THE EFFECT OF FEEDING FREQUENCY ON FISH GROWTH: MINI REVIEW

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ABSTRACT

Feeding Frequency is the amount of feeding given to fish per unit time. Optimal feeding frequency for fish is an important factor to support growth, weight, survival, and play a role in the effectiveness of feed use. Therefore, the purpose of writing this article is to determine the effect of the frequency of feeding on the performance of the observed fish through several parameters, namely growth, size variation, and survival. The method used is in the form of a literature study by collecting reputable journals according to the topic taken, reading, understanding, comparing one journal to another based on their similarities and differences and processing them as a reference for making articles.

Keyword : - *Feeding frequency, Growth, Size variation, and Survival rate.*

1. INTRODUCTION

Feed is one of the factors that greatly determine the success of a cultivation in addition to genetics and the environment. The effect of feeding frequency on fish growth has received a lot of attention from researchers. Knowledge related to proper feeding management, one of which is the frequency of feeding. The frequency of feeding is the amount of feeding per unit time. At the size of fry or larvae, fish tend to have a fast growth rate and require a high frequency of feeding due to their high nutritional requirements and low digestive capacity, consequently requiring a faster gastric emptying rate and easier digestion. In general, the energy obtained from the process of taking and digesting the feed is mostly used for growth.

The larger the size of the fish kept, the frequency of feeding is increasingly rare. However, overfeeding not only reduces feed conversion efficiency and increases costs, but also accumulates waste which adversely affects the quality of culture water. Optimal feeding frequency varies depending on fish species, size and culture system. The frequency of feeding is also a factor that needs to be taken into account in feed management because it will affect the increase in aquaculture operational costs.

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1.1. Feed Frequency and Fish Growth

The frequency of feeding is an important factor that can affect fish growth. Feeding frequency can affect metabolism, nutrient absorption, and fish health. In general, fish need adequate nutrition to grow and develop properly. In determining the frequency of feeding can be seen from several aspects such as fish size, species, and factors that can affect fish appetite [1]. These three factors have an attachment to one another. The smaller the size of the fish, the frequency of feeding will be more frequent. This is related to the capacity and rate of gastric emptying, where the faster the stomach emptying time, the higher the frequency of feeding required. After a reduction in stomach contents, the appetite of some types of fish will increase again if food is available, because each fish has a different level of appetite. Thus, the frequency of feeding for fry will be different from that of adult fish.

The right frequency of feeding can help meet nutritional needs and increase fish growth. However, if the feed frequency is too high or low, it can negatively affect fish growth. The examined of different feeding frequencies on the growth and nutritional utilization of *Clarias gariepinus* African catfish seeds showed that the fry fed five or six times per day compared to a lower frequency of feeding three or four times the ration, indicating a growth advantage [2]. In addition, the crude protein and fat content of fish meat increased significantly with increasing frequency of feeding.

1.2. Feed Fequency and Fish Size Variation

Each type of fish has a different way of eating and varying needs. The frequency of feeding that is different both in terms of the amount or amount of nutrients contained will cause variations or differences in fish body size. Feeding frequency that is too low can cause fish to experience hunger and lack of nutrient intake needed to grow. As a result, fish growth can be stunted and their body weight cannot increase optimally. On the other hand, too high a feeding frequency can cause fish to become fat and overfeed, which can also inhibit fish growth. Overeating fish tends to have a slower digestive system and can cause health problems such as obesity, diabetes and other diseases. The frequency of proper and regular feeding can help increase fish growth. Generally, fish need to be fed 2-3 times a day in an amount sufficient to meet their nutritional requirements. However, this can vary depending on the type of fish, age and the environment in which it is placed.

2. SEVERAL RESEARCHES AND DISCUSSION

2.1. Optimal Feeding Frequency For Growth

Fish weight gain increased with increasing frequency of feeding given [3]. According to [4] fish that are fed with low frequency are unable to meet the capacity requirements of their intestines to meet the nutritional and energy needs that can be absorbed to maintain somatic growth and development. Meanwhile, excessive feeding not only reduces feed conversion efficiency, but also accumulates a lot of waste which has a negative impact on water quality. The effect of feeding frequency on weight, feed consumption, growth and feed conversion efficiency *Clarias gariepinus* × *Heterobranchus longifilis* & hybrid which was investigated in the laboratory for several times for 12 weeks (3 months) [5]. The results showed that the frequency of feeding A (once a day) had the lowest average body weight (21.40 g) while the frequency of feeding E (five times a day) had the highest average body weight (30.41 g).

Studied the effect of different feeding frequencies on the individual weight gain resulted of significant different on the individual average weight gain and specific growth. The results of further tests showed that the highest average individual weight gain and specific growth value were obtained at the frequency of feeding five times a day in a row with feeding of 7.03% and 34.97 g and the lowest specific growth value and weight gain were obtained at the frequency of feeding once a day [6].

Table 1. Optimum Feed Frequency For Increasing Fish Weight

Types Fish	**Feeding Frequency**	**Growth**	**Refference**
Juvenile blunt snout bream *Megalobrama amblycephala*	3 times a day for 8 weeks. Feed is given as much as 8% of biomass per day for the first 4 weeks and 6% for the next 4 weeks	20.86 ± 0.77 g	[7]
Zebrafish (*Danio rerio*)	Feeding every day, 5 times a day. Feed given as much as 5% body weight. Fish were evaluated for weight gain once a week	Wo: 0.07 ± 0.01 g Wt :0.94 ± 0.04 g	[8]
Hybrid sunfish (female green sunfish *Lepomis cyanellus* × male bluegill *L. macrochirus)*	3 times a day for 30 days.	10.2 ± 0.5 g	[9]

Yellow croaker (*Pseudosciaena crocea, Richardson) larvae*	8 times a day for 30 days, where the fish were fed until they were full at every meal	Wo : 4.08±0.1 mg Wt: 59.64± 0.4 mg	[10]
Juvenile tiger puffer fish (*Takifugu rubripes*)	Feeding 4 times a day for 60 days	Wo: 15.33 ± 0.08 Wt : 80.91 ± 1.54	[11]
Juvenile dolly varden char *Salvelinus malma*	The optimal frequency of feeding to increase the juvenile stage is 4 times/day for 8 weeks	16.84 ± 3.64 g	[12]
Largemouth bass (*Micropterus salmoides*)	Feeding 3 times a day in 10 weeks	122.9 ± 0.8 g	[3]
Angel fish *(Pterophyllum scalare)*	Feeding 4 times a day in 90 days	Wo : 0.86 ± 0.02 g Wt : 3.70 ± 0.13 g	[13]

2.2. The Influence of Feeding Frequency on the Survival of Fish

One aspect that needs to be considered in feeding fish is the frequency of feeding. Feeding with the right frequency can affect the survival rate of fish, as well as the overall growth and health of fish. Several previous studies have proven that the frequency of feeding that is not appropriate can cause problems for the health and growth of fish.

The frequency of different feeding significantly affects the survival rate of fish. Feeding 2 times a day resulted in the highest survival rate while feeding 3 times a day resulted in the highest growth in terms of length and weight [14]. This shows that different feeding frequencies can have different effects on growth and survival rates in fish. If the feeding frequency is too low, the fish will lack nutrition and experience stress, thus affecting their survival. Meanwhile, if the feeding frequency is too high, overfeeding will occur which can lead to poor water quality, and this will also affect fish survival.

Fish that are fed with a frequency that is too low have a lower body weight, while fish that are fed with a frequency that is too high have a lower survival rate [15]. This shows that the proper frequency of feeding is very important to ensure fish survival (Table 2).

Table 2. Feeding Frequency for Survial Rate of Yellow Croaker Fish Larvae

Treatment	Final weight (mg)	Survival (%)	SGR	CV %
P1 (2 meals $^{d-1}$)	49.14± 0.8	14.7± 0.6	8.3± 0.1	17.2± 3.2
P1 (4 meals $^{d-1}$)	47.39± 0.6	16.3± 0.2	8.2± 0.1	16.9± 0.9
P1 (8 meals $^{d-1}$)	59.64± 0.4	23.4± 0.9	8.6± 0.1	16.6± 1.1
P1 (12 meals $^{d-1}$)	52.58± 0.1	19.2± 0.2	8.5± 0.1	15.6± 2.4

Reference : [10]

Based on Table 2., the optimal feeding frequency for large yellow croaker fish (*Pseudosciaena crocea*, Richardson) larvae shows that the coefficient of variation (CV) of larval body length for each group decreases with increasing frequency of feeding. As for the final weight of the fish, it was found that feeding 2 times a day showed the ideal final weight of the fish.

3. CONCLUSSION

Proper and regular feeding is very important for the growth and health of fish. Excessive or insufficient feeding frequency can affect fish health and growth. The amount and type of feed given must be adjusted to the type of fish, age and environmental conditions. In practice, feeding should be adjusted to the needs of the fish and pay attention to water quality and the surrounding environment.

4. REFERENCES

[1] Tahapari, E., & Suhenda, N. (2009). Determination of Different Feeding Frequency on the Growth of Patin Pasupati Fingerlings. *Berita Biologi*, *9*(6), 693-698.

[2] Okomoda, V. T., Aminem, W., Hassan, A., & Martins, C. O. (2019). Effects of feeding frequency on fry and fingerlings of African catfish *Clarias gariepinus*. *Aquaculture*, *511*, 734232

[3] Liu, Y., Lei, M., Victor, H., Wang, Z., Yu, C., Zhang, G., & Wang, Y. (2022). The optimal feeding frequency for largemouth bass (*Micropterus salmoides*) reared in pond and in-pond-raceway. *Aquaculture*, *548*, 737464.

[4] Haetami, .K., Y. Mulyani, and Aisyah. (2022). The Effect of Probiotic Induction of *Bacillus* Cgm22 on Feed on Fish Weight and Morfometric Growth of Gold Fish (*Cyprinus carpio*) Intestinal Villi. *Journal Perikanan*, 12 (3), 395-407 (2022) http://doi.org/10.29303/jp.v12i3.342.

[5] Ndome, C. B., Ekwu, A. O., & Ateb, A. A. (2011). Effect of feeding frequency on feed consumption, growth and feed conversion of *Clarias gariepinus x Heterobranchus longifilis* hybrids. *American-Eurasian Journal of Scientific Research*, *6*(1), 6-12.

[6] Rangkuti, M. J., & Aminah, I. S., Feeding several types of feed with different frequencies to Siamese Patin fish fry (*Pangasius hypophthalmus*). Fiseries, 6(1), 17-23.2018.

[7] Tian, H. Y., Zhang, D. D., Li, X. F., Zhang, C. N., Qian, Y., & Liu, W. B. (2015). Optimum feeding frequency of juvenile blunt snout bream *Megalobrama amblycephala*. *Aquaculture*, *437*, 60-66.

[8] Lawrence, C., Best, J., James, A., & Maloney, K. 2012. The effects of feeding frequency on growth and reproduction in zebrafish (*Danio rerio*). *Aquaculture*, *368*, 103-108.

[9] Wang, N., Hayward, R. S., & Noltie, D. B. (1998). Effect of feeding frequency on food consumption, growth, size variation, and feeding pattern of age-0 hybrid sunfish. *Aquaculture*, *165*(3-4), 261-267.

[10] Xie, F., Ai, Q., Mai, K., Xu, W., & Ma, H. (2011). The optimal feeding frequency of large yellow croaker (*Pseudosciaena crocea*, Richardson) larvae. *Aquaculture*, *311*(1-4), 162-167.

[11] Gao, X. Q., Wang, X., Wang, X. Y., Li, H. X., Xu, L., Huang, B., ... & Liu, B. L. 2022. Effects of different feeding frequencies on the growth, plasma biochemical parameters, stress status, and gastric evacuation of juvenile tiger puffer fish (*Takifugu rubripes*). *Aquaculture*, *548*, 737718.

[12] Guo, Z., Cui, J., Li, M., Liu, H., Zhang, M., Meng, F., Zhao, Y. 2018. Effect of feeding frequency on growth performance, antioxidant status, immune response and resistance to hypoxia stress challenge on juvenile dolly varden char *Salvelinus malma*. *Aquaculture*, *486*, 197-201.

[13] Kasiri, M., Farahi, A., & Sudagar, M. 2011. Effects of feeding frequency on growth performance and survival rate of angel fish, Pterophyllum scalare (Perciformes: Cichlidae). In *Veterinary Research Forum* (Vol. 2, No. 2, pp. 97-102). Faculty of Veterinary Medicine, Urmia University.

[14] Adekayasa, Y. 2015. Effect of feeding frequency on growth and survival rate of pomfret starfish (Trachinotus blochii) (Doctoral dissertation, University of Mataram).

[15] Rahman, M. M., Azim, M. E., Wahab, M. A., & Verdegem, M. C. (2011). Effects of feeding frequency on growth and survival of Pangasius catfish, *Pangasius hypophthalmus* (Sauvage), fry reared in hapa-in-pond system. Aquaculture Research, 42(6), 905-910.