

Influence of music on the growth of Koi Carp, *Cyprinus carpio* (Pisces: Cyprinidae)

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Abstract

An experiment was carried out to investigate the influence of music on the growth of Koi Carp (*Cyprinus carpio*) by subjecting the fish to music. Weekly growth in weight was recorded and used to calculate the growth rate and specific growth rate. The difference in growth between the control and experiment groups of fishes was statistically tested for significance. It was observed that the growth of fish subjected to music was significantly higher.

Introduction

Rhythmic or systematic sound is called music. Music is the mother of languages and it is used by organisms, including human beings, to express feelings. It is a form of energy that can be utilized for many purposes. Hardworking people use the energy of music to ease their task. Music is used to wind up the nerves of warriors and sportsmen. Music has a therapeutic effect. It relaxes both mind and body and alleviates tension and worry. Trehub (2001) stated that a mother's lullaby decreased stress hormones in a baby. Black (2001) found that music lowered blood pressure. Music, that is sound, is an abiotic component of the ecosystem which has its own effect on biological systems, as to other environmental factors do. Ramakrishna (1974) reported that sound interferes with the physiological functioning of the body and the sociological behavior of human beings. It has been noted that music reduces stress in poultry and increases yield. North and Mackenzie (2001) showed that milk output increased by three per cent when Holstein Friesian cattle were made to listen to slow music.

Materials and methods

Two rectangular glass tanks (marked Tank 1 and Tank 2), each with a capacity of about 33 l, were taken and filled with potable water. Three Koi Carps (*Cyprinus carpio*) were introduced in each tank. Fish in each tank were given serial numbers (1, 2 and 3) that could be recognized by a color pattern. A loudspeaker was fixed inside a drum with an open bottom. This drum was suspended inside the experimental tank in such a

way that the lower part of the drum was submerged in the water. The speaker was connected to a cassette player. Both tanks were covered with hoods. The tank water was aerated by a diaphragm pump that was switched off while the music was being played. The water was exchanged once in three days. Pelletized feed with 45 per cent protein was used to feed the fish at the rate of 5 per cent of the body weight.

The experiment was started after a fortnight of acclimatization. The experiment was carried out for a period of four months in two stages, each with a duration of eight weeks. In the first stage, Tank 1 was kept as control (A) and Tank 2 was used for the experiment (D). The speaker was placed inside Tank 2 and a prerecorded tape of violin music (the raga Nalinakanthi) was played daily for three hours, from 6 am to 9 am. In the second stage, Tank 1 was kept as the experiment tank (B) and Tank 2 as the control (C), with the same fish. The speaker was placed inside Tank 1 and the experiment was repeated.

The weekly increase in the weight of each fish was recorded and the growth (gain in wet weight) was derived (Table 1). The growth rate (G.R.%) and specific growth rate (S.G.R.%) were calculated by using the following formulae:

$$\text{G.R. \%} = \frac{w_2 - w_1}{w_1} \times 100$$

$$\text{S.G.R. \%} = \frac{1n w_2 - 1n w_1}{t} \times 100$$

Where, w_1 = initial body weight; w_2 = final body weight; t = no. of days of culture = 56.

The difference in average growth between the control and experiment fish was tested for significance by performing the t-test between the samples with different combinations.

Observations

The behavior of the fish was observed during the experiment. When no music was being played, all the fish in the two tanks were actively swimming in all directions and playing with each other. However, when music was being played, the fish in the experiment tank became inactive and remained together below the speaker as if they were listening to the music. From time to time they moved very slowly, but only vertically. The fish in the control tank with no music were as active as usual.

Results and discussion

The growth of all the fish subjected to music was higher than that of the control fish. The growth rate of fish in the Tank 1 experiment (B) was about 18 per cent more than the growth rate of fish in Tank 1 control (A). Likewise, the growth rate of fish in the Tank 2 experiment (D) was about 50 per cent more than the growth rate of fish in Tank 2 control (C) (Table 1).

The results of t-test performed between A and B, A and D and between B and C showed significant differences at the 1 per cent level (d.f. = 4; t value = 4.604),

Table 1. Growth and growth rate of fish

	Initial weight g	Final weight g	Average growth per fish g	GR %	SGR %
Tank 1 Control (A)	24.600	29.340	1.580	19.3	0.32
Tank 1 Experiment (B)	29.340	40.35	3.670	37.53	0.57
Tank 2 Control (C)	14.890	18.760	1.323	25.99	0.41
Tank 2 Experiment (D)	8.420	14.890	2.156	76.84	1.02
Control (A + C)	39.490	48.100	1.435	21.8	0.35
Experiment (B + D)	37.760	55.240	2.914	46.29	0.68

whereas the difference between the growth of C and D was significant at the 5 per cent level (d.f. = 4; t value = 2.776). Thus, the results of the significance test showed that the growth of fish subjected to music was significantly higher than the growth of the control fish. This was further confirmed by the t-test performed between the pooled data, i.e. A + C and B + D, which was also significant at the 1 per cent level (d.f. = 10; t value = 3.169). (Table 2).

These results indicate that the growth increased when fish were made to listen to music. Hence, it can be concluded that music enhanced growth in Koi Carp, *C. carpio*. As noted earlier, music is also an environmental factor, like temperature and light, that can interfere with the physiological functions of fish.

Summary

Since music seems to enhance growth in fish, the use of music as one of the growth promoters, in addition to feed and other environmental factors, can be applied in the field of aquaculture. Music is

Table 2. Results of t-test performed between the average growth of control and experiment fishes

A vs. B	A vs. D	B vs. C	C vs. D	A+C vs. B+D
53.5486 [*]	7.7541 [*]	12.1281 [*]	3.4048 ^{**}	6.0342 [*]

* significant at the 1 per cent level

** significant at the 5 per cent level

eco-friendly and cost-effective. Aquarium watching relaxes the mind and body and reduces stress, thus having a therapeutic effect on human beings. So it is with music. Hence, combining music with an aquarium should certainly double their therapeutic effect on human beings.

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