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Effects of different dietary lipid levels and fatty acids profile in the culture of white shrimp *Litopenaeus vannamei* (Boone) in biofloc technology: water quality, biofloc composition, growth and health

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Abstract

The objective of this study was to evaluate the influence of different dietary lipid and fatty acids on the nutritional value of bioflocs used as a feed, as well as shrimp performance and health. A total of 1800 *Litopenaeus vannamei* juveniles (2.87 ± 0.01 g) were cultured in biofloc technology, with a density of 200 shrimp m^{-2}, and fed with three isoproteic experimental diets at different lipid levels (85 g kg^{-1}, 95 g kg^{-1} and 105 g kg^{-1}); each treatment was performed in triplicate. After 61 days, no significant difference was observed ($P > 0.05$) among the water quality parameters. For the shrimp performance, significant difference was observed ($P = 0.011$) among the values of survival, where treatments with lower lipid levels had higher survival (92.5 ± 3.5% and 91.0 ± 2.5%). Although there are significant differences in survival, no significant differences in the total haemocytes count (THC) were observed. For other growth performance, no differences were observed ($P > 0.05$). A positive correlation ($r = 0.75$) has been observed between the dietary oleic acid and bioflocs. The bioflocs showed 'long-chain' polyunsaturated fat acids (lcPUFA), especially arachidonic acid. The shrimp showed similar growth and stayed healthy at the end of the experimental period.

Keywords: marine shrimp, nutritional value of biofloc, oils, healthy

Introduction

In the natural environment, the algae are the primary producers of essential fatty acids (EFA) such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) (Glencross 2009). In aquaculture, many cultured animals depend on the supplementation of these nutrients in their diet. EFA such as long-chain polyunsaturated fatty acids (lcPUFA) play important role in cell synthesis, neural development, endocrine function and control, ionic regulation, immune function and reproduction (Glencross 2009). Fish oil is a rich source of lcPUFA and is often used in artificially formulated diets for various cultivated aquatic organisms. The use of fish oil, however, will have to decrease in the coming decades, due to its high cost and legislation requiring more sustainable farming practices, in particular the sourcing of sustainably caught fish oil or the use of alternatives.

The move towards replacing fish oil in commercial diets will require significant investigation; however, because of the strong correlation between the fatty acid (FA) profile of the diet and the FA profile of the flesh observed in a number of species (Glencross 2009; González-Félix, Silva, Davis, Sam-

