В рубце жвачных видовое разнообразие бактерий и простейших, дрожжей, актиномицетов может резко изменятся при нарушениях рационов.

Корм для рационального кормления должен соответствовать санитарно-эпидемическим нормативам и быть безвредным для биоты желудочно- кишечного тракта, а содержание в продукте свойственных ему (нутриентов) оптимальным, без посторонних химических веществ (ксенобиотиков), которые вызывают нарушения функций желудочно-кишечного тракта.

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ECOLOGIZATION OF EDUCATION IN THE STUDY OF THE DISCIPLINE " BIOCONVERSION OF WASTE "

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Summary. The article is devoted to the analysis of new trends and methods for the organization and development of ecologization of the discipline “Bioconversion of waste” in higher education when teaching masters of biotechnologists.

Key words: ecologization, education, discipline "Bioconversion of waste", environment safety.

ЭКОЛОГИЗАЦИЯ ОБРАЗОВАНИЯ ПРИ ИЗУЧЕНИИ ДИСЦИПЛИНЫ «БИОКОНВЕРСИЯ ОТХОДОВ»

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Аннотация. Статья посвящена анализу новых тенденций и методов по организации и развитию екологизации дисциплины «Биоконверсия отходов» в высшей школе при обучении магистров биотехнологов.
Ключевые слова: экологизация, образование, дисциплина, «Биоконверсия отходов», экологическая безопасность.

Environmental education is an important area of training for a modern specialist in any field of activity. In universities, it is implemented in the process of studying the compulsory subject "Fundamentals of Ecology" and with the inclusion of the environmental component in the content of individual disciplines. However, students' environmental knowledge remains superficial and, basically, is not related to the study of fundamental, including chemical and special disciplines. In textbooks on chemistry for students of agricultural universities occasionally provides information on the harmful effects of substances on the environment. There are almost no special environmental tasks in the teaching aids. Chemical and environmental concepts associated with the professional training of specialists of the agro-industrial complex have not been identified [1].

Today, according to international standards, the “clean production” strategy is the best approach to environmental protection. It provides, first, for modernization of production facilities to increase the efficiency of processing raw materials, and to reduce emissions of toxic and harmful substances into the atmosphere, surface waters, and soil. The main task of bioconversion of waste from various industries is their processing and production of useful substances. This approach is based on the implementation of the principles of sustainable economic development [2].

The decision to this problem begins with the effective work of environmental protection departments at each enterprise and production. The level of environmental safety of each enterprise largely depends on the proper organization of measures to protect the environment at work, and therefore on the qualifications of workers in this sector.

When studying the discipline “Bioconversion of waste”, the main direction is the greening of theoretical knowledge and practical skills in the

field of studying ways to reduce harmful emissions of production into the environment. For this, it is necessary to create low-waste and non-waste industrial complexes with a closed cycle using the principles of radical transformation of production activity based on the biological laws of the biotic cycle of the biosphere [3].

The main issues of ecologization of the discipline "Bioconversion of waste" are:

• environmental pollution and its impact on the quality of human life;
• new approaches to the problem of sustainable development of society;
• scientific foundations of environmental management;
• resource-saving technological processes of low-waste and non-waste production of food and processing industries;
• legal regime of environmental management and environmental protection;
• environmental passport of the enterprise and environmental management at the food enterprise;
• certification and planning of waste collection at the food enterprise;
• secondary resources of the brewing, alcohol, sugar, oil and fat, starch; fruit and vegetable industries and ways of their processing and use;
• complex processing of waste from malt and beer production;
• waste in the production of food concentrates and their use;
• characteristics of the chemical composition of wastewater from fermentation plants;
• water of waste water treatment methods, their disinfection and agricultural use;
• bioconversion methods for the processing and disinfection of sewage sludge;
• obtaining and using biogas from organic residues, using bio-sludge;
• disposal of environmentally hazardous gases;
• biologization and greening of food products from plant materials;

Due to the use of nitrogen fertilizers on a large scale, the flow of inorganic nitrogen compounds to plants increases. Excessive consumption of nitrogen from mineral fertilizers leads to the accumulation of nitrates in plants, causes methemoglobinemia and other diseases in humans and animals. Therefore, all waste (*Bioconversion of organic waste*) recommended for food and feed additives should be analyzed for nitrate content.

It is established that when using vermicompost, the amount of nitrates in fruits of vegetables and fruits is significantly reduced and even their complete absence is noted. This is due to the fact that vermicompost is a natural, environmentally friendly fertilizer, has a balanced ratio of

biologically active substances, micro and macro elements. Such fertilizer is obtained by vermicultivation of various organic waste. Natural fertilizers include vermicomposts obtained from the processing of organic waste by the red California worm *Eisenia foetida* [4].

Today, an innovative vermiciltration technology is used using the red California worm (*Eisenia foetida*) for wastewater treatment. This allows you to get several main areas of vermicultivation: 1) obtaining biohumus (a very valuable organic fertilizer); 2) obtaining biomass of the worm (for feeding livestock, poultry, fish); 3) breeding a worm for sale [5, 6].

Ecologically safe is the larva bioconversion using the larvae of the fly "Black lion" (black soldier fly, *Hermetia illucens*)) [7, 8]. It is used in many countries of the world for processing waste from the food industry, livestock and crop production, sewage sludge, and its larvae are excellent feed for poultry, fish, etc.

Particular attention should be paid to environmental issues in the disposal of sewage sludge that is formed at aeration stations. As an example, the Bortnichesky aeration station for wastewater treatment in Kiev and the Kiev region, which occupies a very large territory for storage of sludge (silt sites) and carries a huge environmental burden on the metropolis, on the one hand, and on the other, the ability to use rainfall and activated sludge as fertilizers for the production of plant products.

Since sewage sludge in its composition contains a lot of nitrogen, phosphorus, organics, so they can be processed into fertilizers. But at the same time, toxic compounds such as lead, cadmium, and mercury, which are toxic and very dangerous to human health, are found in large quantities in their composition.

Therefore, such fertilizers should not be applied to the soil for growing agricultural products, and it is possible to use only for landscaping park areas and growing flowers in flower beds.

To assess the degree of heavy metal contamination of fertilizers obtained as a result of processing by composting sewage sludge in soils, the ability to work and perform chemical analyzes of modern analytical instruments using Internet technologies is important for a future specialist.

So, during laboratory classes, students are trained to work on an analyzer of heavy metal salts to control lead, copper, zinc, cadmium, cobalt in soil, fertilizers, and spit fermentation products [9-13].

Global trends of the rapid increase in the use of oilseeds for food, cosmetic, therapeutic and therapeutic products, fuels (biodiesel production) are characterized by a corresponding increase in the volume of waste oil extraction and oil and fat production.

The main methods for obtaining vegetable oils are extraction from pre-refined and ground oilseeds with organic solvents and liquid carbon dioxide; cold pressed oil from seeds; combined method. Sunflower, flaxseed, soybean, rapeseed, cottonseed meal and beet pulp are the main waste products of the process of obtaining vegetable oils. The growing demand for alternative therapeutic and therapeutic oils has contributed to the expansion of the range of meal and cake: dogrose, amaranth seeds, pumpkin seeds, milk thistle, wheat germ, oats, mustard, walnuts, pine nuts, peanuts, etc. Usually, waste vegetable oils are used to produce feed for animals and birds. These wastes are characterized by a high protein content (35–50%), low fat content (about 1% in meal after extraction and up to 10% fat in cake after cold pressing), and the presence of a certain amount of micro- and macrocells and vitamins.

One of the options for more efficient use of waste products for the production of vegetable oils, with the creation of waste-free technology for processing vegetable raw materials, is the use of these waste products as a substrate for the cultivation of higher fungi. Mushrooms, thanks to a powerful enzyme system, can be a good tool for the bioconversion of meal and meal. Mainly fruit bodies are grown, at the same time, interest is growing in the cultivation of mushroom biomass (mycelium), which has almost the same content of biologically active substances and is more economical in the production process [14].

In the Bioconversion of Waste curriculum, the basic ways to solve environmental problems with knowledge of chemistry and chemical technologies are necessary: when processing plant waste using the hydrolysis process in aqueous solutions of acids, salts, alkalis, percolation, fermentation, biofermentation, and many others.

Necessary to study are the issues of certification and standardization in the environmental sphere; ability to apply approaches to environmental and economic assessment of environmental measures. Important questions are the study of methods for assessing the socio-ecological and economic damage from environmental degradation and ensuring environmental safety and the disposal of road transport wastes.

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