

MINISTRY OF EDUCATION

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OFF-FLAVOUR DETECTION IN TILAPIA CULTIVATED IN CONDITIONS IN WHICH AN INORGANIC NANOPARTICLE-BASED PRODUCT THAT STIMULATES THE ACTIVITY OF MICROORGANISMS THAT REDUCE ORGANIC MATTER WAS APPLIED

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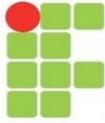
ABSTRACT: Off-flavour characteristics consist of undesirable odours/flavours that are acquired by fish during the process of pisciculture. The fish take on these odours by absorbing substances through their gills that are produced by cyanobacteria and remain dissolved in the water. These substances can also be ingested by the fish intentionally or accidentally as it is feeding.

Such off-flavour problems occur most frequently in fish that are farmed in intensive pisciculture conditions or reared in natural ponds, where the frequent feed intervals and consequent accumulation of nutrients engenders an intense proliferation of cyanobacteria (*Oscillatoria* spp., *Anabaena* spp. e *Simploca* spp.). The cyanobacteria are responsible for the production of geosmin (GEO), which is associated with the flavour or odour of earth or mud, and the production of 2-methylisoborneol (MIB), which is responsible for the flavour or odour associated with mould.

This study had the aim of identifying the threshold for the GEO and MIB compounds in samples of fish that can be sensed through either smell or taste by tasters that are sensitive enough to do so. The fish that were used for the taste test were tilapia that were farmed in breeding ponds to which an aqueous solution of inorganic nanoparticles that stimulates the activity of microorganisms that reduce organic matter was applied. The Nile tilapia, or *Oreochromis niloticus*, were reared for a period of 183 days in three breeding ponds that were filled with groundwater at the Agrícola Famosa farm, which is located in the municipality of Icapuí, in the state of Ceará, approximately 230 kilometres from the capital city of Fortaleza.

The fish were then cultivated in the fingerling and growing stages for a period of 185 days. These GIFT (Genetically Improved Farmed Tilapia) were purchased from Fazenda Aquabel in the district of Icarai de Amontada, in the state of Ceará. The fish were put into three plastic tarp lined breeding ponds (corresponding to three different levels of treatment). Each pond had a useful volume of 600 m³, but were filled with 500 m³ of water, and had a stocking density of 13 fish/m³. Therefore, 6,500 fish received each level of treatment.

The fish had initial average weights and average lengths of 20.3±0.4 g and 9.6±0.8 cm, respectively. They were fed at an initial daily rate of 6% of their biomass, eight times per day. The feeding was then reduced to a rate of 1.5% of their biomass, six times per day. The fish were fed with a nutritionally balanced, extruded aquafeed containing 35% and 32% raw protein, respectively, that was thrown directly onto the surface of the water. During the cultivation of the animals, a product was added to the breeding ponds to aid in the reduction of the organic matter in the water. **Known as Biocelerator 500®**, this product is a colourless, aqueous solution of inorganic nanoparticles which was applied in Treatments 1 and 2 at dosages of 1 litre/week and 200mL/day, five days per week, respectively.



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Biomix Gel®, a bioremediator for use in reducing the amount of organic matter in water, was used as treatment agent 3 at a dosage of 60 g/week. In order to complete the off-flavour test, five fish from each treatment pond were taken out and processed into fillets. The Qualitative Descriptive Analysis (QDA) is a methodology that is used for determining the terms and procedures that are suitable for evaluating a specific product.

A group of tasters was selected in accordance with their individual capacities to discern differences in sensory characteristics, i.e., to detect differences and intensity between sensory attributes. They were also required to describe these attributes and be capable of using their abstract reasoning. Each of the QDA procedures were undertaken in a room that was specifically configured for the sensory analysis testing. Each phase of the testing required something different of the tasters, who were asked to complete an odour recognition test and identify the off-flavour characteristics in cooked and raw tilapia samples. The samples were separated by treatment type and each taster received ten samples (five raw and five cooked). Each sample was delivered in a plastic container that was opaque and sealed.

The cooked samples were cooked for six minutes in a pan containing water on medium heat. Afterwards, the tasters evaluated the samples in terms of smell and taste. Results showed that the fish that were reared in treatment ponds 1 and 2, in which the Biocelerator 500® was applied, were found to be superior in quality to those that were reared in treatment pond 3, in which the Biomix Gel® was applied.

This demonstrated the higher efficiency of Biocelerator 500® in reducing the organic matter content of the water in these intensive pisciculture fish farming conditions. The fish that were farmed in the treatment pond in which 1 litre of Biocelerator 500® was dosed per week (treatment 1) received off-flavour scores of zero from the sensory analysis evaluators. Alternatively, regarding treatment pond 2, in which 200 mL/day of Biocelerator 500® was applied five days per week, evaluators rated the fish as having low off-flavour intensities.

Lastly, with respect to treatment pond 3, in which the Biomix Gel® was applied at a dosage of 60 g/week, the fish *were rated as having moderate off-flavour intensity*. Despite the fact that the data was not submitted to statistical analyses, one may infer that when the Biocelerator 500® was used, the fish had little to no off-flavour characteristics that were detectable by smell or taste. Such a result is indicative of the quality of the fish meat at the end of the growing cycle, especially when using a weekly dosage of this product with which it is possible to increase the fish's market value.

KEYWORDS: grow-out, organic matter off-flavour, Nile tilapia