Environment & Ecology 27 (4A) : 1882—1884, 2009
 ISSN 0970-0420

Effect of Different Concentrations of Vitamin E on Biochemical Composition and Feed Utilization of Common Carp

P. RAMACHANDRAN, M. R. RAJAN AND N. JEYARAJ

Department of Biology, Gandhigram Rural University
Gandhigram 624302, Tamil Nadu, India

Abstract

Four different feeds having different concentrations of vitamin E such as 0 (control), 100, 200, 300 and 400 mg were prepared by using fish meal, ground nut oil cake, wheat flour, tapioca powder. Proximate composition of different feeds was estimated. The condition factor (K) was estimated before and after the experiment. The effects of different concentrations of vitamin E on feed utilization parameters were studied in the common carp for a period of 30 days. Biochemical analysis of the fish such as protein, carbohydrate and lipid were analyzed before and after the experiment. Feed consumption and protein consumption were increased in feed 4 containing 400 mg of vit E. Feed conversion efficiency, protein consumption, protein efficiency ratio, growth, percentage growth, relative growth rate, assimilation and metabolism were high in feed 4. The gross and net growth efficiency were higher in feed 3 containing 300 mg of vit E. The protein and lipid content of the fish significantly increased when the concentration of vit E increased in the feeds. The carbohydrate content decreased with increasing concentrations of vt E.

Key words : Vitamin E, Biochemical composition, Feed utilization, Common carp.

Feed plays an important role in fish culture. The fish feed should need all the vital nutrients for their metabolic activities. Protein, carbohydrate and lipids are the major constituents of the fish feed. The minor constituents of the fish feed are minerals and vitamins. In the past, the fish feed contained protein as the major part, since the only size of the fish was considered as an important criterion. Research on fish nutrition suggests that vitamins are indispensable for most of the fish species to maintain the physiological process to give an improved immunity status that enables them to resist disease condition in a better way (1). Vitamins are needed for higher quantity in the brood stock diet, as it is essential for vitellogenisis and embryonic development in fish (2). Food fishes like common carp, which are cultured might incur heavy loss when affected by diseases. To avoid such deficiency diseases, the fishes are to be provided with vitamin supplements in their diet. One of the vitamin supplements is vitamin E. The studies related to the effect of vitamin E on biochemical composition and feed utilization of common carp

Table 1. Ingredients used in control and experimental feeds (wt in g).

		Feeds				
	Ingredients	Control	F 1	F 2	F 3	F 4
1.	Fish meal	34.15	34.15	34.15	34.15	34.15
2.	Groundnut oil cake	34.15	34.15	34.15	34.15	34.15
3.	Wheat flour	10.85	10.85	10.85	10.85	10.85
4.	Tapioca powder	10.85	10.85	10.85	10.85	10.85
5.	Fish oil	2	2	2	2	2
6.	Sunflower oil	4	4	4	4	4
7.	Mineral mix	2.5	2.5	2.5	2.5	2.5
8.	Sodium chloride	0.5	0.5	0.5	0.5	0.5
9.	Sodium benzoate	1.0	1.0	1.0	1.0	1.0
10.	Vitamin E (mg)	–	100	200	300	400

Table 2. Condition factor (K) of common carp in relation to different vitamin E levels.

Treatment	Initial	Final
Control	1.67 ± 0.03	1.82 ± 0.09
F 1	1.50 ± 0.16	1.74 ± 0.18
F 2	1.17 ± 0.03	1.37 ± 0.23
F 3	2.07 ± 0.17	2.45 ± 0.41
F 4	1.40 ± 0.33	1.73 ± 0.72

is totally wanting. Hence the present study was carried out.

Methods

Common carp *Cyprinus carpio* var communis is an edible fish which is the most extensively cultivated species in India. Although exotic to India, it is already being cultivated in the country singly and along with other Indian major carps. It is omnivorous, efficiently converting the food ingested into flesh, grows rapidly and is non-predatory.

For the present work fish (1.70 ± 0.5 g) were collected from Pandian fish seed farm, Dindigul, Tamil Nadu, India and transported to the laboratory in polythene bags filled with oxygenated water. Fish were acclimated in round plastic troughs for one week at 27 ± 2 C. During acclimation, fish were fed with trainee feed containing fish meal, ground nut oil cake, wheat flour and rice bran in the form of dry pellets. The raw materials used in the present study are fish meal, ground nut oil cake, wheat flour, tapioca powder, sunflower oil, fish oil, Nacl, mineral-mix and sodium benzoate. To increase the growth and disease resistance vitamin E was added to different concentrations. Different ingredients used in feed preparation were tested for its protein content (3). After knowing their protein contents, feeds were prepared according to square method (4), with various concentrations of vitamin E such as 0, 100, 200, 300 and 400 mg for control, experimental feeds 1, 2, 3 and 4 respec-

Table 3. Feed utilization parameters of common carp in relation to different concentrations of vitamin E.

Parameters	Feeds				
	Control	1	2	3	4
1. Feed consumption (FC) g/g live wt/30 days	2.40 ± 0.4a	2.45 ± 0.24b	2.84 ± 0.12c	2.87 ± 0.42d	3.35 ± 0.34e
2. Feed conversion efficiency (FCE)	12.00 ± 0.07	8.10 ± 0.04	12.40 ± 0.07	8.88 ± 0.03	15.20 ± 0.07
3. Feed conversion ratio (FCR)	8.20 ± 4.28	9.08 ± 4.52	9.16 ± 5.84	9.78 ± 4.36	9.83 ± 4.72
4. Protein consumption (PC)	0.25 ± 0.05	0.24 ± 0.08	0.28 ± 0.11	0.30 ± 0.03	0.33 ± 0.01
5. Protein efficiency ratio (PER)	0.13 ± 0.05	0.14 ± 0.1	0.16 ± 0.03	0.19 ± 0.07	0.25 ± 0.17
6. Growth (G) g/g live wt/30 days	0.20 ± 0.02a	0.27 ± 0.04b	0.31 ± 0.06c	0.37 ± 0.07d	0.38 ± 0.09e
7. Percentage growth (PG) (%)	10.00 ± 4.75	13.5 ± 5.25	20.66 ± 4.27	14.8 ± 5.79	25.33 ± 7.24
8. Relative growth rate (RGR) g/g live wt/30 days	1.00 ± 0.69	1.35 ± 0.29	1.55 ± 0.75	1.85 ± 0.34	1.87 ± 0.79
9. Assimilation (A)	1.80 ± 0.24	1.91 ± 0.37	2.34 ± 0.57	2.30 ± 0.32	2.90 ± 0.43
10. Metabolism (M)	1.60 ± 0.14a	1.64 ± 0.23b	2.03 ± 0.36c	1.93 ± 0.07d	2.14 ± 0.13e
11. Gross growth efficiency (GGE) (%)	8.33 ± 3.21a	11.02 ± 2.47b	11.97 ± 4.70c	12.87 ± 3.42d	11.33 ± 5.72e
12. Net growth efficiency (NGE) (%)	11.11 ± 6.70a	14.11 ± 4.52b	13.24 ± 6.57	16.05 ± 7.24d	13.08 ± 7.79e

Feed consumption (FC) ($P > 0.05$)	Growth (G) ($P > 0.05$)	Metabolism (M) ($P > 0.05$)	Gross growth efficiency (GGE) ($P > 0.05$)	Net growth efficiency (NGE) ($P > 0.05$)
a vs b–s	a vs b–s	a vs b–s	a vs b–s	a vs b–s
a vs c–s	a vs c–s	a vs c–s	a vs c–s	a vs c–s
a vs d–s	a vs e–s	a vs d–s	a vs d–s	a vs d–s
a vs e–s	a vs e–s	a vs e–s	a vs e–s	a vs e–s

Table 4. Biochemical analysis of fish at the beginning and end of the experiment (dry weight basis) (%).

		After experiment				
Control	Initial	Control	F 1	F 2	F 3	F 4
Protein	42.1	45.3	46.7	47.9	48.4	51.2
Carbohydrate	21.4	21.1	18.3	18.0	17.1	16.7
Lipid	11.5	12.6	12.8	14.5	14.9	15.5

tively (Table 1).

Uniform size of common carp was selected. The length and weight of the fish were taken. Then the fish were introduced in rectangular troughs (45 cm l × 30 cm wt × 15 cm ht). The water in trough was maintained as 10 liters. Ten fish were distributed in each trough. For each treatment triplicates were maintained. During rearing the fish were fed on ad-libitum diet of prepared feed twice a day for one hour each from 0900—1000 and 4.00—5.00 pm. The unfed were collected after one hour of feeding time without disturbing the fishes. The unfed was dried to constant weight. The fecal matter was collected daily before changing the water with least disturbance to the fishes and dried at 60 C. Then approximately 75% of water in the trough was replaced with tap water. The experiment was continued for a period of 30 days. On the final day the fish were weighed in live condition. The length of fish was also measured. The body composition of fish was estimated before and after the termination of the experiment. Condition factor is calculated before and after the feeding trail (5). The feed utilization parameters were calculated.

Results and Discussion

The condition factor (K) (Table 2) of common carp was higher in feed 3 containing 300 mg of vit E. There was significant difference between control and different concentrations of vit E. Similar increase in condition factor was reported by many authors when common carp and red sword tail were fed with different concentrations of vit C (6, 7).

The feed utilization parameters were presented in Table 3. Feed consumption of common carp was increased when the level of vit C in the feed was increased. As the role of vit E on product quality, increasing supplement of vit E in the diet of channel cat fish may provide additional protection against lipid oxidation in fillet tissue (8). This would mean improved quality of fillet and shelf life. This information will probably be most useful in countries where raw fish is preferred food and freshness brings a premium price. The feed consumption of common carp in control significantly varied with that of other feeds. Protein consumption of common carp reared in different vit E feeds were significantly increased from 100 to 4,000 mg. In the present study the maximum protein consumption was higher in 400 mg of vit E. Feed conversion ratio was higher in feed 4. The feed conversion efficiency was best in feed 4 and decreased in other feeds. The protein efficiency ratio was increased with the increased level of vit E. The growth, percentage growth and relative growth rate was higher in feed 4. The assimilation and metabolism were increased when the level of vit E was increased. The gross and net growth efficiency were decreased with increased level of vit E. The protein and lipid levels were higher in feed 4 (Table 4). It is inferred that among the different feeds, feed 4 containing of 400 mg of vit E was best in feed consumption, feed conversion, growth, protein and lipid content of common carp.

References

1. Leong W. K. 1996. Importance of vit C in aqua feeds. *Fish. World* 12 : 31—35.
2. Gopa Mitra. 1998. Essentiality of dietary vit C for increased productivity. *Fishing Chimes* 17 : 32—34.
3. Jeyaraman J. 1996. Laboratory manuel in biochemistry. New Age Int. Ltd. Publ., New Delhi, India. 75 pp.
4. Ali S. A. 1980. Feed formulation methods. *In Manual of research methods for fish and shell fish nutrition.* CMFRI Spl. Pub. No. 8, Cochin, India.
5. Weatherly A. H. and H. S. Gill. 1987. *The biology of fish growth.* Academic Press, London, UK.
6. Vinothini K. 1999. *Effect of different concentrations of vit C on biochemical and feed utilization of common carp. M. Sc. Diss.*, Gandhigram Rural Inst., Gandhigram, India.
7. Karpagam N. 2000. Effect of vit C on growth, feed utilization and breeding of ornamental fish red sword tail *Xiphophorous helleri.* M. Sc. Diss. Gandhigram Rural Inst., Gandhigram, India.
8. Mollah M. F. A. and M. A. Hossain. 1990. Effects of artificial diets containing different protein levels on growth and feed efficiency of catfish. *Indian J. Fish.* 37 : 251—259.