Effect of ginger (*Zingiber officinale*) and garlic (*Allium sativum*) to enhance health of common carp *Cyprinus carpio L* .

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Summary

The mixing of ginger *Zingiber officinale* and garlic *Allium sativum* used at different concentrations (ginger 10g/kg; garlic 10g/kg; ginger 5g/kg with garlic 5g/kg; ginger 7.5g/kg and garlic 2.5g/kg and ginger 2. 5g/kg and garlic 7.5g/kg in treated 1, 2, 3, 4 and 5 respectively) as a dietary supplements based on their performance in enhancing the fish healthy while control diet was free from ginger and garlic. Haematological parameters of 96 fishes of common carp *Cyprinus carpio L*. were determined after two months, Red blood cells count (RBCs), white blood cells count (WBCs), hemoglobin concentration (Hb) , and Packed cell volume (PCV) , total plasma protein , albumin and Globulin, liver enzymes (ALT,AST and ALP) using several laboratory techniques and equations. Results showed that all the RBCs , WBCs , PCV , Hb ,parameters and total plasma protein , albumin and Globulin concentrations show increase significantly ($P<0.05$) in treatment 2 while (AST), (ALT) and (ALP) activities in plasma decreased significantly with increasing levels of garlic and ginger addition.

Keywords: ginger, common carp, fishes, garlic.

Introduction

Aquaculture developed to adopt more productive means to feed increasing human populations (1) .The increase in aquaculture is said to be paralleled with a corresponding increase in the occurrence of infectious diseases, resulting often from high stocking densities and stress conditions that favor the occurrence and spread of pathogens (2). Cultured fish suffer a wide variety of bacterial, viral, parasitic and fungal diseases (3). The stimulation of normal hematological values in fishes are very important in the prevent of many diseases (4, 5 and 6). Garlic is example of medicinal plant which represents a rich source of calcium, phosphorus and vitamin B1. It has a high content of carbohydrates and as a consequence a high nutritive value. Garlic also contains iodine salts which have a positive effect on the circulatory system and rheumatism, silicates which have a positive effect on the skeletal and circulatory system and sulfur salts with positive effects on the skeletal system, cholesterolemia, and liver diseases. Garlic also contains vitamin complex B, vitamins A and C (7). Another substance with a major role is aliin which has anthelmintic effects. In short, garlic has the following effects: lower the cholesterol and the triglycerides, ameliorates, atherosclerosis, has a hypotensive, coronary dilator, antioxidant and anticancer effect.

The application of garlic in aquaculture is described as an innovative approach to enhancing health of fish and prevents the diseases (8). Accumulating evidence suggests that many dietary factors may be used alone or in combination with traditional chemo-therapeutic agents to prevent or treat diseases, like Ginger (*Zingiber officinale*) which is gaining popularity amongst modern physicians and its underground rhizomes are the medicinally useful part (9). All Ginger's major active ingredients, such as zingerone, gingerdiol, zingibrene, gingerols and shogaols, are known to possess anti-oxidant activities (10). Ginger was also found to possess a protective against DNA damage induced by H2O2 and enhanced healthy (11 and 12). The aim of the present study to detect the effect of garlic and ginger in enhancing health of common carp *Cyprinus carpio L* .

Materials and Methods

Six experimental diets were formulated to contain different levels of *Zingiber officinale*

and *Allium sativum* powder). Control diet was free from both ginger and garlic. Diets were commercially available in garlic formulated from ingredient purchased from the local Baghdad market, then ground to become powder. All diets were transformed into pellet form. After being dried, the pellets were transferred to plastic bags and stored in a freezer at- 4°C until the feeding experiment was started.

The feeding experiment was carried out in (12) glass aquaria. Each aquarium was 70X40X40cm with a total volume of 100L.

Experimental aquaria were supplied with well-aerated freshwater using compressed air via an air stone. Fresh tap water was stored overnight in order to dechlorinate the water. Water exchange daily approximately 25% of the total volume. The water temperature was adjusted (25-26°C) by a thermostat column heater in each aquarium. *Cyprinus carpio* fingerlings were obtained from the ponds of Central Baghdad and acclimated under and laboratory conditions for two weeks and randomly distributed at a stocking density of 16 fish per aquarium. The initial average fish weight was 58±1g/fish. Each group was fed on one of the experimental diets. Diets were given at a rate of 3% live body weight twice a day (9 a.m. and 4 p.m.). Fish were biweekly weighted and the amounts of daily given feed were readjusted according to increase in their body weight until the end of the experiment.

Control treatment: without food additives.

Treatment 1: giving dietary supplements with ginger 10g /kg.

Treatment 2: giving dietary supplements with garlic 10g /kg.

Treatment 3: giving dietary supplements with ginger 5g /kg and garlic 5g /kg.

Treatment 4: giving dietary supplements with ginger 7.5g /kg and garlic 2.5g /kg.

Treatment 5: giving dietary supplements with ginger 2. 5g /kg and garlic 7.5g /kg.

Biochemical test

The blood was collected from the caudal vein in anticoagulant tubes for haematological examination. RBCs count ,and packed cell volume (PCV) was estimated, Hemoglobin(Hb) estimation was done using spectrophotometer and Drabkins solution, WBCs count was done according to(13).Total plasma protein and albumin were estimated using kits from Randox Company. Globulin concentration was calculated according to following equation. Globulin= Total plasma protein – (Albumin). The traditional values were converted to SI values according to (14). Aspartate aminotransferase (AST) and Alanine aminotransferase (ALT) and Alkaline phosphatase (ALP) were determined calorimetrically using kits supplied by Diamond Diagnostics, according to Reitman and Frankel (15).

Results and Discussion

The results of parameters were summarized in tables (1, 2 and 3), show a significant differences (P<0.05)between groups for the RBCs , WBCs , PCV, Hb, all these parameters were high values in the treatment 2 and treatment 5 compared with other groups table,1.

Table, 1: Effect of ginger and garlic in carp fish hematological parameters RBCs, WBCs, PCV and Hb during the period of study (Mean ± S.E.).

Treatments	RBCs 10^9 cells/L×	WBCs 10^9 cells/L ×	PCV(%)	Hb gm/L
Control	1.75± 0.06c	2.35± 0.16c	24.75± 0.75d	7.21± 0.79 d
Treatment 1	1.96± 0.01c	3.16± 0.10b	26.11± 0.72c	8.32± 0.57 c
Treatment 2	2.65± 0.12a	3.88± 0.80a	28.84± 0.72a	9.87± 0.08a
Treatment 3	2.27± 0.06b	3.48± 0.10a	27.43± 0.33b	9.12± 0.24b
Treatment 4	2.11± 0.03b	3.28± 0.15b	26.91± 0.33c	8.73± 0.55b
Treatment 5	2.44± 0.08a	3.65± 0.15a	28.08± 0.31a	9.44± 0.39a

The results of total serum protein, albumin and globulin were summarized in table (2), such parameters were higher in the treatment 2 compared with other group. Results show significant differences (P<0.05) between groups of total serum protein, albumin and globulin. The healthy benefit of garlic relate to the present of S-allyl cysteine ,or because *Allium sativum* has some constituents that may play a role in the immune system stimulation and in the function of organs related to blood cell

formation such as thymus, spleen, and bone marrow these agree with(16).

Table,2: Effect of ginger and garlic in carp fish total plasma protein, albumin and globulin concentration in gm /l

Treatments	Total plasma protein	Albumin	Globulin
Control	2.44± 0.1d	80.00± 0.05f	24.75±0 .75e
Treatment 1	3..16± 0.03c	82.00± 0.02e	26.11±0 .72c
Treatment 2	3.98± 0.04a	87.00± 0.03a	28.84±0 .72a
Treatment 3	3.72± 0.09ab	84.00± 0.03c	27.43±0 .33a
Treatment 4	3.46± 0.08b	83.00± 0.01d	26.91±0 .33b
Treatment 5	3.87± 0.03a	85.00± 0.03b	28.08±0 .31d

The average values for hematological parameters observed in present study were in agreement with (17 and 18). The results (table,3). serum enzyme activity AST, ALT and ALP were seemed significant decrease in all treated groups compared with control group.

Table, 3: Effect of ginger and garlic in AST, ALT and ALP (Mean ± S.E.)

Treatments	AST (IU/l)	ALT (IU/l)	ALP (IU/l)
Control	17.30± 0.39 a	14.80± 0.31 a	34.50± 0.35 a
Treatment 1	16.20± 0.28 b	14.40± 0.20 a	34.00± 0.32 b
Treatment 2	14.50± 0.18 c	13.00± 0.07 b	32.30± 0.22 c
Treatment 3	15.20± 0.13 c	13.80± 0.13 b	33.70± 1.05 c
Treatment 4	15.80± 0.31 c	14.10± 0.13 b	33.70± 0.59 c
Treatment 5	14.90± 0.16 c	13.35± 0.09 b	32.80± 0.67 c

These results can be attributed to *Allium sativum* and *Zingiber officinale* which may cause stabilized cell membrane and protect the liver against deleterious agents and free radical-mediated toxic damages to the liver cells. This is reflected in the reduction of liver enzymes. (*Allium sativum* and *Zingiber officinale*) helps the liver to maintain its normal function by accelerating the regenerative capacity of its cells. These data agree with those reported by other researcher (19), the present study recommend to use garlic at 10 g/kg or 2.5g ginger with 7.5g garlic /kg by mixing with the food of fish .

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تأثير الزنجبيل والثوم في تحسين الحالة الصحية لاسماك الكارب الشائع *Cyprinus carpio L*

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الخلاصة

أستعمل خليط الزنجبيل والثوم ضمن تراكيز مختلفه (10 غم /كغم زنجبيل؛ 10 غم/ كغم ثوم؛ 5 غم /كغم زنجبيل مع 5 غم / كغم ثوم؛ 7.5 غم /كغم زنجبيل مع 2.5 غم/كغم ثوم و 2.5 غم/ كغم زنجبيل مع 7.5غم/ كغم) للمعاملات 4،3،2،1 و5 على التوالي. كاضافات علفية لمعرفة تأثيرهما في تحسين الحالة الصحية للأسماك الكارب الشائع Cyprinus carpio L . قدرت الصفات الدمية لأسماك الكارب الشائع و تم قياس الاقيام الدمية لست وتسعين سمكة بعد شهرين من استعمال العليقة وشملت الفحوصات الدمية: حساب عدد خلايا الدم الحمروالخلايا البيض و تركيز الهيموكلوبين و حجم خلايا الدم المرصوص وحساب تركيز بروتينات بلازما الدم وقياس انزيمات الكبد (ALP,AST,ALT) وذلك باستعمال تقنيات مختبرية عدة مع تطبيق بعض المعادلات الحسابية . اظهرت النتائج ان معايير خلايا الدم الحمر و تركيز الهيموكلوبين و حجم الخلايا المرصوص و حساب العدد الكلي لخلايا الدم البيض وتركيز بروتينات بلازما الدم قد أرتفعت معنويا" ضمن مستوى ($P<0.05$) في المعامله الثانية مقارنة مع بقية المعاملات بينما انخفضت معنويا" مستويات انزيمات الكبد (AST,ALT,ALP) في جميع المعاملات التي تحتوي على مسحوق الثوم والزنجبيل .

الكلمات المفتاحية: الزنجبيل، اسماك الكارب الشائع، الثوم.