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Effect of dietary supplementation with apple cider vinegar and propionic acid on hemolymph chemistry, intestinal microbiota and histological structure of hepatopancreas in white shrimp, Litopenaeus vannamei

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Abstract

This experiment was conducted to evaluate the effects of dietary supplementation of Apple cider vinegar (ACV) and propionic acid (PA) on biochemical parameters of hemolymph, intestinal microbiota and histology of hepatopancreas in white shrimp (Litopenaeus vannamei). Five experimental diets were evaluated in this study including diets supplemented with 1.0, 2.0 and 4.0% of ACV, 0.5% propionic acid, and a control diet with no supplements. Shrimps (initial weight of 10.2 ± 0.04 g) in triplicate groups with the density of 25 shrimps per tank were fed the diets for 60 days. At the end of the feeding trial, shrimps fed with ACV and PA supplemented diets had significantly higher total protein level than those fed the control diet ($P < 0.05$). The number of Vibrio spp., R-cells (lipid storage cells) of hepatopancreas and cholesterol level in shrimps fed the diets containing ACV and PA were lower compared to the control group ($P < 0.05$). However, there was no remarkable variations in glucose concentration, B-cell number and tubule diameter among the experimental diets ($P > 0.05$). In addition, shrimps fed the ACV diets had significantly lower total heterotrophic marine bacteria compared to the control or PA groups, and the lowest bacterial number was observed in shrimp fed 4% ACV supplemented diet ($P < 0.05$). Supplementation of 2 and 4% ACV as well as 0.5% PA in the diet led to a significantly higher calcium concentration than the control treatment ($P < 0.05$). The lowest triglyceride concentration was observed in the shrimps fed diets containing 2.0 and 4.0% ACV, which resulted in 15 and 20% reduction, respectively ($P < 0.05$). Overall, the findings indicates that ACV and PA possess antimicrobial activity and demonstrate beneficial effects on health status, so they can be potentially used as feed additive in the feeding of L. vannamei.

Keywords: Apple cider vinegar; Biochemical parameters; Hepatopancreas histology; Intestinal microbiota; Litopenaeus vannamei; Propionic acid.

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