Evaluation the Effects of *Zingiber officinale* L. as a feed Additive on Growth and Some Serum Biochemical Profiles of *Cyprinus carpio L*

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Abstract

The research was performed to examine the efficacy of *Zingiber officinale* L. as feed additives on growth performance and biochemical parameters in common carp *Cyprinus carpio* L. Used (80) fish and divided into 4 groups 10 fish per aquaria, two replicates were maintained for each treatment. Ginger powder mixed directly with basal diet of fish. It was incorporated in the four diets treatments. The control group diet had no ginger additive (C), while the three supplemented diets contained ginger at 1% (T1), 1.5 (T2) and 2 % (T3). After 35 days' growth was calculated as weight gain, daily weight gain, relative growth ratio, feed conversion ratio, feed efficiency percent and protein efficiency ratio with evaluate total proteins, albumin, globulin, cholesterol and triglycerides. The results of present study were weight gain of T2 and T3 groups showed significant difference comparison with the C. Daily weight gain showed significant difference between C, T2 and T3. Relative growth rate there were no significant difference between C and T1 but there was significant difference between T2 and T3. Feed conversion ratio showed no significant difference between control group and T1. Feed efficiency ratio there were no significant difference between T1, T2 and C. Protein efficiency ratio results showed that decrease in T3 and T2 compared to the C. The results of total protein, albumin, and triglycerides did not show any significant difference between treatments compared with the C. Globulin showed increase in T3 compare to C. While the cholesterol showed significant difference in T3 compare with C, T1 and T2. The results of present study propose that ginger feed additives at the concentration 2% for 35 days can be improvement growth and some serum biochemical parameters.

Keywords: *Zingiber officinale* L.*, growth performance, biochemical parameters, Cyprinus carpio L.*

Introduction

Feed additives used to improve the growth and health of aquaculture species. Extensive use of antibiotics and biocides in aquaculture lead to antibiotic-resistant and generation of toxicants which may cause risks to the environment [1] Consequently. The need of safe and effective alternatives to antibiotics is required, increasing attention to the use of natural alternative feed additives as supplementing ginger in fish diet [2].

Zingiber officinale L. has been used as a spice for over 2000 years [3] .It is also called "The Great Medicament" in Ayurvedic medicines [4] and is generally considered as a safe herbal medicine [5] .Fresh ginger contains 80.9% moisture, 2.3% protein, 0.9% fat, 1.2% minerals, 2.4% fiber and 12.3% carbohydrates.

Ginger contain natural organic materials for control disease in aquaculture by increasing the non-specific and specific immune mechanisms [6] .Supplementing diets ginger was reported to enhance the growth of tilapia (Oreochromis mossambicus) [7,8]. The digestive enzyme activity significantly increased with ginger enrichment [9]. [10] reported Zingiber officinale in diet of koi carps increase its production and enhance growth. Ginger has been reported to possess a broad-spectrum of prophylactic and therapeutic activities [11,12,13]. Serum total proteins are indicator of the biochemical nutritional and health status of the fish [14] .The use of ginger powder as supplemented diet can cause the increase of total protein in Lates calcarifer [15]. Studies have reported increase in serum albumin and globulin with work relating to fish fed with ginger diet [10]. The aim

of the study was to assessment the effects of ginger as a feed additive in the diets of common carp Cyprinus carpio L. on growth and serum biochemical parameters.

Materials and Method

A total of (80) healthy fish of Cyprinus carpio L. average weight (75 ± 2 g) were obtained from a carp farm at Aljadeda - Diyala (Iraq) were used in the experimental study .They were stocked in a two path through (150 x80 x 50 cm) then the fish were selected randomly and dispersed in to the 8 glass aquaria 10 fish per aquaria for each treatment. The ginger was mixed directly with basal diet of fish. It was incorporated in the four diets treatments. The control diet had no ginger additive, while the three supplemented diets contained ginger at 1% (T1), 1.5 (T2) and 2 % (T3). All fish were fed 3% of their body weight two times daily for 35 days. Growth performance parameters calculated via the following equation: Body weight gain (WG) = final fish weight (g) – initial fish weight (g) [16]. Daily weight gain (DG) = Gain (g) / time (day) [17]. Relative growth ratio (RGR%): final fish weight (g) – initial fish weight (g) / time (day) X 100 [18]. Feed conversion ratio (FCR) = feed intake (g) / Weight gain (g) [17]. Feed efficiency percent (FER %) = Weight gain (g) X 100 / feed intake [19]. Protein efficiency ratio (PER) = Weight gain (g) / Protein intake (g) [19]. At the end of the experiment, blood was drawn from caudal vessels using a non-heparinized syringe and collected in plastic gel tube. The evaluate of serum total proteins was carried by colorimetric method described by [20]. While estimation of albumin was carried according to [21]. Globulin content was calculated by subtracting albumin value from serum total protein value. Cholesterol and triglycerides were carried by using laboratory diagnostic kits.

Statistical Analysis

The statistical analysis system [22] program was used to show the effect of different treatments in study parameters. Least significant difference –LSD test and ANOVA were used to show the significant differences and compare between means in this study.

Result

The mean body weight gain(BW), Daily body weight gain (DG), Relative growth ratio (RGR). Food conversion rate (FCR), Food conversion efficiency (FCE) and Protein Efficiency ratio % (PER) were reported in Table (1). The body Weight gain (g/fish) of T2 and T3 groups showed significant difference at (P.≥0.05) (4.81±1.121, 7.99±1.00) respectively comparison with the control group (0.72±0.15) and T1(1.42±0.23) on the other hand there were statistically significant difference between T2 and T3. Daily weight gain showed significant difference at (P≥0.05) between T2, T3, C and T1 were (0.24±0.033, 0.66±0.070) and (0.03±0.005, 0.07±0.019) respectively. Relative growth% there were no statistically significant difference at (P≥0.05) between control and T1 (10.03±0.30, 11.86±0.52) respectively but there was statistically significant difference at (P≥0.05) between T2 and T3 (14±0.61, 17.39±0.86) respectively. Feed conversion Ratio (FCR) showed no significant difference at (P.≥0.05) between control group and T1 (18.55±0.54, 17.2±1.03) respectively but there were significant difference between T3 and C, T1, T2 with low FCR in T2 and T3 (15.57±0.93 and 11.57±0.63) respectively. Feed efficiency ratio % there were no statistically significant difference at (P≥0.05) between control group, T1 and T2 was (1.85±0.30, 1.52±0.21, 3.08±0.47) respectively while T3 (6.16±1.05) showed the greatest value and were statistically significant difference at (P≥0.05) with C, T1 and T2. Protein efficiency ratio % results showed that decrease in T3 and T2 values in fish fed ginger diet (P<0.05) compared to the control and T1 (1.12±0.007, 2.25±0.08 and (5.17±0.12, 5.37±0.31) respectively.

The total protein, albumin, and triglycerides did not show any significant difference between treatments compared with the control group (P≥0.05). Globulin showed significant increase in T3 (0.47±0.04) compare to C (0.28±0.03). While the cholesterol showed significantly reduces in T3 (71.16±3.70) compare with C1, T1, T2 (83.66±3.79, 82 ±2.63, 73.16±5.28) respectively (Table 2).

Table (1) Effect of ginger on growth performance (weigh gain, daily weigh gain, relative grouth %, feed convertion %, feed efficency % and protein efficency %) of C. carpio fed different concentrations of ginger for 35 days. Similar letters represent non-significant difference at P≥ 0.05. Value represent Mean ±SE.

Groups	Body Weigh Gain	Daily Weigh Gain	Relative Grouth %	Feed Convertion %	Feed Efficency %	Protein Efficency %
C	0.72±0.15 C	0.03±0.005 C	10.03±0.30 C	18.55±0.54 A	1.85±0.30 B	5.17±0.12 A
T1	1.42±0.23 C	0.07±0.019 C	11.86±0.52 C	17.2±1.03 AB	1.52±0.21 B	5.37±0.31 A
T2	4.81±1.121 B	0.24±0.033 B	14±0.61 B	15.57±0.93 B	3.08±0.47 B	2.25±0.08 B
T3	7.99±1 A	0.66±0.070 A	17.39±0.86 A	11.57±0.63 C	6.16±1.05 A	1.12±0.007 C
LCD 0.05	2.611	0.133	1.993	2.511	1.972	0.574

Table 2: Blood serum biochemical parameters of C.carpio after 35 days feeding different doses Ginger (1%,1.5%,2%) compared with the control group. Similar letters represent non-significant difference at P≥ 0.05. Value represent Mean ±SE.

Groups	Total protein g/dl	Albumin g/dl	Globulin g/dl	Cholesterol mg/dl	Triglyceride mg/dl
C	1.83±0.07 A	1.49±0.04 A	0.28±0.03 B	83.66±3.79 A	116.16±4.02 A
T1	1.98±0.19 A	1.44±0.04 A	0.38±0.01 AB	82.±2.63 AB	116.16±11.12 A
T2	2.05±0.09 A	1.45±0.05 A	0.41±0.04 AB	73.16±5.28 AB	116±6.21 A
T3	2.08±0.11 A	1.40±0.02 A	0.47±0.04 A	71.16±3.70 B	96.66±4.73 A
LSD 0.05	0.377	0.131	0.186	11.704	20.920

Discussion

Highest supplementation of ginger in T3(2%) achieved the best significant final average body weight followed by fish groups fed on diet contained (1.5% - 1% mg /kg) ginger respectively, while the lowest values were in control group similar results observed that beluga fed diet with ginger powder significantly increased growth performance [23] .These results clearly showed that the ginger stimulated fish growth may be respond to ginger supplementation in a dose dependent manner. These results are also in accordance with [24] who suggesting highest supplementation of ginger was most favorable for the growth and survival. Also, [25] administration of ginger in grouper enhanced innate immune defenses. The enhanced growth response indicated by gainer supplementation stimulates protein synthesis by enzymatic system [27,26] and agreement with [28] who reported that goldfish fed ginger supplemented diets, enhanced growth. The result of the FCR low in T2 and T3 (15.57±0.93 and 11.57±0.63) respectively it is in contrast with that of [29] who reported that there was a significant difference in Feed conversion ratio in shrimp fed ginger supplemented. These values are also observed in other teleosts [30] and tilapia [31] .Previous study significantly increased albumin and globulin are vital elements for maintaining a healthy immune system [32]. This is in agreement with finding of [33, 34] an increase in serum protein levels as an indication of strong innate immune response in fish, likewise [35] showed higher levels of albumin and globulin. Ginger had no significant difference on triglyceride compared with the control (Table 2). In the present study, total protein and albumin was not change after feeding with different doses of ginger at the end of 35 days and globulin had significant difference in fish fed diet containing ginger when compared with the control

Conclusion

The research concluded that ginger supplemented diet at the concentration 2% for 35 days improved growth and higher levels of globulin with reduce in both cholesterol and triglyceride in blood serum analyzer. Further research is needed to clarify the action mechanism of ginger and feeding period in common carp.

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Ethical approval: All applicable international, national, and/or institutional guidelines for the care and use of animals were followed. All procedures performed in studies involving animals were in accordance with the ethical standards of the institution or practice at which the studies were conducted.

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This manuscript has not been previously published and is not under consideration in the same or substantially similar form in any other peer-reviewed media.

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