PRODUCTION OF SCENEDESMUS SP IN MINE WASTEWATERS FOR THE REMOVAL OF MANGANESE FROM THESE EFFLUENTS

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INTRODUCTION

The generation of acid effluents from the mineral processing carried out in polymetallic mining is a very common environmental pollution problem, due to their high metal content and low pH,. As an example of the "acidic waters" is the copper mine discharge into the Rio Tinto River (the Iberian Pyrite Belt), which creates an extremely low pH (1.0–2.5).

When treating the mining effluent, the Neutralization and Dynamic Coagulation process (NCD), transforms the contaminants into easily separable sludge, delivering a treated effluent of sufficient quality; this allows for subsequent microalgae cultivation to remove any remaining nutrients and generate sludge (microalgal biomass) with added value. Therefore, microalgae production plants can be sited near to the mining effluent treatment plants.

OBJECTIVES

In this paper, the utilization of effluents from polymetallic mining operations for the production of Scenedesmus sp. is studied. The removal of manganese from these effluents is also evaluated

MATERIAL AND METHODS

The study was performed with mining effluent that had previously been treated at two different pH levels, pH 8.5 and pH 9.5, to provide two different concentrations of dissolved metals. The culture experiments were performed indoors but simulating outdoor conditions, and the performance of the cultures and the removal of the heavy metals was evaluated.

Mining effluent with no treatment

Mining effluent treatment plant : NCD process

Microalgae cultivated in treated mining effluent

RESULTS

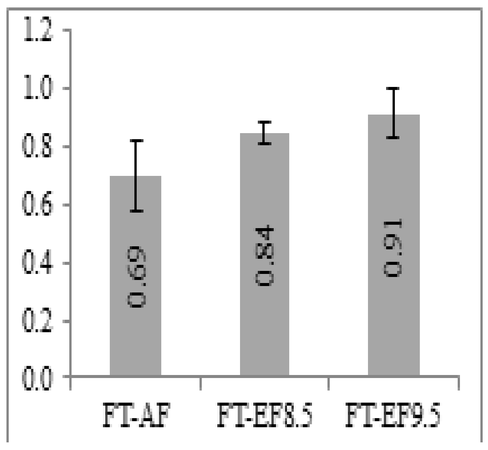

Figure 1

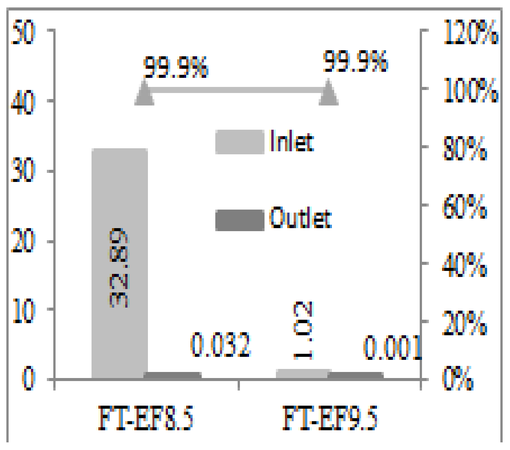

Figure 2

Results show that the mine effluents did not reduce the performance of the Scenedesmus cells; moreover, the biomass productivity increased with respect to the control, whatever the pH, with values up to 0.91 g/L.day being measured at pH 9.5 (Figure 1). Regarding the manganese removal (Figure 2), the inlet concentration was 32.89 ppm for the mining effluent treated at pH 8.5 while the outlet concentration was 0.03 ppm. For the mining effluent treated at pH 9.5, the inlet concentration was 1.02 ppm while the output concentration was 0.001ppm.

CONCLUSIONS

It has been demonstrated that treated mining effluents can be used to produce Scenedesmus sp. biomass, and at the same time remove the manganese contained within them; thus, the treated effluents comply with mine water discharge regulations. Furthermore, the biomass produced can be used in biofertilizers and other high-value products, so the benefit derived from treating the biomass covers the overall operational cost of the facility.

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