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Jatropha curcas Kernel Meal as a Protein Source in Aquaculture Diets

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Abstract

Fish feed price and availability are the main limiting factors in many tropical aquaculture ventures. There is consequently a continuous effort to make fish feed affordable to farmers in these regions. One of the reasons for the high prices of fish feed is the contained fishmeal. For years now, research has been undertaken to lower the fishmeal content of fish feed without lowering its protein content using plant-based feedstuffs. A new option in this respect could be *Jatropha curcas* kernel meal (JKM), which is a by-product of *Jatropha* production for the biodiesel industry. The meal is high in protein content and has a promising essential amino acid composition that is similar to the one of fishmeal. Also, due to the growing interest in biodiesel and therefore *Jatropha*, it might soon be readily available in a number of tropical countries. Procedures for detoxification of phorbol esters from *Jatropha curcas* kernel meal have been developed recently; however, a relatively high content of phytate remains. Commercially available phytase products split phytate into sugar and phosphates, however, it is unclear whether these are effective under the pH and temperature conditions of the fish gut, especially in carp (*Cyprinus carpio*), which do not have a stomach and therefore no acidic conditions. A possible solution to the problem is pre-incubating JKM with phytase in conditions suitable for the enzyme (pH 4.5; 45°C).

In this study, carp were fed five different diets: J100: Fishmeal was replaced 100 % by JKM; J50: Fishmeal was replaced 50 % by JKM; J100Inc: Fishmeal was replaced 100 % by phytase-incubated JKM; J50Inc: Fishmeal was replaced 50 % by phytase-incubated JKM; Control: No fishmeal was replaced. Results showed that feed conversion ratios (FCR) of diets containing 100 % JKM were significantly worse than all other diets (J100: 2.4±0.51; J100Inc: 2.6±0.57). Diet J50Inc (1.2±0.12) showed significantly better FCR than diet J50 (1.5±0.15) and was not significantly different from the control diet (1.2±0.16). These results suggest that at least 50 % of fishmeal may be replaced by JKM, if the JKM is phytase-treated before adding it to the diet.

Keywords: Aquaculture, carp, fish feed, *Jatropha curcas*, phytase, phytate