BIOCHEMICAL PRODUCTION OF VITAMIN B_{12} FROM THE AGRO-INDUSTRIAL WASTES

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Introduction. In addition to the medical importance of vitamin B_{12} (cyanocobalamin) preparations for people, B_{12}-vitaminized forage additives play a major role in economy, given that this vitamin is not contained in the initial vegetable feed for cattle. Being introduced in the cattle forage, such additives increase the outcome of zootechnical products. An efficient approach was proposed to produce high amounts of vitamin B_{12} in composition of fermented post-distillery grains.

Materials and methods. As raw material for biotechnological production of vitamin B_{12} concentrate, post-distillery grains were used from Bardar winery, Hancesti region, Moldova. As the source of microorganisms, the residual sludge from wastewater treatment plant was used, with basic pH ~ 7.5, containing around 23% pf organic matter. It contained large diversity of microorganisms with domination of microbes, along with fungi and methanogenic bacteria, with dehydrogenasic activity and capacity to form CO_2. To increase efficiency of cyanocobalamin production, biodegradable tartaric-ammonia Co complex [$2C_4H_3O_6Co(III)\cdot C_4H_4O_6(NH_4)_2\cdot nH_2O$] and potassium ferrocyanide ($K_4[Fe(CN)_6]$) were introduced in fermented medium.

Results. Anaerobic methanogenic fermentation was carried out under mesophilic conditions, with the additional introduction of has mixture, containing CO_2 formed at the acetogenic fermentation stage, and electrolytical H_2, with volumetric ration of 1:(3.5÷4.5). Experimental data have shown that COD value was reduced from 18250 mg O_2/L to 725 mg O_2/L, BOD - from 12125 mg O_2/L to 475 mg O_2/L. Specific biogas yield made 0,68 m^3/1 kg COD, whereas the biomethane contents on biogas reached 91.8 vol.%. The yield of cyanocobalamine (vitamin B_{12}) made 185 mg/L in composition of fermented biomass. This product can be readily extracted on the mineral adsorbent. At the same time, application of micro-additives of some natural substances belonging to the triterpene series, allowed to increase the fermentation rate and enhance the biomethane contents in biogas.

Conclusion. An improved technology proposed for vitamin B_{12} production from agro-industrial wastes includes stimulation of anaerobic microorganisms activity, reuse of carbon dioxide and additional introduction of hydrogen in the digested biomass, and exogenic supplement of substrate with precursors of vitamin B_{12} synthesis in assimilable form. This allows to intensify biochemical anaerobic digestion, reduce energy consumption, improves efficiency of vitamin B_{12} synthesis and enhances its contents in final product.

Keywords: *cobalamin, forage concentrate, post-distillery grains, methanogenesis, anaerobic fermentation, precursors of vitamin B_{12}.*

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