



CERTIFICATE NO : **ICASEMH /2023/C0223231**

**EFFECT OF COPPER TOXICITY ON FRESH WATER
EDIBLE FISH**

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ABSTRACT

Copper toxicity in freshwater ecosystems poses a significant threat to the health and survival of edible fish species. Copper, an essential trace element, becomes toxic to aquatic organisms when concentrations in water exceed safe levels, often due to industrial discharge, mining activities, agricultural runoff, and improper waste management. When freshwater fish are exposed to elevated levels of copper, it disrupts critical physiological functions, leading to adverse impacts on growth, reproduction, and overall well-being. One of the primary effects of copper toxicity is respiratory distress. Copper ions interfere with the gill function of fish, damaging the gill tissues and reducing the capacity for oxygen exchange. This impairment leads to hypoxia, causing fish to exhibit symptoms like rapid gill movement, erratic swimming, and reduced feeding behavior. Moreover, copper accumulates in the liver and other vital organs of fish, inducing oxidative stress and damaging cellular structures. This accumulation disrupts enzymatic activity, impairs metabolic processes, and can result in liver and kidney dysfunction. The disruption of nervous system functions is another critical impact, as copper interferes with the synaptic transmission and neural regulation in fish, resulting in altered behavior, reduced predator avoidance, and decreased survival rates. Reproductive health is also affected, with copper exposure leading to lower egg production, reduced fertilization success, and developmental abnormalities in offspring. Chronic exposure to copper can weaken the immune system of freshwater fish, making them more susceptible to infections and diseases. This vulnerability increases mortality rates and negatively affects fish populations, which in turn disrupts the balance of the aquatic ecosystem. Additionally, because freshwater edible fish like tilapia and carp are vital food sources for human communities, copper contamination poses significant concerns for human health and food security. Managing copper levels in freshwater habitats is crucial to protect aquatic biodiversity and ensure the sustainability of fish populations.