

Research Article

Effects of Different Dietary Levels of Vitamin C (Ascorbic Acid) On Growth Performance of Tilapia Fry (*Oreochromis niloticus*)

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Abstract

The influences of vitamin C (ascorbic acid, AA) on growth performance of Tilapia fry (*Oreochromis niloticus*) has been studied at Al Neelain University in an experiment comprising three dietary levels of added vitamin C such as 100, 150, 200 mg/kg of feed, plus an untreated control, in triplicate groups of 30 fish each. The mean initial weight of the fish used in the study was 3.4 ± 0.057 g. The four groups of fish in the study received the same feed containing 35% protein content. The duration of the study was six weeks. At the end of which the growth and feeding parameters were evaluated. The average net weight gains were 5.7 ± 0.0 , 9.2 ± 0.0 , 6.0 ± 0.1 and 5.2 ± 0.01 g for the four levels of 0, 50, 100 and 150mg added vitamin C respectively.

The fish fed on diet containing 100mg supplemental vitamin C/kg had significantly ($p < 0.05$) reduced weight gain. Feed efficiency and other nutritional indices were reduced compared to those fed on diets containing supplemented with vitamin C at 150-200 mg/kg. The Food Conversion Ratio (FOR), Daily Growth Rate (DGR), were increased significantly ($p < 0.05$) by higher levels of supplemental vitamin C and was highest in the diet contains 150 mg/kg feed. There were no significant differences in survival rate ($p < 0.05$).

Keywords: Daily Growth Rate; *Oreochromis niloticus*; Survival Rate; Vitamin C

Introduction

Tilapia niloticus is the second most important farmed fish in the world, after carp [1]. Vitamin C is an essential nutrient in aqua feeds and is an indispensable nutrient requirement to maintain the physiological processes of different animals including fishes [2]. Vitamin C is an essential vitamin for normal physiological functions in animals including fish [3,4].

Most teleosts are unable to synthesize ascorbic acid due to the lack of L-gulonolactone oxidase (EC1.1.3.8) which is responsible for synthesis of vitamin C [5].

Vitamin C has been found to be one of nutrients correlating with fish immunity (NRC, 1993)[6]. Found that vitamin C is essential in the fish feed of Nile tilapia [7]. A number of studies have shown beneficial effects of vitamin C on immunological parameters such as lysozyme immunological parameters, such as lysozyme and complement phagocytic activity, respiratory burst [8], and enhance resistance to stress and diseases [9].

However, immune enhancement was not observed in some other studies [10]. Ascorbic acid has been studied in fish due to its dietary essentiality, rapid degradation in feeds and metabolic functions such as antioxidant effects [11]. The present study was conducted to examine the effects of different dietary levels of ascorbic acid on growth, feeding parameters and survival % of *Oreochromis niloticus*.

Materials and Methods

The study was conducted for six weeks (8/12/2015-27/1/2016), in aquarium ponds at the fish farm of Al Neelain University. The experimental diets were formulated with the commonly available ingredients (Table 1). Four graded levels of vitamin C at 0, 100, 150 and 200mg/kg diets were included in the ingredients were milled in the coffee grinder, weighed, mixed and pelleted in a meat mincer through 0.8mm diameter. The feed thus containing 35% crude protein, was throughout the experiment. Parameters were measured, weight gain, Feed Conversion Ratio (FCR), Daily Growth Rate (DGR) and survival rate were measured. One-way analysis of variance (SPSS, version 21) was performed to detect differences between treatments.

Ingredients	Crude protein	Lipids%	ASH%	Carbohydrate%	Ingredients
Ground nut meal	44	7.3	5.3	33.4	Ground nut meal
Wheat pran	15.1	3.2	6.3	64.4	Wheat pran
Sorghum	11.3	2.8	1.7	74.3	Sorghum

Table 1: Proximate composition of diet (dry weight): used.

Ingredients	Treatment1 control	Treatment2 50 mg(AA)	Treatment3 100 mg(AA)	Treatment4 50 mg(AA)1
Ground nut meal	68.00%	68.80%	68.80%	68.80%
Wheat pran	22.70%	22.70%	22.70%	22.70%
sorghum	7.50%	7.50%	7.50%	7.50%
total	100%	100%	100%	100%

Table 2: Formulation of Diets for the Study.

Results

Various levels of supplemental vitamin C significantly influenced weight gain, FCR, Daily Growth Rate, and Survival Rate of

Oreochromis niloticus(Table 3).statistical analysis showed that the differences were significant between treatment levels (0.05) Weight gain was increased at150mg/kg/feed, and similarly was Feed Conversion Ratio (FCR). Daily Growth Rate (DGR) was also higher as compared with other treatments. Survival rate was not observed to be affected by various treatments (Table 4). Results showed that no difference in temperature between treatments (Table 5).

Parameters	Treatment1 control	Treatment 2 100mg/kg	Treatment3 150mg/kg	Treatment 4 200mg/kg
3.5	3.4	3.2	3.6	Initial weight
8.7	9.4	12.36	9.2	Final weight
5.2	5.9	9.12	5.6	Weight gain
148.5	173.5	285%	155.5%	Weight gain%
2.51	2.21	1.41	2.321	FCR
0.12	0.14	0.22	0.13	Daily growth rate
86	85	86	85	Survival%

Table 4: Growth performance of Nile tilapia fish.

Parameters	Treatment 1 M±SE	Treatment 2 M±SE	Treatment 3 M±SE	Treatment 4 M±SE
Initial weight	3.500±.0577 ^a	3.200±.0577 ^a	3.400±.0577 ^a	3.500±.0577 ^a
Final weight	9.200±.0577 ^{ab}	12.383±.0601 ^a	9.400±.0577 ^{ab}	8.700±.0577 ^b
Weight gain	5.700±.1000 ^c	9.200±.0000 ^a	6.000±.1000 ^b	5.200±.0000 ^d
Weight gain%	155.600±.1000 ^c	285.000±.0000 ^a	173.567±.0667 ^b	148.500±.0000 ^d
Daily growth rate	.1300±.00577 ^c	.2233±.00333 ^a	.1433±.00333 ^b	.1167±.00333 ^d
FCR	2.340±.0306 ^b	1.433±.0333 ^a	2.233±.0882 ^b	2.500±.0577 ^b
Survival %	85.200±.0577 ^a	86.333±.0882 ^a	85.000±.0577 ^a	86.200±.0577 ^a

significant level (0.05)

Table 4: Show statistical analysis of growth performance (M±SE) tilapia fish.

Treatments	N	Mean	Std. Deviation	Std. Error	Sig.0.199
Treatment 1	3	30.1	0.1	0.0577	NS
Treatment 2	3	30.23	0.1155	0.0667	NS
Treatment 3	3	30.1	0.1	0.0577	NS
Treatment 4	3	30.17	0.1528	0.0882	NS
Total	12	30.15	0.1168	0.0337	

No significant between treatment and temperature. (0.05) (NS= NO Significant)

Table 5: The temperature with treatment (no significant).

Discussion

The results are in agreement with Osama et al. 1996[12] who reported that the effective dose 113 mg/kg/feed of vitamin C was optimal in diets of fish and [13], who recommended that the dose is range of 125-200 mg / kg/feed of vitamin C, and [14]who found that the effective dose is 125 mg/kg/feed of Nile tilapia. Lovell 1989 [15]reported that the vitamin C requirement for growth promotion was as high as 200 mg / kg /feed,while Alexandru (2012) [16]reported that the 50 mg/kg/feed of vitamin C was best for fish growth,[17]reported even higher requirements of vitamin C for promoting growth how much). Nitzan et al. (1996) [18]reported an intermediate dose of 458 mg/kg/feed of vitamin C.This may partly explain the variations between various results as the reconstruction minibuses may need smaller amounts of vitamin C. Shiau and Hsu (2002)[19] Reported an even smaller dose of 80 Mg/Kg/ Feed of vitamin C.

Conclusion

The results reported from this experiment fall as intermediate between the various results reported above.This indicates the need for further research on the level of supplemental vitamin C which is optimal for growth promotion in Tilapia fry[20-22].

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