TITLE: Degradation of textile dyes by bacteria isolated from contaminated soil with methyl orange

AUTORS: Silva, J.R.[1], Moares, F.C.[1], Brito, L.A.A.[1], Mazotto, A.M.[2]

INSTITUTION: 1. Universidade Federal do Rio de Janeiro (UFRJ), Cidade Universitária, Rio de Janeiro, RJ, Brasil.

ABSTRACT

Brazil is one of the largest textile producers in the world, annually are produced 9.4 billion products according the Brazilian Association of the Textile and Apparel Industry. During textile processing, various chemicals are used such as salts, detergents, bleaches and dyes. About 15% of the total dyes used do not attach to the fibers and are discarded in water courses, causing problems such as water turbidity, reduction of the photosynthetic rate and consequent reduction of dissolved oxygen. In addition, some dyes have toxic, carcinogenic and mutagenic properties, triggering imbalances in the local ecosystem and posing a risk to health. About 70% of the dyes used in the industry are of the azo type, characterized by a double bond between two nitrogen atoms. These dyes are recalcitrant and their degradation in the environment can generate aromatic amines that are potentially toxic and carcinogenic. Several treatments for this type of dye have been proposed, among them, the biodegradation. In the present work, dye-degrading microorganisms were isolated from soil contaminated with an azo dye (methyl orange) and the degradation of this and other dyes, such as reactive black 5, yellow gold RNL, reactive violet 5R and reactive red CA were evaluated. The isolates were incubated for 7 days in media containing the dyes under aeration and non-aeration conditions, and spectrophotometer readings (400-800nm) were carried out in order to measure the degradation throughout the incubation time. The results showed that twenty-two isolates exhibited discoloration above 50% in one of the dyes tested. The C6 isolate was able to degrade more than 80% of the methyl orange dye in 2 days under non-aerated conditions, while under aerated conditions the degradation reached only 26% in 5 days. This sample also degraded 71% of black dye in 7 days under non-aerated conditions and 24% under aeration. The L6 sample was able to degrade multiple stains in non-aerated culture after five days of cultivation: 81% of the black dye, 86% of the red dye, and 84% of the violet dye. L7 strain degraded 85% of orange and violet dyes in only 2 days. Nine strains were able to efficiently degrade different dyes (>80%). All degrading-dye strains showed better performance under non aerated growth conditions. The strains that showed more than 75% degradation in one of the tested dyes will be identified and enzymatic tests are being performed to determine the enzymes involved in the process.

Keywords: Azo dyes, Biodegradation, Biotransformation, Soil bacteria, Textile industry

Development Agencies: CNPq, FAPERJ, MCTIC-UFRJ