



SUCCESS STORY

Optimization of vitamin C in Feed for Snakehead Fish (*channa striata*) Culture in Vietnam

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Improved feeds decrease negative environmental impacts



Experimental ponds containing hapa cages used during snakehead feeding trials (Photo courtesy: Pham Minh Duc).

In Vietnam, snakehead (*Channa striata*) is considered one of the most valuable cultured fish due to its high quality meat and reasonable price. As a result, total production of snakehead in the Mekong Delta increased rapidly from 14,478 metric tons in 2006 to 77,682 metric tons in 2016. The growth of snakehead aquaculture increased the need for pelleted diets with alternative protein sources to decrease the traditional use of small, wild-caught fish harvested from the Mekong Delta.

Research collaborations between Can Tho University (CTU) in Vietnam, University of Rhode Island (URI), University of Connecticut (UConn), and Oregon State University, in the US, addressed the need to reduce the reliance on small-sized fish as feed by formulating a pelleted feed with soy protein without compromising the growth performance and marketability of farmed snakehead. AquaFish partnered with private feed mills in the Mekong Delta, leading to over 10 manufacturers committing to making the pelleted feed. In 2011, only 33% of Vietnamese snakehead farmers in 13 southern provinces used pelleted diets, but by 2015 more than 90% of those farmers used the pelleted feeds developed by AquaFish.

Farmers, however, reported that fish fed pelleted feed often had a ‘hunchback-like’ appearance. Despite the fact that the feed originally contained 80-150 mg/kg vitamin C, on-farm, commercial-scale trials confirmed these reports and revealed that 20% of fish fed pelleted feed developed spinal column abnormalities, such as lordosis and scoliosis, which are commonly associated with vitamin C deficiency.

Vitamin C supplementation has several benefits, such as decreased likelihood of skeletal deformities and increased fish growth, survival, and disease resistance. Therefore, AquaFish incorporated laboratory and on-farm trials into the next phase of research to determine the optimal dietary vitamin C levels.

During laboratory feeding trials, soy-based fish meal (45% protein) was supplemented with varying levels of vitamin C (ranging from 0 to 2000 mg vitamin C per kg feed). Results showed that growth rates and protein efficiency ratios were significantly greater in fish ingesting vitamin C supplemented feed compared to diets without vitamin C. Optimal growth

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rates of snakehead resulted in fish fed diets supplemented with 500 mg/kg vitamin C. Farm trials confirmed that lab results also apply to on-farm conditions, where soy-based pelleted diets containing vitamin C resulted in significantly lower rates of spinal abnormalities, and greater growth rates and protein efficiency ratios, when compared to fish fed commercial feed.

Overall, AquaFish research revealed that feed supplemented with 500 mg/kg vitamin C, a larger amount than previously thought adequate (80-150 mg/kg), resulted in optimal production costs and fish growth in commercial-scale farms. Improved fish health and fish growth from vitamin C supplemented feed has great potential for increasing farmers' incomes and decreasing negative environmental impacts by reducing reliance on previously declining stocks of wild fish. These findings serve as a fundamental step in building a more sustainable and cost-effective snakehead aquaculture strategy that maximizes fish health and productivity in the Mekong Delta and beyond.