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Review

Characterization and biodegradation of soil humic acids and preliminary identification of decolorizing actinomycetes at Mitidja plain soils (Algeria)

A. Badis[1,2]*, F. Z. Ferradji[1,2], A. Boucherit [3], D. Fodil[2] and H. Boutoumi[2]

[1]Centre National de Recherche et de Développement de la Pêche et de l'Aquaculture 11, Bd Colonel Amirouche B.P 67, Bousmaïl (W. Tipaza), Algérie.
[2]Université Saad Dahlab de Blida, Laboratoire pédagogique de microbiologie et biochimie. Département de chimie industrielle. Faculté des sciences de l'ingénieur, BP 270, 09000 Blida, Algérie.
[3]Université Saad Dahlab de Blida, Laboratoire de Génie Chimique, BP 270, 09000 Blida, Algérie.

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There are abundance of lignite resources in Algeria, particularly in Mitidja plain soils which is known by its fertility and a rapid disappearance of natural organic matters (NOM). The scanning electron microscopy (SEM) morphologies and optical parameters observed for soil humic acids (SHAs) made them different to the commercial ones. Three of the most active strains of 19 actinomycetes were isolated and selected from surface soils at this plain. These strains were identified based on cultural characteristics and chemotaxonomic analysis and classified in the genus *Streptomyces*. Growth of these strains was assured on a poor liquid medium containing SHAs as carbon and nitrogen sources and degradation occur only in the presence of glucose. A maximal decolorization extent was obtained for 28 days at 30°C under shake culture (67, 66 and 57% for *Streptomyces* sp. AB1, *Streptomyces* sp. AM2 and *Streptomyces* sp. AH4, respectively). As compared with initial and final structures of SHAs after incubation (28 days), the structural changes in FTIR spectrum and metabolite products analysed by HPLC indicate the capability of the selected *Streptomyces* sp. strains to degrade SHAs and to play a part role in lignin degradation and humus turnover in local soils.

Key words: Soil humic acids, *Streptomyces,* actinomycetes, decolorization, biodegradation.

INTRODUCTION

Humic substances (HS) represent the main carbon reservoir in the biosphere, estimated at 1600 x 10^{15} g C. Due to their crucial role in reductive and oxidative reactions, sorption, complexation and transport of pollutants, minerals and trace elements, sustaining plant growth, soil structure and formation, and control of the biogeochemistry of organic carbon in the global ecosystem, HS are then extremely important to environmental processes (Grinhut et al, 2007).

HS can be operationally divided into three fractions based on their solubility in aqueous solutions as a function of pH. Humic acid (HAs) is the fraction soluble in an alkaline solution, fulvic acid (FA) is the fraction soluble in an aqueous solution regardless of pH, and humin is the fraction insoluble at any pH value. The characteristic that remains associated with each humic fraction after their separation from a natural organic matter (NOM) sample is the high degree of their heterogeneity (Chilom et al, 2009).

In recent years, more and more research for producing several kinds of fuel and industrial materials by biodegradation have been taken into account (Polman et al., 1995; Yong et al., 1995; Thygesen et al., 2009). It has been established that treatment of low-rank coals with aerobic coal-solubilizing microorganisms results in the production of highly polar, heterogeneous materials with a relatively high oxygen content (Davison et al., 1990).

Microbial treatment has been considered as an economically effective and environmentally safe way of pro-

*Corresponding author. E-mail : badisabdelmalek@yahoo.fr. Tel: +213 25 43 36 31. Fax: +213 25 43 36 31.