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Fate of Cypermethrin in Freshwater Aquaculture: Influence of Antidote Treatment Strategies

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Dispersal of environmental pollution could be attributed to variety of sources from different industrial and agricultural activities. In fish, pollutants can be captured from persistent contaminants mainly of agricultural origin. Accordingly, this might seriously lead to the generation of potentially toxic elements such as free radicals. However, antioxidants such as falvonoids are thus capable to inhibit or neutralize this kind of toxins. Flavonoids are polyphenolic compounds occurring naturally in plants that have profitable effects on human health. In the present investigation, we examined the influence of such natural antioxidants on the oxidative stress induced by cypermethrin (a synthetic pyrethroid insecticide) used widely to control pests in domestic, industry and agriculture of Jordan.

One hundred sixty *Tilapia zilli* fish with the same age (six months) and average body weight 150g were exposed to 42.7μg cypermethrin/L administered in bathing water to evaluate the time dependent deterioration of fish health. Results showed severe tissue damage due to cypermethrin intoxication suggesting the presence of oxidative stress and pathogenesis of cypermethrin and its role to induce tissue toxicity. The behavior of the first treated fish group with cypermethrin could be noticed immediately when fish lose their activity with apparent reduction in food consumption and subsequently to death. In contrast, the regression of damage was observed at later stages in control groups received similar dose of toxin that were pre-treated but were given incorporated diets of 300 and 400 mg naringin and silymarin/kg body Wt, respectively (as two effective antioxidants), for a period of 14 days. Results demonstrated that naringin and silymarin surprisingly void control fish and/or antioxidants pre-treated fish (*Tilapia zilli*) from the cypermethrin induced oxidative stress and tissue damage.

Yet, little is reported to have an effective natural treatment to the acute tissue injury induced by the cypermethrin on aquactic organisms. Some studies confirmed the oxidative stress induced by cypermethrin and it further contributes to the acute toxicity in several fish species. However, the protective effect of naringin and silymarin as two natural antidotes implemented in the present study might suggest new insights into the potential alternative therapeutic solution to tissue injury induced by cypermethrin. This study highlights also the importance of naringin and silymarin protective actions against the oxidative stress imposed by this kind of toxin on the experimental fish. This was supported by the biochemical and histological analysis in the pretreated groups of fish. It could be concluded that the cypermethrin might be metabolized and eliminated slowly by fish that might explain its higher toxicity in fish in contrary to what has been reported in mammals or birds. Utilizing such outcomes could promote future intensive fish aquaculture through knowledge dissemination to private enterprise on the effectiveness of our investigated two antidotes.

Keywords: *Tilapia zilli, Cypermethrin , Aquaculture, Toxicity, Flavonoids, Naingin, Silymarin.*