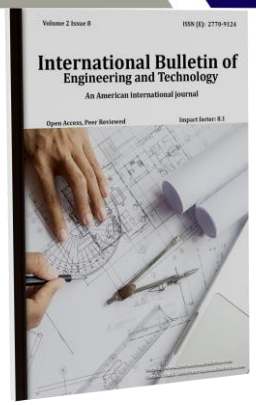


ENZYMES AND THEIR INDUSTRIAL APPLICATION METHODS

Jankorazov Abror Mamrajab o'g'li
Teacher of Gulistan State University
abrorbek9306.@gmail.com
Xolmamatova Diyora Alisher qizi
Student of Gulistan State University
Diyoraholmamatova004@gmail.com
Murodboyeva Marjona Muhriddin qizi
Student of Gulistan State University
marjona10112001agmail.com
https://doi.org/10.5281/zenodo.7751715

Abstract: Enzymes are biocatalysts that speed up a chemical reaction to produce a valuable end product. Currently, enzyme preparations obtained from microorganisms are used in many fields of industry, in agriculture and in medicine. The use of enzymes makes it possible to increase the speed of technological processes, significantly increase the yield of finished products, improve their quality, save valuable raw materials and reduce the amount of waste. As a kind of high-performance, non-toxic, side-effect and environmentally friendly green feed additive, feed enzyme preparation is becoming the fastest growing field of industrial enzyme industry in the world.
Keywords: Biotechnology, integration, factors, enzymes, microorganisms, malt, lactases, bioenergetics, pharmaceuticals, exponential, preparations, papain.
Аннотация: Ферменты — это биокатализаторы, которые ускоряют химическую реакцию для получения ценного конечного продукта. В настоящее время ферментные препараты, полученные из микроорганизмов, используются во многих областях промышленности, в сельском хозяйстве и медицине. Использование ферментов позволяет увеличить скорость технологических процессов, значительно увеличить выход готовой продукции, улучшить ее качество, сэкономить ценное сырье и уменьшить количество отходов. Являясь своего рода высокоэффективной, нетоксичной, экологически чистой зеленой кормовой добавкой с побочными эффектами, подготовка кормовых ферментов становится самой быстрорастущей областью промышленной ферментной промышленности в мире.
Ключевые слова: Биотехнология, интеграция, факторы, ферменты, микроорганизмы, солод, лактазы, биоэнергетика, фармацевтика, экспоненциал, препараты, папаин.

Introduction: To determine the priorities for the development of biotechnology and the improvement of the country's biological safety system, to ensure the integration of science, education and production in these areas, to develop the economy and social sphere on the basis of advanced biotechnologies, Implementation and organization of a unified state policy in the field of ensuring biological safety of the country, protection of the population from the effects of dangerous biological factors and protection of the environment, prevention of biological hazards, creation of a biological hazard monitoring system is aimed at ensuring the biological safety of the country.

The rapid development of biotechnology and scientific discoveries in the field of enzymology have made enzyme preparations an indispensable element of many food technologies. The use of microorganism enzymes in various sectors of the national economy is

very promising. Currently, enzyme preparations obtained from microorganisms are used in many fields of industry, in agriculture and in medicine. Enzymes are biocatalysts of protein nature, they are formed in the course of vital processes, and due to their participation in the exchange of substances, they provide a dialectic unity between the environment and the organism. The importance of enzymes in life processes occurring in animals, plants and microorganisms is incomparable. These macromolecules provide such important vital processes as transfer of genetic information, bioenergetics, synthesis and decomposition of biomolecules. In the preparation of beer and wine, amylase enzyme preparation of the fungus is used instead of malt. This makes production cheaper. A similar amylase is also used to obtain soluble starch and dextrin. Products made from vegetables and fruits with amylase enzyme contain a lot of sugar and are well digested, especially useful for children. In the preparation of bread and bakery products, amylase accelerates the fermentation of dough and improves the quality of bread. In the confectionery industry, yeast invertase (sucrose) is used to convert sucrose into glucose and fructose, which prevents high amounts of sucrose from crystallization.

Fungal pectinase is used to thicken fruit and grape juice. Lactose is used to obtain lactose-free milk. With the help of lactose, sugar (glucose, galactose) is obtained from whey, which contains a lot of lactose. Fungal glucose oxidase is important because it frees food products from residual glucose and molecular oxygen, thereby extending their shelf life. Glucose oxidase is added to egg powder, mayonnaise, and beer in certain quantities to preserve them for a long time. This enzyme slows down the oxidation of ascorbic acid (vitamin C).

Cellulose preparation is used for sweetening potatoes, extracting starch from potatoes and grain, increasing agar-agar production from algae, preparing vegetable paste, and peeling citrus fruits. It is used in breaking down plant cellulose into sugar. Proteolytic enzymes obtained from microorganisms can replace rennin, which is used to thicken cheese, and later they were used to soften (tenderize) meat. In addition, it is used in the preparation of wine and beer to speed up the ripening of fish when salted.

Lipase has found its place in the production of dry milk, it is used in the preparation of cheese, to accelerate its ripening, to give cheese a special taste and a pleasant smell.

Microbial enzymes are widely used in the production of detergents. Bac. subtilis enzymes with proteolytic, amylolytic and lipolytic activity are usually added to themDrugs are used together with surfactants. Detergents containing enzymes shorten the washing time and extend the preservation of fabrics, as washing is carried out at a temperature not exceeding 40-600C. The use of enzymes makes it possible to increase the speed of technological processes, significantly increase the yield of finished products, improve their quality, save valuable raw materials and reduce the amount of waste. Enzymes are biocatalysts that speed up a chemical reaction to produce a valuable end product. Biotechnology has revolutionized the use of traditional enzymes with potential applications in food, beverages, personal and household care, agriculture, bioenergy, pharmaceuticals and other diverse industries. Regarding the exponential growth of enzymes in biotechnology fields, it is important to highlight the advances and impact of enzyme technology in recent years.

We discuss existing and emerging production approaches, applications, developments and the global need for enzymes. Special attention is paid to hydrolytic microbial enzymes mainly used in industrial bioprocesses. Organs and tissues of cultured plants, special strains

of microorganisms (mold fungi, bacteria) are used to obtain enzyme preparations for food purposes.

Enzyme preparations of microbial origin are obtained by cultivating specific microorganisms capable of producing certain enzymes. Currently, most of the enzymes in the industry are produced under strict control in special bioreactors (fermenters) using bacteria and molds. There are bacterial enzyme preparations obtained by deep cultivation of bacteria and fungal preparations obtained by surface cultivation of microscopic fungi. Enzyme preparations with amylolytic, proteolytic, lipolytic, pectolytic, oxidase activity are used in food technology. They are used in beer, winemaking, baking, alcohol, fruit and vegetable juices, yeast, cheese, cottage cheese, meat and fish products, protein hydrolysates, invert syrup, starch processing.

Modern technologies allow expanding the scope of enzyme preparations. Today, enzymes are successfully used in about 15 food industries, and in each industry, a specific group of enzymes achieves specific goals that improve the quality of the product or increase the yield of this product or reduce the cost of the process. and therefore lowers the cost of production. A deeper understanding of enzyme engineering and integrated use of in silico analysis has not only increased the number of industrial enzymes, but also improved efficiency and production. About 90% of commercial enzymes have been developed. In addition, efficient processing and immobilization strategies have greatly helped to increase the stability, purity, and reusability of enzymes.

Feed enzyme preparation is a new type of nutritional supplement that has appeared in recent years with the continuous development of feed industry and enzyme preparation industry. It has the functions of improving the digestibility of nutrients, improving the stability of compound feed quality, and reducing environmental pollution. As a kind of high-efficiency, non-toxic, side-effect-free and environmentally friendly green feed additive, feed enzyme preparation has become the fastest growing and strongest part of the industrial enzyme industry in the world, and its application effects have been identified .

Since the 80s, Chinese feed enzyme preparations have been added to feeds.

Enzyme preparations approved for use in the Chinese food industry include amylase, glucoamylase, immobilized glucose isomerase, papain, pectinase, β-glucanase, grape oxidase, and α-acetolactate deamination.

Enzymes are mainly used in fruit and vegetable processing, cooking and dairy processing. The amylase industry developed rapidly, the product volume doubled, and the variety gradually increased. By 2006, production exceeded 5 million tons.

The protein content of starch residues and the gelatinization properties of starch in the fermented wet milling process are better than those in the conventional wet milling process. New enzyme preparations are used in the production of glucose, liquid glucose syrup, high maltose syrup, fructose syrup and various oligosaccharides. Instead of sucrose, starch sugar has been used in food processing, candy, beer, and beverage production. It should be noted separately that the parameters of km and ks of all enzymes are not close to each other. The magnitude of the inverse of the dissociation constant is the substrate compatibility constant of the enzyme.

Commercially produced cellulosic enzyme preparations are usually S1 and Sx and similar cellobiase and hemicellulase enzymes, and the pH of these preparations is between 3.0 and 8.0. They are stable between these rNs. Cellulase producers are often mycelial fungi,

including Penicillium notatum, P. vuriabili, P. iriense, Trichoderma roseum, Verticillium alboatrum and others.

Pectinases are enzymes that synthesize pectin. Pectolytic enzymes form a complex, the individual components of which break down the pectin molecule from different parts.

Pectinases (polygalacturonases) are widely distributed in microorganisms and rarely found in plants

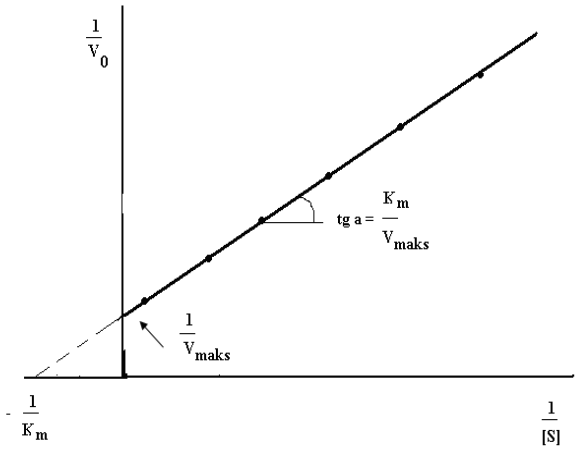
Proteinases. Proteinases or proteases - (peptide-peptide-hydrolases) catalyze the reaction of breaking peptide bonds in the protein molecule, as a result of which free amino acids form di- and polypeptides.

There are many such enzymes. Some of them are obtained in the crystalline state. Microorganism proteinases can be radically different in their properties. They can be neutral (Bacillus subtillis, Asp.terricola), acidic (Asp.foetidus) and alkaline, that is, they are active at different levels of pH. microorganisms have the ability to synthesize several proteinases. For example: Actinomyces fradiae synthesizes 6 proteinases

Methodology: Amylases - amylases obtained from bacteria and fungi break down starch into small molecular sugars: dextrins, glucoses, maltoses.

Bacterial proteases are used to break down proteins in cheese making and tanning. Bacillus sp. Glucose isomerase enzyme helps to convert glucose into fructose In recent times, scientists have been paying attention to the following: adaptation to cyclodextrin glucosyltransferase (SDGT), production of cyclodextrin compounds: it is necessary in chemical and pharmacological production, in improving the quality of food products, in the production of cosmetics, etc.

Lipases - (3.1.1.3-triacylglycerol hydrolases) are enzymes of great practical interest, involved in lipid (fat) metabolism.



The higher the substrate compatibility constant of the enzyme, the smaller the value of ks. The value of km can be determined according to the formula. But in order to ensure a high degree of accuracy of determination, it is required to use the linear form of Michaelis-Menten equation. Based on the Michaelis-Menten equation, G. Leinunver and D. Berkler proposed to determine in the method of binary inverse quantities

$1/V_0 = (k_m/V_{maks} * 1/[S]) + 1/V_{maks}$

In the picture. Dependence of the rate of enzymatic reactions on the concentration of the substrate in secondary inverse quantities (Leinunver-Burke graph)

As shown in the picture, the dependence of 1 / [S] on 1 / V0 is calculated by shortening the abscissa axis by linear extrapolation and calculating km and Vmax.

With the help of various inhibitors, it is possible to change the speed of enzymatic reactions and determine the way in which the inhibition takes place. As an example, some models of the effect of feedback inhibitors can be considered.

Competitive Inhibition:

$$E_{erkin} + S \leftrightarrow ES \rightarrow E + M$$
$$E_{erkin} + I \leftrightarrow EI$$

Here, the inhibitor reacts only with the free enzyme and cannot bind to the substrate bound enzyme. According to the Michaelis equation, the speed of the enzymatic reaction in the presence of a competitive inhibitor can be determined based on the following formula.

Conclusions: Standardization is an activity aimed at achieving the most optimal level of regulation in a specific field, defining rules for common and repeated use in relation to existing or expected tasks. the main goal of international standards is to create a unified methodological basis for the development of new quality systems at the international level and the improvement of existing quality systems and their certification. Scientific and technical cooperation in the field of standardization is aimed at coordinating the national standardization system with international, regional and progressive national standardization systems. Both backward countries and developed countries are equally interested in international standardization. Depending on the certification procedure, one type of copy of this product, a selection, or a copy of the product may be tested. Descriptions and parameters of the product, requirements for them are given in regulatory documents.

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