milibili Roxas City, the nine (9) aquariums were placed in the porch of the Sitjar residence located in Brgy. Milibili Roxas City, the tanks will be labeled as C1, A1, B1, A2, B2, C2, C3, B3, A3 in that order, an air compressor was positioned near the aquariums where nine (9) aerator hoses were connected to deliver air to each of the nine (9) aquariums. Tilapia (*Oreochromis niloticus*) fingerlings were collected from a fish keeper located in Brgy. Cogon, Roxas City, forty-five (45) tilapia (*Oreochromis niloticus*) fingerlings were purchased in total, the fingerlings were stocked temporarily to a bigger aquarium before the feeding trials took place. The tilapia *(Oreochromis niloticus*) fingerlings were scooped up randomly and placed in a little plastic container in groups of five to be weighed before transferring them to their respective tanks. The feeding trials were then started.

Figure 7. Preparing the aquariums and tilapia (*Oreochromis niloticus*) fingerlings

Feeding

In this study, there were three treatments, Treatment A (66.64g golden apple snail, 10.65g Azolla (*Azolla pinnata*), 22.67g rice bran) were applied to tanks A1, A2, and A3, Treatment B (66.6g golden apple snail, 10.3g kangkong (*Ipomoea aquatica*), 23.1g rice bran) were applied to tanks B1, B2 and B3, and treatment C (commercial fish feed) were applied to tanks C1, C2 and C3. Before feeding the tilapia (*Oreochromis niloticus*) fingerlings, the amount of feed to be fed to the tilapia (*Oreochromis niloticus*) fingerlings were measured, the feeding rate that was utilized was 10% of the bodyweight of the fish, this was done in each of the nine tanks. The feed was given twice a day between 08:00 am and 08:30 am and between 05:00am and 5:30 am based on the bodyweight of the fish.

Figure 8. Feeding

Feed formulation

For the formulation of treatment A and treatment B, Pearson square ration formulation procedure was utilized in order to determine the correct proportions and percentages of ingredients that were mixed together. The crude protein of the ingredients was determined before calculating its proportions using Pearson square ration formulation procedure, in this case the golden apple snail had a crude protein of 52.4%, rice bran with 13.3 %, Kangkong with 28.5% and Azolla with 27.2 %. The crude protein requirement of the Tilapia was also determined which is 35%.

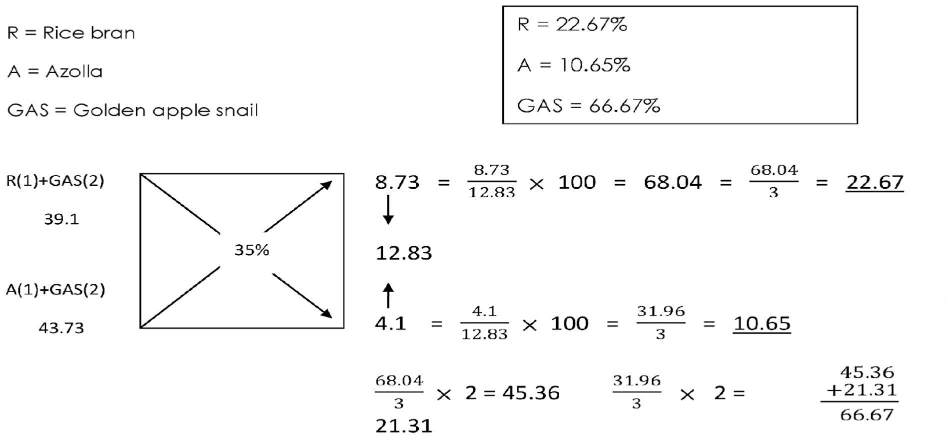


Figure 9. Pearson square ration formulation for treatment A

Data Observation

The feeding lasted for 30 days, the weight of the tilapia was measured and recorded every six days, in weighing a weighing scale with a 0.1g graduation was used. On the first, eighteenth and thirtieth day the length of the fish was measured, the data gathered were then recorded for analysis and interpretation.

Figure 10. Data observation

Data organization and statistical analysis

The obtained information was correctly structured in accordance with the treatments, and the encoded information was then sent into the SPSS program for statistical analysis and hypothesis testing. Analysis of variance (ANOVA) and the mean were used as statistical tools. The Analysis of Variance was used to determine if there were significant differences amongst the treatments at 5% level of significance.

4. Results and Discussion

The researcher weighs and measure the tilapia once every 6 days for thirty days to compare the different results and to prove the effectiveness between the experimental group compared to the controlled group.

As shown in table 1 treatment A with replicates 1 to 3 have a combined mass of 21.6 grams and an average mass of 7.2 grams, treatment B with replicates 1 to 3 have a combined mass of 23.2 grams and an average mass of 7.73 grams, and treatment C with replicates 1 to 3 have a combined mass of 7.73 grams and an average mass of 7.73 grams, this is the mass gained by the tilapia after 6 days of treatment application.

Table 1. Mass of the tilapia after 6 days of applying the treatments.

	Treatments		
Replicate	A	B	C
1	7.9 g	7.2 g	10.0 g
2	7.6 g	8.3 g	7.1 g
3	6.1 g	7.7 g	6.1 g
Total	21.6 g	23.2 g	23.2 g
Average	7.2 g	7.73 g	7.73 g

As shown in table 1A treatment A with replicates 1 to 3 have a combined mass of 25.8 grams and an average mass of 8.6 grams, treatment B with replicates 1 to 3 have a combined mass of 28.9 grams and an average mass of 9.63 grams, and treatment C with replicates 1 to 3 have a combined mass of 29.0 grams and an average mass of 9.67 grams, this is the mass gained by the tilapia after 12 days of treatment application.

Table 1A. Mass of the tilapia after 12 days of applying the treatments.

	Treatments		
Replicate	A	B	C
1	9.5 g	9.5 g	10.7 g
2	8.4 g	10.5 g	9.4 g
3	7.9 g	8.9 g	8.9 g
Total	25.8 g	28.9 g	29.0 g
Average	8.6 g	9.63 g	9.67 g

As shown in table 1B treatment A with replicates 1 to 3 have a combined mass of 33.4 grams and an average mass of 11.13 grams, treatment B with replicates 1 to 3 have a combined mass of 41.8 grams and an average mass of 13.93 grams, and treatment C with replicates 1 to 3 have a combined mass of 41.9 grams and an average mass of 13.96 grams, this is the mass gained by the tilapia after 18 days of treatment application.

Table 1B. Mass of the tilapia after 18 days of applying the treatments.

	Treatments		
Replicate	A	B	C
1	12.3 g	13.5 g	15.6 g
2	10.4 g	14.0 g	13.4 g
3	10.7 g	14.3 g	12.9 g
Total	33.4 g	41.8 g	41.9 g
Average	11.13 g	13.93 g	13.96 g

As shown in table 1C treatment A with replicates 1 to 3 have a combined mass of 44.6 grams and an average mass of 14.87 grams, treatment B with replicates 1 to 3 have a combined mass of 57.4 grams and an average mass of 19.13 grams, and treatment C with replicates 1 to 3 have a combined mass of 57.8 grams and an average mass of 19.27 grams, this is the mass gained by the tilapia after 24 days of treatment application.

Table 1C. Mass of the tilapia after 24 days of applying the treatments.

	Treatments		
Replicate	A	B	C

1	15.6 g	18.6 g	19.4 g
2	14.8 g	18.7 g	20.3 g
3	14.2 g	20.1 g	18.1 g
Total	44.6 g	57.4 g	57.8 g
Average	14.87 g	19.13 g	19.27 g

As shown in table 1D treatment A with replicates 1 to 3 have a combined mass of 49.5 grams and an average mass of 11.13 grams, treatment B with replicates 1 to 3 have a combined mass of 64.0 grams and an average mass of 21.33 grams, and treatment C with replicates 1 to 3 have a combined mass of 57.4 grams and an average mass of 19.13 grams.

Table 1D. The mass of the tilapia after 30 days of applying treatments.

Replicate	**Treatments**		
	A	B	C
1	17.9 g	19.0 g	20.9 g
2	16.7 g	21.9 g	22.1 g
3	14.9 g	23.1 g	21.3 g
Total	49.5 g	64.0 g	64.3 g
Average	16.5 g	21.33 g	21.43 g

The table below shows the initial mass and final mass in grams, treatment A has an initial mass of 4.17g and a final mass of 16.5, treatment B has an initial mass of 5.07g and a final mass of 19.6g and treatment C has an initial mass of 4.87 and a final mass of 19.13g.

The table also shows the mass gained by the tilapia during the duration of the experiment, in treatment A replicate 1 gained 13.73 grams, replicate 2 gained 12.53 grams and replicate 3 gained 10.73 grams, in treatment B replicate 1 gained 13.93g, replicate 2 gained 16.83g, and replicate 3 gained 18.03g, and in treatment C replicate 1 gained 16.03g, replicate 2 gained 10.33g and replicate 3 gained 16.43g.

The table below shows that treatment B has the highest mass gained in terms of grams with a mean of 16.26 while treatment A had the lowest mass gained in terms of grams with a mean of 12.33.

Table 1E. The initial mass, final mass and mass gain of tilapia in grams after thirty days of applying the treatments.

Treatment	**Initial mass(g)**	**Final mass(g)**	**Growth of tilapia in terms of mass (g).**			**Total**	**Mean**	**Std. Dev.**
			1	2	3			
A	4.17	16.50	13.73	12.53	10.73	36.99	12.33	1.51
B	5.07	21.33	13.93	16.83	18.03	48.79	16.26	2.11
C	4.87	19.13	16.03	10.33	16.43	42.79	14.26	3.41

Table 1F. ANOVA Table of the Mass Gained by the Tilapia (in grams) after 30 days of Applying the Treatments.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	23.209	2	11.604	1.895	.230
Within Groups	36.733	6	6.122		
Total	59.942	8			

- accept the null hypothesis, there is no significant difference.

According to Table 2, replicates 1 through 3 who received Treatment A had a combined body length of 14.53 cm, or an average of 4.84 cm; replicates 1 through 3 who received Treatment B had a combined body length of 15.40 cm, or an average of 5.13 cm; and replicates 1 through 3 who received Treatment C had a combined body length of 15.62 cm, or an average of 5.21 cm.

Table 2. Length gained by the Tilapia after 14 days of applying treatments.

Replicate	Treatments		
	A	B	C
1	4.88 cm	5.02 cm	5.50 cm
2	4.78 cm	5.20 cm	5.10 cm
3	4.86 cm	5.18 cm	5.02 cm
Total	14.52 cm	15.40 cm	15.62 cm
Average	4.84 cm	5.13 cm	5.21 cm

According to Table 2, replicates 1 through 3 who received Treatment A had a combined body length of 18.14 cm, or an average of 6.05 cm; replicates 1 through 3 who received Treatment B had a combined body length of 18.98 cm, or an average of 6.33 cm; and replicates 1 through 3 who received Treatment C had a combined body length of 18.48 cm, or an average of 6.16 cm.

Table 2A. Length gained by the Tilapia after 30 days of applying treatments.

	Treatment		
Replicate	A	B	C
1	6.50 cm	6.10 cm	5.36 cm
2	5.98 cm	6.34 cm	6.66 cm
3	5.66 cm	6.54 cm	6.46 cm
Total	18.14 cm	18.98 cm	18.48 cm
Average	6.05 cm	6.33 cm	6.16 cm

The table below shows the initial length and final length in centimeters (cm), treatment A has an initial length of 3.5 cm and a final length of 6.05 cm, treatment B has an initial length of 3.5 cm and a final length of 6.33 cm and treatment C has an initial length of 3.7 cm and a final length of 6.16 cm.

The table also shows the length gained by the tilapia during the duration of the experiment, in treatment A replicate 1 gained 3 cm, replicate 2 gained 2.48 cm and replicate 3 gained 2.16 cm, in treatment B replicate 1 gained 2.6 cm, replicate 2 gained 2.84 cm, and replicate 3 gained 3.04 cm, and in treatment C replicate 1 gained 1.66 cm, replicate 2 gained 2.96 cm and replicate 3 gained 2.76 cm. The table below shows that treatment B has the highest length gained in terms of centimeters with a mean of 2.83 while treatment C had the lowest length gained in terms of centimeters with a mean of 2.46.

Table 2B. The initial length, final length and length gained by the tilapia in centimeters after thirty days of applying the treatments.

Treatment	**Initial length(cm)**	**Final length(cm)**	**Growth of tilapia in terms of length (cm).**			**Total**	**Mean**	**Std. Dev.**
			1	2	3			
A	3.5	6.05	3.00	2.48	2.16	7.64	2.55	0.42
B	3.5	6.33	2.60	2.84	3.04	8.48	2.83	0.22

C	3.7	6.16	1.66	2.96	2.76	7.38	2.46	0.70

Table 2C. ANOVA Table of the length gained by the tilapia (in centimeters) after 30 days of applying the treatments.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.119	2	.060	.249	.788
Within Groups	1.437	6	.239		
Total	1.556	8			

accept the null hypothesis, there is no significant difference.

5. Conclusions

1. It was concluded that the developed feed is effective in improving the growth and survival of the Nile tilapia (*Oreochromis niloticus*).
2. It was concluded that the developed feed is effective in improving the growth and survival of the Nile tilapia, (*Oreochromis niloticus*) in terms of weight and length.
3. It was concluded that treatment B is the most effective in the growth and survival of the Nile tilapia, (*Oreochromis niloticus*) in terms of weight and length.
4. It was concluded that there is no significant difference between the treatments A, B, and C in terms of weight and length.
5. Throughout the experimentation period there was no recorded mortality.

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