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Effects of three agricultural by-products on cage culture growth performances of a landlocked population of *Sarotherodon melanotheron* (Teleostei: Cichlidae) in man-made Lake Ayame, Côte d'Ivoire

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In man-made Lake Ayame, a 180-day cage culture feeding trial was conducted to investigate the effects of three agricultural by-products — chicken droppings, wheat bran and corn bran — on the survival rates, mean daily weight gain and feed conversion ratio in juveniles of a landlocked population of *Sarotherodon melanotheron*. Results were compared to those obtained from fishes fed on a local commercial diet and a group of unfed fishes. Survival rate (SR), mean daily weight gain (MDWG) and feed conversion ratio (FCR) were better for fish fed on the commercial diet (SR: 95.0 ± 4.2%, MDWG: 0.26 ± 0.00 g.d^{-1} and FCR: 4.27 ± 0.47) than for the unfed fish (SR: 53.0 ± 0.0% and MDWG: 0.02 ± 0.00g.d^{-1}). Of the by-products, corn bran resulted in the best mean daily weight gain (0.09 ± 0.01g.d^{-1}). A significant positive correlation of the dietary dry matter (beta: 0.98), lipid (beta: 0.99), protein (beta: 0.85) and energy (beta: 0.98) levels with the mean daily weight gain was also observed.

Keywords: agricullural by-products, aquaculture, growth, *Sarotherodon melanotheron*

Introduction

The black-chinned tilapia *Sarotherodon melanotheron* Rüppell 1852 is one of the major fish species that is frequently caught in West African coastal waters (Teugels and Falk 2000). This is a brackish water tilapia species generally found in estuaries, lagoons and occasionally in the mouths and lower river courses of coastal basins from Senegal to Congo (Trewavas and Teugels 1991). Trewavas (1983) identified five subspecies, but Teugels and Falk (2000) questioned the validity of these and retained only *S. m. heudelotii*, *S. m. melanotheron* and *S. m. nigripinnis*. The species found in Côte d'Ivoire is *S. m. melanotheron*. In man-made Lake Ayame (Côte d'Ivoire), a population of this subspecies has been landlocked since the construction of a dam in 1959. Fishery statistics show that *S. melanotheron* represents 51% of commercial catches in Lake Ayame which, in 1996, totalled over 1 000 tons (Gourène *et al.* 1999). Several studies, including allozyme analysis (Adépo-Gourène *et al.* 1998), morphometric studies (Falk *et al.* 2000) and ecological studies (Koné and Teugels 1999, 2003) on this population showed that they had a lower fecundity, larger oocyte diameter and a good condition factor, indicating a good adaptation to pure freshwater conditions. The aquaculture potential of *S. melanotheron* has already been studied in brackish water by Legendre *et al.* (1989). The high feed conversion ratios recorded do not favour its commercial culture. In tilapia culture systems, the price of feed may account for more than 50% of the production cost (Lazard *et al.* 1990), even though 65% of tilapia worldwide are farmed without the use of modern compound feeds (Naylor *et al.* 2000).

Tilapia are fundamentally herbivorous fishes (Lowe-McConnell 2000). This herbivorous aspect of their feeding habits has not been fully exploited in aquaculture. Most formulated feeds for tilapia resemble those for omnivorous fishes in that they contain significant levels of animal protein (Hughes and Handwerker 1993), whereas non-traditional feeds such as agricultural wastes and/or by-products have been used in fish diets with partial (Ulloa and Verreth 2003) or complete (Garg *et al.* 2002) success. Several studies have investigated the possible use of soybean (Garg *et al.* 2002), cocoa cake (Fagbenro 1988) and rice bran (Cissé and Da Costa 1994) as a protein source for *Cirrhinus mrigala* (0.50g.d^{-1}), *Tilapia guineensis* (1.34g.d^{-1}) and *Oreochromis niloticus* (1.30g.d^{-1}) diets, respectively. To date, the response of *Sarotherodon melanotheron* to such bean protein or other agricultural by-product diets has not been studied. The use of agricultural products might be of particular interest, especially in areas where the high cost of feed is a major constraint for aquaculture expansion.