Bionatura
Latin American Journal of Biotechnology and Life Sciences

Bionatura Issue 2 Vol 8 No 1 2023

Article

Effect of varied amounts of ginger oil in the feed on common carp growth metrics L. Cyprinus Carpio

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Available from: http://dx.doi.org/10.21931/RB/CSS/2023.08.02.89

Abstract
The current study was conducted in experimental cages in a mud pond, First Agricultural Research and Experiment Station, Agriculture College, Al-Muthanna University, to determine the effect of different levels of ginger oil on the diets of common carp Cyprinus carpio L., the experiment lasted for 82 days, including the 10-day acclimatization period. 80 common carp fish with an average weight of 77±0.56 g was used. It was randomly distributed to 5 treatments with 3 replicates (5 fish each replicate). The fish were fed on experimental diets, divided into four equal treatments in terms of protein percentages and different levels of ginger oil, and the percentage of seeds added to the treatments was 0, 0.25, 0.50 and 1.00%, respectively. The fish were fed on the experimental diets at 5% of the live weight, divided into 4 meals daily. The results indicated a significant superiority of all ginger oil treatments in the growth parameters of carp fish, represented by body weight, weight gain, and daily, specific and relative growth rate. Adding 0.50% ginger oil gave the best results, compared with all ginger oil treatments in growth parameters of carp fish.
Keywords: ginger oil, growth parameters, common carp Cyprinus Carpio L.

Introduction

Despite the role and importance of fish farming as a food source for most of the world's population, it faces many challenges that hinder its sustainability and development. Fish diseases are one of the main factors limiting aquaculture development and cultivation of aquaculture[1].

The expansion of global trade and increased demand for fish led to the expansion of fish farming according to intensive systems, facilitated the spread and development of the deadliest pathogens and the spread of infectious diseases, in addition to exposure to some severe weather phenomena, like droughts, storms, and high temperatures, which negatively affects the quality of water, this exposes the animals to stress and deteriorates their immune system[2,3,4].

Despite the efforts and efforts made by specialists in disease control and management, the losses caused by disease outbreaks in fish farms around the world, especially in developing countries, were estimated at US$ 9.5 billion annually[5]. In order to reduce the economic losses due to the outbreak of diseases threatening the livelihoods of fish farmers, they resort to the use of antibiotics and veterinary chemical drugs. Frequent use of this material has adverse side effects, whether health or economic, contributing to the weakening of the immune system of fish, the emergence of antibiotic-resistant bacteria and the pollution of the aquatic environment. These drugs and vaccines are very expensive[6,7,8].

Ginger is an aromatic plant in the Zingiberaceae family, distributed in the tropics. Its height ranges between 2 to 4 feet, about 16 to 122 cm. It is a traditional herbal medicinal plant used for 2,000 years to treat many diseases. It was also widely used as a cooking spice worldwide, especially in China, India, America, tropical Africa and Pakistan[9].

Ginger is called ginger in English and is derived from the Sanskrit word shrigavera, which means the shape of deer horns due to the rhizome resembling horns. It comes from the Greek name Ziggideris, derived from the Arabic name Zangabil. The Latin term zingibre appears later, and gingembre was written in Old French in the thirteenth century[10].

Ginger contains carbohydrates, fats, water, fiber and proteins. It has an important role in Chinese, Indian and Japanese folk medicine. The roots act as a gas repellent, a digestive stimulant, and a diuretic that relieves headaches. Being hot can warm the body, so it is used to treat cold and strengthen the body after blood loss, as well as in treating slow pulse and cases of weakness and pallor in general. It has other therapeutic values such as antimicrobial, antiparasitic, and antioxidant[11].

The study by Da Silva et al.[12] shows that when fed Nile tilapia fish with diets containing four levels of ginger oil 0, 0.57, 1.14, 2.27 (ml/kg), the feeding of the fish resulted in a level of 0.57 ml/kg of ginger oil, to increase feed intake and increase growth. Moreover, the level of 0.57 ml/kg of ginger oil improved the feed conversion rate of fish, compared with fish without ginger (control treatment).

The current study aims to determine the effect of using different levels of ginger oil on the diets of common carp fish Cyprinus carpio L.

Materials and Methods

Experiment place and cages

The experiment was conducted at the first agricultural research and experiment station, Umm Al-Akf area, Al-Muthanna Governorate, from 1/10/2120 to 20/12/2021, in dugout ponds, 45 m long, 35 m wide and 1.5 m deep, it was about 570 m away from the Euphrates River, Atshan River. The experiment used fish farming cages consisting of two rectangular pieces of wood, 244 cm long and 122 cm wide. 8 circles were drilled in each piece with a diameter of 45 cm in two parallel rows. The circular holes in the wooden cages were filled by installing 15 clip-on plastic cylindrical troughs with a diameter of 45 cm and a depth of 65 cm.

Experiment fish

80 Common carp Cyprinus carpio L., with an average weight of 77±0.56 g, were distributed randomly and evenly to the experimental cages (5 fish in each tank).

Feed manufactured

Ginger oil was brought from local markets, added to the experimental diet components, and distributed to treatments at rates of 0, 0.25, 0.50, and 1.00%, respectively (Table 1).

The statistical analysis

The statistical analysis of the studied traits was carried out according to a complete random design (CRD) using the ready-made statistical program[8], and the significant differences between the means were compared using the Duncan[9] multiple range test.

Items	T1 Control	T2 0.25% Ginger oil	T3 0.50% Ginger oil	T4 1.00% Ginger oil
Concentrated protein*	20.00	20.00	20.00	20.00
Soybean**	35.00	35.00	35.00	35.00
Wheat bran	15.00	15.00	15.00	15.00
Maize***	15.00	15.50	15.00	15.00
Barley	10.00	10.00	10.00	10.00
Flour	3.00	3.00	3.00	3.00
Oil	1.00	0.75	0.50	0
Ginger oil****	0	0.25	0.50	1.00
Premix	1.00	1.00	1.00	1.00
Total	100.00	100.00	100.00	100.00

* Animal protein concentrate (WAFI) of Dutch origin.
** Soybean meal (EAGLE) of Argentine origin.
*** Maize (EAGLE) of Argentine origin.
**** Each kg contains Vitamin A (400 and D), Vitamin D3 (160 and D), Vitamin E (1200 mg), Vitamin B1 (120 mg), Vitamin B2 (280 mg), Vitamin B6 (160 mg), Vitamin B12 (1400 mg), Vitamin H (4 mg), Calcium (20.08%), Phosphorous (4.90%), Sodium (5%).

Table 1. The composition of the diets in the experiment.

Field experience

The experiment lasted for 82 days with localization; four different experimental formulas were used for the proportions of adding ginger oil. The four experimental diets were T1 as the control diet, T2: 0.25%, T3: 0.50% and T4: 1.00% Ginger oil, with a crude protein percentage of 28% in all diets. The experimental fish were fed 5% of their live weight and served 4 meals daily. The amount of feed was adjusted according to the periodic weight of the fish every ten days. Weighing was done for the experimental fish, using a sensitive scale 500 g type DIGITAL SCALE, after drying it with a cotton cloth.

Growth parameters

Total weight gain (W.G.):

$$W.G. = F.W-I.W \quad (1)$$

Daily Growth Rate (DGR):

$$(DGR) = (W2 – W1)/(T2 – T1) \quad D.G.R \ (2)$$

(W1: Initial weight, W2: final weight (second), T2–T1: The duration of the trial or between the two weights).

Relative Growth Rate (RGR):

$$RGR=(W2-W1)/W1\times100$$

Specific Growth Rate (SGR):

$$SGR=(Ln\ W2-LnW1)/(T2-T1)\times100$$

Feed Conversion Ratio (FCR):

$$FCR=(R(gm))/(G\ (gm))$$

(R: weight of food intake (gm), G: weight gain of fish (gm)).

Feed conversion efficiency (FCE):

$$FCE=G/R\times100$$

Protein Efficiency Ratio (PER):

$$PER=(T.W.G)/(P.I)$$

(TWG: total weight gain (kg), P.I.: protein intake (kg)).

Where (F.W.: Final weight, I.W.: Initial weight)

Statistical analysis

Randomized Complete Design (CRD) was used to study treatments' effect on the traits studied. Significant differences between means were tested using Duncan's[13] multiple range test, at a significance level 0.05. The ready-made statistical program SPSS[14] was used to analyze the data.

Results

Table 2 shows significant differences (P≤0.05) in the weight gain in treatment T3, T2, then T4. While these differences did not appear with the control treatment, T3 (242.58 g/fish) recorded a significant superiority compared with T2 (238.94 g/fish), which in turn outperformed treatment T4 (223.70 g/fish). Control treatment recorded the lowest values, reaching 213.35 g/fish.

The daily growth rate Table 2 showed significant differences (P≤0.05) among the experimental treatments, the highest value recorded for T3 was 2.36 g/day, this was followed by the second treatment, which amounted to 2.30 g/day, then T4, which was 2.08 g / day, while the lowest daily growth rate in the first treatment was 1.93 g/day, record the lowest daily growth rate for all transactions after the first ten days of the experiment, the highest value recorded for T3 was 1.28 g, while the lowest value was recorded for T1, which amounted to 0.96 g, while the highest daily growth rate was recorded for all treatments after forty days of the experiment, the highest daily growth rate value was recorded for T3, which amounted to 3.46 days, the lowest value was for T4 treatment, which amounted to 3.09 g.

Table 2 shows that significant differences (P≤0.05) between the experimental treatments, T2 and T3, which did not differ significantly, recorded the highest relative growth rate of 212.92 and 208.45%, respectively, the T4 treatment, followed by a value of 188.12%, then followed by the control treatment in which the relative growth rate reached 174.81%.

Table 2 shows significant differences (P≤0.05) between the treatments, with a significant superiority of T2 and T3 treatments in the specific growth rate with values of 3.80 and 3.75% g/day, respectively, as there were no significant differences between them, then T4 treatment, which recorded 3.52% g/day, then T1 treatment with a value of 3.36% g/day.

Growth parameters	Treatments				Sig.
	T1 Control	T2 0.25% Ginger oil	T3 0.50% Ginger oil	T4 1.00% Ginger oil	
Initial Weight (g/ fish)	0.37±77.64	0.17±77.46	0.38±77.53	0.13±77.64	N.S.
Final Weight (g/ fish)	0.39±213.35 d	0.13±238.94 b	0.80±242.58 a	0.61±223.70 c	0.05
Weight gain (g/ fish)	135.710.42± d	0.18±161.48 b	1.15±165.05 a	0.67±146.06 c	0.05
daily growth rate (g/ fish/ day)	0.006±1.93 d	0.002±2.30 b	0.015±2.36 a	0.008±2.08 c	0.05
relative growth rate (%)	1.23±176.81 c	0.67±208.45 a	2.49±212.92 a	1.14±188.12 b	0.05

specific growth rate (g/ fish/ day)	0.014±3.36 c	0.008±3.75 a	0.028±3.80 a	0.137±3.52 b	0.05

Table 2. Effect of deferent levels of ginger oil to the diet on the growth parameters of common carp Cyprinus Carpio L. (mean± Standard error).

Discussion

The improvement in growth parameters after adding ginger oil can be attributed to stimulating the secretion of intestinal proteases, thus improving the digestion and absorption of protein components in the feed. Ginger oil enhances the digestion of proteins and the absorption of amino acids in the gastrointestinal tract [15], [16]. Ginger also positively affects the biological intestinal microflora and helps in acquiring more nutrients [17, 18,19].

Conclusions

The results indicated a significant superiority of all ginger oil treatments in the growth parameters of carp fish, represented by body weight, weight gain, and daily, specific and relative growth rate. Adding 0.50% of ginger oil gave the best results, compared with all ginger oil treatments in the growth parameters of carp fish.

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Received: May 15, 2023/ Accepted: June 10, 2023 / Published: June 15, 2023
Citation: Al-Hussaini, A.S.F.; Salman, A.H.; Al-Gharawi, J.K. Effect of different levels of ginger oil to diet on growth parameters of common carp Cyprinus Carpio L. Revis Bionatura 2023;8 (2) 89. http://dx.doi.org/10.21931/RB/CSS/2023.08.02.89