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Impact of Estradiol-17B on the Growth of Sex Reversed Gymnocorymbus Ternetzi (Boulenger)

KEYWORDS: Growth - Sex reversal - Estradiol-17β - Gymnocorymbus ternetzi

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ABSTRACT *Growth increment was seen only in females of Estradiol -17β exposed fish at sub- optimal doses of 200 and 400 μg/l for 7 hours of short term immersion . While the fish exposed to sub-optimal dose of 200 μg/l recorded an increment of 5.5%, those exposed to 400 μg/l recorded a growth increment of 9.2% over the control. However, at doses of 600 and 800 μg/l, females recorded growth decrement of 11.6 and 14.3% respectively relative to controls. However, in males, growth decrement was observed at all doses. At a dose of 200 μg/l (exposed for 7 hours) there was a growth decrement of 6%, 400 μg/l recorded 6.6%, 600 μg/l recorded 16.1% and 800 μg/l recorded a decrement of 21.9% in relation to control. This had clearly indicated that the genetic males which were not amenable for E-17β treatment suffered significantly (P< 0.1). A similar trend was observed for a dose of 600 μg/l exposed for 10 hours as well. Males suffered significantly (P< 0.01) than the females, as there was only 17.5% growth decrement in females unlike in males (26.2%) over their respective controls.*

INTRODUCTION

Yamazaki (1983) claimed that functional endocrine sex reversal has been successfully achieved in 15 gonochoristic species (5 families) using one or the other of 14 (8 androgens; 6 estrogens) steroids. But at present, treatment protocols are available for 48 species (16 families) of gonochores (35 species; 10 families) and hermaphrodites using one of the 31 (16 androgens; 15 estrogens) steroids (Pandian & Sheela, 1995). 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 also quite scanty. The present study is a step put forward in this direction ; to assess the impact of growth in a characid, when exposed to Estradiol-17β .

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.

Hormone administration

For treatment, a stock solution of hormone was prepared by dissolving the steroids (Sigma, USA)- Estradiol-17β (E-17β), a natural steroid mostly preferred for achieving feminization (Pandian & Sheela, 1995) - in an appropriate solvent (ethanol) at a concentration of 1μg/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).

RESULTS

Table-1 shows the data on the growth of E-17β exposed and control fish at 75 days after hatching (DAH). Growth increment was seen only in females of hormone exposed fish at sub- optimal doses of 200 and 400 μg/l for 7 hours. While the fish exposed to sub-optimal dose of 200 μg/l recorded an increment of 5.5%, those exposed to 400 μg/l recorded a growth increment of 9.2% over the control. However, at doses of 600 (optimal dose) and 800μg/l (super-optimal dose), females recorded growth decrement of 11.6 and 14.3% respectively relative to controls.

However, in males, growth decrement was observed at all doses. At a dose of 200 μg/l (exposed for 7 hours) there was a growth decrement of 6%, 400 μg/l recorded 6.6%, 600 mg/l recorded 16.1% and 800 μg/l recorded a decrement of 21.9% in relation to control. This had clearly indicated that the genetic males which were not amenable for Estradiol-17β treatment suffered significantly (P< 0.1).

A similar trend was observed for a dose of 600 mg/l (optimal dose) exposed for 10 hours as well. Males suffered significantly (P< 0.01) than the females, as there was only 17.5% growth decrement in females unlike in males (26.2%) over their respective controls.

DISCUSSION

In the present study, in females, increased growth is observed at sub-optimal doses , but, growth decrement at optimal and super-optimal doses. In males, the growth decrement is greater than in females, clearly indicating that genetic males which were not amenable for feminization suffered more than females. Similar dose dependent decrease

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in size in fish with high Estradiol-17β concentrations has been reported in coho salmon, O.kisutch (Goetz et al., 1979), pink salmon, O.gorbuscha (Funk et al., 1973) rainbow trout, O.mykiss (Johnstone et al., 1978), gold fish, Carassius auratus (Yamazaki, 1976) and zebra cichlid, Cichlasoma nigrofaciatum (George & Pandian,1996) indicating that hormonal manipulation is a stressful process impairing the growth potential of fishes at higher doses, although lower doses may have anabolic effect. Similar dose dependent decrease in size in fish with other hormones during feminization have also been reported in Salmo gairdneri with Estrone (Okada, 1973) and in Oreochromis aureus with Mibolerone (Meriwether & Torrans , 1986).

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Table 1; Growth of G.ternetzi exposed to Estradiol -17 b, short term immersion for sex reversal (N=5)

Sex	Body weight (gms) at 75 days					
	Control	Hormone dose (µg/l)				
		200(7hrs)	400(7hrs)	600(hrs)	600(10hrs)	800(hrs)
Male	0.630±0.02	0.592±0.1	0.588±0.1	0.528±0.05 [a]	0.465±0.02[b]	0.492±0.1[a]
Female	0.692±0.04	0.730±0.04	0.756±0.05	0.612±0.06	0.589±0.05[a]	0.593±0.05

a - P<0.1 b - P<0.01

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