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Oxygen Consumption of Tilapia Eggs/Larvae up to 12 Days after Fertilisation

PETER LAWRENCE¹, OLAF WEINREICH¹, TIMO STADTLANDER¹, ULFERT FOCKEN², KLAUS BECKER¹

¹University of Hohenheim, Dept. of Animal Production in the Tropics and Subtropics, Germany

²Thuenen-Institute for Fisheries Ecology, Ahrensburg Branch, Germany

Abstract

Aquaculture is growing faster than any other food producing sector. Nile tilapia, *Oreochromis niloticus* (L.) is among the five most commonly produced fresh- or brackishwater fish of the world with an annual production of 2.7 million tons (FAO 2013) It is particularly well suited to tropical and subtropical environments where dissolved oxygen concentrations are low and/or very variable. Despite its commercial importance there are very few published studies on the oxygen consumption of newly hatched tilapia and none (that we could find) on eggs before hatching.

A total of six X 12 day determinations were made in which 400–700 freshly fertilised eggs were kept in a closed 1.65 L capacity glass jar filled with freshly aerated, non-chlorinated tap water at 28°C. A 20 mm magnetic stirrer bar circulated the water gently Measurements of dissolved oxygen were recorded by computer every 120 seconds using a “WTW Oxi 1970i” portable oxygen analyser. Every 6 h, the jar was flushed automatically with freshly aerated water at 28°C for 10 min at a rate of approximately 1 L per min.

Every 24 h any dead eggs/larvae were removed and the remainder counted. Sometimes eggs/larvae were deliberately removed so that the oxygen concentration in the jar would not fall by more than about 3 mg/L during a 6 h period. Eggs usually started to hatch around day 5 and larvae consumed their yolk sacs by day 10–12

Average rates of O₂ consumption rose from around 1 to 12 µg per egg/larva h⁻¹ over 12 days with a distinct acceleration in rate around 120 h when the eggs were hatching.

Average overall O₂ consumption was 1.89±0.37 (SD, n=6) mg egg/larva with a best fit straight line $y = 0.0401x - 0.2101$ (R = 0.98) where (y = µg per egg/larva h⁻¹ ; x = h⁻¹)

Average initial dry mass was 2.22±0.21 (n=5) mg egg⁻¹. Average final dry mass was 1.63±0.16 (n=5) mg larva⁻¹. Average loss of dry mass was 0.59±0.16 mg per egg/larva corresponding to a theoretical loss of 0.65±0.13 mg if all the oxygen was used to oxidise a lipid such as tristearin.

Keywords: Eggs, larvae, oxygen consumption, respirometer, tilapia