Phytoremediation of samples extracted from wastewater treatment plant and their socioeconomic impact

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ABSTRACT

The physico-chemical and bacteriological quality was evaluated in wastewater samples before and after treatment by microalgae enrichment. Three types of wastewater samples – raw water, inlet water and outlet water – were taken directly from the wastewater treatment plant and subjected to microalgae enrichment culture during two months. The main objective of this work was to apply a phytoremediation process based on the use of compulsory microalgae treatment of wastewater from treatment plants compared to other secondary treatments. The biomass of microalgae was extracted to determine the concentrations of phenolic compounds, sugars and especially lipids, which can be subsequently transformed into biodiesel. As a result, the pH showed a significant increase after microalgae proliferation, with values ranging from 9.94 to 10.36. Bacterial community analysis before and after microalgae culture showed a clear shift in biomass content. The total coliform (TC) and the fecal coliform (FC) contents decreased after microalgae enrichment. In addition, the fecal streptococci (FS) and *Pseudomonas* present in the different wastewater samples completely disappeared after treatment. The applied phytoremediation process showed a drop until the disappearance of the contagious microbes – which present a very serious health risk – due to the release of the quinic acid. The quinic acid observed in the treated waters exceeded the content of 464.328 mg/L. This phenolic compound naturally produced during the process demonstrated a very effective antimicrobial power. However, a significant increment of 100% of phenol compound removal was observed after microalgae enrichment. The lipid content in the various studied samples appeared after microalgae culture. In addition, the heavy metals, namely cadmium and chromium, were completely eliminated after the treatment. Several socioeconomic advantages can be achieved by the use of this process, notably the environmental advantages of bioenergetics and economic and social benefits of the non-expensive valorization of wastewaters for irrigation.

Key words | economic and social benefits, microalgae, phytoremediation, wastewater

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