Testing Soybean Meal in Tilapia Diets

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Aquaculture, the production of aquatic species such as finfish, shellfish and aquatic plants in a controlled environment, is the fastest growing segment of agriculture in the U.S. (report by the USDA).

American consumers spend more than $46 billion each year on fish and shellfish. This total includes about $31 billion purchased in food service establishments, and about $15 billion in retail stores. The thousands of firms which produce, process and distribute the fish and shellfish, contribute more than $24 billion to the U.S. Gross National Product. In 1980 U.S. production was 203 million pounds with a farm gate value (commodity price) of $192 million. By 1990, U.S. production had quadrupled to nearly 860 million pounds valued at $760 million.

On average Americans today consume 14.9 pounds of seafood each year. This compares to about 10.3 pounds per person in 1960 and 12.5 pounds per person in 1980. Most of the increased interest in seafood is due to the rise in health consciousness. Seafood is low fat, easily digestible, and a good source of protein, minerals, and vitamins.

Due to the ever-growing demand for aquaculture products the search is ongoing to find high-quality food sources for aquaculture livestock. Most important is the discovery of high quality, highly palatable protein sources. The Northern Aquaculture Center believes it has found that protein in soybeans.

Recently NAC completed a feed trial using soybean meal as the primary source of protein in Tilapia diets.

Weight gain and feed conversion ratios (FCR) were compared in an 84-day feeding trial using all male Tilapia nilotica fingerlings stocked at an average body mass of 2.88 g (.10oz) each. This trial was designed to examine the differentiation in feed conversion and weight gain that would occur by varying the quantity and type of soybean meal used in the feed formulations.

The diets formulated were designed to incorporate either expeller or hexane-solvent extracted soybean meal as the primary source of protein. The diets can be categorized as either expeller or hexane-solvent extracted (solvent extracted). Within the two soybean meals, the diets were further divided into three subsets each. Each subset consisted of varying amounts of soybean meal (SBM). Diets 1, 2, and 3 had 50 percent, 40 percent, and 30 percent solvent extracted SBM, respectively. Diets 4, 5, and 6 had 50 percent, 40 percent, and 30 percent expeller SBM, respectively. The target protein level for each diet was 36.2 percent.

The fish were stocked into 18 circular tanks (three replicates for each of the six diets), each with a capacity of 681 liters (180 gallons). Each of the replicate tanks was self-contained and independent of the others (having its own filtration). Temperature of each tank was maintained by thermostat-controlled submersible heaters and adjusted to maintain a mean water temperature of 28 C (82.4 F). Each of the 18 tanks was stocked with a sample number of 65 individuals (n=195/diet) (total n=1170). Initial weights were recorded as total weight of fish per tank. Fish

were fed to satiation twice daily. Small amounts of feed were repeatedly offered during a period of time until fish no longer accepted additional feed (feed was seen floating uneaten in each tank). Fish were considered satiated when no more feed was accepted during any one feeding. The feedings occurred once in the morning and once in the afternoon. Weight of feed was recorded after the afternoon feeding. The total weight of feed given was recorded on a daily basis.

Fish were weighed initially on May 5, 1999 and again on June 16, 1999, June 30, 1999 and conclusively on July 29, 1999. Weights were recorded as weight of fish per tank. The final trial weights were analyzed using the Student-Newman-Keuls (SNK) test for variable: GROWTH. SNK results showed a significant difference between diets 2 and 6. Diet 2 had a mean growth of 85.367g (3.01oz.) and diet 6 had a mean growth of 58.100 (2.05oz.). An SNK was also performed on the Feed Conversion Ratios (FCR) with a mean of 1.13333 for diet 6, solvent extracted SBM, and a mean of 0.98000 for diet 2, expeller SBM. Results of the trial indicate that solvent extracted SBM diets (diets 1, 2 and 3) provided greater weight gain and better FCR than did the expeller diets (diets 4, 5 and 6).