Thematic Section: Biochemical Research. **Analytical Review**
Subsection: Biotechnology. *Reference Object Identifier* – ROI: jbc-02/17-50-5-73
Publication is available for discussion in the framework of the on-line Internet conference "*Butlerov readings*".
http://butlerov.com/readings/
Dedicated to the 40th anniversary of the department of biotechnology
of the D.I. Mendeleev University Russian Chemical Technical University.
Submitted on May 07, 2017.

Complex processing of renewable plant raw materials for high protein and probiotic fodder products

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Keywords: reagent hydrolysis, enzymatic hydrolysis, renewable plant raw materials, lactic acid bacteria, deep heterophase cultivation, filtration of suspensions, plant waste, bioconversion of plant material.

Abstract

Teachers, researchers, students and graduates of Biotechnology Department of D.I. Mendeleyev University have been studying the main regularities of raw material bioconversion under the guidance of professors M.N. Manakov and V.I. Panfilov for 40 years. Pretreatment of raw materials, different types of hydrolysis, submerged heterogeneous fermentation of microorganisms for protein production and filtration of the resulting suspensions were studied. Energy-saving low-waste technologies were developed for the production of plant carbohydrate-protein feed. The article presents the data obtained in the development of bioconversion technologies for deproteinized soybean meal, deproteinized sunflower meal, coffees ludge and Jerusalem artichoke beetroot pulp. It is shown that acid hydrolysis is the optimal pretreatment method for such raw materials as coffee sludge and deproteinized soybean and sunflower meal. A significant increase in the efficiency of bioconversion of coffee wastes by yeasts has been shown for pretreatment including extraction of fat-like substances of coffee with organic solvents. Optimal parameters of enzyme-assisted extraction were determined for sunflower meal protein isolation. Enzymatic hydrolysis of sunflower meal with a proteolytic enzyme complex is the necessary stage of bioconversion. The process of ultrasonic extraction of fructans from Jerusalem artichoke was studied and the pulp bioconversion technology was developed. The parameters of submerged heterogeneous bioconversion of coffee sludge and deproteinized soybean meal by *Saccharomyces cerevisiae II* and *Candida tropicalis* yeasts respectively were determined. *Lactobacillus plantarum* were used for Jerusalem artichoke pulp bioconversion and *Bacillus subtilis* for deproteinized sunflower meal processing. The composition of plant raw materials bioconversion products was determined. Additional products such as coffee oil, inulin, vegetable protein obtained by complex deep processing of plant raw materials may cut costs and increase production efficiency. The implementation of the developed technologies will allow not only to support the feed base with new high-quality products, but will also solve a number of environmental problems related to the storage and processing of the generated waste.

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