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“Bridging the gap between increasing knowledge and decreasing resources”

Development of Aquafeeds for Tilapia and Carp Using Detoxified *Jatropha curcas* Meal as Protein Source

CARSTEN KROME¹, KIM JAUNCEY², ULFERT FOCKEN¹

¹Thuenen-Institute for Fisheries Ecology, Ahrensburg Branch, Germany

²University of Stirling, Institute of Aquaculture, United Kingdom

Abstract

Productivity of rural fish ponds in tropical countries is many times low due to low feed quality. Since it is these same countries, which disproportionately often suffer from protein deficiency within their population, higher fish yields of aquaculture operations could significantly add to a solution of this problem.

Jatropha curcas is a tropical shrub that is increasingly cultivated on marginal land in several African and Asian countries. Its seeds are harvested to retrieve oil; the remaining press cake can be detoxified to leave a high-protein meal with a balanced essential amino acid composition. In a series of feeding trials, we tested the suitability of detoxified *Jatropha curcas* kernel meal (JKM) as a protein source in comparison to fishmeal in diets for carp and tilapia.

Two types of diets were tested for both species: A diet containing only fishmeal as a protein source as well as a diet where fishmeal only supplied 25 % of the protein. In all trials, fishmeal was replaced in incremental steps from 30 % to 100 % with JKM. For both diet types and species, fish grew generally well throughout all JKM inclusion levels, however, a linear decline of growth could be observed the more JKM was included in the diet. This was assumed to be caused by anti-nutritional factors, namely phytate and oxalate, which have been shown to be present in three- and ten-fold concentrations, respectively, compared to soybean meal as a reference feedstuff (3 % vs. 1 % and 2.5 % vs. 0.25 %).

Closer investigation of dietary phytate revealed no effect of growth in 100 % JKM based diets, however, a strong negative impact on mineral availability.

Dietary addition of oxalate also showed no impairment of growth, but severely influenced energy metabolism, decreasing body lipid, energy and plasma cholesterol content at inclusion levels of 1.5 % and higher.

In conclusion, JKM can be used as a protein source in carp and tilapia feeds, especially in rural areas where fishmeal is scarce. The exact compound responsible for its reduced growth performance compared to fishmeal remains unknown, however, new interesting insights of these compound could be gained.

Keywords: Antinutrients, aquaculture, aquafeeds, biofuels, carp, tilapia