Cooperative Extension Service

Off-Flavor

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Off-flavor in channel catfish is caused by the uptake of various chemical compounds that impart tastes and odors which render the fish flesh unpalatable. Catfish farmers now consider off-flavor to be the biggest problem facing the industry. During July, August and September, approximately 50 to 70 percent of all harvestable sized channel catfish are judged to be off-flavor at any given time and rejected by processors.

The Causes of Off-Flavor

Two chemical compounds, Geosmin and 2-Methylisoborneol (MIB), have been identified as the cause of a majority of off-flavor incidents. Geosmin and MIB are secondary metabolic products of some species of bluegreen algae and actinomycete bacteria. MIB causes a flavor to be imparted to the flesh described as "musty" or "lagoon" and geosmin results in "earthy" or "woody" flavors. These two compounds are extremely potent. Geosmin and MIB can be tasted in the water by humans at concentrations of 0.01 and 0.03 parts per billion (ppb), respectively. In other words, if you added 1 ounce of geosmin or 3 ounces of MIB to a catfish pond that covers 600 surface acres, you would taste it.

A number of other less frequent off-flavors have been recognized such as moldy, astringent, rotten and sewage for which no chemical compounds have been identified. It should be noted that common farming chemicals can and do impart off-flavor in channel catfish. A good example is diesel fuel which has been recognized in a number of off-flavor cases.

Several studies have been conducted to determine the environmental factors responsible for the onset of off-flavor in channel catfish. Studies have shown that off-flavor has been encountered since the beginning of commercial culture, but in recent years the problem has greatly intensified. To date, research results have been somewhat inconclusive. The off-flavor phenomenon is most commonly associated with periods of high water temperatures, high fish stocking densities and heavy feeding regimes which are common under today's production techniques as opposed to the conditions found in the early years of the industry. These eutrophic environmental conditions are ideal for the development of heavy bluegreen algae and actinomycete populations. However, off-flavor occurs during every month of the year with and without dense population of these microorganisms.

Off-flavor compounds can be absorbed in a matter of minutes once they are present in pond water. Fish absorb chemical compounds through their gill membranes as well as through their digestive tract. The compounds are fat soluble and are stored in fatty tissues. The amount of off-flavor absorbed by fish seems to be related to water temperatures, environmental concentrations and exposure time.

Methods of Control and Management

Catfish farmers are searching for answers on how to reduce and eliminate off-flavor problems. There are a number of products on the market today claiming to be the answer to off-flavor problems. To date, there is no conclusive scientific evidence that any of these products work. It is advised that farmers not waste their money on these "sure-cure" products.

The use of herbicides to control off-flavor has not been shown to work and may even increase the problem. Herbicides are used to control bluegreen algae blooms. As the algae cells die and decompose, they may release off-flavor compounds into the water and thereby aggravate the problem. The algae bloom is sure to come back and in the meantime you are faced with poor water quality.

Proper pond management can increase your chances of not developing off-flavored fish. Reducing stocking and feeding rates and managing ponds so that catfish are ready to sell during periods other than July and August will significantly improve your odds of selling on-flavor fish. In addition, dividing large ponds into smaller units will increase the probability of having at least some ponds on-flavor and ready to sell at any given time.

Purging Off-Flavor

Currently, one promising option for handling off-flavor fish is through the use of raceways or flushout ponds to purge the off-flavor compounds. This method involves holding off-flavored catfish in a small pond or raceway and continuously flushing it with well water until the off-flavor is removed.

Recent studies have found that the "musty" and "lagoon" flavors produced by MIB can be purged from catfish in three to five days in clean water. The water is exchanged in the system three or more times per day. During the purging procedure, the fish are at high density (30,000 to 70,000 pounds per acre) and fed very little, if any. As a result, catfish lose 1 to 5 percent of their body weight.

The "woody" and "earthy" off-flavors associated with geosmin are not as easily purged. It may take three to four weeks with the fish in clean water for the off-flavors to dissipate. It is not feasible to purge geosmin in a similar manner as with MIB. The fish would lose a large percent of their body weight and become susceptible to disease outbreaks. The manager must wait for the geosmin to dissipate from the pond water before recovery can begin. Geosmin and MIB are removed from ponds by evaporation and biodegradation through the actions of naturally occurring microorganisms. It is extremely important for pond managers to know exactly what compounds are responsible for the offending flavor before the flushout pond/raceway method is chosen.

If you don't have the facilities for flushout ponds or geosmin is the compound causing the problem, you will have to wait a few days or weeks for the fish to come back on-flavor. Any way you look at it, off-flavor is a very time consuming problem.

The Economics of Off-Flavor

Catfish producers are most affected by off-flavor because they are unable to sell their fish when it is economically desirable. Off-flavor interferes with restocking and production management plans, prolongs the period of risk, delays cash flow and can result in the production of larger fish (if the bout with off-flavor lasts for an extended period of time) which convert feed less efficiently and receive lower market prices per pound. Off-flavor can also prevent the sale of fish when the market is offering high prices or when catfish must be sold as a result of proliferative gill disease (hamburger gill disease) to avoid massive economic losses.

Even though off-flavor results in economic hardship for the producer, it is imperative that the processor thoroughly check fish for off-flavor and keep their standards high. When fish are recovering from an episode of off-flavor, not all the fish will come back on-flavor at the same time. This means there is a chance some bad fish could get through to the market if a processor is not extremely thorough. The result could mean the loss of new customers and long term damage to the channel catfish's image.

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