Effect of salts addition of some organic acids on growth performance of Common Carp Juvenile *Cyprinus carpio L.*

Ashwaq Muhan Muhsan and Saeed Abdulsaddah Al-Shawi
Animal Resource Department, College of Agriculture, Baghdad University, Iraq.
E-mail: tarik.alani26@yahoo.com
Received: 1/9/2015; Accepted: 27/1/2016

Summary

This study was carried out in the laboratories of fish for 90 days in 16 glass aquaria (60 cm, 40 cm and 30 cm/70 L) to investigate the effect of some organic acids salts on some growth indices of common carp fish *Cyprinus carpio L*. A 128 fish were used with an average weight of (40.8±1) gm. and have been distributed on eight treatments with two replicate and eight fish for each replicate. Formulated eight diets that equally iso-nitrogenous (33.85%) and iso-caloric (1535.605 KJ/gm) were investigated. Organic acids salts (Sodium lactate, Sodium acetate and Sodiumformate) were supplemented singly (0.5% of each salts) and mixed to the experimental diets (0.25% of each salts). The statistical results showed that treatments T6 (0.25% sodium lactate + 0.25% sodium formate) had the best studied growth parameters at the level of P≤0.05 which clarified by weight gain (41.05±0.25 gm) and food conversion ratio (2.8±0.02).

Keywords: Organic acids salts, Growth indices, Common carp.

Introduction

Fish feeding was related for years with the development of fisheries and methods of fish breeding, the fish feeding system is considered a proof for the successful of fish breeding and the ability to increase the intensively of fields over the unit of area or capacity. The nutrition is one of the most voluntary activities important and replicate which is considered part of the routine daily work (1) and in order to obtain highly nutritive value it become necessary to enrich them with special type of feed additives that can support growth average. Food conversion ratio and ability of protein precipitation and lowering mortality rate (2). The organic salts are derived from organic acids which are short chain fatty acids that has been used in the post in food preservation ,recently their use in the field of animal production was positively proved as an active and safe substitute instead of antibiotics used as growth promoters and prevention from diseases also used as an additives in food and drinking water (3). The aim of this study was to investigate the effect of some organic acids salts on some growth indices of common carp fish *Cyprinus carpio L*.

Materials and Methods

128 fish of the common carp (*C. carpio*) in a single average weight (40.8±1gm) distributed randomly on 16 glass aquaria (60 cm, 40 cm and 30 cm/ 70 L) that have been treated with solution of potassium permanganate in the concentration of 1.5 p/ million to get rid of any ectoparasitic if present (4). Those fishes have been distributed among eight nutritive treatments in the fact of two replicate to each treatment and eight fishes for each replicate. The experimental diets formulated in the laboratory (Table, 1). The salts of organic acids were added as follows. The first treatment without any addition considered as control T1, 0.5% of sodium lactate/kg, fish feed was added considered as T2, 0.5% of sodium acetate /kg, fish feed was added considered as T3, 0.5% of sodium formate/ kg, fish feed was added considered T4, and to the T5 a mixture of 0.25% sodium lactate and 0.25% sodium acetate /kg, fish feed was added, A mixture of 0.25% sodium lactate and 0.25% sodium formate /kg, fish feed was added considered T6, 0.25% sodium acetate and 0.25% sodium formate /kg, fish feed considered T7, and to eight treatment T8 a mixture of 0.20% sodium lactate and 0.20% sodium acetate and 0.20% sodium formate /kg fish feed was added. The fish was fed 3%of their weight in fact of 3 times daily. The fishes were weighted every ten days to monitor the growth and efficiency of performance, the quantity of feed given were balanced according to the weight gain. The temperature and pH of the water of the experimental glass aquaria were measured. The air exchange of

the water was done all the time of the experiment by small pump of each glass aquarium, also the water was changed daily by the same quantity of water that has been left for 24 hours inside the laboratory to get rid of its content of chlorine and to reach the same temperature of the laboratory and glass aquaria. The chemical analysis of experimental diets protein, Ether extra crude fiber and ash in laboratories of Veterinary Ministry of Agriculture (Table, 2), the analysis done depending on methods that were dependent in (5) as for as the soluble carbohydrates Nitrogen Free Extracts (NFE) over mathematically calculated by method of difference according to equation mentioned by (6) as follows:

Soluble carbohydrates = 100-(protein%+Ether% + Ash% +crude fiber %).

Table, 1: Feed component% and chemical analysis % of the experiment diets calculate on basis of dry matter.

Feed substance used in the exp.	Percentage
Fish meal	20%
Soya bean meal	30%
Yellow corn	10%
Barely	10%
Wheat bran ground	14%
Wheat powder	14%
Vitamins	1%
Fish oil	1%

Table, 2: Chemical analysis % calculated on basis of dry matter by using to replicates for each sample.

Substance	Percentage
Protein	33.85%
Fat	6.4%
Ash	6.235%
Fiber	3.89
NFE*	49.625
Metabolism energy**	1535.605 mega gule/kg

***(NFE) Nitrogen free extracts**

****Metabolism energy was calculated depending on the equation demonstrated by (7) as follows:**

Metabolism energy (mg/kg)

=Protein%×18.8+Fat%×33.5+Solucarbohydrate × 13.8

The growth parameter was calculated as below:

Weight Gain (GW) = Final weight –Beginning weight

$$\text{Daily weight Gain (DWG)} = \frac{\text{Final weight - Beginning weight}}{\text{Period of (wg)/day}} \quad (8)$$

$$\text{Feed conversion Rate (FCR)} = \frac{\text{weight of dry diet fed}}{\text{Daily moist weight gain}} \quad (8)$$

Complete Randomized Design (CRD) was used in the analysis of the effect of the treatments on the criteria studied which test the significant differences between average of criteria studied according to Duncan's multiple range test on significance P≤0.05 (9) by using SAS (10) Statistical Analysis System in the analysis of data.

Results and Discussion

The results of the statistical analysis for the parameters of the average total weight gain (Table, 3) revealed the presence of high significance (P<0.05) of the T6 compared with all other treatments that recorded total weight gain (41.05±0.25) gm/fish followed by T2, T3 respectively which didn't differ significantly (P>0.05) and followed by T5, T7 and T4, respectively which gave no significant different. However concerning daily weight gain (Table, 3), T6 demonstrated higher daily weight gain (P<0.05) and recorded (0.45) gm/day also T6 had significant effect (P<0.05) in the best feed conversion rate (2.8) (Table, 3). Probably the reason of the weight gain for the treatments that contains organic acids salts single or mixed, compared with the control group was because of no added salts. The ability of organic salts to lower (pH) of the digestive tract and accordingly it prepared a fit environment for perfect effect of the enzymes that cause digestion of proteins leading to better digestion and absorption of nutrients (11) or it may be due to the causes of superiority of the effect of organic acids salts in supporting the growth Via the best utilization for protein present in the diet making it pure for growth by decreasing numbers of harmful bacteria (12) knowing that (13) had showed that the addition of organic acids and their salts leads to decrease the pH of the digestive tract so by suppressing the growth of disease bacteria which result in lowering competition of the host in consumption of the nutrients materials and the release of toxins that effect the host of the nutrients, or the reason may belong to the length of Villi of the intestines which in turn causes an increase in the surface area of absorption of nutrients. These results resembled for those that mentioned by (14) which feeding charr fish (*Salvelinus alpines*) on diets containing lactic and propionic salts. Also the results agreed with the study that performed by (15 and 16) when feeding the

youth of Atlantic salmon on diets containing sodium lactate. The results of the present study is similar to data recorded by (17) when he added a mixture of sodium formate, sorbate in the diets of (*Oncorhynchusmykiss*). Also similar to the results of the study done by (18) on the fingerlings (*Labeorohita*) when fed on diets containing citric acids. The results of the present study resemble what was recorded by (19) when feeding the (*Pagrusmajior*) by using 1% of mixture citric and malic acids .Also the results was agreeing with (20) when feeding the (*O. mykiss*) on diets containing 1% sodium formate that showed best growth rates and weight gain. Also the result agreed with the study that performed by (21) when feeding the (*Oncorhynchusniloticus*) on diets containing salts organic acids. The results of the present study coincided with results recorded by (22) when feeding the (*Pagrusmajior*) by using 0.5-3% citric acid salts. Also the results was agreeing with (23) when feeding the (*Husohuso*) on diets containing 0.3% salts citric acids that showed best growth rates and weight gain.

In Conclusion of this study were revealed the positive role of the addition of the organic acids salts singly or in a mixture on the different growth parameters of *Cyprinus carpio.* Also this study showed that the best growth rates obtained when mixture of sodium lactate and Sodium formate were added in percentage of 5gm/kg.

Table, 3: Rates of growth and feed conversion for *Cyprinus carpio* fish feed diets contain organic acids salts during 90 days.

Studied Criteria	Beginning weight gm/fish	Final weight gm/fish	Total weight gain gm/fish	Daily weight gain gm/day	Food conversion rate FCR
Control	41.35±0.25	74.55±0.75	33.20±0.50	0.36±0.0	4.07±0.06
T1	AB	E	D	E	F
Sodium lactate 0.5%	41.30±0.20	79.60±0.30	38.35±0.15	0.42±0.0	3.09±0.0
T2	AB	B	B	B	B
Sodium acetate 0.5%	41.15±0.35	79.70±0.01	38.56±0.45	0.42±0.0	3.07±0.05
T3	AB	B	B	B	B
Sodium formate 0.5%	41.65±0.05	78.60±0.50	36.95±0.45	0.41±0.0	3.13±0.01
T4	A	BC	C	BC	BC
Lactate+acetate 0.25%+0.25%	41.0±0.30	76.70±0.10	35.70±0.40	0.39±0.0	3.30±0.02
T5	AB	D	C	D	D
Lactate+formate 0.25%+0.25%	41.20±0	82.25±0.25	41.05±0.25	0.45±0.0	2.8±0.02
T6	AB	A	A	A	A
Acetate+formate 0.25%+0.25%	41.35±0.15	77.90±0.40	36.55±0.55	0.40±0.0	3.24±0.04
T7	AB	CD	C	CD	CD
Lactate+Acetate+Formate 0.20+0.20+0.20%	40.75±0.05	74.70±0.30	33.95±0.25	0.73±0.0	3.48±0.04
T8	B	E	D	E	E

***The different letters vertically refers to present different significance.**

Reference

1. Talbot, B. (1993). Some aspects of the biology of feeding and growth in 22 Fish proceeding of the Nut. Soc., 52:403-416.
2. Gumus, E.; Kaya, Y.; Balc, B. A. and Acar, B. B. (2009). Parial replacement of fishmeal with tuna liver meal in diets for common carp Fry, *Cyprinus carpio* L., 1758. Pakistan Vet. J., 29:154-160.
3. Celik, K.; Mine, M. and Uzatici, A. (2007). Effect of propitic and organic Acids on performance and organ weight in broiler chicks. Archiva Zootechica. 10:51-56.
4. Herwing, N.; Garibald, L. and Walke, R. E. (1979). Handbook of drugs and chemicals used in the treatment of fish disease. Charles C. Higher vertebrates, in Robert, R. J. (Ed) Microbial of fish Academic press, London. Pp: 1-33.
5. Association of Official Analytical Chemists (1984). Official Methods of Analysis. 13th ed.Washington, D.C., USA, Pp:275-284.
6. Wee, K. L. and Shu, S. W. (1989). The nutritive value of boiled full-fat 21 Soybean meal in pelleted feed for Nile tilapia, Aquac., 81:303-314.
7. Smith, R. R. (1971). A method for measuring digestibility and metabolism energy of feed. Prog. Fish Culture., 33:132-134.

8. Uten, F. (1978). Standard methods and terminology in finfish nutrition. Proc. World Symp. Finfish Nutrition and Fish-Technology, 11:20- 23.
9. Duncan, D. B. (1955). Multiple ranges and multiple F test. Biometerics. 1:11-19.
10. SAS. (2012). Statistical Analysis System, Users Guide Statistical. Version 9.1th ed SAS. Inst. Inc. Cary. N.C. USA.
11. Jin, T. Z.; Who, N.; Abdullah, H. and Jalaludin, S. (1997). Probiotic in poultry mods of action. Worlds Poult. Sci. J., 53:351-368.
12. Ghazalah, A. A.; Atta, A. M.; Elkloub, K.; Moustafa, M. and Shata, R. F. (2011). Effect of dietary supplementation of organic acids on performance nutrients digestibility and health of broiler Chicks. Inter. J. Poult. Sci., 10(3):176-184.
13. Adil, S. T.; Bandy, G. A.; Bhat, H. S.; and Saleim, M. (2010). Effect of dietary Supplementation of organic acids performance, intestinal histomorphology and serum biochemistry of broiler chicken-Vet. Med. Inter. Art., ID 479485, Pp: 1-7.
14. Ringo, E. (1991). Effect of dietary lactate propionate on growth and digest in arctic charr (*S. alpinus L.*). Aquac., 96:321-333.
15. Ringo, E.; Olsen, R. E. and Castell, J. D. (1994). Effect of dietary lactate ongrowth and chemical composition of Arctic charr (*Salvelinus alpinus L.*) J. World Aquac. Society, 25:483-486.
16. Gislason, G.; Olsen, R. E.; and Ringo, E. (1996). Compartive effects of Dietary Na-lactate on Arctic charr (*Salvenlinus alpinus*) and Atlantic salmon (*Salmosalar*). Aquac. Res., 27:429-435.
17. Dewet, L. (2005). Can organic acids effectively replace antibiotic growth Promotants in diets for rainbow trout (*Oncorhynchusmykiss*) raised under sub-optimed temperatures, Abstract CD-Rom, World Aquac. Soc., Pp: 9-13.
18. Baruah, K.; Sahu, N. P.; Pal, A. K.; Jain, K. K.; Debnath, D. and Mukharjee, S. C. (2007). Dietary microbial phytase and citric acid Synergistically enhances nutrient digestibility and growth Performance of Labeorohita (*Hamilton*) juveniles at Sub-obtimal protein level. Aquac. Res., 38:109-120.
19. Lim, C. C.; Luckstadt, C. and Klesius, P. H. (2010). Review: Use organic acids and salts in fish diets. Glob. Aquac. Advo., 5:45-46.
20. Morken, T.; Kraugerud, O. F.; Barrows, F. T.; Sorens, M.; Sterebakken, T. and Qverland, M. (2011). Sodium diformate and extrusion temperature effects nutrient digestibility and physical quality of diets with fish meal and barley protein concentrate for rainbow trout (*O. mykiss*) Aquac., 317(1-4):138-145.
21. Hossain, M. A.; Pandoy, A. and Satoh, S. (2007). Effects of salts organic acids on growth and phosphor ustilization in red sea (*pagrus major*)Fisheries Sci.,73:1309-1317.
22. Khajepour, F.; Hosseini, S. A. and Mahoseini, S. (2011). Study on some hematological and biochemical parameters of juvenile Belugo (*Husohuso*) fed salts citric acids supplemented diet. Glob. Vet., 7:361-364.
23. Petkam, R.; Luckstadt, C.; Nittayachit, P.; Sadaoand, P. and Encarnacoa, I. (2008). Evaluation of a dietary organic acids blend on tilapia (*Oreochromicniloticus*) growth performance. Abstract, World Aquac. Busan, Korea.

تأثير أضافة أملاح بعض الأحماض العضوية على دلائل النمو ليافعات اسماك الكارب الشائع *Cyprinus carpio*

أشواق موحان محسن و سعيد عبد الصداح الشاوي

قسم الثروة الحيوانية، كلية الزراعة، جامعة بغداد، العراق.

E-mail: tarik.alani26@yahoo.com

الخلاصة

أجريت هذه الدراسة في مختبر الأسماك لمدة 90 يوم باستعمال 16 حوض زجاجي (60 سم× 40 سم× 30 سم /70 لتر) لبحث إمكانية إضافة أملاح بعض الأحماض العضوية وأثرها في بعض دلائل النمو لأسماك الكارب الشائع *Cyprinus carpio L.* استعملت 128 سمكة وبمعدل وزن بلغ (40.8±1) غم وزعت الاسماك عشوائيا على ثماني معاملات / مكررين/ ثماني مشاهدات لكل مكرر. صنعت مختبريا ثماني علائق متساوية المحتوى من البروتين (33.85%) والطاقة (1535.605 ميكاجول/كغم) وأضيفت أملاح الاحماض العضوية (لاكتات الصوديوم وخلات الصوديوم وفورمات الصوديوم) بصورة مفردة بنسبة (0.5 % لكل نوع ملح) ومخلوطة بنسبة (0.25 % لكل نوع ملح). أظهرت نتائج التحليل الإحصائي أفضلية المعاملة السادسة (0.25% لاكتات الصوديوم + 0.25% فورمات الصوديوم) وتفوقها معنويا (P>0.05) لجميع معايير المدروسة في الزيادة الكلية (41.05±0.25) ومعدل التحويل الغذائي (2.8±0.02) .

الكلمات المفتاحية: أملاح الاحماض العضوية، دلائل النمو، الكارب الشائع.