

ABSTRACT

Fingerlings of the Jamaican freshwater red hybrid tilapia (*Oreochromis nilotica*), when exposed to endosulfan in the range 0.005 - 0.04 mg/L, displayed symptoms of toxicity (including darting, shuddering and side-swimming). The 72-hour LC₁₀, LC₅₀ and LC₉₅ of endosulfan to fish were 0.023, 0.045 and 0.086 mg/L, respectively, while the 7-day LC₁₀, LC₅₀ and LC₉₅ were 0.014, 0.026 and 0.054 mg/L. The 28-day LC₁₀, LC₅₀ and LC₉₅ were 0.007, 0.011, 0.018 mg/L, respectively. The 28-day NOEC (no-observable-effect-concentration), LOEC (least-observable-effect-concentration) and POEC (pronounced-observable-effect-concentration) were 0.0025, 0.005 and 0.006 mg/L, respectively.

Brain and liver acetylcholinesterase (AChE) levels between control and 0.005 mg/L endosulfan-treated fish were not significantly different ($p > 0.05$) over 28 days, but there was a significant difference at 0.008 mg/L. There was no significant difference ($p > 0.05$) between the brain AChE levels of control fish and those of fish exposed to 0.009 mg/L endosulfan for 48 hours. AChE levels in liver changed significantly ($p < 0.05$) upon exposure to endosulfan, with an overall 1.36-fold decrease in 48 hours. AChE activities in brain and liver, treated *in vitro* with endosulfan were significantly different ($p < 0.05$) from untreated tissues.

Total protein content in brain and liver of control and treated fish were not significantly different ($p > 0.05$) over 28 days. There was however, a significant difference ($p < 0.05$) in total protein levels in the rest of the body of control and treated fish. An overall significant ($p < 0.05$) increase in protein levels occurred in

treated fish. Fish exposed to 0.008 mg/L endosulfan over 28 days had significantly different ($p < 0.05$) total protein levels in brain and liver. An overall significant ($p < 0.05$) 1.37-fold increase and a significant 1.30-fold decrease in total protein were noted in brain and liver, respectively. Total protein in the rest of the body of treated fish was not significantly different ($p > 0.05$) from that of the controls. An overall slight but insignificant ($p > 0.05$) decline in protein levels occurred in treated fish. Total protein in brain, liver and rest of body of fish exposed to 0.009 mg/L endosulfan for 48 hours, did not vary significantly ($p > 0.05$) from that of control fish. Protein levels in gonads of fish exposed to 0.008 mg/L endosulfan were significantly different ($p < 0.05$) from those in control fish and from those in fish exposed to 0.009 mg/L endosulfan for 28 days. There was no significant difference ($p > 0.05$) between total protein levels in the rest of the body of control and treated fish.

An increased formation of proteins with molecular weights (M.W.s.) 66,000 - 70,000 and 22,000 - 24,000 Da. occurred in the gonads of control fish over 28 days. On day 7, proteins of M.W.s. 22,000 - 24,000, 43,000 and 64,000 Da. were more conspicuous in gonads of fish exposed to 0.008 mg/L endosulfan. By day 14, proteins of M.W. 14,200 - 66,000 Da. were most conspicuous in gonads of fish exposed to 0.009 mg/L endosulfan. By day 28, proteins of M.W. 66,000 - 70,000 Da. were absent from the gonads of these fish. By day 28, a protein of M.W. 15,000 Da. was noticeable only in the gonads of the 0.009 mg/L endosulfan-treated fish.

Total lipid in whole body of control and treated (0.005, 0.008 and 0.009 mg/L endosulfan) fish varied significantly ($p < 0.05$) over 28 days. Overall decreases of

1.18, 1.78 and 2.27 orders of magnitude were noted in fish exposed to 0.005, 0.008 and 0.009 mg/L endosulfan, respectively.

An overall significant ($p < 0.05$) 2.25-fold decline in total lipid occurred in the gonads of fish exposed to 0.009 mg/L endosulfan for the 28-day period, while an overall slight but insignificant ($p > 0.05$) increase was noted in the rest of the body. Thin layer chromatography (TLC) revealed that whole body homogenate of the fish contained oleic acid, cholesterol, olive oil, cholesterol oleate and phospholipid.