

The application of chenodeoxycholic acid in the low fishmeal diet of shrimp

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Abstract:

Fish meal (FM) replacement is one of the critical issues exists in the shrimp feed industry. Dietary FM alternatives have been reported disturbing bile acids (BA) status of aquatic animals, especially when FM is replaced by plant proteins. An eight-weeks feeding experiment was conducted to evaluate the effects of dietary chenodeoxycholic acid (CDCA) supplementation on growth, immune response and intestinal health of *Penaeus monodon* fed a low FM diet. Three diets were formulated: high FM (25%) diet (HF), low FM (15%) diet (LF), and low FM diet supplemented with 0.1% CDCA (LFC). Shrimp fed Diet LF showed lower weight gain and feed efficiency than those fed Diet HF. Low dietary FM up-regulated the mRNA level of *xbp1*, and down-regulated the mRNA levels of *sod*, *iap* and NF- κ B signaling pathway-related genes (*traf6*, *tube*). Dietary supplementation of CDCA up-regulated the expression of *relish* and anti-oxidative-related genes (*sod* and *cat*) in the hepatopancreas and midgut. Low dietary FM impaired the intestinal fold and induced the endoplasmic reticulum swollen of intestinal epithelial cell, dietary supplementation of CDCA alleviated this problem. The intestinal microbiota diversity was lower in shrimp fed Diet LF than those fed HF. Dietary supplementation of CDCA in a low FM diet increased the intestinal microbiota diversity by decreasing the relative abundance of dominant phylum Proteobacteria. Low dietary FM increased the relative abundance of a dominant pathogenic bacterium (*Vibrio*), which was decreased by the supplementation of CDCA. These results indicated that dietary supplementation of CDCA in a low FM diet improved the growth performance, immune response and intestinal health of shrimp.