The Protective Role of Spirulina Platensis Against the Alterations in Some Biomarkers in Crayfish (*Procambarus clarkii*) Exposed to Polyethylene Nanoplastics

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Abstract

Nanoplastics (NPs) pose potential environmental risks to crustaceans such as growth delay, inflammation, stress responses, reproductive and developmental toxicity. *Spirulina platensis* is considered as antioxidant, immunomodulatory, and anti-inflammatory species. This work aims to elucidate the potential involvement of *S. platensis* in hindering the accumulation of polyethylene nanoparticles (PE-NPS) in crayfish (*Procambarus clarkii*) and reducing their detrimental impacts. In this study, we divided the crayfish species into four groups; 1) control, 2) PE-NPS (10mg/L), 3) PE-NPS (10mg/L) + *S. platensis* and 4) *S. platensis.* The group exposed to PE-NPS only showed 1) an increase in oxidative stress enzymes ((the superoxide dismutase (SOD), glutathione peroxidase (GPx), glutathione (GSH), and total active cannabinoids (TAC); 2) a decrease in the activity of the nervous and immune system enzymes (Nitric Oxide (NO), acetylcholinesterase (AchE), lysozyme activities LYZ, phenoloxidase (POX) and acid phosphatase (ACP)); 3) a reduction in the hemocyte counts as a circulatory system marker. In the group treated with PE-NPs+ *S. platensis*, there was a positive effect on 1) the oxidative stress enzymes which reduced by almost 9%; 2) the neurological parameters have shown a significant increase by around 10.5%; the immune parameters (LYZ and ACP) showed a slight increase by almost 6.5%, while the POX enzyme elevated by 18% till reached to its normal activity. 3) the hemocyte counts increased significantly with 18%. The results illustrate the ability of the *S. platensis* to reduce the adverse impacts of PE-NPs on crayfish.

Keywords

Procambarus clarkii, nanoplastics, *Spirulina platensis*, oxidative stress, neurological and immunological activity, liver function, hemocytes.

Highlight:

- PE- NPS caused detrimental impact to *Procambarus clarkii.*
- Oxidative stress, liver function and hemocytes counts were observed.
- Neurological and immunological enzymes were used as biomarkers.
- *Spirulina platensis* potentially reduce the deteriorating effects of PE- NPS.