

Bioremediation and mangrove: an original method for wastewater treatment

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Abstract

The use of mangrove as natural domestic wastewater treatment is currently proposed as an alternative solution applicable to the tropical littoral regions. Characterized by high productivity, mangrove trees have a natural ability to absorb nutrients in excess, without any apparent functional or structural disturbances. Mayotte, (French Island, Indian Ocean), is surrounded by a vast lagoon sheltered by mangrove forests. The recent population increases have led to a strong degradation of the environment, associated to productions and diffusions of untreated wastewater in the lagoon.

In this context, a pilot project was designed, (i) to estimate domestic wastewater remediation capacities of mangroves and (ii) to protect this ecosystem with strong ecological and patrimonial values. The originality of this work relies essentially on the development of a new technique of purification, based on the filtration capacity of mangroves, adapted to the tropical insularity.

After 18 months of experiment, the supply of domestic pretreated wastewater on mangrove ecosystem resulted in an increase of mangrove trees growth and an increase of photosynthetic pigment concentrations, correlated with a higher photosynthetic efficiency. The structure and activity of crab populations, engineer species of mangrove ecosystems, did not seem to be affected by wastewater supplies. The analysis of nitrogen kinetic through ¹⁵N isotopic tracing showed that nitrogen is absorbed by mangrove trees (*Ceriops tagal* and *Rhizophora mucronata*), preferentially under the form of NH₄, which is the main form in domestic wastewater.

Taking into account these results and other data and experiments not presented here (water and sediment analyses, bacteriological characterization), mangrove ecosystems seem to be efficient as domestic wastewater treatment on the short term. Additional experiments and long term surveys are required to fully evaluate the wastewater impact on mangroves and the remediation capacity of this ecosystem.

Keywords

ecoremediation, ecological engineering, wastewater, mangle, pilot site