Characteristics of the polysaccharide-producing culture *Haloterrigena saccharevitans* EG3QL57 isolated from the saltworks at lake Karun (Egypt)

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Key message. According to the physiological-morphological and molecular-biological characteristics, the halophilic representative of archaea strain-isolate from the saltworks of lake Karun (Egypt) was identified as *Haloterrigena saccharevitans* EG3QL57. The ability of *H. saccharevitans* EG3QL57 to utilize oil with an efficiency of 27.4%, resistance to the presence of concentrations of up to 5 mm of heavy metals in the growth medium is shown. It is shown that when the growth conditions of microorganisms are optimized, they produce up to 2.3 g/l of exopolysaccharides (EPS).

Keywords: *Haloterrigena saccharevitans*, identification of oil utilization, optimization of exopolysaccharide production, resistance to heavy metals

Halophilic archaea are unique microorganisms that are resistant to extreme conditions of existence. Many archaea produce biopolymers that are important for their survival, including exopolysaccharides (EPS), the study of which is relevant both in theoretical terms and from a practical point of view. The purpose of the study: identification and characterization of the properties of the *H. saccharevitans* strain EG3QL57 and the EPS produced by it.

Culture of microorganisms was isolated from artificial solar salt ponds near lake Karun (Arab Republic of Egypt) using a storage culture on the medium of Segal and Gibson (1960), modified by the addition of glucose and salt in optimal concentrations for the culture. EPS-producing microorganisms were selected based on their ability to form donkey colonies. Identification of the microorganism was performed based on the analysis of data from cultural-morphological and molecular-biological studies of the nucleotide sequence of the 16S RNA gene (registration number GenBank MK463953). Studies have shown that on SG-agar microorganisms form small (1.5-2 mm), round, with smooth edges, raised above the surface of the medium colonies of light red or pink color. The cells are gram-negative and mobile. Growth requires at least 2.6 M NaCl, and the optimal concentration is 4.3–5.1 M NaCl. Microorganisms can be classified as chemoorganotrophs, capable of growing in anaerobic conditions in the presence of nitrate.

The ability to degrade crude oil (1 g/l) in a liquid mineral medium that does not contain any other carbon sources has been identified. At the same time, the oil content during cultivation is high. *H. saccharevitans* EG3QL57 for 12 days decreased by 27.4 %. The most effective enzyme systems of *H. saccharevitans* EG3QL57 degraded fractions of paraffins and naphthenes.

It is shown that the culture was resistant to high (up to 5 mM) concentrations of lead and cadmium salts, but responded to the presence of these metal ions in the medium by reducing the yield of biomass by 4.5 times, as well as the amount of EPS by 20 times. The EG3QL57 strain showed less resistance to copper, zinc and nickel salts.

According to the results of optimization of the duration of cultivation, temperature, pH, nature of carbon sources and their concentration, the content of NaCl, the maximum yield of EPS for *H. saccharevitans* EG3QL57 was obtained-2.3 g/l. The EPS of the culture of *H. saccharevitans* EG3QL57 is represented by β -1,6-glucan according to NMR spectroscopy. The emulsifying activity of *H. saccharevitans* EG3QL57 EPS solution with respect to hydrophobic substances (kerosene) was revealed, while the emulsion remained stable for a year.