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EFFECT OF FEED ADDITIVES ON GROWTH, SURVIVAL RATE AND FEED UTILIZATION OF CARP FINGERLINGS (*Cyprinus carpio L.*).

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ABSTRACT
This study was carried out to assess the effect of different commercial feed additives on growth, survival rate and feed utilization of carp fingerlings. Three treatments were used, control, Toniphos and Periavit respectively. The experiment lasted for 45 days.The maximum growth was obtained with Toniphos and Periavit treatments respectively. On the other hand, the reduced growth was recorded at treatment with control. Generally, growth and feed conversion ratio were improved for carp fingerlings fed on diets with feed additives compared to fish fed on the control diet. Feed cost essential to make 1Kg weight gain compared to fish fed the control diet treatment was reduced by using feed additives (Toniphos and Periavit).These results indicated that using Toniphos at level of 0.1% was the greatest in terms of growth performance and economic evaluation.

KEYWORDS: feed additives, common carp, growth performance, feed utilization.

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INTRODUCTION

Carp (*Cyprinus carpio L.*) is one of the most important fish species use for aquaculture all over the world because of its suitability for the culture environment, high growth rate, tolerance to environmental stress and its market demand (El-Sayed, 1999; Salah, 2007; Al-hamadany, 2010). The artificial feed content should have considerable amount of protein, carbohydrate and fats, minerals, vitamins and any materials to increase the fish growth (Huisman*et et al.*, 1979). Suitable diets needs to be supplied either as a full or a supplementary diet. Otherwise, the growth and diseases of fish may be caused by the starvation and poor diet (Bagenal, 1987; Lovell, 1989). However, protein is the important and expensive part in fish diet in particular in carp diet. Therefore, best apply of dietary proteins is needed for economical production (Andrews, 1977). The content of dietary protein which gives a good growth of carp depends upon the protein quality, energy content of the diet, fish age, fish reproductive state, fish condition and environmental factors such as temperature, salinity, pH and dissolved oxygen (Lovell, 1989). However, fish size, production and market demands affect the price of cultured fish, which depend on the growth of fish. Therefore, the high-quality diet, which should have necessary nutrients and feed additives to maintain fish health and good growth, are required for fish farming. Some of the growth-promoting feed additives contain hormones, antibiotics, and salts (Fuller, 1992; Klaenhammer and kullen, 1999).

The aim of this study was to assess the effects of the feed additives (Toniphos and Periavit) on growth e, survival rate, feed utilization and economic evaluation of common carp (*C. carpio*) fingerlings. However, the use of these additives in animal nutrition does not pose a risk to the environment.

To best of our knowledge, no work has been reported using Toniphos and Periavit as feed additive substance in carp aquaculture. This investigation is a preliminary work conducted for the first time to provide a new perspective for the use of Toniphos and Periavit as a dietary supplement added to fish feed to promote a good growth for fish aquaculture

MATERIALS AND METHODS

Sixty carp fingerlings with an average body weight 10.18± 0.77 - 10.51 ±0.39 gm) were collected from the outdoor of marine Science Center's fish farm, Basrah University. Fish were acclimated to laboratory conditions for ten days before being randomly distributed into three equal groups 20L plastic aquaria (10 fish each treatment and two replicate for each treatment) representing three nutritional groups. One group was a control and the other two groups represented the feed additives tested. The experimental fish were weighed every 15 days in order to regulate the daily feed rate which was 3 % of the total biomass at twice / day for seven days.

The total period of the experiment was 45 days.

Photoperiod was 12h light/ 12h dark. Water temperature was (28.5 ± 0.03 ^{o}C)., dissolved oxygen was about 6.20 ± 0.10mg/l. and pH was about 8.10 ± 1.50 during the experiment.

Experimental diets were formulated from practical ingredients (Table1) where the control diet (A) was without feed additives and the other diets were supplemented by 1% Toniphos and Periavit for diets B and C, respectively. 1 gram of feed additives was mixed with 100g of Food diet (Halver and Hardy, 2002).

The trial diets were formulated to have almost 30% crude protein. The trial diets were done by individually weighing of each component and by carefully mixing the mineral, additives with corn. This mixture was added to the components together with sunflower oil. Water was added until the mixture became suitable for making granules. The wet mixture was passed through CBM granule machine with 2mm diameter to make the pellets which left to dry at room temperature and then kept in fridge.

Different growth and feed parameters were calculated following Sveier *et al.* (2000) as:

Mean weight gain (MWG) = (Mean final weight – Mean initial
Specific growth rate (SGR) = 100 (ln W2 – ln W1) / T

where
W1: average initial
W2: average final body weights, respectively
T: time (days)

Feed conversion ratio (FCR) = Food consumed (g)/Weight gain (g)

Feed conversion efficiency (FCE) = (Body weight gain (g)/ feed intake (g)
Survival rate = Number of survive fish / total number of fish at the beginning X100
The tested diets were analyzed for crude protein (CP %), crude fat (CF %), ash (%) following standard Association of Official Analytical Chemists (A.O.A.C.) methods (1995).

Feed additives:
Toniphos and Periavit (Appetizers)

Composition of Toniphos:Calc.glycenophosphate,Magnesium , glycenophosphate, Potassium glycenphosphate, Sodium glycenophosphate and Glycerin.

Composition of Periavit: Nicotinamide, Vitamin B1(Thiamine), Vit B2 (Riboflavine), Vit B6(Pyridoxine HCl).

Economic estimation was calculated (New (1989), Faturoti and Lawal (1986) and Mazid*etal.* (1997) as:
Margin = Income from body gain weight - Feed cost

Statistical analysis

The effects of the feed additive on growth,survival rate and feed utilization of carp fingerlings were analysed using one-way analysis of variance (ANOVA) and significant differences among treatment means were compared using Duncan's multiple range test (DMRT) using SPSS version 17 (Duncan, 1955). Significance was tested at 0.05 levels.

RESULTS

High survival rate was recorded during the experiment (Table 2). However, the survival rate was not significantly affected by the supplementation of feed with additives (Table 2).

Growth

The weight gain and specific growth rate (SGR) of carp (*C. carpio*) fingerlingsfed with diets supplemented and without feed additives (Control) are given in Table 2.

The final body weight of the fish groups fed on diets B (Toniphos) andC (Periavit) had significantly ($P<0.05$) higher than final body weight of the fish at control diet (A). Growth performance increased significantly ($P < 0.05$) for the fish fed with diet B followed with diet C and the lowest was recorded at control treatment (A).

The maximum growth of the fish during 45 days was recorded in treatment B (10.14±0.15) and followed by treatment C (6.38 ±0.04), whereas the lowest growth was obtained in A (5.89 ±0.19).

The best weight gain (0.23 ± 0.001) of the fish per day was recorded by the fish fed with dietary B (Toniphos). It was significantly ($P<0.05$) higher than that of fish fed with diet containing Periavit(0.16 ± 0.001) and the fish fed with control diet (0.15 ± 0.001) (Table 2).

The highest value of SGR was recorded at treatment B, followed by treatment C and A. Their values were 97.22 ±0.04 ,60.74± 2.58 and 58.08 ±6.27 respectively.

Similarly, carp at treatment B fed with Toniphos gave the highest SGR (1.51 ± 0.001) followed by treatment C (1.05± 0.04) whereas the lowest growth obtained by fish fed with controlled treatment A (1.01± 0, 06) ($P < 0.05$). Survival rate of fish at the three types of the treatments as (100%) (Table 2).

Feed Utilization

Results of feed intake and feed conversion ratio (FCR) of common carp juveniles fed different diets are given in Table 3. The best FCR was found in diet at treatment B (1.59 ±0.06) followed by treatment C (2.42 ± 0.10) and the poorest was recorded at control Treatments A (2.71 ±0.34) (Table 2).

The highest values of FCE were found at Treatment B (62.72 ± 1.89) followed by Treatment C (41.18±1.78) while the lowest of 37.08 ± 4.75 was recorded at the control (Treatment A) with significant difference at $P<0.05$ (Table 2).

Economic estimation

Other overhead expenses were assumed unchanged. Price of one kg of diet 25% protein was about 1000 D (Iraqi Dinar (D) = 0.185US$) and price of selling of one kg live body weight of Carp was about 7000 D. Then, the cost of the 1Kg diet at the control diet is about 1043 D and the cost for 1Kg of the diet with feed additives at treatment B and C is in the region of 1045 D.

DISCUSSION

Growth

Average of initial body weight of carp fingerlings fed the experimental diets at the start did not differ, indicating that groups were homogenous. At the end of the experimental period (45 days), the group of fish fed the supplemented diets B and C (Toniphos and Periavit) grew better than the group of fish fed the control diet A.

Similar results were previously suggested by of Mehrim (2001), and Diab *et al*. (2002) for tilapia. Later, Khattab *et al*. (2004) and Mohamed *et al*. (2007) who also indicated that the Nile tilapia (*Oreochromis. niloticus)* fingerlings fed on diets supplemented by probiotics exhibited better growth than those fed with the control diet. Comparable results were also reported by several authors using bacteria as a probiotics by Kozasa (1986) for yellowtail (*Seriolalalandei*), Gatesoupe *et al*. (1989) for Turbot (*Psetta maxima*) and Japanese flounder (*Paralichthysolivaceus*) and Yanbo and Zirong (2006) for common carp (*C. carpio*). Noh *et al.* (1994) and Bogut*et al.* (1998) who studied the effect of supplementing common carp feeds with different additives, including antibiotics, yeast (*S.cerevisiae*) and bacteria (*S. faecium*).They reported a good growth rate was found with probiotic-supplemented diets but finally observed the greatest growth occurred with the bacterium.

Feed Utilization

Results of feed utilization in terms of FCR and FE indicated that the addition of feed additives made a significant improvement in feed utilization. Similar trends have been suggested by Khattabet *al*. (2004) and Mohamed *et al.* (2007) for probiotics use in diets for tilapia fingerling. However, these results suggest that the use of additives can decrease the amount of feed essential for fish growth which making significant decrease in the production cost. It is possible to conclude from this investigation that the feed additive used significantly ($P<0.05$) improved feed efficiency. Similar results were also reported by Bomba*et al*. (2002), Khattab*et al*. (2004) and Mohamed *et al.* (2007).

Economic advantage

These results indicate that the effect of Toniphosand Baribofay for improving growth and feed utilization parameters of carp fingerlings will increase the net profit for the carp farmers. On the other hand, the incorporation of Toniphos and Periavit in carp fingerlings diets seemed to be economic at incorporation level 0.1% . The reduction of feed costs was clearly observed in this study by using the additives for carp fingerling diets. This finding is in agreement with Khattab*et al*. (2004) and Mohamed *et al*. (2007).

CONCLUSION

From the present results, it could be concluded that the positive influence of additions (Toniphos and Periavit) on growth performance of carp fingerlings *C. carpio* diets showed positive effects. From feed utilization data and the economical point of view the diet supplemented with 1% Toniphos was the best treatment.

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Table 1.The composition of ingredients (for 100 g feed) in experimental diets.

Treatment	A Control	B Toniphos	C Periavit
Fish Meal	30	30	30
Soyabean meal	15	15	15
Corn	15	15	15
Wheat bran	15	15	15
Wheat flour	20	19	19
Strach	1.5	1.5	1.5
Commercial feed additives	—	1	1
Sun flower oil	2	2	2
Vitamin & Minerals	1.5	1.5	1.5
Total	100	100	100
Crude Protien	30.48 ± 1.23	30.35 ± 1.11	30.35 ± 1.11
Crude Fat	5.87 ± 0.11	5.86 ± 0.35	5.86 ±1.06
Ash	11.25 ± 0.24	11.23 ±0.14	11.23 ± 0.11
Moisture	7.19 ± 0.27	7.06 ± 0.15	7.06 ±1.60

Table 2.Growth and feed utilization of fingerlings of common carp fed experimental diets containing various sources of feed additives type for 50 days.

Treatment	A Control	B Toniphos	C Periavit
Initial weight rate (gm)	10.18 ± 0.77 [a]	10.43 ± 0.19 [a]	10.51± 0.39 [a]
Final weightrate (gm)	16.06 ± 0.58 [a]	20.56 ± 0.34 [b]	16.88 ± 0.35[a]
Weight increment rate (gm)	5.89 ± 0.19[a]	10.14±0.15 [b]	20.56 ± 0.34[c]
Growth rate (gm/day)	0.15 ± 0.001 [a]	0.23 ± 0.001 [b]	0.16 ± 0.001 [c]
Relative growth rate (%)	58.08 ± 6.27[a]	97.22 ± 0.04[b]	60.74±2.58[a]
Specific growth rate (%/(SGR)	1.01 ± 0.10 [a]	1.51 ± 0.001[b]	1.05 ± 0.04[a]
Food conversion ratio (FCR)	2.71 ±0.34 [a]	1.59 ± 0.06 [b]	2 .4 2 ± 0.10 [b]
Food conversion efficiency (FCE)	37.08 ± 4.75 [a]	62.72 ± 1.89 [b]	41.18 ± 1.78 [a]
Survival rate	100%	100%	% 100

Values are means ± SD of three replicates. Values within column with different superscript are significantly difference ($P < 0.05$).