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Ameliorative Role of Spirulina on Sumithion-Induced Hematological and Molecular Altarations in Nile tilapia

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Abstract

This study evaluated the ameliorative role of Spirulina in overcoming the adverse effects of the organophosphate insecticide sumithion on Nile tilapia (Oreochromis niloticus). Sumithion is extensively utilized in agricultural land and aquaculture ponds. The indiscriminate use poses a potential threat to many non-target organisms, including fish. For conducting the experiment, 240 Nile tilapia (O. niloticus) fingerlings, with an average weight (12.84 ± 0.09 g) were collected and randomly distributed in four treatments with three replications of each, namely T1 (Control), T2 (Sumithion; 0.3 mg/L), T3 (Spirulina; 50gm/kg), and T4 (Sumithion + Spirulina) for 42 days. According to the experimental outcomes, hemoglobin (g/dL) and blood glucose (mg/dL) levels were significantly ($p < 0.05$) altered in sumithion-treated fish. Regarding erythrocytic abnormalities, both cellular (teardrop, twin, spindle) and nuclear (nuclear buds, notched nuclei, karyopyknosis) abnormalities were most abundantly identified in sumithion-treated fish. Additionally, sumithion exhibited adverse effects on antioxidant and immune-related genes expression. In T2 (Sumithion), the expression of the antioxidant gene Superoxide Dismutase (SOD) was significantly ($p < 0.05$) downregulated, whereas the immune-related genes Tumor Necrosis Factor-alpha (TNF-α) and Interferon-gamma (IFN-γ) were significantly ($p < 0.05$) downregulated. However, Spirulina's protective role helped reverse the alterations that sumithion treatment induced. Consequently, Spirulina supplementation improved blood parameters, structure of erythrocytes, and expression of genes. The present study unveiled the implementation of dietary Spirulina to be an effective approach to mitigate sumithion-induced stress and optimize health condition in Nile tilapia by improving hemato-biochemical index and antioxidant-immune genes expression.

Key Words: *Aquaculture, Pesticides, Toxicity, Bioremediation, Spirulina, Nile tilapia*