

## **EFFECT OF DIETARY PROTEIN LEVELS ON GROWTH HORMONE (GH) LEVELS AND GROWTH RATE OF OREOCHROMIS NILOTICUS**

BY

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### **ABSTRACT**

*Fingerlings Nile tilapia, Oreochromis niloticus (average weight of 21.8 gm/fish) were raised in glass aquaria for 80 days under controlled laboratory conditions. GH and growth rate of Oreochromis niloticus fed on 2 diets of different protein levels (15 % and 25 %) were studied in comparison with the control (without feeding). The results showed an increase in growth rate and GH in Oreochromis niloticus with increasing protein levels and a decrease in un-fed one. Amounts of protein and fat in Oreochromis niloticus muscles were studied. It was found that the amounts of protein and lipid in muscles varied directly with the percentage of protein in food. The highest growth hormone levels were obtained with 25 % protein diet and the lowest were recorded in the control one (without feeding).*

### **INTRODUCTION**

Tilapias are considered as the best species for culture because of their high tolerance to adverse environmental conditions, their relatively fast growth and they could be easily breed. (El-Sayed, 1999). Supplementary food is one of the most important items to increase production in fish farms. Protein is the main constituent of the fish body. Thus sufficient dietary supply is needed for optimum growth. (Jauncey, 1982 and Lovell, 1989).

Several supplementary food materials for fish have been used in different regions of the world (Schaperclaus, 1933; Hickling, 1962; Chervinski et al., 1986 and Omar and Gunther, 1987). Dietary proteins play important roles in providing energy for *O. niloticus*. Many authors reported on the effects of dietary protein levels on growth and reproduction of Nile tilapia *O. niloticus*. (Jauncey, 1982; Desilva and Perera, 1985; Wang et al. 1985; Wee and Tuan, 1988; Wany, et al. 1995; Al-Hafeth, 1999; Abdel-Ghany, 2000; Khattab et al. 2000 and Mohamed et al. 2001). The present study reports the effect of dietary protein level on growth rate and growth hormone of *O. niloticus* fingerlings raised in glass aquaria under controlled laboratory conditions. The prime purpose of this study was to evaluate the dietary protein effects on growth of *O. niloticus*.

## MATERIALS AND METHODS

A total number of 30 fingerlings *O. niloticus* with an average initial body weight of 21.8 gm/fish were randomly divided into three 100 L glass aquaria (10 fish/aquarium), representing three dietary protein levels namely 0, 15 and 25 %. All aquaria were provided with continuous aeration and cleaned daily by siphoning off accumulating waste materials and an equal volume of water replaced it. The aquarium No. 1 remained without feeding as control. The aquaria No. 2 and 3 were fed with 15 and 25 % protein diets respectively.

Fish were fed for 6 days a week with a rate of 5 % of the total biomass for 80 days. Individual measurements for weight and length of raised fish were carried biweekly for all stocked fish. The survival rate of stocked fish was 100 %. Water quality parameters (Temp., pH, DO and alkalinity) were within the suitable ranges (average, 25 °C, 7.8, 8 mg/l and 140 mg/l respectively) for tilapia growth (Stickney, 1979).

Biochemical estimation for muscle protein and fat were carried out. Fat contents was estimated by Soxhelt method as adapted by Wimpenny, (1938). Protein content was determined by Kjeldahl method suggested by Mchenzie and Wallace, (1954). For GH estimation, blood was collected directly from the caudal artery of fish in glass tubes, centrifuged and serum is collected in Eppendorf tubes for estimation which was carried in a special medical analysis laboratory.

## RESULTS

The results of the present study are summarized in Tables from 1 to 5. The average initial and final weight, length, increment in weight, daily gain in weight, % increment in weight and condition factor are summarized in Tables 1, 2 and 3.

The results showed that the average final weight of fasting fish (control) decreased from 21.8 gm/fish to 18.2 gm/fish with daily decrease of -0.05 gm/fish. (Table 1). While the average final weight showed positive increase with feeding 15 % and 25 % protein diets. (Tables 2 and 3).

The highest growth rate is recorded in aquarium fed with 25 % protein. (Table 3). The condition factors (K) increased with increasing protein levels. The dry weight muscle fat content of *O. niloticus* was minimum in control (2.05 %) and maximum (8.2 %) in aquarium fed with 25 % protein. (Table 4). The muscle protein content of *O. niloticus* was minimum (17 % dry weight) in control (without feeding) and maximum (53 % dry weight) in aquarium fed with 25 % protein. (Table 4). The serum GH increased with increasing protein content in food where maximum (< 0.8 ng/ml) GH level (Table 5 and Fig. 1) was recorded in 25 % protein fed fish and the minimum (< 0.2 ng/ml) level was recorded in the control one.

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Table 1: Growth in weight and length of *O. niloticus* cultured in glass aquarium without feeding (control)

Items	Rate
Average initial weight (gm/fish)	21.8
Average final weight (gm/fish)	18.2
Average initial length (cm/fish)	10.34
Average final length (cm/fish)	10.7
Increment in weight (gm/fish)	-3.6
Rearing period /day	80
Daily gain in weight (gm/fish)	-0.05
% increment in weight /fish	-16.5
condition factor (k)	1.5

Table 2: Growth in weight and length of *O. niloticus* fed with 15 % protein

Items	Rate
Average initial weight (gm/fish)	21.8
Average final weight (gm/fish)	57
Average initial length (cm/fish)	10.34
Average final length (cm/fish)	14.6
Increment in weight (gm/fish)	35.2
Rearing period /day	80
Daily gain in weight (gm/fish)	0.44
% increment in weight /fish	161.47
condition factor (k)	1.83

Table 3: Growth in weight and length of *O. niloticus* fed with 25 % protein

Items	Rate
Average initial weight (gm/fish)	21.8
Average final weight (gm/fish)	79
Average initial length (cm/fish)	10.34
Average final length (cm/fish)	16
Increment in weight (gm/fish)	57.2
Rearing period /day	80
Daily gain in weight (gm/fish)	0.72
% increment in weight /fish	262.39
condition factor (k)	1.93

Table 4: Changes in some biochemical constituents of *O. niloticus* tissue fed on different dietary protein levels (dry weight)

Aqua. No	Protein level in diet	Fat, %	Protein, %
1	Without feeding (control)	2.05	17
2	15 % protein	6.75	41
3	25 % protein	8.2	53

Table 5: Changes in serum concentrations of growth hormone (GH) in *O. niloticus* fed with different dietary protein levels

Aqua. No	Protein level in diet	GH ng/ml
1	Without feeding (control)	< 0.2
2	15 % protein	< 0.5
3	25 % protein	< 0.8

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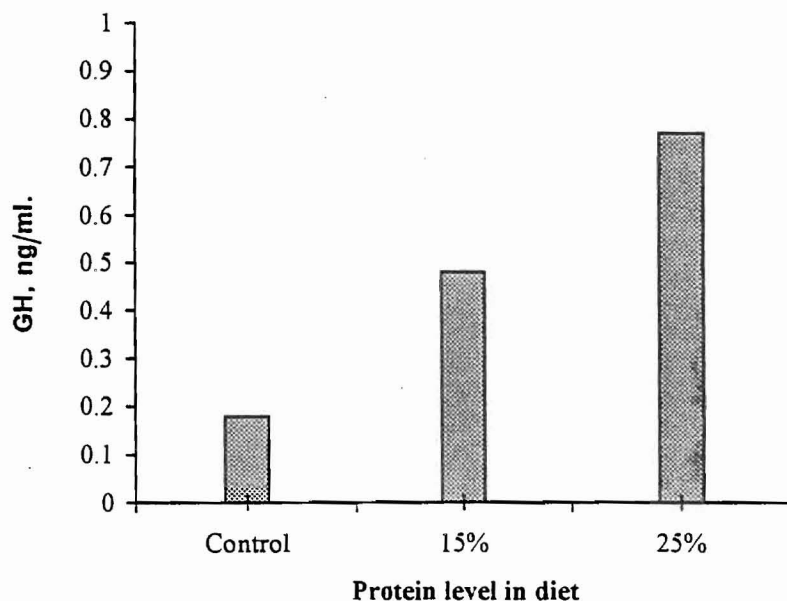


Fig. 1: Effect of dietary protein levels on growth hormone (GH)

## DISCUSSION

Dietary proteins play important roles in providing energy for fish, thus sufficient supply of dietary protein is needed for rapid growth (Lovell, 1989). In the present work, the effect of dietary protein levels on growth hormone (GH) and accordingly on growth rate and nutritive values in *O. niloticus* were reported. The biochemical analysis were carried out on the muscle where muscles represent the edible part of the fish. Growth was better in aquaria receiving high protein food where the increment in weight, daily gain in weight and percentage gain in weight were higher with the 25 % protein diet followed by those fed 15 % and the poorest growth of fish was obtained with no fed fish (control). Many authors studied the effect of dietary protein level on the growth of Nile tilapia in different location all over the world. The dietary protein requirements of several species of tilapia have been estimated to range between 20 % and 50 % (El-Sayed and Teshima, 1991). Wang et al. (1985), De Silva and Perera (1985); Siddiqui et al. (1988) and Abdel-Ghany (2000) reported that the optimum dietary protein level for growth of Nile tilapia was 30 % crude protein. Hamza and Kenawy (1997) found that, the diet of 40 % protein proved to be more potent than other levels for Nile tilapia growth. Al-Hafedh (1999) and Al-Hafedh et al. (1999) found that the better growth of Nile tilapia was obtained at high dietary protein levels. The present study has led to a better understanding of the importance of supplementary feeding on *O. niloticus*. The present results agree with the observations of the previous authors. The results obtained with 15 % and 25 % dietary protein feed agree with the result obtained by Stansby

(1962), Brogestrom (1962) and Jimbin et al. (1980) where they recorded the same value of protein and fats in fish flesh. Nabil and Gamal (2001) studied the effect of dietary protein levels on growth of *Clarias gariepinus* and they recorded a decreased body weight with the decrease in the protein level feed which agree with the present results.

Blood GH were measured in an attempt to identify the effect of dietary protein feeding on growth. A positive correlation was found between the amount of dietary protein food given and the GH level in *O. niloticus* where the lowest levels of GH (< 0.2 ng/m) was recorded in the fasting fish. The GH levels increased directly with increasing protein in food reaching its maximum in aquarium 3 (table 5 and figure 1).

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