



**Influence of Probiotics and Spirulina on Growth  
Performance and the Expression of *gh*, *igf-1*, and *igf-2*  
Genes in Nile Tilapia (*Oreochromis niloticus*) Under  
Sumithion Induced Toxicity**

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Roll No.: 0124/07

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Session: 2023–2024

**A thesis submitted in the partial fulfillment of the requirements for the degree of  
Master of Science in Fish Biology and Biotechnology**

**Department of Fish Biology and Biotechnology  
Faculty of Fisheries  
Chattogram Veterinary and Animal Sciences University  
Chattogram-4225, Bangladesh**

**June 2025**

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**This is to certify that we have examined the above Master's thesis and have  
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## Abstract

Sumithion, a commonly used pesticide in aquaculture, poses potential toxicity risks to fish. This study aimed to evaluate the protective effects of probiotics and *Spirulina* against sumithion toxicity on growth performance including weight gain (WG), specific growth rate (SGR), and feed conversion ratio (FCR), along with the mRNA levels of growth hormone (*gh*) genes in the pituitary and insulin-like growth factors (*igf-1* and *igf-2*) genes in the liver were assessed in Nile tilapia (*Oreochromis niloticus*). Fish were assigned to four treatment groups: Control (no sumithion, probiotics, or spirulina), Sumithion-exposed (0.3 mg/L), Sumithion + Probiotics (1.0 ml/L in water), and Sumithion + Spirulina (50 g/kg feed), with three replicates per group over a 42-day trial. Fish in the sumithion + probiotics group exhibited the highest WG ( $40.86 \pm 7.38$  g) and SGR ( $1.30 \pm 0.22$  %/day) while achieving the lowest FCR ( $0.94 \pm 0.24$ ). The intestine-somatic index (ISI) was highest in the sumithion + probiotics group ( $2.58 \pm 0.49$ ), whereas the hepatosomatic index (HSI) was significantly increased in the sumithion + spirulina group ( $2.32 \pm 0.28$ ). Relative expression of *gh* mRNA in the pituitary was significantly upregulated in fish treated with sumithion + probiotics compared to the other groups. Similarly, a 3-fold and 1.92-fold expression of *igf-1* and *igf-2* respectively were found markedly higher in the sumithion + probiotics group compared to the control in the liver. These findings indicate that probiotics and spirulina can mitigate sumithion-induced toxicity, enhance growth performance, and activate the GH/IGF axis highlighting the potential dietary supplements for improving fish health in aquaculture.

**Keywords:** Sumithion, Probiotics, *Spirulina*, Growth, Insulin-like growth factor, Nile tilapia