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Interactions of natural organic matters with nanoparticles and their combined effects in aquatic organisms

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In the last decade, population growth and increased industrial activity has led to both intentional and inadvertent release of nanoparticles (NPs) into the environment. Therefore, large number of NPs exist in the environment for which toxicity data are not sufficient due to limited understanding of their behaviour in the aquatic ecosystem and bioavailability to the aquatic organisms. The present study has attempted to investigate the behaviour of titanium dioxide nanoparticles (TiO₂ NPs), one of the most commonly used NPs in different experimental buffers in the presence of humic acid (HA). Also, the effect of TiO₂ NPs were assessed in different aquatic organisms with and without the presence of HA. The results demonstrate that the HA increases the dispersion of TiO₂ NPs in the experimental buffers by adsorption on the surface of NPs. The adsorption of HA on TiO₂ NPs was mainly driven by electrostatic interactions as observed by deference in the values of zeta potential in the presence and absence of HA. The maximum aggregation was observed in the E3 medium even in the presence of HA. The intensity of TiO₂ NPs sedimentation was observed in the order: E3 media>Dryl's buffer>MilliQ water. Interestingly, the ecotoxicity results on the *Tetrahymena pyriformis* and *Danio rerio* showed that presence of HA reduces the toxicity of TiO₂ NPs. The above study had following environmental significance: it provides significant insights on the effects of humic acid in the experimental buffers extensively used in the ecotoxicological assays. The finding suggests that the use of HA in the ecotoxicological assays will facilitate the long term risk assessment of NPs by increasing the stability.

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