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Biodegradation of petroleum hydrocarbon fractions

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Environmental pollution caused by oil spills and tank leaks have been a major concern to the modern society. Thus, this study proposed to isolate and characterize microorganisms with biodegradation ability of petroleum hydrocarbons fractions in terrestrial environment. Nineteen (19) isolates were recovered from petroleum impacted soils, which were analyzed by modified Bartha's respirometric method for microbial activity by the generation of carbon dioxide and expressing the biodegradation ability of soil contaminants. The study was conducted in three assays. In the first trial, the whole biodegradability of 19 isolates was assessed using sand vermiculite as inert substrate and petroleum mix as carbon source. The best four (4) isolates from these assays were assessed for petroleum hydrocarbon fractions (ABCD) generating a 16 treatments with 3 replications. The superior strains for four petroleum fractions were assessed for petroleum fraction biodegradability by using a sandy loam soil. The tested strains showed high potential for biodegradation of petroleum hydrocarbons according to the soil type. The analysis was performed by degradation of release of carbon dioxide generated by bacteria in the respirometric system. Data were adjusted to calculate the proposed rate of biodegradation by biodegradation kinetics. Values up to 62% biodegradation were observed hydrocarbons over a period of 15 days, whereas other tested models showed slower biodegradation rates. It is concluded that higher biodegradation rates were achieved when autochthonous microorganisms were isolated and directed used in the petroleum fractions biodegradation.

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Study of milk-clotting proteases produced by local fungal strains: Use in cheese-making

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The coagulant traditionally used for cheese-making in most of the world is rennet extract from the fourth stomach of suckling calves. There have been temporary shortages of rennet in various countries, but a world chronic shortage occurred after. This has stimulated interest in the search for suitable substitutes for use as coagulants in cheese-making. The work was carried out to study the production of extracellular milk-clotting enzymes by local fungal strains *Aspergillus niger* FFB1, *Rhizopus stolonifer* and *Mucor sp.* under SSF conditions using wheat bran as substrate, followed by the application of crude extracts in the manufacture of two kinds of cheese, compared to the commercial preparation of rennet used at "Laiterie et Fromagerie Boudouaou" (LFB). After fermentation using wheat bran (10g) at 30°C for 72h, the acid proteinases of *A. niger* FFB1 and *R. stolonifer* extracted with sterile distilled water (1:5w/v) present milk-clotting activities of 830SU/g and 504,6SU/g respectively. The maximum enzyme productivity of *Mucor sp.* (4800SU/g) was obtained under the optimum conditions of temperature (25°C), incubation time (96h), moisture content of solid substrate (43%) adjusted suitably with mineral solution (Czapek-Dox) of pH 3. The crude extract of *A. niger* FFB1 was applied in the production of the pressed and unripened cheese, where the others extracts (*R. stolonifer* and *Mucor sp.*) were used in the manufacture of cheese kind Edam using raw milk according to the conventional process of manufacture. The yields of cheese obtained by the commercial preparation and by the coagulating enzyme from *A. niger* FFB1 (a) differ only by 2.8%, where the organoleptic qualities of the two hard cheeses produced are very close. In the case of *R. stolonifer* (b) and *Mucor sp.* (c,c'), the yields cheese of 21.56g/l and 90.84g/l were obtained using the crude extract produced by this strain, where the commercial rennet gives a yield of 104.22g/l. The results obtained are encouraging and require more work to optimize the production procedure, but also pave the way to test the ability of the fungal crude extracts and the purified enzymes (acid proteases of *A. niger*, *R. stolonifer* and *Mucor sp.*: 47.7kDa, 43kDa and 36 kDa respectively) in the production of this kinds and other types of cheese.