EFFICIENCY OF XANTHAN BIOSYNTHESIS BY LOCAL *Xanthomonas* ISOLATE USING INDUSTRIAL EFFLUENTS GENERATED IN AP VOJVODINA

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Abstract

Rapid industrialization and intensification of agricultural production are responsible for the exploitation of natural resources and the simultaneous generation of different effluents. The emission of untreated effluents into the environment is ecologically unacceptable due to its high negative environmental impact. Since developed treatment methods mainly result in waste conversion from one form into another, there is an urgent need for suitable utilization of agro-industrial effluents in their crude form. Industrial effluents, which include various biodegradable waste streams and by-products, are characterized by high presence of organic and inorganic compounds, and hence, they have a great potential for valorisation in biotechnological production of value-added products. One of valuable bioproducts that can be obtained by cultivation of microorganisms on different effluents is xanthan, biopolymer of microbial origin. Due to its outstanding rheological properties, biodegradability, non-toxic nature and biocompatibility, xanthan is widely exploited and has high commercial value. Although this biopolymer is generally produced by the reference strain *Xanthomonas campestris* ATCC 13951 on glucose or sucrose containing medium, the other members of the genus *Xanthomonas* are also examined as xanthan-producing microorganisms especially when alternative raw materials are used. Therefore, the aim of this study was to compare the success of xanthan biosynthesis by local *Xanthomonas* isolate on media based on industrial effluents in relation to the biosynthesis performed with reference strain *Xanthomonas campestris* ATCC 13951 on commonly applied semi-synthetic medium with glucose.

Within the experimental part, the cultivation of reference strain on standard semi-synthetic medium was performed simultaneously with cultivation of local isolate on media based on effluents generated by the biodiesel, wine, dairy and confectionery industry in the AP Vojvodina. Applied alternative production media contained glycerol, fructose and glucose, lactose, and starch as a carbon sources, respectively. Xanthan biosynthesis was carried out at laboratory level (300 mL Erlenmeyer flasks) in aerobic conditions on media with the same initial concentrations of carbon source (20 g/L) at temperature of 30°C and agitation of 150 rpm for 120 h. Bioprocess success was estimated based on the quantity of produced xanthan. In order to conduct mutual comparison and to easier interpret the obtained results, experimental data for xanthan concentration in media at the end of biosynthesis were relativized. Cultivation of reference strain on semi-synthetic medium is considered as 100% successful, and in relation to this, the values of xanthan concentration in alternative media were relativized.

Based on the obtained results, xanthan biosynthesis by applied isolate on medium prepared with winery effluents was 97.38% successful, while xanthan production on medium containing effluents from biodiesel and confectionery industry conducted with the same producing strain resulted in 50.86% and 48.69 of success, respectively. The lowest success of 26.56%, in applied experimental conditions, was achieved when xanthan biosynthesis was performed on medium based on effluents originated from diary industry. These differences in the xanthan quantity probably are the consequence of different carbon sources in alternative media, as well as the

presence of other compounds originating from the raw material that can inhibit the metabolic activity of producing strain.

The obtained results confirm the possibility of xanthan biosynthesis by local *Xanthomonas* isolate on media based on effluents from selected branches of industry that is generated in the AP Vojvodina. Considering the discussed values, it can be concluded that effluents generated during the wine production have a high potential for valorisation in xanthan production by examined isolate, which represents the basis for further research aimed to improve this production process.

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