Assessment the Impact of 17 α-Methyl Testosterone on the Growth and Survival Rate of Golden Barb Fish, *Puntius gelius* (Hamilton, 1822)

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**Abstract:** The present study was conducted to assess the impact of an androgenic hormone, 17 α-methyl testosterone (MT) on comparative growth promoting efficiency in Golden Barb, *Puntius gelius*. The hormone incorporated feed was fed to the fish through pelleted diets at three concentrations: 5, 15 and 25 ppm kg diet\(^{-1}\) in addition to a fourth control group without hormone. From the results obtained it is clear that the hormone MT has promoted the growth rate to a significant level (P<0.05) over the control. While the 25 ppm concentration recorded a maximum specific growth rate (1.83±0.1 ppm/d) a forceful reduction in the growth rate (0.52±0.64 ppm/d) was observed at 5 ppm level. The survival rate was not affected by different dosages of this hormone.

**Key words:** 17 α-Methyl Testosterone • Growth Performance • Golden Barb Fish • *Puntius Gelius*

**INTRODUCTION**

Fishes of the genus *Puntius* are prolific and are known to occupy all niches [1]. These fishes have been well studied and have been exploited for the aquarium trade and transported throughout the world. One such fish is *Puntius gelius*, which was first described by Hamilton-Buchanan [2] in his work on the fishes of the river Ganges. In the same work he also described another fish very similar to *P. gelius* but for the characteristic spots on fin bases, called *P. canius* which was later synonymized as *P. gelius* by Day [3]. *P. gelius* is a colorful fish which grows to a maximum of 5cm in length [4]. Though this fish was described more than a hundred years ago and has since been exported throughout the world by the ornamental fish trade, it is not very popular among hobbyists in India [5].

*P. gelius* is described as elongated with body depth 3 to 3.5 times in the total length. It has fairly large scales which are dotted and an incomplete lateral line which ceases after the fifth or the sixth scale. The body is honey-colored with a black band over the tail anterior to the caudal fin and another less distinct one behind the base of the caudal fin. The dorsal fin is yellowish with a black spot at the base and so are the ventral and the anal fins [2-3]. *P. gelius* has been recorded from Maharashtra, Madhya Pradesh, Uttar Pradesh, Orissa, West Bengal, Bihar, Assam and Bangladesh [1, 3-6]. According to Menon [4] the species is rare.

As it is known, very different kind of materials can be added to feed in order to stimulate feed intake and the growth of fishes. Anabolic hormones are among these substances [7]. Considerable information is available on the growth promoting efficiency of anabolic steroid hormones in fishes [8-19]. 17α-Methyl testosterone (MT) is a synthetically produced anabolic and androgenic steroid hormone; i.e. it promotes both muscle growth and the development of male sexual characters. Hanson *et al.* [20] reported that 10- 60 MT treatment showed the best growth than control. On the other hand, Dan and Little [21] who compared the culture performance of different species of stains of *O. niloticus* found that, MT treatment increased the final size of fish 10.7 % larger than the mixed sex fish.

However, investigations on the influence of this hormone on the food intake and conversion efficiency of fish are scanty [17, 22]. The present study therefore was undertaken in order to know about the growth promoting efficiency of the steroid hormone, 17 α-MT on an ornamental fish, the Golden Barb fish (*Puntius gelius*).
MATERIALS AND METHODS

Experimental Design: A total of 120 pieces of Golden Barb fish (*Puntius gelius*) with 0.7±0.15 g initial average weight, were used as an experimental fish and the feeding trial was conducted in a private Laboratory in Gorgan, Iran. Prior to the start of the experiment, the Golden Barb fish were reared in 150 L glass tanks for two weeks to acclimatize to the experimental diet and conditions. After that, they were kept in glass aquaria (each with a dimension of 30×40×60 cm). Fish with similar sizes were randomly distributed into 11 glass tanks (72 L) and each tank was stocked with 10 fish. Each diet was randomly assigned to triplicate tank. Fish were fed to apparent satiation twice daily for 60 days. During the experimental period, the temperature ranged from 25.5 to 28°C, the pH was 7.4 to 7.9. At the termination of the experiment, the fish were fasted for 24 h before harvest.

Total number and mean body weight of fish in each tank were measured. After feeding, fish fed the diets with different level of 17α-methyl testosterone (5, 15 and 25 ppm kg diet⁻¹) were selected to investigate the effects of them on growth and survival of Golden Barb fish.

Experimental Diet: The pelleted feed used in this study was incorporated with the steroid hormone 17α-MT. The experimental fishes were fed with the pelleted feeds having different concentrations of hormone viz. 5, 15, 25 ppm. Along with the replications a control was also maintained. The control fish were fed with the similar feed but without hormone. The experiment was continued for 60 days.

The growth of experimental fishes was estimated at 15 days interval by measuring their total biomass. The data on feeding rate, feed conversion, feed efficiency and conversion efficiency and growth rate were analyzed statistically using random block design [23].

Feed Analysis: Nutrient compositions of experimental diets (Biomar) are given in Table 1. Proximate composition of diets was carried out using the Association of Analytical Chemists [24] methods. Protein was determined by measuring nitrogen (N×6.25) using the Kjeldahl method; Crude fat was determined using petroleum ether (40–60 Bp) extraction method with Soxhlet apparatus and ash by combustion at 550°C.

Statistical Analysis: In order to determine significant differences, results were analyzed by one-way Analysis of variance (ANOVA) and Duncan’s multiple range tests were used to analyze the significance of the difference among the means of treatments by using the SPSS-19 programmer.

RESULTS AND DISCUSSION

Growth factors are summarized in Table 2. It is clear from Table 2, that the feeding rate showed a remarkable increment at 25ppm concentration over the control. It however, followed a decreasing trend beyond 25 ppm.

The feed conversion and efficiency was also found to be better in 25 ppm than in 15 ppm. The increment in the conversion rate and conversion efficiency was distinctively more at 25 ppm level. Similarly the maximum specific growth rate was observed at 25 ppm (1.83±0.10 ppm/day), followed by 15 ppm (1.57±0.41 ppm/day) and 5 ppm (1.37±0.79 ppm/day) in their order. This suggests that the concentration of 25 ppm is more effective to stimulate growth in the juveniles of Golden Barbs. It was observed that both the conversion efficiency and growth rate showed a declining trend especially at control group.

A perusal of literature revealed that while 17α-MT induces appetite and food consumption in gold fish, *Carassius auratus* [27] and *Onchorhynchus kisutch* [12-13], it depresses appetite and feeding rate in *Salmo gairdneri* [28, 29]. An increase in feeding rate was also observed by Nirmala and Pandian [17] in *Channa striatus* when it is injected with 10 ppm of 17α-MT. In the present study the increased feeding rate was observed in hormone treated fishes indicate that 17α-MT could induce the appetite of Golden Barb resulting in more food ingestion.

The increased growth rate in fishes, through the administration of androgenic hormone has been reported by many workers [14, 17, 18]. The enhanced growth rate obtained in *Cyprinus carpio* by Lone and Matty [15] using 17α-MT revealed that this hormone would induce faster growth by acting probably in three different ways, viz. (a) increased food conversion (b) activation on secretion of other androgenic anabolic hormones and (c) direct effect of 17α-MT on the gene expression in the muscle cells.

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>54</td>
</tr>
<tr>
<td>Lipid</td>
<td>18</td>
</tr>
<tr>
<td>Fiber</td>
<td>1.5</td>
</tr>
<tr>
<td>Ash</td>
<td>10</td>
</tr>
<tr>
<td>Vitamin</td>
<td>2</td>
</tr>
</tbody>
</table>
Table 2: Growth parameters and survival rate of Golden Barb fish (*Puntius gelius*) in the experimental treatments

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control</th>
<th>5 ppm</th>
<th>15 ppm</th>
<th>25 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial weight (g)</td>
<td>0.7±0.15</td>
<td>0.7±0.15</td>
<td>0.7±0.15</td>
<td>0.7±0.15</td>
</tr>
<tr>
<td>Final body weight (g)</td>
<td>1.3±0.02</td>
<td>1.6±0.3</td>
<td>1.8±0.07</td>
<td>2.1±0.04</td>
</tr>
<tr>
<td>Body weight gain (g)</td>
<td>0.6±0.03</td>
<td>0.9±0.12</td>
<td>1.1±0.03</td>
<td>1.4±0.07</td>
</tr>
<tr>
<td>Body length increased (cm)</td>
<td>0.8±0.02</td>
<td>1.51±0.1</td>
<td>1.7±0.5</td>
<td>2.41±0.2</td>
</tr>
<tr>
<td>Specific growth rate for weight</td>
<td>0.52±0.64</td>
<td>1.37±0.79</td>
<td>1.57±0.41</td>
<td>1.83±0.10</td>
</tr>
<tr>
<td>Survival rate (%)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Determination of growth parameters: growth parameters were calculated as follows:

- Body Weight Gain (BWG) = final fish weight (G) – initial fish weight (G) [25]
- Specific growth rate (SGR) = (Ln W - Ln W) × 100 t [26]
- Survival rate = (N t × 100) / N 0 [27]

Data are represented as Mean ± SD.
- Means with the same letters in the same row are not significantly different.

The present study also revealed that the increased feed intake coupled with the improved food conversion could have enhanced the growth rate in the young ones of *Puntius gelius*. While it is very well clear that the hormone treated fish have better growth rate than the control, the maximum growth, however, is achieved from 25 ppm concentration. Next to 25 ppm, 15 ppm concentration was found to be effective. However, the concentration under 15 ppm showed a declining trend in growth parameters.

Over 35 ppm, Matty and Cheema [30] have reported higher growth rate and improved food conversion efficiency in rainbow trout due to oral administration of dimethazine and norethandrolone at 25 ppm. Anabolic effectiveness of MT in rainbow trout which enhanced weight by 27.3% after 10 weeks has been demonstrated by Ostrowski and Garling [31]. In the present study the 25 ppm level exhibited a growth increment compared to an increment at 5 ppm concentration. It is also clear from the present observation that the administration of 17α-MT through feed increases growth rate and thus helps to attain faster growth rate in juvenile fishes. This would enable the aquaculturists to economize the production cost of mass rearing of Golden Barb fish.

CONCLUSION

According to the obtained results, this hormone in these dosages affected fish growth.

Dose of the last group (25ppm) showed the most important effects from point of view of all growth parameters (P<0.05).

MT, at the rate of 25 ppm/kg feed, is found proper to increase the Golden Barb growth in fresh water. It is believed that this study will contribute to fish culture studies especially in Iran and the other countries having similar climates and especially having fresh water.

REFERENCES


