Effect of Growth Conditions on the Rheological Properties and Chemical Composition of Volcaniella eurihalina Exopolysaccharide

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ABSTRACT

The exopolysaccharide produced by Volcaniella eurihalina, an halophilic eubacterium, under different environmental and nutritional conditions, is studied. V. eurihalina synthesizes an acidic heteropolysaccharide, composed by rhamnose, glucose, and mannose, as well as amino sugars, uronic acids, and acetyl and sulphate residues. This composition varies depending on the nutrients of culture medium. Viscosity and pseudoplasticity of the polymer solutions are also influenced by the nutritional conditions in which the microorganism was grown.

Index Entries: Exopolysaccharides; halophilic bacteria; Volcaniella eurihalina.

INTRODUCTION

The growth of bacteria is often accompanied by the production of polysaccharides found outside the cell wall. These exopolysaccharides (EPS) can take the physical form of capsules attached to the cells or may be released to the environment as extracellular slimes. In chemical terms,

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the EPS are either homopolymers or heteropolymers, and may carry a variety of noncarbohydrate substituents such as ester-linked acetate, pyruvate, and others (1).

Microbial EPS are an attractive alternative to traditional gums extracted from plants and seaweeds, as they are not vulnerable to adverse crop conditions or pollution, show a wide range of physical properties, and their chemical composition can be changed in accordance with the growth conditions (2–4). Some polysaccharides have gelling properties, others are emulsifying or suspending agents or protective colloids, and still others may be useful owing to their biological properties (1,5). All these features allow microbial EPS to be useful in many applications in food, in the oil industry, and in medicine.

*Volcaniella eurihalina* is a moderately halophilic eubacterium, which grows optimally at salt concentrations of 5–10% (w/v) (6). This microorganism synthesizes an extracellular polysaccharidic substance (7), which, in solution, shows a pseudoplastic non-newtonian behavior quite resistant to high ionic strength and thermostable. Moreover, it is able to form high viscosity solutions like a gel at low pH values even in the presence of inorganic salts (8). From this point of view, this EPS would be valuable for use in various industrial applications, e.g., in the food industry for salad sauces or citric desserts where the pH is usually acid or in oil-recovery because of its stability to temperature and ionic strength. The objective of this work is focused on the study of chemical composition and physical properties of the extracellular polysaccharide produced by *V. eurihalina* strain F2-7, under different environmental and nutritional conditions. Our aim is to determine to what extent those conditions have an influence on the chemical composition and therefore on the physical properties of the polymer, to improve their characteristics to a particular end-use.

**MATERIALS AND METHODS**

**Microorganism**

*V. eurihalina* strain F2-7 was used through this study. This is a moderate halophile, with optimal growth at a total salt concentration of 7.5% (w/v). Other features of this microorganism have been described previously (6).

**Growth Media and Cultivation Conditions**

The complex medium used was MY (9) modified by adding the appropriate balanced mixture of sea salts (10) to give the final salt concentration of 7.5% (w/v); its composition is the following: 10.0 g/L glucose; 5.0 g/L