



**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**

Shaharier Ahmed

Roll No.: 0124/07

Registration No.: 1486

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

Authorization

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The author

June 2025

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**This is to certify that we have examined the above Master’s thesis and have
found that is complete and satisfactory in all respects and that all revisions
required by the thesis examination committee have been made**

.....
Dr. Ishrat Zahan Anka

Supervisor

.....
Dr. Md. Mahiuddin Zahangir

Co-supervisor

.....
Dr. Md. Mahiuddin Zahangir

Chairman of the Examination Committee

Department of Fish Biology and Biotechnology

Faculty of Fisheries

Chattogram Veterinary and Animal Sciences University

Khulshi, Chattogram-4225, Bangladesh

June 2025

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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 ± 7.38 g) and SGR (1.30 ± 0.22 %/day) while achieving the lowest FCR (0.94 ± 0.24). The intestine-somatic index (ISI) was highest in the sumithion + probiotics group (2.58 ± 0.49), whereas the hepatosomatic index (HSI) was significantly increased in the sumithion + spirulina group (2.32 ± 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