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Unveiling the role of spirulina in the mitigation of sumithion-induced toxicity in Thai pangas, *Pangasianodon hypophthalmus*

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Abstract

Sumithion is an organophosphate insecticide, widely used in aquaculture ponds to eradicate aquatic insect (mainly tiger bugs), typically applied before stocking fish larvae. However, it adversely affects non-target aquatic organisms, particularly fish. This study was conducted to evaluate the potential toxicity of sumithion in Thai pangas (*Pangasianodon hypophthalmus*) as well as the role of dietary *Spirulina platensis* in mitigating the toxic effects of sumithion. Over a 42-day trial, a total 240 of striped catfish fingerlings were exposed to four different treatments: control (without Sumithion or Spirulina), sumithion (0.6 mg/L), Spirulina (50 g/kg feed) and combined treatment (sumithion + Spirulina) with three replicates each. Sumithion-treated fish exhibited altered hemato-biochemical indices (hemoglobin and glucose) as well as erythrocyte morphology such as cellular (teardrop, twin, fusion) and nuclear (nuclear bridge, nuclear buds, notch, karyopyknosis) abnormalities. Furthermore, the sumithion-treated fish exhibited a considerable difference in the expression levels of antioxidant genes with down-regulated of *SOD*, *CAT* and up-regulated of *GPx* as well as immune-related genes with up-regulated of *MHC-II* and *IFN-β2* and down-regulated of *IL-1β* and *IFN-α2* compared to control. Moreover, it has been found that Spirulina along with sumithion improves the immunological, anti-oxidative, and physiological conditions of fish. The present study unveiled the implementation of dietary Spirulina to be an effective approach to mitigate sumithion-induced stress and optimize health condition in striped catfish by improving haemato-biochemical index and immune-antioxidant genes expression.

Keywords: *aquaculture, spirulina, sumithion, antioxidant genes, immune modulation*