Sociedad Argentina de Microbiología General

XIX CONGRESO DE LA SOCIEDAD ARGENTINA DE MICROBIOLOGÍA GENERAL

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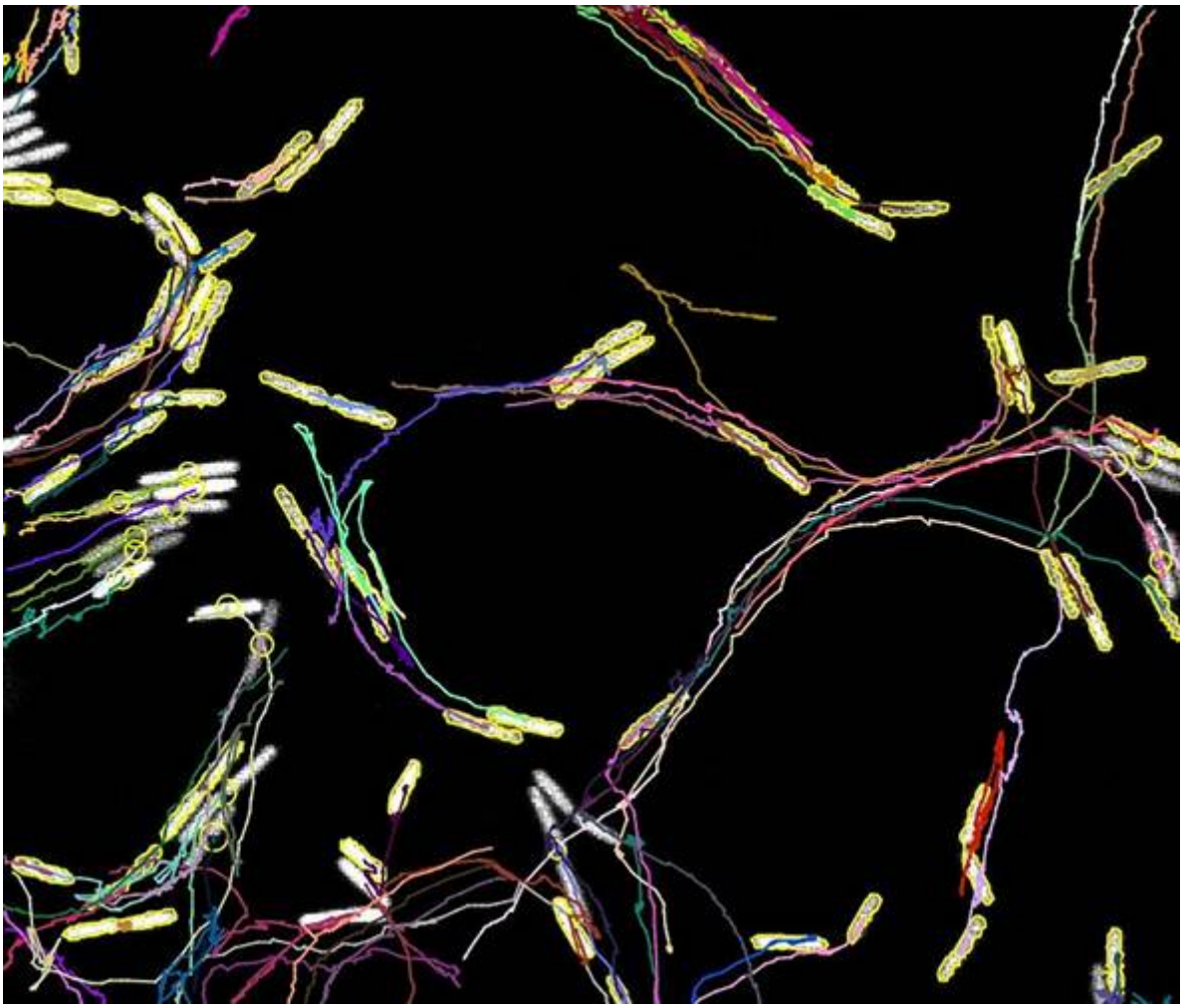

Foto: Se hace camino al andar. Celeste Dea. 1er puesto. Concurso fotográfico SAMIGE 20 años.

201 - Biodegradación, Biorremediación y Biodeterioro

ENHANCEMENT OF A HYDROCARBON BIODEGRADATION PROCESS THROUGH SUPPLEMENTATION WITH A SUNFLOWER OIL INDUSTRY RESIDUE

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Effluent management is a growing concern. It is necessary to look for simple and economical methods for their correct disposal and/or treatment. Among the effluents produced by the naval industry, bilge water is one of the most alarming, being composed mainly of seawater mixed with a variety of hydrocarbons (HC). This waste must be treated on board and/or on land using physical, chemical and/or biological methods, with biodegradation being a promising biological approach. Sunflower oil production generates a by-product called sunflower cake (SC), mainly composed of proteins, oil and fibers, which is typically used for animal feed or discarded. Given its abundance and the need to revalue agricultural residues, new uses are being sought for this waste. It has been described that some sunflower seed proteins have emulsifying properties, which could be used to increase HC solubility in biodegradation processes, potentially enhancing the bacteria capacity of breaking-down the HC. The objective of this work was to utilize a sunflower protein extract as a source of carbon and emulsifiers in a HC biodegradation process by an environmental microbial consortium. First, the SC was dispersed in water, which, after centrifugation and freeze-drying, allowed obtaining two different fractions: one protein-rich water-soluble and another one fiber-rich and insoluble. Both fractions were characterized physicochemically. The protein extract (PE) fraction had a relatively high protein concentration (30% m/m). The emulsifying capacity of the PE was measured by emulsification tests in kerosene-water. Different concentrations (0.01%, 0.05%, 0.1%, 0.2%, 0.5%, 1% m/v) of the fraction were dispersed in water and mixed with kerosene. Emulsions were formed using a vortex. All PE concentrations tested generated at least 30% emulsion (relative to the total), with the two highest concentrations obtaining up to 90% emulsion, with stability over 48 hours. The microbial consortium was introduced into 100 ml cultures of seawater that had been supplemented with phosphorus and nitrogen and 0.25% v/v bilge water. Some media were supplemented with different amounts of the extract (0.05%, 0.2% and 0.5% m/v). By measuring the OD 600

nm, higher growth was seen in the consortia supplemented with the extract than in those without supplementation. The cultures doubling time during exponential phase was reduced from 27 hours without supplementation to 21 hours with 0.05% PE. The HC biodegradation percentage after 10 days of culture was determined by infrared spectrophotometry. The unsupplemented consortium degraded 60.0 ± 1.8% of the total bilge HC, while with 0.05% EP supplementation, a degradation of 78.8 ± 3.4% was obtained; with 0.2%, 80.2 ± 2.9%; and with 0.5%, 88.8 ± 5.8%. The results obtained contribute to developing cost-effective and efficient methods for degrading contaminated effluents and pave the way for future large-scale procedures that integrate various treatment processes.

Palabras clave: Biodegradation - Hydrocarbons - Emulsifiers - Consortium