The Torch
Vol. 2 (41)

Lactic acid bacteria playing role in the exploration of crude oil

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Lactic acid bacteria can be defined as a group of Gram-positive bacteria that live in an anaerobic habitat and produce lactic acid as the major end product during the fermentation of carbohydrates. Examples of these bacteria include Lactobacillus, Carnobacterium, Lactococcus, Streptococcus, Enterococcus, Leuconostoc, Oenococcus, Pediococcus and Tetragenococcus. In the body, they inhabit the gastrointestinal tract, mouth and vagina. Additionally, they can be found in food, such as meat, milk and other dairy products. They are generally regarded as safe (GRAS) organisms as they are not hazardous to health and are approved to be used in food products. Besides lactic acid, lactic acid bacteria (LAB) also produce a variety of other metabolites, such as vitamins, exopolysaccharides, bacteriocins and vitamins. Lactic acid bacteria are the main source of lactic acid; nearly 90% of the lactic acid made available in the world comes from the fermentation of carbohydrates by LAB while the remaining percentage comes from the hydrolysis of lactonitrile. With the increase in the global energy demand and depletion of oil resources, there is a need for better oil recovery technologies. Interestingly, one third to a half of the oil reserves in the world are deposited in carbonate rocks which includes limestone and dolostone. As these rocks tend to have very low permeability, they can be ameliorated by acid injection. Microbial acid producers like LAB might provide a solution for this problem. The rocks are injected with the nutrient substrate through a production well or water injection well where bacteria while reacting with $CaCO_3$ produce lactic acid, thereby facilitating the recovery of crude oil from these carbonate rocks. Besides helping to increase the permeability of carbonate rocks, lactic acid which has been produced in the oil well of the rocks helps to clean perforations that have been stopped by drilling mud. The role of lactic acid bacteria in oil exploration is yet to be fully understood, therefore through further research, the potential and applications of these bacteria can be unravelled.

Keywords: Lactic acid bacteria, Gram-positive bacteria, Carbonate rocks, Crude oil, Oil recovery technology

Citation:
Dimgba Raphael Osinachi. Lactic acid bacteria playing role in the exploration of crude oil. The Torch. 2021. 2(41). Available from: https://www.styvalley.com/pub/magazines/torch/read/lactic-acid-bacteria-playing-role-in-the-exploration-of-crude-oil.