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Biotreatment for in-situ dredging of sediments from the Golfe Juan marina: results of microcosms experiments

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Inoculation of selected bacterial strains in aquatic sediment in order to decrease their volume and organic matter content has been proposed as an alternative to classical dredging. Whereas increasingly applied, this type of in-situ biotreatment was not entirely studied in terms of environmental impacts, such as influence on biodiversity and possible mobilization of pollutants from the solids to the water phase. In parallel to an experimental in-situ operation for the treatment of sediments from the Golfe Juan marina, microcosm experiments were performed at laboratory scale in order to monitor the evolution of bacterial biodiversity in the sediment and pollutants concentration in the water phase after addition of a commercial inoculum to the sediment. Experiments in flasks showed that the rate of mineralization of the organic carbon, initially present in the sediment, increases with the quantity of added inoculum, and that the effect of added bacteria on the CO₂ production is still significant after 80 days for the highest inoculum dose. The inoculum seemed to stimulate metabolisms involving both oxygen and ferric iron as electron acceptors. Column experiments showed a limited increase (maximum 20%) of As, Cu and Zn concentrations in the water column after the addition of inoculum. The concentrations decreased down to the initial value 60 days after inoculation. The structure of the sediment bacterial community showed only slight changes, suggesting that the inoculated bacteria did not become major microbial components of the sediment microflora.

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