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Growth capacity of lipolytic bacteria in fat residues from dairy wastewater

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The effective management of effluents and waste degradation is crucial for environmental sustainability and public health. Industrial waste, particularly from the dairy industry, contains high levels of organic matter and nutrients that, if not properly treated, can lead to serious environmental impacts. Reviewing the general characteristics and treatment possibilities of dairy effluents highlights the need for advanced and sustainable technologies to mitigate these impacts. Waste degradation is equally important, with an increasing emphasis on using biological processes to convert organic waste into useful products. Therefore, this study aimed to evaluate the growth capacity of lipolytic bacteria in fat residues from dairy wastewater. On April 25, 2024, fat residues were collected in a sterile bottle from the grease trap at the wastewater treatment station of the “Laticínio Escola – Produtos Viçosa” dairy factory, which is part of the Fundação Arthur Bernardes (FUNARBE) in Viçosa, MG, Brazil. A portion of the collected fat residue was heated to 100 °C, centrifuged at 5000 rpm for 5 min at room temperature (Sorvall, USA) in a 50 mL tube, and the fat separated at the top of the tube was collected and stored in a sterile bottle at -20 °C protected from light. Both the fat residue and the separated fat were used to prepare culture media. Lipolytic bacteria strains, including Serratia liquefaciens L132, L135, L140, L153, and MG44; Pseudomonas fluorescens 07A; and Staphylococcus warneri UFV_01_21, along with Escherichia coli ATCC 29214 as a negative control, were activated twice in Luria Bertani (LB) broth (Sigma-Aldrich, USA) at 30 ºC for 24 h. These bacteria were then streaked and incubated under the following conditions: minimal salts medium (MSM) (Himedia, India) containing 22% (w/v) fat residues and 1.5% (w/v) agar (Kasvi, Spain) and incubated at 25, 30, and 37 °C for five days; MSM containing 0.5 and 2% (w/v) fat and 1.5% agar and incubated at 30 °C for five days; LB broth containing 0.5 and 2% fat and 1.5% agar and incubated at 30 °C for five days. None of the bacteria evaluated were able to grow in the MSM with fat residues at any of the evaluated temperatures. All bacteria were able to grow in MSM and LB agar containing 0.5 and 2% fat at 30 °C. However, S. liquefaciens L132, L140, and L153 and E. coli ATCC 29214 did not grow in MSM agar containing 2% fat. The ability of bacteria to grow in the separated fat suggests that fat residues from grease traps at the dairy factory may contain growth inhibitors, such as sanitizers, detergents, among others, and the concentration of these residues may have been high. Future research will focus on evaluating the capacity of these bacteria to degrade fat from wastewater for biological treatment and its potential for producing lipases of industrial interest.

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factory.