Electronic Journal of Biotechnology
E-ISSN: 0717-3458
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Biodegradation of a blended starch/natural rubber foam biopolymer and rubber gloves by Streptomyces coelicolor CH13

Electronic Journal of Biotechnology, vol. 15, núm. 1, 2012, pp. 1-14
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Valparaíso, Chile

Available in: http://www.redalyc.org/articulo.oa?id=173323077008

Abstract

Background: The growing problem of environmental pollution caused by synthetic plastics has led to the search for alternative materials such as biodegradable plastics. Of the biopolymers presently under development, starch/natural rubber is one promising alternative. Several species of bacteria and fungi are capable of degrading natural rubber and many can degrade starch. Results: Streptomyces coelicolor CH13 was isolated from soil according to its ability to produce translucent halos on a mineral salts medium, MSM, supplemented with natural rubber and to degrade starch. Scanning electron microscope studies showed that it colonized the surfaces of strips of a new starch/natural rubber biopolymer and rubber gloves and caused degradation by forming holes, and surface degradation. Starch was completely removed and polyisoprene chains were broken down to produce aldehyde and/or carbonyl groups. After 6 weeks of cultivation with strips of the polymers in MSM, S. coelicolor CH13 reduced the weight of the starch/NR biopolymer by 92% and that of the rubber gloves by 14.3%. Conclusions: This study indicated that this bacterium causes the biodegradation of the new biopolymer and natural rubber and confirms that this new biopolymer can be degraded in the environment and would be suitable as a ¿green plastic¿ derived from natural sources.

Keywords

Biodegradation, biopolymer, natural rubber, starch, Streptomyces coelicolor.