PRODUCTION OF EXOPOLYSACCHARIDES BY BACTERIA ISOLATED FROM EGYPTIAN SOILS

By

FATMA SHAMS LOTFY ALI MAHMOUD

B.Sc. Agric. Sci. (Biotechnology), Fac. Agric., Cairo Univ., 2014

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APPROVAL SHEET

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Date: 7/ 7 / 2020

SUPERVISION SHEET

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Title of Thesis: Production of Exopolysaccharides by Bacteria Isolated from Egyptian Soils.
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Department: Agricultural Microbiology

Date: 7/ 7 / 2020

ABSTRACT

The aim of the present study was to isolate and screening for bacteria that producing higher quantities of exopolysaccharides (EPSs) from the Egyptian soils. Forty soil samples were collected from different regions of three Governorates (Beheira, Giza and Qalyubia). A total of 165 bacterial isolates were obtained from the soil rhizosphere. Thirty-five of them (21.2 %) had the ability to produce stable ropy colonies. After screening, two isolates Cs5 and T1 were selected for further study according to their capacity to produce high quantity of EPS (7.1 and 5.7 gL^{-1}, respectively). The selected bacterial isolates were identified as non-similar strains of *Agrobacterium tumefaciens* based on their morphological, biochemical characteristics as well as 16S rRNA gene sequencing. To obtain maximum EPS production by both strains, nutritional (media type, carbon and nitrogen sources) and cultivation (pH, inoculum size, agitation speed, incubation temperature and time) parameters were optimized using one-factor-at-a-time method. Thus, the maximum EPS yield of 21.63 and 19.57 gL^{-1} were achieved from the strains Cs5 and T1, respectively. When molasses and corn steep liquor substituted synthetic carbon and nitrogen sources as low cost-substrates, the EPS yield improved to be 28.73 and 24.5 gL^{-1} for Cs5 and T1, respectively. The Fourier transform infrared (FT-IR) spectra for both extracts revealed the typical patterns of polysaccharide absorption. Moreover, HPLC analysis indicated that the EPS were heteropolysaccharide composed of glucosamine, glucose and fructose. The produced EPS showed antioxidant capacity as well as strong antibacterial activity against methicillin-resistant *Staphylococcus aureus* and *Bacillus cereus* as hazardous human pathogens, suggesting their application in food industry. While, the produced EPS had no effect on cancer cells.

Keywords: *Agrobacterium tumefaciens*, exopolysaccharides, optimization, antibacterial, antioxidant, soil.

DEDICATION

I would like to lovingly dedicate this work and achievement to my family for their support and who taught me how to think, to be smart, never give up of my dreams and to be patient for their endless support, encouragement, holding my back and caring and faith in me, God bless all of them.

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