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Effect of selected millets combination in supplementary diet on digestibility & growth of *Oreochromis niloticus*, Nile tilapia, (Linnaeus, 1758) fingerlings

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Abstract

An experiment was conducted in order to verify the “Effect of Selected Millets Combination in supplementary diet on Growth & Digestibility of Nile tilapia, *Oreochromis niloticus* (Linnaeus, 1758) Fingerlings”. Dietary supplementation of Pearl millet & sorghum millet (1:1) using a 0% (T₀), 5% (T₁), 10% (T₂), 15% (T₃), and 20% (T₄) inclusion rate 20% (T₄) were fed to fish @ 4% body weight twice a day morning and evening. In experiment total number of 200 *Oreochromis niloticus* fingerlings were used in 225 litres of volume in 20 FRP tanks of. 10 fishes distributed to one of 5 treatments (including the control) and with 4 replicates. During experimental period, Apparent protein digestibility (76.433±0.4695) of various treatments along with higher weight gain (42.48±0.0779 g), percent weight gain (85.811±0.4695) SGR (1.032±0.0042), GCE (0.366±0.0015) and lowest (best) FCR (2.729±0.113) of *Oreochromis niloticus* fingerlings showed the highest value at 20% in treatment T₄ with a significant difference of ($p<0.05$) by using different levels of millets combination in fish diet. The results of the investigation demonstrated that adding millets to fish diets at a rate of 20% had a positive impact on Nile tilapia (*Oreochromis niloticus*) fingerlings on growth and digestibility.

Keywords: Growth parameters, apparent protein digestibility, millet’s combination

1. Introduction

In 2020, 214 million tonnes of fisheries and aquaculture products were produced worldwide, including 178 million tonnes of aquatic animals. A record 122.6 million tonnes of aquaculture production were produced globally in 2020, including 87.5 million tonnes of aquatic animals worth USD 264.8 billion. (FAO, SOFIA, 2022) [3]. Fish meal is still expensive and its production helps to decrease fish from the depletion of natural stocks. The utilisation of plant-based components is being investigated more and their capacity to fulfil the fish's dietary requirements is being researched. (Kaushik *et al.*, 1995) [4].

Feed makes up more than 60% of the production's input expenses in aquaculture. In order to achieve the goal of large profit, some inexpensive feed ingredients must be used without affecting fish development. Several alternative substances in feed can be used to raise the quality of the feed. So, pearl millet and sorghum millet are alternative ingredients that may be utilised in feed.

Oreochromis niloticus is native to Middle east and Africa, occurs in a wide variety of freshwater habitats like rivers, lakes, sewage canals and irrigation channels. Compared to carnivorous fish species that consume food at higher trophic levels, omnivorous fish species like Nile tilapia and Common carp, which consume at lower levels, can efficiently utilize high levels of carbohydrates. (Enes, *et al.* 2011) [2].

Examining the importance of different sources of carbohydrates as natural foods enhances performance in fish nutrition. According to these results, current investigation was conducted in order to verify the “Effect of Certain Combination of Millets on several water quality parameters for Nile tilapia, *Oreochromis niloticus* (Linnaeus, 1758) Fingerlings”.

2. Methods and Material

The experiment was conducted for 60 days in the Department of Aquaculture's wet lab at COF, MPUAT, Udaipur (Rajasthan). 200 *Oreochromis niloticus* fingerlings and 20 FRP tanks with a capacity of 225 litres were utilised for the experiment. The collected fingerlings fed with a control diet and were acclimated for 7 days.

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Ten fish were distributed at random to each of the five treatments (control included) and their respective four replicates. Ground water was added into each tank and Each tank provided aeration. For 60 days, fingerlings were fed two times daily at 4% body weight in the morning and the evening. Every 15 days, syphoning was done to remove uneaten food and faeces from tanks. The measurements for the analysis of the growth parameters were taken every two

weeks.

3. Basal Diet

By using Fish meal 46%, Soyabean meal 25%, Rice bran 20%, wheat flour 5%, vegetable oil 2% and 2% vitamin and mineral mixture basal diet was prepared and Cr₂O₃ was added in diets to determine digestibility.

Table 1: The details of experimental diet and treatments are given below

S. No.	Treatment	Basal diet (%)	Pearl millet & sorghum millet in percentage (1:1)
1.	T ₀	100	0
2.	T ₁	95	5
3.	T ₂	90	10
4.	T ₃	85	15
5.	T ₄	80	20

4. Preparation of experimentation diet

The experimentation diets were prepared with mixing the pearl millet and sorghum millet in basal diet. The ingredients were measured, properly mixed using a mixer and then added with enough water to form a dough. The dough was placed in an autoclave and steam cooked for 30 minutes at 15

lbs pressure. After cooling, chromium oxide (1%) and vitamin & mineral mixture were added to each experimental diet. The dough has been passed through a pelletizer in order to make the pellets. prepared pellets were dried in laboratory and placed in plastic container.

Table 2: Details showing proximate composition of experimentation diet and treatments (in %) are given below:

S. No	Treatments	Moisture	Crude protein	Fat	Ash	Carbohydrate
1.	T ₀	8.45 ^a ±0.1707	30.047 ^a ±0.2389	4.182 ^a ±0.2107	8.550 ^b ±0.1258	48.770 ^a ±0.5119
2.	T ₁	8.147 ^a ±0.2170	30.260 ^{ab} ±0.1140	4.382 ^a ±0.2355	8.300 ^{ab} ±0.2549	48.910 ^a ±0.2143
3.	T ₂	8.525 ^a ±0.2393	30.315 ^{ab} ±0.4299	4.245 ^a ±0.2480	8.575 ^b ±0.1108	48.340 ^a ±0.2758
4.	T ₃	8.475 ^a ±0.1842	30.772 ^{ab} ±0.3484	4.255 ^a ±0.2430	7.975 ^{ab} ±0.1887	48.522 ^a ±0.5395
5.	T ₄	8.605 ^a ±0.2090	31.097 ^b ±0.2025	4.370 ^a ±0.1999	7.745 ^a ±0.2098	48.182 ^a ±0.1353

5. Digestibility analysis

$$\text{Apparent Digestibility (\%)} = 100 - \frac{100(\% \text{Cr}^2\text{O}_3 \text{ in feed} \times \% \text{ nutrients in faeces})}{100(\% \text{Cr}^2\text{O}_3 \text{ in faeces} \times \% \text{ nutrients in feed})}$$

6. Results and Discussion

6.1 Growth performance

In current study the best growth was observed at 20% in T₄. The best gain in weight, percentage weight gain, GCE and SGR were also found in T₄ as 42.48±0.0779 g, 85.811±0.4695, 1.032±0.0042 and 0.366±0.0015, respectively. The lowest (best) FCR was found in T₄. 2.729±0.113. Sharma *et al.*, (2020) [8] suggests that including of sorghum millet (20%) in the diet of Nile tilapia can increased their growth and does not show any adverse impacts on fish with weight gain of 54.210±0.883 SGR 6.87±0.069 and GCE 0.64±0.015 and FCR was significant lower 1.56±0.013. According to Boscolo *et al.*, (2010) incorporation of pearl millet at 30% can be utilised in feeds for Nile tilapia

fingerlings, almost replacing energy and protein from corn, without showing any adverse effects on animal performance or carcass quality.

6.2 Apparent Protein Digestibility

In treated groups compared to control groups, the apparent protein digestibility values were greater, with statistically significant differences ($p < 0.05$) between the groups. In the present study comparison to other levels, the administration of millets (sorghum & pearl) in 1:1 ratio in supplementary diet of fish at 20% showed positive effects. The lowest apparent protein digestibility was observed 68.157±0.7062 in T₀ followed by 71.214±0.8226 in T₁, 72.178±1.0980 in T₂, 73.573±0.4306 in T₃ and the highest was 76.433±0.4695 in T₄. Matoria, *et al.* (2020) [6] evaluated that Papaya leaf meal has a positive impact on Nile tilapia's ability to digest it, which showed highest digestibility level of 74%, which is similar to the results of the current experiment.

Table 3: Results of current investigation

S. No.	Treatments	Parameter					
		Net weight gain (g)	Percentage weight gain (g)	FCR	SGR (%/day)	GCE	APD
1.	T ₀ Control	30.010 ^a ±0.2917	60.615 ^a ±0.7062	3.576 ^e ±0.322	0.789 ^a ±0.0073	0.279 ^a ±0.0025	68.157 ^a ±0.7062
2.	T ₁	33.422 ^b ±0.3808	67.583 ^b ±0.8226	3.274 ^d ±0.311	0.860 ^b ±0.0081	0.305 ^b ±0.0029	71.214 ^b ±0.8226
3.	T ₂	35.742 ^c ±0.3696	72.144 ^c ±1.098	3.120 ^c ±0.361	0.905 ^c ±0.0105	0.320 ^c ±0.0037	72.178 ^c ±1.0980
4.	T ₃	39.695 ^d ±0.3346	80.986 ^d ±0.4306	2.855 ^b ±0.144	0.988 ^d ±0.0039	0.350 ^d ±0.0017	73.573 ^d ±0.4306
5.	T ₄	42.480 ^e ±0.0779	85.811 ^e ±0.4695	2.729 ^a ±0.113	1.032 ^e ±0.0042	0.366 ^e ±0.0015	76.433 ^e ±0.4695

7. Conclusion

According to the results of this research introducing 20% of millets combination in 1:1 ratio in the diets of fish is found beneficial in terms of Net weight gain (g), percentage weight

gain (g), feed conversion ratio (FCR), specific growth rate (SGR), gross conversion efficiency (GCE) ratio, and apparent protein digestibility in the diet of *Oreochromis niloticus* fingerlings.

However, it is suggested that incorporation of millets combination in supplementary diet on Nile tilapia above at the rate of 20% may shows higher growth performance and digestibility on same species and different millets at different levels is recommended for further studies.

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