ANALYSIS OF XANTHAN PRODUCED ON CRUDE GLYCEROL: PROLONGED EMULSIFICATION TEST WITH HYDROCARBONS AND OILS

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Abstract

Xanthan is known as one of the commercially most important microbial polysaccharide. Exceptional rheological characteristics, biocompatibility, biodegradability, and non-toxicity enable its extensive application in food, cosmetics, pharmaceutical, paper, textile, and other industries. It is widely used as a stabilizer, thickener, and emulsifier because of its high viscosity at low concentrations, stability over a broad range of temperature and pH value, and excellent solubility in hot and cold water, among other. Industrial-scale xanthan production is generally performed by aerobic submerged batch cultivation of the reference strain *Xanthomonas campestris* ATCC 13951 on a medium containing glucose or sucrose under optimal conditions [1]. Taking into account that the cost of substrate is an important factor for commercial xanthan production and that an actual rise in prices of aforementioned sugars is present, it is necessary to exploit more economical carbon sources in order to reduce the overall production costs. Specific characteristics and low price of crude glycerol indicate that this effluent may be a suitable substrate for biotechnological xanthan production [2].

The aim of this study was to examine the emulsifying properties of xanthan, produced by the reference strain *X. campestris* ATCC 13951 on crude glycerol-based medium, after 240 h of rest.

Xanthan synthesized by reference strain *X. campestris* ATCC 13951 on medium containing crude glycerol from biodiesel production in a factory located in the Republic of Serbia under previously reported conditions [2], was used in this study. The emulsifying properties of separated xanthan were tested by measuring the emulsification index using the method described by Cooper and Goldenberg (1987) [3]. Hydrocarbon (n-hexane, toluene, liquid paraffin, and chloroform) or oil (sunflower, soybean, and olive oil) was added to the aqueous phase containing xanthan (0.1% w/v) at a ratio of 3:2 (v/v) and agitated vigorously for 2 min on a vortex mixer (VIBROMIX 10 Vortex Mixer, Domel, Železniki, Slovenia) at 2850 rpm. After 240 h of rest at 25 °C, the emulsified layer height and total height of the liquid layer were measured and used for calculation of emulsification index, as proposed by the applied method and previous study [4].

The results of the emulsification test show that the formation of xanthan emulsions with soybean, sunflower, and olive oils is reflected by higher values of the emulsification index comparing to hydrocarbons. The highest emulsification index of approximately 61% was obtained when the emulsifying activity of xanthan was examined with soybean oil, while somewhat lower values, i.e. 57% and 59% were achieved when using sunflower and olive oil, respectively. These values are in agreement with the results of a previous study in which the emulsifying activity of xanthan in the same oils was examined for 24 h, and values higher than 50% were reported [4]. The obtained results indicate that there is no drastic change in the emulsifying properties of xanthan with prolongation of the resting time when oils are used. However, a much lower emulsification index was noted when prolonged emulsification test was conducted with hydrocarbons. The emulsification index was approximately 20% for liquid

paraffin and less than 10% for toluene and chloroform. The lowest emulsification index of approximately 3.6 % was achieved when the emulsifying activity was examined with n-hexane. According to the results obtained in this study, xanthan produced on a crude glycerol-based medium can be used as an emulsion-forming and stabilizing agent between aqueous solutions and hydrocarbons or oils, but an increase in resting time has a negative effect on the xanthan emulsification index when using hydrocarbons. The findings of this study provide valuable information that can be used in future research related to the examination of potential xanthan applications.

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