Changes in some water quality conditions in recycling water using three types of biofiltration systems during the production of the sharptooth catfish *Clarias gariepinus* (Burchell)

Part II: Growth and production of sharptooth catfish over a period of 78 days

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Abstract

An investigation into the growth and production of the sharptooth catfish *Clarias gariepinus* (Burchell) was conducted over a period of 75 d in recirculating water, using three types of biofiltration systems. Yields fluctuating between 195.2 kg and 242.1 kg were obtained with the mean fish mass per m^3 of water ranging between 19.5 and 22.5 kg. A biofilter system using PVC shavings was not only found to be the most efficient in the transformation of nitrogenous wastes, but also produced the highest growth and production of catfish as well as the best feed conversion ratio of the three biofiltration systems used.

Introduction

Factors which may affect water quality conditions and consequently the growth performance of fish in recirculating water and steps which can be taken to neutralise or eliminate potentially harmful metabolic wastes from such systems, have been investigated in recent years by a number of research workers (Paller and Lewis, 1982; Miller and Libey, 1984; Watten and Busch, 1984; Van Rijn, 1996). Attention was also given to the intensive culture of the African sharptooth catfish *Clarias gariepinus* in recirculation water (Hogendoorn et al., 1983; Bovendeur et al., 1987). In South Africa the pond fish farming of *Clarias gariepinus* only commenced in 1984 (Bok and Jongbloed, 1984). Prinsloo and Schoonbee (1987a) used chicken offal to obtain yields of *Clarias gariepinus* of more than 2 t/ha over a period of 75 d. Using the sharptooth catfish in polyculture with the European common carp *Cyprinus carpio* L., Prinsloo et al. (1989a) obtained yields of 4.55 t over a period of 100d with the catfish comprising 35.9% (1.6 t/ha). Prinsloo and Schoonbee (1992) achieved a yield of 2.824 t/ha for the sharptooth catfish in final effluent water from sewage maturation ponds over a period of 126 d commencing during the second half of summer (February) and ending during the beginning of June (early winter) when mean water temperatures were 16.3 °C with a fluctuation of 14.7°C to 18.0°C. Using a combination of minced fish and bakery floor sweepings as well as a formulated diet, a yield of 7.64 t/ha was recorded for *C. gariepinus* over a summer production period of 140 d. In this case, the mean feed conversion ratio (FCR) was 1.9 (Prinsloo et al., 1989b).

The present exploratory production investigation on the *C. gariepinus* in recirculating water using three types of biofiltration systems must be considered the first serious attempt in South Africa to produce the sharptooth catfish under such conditions. This paper forms **Part 2** of two papers investigating the efficiency of three types of biofiltration units on the oxidation of nitrogenous metabolic wastes in water recirculation systems for the intensive production of the sharptooth catfish.

Material and methods

As mentioned in Part 1 (Prinsloo et al., 1999), each biofiltration system consisted of five aquadams of which each dam, holding 5 m^3 of water, was stocked at the onset of the investigation with 520 young catfish with a mean individual mass at stocking of 83 g. These fish were all pre-treated prophylactically for possible ecto-parasites.

Where some initial fish mortalities occurred, they were replaced by similar sized fish. Water quality conditions were regularly evaluated. The food applied and feeding programme followed, are briefly reported upon in **Part 1** (Prinsloo et al., 1999).

Mass determinations of fish

Because of practical considerations and the fact that subsampling of catfish in such holding tanks did not provide a representative sample of the fish in a specific tank as a result of the specific avoidance behaviour of the catfish, individual aquadams in each system were drained weekly on a rotational basis. All fish were then removed and the individual length and biomass of fish determined. The total fish biomass in the remaining four aquadams of each system was then calculated using the percentage increase in biomass of the fish sampled in one tank compared to the biomass determined the previous week.

Fish growth and feed conversion ratio

Fish growth based on determined fish biomass was calculated on a weekly basis. From these data the amount of feed to be given

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