

ENZYME ACTIVITIES AS BIOMARKERS IN NILE TILAPIA *Oreochromis Niloticus* EXPOSED TO NATURAL HORMONE 17 β -ESTRADIOL

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Nile tilapia is an omnivorous feeder and normally feed along the whole water column with occasional contact with sediments. It is a widespread fish species in tropical countries, and it is the most cultivated freshwater fish in Brazil, with increasing occurrence in Brazilian natural environments. These characteristics make Nile tilapia a suitable indicator species for bio-monitoring of aquatic pollution in tropical environments. In this regard, an experimental study on laboratorial scale was realized based on a randomised delineation with three levels of estradiol (E2) (0, 5, 15 μ g/L) and three replicates. Tilapias ($207,3 \pm 10,4$ g), 24 fishes, were exposed to concentrations of 5 μ g/L and 15 μ g/L of E2, during seven days, in 100 L aquarium. After the exposure time, liver and gills were extracted for the analysis of three isoforms of cytochrome P450: EROD (1A), BROD (2B), PROD (3B) and activity of Glutathione S-Transferase (GST). The main finding of this study showed that the exposure to E2 caused strong activities of BROD in liver and gills tissues and GST activities in liver tissues. It was observed that the GST activity compared to the control was statistically significant, being much higher in fish liver exposed to the hormone, with >90% of confidence. However, E2 did not induced isoform 1A in fish. These results might have implications for aquatic ecosystem monitoring studies that use biomarker analysis, but it is still necessary to evaluate under controlled exposure with other contaminants, in combination or alone, or pre-exposure to the mixture. The major characteristic of estrogen is due to its capacity of biological responses induction, where the minor concentration produces higher effects on biochemical parameters, along with BROD and GST activities. Those biologically active compounds were detected with certain frequency in natural aquatic ecosystems (Table 1). The estrogen concentrations found by other authors and also in this study are much higher than the minimum concentration that presented observable effects (10 ng) (6).

Table 1. Estrogen concentrations detected in this study and by other authors in Brazil

Sampling site	17 β -estradiol (ng/L)			Estrone (ng/L)	
River water	1560 (this study)	38-2510 (3)	8.6-25.8 (4)	N.D. (this study)	600 (4)
Water Source		1900-6000 (5)	16.0-30.6 (4)	3500-5000 (5)	< 600 (4)
Treated Water		2100-2600 (5)	6.8 (4)	N.D.	N.D.
Fish Ponds	1300-2200 (this study)			N.D. (this study)	

(3) Sodré et al., *J Braz Soc Ecotox* 2, 187-196, 2007.; (4) Lopes et al., *Quimica Nova* 33, 3, 639-643, 2010.; (5) Ghiselli, Doctoral Thesis, 2006.; (6) Barel-Cohen et al., *J Environ Manag* 78, 1, 16-23, 2006.



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ABSTRACTS



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