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Identification and exopolysaccharide synthesis by Antarctic yeasts

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Antarctic is among the most scarcely investigated extreme niches in relation to microorganisms living there and synthesis of unusual molecules. Antarctic microorganisms have adaptation to extremely low temperatures, lack of water availability and precipitation, numerous freeze – thaw cycles, strong wind levels and high sublimation, evaporation and ultraviolet radiation. Several yeast genera such as *Cryptococcus, Mrakia, Candida, Rhodotorula, Leucosporidium, Debaryomyces* have been described as part of the biodiversity of the continent. Psychrophilic microorganisms can survive under unfavorable conditions by synthesizing unique substances with documented biological activities – exopolysaccharides, glycerol, trehalose in the cell, anti-freeze proteins, high amount of polyunsaturated fatty acids in the membrane lipids, β-carotene, coenzyme Q_{10}, ergosterole and etc. (*Zlatanov et al., 2010; Dimitrova et al., 2010; Rusinova-Videva et al., 2016*)

The aim of the present research was to study yeast variety in the Livingston Island, Antarctica, and yeast potential to synthesize extracellular polysaccharides. Thanks to the cooperation of the Bulgarian Antarctic Expedition, three different strains were isolated and identified.

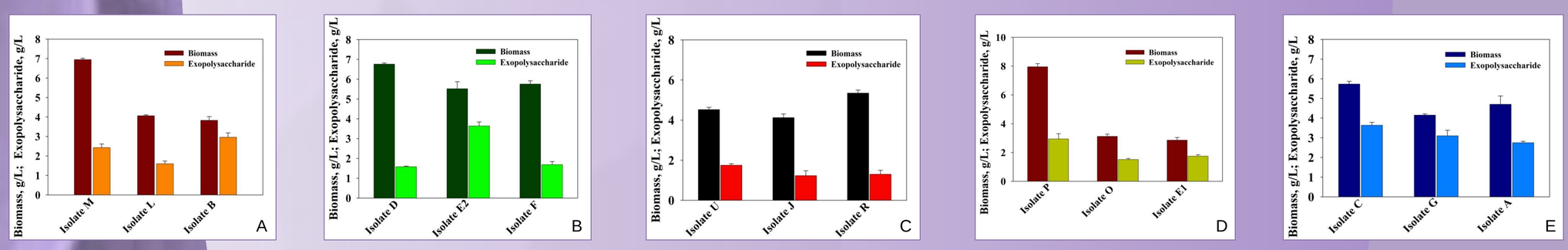

Fig.1.Biomass and exopolysaccharide synthesized by Antarctic yeast Isolates.

Fig. 2. Antarctic yeast isolates.

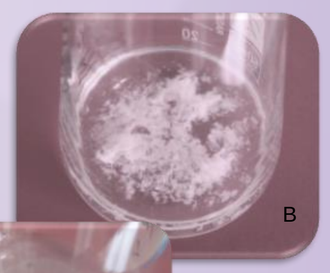

Fig. 3. precipitated selected yeast exopolysaccharides in 95% ethanol solution.

The process of extracellular polymer biosynthesis was performed at a cultivation temperature of 21°C±1°C. The cell growth over 5.5gL^{-1} and exopolysaccharide production from 1.6 to 3.6gL^{-1} were registered at 120th h of the fermentation process (**Fig.1**).

Fig. 4. *Cystobasidium ongulense*

Fig. 5. *Vishniacozima victoriae*

Based on sampling of soil, moss or penguin feathers in Bulgarian base, the Livingston Island, new results for yeast diversity were accumulated and they can contribute to the fundamental worldwide knowledge on the biodiversity of the Antarctic continent. Unusual origin of exopolysaccharides synthesized by the isolates and their valuable preliminary characterized properties suggest a possibility for their biotechnological exploration.

Based on a genetic analysis of ITS1-5.8S-ITS4 regions of rRNA, the yeasts were related to two genera – *Cystobasidium* and *Vishniacozima.* One of the strains belonged to the species *Cystobasidium ongulense* (**Fig.4**) and two to *Vishniacozima victoriae* (**Fig.5**). The morphological differences of the two species included the color of the colonies - red and cream, respectively, while both species were glossy and with a smooth edge. *Cystobasidium ongulense* cells were larger and elongated. The differences between the species also included the different number of assimilated carbon sources. The type of *C. ongulense* was firstly described in 2017 as a producer of the enzymes esterase, lipase and β-glucosidase (*Tsuji et al., 2017*). *V. victoriae* has the ability to synthesize lipase (*Baeza et al., 2017*).

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