SATIATION TIME AND FEEDING RATE OF *MELANOCHROMIS AURATUS* FED WITH VARIOUS LIVE FEED

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(Received on Date: 7th May 2017 Date of Acceptance: 17th July 2017)

ABSTRACT

In the present investigation, series of experiments were carried out to study the satiation time and feeding rate of *Melanochromis auratus* (Golden *cichlid*) fed with live feed such as artemia, chironomus and mosquito larva. From the findings, it was observed that the satiation time was higher in larger size group fish when compared with smaller size group. It was also observed that biomass of fish clearly affected the satiation time. The variation in the satiation time might be due to size of the prey and also to the easier accessibility of the larva in the column and surface region of the aquaria. Rates of food consumption were measured as the satiation amount of prey consumed during the satiation time. It is interesting to point out that temperature had a significant effect ($P > 0.05$) on the satiation time. It is evident from the experiment at high temperature which clearly indicated that smaller size group showed higher consumption rate than the larger size group of experimental animals.

Key Words: Live feed, satiation time, feeding rate and ***Melanochromis auratus***

No: of Tables: 2 **No: of References: 14**

INTRODUCTION

Ornamental fishes are attractive colourful fishes of peaceful nature that are kept as pets in confined spaces of an aquarium or a garden pool with the purpose of enjoying their beauty for fun and fancy. They are also called as live jewels for their beautiful colours and playful behavior. Ornamental fishes accept a wide variety of live and formulated feeds. Although some of the formulated feeds are richer in protein than the live feeds, they can create unhygienic conditions in a captive environment, particularly in aquaria, small plastic pools, fiber glass thanks and cement cisterns. Therefore, it is always desirable to have a regular supply of live feed. But excess of live feed is also not desirable. From the quantity of live feed consumption and satiation time one could determine the quantity of formulated feed to be given to the fishes in aquaria. It is very important to feed the fish for its requirement or until it gets satiated. Optimal feeding rate is the most important factor to access of any aquaculture operation. However, the optimal feeding rate depends on fish size, fish species, rearing system and water temperature (Kestemont and Barras, 2001 & Cho *et al, 2003* and Wang *et al., 2009)*. Satiation time is defined as the time taken by the fish to get satisfied with the given feed and refuse to take the feed further even if they are present in the same environment.Size and hunger level of predator, size and density of prey and temperature affect satiation time and feeding rate in many aquatic animals (Mathavan 1976 and James *et al.,* 1993 & 1997). However, working with *Anabas testudineus* (Srikumari and Aravindan 1993) obtained higher satiation time in smaller size group fish when compared with larger size groups. Thus satiation time might be species specific. In the present investigation, *Melanochromis auratus* was tried with three different live feed namely *Artemia, Chironomus* and mosquito larvae to estimate the satiation time and feeding rate.

MATERIALS AND METHODS

The experimental fish *M. auratus* are purchased from the Aqua garden, Madurai and transported and stocked in the laboratory. The live feed, *Artemia* was collected from salt pans of Thoothukudi and frozen. Chironomus and mosquito larvae were collected from the nearby stagnant water bodies and were washed thoroughly with a clean water before they are fed to the fish. Experimental fishes were sorted out into three size groups according to their weight namely size group A (0.02 ± 0.03g), B (0.24 ± 0.08 g) and C (0.46 ± 0.07 g) and were taken in round troughs of about 5 litre capacity. The volume of water taken for the experiment was 4 litres and it was kept constant throughout. Initially experimental animals were accustomed with the live feed namely artemia, chironomus and mosquito larvae. The live feed was supplied to the fish one by one till the fish gets satiated and their satiation time was noted. The temperature of the water was also noted. The time when the fish first start eating the food and the time when the fish refused to take the feed

were noted. The intervening duration is calculated as satiation time for the chosen live feed. Experiments were carried out with the experimental fish fed with *Artemia*, *Chironomus* larvae and mosquito larvaet at three ambient temperatures *viz*., 25 ± 1°C, 30 ± 1°C and 35 ± 1°C. The data were analyzed by one way ANOVA.

RESULTS

Satiation time:

The satiation time showed a linear trend with respect to the size groups. It increased with the increase of size group. For instance, the satiation time for *Artemia* fed animals were increased from 5.00 ± 1.41 min. in A group to 11.33 ± 3.29 min. in C group (Table- 1). Similar trend was also observed in other live feed fed animals. When the live feed was taken in to account, the satiation time was maximum for *Chironomus* fed group *i.e.,* 15.00 ± 4.24 min. maintained at 25°C and the minimum satiation time *i.e.* 4.64 ± 1.23 min. was obtained for *Artemia* fed group at 35°C (Table - 1). The calculated ANOVA showed that the temperature and size groups was not significantly (F = 2.53; P< 0. 05) affected the satiation time of *M. auratus*.

Feeding rate:

In general the rate of food consumption showed a declining trend with increasing size group, irrespective of variations in temperature and quality of live feed. For instance, the rate of food consumption decreased from 995.0 ± 5.75 mg/g to 141.3 ± 16.3 mg/g as the size increased from 0.02 ± 0.03g to 0.46 ± 0.07g in *Artemia* fed group maintained at 25° (Table - 2). Temperature and size groups influence a significant variation (F = 3.588 ; P> 0. 05) in the feeding rate of *M. auratus* when fed with artemia, chironomus and mosquito larva.

Table 1: Shows the satiation time of *Melanochromis auratus* fed with three different live feed as a function of temperature.

Temperature	Size group	Satiation time (min)		
		Artemia	Chironomus	Mosquito Larvae
25°C	A	5.0 ± 1.41	6.3 ± 1.89	9.0 ± 1.41
	B	8.0 ± 2.16	11.0 ± 2.83	9.0 ± 047
	C	11.3 ± 3.29	15.0 ± 4.24	9.0 ± 2.36
30°C	A	4.8 ± 1.38	6.1 ± 1.64	7.4 ± 1.24
	B	7.8 ± 2.12	11.4 ± 2.68	9.0 ± 0.36
	C	10.3 ± 3.24	13.4 ± 3.98	12.2 ± 3.69
35°C	A	4.6 ± 1.23	6.4 ± 1.78	8.8 ± 1.37
	B	8.3 ± 2.34	11.7 ± 2.79	9.1 ± 0.86
	C	10.2 ± 3.58	14.0 ± 4.12	11.6 ± 3.24

Table 2: Shows the rate of food consumption (mg/g) of *Melanochromis auratus* fed with three different live feed as a function of temperature. Values in the parentheses show the number of live feed consumed.

Temperature	Size group	Number of live feed consumed		
		Artemia	*Chironomus*	Mosquito larvae
25°C	A	995.0 ± 5.75 (4)	200.0 ± 5.15 (4)	400.0 ± 10.05 (4)
	B	187.5 ± 3.25 (9)	41.7 ± 8.33 (10)	66.7 ± 16.67 (8)
	C	141.3 ± 16.3 (13)	30.4 ± 6.52 (14)	43.5 ± 6.53 (10)
30°C	A	750.0 ± 25.0 (3)	200.0 ± 5.05 (4)	300.0 ± 5.10 (3)
	B	145.8 ± 12.5 (7)	29.2 ± 1042 (7)	50.0 ± 1.67 (6)
	C	97.8 ± 17.5 (9)	28.3 ± 5.46 (13)	43.5 ± 4.35 (10)
35°C	A	750.0 ± 12.05 (3)	250.0 ± 25.05 (5)	400.0 ± 35.05 (4)
	B	166.7 ± 10.4 (8)	37.05 ± 8.34 (9)	66.7 ± 4.17 (8)
	C	108.7 ± 5.44 (10)	28.3 ± 2.18 (13)	43.5 ± 2.18 (10)

Discussion:

A predator fish is considered to be satiated when it does not accept any more food after continuous feeding (Brett, 1971). It is clearly observed that biomass of the fish positively affected the satiation time when *M. auratus* was fed with *Artemia, Chironomus* and mosquito larvae. James *et al*.,(1997) working with sword tail also opined similar conclusion on the effect of size on the satiation time. Elliott (1975) also reported increasing of satiation time with increasing body weight in salmon. Satiation time increased not only in the fish but also in the dragon fly nymph, *Mesogomphus lineatus* with increasing body weight (Pandian *et al.,* 1979). However, Narayanan (1980) has questioned the concept of satiation itself. He opined that on wet weight basis, the fish takes double the quantity of Wolffia when compared to that of beef in the fish *Sarotherodon mossambicus*. If the term satiation means filling of the stomach, then the stomach which is satiated with a given quantity of animal matter should also be satiated with the same quantity of plant matter. Thus one is forced to conclude that the process of satiation might be influenced by other related factors also. The increase in satiation time with biomass of the fish might be due to the size of the stomach capacity as small animals had satiated within a short time with the filling of the stomach. Another reason for the variation in the satiation time might be due to size of the prey. Thus invariability the minimum satiation time in the smallest size groups was obtained when the fish were fed with *Artemia.* However, in the larger size groups, the satiation time for *Chironomus* was more than that of with Mosquito larvae. It is interesting to pointed out that the satiation time in mosquito

larvae fed group remain constant with nine minutes (25 ◦ C) . This might be due to the familiarity of the prey to the predator and also easy accessibility of the larva in the column and surface region to the fish. Present investigation throw new information on the feeding pattern of this ornamental fish. It is clear that *M. auratus* is a column and surface feeder. Though, Sedgewick (1979) working on *Penaeus merguiensis* and Narayanan (1980) on *S.mossamibicus* opined that satiation time was influenced by calorific values of the diet. Present investigation on *M. auratus* failed to show such a trend as the biomass consumption of *Artemia* surpasses other feeds irrespective of size group and temperature.

Rate of food consumption:

Rate of food consumption was measured as the satiation amount of prey consumed during the satiation time. The satiation amount invariably increased with increasing size group of the predators irrespective of the live feed given. Similar trend was also obtained by Narayanan (1980) in *S. mossanbicus* and Srikumari and Aravindhan (1993) in *Anabus testudineus*. However, when the trend was represented as the rates of food consumption, then the smaller size group showed higher rates of food consumption than the larger ones in all the tested temperatures level. Similar report was also presented by (Narayanan 1980), Srikumari and Aravindhan (1993) and James *et al.,* (1993 and 1997). Fish tend to optimize their digestion to extract nutrients more efficiently at lower feeding rates (Van Ham *et al.,* 2003). Present experiment indicated that optimum feeding rate in 0.02 ± 0.03g *M. auratus* were below the satiation level of feeding rates.

It is interesting to pointed out that temperature had a significant effect on the satiation time and consumption of satiation amount. It is evident from the experiment at high temperatures indicated that smallest size group showed higher consumption rate than at lower temperatures. As satiation time is dependent on the quality of feed, one has to be aware of this factor for proper management of ornamental aquaria.

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