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“Development on the margin”

Protein and Energy Digestibility of Selected Aquatic Macrophytes Treated by Sun Drying and Lactic-acid Fermentation for the Amazonian Fish *Piaractus brachypomus* (Cuvier, 1818)

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Abstract

The South American red pacu (*Piaractus brachypomus*) is an omnivorous fish with a predominantly herbivorous-feeding behaviour. It is the primary fish species in the national programme of food safety in Colombia and occupies the second place in the national aquaculture production. To reduce feed costs in red pacu cultivation and therefore to ensure small-scale farmer's income in the marginal areas of the Neotropics, the use of non-conventional feed sources for this species should be tested. Aquatic macrophytes are one of the most abundant plant materials in the Neotropical floodplain systems and a natural feed source for native fish. However, information on the nutritional value of aquatic macrophytes for red pacu is lacking. As the apparent digestibility coefficients (ADCs) provide valuable information for the formulation of nutritional and economically feasible diets and for the preservation of the aquatic environment avoiding the accumulation of indigestible ingredients in the water, the ADCs of crude protein (ADC_{protein}) and the gross energy (ADC_{energy}) of sundried and fermented aquatic macrophytes (*Spirodela polyrhiza*, *Lemna minor* and *Azolla filiculoides*) for juveniles (31.0 ± 5.2 g) of *Piaractus brachypomus* were determined. In this study each test ingredient was included at 300 g kg⁻¹ the reference diet were 97.2 % and 70.1 %, respectively. ADC_{protein} and ADC_{energy} of the tested macrophytes were significantly different between plant material types and processing methods, but not between their combinations. ADC_{protein} ranged from 74.9 % to 84.5 % for fermented macrophytes and from 51.1 % to 60.4 % for sundried macrophytes, indicating that the fermentation affected positively the protein digestibility of the plant material ($p < 0.05$). Among the plants, fermented *Spirodela polyrhiza* showed the highest ADC_{protein}. The sundried aquatic macrophytes would not be recommended as exclusive nutrient sources. However, the fermented aquatic macrophytes can be recommended as supplementary protein source in practical diets for *Piaractus brachypomus*.

Keywords: Amazonian fish, aquatic plants, fermentation, nutrients digestibility, sun drying