Effect of L-Carnitine and Niacin addition on some blood parameters of fry Common Carp *Cyprinus carpio*

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Summary

The present study was conducted in order to focus on the effect of the addition of Carnitine and Niacin on some blood serum parameters of Common Carp *Cyprinus Carpio*. 48 fish carp mean weight 44.13 gm were distributed randomly on four feeding treatments (12 fish each) with replicates (6 fish each) in 8 glass aquaria. Treatments were as follows: fish were fed on basic diet without any addition and conducted as control (T1); addition of 200 mg Carnitine/ Kg diet, (T2) addition of 28 mg Niacin/Kg diet (T3), addition of a mixture of 200 mg Carnitine and 28 mg Niacin/ Kg diet as (T4). The experiment was conducted for 70 days and the results showed an increase in the Cholesterol concentration of T1 (187.6 mg/ 100 ml) and differed significantly ($P<0.05$) from T2 (163.95 mg / 100 ml), T3 (157.6 mg/ 100 ml) and T4 (162.43 mg / 100 ml) where they did not differ between them. Total protein Serum concentrations of T2 (5.11 mg/ dl), T3 (5.00 mg / dl) and T4 (5.07mg/dl) were not differ significantly but all differed significantly ($P\leq0.05$) with T1 (4.07mg/ dl). Conclusion showed that fish fed on (200 mg Carnitine and 28 mg Niacin) had low serum cholesterol concentrations and high serum total protein

Keywords: Carnitine, Niacin, Cholesterol, Total protein, Common carp *Cyprinus Carpio*.

Introduction

Common carp fish Cyprinus carpio belong to Cyprinidae family, whose original home extends from Europe to China, and has spread to various parts of the world from the lagoons to the slow- flowing rivers, as these fish were able to live in deep lakes and rivers (1). Protein is a primary energy source in fish, so fish need high protein percentages in their diets that leads to raising the cost economically. Many researchers have worked on to find alternatives for protein through food additives in fish diets such as probiotics (2), medicinal plants and herbs, such as black seed cake (3), licorice (4), fenugreek (5) and garlic (6). In the last decay, antibiotics and hormones were added in fish diets in order to increase growth rates, but recently they were banned internationally because of the cumulative effects on consumers. Nutritionists focused on other materials to increase the growth rates of fish without causing any harmful effects on consumers such organic acids, Carnitine and Niacin. Carnitine is a compound optically active, quaternary ammonium tri methyl butyric amino acid, soluble in water and it is responsible for transferring long-chain fatty acids across the inner membrane of the mitochondria and removes collected toxic effects of acids and maintaining the health and function of these mitochondria as well as a contraceptive oxidant properties (7). Niacin (vitamin B3) is a part bio-oxidation action of the enzymatic escorts of amino acids metabolism for energy (8). The present study aims to investigate the effectiveness of Carnitine and Niacin on some blood parameters in common carp juveniles in Iraq.

Methods and Materials

The experiment was conducted on 17/11/2013 and lasted until 25/01/2014. 96 common carp fish at 12 individuals (average weight 44.13 gm/fish) per aquarium (60 cm × 40 cm × 30 cm) were randomly distributed in 8 glass aquaria filled with 50 l dechlorinated tap-water after treatment with 1part per million potassium permanganate solution for an hour and a half to get rid of external parasites (9). Experimental aquaria water were aerated by air pump over 24 hours. Water of the aquarium was replaced by reserved water in a large tank (capacity 1m3) provided with regulated electric heater and leave for 48 hours to ensure the removal of chlorine and keep its temperature suitable to life and growth of common carp. A commercial fish diet (23% protein) was purchased from Baghdad local market and analyzed biochemically (10) to determined moisture, lipid, ash and carbohydrates (Table, 1)

in the central laboratory of Agriculture Faculty (All other analyses were determined as well). Protein percentage of the commercial diet was raised up to 30% to cover the needs of common carp juveniles, by mixing 74% of the commercial diet with 25% of commercial fish meal and adding 1% vitamins and minerals mixture to manufacture experimental diet (Table, 2 and 3). This diet was divided into four equal parts, where the first part without any addition was considered as a control treatment (T1), 200 mg of Carnitin/ kg of diet was added (T2), 28 Niacin mg/ kg feed was considered T3 and 200 mg of Carnitine and 28mg of Niacin/kg diet was considered as T4. At the end of the experiment, blood samples were collected through heart puncture (three fish/ replicate/ treatment) using a syringe capacity of 1ml and emptied into 10 ml plastic tube contained coagulation gel. Blood samples were centrifuged under 10000 cir./min to separate the serum and reserved it another plastic tubes, and kept at a temperature (20º m) for later analysis of total cholesterol concentration according to standard kit by Bio-Maghreb company using spectrophotometer (505 nm) and total protein concentration (TP) according to Biuret method and using Spectrophotometer with 550 nm wave-length (11). All experimental data were analyzed according to a Complete Randomized Design (CRD) to study the effect of various treatments in the trait and compared the significant differences between the averages by (12) and polynomial statistical program (13) according to the mathematical model and the level of significant differences P≤ 0.05.

Yij = μ + Ti + eij, So: Yij = value viewing j i studied.
μ = overall average for the recipe studied.
ti = effect of treatment (eight treatments with two replicates).
eij = random error which is distributed naturally with an average of zero and variance of eδ2.

Table, 1: Percentages of biochemical analysis of local commercial fish diet.

Biochemical analysis	Percentages
Moisture	5.91
Protein	23.00
Lipids	5.88
Ash	8.23
Carbohydrate	56.98

Metabolizable Energy calculated according to Smith (12) = %Protein × 18.8% + Lipids × 33.5 + Carbohydrate = 13.8× % 1415.7cal / KJ

Table, 2: Percentages of biochemical analysis of experimental fish diet.

Biochemical analysis	Percentages
Protein	30±0.9
Lipids	6.00±0.2
Ash	0.21±9.99
Moisture	8.91±1.2
Carbohydrates	43.88±0.12

ME %= Protein × 18.8 % + Lipids× 33.5 % + Carbohydrates ×13.8 = 1415.7 cal / KJ

Table, 3: Percentages of commercial fish meal biochemical analysis.

Biochemical analysis	Percentages
Protein	55.42
Lipids	5.63
Moisture	6.52
Ash	17.09

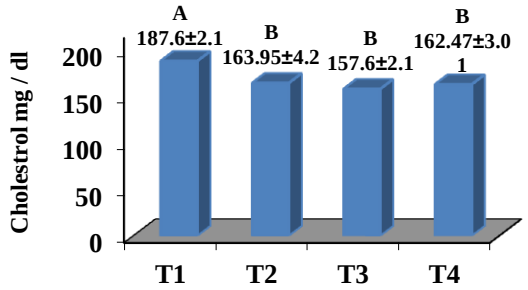
Results and Discussion

Results of the current study indicated a significant decrease (P<0.05) in the cholesterol concentrations of T2, T3 and T4 (163.95 ±4.2, 157.6 ±2.1 and 162.47 ±3.0) mg/ 100ml, respectively, comparably with control treatment T1 (187.6 ±2.1 mg/ 100ml) as shown in (Fig. 1) .This is due to the impact of using Carnitine and Niacin in the nutritional diets and it can be seen from (Fig.2) the significant increase of the total protein concentrations (P <0.05) in T2, T3 and T4 (5.11 ±0.5, 5.00 ±0.1 and 5.07 ±0.2) mg/ dL on the sequence comparison treatment with T1 (4.07 ±0.9 mg/ dL).

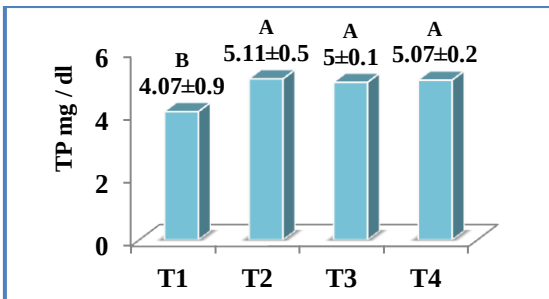
The reasons for lowering cholesterol concentrations in the blood serum, for example, could be to the importance of Carnitine in fatty acid oxidation and energy metabolism (14). Addition of Carnitine to broiler diet may increase the secretion of growth hormone from the pituitary gland and T4 hormone from the thyroid, where growth hormone restore the fatty acids in the liver after stimuli fat analysis and reduce the levels of free fatty acids resulting from the decomposition of triglycerides (15). Growth hormone is a stimulating key for releasing 7-α hydroxylase enzyme, which convert fatty acids to bile acids and stimulate the cholesterol metabolism enzymes (16). While (17) showed that supplemented Niacin decreased cholesterol concentrations in the blood of

poultry and this may apply to the results of the present study where observed lower concentrations of cholesterol in the blood of fish fed diet containing Niacin. The results of the current study did not agree with the study of (18) where they noted that protein and cholesterol levels were not affected when Carnitine (15 and 1000 mg/kg diet) and lipids (100 and 180 g/kg diet) were added to the diets of African catfish., and (19) noted no differences in the concentration of blood cholesterol of rainbow trout fed on a diet containing L-Carnitine 500 mg/ kg. Results of the current study, agreed with (20) when he added Carnitine 200 mg / kg diet of grass carp that reduced blood cholesterol. These results also agreed with (21) that Carnitine has reduced significantly ($P<0.05$) cholesterol concentration in tilapia comparably with control. The results of present study also agreed with the results of (22) when added Carnitine level of 400 mg/ kg diet to silver perch. Another reason may have a role in the low cholesterol, namely the entry of Niacin in the synthesis of enzymatic NAD facilities which activates an enzyme 7-α hydroxylase, which contributes in break down and excretion of cholesterol molecules (23). The reasons for an increase of the blood total protein of fish fed on diet contained Carnitine and Niacin might be to the importance of Carnitine in the oxidation of fatty acids and energy metabolism (14).

Total protein concentration of serum is controlling the osmoregulation pressure of the plasmal and maintain blood viscosity (24) which is influenced by nutritional status and liver functions. Tryptophan was considered as one of the smallest amine group that create Niacin inside animal body and it plays a key role in the construction and synthesis of most of the body's proteins (25). It is likely that the high concentration of protein in the blood serum might be due to the role of Carnitine in creation of many amino acids and vitamins (26) or possibly due to an increase in the activity of the pituitary gland in secretion of growth hormone as a result of Carnitine function (15), whereas, decreasing growth hormone reduce the synthesis of glucose in the body (27).



Figure,1: Blood serum cholestrol concentrations of common carp fed on supplemented Carnitine and Niacin



Figure, 2: Serum total protein concentrations of common carp fed on supplemented Carnitine and Niacin

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تأثير إضافة الكارنتين والنياسين في بعض المعايير الدمية لصغار أسماك الكارب الشائع *Cyprinus carpio*

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الخلاصة

أجريت هذه الدراسة لتسليط الضوء على تأثير إضافة الكارنتين والنياسين في بعض المعايير الدمية لأسماك الكارب الشائع *Cyprinus carpio*. استعمل 48 سمكة كارب بمعدل وزن 44.13 غم. وزعت الأسماك عشوائياً على أربع معاملات تغذوية وبمكررين لكل معاملة (6 سمكة لكل مكرر) في 8 أحواض زجاجية. قسمت المعاملات كالأتي: معاملة السيطرة (T1) غُذّيت على عليقة أساسية بدون أي إضافة، والمعاملة الثانية (T2) غُذّيت على عليقة أساسية مضاف إليها 200 ملغرام كارنتين/كغم علف، المعاملة الثالثة (T3) على عليقة أساسية مضاف إليها 28 ملغرام النياسين/كغم علف، المعاملة الرابعة (T4) غُذّيت على عليقة أساسية مضاف إليها 200 ملغرام كارنتين و28 ملغرام نياسين/كغم علف. أستمرت التجربة لمدة 70 يوم وفي نهاية التجربة تم قياس تراكيز الكولسترول والبروتين الكلي في مصل الدم. أظهرت النتائج انخفاض تركيز الكولسترول معنوياً في مصل الدم للمجاميع المعاملة T2 وT3 وT4 مقارنة مع مجموعة السيطرة. كما لوحظ عدم وجود فروقات معنوية بين المجاميع المعاملة T2 وT3 وT4 عند مقارنتهم مع بعضهم. في حين بينت النتائج حصول ارتفاع معنوي في تركيز البروتين الكلي في مصل الدم للمعاملات T2 وT3 وT4 مقارنة مجموعة السيطرة. فضلاً عن ذلك فقد لوحظ عدم وجود فروقات معنوية بين المجاميع T2 وT3 وT4عند مقارنتهم مع بعضهم. نستنتج من دراسة ذلك التأثيرالأيجابي للكارنتين والنياسين على مستوى الكولستيرول والبروتين الكلي في مصل دم أسماك الكارب الشائع.

الكلمات المفتاحية: الكارنتين، النياسين، كوليسترول، البروتين الكلي، أسماك الكارب الشائع.