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“Bridging the gap between increasing knowledge and decreasing resources”

Apparent Digestibility of Earthworm Meal in Plant-Based Feeds for Nile Tilapia, *Oreochromis niloticus* (L.)

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Abstract

Fishmeal is a limited resource and restricts the development of aquaculture especially in rural areas which have no established markets to supply suitable feed resources. Previous studies have shown that earthworm might be used to replace fishmeal in plant-based feeds. Aim of this study was to evaluate the apparent digestibility of earthworm meal in plant-based feeds for Nile Tilapia.

Four iso-nitrogenous (36 % crude protein) and iso-lipidic (10.5 % crude lipid) feeds were formulated mainly based on plant ingredients with 20 % animal derived crude protein from fishmeal and/or earthworm meal. From feed 1 to 4, 0 %, 33 %, 66 % and 100 % of fishmeal protein was replaced by protein from freeze-dried earthworm (*Perionyx excavatus*). All feeds contained 1 % TiO₂. 24 aquaria of 40 L each were equipped with a separation wall and were stocked with one Nile Tilapia of 40 g body mass in each sector. Water flow-through was adjusted at a rate of 6–7 L min⁻¹. The light was adjusted to 12 hours light 12 hours dark. Water temperature was 27.5 ± 0.5°C. Dissolved oxygen was kept at above 4 mg L⁻¹ and pH between 7.0 and 8.0. Trial lasted for 56 days. Weekly, fishes were weighed and adjusted feed amounts were fed by automatic feeders. At a feeding ratio of 5-times maintenance, faeces was collected in all aquaria and pooled per aquarium over two replicated 7-days periods. Dry matter, crude ash, crude fibre, crude lipid, crude protein, gross energy and TiO₂ content was analysed for feeds. Faeces was analysed for dry matter, crude ash, crude protein and TiO₂ content. Feed conversion ratio, growth rate and apparent digestibility coefficients for crude protein and dry matter were tested statistically with ANOVAs.

Earthworm showed similar crude protein and even better essential amino acid contents and was digested as well as fishmeal. Earthworm-based feeds significantly reduced growth. Assimilation of earthworm-based feeds into fish mass was lower than of fishmeal-based feeds. This suggests a higher catabolism of nutrients in fish fed by earthworm-based feeds which is potentially caused by feed related stress. To utilise earthworm as feed source, pre-treatments of earthworm should be evaluated to reduce anti-nutritional effects.

Keywords: Alternative feed resource, aquaculture, fish nutrition