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Hormonal Masculinization impact of 17α- MT on The Growth of Sex Reversed *Gymnocorymbus Ternetzi* (Boulenger)

KEYWORDS: Growth – sex reversal - 17α-Methyltestosterone – G. ternetzi

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ABSTRACT *At sub-optimal dose (200μg/l) of 17α-Methyltestosterone (17α-MT) exposure, there was growth increment in both Gymnocorymbus.ternetzi males (3.17%) and females (1.3%) than their respective controls. However, growth decrement was observed at optimal (400 μg/l) and super-optimal doses (600 and 800 μg/l) in a higher percentage for females than males, probably indicating that genetic females which were not amenable for hormonal impact suffered the most than genetic males.*

INTRODUCTION

Hormonal sex reversal using androgens and estrogens has been achieved in 48 species and the effective protocols for the successful sex reversal are available for various species (Pandian & Sheela, 1995). In general, a treatment involving a synthetic steroid results in higher mortality of most species. Growth of sex reversed individuals vary from equal to lesser to greater values over untreated controls and the available information on long-term growth studies on sex reversed individuals (George & Pandian, 1995) are quite scanty. The present attempt adds more information to the literature pertained to growth of a sex reversed characid.

MATERIAL AND METHODS

Experimental fish :

Gymnocorymbus ternetzi (Boulenger) ,commonly known as black or widow tetra, belonging to family Characidae , has been selected as the candidate species in the present study.

Collection and maintenance of fish :

G.ternetzi, obtained in their immature stage (30-45 days old), from local private ornamental fish dealers, were stocked in outdoor concrete tanks till they attained maturity. Later, they were transferred to indoor glass aquaria and maintained at 28 ± 1°C and 14L: 10D photothermal cycle. One week prior to breeding, sexes were maintained separately as it may considerably enhance the willingness to breed, besides avoiding breeding on their own without our eye on it.

Breeding in ornamental fish farm :

Breeding was usually carried out in larger cement tanks of 200 - 700 l capacity Females and males in the ratio of 5-6 to 10-12 were introduced into the tanks. Plants (Ceratophyllum sp.) were also put in. Spawning occurred in the morning, next day, and the parents were immediately removed. Three days after spawning, hatchlings started to swim freely. The growth was rapid and they became sexually mature at the age of 3.5-4 months.

Hormone administration :

For treatment, a stock solution of hormone was prepared by dissolving the steroids (Sigma, USA)-17α-Methyltestosterone (17α - MT), a synthetic hormone mostly preferred for achieving masculinization (Pandian & Sheela, 1995) - in an appropriate solvent (ethanol) at a concentration of 1mg/ml. The stock solution was then added to the rearing water to achieve the desired concentration and experiments were done. Controls with neither hormone nor solvent were run side by side.

In short term immersion experiments, after exposure for a definite period, the fry were transferred back to rearing tanks. Five day old posthatchlings obtained using 6-10 females and 12-20 males, were pooled and from that lot, required number of posthatchlings were used for hormone treatment. Feeding regimes were similar to farm practices. For growth studies the body weights of the fish were weighed accurately using a microbalance (August sauter ,GmbH ,D-7470 ,Albstadt / -Ebingen, make).

STATISTICAL ANALYSIS

Data from growth studies in sex reversed individuals were treated with Student's 't' –test, to find out the significant differences at various 'P' levels.

RESULTS

Growth (at 75 days after hatching) : Data on the growth of hormone exposed as well as control fish are given in Table 1. At a sub- optimal dose (200 mg/l) of hormone exposure, there was increment in growth in terms of weight both in males (3.17%) and females (1.3%) than their corresponding controls. However at optimal (400 mg/l) and super -optimal (600 & 800 mg/l) doses, fish suffered growth retardation. In males, there was 1.7, 11.4 and 14.6% ($P<0.005$)growth decrement at 400, 600 and 800 mg/l doses while in females, 20.7 and 24.0% ($P<0.05$) growth decrement at 600 and 800 mg/l than their respective control counterparts.

DISCUSSION

Increased growth over control is observed at lower dose (sub-optimal) of 17α-Methyltestosterone, while growth decrement is observed at optimal and super-optimal doses, in the present study. A similar trend has also been reported in other species like O.kisutch (Goetz et al., 1979; Piferrer et al., 1994 – immersion method) ; similar negative growth in other species of fish when sex reversed ,are given in Table 2. Females exhibit greater growth decrement than males, pointing out clearly that genetic or paradoxically resulted females which were not amenable for masculinization suffered the most in terms of growth.

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Table-1 Growth of G.ternetzi exposed to 17α-Methyltestosterone, STI for sex reversal (N=5)

Sex	Body weight ,in gms at 75 days				
	Control	Hormone dose (µg/l)			
		200	400*	600	800
Male	0.630±0.02	0.650±0.05	0.619±0.03	0.558±0.06	0.538±0.02 a
Female	0.692±0.04	0.701±0.1	-	0.549±0.03	0.526±0.05 b

± SEM STI – short term immersion for 4 hrs *optimal dose
a- P<0.005 b- P< 0.05

Table-2 : Negative growth response (< lesser) reported for some of the sex reversed fishes

Species	Hormone used	Growth	Reference
	Androgens (Masculinization / /Sterilization)		
Cyprinus carpio	Mibolerone	<	Das et al., 1990
Ctenopharyngodon idella	Methyltestosterone	<	Jensen et al., 1983
O. aureus	Mibolerone	<	Meriwether & Torrans, 1986
Cichlasoma nigrofaciatum	Methyltestosterone	<	George & Pandian, 1996
Clarias gariepinus	Methyltestosterone	<	Hurk et al., 1989
Dicentrarchus labrax	Methyltestosterone	<	Blazque et al., 1995

REFERENCE Blazquez, M., Piferrer, F., Zanuy, S., Carrillo, M. and Donaldson, E.M. 1995. Development of sex control techniques for European sea bass (Dicentrachus labrax L.) aquaculture. Effects of dietary 17α-methyltestosterone prior to sex differentiation. Aquaculture, 135:329-342. | | Das, S.K., Shetty, H.P.C. and Nandeesha, M.C. 1990. Production of female-free common carp, Cyprinus carpio var. communis (L) through dietary adminstration of the androgen mibolerone. Asian Fish. Sci., 3: 197-203. | | George, T. and Pandian, T.J. 1995. Ineffective masculinization and anabolic growth effect in Poecilia sphenops. Asian Fish. Sci. (Submitted, cited in Pandian and Sheela, 1995). | | George, T. and Pandian, T.J. 1996. Hormonal induction of sex reversal and progeny testing in the zebra cichlid, Cichlasoma nigrofasciatum. J. Exp. Zool., 275: 374-382. | | Goetz, F.W., Donaldson, E.M., Hunter, G.A. and Dye, H.M. 1979. Effects of 17ß-estradiol and 17α-methyltestosterone on gonadal differentiation in the coho salmon, Oncorhynchus kisutch. Aquaculture, 17: 267-278. | | Hurk, R.V.D., Richter, C.J.J. and Dommerhot, J.J. 1989. Effects of 17α-Methyltestosterone and 11ß- hydroxyandrostenedione on gonad differntiation in the African catfish, Clarias gariepinus. Aquaculture, 83: 179-191. | | Jensen, G.L., Shelton, W. L., Yang, S.L. and Wilken, L.O. 1983. Sex reversal of gynogenetic grass carp by implantation of methyltestostreone. Trans. Am. Fish. Soc. 112:79-85. | | Meriwether, F.H. and Torrans, E.K. 1986. Evaluation of new androgen (mibolerone) and procedure to induce functional sex reversal in tilapia. In: J.L. Maclean, L.B. Dizon and L.V. Hossillos (eds.) Proc. First Asian Fish. Soc. Manila, Phillippines pp. 675-678. | | Pandian, T.J. and Sheela, S.G. 1995. Hormonal induction of sex reversal in fish, A review. Aquaculture, 138:1-22. | | Piferrer, F., Currillo, J., Zancry, S., Solar, I.I. and Donaldson, E.M. 1994. Induction of sterility in coho salmon (Oncorhynchus kisutch) by androgen immersion before first feeding. Aquaculture, 119 : 409-423. |