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Condition Factor as an Indicator of Growth and Feeding Intensity of Nile Tilapia Fingerlings (*Oreochromis niloticus)* Feed on Different Levels of Maltose

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Abstract: The present study describes the Length -Weight relationship (LWR), relative condition factor (k) and dietary maltose of the Nile tilapia fingerlings (*Oreochromis niloticus*) to determine the growth pattern. Five isonitrogenous and isocarloric experimental diets were formulated to contain different maltose levels (0.0, 20%, 25%, 30% and 35%). Triplicate groups of fish (30 fish per tank with an average body weight, of 2.1 ±0.2 g) were assigned to each diet. At the end of the experimental (after 8 weeks). Samples of *Oreochromis niloticus* were collected from the tanks and transported to the laboratory for analyses. Length weight relationship (LWR) was described by the equation: $W = a L^b$. The value of the regression co-efficient obtained from the WLR was 0.82, 0.87, 0.93, 0.82 and 0.90, respectively. There was a significant correlation between length and weight, while the condition factor computed for *Oreochromis niloticus* were 1.64, 1.77, 1.74, 1.72 and 1.79, which indicated good health condition during the experiment and it is indicating an isometric growth, which is the desirable for fish of fish farm.

Key words: *Length · Weight relationship · Condition Factor · Dietary Composition · O. niloticus*

INTRODUCTION

Nile tilapia, *Oreochromis niloticus* is among leading farmed species around the world. In addition to the high growth rate of Nile tilapia and the consumer performance, Nile tilapia is also resistant to considerable levels of adverse environmental and management conditions. However, the problem of mass production is still remains. There are many possible reasons for the low production of tilapia, such as too early maturation, nutrition and high mortality [1] and the crowded condition and consequently reduces growth [2, 3]. The information on nutritional requirements of major dietary components such as protein and energy is a prerequisite for the formulation of an inexpensive and balanced diet for the fish. Carbohydrates, one of the major dietary components, not only supply the necessary energy but also have a protein-sparing effect in fish [4]. The relative use of dietary carbohydrates by fish varies and appears to be associated with the complexity of the carbohydrate. Glucose, maltose and sucrose resulted in the best growth rates, followed in descending order by dextrin and fructose, galactose and potato starch and glucosamine [5]. The study of Length - Weight relationship (LWR) of fishes are important in fisheries biology because they used for estimating the weight corresponding to a given length [6, 7, 8] and may be also used to determine possible differences between separate unit stocks of the same species. In addition LWR give information on the condition and growth patterns of fish [9]. Condition factor has been used as an indicator of health in fishing biology studies since the beginning of the 20th century, such as growth and feeding intensity [7]. Condition factor decrease with increase in length [10, 11]. The condition factor provides information on the variation of fish physiological status and may be used for comparing populations living in certain feeding, climate and other conditions [12, 13, 8]. Therefore, condition factor can be used to determine the feeding activity of a species to determine whether it is making good use of its feeding source [13, 14, 8]. Although, the length-Weight relationship and feeding habits of tilapia have been studied [15], unfortunately, the information on the relationship between dietary maltose levels and condition factor is scant. Thus, the present study aims to provide

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information regarding the Length-weight relationship, relative condition factor (Kn) and dietary levels of maltose for Nile tilapia fingerlings *(Oreochromis niloticus),* with a view to determining whether the fishes are in good condition.

MATERIALS AND METHODS

Experimental Diets: Five iso-nitrogenous and iso-caloric feeds incorporated with different levels of maltose (0%, 20%, 25%, 30% and 35%) which got from barley. All feeds were formulated with ingredients commonly used, including fish meal, soy bean, wheat flour, cellulose, sunflower oil, mineral premix, vitamin premix, ascorbic acid, binder and chromic oxide, were presented in Table 1.

Fish and Experimental Condition: The experiments of this study were conducted in the Fresh Water Hatchery, Faculty of Agro-Technology and Food Sciences (FASM). University Malaysia Terengganu, Malaysia. 450 Fingerlings of Nile tilapia (*Oreochromis niloticus*) with an average body weight (2.1 ±0.2 g), were randomly distributed into 15 tanks measuring each one 150 m^2 and having underwent acclimated in big tank to the experimental conditions for 2 weeks prior to the commencement of the study and fed a commercial feed during this period. The fish were fed on the five tested diets for 8 weeks during experiment.

Length-Weight Relationship: Fish total length (cm) was measured using measuring board as described by Lagler [16], while weight was measured using AND GF.3000 weighing balance.

The Length-weight relationship (LWR) was estimated by using the equation:

$W = aL^b$

Where

W = The weight (g) of fish in grams
L = The Total length of fish in centimeters
a = Exponent describing the rate of change of weight with length (= the intercept of the regression line on the Y axis)
b = The slope of the regression line (also referred to as the Allometric coefficient)

The log transformed data gave a regression equation.

$$\text{Log } w = \log a + b \log L$$

Where;

a = Constant
b = The regression co-efficient

Condition Factor: The condition factor (k) of the experimental fish was estimated from the relationship:

$K = 100\ w/L^b$ [17].

Where;

W = Weight of the fish in grams
L = The total length of the fish in centimeters
b = The value obtained from the length-eight equation formula.

Table 1: Proportions of different ingredients in the formulated feeds

Ingredient	Feed A (0.0 % Malt)	Feed B (20 % Malt)	Feed C (25 % Malt)	Feed D (30 % Malt)	Feed E (35 % Malt)
Fish meal	12.0	12.0	12.0	12.0	12.0
Soya bean	38.0	38.0	38.0	38.0	38.0
Wheat flour	10.0	10.0	10.0	10.0	10.0
Maltose	0.0	20.0	25.0	30.0	35.0
Cellulose	35.0	15.0	10.0	5.0	0.0
Palm oil	3.0	3.0	3.0	3.0	3.0
Mineral premix	0.5	0.5	0.5	0.5	0.5
Vitamin premix	0.5	0.5	0.5	0.5	0.5
Vitamin C	0.4	0.4	0.4	0.4	0.4
Binder (CMC)	0.5	0.5	0.5	0.5	0.5
Chromic oxide	0.1	0.1	0.1	0.1	0.1

Table 2: Mean values ± Standard deviation (SD) and ranges for biometric of Nile tilapia fingerlings *Oreochromis niloticus* fed on different levels of maltose for 8 weeks

	Weight (g)		Length (cm)		
Diets	Mean ±S.D	Ranges	Mean ±S.D	Ranges	R^2
Feed A (0.0 %Malt)	8.29±3.46	7.1-13.830	7.40±2.64	7.8-9.2	0.82
Feed B (20 % Malt)	13.84±6.03	11.44-19.77	8.59±3.19	8.5- 12	0.87
Feed C (25 % Malt)	12.22±5.84	5.00-19.20	8.18±2.96	7.5-10	0.93
Feed D (30 % Malt)	12.05±5.07	9.12-18.72	8.25±2.97	8.5-10.5	0.82
Feed E (35 % Malt)	14.52±6.39	8.10-19.75	8.72±3.19	7.5-11	0.90

Statistical parameters of various relationships, Regression coefficient (R^2), standard division (S.D.)

Table 3: Condition factor of Nile tilapia fingerlings *Oreochromis niloticus* fed on different levels of maltose for 8 weeks

Feeds	Range	Mean value
Feed A (0.0 %Malt)	1.45-1.80	1.64
Feed B (20 % Malt)	1.57-2.22	1.86
Feed C (25 % Malt)	1.19-1.95	1.74
Feed D (30 % Malt)	1.49-2.05	1.72
Feed E (35 % Malt)	1.37-1.98	1.79

Water Quality Analyses: To analyze variations in physiochemical parameters of water quality during the experiment, we performed weekly analysis of dissolved oxygen (DO), hydrogen potential (pH), temperature and electrical conductivity and total ammonia. Values of DO varied from 5.38 to 6.50 mg/L, temperature from 27.24 - 27.75°C, pH from 6.43 - 6.98, electrical conductivity from 24.0-32.0 μscm^{-1} and total ammonia from 0.8-1.0 mg/L.

RESULTS

At the end of experiment, the results of the length-weight analysis are presented in Table 2. The mean lengths for Nile tilapia *Oreochromis niloticus* were 7.40 ± 2.64 cm, 8.59 ± 3.19 cm, 8.18 ± 2.96 cm, 8.25 ± 2.97 cm and 8.72 ± 3.19 cm respectively, while the mean weights were 8.29 ± 3.46 g, 13.84 ± 6.03 g, 12.22 ± 5.84 g, 12.05 ± 5.07 g and 14.52 ± 6.39 g respectively, for different levels of maltose 0%, 20%, 25%, 30% and 35%.

Length-Weight Relationship: The Length-weight relationship among pairs of plotted data, values of determination coefficients (R^2) and corresponding equation are demonstrated in Table 2. The value of the regression coefficient obtained from the LWR was 0.82, 0.87, 0.93, 0.82 and 0.90 for fish feed on different maltose levels (0.0, 20%, 25%, 30% and 35% respectively). There was a significant correlation between length and weight.

Condition Factor: The condition factor for the *Oreochromis niloticus* is shown in Table 3. The condition factor computed for *O. niloticus* were 1.64, 1.86, 1.74, 1.72 and 1.79 respectively for fish feed on different maltose levels (0.0, 20%, 25%, 30% and 35%).

DISCUSSION

A length-weight relationship (LWR) provides information on growth patterns and growth of animals. During their development, fish are known to pass through stages in their life history which are defined by different length-weight relationships. Very scanty information exists on the biology of tilapia fingerlings [18]. Statistical analysis of the LWR showed that the Regression coefficients obtained from length-weight relationships (LWR) which are indicative of isometric or allometric growths differences between all groups. This result agrees with the findings of Stewart [19] observed type of food as a result of the reduction in the growth of *O. niloticus*. Thus, several other factors could also be the cause of variation in b values such as water quality and food availability [20]; sample size and length range [21]. Condition coefficient is one of the standard practices in fisheries which is used as an indicator of the variability attributable to growth coefficient (b).Here, the individual fish a species condition is determined based on the analysis of length weight data reflecting that the heavier fish at a give length is in better condition, Bolger and Connolly [22], hence indicating Favorable condition. The mean condition coefficient (K) for the *Oreochromis niloticus* was 1.64, 1.86, 1.74, 1.72 and 1.79 and this show that fish is above average condition or higher than one during the experiment [23], which indicated good health condition during the experiment and it is indicating an isometric growth, which is the desirable for fish of fish farm.

CONCLUSION

It is concluded that the fingerlings Nile tilapia *Oreochromis niloticus* examined were in good condition and healthy, when feed on maltose. Therefore, the carbohydrates are important bio indicators of their physiological status and a helpful tool in the evaluation of their energy, but only when they are correctly interpreted.

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