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Commentary

Assessment of Dietary and Nutritional Requirements in Aquaculture

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DESCRIPTION

Successful fish culture requires providing a diet with adequate energy content and nutritional balance to enable the most efficient growth and maintain animal health under certain circumstances. When a low-calorie diet is given to fish, the energy content of the diet is also important because the protein in the diet is used as an energy source. On the other hand, feeding high-calorie foods reduces food intake and slows growth due to a lack of other nutrients needed for normal growth. As protein constitutes the single most expensive item in fish diets, it is necessary to incorporate only the amount necessary for normal maintenance and growth. Excess dietary protein is considered biologically and economically not useful. Incorporating the right amount of non-protein energy sources into your diet determines the efficiency of protein utilization and the growth of fish. Carbohydrates and lipids are the major non-protein sources in fish nutrition. Compared to lipids, carbohydrates are a much cheaper, richer and faster source of energy. Carbohydrates also improve feed pelleting quality due to their fairly good binding properties. Therefore, it is suggested that carbohydrates can be added in excess of the required amount that fish can efficiently use as energy. Again, the use of high fat content as an energy source in the diet can adversely affect the overall body composition of the fish and can also cause problems in pelleting and maintaining feed quality.

Not only is it necessary to measure dietary protein and energy, but it is becoming increasingly important to understand the relationship between these two requirements. A diet with an optimal PIE ratio results in the highest growth, feed conversion ratio, and protein retention. Inappropriate protein, energy levels, and/or their proportions in the diet lead to increased fish production costs and poor water quality due to feed and fish waste. Therefore, they are important in the formulation of commercial feeds.

Lipids, along with protein, are considered as one of the most important nutrients and play an important role in the optimal use of dietary protein for growth. Lipids are almost completely digestible by fish and appear to be preferred over carbohydrates as an energy source. Currently, researchers, feed manufacturers and farmers are paying particular attention to developing feeds that maximize nutrient retention while minimizing nutrient loss. Fish are known to use protein as an energy source rather than lipids and carbohydrates. Therefore, from a nutritional, environmental and economic perspective, it is important to improve protein utilization for tissue synthesis rather than energy purposes. Optimizing dietary protein/energy ratios has been shown to play an important role in protein and energy utilization. Increased DE content in fish diets with lipid supplementation has been shown to have a protein-saving effect and thus reduce nitrogen to the environment.

Increased dietary lipid levels should be carefully evaluated as increased lipid deposition can affect dead body composition. The location and composition of lipid deposits also strongly influences the nutritional value, sensory properties, conversion yield, and storage time of carcasses of fish. Excess lipids not only suppress *de novo* fatty acid synthesis, but also reduce the ability of fish to digest and absorb them, resulting in slower growth rates. Again, excess fat in the diet can also lead to the production of oily fish, ultimately adversely affecting the taste, texture and shelf life of the final product. Too much fat in the diet can cause problems with feed production.

The amount of protein in a fish diet is affected by the protein-energy ratio, protein digestibility, and the amount of non-protein energy in the diet. When the non-protein energy available in the feed is inadequate, dietary protein is delaminated and supplied with energy in the body instead of being used for tissue growth and protein synthesis. Excess protein causes high ammonia production, which can affect spontaneous feeding and fish growth. Appropriate amounts of non-protein energy sources such as lipids and carbohydrates in the diet have been reported to minimize the use of protein as the most economical energy source for carbohydrates. Hot water fish such as omnivores and carp have higher carbohydrate utilization than other species. It is important to provide enough carbohydrates in the diet to reduce protein catabolism for energy and glucose synthesis. This reduces protein retention and increases nitrogen release into the environment.

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