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A NEW METHOD OF CYANCOBALAMIN (VITAMIN B_{12}) PRODUCTION AND ITS PRACTICAL USES

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Cyanocobalamin is widely used in medicine as a therapeutic drug, as well as a cattle and poultry feed additive as an important preparation against many diseases. This is a complex protein Co compound of porphyrin series with general formula $C_{63}H_{90}O_{14}N_{14}PCo$ and molecular weight 1357,39, being the largest metal-organic molecule which structure was determined by Nobel Prize Winner Dorothy Hodgkin in 1956 [1]. CN group in the B_{12} molecule can be substituted with OH, ONO, SO_3, SCN, Cl, Br and other groups, forming the appropriate cobalamins derivatives, many of them possessing the biological activity.

In spite of the long-term efforts of the researchers, among them Woodwarth and Eshengover [2, 3], chemical synthesis of cobalamin still remained to be extremely complicated and low-productive process. Therefore, the industrial synthesis of cyanocobalamin is performed exclusively with the methanogenic bacteria during their living activity. The typical production technology is based on the anaerobic digestion processes of mainly the distillery or winery vinasse, which sludge contained the raw protein (34,2-37,2 % dry substance mass), aminoacids, fat-like substances (10-14,7%) and other valuable components. However, the product yield is low and the process is energy-consuming. Due to its solubility in water, cobalamin is extracted from water fraction by the long-term (about one-month) evaporation.

Our studies made it possible to proposed the improved technology for vitamin B_{12} production, which involves the anaerobic microbiological synthesis of B_{12} under the meso- or thermophylic digestion regime, along with the biomethane formation. The intergater reactor for this process realization was developed.

To intensify the anaerobic digestion process, types new phytocatalysts related to the natural biologically active compounds, were proposed. In this way, a higher target product and methane yield was reached. As a cobalt-containing additives, being the precursors of anaerobic synthesis of vitamin B_{12}, suppliers of Co and cyanide, the inorganic substances attainable for methanogenic microorganisms were selected: Co complexes – cytrate-mmonia complex $[2C_6H_5O_7Co(III)\cdot C_6H_6O_7(NH_4)_2 \cdot nH_2O]$ and tartrate-ammonia one $[2\ C_4H_3O_6Co(III)\cdot C_4H_4O_6(NH_4)_2 \cdot nH_2O]$, as well as potassium ferrocyanide.

To extract cobalamin from the liquid fraction, instead of evaporation, use of the natural diatomite was proposed. The resulted product, enriched with vitamin B_{12}, is an important component of the mixed cattle forage, stimulating the animals growth. This work is based on the series of Moldovan patents: Nr. 322, 3716, 4129, 4156, 4176, 4192 (Pat.MD).

Currently, the pilot equipment for the production of forage additive containing vitamin B_{12} is on the stage of manufacturing.

References:

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