

Studies on tilapia feeding : —**1 — Effect of different levels of feeding on growth performance and feed utilization.****Eglal Omar***Dept. Anim. and Fish Prod., Helwan Univ., Alexandria, Egypt.*

TILAPIA zillii fingerlings (2g/fish) were assigned to feeding experiment in 12 glass aquarium jars for 10 weeks in order to study the effect of different levels of feeding (0, 2, 4, 6, 8, and 10% of fresh body weight) on growth performance and feed utilization by fishes. The fish received its diet in a pelleted form three times daily and 6 days a week, the amount of feed were readjusted weekly based on weight of Fishes in each jar.

The results showed that increasing, the level of feeding, significantly ($P < 0.01$) increased body weight gain and the specific growth weight (SGR % day). Feed utilization greatly improved by increasing the feeding level from 2 to 4% of the fresh weight of fishes. However there were no differences between 4 and 6% feeding level, feeding of fish on 6% level resulted in a significant ($P < 0.01$) decrease in feed utilization. Therefore, it could be suggested that optimum feeding level of *T. zillii* under the present experimental condition ranged between 4 to 6% of its fresh body weight.

Key words : Fish, Tilapia, Feed, Growth.

Tilapia zillii, is an herbivorous species belonging to the family Cichlidae and originates from Africa (Fryer and Iles, 1972). *Tilapia* has been cultured in Africa since 2500 years ago (Ghittino, 1972), because of easiness in culture, high growth rate, and rapid production. Now the fish has been distributed all over the tropical and subtropical countries.

For an economical and intensive fish culture the knowledge on nutritional requirements of *T. zillii* is indispensable. In spite of the wide distribution in the world, the information of nutritional requirements is limited (Bardach *et al.*, 1972).

The relationship between rate of feeding and rate of conversion is very important in fish culture. If fish are fed at too high rate, much food is wasted, and, even though may be excellent the cost of production is excessive. Further, in some cases uneaten

food decaying in water may be detrimental to fish growth. If feeding rate is too low, approaching the rate required for maintenance, growth is very slow, and the rate of conversion very high. In this case the amount of food is low largely wasted, and resulted in no growth. The present study was carried out to investigate the effect of different levels of feeding on the growth performance, nutrient retention and feed utilization of *T. zillii* fed on a pelleted diet.

Material and Methods

The experiment was conducted in 105 litre glass jars with equal quantities of tap water; this eliminated the possibility of introducing extraneous food items.

The experiment consisted of six treatments (levels of feeding 0, 2, 4, 6, 8 and 10% from the wet body weight of fishes) on a pelleted feed contain 30% crude protein as shown in Table (1).

TABLE 1 : Composition % of the tested diet.

Ingredients	%
Fish meal	38.5
Yellow corn	60.0
Salt	0.5
Vitamins and minerals mixture	1.0

* The chemical composition of the tested diet was : DM, 91.56% and % on DM basis : Ash, 8.82%; CP, 29.95%; CF, 1.51%; EE, 1.85% and NFE, 57.87%.

Two duplicates were made for each treatment. The treatments were assigned to the experimental units completely at random. Each jar stocked with 10 *T. zillii* fingerlings with an average weight of 2g fish.

Fish in each jar received the pelleted diet three times daily, six days per week, the amounts of feed were readjusted weekly based on weight of the fishes in each jar.

Water in all the jars was partially replaced once in three days with fresh tap water after cleaning and removal of accumulated unused feed and excreta. Each jar was supplied with compressed air and the temperature of the aquarium water is thermostatically regulated and fixed at 28.0°C by using electric heaters.

Growth and survival in individual jars were taken as criteria for deciding the effect of different levels of feeding on growth performance of fishes. While the feed/gain ratio, protein and energy utilization were selected as criteria for nutritional utilization as described by Omar (1984).

Fish samples were taken at the beginning and at the end of the experiment. The samples were pulverized and homogenised with Ultra Turrax. The homogenised samples were dried at 60°C for 48hr.

Chemical analysis of feed and fish samples were carried out according to the methods described by Naumann and Sassler (1976).

Statistical analysis of the experimental results were conducted according to Snedecor and Cochran (1967).

Results and Discussion

Tilapia zillii showed a good appetite for the pelleted diet during the experimental period.

Results in Table (2) shows the growth performance of *T. zillii* fed on different levels of feeding on the experimental diet. Fasting fishes (without feeding) resulted in a mortality rates of 10, 25, 65, 75 and 100% during 3rd, 4rd, 5th and 7th weeks after feeding respectively. However, there were no mortalities observed in the other groups received any amount of feeds.

Increasing the level of feeding, significantly ($P < 0.01$) increased weight gain and specific growth rate (SGR%/day) of fishes. It is well known that the amount of diet, fed to fish is a fundamental consideration. Too little feed, results in poor growth since most of the feed may be used for body maintenance (NRC, 1977).

TABLE 2 : Growth performance* of *T. zilli* fed on different levels of feeding on the experimental diet.

Feeding level (% WBW**)	Body weight (g/group***)		Gain (g/group)	SGR %
	Initial	Final		
0****	20.27 ± 0.35	—	—	—
2	19.70 ± 1.29	21.83 ± 1.59	2.13 ± .30	0.14 ± 0.01
4	20.33 ± 0.78	42.87 ± 1.83	22.54 ± 2.61	1.08 ± 0.18
6	20.00 ± 0.30	60.05 ± 3.80	40.06 ± 3.52	1.56 ± 0.07
8	19.06 ± 0.97	74.82 ± 5.40	55.77 ± 4.4	1.95 ± .03
10	19.29 ± 1.07	85.97 ± 6.30	66.68 ± 5.45	2.13 ± .05

* Each value was an average of two duplicates for each treatment.

** %wet body weight.

*** Each group contain 10 fishes

**** Not completed because fish died in the period between the 3rd and 7th weeks after feeding.

The present results showed that the growth of *T. zilli* have been shown to be limitable by the availability of the diet. At 20% feeding level the SGR %/day was very low (0.14%) and its value greatly increased (1.5%) by increasing the feeding level (6%) resulted in more growth (SGR 1.56%/day).

Higher growth rates in most of cases recorded in fish greatly affected by the ration level. However, *T. zilli* in the present experiment has shown some reduction in growth rate at the maximum ration (10%). A similar results were observed on common carp (*Cyprinus carpio*) by Omar (1984).

Results in Table (3) showed the chemical composition of the wet body weights (WBW%) of *T. zilli* fed on different levels of feeding on the experimental diet for 70 days. Fasting fishes as compared to the initial resulted in increasing DM, EE

and Ash. however CP was decreased. Increasing the level of feeding increased DM and EE, however, ash and protein contents were decreased.

TABLE 3 : Chemical composition of *T. Zilli* fed on different levels of feeding on the experimental diet for 70 days.

Level of feeding (%WBW)	Dry matter %	% on DM Basis		
		CP	EE	Ash
At the Start :	19.91	57.86	16.66	22.81
At the end :				
0	21.08	50.36	19.79	31.06
2	25.91	59.59	20.47	22.58
4	26.46	58.50	23.06	18.60
6	30.16	56.88	25.73	16.71
8	29.85	52.91	29.85	16.87
10	31.26	57.06	25.97	18.97

* Each value was an average of two duplicates for each treatment.

**% Wet body weight.

Quantitatively, growth is an accumulation of a large amount of fat, a moderate amount of protein, a small amount of minerals and considerably large amount of water (Huisman, *et al.*, 1979). Figure (1) show the effect of different feeding levels on the gain of nutrients tilapia. The results showed crude protein gain was higher than fat at any feeding level. A similar results were obtained by Omar (1984) on common carp. Increasing the level of feeding from 2 to 4% of the fresh body weight resulted in a significant ($P < 0.01$) improve in feed/gain ratio and significant ($P < 0.01$) increase in protein efficiency ratio (PER) and protein productive value (PPV %) and energy utilization (energy retention %). However, the differences were not significant when fish were fed on 4% and 6% levels (except energy utilization was significantly higher on 6% level than 4%). The higher feeding levels (8 and 10%) decreased the feed utilization, PER, PPV% and energy utilization % than feeding on 6% level.

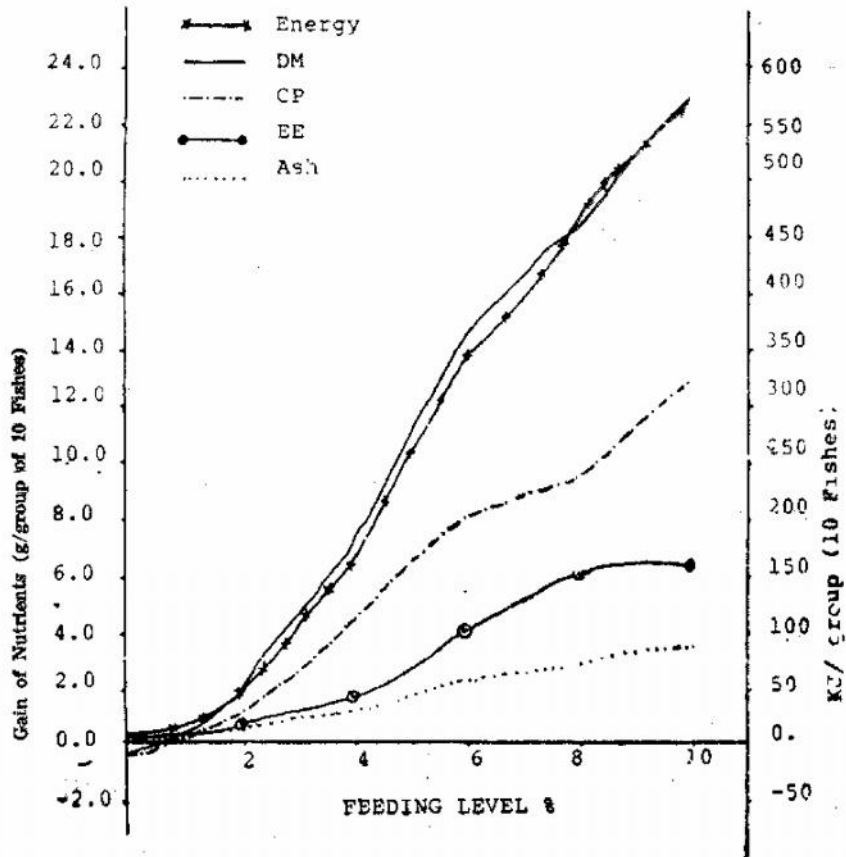


Fig. (1) : Effect of level of feeding on gain of nutrients in *Tilapia zilli*.

The present results shows that *T. zillii* fed on 4 and 6% levels of feeding utilize the feed more efficiently than fishes fed on the higher levels. (8 and 10%). The major factors must be taken into account for establishing the feeding level for fish as the following:

- a) requirement for maintenance.
- b) requirement for growth.
- c) utilization of food for both these purposes. (Hepher *et al.*, 1983).

The results clearly showed that most of the feed nutrients are going to cover the maintenance requirement when fishes were fed on 2% of its fresh body weight. The higher feeding level up to 6% resulted in a higher protein and energy utilization.

Energy retention (Fig. 1), linearly increased by increasing the feeding level from 2 to 10%, however, energy utilization (Table 4) was significantly decreased with the feeding levels (more than 6%). A similar results were observed by Huisman (1974 and 1976) and Omar (1984) on common carp. This case serves to

TABLE 4 : Effect of different levels of feeding on feed utilization* by *T. zillii*.

Feeding level (% BW)***	Feed intake g DM/ group***	Feed/gain ratio	protein Utilization PRE	Utilization PPV%	Energy Utilization%
0****	0.0	—	—	—	—
2	24.48	11.52	0.31	15.35	13.84
	+ 1.70	± 0.81	± .02	± 2.45	± 1.85
4	75.68	3.37	1.04	20.35	16.01
	+ 3.22	± .25	± 0.08	± 0.47	± 0.33
6	136.4	3.41	1.02	20.43	19.04
	+ 6.92	± .13	± 0.04	± 0.65	± 0.54
8	210.09	3.78	0.92	15.76	16.45
	+ 10.81	± .11	± 0.03	± 0.61	± 0.54
10	326.48	4.91	0.71	13.89	13.23
	+ 26.20	± .16	± .02	± 0.52	± .45

* Each value was an average of two duplicates for each treatment.

**% We body weight

*** Each group contain ten fishes.

**** Not completed because fish died in the period between the 3rd and 7th weeks after feeding.

illustrate an extreme of the general «glutton effect» of high rations, in which efficiency of feed utilization is decidedly less than at submaximal point defining the optimum ration.

From the obtained results it could be concluded that the optimum feeding level of *T. zillii* under the present condition ranged between 4 to 6% of its fresh body weight.

References

- Baradach, J. E., Ryther, J. H. and McLaren, W. O. (1972) "Aquaculture; The Farming and Husbandry of Fresh Water and Marine Organisms". John Wiley, New York, 868 P.
- Fryer, G. and Iles, T. D. (1972) "The Cichlid Fishes of the Great Lakes of Africa". Oliver and Boyd, Edinburgh.
- Ghiattino, P. (1972) In Halver J. E. (ed.) "Fish Nutrition". Academic Press, New York, San Francisco and London, PP. 540-650.
- Hepher, B., Liao, I. C. Cheng, S. H. and Hsieh, C. S. (1983) Food utilization by red tilapia. Effect of diet composition, feeding level and temperature on utilization efficiencies for maintenance and growth. *Aquaculture* 32 : 255-272.
- Huisman, E. (1974) Optimalisering van de groei bij de karper (*Cyprinus carpio* L.). Thesis, Wageningen, 95 p.
- Huisman, E. (1976) Food conversion efficiencies at maintenance and production levels for carp and rainbow trout. *Aquaculture* 9 : 259-273.
- Huisman, E.; Breteler, J., Vismans, M. and Kanis, E. (1979) Retention of energy, protein, fat and ash in growing carp (*Cyprinus carpio* L.) under different feeding and temperature regimes. In the World Symp. on Finfish Nutrition and Fish. Techn. Hamburg 20-23 June, 1978 Vol. 1, Berlin, PP. 175-188.
- Nauman, K. and Bassler, R. (1976) "Methodenbuch B and III. Die chemische Untersuchung von Futtermitteln". verlag J. Neumann-Neudamm.
- NRC (1977) National Research Council : Nutrient Requirements of Warm water Fishes. National Academy of Science, Washington, D. C.
- Omar, Eglal Ali (1984) Effect of type of feed, level and frequency of feeding on growth performance and feed utilization by mirror carp (*Cyprinus carpio* L.), Thesis Dr. Agric. Sci., Fac. Agric. Göttingen Univ., Göttingen, West Germany.
- Snedecor, G. W. and Cochran, W. H. (1967) "Statistical Methods", 8th ed. Iowa State Univ. Press, Ames, Iowa, U S A.

دراسات في تغذية البلطي : —
 ١ — تأثير المستويات المختلفة من التغذية على كفاءة النمو
 والاستفادة من الغذاء

إجلال عمر

قسم الانتاج الحيواني — كلية الزراعة — جامعة الاسكندرية

استخدم في هذه الدراسة أصبعيات البلطي (٢ جرام / سمكة) والتي وضعت في ١٢ حوض زجاجي لمدة عشرة أسابيع بهدف دراسة أثر المستويات المختلفة من التغذية (صفر ، ٢ ، ٤ ، ٦ ، ٨ ، ١٠ ٪ من الوزن الطازج للجسم) على كفاءة النمو وكفاءة الاستفادة من الغذاء . وكانت الطريقة تقدم للأسماك في صورة كميات ثلاث مرات يوميا وستة أيام أسبوعيا وكان يتم تعديل كميات العلف المقدمة أسبوعيا على أساس وزن الأسماك .

والنتائج تشير بأن زيادة مستويات التغذية كانت تزيد معدلات النمو للأسماك وكذلك وجد أن كفاءة الاستفادة من الغذاء تتحسن جدا بزيادة مستوى التغذية من ٢ الى ٤ ٪ من الوزن الطازج للأسماك . في حين أنه لم توجد أية اختلافات عندما زادت معدلات التغذية من ٤ الى ٦ ٪ وأن زيادة كميات الغذاء المقدمة عن ٦ ٪ أدت الى نتائج سلبية .

من النتائج السابقة يمكن اقتراح أن المستوى الأمثل لتغذية البلطي الأخضر T. Zilli تحت ظروف التجربة يتراوح ما بين ٤ الى ٦ ٪ من وزنها الطازج يوميا .