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Health & Welfare

Essential oils increase weight gain in channel catfish

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Fillets tended to have more protein, less fat

Research with domestic livestock that suggested essential oils can improve growth, feed efficiency and the ability to ward off diseases is carrying over to aquaculture species.

Essential oils, also known as volatile oils, are highly scented compounds of fragrant grasses, trees and plants. The word “essential” suggests that essential oils are vital to the life of plants, but this is not the case. The word “essential” is derived from the word “quintessence,” which can be defined as the “pure and concentrated essence of a substance.” Essential oils contain most of the plants’ active substances.

Many essential oil mixtures have been used for centuries in traditional medicine in the treatment of bacterial and viral diseases, inflammation, pain and even some forms of cancer. Today, they are commonly found as ingredients in cosmetics, perfumes, cleaning products and flavorings for food and drinks.

As the popularity of essential oils increases, products specific to the domestic livestock and aquaculture markets have emerged. These products – often sold as feed additives – appear to be associated with realized performance gains. Several studies have focused on unraveling the mode of action of the oils. It seems the modulation of gut microflora plays an important role, but many questions remain on how the additives provide their apparent medicinal effects.

At the animal level, research with domestic livestock suggests that essential oils may improve growth and feed efficiency, and increase the ability to ward off diseases. Although fewer studies using the oils in fish have been conducted, the data also suggest that essential oils have benefits in improving growth and controlling diseases.

Current research

At the Thad Cochran National Warmwater Aquaculture Center in Stoneville, Mississippi, USA, the authors conducted a trial to examine the effects of a commercial matrix-encapsulated essential oil (Biomin P.E.P. MGE) on weight gain, specific growth rate, feed-conversion ratio (FCR) and survival of

channel catfish.

Groups of 50, 32.4 ± 1.7-gram fish per tank were randomly assigned to two treatments with five replicate tanks per treatment. Treatment 1 was a control with a 32 percent-crude protein floating commercial diet. Treatment 2 used the same diet with the addition of the essential oil at 200 g/mt.

The 1.15-m^3 tanks were supplied with recirculated pond water and aeration. The fish were fed once a day to apparent satiation for 12 weeks and weighed every four weeks. Water quality was monitored throughout the study. At the end of the study, fillets from two fish per tank were analyzed for protein and fat.

Results

Water temperature and dissolved-oxygen concentrations averaged 32.9 degrees-C and 9.3 mg/L, respectively. Total ammonia nitrogen and nitrite averaged 0.34 and 0.01 mg/L, respectively. By week 8, fish in treatment 2 gained more weight (51.4 ± 1.9 versus 37.3 ± 5.1 grams/fish) and had a higher specific growth rate (1.8 ± 0.1 versus 1.5 ± 0.1) than the controls (P < 0.03).

At the end of the study, fish that received the essential oil product gained more weight (76.9 ± 2.0 versus 53.4 ± 3.2 g/fish) and had a higher specific growth rate (1.5 ± 0.1 versus 1.3 ± 0.1) than the controls (P < 0.001) (Table 1). In addition, fish fed the essential oil consumed more feed (104.3 ± 3.6 versus 79.6 ± 3.0 grams/fish), suggesting an increase in feed palatability.

Peterson, Growth performance of channel catfish fed diets, Table 1

Treatment	Initial Weight (g)	Final Weight (g)	Weight Gain (g)	Specific Growth Weight	Feed Conversion Ratio	Survival (%)
Control diet	33.40	88.40[a]	53.4[a]	1.30[a]	1.51	89.5
Diet with essential oil	31.40	112.80[b]	76.90[b]	1.50[b]	1.36	90.0
Standard error	1.94	2.48	2.17	0.03	0.06	4.8

Table 1. Growth performance of channel catfish fed diets with and without an essential oil additive for 12 weeks. Values with different letters within columns are significantly different (P < 0.001).

There was an improvement in FCR (1.36 versus 1.51) in fish that received the essential oil, although it was not statistically different (P > 0.05). The survival rates of about 90 percent were similar in both treatments, as no natural outbreaks of disease were recorded. Fillet composition analysis showed that the amount of fat in the fillets of fish fed the essential oil was lower (16.1 versus 18.7 percent), and the amount of protein was higher (79.6 versus 76.5 percent) compared to controls (P < 0.09).

Perspectives

The results showed that fish fed an essential oil consumed more feed and gained more weight. In addition, fillets from fish fed the oil tended to have higher amounts of protein and lower amounts of fat.

The mechanisms through which the essential oil increased weight gain were not determined in this study, but may be related to an increase in appetite. The addition of essential oils to catfish diets may prove beneficial in improving the palatability of feed as well as the growth efficiency of channel catfish.

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